ENVIRONMENTAL IMPACT ASSESSMENT REPORT

PROPOSED DEVELOPMENT OF THE NEW MONTROSE INTERCHANGE, MPUMALANGA, SOUTH AFRICA

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1 INTRODUCTION

The **South African National Roads Agency (SANRAL)** is proposing road upgrades by introducing a road interchange at the existing T-junction of the National N4 toll route via Ngodwana between eMgwenya (Waterval Boven) and Mbombela (Nelspruit) with the alternative N4 Schoemanskloof (R539) Route, Mpumalanga Province of South Africa.

As part of continual upgrading of this road corridor between Pretoria in the west and Maputo, Mozambique in the east; a need has arisen to introduce such an interchange to:

- Improve traffic flow speeds; and
- Drastically improve the safety of motorists.

Currently, unsafe conditions and a high number of road accidents are experienced at (and in close proximity) to this existing T-junction which can be attributed to a few factors such as confusion at the right turn made (east to west bound) by motorists to the N4 Schoemanskloof (R539) Route, vehicles colliding with stationery vehicles waiting to turn right (east to west bound), blind rise just before the T-junction for motorists travelling on the N4 from west to east bound and a blind rise and sharp corner currently posing a hazard to motorists travelling on the N4 Schoemanskloof (R539) Route after taking the T-junction right turn (east – west bound).

SANRAL has appointed an implementing agent and concessionaire for the National N4 Toll Route existing between Pretoria and Maputo known as “Trans African Concessions” (TracN4) – a concessionaire established during the mid-90’s specifically for the management of the N4 corridor between South Africa and Mozambique. TracN4, as SANRAL’s implementing agent ultimately needs to ensure compliance with all conditions of environmental licenses, permits and similar authorisations as custodians of the N4 road on behalf of SANRAL.

Prism Environmental Management Services (Prism EMS) has been appointed as the independent Environmental Assessment Practitioners (EAP) to undertake the required environmental authorisation processes required by a host of environmental legislation. Such process referred to as an ***Environmental Authorisation process*** and the details of which are discussed and described in the contents of this report.

1.1 Process to Date

1.1.1 Public Participation | Initial Notification and Registration

In order to provide an opportunity to all potential Interested and Affected Parties (I&APs), and I&AP database was compiled and included adjacent landowners, businesses, and authorities. A Background Information Document (BID) as well as Advert and Site Notice were also developed and included information on the proposed development.

I&APs were provided with a copy of the BID via email and were provided between **13 September 2019 and 4 October 2019** to register. An advert was also placed in the Lowvelder and the Star Newspaper. In addition, four site notices were placed in the area. All comments received were added to the Comments and Response Report.

1.1.2 Public Participation | Additional Notification and Public Open Days

After initial notification was completed, an additional round of notification was undertaken and combined with another project which is subsequently been run separately to the Scoping and EIA process. Details of this additional notification are however included.

As part of this an advert was placed in the Lowvelder and the Star Newspaper on 15 November 2019. In addition, site notices were placed in the area and I&APs were provided copies of an updated copy of the BID. All comments received relating to the Montrose Interchange were added to the Comments and Response Report. A 30-day registration period was provided between **15 November 2019 and 14 December 2019**.

Further, two open days were undertaken at the Schoemanskloof Boerevereeniging Hall on **29 and 30 November 2019**. These open days were well attended; however, these attendees have registered for the BAR process for the upgrade of the R539 road being run in parallel to this EIA process. There details have however been included in the I&AP database for this project.

1.1.3 Application

An application for the Environmental Authorisation was submitted to the competent authority, the Department of Environmental Affairs, Forestry and Fisheries (DEFF) on 22 September 2020. A reference number was issued by the Department on 2 October 2020:

- 14/12/16/3/3/2/2003

1.1.4 Scoping Report

The public review of the Scoping Report took place between **22 September 2020 and 23 October 2020**. Formal comments were received from the DEFF. In addition, a number of smaller comments (in regard to access to the report and organisation of a site visit etc.) were also received. These were included in the Comments and Responses Report and taken into account in the final submission of the Scoping Report which took place on **26 October 2020**.

The Scoping Report was subsequently approved by the Department on **13 November 2020**.

1.1.5 Public Review of the EIA Report

The public review of the Environmental Impact Assessment (EIA) Report took place between **13 November 2020 and 14 December 2020**. Further, it should be noted that a reminder email was sent out to encourage I&APs to provide comments on 3 December 2020. Proof of this reminder is provided in Appendix 14.5.5.3.

Formal comments were received from the Department of Environment, Forestry and Fisheries (DEFF) on 14 December 2020. In addition, formal comments were also received from the following Departments:

- Mpumalanga Tourism and Parks Agency (MTPA) on 11 December 2020; and
- City of Mbombela Local Municipality on 11 December 2020.

In addition, a number of smaller comments (acknowledging receipt, noting support or requesting a document) were also received. . All comments received have been included in the Comments and Responses Register which can be found in Appendix 14.5.6**.** A copy of these comments are also included in Appendix 14.5.7.3. Furthermore, at the request of the Mbombela Local Municipality, a site visit was arranged and with Authorities and took place on 8 December 2020. The following authorities attended:

- MTPA;
- City of Mbombela; and
- Ehlanzeni District Municipality;

A copy of the attendance register is contained in Appendix 14.5.9.

These comments received during the public review of the EIA Report have not resulted in substantive changes. Small changes that were necessary are underlined and include:

- Addition of Section 1.1.5. to discuss the public review of the EIA Report.
- General changes in tense where necessary relating to the public review.
- Addition of paragraph under Section 1.2. to show how DEFF Comments on the EIA Report have been taken into account.
- Addition of Table 4.4. to Section 4.4. to summarise project components as requested by DEFF comments.
- Addition of Section 8.5.3 to discuss comments received during the EIA Phase.
- Addition to Section 8.5.4 to discuss the site visit that took place on 8 December 2020.
- Addition to Section 10.2.5. in regards to issues raised during the EIA Report review and how these were incorporated into the Impact Assessment.
- Relevant changes to Table 8-1 regarding the status of the process.
- Addition of Appendix 14.6.8. to provide specialist declarations as requested by the Department in their Acceptance of Scoping letter dated 13 November 2020.

The requirements of MTPA have also been taken into account in the EMPR.

1.2 EIA Report Requirements and Outline

According to Section 2 of Appendix 3 of the 2014 EIA Regulations, the objective of the EIA process is to, through a consultative process.

(a) determine the policy and legislative context within which the activity is located and document how the proposed activity complies with and responds to the policy and legislative context;

(b) describe the need and desirability of the proposed activity, including the need and desirability of the activity in the context of the preferred location;

(c) identify the location of the development footprint within the preferred site based on an impact and risk assessment process inclusive of cumulative impacts and a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment;

(d) determine the--

(i) nature, significance, consequence, extent, duration and probability of the impacts occurring to inform identified preferred alternatives; and

(ii) degree to which these impacts-

(aa) can be reversed;

(bb) may cause irreplaceable loss of resources, and

(cc) can be avoided, managed or mitigated;

(e) identify the most ideal location for the activity within the preferred site based on the lowest level of environmental sensitivity identified during the assessment;

(f) identify, assess, and rank the impacts the activity will impose on the preferred location through the life of the activity;

(g) identify suitable measures to avoid, manage or mitigate identified impacts; and

(h) identify residual risks that need to be managed and monitored.

The EIA process for the proposed Montrose Interchange aims to ensure that the objectives described above are met. In line with this, an outline of the EIA Report (and its relationship to the requirements to Appendix 3 of 2014 EIA Regulations) is provided in **Table 1-1.**

Table 1-1: Required contents of the EIA Report.

Chapter Number	Chapter Name	Requirements included in Appendix 3 of 2014 EIA Regulations
1.	Introduction	3(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.
2.	Environmental Assessment Practitioner	3(a) details of- (i) the EAP who prepared the report; and (ii) the expertise of the EAP, including a curriculum vitae
3.	Legislative Framework	3(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
4.	Project Description	3 (b) the location of the activity, 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; 3 (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; 3 (d) a description of the scope of the proposed activity, including-

Chapter Number	Chapter Name	Requirements included in Appendix 3 of 2014 EIA Regulations
		(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.
5.	Description of the Receiving Environment	3(h) a full description of the process followed to reach the proposed development footprint within the approved site, including: (iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.
6.	Need and Desirability	3 (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 location;
7.	Alternatives	3(h) a full description of the process followed to reach the proposed development footprint within the approved site, including: (i) details of the development footprint alternatives considered (iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.
8.	Public Participation	3(h) a full description of the process followed to reach the proposed development footprint within the approved site, including: (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.
9.	Summary of Specialist Studies	3(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.

Chapter Number	Chapter Name	Requirements included in Appendix 3 of 2014 EIA Regulations
10.	Impact Assessment	3(h) a full description of the process followed to reach the proposed development footprint within the approved site, including: (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 locations for the activity were investigated, the motivation for not considering such; and 3(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 location 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

Chapter Number	Chapter Name	Requirements included in Appendix 3 of 2014 EIA Regulations
		(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. 3(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.
11.	Environmental Impact Statement	3(h) a full description of the process followed to reach the proposed development footprint within the approved site, including: (x) a concluding statement indicating the preferred alternative development location within the approved site. 3(g) a motivation for the preferred development footprint within the approved site. 3(I) 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 site 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.

Chapter Number	Chapter Name	Requirements included in Appendix 3 of 2014 EIA Regulations
		3(m) based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorization. 3 (n) the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment; 3(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. 3(p) a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed; 3(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; 3(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; 3(t) where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts; 3(v) any specific information that may be required by the competent authority; and 3(w) any other matters required in terms of section 24(4)(a) and (b) of the Act.
12.	EAP Undertaking	3(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

Chapter Number	Chapter Name	Requirements included in Appendix 3 of 2014 EIA Regulations
		(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.
13.	References	-
14.	Appendices	3(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.

In addition to the above, the Regulations also note that the EIA process must be undertaken in line with the approved plan of study for environmental impact assessment that was included in the Scoping Report. To this end, a summary of how the EIA Process is in line with the Approved Plan of Study is provided in **Table 1-2.**

Table 1-2: Alignment with Plan of Study

Item	Plan of Study Requirement	Reference in Report
1.	Specialist Studies – • Ecological Assessment; • Aquatic Assessment; • Wetland Assessment; • Visual Impact Assessment; and • Phase 1 Heritage Impact Assessment. Technical Reports/Input • Preliminary design report; and • Geotechnical Assessment. .	Section 9 Copies included in Appendix 14.6
2.	Impact Assessment Methodology	Section 10 Appendix 14.7.
3.	Public Participation	Section 8 Appendix 14.5

Section 3(u) of Appendix 3 of the 2014 EIA Regulations notes that the EIA Report should provide an indication of any deviation from the approved scoping report. **No deviation from the Plan of Study for the EIA however has been undertaken.**

In addition to the above, the EIA Report aims to ensure that DEFF's comments on the Scoping Report (as part of the acceptance of the Scoping Report) are addressed. **Table 1-3** below provide a summary of these comments, as well as where they have been addressed in the report.

Table 1-3: DEFF requirements for the EIA Report

Item	DEFFs Comment – 13 November 2020	Reference in the Report	Comment
1.	**ACCEPTANCE OF THE SCOPING REPORT FOR THE PROPOSED ROAD UPGRADES BY INTRODUCING A ROAD INTERCHANGE AT THE EXISTING T·JUNCTION OF THE NATIONAL N4 TOLL ROUTE VIA NGODWANA BETWEEN EMGWENYA (WATERVAL BOVEN) AND MBOMBELA (NELSPRUIT) WITH THE ALTERNATIVE N4 SCHOEMANSKLOOF (R539) ROUTE IN THE MPUMALANGA PROVINCE** The final Scoping Report (SR) and the Plan of Study for Environmental Impact Assessment dated October 2020 and received by the Department on 26 October 2020, refer. The Department has evaluated the submitted final SR and the Plan of Study for Environmental Impact Assessment dated October 2020 and is satisfied that the documents comply with the minimum requirements of the Environmental Impact Assessment (EIA) Regulations, 2014, as amended. The FSR is hereby accepted by the Department in terms of Regulation 22{1)(a) of the EIA Regulations,2014, as amended. You may proceed with the Environmental Impact Assessment {EIA) process in accordance with the tasks contemplated in the Plan of Study for Environmental Impact Assessment as required in terms of the EtA Regulations, 2014, as amended.	N/A	Noted and included in the Comments and Responses. Refer to specific responses below.

Item	DEFFs Comment – 13 November 2020	Reference in the Report	Comment
	In addition, the following amendments and additional information are required for the EIAr:		
2.	(a) Listed Activities i. The application form must be amended to include the specific and correct sub listed activity for each listed activity applied for. The amended signed application form must be submitted with the EIAr. ii. Please note that the Department's application form template has been amended and can be downloaded from the following link https://www .environment.gov .za/documents/forms. iii. The listed activities represented in the EIAr and the application form must be the same and correct. iv. The EIAr must provide an assessment of the impacts and mitigation measures for each of the listed activities applied for.	Section 4.2. Section 10.2.1.	Details of the sub activities are included in the Section 4.2 An amended application form will be submitted with the Final EIR. Further, please refer to Section 10.2.1. which provides an assessment of the impacts related to the listed activities. Mitigation measures are also included in the Quantitative Impact Assessment Table in Section 10.3. and detailed further in the EMPr.
3.	(b) Public Participation (i) Please ensure that comments from all relevant stakeholders are submitted to the Department with the EIAr. This includes but is not limited to the Mpumalanga Department of Agriculture ,Rural Development, Land & Environmental Affairs (MDARDLEA), the Ehlanzeni District Municipality {EDM) ,Mbombela Local Municipality (MLM), the Mpumalanga Provincial Heritage Resource Authority (MPHRA), the South African Heritage Resources Agency {SAHRIS) the lnkomati-Usuthu Catchment Management Agency (IUCMA) ;	Section 8 Appendix 14.5.6..	Noted. A copy of the EIR was provided to the mentioned Departments. They have all confirmed that email with a link to download is sufficient other than MDARDLEA who requested a USB which was duly been provided. A dropbox link will also be provided to Mr Lekota. All proof of notification is included in the Final EIR.

Item	DEFFs Comment – 13 November 2020	Reference in the Report	Comment
	The Department of Environment, Forestry and Fisheries - Biodiversity and Conservation Directorate contact details are as follows : For attention: Mr. Seoka Lekota Tel: 012 399 9573 Email: Slekota@environment.gov.za (ii) Please ensure that all issues raised and comments received during the circulation of the draft SR and draft EIAr from registered I&APs and organs of state which have jurisdiction in respect of the proposed activity are adequately addressed in the final EIAr. (iii) Proof of correspondence with the various stakeholders must be included in the final EIAr. Should you be unable to obtain comments, proof should be submitted to the Department of the attempts that were made to obtain comments . (iv) A Comments and Response trail report {C&R) must be submitted with the final EIAr. The C&R report must incorporate all comments for this development. The C&R report must be a separate document from the main report and the format must be in the table format as indicated in Appendix 1 of this letter. Please refrain from summarising comments made by I&APs. All comments from I&APs must be copied verbatim and responded to clearly. Please note that a response such as "noted" is not regarded as an adequate response to I&AP's comments. {v) Comments from I&APs must not be split and arranged into categories. Comments from each submission must be responded to individually. (vi) The Public Participation Process must be conducted in terms of Regulation 39, 40,41, 42, 43 & 44 of the EIA Regulations, 2014, as amended.		Further, the comments and responses report included in Section 14.5.6. has been updated to include all comments received during the review of the EIR and included in the final submission. Comments and have not been summarised and are provided verbatim. Public participation was undertaken in line with EIA Regulations, 2014 (as amended) It should be noted that a reminder email was sent out to encourage I&APs to provide comments on 3 December 2020. Proof of this is provided in Appendix 14.5.5.3. In addition, a site visit was undertaken at the request of the local municipality and all Authoriries were invited so that they could see the project site and gain a better understanding of the proposed development. Representatives of MTPA, City of Mbombela Local Municipality and Ehlanzeni District Municipality attended.

Item	DEFFs Comment – 13 November 2020	Reference in the Report	Comment
4.	(c) Layout & Sensitivity Maps (i) The EIAr must provide coordinate points for the proposed development site (note that if the site has numerous bend points, at each bend point coordinates must be provided) as well as the start, middle and end point of all linear activities . (ii) A copy of the final layout map must be submitted with the final EIAr and all available biodiversity information must be used in the finalisation of the layout map. (iii) Existing infrastructure must be used as far as possible and the layout map must indicate the following: All supporting onsite infrastructure ; The location of sensitive environmental features on site e.g.CBAs,heritage sites, wetlands ,drainage lines etc. that will be affected; Buffer areas; and All "no-go" areas. (iv) The final EIAr must include an environmental sensitivity map indicating environmental sensitive areas, buffer areas and features identified during the assessment process. (v) A map combining the final layout map superimposed {overlain) on the environmental sensitivity map.	Section 7.4. Section 11.1.	A desktop sensitivity map is included in Section 7.4. This map was utilized to identify the necessary specialist studies. This map was then updated on the basis of the findings of the various specialists. The updated and final sensitivity map is included in Section 11.1.
5.	(d) Specialist assessments (i) The EAP must ensure that the terms of reference for all the identified specialist studies must include the following: - A detailed description of the study's methodology; indication of the locations and descriptions of the development footprint, and all other	Section 9 Appendix 14.6.	Please refer to Section 9 for the summarises of the Specialist studies as well as Appendix 14.6 for copies of all specialist studies. All specialists were provided with the development layout which form the basis of their findings.

Item	DEFFs Comment – 13 November 2020	Reference in the Report	Comment
	associated infrastructures that they have assessed and are recommending for authorisations. Provide a detailed description of all limitations to the studies. All specialist studies must be conducted in the right season and providing that as a limitation will not be allowed. Please note that the Department considers a 'no-go' area, as an area where no development of any infrastructure is allowed; therefore, no development of associated infrastructure including access roads is allowed in the 'no-go' areas. Should the specialist definition of 'no-go' area differ from the Departments definition; this must be clearly indicated. The specialist must also indicate the 'no-go' area's buffer if applicable. - All specialist studies must be final, and provide detailed/practical mitigation measures for the preferred alternative and recommendations, and must not recommend further studies to be completed post EA. (ii) Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons; and were necessary, include further expertise advice .		No contradictory findings from specialists were received. However please refer to Section 10 and 11 for a summary of the findings of the specialists as well as the assessment of alternatives.
6.	(e) Specialist Declaration of Interest (i) Specialist Declaration of Interest forms must be attached to the final EIAr. The forms are available on Department's website (please use the Department's template}.	N/A	A copy of all specialist declarations are included in Appendix 14.6.8.

Item	DEFFs Comment – 13 November 2020	Reference in the Report	Comment
7.	(f) The EMPr must include the following: (i) All recommendations and mitigation measures recorded in the EIAr and the specialist studies conducted. (ii} The final site layout map. (iii) Measures as dictated by the final site layout map and micro-siting. (iv) An environmental sensitivity map indicating environmental sensitive areas and features identified during the EIA process. (v) A map combining the final layout map superimposed (overlain) on the environmental sensitivity map. (vi) An alien invasive management plan to be implemented during construction and operation. The plan must include mitigation measures to reduce the invasion of alien species and ensure that the continuous monitoring and removal of alien species is undertaken. (vii} A plant rescue and protection plan which allows for the maximum transplant of conservation important species from areas to be transformed . This plan must be compiled by a vegetation specialist familiar with the site and be implemented prior to commencement of the construction phase. (viii} A re-vegetation and habitat rehabilitation plan to be implemented during construction and operation. Restoration must be undertaken as soon as possible after completion of construction activities to reduce the amount of habitat converted at any one time and to speed up the recovery to natural habitats.	Appendix 14.8.	Please refer to Appendix 14.8 for a copy of the EMPr. Mitigation measures in regard to alien invasive species, plant rescue, rehabilitation, traffic, stormwater, and fire are included therein. Further, a monitoring plan is also included as part of the EMPr. Very detailed measures in regard to aquatic resources and drainage lines as recommended by the Aquatic and Wetland Specialist are also included.

Item	DEFFs Comment – 13 November 2020	Reference in the Report	Comment
	(ix} A traffic management plan to ensure that no hazards would results from the increased traffic and that traffic flow would not be adversely impacted. This plan must include measures to minimize impacts on local commuters. (x} A storm water management plan to be implemented during construction and operation. The plan must ensure compliance with applicable regulations and prevent off-site migration of contaminated storm water or increased soil erosion. The plan must include the construction of appropriate design measures that allow surface and subsurface movement of water along drainage lines so as not to impede natural surface and subsurface flows. (xi) A fire management plan to be implemented during the construction. (xii) An effective monitoring system to detect any leakage or spillage of all hazardous substances during their transportation, handling, use and storage. This must include precautionary measures to limit the possibility of oil and other toxic liquids from entering the soil or storm water systems. (xiii) Measures to protect hydrological features such as streams , rivers, pans, wetlands , dams and their catchments, and other environmental sensitive areas from construction impacts including the direct or indirect spillage of pollutants.		
8.	General The applicant is hereby reminded to comply with the requirements of Regulation 45 of GN R982 of 04 December 2014, as amended, with regard to the time period allowed for complying with the requirements of the Regulations.	N/A	Noted. The Final EIR will be submitted within the prescribed timeframes. The applicant is aware of Section 24F and no activity will commence prior to the granting of the EA.

Item	DEFFs Comment – 13 November 2020	Reference in the Report	Comment
	You are hereby reminded of Section 24F of the National Environmental Management Act, Act No. 107of 1998, as amended,that no activity may commence prior to an environmental authorisation being granted by the Department.		

Further, as mentioned, the EIA Report was made available for public review between 13 November 2020 and 14 December 2020. Formal comments were received from DEFF on 14 December 2020. The final submission of the EIA Report plans to ensure that these comments have been addressed.

These comments received during the public review of the EIA Report have not resulted in substantive changes. Small changes that were necessary are underlined and include:

- Addition of Section 1.1.5. to discuss the public review of the EIA Report.
- General changes in tense where necessary relating to the public review.
- Addition of paragraph under Section 1.2. to show how DEFF Comments on the EIA Report have been taken into account.
- Addition of Table 4.4. to Section 4.4. to summarise project components as requested by DEFF comments.
- Addition of Section 8.5.3 to discuss comments received during the EIA Phase.
- Addition to Section 8.5.4 to discuss the site visit that took place on 8 December 2020.
- Addition to Section 10.2.5. in regards to issues raised during the EIA Report review and how these were incorporated into the Impact Assessment.
- Relevant changes to Table 8-1 regarding the status of the process.
- Addition of Appendix 14.6.8. to provide specialist declarations as requested by the Department in their Acceptance of Scoping letter dated 13 November 2020.

1.3 Public Participation as part of the EIA Phase

In order to ensure that all I&APs have an opportunity to review and comment on the EIA Report (EIR), all registered I&APs were notified by email or SMS of the review of the EIA Report which took place between **13 November 2020 and 14 December 2020.**

It should be noted that the President of the Republic of South Africa has called a National State of Emergency related to the Global COVID-19 Pandemic. In light of this, the Minister published Directions regarding permitting processes (GN 650 Of 5 June 2020). These directions have been taken into account and a Public Participation Plan was submitted on 21 September 2020 and approved the next day. Proof was submitted as part of the Application Form.

As part of the public participation plan, the following was noted in terms of the public review of the EIA Report:

- The EIA report will also be made available for comment on the Prism EMS website i.e. no physical interactions are planned for the rest of the process as I&AP's indicated that the preferred way of communique to be via digital platform.
- In cases where hand delivery of reports is required, the following measures will be implemented.
    - Reports will be placed in file or saved on an USB device and the file/device will be wiped down with sanitizer prior to delivery.

- Delivery person will maintain at least 2m distance.
- Delivery person will wear mask.
- Delivery person will sanitize his/her hands prior to and after delivery of documents.
- Where possible electronic means of communication will be utilized
- Standard COVID-19 safety protocols apply.
- Internal Prism EMS COVID-19 safety protocols

1.4 Authorities

The following competent authorities are involved in the decision-making process:

- DEFF with reference to activities under the:
  - EIA Regulations and Listing Notices, 2014 (NEMA)
- The Inkomati-Usuthu Catchment Management Agency (IUCMA) in reference to
  - Section 21 Activities in terms of the National Water Act (NWA) (Act No 36 of 1998) in regard to the General Authorisation (Notice 509 of 2016).
- The South African Heritage Resources Agency (SAHRIS) and Mpumalanga Provincial Heritage Resource Authority (MPHRA) in reference to:
  - Section 38(8) of the National Heritage Resources Act, 1999 (Act 25 of 1999).

Other commenting authorities will be the Mpumalanga Department of Agriculture, Rural Development, Land & Environmental Affairs (MDARDLEA), the Ehlanzeni District Municipality (EDM) as well as the Mbombela Local Municipality (MLM).

1.5 Applicant and Landowners

The applicant is the entity that will assume responsibilities as the holder of the environmental authorisation if granted. Details of the applicant are contained in **Table 1-4**.

Table 1-4.: Details of the Applicant and Landowner

Applicant:	South African National Road Agency Limited
Contact Person:	Mr Mogole Mphahlele
Address:	PO Box 415 Pretoria 0001

Please note that SANRAL through its Concessionaire (TracN4) is in the process of acquiring the necessary sections of the affected land but the process is not complete. These landowners however have been notified of the proposed development and included in consultations and communications. They will also be provided an opportunity to comment on the Scoping and EIA Reports. **Table 1-5** provides the details of the affected properties and landowners.

Table 1-5: Details of Landowners

Property Name	Owner	Contact Person
Portion 19 of Farm Elandshoek 302	Mashobotho Communal Property Association	Johann Mare
Portion 0 of Farm Montrose 573	Houtbosloop Boerdery PTY LTD	Francois Johannes Joubert (Joubert and Sons Citrus)
Portion 2 of Farm Montrose 290	Smokey Mountain Trading 189 Pty Ltd	
Portion 4 of Farm Montrose 290	Lag N Biekie Boerdery CC	Willem Johannes Marthinus Piek
Portion 0 of Farm Montrose 574	Hotazel Developments No 1	Adriaan Petrus Smuts

2 ENVIRONMENTAL ASSESSMENT PRACTITIONER

Prism EMS have been appointed to undertake the required Environmental Authorisation process in terms of the required Environmental Impact Assessment. Details and expertise of the Environmental Assessment Practitioner (EAP) who prepared the EIA Report and EMPr are provided in **Table 2-1** and Curriculum Vitae is appended in **Appendix 14.1**.

Table 2-1.: Details of the EAP.

EAP:	Vanessa Stippel	Ryan Nawn
Company:	Prism Environmental Management Services	Prism EMS
Qualifications:	MSc. Ecology, Environment and Conservation	MSc. Environmental Management
Experience:	10 years	19 years
Affiliation/ Registration	Professional Member of Southern African Institute of Ecologists and Environmental Scientists Member of IAIAsa (6020) SACNASP: Pr.Sci.Nat. (116221) EAPASA: Registered EAP in terms of Section 24H of NEMA, 1998 (as amended) (2019/175)	SAATCA Registered Lead Auditor Member of IAIAsa (2450)
Address:	PO Box 1401, Wilgeheuwel, 1736	89 Burns Street, Colbyn, Pretoria
Tel:	087 985 0951	073 253 1081
Fax:	086 601 4800	086 601 4800
Email:	vanessa@prismems.co.za	ryan@prismems.co.za

Designation	**Name**	**Qualification**	**Professional Registration**	**Specialist Assessment**
Prism EMS Team				
Contact Details	**Post:** PO Box 1401, Wilgeheuwel, Johannesburg, 1736		**Tel:** 087 985 0951 Fax: 086 601 4800 **Email:** prism@prismems.co.za www.prismems.co.za	
Project Director	De Wet Botha	MA. Environmental Management PHED	SACNASP Registered Scientist – Pr.Sci.Nat. (119979) EAPASA: Registered EAP (2019/1209) Member of the International Association for Impact Assessors (IAIAsa) (1653) Member of the Gauteng Wetland Forum Member of the South African Wetland Society	Project Management and Quality Control and Review

3 LEGISLATIVE FRAMEWORK

This section aims to provide an overview of key policy, legislation, plans, guidelines and municipal development planning frameworks triggered by the proposed project. The requirements set out in these Act's and Regulations will be adhered to through the scoping and impact assessment phases of the project.

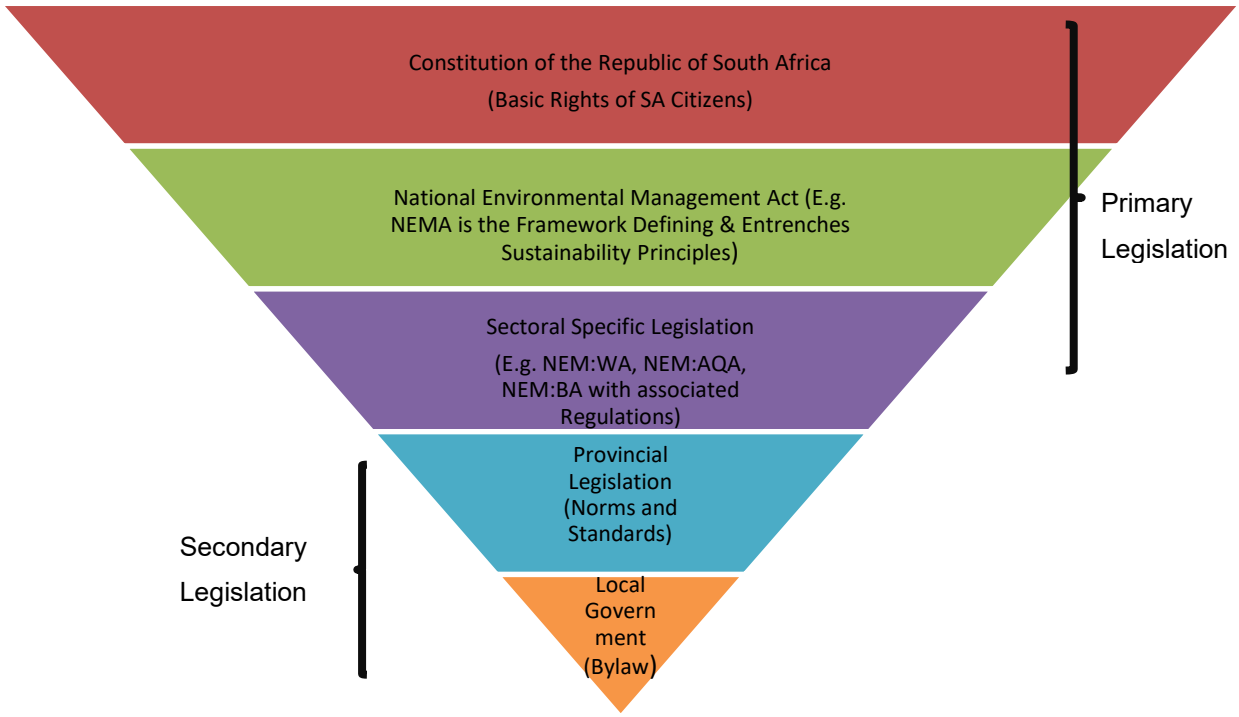


Figure 3-1: South African Environmental Legislation Hierarchy.

The following Acts, Regulations, By-Laws and Guidelines are applicable to the proposed development.

3.1 Constitution of the Republic of South Africa

Section 24 of the Constitution states that –

"Everyone has the right to -

a) an environment that is not harmful to their health or well-being; and

b) 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 ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

3.2 National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998)

The NEMA is the umbrella framework for all environmental legislation primarily to assist with implementing the environmental rights of the Constitution (refer to Section 3.1). The NEMA provides fundamental principles required for environmental decision making and to achieve sustainable development. It also makes provision for duty of care to prevent, control and rehabilitate the effects of significant pollution and environmental degradation, and prosecute environmental crimes. These principles must be adhered to and taken into consideration during the impact assessment phase.

NEMA defines "environment" as –

"the surroundings within which humans exist and that are made up of –

(i) the land, water and atmosphere of the earth;

(ii) micro-organisms, plants and animal life;

(iii) any part or combination of (i) or (ii) and the interrelationship among and between them; and

(iv) the physical, chemical, aesthetic and cultural, properties and conditions of the foregoing that influence human health and well-being."

Section 24D and 24(2) of the NEMA makes provision for the publication of list and associated regulations containing activities identified that may not commence without obtaining prior environmental authorisation from the competent authority. These regulations are referred to as the EIA Regulations and are interpreted hand in hand with the various listed activities discussed further below.

3.2.1 Environmental Impact Assessment Regulations, 2014 (GN R 982 of 4 December 2014, as amended)

The EIA regulations were promulgated in terms of Section 24 of the NEMA, for the purpose of providing methodologies and specific requirements for the undertaking of an EIA. The Regulations stipulate that any proposed activity listed in the associated notices must undertake either a Basic Assessment (BA) or Scoping & Environmental Impact Report (S&EIR) in order to obtain an environmental authorisation (if granted) by the competent authority before the commencement of the specified listed activity.

The EIA Regulations provide the minimum requirements for appointing an Environmental Assessment Practitioner (EAP) and for undertaking the relevant Public Participation Process (PPP) as required. They also detail the contents of the impact assessment reports and all other aspects associated with BA and/or EIAs.

The following listed activities have been identified in terms of the subsequent Government Notices:

3.2.1.1 Listing Notice 1: GN R 983 of 4 December 2014 (as amended)

Activities listed under this process require a Basic Assessment process to be undertaken. A number of activities are triggered in terms of Listing Notice 1 and include:

- **Activity 9 (1) -** The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water (i) with an internal diameter of 0,36 metres or more; or (ii) with a peak throughput of 120 litres per second or more;
- **Activity 12(ii)(a)(c**) - The development of—(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;
- **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;
- **Activity 48 (i)(a)(c)-** The expansion of – (i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or (ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more; where such expansion occurs – (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; and
- **Activity 56** - The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre – (i) where the existing reserve is wider than 13,5 meters; or (ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.

Please refer to **Section 4.2.** which provides a more detailed assessed of why these activities are triggered.

3.2.1.2 Listing Notice 2: GN R 984 of 4 December 2014

Activities listed under this process require Scoping and EIA to be undertaken. Due to the fact that the proposed interchange development involves the development of a road which caters for more than one lane of traffic and has a road reserve wider than 30m, Activity 27 of Listing Notice 2 is triggered:

The development of a road –

-with a reserve wider than 30 metres; or

-catering for more than one lane of traffic in both directions;

but excluding a road—

-for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010, in which case activity 24 in Listing Notice 1 of 2014 applies;

-which is 1 kilometre or shorter; or

-where the entire road falls within an urban area.

As such a Scoping and EIA process is applicable. Please refer to **Section 4.2**. which provides a more detailed assessed of why this activity is triggered.

3.2.1.3 Listing Notice 3: GN R 985 of 4 December 2014

Activities listed under this process require a Basic Assessment process to be undertaken but only in specified geographic areas. Due to the fact that part of the proposed development falls within a Critical Biodiversity Areas, a number of activities are triggered in terms of Listing Notice 3. These include:

- **Activity 4(f)(i)(ff)** - The development of a road wider than 4 metres with a reserve less than 13,5 metres;
- **Activity 12 (f)** - 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;
- **Activity 14 (f)** - The development of (i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such Development occurs— (a) within a watercourse; (b) in front of a development setback; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;
- **Activity 18 (f) -** The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre;
- **Activity 23 (f)(i)(ee)** - The expansion of – (i) dams or weirs where the dam or weir is expanded by 10 square metres or more; or (ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such expansion occurs – (a) within a watercourse; (b) in front of a development setback adopted in the prescribed manner; or (c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.

Please refer to **Section 4.2**. which provides a more detailed assessed of why these activities are triggered.

3.2.2 GN 960 of 5 July 2019 | Notice of the requirements to submit a report generated by the National Web Based Environmental Screening Tool in terms of Section 24(5)(h) of the National Environmental Management Act, 1998 and Regulation 18(1)(b)(v) of the EIA Regulations, 2014 (as amended)

As per the requirements of GN 960 of 5 July 2019, a report was generated on the National Screening tool and is submitted as part of the Scoping Report.

3.2.3 Directions Regarding Measures to Address, Prevent and Combat The Spread Of COVID -19 Relating To National Environmental Management Permits And Licences (GN 650 Of 5 June 2020)

The purpose of the Directions is to curtail the threat posed by the COVID -19 pandemic and to alleviate, contain and minimise the effects of the national state of disaster, and in particular to provide directions to ensure fair licensing processes and public participation processes. In line with the requirements, a Public Participation Plan has been compiled and subsequently approved by the Department.

3.2.4 Directions Regarding Measures to Address, Prevent and Combat The Spread Of COVID -19 Relating To National Environmental Management Permits And Licences (GN 970 Of 9 September 2020)

The purpose of the Directions is to curtail the threat posed by the COVID -19 pandemic and to alleviate, contain and minimise the effects of the national state of disaster, and in particular to provide directions to ensure fair licensing processes and public participation processes. These Directions apply to Alert Level 2 and lower. As part of this, the Directions require that any activity that was affected by timeframes in terms of the repealed timeframes and have not yet resumed must do so in order to avoid lapsing of the decision within 30 days of the Gazette or where this cannot be undertaken, an extension must be obtained in writing within 30 days.

3.3 National Water Act (NWA), 1998 (Act No. 36 of 1998)

The NWA is the primary regulatory legislation; controlling and managing the use of water resources as well as the pollution thereof and is implemented and enforced by the Department of Human Settlements, Water and Sanitation (DHSWS[1]). Section 21 of the NWA lists water uses that must be licensed unless it is listed in the schedule (existing lawful use) and/or is permissible under a general authorisation, or if a responsible authority waives the need for a Water Use Licence. Section 21 water uses include:

- Section 21(a): taking water from a water resource
- Section 21(b): storing water
- Section 21(c): impeding or diverting the flow of water in a watercourse
- Section 21(d): engaging in a stream flow reduction activity contemplated in section 36
- Section 21(e): engaging in a controlled activity as identified in Section 37 (1) or declared under Section 38 (1).
- Section 21(f): discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall, or other conduit.

[1] Previously referred to as the Department of Water and Sanitation or DWS

- Section 21(g): disposal of waste (i.e. effluent from sewage works) in a manner which may detrimentally impact on a water resource;
- Section 21 (h): disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process.
- Section 21 (i): altering the bed, banks, course or characteristics of a watercourse.
- Section 21 (j): removing, discharging, or disposing of water found underground if it necessary for the efficient continuation of an activity or for the safety of people.
- Section 21(k): using water for recreational purposes.

Applicable definitions included in the NWA include watercourse which is defined as "*(a) a river or spring; (b) a natural channel 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).* The Act also defines a wetland as "*land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil".*

Due to the expansion of the bridge over the Crocodile Bridge amongst others, Section 21 uses are triggered and required licencing:

- Section 21(c): impeding or diverting the flow of water in a watercourse
- Section 21 (i): altering the bed, banks, course or characteristics of a watercourse.

3.3.1 General Authorisations in terms of Notice 509 of 2016

The DWS recently published a new General Authorisation (GA) in terms of Section 39 of the NWA for water uses as defined in Section 21(c) or Section 21(i) (GN 509 of 26 August 2016).

The recently published General Authorisation in terms defines the regulated area of a watercourse as meaning: *(a) The outer edge of the 1 in 100 year flood line and /or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; (b) In the absence of a determined 1 in 100 year flood line or riparian area the area within 100m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench (subject to compliance to section 144 of the Act); or (c) A 500 m radius from the delineated boundary (extent) of any wetland or pan.*

In terms of this GA, any persons who owns or lawfully occupies property or has access to land in which the use of water takes place, can do as follows:

(i) exercise the water use activities in terms of Section 21(c) or (i) of the Act as set out in Appendix D1 subject to the conditions of this authorisation

(ii) use water in terms of Section 21(c) or (i) of the Act if it has a low risk class as determined through low risk class as determined through the Risk Matrix

(iii) do maintenance work associated with their existing lawful water use in terms of Section 21(c) or (i) of the Act that has a LOW risk class as determined through the Risk Matrix

(iv) conduct river and storm water management activities as contained in a river management plan

(v) conduct rehabilitation of wetlands (read together with Notice 1198 published in Government Gazette 32805 dated 18 December 2009) or rivers where such rehabilitation activities have a **LOW** risk class as determined through the Risk Matrix

(vi) conduct emergency work arising from an emergency situation or incident associated with the persons' existing lawful water use, provided that all work is executed and reported in the manner prescribed in the Emergency Protocol

In addition, the GA allows State Owned Companies (SOC's), and other institutions specified to use water in terms of Section 21(c) or (i) of the Act as specified. This is applicable in this case and a General Authorisation is therefore applicable.

3.4 National Heritage Resource Act (NHRA), 1999 (Act No. 25 of 1999)

The NHRA provides for the protection and management of South Africa's heritage resources. The South African National Heritage Resources Agency (SAHRA) is the administering authority in regard to all matters relating to heritage resources. A heritage resource refers to any historically important feature such as graves, trees, archaeology, culturally significant symbols, spaces, landscapes and fossil beds as protected heritage resources. In terms of Section 38 of the NHRA, SAHRA can call for a Heritage Impact Assessment (HIA) for certain categories of development. The NHRA also makes provision for the assessment of heritage impacts as part of an EIA process and indicates that if such an assessment is deemed adequate, a separate HIA is not required.

Section 38 (1) of the NHRA notes that the relevant heritage authority should be notified provided with details such as location, nature and extent of the following developments:

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50 m in length;

(c) any development or other activity which will change the character of a site—

(i) exceeding 5 000 m2 in extent; or

(ii) involving three or more existing erven or subdivisions thereof; or

(iii) involving three or more erven or divisions thereof which have been consolidated within the past five years; or

(iv) the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

(d) the re-zoning of a site exceeding 10 000 m2 in extent; or

(e) any other category of development provided for in regulations by SAHRA or

a provincial heritage resources authority,

Apart from the above, the proposed development triggers the NEMA - Section 23 (2) (b) and therefore a Heritage Impact Assessment (HIA) is required under section 38(8) of the NHRA. A HIA has been undertaken and is included in Appendix 14.6.5. The study recorded two, small ephemeral stone-walled enclosures that would have formed part of a larger settlement complex that has been destroyed by earthmoving activities relating to quarries and historic road construction in the study area. The location of these is shown in **Table 3-1** below. It also further identified in the Sensitivity Map in Section 11.1. Necessary permits will be obtained from SAHRA.

Table 3-1: Location of Stone walled structures

Longitude	Latitude	Label
30° 42’ 07.5097” E	25° 27’ 11.0341” S	Stone-walled enclosure 1
30° 42’ 39.1248” E	25° 27’ 09.0181” S	Stone-walled enclosure 2

Furthermore, the South African Heritage Resources Agency (SAHRA) and the Mpumalanga Heritage Resources Agency (MHRA) will be notified and provided an opportunity to comment on the EIR which is available for public review.

3.5 National Environmental Management: Biodiversity Act (NEM:BA), 2004 (Act No. 10 of 2004)

The NEM:BA aims to provide for the management and conservation of South Africa’s biodiversity within the framework of the NEMA. The purpose of the NEM:BA is to protect ecosystems and the species within as well as the promoting of sustainable use of indigenous biodiversity. During any environmental authorisation process the following regulations are considered and researched if at any stage the following regulations are applicable:

- Alien and Invasive Species Regulations;
- Alien and Invasive Species List;
- Lists of Critically Endangered, Endangered, Vulnerable and Protected Species; and
- Threatened or Protected Species Regulations.

An Ecological Assessment was undertaken and includes a number of mitigation measures that will be implemented. The proposed development occurs within a Threatened Ecosystem and CBA however due to the extent of the development, the impact it was not considered to be extensive on these habitats.

No threatened (Vulnerable, Endangered, Critical Endangered) Red Data species were recorded within the plots surveyed.

The following declared alien invasive species were recorded within the plots surveyed: *Lantana camara, Jacaranda mimosifolia, Opuntia ficus-indica, Psidium guajava*. It should be noted that these species are

declared in terms of both the Conservation of Agricultural Resources Act and the National Environmental Management Biodiversity Act Alien and Invasive Species Regulations. Category 1 species have to be eradicated or controlled, while permits are required for category 2 and 3 species.

3.6 National Environmental Management: Protected Areas Act (NEMPA) (Act 57 of 2003)

The aim of NEMPA is to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscape. It also provides for the establishment of a national register of national, provincial and local protected areas and for the management of those areas in accordance with national norms and standards.

In line with the Minister has established a **Register of Protected Areas** which was utilized to determine whether the proposed development was affected by Protected areas. The proposed development occurs within the 5km buffer of a protected area but is not within a Protected Area itself.

3.7 National Environmental Management: Waste Management Act (NEM: WA), 2008 (Act No. 59 of 2008)

The NEM: WA aims to regulate waste management in South Africa in order to protect health and the environment through the provision of reasonable measures for the prevent pollution and ecological degradation.

The Act includes regulations which provide a list of waste management activities that require a waste management licence terms of NEM: WA (GN 921 of 29 November 2013). The proposed development has been assessed as no waste management licence is required for the proposed development. Waste will be collected by municipal waste collectors and disposed of at the municipal landfill.

Storage Facilities in excess of 100m^3 (general waste) or 80m^3 (hazardous) (if required) will comply with the Norms and Standards for the Storage of Waste.

3.8 National Environmental Management: Air Quality Act (NEM: AQA), 2004 (Act No. 39 of 2004)

The aim of NEM: AQA is to regulate air quality in order to protect the environment from pollution and ecological degradation.

The proposed development does not trigger any activities that require an Air Emissions Licence. Dust produced during the construction phase will be managed through the implementation of mitigation measures which will be included in the Environmental Management Programme (EMPr).

3.8.1 National Dust Control Regulations (GN 827 of 1 November 2013)

The purpose of the National Dust Control Regulations, 2013, is to prescribe general measures for the control of dust in all areas.

The proposed development will generate dust which will require proper management. The prescribed dust fallout rates for non-urban areas is:

- 600 < D <1200 mg/m^2/day – 30-day average.

The Regulations allow for two instances of exceeding the Dust fallout rates. In non-urban setting, this is limited to two instances within a year (not sequential months).

3.9 National Veld and Forest Fire Act (Act No. 101 of 1998)

The purpose of this Act is to prevent and combat veld, forest and mountain fires throughout the Republic. The Act provides for a variety of institutions, methods and practices for achieving this purpose.

- Chapter 4 places a duty on owners to prepare and maintain firebreaks; and
- Chapter 5 places a duty on all owners to acquire equipment and have available personnel to fight fires.

Requirements for prevention of fires will be included in the EMPr during the EIA Phase.

3.10 National Forests Act, 1998 (Act No. 84 of 1998)

The purposes of this Act are to-

- promote the sustainable management and development of forests for the benefit of all;
- create the conditions necessary to restructure forestry in State forests;
- provide special measures for the protection of certain forests and trees;
- promote the sustainable use of forests for environmental, economic, educational, recreational, cultural, health and spiritual purposes;
- promote community forestry;
- promote greater participation in all aspects of forestry and the forest products industry by persons disadvantaged by unfair discrimination.

In terms of section 15(1) of the National Forests Act, 1998, no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree, except under a licence or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated. Protected trees are listed in the: List of Protected Tree Species under the National Forests Act, 1998 (Act No. 84 of 1998) as published in Government Notice Number 690, September 2017.

An Ecological Assessment was undertaken and includes a number of mitigation measures that will be implemented. Two nationally protected trees in terms of the National Forest Act (1998) were recorded within the plots surveyed, namely *Pterocarpus angolensis* and *Sclerocarya birrea*. *Pterocarpus angolensis* occurred in all the plots surveyed, and *Sclerocarya birrea* occurred in 50% of the plots surveyed. A permit is required to destroy or remove these trees and will be applied for prior to removal.

3.11 Mineral and Petroleum Resources Development Act

The purpose of the Act is to regulate the prospecting for and the optimal exploitation, processing and utilization of minerals; to regulate the orderly utilization and the rehabilitation of the surface of land during and after prospecting and mining operations; and to provide for matters connected therewith.

The objectives of this Act are to-

- recognise the internationally accepted right of the State to exercise sovereignty over all the mineral and petroleum resources within the Republic;
- give effect to the principle of the State's custodianship of the nation's mineral and petroleum resources;
- promote equitable access to the nation's mineral and petroleum resources to all the people of South Africa;
- substantially and meaningfully expand opportunities for historically disadvantaged persons, including women and communities, to enter into and actively participate in the mineral and petroleum industries and to benefit from the exploitation of the nation's mineral and petroleum resources; (Section 2(d) substituted by section 2 of Act 49 of 2008 with effect from 7 June 2013);
- promote economic growth and mineral and petroleum resources development in the Republic, particularly development of downstream industries through provision of feedstock, and development of mining and petroleum inputs industries; (Section 2(e) substituted by section 2 of Act 49 of 2008 with effect from 7 June 2013);
- promote employment and advance the social and economic welfare of all South Africans;
- provide for security of tenure in respect of prospecting, exploration, mining and production operations;
- give effect to section 24 of the Constitution by ensuring that the nation's mineral and petroleum resources are developed in an orderly and ecologically sustainable manner while promoting justifiable social and economic development; and
- ensure that holders of mining and production rights contribute towards the socio-economic development of the areas in which they are operating.

It should be noted that:

- SANRAL is exempted from the application for a Mining Permit/Right but is not exempted from an application for Environmental Authorisation.
- Any activities requiring extraction of sand or hard rock for construction purposes will require the submission of an application to Department of Mineral Resources and Energy (DMRE) for Environmental Authorisation.

An Application for a Mining Permit may be necessary but will be undertaken separately once the relevant requirements have been determined. It is therefore not included in the scope of this application.

3.12 National Guidelines and Plans

3.12.1 National Biodiversity Assessment (NBA)

The National Biodiversity Assessment (NBA) was completed as a collaboration between the South African National Biodiversity Institute (SANBI), the Department of Environmental Affairs (DEA) and other stakeholders, including scientists and biodiversity management experts throughout the country over a three-year period (Driver at al., 2012).

The purpose of the NBA is to assess the state of South Africa's biodiversity with a view to understanding trends over time and informing policy and decision-making across a range of sectors (Driver at al., 2012).

3.12.2 The National Development Plan

The National Development Plan (NDP) identifies five principles for spatial development: spatial justice, spatial sustainability, spatial resilience, spatial quality and special efficiency. It confirms that South African cities are highly fragmented, as little has been achieved in reversing apartheid geography. The Plan proposes that the situation be addressed by establishing new norms and standards: among others by densifying cities, improving transport and locating jobs where people live. The containment of urban sprawl is particularly highlighted in the Plan, confirming that sprawl be contained and reversed (if possible), "…as denser forms of development are more efficient in terms of land usage, infrastructure cost and environmental protection.

The proposed development aligns with the vision of the National Development Plan, as it will promote improved road transport infrastructure to allow for safer travel amongst inhabitants of Mbombela travelling to- and from the western regions of the province and beyond.

3.12.3 Maputo Development Corridor Spatial Development Initiative (SDI)

The "Spatial Development Initiatives (SDI) programme is an interdepartmental investment strategy led by the National Department of Trade and Industry (DTI) and Department of Transport (DoT) and involves strategic initiatives by government. There are a number of these initiatives being pursued by national, provincial and local government in South Africa. The **Maputo Development Corridor (MDC)** is the most advanced and the best known of the SDI's. The Maputo Development Corridor focuses on the N4 route stretching from Witbank to Recano Garcia in Mozambique. The Corridor programme is more than just the construction of the road and includes the following rail, telecommunications, port facilities and gas pipelines. The proposed Montrose Interchange will take place on the MDC. The efficient and safe functioning of the route which is at the heart of the MDC is of paramount importance.

3.12.4 DEA, 2014 – IEMS Guideline series

The following guidelines have been adopted by the applicant in the pursuit of best practice and sustainable development and are considered in the management measures and mitigation of impacts identified.

- Integrated Environmental Management Guideline: Guideline on Need and Desirability;
- Integrated Environmental Management Guideline Series (Guideline 7);
- Public Participation in the Environmental Impact Assessment Process; and
- Guidelines on Alternatives.

3.13 Provincial Legislation and Guidelines

In addition to national legislation, South Africa's nine provinces have their own provincial biodiversity legislation, as nature conservation is a concurrent function of national and provincial government in terms of the Constitution (Act 108 of 1996). A short summary of applicable provincial legislation and guidelines is provided below.

3.13.1 Mpumalanga Conservation Act, 1998 (Act 10 of 1998)

The aim of this Act is to consolidate and amend the laws relating to nature conservation within the Province and to provide for matters connected therewith. This Act was taken into account by the Ecological Specialist who found that the following provincially protected species, genera and families were recorded in the plots surveyed:

- Aloe species, Faurea saligna, Pterocarpus angolensis and Zanthadescia species. A permit for the destruction of these species are only required if the developer is not the owner of the land, or if the species would be sold or translocated outside the province.
- The following species with medicinal properties had been recorded within the plots surveyed: Dombeya rotundifolia, Elephantorrhiza elephantina, Heteropyxis natalensis, Psidium guajava, Sclerocarya birrea and Syzygium cordatum (Van Wyk, Van Oudtshoorn & Gericke 2000).

3.13.2 Mpumalanga Tourism and Parks Agency Act, 2005 (Act of 2005)

This act provides for the establishment of the Mpumalanga Tourism and Parks Agency (MTPA) and for the management thereof by a Board; to provide for the sustainable development and improvement of the tourism industry in Mpumalanga; to provide for conservation management of the natural resources of Mpumalanga; to confer powers and functions upon the Agency; to provide for the registration of certain persons and entities directly involved in tourism; to provide for transitional arrangements; and to provide for matters incidental thereto.

As the proposed development involves development with the Mpumalanga Province, the MPTA has been included on the Interested and Affected Party (I&AP) Database.

3.13.3 MTPA Guidelines for Biodiversity Assessment

To promote national uniform standards in Environmental Management Plans (EMP's) the Mpumalanga Tourism and Parks Agency (MTPA) have set minimum standards that need to be conformed to in terms of Biodiversity Assessments for development applications. These guidelines cover flora, fauna, aquatic and wetland systems. The guidelines will be taken into account in the necessary specialist studies.

3.13.4 Mpumalanga Conservation Plan

Mpumalanga's Conservation Plan Version 2 (C-Plan 2) database (MPSB, 2006), is intended to guide conservation and land-use decisions in support of sustainable development at a strategic level, have been identified. The C-Plan 2 maps the distribution of the Province's known biodiversity into categories according to ecological and biodiversity importance and their contribution to meeting the quantitative targets set for each biodiversity feature.

The Mpumalanga Conservation Plan has been used to better understand potential sensitivities which required further assessment. It has also been taken into account by the Ecological Specialist in the Ecological Assessment which is included in **Appendix 14.6.1**.

3.13.5 Mpumalanga Biodiversity Sector Plan (MBSP)

In 2006 the MTPA and the Department of Agriculture and Land Administration (DALA) initiated the development of the Mpumalanga Biodiversity Conservation Plan (MBSP). As the first such plan produced for the Province, it was intended to guide conservation and land-use decisions in support of sustainable development. The MBSP provided a spatial framework that supported land-use planning and helped to streamline and monitor environmental decision-making (Ferrar & Lotter, 2007).

Since 2007 several technical advances and land use changes necessitated the need for an update of the MBSP. The updated product is called the Mpumalanga Biodiversity Sector Plan (MBSP) and builds on the successes of the MBSP but incorporates improvements in science, technology and data, to provide a more comprehensive assessment of the biodiversity of the terrestrial and freshwater environment in Mpumalanga (MTPA, 2014).

The MBSP has been used to better understand potential sensitivities which required further assessment. It has also been taken into account by the Ecological Specialist in the Ecological Assessment which is included in **Appendix 14.6.1**.

3.13.6 Mpumalanga Vision 2030 Strategic Implementation Framework

The Mpumalanga Vision 2030 Strategic Implementation Framework (2013-2030) is established as a direct implementation response to the National Development Plan Vision 2030. It seeks to present and affirm the province's approach towards realising the adopted and articulated national vision and development plan.

It includes a number of key drivers for spatial development including corridor and nodal development. As the proposed development will improve road infrastructure and assist transportation in the area, it is in line with this driver.

3.13.7 Mpumalanga Spatial Development Framework

The Mpumalanga Spatial Development Framework (MSDF) is an indicative framework that promotes, clarifies and refines the spatial development principles and development priorities supported by the relevant policies and legislations such as the National Development Plan and the Mpumalanga Vision 2030 and define the desired spatial form of Mpumalanga.

The MSDFs aim is to guide specific decision regarding the spatial development and arrangement, within and between settlements, and to guide investment and development spending. A set of interrelated strategic development objectives provide the foundation for the spatial development strategies for Mpumalanga supporting the Spatial Indicative Framework. Ten strategic objectives were identified providing Strategic Focus Areas (Areas of Intervention on provincial, district and local level). This includes focus development on development corridors and nodes as well as infrastructure investment. The proposed development aims to improve road safety and efficiency along one of the main routes in the province and is thus in line with this.

3.13.8 Mpumalanga Tourism Growth Strategy

The aim of the strategy is to elaborate a framework to guide tourism initiatives and development. The ultimate objective is to attain sustainable benefits for the people of Mpumalanga by creating additional economic activity. Having a safe and efficient road network is key to the tourism strategy and is therefore the development is in line with this.

3.14 Local Legislation and Guidelines

A summary of the other legislation and guidelines which have guided the preparation of this report are provided in the subsections below.

3.14.1 City of Mbombela Integrated Development Plan

Section 25 of the Municipal Systems Act, 32 of 2000 requires that each municipal council must within a prescribed period after the start of its elected term adopt a single, inclusive and strategic plan, commonly known as Integrated Development Plan (IDP). The IDP must guide and inform all planning, development, budgeting decisions of the municipality. The City of Mbombela's 2017-2022 IDP is crafted under the following mission statement:

"Together in partnership spatially transforming the city, providing effective local governance and rendering competitive municipal services and sustainable development for living, working, investing and leisure"

The Mbombela IDP has identified a number of objectives to be implemented over the 5-year period. These include the provision of infrastructure and sustainable basic services as well as initiating strong and sustainable economic development. The N4 Toll Route via Ngodwana and N4 Schoemanskloof (R539) Route are both important routes within the Municipality (although not managed or operated by the municipality). Improving the road safety and efficiency is aligned to the concepts entrenched in the IDP.

3.14.2 Mbombela Spatial Development Framework (SDF), 2011-2030

The purpose of a municipal SDF is to guide all decisions of a municipality relating to the use, development and planning of land and should have the following key objectives:

- To provide a strategic and indicative forward planning tool to guide decisions on land development;
- To provide a set of policies, principles and directives for spatial development
- To provide a clear and logical framework for private and public sector investment;
- To promote sustainable development in terms of the natural and built environment;
- To provide a framework for dealing with key issues such as natural resource management, land reform and land use management;
- To guide and inform directions of growth and major movement routes

The City of Mbombela SPF includes a focus on development corridors, which are broadly defined as urban areas of high-intensity (i.e. dense and diverse) nodal or ‘strip’ development focused around (a combination of) rail, high-capacity road and trunk bus routes. They are characterised by a dynamic, mutually supporting relationship between land use and the movement system.

The Plan notes that Development corridors are generally supported by a hierarchy of transport services that function as an integrated system to facilitate ease of movement for private and public transport users. Corridors within the municipality have been categorized into primary and secondary corridors

The SDF classifies the N4 as a primary transportation corridor. The improvement of the safety and efficiency of the interchange is therefore in line with the SDF.

4 PROJECT DESCRIPTION

The Appendix 3 of the 2014 EIA Regulations requires that the following information is provided in the EIA Report:

3 (b) the location of the activity, 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;

3 (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;

3 (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.

In line with this, **Section 4.2**. provides information on the listed activities triggered, **Section 4.3**, provides information on the project location and **Section 4.4.** provides information on the proposed development (including associated infrastructure).

Please note that A3 copies of maps and drawings are included in **Appendix 14.4**.

4.1 Environmental Authorisation

An **"Environmental Authorisation"** means an authorisation granted by the competent authority of a listed activity in terms of Section 24 of the National Environmental Management Amendment Act, (Act No. 107 of 1998). An application for Environmental Authorisation (EA) was submitted to DEFF on 22 September 2020 and the following reference number was issued by the Department on 2 October 2020:

- 14/12/16/3/3/2/2003

As activities under Listing Notice 1, 2 and 3 of the 2014 EIA Regulations are triggered, a Scoping and EIA process is being conducted. The process being followed is detailed in **Figure 4-1** below.

Figure 4-1: Proposed environmental authorisation process

4.2 Listed Activities

In terms of the EIA Regulations and Listed Activities 2014 (introduced in **Section 3.2.1**), the activities that are triggered under the Listing Notices for this proposed development are provided in **Table 4-1.** Refer to **Section 3.2** for a description and overview of the applicable legislative framework

Table 4-1.: Description of the Listed Activities.

Listing Notice	Activity	Description of Listed Activity	Interpretation
NEMA: Listing Notice 1 (require Basic Assessment)			
GN R 983 4 December 2014 (as amended)	9 (i)	*The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water—* *(i) with an internal diameter of 0,36 metres or more; or* *(ii) with a peak throughput of 120 litres per second or more;* *excluding where—* *(a) such infrastructure is for bulk transportation of water or storm water or storm water drainage inside a road reserve or railway line reserve; or* *(b) where such development will occur within an urban area.*	As part of the new interchange development, a section of the existing N4 Schoemanskloof (R539) Route will be re-aligned. As part of this, new stormwater drainage will be put in place and will include: • Cut-off berms or drains on top of deep cuts; • Type Of concrete side drains and grid inlets to intercept road surface runoff; • Type A concrete side drains in high fills; where run-off will be discharged by downpipes/ chutes; • A minimum of 900mm diameter cross drainage culverts (In accordance with SANRAL standards for culverts longer than 30m);
	12 (ii)(a) (c)	*The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;* *excluding—* *(aa) the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;* *(bb) where such development activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;*	The proposed interchange development involves re-aligning a section of the existing N4 Schoemanskloof (R539) Route to approximately 100m south of the existing road. Part of this road traverses three minor drainage lines and as such will result in infrastructure of more than 100m^2 within a watercourse as well as within 32m of a watercourse. An access road to re-instate access to affected properties will also be put in place.

Listing Notice	Activity	Description of Listed Activity	Interpretation
		(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies; *(dd) where such development occurs within an urban area;* *(ee) where such development occurs within existing roads, road reserves or railway line reserves; or* *(ff) the development of temporary infrastructure or structures where such infrastructure or structures will be removed within 6 weeks of the commencement of development and where indigenous vegetation will not be cleared.*	
	19 (i)	*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-* *(i**) a watercourse;*** *(ii) the seashore; or* *(iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater but excluding where such infilling, depositing , dredging, excavation, removal or moving-* *(a) will occur behind a development setback;* *(b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or* *(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.*	The proposed interchange development involves the upgrade of the existing bridge over the Crocodile River which will be widened to accommodate an undivided 5-lane cross-section. An additional deck will need to be stitched to the existing to accommodate the larger cross section along with extended abutments and additional piers. An access road to re-instate access to affected properties will also be put in place. In addition, the re-aligned N4 Schoemanskloof (R539) Route crosses a number of small drainage lines. These activities will result in more than 10 cubic metres of material from the Crocodile River as well as unnamed drainage lines. In addition, depositing of material (concrete etc.) will be undertaken as part of the road and bridge construction.
	48.(i) (a)(c)	*The expansion of –* *(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or* *(ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more;* *where such expansion occurs –* *(a) within a watercourse;* *(b) in front of a development setback; or*	The proposed interchange development involves the upgrade of the existing bridge over the Crocodile River which will be widened to accommodate an undivided 5-lane cross-section. This will result in the expansion of infrastructure by more than 100m^2 within a watercourse. This will result in an expansion of infrastructure within the watercourse and within 32m of the watercourse.

Listing Notice	Activity	Description of Listed Activity	Interpretation
		(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; *excluding –* *(aa) the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour;* *bb) where such expansion activities are related to the development of a port or harbour, in which case activity 26 in Listing Notice 2 of 2014 applies;* *(cc) activities listed in activity 14 in Listing Notice 2 of 2014 or activity 14 in Listing Notice 3 of 2014, in which case that activity applies;* *(dd) where such expansion occurs within an urban area; or* *(ee) where such expansion occurs within existing roads, road reserves or railway line reserves.*	
	56 (i)	*The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre –* *(i) where the existing reserve is wider than 13,5 meters; or* *(ii) where no reserve exists, where the existing road is wider than 8 metres;* *excluding where widening or lengthening occur inside urban areas.*	The proposed new Montrose Interchange aims to replace the existing at-grade intersection of Maputo Development Corridor (MDC) sections 6N (known as N4 Schoemanskloof (R539) Route) and 6E (known as Elands Valley). As part of, a section of the existing N4 toll route via Ngodwana will be widened by more than 6m to accommodate undivided 5-lane cross-section.
NEMA: Listing Notice 2 (require Scoping and EIR)			
GN R 984 4 December 2014 (as amended)	27.	*The development of a road –* *-with a reserve wider than 30 metres; or* *-catering for more than one lane of traffic in both directions; but excluding a road—* *-for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010, in which case activity 24 in Listing Notice 1 of 2014 applies;* *-which is 1 kilometre or shorter; or* *-where the entire road falls within an urban area.*	The proposed development involves the development of a new interchange. As part of this, the existing N4 Schoemanskloof (R539) Route will be realigned to approximately 100m south of its current location. In addition, a number of new ramps will be put in place. This new section caters for more than one lane of traffic in both directions. Further, the minimum road reserve width requirement for the realigned N4 Schoemanskloof (R539) Route is 40 m (with the cut and fill sections resulting in a much wider road reserve). The minimum road reserve width required for all ramps is 20 m either side of the centre of the ramp.

Listing Notice	Activity	Description of Listed Activity	Interpretation
NEMA: Listing Notice 3 (require Basic Assessment)			
GN R 985 4 December 2014 (as amended)	4 (f)(i) (ee) (gg)	*The development of a road wider than 4 metres with a reserve less than 13,5 metres.* ***(f) Mpumalanga*** *i. Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding disturbed areas;* *(bb) National Protected Area Expansion Strategy Focus areas;* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(dd) Sites or areas identified in terms of an international convention;* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(ff) Core areas in biosphere reserves; or* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas, where such areas comprise indigenous vegetation.*	The proposed development involves the development of a new interchange. As part of this, the existing N4 Schoemanskloof (R539) Route will be realigned to approximately 100m south of its current location. Additional ramps will also be put in place. These activities will take place outside an urban area in areas identified as a Critical Biodiversity Areas (CBA). Temporary access roads will also be required as well as re-instatement of access for affected landowners.
	12 (f)(i)(ii)	*The clearance of an area of 300m^2 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.* ***f. Mpumalanga*** *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 identified in 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 or proclamation in terms of NEMPAA.*	The proposed development involves the development of a new interchange. As part of this, the existing N4 Schoemanskloof (R539) Route will be realigned to approximately 100m south of its current location. Additional ramps will also be put in place. Temporary access roads will also be required as well as re-instatement of access for affected landowners. These activities will take place in areas identified as a Critical Biodiversity Areas (CBA) as well as within the historical extent of a threatened ecosystem (Legogote Sour Bushveld). This will result in the clearance of more than 300m^2 of indigenous vegetation,
	14 (ii)(f)(i) (ff) (hh)	*The development of* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or*	The proposed interchange development involves the upgrade of the existing bridge over the Crocodile River which will be widened to accommodate an undivided 5-lane cross-section.

Listing Notice	Activity	Description of Listed Activity	Interpretation
		(ii) infrastructure or structures with a physical footprint of 10 square metres or more; *where such Development occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.* ***f. Mpumalanga*** *i. Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding conservancies;* *(bb) National Protected Area Expansion Strategy Focus areas;* *(cc) World Heritage Sites;* *(dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(ee) Sites or areas identified in terms of an international convention;* *(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(gg) Core areas in biosphere reserves; or* *(hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation.*	An additional deck will need to be stitched to the existing to accommodate the larger cross section along with extended abutments and additional piers. Temporary access roads will also be required as well as re-instatement of access for affected landowners In addition, the re-aligned N4 Schoemanskloof (R539) Route crosses a number of small drainage lines. These activities will result in the development of more than 10m^2 of infrastructure within a watercourse or within 32m of a watercourse in a Critical Biodiversity Area (CBA).
	18 (f)(i) (ee) (gg)	*The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.* *f. Mpumalanga* *i. Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding conservancies;* *(bb) National Protected Area Expansion Strategy Focus areas;* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(dd) Sites or areas identified in terms of an international convention;* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans*	The proposed new Montrose Interchange aims to replace the existing at-grade intersection of Maputo Development Corridor (MDC) sections 6N (known as N4 Schoemanskloof (R539) Route) and 6E (known as Elands Valley). As part of, a section of the existing N4 toll route via Ngodwana will be widened by more than 6m to accommodate undivided 5-lane cross-section. Temporary access roads will also be required as well as re-instatement of access for affected landowners This widening will take place in area identified as a Critical Biodiversity Area (CBA).

Listing Notice	Activity	Description of Listed Activity	Interpretation
		adopted by the competent authority or in bioregional plans; *(ff) Core areas in biosphere reserves; or* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation.*	
	23 (ii) (f)(i) (ee) (gg)	*The expansion of –* *(i) dams or weirs where the dam or weir is expanded by 10 square metres or more; or* *(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such expansion occurs –* *(a) within a watercourse;* *(b) in front of a development setback adopted in the prescribed manner; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.* *f. Mpumalanga* *i. Outside urban areas:* *(aa) A protected area identified in terms of NEMPAA, excluding conservancies;* *(bb) National Protected Area Expansion Strategy Focus areas;* *(cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority;* *(dd) Sites or areas identified in terms of an international convention;* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(ff) Core areas in biosphere reserves;* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation.*	The proposed interchange development involves the upgrade of the existing bridge over the Crocodile River which will be widened to accommodate an undivided 5-lane cross-section. This will result in the expansion of infrastructure by more than 100m^2 within a watercourse. This will result in an expansion of infrastructure within the watercourse and within 32m of the watercourse. This widening will take place in area identified as a Critical Biodiversity Area (CBA).

4.3 Location

The existing Montrose Interchange is an at-grade intersection the Maputo Development Corridor (MDC) sections 6N (known as N4 Schoemanskloof (R539) Route) and 6E (known as Elands Valley) where the N4 Schoemanskloof (R539) Route intersects the N4 toll route via Ngodwana. The interchange is located in the Mpumalanga Province, west of Mbombela (Nelspruit) and occurs in Ward 12 of the City of Mbombela Municipality.

The proposed interchange affects the following properties:

- Portion 19 of the Farm Elandshoek 302;
- Portion 0 of the Farm Montrose 573;
- Portion 2 of the Farm Montrose 290;
- Portion 4 of the Farm Montrose 290; and
- Portion 0 of the Farm Montrose 574.

Table 4-2.: Route Coordinates

Number	Coordinates
1	25°27'30.75"S; 30°41'48.49"E
2	25°27'8.78"S; 30°42'25.33"E
3	25°26'49.35"S; 30°42'43.31"E
4	25°27'21.24"S; 30°42'35.74"E

The Surveyor General 21-digit diagram numbers for the affected properties are provided in **Table 4-3** below.

Table 4-3.: Surveyor General Diagram Numbers.

Surveyor General Diagram number	Property Description
T0JT00000000030200019	Portion 19 of Farm Elandshoek 302
T0JT00000000057300000	Portion 0 of Farm Montrose 573
T0JT00000000029000002	Portion 2 of Farm Montrose 290
T0JT00000000029000004	Portion 4 of Farm Montrose 290
T0JT00000000057400000	Portion 0 of Farm Montrose 574

Refer to **Figure 4-2** below for a visual indication of the site location. Please note that A3 maps are also provided in **Appendix 14.4**.

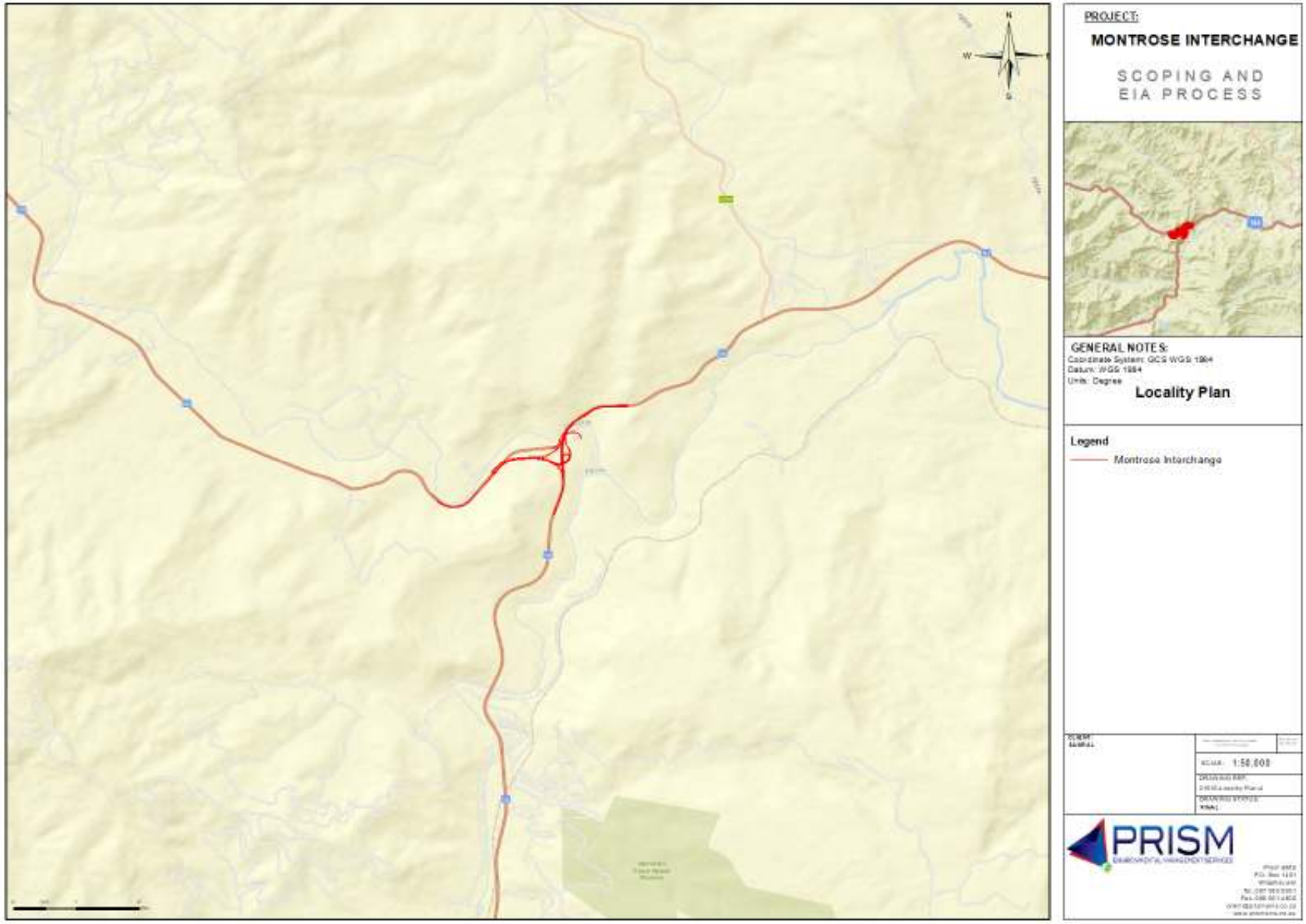


Figure 4-2: Locality Map

4.4 Description of Project Activities

4.4.1 Description of Montrose Interchange Upgrade

The proposed new Montrose Interchange aims to replace the existing at-grade intersection of Maputo Development Corridor (MDC) sections 6N (known as N4 Schoemanskloof (R539) Route) and 6E (known as Elands Valley). This intersection is located at the convergence of two parallel routes, which make up a 60km long portion of the MDC.

A grade separated intersection is required in terms of the Concession Contract to alleviate safety issues at the existing intersection and to prioritise the east-west movements between N4 Schoemanskloof (R539) Route and MDC Section 7A.

Figure 4-3: Conceptual layout of the proposed new interchange

Existing infrastructure was used as far as possible by using the existing road infrastructure to provide access to properties, retain existing drainage networks and widen the Crocodile River Bridge in lieu of constructing a new river bridge. **Figure 4-4** provides an overview of the proposed development. A summary of the existing infrastructure together with the proposed changes is then provided and is based on the Preliminary Design Report for the Montrose Interchange (SMEC, 2019).

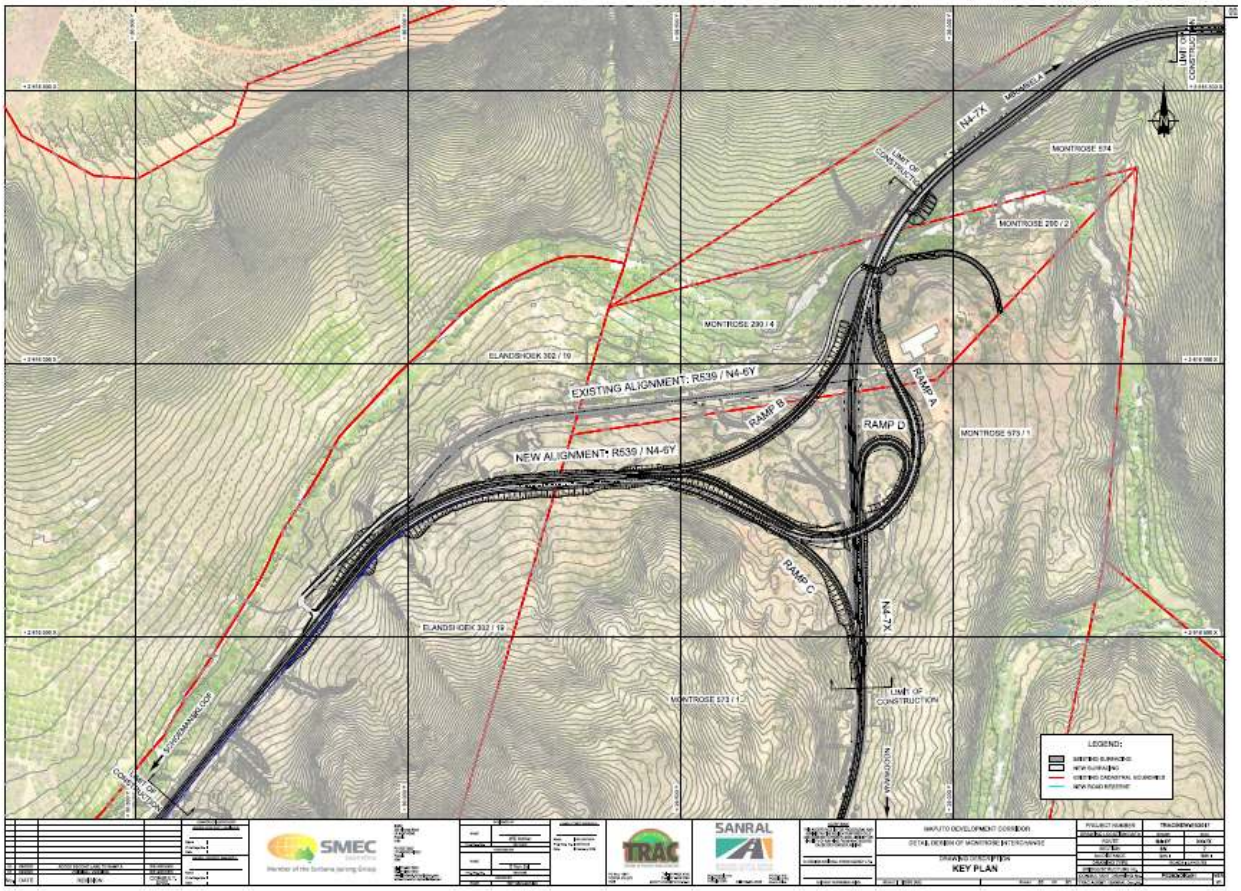


Figure 4-4: Proposed Montrose Interchange

As requested by DEFF in their comments received 14 December 2020, a summary of project components is provided in Table 4-4 below.

Table 4-4: Project Summary

Item	Interpretation
Stormwater	As part of the new interchange development, a section of the existing N4 Schoemanskloof (R539) Route will be re-aligned. As part of this, new stormwater drainage will be put in place and will include: • Cut-off berms or drains on top of deep cuts; • Type Of concrete side drains and grid inlets to intercept road surface runoff; • Type A concrete side drains in high fills; where run-off will be discharged by downpipes/ chutes; • A minimum of 900mm diameter cross drainage culverts (In accordance with SANRAL standards for culverts longer than 30m);
N4 Schoemanskloof (R539) re-alignment.	The proposed development involves the development of a new interchange. As part of this, the existing N4 Schoemanskloof (R539) Route will be realigned to approximately 100m south of its current location. In addition, a number of new ramps will be put in place. This new section caters for more than one lane of traffic in both directions. Further, the minimum road reserve width requirement for the realigned N4 Schoemanskloof (R539) Route is 40 m (with the cut and fill sections resulting in a much wider road reserve). The minimum road reserve width required for all ramps is 20 m either side of the centre of the ramp

Item	Interpretation
	Part of this road traverses three minor drainage lines and as such will result in infrastructure of more than 100m^2 within a watercourse as well as within 32m of a watercourse.
N4 toll route via Ngodwana expansion	The proposed new Montrose Interchange aims to replace the existing at-grade intersection of Maputo Development Corridor (MDC) sections 6N (known as N4 Schoemanskloof (R539) Route) and 6E (known as Elands Valley). As part of, a section of the existing N4 toll route via Ngodwana will be widened by more than 6m to accommodate undivided 5-lane cross-section.
Crocodile Bridge Expansion	The proposed interchange development involves the upgrade of the existing bridge over the Crocodile River which will be widened to accommodate an undivided 5-lane cross-section. An additional deck will need to be stitched to the existing to accommodate the larger cross section along with extended abutments and additional piers.
Re-instatement of access	An access road to re-instate access to affected properties will also be put in place.
Ancillary Infrastructure Required for Construction	• A construction camp will be erected on site for the duration of the construction. This camp will be fenced for security purposes. A security guard will also be posted on site during non-operational times. A wall will be erected around the property boundary as part of the development project. • During the construction phase of the project, chemical toilets will be placed on site for the duration of the construction phase. • Designated areas will be established during the construction phase for construction equipment and vehicles. This area will be outside all sensitive areas (delineated wetlands etc.). As far as possible these will be located within already disturbed areas or areas that will be directly impacted by the road construction footprint. • Existing roads will be used as far as possible for access during construction, however, where necessary, temporary access roads will be put in place.
Interchange Ramps	Four ramps will be put in place. • Ramp A carries the traffic movement from Mbombela to Schoemanskloof. The forecast 30th highest hour volume is 703 veh/h in 2028. Ramp A is a continuation of the left-hand lane of N4-7X and diverges from the main N4 roadway at a 1:15 taper rate. The proposed cross-section consists of two 3.7 m lanes a 2.5 m slow-lane surfaced shoulder and a 1.0 m surfaced fast-lane shoulder. • Ramp B carries the traffic movement from Schoemanskloof to Mbombela. The forecast 30th highest hour volume is 813

Item	Interpretation
	veh/h in 2028. Ramp B is a continuation of the eastbound core lane of N4 Schoemanskloof (R539) Route and continues on to form the left-hand lane of N4-7X.Ramp B is designed for 100 km/h as it will for part of the future prioritised N4-6Y. • Ramp C carries traffic from the Elands Valley to Schoemanskloof. The forecast traffic volume in the 30th highest hour is based on 24-hour intersection counts done in 2017 and is estimated to be a very low 7 veh/h. This ramp is entirely in cut and may be used as a source for fill material. • Ramp D carries traffic from Schoemanskloof to Waterval Boven. The forecast traffic volume in the 30th highest hour is based on 24-hour intersection counts done in 2017 and is estimated to be a very low 7 veh/h. The loop component of the ramp is designed for 40 km/h while the directional component is designed for 70 km/h. The loop ramp enters the N4 with a parallel acceleration lane with a length of 185 m required to accelerate from 40 km/h to 100 km/h.
New Interchange Bridge B0571	The new Montrose Interchange Bridge (B0571) will be a new structure to accommodate the new interchange Ramps A and D over the existing N4-7X. The proposed design makes use of the existing rock faces for founding and will be approximately 47.9 m from deck end to end. As part of the design, the superstructure will consist of a 600 mm thick, continuous slender slab deck 47.9 m from expansion joint to expansion joint. The deck has substantial cantilevers and is supported by a slender arch under the deck which springs off spread footings in the rock cutting. The deck ends are supported on shallow abutments with spread footings on rock. Figure 4 18 below shows the proposed deck cross section at the centre of the arch.

4.4.2 Realigned N4-6Y (N4 Schoemanskloof (R539) Route)

N4 Schoemanskloof (R539) Route is currently a two-lane road with occasional additional climbing and passing lanes along the route. Currently, the design speed of N4 Schoemanskloof (R539) Route varies along the route, but is generally designed for 80 km/h with a posted speed of 100 km/h. The cross-section comprises of two 3.7 m lanes and shoulders of approximately 1.0 m wide at the point where the Montrose Interchange starts.

To be able to accommodate the proposed directional ramps, without constructing an entirely new bridge across the Crocodile River, N4 Schoemanskloof (R539) Route is realigned to a position approximately 100 m parallel to the south of the existing road.

The design speed of this realignment is 100 km/h, which is an improvement on the existing alignment. The existing alignment has various safety issues which are also improved on. Lane widths of 3.7 m are proposed for the lanes. **Table 4-5** provides a comparison of existing alignment and the new proposed alignment

Table 4-5: Comparison between existing and proposed intersection

Current Status	Proposed Changes

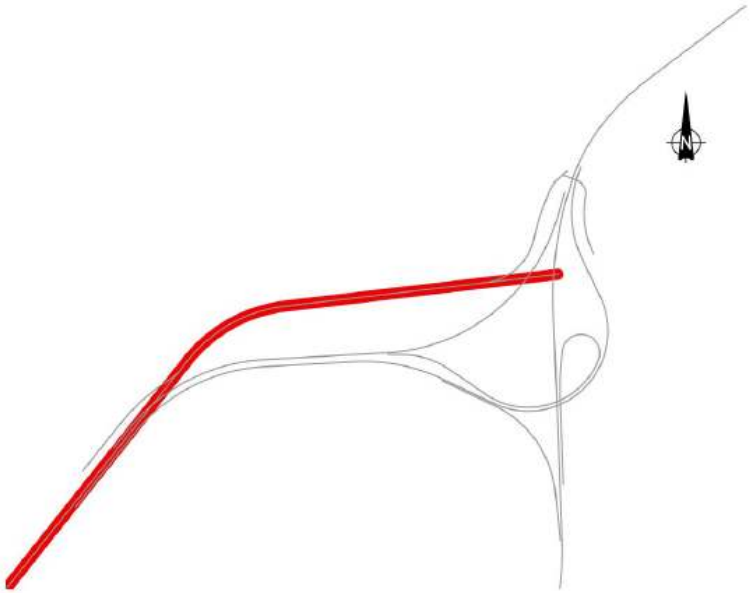
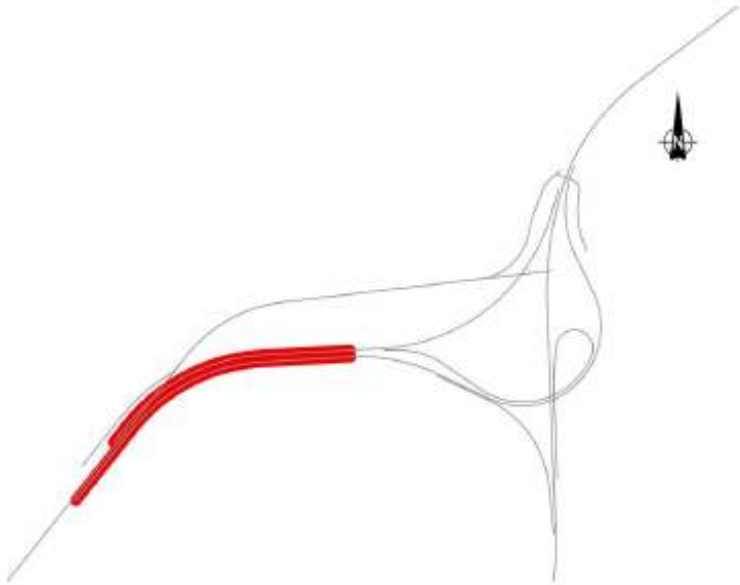

	

Figure 4-5: Existing N4 Schoemanskloof (R539) Route Alignment	**Figure 4-6: New N4 Schoemanskloof (R539) Route Alignment**

4.4.3 N4-7X (MDC Section 6E and 7A) (Elands Valley)

N4-7X is split in to two distinct sections at the proposed Montrose Interchange – to the south of the Crocodile River Bridge (Coinciding with MDC Section 6E and a 180 m portion of 7A) and to the north of the bridge (coinciding with MDC Section 7A). **Table 4-6** below shows these two sections (**Figure 4-7** and **Figure 4-8**).

Table 4-6: N4-7X (MDC Section 6E and 7A)

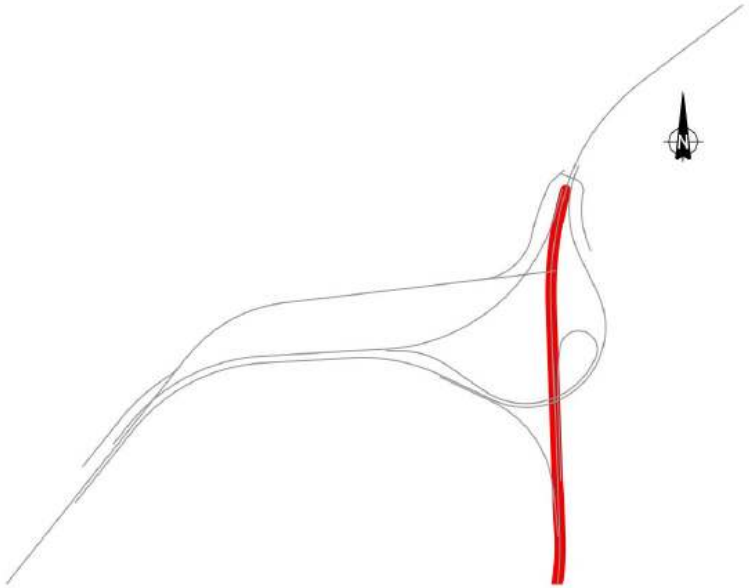


Figure 4-7: N4-7X (MDC Section 6E)

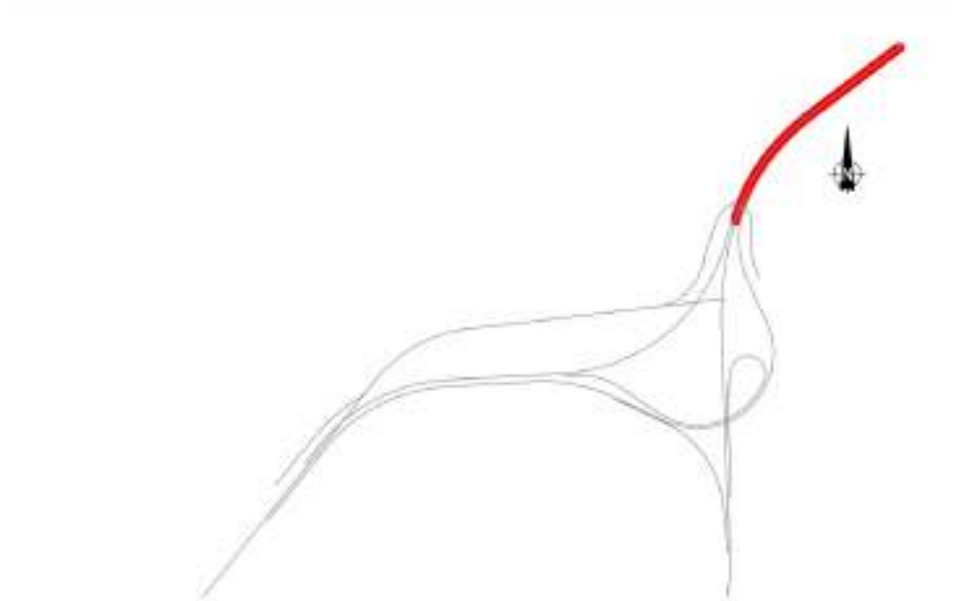


Figure 4-8: N4-7X (MDC Section 7A)

4.4.3.1 Southern section (MDC Section 6E)

The southern portion is currently a two-lane road with occasional climbing and passing lanes further along the route. The proposed interchange layout retains the two-lane facility from the Crocodile River bridge, heading south towards Waterval Boven. The design speed is 95 km/h according to the Concession Contract. The cross-section comprises of two 3.7 m lanes and 1.8 m shoulders.

This existing road is being retained, however all four of the proposed ramps tie into this section of the road. Further, the existing at-grade intersection will fall away. The cross-section is being standardised at the at-grade intersection to a 3.7 m lane in each direction with 2.5 m surfaced shoulders, with the turning lanes being removed. **Figure 4-9** provides the typical cross section for N4-7X south of the Crocodile Bridge.

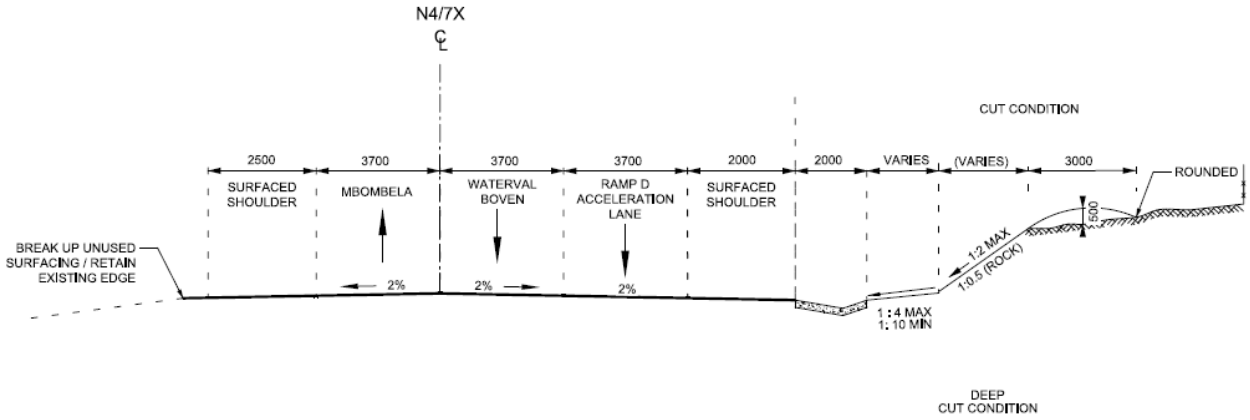


Figure 4-9: Typical Cross Section N4-7X South Of Crocodile River Bridge

A parallel acceleration lane from Loop D is added through the cutting underneath the proposed Ramp A/ Loop D bridge over the N4, requiring widening of the existing cutting to accommodate a new concrete drainage channel. The existing cross-fall, which is less than 2% in some areas, is being retained. Correction of the camber of the existing road may be done at a later stage.

From 80 m south of the Crocodile River Bridge up to the abutment thereof, there is an existing localised dip in road levels. The dip is located at the off-ramp for Ramp A and the on-ramp for Ramp B. It is proposed that this dip be corrected through a level correction. The length affected is approximately 80 m and the maximum difference in level is 100 mm at the centre of the dip. It is proposed that the existing surfacing be milled to the required depth to accommodate a new BTB base and asphalt wearing course to final road level.

4.4.3.2 Northern Section (N4-7X (MDC Section 7A)

The northern portion starts on a transition from a two-lane road to an undivided four-lane cross-section in the first kilometre north of the Crocodile River Bridge.

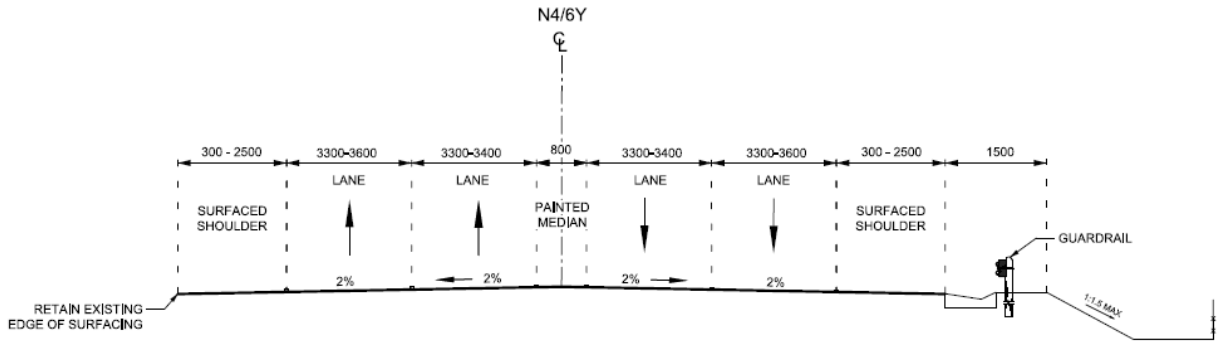


Figure 4-10: Typical Cross Section N4-7X North of Crocodile River

The design speed is 100 km/h. The cross-section is a very narrow four-lane undivided road with lane widths of approximately 3.3 m, shoulder widths of 0.3 m, and a 0.8 m painted median. Gravel shoulders make up the remainder of the cross-section, with stormwater channels and guardrails having been positioned for the 19.8 m cross-section. This section includes the widening of the Crocodile River Bridge, heading east to tie in to the existing 4-lane undivided N4-7X towards Mbombela. The Crocodile River Bridge and N4-7X is widened only to the right to accommodate an undivided 5-lane cross-section.

4.4.1 Crocodile River Bridge

The existing bridge over the Crocodile River (B1577) has a total length of 160 m with a roadway width of 11.8 m and a cross-fall ranging between 6 and 9.6%. The superstructure, a continuous reinforced concrete voided deck, consists of eight spans of 20 m each. The existing sub-structure includes seven slender reinforced concrete wall type piers, ranging in height from 12.6 to 17.2 m and two reinforced concrete abutment seating beams supported by strut frames on the underlying rock interface.

The bridge currently accommodates two 3.7 m lanes and 2.2 m shoulders (11.8 m surfaced width) and will be widened only to the right (east side) to accommodate three additional lanes and a shoulder lane (i.e. 5 lanes in total).

In terms of designs, the voided deck option was considered the most suitable for this type of widening due to having a similar appearance and the same structural behaviour as the existing structure. The proposed new typical road cross-section across the bridge includes five (5) lanes in total together with two (2) shoulder lane and will be approximately 24.86m in width.

Figure 4-11 illustrates the current structure while **Figure 4-12** shows the proposed upgrade to the Bridge.

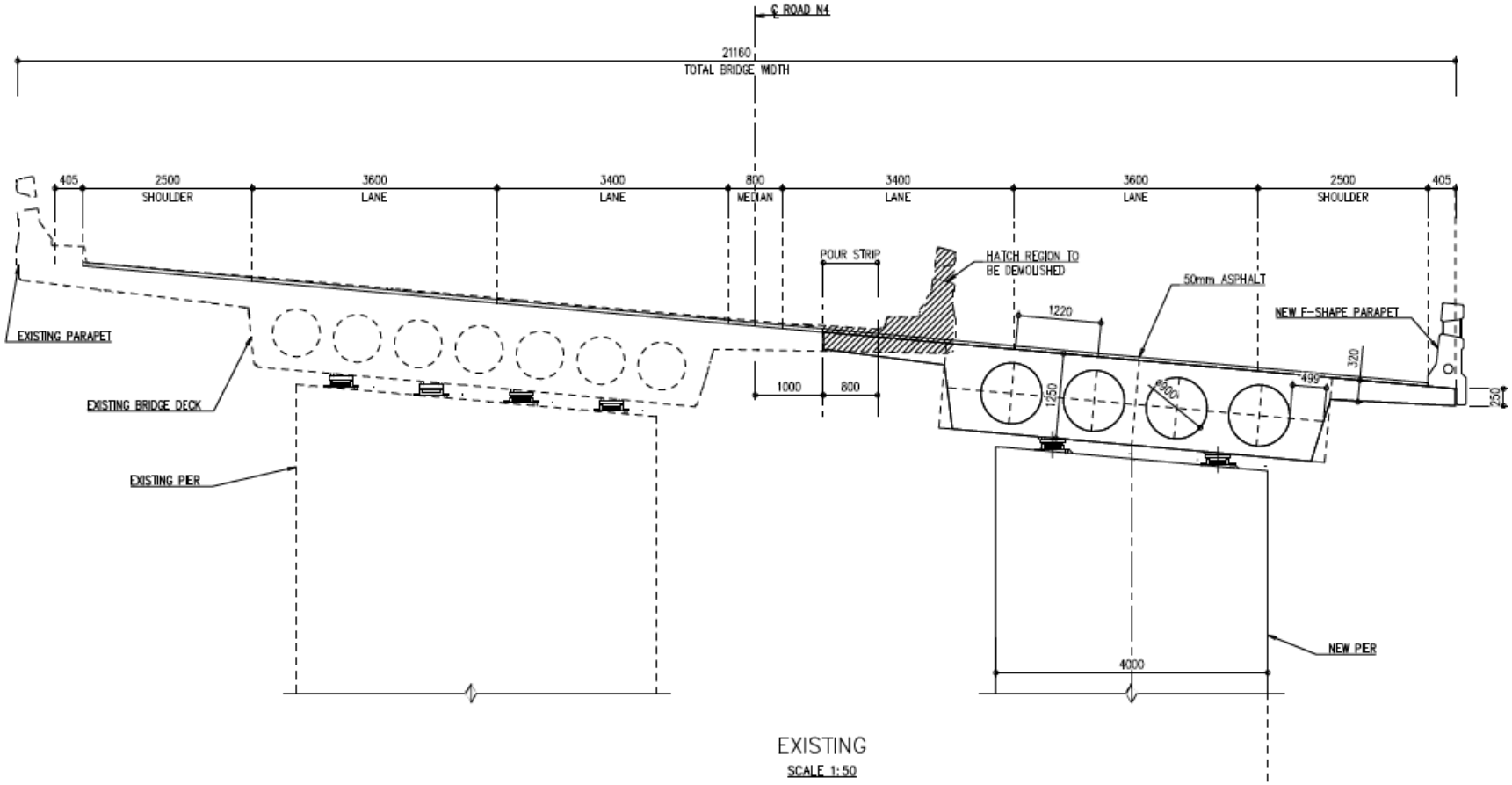


Figure 4-11: Existing Crocodile Bridge Structures

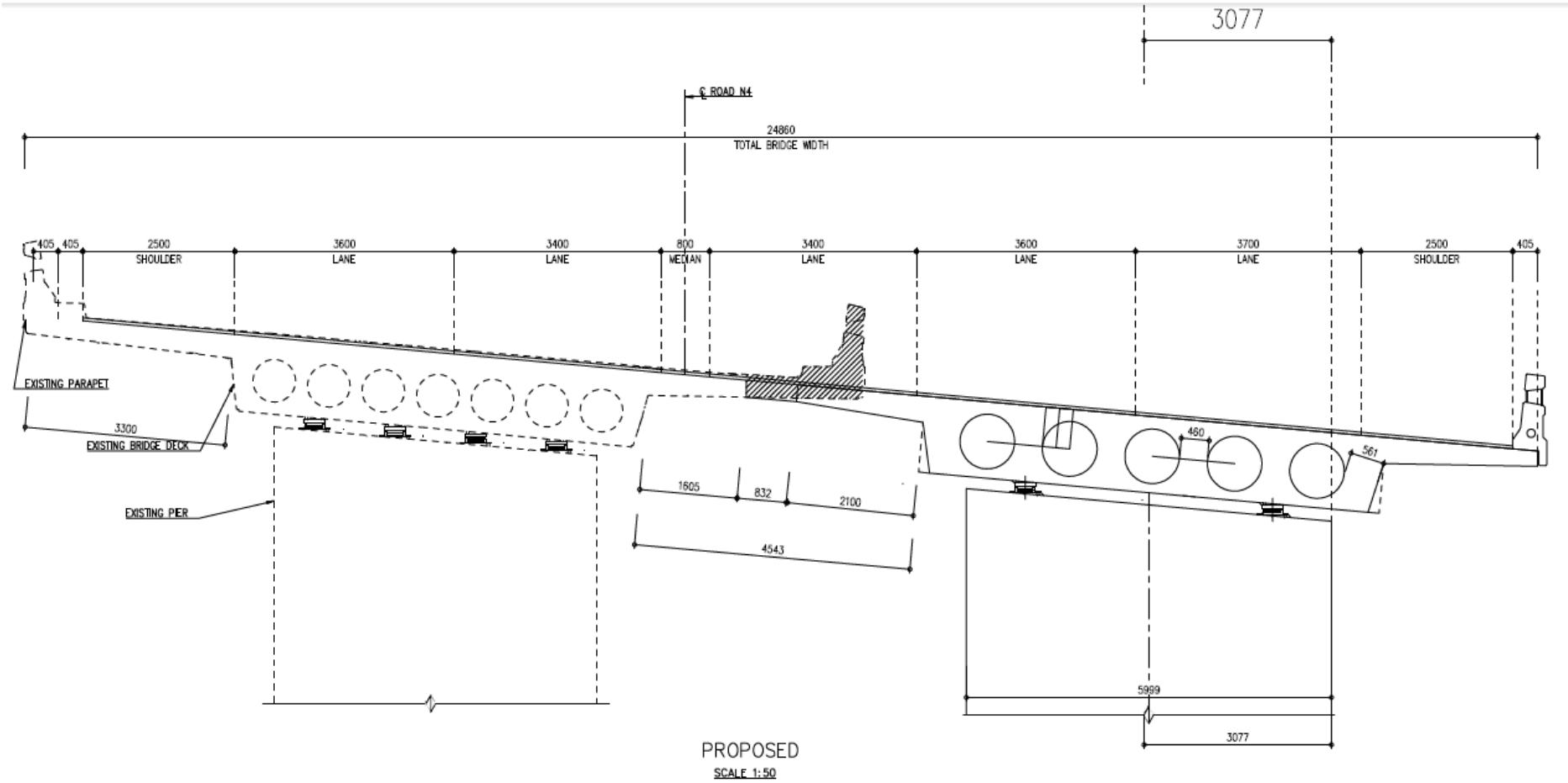


Figure 4-12: Proposed Crocodile Bridge Structures Plan

4.4.2 Ramps

Four ramps will be put in place and are described in the subsections that follow. The Typical Cross Section for all four ramps is provided in **Figure 4-13** below.

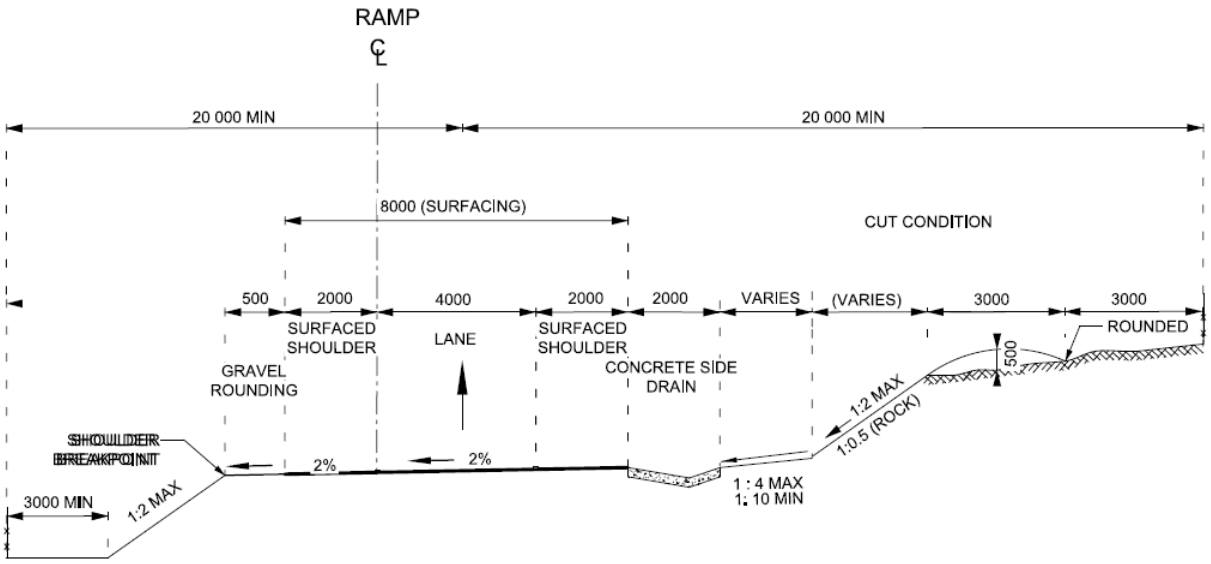


Figure 4-13: Typical Cross Section – All ramps

4.4.2.1 Ramp A

Ramp A carries the traffic movement from Mbombela to Schoemanskloof. The forecast 30th highest hour volume is 703 veh/h in 2028. Ramp A is a continuation of the left-hand lane of N4-7X and diverges from the main N4 roadway at a 1:15 taper rate. The proposed cross-section consists of two 3.7 m lanes a 2.5 m slow-lane surfaced shoulder and a 1.0 m surfaced fast-lane shoulder.

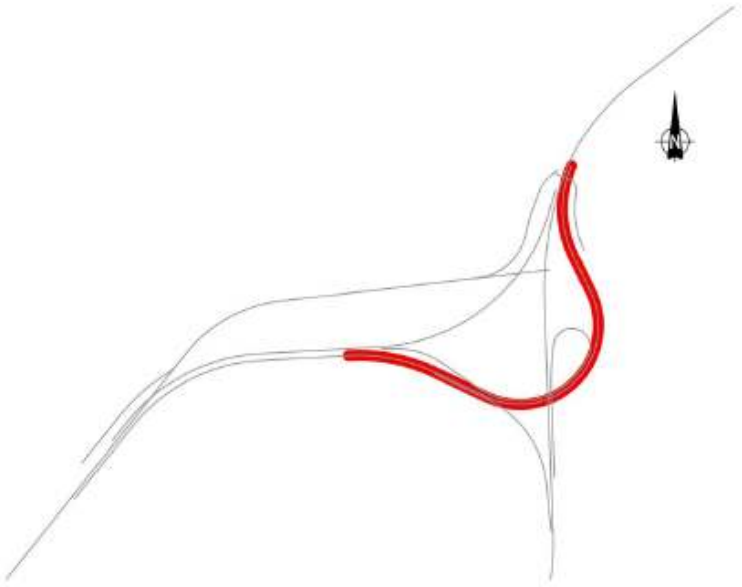


Figure 4-14: Ramp A

As part of this, a new interchange bridge will be put in place and will be a new overpass structure located at km 22.31 over N4-7X. The bridge will carry the new Ramps A and D over the existing cutting (Refer to **Section 4.4.3** for more information).

4.4.2.2 Ramp B

Ramp B carries the traffic movement from Schoemanskloof to Mbombela. The forecast 30th highest hour volume is 813 veh/h in 2028. Ramp B is a continuation of the eastbound core lane of N4 Schoemanskloof (R539) Route and continues on to form the left-hand lane of N4-7X.Ramp B is designed for 100 km/h as it will for part of the future prioritised N4-6Y.

The vertical alignment of Ramp B is designed to tie into the vertical alignment of the realigned Schoemanskloof Road at km 63 100 and to tie into the level of the existing Schoemanskloof Road to minimise the cost and duration for accommodation of traffic.

The proposed cross-section will have a 4.0 m lane width and 2.0 m surfaced shoulders.

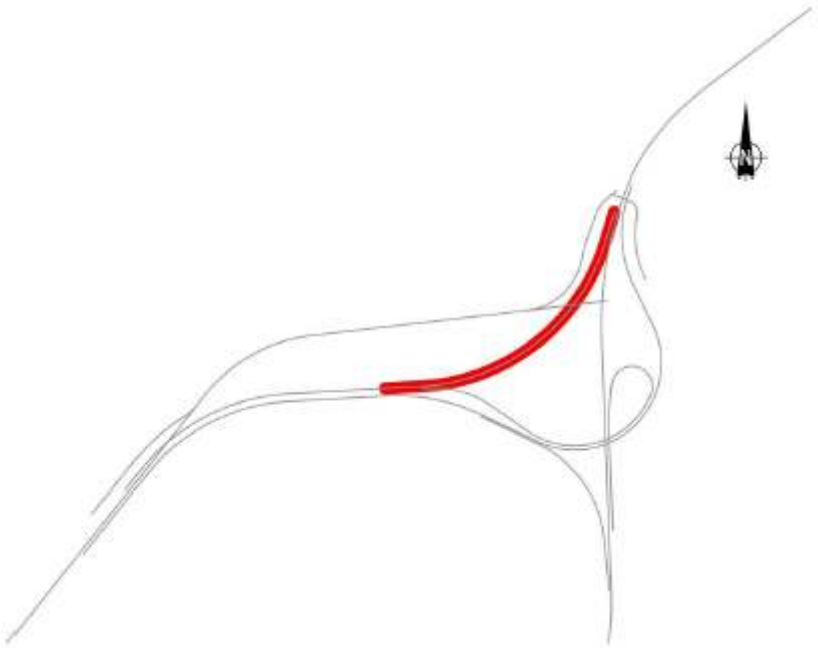


Figure 4-15: Ramp B

4.4.2.3 Ramp C

Ramp C carries traffic from the Elands Valley to Schoemanskloof. The forecast traffic volume in the 30th highest hour is based on 24-hour intersection counts done in 2017 and is estimated to be a very low 7 veh/h. This ramp is entirely in cut and may be used as a source for fill material.

The ramp begins with a 1:15 taper off of the N4 and continues on in an auxiliary lane parallel to the lane from Ramp A. This auxiliary lane serves an additional function as a passing opportunity for the Schoemanskloof route as a whole.

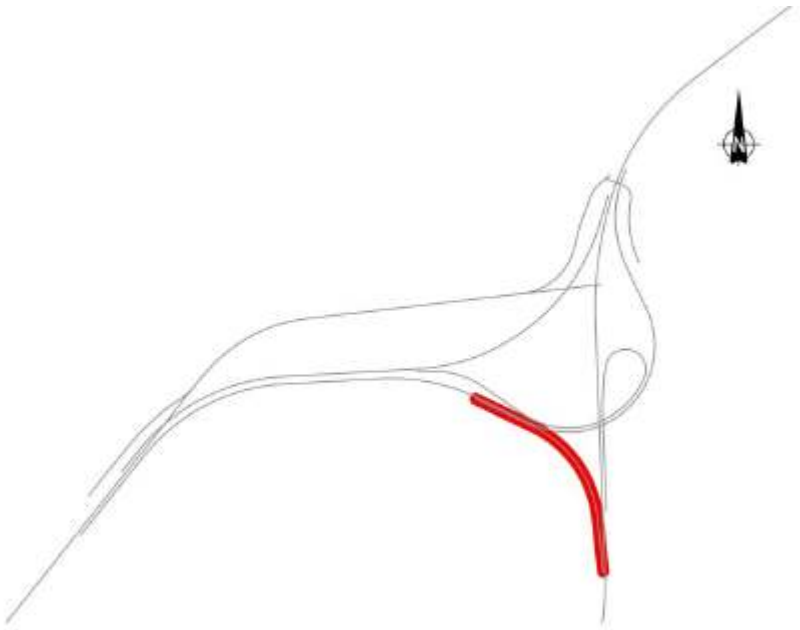


Figure 4-16: Ramp C

The proposed cross-section is a 4.0 m lane width and 2.0 m surfaced shoulders. The lane width reduces to a typical 3.7 m wide and the right-hand shoulder falls away where Ramp C joins Ramp A's alignment.

4.4.2.4 Ramp D

Ramp D carries traffic from Schoemanskloof to Waterval Boven. The forecast traffic volume in the 30th highest hour is based on 24-hour intersection counts done in 2017 and is estimated to be a very low 7 veh/h. The loop component of the ramp is designed for 40 km/h while the directional component is designed for 70 km/h. The loop ramp enters the N4 with a parallel acceleration lane with a length of 185 m required to accelerate from 40 km/h to 100 km/h.

The proposed cross-section is a 4.0 m lane and 2.0 m shoulders. The right-hand surfaced shoulder falls away where Loop D runs parallel to Ramp A, returning when Loop D diverges from the Ramp A alignment.

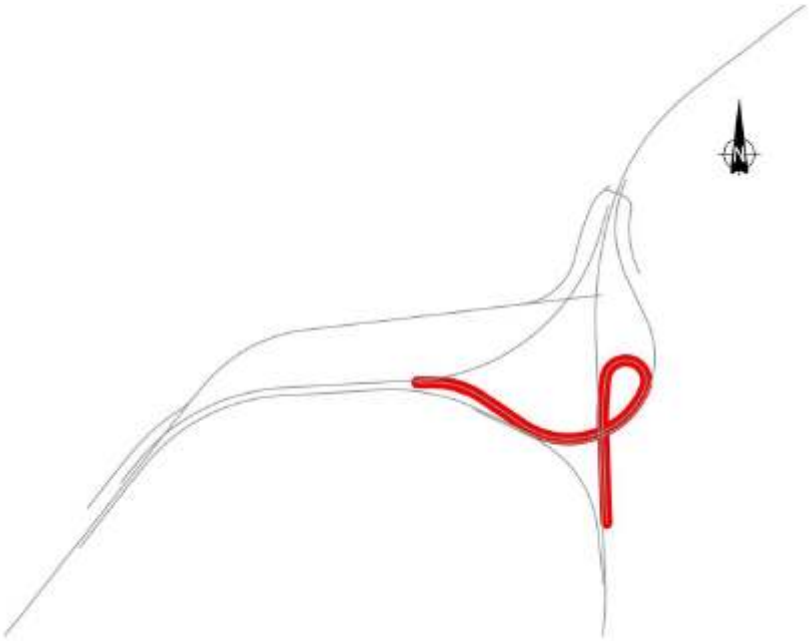


Figure 4-17: Ramp D

As part of this, a new interchange bridge will be put in place and will be a new overpass structure located at km 22.31 over N4-7X. The bridge will carry the new Ramps A and D over the existing cutting.

4.4.3 New Interchange Bridge B0571

The new Montrose Interchange Bridge (B0571) will be a new structure to accommodate the new interchange Ramps A and D over the existing N4-7X. The proposed design makes use of the existing rock faces for founding and will be approximately 47.9 m from deck end to end. As part of the design, the superstructure will consist of a 600 mm thick, continuous slender slab deck 47.9 m from expansion joint to expansion joint. The deck has substantial cantilevers and is supported by a slender arch under the deck which springs off spread footings in the rock cutting. The deck ends are supported on shallow abutments with spread footings on rock. **Figure 4-18** below shows the proposed deck cross section at the centre of the arch.

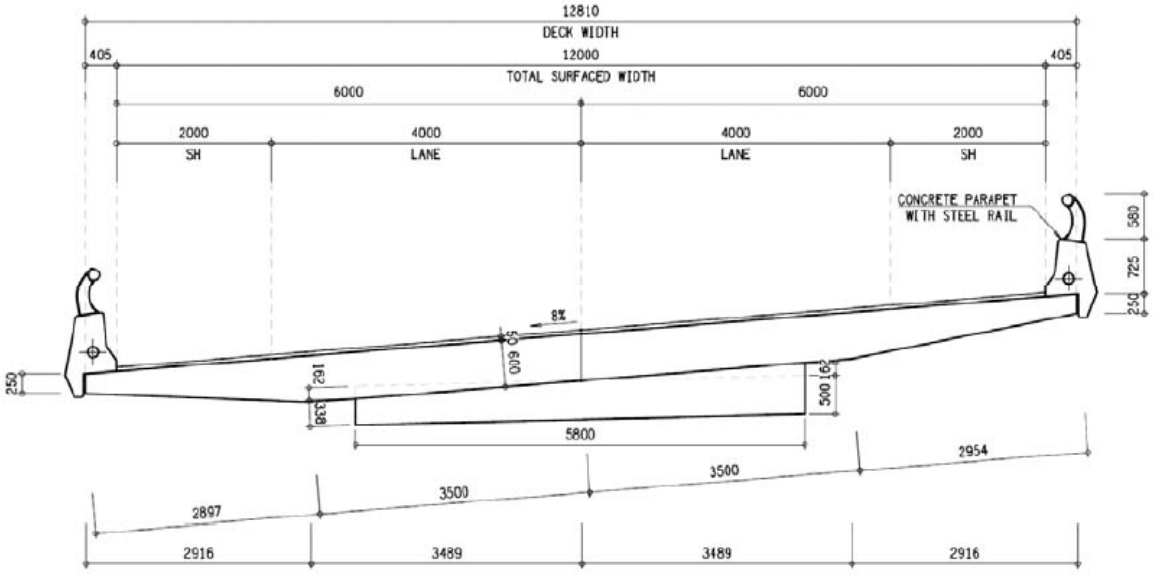


Figure 4-18: Deck cross section near the centre of the arch bridge

The road cross-section over the bridge includes two 4.0 m lanes and two 2.0 m surfaced shoulders at an 8% superelevation. The cross-section of the N4-7X under the bridge will be modified to incorporate an additional 3.7 m acceleration lane from Ramp D (which carries traffic from Schoemanskloof to Waterval Boven). **Figure 4-19** shows the elevation view.

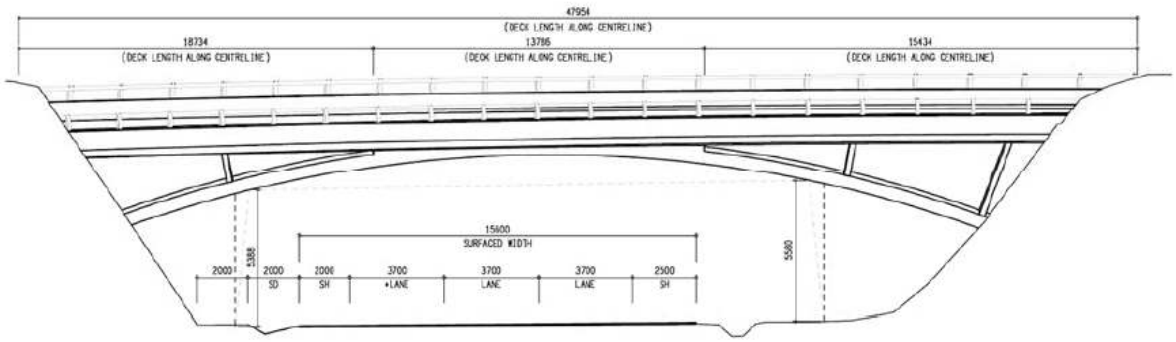


Figure 4-19: Elevation of the arch bridge (looking south) and lane layout

4.4.4 Access to properties

There are a number of properties that currently get direct access to the national road network that are affected by the proposed interchange:

- Remainder of Portion 19 of the farm Elandshoek 302 (direct access to N4 Schoemanskloof (R539) Route via shared access to Portion 8 of the farm Mooifontein 292, and further west of Montrose Interchange);
- Remainder of the farm Montrose 573 (access via formalised farm access to dilapidated weigh bridge and informal access along N4 Elands Valley, south of Montrose Interchange);

- Portion 8 of the farm Mooifontein 292, through Remainder of Portion 19 of the farm Elandshoek 302 (shared access);
- Remainder of Portion 2 of the farm Montrose 290 (via the existing at-grade intersection being replaced by the proposed interchange); and
- Remainder of Portion 4 of the farm Montrose 290 (direct access to N4 Schoemanskloof (R539) Route).

The proposed access reinstatement is detailed below:

- Access to Remainder of Portion 19 of the farm Elandshoek 302 is retained by formalising the existing shared access. A farm access-type intersection is proposed because the median for the realigned N4 Schoemanskloof (R539) Route is opened up immediately to the east of this access. A lower-standard access may be considered as an alternative.
- Remainder of the farm Montrose 573 is divided into three portions by the existing N4-7X and now the Montrose Interchange. Existing access is retained via the existing N4 Schoemanskloof (R539) Route and two new farm accesses along N4-7X.
- Portion 8 of the farm Mooifontein 292, through Remainder of Portion 19 of the farm Elandshoek 302 (shared access, as described above).
- Remainder of Portion 2 of the farm Montrose 290. Should access be required, it is proposed that the defunct alignment of Road P154/6 be re-formalised and access to this portion be provided via a new private gravel road passing underneath the Crocodile River Bridge. The proposed access road will link from the old bridge B381 to the property.

4.4.5 Stormwater

4.4.5.1 Existing minor drainage

For the R539 / N4-6Y, the existing minor stormwater drainage system consists of concrete lined side drains and medium-sized concrete pipes and portal culverts discharging stormwater across the road towards the Crocodile River.

Similarly, for the N4-7X, the existing minor stormwater drainage system consists mainly of concrete lined side drains conveying stormwater run-off from the road and small adjacent catchment areas along the road and subsequently towards the Crocodile River.

There are a few minor cross drainage pipe culverts discharging stormwater run-off from adjacent catchment areas towards the Elands River.

4.4.5.2 Proposed minor drainage

The following minor stormwater drainage systems are proposed:

- Cut-off berms or drains on top of deep cuts;
- Type F concrete side drains and grid inlets to intercept road surface runoff;

- Type A concrete side drains in high fills; where run-off will be discharged by downpipes / chutes;
- Minimum size of 900 mm diameter for new cross drainage culverts discharging stormwater in accordance with SANRAL standards for culverts longer than 30 m;
- Existing side drains to be reconstructed to suit the proposed geometric layout and resized based on the most recent SANRAL design standards;
- Erosion protection measures to be implemented along the route; and
- Subsoil drains to be provided under all concrete side drains.

The re-aligned N4 Schoemanskloof (R539) Route crosses a number of small drainage lines. The same drainage paths were crossed by the existing N4-6Y alignment and so the stormwater will be handled in much the same way:

- Earth embankments/ berms will be constructed at the top of the cuttings to channel stormwater runoff for a short distance to inlet structures at the top of the cuttings.
- The water will then be conveyed beneath the realigned N4-6Y in concrete pipes with a minimum diameter of 600 mm.
- The stormwater will then discharge from these culverts into existing open, unlined channels or into newly-constructed open earth channels.

It should be noted that the new stormwater infrastructure aims to reinstate existing drainage paths as far as possible and that the proposed stormwater management is, in principle, identical to the status quo. The following applies:

- Runoff from the south is intercepted by earth berms positioned at the top of cuttings and conveyed to the toe of the cuttings by means of inlets behind berms
- Proposed cross-drainage culverts reinstate the existing flow by discharging back into the existing drainage paths
- The terrain is shaped, in certain situations, for the purpose of directing the flow of runoff as described above
- The inflow into existing culverts is not increased
- Runoff from the new road surfaces is intercepted by means of concrete drains in front of guardrails (where in high fill) or concrete-lined drains adjacent to the edge of surfacing and conveyed to either down-chutes or grid inlets to be discharged in a similar manner as described above

Please refer to **Appendix 14.3** for copies of the stormwater layout.

Note that all designs have been undertaken in line with the SANRAL Drainage Manual.

4.4.6 Timeframes

The proposed development will be constructed according to the following preliminary timeframes, see **Table 4-7:**

Table 4-7: Operational hours for construction phases.

Period	Open	Close*
Weekdays	07:00	18:00
Saturdays	07:00	15:00
Sunday	Only when required	
Public holidays	Only when required	

' Should night-time work be required, it will be arranged formally and in agreement with surrounding landowners.*

4.4.7 Ancillary Infrastructure Required for Construction

No major infrastructure is required on site for the construction of the development. The required ancillary infrastructure for the purposes of supporting services is discussed below.

4.4.7.1 Security

A construction camp will be erected on site for the duration of the construction. This camp will be fenced for security purposes. A security guard will also be posted on site during non-operational times. A wall will be erected around the property boundary as part of the development project.

4.4.7.2 Sanitation

During the construction phase of the project, chemical toilets will be placed on site for the duration of the construction phase.

4.4.7.3 Construction Camp and Laydown Areas

Designated areas will be established during the construction phase for construction equipment and vehicles. This area will be outside all sensitive areas (delineated wetlands etc.). As far as possible these will be located within already disturbed areas or areas that will be directly impacted by the road construction footprint.

4.4.7.4 Temporary access roads

Existing roads will be used as far as possible for access during construction, however, where necessary, temporary access roads will be put in place.

4.4.8 Operational Timeframes

The proposed development involves the development of a road which once completed, will be operational on a 24- hour basis, all through the year

Maintenance activities (collection of litter, routine inspections and maintenance etc.) will however be limited to the same timeframes as those in the construction phase (**Table 4-8)**.

Table 4-8: Operational hours for maintenance activities

Period	Open	Close
Weekdays	07:00	18:00
Saturdays	07:00	15:00
Sunday	Only when required	
Public holidays	Only when required	

4.5 Project Lifecycle

To adequately consider the impacts associated with the proposed development, the major activities during each phase of the project life cycle are listed below:

- Feasibility Studies
  - Technical, economic and environmental screening of alternatives;
  - Development of Preliminary Design Report;
  - Geotechnical Assessment;
  - Discussions with landowner; and
  - Environmental Authorization and WULA process.
- Pre-construction Phase
  - Detailed layouts and services designs;
  - Procurement process for Contractors;
  - Land acquisition; and
  - Procurement of other necessary materials.
  - Appoint Environmental Control Officer;
- Construction Phase
  - Appointments and site camp set up:
    - Set up site camp with temporary offices and administrative facilities;
    - Set up ablutions;
    - Set up access control, security; signage and lighting;
    - General materials storage and laydown areas
    - Construction employment;
    - Change-houses, chemical toilets and showering facilities (linked to conservancy tanks – removal of contents by exhauster vehicle and disposal at permitted facility); and

- Temporary waste storage areas; these shall be established and managed in accordance with EMPr requirements to be developed in the EIA phase.

- Sourcing of construction materials and equipment:
  - All bulk materials (aggregate, cement, steel etc.) will be sourced from existing lawful commercial sources; or should it be necessary separate applications for mining permits to allow for borrow pits will be undertaken prior to use.
- Excavation and earthworks
  - Removal of existing surfacing material where necessary (concrete, asphalt etc.) which could involve excavation below ground level;
  - Levelling and compaction using heavy machinery / earthmoving equipment.
  - Cut and fill activities
    - From the centre line soils investigation, the gravels found in the vicinity of the new road alignment can be used in the selected subgrade layers or as fill with careful selection of materials. From the initial modelling of cut and fill it was found that the construction of the new alignment would yield surplus cut material and therefore none to limited additional material would be required from other sources for the selected and fill layers.
  - Therefore, such of the fill material will be sourced from the cuts undertaken and will therefore be crushed on site.
  - A multistage crusher will be established on site.
  - Potential for excavations and trenching in order to lay of below ground level equipment (cables, pipes, sumps, drainage etc.);
  - Relocation or protection of existing services
  - Potential for excavation dewatering in the event of water-table interception;
  - Use of general mechanical equipment within construction areas (generators, cutting and welding equipment, compressors etc.).
- Storage
  - Storage of aggregate and materials required for road construction (bitumen etc.)
  - Storage of topsoil and sub soil
  - Storage of hazardous material
  - Storage of waste
- Expansion of Crocodile Bridge
  - To achieve the required roadway widening, a second bridge will be constructed alongside the existing structure. The decks of the existing and new bridge will be stitched together by means of a reinforced concrete connection
  - New piers found on bedrock will be constructed to support the new deck (existing piers founded similarly)
  - The new abutments will be perched and founded into bedrock by piling through the constructed road approach fills. These road embankments will spill through the abutments and will require gabion protection at fill toes

        - Span by span construction will be undertaken and the streamflow will be accommodated within unaffected spans during construction
        - Conventional ground supported staging will be used to construct the new bridge deck
    - New N4 Schoemanskloof (R539) through drainage lines
        - The re-aligned N4 Schoemanskloof (R539) Route crosses a number of small drainage lines. The same drainage paths were crossed by the existing N4-6Y alignment and so the stormwater will be handled in much the same way:
        - Earth embankments/ berms will be constructed at the top of the cuttings to channel stormwater runoff for a short distance to inlet structures at the top of the cuttings.
        - The water will then be conveyed beneath the realigned N4-6Y in concrete pipes with a minimum diameter of 600 mm.
        - The stormwater will then discharge from these culverts into existing open, unlined channels or into newly constructed open earth channels.
        - The aim is to reinstate the existing flow paths and to not increase the discharge flows at any of the existing culverts where possible.
- **Operation Phase:**
    - Maintenance of infrastructure.
- **Decommissioning Phase**
    - Decommissioning of the development and associated services is not envisioned. However, should decommissioning be required the activity will need to comply with the appropriate environmental legislation and best practices at that time.

5 DESCRIPTION OF THE RECEIVING ENVIRONMENT

Section 3(h) of Appendix 3 of the 2014 EIA Regulations, requires that the EIA Report includes information on the *environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects*. In line with this, and in order to understand how the environment will be affected by the proposed development, the following section provides an overview of the receiving environment. Where necessary, this section includes information obtained from the specialist studies on the baseline conditions.

5.1 Local Climate

The climatological data in this section applies to the Schoemanskloof valley as a 30-year average.

5.1.1 Temperature

The "mean daily maximum" (solid red line) in **Figure 5-1**, shows the maximum temperature of an average day for every month for the Schoemanskloof. Likewise, "mean daily minimum" (solid blue line) shows the average minimum temperature. The average recorded temperatures range from 14°C (average minimum) to 25°C (average maximum) in summer and 8°C (average minimum) to 21°C (average maximum) in winter.

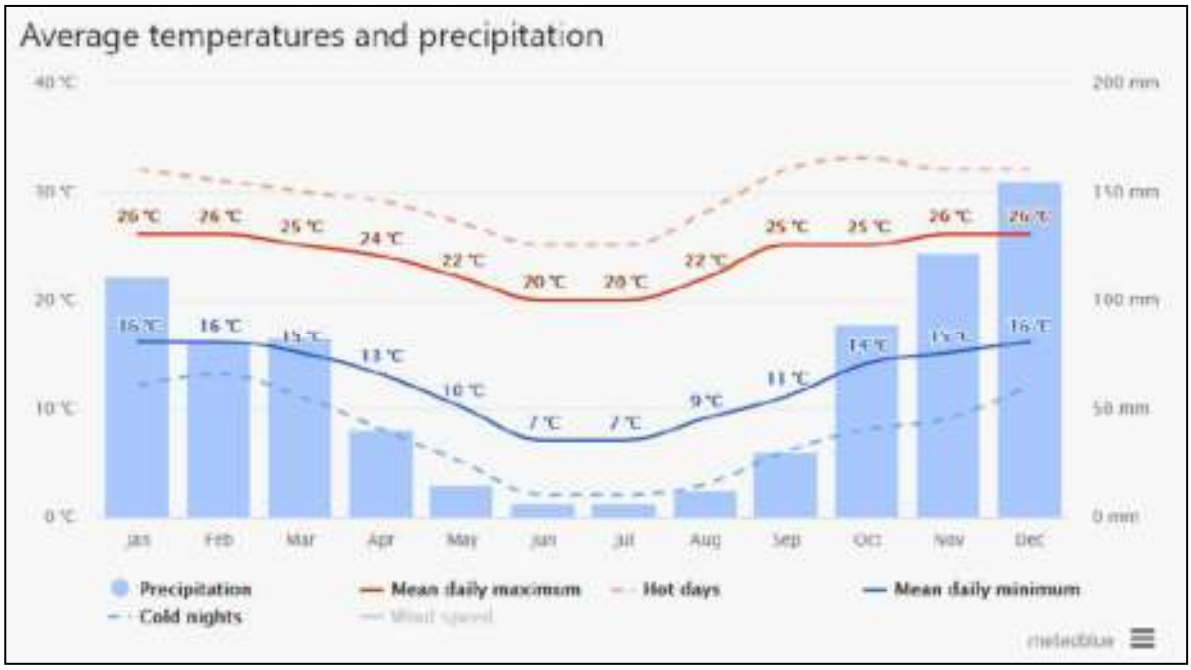


Figure 5-1: Average temperature data for the Schoemanskloof (www.meteoblue.com) [Date accessed: 29 May 2020]

5.1.2 Rainfall

Precipitation in the Schoemanskloof range mostly between 2 mm to 20 mm for most of the summer months (wet season) in the region. The most common forms of precipitation include thunderstorms, moderate rain,

and light rain. The dry season in winter (May to August) may only have 3 – 5 days of precipitation per month average (refer to **Figure 5-2**.

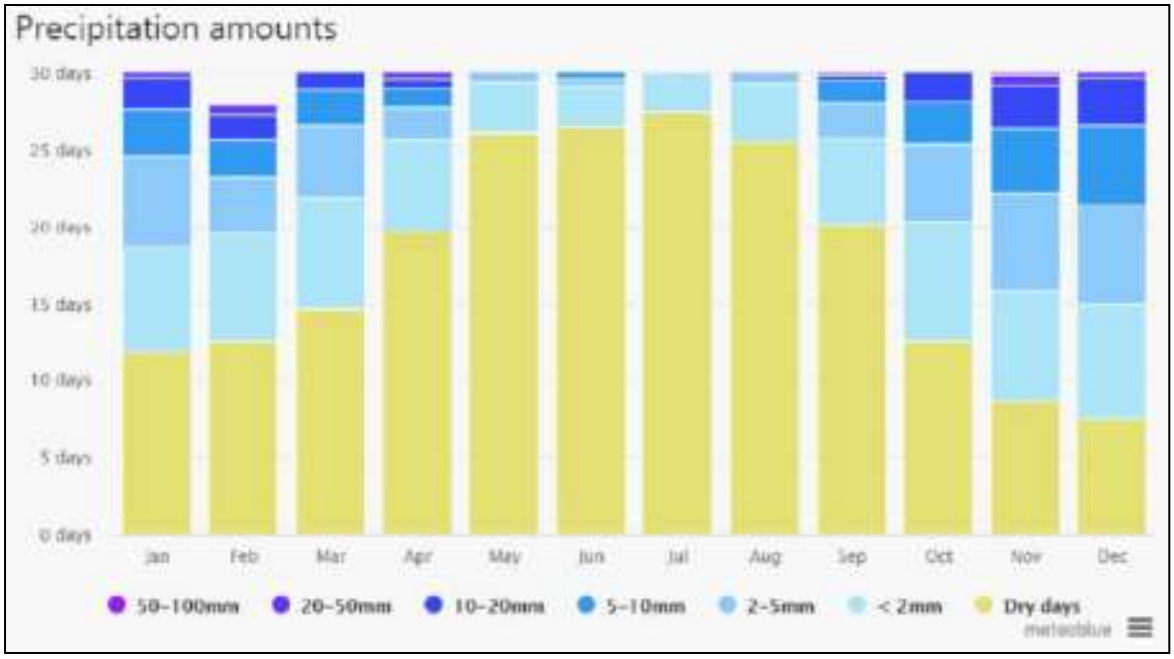


Figure 5-2: Average precipitation data for the Schoemanskloof (www.meteoblue.com) [Date accessed: 29 May 2020]

5.1.3 Wind

The wind rose for the Schoemanskloof valley indicates how many hours per year the wind blows from the indicated direction (**Figure 5-3)**. The wind rose shows that the wind is blowing from the East-North-Easterly direction for over 1600 hours per year, a North-Easterly direction for approximately 800 hours per year and an Easterly direction for approximately 1200 hours per year. The three spokes around the North-East direction i.e. NE, ENS and E comprise a very high percentage of all hourly wind directions. The wind rose also show that the wind rarely blows from Southerly directions in the Schoemanskloof. The wind rose also provides the wind speeds from different directions. The average annual wind speed for Schoemanskloof is approximately 9 km/h.

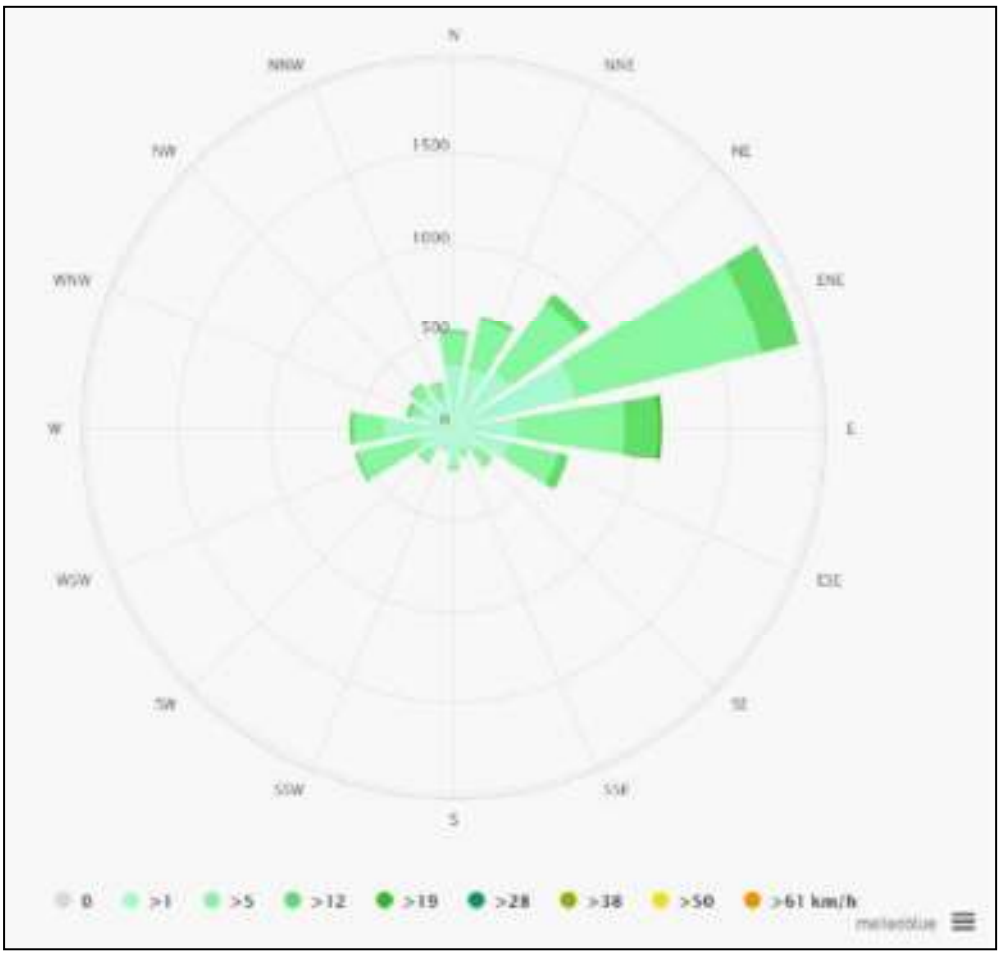


Figure 5-3: Wind rose for the Schoemanskloof valley (www.meteoblue.com) [Date accessed: 29 May 2020]

5.2 Topography

The proposed interchange occurs in an area which consists of undulating hills where two rivers confluence and therefore has slope gradients towards the watercourses while being surrounded by hills. The Crocodile and Elands Rivers below the proposed interchange lie at approximately 790 m above sea level, whilst surrounding hills to the North and South of the site reach approximately 1120 m above sea level.

The contours of the proposed interchange are provided in **Figure 5-4**.

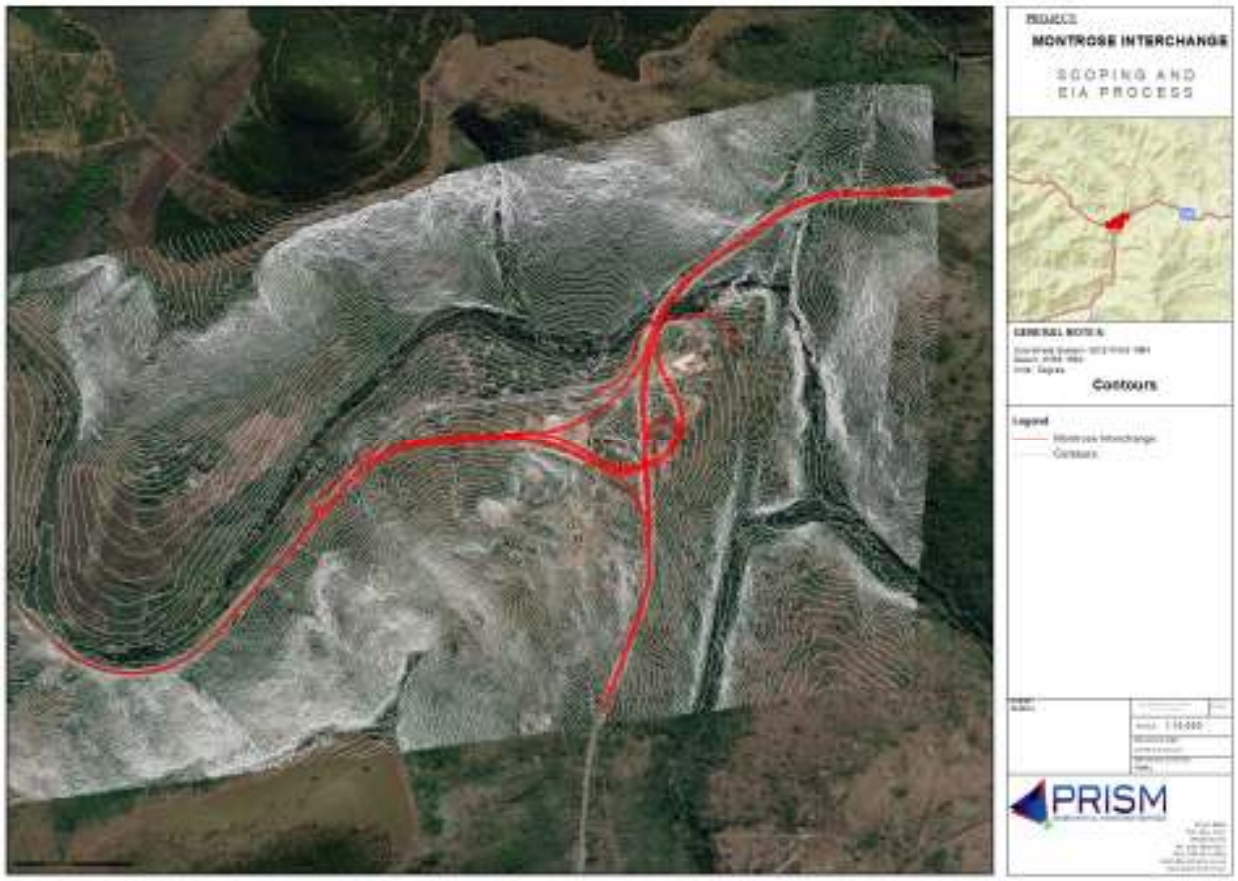


Figure 5-4: 5m Contours

5.3 Geology and Soils

The route alignment is underlain by Palaeo- to Meso-archean basement rocks of the Barberton Greenstone Belt (BGB) and the Nelspruit Suite. The regional geology of the site is shown in **Figure 5-5,** with the BGB denoted by the symbol ‘Zt’, whilst the Nelspruit Suite is denoted by the symbol ‘Zn’.

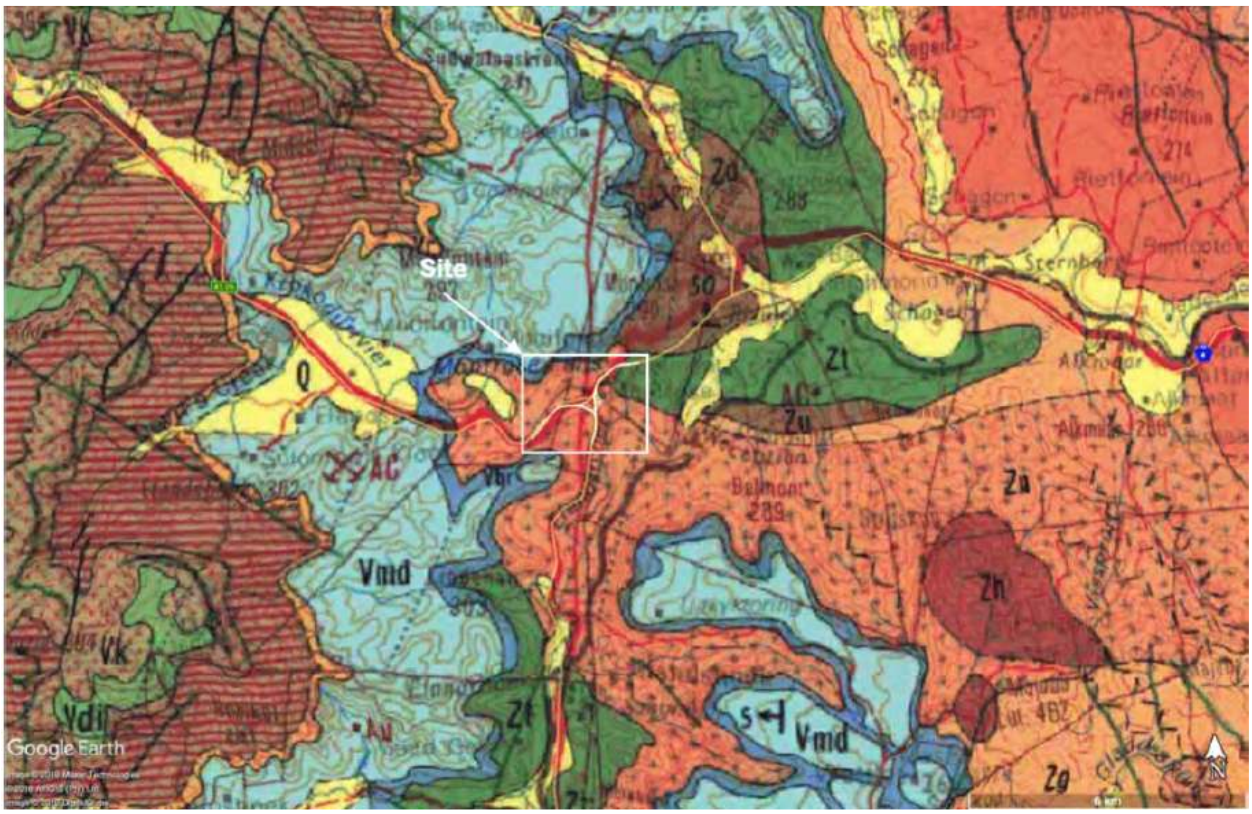


Figure 5-5: Regional Geology (SMEC, 2019)

A summary of these two main types are as follows:

- During metamorphism of these rocks, which accompanied granitization, green minerals such as chlorine, hornblende and epidote were commonly developed in the mafic volcanic rocks, giving rise to the sack term “greenstones” for the rocks containing them. These rocks constitute the oldest preserved material on earth’s surface, and typically comprise undifferentiated mafic and ultramafic plutonic and volcanic rocks that have been altered to serpentinites, a variety of amphibolites and chlorite talc, talc carbonate and talc chlorite schists, with hybrid granitic rocks developed in places.
- The Nelspruit Suite comprises a number of texturally distinct varieties including gneiss, porphyritic granite and two small plutons. The most widespread variety is a coarse-grained, strongly porphyritic granitoid, which is compositionally a granodiorite or quartz monzonite. The rock is greyish to pinkish, and comprises quartz, plagioclase, microcline perthite and biotite. The K-feldspar invariably forms the phenocrysts, which can measure up to 30 mm in length, and outline magmatic flow textures (Robb et. al., 2006). Somewhat less common is gneiss of granodioritic composition, which topographically underlies the porphyritic granite and occupies relatively low-lying ground. A broad, gradational, sub horizontal contact zone is developed between the two units. Residual soils developed on the greenstone belts are usually not deep and are seldom present to depths of greater than 3 m. notwithstanding, the residual soils are clayey, and can exhibit a highly expansive character. Furthermore, the residual soils are highly variable in thickness, even over short distances. The granite can be variable in places, and deep residual soil profiles can develop, with these soils often exhibiting a collapsible soil grain structure.

5.4 Land Use

The site is currently mostly developed and largely altered by anthropogenic activity. The site is located around the existing roads T-junction of the **N4 Toll route via Ngodwana** and the N**4 Schoemanskloof (R539) Route**. The T-junction itself is in an area known as Montrose. An old cement batching plant site is in the centre of the proposed interchange. This site was also where the old Montrose Hotel was situated some decades ago. To the east of this site and across the N4 road, an existing construction plant park area and agricultural sheds of Jouberts & Sons are situated that has also largely altered the land from its natural state. The site also includes the expansion of the existing Crocodile River Bridge. Site Photographs taken by Drone in October 2019 are provided in **Figure 5-6** below and show the current land use (road, vacant land, historically altered land etc.).

Figure 5-6: Site Photographs

5.5 Access Roads

In addition, there are a number of properties that currently get direct access to the national road network that are affected by the proposed interchange:

- Remainder of Portion 19 of the farm Elandshoek 302 (direct access to N4 Schoemanskloof (R539) Route via shared access to Portion 8 of the farm Mooifontein 292, and further west of Montrose Interchange);

- Remainder of the farm Montrose 573 (access via formalised farm access to dilapidated weigh bridge and informal access along N4 Elands Valley, south of Montrose Interchange);
- Portion 8 of the farm Mooifontein 292, through Remainder of Portion 19 of the farm Elandshoek 302 (shared access);
- Remainder of Portion 2 of the farm Montrose 290 (via the existing at-grade intersection being replaced by the proposed interchange); and
- Remainder of Portion 4 of the farm Montrose 290 (direct access to N4 Schoemanskloof (R539) Route).

5.6 Existing Services

Three known services may be affected by construction of the Montrose Interchange and will require relocation or protection, if necessary.

- An 11kV overhead electrical powerline crosses over the existing N4-6Y, with a vertical clearance of 11.63 m. The realignment of this portion of N4-6Y reduces the vertical clearance to 9.6 m. This clearance is sufficient to meet Eskom's standards, but needs to be checked against abnormal load route requirements.
- One pylon for the abovementioned 11kV line is affected by the proposed service road to reinstate access on the Farm Elandshoek 302-JR.
- A fibre optic cable installed by LightFibre Infrastructure follows N4-6Y to the left of the road, turning abruptly northwards at the existing at-grade Montrose intersection to continue on along N4-7X. This service lies at the toe of the fill batter for Ramp B and crosses the proposed access road to the Farm Elandshoek 302-JR to Joubert & Sons. This service will have to be exposed and protected.
- A Telkom service follows N4-7X to the left of the road. All four of the ramps cross this service. This service will have to be exposed and protected.

5.7 Agricultural Potential

Agricultural land capability is the total suitability for use, in an ecologically sustainable way, for crops, for grazing, for woodland and for wildlife. The Department of Environmental Affairs, Forestry and Fisheries (DEFF) environmental screening tool (**Figure 5-7**) was used to better understand agricultural potential. According to the Land Capability data available from DEFF, the site has a very low to moderate land capability with some sections showing a high land capacity.

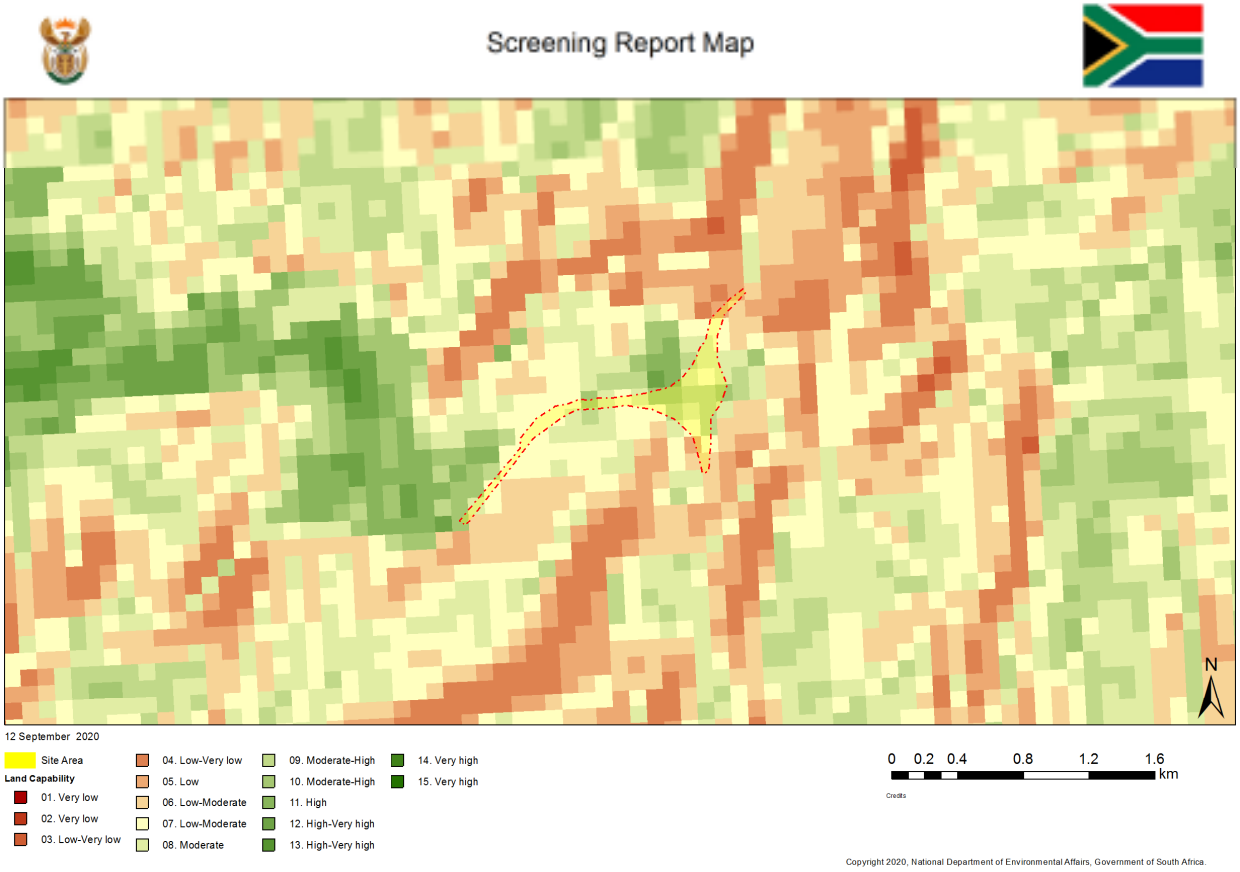


Figure 5-7: Agricultural Land Capability

Photographs from the site visit however indicate that the site is altered by anthropogenic use or is more indicative of veld/ riparian area (**Figure 5-6**).

This is further corroborated by information in the City of Mbombela SDP which notes that the land with a low agricultural capability is located in the Kruger National Park, ***Schoemanskloof,*** Ngodwana, at Pienaar, Matsulu, Daantjie, north-east of Legogote, Hilltop areas along the R40, and the western & southern escarpments of the municipality (Figure 5-8).

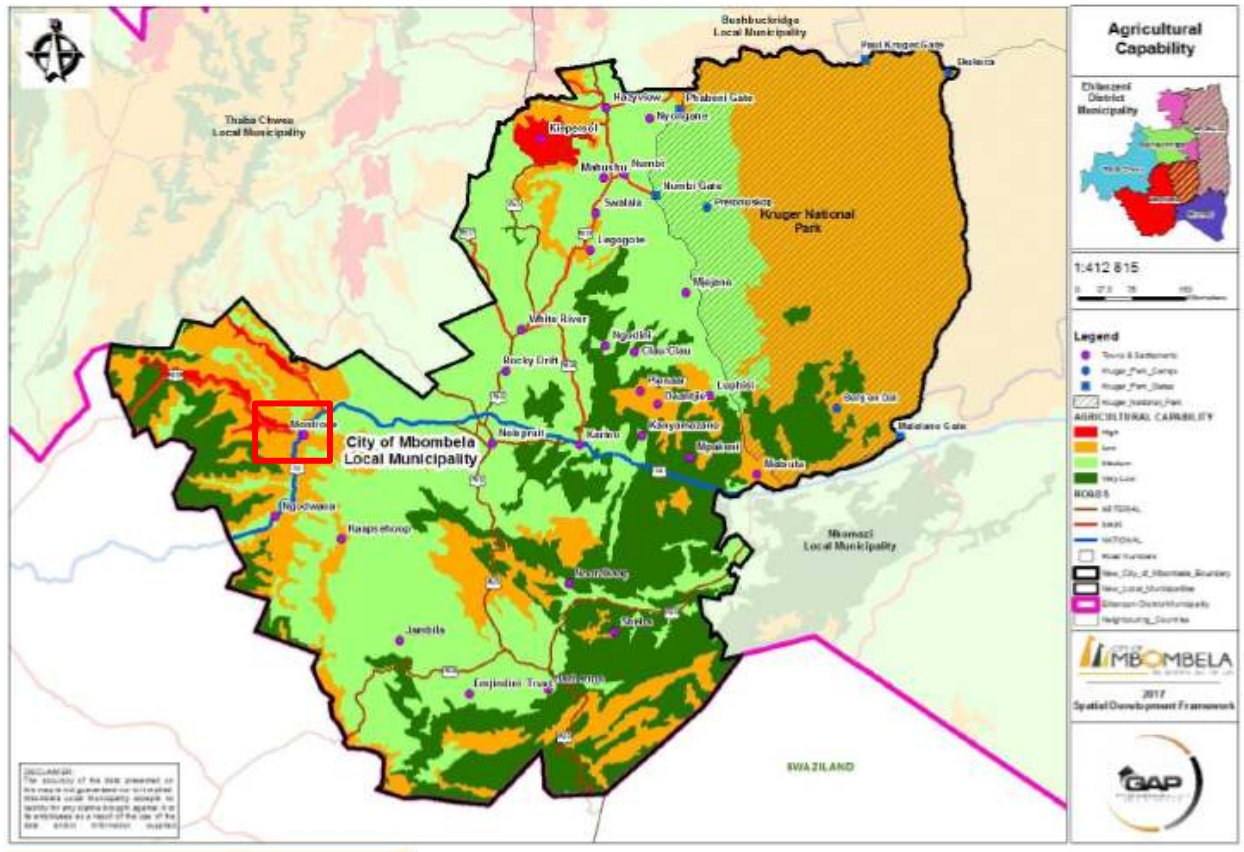


Figure 5-8: Agricultural Land Capability (From City of Mbombela SDP, 2018)

5.8 Socio-Economic Environment

5.8.1 City of Mbombela Socio-Economic Environment

The proposed development occurs within the City of Mbombela in Mpumalanga. A summary of the socio-economic environment for the City of Mbombela obtained from the City of Mbombela Integrated Development Plan (IDP), the City of Mbombela SDP (2018) and the StatSA Census 2011 and Community Survey 2016 is included below.

The City of Mbombela occurs within the Ehlanzeni District Municipality, in Mpumalanga province. It was established subsequent to the disestablishment of two municipalities, Mbombela Local Municipality and uMjindi Local Municipality and is an amalgamation of the two. The Municipality is situated in the North Eastern part of South Africa within the Lowveld sub-region of the Province (**Figure 5-9**). The municipality is made up of 45 wards and 4 regions. The proposed development occurs within Ward 12 in the Central Region (City of Mbombela IDP, 2018)

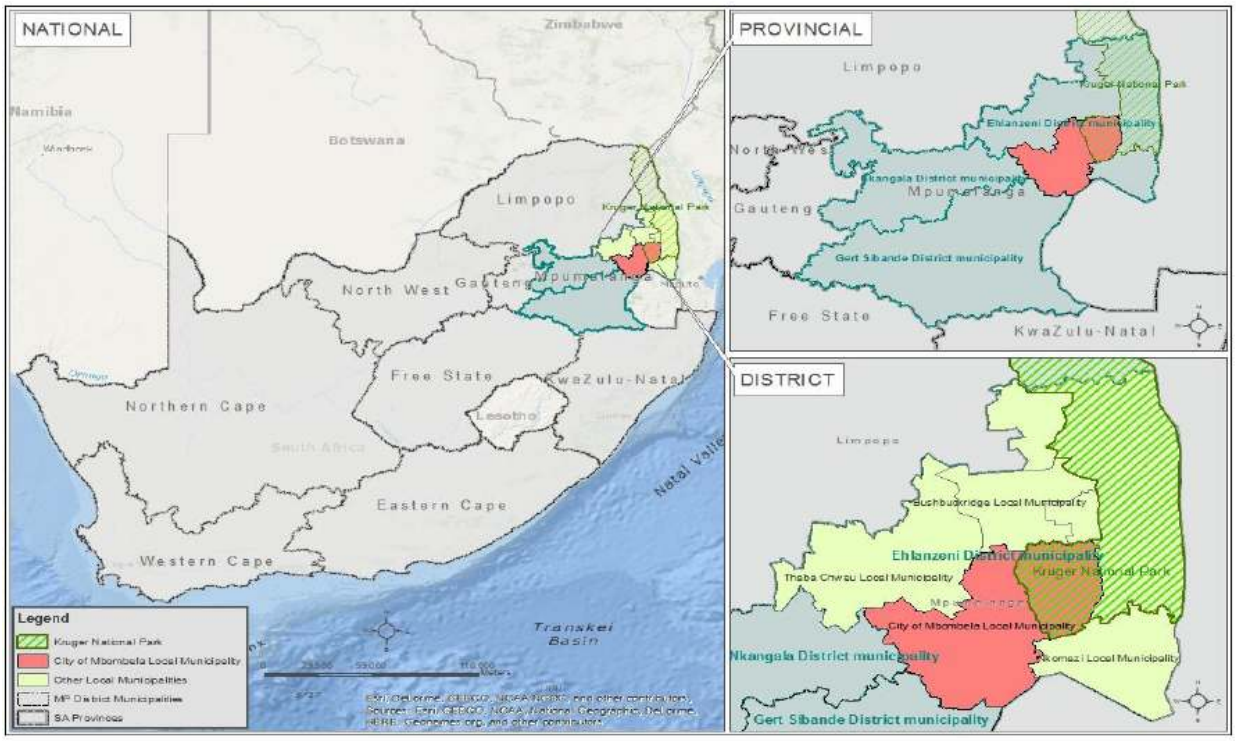


Figure 5-9: City of Mbombela Provincial, Regional and Municipal Context

The population growth data for the Municipality shows that population was 658 604 in 2011 and 695 913 in 2016 with a 1.25% population growth rate – the fastest growing population within Ehlanzeni District. In terms of age breakdown, according to Community Survey data from 2016, the Municipality has a very young population with 31.2% of the population between 0-14 and a further 38.4% is between 15 and 34 (**Table 5-1**).

Table 5-1: Age breakdown for City of Mbombela (Community Survey, 2016)

Age	Percentage
0-14	31.2%
15-34	38.4%
35-64	26.0%
65+	4.3%

In terms of the racial profile, the Community Survey 2016 indicates that the municipality is dominated by people of African (Black) descent most of whom speak the SiSwati language. The total contribution of the African group has increased between 2011 and 2016, from 89.1% to 95.9%. White people are the second dominant population group with 2.6% contribution to the total population whilst the Asian group remained the least contributing group with 0.4%. This information is indicated on the table below and is based on the 2016 municipal boundaries. Linked to the race, the dominating language is SiSwati, followed by Xitsonga and Afrikaans respectively.

Table 5-2: Racial profile of the Mbombela municipal area (Community Survey, 2016)

Race / Population Group	2016	
	Number of People	Percentage
Blacks (African)	667 827	95.96 %
Whites	18 695	2.69 %
Coloureds	6 535	0.94 %
Asian	2 855	0.41 %

The Community Survey 2016 shows that the unemployment within the Mbombela municipal area has declined by 3.2% between 2011 and 2016. The unemployment rate (strict definition) thus stood at 24.8% during 2016 from 28.0% in 2011. The unemployment rate is greater for females (27.1%) versus males (22.7%) (**Table 5-3**).

Table 5-3: Unemployment rates from 2011 to 2016 (Community Survey, 2016)

Unemployment rate	Age	City of Mbombela			
	15 -65 years	Year	%	Year	
				Male	Female
		2011	28.0	22.7	27.1
		2016	24.8		

Poverty is one of the elements used to measure the level of development within a country. It can be described as a lack of income and productive resources to ensure sustainable livelihoods such as lack or limited access to food, safe drinking water, sanitation facilities, health, shelter, education and information. The United Nations describes people who are affected by poverty as those who live below $1 a day. In terms of its Millennium Development Goals, the United Nations has set a target of halving the proportion of people whose income is less than $1 a day by 2015. The following table compares the level of poverty which existed in 2011 and 2016 within the Mbombela municipal area (SERO Report, 2017).

According to the SERO Report (2017), the share of the population in City of Mbombela below the lower-bound poverty line deteriorated from 36.9% in 2014 to 41.1% in 2017. The municipal area of Mbombela had 295 186 people living in lower bound poverty line. Poverty is therefore a serious issue in the area.

The Community Survey (2016) does show that there was a significant improvement in the number of persons who have completed their Grade 12/Matric within the Mbombela municipal area. In 2011, there were 135 136 people who completed their Grade 12 and this increased to 158 713 in 2016, recording a 17% increase. It is nonetheless imperative to note that during the same period, a dramatic increase was recorded in the number of people who have not been to school coupled with a decrease in the number of people with post matric qualifications. The results thereof indicate an increase by 79 334 in the number of people with no schooling and a 27.4% decline in the number of people in possession of post matric qualifications as depicted in the Figure 5-10 below (Note: 2011 results based on a combined 2011 municipal

boundaries for the former Umjindi and Mbombela Municipalities whilst 2016 results based on 2016 municipal boundary for the newly formed City of Mbombela).

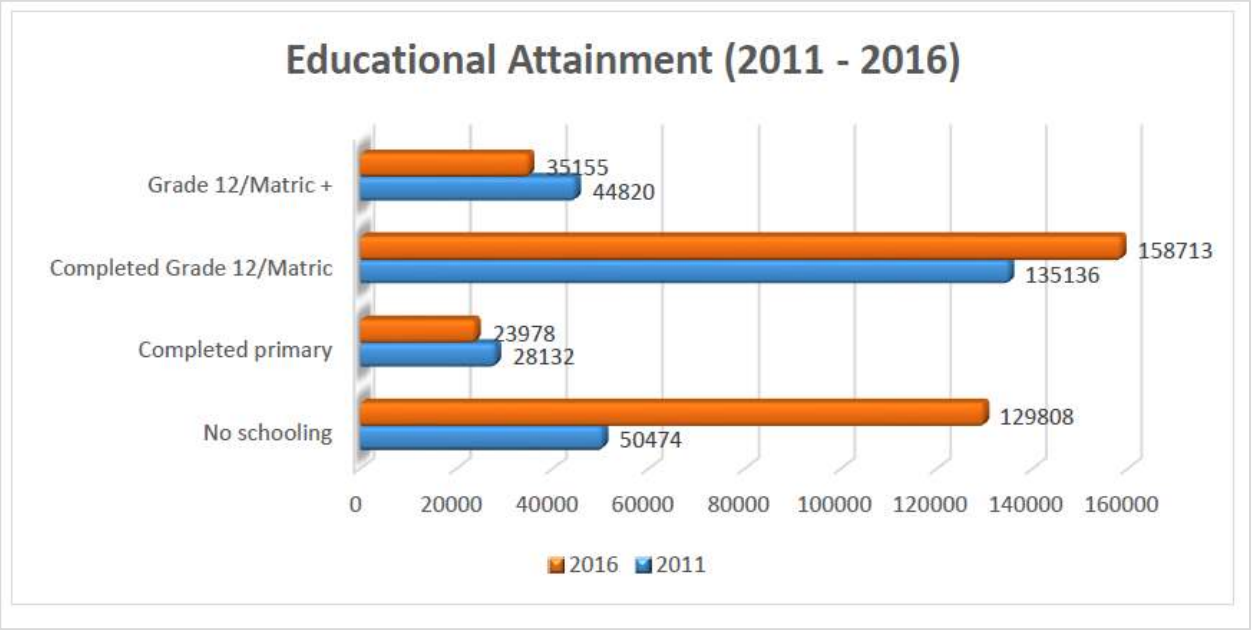


Figure 5-10: Employment for those aged 15-64 (Stats SA, 2017)

In addition to the above, the following planning documents and frameworks apply to the area and are discussed in more detail in the following subsections:

5.8.2 City of Mbombela Integrated Development Plan

The Mbombela IDP has identified a number of objectives to be implemented over the 5-year period. These include the provision of infrastructure and sustainable basic services as well as initiating strong and sustainable economic development. The N4 toll route via Ngodwana and N4 Schoemanskloof (R539) Route are both important routes within the Municipality (although not managed or operated by the municipality). Improving the road safety and efficiency is aligned to the concepts entrenched in the IDP.

The IDP also notes that the municipality has adopted the following 14 priorities to be implemented within the period of 5 years (2017-2022). These include:

- Water supply
- Road infrastructure development and storm water
- Electricity supply and management
- Integrated human settlement
- Good governance and public participation
- Sanitation/sewerage
- Community development
- Rural development
- Economic development

- Waste and environmental management
- Financial management and viability
- Public transport
- Public Safety
- 2010 legacy

Whilst the proposed Montrose Interchange will not be developed by the Municipality it will contribute to a number of these goals in terms of improving infrastructure, economic development through employment and improving safety.

5.8.3 Mbombela Spatial Development Framework (SDF), 2011-2030

The purpose of a municipal SDF is to guide all decisions of a municipality relating to the use, development and planning of land and should have the following key objectives:

- To provide a strategic and indicative forward planning tool to guide decisions on land development;
- To provide a set of policies, principles and directives for spatial development
- To provide a clear and logical framework for private and public sector investment;
- To promote sustainable development in terms of the natural and built environment;
- To provide a framework for dealing with key issues such as natural resource management, land reform and land use management;
- To guide and inform directions of growth and major movement routes

The City of Mbombela SPF includes a focus on development corridors, which are broadly defined as urban areas of high-intensity (i.e. dense and diverse) nodal or ‘strip’ development focused around (a combination of) rail, high-capacity road and trunk bus routes. They are characterised by a dynamic, mutually supporting relationship between land use and the movement system.

The Plan notes that Development corridors are generally supported by a hierarchy of transport services that function as an integrated system to facilitate ease of movement for private and public transport users. Corridors within the municipality have been categorized into primary and secondary corridors

The SDF classifies the N4 as a primary transportation corridor. The improvement of the safety and efficiency of the interchange is therefore in line with the SDF (**Figure 5-11**).

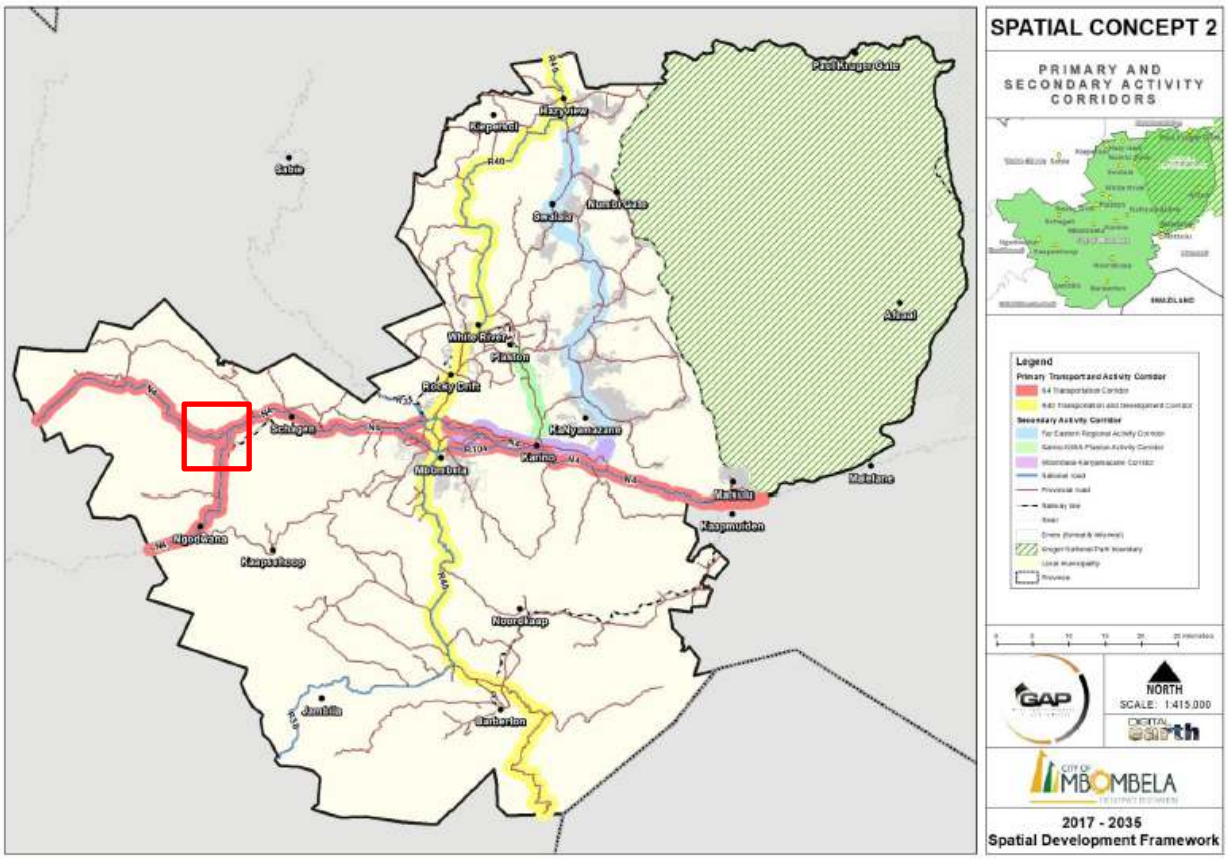


Figure 5-11: Spatial Concept 2: Development Corridors Classification (City of Mbombela SDP, 2018)

Figure 5-12 framework spatially depicts the vision and spatial strategies rationale described in the preceding sections into one coherent spatial plan indicating the desired spatial pattern which will guide and direct decision-making. The Plan aims to protect and enhance the areas of environmental significance. It also identifies sensible hierarchy of nodes which are critical towards the servicing and access of community facilities of the whole municipal area. It notes is the importance of corridor within the municipality. Major tourism development areas were also incorporated, and lastly the municipality was classified into different zones of spatial transformation.

As the proposed Montrose Interchange occurs within a development corridor, it is in line with the SDP.

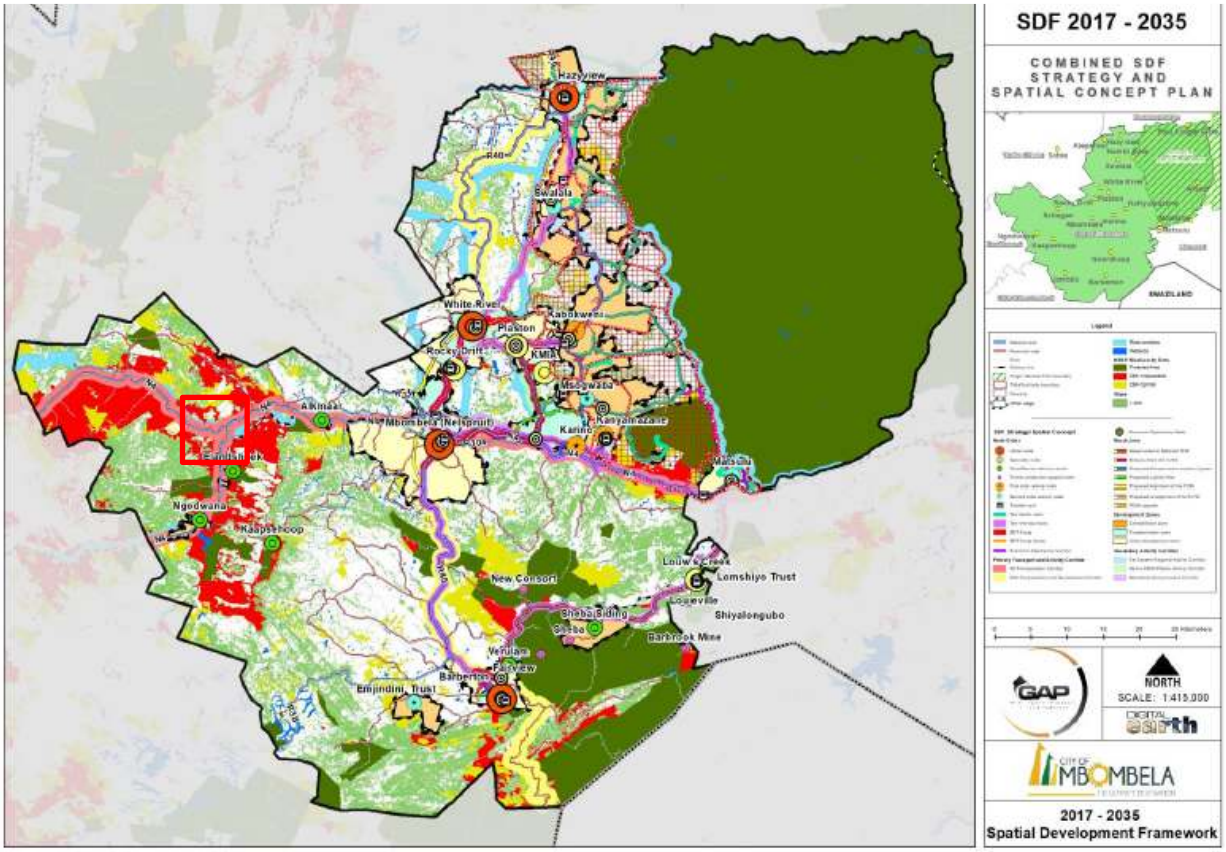


Figure 5-12: Spatial Framework & Desired Spatial Pattern (City of Mbombela SDP, 2018)

5.8.4 Local Economic Development (LED) Strategy

The Municipality also has a Local Economic Development Strategy with the following vision:

"Together in partnership, stimulating economic development by providing efficient service delivery, meeting the needs of local communities and creating an enabling environment for business development, economic growth and employment creation".

The Strategy includes the following objectives:

- Development Objective 1: An Efficient and Enabling Municipality with Exceptional Infrastructure
- Development Objective 2: An Inclusive Municipal Economy
- Development Objective 3: An Innovative and Technologically Advanced Municipality
- Development Objective 4: An Education and Skills Development Orientated Municipality
- Development Objective 5: An Environmentally Friendly and Tourism Centred Municipality

The Strategy notes that growth in the local economy of the City of Mbombela municipal area has somewhat stagnated at 2% since 2009. Sectors that make the largest contribution to the local economy include the manufacturing sector, trade and accommodation (tourism) and the finance and business sector. The sectors that can contribute to the future economic growth of the City of Mbombela include:

- Agriculture: The Mbombela municipal area is ideally located for an expanding agriculture sector. New developments such as the National Fresh Produce Market as well as the Agri-Parks Project provide opportunity for local farmers to have better access to markets. The manufacturing sector also largely depends on the agriculture sector for inputs.
- Manufacturing: Expanding existing industries and developing new niche industries will not only benefit the manufacturing sector but also promote local exports.
- Trade: This important sector requires the necessary pro-active measures to ensure that Mbombela can grow as the regional trade hub.
- Tourism: This sector's influence spans over a multitude of economic sectors and has a significant multiplier effect. The existing, numerous, tourism assets in Mbombela municipal area should be optimally promoted and developed.
- Construction: New developments such as the Mpumalanga University and the International Conference Centre (ICC) as well as infrastructure investment by government also provide opportunity for local construction companies to benefit.

Construction of the Montrose Interchange will assist in economic development in the Municipality.

5.9 Noise

Existing noise in the area is mostly originating from the road traffic along the N4 toll route via Ngodwana and N4 Schoemanskloof (R539) Route. The existing T-junction at Montrose is a source of elevated noise levels due to the deceleration and acceleration of vehicles, and especially large trucks from all directions. It is expected that the proposed road interchange may even result in reduced road noise levels due to the free-flowing nature of an interchange's very design and purpose with less deceleration and acceleration of vehicles and trucks.

5.10 Air Quality

Existing potential sources of air pollution on and around the study area include:

- Exhaust emissions from vehicles on the N4 toll route via Ngodwana and N4 Schoemanskloof (R539) Route at and around the existing T-junction at Montrose; and
- Dust created by the redundant cement batching plant site at the T-junction of Montrose.

Existing impacts as described above may be reduced because vehicles and large trucks would not need to decelerate and accelerate as much as the current T-junction scenario and therefore less fuel will be burned resulting in less exhaust emissions. Furthermore, the existing redundant cement batching site will be developed to accommodate Ramp C and Ramp D of the interchange i.e. road embankments will be shaped and vegetated replacing most of the existing cement batch plant site and its open areas for sources of dust.

5.11 Biodiversity

An overview of the important biodiversity aspects is provided in the subsections that follow.

5.11.1 Threatened Terrestrial Ecosystems

The first national list of threatened terrestrial ecosystems for South Africa was gazetted on 9 December 2011 (National Environmental Management: Biodiversity Act: National list of ecosystems that are threatened and in need of protection, (G 34809, GoN 1002), 9 December 2011). The purpose of listing threatened ecosystems is primarily to reduce the rate of ecosystem and species extinction. This includes preventing further degradation and loss of structure, function and composition of threatened ecosystems. The purpose of listing protected ecosystems is primarily to preserve witness sites of exceptionally high conservation value.

In terms of flora, the extent of area not associated with existing road infrastructure to be transformed by the upgrade of the interchange is approximately 4 - 10 ha. This regional vegetation unit is classified as being Endangered.

On a national scale, the study area is located within the Legogote Sour Bushveld within the Savanna Biome of South Africa (**Figure 5-13**). The vegetation unit is described as follows (Mucina & Rutherford 2006):

- “Gently to moderately sloping upper pediment slopes with dense woodland including many medium to large shrubs often dominated by Parinari curatellifolia and Bauhinia galpinii with Hyperthelia dissoluta and Panicum maximum in the undergrowth. Short thicket dominated by Acacia ataxacantha occurs on less rocky sites. Exposed granite outcrops have low vegetation cover, typically with Englerophytum magalismontanum, Aloe petricola and Myrothamnus flabellifolia.
- Conservation Endangered. Target 19%. About 2% statutorily conserved mainly in the Bosbokrand and Barberton Nature Reserves; at least a further 2% is conserved in private reserves including the Mbesan and Kaapsehoop Reserves and Mondi Cycad Reserve. It has been greatly transformed (50%), mainly by plantations and also by cultivated areas and urban development. Scattered alien plants include Lantana camara, Psidium guajava and Solanum mauritianum. Erosion is very low to moderate.”

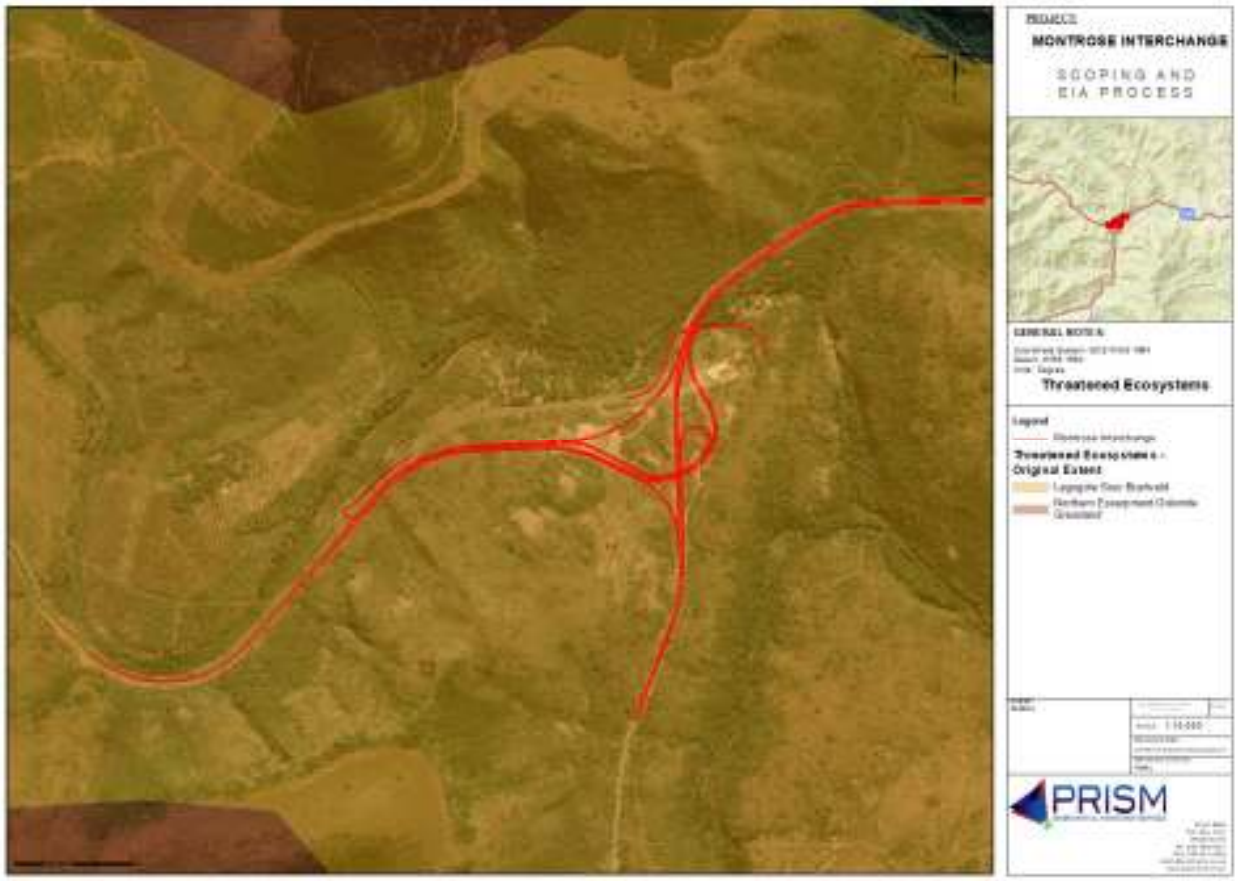


Figure 5-13: Threatened Ecosystems – Original Extent

5.11.2 Mpumalanga Biodiversity Sector Plan

The Mpumalanga Biodiversity Sector Plan (MBSP) is a spatial tool with land-use guidelines that forms part of a broader set of national biodiversity planning tools and initiatives that are provided for in national legislation and policy.

As part of this, MBSP has a terrestrial assessment which is based on a systematic biodiversity planning approach to identify spatial priority areas that meet both national and provincial targets in the most efficient way possible, while trying to avoid conflict with other land-uses. It actively tries to build-in landscape resilience to a changing climate. These spatial priorities are used to inform sustainable development within Mpumalanga.

Areas with an irreplaceability value (or frequency of selection value) of more than 80% were categorised as 'CBA Irreplaceable'. If the required planning unit was identified as part of the most efficient Marxan solution to meet targets, then it was categorised as 'CBA Optimal'. Ecological Support Areas (ESAs) support the persistence of CBAs. The proposed interchange upgrade transects 'Critical Biodiversity Areas' (CBA Irreplaceable) (**Figure 5-14**). Approximately 2.7263 ha or 69 % of the proposed interchange upgrade footprint represents irreplaceable CBA. The other 31 % transects 'Heavily or Moderately Modified'. An Environmental Impact Assessment is required if more than 300 m^2 of CBA is to be transformed. It should be noted that from the site visit, it is clear that much of the site is historically altered and that

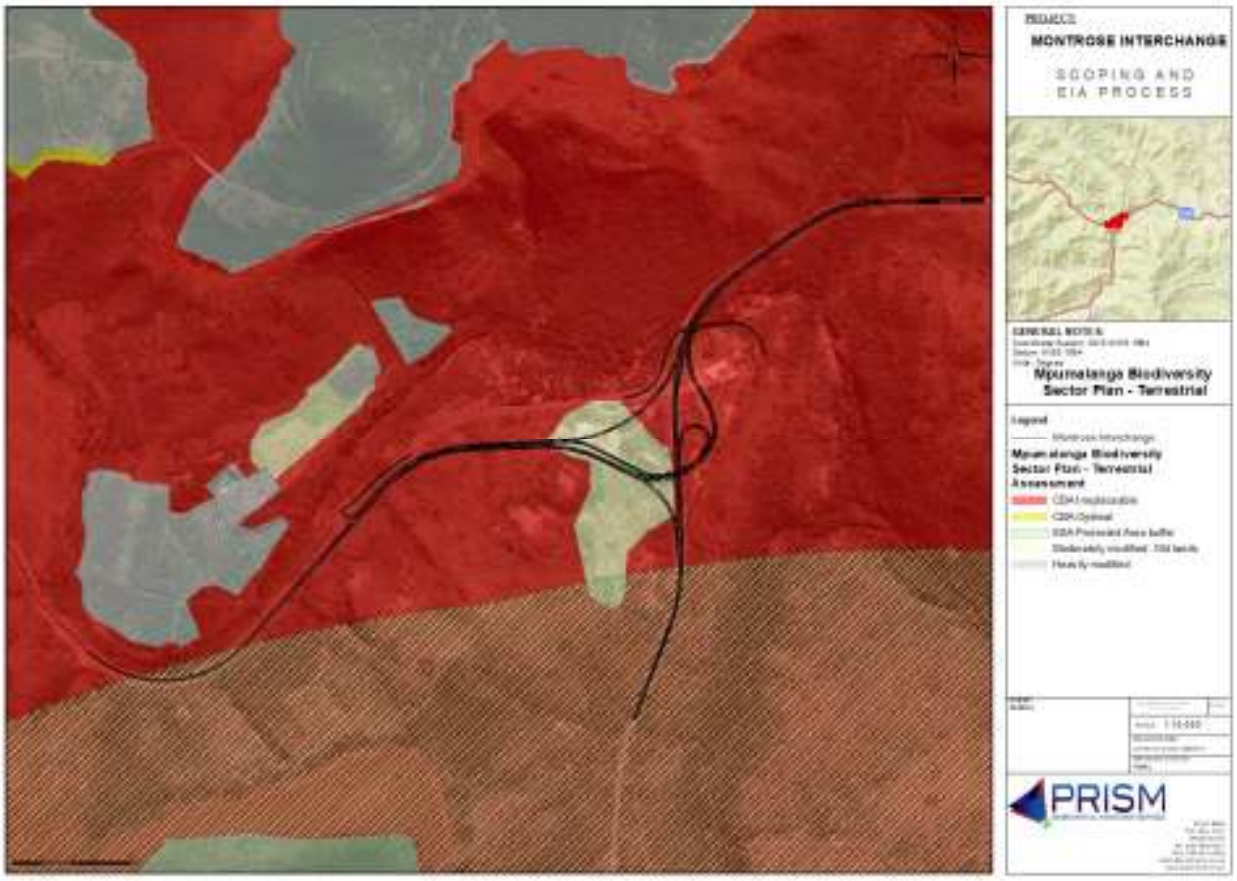


Figure 5-14: Mpumalanga Biodiversity Sector Plan – Terrestrial

Further, the site's locality falls across two eco-regions, namely the 'Northern escarpment mountains' and 'North Eastern highlands' (**Figure 5-15**).

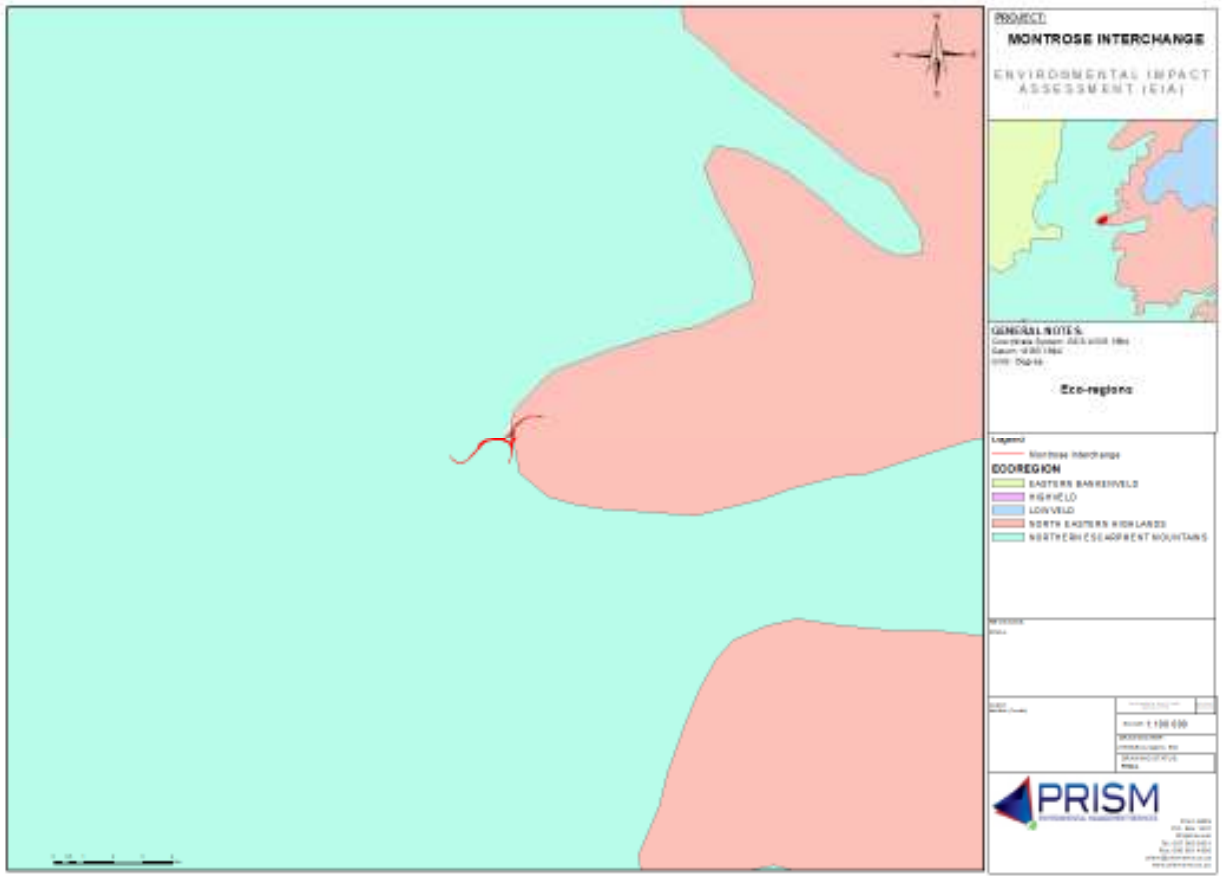


Figure 5-15: Ecoregions

5.11.3 Fauna

In terms of fauna; although the upgrade of the interchange will impact on habitat utilised by fauna – especially ground dwelling fauna, the animals are highly mobile in contrast to the plants. There have been 135 mammal species which had been recorded within the 1-degree grid 25303. The surrounding landscape represents a potential source for these species, especially the conservation areas present, while the drainage lines and ridges providing corridors for their movement. Some of the larger animals (antelope, jackal, baboons, leopard and hippopotamus) could collide with vehicles on the road, while the smaller animals' habitat (burrows) could be destroyed by the construction activities, however very few of these species are threatened. Signs warning against the presence of hippopotamus were noted during numerous site visits along the Crocodile River.

Reptiles have been recorded at 41 species in the quarter degree grid 2530BC. The search at the time of assessing the site was restricted to the quarter degree grid instead of the 1-degree grid, because it is expected that the lizards and geckos will move over shorter distance than mammals and will therefore be more habitat specific, especially those species associated with outcrops/ surface rock. None of these species are threatened.

5.11.4 Important Bird Areas and Avifauna

The proposed development does not fall within an Important Bird Area. Further, it is unlikely that the interchange upgrade will affect flying animals such as the birds, bats and most of the invertebrate species. No nests of birds of prey was observed during the site, and it is most probably due to human activity already present in the area.

5.11.5 Protected Areas

According to the Protected Area Database for Quarter 4 of 2019, the proposed development is not located in close proximity to any formally protected areas (although part of the development falls within the 5km buffer of a Protected Area). The closest protected areas are:

- Red Acres Private Nature Reserve;
- Starvation Creek Nature Reserve; and
- Vischspruit Private Nature Reserve

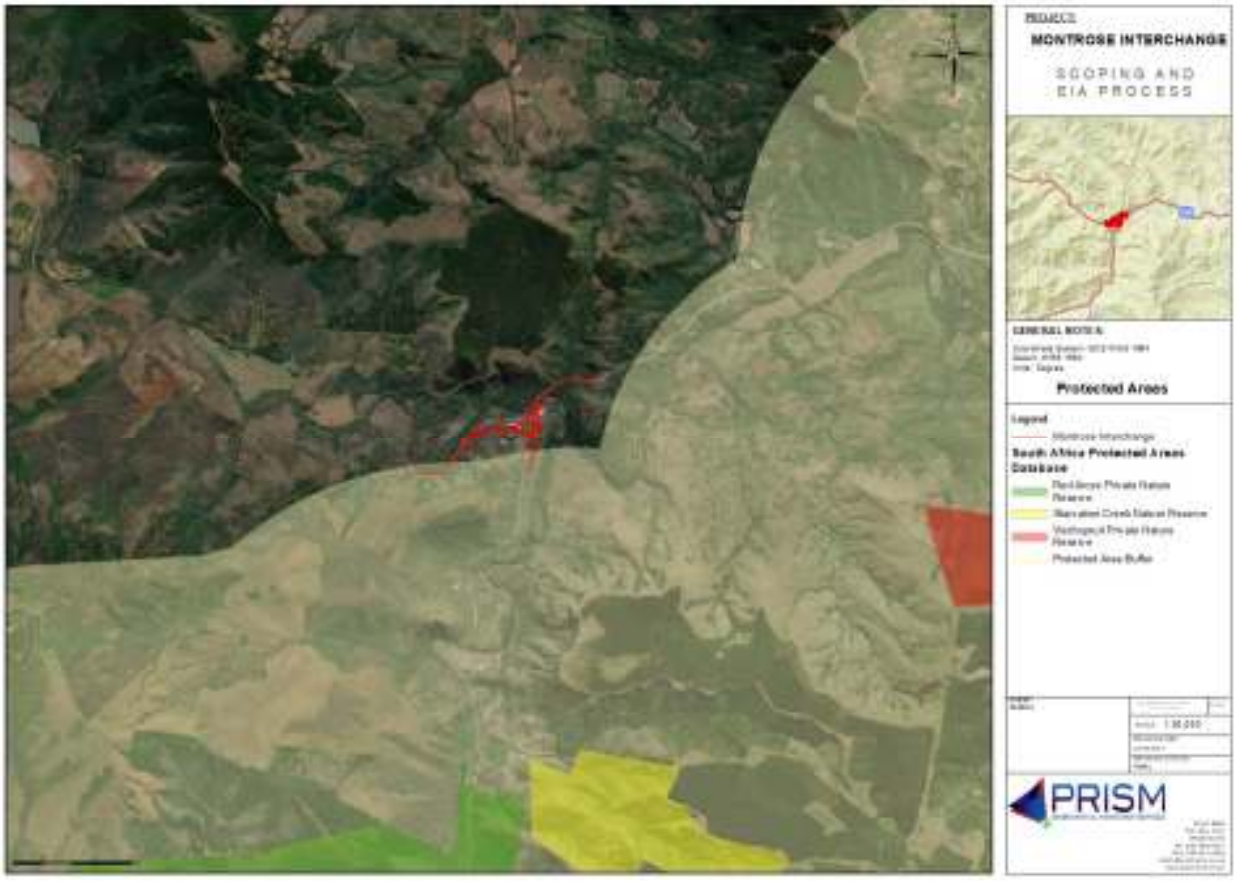


Figure 5-16: Protected areas (South African Protected Areas Database, 2019 Quarter 4) and 5km buffer

5.12 Surface Water

The proposed development is located within quaternary catchments X21E and X21K of the Inkomati-Usuthu Management Area (WMA 3) (**Figure 5-17)** (sub-quaternary catchment SQR X21E-00943

Crocodile). Two rivers are found in proximity in terms of the proposed interchange development locality – the Crocodile River and Elands River.

The Crocodile River flows in an easterly direction along the northern side of the N4 Schoemanskloof (R539) Route. It is then crossed by the N4 toll route via Ngodwana approximately 250 m north of the existing N4 / R539 T-junction. Its 10,446 km^2 catchment area originates north of Dullstroom, Mpumalanga, in the Steenkampsberg Mountains. Downstream of Kwena Dam, the Crocodile River winds through the Schoemanskloof and down the Montrose Falls. It then flows eastwards past Mbombela (Nelspruit) where it forms the southern boundary of the Kruger National Park and joins the Komati River at Komatipoort before continuing through Mozambique to the Indian Ocean.

At approximately 990 m downstream of the Montrose Falls that the Elands River confluences with the Crocodile River. The Elands River upper catchment is near the town of Machadodorp in the Highveld zone of Mpumalanga Province.

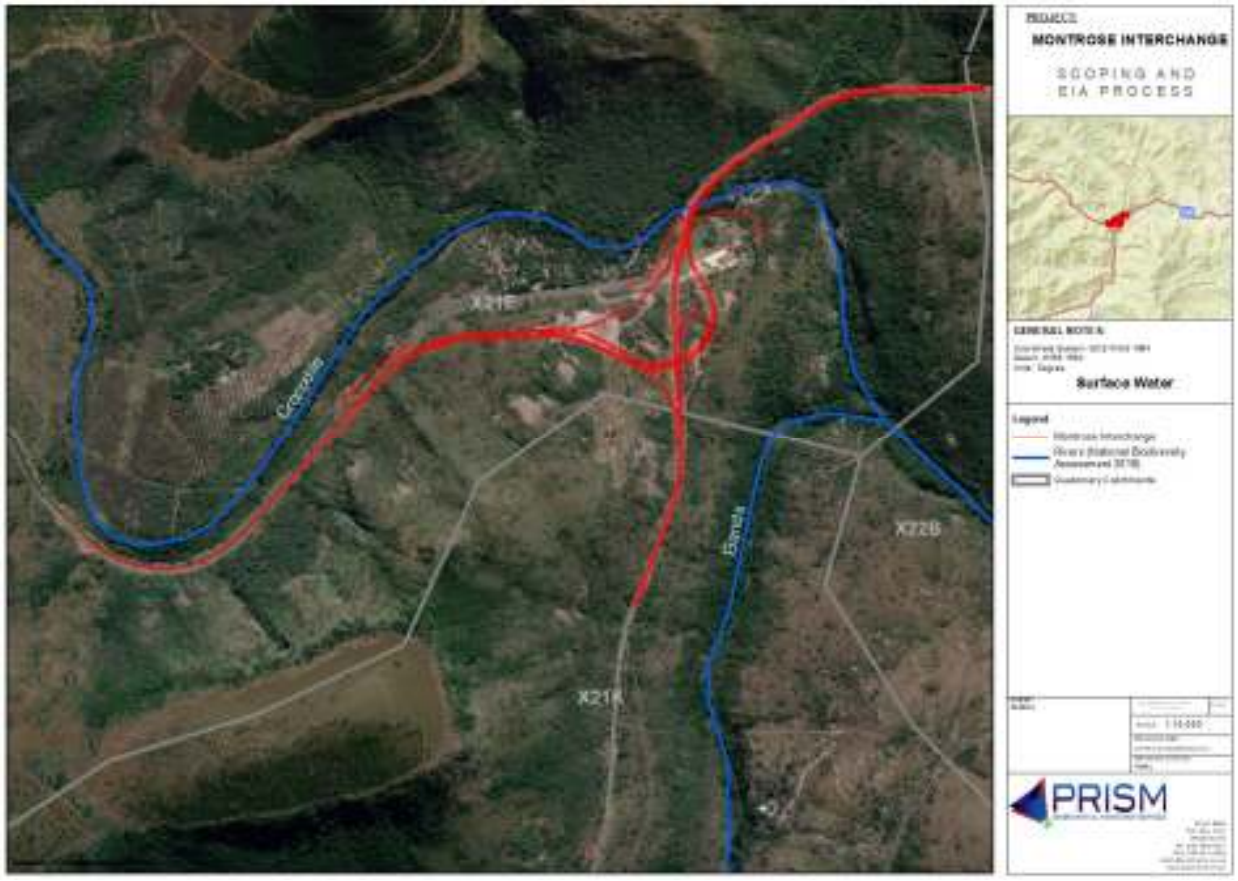


Figure 5-17: Surface Water

The MBSP freshwater assessment serves as an important land-use decision support tool and shows priority areas for freshwater biodiversity in Mpumalanga. The features included are predominantly derived from the National Freshwater Ecosystem Priority Areas (FEPA) and layers include CBA Rivers (based on FEPA and free-flowing rivers), CBA Wetlands (based on FEPA wetlands), CBA Aquatic species (odonata & crab taxa

of conservation concern only), ESA Wetland Clusters (FEPA wetland clusters), and ESA Wetlands (all other non-FEPA wetlands) (MTPA, CSIR, SANBI, 2011).

Figure 5-18 shows that from an aquatic ecosystem perspective, the site mostly occurs in Ecological Support Area (ESA) sub catchment. Further, the river to the east to the interchange (the Elands River) is also classified as a CBA.

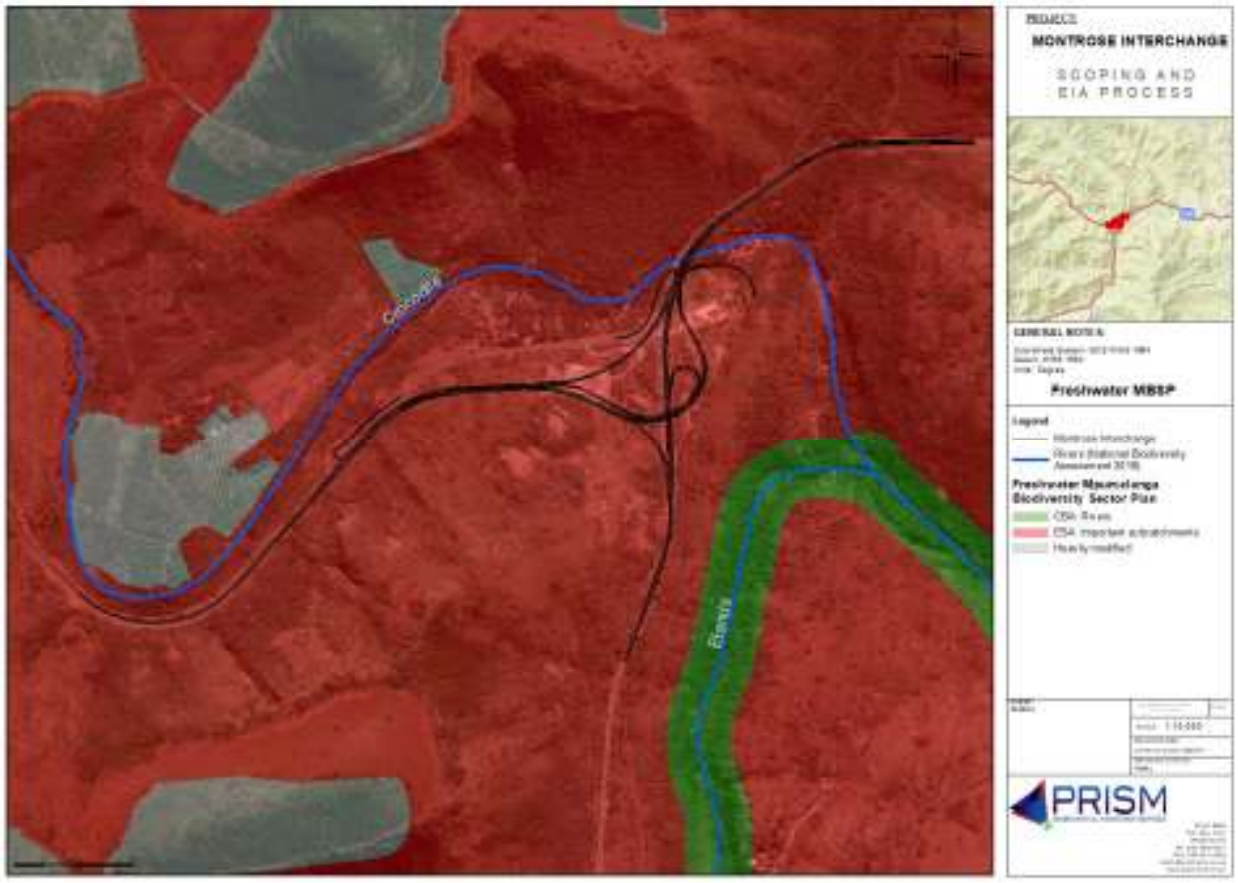


Figure 5-18: MBSP Freshwater Assessment

5.13 Archaeology, Cultural Heritage and Palaeontology

5.13.1 Archaeology and Cultural Heritage

The presence and distribution of heritage resources define a 'heritage landscape'. In this landscape, every undisturbed site is relevant and in addition, because heritage resources are non-renewable, heritage surveys need to investigate an entire project area, or a representative sample, depending on the nature of the project.

The study area is altered to the extent that most surface indicators of heritage sites would have been obliterated by an existing batch plant, old quarries, old roads, the old Montrose Hotel as well as construction of provincial roads the N4 toll route via Ngodwana and N4 Schoemanskloof (R539) route that borders the study area.

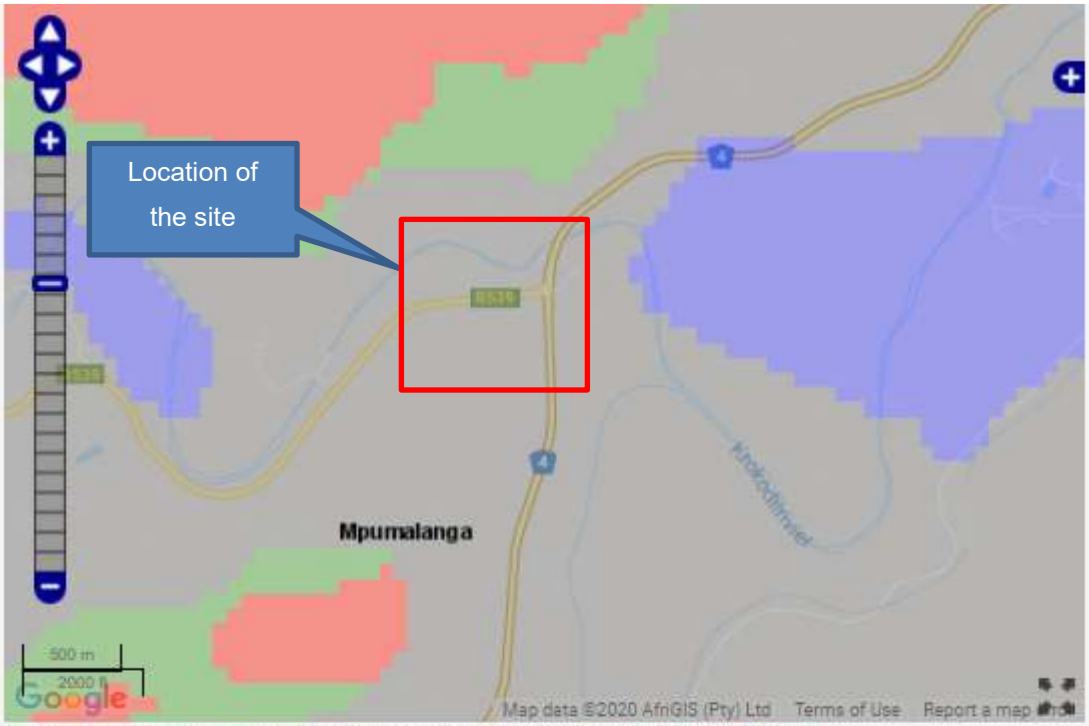
A desktop heritage determination reveals that the later phases of the Iron Age (AD 1600-1800's) are represented by various tribes including Ndebele, Swazi, BaKoni, and Pedi, marked by extensive stonewalled settlements found throughout the escarpment and particularly around Machadodorp, Lydenburg, Badfontein, Sekhukuneland, Roossenekal and Steelpoort. The BaKoni were the architects of a unique archaeological stone building complex who by the 19th century spoke seKoni which was similar to Sepedi. The core elements of this tradition are stone-walled enclosures, roads and terraces. These settlement complexes may be divided into three basic features: homesteads, terraces and cattle tracks.

Researchers such as Mike Evers (1975) and David Collett (1982) identified three basic settlement layouts in this area. These sites can be divided into simple and complex ruins. Simple ruins are normally small in relation to more complex sites and have smaller central cattle byres and fewer huts. Complex ruins consist of a central cattle byre, which has two opposing entrances and several semi-circular enclosures surrounding it. The perimeter wall of these sites is sometimes poorly visible. Huts are built between the central enclosure and the perimeter wall. These are all connected by trackways referred to as cattle tracks. These tracks are made by building stone walls, which forms a walkway for cattle to the centrally located cattle byres. A combination of these features occurs on a few dispersed sites to the north-west of the study area (Celliers 2019).

Individual sites range from simple enclosures, which consist of single or two concentric stonewalled circles found in small, isolated settlements, to complex sites with large central enclosures which have smaller enclosures attached to their outer walls. The walls are built with undressed, locally occurring, stone. Walls on average are 0.5 to approximately 1 meter high, although often only the foundation stones are left intact.

5.13.2 Palaeontology

The Palaeontological (Fossil) Sensitivity Map developed by SAHRA has been reviewed and shows that the proposed site does not fall within an area with high fossil sensitivity. Instead, the site falls within an area of insignificant or zero sensitivity and no palaeontological studies are required (**Figure 5-19** below).



1 in 250 000 geological formation layers are courtesy of the Council for GeoScience
For more information, go to How to Use the Palaeontological (fossil) Sensitivity Map

Colour	Sensitivity	Required Action
RED	VERY HIGH	field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	desktop study is required
BLUE	LOW	no palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	no palaeontological studies are required
WHITE/CLEAR	UNKNOWN	these areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map.

Figure 5-19: Palaeontological (Fossil) Sensitivity Map (obtained from South African Heritage Resources Information System (SAHRIS) - https://sahris.sahra.org.za/map/palaeo)

6 MOTIVATION FOR NEED AND DESIRABILITY

In terms of 3 (f) of Appendix 3 of the EIA Regulations, 2014 (as amended), 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 location is required. Further Notice 891 of 2014 which is the updated guideline available regarding need and desirability was also reviewed.

In line with this, the consideration of "need and desirability" included consideration of the strategic context of the proposed development along with the broader societal needs and the public interest.

6.1 Overview

The consideration of "need and desirability" included consideration of the strategic context of the proposed development along with the broader societal needs and the public interest. In order to better understand the need and desirability, one needs to understand the proposed development. The proposed development involves introducing a road interchange at the existing T-junction of the National N4 toll route via Ngodwana between eMgwenya (Waterval Boven) and Mbombela (Nelspruit) with the alternative N4 Schoemanskloof (R539) Route, Mpumalanga Province of South Africa. As part of this a number of ramps will be put in place as well as an upgrade and widening of the existing Crocodile Bridge.

Currently, unsafe conditions and a high number of road accidents are experienced at (and in close proximity) to this existing T-junction which can be attributed to a few factors such as confusion at the right turn made (east to west bound) by motorists to the N4 Schoemanskloof (R539) Route, vehicles colliding with stationery vehicles waiting to turn right (east to west bound), blind rise just before the T-junction for motorists travelling on the N4 from west to east bound and a blind rise and sharp corner currently posing a hazard to motorists travelling on the Schoemanskloof Road after taking the T-junction right turn (east – west bound).

Therefore, the main reason for the proposed development is:

- Improve traffic flow speeds; and
- Drastically improve the safety of motorists.

In terms of the City of Mbombela SDP, the proposed upgrade falls within the existing N4 primary transportation corridor and is therefore in line with the spatial planning of the municipality. The site is also historically impacted upon and is in close proximity to the existing interchange. The site selection for the proposed development is therefore supported as using this site reduces the need for greenfields development and is in line with spatial planning for the area. The Preliminary Design Report in particular notes that the re-alignment of the N4 Schoemanskloof (R539) is specifically undertaken so that the existing Crocodile Bridge can be utilized and expanded upon instead of developing a new bridge at a different location.

In addition, as part of the Preliminary Design Report, an traffic assessment was undertaken and found that In the final year of the Concession (2028), the traffic volumes are expected to reach a peak of 813 vehicles per hour in the eastbound direction and 710 vehicles per hour in the westbound direction in the 30th highest peak hour. The new interchange will involve the development of four ramps which will accommodate traffic in free-flow movements in all directions. The achieved design speed of the ramps ranges from 40 km/h (on the loop ramp only) to 100 km/h. Further, the existing Crocodile River Bridge is widened to accommodate two eastbound lanes of traffic and three westbound lanes of traffic. The proposed development is supported as it improves traffic flows and will accommodate increased vehicle numbers (which will occur regardless of whether the interchange is upgraded or not).

Another important implication is the economic benefits associated with the development. According to the Preliminary Design Report, the proposed development will involve an investment of approximately R165 million in the area. It will also result in 300 construction related jobs which is extremely important in light of the 24.8% unemployment rate in the Municipality.

The proposed development will also ensure safe and efficient transport along the MDC between South Africa and Mozambique and thus has indirect benefits at a national level. Although no direct employment will be undertaken during the operational phase, the development is necessary to improve the current status of the MDC. This will likely have a number of positive multiplier effects in terms of employment in the region.

No environmental or technical specialist study identified any fatal flaws related to the site selection for the proposed development

6.2 Need and Desirability Table

In addition to the above, the following questions have also been addressed in line with the Guideline for Need and Desirability (Notice 891 of 2014) (**Table 6-1**).

Table 6-1: Need and Desirability

Question from the Need and Desirability Guideline	Response
Securing ecological sustainable development and use of natural resources	
How will this development (and its separate elements / aspects) on the ecological integrity of the area?	An Ecological Assessment, Aquatic Assessment and Wetland Assessment have been undertaken and are summarised in Section 9. They are also appended in Appendix 14.6. It is not expected that the proposed development will negatively impact on the ecological integrity of the area as the site is not pristine and has been degraded by historical use. The Ecological Assessment noted that the upgrade of the interchange will result in the removal of natural vegetation, associated with a threatened vegetation unit on a regional scale and Critical Biodiversity Area on a provincial scale, however taking in consideration the extent of the area involved, of less than four hectares, it cannot be considered that it would contribute significantly to habitat loss, whether for plants or animals within the immediate landscape. Further, due to the existing road infrastructure, it is highly unlikely that the upgrade of the interchange would significantly contribute to incidents of roadkill as the animals present in the landscape is used to the existing road infrastructure and traffic volumes. In addition, the Crocodile Bridge is already affected by the existing bridge which will be widened. An Aquatic Impact Assessment was undertaken and the specialist found possible impacts to flow, water quality, habitat, biota and geomorphology. These impacts were rated between low and medium significance prior to mitigation. However, with the implementation of the appropriate mitigation, these impacts were assessed to be “low”. He therefore noted that the proposed development can be supported. The Wetland Assessment did not identify any wetlands but instead found the proposed development crossed a number of drainage lines. With the implementation of the necessary

Question from the Need and Desirability Guideline	Response
	mitigation measures, all impacts could be mitigated to a low significance and the specialist concluded that the project can be supported. On this basis, it is not expected that the proposed development will negatively impact on the ecological integrity of the area.
How were the following ecological integrity considerations taken into account? • Threatened Ecosystems • 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, • Critical Biodiversity Areas ("CBAs") and Ecological Support Areas ("ESAs") • Conservation targets, • Environmental Management Framework, • Spatial Development Framework, and • Global and international responsibilities relating to the environment (e.g. RAMSAR sites, Climate Change, etc.	The Scoping Report includes a summary of the receiving environment which includes applicable information on: • Threatened ecosystems; • CBAs and ESAs; • Sensitive features such as rivers and wetlands; and • Socio-Economic Information including information on the City of Mbombela SDF. This was used to identify potential sensitivities which required further assessment by a specialist. Based on this, the following specialist studies which are included in EIR: • Ecological Assessment; and • Aquatic Assessment; and • Wetland Assessment. The Ecological Assessment noted that the upgrade of the interchange will result in the removal of natural vegetation, associated with a threatened vegetation unit on a regional scale and Critical Biodiversity Area on a provincial scale, however taking in consideration the extent of the area involved, of less than four hectares, it cannot be considered that it would contribute significantly to habitat loss, whether for plants or animals within the immediate landscape. Further, due to the existing road infrastructure, it is highly unlikely that the upgrade of the

Question from the Need and Desirability Guideline	Response
	interchange would significantly contribute to incidents of roadkill as the animals present in the landscape is used to the existing road infrastructure and traffic volumes. In addition, the Crocodile Bridge is already affected by the existing bridge which will be widened. An Aquatic Impact Assessment was undertaken and the specialist found possible impacts to flow, water quality, habitat, biota and geomorphology. These impacts were rated between low and medium significance prior to mitigation. However, with the implementation of the appropriate mitigation, these impacts were assessed to be "low". He therefore noted that the proposed development can be supported. The Wetland Assessment did not identify any wetlands but instead found the proposed development crossed a number of drainage lines. With the implementation of the necessary mitigation measures, all impacts could be mitigated to a low significance and the specialist concluded that the project can be supported. Ecological considerations were thus taken into account through assessment by the necessary specialists.
How will this development disturb or enhance ecosystems and / or result in the loss or protection of biological impacts that could not be avoided altogether, what measures were explored to minimize and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	An Ecological Assessment, Aquatic Assessment and Wetland Assessment have been undertaken and are included in the EIR. The mitigation measures recommended by these specialists have been included in the EMPr. These include measures to mitigate impacts as well as those to enhance positive benefits. With implementation of the necessary measures, all specialists found that the development could proceed.

Question from the Need and Desirability Guideline	Response
	The Ecological Assessment in particular noted that the upgrade of the interchange will result in the removal of natural vegetation, associated with a threatened vegetation unit on a regional scale and Critical Biodiversity Area on a provincial scale, however taking in consideration the extent of the area involved, of less than four hectares, it cannot be considered that it would contribute significantly to habitat loss, whether for plants or animals within the immediate landscape. In terms of the Crocodile River, the site is affected by the existing bridge. Appendix C of the Aquatic Impact Assessment provides a number of very specific mitigation measures that aim to ensure that the PES, EIS and REC of the river are not negatively affected. Requirements for Rehabilitation are provided. Further, all designs have been undertaken in terms of the SANRAL Drainage manual and thus stormwater will be managed in such a way that it does not negatively impact on aquatic resources. The drainage lines identified by the Wetland Specialist are also currently impacted by the existing N4 Schoemanskloof (R539). Stormwater and erosion control measures are included and rehabilitation of impacted drainage lines will ensure the impact is suitably mitigated.
How will this development pollute and/or degrade the biophysical environment? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimize and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	A detailed impact assessment has been undertaken and is included in **Section 10**. However, the proposed development involves a road interchange development and occurs adjacent to the existing road. Significant pollution is not expected. During construction, hazardous material will be managed with caution and in line with the EMPr. Significant spills are not expected. During operation, pollution would be incidental and due to traffic accidents. Significant impacts are therefore not expected. In terms of degradation of the biophysical environment, significant impacts are not expected. Firstly, the site is historically degraded. Secondly, the footprint of the proposed development

Question from the Need and Desirability Guideline	Response
	will be rehabilitated. Proper stormwater management and erosion control will also be put in place to limit degradation.
What waste will be generated by this development? What measures were explored to firstly avoid waste, and where waste could not be avoided altogether, what measures were explored to minimize, reuse and/or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?	During construction, construction waste will be produced whilst during operation, a small amount of waste (littering from vehicles) may occur during operation. This will be managed by the road concessionaire as part of their current management of the road. It is not expected that they upgrade will result in additional waste during operation than what is currently produced. Please refer to **Section 10.4.5**. for a detailed analysis of impacts related to waste. The EMPr which has been compiled and is included in **Appendix 14.8**. includes a waste management plan that aims to ensure measures to minimize, reuse and/or recycle the waste are incorporated into the development.
How will this development use and/or impact on non-renewable natural resources? What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered? What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimize and remedy (including offsetting) the impacts? What measures were explored to enhance positive impacts?	The proposed development does not involve the mining of non-renewable resources. As part of the re-alignment of N4 Schoemanskloof (R539), significant cuts will be required and material from these will be used for the road development. This reduces the need for additional material to be utilised for construction. It also reduces indirect associated impacts related to the transport of material to site. Please refer to **Section 10** for the full impact assessment and associated discussion. However, during detailed design, should it be necessary for some additional material to be imported, a separate process will be undertaken to obtain a mining permit for borrow material. A full impact assessment will be undertaken for this if required.
How will this development use and/or impact on renewable natural resources and the ecosystem of which they are part? Will the use of the resources and/or impact on the ecosystem jeopardize the integrity of the resource and/or system taking	An Ecological Assessment, Aquatic Assessment and Wetland Assessment have been undertaken and are included in the EIR. Please refer to **Section 9** and **Appendix 14.6**.

Question from the Need and Desirability Guideline	Response
into account carrying capacity restrictions, limits of acceptable change, and thresholds? What measures were explored to firstly avoid the use of resources, or if avoidance is not possible, to minimize the use of resources? What measures were taken to ensure responsible and equitable use of the resources? What measures were explored to enhance positive impacts? • Does the proposed development exacerbate the increased dependency on increased use of resources to maintain economic growth or does it reduce resource dependency (i.e. de-materialized growth)? (note: sustainability requires that settlements reduce their ecological footprint by using less material and energy demands and reduce the amount of waste they generate, without compromising their quest to improve their quality of life) • Does the proposed use of natural resources constitute the best use thereof? Is the use justifiable when considering intra- and intergenerational equity and are there more important priorities for which the resources should be used (i.e. what are the opportunity costs of using these resources this the proposed development alternative?). • Do the proposed location, type and scale of development promote a reduced dependency on resources?	The Ecological Assessment in particular noted that the upgrade of the interchange will result in the removal of natural vegetation, associated with a threatened vegetation unit on a regional scale and Critical Biodiversity Area on a provincial scale, however taking in consideration the extent of the area involved, of less than four hectares, it cannot be considered that it would contribute significantly to habitat loss, whether for plants or animals within the immediate landscape. In terms of the Crocodile River, the site is affected by the existing bridge. Appendix C of the Aquatic Impact Assessment provides a number of very specific mitigation measures that aim to ensure that the PES, EIS and REC of the river are not negatively affected. Requirements for Rehabilitation are provided. Further, all designs have been undertaken in terms of the SANRAL Drainage manual and thus stormwater will be managed in such a way that it does not negatively impact on aquatic resources. The drainage lines identified by the Wetland Specialist are also currently impacted by the existing N4 Schoemanskloof (R539). Stormwater and erosion control measures are included and rehabilitation of impacted drainage lines will ensure the impact is suitably mitigated. The proposed interchange also occurs in close proximity to the existing T-junction and thus utilises some existing infrastructure (including the Crocodile River Bridge). The location of the interchange therefore is the best use of the site which falls within the City of Mbombela SDF transportation corridor. Further, due to the type of development, it is not expected that the proposed new interchange will increase or exacerbate dependence on natural resources. In contrast, the proposed development will likely reduce fuel consumption as in the current T-junction, cars and trucks are required to accelerate and decelerate which increases fuel use. In the new configuration,

Question from the Need and Desirability Guideline	Response
	there will be a more standard speed and therefore less fuel used (and indirectly less fuel emissions). Lastly, as part of the proposed development, significant cuts will be required and material from these will be used for the road development. This reduces the need for additional material to be utilised for construction. It also reduces indirect associated impacts related to the transport of material to site.
How were a risk-averse and cautious approach applied in terms of ecological impacts? • What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? • What is the level of risk associated with the limits of current knowledge? • Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	A risk-averse and cautious approach has been undertaken. The following has reference: • The specialist studies identify gaps which will have been noted in both the specialist report and EIA. Refer to **Section 9.8.** • The impact assessment included in **Section 10** specifically deals with gaps identified by specialists and/or lack of information through the assessment of 'Level of Confidence'. In general, there was a high level of confidence in the impact assessments undertaken. • The EMPr included in Appendix 14.8 provides numerous mitigation measures to ensure that impacts identified to be a 'low' risk can be further mitigated.
How will the ecological impacts resulting from this development impact on people's environmental right in terms following: • Negative impacts e.g. access to resources, opportunity costs, loss of amenity (e.g. open space), air and water quality impacts, nuisance (noise, odour, etc.), health impacts, visual impacts, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not	A detailed impact assessment was undertaken and did not identify any significant impacts to people's environmental rights. The site is disturbed and the wetland buffer which falls within the proposed development will not be developed. Furthermore, whilst some infrastructure will occur within the drainage lines and Crocodile River, the impact of this is reduced through the implementation of the necessary mitigation measures. A vegetation walkthrough will also be undertaken prior to construction and

Question from the Need and Desirability Guideline	Response
possible, to minimize, manage and remedy negative impacts? • Positive impacts: e.g. improved access to resources, improved amenity, improved air or water quality, etc. What measures were taken to enhance positive impacts?	protected species will be removed to a nursery to be used during rehabilitation or to areas not affected by the development. Necessary permits will be put in place. The Ecological Assessment also noted that taking in consideration the extent of the area involved, of less than four hectares, it cannot be considered that it would contribute significantly to habitat loss, whether for plants or animals within the immediate landscape. In addition, as part of the Preliminary Design Report, an traffic assessment was undertaken and found that In the final year of the Concession (2028), the traffic volumes are expected to reach a peak of 813 vehicles per hour in the eastbound direction and 710 vehicles per hour in the westbound direction in the 30th highest peak hour. The new interchange will involve the development of four ramps which will accommodate traffic in free-flow movements in all directions. The achieved design speed of the ramps ranges from 40 km/h (on the loop ramp only) to 100 km/h. Further, the existing Crocodile River Bridge is widened to accommodate two eastbound lanes of traffic and three westbound lanes of traffic. The proposed development is supported as it improves traffic flows and will accommodate increased vehicle numbers (which will occur regardless of whether the interchange is upgraded or not). Another important implication is the economic benefits associated with the development. According to the Preliminary Design Report, the proposed development will involve an investment of approximately R165 million in the area. It will also result in 300 construction related jobs which is extremely important in light of the 24.8% unemployment rate in the Municipality. Local labour will be utilised as far as possible and will enhance this benefit. The proposed development will also ensure safe and efficient transport along the MDC between South Africa and Mozambique and thus has indirect benefits at a national level. Although no direct employment will be undertaken during the operational phase, the

Question from the Need and Desirability Guideline	Response
	development is necessary to improve the current status of the MDC. This will likely have a number of positive multiplier effects in terms of employment in the region.
Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts (e.g. on livelihoods, loss of heritage site, opportunity costs, etc.)?	A detailed impact assessment was undertaken and did not identify any significant impacts to ecosystem services, loss of livelihoods, heritage or significant opportunity costs. The EMPr included in **Appendix 14.8**. includes a number of mitigation measures which specifically deal with management of potential impacts to heritage, biodiversity and wetland/aquatic resources.
Based on all of the above, how will this development positively or negatively impact on ecological integrity objectives/targets/considerations of the area?	It is not expected that the development will negatively impact on the ecological integrity objectives of the area. Whilst the site falls within a CBA area as well as the historical extent of a threatened ecosystem, the site visit indicates that the area itself has been altered by historical use. It should also be noted that the proposed development falls within the primary transportation corridor of the City of Mbombela SDF and is therefore in line with the spatial planning of the municipality. The Ecological Assessment noted that the upgrade of the interchange will result in the removal of natural vegetation, associated with a threatened vegetation unit on a regional scale and Critical Biodiversity Area on a provincial scale, however taking in consideration the extent of the area involved, of less than four hectares, it cannot be considered that it would contribute significantly to habitat loss, whether for plants or animals within the immediate landscape. Further, due to the existing road infrastructure, it is highly unlikely that the upgrade of the interchange would significantly contribute to incidents of roadkill as the animals present in the landscape is used to the existing road infrastructure and traffic volumes.

Question from the Need and Desirability Guideline	Response
	In addition, the Crocodile Bridge is already affected by the existing bridge which will be widened. An Aquatic Impact Assessment was undertaken and the specialist found possible impacts to flow, water quality, habitat, biota and geomorphology. These impacts were rated between low and medium significance prior to mitigation. However, with the implementation of the appropriate mitigation, these impacts were assessed to be "low". He therefore noted that the proposed development can be supported. The Wetland Assessment did not identify any wetlands but instead found the proposed development crossed a number of drainage lines. With the implementation of the necessary mitigation measures, all impacts could be mitigated to a low significance and the specialist concluded that the project can be supported.
Considering the need to secure ecological integrity and a healthy biophysical environment, describe how the alternatives identified (in terms of all the different elements of the development and all the different impacts being proposed), resulted in the selection of the "best practicable environmental option" in terms of ecological considerations?	A number of conceptual options have been explored as part of the preliminary design phase of the proposed interchange and are described in **Section 7**. In addition, two bridge designs have been assessed as alternatives as part of the EIR: These are: • Alternative 1 – Additional Piers; and • Alternative 2 – Pier Head Addition. Alternative 1: Additional Piers was selected as the BPEO for the following reasons:

Question from the Need and Desirability Guideline	Response
	• From an ecological, wetland (drainage lines), heritage and visual impact perspective, there was no difference between the two alternatives. • However, from a technical perspective there are a number of advantages associated with this alternative. Many of these have important safety implications including: - No excessive drilling or additional loads will be applied to the already slender existing piers. - The construction procedure will not be complex, resulting in standard staging and formwork. No pre-stressing processes will be required. - The additional piers provide a simple, direct load path supporting the widening. - Construction is simple with one column type that can be utilized at all of the piers. - Lower risks are achieved from a design and a construction point of view. - This is a cost-effective solution. - This is an aesthetically pleasing option. • From an aquatic perspective, the specialist found that both designs presented a similar post-mitigation impact significance. Therefore, taking into account existing bridge infrastructure, and the higher risk and cumulative impact of for Alternative 2, **Alternative 1 was preferred**.
Promoting justifiable economic and social development	
What is the socio-economic context of the area, based on, amongst other considerations, the following considerations? • The IDP (and its sector plans' vision, objectives, strategies, indicators and targets) and any strategic plans, frameworks of policies applicable to the area,	Please see **Section 5.8** of the EIR which provides an overview of the socio-economic context of the area and includes information on the City of Mbombela IDP, SDF and LED Strategy. In summary it should be noted that the N4 is an extremely important transport corridor for the municipality and province at large and is necessary for both tourism as well as transportation

Question from the Need and Desirability Guideline	Response
• Spatial priorities and desired spatial patterns (e.g. need for integrated of segregated communities, need to upgrade informal settlements, need for densification, etc.). • Spatial characteristics (e.g. existing land uses, planned land uses, cultural landscapes, etc.), and • Municipal Economic Development Strategy ("LED Strategy").	of good between South Africa and Mozambique. The proposed development aims to improve road efficiency and safety and therefore is an important component in terms of the socio-economic context of the area. In addition, the proposed development will cost approximately R165 million and will have a substantial local multiplier effect in the area. It will also create approximately 300 temporary jobs during construction. Local skills will be encouraged within the EMPr (to be compiled as part of the EIA Phase.
Considering the socio-economic context, what will the socio-economic impacts be of the development (and its separate elements/aspects), and specifically also on the socio-economic objectives of the area? • Will the development complement the local socio-economic initiatives (such as local economic development (LED) initiatives), or skills development programs?	
How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?	The proposed development aims to improve road safety and efficiency of the existing N4 route which is a major transportation corridor in the province and municipality. In addition, through the construction of the development, local community members will be employed. There will also be a number of positive economic multiplier effects through the capital investment required for the development.
Will the development result in equitable (intra- and inter-generational) impact distribution, in the short- and long-term? Will the impact be socially and economically sustainable in the short- and long-term?	A detailed impact assessment will be undertaken in the EIA Phase and will include an assessment of social and economic impacts. The proposed development aims to improve road safety and efficiency of the existing N4 route which is a major transportation corridor in

Question from the Need and Desirability Guideline	Response
	the province and municipality. It is therefore not expected that there will be substantial or significant negative socio-economic impacts in the short or long term.
In terms of location, describe how the placement of the proposed development will: • Result in the creation of residential and employment opportunities in close proximity to or integrated with each other • Reduce the need for transport of people and goods • Result in access to public transport or enable non-motorized and pedestrian transport (e.g. will the development result in densification and the achievement of thresholds in terms public transport), • Compliment other uses in the area • Be in line with the planning for the area, • for urban related development, make use of underutilized land available with the urban edge • optimize the use of existing resources and infrastructure, • opportunity costs in terms of bulk infrastructure expansions in non-priority areas (e.g. not aligned with the bulk infrastructure planning for the settlement that reflects the spatial reconstruction priorities of the settlement), • discourage "urban sprawl" and contribute to compaction/densification,	The location of the proposed development is dependent on a key aspect namely, the existing N4 Schoemanskloof (R539) Route and N4 (Elands Valley) Roads and associated interchange. Currently, unsafe conditions and a high number of road accidents are experienced at (and in close proximity) to this existing T-junction which can be attributed to a few factors such as confusion at the right turn made (east to west bound) by motorists to the N4 Schoemanskloof (R539) Route, vehicles colliding with stationery vehicles waiting to turn right (east to west bound), blind rise just before the T-junction for motorists travelling on the N4 from west to east bound and a blind rise and sharp corner currently posing a hazard to motorists travelling on the N4 Schoemanskloof (R539) Route R539 after taking the T-junction right turn (east – west bound). Therefore, a new interchange is required. The following can also be noted: • As a new interchange development for the existing N4 Schoemanskloof (R539) Route and N4 (Elands Valley), the proposed development does not result in urban sprawl or densification. • During the EIA Process, an Ecological assessment, Aquatic Assessment and Wetland Assessment have been undertaken and did not identify any fatal flaws. The findings and mitigation measures of these studies have incorporated into the EIR and associated EMPr.

Question from the Need and Desirability Guideline	Response
• contribute to the correction of the historically distorted spatial patterns of settlements and to the optimum use of existing infrastructure in excess of current needs, • encourage environmentally sustainable land development practices and processes, • take into account special locational factors that might favour the specific location (e.g. the location of a strategic mineral resource, access to the port, access to rail, etc.), • the investment in the settlement or area in question will generate the highest socio=economic returns (i.e. an area with high economic potential), • impact on the sensitivities of the area, and • in terms of the nature, scale and location of the development promote or act as a catalyst to create a more integrated settlement?	• A Heritage Impact Assessment has been undertaken to ensure the proposed development does not impact on the sense of history and heritage of the area and the socio-cultural and cultural-historic characteristics of the site. The specialist found that the study area is extensively disturbed by road developments, an existing Asphalt plant, old quarry and modern buildings and although the larger area is known for Iron Age stonewalled sites the extensive developments in the area would have impacted on surface indications of archaeological sites. This was confirmed during the field survey and finds were limited to two small stone enclosures recorded as Feature 1 & Feature2. The impact of the project on heritage resources can be mitigated to an acceptable level and it is recommended that the proposed project is approved on the condition that the mitigation measures recommended are implemented. • The proposed development will create employment during construction and result in a number of economic multiplier effects through the capital spend which is estimated at R165 million.
How were a risk-averse and cautious approach applied in terms of socio-economic impacts? • What are the limits of current knowledge (note: the gaps, uncertainties and assumptions must be clearly stated)? • What is the level of risk (note: related to inequality, social fabric, livelihoods, vulnerable communities, critical resources, economic vulnerability and sustainability) associated with the limits of current knowledge?	Other than the Heritage Impact Assessment and Visual Impact Assessment, no social or economic specialist studies have been triggered and are required. However, a risk-averse and cautious approach has been undertaken. The following has reference: • The Heritage Impact Assessment and Visual Impact Assessment identified gaps which have been noted in both the specialist report and EIA. • The impact assessment included in **Section 10** specifically deal with gaps identified by specialists and/or lack of information through the assessment of 'Level of Confidence'. A high level of confidence was noted in general.

Question from the Need and Desirability Guideline	Response
• Based on the limits of knowledge and the level of risk, how and to what extent was a risk-averse and cautious approach applied to the development?	• The EMPr has been compiled and included in **Appendix 14.8** in the EIR and provides numerous mitigation measures to ensure that impacts identified to be a 'low' risk can be further mitigated.
How will the socio-economic impacts resulting from this development impact on people's environmental right in terms following: • Negative impacts: e.g. health (e.g. HIV-Aids), safety, social ills, etc. What measures were taken to firstly avoid negative impacts, but if avoidance is not possible, to minimize, manage and remedy negative impacts? • Positive impacts. What measures were taken to enhance positive impacts?	• A detailed impact assessment has been undertaken and is included in **Section 10**. It includes an assessment of social and economic impacts (both positive and negative). A summary is provided below: • During construction, the following impacts were assessed: Visual impact – Construction, Safety and security, Traffic disruptions, Loss of cultural and palaeontological heritage, Loss of sense of place and Change of land use. In addition, during operation, Visual impact and Visual impact – Lighting and Traffic incidents and accidents (safety) were also assessed. • There are three main components related to visual impacts. The first is general construction visual impacts which only apply during construction. These are temporary in nature and were therefore found to be of a low medium significance. With mitigation, the impact is therefore expected to be reduced to low. • The second and third component relate to the visual impact of the interchange itself as well as the impact of the lighting which are both related to operation. • In terms of the former, the Visual Impact Assessment found that that the overall visual impact is expected to be moderate (medium. A number of mitigation measures were recommended. Taking into account this mitigation together with the fact that the area is not pristine but affected by the existing interchange and historic uses, the impact can be expected to be lowered to a low-medium significance. • In terms of lighting, the Visual Impact Assessment found that from a lighting perspective, the sensitivity of the environment was high as it was classified as dark night sky with many
Considering the linkages and dependencies between human wellbeing, livelihoods and ecosystem services, describe the linkages and dependencies applicable to the area in question and how the development's socio-economic impacts will result in ecological impacts (e.g. over utilization of natural resources, etc.)?	

Question from the Need and Desirability Guideline	Response
	bright and faint stars visible. The lights would be visible at a local level and therefore, lighting of lighting on the new interchange has an assessed to have a medium impact. However, the models show that the intrusion of light at night it expected to be significantly reduced by shielding the lights. As the mitigation recommended is highly efficient, the impact is reduced to a low significance. • In terms of safety and security, during construction, crime may increase due to the influx of workers into the area. This impact would be short-term in nature (i.e. limited to construction) and would potentially impact neighbouring properties. Without mitigation, the potential impact would be 'medium'. However, a number of mitigation measures will be implemented. Based on these, the impact is seen to be 'low'. • In terms of traffic, there will be traffic disruptions during the construction phase. This was assessed as low- medium prior to mitigation as these impacts will be short-term (limited to construction). Further, a number of deviations will be put in place together with a number of mitigation measures. Based on this, the impact will be 'low' during construction. • During the operation of the proposed interchange is expected to reduce traffic disruptions (as there will be reduced need for accelerations and de-acceleration). Therefore, there is a positive benefit of medium significance in regards to traffic disturbances. In contrast, the current status (no-go alternative) is such that due to the existing interchange configuration, there is a lot of acceleration and deceleration which in high traffic volumes can result in traffic disruptions. Further, disruptions also occur due to accidents. • In terms of traffic safety, the no go option has unsafe conditions and a high number of road accidents are experienced at (and in close proximity) to this existing T-junction. The impact of the no-go option is medium and cannot be suitably mitigated. In contrast, the proposed interchange will drastically improve the safety of motorists and thus there is a positive benefit of medium significance in regards to traffic safety.

Question from the Need and Desirability Guideline	Response
	• In terms of heritage, a Heritage Impact Assessment was undertaken and the specialist found that the study area is extensively disturbed by road developments, an existing Asphalt plant, old quarry and modern buildings and although the larger area is known for Iron Age stonewalled sites the extensive developments in the area would have impacted on surface indications of archaeological sites. This was confirmed during the field survey and finds were limited to two small stone enclosures recorded as Feature 1 & Feature2. The impact of the project on heritage resources can be mitigated to an acceptable level and it is recommended that the proposed project is approved on the condition that the mitigation measures recommended are implemented. • In terms of sense of place of the area, the new interchange is adjacent to the existing road and T-junction and long term (operational) impacts to the sense of place are not expected. Some impacts during construction will be experienced but these can be suitably mitigated. • The site is currently mostly developed and largely altered by anthropogenic activity. Therefore, the change in land use is not expected to be significant as the land is adjacent to the current N4 and falls within the City of Mbombela transportation corridor. A number of mitigation measures are recommended. Based on these mitigation measures, the impact is expected to have low significance. • From an economic perspective, there are three main aspects that were assessed which included Decline/increase in economy; Construction costs (affordability); and Employment. • During construction, the proposed development will cost approximately R165 million and will provide a significant boost to the local economy. Therefore, there is a positive benefit of medium significance.

Question from the Need and Desirability Guideline	Response
	• In contrast, should the development not proceed, the benefits to the local community will be long term and negative. Firstly, there will be a loss of the injection of cash in the area. This impact is of negative medium-high significance and cannot be satisfactorily mitigated. The no-go option is therefore not recommended from an economic standpoint. • In addition, during operation, the proposed development will ensure safe and efficient transport along the MDC between South Africa and Mozambique and thus has indirect benefits at a national level. This has a significance positive (medium-high benefit). • Should the development not proceed, the benefits to the local community will be long term and negative. A grade separated intersection is required in terms of the Concession Contract to alleviate safety issues at the existing intersection and to prioritise the east-west movements between Schoemanskloof and MDC Section 7A. The MDC is an important route between South Africa and Mozambique, the lack of necessary upgrades may have a significant negative impact to the country. The no-go option is therefore not preferred. • Affordability is an important consideration as the SANRAL and its concessionaires have limited budgets which need to be utilized for a multitude of projects. Additional Pier Heads (Alternative 1) is preferred from an affordability perspective and therefore has a positive medium benefit. Alternative 2 is not preferred as it is more costly. Although the no-go option will require direct capital investment, overall it will result in a negative impact to the economy and therefore is not the affordable option. • The proposed development will result in approximately 300 construction related employment opportunities for the local community (positive medium significance). Should the development not proceed, the benefits to the local community will be long term and negative as potential employment opportunities will be lost. No mitigation measures are available and therefore the no go option is not preferred.

Question from the Need and Desirability Guideline	Response
	• During operation, there will be an indirect benefit: 'the proposed development will ensure safe and efficient transport along the MDC between South Africa and Mozambique and thus has indirect benefits at a national level. Although no direct employment will be undertaken during the operational phase, the development is necessary to improve the current status of the MDC. This will likely have a number of positive multiplier effects in terms of employment in the region (positive medium significance). 'Should the development not proceed, the benefits to the local community will be long term and negative as potential employment opportunities will be lost. No mitigation measures are available. The no-go option is therefore not preferred. A detailed EMPr is included in **Appendix 14.8** and includes necessary measures to reduce or enhance impacts. Based on the type of proposed development, it is not expected that the socio-economic impacts will result in ecological impacts.
What measures were taken to pursue the selection of the "best practicable environmental option" in terms of socio-economic considerations?	A number of conceptual options have been explored as part of the preliminary design phase of the proposed interchange and are described in **Section 7.3**. In addition, two bridge designs are being assessed as alternatives as part of the Scoping and EIA Phase. These are: • Alternative 1 – Additional Piers; and • Alternative 2 – Pier Head Addition.

Question from the Need and Desirability Guideline	Response
	A detailed assessment of alternatives has been undertaken and also includes socio-economic aspects such as construction risk and affordability. These include: • No excessive drilling or additional loads will be applied to the already slender existing piers. • The construction procedure will not be complex, resulting in standard staging and formwork. No pre-stressing processes will be required. • The additional piers provide a simple, direct load path supporting the widening. • Construction is simple with one column type that can be utilized at all of the piers. • Lower risks are achieved from a design and a construction point of view. • This is a cost-effective solution. • This is an aesthetically pleasing option
What measures were taken to pursue environmental justice 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 (who are the beneficiaries and is the development located appropriately)? Considering the need for social equity and justice, do the alternatives identified, allow the "best practicable environmental option" to be selected, or is there a need for other alternatives to be considered?	A detailed Scoping and EIA process is currently being undertaken. This includes the assessment of alternatives, compilation of a detailed impact assessment and undertaking relevant specialist studies. Further, as noted above, the proposed development aims improve road safety and efficiency. Based on the preliminary assessment of alternatives undertaken as part of the Scoping phase, it is believed that the alternatives assessed do allow for the best practicable environmental option to be determined and the EAP is of the opinion that no further alternatives need to be assessed. Alternative 1 has been assessed as the BPEO.
What measures were taken to pursue equitable access to environmental resources, benefits and services to meet basic human needs and ensure human wellbeing and what special measures were taken to ensure access thereto by categories of persons disadvantaged by unfair discrimination?	A number of specialist studies have been undertaken as part of the EIA Phase to ensure that the proposed development is sustainable and does not result any negative impacts to disadvantaged persons. No fatal flaws were identified. All studies recommended that the proposed development proceed.

Question from the Need and Desirability Guideline	Response
What measures were taken to ensure that the responsibility for the environmental health and safety consequences of the development has been addressed throughout the development's life cycle?	In identifying the potential impacts associated with the development, the full lifecycle was assessed. Please refer to **Section 10.2.** Further, the full EMPr includes the roles and responsibilities for the development and ensures that the responsibility of the implementation of the EMPr falls to the developer.
What measures were taken to: • ensure the participation of all interested and affected parties, • provide all people with an opportunity to develop the understanding, skills and capacity necessary for achieving equitable and effective participation • ensure participation by vulnerable and disadvantaged persons, • promote community wellbeing and empowerment through environmental education, the raising of environmental awareness, the sharing of knowledge and experience and other appropriate means, • ensure openness and transparency, and access to information in terms of the process, • ensure that the interests, needs and values of all interested and affected parties were taken into account, and that adequate recognition were given to all forms of knowledge, including traditional and ordinary knowledge, and	A detailed public participation process is being undertaken as part of the Scoping and EIA process. As part of this, a detailed Interested and Affected Party (I&AP) Database was compiled and included affected and adjacent landowners, organs of state such as the City of Mbombela, IUCMA, DHSWS, DEFF, and MDARDLEA etc. In addition, the I&AP database included the affected ward councillor of the area. To date, these I&APs have been notified of the Scoping and EIA process and provided an opportunity to register their interest and attend public open days where information on the proposed upgrade was provided (together with a separate project). All registered I&APs were also provided with an opportunity to comment on the Scoping Report and will be notified of the review of the EIR (this document). Numerous communication methods (including site notices, adverts, hand delivery of BIDs and emails) are being employed, and it is felt that public participation has been such to ensure participation by all potentially interested or affected people.

Question from the Need and Desirability Guideline	Response
• ensure that the vital role of women and youth in environmental management and development were recognized and their full participation therein were promoted?	
Considering the interests, needs and values of all the interested and affected parties, describe how the development will allow for opportunities for all the segments of the community (e.g. a mixture of low- middle-, and high-income housing opportunities) that is consistent with the priority needs of the local area (or that is proportional to the needs of an area)	The proposed development aims to improve the existing road safety and efficiency. In addition, through the construction of the development, local community members will be employed. There will also be a number of economic multiplier effects. Through the capital spend of R165 million.
What measures have been taken to ensure that current and / or future workers will be informed of work that potentially might be harmful to human health or the or the environment or of dangers associated with the work, and what measures have been taken to ensure that the right of workers to refuse such work will be respected and protected?	A site specific EMPr has been compiled and included in **Appendix 14.8** and includes an Environmental Awareness Plan. As part of this, workers will be informed of their rights to refuse work that might be harmful to human health or the environment.
Describe how the development will impact on job creation in terms of, amongst other aspects: • the number of temporary versus permanent jobs that will be created, • whether the labour available in the area will be able to take up the job opportunities (i.e. do the required skills match the skills available in the area), • the distance from where labourers will have to travel,	The following can be noted in regards to this: • The EMPr notes that local employment should be encouraged to promote skills transfer and development. This will enhance the general area and provide job opportunities to potential job seekers and manage it in the best suitable way. • An assessment of the social environment of the area suggests that there is labour available in the Municipal area. • The proposed development will not result in any losses of any jobs and job-related opportunity costs are not expected.

Question from the Need and Desirability Guideline	Response
• the location of jobs opportunities versus the location of impacts (i.e. equitable distribution of costs and benefits); and • the opportunity costs in terms of job creation (e.g. a mine might create 100 jobs, but impact on 1000 agricultural jobs, etc.)	
What measures were taken to ensure: • That there were intergovernmental coordination and harmonization of policies, legislation and actions relating to the environment, and • That actual or potential conflicts of interest between organs of state were resolved through conflict resolution procedures?	National Legislation i.e. NEMA, NWA, NHRA, NEM:BA were consulted in the preparation of this Scoping Report. Provincial guidelines also formed part of the literature review. Spatial development tools also aided the EAP to assess and provide information pertaining to the proposed development. Any comments received from I&APs or organs of state are included in the comments and response register.
Are the mitigation measures proposed realistic and what long-term environmental legacy and managed burden will be left?	The site specific EMPr has been compiled includes realistic and achievable mitigation measures which aim to reduce any negative impacts as well as to enhance any positive benefits associated with the project.
What measures were taken to ensure that the costs of remedying pollution, environmental degradation and consequent adverse health effects and of preventing, controlling or minimizing further pollution, environmental damage or adverse health effects will be paid for by those responsible for harming the environment?	The site specific EMPr has been compiled an includes detailed roles and responsibilities. In addition, a penalty system for contractors will be included.
Considering the need to secure ecological integrity and a healthy bio-physical environment, describe how the alternatives	A number of conceptual options have been explored as part of the preliminary design phase of the proposed interchange and are described in **Section 7**.

Question from the Need and Desirability Guideline	Response
identified (in terms of all the different impacts being proposed), resulted in the selection of the best practicable environmental option in terms of socio-economic considerations?	In addition, two bridge designs have been assessed as alternatives as part of the EIR: These are: • Alternative 1 – Additional Piers; and • Alternative 2 – Pier Head Addition. Alternative 1: Additional Piers was selected as the BPEO for the following reasons: • From an ecological, wetland (drainage lines), heritage and visual impact perspective, there was no difference between the two alternatives. • However, from a technical perspective there are a number of advantages associated with this alternative. Many of these have important safety implications including: - No excessive drilling or additional loads will be applied to the already slender existing piers. - The construction procedure will not be complex, resulting in standard staging and formwork. No pre-stressing processes will be required. - The additional piers provide a simple, direct load path supporting the widening. - Construction is simple with one column type that can be utilized at all of the piers. - Lower risks are achieved from a design and a construction point of view. - This is a cost-effective solution. - This is an aesthetically pleasing option. • From an aquatic perspective, the specialist found that both designs presented a similar post-mitigation impact significance. Therefore, taking into account existing bridge

Question from the Need and Desirability Guideline	Response
	infrastructure, and the higher risk and cumulative impact of for Alternative 2, **Alternative 1 was preferred**.

7 ALTERNATIVES

The Appendix 3 of the 2014 EIA Regulations requires that the following information is provided in the EIA Report and includes amongst others:

3(h) A full description of the process followed to reach the proposed development footprint within the approved site, including:

(i) details of the development footprint alternatives considered

(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects.

7.1 Nature of the Activities

The proposed new Montrose Interchange aims to replace the existing at-grade intersection of MDC sections 6N (known as N4 Schoemanskloof (R539) Route) and 6E (known as Elands Valley). This intersection is located at the convergence of two parallel routes, which make up a 60 km long portion of the MDC.

A grade separated intersection is required in terms of the Concession Contract to alleviate safety issues at the existing intersection and to prioritise the east-west movements between N4 Schoemanskloof (R539) Route and MDC Section 7A.

7.2 Design Process and Conceptual Assessment

As part of the proposed interchange development, SMEC South Africa (Pty) Ltd. was appointed to do the Assessment, Preliminary Design and Detailed Design. During the assessment phase, a number of conceptual options were assessed and workshopped to produce the current interchange which forms the basis of this application.

It should be noted that due to the specific engineering requirements for an interchange of this nature, the interchange configurations and bridge types do not form part of the alternative assessment for this application but are rather provided to indicate the design process followed to obtain the current layout in line with Appendix 3 (h)(i) which notes that the EIA Report needs to include the "*process followed to reach the proposed development footprint within the approved site.*"

7.2.1 Interchange Layout Concepts

A number of interchange layouts were assessed to obtain the current proposed interchange configuration. These include:

- Option 1 - This option has features of a partial clover interchange as well a trumpet interchange, consisting of three directional ramps (W to N, S to W, and W to S movements) and a 270° loop ramp.

The major north to west movement is accommodated on the loop, with the minor west to south movement accommodated on a directional ramp.

- Option 2 - This option takes the form of a half clover interchange, consisting of two directional ramps (W to N, and S to W movements) and two 270° loop ramps (N to W and W to S movements). **This was further refined into the current alignment (see Section 4.4.1).**
- Option 3 **-** This option takes the form of a trumpet interchange, consisting of three directional ramps (W to N, S to W, and N to W movements) and a 360° loop ramp. The major north to west movement is accommodated on a directional ramp, while the minor west to south movement is accommodated on the loop ramp.

7.2.2 Bridge Concepts – B0571

In addition to the above, an assessment of bridge concept options was also undertaken for the new interchange bridge over the N4-7X. These included:

- Option 1: Steel tied arch bridge;
- Option 2: Deck-stiffened concrete arch bridge (This was identified as the optimal solution for the interchange and is described in more detail in **Section 4.4.1**.);
- Option 3: Integral portal frame bridge;
- Option 4: One sided strutted frame bridge;
- Option 5: Continuous twin spine with integral pier columns; and
- Option 6: Cable stayed bridge.

7.2.3 Bridge Concepts – Crocodile Bridge Upgrade

The three possible concepts for the Crocodile River Bridge B1577 include:

- Option 1 – Eight Span Voided Slab Deck (This was identified as the optimal option and is described in more detail in **Section 4.4.1**);
- Option 2 – Eight Span Continuous Concrete Twin Spine Deck; and
- Option 3 – Composite Structural Steel Box Girders and In-Situ Slab.

7.3 Alternatives

According to the 2014 EIA Regulations, alternatives are defined as:

"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; or

(e) operational aspects of the activity;

and includes the option of not implementing the activity"

In line with the Regulations as well as the type of development, this Scoping and EIA process assessed design alternatives regarding the Crocodile River Bridge upgrade have been assessed. These include:

- Alternative 1: Additional piers;
- Alternative 2: Pier head addition; and
- The No -Go Option.

More information on each of these alternatives is provided below.

7.3.1 Alternative 1 – Additional Piers

Alternative 1 involves the addition of new pier columns and foundations to rock level. This will result in seven additional piers on the western side of the bridge widening and three additional piers at the tapered eastern widening. The new piers will have a similar geometry when compared to the existing piers (refer to Figure 7-1, Figure 6-2 and Figure 6-3).

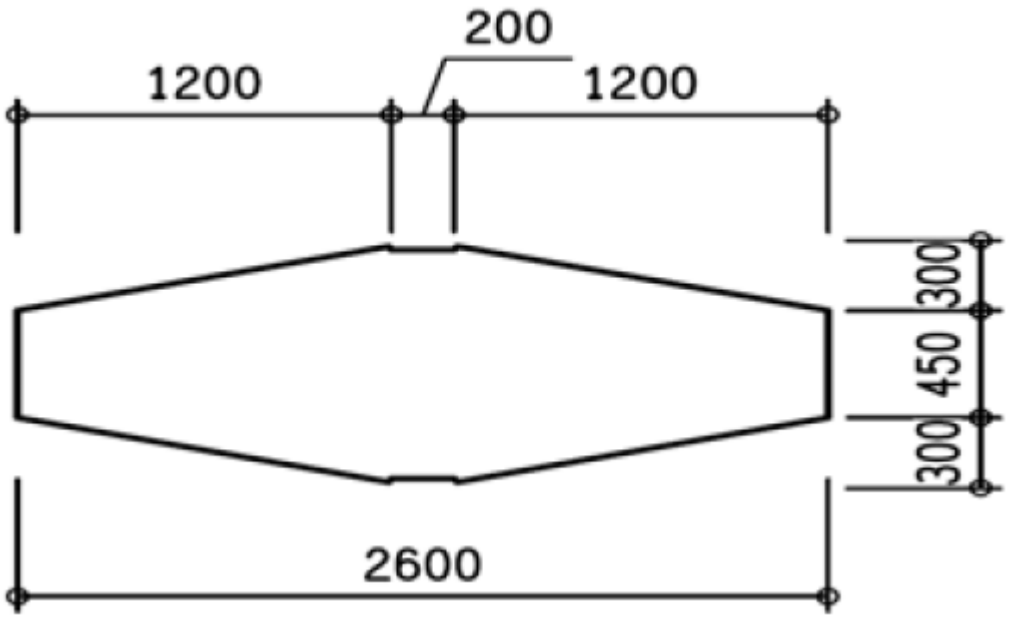


Figure 7-1: Typical new pier dimensions

From a technical perspective there are a number of advantages associated with this alternative including:

- No excessive drilling or additional loads will be applied to the already slender existing piers.
- The construction procedure will not be complex, resulting in standard staging and formwork. No pre-stressing processes will be required.
- The additional piers provide a simple, direct load path supporting the widening.
- Construction is simple with one column type that can be utilized at all of the piers.

- Lower risks are achieved from a design and a construction point of view.
- This is a cost-effective solution.
- This is an aesthetically pleasing option.

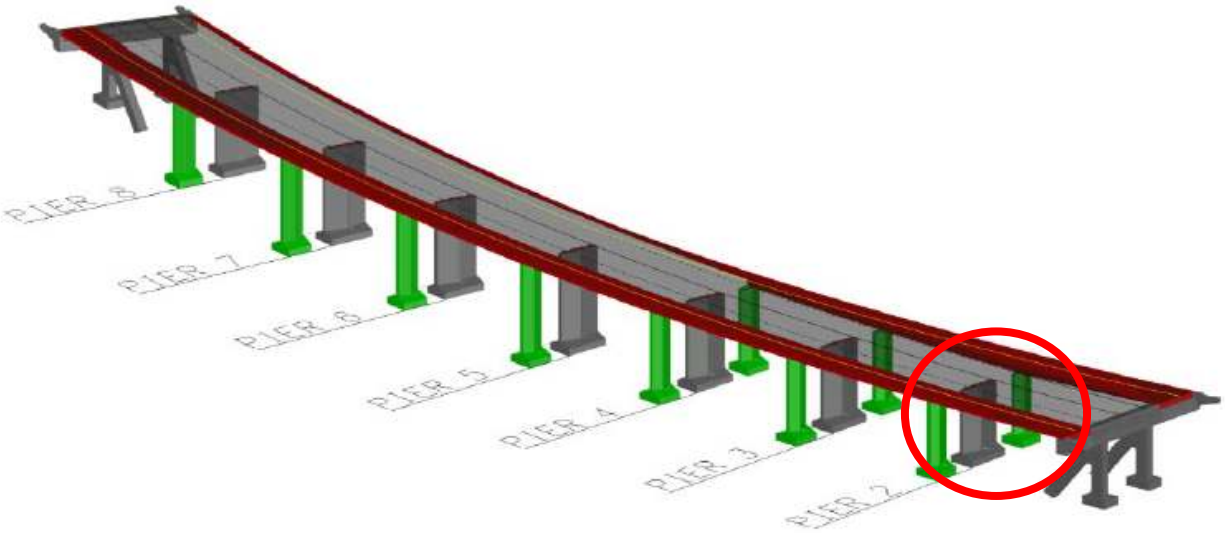


Figure 7-2: Rendering of Alternative 1 – New Piers (Pier 2 is indicated in red)

A typical cross section of Pier 2 (shown in red in **Figure 7-2**) is provided in **Figure 7-3** below.

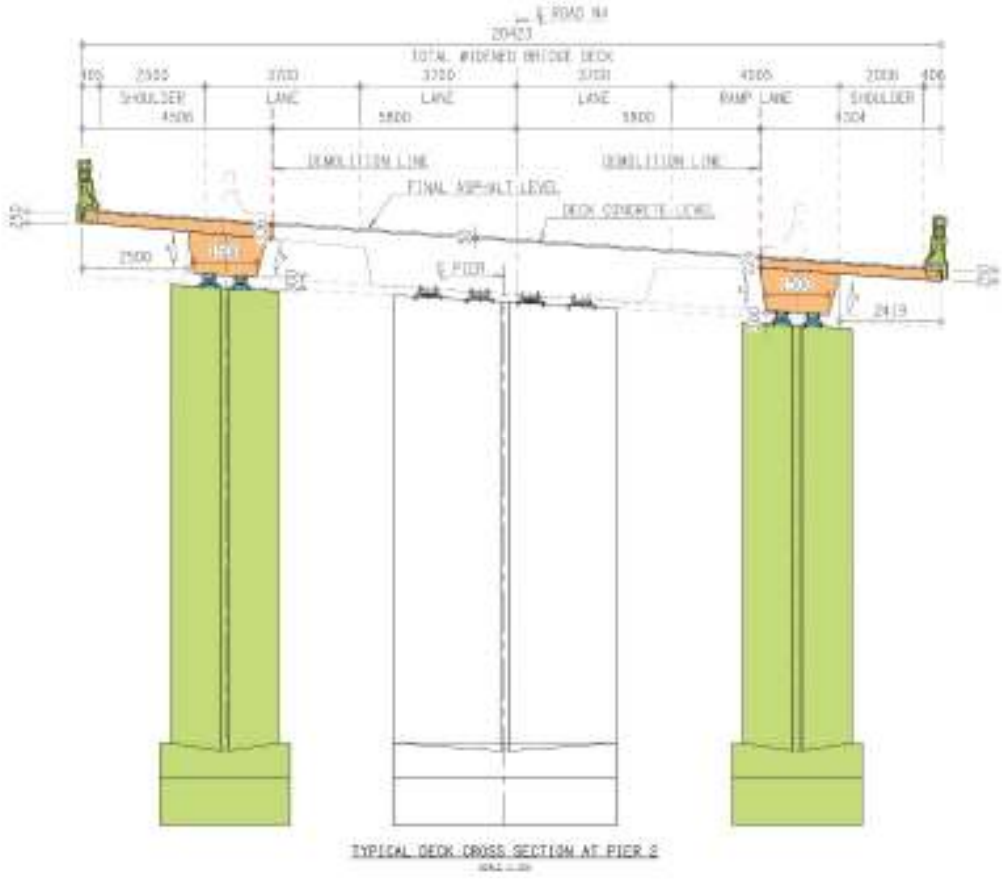


Figure 7-3: Typical Option 1 sub-structure at Pier 2

Therefore, although excavations to founding level will be required as well as false- and formwork of significant height, this is the preferred alternative from a technical perspective. An artistic rendering of the proposed upgraded bridge showing the new piers is provided in Figure 7-4.

Figure 7-4: Rendering of Alternative 1 – New Piers

7.3.2 Alternative 2 – Pier Head Addition

The second pier alternative considered entails the widening of the existing piers by means of an additional pier head. Trapezoidal extensions will be added to the piers' sides, approximately 4.0 m in height from the top of the existing piers. The extensions will be required on both sides of the existing piers at three locations, and only on one side at the other four piers. The new pier heads would require a local thickening of the existing pier, to a width of approximately 1.65 m, to connect the new pier head to the existing pier (Figure 7-5).

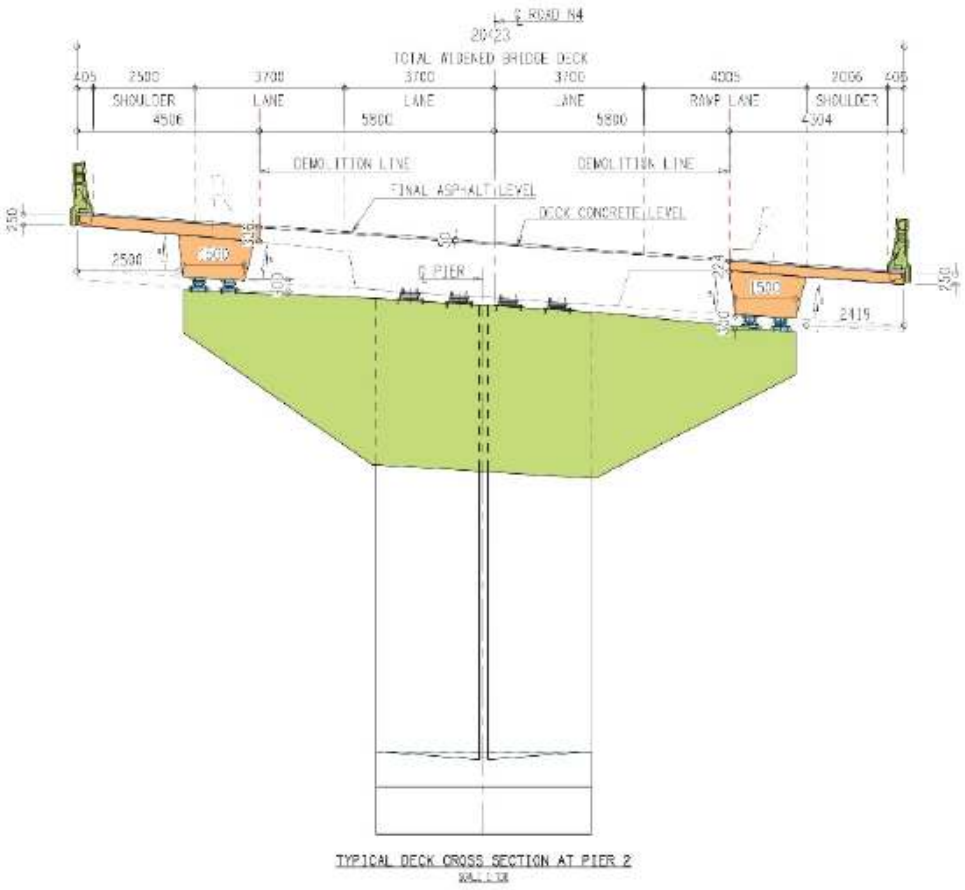


Figure 7-5: Typical Alternative 2 sub-structure at Pier 2

Some pier head extensions will vary at different piers to follow the tapering superstructure widening at the eastern side.

The advantages of this option include the following:

- No excavation or founding works will be required.
- The quantity of construction materials is reduced.

However, there are a number of very significant technical disadvantages which include the following:

- Numerous dowels and excessive drilling into the existing piers is required, which is time-consuming and costly.
- Specialized temporary works and access will be required to work at the top of the existing piers.
- Unique and differing designs will be required for the piers supporting the tapering bridge superstructure.
- Complex construction procedures will be required, such as pre-stressing at height
- Significantly higher risks in design and construction.
- A more costly solution.
- Thick and bulky pier heads on a slender existing pier will not result in an aesthetically pleasing option

An artistic rendering of the proposed bridge with pier modification is provided in Figure 7-6.

Figure 7-6: Artistic rendering – Alternative 2 – Pier modification

7.3.3 No-Go Alternative

As standard practice and to satisfy regulatory requirements, the option of not proceeding with the project is included in the evaluation of the alternatives.

The main implication of the No Go Option is that should the development not proceed, the continued safety issues at the intersection will continue. This is a significant negative impact that results in loss of life through accidents as well as potential economic impacts related to impacts to infrastructure during road accidents. In addition, road efficiency will be affected. As important transport corridor, the N4 is an integral route and needs to be maintained at certain levels. Lastly, there will be a loss of the economic benefits of the investment of approximately R165 million in the area. There will also be a loss of approximately 300 construction related employment opportunities.

7.4 Environmental Attributes and Sensitivity Map

As part of the compilation of the Scoping Report, a preliminary assessment was undertaken using the C-Plan and rivers, wetlands and vegetation data sources and is indicated in **Figure 7-7**. These environmental attributes were considered to ascertain areas where further investigation and included the following:

- Rivers: a watercourse (the proposed interchange crosses the Crocodile River);
- Ecological sensitive areas including CBA: Irreplaceable (Terrestrial) and CBA Rivers (Elands river in close proximity to the site);

- Heritage and Cultural aspects; and
- Vegetation Map.

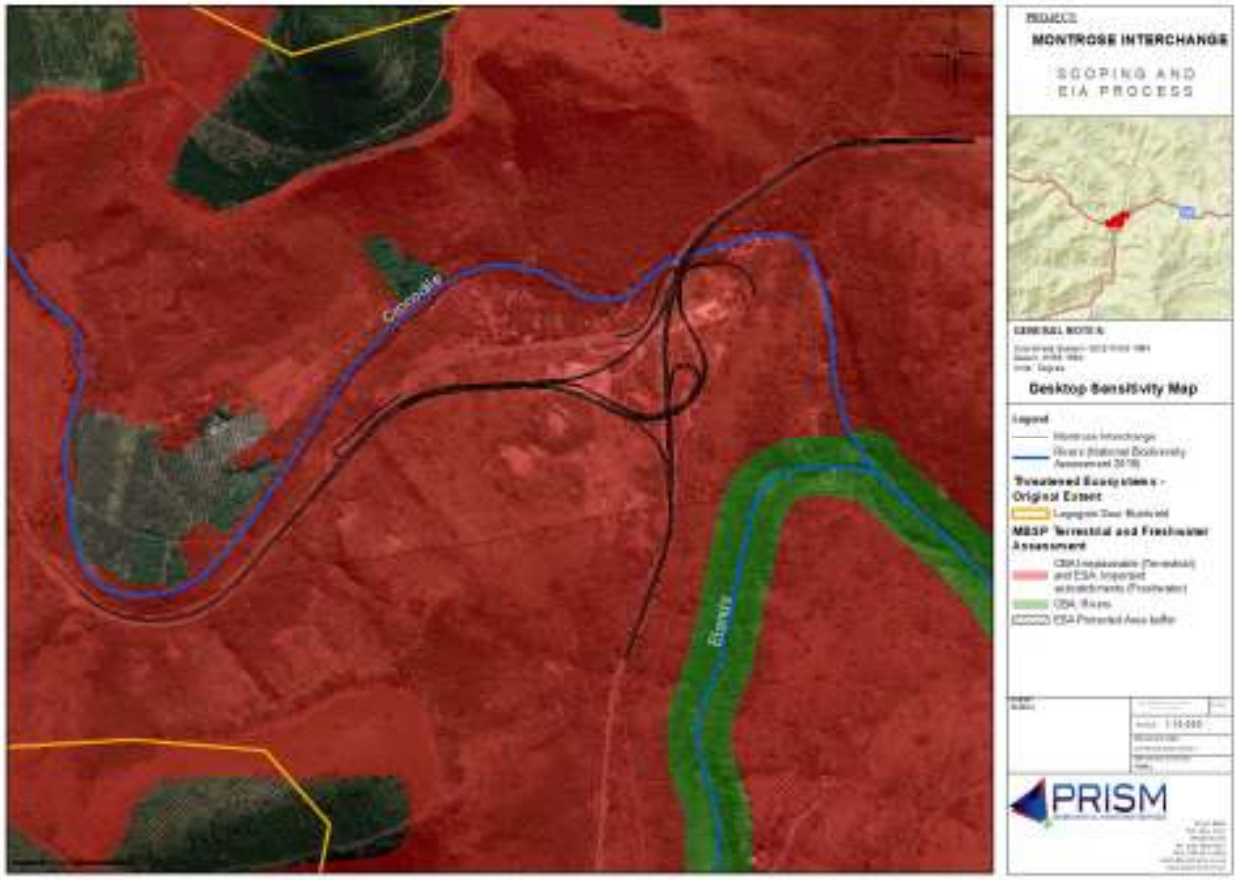


Figure 7-7: Preliminary (Desktop) Sensitivity Map

This sensitivity map has been updated on the basis of the Specialist Studies that were undertaken. A detailed description and assessment of alternatives is provided in **Section 10** and an updated Sensitivity Map is included in **Section 11.1.**

8 PUBLIC PARTICIPATION PROCESS

8.1 Objective and Purpose of Public Participation

The purpose of the public participation process is to provide information regarding the proposed project to any potentially interested and/or affected person for use and consideration throughout the environmental assessment process. The information usually involves a combination of the technical project scope, environmental attributes and sensitives, cultural and heritage aspects as well as socio-economic factors that may be potentially beneficial or problematic to various role players.

The dissemination of such information is intended to assist the public with understanding how the proposed project and/or development may impact them and the environment in either a positive and/or negative manner, and especially where impacts are determined or perceived as significantly high, how such impacts may be influenced by project changes (layout or design aspects) or management measures may be implemented to reduce or minimise the significance of any identified impacts.

As a registered I&AP, members of the public of any affiliation are awarded the opportunity to remain informed of the steps, actions and decisions made within the environmental impact assessment process and are able to actively participate by reviewing all information provided by the EAP to the I&AP's in a reasonable period in order to provide comments, objections, suggestions or any other information that will assist the project to develop in a favourable for all manner or contribute to the competent authority's knowledge in order to make an informed decision on the application for environmental authorisation.

8.2 Notification Phase of Public Participation

The public participation process commenced with identifying and notifying all potential Interested and Affected Parties (I&AP's). Background information documents and comment forms were provided as a basic source of information or notices were viewed and potential interested and/or affected members of the public were invited to register as I&AP's for the remainder of the Scoping and Environmental Impact Reporting phases of the process.

8.2.1 Identified I&AP's

The following potential I&AP's were identified:

- DEFF;
- IUCMA;
- DHSWS;
- MDARDLEA;
- City of Mbombela;
- Ehlanzeni District Municipality;
- SAHRA;
- MPTA;

- MHRA;
- Adjacent and affected landowners;
- Local businesses in the area; and the
- The relevant ward councillor.

Refer to **Appendix 14.5.1**. for a detailed list of the interested and/or affected members of the public that were notified and/or subsequently registered as an I&AP.

8.2.2 Newspaper Notice

A notice was published in The Lowvelder and the Star Newspaper on **13 September 2019**.

Refer to Appendix 14.5.2.1 for proof of the newspaper notices.

8.2.3 Site Notice

Four site notices were placed on **13 September 2019** around the proposed development site at the following locations:

- On the eastern side of the existing road T-junction of the R539 and N4 toll route via Ngodwana,
- On the southern side of T-junction of the R539 and where a batching plant was operating at the time,
- On display at the entrance of the convenience store of the Viva Fuel Station, approximately 10 km west along the R539 of the proposed site, and
- On a fence along the N4 toll route via Ngodwana east of the T-junction and Crocodile Bridge crossing.

Refer to Appendix 14.5.2.2 for proof of the notices placed on site.

8.2.4 Written Notifications

The surrounding landowners and/or occupiers and organs of state (listed in **Appendix 14.5.1**) were notified in writing via telephone calls and e-mail between **13 September 2019 – 18 September 2019** and were issued with a copy of the Background Information Document (BID) to provide further information on the project. A copy of the BID is provided in **Appendix 14.5.2.3**.

Refer to **Appendix 14.5.2.4** for proof of the Written Notifications undertaken as part of the initial notification.

8.2.5 Comments Raised by I&AP's during the Initial Notification Period

The comments received during the initial notification period are summarised in the Comments and Responses Report attached in **Appendix 14.5.6**. Most comments received were requests to be registered. SAPPI Ngodwana have raised a concern regarding the potential traffic impacts the construction of the interchange might have on their logistics and travels of large haul trucks transporting timber. Martin's Haven have raised their concern over potentially losing much business and revenue when the interchange replaces the existing R539 last section of road which also form current access to the resort.

8.3 Additional Notification and Public Open Days

After initial notification was completed, an additional round of notification was undertaken and combined with another project which is subsequently been run separately to the Scoping and EIA process. Details of this additional notification are however included as two open days were run to present the Montrose Interchange Upgrade as part of this notification process.

8.3.1 Newspaper Notice

A notice was also published in the Lowvelder and the Star Newspaper on **15 November 2019**. The advert provided information on the proposed development as well as the public open day details.

Refer to **Appendix 14.5.3.1**. for a copy of the newspaper notice.

8.3.2 Site Notice

Three site notices were placed on the **15 November 2019** around the proposed development site at the following locations:

- At the SAPPI entrance route off the R539, approximately 1,2 km off the N4 toll route via Ngodwana in the west,
- At the SAPPI entrance route off the R539, approximately 4,5 km off the N4 toll route via Ngodwana in the west,
- At a farming community entrance off the R539, approximately 7,7 km off the N4 toll route via Ngodwana in the west.

Refer to **Appendix 14.5.3.2** for a copy of notice placed on site.

8.3.3 Written Notification

The surrounding landowners and/or occupiers and organs of state (listed in **Appendix 14.5.1**) were notified in writing via telephone calls and e-mail between on 15 November 2019 and were issued with a copy of the Background Information Document (BID) to provide further information on the project. A copy of the BID is provided in **Appendix 14.5.3.3**.

Refer to **Appendix 14.5.3.4** for proof of the Written Notifications undertaken as part of the additional notification.

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8.3.4 Public Open Days

Two open days were undertaken at the Schoemanskloof Boerevereeniging Hall on 29 and 30 November 2019. These open days were well attended, however these attendees have registered for the BAR process for the upgrade of the R539 road being run in parallel to this EIA process. There details have been included in the I&AP database and they will be afforded an opportunity to review and comment on the EIA Report should they wish.

Please refer to **Appendix 14.5.3.5** for a copy of the attendance registers from the Open Days.

8.4 Scoping Phase Comment Period

8.4.1 Scoping Phase Notification

The Scoping Report was made available for review by registered I&APs and Organs of State/Authorities between **22 September 2020 and 23 October 2020**. Email notification was sent to all registered I&APs on 22 September 2020 to notify them of the review of the Scoping Report. A copy of the Scoping Report was made available for download and review from: www.prismems.co.za under the **Current Projects Tab**. Proof of notification is included in **Section 14.5.4.1**.

Notification and the link to download was also sent to necessary Competent and/or Commenting authorities including:

- DEFF;
- IUCMA;
- DHSWS;
- MDARDLEA;
- City of Mbombela;
- Ehlanzeni District Municipality;

The Scoping Report was be uploaded to SAHRIS to enable the review of the document by:

- SAHRA;
- MHRA;

A reminder email was sent out to encourage I&APs to provide comments and proof of this reminder is also provided in **Appendix 14.5.4.1**.

8.4.2 Comments Received during Scoping Report Review

Formal comments were received from the DEFF on 12 October 2020. In addition, a number of smaller comments were also received and included:

- An email from SAHRIS was received and requested that the Scoping Report and associated annexures to be added to the existing case and the additional case be deleted.
- An email was received from the Local Municipality requesting a site visit.
- An email was sent noting that the I&AP was not in close proximity to the Montrose Interchange and would thus not be providing comments.
- An email was sent requesting registration and noting support of the project. The I&AP also requested interest is providing accommodation to contractor employees.
- An email was sent to note issues with the website.

All comments received have been included in the Comments and Responses Register which can be found in Appendix **14.5.6**. A copy of these comments is also included in **Appendix 14.5.7.2**.

8.5 EIA Phase Comment Period

As required by the EIA Regulations, 2014 (as amended). The EIA Report (this document) was subjected to public participation. The details of such is described in the subsections that follow:

8.5.1 Public Review of the EIA Report

Email notification were sent to all registered I&APs on the I&AP Database notifying them of the review of the EIA Report. A link to download a copy of the EIA Report was included in the notification email. A 30-day public review period has been provided between **13 November 2020 to 14 December 2020.** Proof of notification of registered I&APs is included in Appendix 14.5.5.1.

8.5.2 Authority Review of the EIA Report

In addition to the public review, copies of the EIA Report were also provided to key commenting and/or decision-making authorities. These included:

- DEFF;
- IUCMA;
- DHSWS;
- MDARDLEA;
- City of Mbombela;
- Ehlanzeni District Municipality;

In addition, the EIA Report was also uploaded to SAHRIS to enable the review of the document by:

- SAHRA;
- MHRA;

Proof of delivery to authorities is included in Appendix 14.5.5.2.

A 30-day review period was provided between **13 November 2020 to 14 December 2020.**

8.5.3 Comments received on the EIA Report

Formal comments were received from the Department of Environment, Forestry and Fisheries (DEFF) on XX. In addition, a number of smaller comments were also received and included:

- MTPA dated 11 December 2020;
- City of Mbombela Local Municipality Local Municipality
- xX

- XX
- XX

All comments received have been included in the Comments and Responses Register which can be found in Appendix 14.5.6**.** A copy of these comments are also included in Appendix 14.5.7.3.

It should be noted that a reminder email was sent out to encourage I&APs to provide comments on 3 December 2020 and 9 December 2020. Proof of these reminder is provided in Appendix 14.5.5.3.

8.5.4 Authority Site Visit

At the request of the Mbombela Local Municipality, a site visit was arranged and with Authorities and Organs of state. Invitations were extended to the following authorities:

- DEFF;
- IUCMA;
- MDARDLEA;
- MTPA
- City of Mbombela; and
- Ehlanzeni District Municipality.

The site visit was arranged and took place on 8 December 2020. The following authorities attended:

- MTPA;
- City of Mbombela; and
- Ehlanzeni District Municipality;

A copy of the attendance register is contained in Appendix 14.5.9.

8.6 Updated EIA Report and DEFF Decision

All comments received during the comment period discussed above have been considered and incorporated into the Final EIA Report and documented in the Comments and Response Report.

The Final EIA Report will then be submitted to DEFF for decision.

8.7 Outcome of the Decision

Registered I&AP's will be notified in writing of the outcome of the Department's decision within 12 days of the decision. The notification will include details of the process and timeframes in which to appeal the outcome of the decision made by the competent authority, DEFF.

8.8 Timeframes

An overview of the Scoping and EIA process undertaken to date is provided in **Table 8-1.**

Table 8-1: Proposed timeframes for the EIA process.

Responsible Role Player	Milestone Tasks	Required Time Period	Proposed Timeframes	Status
Application Phase				
PPP	Written, Newspaper, Site Notices & BID's	30 days	13 September 2019	✓
EAP	Submit Application for EA	N/A	22 September 2020	✓
DEFF	Accept/Acknowledge Application for EA	10 days	October 2020	✓
Scoping Phase				
EAP	Compile SR	N/A	June- September 2020	✓
PPP	I&AP Comment Period on SR	30 days	22 September 2020 – 23 October 2020	✓
EAP	Review / Incorporate Comments	2 days	23 October 2020 – 25 October 2020	✓
DEFF	Review SR	43 days	26 October 2020 -12 November 2020	✓
Impact Assessment Phase				
Specialists	Ecology, Aquatic, Wetland, HIA, Noise	N/A	During appropriate season	✓
EAP	Compile EIA Report	N/A	October 2020	✓
PPP	I&AP Comment on EIA Report	30 days	November/December 2020	✓
EAP	Review / Incorporate Comments	2 days	December 2020	✓
DEFF	Review EIA Report and Provide Decision	106 days	December-February 2020	*In progress*
PPP	Notification of Decision / Appeal		February/March 2020	✗

9 SUMMARY OF SPECIALIST STUDIES

One of the most important aspects of the Scoping Phase was the identification of specialist studies required for the EIA Phase.

According to Münster (2005), a 'trigger' is "a particular characteristic of either the receiving environment or the proposed project which indicates that there is likely to be an issue and/or potentially significant impact associated with that proposed development that may require specialist input".

Further, the EIA Regulations, 2014 (as amended) define a specialist as: "*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 studi*es."

The specialist studies 'triggered' by the findings of the Scoping process include the following:

- Ecological Assessment;
- Aquatic Assessment;
- Wetland Assessment;
- Visual Impact Assessment; and
- Phase 1 Heritage Impact Assessment.

In addition to the above-mentioned environmental specialist studies, the following technical studies were also undertaken info the EIA and are thus summarised below:

- Preliminary design report; and
- Geotechnical Assessment.

The *Guideline for the review of specialist input in EIA processes (Keatimilwe & Ashton, 2005)* was used to ensure that specialist input was incorporated into the EIA Report comprehensively. This included the incorporation of the following information:

- The assumptions and limitations identified in each study are included in **Section 9.8**.;
- A summary of each specialist study is provided below and includes information on the key findings and conclusions drawn;
- The Specialists' impacts assessment, and the identified mitigation measures, were included in the overall project impact assessment contained in **Section 10.3.**
- Specialist information was used to assess alternatives and identify the BPEO (**Section 10.6**);
- Specialist input was obtained to address comments made by I&APs that related to specific environmental features; and
- Recommendations made by the specialists were taken forward to the EIA Conclusions and Recommendations and associated EMPr (**Section 11** and **Appendix 14.8**).

9.1 Ecological Assessment

The key issues and triggers identified during Scoping for the Ecological Assessment include:

- Ecological sensitive areas including CBA: Irreplaceable (Terrestrial)
- Threatened Ecosystems - Legogote Sour Bushveld;
- A small section of the road upgrade falls within the 5km Protected Area buffer.

The details of the Ecological Specialist that was responsible for the compilation of the study is as follows:

- EkoInfo CC | Willem De Frey
- **Qualifications**: MSc. Wildlife Management
- **Experience:** 15 years' experience.
- **Affiliations:** Pr. Sci. Nat (Botany and Ecology – 400100/02).

The full Ecological Assessment is appended in Appendix 14.6.1.

9.1.1 Key Findings

9.1.1.1 Scope of work/ Terms of reference

EkoInfo CC was appointed to do an ecological assessment of the area to be impacted upon by the proposed upgraded of the Montrose interchange along the N4 in Mpumalanga Province. The appointment did not specify any criteria, and therefore the criteria/ guidelines provided in Appendix 6 of the NEMA EIA Regulations of 2014 was implemented.

9.1.1.2 Method

The following methods were utilized:

- Literature – And Desktop Review
    - Available small-scale dataset available from government and academic institutions were reviewed. Most
    - of the datasets are available on the Internet at the various institutions. A primary source of this information is SANBI's BGIS platform.
    - An additional small-scale data that was obtained was from international institutions such as USGS Earth Explorer2, which provide satellite imagery and Digital Elevation Models.
- Fieldwork
    - Fieldwork was done on the 8th of October 2019 and involved the use of the Braun-Blanquet approach, which is the national standard for vegetation description and mapping in South Africa (Brown et al 2013).
    - The Braun-Blanquet approach involves the use of plots, where in the floristic composition, vegetation characteristics and environmental data is recorded (Kent & Coker 1992, De Frey

1999). The plot size varies according to the dominant vegetation, whether Savanna or Grassland, within the Savanna Biome the standard plot size is 10 x 20 m. Four plots were surveyed based on expected variation in soil conditions.

9.1.1.3 Results

9.1.1.3.1 Regional Context – Literature and Desktop Review

The extent of area not associated with existing road infrastructure, to be transformed by the upgrade of the interchange is approximately 4 ha. This regional vegetation unit is classified as being Endangered.

Ecosystem Diversity

On a national scale, the study area is located within the Legogote Sour Bushveld within the Savanna Biome of South Africa (**Figure 9-1**). According to Mucina and Rutherford (2006), the conservation target is 19% with about 2% statutorily conserved mainly in the Bosbokrand and Barberton Nature Reserves; at least a further 2% is conserved in private reserves including the Mbesan and Kaapsehoop Reserves and Mondi Cycad Reserve. It has been greatly transformed (50%), mainly by plantations and also by cultivated areas and urban development. Scattered alien plants include *Lantana camara*, *Psidium guajava* and *Solanum mauritianum*. Erosion is very low to moderate.

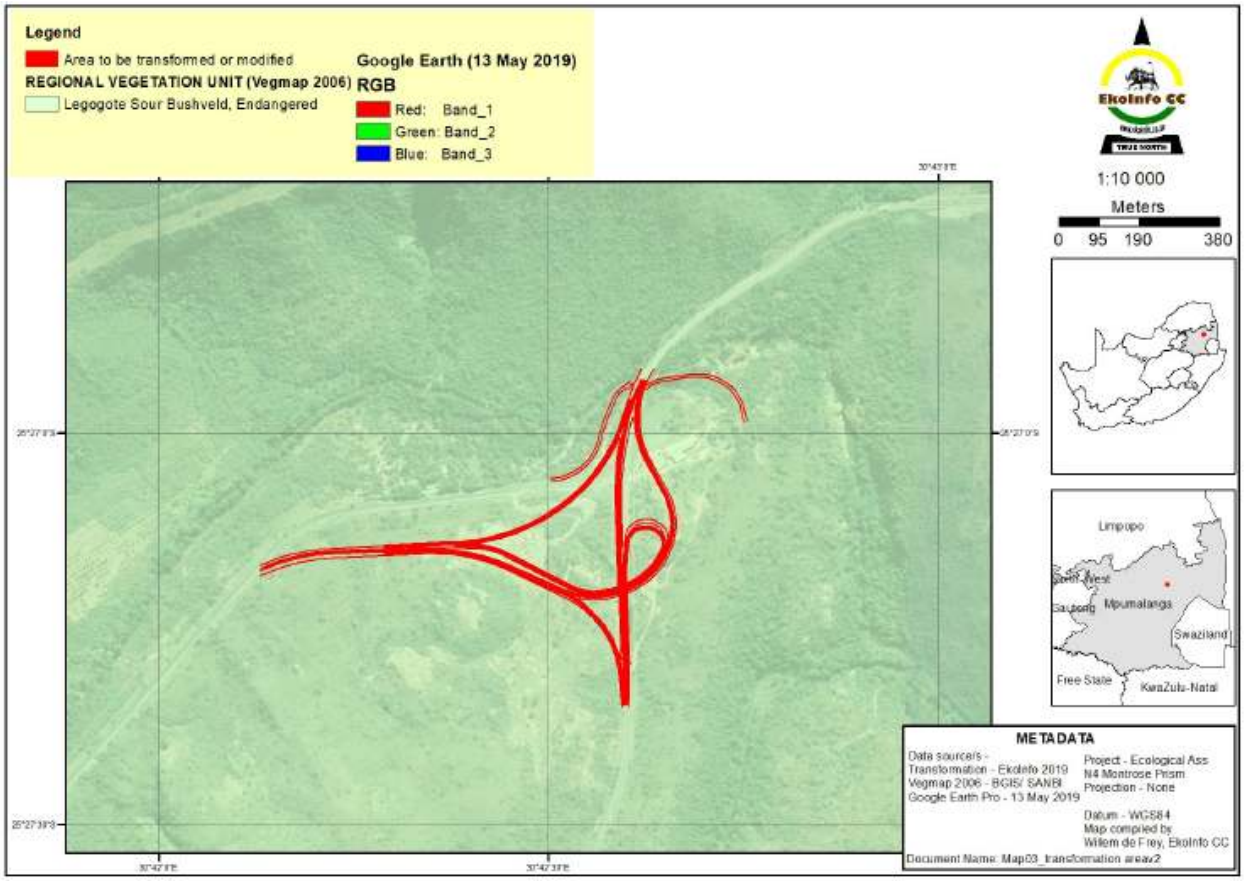


Figure 9-1: Regional Vegetation (EkoInfo, 2019)

Species Diversity

Within the regional vegetation, 68 plant species are listed. Of these, one species is nationally protected and threatened in terms of the National Environmental Management Biodiversity Act, namely *Aloe simii*, this succulent is classified as Critically Endangered, and associated with wetland habitat.

In addition, two nationally protected trees in terms of the National Forest Act (1998) occurs within the regional unit namely: *Pterocarpus angolensis* and *Sclerocarya birrea*.

Further, the following species which are protected in terms of the Mpumalanga Nature Conservation Act (No 10 of 1998) occur in the regional vegetation unit, namely: *Pterocarpus angolensis*, all of the species within the following genera *Aloe*, *Gladiolus*, *Olea*, *Huernia, Stapelia* and *Orbea* and all of the species in the family Proteacea (*Faurea rochetiana, Faurea saligna*).

Areas of Conservation Concern

The proposed interchange upgrade transects Critical Biodiversity Areas (CBA Irreplaceable). Approximately 2.7263 ha or 69% of the proposed interchange upgrade footprint represents irreplaceable Critical Biodiversity Area (**Figure 9-2**).

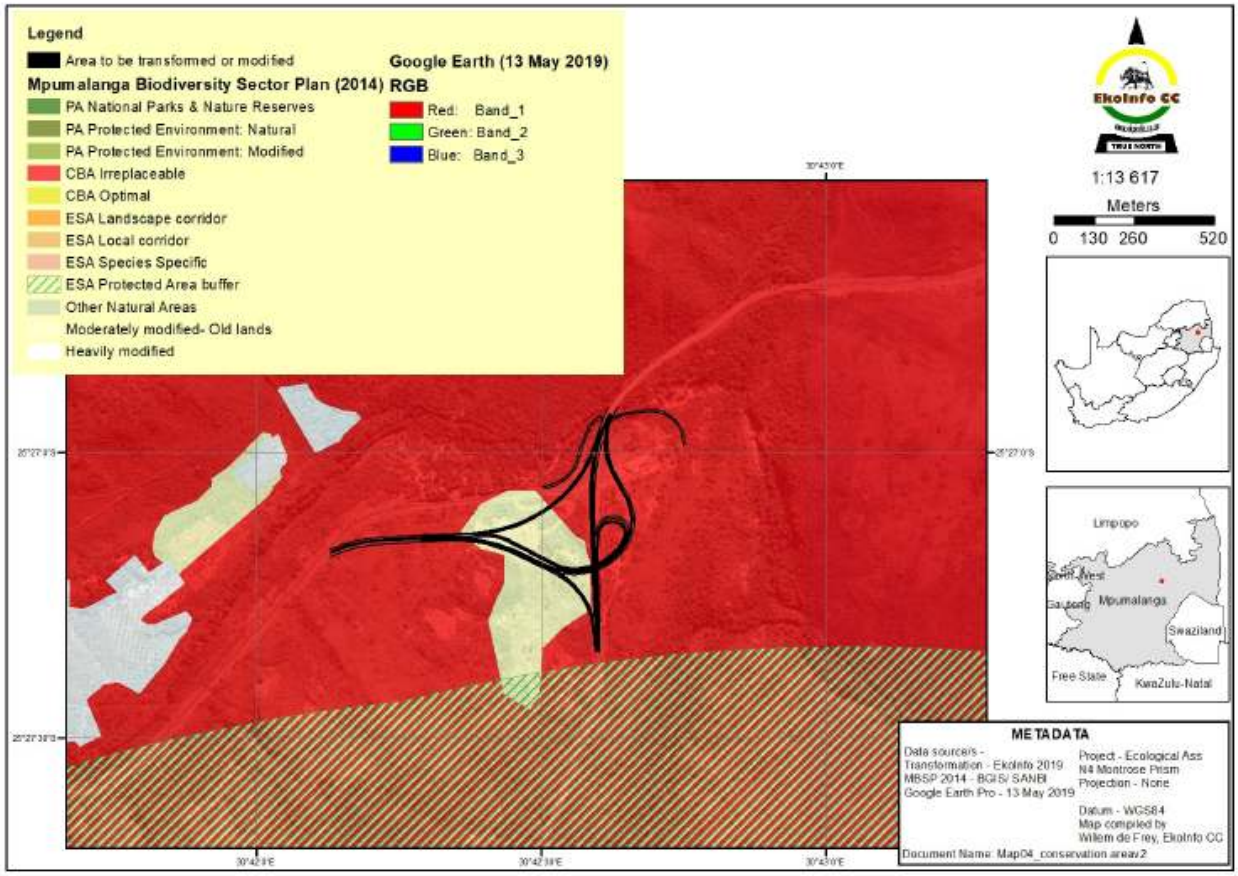


Figure 9-2: Areas of conservation concern associated with the interchange upgrade (EkoInfo, 2019)

9.1.1.3.2 Local Context – Site Visit

The objective of the site visit done on the 8th of October 2019, was to verify the relevance of the regional information, as well as confirm the absence or presence of species of concern.

Four sites were placed across the area based on observed vegetation cover and expected variation in soil conditions (**Figure 9-3**). At each plot, the environmental attributes were recorded, as well as the flora species identified in the plot. Georeferenced digital photographs were taken in the four major wind directions, as well as a profile of the soil.

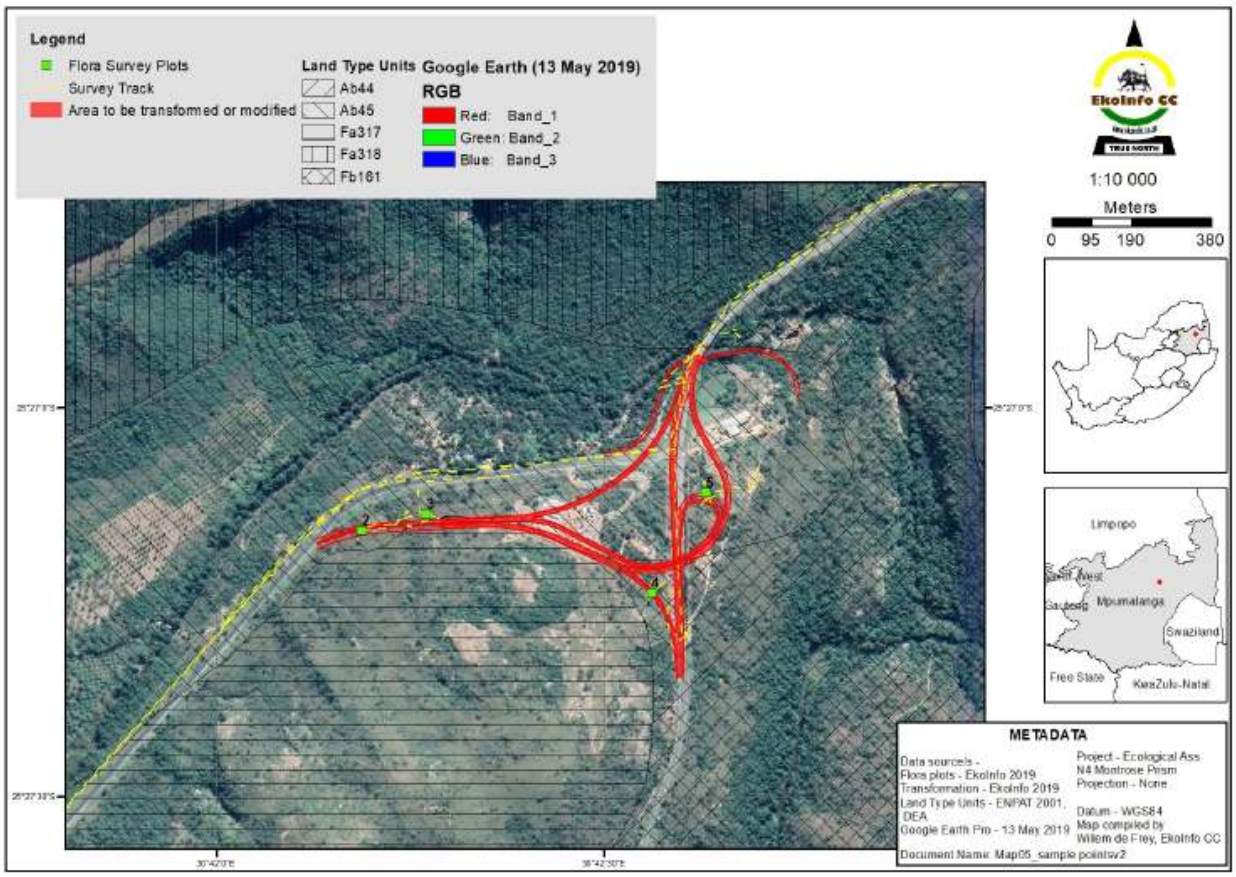


Figure 9-3: Distribution of the four sample plots based on expected soil variation (EkoInfo, 2019)

Ecosystem Diversity

The floristic - and environmental data collected confirms the study area's association with the Legogote Sour Bushveld regional vegetation, due to the high frequency (50% >) of the following species in the four plots surveyed: *Acacia sieberiana, Annona senegalensis, Athrixia elata, Barleria obtusa, Cussonia natalensis, Dichrostachys cinerea, Dombeya rotundifolia, Elephantorrhiza elephantina, Faurea saligna, Helichrysum nudifolium, Hyparrhenia hirta, Lantana camara, Loudetia flavida, Peltophorum africanum, Psidium guajava, Pterocarpus angolensis, Pterocarpus rotundifolius, Rhus pyroides, Rhus transvaalensis, Sclerocarya birrea, Sebaea grandis, Senecio venosus*.

Further, based on the environmental data record and those derived from the SRTM 1arc Digital Elevation Model (DEM), the area has the potential of two terrestrial communities:

- Rocky areas with shallow soils (<= 300mm) and finer textured soils (A horizon Clay: 10% >) towards the east (Plot 4 and 5), and
- Areas with no surface rock, and deeper soils (> 300 mm with coarse textured soils (A horizon Clay: < = 10%) towards the west (Plot 2 and 3).

Overall, the vegetation recorded is typical of the remaining natural areas within the landscape, it is evident that the landcover data cannot distinguish between the terrestrial vegetation on the midslope to crest, and the riparian vegetation within the valley bottom and foot slopes, nor does it reflect the currently transformed areas associated with factories or batching plants.

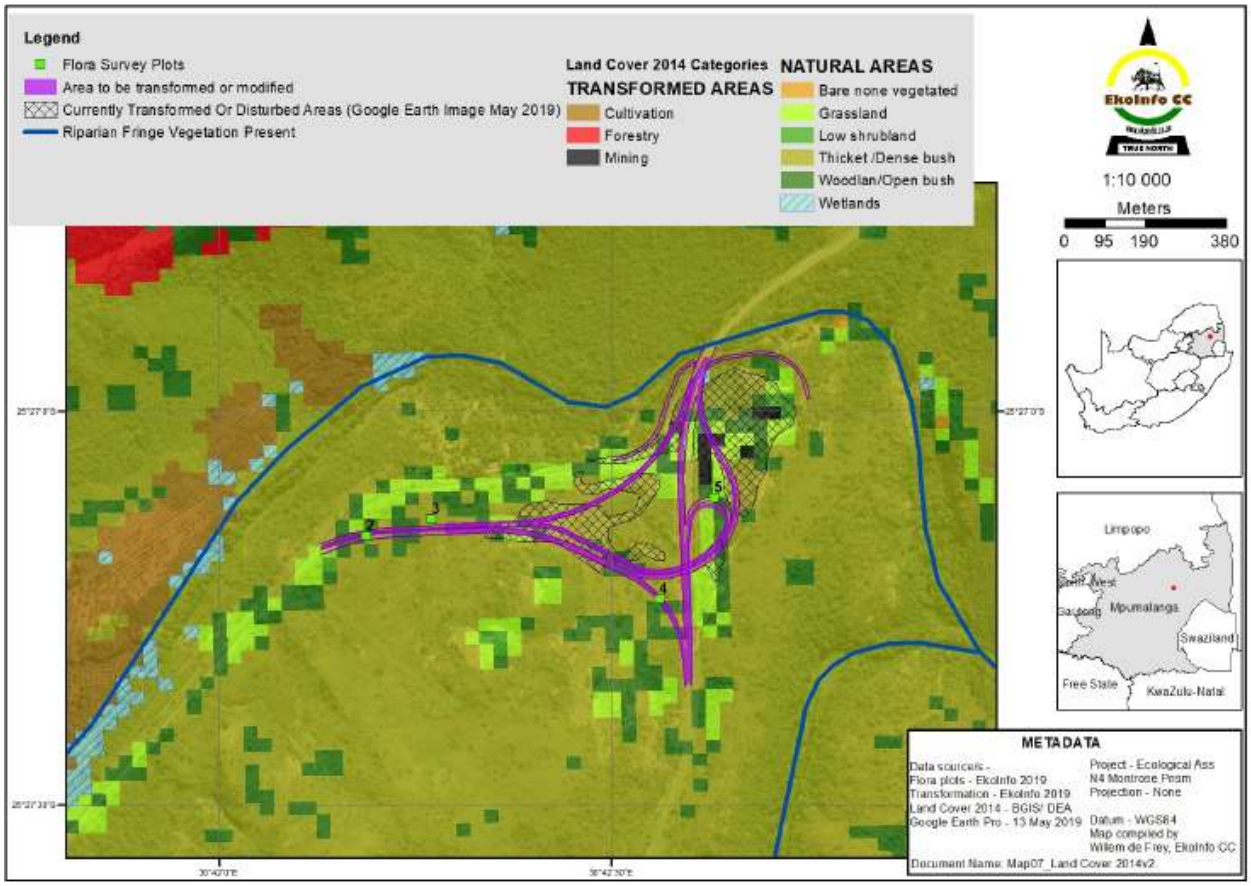


Figure 9-4: Overview of the overall intactness of the natural vegetation within the surrounding landscape (EkoInfo, 2019)

Species Diversity

Sixty-nine species were recorded across the four survey plots, with the mean number of species being 25 species. The most species were recorded in plot five (39 species), and the least in plot three (14 species). Of the 69 species recorded, 27 species were forbs (39%), nine species (13%) were gramnoids (grasses and sedges) and 33 species were woody species (trees and shrubs) (48%).

Species of Concern

No nationally protected species in terms of the National Environmental Management Biodiversity Act was recorded within the plots surveyed.

No threatened (Vulnerable, Endangered, Critical Endangered) Red Data species were recorded within the plots surveyed.

Two nationally protected trees in terms of the National Forest Act (1998) were recorded within the plots surveyed, namely *Pterocarpus angolensis* and *Sclerocarya birrea*. *Pterocarpus angolensis* occurred in all the plots surveyed, and *Sclerocarya birrea* occurred in 50% of the plots surveyed. A permit is required to destroy or remove these trees.

The following provincially protected species, genera and families were recorded in the plots surveyed:

- Aloe species, Faurea saligna, Pterocarpus angolensis and Zanthadescia species. A permit for the destruction of these species are only required if the developer is not the owner of the land, or if the species would be sold or translocated outside the province.
- The following species with medicinal properties had been recorded within the plots surveyed: Dombeya rotundifolia, Elephantorrhiza elephantina, Heteropyxis natalensis, Psidium guajava, Sclerocarya birrea and Syzygium cordatum (Van Wyk, Van Oudtshoorn & Gericke 2000).
- The following declared alien invasive species were recorded within the plots surveyed: Lantana camara, Jacaranda mimosifolia, Opuntia ficus-indica, Psidium guajava. It should be noted that these species are declared in terms of both the Conservation of Agricultural Resources Act and the National
- Environmental Management Biodiversity Act Alien and Invasive Species Regulations. Category 1 species have to be eradicated or controlled, while permits are required for category 2 and 3 species.

9.1.1.3.3 Fauna Component

Although the upgrade of the interchange will impact on habitat utilised by fauna, especially ground dwelling fauna, the animals are highly mobile in contrast to the plants. During the site visit no obvious signs of fauna activity were noted.

9.1.2 Conclusion

The upgrade of the interchange will result in the removal of natural vegetation, associated with a threatened vegetation unit on a regional scale and Critical Biodiversity Area on a provincial scale, however taking in consideration the extent of the area involved, of less than four hectares, it cannot be considered that it would contribute significantly to habitat loss, whether for plants or animals within the immediate landscape.

Due to the existing road infrastructure, it is highly unlikely that the upgrade of the interchange would significantly contribute to incidents of roadkill as the animals present in the landscape is used to the existing road infrastructure and traffic volumes.

The following mitigation measures are recommended:

- A vegetation scientist specialising in vegetation ecology should do a walkthrough prior construction commencing during the summer season, optimally January/ February to identify and mark protected plants for which permits are required. Those plants small enough to translocate could be temporarily stored in a nursery for re-introduction post construction.
- It is strongly recommended that the topsoil from the natural areas be stored and used in the subsequent rehabilitation of the road reserve once construction had ended. The topsoil should be stored in low (1 m high), levelled stockpiles which would reduce the establishment of alien invasive species, as well as facilitate the control alien invasive species which could establish.
- The upgrade of the interchange allows for an opportunity to increase the permeability of the road infrastructure to facilitate animal movement in the landscape. Therefore, culverts should be design to allow movement for small to medium size mammals to and from a water source such as the Crocodile River, this is especially relevant for the section towards the west.

Due to the fact that the upgrade of the interchange is not a green fields project, but involves the improvement of existing road infrastructure, it is the opinion of the specialist that the proposed activity will not significantly add to the habitat loss and – fragmentation in the landscape. It contributes less than 1% (4 ha) to transformation within quaternary catchment X21E in which it is located. For a development to stimulate or result in one percent (1%) land use change within the quaternary catchment it would require 346 ha.

However, it does provide an opportunity to improve the permeability of the road in terms of animal movement, by improving the design of culverts and storm water drains to facilitate the movement of small to medium size animals and herpetofauna.

Therefore, the proposed activity cannot be considered a no-go.

9.2 Aquatic Assessment

The key issues and triggers identified during Scoping for the Ecological Assessment include:

- Part of the development involves the upgrade of the Bridge over the Crocodile River; and
- The proposed development is in close proximity to the Elands River which is a CBA in terms of the MBSP.

The details of the Aquatic Specialist that was responsible for the compilation of the study is as follows:

- Prism Environmental Management Services | P. Singh
- **Qualifications**: MSc Cum Laude: Aquatic Health
- **Experience**: 8 years' experience.
- **Affiliations**: Professional registered scientist with SACNASP (116822).
-

The full Aquatic Assessment is appended in **Appendix 14.6.2**.

▪

9.2.1 Key Findings

9.2.1.1 Scope of Work

The assessment determined the health of the Crocodile River (East) traversing the study site, based on a combination of the in situ water quality, habitat characteristics, SASS5 macroinvertebrate assessment, an ichthyofaunal assessment, as well as the estimated impacts of the road and bridge upgrade on the said aquatic resource.

9.2.1.2 Method

- Desktop Assessment
    - A preliminary delineation of the riparian area and stream pathway was undertaken using aerial photography interpretation. Historical records and reports were consulted. The Department of Water and Sanitation (DWS) database was also consulted to obtain historical data for the study area (DWS, 2014). The National Wetland Map version 5 (NWM5) as presented by South African National Biodiversity Institute (SANBI) was also scrutinised (Van Deventer, et al., 2019)
- Field Investigation and Delineation
    - The field investigation was undertaken on the 16th October 2019 to assess and corroborate the delineated riparian zones and stream present in the survey area. Monitoring points were selected upstream and downstream of the proposed activity(s).
    - The field procedure for the riparian delineation was conducted according to the guidelines for delineating the boundaries of wetlands and riparian areas set out by the Department of Water Affairs and Forestry (DWAF, 2005).
- In situ Water Quality

  - Physico-chemical properties of the water samples, such as dissolved oxygen, electrical conductivity, pH, and temperature were determined using the EXTECH® ExStik® DO600 and ExStik® EC500.
  - The velocity / flow of the aquatic resource was measured using a Ground Truth Transparent Velocity Head Rod (TVHR).
  - The clarity of the aquatic resource was measured using a Ground Truth Water Clarity Tube. The South African River Health Program utilises the clarity tube and TVHR to monitor South African rivers. Water quality data was compared to the Target Water Quality Range (TWQR) guidelines for aquatic ecosystems (DWAF, 1996b), allowable concentrations to support aquatic (Chapman & Kimstach, 1996), and the recommended values to support diverse aquatic life (Behar, 1996).

- Habitat Assessment
  - A habitat assessment can be defined as the evaluation of the structure of the surrounding physical habitat that influences the quality of the water resource and the condition of the resident aquatic community (Barbour, et al., 1996).
  - The Invertebrate Habitat Assessment System (IHAS, version 2) was applied at all the sampling sites in order to assess the suitability of biotopes present. The IHAS method scores the habitat based on stones in current, vegetation, and gravel/sand/mud biotopes, scores the physical stream condition based on hydrological dynamics, riparian make-up and physical properties.
  - The ecological integrity of a river is defined as its ability to support and maintain a balanced, integrated composition of physico-chemical and habitat characteristics, as well as biotic components on a temporal and spatial scale that are comparable to the natural characteristics of ecosystems in the region (Karr & Dudley, 1981). Habitat integrity in this sense then refers to the maintenance of a balanced, integrated composition of physico-chemical and habitat characteristics on a temporal and spatial scale that are comparable to the characteristics of natural habitats of the region (Kleynhans, 1996). The criteria, scoring system and ecological categories/classes (PES) from Kleynhans (1996) were used to determine habitat integrity.
- Aquatic macro invertebrate assessment (SASS5)
  - Aquatic macro invertebrates were sampled using the qualitative kick sampling method called SASS5 (South African Scoring System version 5) (Dickens & Graham, 2002).
  - Identification of the collected samples is then conducted to family level (Dickens & Graham, 2002; Gerber & Gabriel, 2002). The SASS5 scoring system allocates a score to each taxon based on sensitivity. More tolerant taxa are allocated a low value, whilst taxa most sensitive to pollutants are allocated a high score, ranging on a scale of 1 to 15. The score of all the collected taxa is combined to give the 'Total SASS Score'. The 'Total SASS Score' is then divided by the number of taxa collected, giving the Average Score per Taxon (ASPT). The ASPT reflects the overall sensitivity of the macro invertebrate assemblage, allowing the comparison of sites with limited availability of biotopes.
- Ichthyofauna
  - Fish are used as ecological indicators owing to them being relatively long-lived and mobile.

- Ichthyofaunal samples were collected by means of electrofishing. Electrofishing is the use of electricity to catch fish. The electricity is generated by a system whereby a high voltage potential is applied between two electrodes placed in the water (USGS, 2004).

- Impact Assessment
  - The impact of the proposed development on the aquatic resource was determined and based on specific criteria. In particular, the significance of an impact is defined as the combination of the consequence of the impact occurring and the probability that the impact will occur. The nature and type of impact may be direct or indirect and may also be positive or negative.

9.2.1.3 Results and Discussion

A summary of the results and discussion is provided below.

9.2.1.3.1 Desktop Assessment

During the desktop investigation, one (1) possible aquatic resource was identified that would be affected by the proposed activities. The Department of Water and Sanitation identifies the aquatic resource as the Crocodile River (Stream Order 3) (Crocodile East) and is shown in **Figure 9-5**.

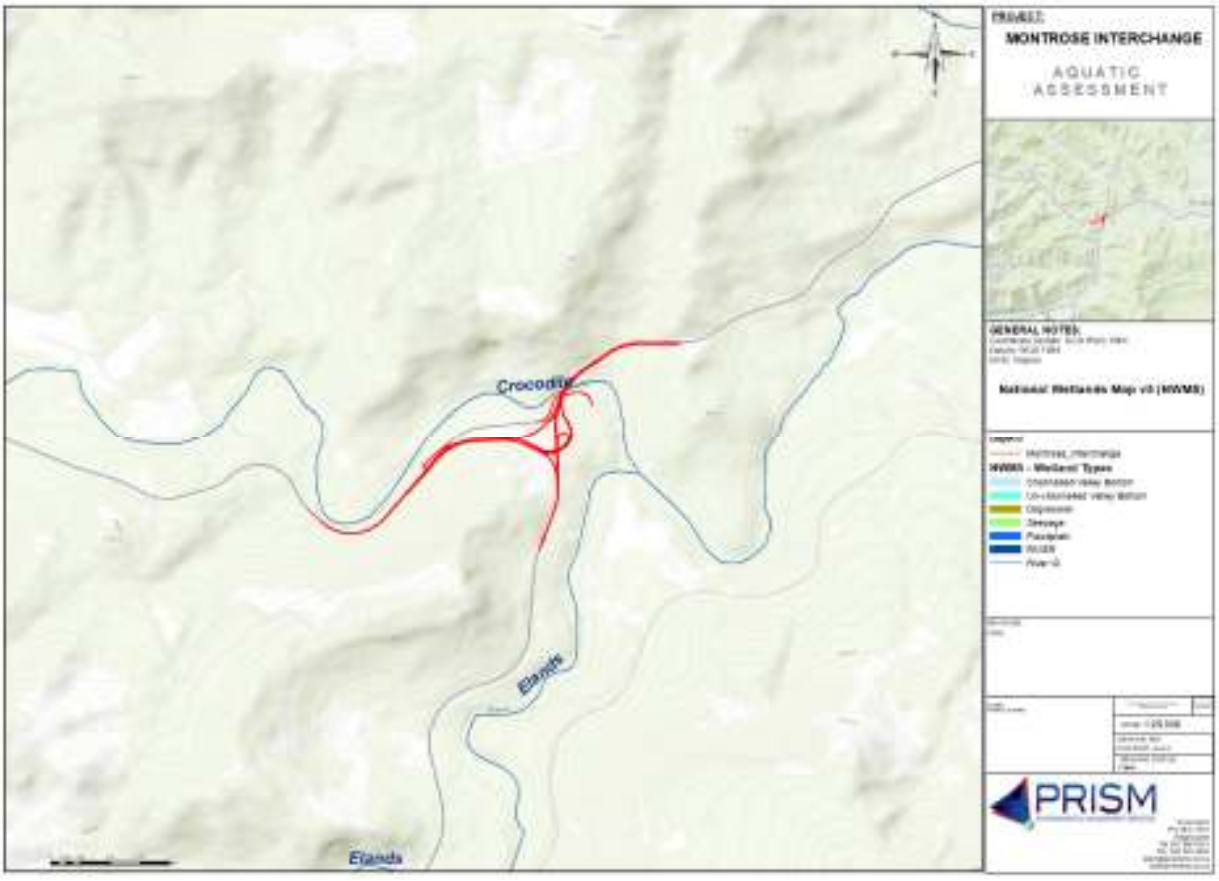


Figure 9-5: Study area in relation to the National Wetland Map version 5 (Prism EMS, 2020a)

9.2.1.3.2 Field Investigation and Delineation.

The field investigation was undertaken on the 16th October 2019 to assess and corroborate the delineated riparian zones and river present in the survey area. Monitoring points were selected upstream and downstream of the proposed activity(s). The riparian areas/boundaries were delineated using DWAF (2005) indicators and is included in **Figure 9-6** below.

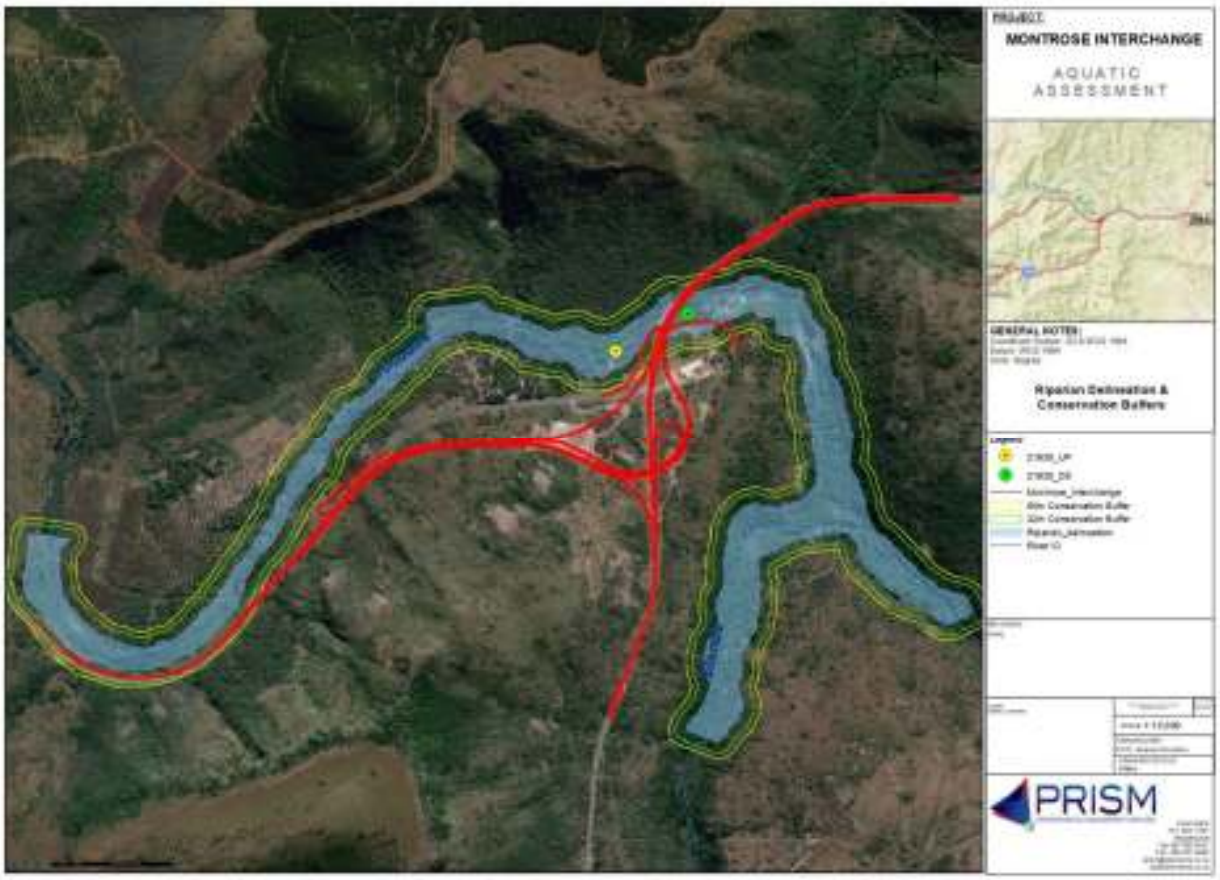


Figure 9-6: Study site, monitoring points and sensitivity mapping for the proposed activity(s) (Prism EMS, 2020a)

9.2.1.3.3 In situ Water Quality

The *in situ* water quality water quality of the Crocodile River traversing the upstream and downstream sampling points (21935_UP and 21935_DS) associated with the proposed bridge crossing was of good quality and therefore adequate enough to support aquatic ecosystems with no limiting effects. The variable depth and flow classes may be preferable for aquatic biota. The water quality may be considered good and since this is an ecologically important and sensitive area, maintaining good water quality is imperative.

9.2.1.3.4 Habitat Assessment

Habitat quality and availability plays a critical role in the occurrence of aquatic biota. For this reason, habitat evaluation was conducted simultaneously with biological evaluations in order to facilitate the interpretation of results and inferences.

- Invertebrate Habitat Assessment System (IHAS, version 2)
    - The quantity and quality of the instream and associated riparian habitat has a direct influence on aquatic macro invertebrate communities. Evaluating the structure and functioning of an aquatic ecosystem must therefore consider the physical habitat to assess the ecological integrity. McMillan (1998) developed the Invertebrate Habitat Assessment System (IHAS) to be used in conjunction with the SASS5 protocol. Habitat integrity refers to the maintenance of a balanced, integrated composition of physico-chemical and habitat characteristics on a temporal and spatial scale that are comparable to the characteristics of natural habitats of the region (Kleynhans, 1996). Both sites scored "Good" in terms of IHAS (65 and 67 respectively).
- Intermediate Habitat Integrity Assessment (IHIA)
    - Upstream (21935_UP)
        - Instream – B (Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged)
        - Riparian – B (Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged)
    - Downstream (21935_DS)
        - Instream – C (Moderately modified. A loss and change of natural habitat and biota have occurred but the basic ecosystem functions are still predominantly unchanged.)
        - Riparian – C (Moderately modified. A loss and change of natural habitat and biota have occurred but the basic ecosystem functions are still predominantly unchanged).)
    - Based on the IHIA results, habitat integrity in this reach at both the instream zone and the riparian zone is currently largely natural with few modifications at the upstream site (Class B), and moderately modified at the downstream site (Class C). Modifications relating to the existing bridge contribute significantly to instream and riparian habitat integrity classes at the downstream site. Based on this assessment it can be concluded that habitat integrity may not have a limiting effect on biotic integrity in this reach of the Crocodile River.

9.2.1.3.5 Aquatic macro invertebrate assessment (SASS5)

The SASS5 methodology was specifically designed for characterising impairment of biotic integrity, and thus can be used to assess the 'state of a river' with regards to unseen pollutants and long-term change (Davies & Day, 1998). During the October 2019 survey aquatic macroinvertebrates were sampled at the two (2) sites:

- 21935_UP
    - SASS5 data recorded at the upstream site 21935_UP during the October 2019 survey included a total of 22 aquatic macroinvertebrate taxa, a SASS5 score of 134 and an ASPT of 6.1. A total number of 5 EPT taxa were recorded.
- 21935_DS

  - SASS5 data recorded at the downstream site 21935_DS during the October 2019 survey included a total of 23 aquatic macroinvertebrate taxa, a SASS5 score of 142 and an ASPT of 6.2. A total number of 6 EPT taxa were recorded.
- The limited habitat combined with sampling during the wet season may be a contributing factor for reduced macro-invertebrate diversity and abundance. Habitat availability was rated as adequate/fair at the upstream site and poor at the downstream, and the impacts of habitat availability was apparent from the SASS5 results. Low aquatic macroinvertebrate diversity may not be attributed to water quality as good water quality was recorded during the October 2019 survey.
- Based on the SASS5 results, the site specific PES can be summarised as follows:
  - 21935_UP attained a PES of “Fair/Moderately modified” (PES Class C).
  - 21935_DS attained a PES of “Fair/Moderately modified” (PES Class C).
- Both sites may therefore be characterised as being moderately impaired/modified (moderate diversity of taxa). This reach of the stream had good water quality (based on in situ water quality parameters), and good habitat availability which may be a contributing factor for middle-range PES. The presence of sensitive invertebrate taxa indicates that the habitat is not considerable modified. This river is also affected by agricultural and recreational activities, and road run-off which may comprise water quality.

9.2.1.3.6 Ichthyofauna

An ichthyofaunal assessment was carried out for the purposes of the baseline aquatic assessment. The assessment yielded three (3) fish species in the sampled reach. All representative aquatic habitat available at each of the two (2) sites were shocked with the appropriate amount of sampling effort (30 minutes). Tolerant and intolerant species were found in this reach of the Crocodile River. This reach of the river may therefore be adequate to support the survival and/or presence of tolerant and intolerant fish species.

In comparison to the expected fish species list (DWS, 2014), three (3) of the 10 expected indigenous species were found during this survey and no unexpected species were observed. One (1) intolerant species was observed (*Barbus argenteus*). Possible reasons for the absence of fish species are the location of the reach within the catchment, sampling effort, absence of suitable habitat and fast flows. No exotic species were found in this reach of the Crocodile River.

9.2.1.3.7 Additional Aquatic Fauna

Additional aquatic fauna/fauna dependent on the aquatic resource observed during the October 2019 sampling included tadpoles and the presence of a hippo (tracks).

9.2.1.3.8 Impact Assessment

An impact assessment was undertaken and identified possible impacts to flow, water quality, habitat, biota and geomorphology. These impacts were rated between low and medium significance prior to mitigation. However, with the implementation of the appropriate mitigation, these impacts were assessed to be “low”.

9.2.2 Conclusion

The Present Ecological Status (PES) for the stream scored in the middle ranges as the aquatic resource (Crocodile River) is moderately modified and impacted on by surrounding agricultural, recreational, and storage activities/facilities, as well as existing roads and crossings. The Ecological Importance and Sensitivity (EIS) falls in the high range and has functionality in respect of moderating water quality and supporting intolerant fish species and sensitive aquatic macroinvertebrates. Rehabilitation may be required to enhance the ecological function of riparian areas affected by the road and bridge upgrades. The aquatic resource under study was considered to be a highly sensitive river, more specifically in respect of flow, water quality and biodiversity. Two (2) design alternatives were assessed, with both designs presenting a similar post-mitigation impact significance. Alternative 2, although more ecologically appropriate, may result in compromising the strength of the existing pillars and may lead to safety issues (according to discussions with the Engineer). Alternative 1, albeit with a slightly larger ecological impact, can be mitigated to result in a low overall impact. It is therefore the opinion of the specialist that this together with existing bridge infrastructure, the higher risk and cumulative impact of for Alternative 2, and the absence of safety concerns favours Alternative 1.

For this reason, it can be supported that the road upgrade and bridge construction may proceed on condition that the required buffers are adhered to and the resource drivers preserved. Extra care should be taken as any inputs and ecological disturbances will impact the Critical Biodiversity Area downstream of the road and bridge upgrade. Workers should also be made aware of the possibility of hippos and crocodile presence in this reach of the Crocodile River. Measures must therefore be put in place to protect workers and resident fauna. Only activities as authorised by the Environmental Authorisation and Water Use License should be permitted to take place. The rehabilitation of affected sections of the aquatic resource is vital to recover the required ecological function. The resource drivers must be enhanced as part of the rehabilitation of the affected areas. In respect of the construction phase, it is important to ensure that the required erosion protection measures linked to the crossing sections and areas in proximity of the riparian area be carefully designed and installed.

The project can be supported, should all the mitigation measures be implemented and monitored against to ensure compliance. This will ensure mitigation to acceptable levels. An aquatic biomonitoring assessment should take place during the construction phase, and further to assess the effectiveness of the post-construction rehabilitation, as well as mitigation measures. This will ensure the establishment of biotic trends regarding the water course. Trend data will illustrate what impact construction activities had, or are having, on the affected reaches of the Crocodile River. It is recommended that *in situ* water quality be monitored weekly during construction as an early warning system.

9.2.2.1 Mitigation and Monitoring Requirements

The road and bridge upgrade relation to the development of Montrose Interchange may impact negatively on the resource drivers (water quality, flow regime, habitat, biota and geomorphology). It is therefore imperative that mitigation measures are implemented from initiation to completion to ensure no detrimental

impacts to the aquatic resource ensue. The Aquatic Assessment includes an appendix dedicated to providing the necessary and appropriate mitigation measures. In summary, these include:

- Soil erosion prevention
    - Control measures should be in place to minimise the spread of suspended sediment and limit it as far as feasibly possible to the direct area of influence. Ensure that control measures are in place to control erosion (e.g. access road drainage) and additional sediment inputs into the aquatic resource. Excavation methods must also be in line with environmental best practises.
- Chemical spillage prevention
    - Control measures to prevent chemical spillages prevention includes a number of best practice measures such as ensuring changing, servicing and repairs don't take place near the watercourse and that specific storage areas are designated for storage of hazardous chemicals.
- Protection of aquatic biodiversity
    - Prevent alteration in water quality and a further decline to the aquatic community structures through the prevention and reduction of impacts, and ensuring the rehabilitation of the construction site to the condition pre-construction, equivalent to neighbouring sections of the river, or better, whichever will maintain and protect aquatic biota. Implementing and managing these mitigation measures for impacts related to water quality will largely mitigate the expected impacts on aquatic biota.
- Habitat loss and clearing of vegetation
    - Habitat plays an integral role in species richness, hence any reduction/deviation from the optimal vegetation, stones, gravel, sand, mud, and/or differential flow availability may reduce biodiversity. Therefore measures to ensure stabilisation of the river bank should be implemented at sections of the river with a high probability of being affected by the construction activities. The stabilisation methods should ensure that adequate marginal vegetation is available for aquatic biota. Re-vegetation, de silting may also be required.
- Contamination – hazardous, general and human waste
    - Hazardous, general and/or human waste may contribute to poor, and even toxic, water quality with the potential to eradicate aquatic biota on a regional scale. It is therefore imperative that these types of waste do not enter the water course and riparian area.
- Resuspension and introduction of sediment/materials
    - An increase in turbidity, due to suspended sediment/materials during construction activities may result in reduced photosynthetic capacity of primary producers, increased bacterial activity and a decrease in oxygen saturation. The suspended matter could interfere with the reproduction, growth and survival of aquatic organisms according to Hill and Kleynhans (1999), which would ultimately compromise biotic integrity. Stormwater management during construction must be implemented.
- Hazardous, human and general waste introduction

  - Personnel should not use watercourses for sanitation purposes. Ablution facilities should be made available in close proximity to active work areas, but outside the riparian/wetland buffer boundaries. Proper waste management must also be implemented.

- Flow modification
  - The design of the storm water system should ensure that no adverse impacts on the natural systems in terms of increased velocity of storm water. Effective and sustainable stormwater management.

9.3 Wetland Assessment

The key issues and triggers identified during Scoping for the Wetland Assessment include:

- Part of the development involves the upgrade of the Bridge over the Crocodile River;
- The proposed development is in close proximity to the Elands River which is a CBA in terms of the MBSP; and
- There was potential for wetland habitats to occur in and around the site which needed to be confirmed.

The details of the Specialist are as follows:

- Prism Environmental Management Services | D. Botha
- **Qualifications**: M.A. Environmental Management; B.A. Hons. Geography & Environmental Management; Wetland and Riparian Delineation (DWAF Accredited Short Course); Soil Classification and Wetland Delineation (Terrasoil Science Short Course) and Tools for Wetland Assessment (Cum Laude) (Rhodes University)
- **Experience:** 17 years' experience.
- **Affiliations**: SACNASP Registered Scientist – Pr.Sci.Nat. (119979), EAPASA: Registered EAP (2019/1209), Member of the International Association for Impact Assessors (IAIAsa) (1653), Member of the Gauteng Wetland Forum, Member of the South African Wetland Society.

The full Wetland Assessment is appended in **Appendix 14.6.3.**

9.3.1 Key Findings

9.3.1.1 Scope of Work

The aim of this study was to undertake a wetland assessment to delineate the wetland and to determine the Present Ecological State (PES), the Ecological Importance and Sensitivity (EIS) and the Recommended Ecological Classification (REC) for the proposed development. This, specifically to inform the Environmental Impact Assessment (EIA) and Water Use License Application (WULA) for the said development

9.3.1.2 Method

The methods involved in this study involved the following:

- Desktop Assessment
    - A preliminary delineation of the Wetland boundary was undertaken using aerial photograph interpretation.
    - Historical records and reports were consulted.
    - The Department of Water and Sanitation (DWS) database was also consulted to obtain historical data for the study area. The National Wetland Map version 5 (NWM5) as presented

by South African National Biodiversity Institute (SANBI) was also scrutinised (Van Deventer et al, 2019).
  - Historical data and official approvals were also consulted during the assessment.
- Field Assessment
  - The field investigation was undertaken during October 2019 and January 2020 to assess and corroborate the delineated Wetland zones present on the survey area.
  - The field procedure for the wetland delineation was conducted according to the Guidelines for delineating the boundaries of a wetland set out by the Department of Water Affairs and Forestry (DWAF 2005/8). The following wetland indicators were considered (DWAF 2005/8):
    - Terrain unit indicator;
    - Soil wetness indicator; and
    - The vegetation indicator.
  - The following procedure was followed during the delineation of the wetland boundaries and zones:
    - A desktop delineation of the larger wetland area was undertaken using satellite imagery of the study site;
    - Areas for verification were identified; and
    - Identified areas were then assessed in the field with boundaries being recorded using a GPS.
- Mapping
  - Mapping of the wetland boundaries was done by computerised processing utilising GPS tools, mobile applications and GIS modelling.
- Wetland Classification
  - SANBI's "Further development of a proposed National Classification System for South Africa" was used to verify the classification of the wetlands within the study area (SANBI, 2009). The wetlands were classified up to level four, which includes the system, regional setting, landscape unit and hydrogeomorphic unit.
- Present Ecological Status (PES) Assessment
  - WET-Health assists in assessing the health of wetlands using indicators based on geomorphology, hydrology and vegetation. WET-Health is tailored specifically for South African conditions and has wide application, including assessing the Present Ecological State of a wetland for purposes of Ecological Reserve determination in terms of the National Water Act, and for environmental impact assessments WET-Health (Macfarlane et al, 2008). A level 1 wetland assessment was undertaken to determine the PES of the wetland system. The PES assessment is concluded by following a 5 step process:
    - Divide the wetland into HGM units
    - Assess hydrological health of the wetland
    - Assess geomorphological health
    - Assess vegetation health of the wetland
    - Represent the health scores for the overall wetland
- Wetland Ecological Importance and Sensitivity (EIS)

  - The ecological importance and sensitivity assessment were conducted according to the guidelines as discussed by DWAF (1999). In the method outlined by DWAF (1999) a series of determinants for EIS are assessed for the wetlands on a scale of 0 to 4, where 0 indicates no importance and 4 indicates very high importance. The median of the determinants is used to determine the EIS and EMC of the wetland unit.
- Recommended Ecological Category (REC)
  - The Recommended Ecological Category (REC) is determined based on the results obtained from the Present Ecological State (PES), reference conditions and Ecological Importance and Sensitivity (EIS) of the aquatic resource. This is then followed by realistic recommendations, mitigation, and rehabilitation measures to achieve the desired REC.
  - A system may receive the same class for the PES, as the REC if the system is deemed to be in good condition, and therefore must stay in good condition. Otherwise, an appropriate REC should be assigned in order to prevent any further degradation as well as to enhance the PES of the riparian system.
- Impact Assessment
  - As standardized impact assessment methodology was utilized to determine the impacts associated with the proposed installation. The significance of an impact is defined as the combination of the consequence of the impact occurring and the probability that the impact will occur. The nature and type of impact may be direct or indirect and may also be positive or negative.
  - Once significance rating has been determined for each impact, management and mitigation measures must be determined for all impacts that have a significance ranking of Medium and higher in order to attempt to reduce the level of significance that the impact may reflect.

9.3.1.3 Results and Discussion

9.3.1.3.1 Desktop Assessment

During the desktop investigation, three (3) possible area where wetlands or drainage lines could occur was identified on or in close proximity to the study site that would be affected by the proposed development activities.

The National Wetland Map version 5 (NWM5) as presented by SANBI (Van Deventer et al., 2019) as well the NFEPA Wetlands layer was also scrutinised and one wetland area was identified (refer to **Figure 9-7**) on or in close proximity to the study site that could be affected by the proposed activities. These wetlands as indicated by the NWM5 and NFEPA wetland layers were further investigated on site.

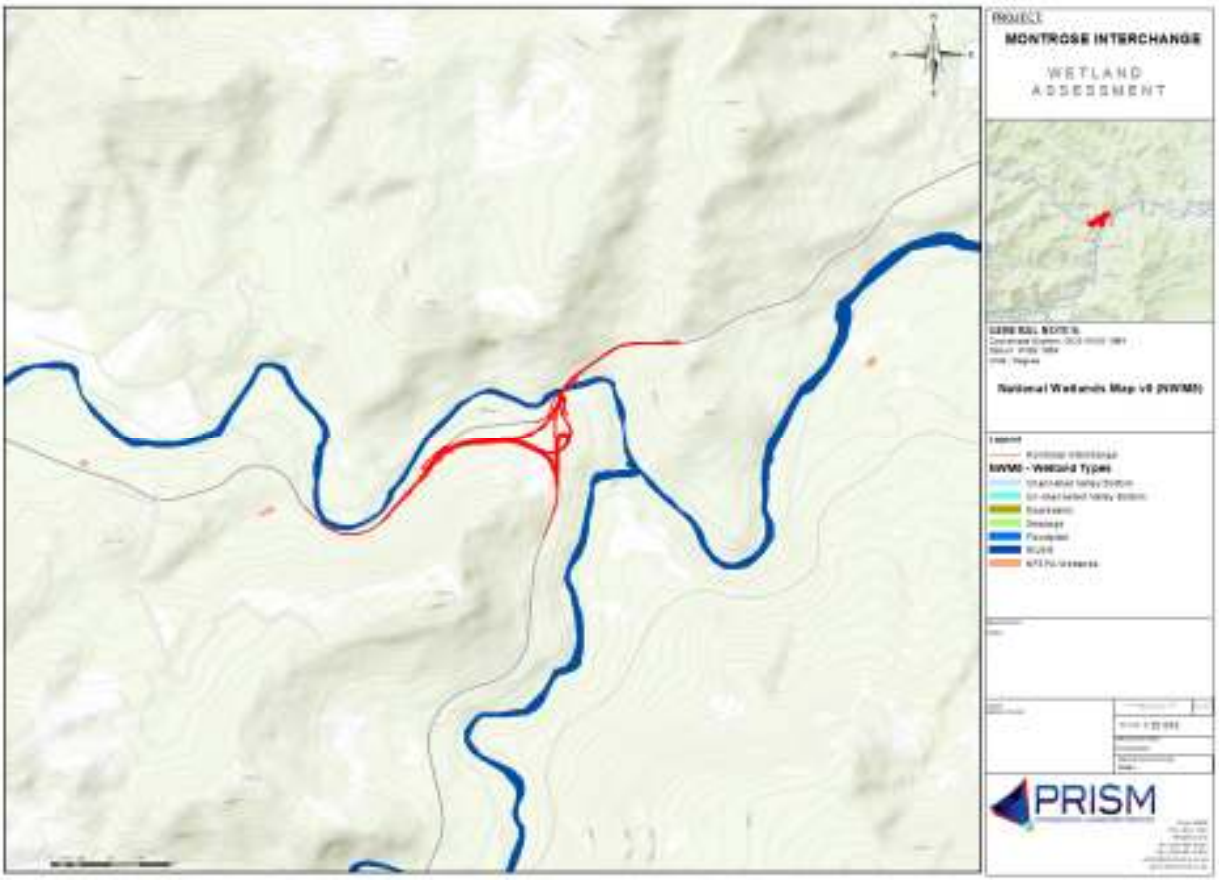


Figure 9-7: National Wetland Map version 5 (NWM5) (Van Deventer et al., 2019) & NFEPA Wetlands (Nel, 2011).

9.3.1.3.2 Field Assessment

The field investigations were undertaken during October 2019 and January 2020 to assess and confirm the possible Wetland and Drainage lines present on the survey area.

The field investigations concluded that no natural wetland unit could be recorded as per the DWAF, 2005 guidelines and that three drainage areas could be affected by the proposed development (**Figure 9-8**).

These naturally occurring drainages are not streams, as they do not have the morphological structure, nor the duration of water retention or links to the adjacent aquatic zones, such as floodplains or riparian wetlands. They are simply temporary drainage lines acting as temporary flow paths. They also resemble the adjacent terrestrial zones.

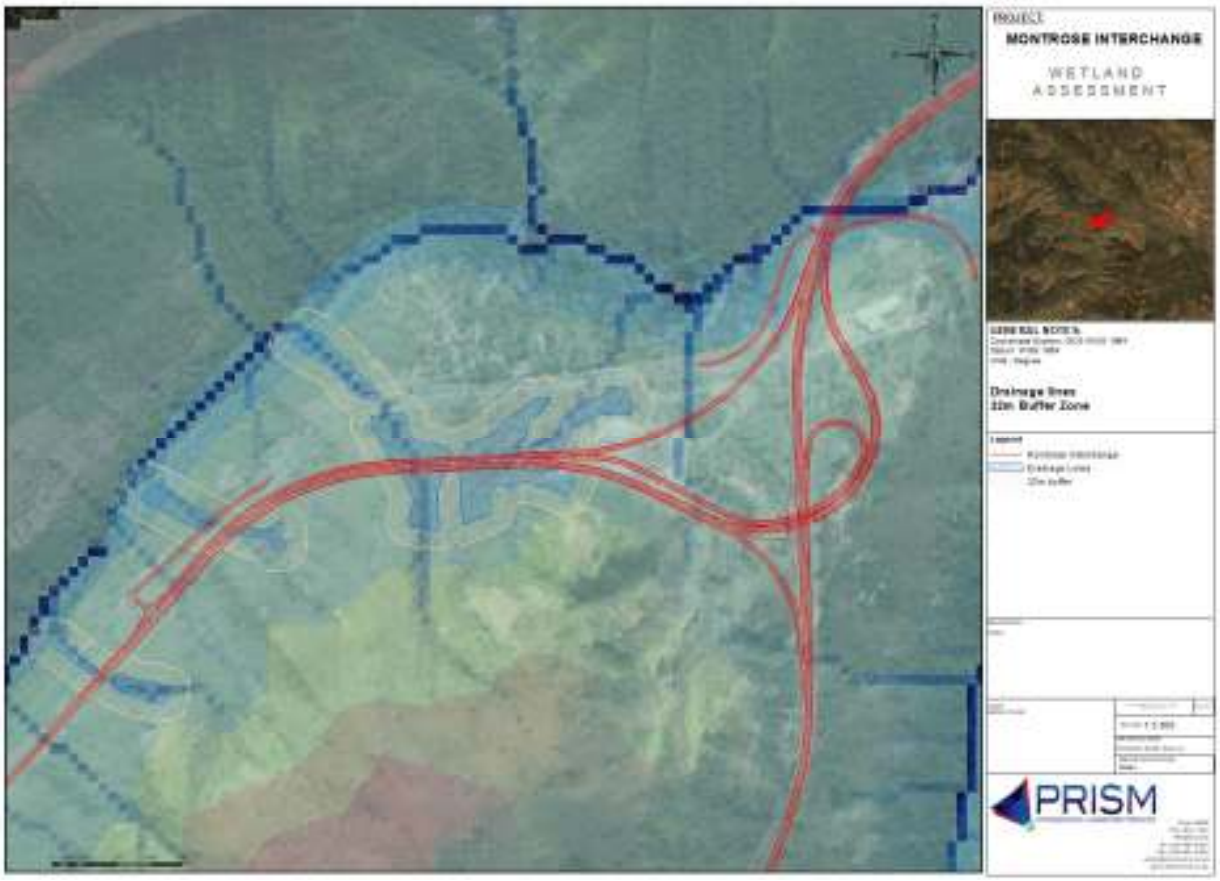


Figure 9-8: Drainage lines and 32m buffer

9.3.1.3.2.1 Terrain Unit Indicator

Terrain unit indicator helps identify those parts of the landscape where wetlands and drainage lines are most likely to occur. Wetlands occupy characteristic positions in the landscape and can occur on the following terrain units:

- crest,
- midslope,
- footslope, and
- valley bottom.

No wetlands were recorded in the study area. The study area presented rivers and drainage lines.

9.3.1.3.2.2 Soil Form and Soil Wetness Indicator

Soil erodibility in hydrologically transformed environments contributes to the difficulties to precisely determining wetland boundaries. This investigation focussed on the delineation of the wetland features based on soil hydro-morphology and landscape hydrology as observed in the catchment and on the site.

Soils were found to be of a low clay content in general. Mostly sandy soils were present especially in the top 150mm. Typical soils observed. No clear wetland soil characteristics were observed. It was observed

that interflow and sub-lateral flow patterns do occur and is linked to sheet flow from the catchment and drainage lines. This is typical to the topography of the area.

These naturally occurring drainages are not streams, as they do not have the morphological structure, nor the duration of water retention or links to the adjacent terrestrial zone, such as floodplains or riparian wetlands. They are simply temporary drainage lines acting as temporary flow paths.

9.3.1.3.2.3 Vegetation Indicator

Upon the assessment of the area, the vegetation components were assessed and recorded. Dominant species were characterised as either wetland species or terrestrial species. No representative hydrophytic vegetation species were observed. Predominantly grass, sedge and tree species were recorded. This unit was predominantly utilised to assess the site conditions related to wetland and drainage units.

9.3.1.3.3 PES, EIS and REC

The drainage lines recorded were assessed and the following results were attained:

- The drainage lines attained a moderate overall PES (Present Ecological State)
    - The drainage lines are all largely natural with few moderate modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place. They can all be classified as falling into the category B/C. The trajectory of change will remain stable over the next five years should no activity take place and no intervention in terms of rehabilitation is implemented.
- The drainage lines attained a Moderate Ecological Importance and Sensitivity (EIS) score.
    - An assessment based on the principles of the ecological importance and sensitivity assessment were conducted according to the guidelines as discussed by DWAF (1999). It was found that the drainage lines are considered ecologically important and sensitive on local scale. The biodiversity of these drainage lines is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers. The drainage lines was classified to fall in the moderate class : EIS = C.
- The drainage lines Recommended Ecological Classification (REC) classification was rated as:
    - The drainage lines will be impacted by the proposed development activities. This impact will be localised and at the transitional point leading from the development and infrastructure installations into the drainage lines. It will in all likelihood regress slightly in terms of its current Ecological Category if not managed in specific during the construction period. Stormwater management for the site is required in specific the construction phase. This will mitigate the impact on the drainage lines. Rehabilitation of the impacts and maintenance of the system will further mitigate the impacts and could improve the sustainability of the system. It is thus rated that the Recommended Ecological Category (REC) will fall into: **Category C**

9.3.1.3.4 Impact Assessment

An impact assessment was undertaken and identified possible impacts to flow, water quality, habitat, biota and geomorphology. These impacts were rated between low and medium significance prior to mitigation. However, with the implementation of the appropriate mitigation, these impacts were assessed to be “low”.

9.3.2 Conclusion

The drainage lines are all largely natural with few moderate modifications and impacts by historical and ongoing anthropogenic activities. The Present Ecological Status (PES) for the drainage lines were scored in the mid-high ranges. The Ecological Importance and Sensitivity (EIS) falls in the moderate range and some functionality in respect of biodiversity conservation and play a small role in moderating the quantity and quality of water of major rivers. The Recommended Ecological Category (REC) for the wetlands were categorised as moderate. It will thus require some rehabilitation to enhance the ecological function of the system.

For this reason, it can be supported that the development may go-ahead if the design requirements include measures to preserve the major resource drivers, i.e. flow and water quality. The rehabilitation of the areas is vital to recover some ecological function. The resource drivers must be enhanced as part of the rehabilitation of the affected areas. In respect of the construction phase, it is important to ensure that the required erosion protection measures linked to the crossing sections be carefully designed and installed.

The project can be supported, should all the mitigation measures be implemented and monitored against to ensure compliance.

9.3.2.1 Mitigation and Monitoring Requirements

Monitoring programmes can measure the success of mitigation implementations, monitor unforeseen impacts, and can be used as a feedback system to adjust or correct management of the wetlands.

The following are recommended:

- It should be attempted to enhance the current ecological function.
    - Resource drivers should be protected as far as possible.
    - Water quality preservation is key. Silt protection measure to be implemented in consultation with the wetland specialist (ECO).
- Mitigation measures for the proposed development activities should be implemented, managed and monitored according to:
    - The following ecosystem impact assessment conclusions, based on the results of the baseline survey:
        - Runoff from the construction areas may result in contamination of aquatic resources and downstream aquatic habitat;
        - On site storm water management must be implemented.

        - On site filtration must be adopted (hay bales can be used affectively)

    - The following impacts may result in changes to the soil structure:
        - Heavy construction vehicles moving within the drainage line areas;
            - Ingress and Egress must be managed to minimise impacts in respect of compaction of the soils.
            - Single entry and exit points must be established.
            - These areas must be scarified with the contours in mind as part of the rehabilitation plan.
        - Stock piling;
            - Stock piling must be located outside the delineated drainage line and buffer boundaries.
        - Spills from machinery;
            - To be managed as per the Environmental Management Programme (EMPr).
        - The mixing of concrete; and
            - To be managed as per the Environmental Management Programme (EMPr).

    - The following aspects may result in reduction of ecosystem habitat integrity:
        - Dust and sediment runoff from construction activities;
        - Diesel and oil spill from equipment and machinery; and
        - Higher and faster water flow from the site that could cause soil erosion.

    - The following aspects may result in sedimentation of the associated aquatic systems:
        - Sedimentation due to increase runoff and dispensed soil particles and runoff from the affected areas; and
        - Increase in the velocity of the runoff from the exposed soil, due to construction.

    - The proposed activities must be initiated and constructed in such a way to prevent the reduction of natural water flow into the drainage line and downstream which, in essence, is the driving factor in terms of water provision.
        - An approved stormwater management plan must be implemented.
        - Velocity dissipation structures and sheet flow structures (such as reno mattresses) must also be installed to prevent water flowing through culverts to gain velocity and be released uncontrolled.
        - Dispersed flow must be attained post formal structures.

- The drainage line integrity should be improved during the rehabilitation phase. This may entail the following:
    - Removal of alien and invasive plant species during the construction and operational phases.
    - Stabilisation of gullies and drainage lines to prevent erosion.

- Implementation of topsoil management (stockpiling, topography shaping) and erosion control (berms, geotextiling, silt fences, hay bales and gabion structures).
- Re-vegetation with indigenous plant species.

9.4 Visual Impact Assessment

The key issues and triggers identified during Scoping for the Ecological Assessment include:

- The new interchange will include overpass bridges with lights. It was thus requested by the Department at the Pre-application meeting, that a Visual Impact Assessment be undertaken.

The details of the Specialist responsible for the compilation of the study is as follows:

- Terra Logix Consulting | Karsten Drescher
- **Qualifications**: M.Sc Engineering Geology; Diploma in GIS
- **Experience:** 30 years' experience.
- Affiliations: Pr.Sci.Nat (400038/04)

The full Visual Impact Assessment (VIA) is appended in **Appendix 14.6.4**.

9.4.1 Key Findings

9.4.1.1 Terms of Reference

The potential visual impact of the proposed Montrose Interchange, Mpumalanga is the subject of this report. General terms of reference for Environmental impact assessments are applicable.

9.4.1.2 Analysis (Method and Findings)

The VIA provided an analysis of a number of components which are described below:

9.4.1.2.1 Viewshed and viewing distance

A viewshed analysis (proportional viewshed) for the proposed interchange was done to determine the modelled daytime visibility, limited to 5000m. At distances greater than this, the proposed structure becomes such a small component of the visual scene that it is regarded as invisible. **Figure 9-9** below provides the Viewshed analysis which was combined with the exponential decay (reduction of visibility with distance).

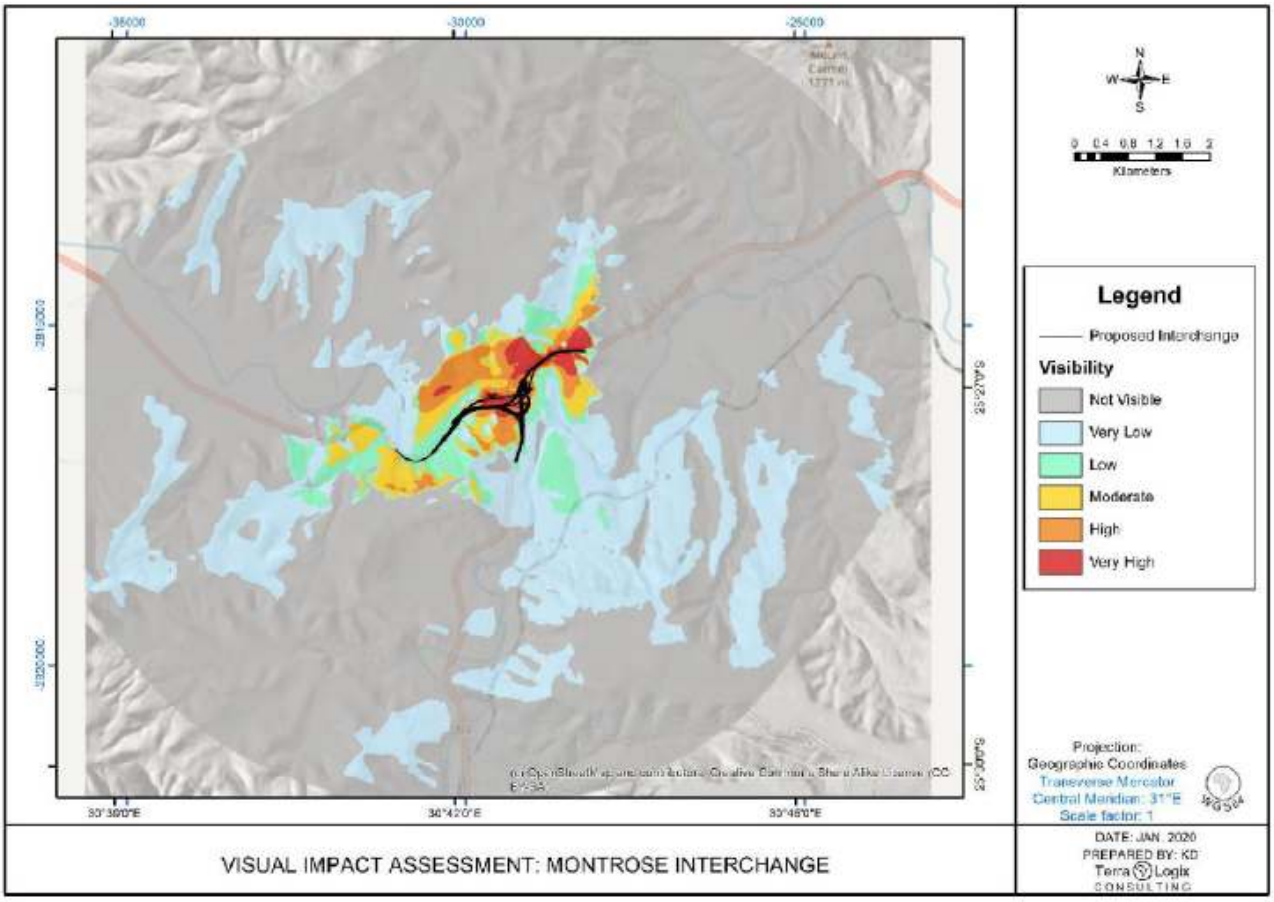


Figure 9-9: Viewshed Analysis

9.4.1.2.2 Visual Exposure Analysis

Visual Exposure Analysis (VE) uses the digital terrain model (DTM) to determine to what extent the topography of the study area exposes or hides human structures. VE scores range from -3 to 3 with the negative values indicating a reduction in VE, positive values indicating an increased VE. The following aspects were taken into account in determining the VE:

- Slope;
- Aspect;
- Landforms;
- Slope Position;
- Relative Elevation; and
- Ruggedness.

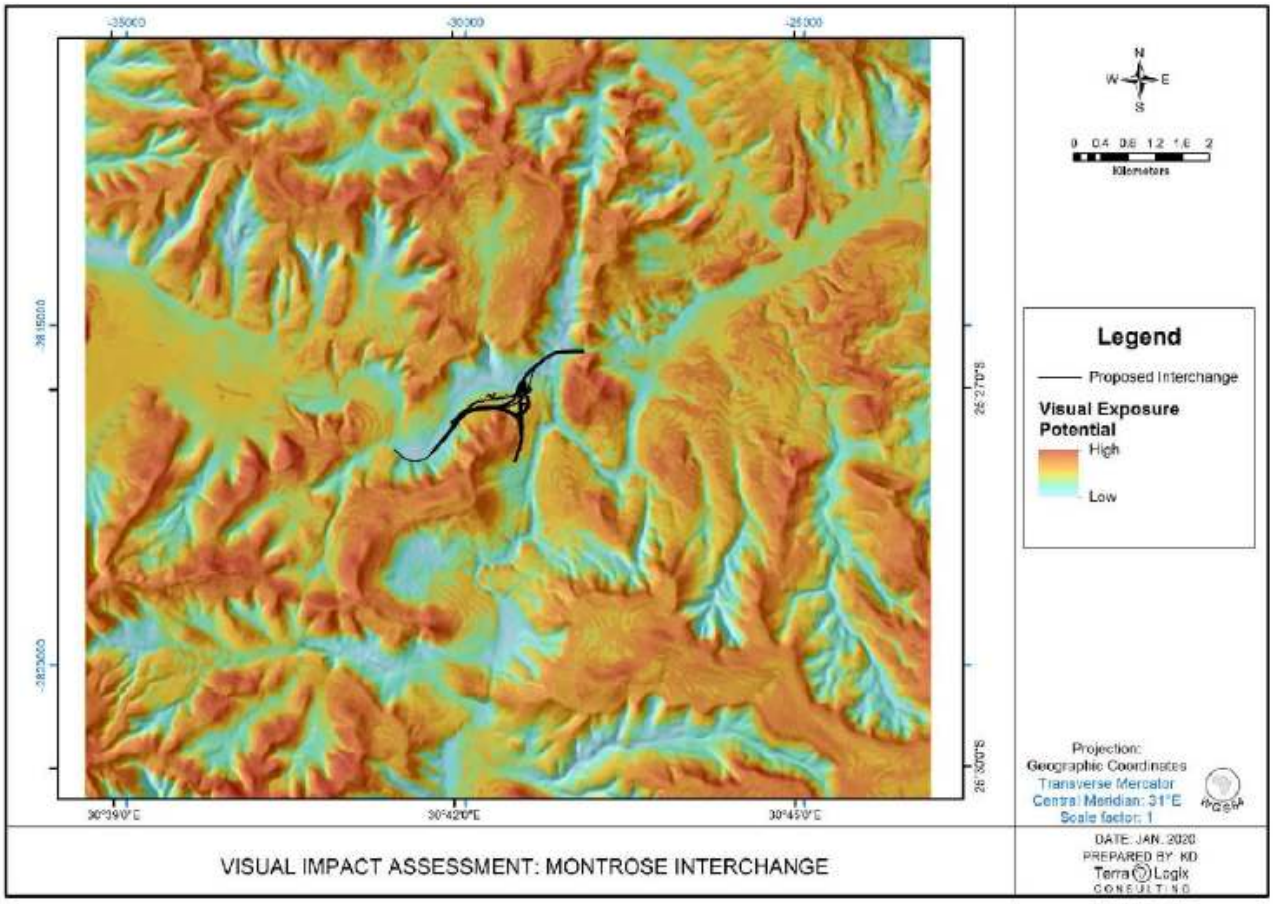


Figure 9-10: Visual Exposure

9.4.1.2.3 Visual Absorption Capacity

Visual Absorption Capacity (VAC) is a measure of the ability of the topographical features to hide introduced structures. It is thus the inverse of VE.

9.4.1.2.4 View Sensitivity

A Viewer Sensitivity raster dataset was created using the following datasets:

- Topographic data (NGI)
- Conservation (ENPAT)
- Natural Features (ENPAT)
- Formal protected Areas (SANBI)
- Informal protected areas (SANBI)
- Landcover 2013/2014

The sensitivity of viewers (visual receptors) is closely related to the activities taking place (land use) as well as natural features. Values between -3 and 3 were assigned to the topographic data, such that -3 represents

existing topographic data that reduce the visual sensitivity (e.g. high urban density, infrastructure) and 3 represents data that increase the visual sensitivity (e.g. nature reserve, parks, heritage site).

The viewer sensitivity raster dataset was first combined with the final visual exposure raster and then with the viewshed datasets to obtain the modelled daytime visual sensitivity raster dataset which is shown in **Figure 9-11.**

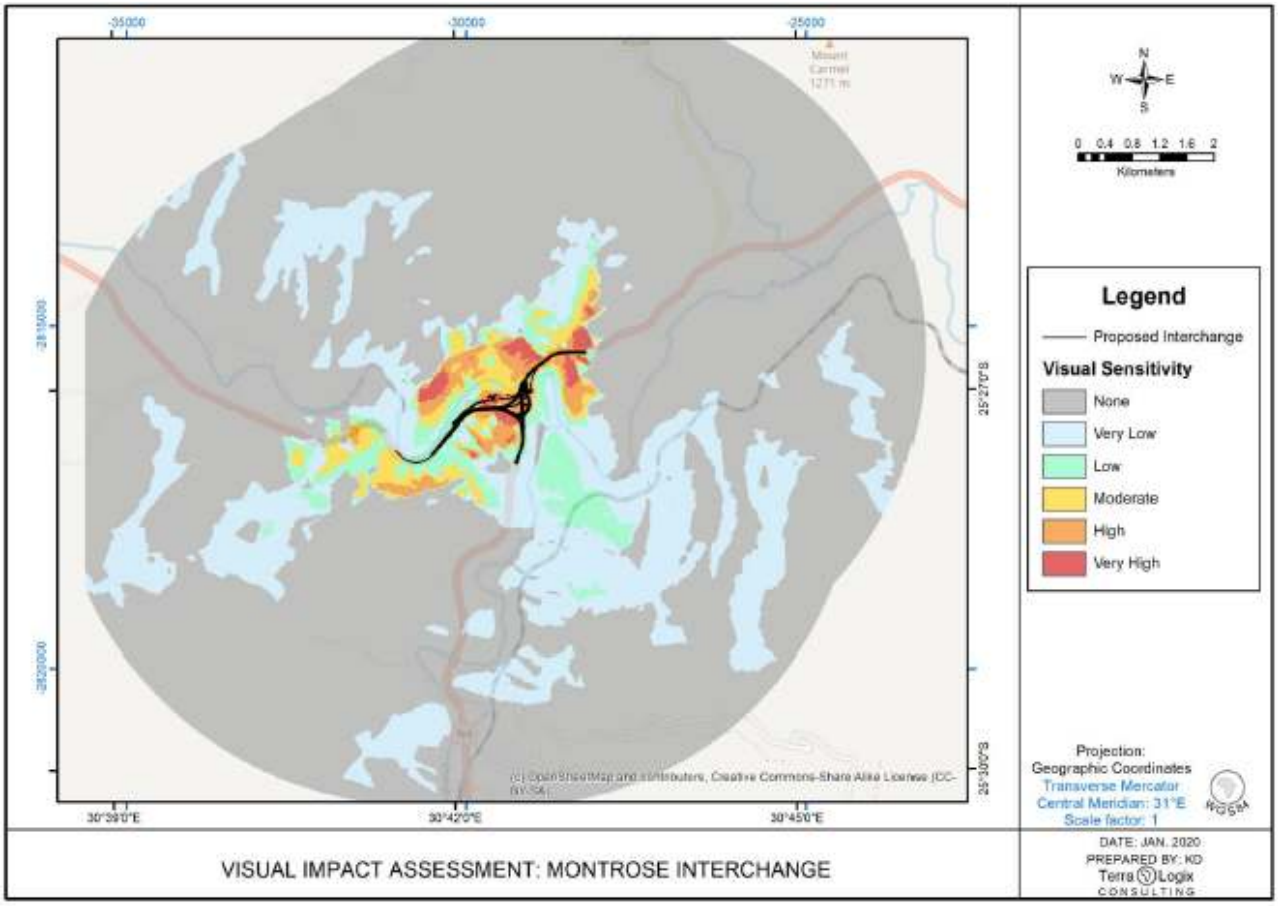


Figure 9-11: Visual Sensitivity

9.4.1.2.5 Light Pollution

A light pollution model, using the Census 2011 population data, was used to estimate the current level of light pollution (artificial sky glow) for the study area. As part of this, the artificial sky glow is reclassified into seven classes according to a modified Schaaf scale. A Schaaf classification of 1 represents a very bright city-centre night sky with only few bright stars visible while a Schaaf classification of 7 represents pristine dark night sky with many bright and faint stars visible. The study area has a Schaaf classification of 6, indicating near pristine night sky (**Figure 9-12**).

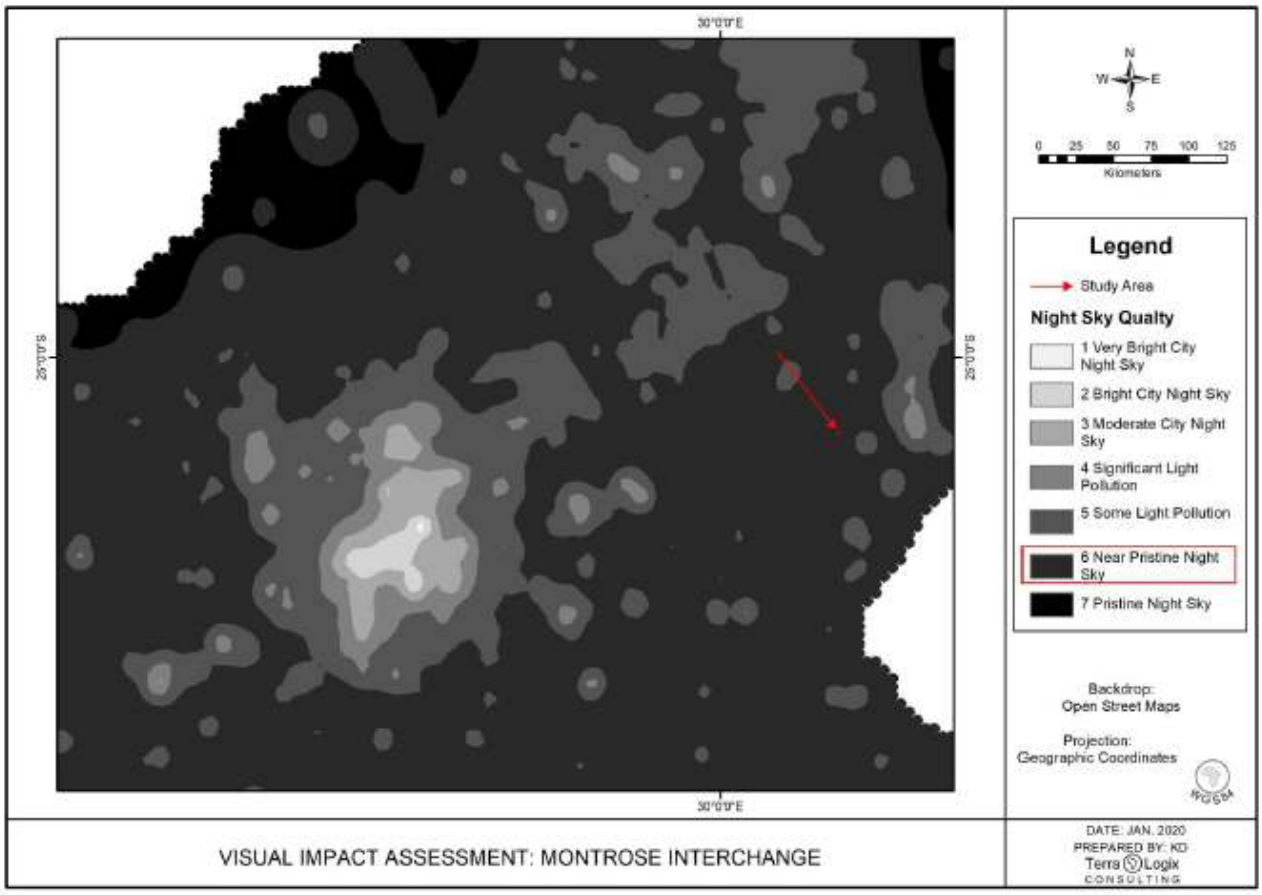


Figure 9-12: Night Sky quality

However, the near pristine night sky is currently intermittently disturbed by traffic moving through the existing T-junction

Figure 9-13: Night scene from Site 11

The 10m DTM was used to derive viewshed analyses for the following scenarios:

- Lights at the positions as provided, completely unshielded – the result of this viewshed analysis (**Figure 9-14**) is similar to the viewshed analysis for the daytime visibility.
- Lights as the same positions but shielded such than no light is visible above 10° below horizontal (Figure **9-15**). The notation used in this regard is as follows: 90° is vertical up, 0° is horizontal and -90° is vertical down; this viewshed analysis is thus done for angles of between -90° and -10°.
-
- Although the above mentioned may be somewhat simplified in terms of lights at night, the two scenarios show nevertheless how the visibility at night is affected by using properly shielded lighting fixtures. Simulated night scenes with unshielded and shielded lights are also shown below in **Figure 9-16** and **Figure 9-17.**

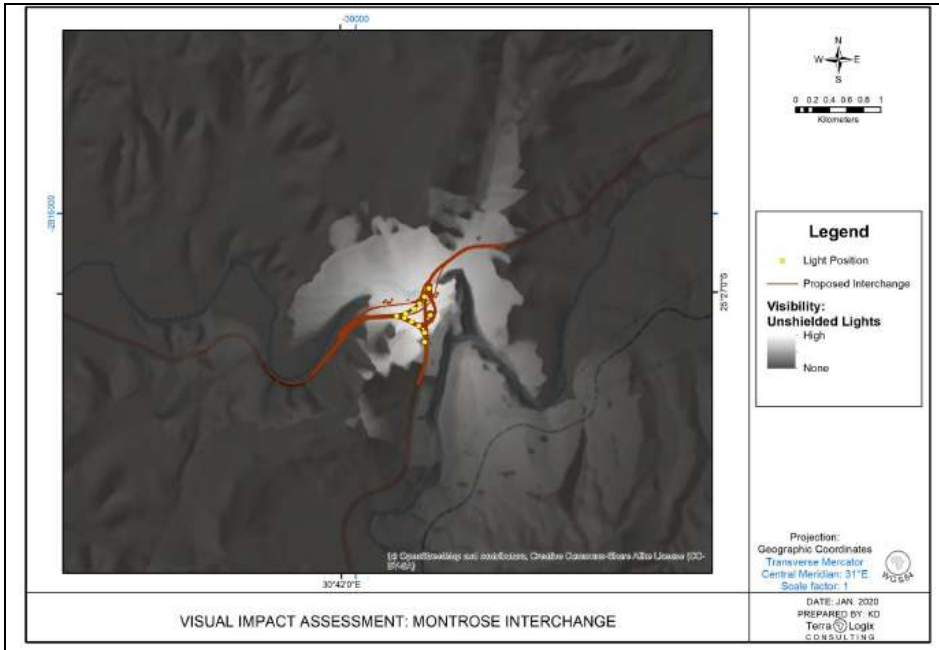


Figure 9-14: Visibility: Unshielded lights

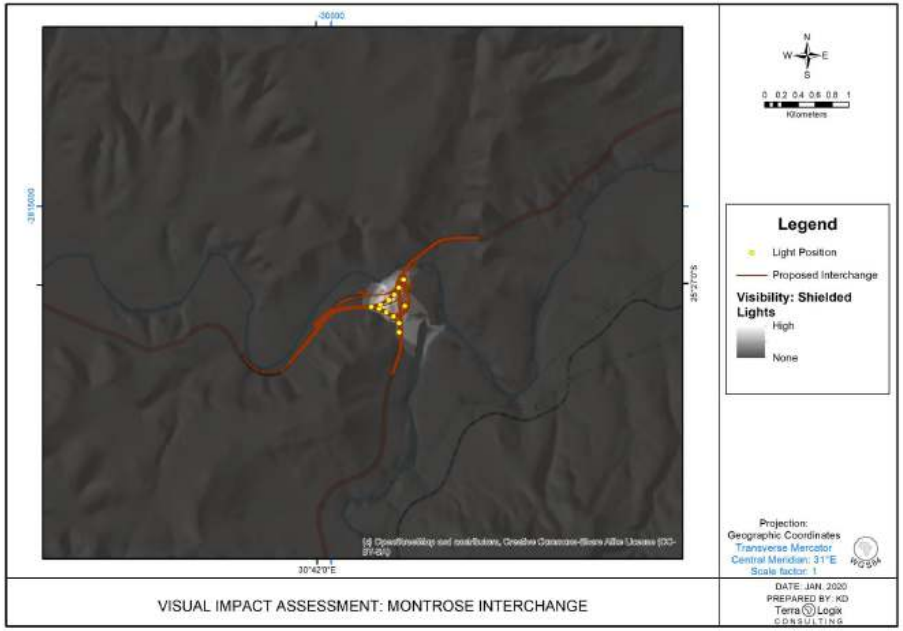


Figure 9-15: Visibility: Shielded Lights

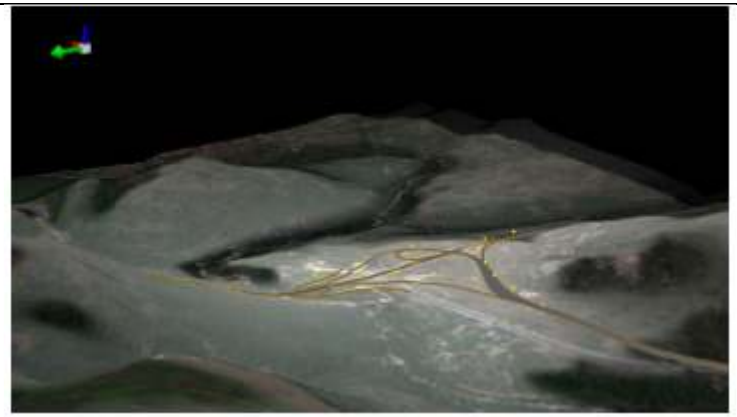


Figure 9-16: simulated night scene with unshielded light

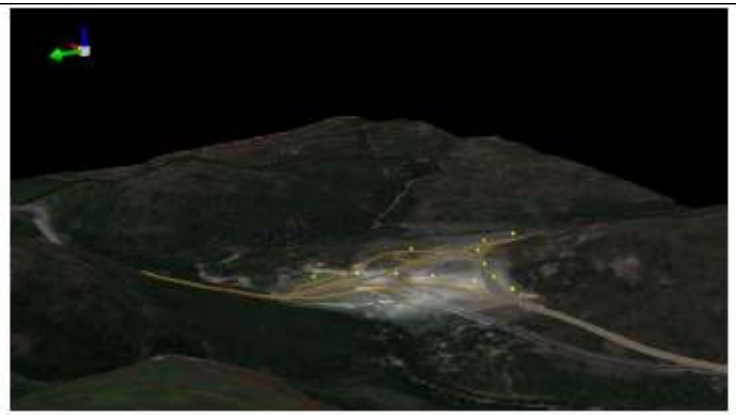


Figure 9-17: Simulated night scene with shielded lights

9.4.1.2.6 Visual Contrast Rating

A site visit was undertaken in January 2020 and a number of photos were taken. In addition, at selected sites visual simulations were done. Table 9-1 provides the comparison between the current status of the site and the proposed development (*Note should be taken that the visual simulations are not exact engineering drawings but impressions of what the proposed development could look like).*

In addition, the site of the proposed interchange was subjected to a visual contrast rating. The contrast rating is based on the methods given by the Landscape Institute & IEMA, the BLM, Smardon, and Blair. The method involves describing the existing landscape and the planned development in terms of land, water, vegetation and structures, followed by rating the contrast between the existing elements and the planned elements.

The rating procedures and results for the proposed development are given in **Figure 9-18**. The overall visual contrast rating is moderate. The following items were assessed as part of this.

- Colour Contrast
    - Some clearing of vegetation and earth works are expected to take place. The contrast in terms vegetation is rated as moderate.
    - The proposed structures are expected to have similar colours as the existing roads and will be in the vicinity of existing infrastructure. The streetlights of the proposed interchange are expected to be shielded and are expected to have a similar but constant effect on the night sky as the road traffic which currently intermittently disturbs to the night sky. The colour contrast in terms of land / water is rated as moderate.
- Form Contrast
    - The proposed structures will involve clearing of vegetation and earth works. Strong linear shapes are expected to cut across land/water (locally) and vegetation but follow he general form of the valley. The form contrast in terms of land/water is thus rated as moderate and in terms of vegetation it is rated as high.
- Line Contrast
    - The mostly curved lines of the proposed interchange are expected to be in moderate contrast to land/water and vegetation. The contrast rating in terms of land/water and vegetation is thus rated as moderate.
- Texture Contrast
    - The fine-grained texture of the roads is expected to be in moderate contrast to the coarse texture of the rocky outcrops and boulders as well as the coarse-grained vegetation (bush). The texture contrast in terms of land/water and vegetation is thus rated as moderate.
- Scale Contrast
    - The proposed roads are expected to be of lower height as the surrounding bush and are expected to mostly blend in with the landforms. The scale contrast in terms of land/water is thus rated as low and in terms of vegetation it is rated as none.

- Scale Dominance
    - The proposed new structures are expected to be a significant object occupying a minor part of the general scene. The scale dominance is thus rated as subordinate.
- Spatial Dominance
    - The landscape composition is weak focal, in the bottom of a valley with surrounding hills leading to a spatial composition rating of significant.
    - The interchange will be positioned towards the bottom of a valley, giving a spatial position rating of inconspicuous.
    - The proposed development will be seen against the background of the surrounding high hills giving a backdrop rating of inconspicuous

Table 9-1: Current status versus visual simulations

Site	Site photographs taken in January 2020	Visual Simulations
Site 6		

Site	Site photographs taken in January 2020	Visual Simulations
Site 23		

Site	Site photographs taken in January 2020	Visual Simulations
Site 28		

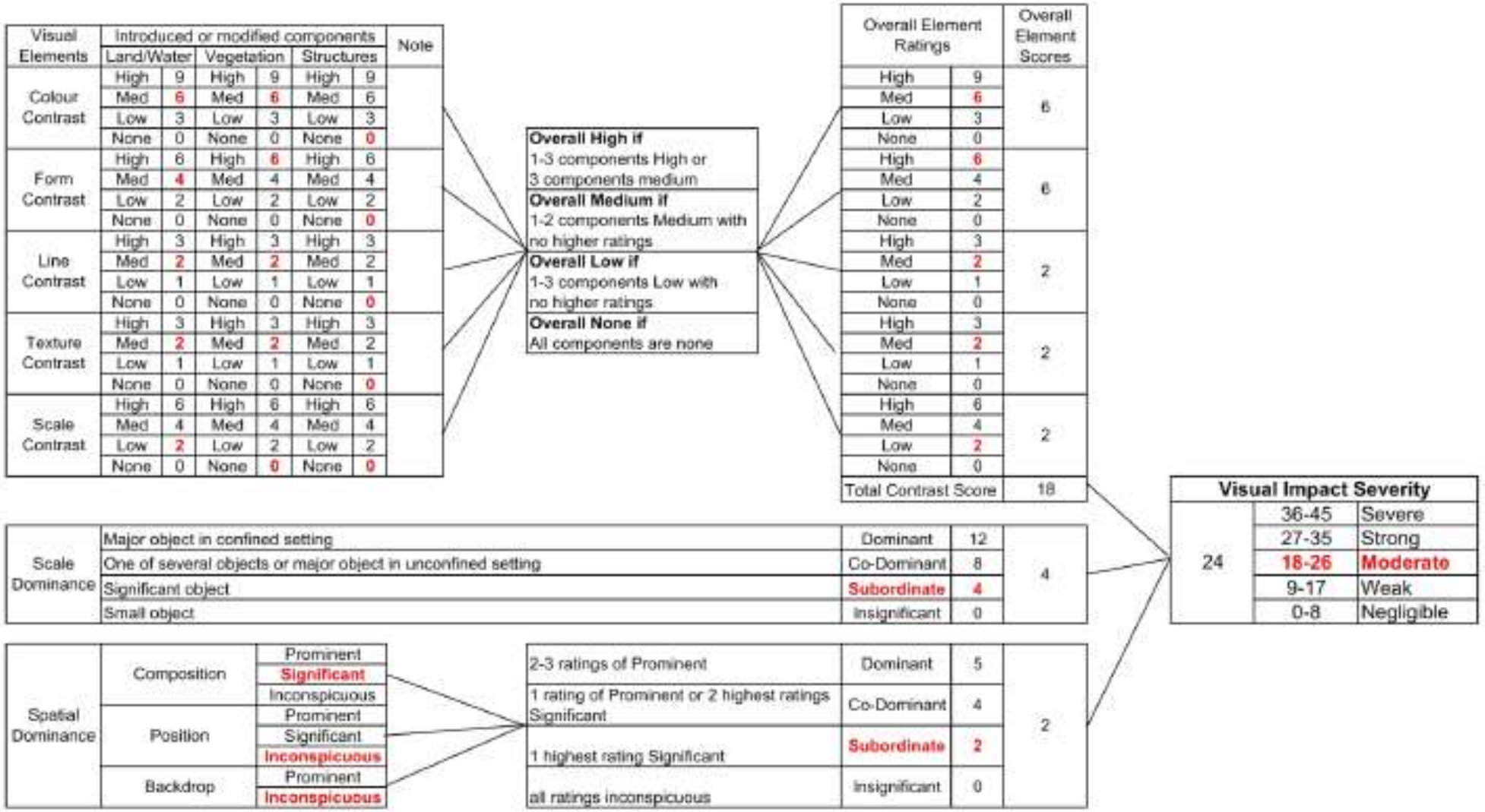


Figure 9-18: Visual Contrast Rating

9.4.2 Conclusion

The analysis shows that the overall visual impact is expected to be moderate. The intrusion of light at night it expected to be significantly reduced by shielding the lights.

9.4.2.1 General mitigation measures

The most important mitigation measure is planning and design in such that the structures are placed is such a manner that the visual intrusion is either avoided or limited as far as possible. Secondarily, it is important that during the construction phase the short term visual disturbance is kept to a minimum that any such disturbance is adequately rehabilitated such that no long term disturbance remains. General mitigation measures include the following:

- The colour temperature of the lights used should be lower than 3000 K (warm white opposed to too much blue light)
- Existing linear features: Placing new linear structures alongside existing linear features will reduce the overall impact.
- Erosion: special attention to erosion control is important as erosion tends to develop long term scars in the landscape.
- Clearing of vegetation: Clearing of any vegetation that would provide a screening effect should be avoided. Generally, the overall area has abundance vegetation which could be utilised as a shield.
- Access Roads: Use existing roads and tracks as far as possible
- Rehabilitation: Any temporary disturbance should be rehabilitated as soon as possible to reduce the effects of erosion.

9.5 Phase 1 Heritage Impact Assessment

The key issues and triggers identified during Scoping for the HIA include:

- The proposed development involves the construction of a road that is more than 300m in length and thus in terms of Section 38(1) of the NHRA, 1999, a Phase 1 Heritage Impact Assessment is required.

The details of the Specialist are as follows:

- Heritage Contracts and Archaeological Consulting | J. Van Der Walt
- **Qualifications**: MA: Archaeology (PhD in progress)
- **Experience**: 13 years' experience.
- **Affiliations**: Professional Member of the Association of Southern African Professional Archaeologist (#159)

The full HIA is appended in **Appendix 14.6.5**.

9.5.1 Key Findings

9.5.1.1 Terms of Reference

The aim of the study is to survey the proposed development footprint to identify cultural heritage sites, document, and assess their importance within local, provincial and national context. It serves to assess the impact of the proposed project on non-renewable heritage resources, and to submit appropriate recommendations with regard to the responsible cultural resources management measures that might be required to assist the developer in managing the discovered heritage resources in a responsible manner. It is also conducted to protect, preserve, and develop such resources within the framework provided by the National Heritage Resources Act of 1999 (Act No 25 of 1999).

Specifically, the following was to be undertaken:

- Field study
    - Conduct a field study to: (a) locate, identify, record, photograph and describe sites of archaeological, historical or cultural interest; b) record GPS points of sites/areas identified as significant areas; c) determine the levels of significance of the various types of heritage resources affected by the proposed development.
- Reporting
    - Report on the identification of anticipated and cumulative impacts the operational units of the proposed project activity may have on the identified heritage resources for all 3 phases of the project; i.e., construction, operation and decommissioning phases. Consider alternatives, should any significant sites be impacted adversely by the proposed project. Ensure that all

studies and results comply with the relevant legislation, SAHRA minimum standards and the code of ethics and guidelines of ASAPA.

- To assist the developer in managing the discovered heritage resources in a responsible manner, and to protect, preserve, and develop them within the framework provided by the National Heritage Resources Act of 1999 (Act No 25 of 1999).

9.5.1.2 Methodology

The following methodology was employed:

- Literature Review
  - A brief survey of available literature was conducted to extract data and information on the area in question to provide general heritage context into which the development would be set. This literature search included published material, unpublished commercial reports and online material, including reports sourced from the South African Heritage Resources Information System (SAHRIS).
- Genealogical Society and Google Earth Monuments
  - Google Earth and 1:50 000 maps of the area were utilised to identify possible places where sites of heritage significance might be located; these locations were marked and visited during the field work phase. The database of the Genealogical Society was consulted to collect data on any known graves in the area.
- Public Consultation and Stakeholder Engagement:
  - Stakeholder engagement is a key component of any EIA process, it involves stakeholders interested in, or affected by the proposed development. Stakeholders are provided with an opportunity to raise issues of concern (for the purposes of this report only heritage related issues will be included). The aim of the public consultation process was to capture and address any issues raised by community members and other stakeholders during key stakeholder and public meetings. The process involved was integrated with the S&EIA process.
- Site Investigation
  - Conduct a field study to: a) systematically survey the proposed project area to locate, identify, record, photograph and describe sites of archaeological, historical or cultural interest; b) record GPS points of sites/areas identified as significant areas; c) determine the levels of significance of the various types of heritage resources recorded in the project area.
  - The site investigation took place on **28 September 2019** and **10 November 2020**.
- Site Significance and Field Rating
  - Section 3 of the NHRA distinguishes nine criteria for places and objects to qualify as 'part of the national estate' if they have cultural significance or other special value. A number of criteria were used to establish site significance with cognisance of Section 3 of the NHRA. In addition to this criteria field ratings prescribed by SAHRA (2006), and acknowledged by ASAPA for the SADC region, were used for the purpose of this report.
- Impact Assessment Methodology
  - In addition, a specific impact assessment methodology was utilized to assess potential impacts.

9.5.1.3 Findings

9.5.1.3.1 Literature Review

Google Earth and 1:50 000 maps of the area were utilised to identify possible places where archaeological and historical sites might be located.

Various sites are known for the area. The sites recorded vary from early and middle Stone Age sites to early and late Iron Age sites. The following CRM assessments were consulted for this report:

- Heritage Impact Scoping Report for The Planned Hendrina-Marathon Powerline, Mpumalanga Province (Van Schalkwyk, 2007)
- Phase 1 Archaeological / Heritage Impact Assessment for The Development Of A Footbridge Across The Elands River, Elandshoek, Mpumalanga (Van Wyk Rowe, 2014).
- Historical structures
- Phase 1 Archaeological and Heritage Impact Assessment on the farm Mooifontein 292 JT in respect of proposed agricultural development, Mpumalanga Province (Celliers, 2018)

9.5.1.3.2 Genealogical Society and Google Earth Monuments

No known grave sites are on record close to the study area.

9.5.1.3.3 General History of the Area

The archaeology of the area can be divided in three main periods namely the Stone Age, Iron Age and Historical period:

- Stone Age
    - South Africa has a long and complex Stone Age sequence of more than 2 million years. The broad sequence includes the Later Stone Age, the Middle Stone Age and the Earlier Stone Age. Each of these phases contains sub-phases or industrial complexes, and within these we can expect regional variation regarding characteristics and time ranges. The three main phases can be divided as follows:
        - Later Stone Age; associated with Khoi and San societies and their immediate predecessors. - Recently to ~30 thousand years ago. Sites dating to the LSA are found in numerous rock shelters throughout Eastern Mpumalanga, where some of their rock art is still visible. A number of these shelters have been documented throughout the Province (Schoonraad in Barnard, 1975; Bornman, 1995 and Delius, 2007). These include areas such as Witbank, Ermelo, Barberton, Nelspruit, White River, Lydenburg and Ohrigstad.
        - Middle Stone Age; associated with Homo sapiens and archaic modern human - . 30-300 thousand years ago. An example outside of the study area is at Bushman Rock Shelter (Mason 1969, Wadley 1987), a well-known site in the Ohrigstad district. This cave was excavated twice in the 1960s by Louw and later by Eloff. The MSA layers

show that the cave was repeatedly frequented over a long period. Lower layers have been dated to over 40 000 Before Present (BP), while the top layers date to approximately 27 000 BP (Esterhuysen and Smith in Delius, 2007). MSA material is found widely across South Africa and some MSA manifestations can be expected in the study area.

- Earlier Stone Age; associated with early Homo groups such as Homo habilis and Homo erectus. - 400 000-> 2 million years ago. Very few Early Stone Age (ESA) sites are on record for Mpumalanga.

- Iron Age
  - Bantu-speaking people moved into Eastern and Southern Africa about 2,000 years ago (Mitchell, 2002). These people cultivated sorghum and millets, herded cattle and small stock and manufactured iron tools and copper ornaments. Because metalworking represents a new technology, archaeologists call this period the Iron Age. Characteristic ceramic styles help archaeologists to separate the sites into different groups and time periods. The Iron Age as a whole represents the spread of Bantu speaking people and includes both the Pre-Historic and Historic periods. It can be divided into three distinct periods:
    - The Early Iron Age: Most of the first millennium AD.
    - The Middle Iron Age: 10th to 13th centuries AD.
    - The Late Iron Age: 14th century to colonial period.
  - Researchers such as Mike Evers (1975) and David Collett (1982) identified three basic settlement layouts in this area. These sites can be divided into simple and complex ruins. Simple ruins are normally small in relation to more complex sites and have smaller central cattle byres and fewer huts. Complex ruins consist of a central cattle byre, which has two opposing entrances and several semi-circular enclosures surrounding it. The perimeter wall of these sites is sometimes poorly visible. Huts are built between the central enclosure and the perimeter wall. These are all connected by track-ways referred to as cattle tracks. These tracks are made by building stone walls, which forms a walkway for cattle to the centrally located cattle byres. A combination of these features occurs on a few dispersed sites to the north west of the study area (Celliers 2019).
  - Individual sites range from simple enclosures, which consist of single or two concentric stonewalled circles found in small, isolated settlements, to complex sites with large central enclosures which have smaller enclosures attached to their outer walls. The walls are built with undressed, locally occurring, stone. Walls on average are 0.5 to approximately 1 meter high, although often only the foundation stones are left.
- Cultural Landscape
  - The area has been subjected to limited development from prior to 1969 and successive historical aerial photographs and topographic maps indicate the changes in the study area and surrounds (**Figure 9-19).** From these images, it can be deduced that the only developments in the area up to 1959 was few roads and some earthworks. By 1969 the Montrose hotel was built with several associated outbuildings most of which has been demolished over the years

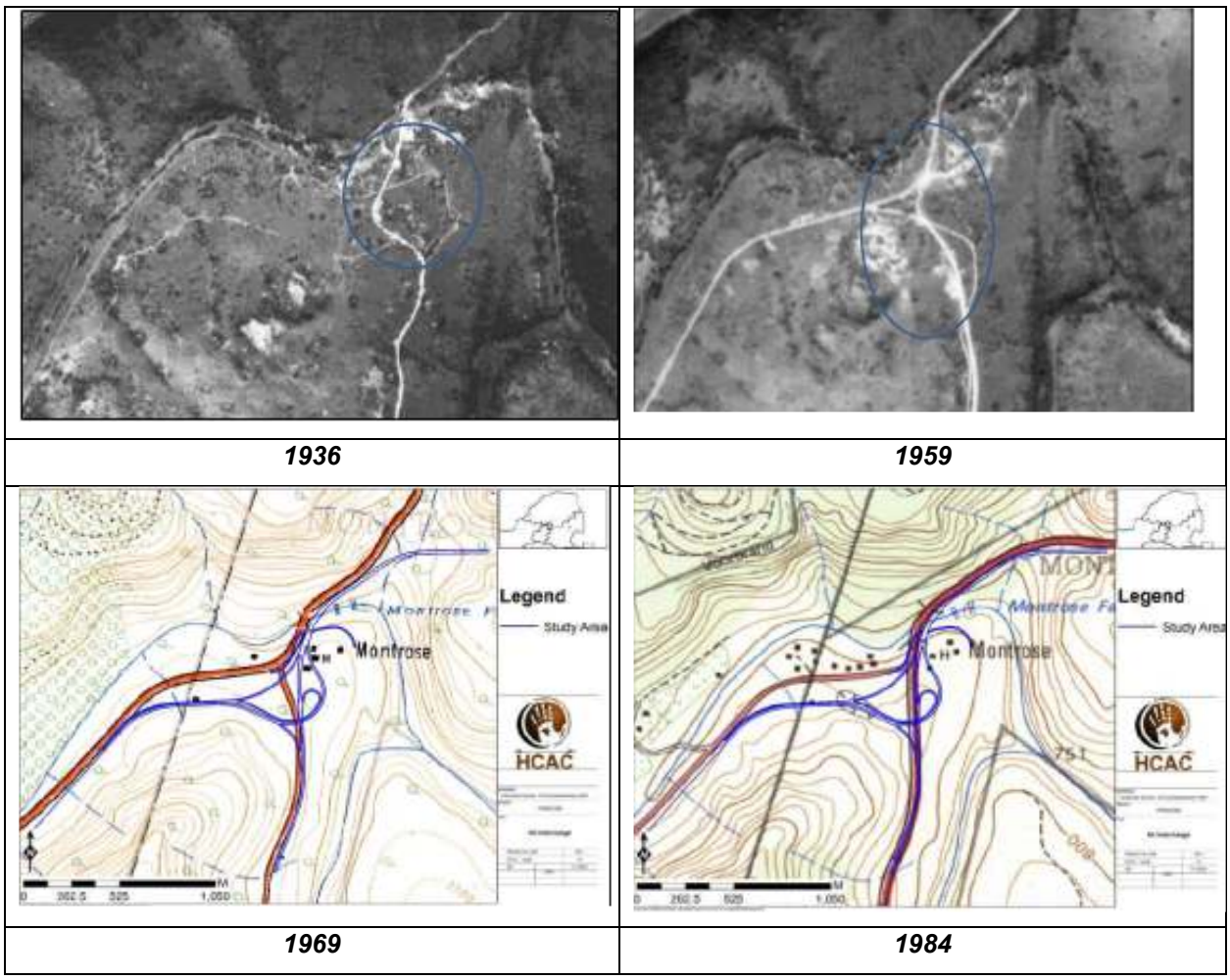


Figure 9-19: Historic aerial imagery and topographic maps for the area

9.5.1.3.4 Field Survey

9.5.1.3.4.1 Archaeology

The field survey took place on 28 September 2019 and 10 November 2020 (Summer). Vegetation in the study area is high and existing activities like mining and road developments hamper archaeological visibility. The impact area was however sufficiently covered to understand the heritage character of the study area.

Figure 9-20**Figure 9-20** below shows the extent of the field survey that was undertaken. The study area is extensively disturbed by road developments, an existing Asphalt plant , old quarry, and modern buildings.

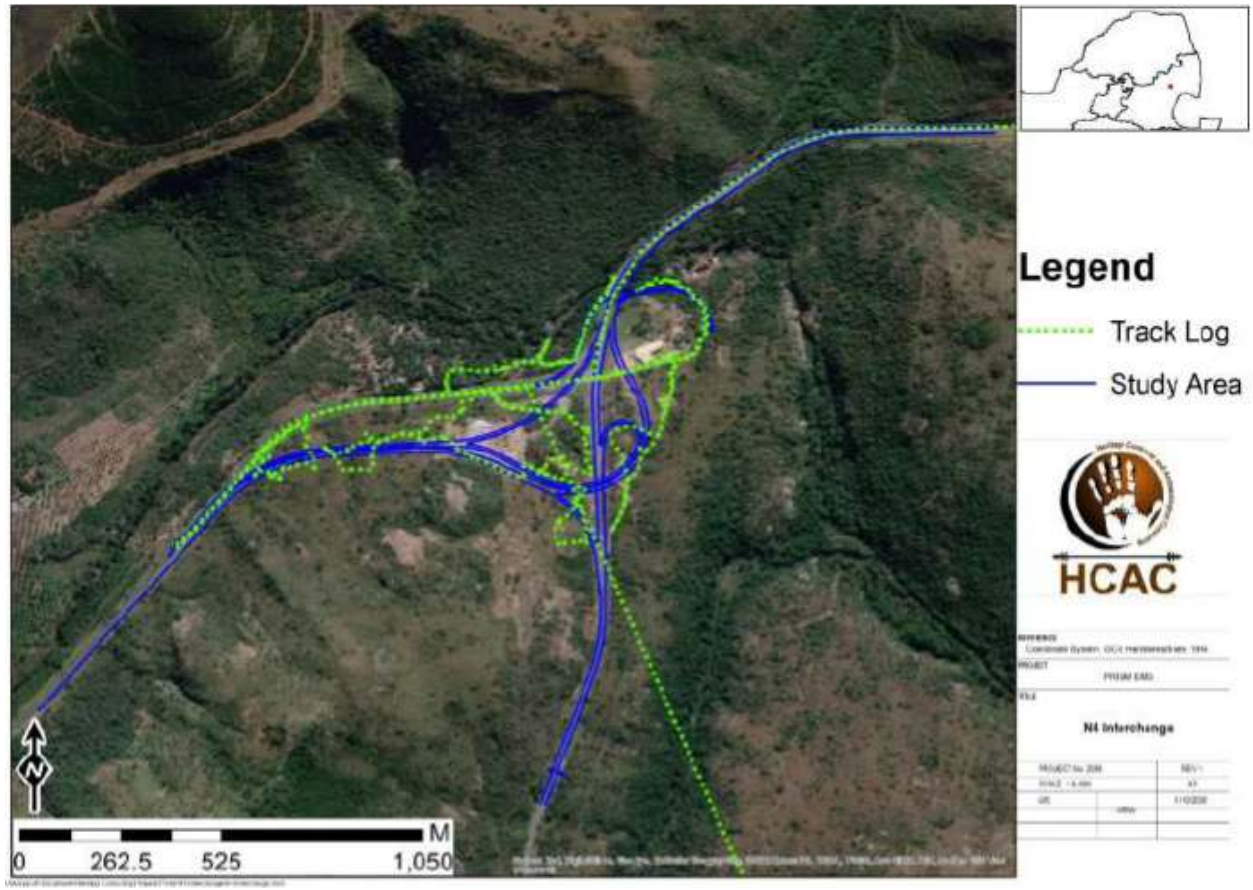


Figure 9-20: Track plots

Although the larger area is known for Iron Age stonewalled sites, the extensive developments in the area would have impacted on surface indications of archaeological sites. This was confirmed during the field survey and finds were limited to two small stone enclosures (**Figure 9-21** and **Figure 9-22**) and are briefly described below:

- The study recorded two, small ephemeral stone-walled enclosures (Feature 1 & Feature 2).
- It is not certain if these features could have formed part of a larger Iron Age settlement complex that has been destroyed by earthmoving activities relating to quarries and road construction in the study area or if they are of a more recent nature.
- No other cultural material was found associated with these features apart from a single undecorated potsherd at Feature 2.
- The walls collapsed with no clear discernible entrances and measures less than 2.5 meters in diameter.

The heritage significance was therefore given as:

- The site is of **low heritage significance** due to the existing impacts to the site, the lack of cultural material and features.
- Field Rating – GP B

Feature 1 – From the East

Feature 1 – from the West

Feature 2 – From the East

Feature 2 – from the West

Figure 9-21: Photographs of stone walled enclosures

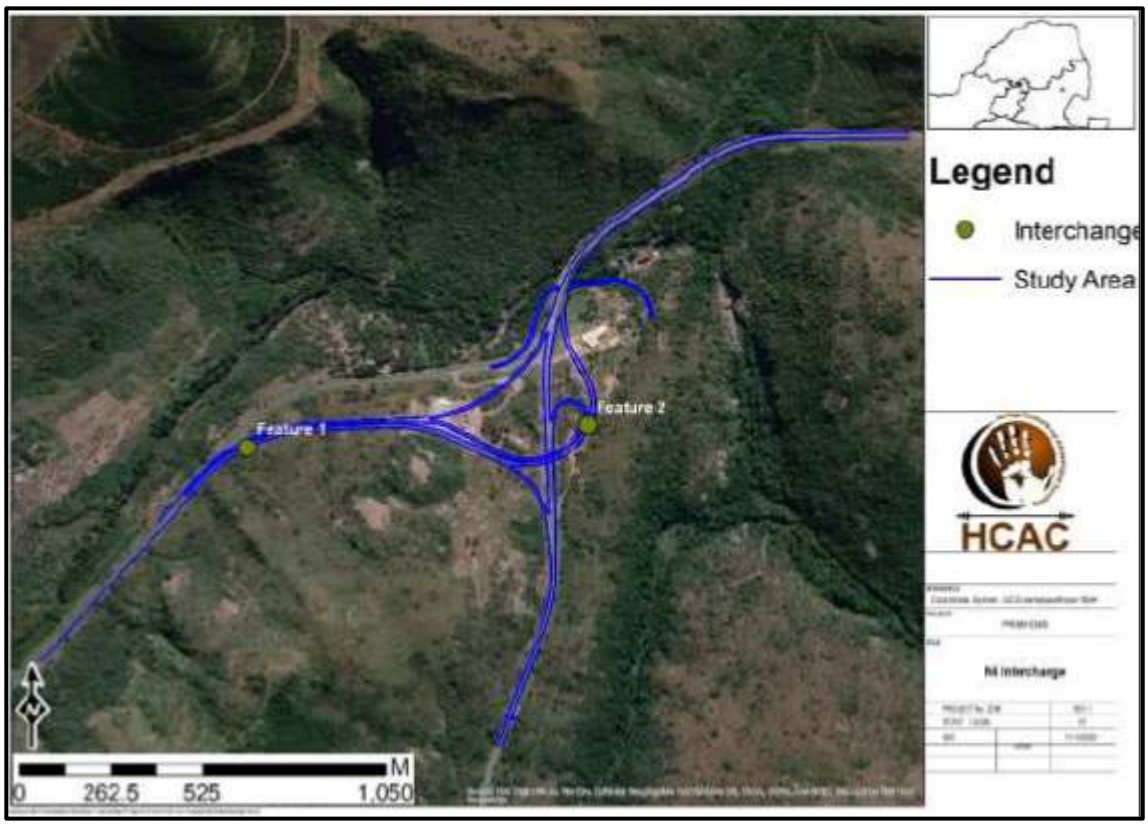
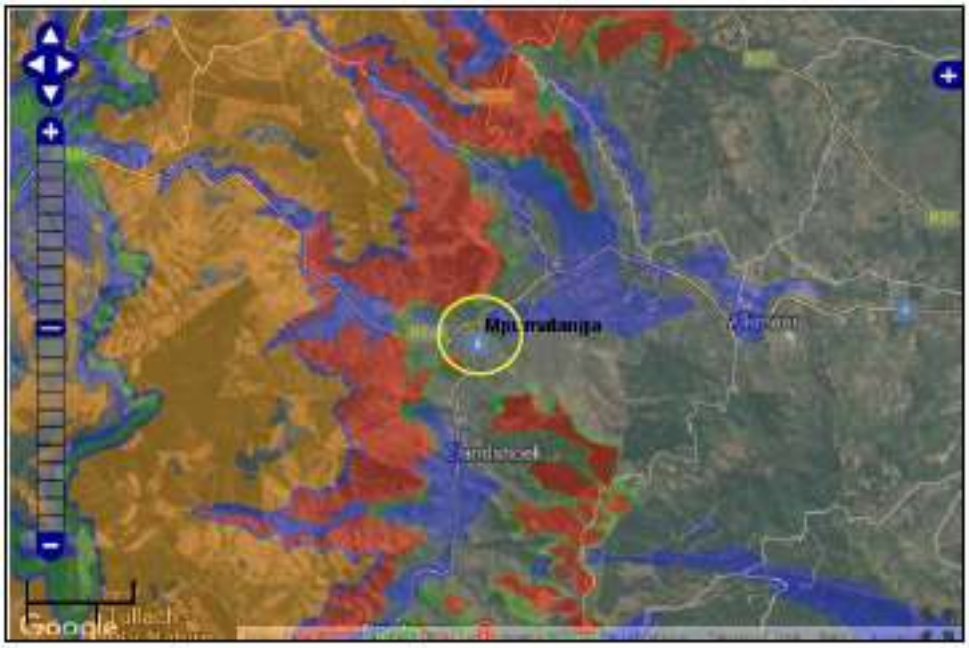


Figure 9-22: Location of Stone walled enclosures

9.5.1.3.4.2 Palaeontology

According to the paleontological sensitivity of the study area based on the SAHRA Paleontological map no further studies are required



Colour	Sensitivity	Required Action
RED	VERY HIGH	Field assessment and protocol for finds is required
ORANGE/YELLOW	HIGH	Desktop study is required and based on the outcome of the desktop study, a field assessment is likely
GREEN	MODERATE	Desktop study is required
BLUE	LOW	No palaeontological studies are required however a protocol for finds is required
GREY	INSIGNIFICANT/ZERO	No palaeontological studies are required
WHITE/CLEAR	UNKNOWN	These areas will require a minimum of a desktop study. As more information comes to light, SAHRA will continue to populate the map

Figure 9-23: Paleontological sensitivity of the study area as indicated on the SAHRA Palaeontological sensitivity map.

9.5.1.3.4.3 Graves and Burials

No graves or burial sites were recorded during the survey although the recorded sites are known to contain unmarked burials.

9.5.1.3.5 Potential Impact

Impacts to non-renewable heritage resources will be permanent and negative and expected to occur during the vegetation clearing and initial construction and would be of low/ medium significance but can be mitigated to an acceptable level through the implementation of necessary mitigation measures.

Cumulative impacts occur from the combination of effects of various impacts on heritage resources. The importance of identifying and assessing cumulative impacts is that the whole is greater than the sum of its parts. In the case of the development, impacts can be mitigated to an acceptable level.

9.5.2 Conclusion and Recommendations

The study area is extensively disturbed by road developments, an existing Asphalt plant, old quarry and modern buildings and although the larger area is known for Iron Age stonewalled sites the extensive developments in the area would have impacted on surface indications of archaeological sites. This was confirmed during the field survey and finds were limited to two small stone enclosures recorded as Feature 1 & Feature2.

It is not certain if these features could have formed part of a larger Iron Age settlement complex that has been destroyed by earthmoving activities relating to quarries and road construction in the study area or if they are of a more recent nature. No other cultural material was found associated with these features apart from a single undecorated potsherd at Feature 2. The walls collapsed with no clear discernible entrances and measures less than 2.5 meters in diameter. According to the SAHRIS paleontological sensitivity map the area is of low paleontological sensitivity and no further studies are required.

The impact of the project on heritage resources can be mitigated to an acceptable level and it is recommended that the proposed project is approved on the condition that the following recommendations are implemented as part of the EMPr and based on approval from SAHRA:

- Documentation of the enclosures that includes scaled drawings upon which a destruction permit must be applied for from SAHRA;
- These features will have to be monitored during construction;
- Implementation of a chance find procedure for the project (archaeology and palaeontology) as outlined below.

Chance find procedure

This procedure applies to the developer's permanent employees, its subsidiaries, contractors and subcontractors, and service providers. The aim of this procedure is to establish monitoring and reporting procedures to ensure compliance with this policy and its associated procedures. Construction crews must be properly inducted to ensure they are fully aware of the procedures regarding chance finds as discussed below.

- 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 service 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.

From a heritage perspective, the proposed project is acceptable. If the above recommendations are adhered to and based on approval from SAHRA, HCAC is of the opinion that the development can continue as the development will not impact negatively on the heritage record of the area

The impact of the proposed project on heritage resources can be mitigated to an acceptable level based on approval from SAHRA. Furthermore, the socio-economic benefits also outweigh the possible impacts of the development if the correct mitigation measures are implemented for the project.

Potential risks to the proposed project are the occurrence of unknown or unmarked graves of which surface indicators have been destroyed and subsurface archaeological deposits. These risks can be mitigated to an acceptable level with monitoring and the implementation of a chance find procedure as outlined above.

9.6 Preliminary design report

The key issues and triggers identified during Scoping for the Preliminary Design Report include:

- The need to understand the proposed development and design philosophy for the upgrade.

The details of the Engineers that were responsible for the compilation of the design are as follows:

- SMEC:
    - W McLachlan (BEng (Civil Engineering)
    - W.E. Archer (BEng (Civil Engineering)

The full Preliminary Design Report is included in **Appendix 14.6.6**.

9.6.1 Key Findings

9.6.1.1 Terms of Reference

9.6.1.1.1 Terms of Reference

SMEC South Africa (Pty) Ltd was appointed by TRAC for the assessment, preliminary and detailed design of the proposed Montrose Interchange to replace the existing at-grade intersection of MDC sections 6N (known as Schoemanskloof) and 6E (known as Elands Valley).

The scope of this project is to design a grade-separated interchange to replace the existing at-grade intersection at km 22,7 on N4-7X, where N5-6Y intersects the N4-7X alignment at an at-grade T-junction.

9.6.1.1.2 Topographical Survey

The topographical- and structural survey was concluded in April 2019. In addition to the typical requirements of TMH11, a very high-density point cloud of the existing Crocodile River Bridge was provided by the survey to address some of the inaccuracies and omissions from the supplied as-built plan.

9.6.1.1.3 Existing Infrastructure

The preliminary design report discusses the existing infrastructure that is to be tied into by the new interchange. This includes:

- N4-6Y (Schoemanskloof Road)
    - Schoemanskloof is currently a two-lane road with occasional additional climbing and passing lanes along the route.
    - The design speed of Schoemanskloof varies along the route, but is generally designed for 80 km/h with a posted speed of 100 km/h. The cross-section comprises of two 3.7 m lanes and shoulders of approximately 1.0 m wide at the point where the Montrose Interchange starts.

- N4-7X (Elands Valley Road and MDC 7A)
    - N4-7X is split in to two distinct sections at the proposed Montrose Interchange – to the south of the Crocodile River Bridge (Coinciding with MDC Section 6E and a 180 m portion of 7A) and to the north of the bridge (coinciding with MDC Section 7A).
        - The southern portion is currently a two-lane road with occasional climbing and passing lanes further along the route. The proposed interchange layout retains the two-lane facility from the Crocodile River bridge, heading south towards Ngodwana. The design speed is 95 km/h according to the Concession Contract. The cross-section comprises of two 3.7 m lanes and 1.8 m shoulders.
        - The northern portion starts on a transition from a two-lane road to an undivided four-lane cross-section in the first kilometre north of the Crocodile River Bridge. The design speed is 100 km/h. The cross-section is a very narrow four-lane undivided road with lane widths of approximately 3.3 m, shoulder widths of 0.3 m, and a 0.8 m painted median. Gravel shoulders make up the remainder of the cross-section, with stormwater channels and guardrails having been positioned for the 19.8 m cross-section
- Crocodile River Bridge (B1577)
    - The existing bridge over the Crocodile River (B1577) has a total length of 160 m with a roadway width of 11.8 m and a cross-fall ranging between 6 and 9.6%. The superstructure, a continuous reinforced concrete voided deck, consists of eight spans of 20 m each. The existing sub-structure includes seven slender reinforced concrete wall type piers, ranging in height from 12.6 to 17.2 m and two reinforced concrete abutment seating beams supported by strut frames on the underlying rock interface.
- Intersections and Accesses
    - Access to Mooifontein 292-JR
    - Access to Montrose 290-JT
    - Access to Montrose 573-JT
    - R539/N4 Intersection
-

9.6.1.1.4 Proposed Design

A summary of the findings of preliminary design report is provided below. It should be noted however that more detail is included in the Project Description and is not repeated here to prevent repetition.

- Existing infrastructure was used as far as possible by using the existing road infrastructure to provide access to properties, retain existing drainage networks and widen the Crocodile River Bridge in lieu of constructing a new river bridge.
- The proposed design will accommodate traffic volumes at an acceptable level of service until at least 2028.
- The interchange takes the form of a trumpet interchange. Four ramps are proposed to accommodate traffic in free-flow movements in all directions. Approximately 560 m of the existing Schoemanskloof Road is realigned to accommodate the new interchange. The achieved design speed of the ramps

ranges from 40 km/h (on the loop ramp only) to 100 km/h. The proposed layout allows for the future prioritization of the Schoemanskloof Road as the preferred N4 alignment.

- Reinstating existing access to properties will require approximately 800 m of new access roads and a new farm access along N4-7X. The extent and layout of these access roads may change according to land owner requirements.
- The existing Crocodile River Bridge is widened to accommodate two eastbound lanes of traffic and three westbound lanes of traffic. Shoulder widths are according to SANRAL's standards. This widening requires additional piers to be constructed in the river gorge.
- Two new ramp bridges across the existing N4 have been designed for the westbound and southbound directional ramps as deck-stiffened arch types. The arches are anchored into the adjacent rock cut faces.
- The pavement design for all new road construction consists of 45 mm Asphalt, 150 mm G1 base and a 250 mm C3 Subbase on top of the selected layers.
- Geotechnical investigations showed that the in-situ material can be used to construct fill, selected and subbase layers. In addition to this, the availability of suitable base material (G1) was also confirmed in a borrowpit/quarry investigation. Additional material can also be sourced from within the interchange road reserve to supply base and subbase material.
- Stormwater is accommodated in much the same way as the existing situation. Two new pipe crossings across the N4 are required.
- Services within the construction envelope have been identified and will require relocation or protection. This includes two fibre optic cables and one 11 kV overhead electrical line.
-

Figure 9-24 provides the proposed interchange layout and is followed by **Figure 9-25** which shows the proposed Crocodile Bridge Upgrade.

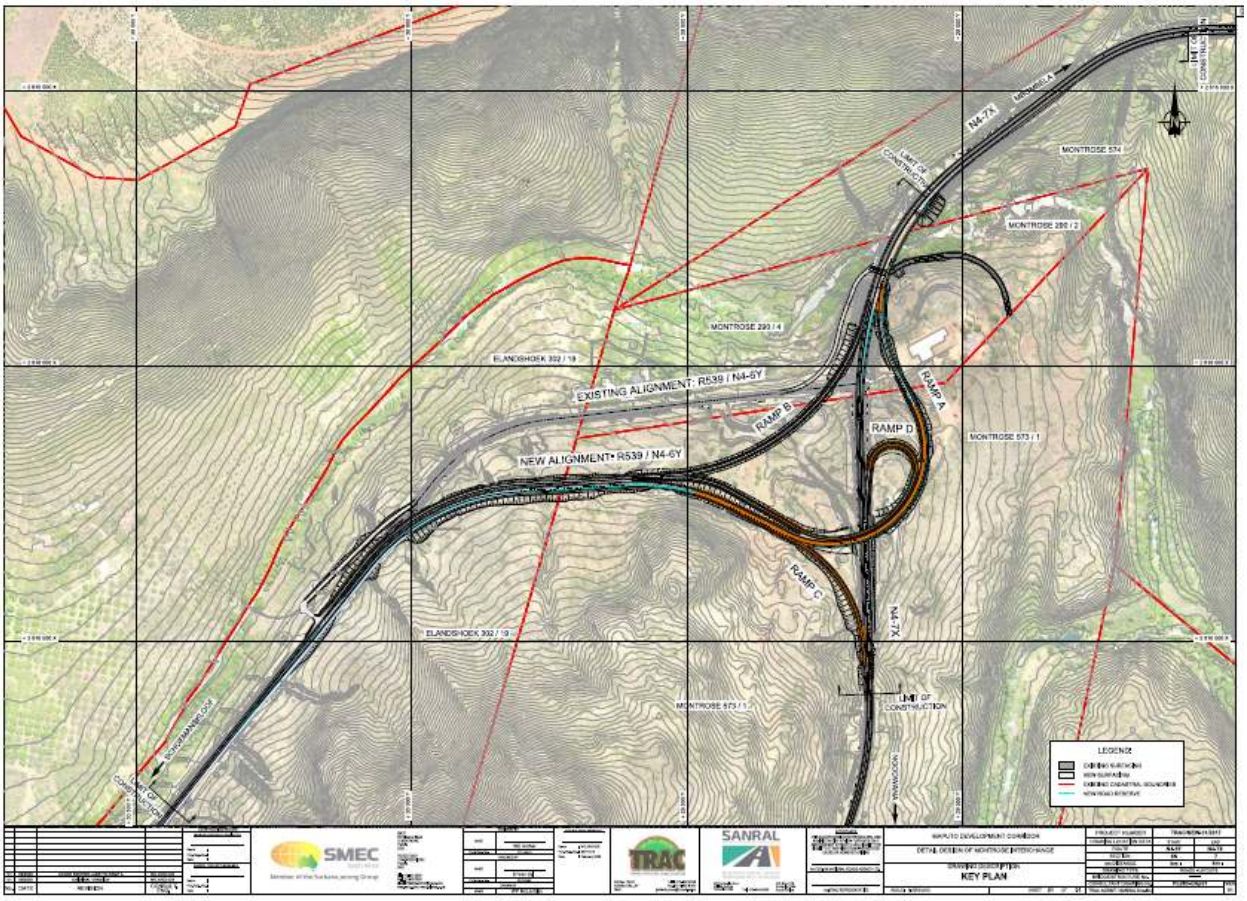


Figure 9-24: Proposed Layout

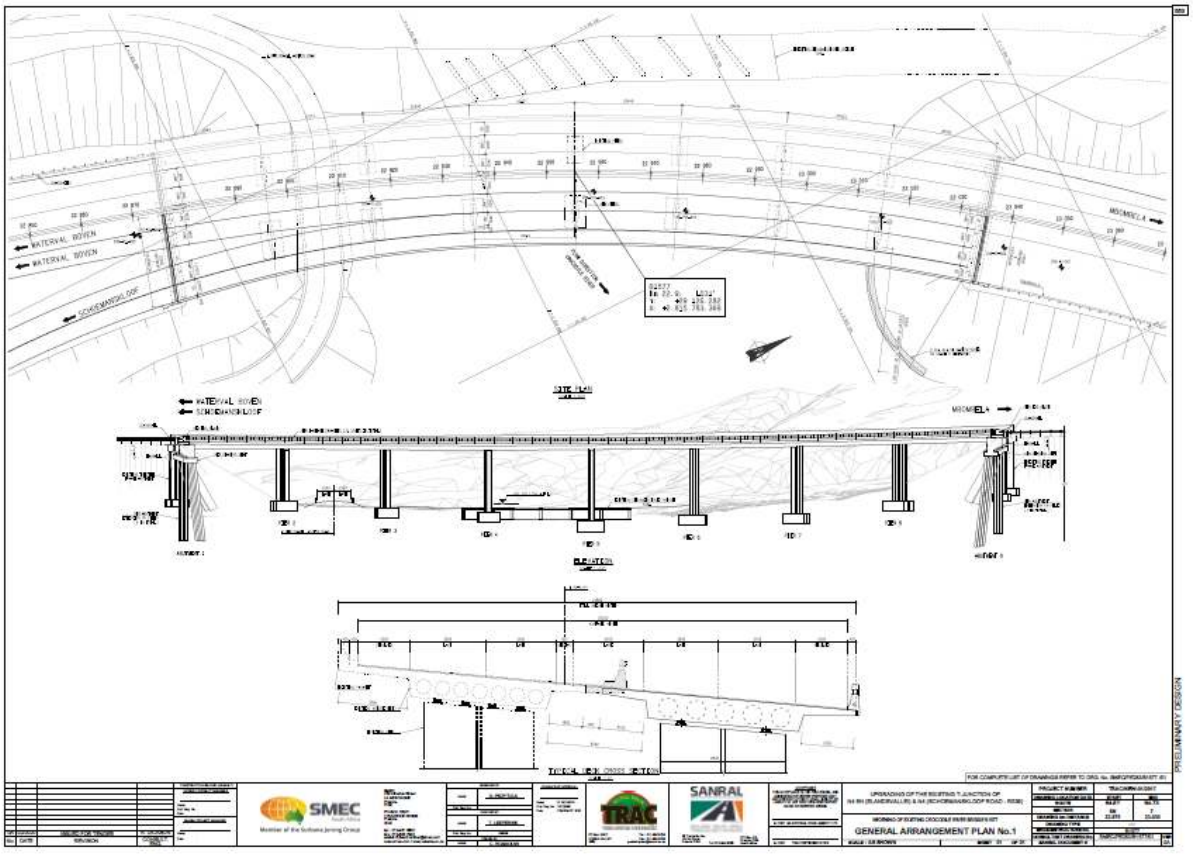


Figure 9-25: Crocodile Bridge Upgrade

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9.6.2 Conclusion

From the report, the following conclusions and recommendations are made:

- The proposed construction of the Montrose Interchange is required and is feasible from a technical engineering and safety perspective.
- It is recommended that this report be distributed to the Implementing Authority for approval.
- The following issues are of importance:
    - Timeous acquisition of portions of land as identified in the design drawings and the property reports submitted to SANRAL.
    - The EIA and WULAR timelines are on the critical path for the programme.
    - Agreement with service owners for relocation and/ or protection of the fibre optic cables affected by the design.
    - Timeous review and approval of the Preliminary Design in order to commence with the Detail Design and Contract Documentation.

9.7 Geotechnical Assessment

The key issues and triggers identified during Scoping for the Ecological Assessment include:

- Geotechnical information is required as part of the preliminary design to ensure all designs take into account the geotechnical conditions of the site.

The details of the Engineers that were responsible for the compilation of the Geotechnical are as follows:

- GaGE Consulting:
    - Brendon Jones PhD (Eng. Geology) PrSciNat MSAIEG
    - Frans van der Merwe MEng (Geotech.) PrEng MSAICE
    - Katlego Segole MSc (Eng. Geology) CSAIEG
    - Duan Swart MSc (Eng. Geology) CSAIEG
    - Keabetswe Mogotsi BTech (Civil)

The full Geotechnical Study is included in **Appendix 14.6.7**.

9.7.1 Key Findings

9.7.1.1 Terms of Reference

GaGE Consulting (Pty) Ltd was appointed by SMEC South Africa (Pty) Ltd, on behalf of their client, the Trans African Concessions (TRAC) (Pty) Ltd to conduct a detailed-design geotechnical investigation for the proposed Montrose Interchange along the National Route 4 (N4) in Mpumalanga, South Africa. The N4 Toll Route is a Build, Operate and Transfer (BOT) toll road; TRAC (Pty) Ltd is the concessioner and is responsible for developing, managing and maintaining the road.

The proposed new development will comprise the construction of several ramps in cuts and fills, the idening of the Crocodile River bridge, as well as the construction of a new arch bridge, which result from the proposed widening of the N4 to four lanes.

9.7.1.2 Methods

The following methodology was adopted in order to realise the aims of this study:

- A general site walk-over along with a review of available geological and geotechnical records;
- Geotechnical site investigation, including the excavation of trial pits, and the rotary coring of several boreholes, in conjunction with in-situ testing across the site;
- Ground geophysical surveys to interpolate the ground profile between investigation points;
- Down-the-hole photography;
- Geological and structural mapping of rock masses exposed across the site; and
- Laboratory testing of ground units to establish geotechnical and materials design parameters

More detail on the specific methodology employed for each item above is included in the report.

9.7.1.3 Findings

9.7.1.3.1 Regional Geology

The route alignment is underlain by Palaeo- to Mesoarchean basement rocks of the Barberton Greenstone Belt (BGB) and the Nelspruit Suite, that are intruded by Mesozoic dykes. The regional geology of the site is shown in **Figure 9-26**, with the BGB denoted by the symbol 'Zt', whilst the Nelspruit Suite is denoted by the symbol 'Zn'. The dykes are indicated by a red line on the geological map.

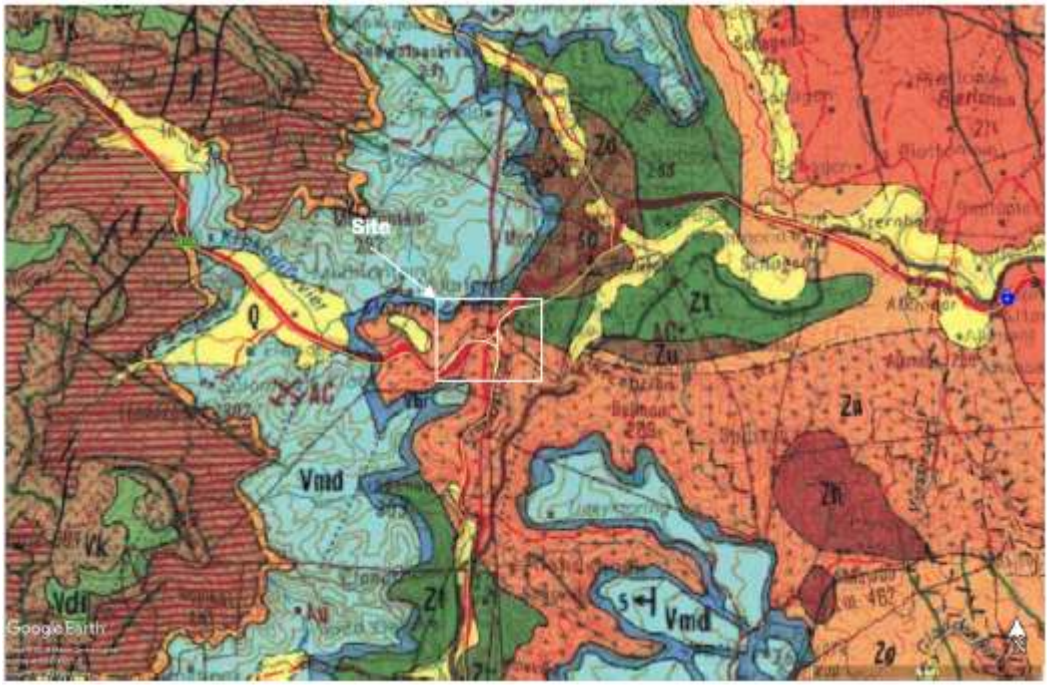

Figure 9-26: Regional Geology

The BGB is a strongly folded, ENE-trending, mid-Archaean, volcano sedimentary remnant, entirely surrounded by a variety of granitoids of the Kaapvaal Craton (Bandl et. Al., 2006). During metamorphism of these rocks, which accompanied granitization, green minerals such as chlorine, hornblende and epidote were commonly developed in the mafic volcanic rocks, giving rise to the sack term "greenstones" for the rocks containing them.

These rocks constitute the oldest preserved material on earth's surface, and typically comprise undifferentiated mafic and ultramafic plutonic and volcanic rocks that have been altered to serpentinites, a variety of amphibolites and chlorite talc, talc carbonate and talc chlorite schists, with hybrid granitic rocks developed in places.

9.7.1.3.2 Structural Geology

The Swazian-era granitoids and greenstone belts underwent several periods of deformation during which they were intensely folded and metamorphosed. Younger intrusive granites were less deformed. Two prominent directions of shear fracture are developed in the Nelspruit area. The oldest strikes north-northeast, whilst the second and younger trends north-northwest. The latter developed after the intrusion of the pre-Godwana diabase (Vegter, 2003).

Walraven (1989) mentions the existence of north-south oriented shear zones in the area. Faulting seen in adjoining rocks of the Transvaal Supergroup in the west and Karoo Supergroup strata in the east strike NW-SE and NE-SW. North-south oriented faults are also present in the Lebombo Range (Vegter, 2003).

9.7.1.3.3 Regolith Cover and Weathering Profile

The term "regolith" is used to describe the transported and residual weathered products of the various bedrock types in the site area. The regolith includes all unconsolidated sediments and soils, including alluvial, colluvial and residual materials, as well as in-situ highly weathered very soft bedrock (saprolite).

Basement granites in South Africa vary based on mineralogy, igneous or metamorphic textures and younger structural influences. This, together with climatic variations, result in distinct geomorphology and landforms with characteristic soil successions both vertically and between crests and drainage channels. Variable bedrock topography is associated with most such granitic terrains in temperate to humid areas in South Africa and ferricrete or duplex soils are commonly found on mid-slopes to foot-slopes (Dippenaar and van Rooy, 2014).

The granitoids in the Nelspruit region can be decomposed into residual soils to great depth. The quartz remains unaltered as sand grains, whilst the mica remains partially unaltered, except in the upper zones of the soil profile where they may become fully decomposed to kaolinite (Brink, 1981). Typically, the regolith underlain by granitoids are dominated by grey-brown gravelly sands with low to moderate clay content overlying decomposing granitoids.

Ferricrete occurs to a lesser extent in the Nelspruit Suite and the translocation of clay minerals is more common, forming so-called duplex soils. (Dippenaar and van Rooy, 2014). The sodic duplex soils are generally characterised by dark grey to black surface soils of distinct clayey texture. The deeper in-situ (not transported) soils resemble typical granitic soils, being white to reddish brown in colour and mainly of sandy texture (Dippenaar and van Rooy, 2014).

9.7.1.3.4 Engineering Geology

Residual soils developed on the greenstone belts are usually not deep and are seldom present to depths of greater than 3 m. Notwithstanding, the residual soils are clayey, and can exhibit a highly expansive

character. Furthermore, the residual soils are highly variable in thickness, even over short distances (Brink, 1981).

Where deep residual soil profiles develop on the granitoids, and in conjunction with high rainfall (as experienced in the Nelspruit area) where and in situations conducive to leaching, the kaolinite in these decomposed granitoids may be removed to leave a residuum of micaceous silty sand possibly exhibiting collapse potential (Brink, 1981). These collapsible surface horizons may also be dispersive when the granite contains significant amounts of albite (Dippenaar and van Rooy, 2014). The variability of the granitoids is further complicated by the presence of corestones of hard rock granite within the residual granite soil presents special problems in foundation engineering.

Seepage lines, hillslope wetlands and seepage problems have to be anticipated given the low permeability of bedrock and the altered hydrology of the profile resulting from leaching and translocation.

9.7.1.3.5 Hydrogeology

The groundwater-bearing capacity of the Mesoarchaean granitoid and gneissic rocks is generally poor. The *Nelspruit* Granite Suite as a whole appears to be the least favourable of the granitic lithostratigraphic units in terms of its groundwater-bearing capacity. Fractures (i.e. secondary-porosity) are most numerous within the near-surface zone of weathering, which are mostly less than 40 m thick. The probability of groundwater is therefore greatest at the base of the near-surface zone of weathering and fracturing provided it lies within the saturated zone. The depth to groundwater level (i.e. top of the saturated zone) is between 5 and 40 m below ground surface, with a standard deviation of 10 to 15 m (Vegter, 2003).

The chances of striking water are neither enhanced nor on the other hand appreciably reduced by the presence of dykes. Dykes should not be regarded as hydrogeologically different from the gneisses, granites and granitoids in which they occur but as part and parcel of a hard-rock entirety. Their water-bearing characteristics should be seen neither as barrier nor as conduit but as variable as the adjoining country rock. The groundwater-bearing capacity therefore depends on whether country rock or dykes, or both, are weathered and fractured to below the water level.

The poor groundwater-bearing nature in the rocks of the Nelspruit Granite Suite can be attributed to the scarcity of basins, troughs or zones of weathering and fracturing. Compared to the strike distribution between weathered/fractured and fresh rock in the other lithostratigraphic units, a larger fraction of the groundwater strikes in the Nelspruit Granite Suite appears to be in fresh rock (Vegter, 2003).

9.7.1.3.6 Seismicity

According to the Seismic Hazard Map of South Africa in the SANS 10160-4 (2009), the peak ground acceleration (PGA) with a 10% probability of being exceeded in a 50-year period in the Nelspruit area is less than 0.05g, which would be considered a low hazard.

9.7.1.3.7 Trial Pits

Trial pits were excavated to maximum depth of 2.81 m BGL, unless terminated or refusing at a shallower depth, by means of a JCB 3DX SUPER (69 kW) tractor-loaded-backhoe (TLB). The trial pit excavations were photographed, sampled and profiled according to the relevant standards and guidelines (AEG/SAICE/SAIEG, 2002). Of the 34 trial pits, 13 ended in refusal. None of the trial pits showed signs of seepage. The locations of the trial pits are indicated in **Figure 9-27** below.

Figure 9-27: Trial pit locations

9.7.1.3.8 Rotary Core Borehole Drilling

Thirty (30 No.) rotary cored boreholes were drilled across the site. The borehole core was photographed by the drilling contractor, and subsequently the core logged according to the relevant standards and guidelines (AEG/SAICE/SAIEG, 2002). Furthermore, samples were retrieved and submitted to Rocklab, Soillab and STLab for rock, aggregate and material testing. The locations of the boreholes are indicated in **Figure 9-28** below.

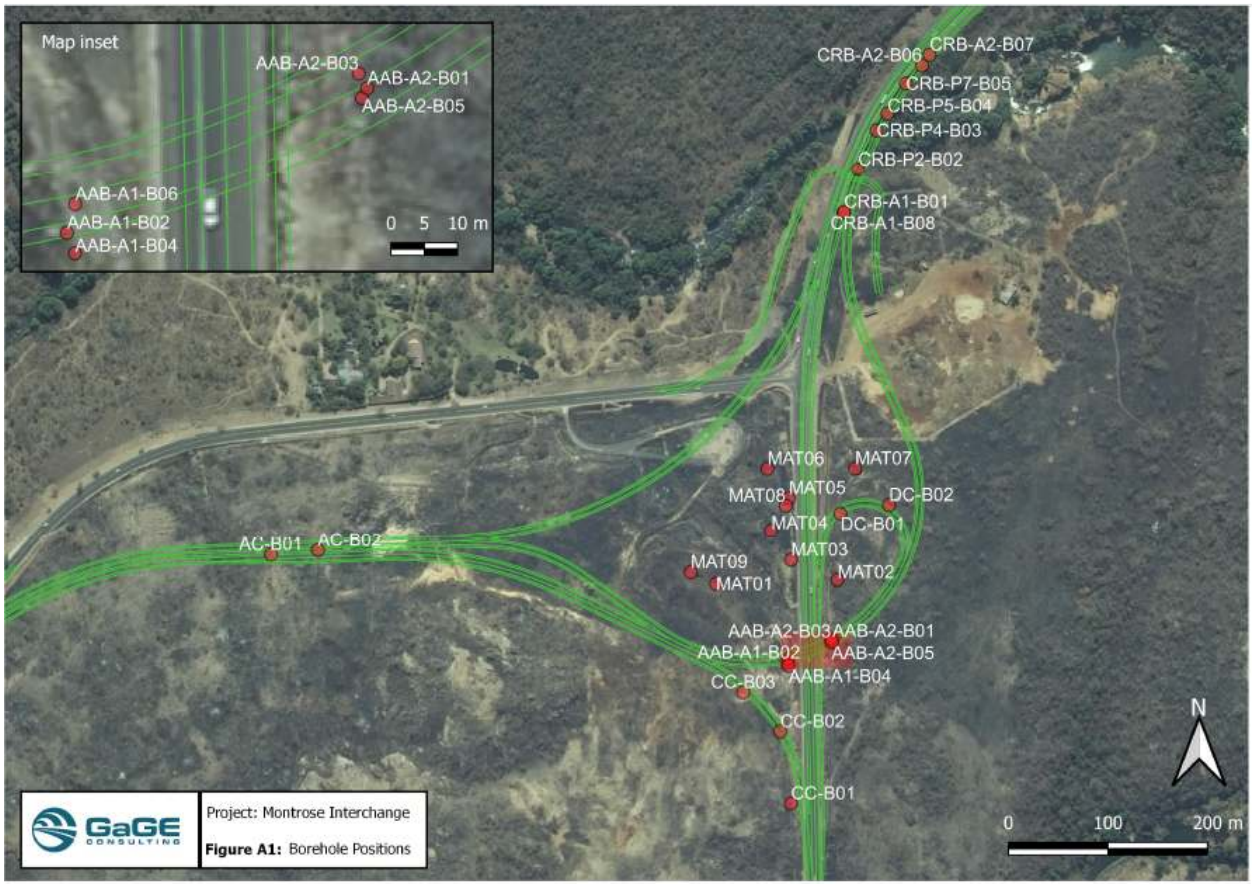

Figure 9-28: Borehole positions

9.7.1.4 Conclusion

Detailed assessments have been undertaken and inform the design of the interchange.

9.8 Assumptions and Limitations Identified by Specialists

The impacts identified as part of the various specialist studies have heavily influenced the impact assessment included in the EIA. As such, it is important to note the assumptions and limitations identified by the various specialists (where applicable):

- Ecological Assessment (EkoInfo, 2020)
  - The assessment represents a sample not a census, therefore not all of the area was covered, only plots were surveyed, no walkdown of the proposed road servitude was done.
  - The main objective was to verify the presence or absence of species of concern, specifically plants for which permits are required to remove
  - The survey was done at the beginning of the growing season, thus not all of the plant was flowering or having seed.
  - The optimal time for vegetation surveys in the summer rainfall area of South Africa is January/February to April/ May in the Savanna Biome.
  - For the purpose of this ecological assessment, only those areas not associated with existing road infrastructure had been considered.
  - It is assumed that information from third parties are accurate and/ or correct.
- Aquatic Assessment (Prism EMS, 2020a)
  - The report is based on survey and assessment techniques which were limited by time and budgetary constraints relevant to the type and level of investigation undertaken. GPS coordinates may vary as they were recorded with a handheld GPS.
  - The study was limited to a snapshot view during a single site visit and may therefore only be indicative of site conditions and aquatic diversity during the respective season. The field investigation was undertaken during October 2019 (wet season); which may subsequently result in reduced aquatic macroinvertebrate diversity due to flood events. The SASS5 and IHAS scores are representative of the Wet Season.
  - It must be noted that, during the process of converting spatial data to final output drawings, several steps are followed that may affect the accuracy of marked points and boundaries. Due care has been taken to preserve accuracy. Printing or other forms of reproduction may also distort the scale indicated in maps. It is unlikely that more surveys would alter the outcome of this study radically due to the study being conducted by a SASS5 Accredited Practitioner and SACNASP registered Professional Scientist.
- Wetland Assessment (Prism EMS, 2020b)
  - The study was limited to a snapshot view during a few site visits. The field investigations were undertaken during October 2019 and January 2020 to assess and confirm the delineated Wetland zones present on the survey area. Weather conditions during the survey were favourable for recordings. The delineations were recorded by handheld GPS.
  - It must be noted that, during the process of converting spatial data to final output drawings, several steps are followed that may affect the accuracy of areas delineated. Due care has been taken to preserve accuracy. Printing or other forms of reproduction may also distort the scale

indicated in maps. It is therefore suggested that the wetland areas identified in this report be pegged in the field in collaboration with the surveyor for precise boundaries.
    - It is unlikely that more surveys would alter the outcome of this study radically.
- Visual Impact Assessment (Terralogix, 2020)
    - The analyses are based on available data at a scale of 1: 50 000 and smaller.
    - The analyses do not take any vegetation cover into account and can thus be regarded as worst-case scenarios.
    - For the analyses, the provided layout (DXF) was used.
    - The positions of the proposed lights were provided.
- Phase 1 Heritage Impact Assessment (HCAC, 2020)
    - The authors acknowledge that the brief literature review is not exhaustive on the literature of the area. Due to the nature of heritage resources and pedestrian surveys, the possibility exists that some features or artefacts may not have been discovered/recorded during the survey and the possible occurrence of graves and other cultural material cannot be excluded.
    - Similarly, the depth of the deposit of heritage sites cannot be accurately determined due its subsurface nature. This report only deals with the footprint area of the proposed development and consisted of non-intrusive surface surveys.
    - This study did not assess the impact on medicinal plants and intangible heritage as it is assumed that these components would have been highlighted through the public consultation process if relevant. It is possible that new information could come to light in future, which might change the results of this Impact Assessment

10 IMPACT ASSESSMENT

10.1 Overall Impact Assessment

This section focuses on the potential environmental impacts that could be caused by the proposed development.

An 'impact' refers to the change to the environment resulting from an environmental aspect (or activity), whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity. From a qualitative perspective, impacts were identified as follows:

- Impacts associated with listed activities contained in GN 983-985 of 4 December 2014 (Listing Notice, 1, 2 and 3), for which authorisation has been applied for;
- An assessment of the project activities and components; and
- Issues highlighted by I&APs (both the general public and authorities).
-

In addition to the above more qualitative descriptions of impacts, a more detailed quantitative assessment of impacts is also provided and specifically takes into account impacts to the receiving environment (Section 5) and the findings from Specialist Studies (Section 9). This quantitative impact assessment uses the impact assessment methodology discussed in the approved Scoping Report and Plan of Study for the EIA. A summary of the methodology is provided below.

The **significance** of an impact is defined as the combination of the **consequence** of the impact occurring and the **probability** that the impact will occur. The nature and type of impact may be direct or indirect and may also be positive or negative, refer to **Table 10-1:** below for the specific definitions.

Table 10-1: Nature and type of impact.

	Nature and Type of Impact:		
IMPACT	**Direct**	Impacts that are caused directly by the activity and generally occur at the same time and place as the activity	✓/✖
	Indirect	Indirect or induced changes that may occur as a result of the activity. These include all impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity	✓/✖
	Cumulative	Those impacts associated with the activity which add to, or interact synergistically with existing impacts of past or existing activities, and include direct or indirect impacts which accumulate over time and space	✓/✖
	Positive	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes will benefit significantly, and includes neutral impacts (those that are not considered to be negative	✓
	Negative	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes will be comprised	✖

Table 10-2: presents the defined criteria used to determine the **consequence** of the impact occurring which incorporates the extent, duration, and intensity (severity) of the impact.

Table 10-2: Consequence of the Impact occurring.

CONSEQUENCE		
	Extent of Impact:	
	Site	Impact is limited to the site and immediate surroundings, within the study site boundary or property (immobile impacts)
	Neighbouring	Impact extends across the site boundary to adjacent properties (mobile impacts)
	Local	Impact occurs within a 5km radius of the site
	Regional	Impact occurs within a provincial boundary
	National	Impact occurs across one or more provincial boundaries
	Duration of Impact:	
	Incidental	The impact will cease almost immediately (within weeks) if the activity is stopped, or may occur during isolated or sporadic incidences
	Short-term	The impact is limited to the construction phase, or the impact will cease within 1 - 2 years if the activity is stopped
	Medium-term	The impact will cease within 5 years if the activity is stopped
	Long-term	The impact will cease after the operational life of the activity, either by natural processes or by human intervention
	Permanent	Where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the impact can be considered transient
	Intensity or Severity of Impact:	
	Low	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are not affected
	Low-Medium	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are modified insignificantly
	Medium	Impacts affect the environment in such a way that natural, cultural and/or social functions and processes are altered
	Medium-High	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes are severely altered
	High	Impacts affect the environment in such a way that natural, cultural and / or social functions and processes will permanently cease

The probability of the impact occurring is the likelihood of the impacts actually occurring, and is determined based on the classification provided in **Table 10-3**.

Table 10-3: Probability and confidence of impact prediction

PROBABILITY		
	Probability of Potential Impact Occurrence:	
	Improbable	The possibility of the impact materialising is very low either because of design or historic experience
	Possible	The possibility of the impact materialising is low either because of design or historic experience
	Likely	There is a possibility that the impact will occur
	Highly Likely	There is a distinct possibility that the impact will occur
	Definite	The impact will occur regardless of any prevention measures

The **significance** of the impact is determined by considering the consequence and probability without taking into account any mitigation or management measures and is then ranked according to the ratings listed in **Table 10-4**:. The level of confidence associated with the impact prediction is also considered as low, medium or high (**Table 10-5:**).

Table 10-4: Significance rating of the impact.

	Significance Ratings:	
SIGNIFICANCE	**Low**	Neither environmental nor social and cultural receptors will be adversely affected by the impact. Management measures are usually not provided for low impacts
	Low-Medium	Management measures are usually encouraged to ensure that the impacts remain of Low-Medium significance. Management measures may be proposed to ensure that the significance ranking remains low-medium
	Medium	Natural, cultural and/or social functions and processes are altered by the activities, and management measures must be provided to reduce the significance rating
	Medium-High	Natural, cultural and/or social functions and processes are altered significantly by the activities, although management measures may still be feasible
	High	Natural, cultural, and/or social functions and processes are adversely affected by the activities. The precautionary approach will be adopted for all high significant impacts and all possible measures must be taken to reduce the impact

Table 10-5: Level of confidence of the impact prediction

	Level of Confidence in the Impact Prediction:	
CONFIDENCE	**Low**	Less than 40% sure of impact prediction due to gaps in specialist knowledge and/or availability of information
	Medium	Between 40 and 70% sure of impact prediction due to limited specialist knowledge and/or availability of information
	High	Greater than 70% sure of impact prediction due to outcome of specialist knowledge and/or availability of information

Once significance rating has been determined for each impact, management and mitigation measures must be determined for all impacts that have a significance ranking of Medium and higher in order to attempt to reduce the level of significance that the impact may reflect.

The EIA Regulations, 2014 specifically require a description is provided of the degree to which these impacts:

- can be reversed;
- may cause irreplaceable loss of resources; and
- can be avoided, managed, or mitigated.

Based on the proposed mitigation measures the EAP will determined a mitigation efficiency (Table 10-6:) whereby the initial significance is re-evaluated and ranked again to effect a significance that incorporates the mitigation based on its effectiveness. The overall significance is then re-ranked and a final significance rating is determined.

Table 10-6: Mitigation efficiency

MITIGATION EFFICIENCY	Mitigation Efficiency	
	None	Not applicable
	Very Low	Where the significance rating stays the same, but where mitigation will reduce the intensity of the impact. Positive impacts will remain the same
	Low	Where the significance rating reduces by one level, after mitigation
	Medium	Where the significance rating reduces by two levels, after mitigation
	High	Where the significance rating reduces by three levels, after mitigation
	Very High	Where the significance rating reduces by more than three levels, after mitigation

The reversibility is directly proportional the "Loss of Resource" where no loss of resource is experienced, the impact is completely reversible; where a substantial "Loss of resource" is experienced there is a medium degree of reversibility; and an irreversible impact relates to a complete loss of resources, i.e. irreplaceable (**Table 10-7**:).

Table 10-7: Degree of reversibility and loss of resources

DEGREE REVERSABILITY & LOSS OF RESOURCES	Loss of Resources:	
	No Loss	No loss of social, cultural and/or ecological resource(s) are experienced. Positive impacts will not experience resource loss
	Partial	The activity results in an insignificant or partial loss of social, cultural and/or ecological resource(s)
	Substantial	The activity results in a significant loss of social, cultural and/or ecological resource(s)
	Irreplaceable	The activity results in the complete and irreplaceable social, cultural and/or ecological loss of resource(s)
	Reversibility:	
	Irreversible	Impacts on natural, cultural and/or social functions and processes are irreversible to the pre-impacted state in such a way that the application of resources will not cause any degree of reversibility
	Medium Degree	Impacts on natural, cultural and/or social functions and processes are partially reversible to the pre-impacted state if less than 50% resources are applied
	High Degree	Impacts on natural, cultural and/or social functions and processes are partially reversible to the pre-impacted state if more than 50% resources are applied
	Reversible	Impacts on natural, cultural and/or social functions and processes are fully reversible to the pre-impacted state if adequate resources are applied

10.1.1 Cumulative Impacts

It is important to assess the natural environment using a systems approach that will consider the cumulative impact of various actions. Cumulative impact refers to the impact on the environment, which results from the incremental impact of the actions when added to other past, present, and reasonably foreseeable future actions regardless of what agencies or persons undertake such actions. Cumulative impacts can result from individually minor, but collectively significant actions or activities taking place over a period of time.

Cumulative effects can take place frequently and over a period of time that the effects cannot be assimilated by the environment.

10.2 Qualitative Discussion of Impacts

10.2.1 Impacts Associated with Listed Activities

As mentioned, the project requires authorisation for certain activities listed in the 2014 EIA Regulations, which serve as triggers for the environmental assessment process. The potential impacts associated with the key listed activities are broadly stated in **Table 10-8.**

Table 10-8: Potential impacts associated with Listed Activities

Listing Notice	Activity	Description of Listed Activity (Summary- please refer to Section 4.2. for full wording including exclusions.	Interpretation	Potential Impacts
NEMA: Listing Notice 1 (require Basic Assessment)				
GN R 983 4 December 2014 (as amended)	9 (i)	*The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water—* *(i) with an internal diameter of 0,36 metres or more; or* *(ii) with a peak throughput of 120 litres per second or more;*	As part of the new interchange development, a section of the existing N4 Schoemanskloof (R539) Route will be re-aligned. As part of this, new stormwater drainage will be put in place and will include: • Cut-off berms or drains on top of deep cuts; • Type F concrete side drains and grid inlets to intercept road surface runoff; • Type A concrete side drains in high fills; where run-off will be discharged by downpipes/ chutes; • A minimum of 900 mm diameter cross drainage culverts (In accordance with SANRAL standards for culverts longer than 30 m);	Due to the fact that the existing alignment of the N4 Schoemanskloof (R539) already has stormwater infrastructure, it is not expected that the newly developed alignment and associated stormwater will have an additional extensive impact to the resource quality of the drainage lines they cross. However, the following general impacts apply: • Potential adverse effects to resource quality of the drainage lines they cross (i.e. flow, in-stream and riparian habitat, aquatic biota, and water quality). • Destabilisation of affected drainage lines. • Potential loss of sensitive environmental features. • Erosion and siltation of watercourse.
	12 (ii)(a) (c)	*The development of—* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;*	The proposed interchange development involves re-aligning a section of the existing N4 Schoemanskloof (R539) Route to approximately 100m south of the existing road. Part of this road traverses three minor drainage lines and as such will result in infrastructure of more than 100m^2 within a watercourse as well as within 32m of a watercourse.	• Potential adverse effects to resource quality of the drainage lines the new road alignment crosses (i.e. flow, in-stream and riparian habitat, aquatic biota, and water quality). • Destabilisation of affected drainage lines. • Potential loss of sensitive environmental features.

Listing Notice	Activity	Description of Listed Activity (Summary- please refer to Section 4.2. for full wording including exclusions.	Interpretation	Potential Impacts
		that activity applies		• Erosion and siltation of watercourse.
	19 (i)	*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-* *(i**) a watercourse;*** *(ii) the seashore; or* *(iii) the littoral active zone, an estuary or a distance of 100 metres inland of the high-water mark of the sea or an estuary, whichever distance is the greater but excluding where such infilling, depositing , dredging, excavation, removal or moving-* *(a) will occur behind a development setback;* *(b) is for maintenance purposes undertaken in accordance with a maintenance management plan; or* *(c) falls within the ambit of activity 21 in this Notice, in which case that activity applies.*	The proposed interchange development involves the upgrade of the existing bridge over the Crocodile River which will be widened to accommodate an undivided 4-lane cross-section. An additional deck will need to be stitched to the existing to accommodate the larger cross section along with extended abutments and additional piers. In addition, the re-aligned N4 Schoemanskloof (R539) Route crosses a number of small drainage lines. These activities will result in more than 10 cubic metres of material from the Crocodile River as well as unnamed drainage lines. In addition, depositing of material (concrete etc.) will be undertaken as part of the road and bridge construction.	• Potential adverse effects to resource quality of the drainage lines and Crocodile River due to the new road alignment crossing drainage lines as well as the expansion of the Crocodile River bridge (e.g. impacts to flow, in-stream and riparian habitat, aquatic biota and water quality). • Destabilisation of affected drainage lines and Crocodile River. • Potential loss of sensitive environmental features. • Erosion and siltation of watercourse. • Construction impacts related to poor management of waste and hazardous substances (spills, leaks etc).
	48.(i) (a)(c)	*The expansion of –* *(i) infrastructure or structures where the physical footprint is expanded by 100 square metres or more; or* *(ii) dams or weirs, where the dam or weir, including infrastructure and water surface area, is expanded by 100 square metres or more;* *where such expansion occurs –* *(a) within a watercourse;* *(b) in front of a development setback; or*	The proposed interchange development involves the upgrade of the existing bridge over the Crocodile River which will be widened to accommodate an undivided 4-lane cross-section. This will result in the expansion of infrastructure by more than 100m^2 within a watercourse. This will result in an expansion of infrastructure within the watercourse and within 32m of the watercourse.	• Potential adverse effects to resource quality of the Crocodile River due to the expansion of the Crocodile River bridge (e.g. impacts to flow, in-stream and riparian habitat, aquatic biota, and water quality). • Destabilisation of affected riverbank.

Listing Notice	Activity	Description of Listed Activity (Summary- please refer to Section 4.2. for full wording including exclusions.	Interpretation	Potential Impacts
		(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse		• Potential loss of sensitive environmental features. • Erosion and siltation of watercourse. • Construction impacts related to poor management of waste and hazardous substances (spills, leaks etc affecting Crocodile River).
	56.(i)	*The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre –* *(i) where the existing reserve is wider than 13,5 meters; or* *(ii) where no reserve exists, where the existing road is wider than 8 metres;*	The proposed new Montrose Interchange aims to replace the existing at-grade intersection of Maputo Development Corridor (MDC) sections 6N (known as N4 Schoemanskloof (R539) Route) and 6E (known as Elands Valley). As part of, a section of the existing N4 toll route via Ngodwana will be widened by more than 6m to accommodate undivided 4-lane cross-section.	• Clearance of vegetation resulting in potential loss of sensitive species • Disturbance to fauna and avifauna during construction. • Loss of available habitat and associated impacts on fauna that depends on the habitat. • Potential for erosion. • Increased invasive alien species in road reserve. • Disturbances to traffic during construction. • Construction impacts related to poor management of waste and hazardous substances (spills, leaks etc).
NEMA: Listing Notice 2 (require Scoping and EIR)				
GN R 984 4 December 2014 (as amended)	27.	*The development of a road –* *-with a reserve wider than 30 metres; or* *-catering for more than one lane of traffic in both directions*	The proposed development involves the development of a new interchange. As part of this, the existing N4 Schoemanskloof (R539) Route will be realigned to approximately 100m south of its current location. In addition, a number of new ramps will be put in place. This	• Clearance of vegetation resulting in potential loss of sensitive species • Disturbance to fauna and avifauna during construction. • Loss of available habitat and associated impacts on fauna that depends on the habitat.

Listing Notice	Activity	Description of Listed Activity (Summary- please refer to Section 4.2. for full wording including exclusions.	Interpretation	Potential Impacts
			new section caters for more than one lane of traffic in both directions. Further, the minimum road reserve width requirement for the realigned N4 Schoemanskloof (R539) Route is 40 m (with the cut and fill sections resulting in a much wider road reserve). The minimum road reserve width required for all ramps is 20 m either side of the centre of the ramp.	• Potential for erosion. • Increased invasive alien species in road reserve. • Construction impacts related to poor management of waste and hazardous substances (spills, leaks etc).
NEMA: Listing Notice 3 (require Basic Assessment)				
GN R 985 4 December 2014 (as amended)	4 (f)(i) (ee) (gg)	*The development of a road wider than 4 metres with a reserve less than 13,5 metres.* ***(f) Mpumalanga*** *i. Outside urban areas:* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; or* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas, where such areas comprise indigenous vegetation.*	The proposed development involves the development of a new interchange. As part of this, the existing N4 Schoemanskloof (R539) Route will be realigned to approximately 100m south of its current location. Additional ramps will also be put in place. These activities will take place outside an urban area in areas identified as a Critical Biodiversity Areas (CBA). Temporary access roads will also be required as well as re-instatement of access for affected landowners.	• Clearance of vegetation resulting in potential loss of sensitive species • Disturbance to fauna and avifauna during construction. • Loss of sensitive vegetation related to the CBA • Loss of available habitat and associated impacts on fauna that depends on the habitat. • Potential for erosion. • Increased invasive alien species in road reserve. • Construction impacts related to poor management of waste and hazardous substances (spills, leaks etc).
	12 (f)(i)(ii)	*The clearance of an area of 300m^2 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.* ***f. Mpumalanga***	The proposed development involves the development of a new interchange. As part of this, the existing N4 Schoemanskloof (R539) Route will be realigned to approximately 100m south of its current location. Additional ramps will also be put in place. These activities	• Clearance of vegetation resulting in potential loss of sensitive species • Disturbance to fauna and avifauna during construction. • Loss of sensitive vegetation related to the CBA and threatened vegetation type.

Listing Notice	Activity	Description of Listed Activity (Summary- please refer to Section 4.2. for full wording including exclusions.	Interpretation	Potential Impacts
		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 identified in bioregional plans*	will take place in areas identified as a Critical Biodiversity Areas (CBA) as well as within the historical extent of a threatened ecosystem (Legogote Sour Bushveld). This will result in the clearance of more than 300m^2 of indigenous vegetation,	(Note according to the Ecologist, due to the size of the development, this impact will not be significant). • Loss of available habitat and associated impacts on fauna that depends on the habitat. • Potential for erosion. • Increased invasive alien species in road reserve. • Construction impacts related to poor management of waste and hazardous substances (spills, leaks etc).
	14 (ii)(f)(i) (ff) (hh)	*The development of* *(i) dams or weirs, where the dam or weir, including infrastructure and water surface area exceeds 10 square metres; or* *(ii) infrastructure or structures with a physical footprint of 10 square metres or more;* *where such Development occurs—* *(a) within a watercourse;* *(b) in front of a development setback; or* *(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour.* ***f. Mpumalanga*** *i. Outside urban areas:*	The proposed interchange development involves the upgrade of the existing bridge over the Crocodile River which will be widened to accommodate an undivided 4-lane cross-section. An additional deck will need to be stitched to the existing to accommodate the larger cross section along with extended abutments and additional piers. In addition, the re-aligned N4 Schoemanskloof (R539) Route crosses a number of small drainage lines. These activities will result in the development of more than 10m^2 of infrastructure within a watercourse or within 32m of a watercourse in a Critical Biodiversity Area (CBA).	• Potential adverse effects to resource quality of the Crocodile River due to the expansion of the Crocodile River bridge and the new alignment through drainage lines (e.g. impacts to flow, in-stream and riparian habitat, aquatic biota and water quality). • Destabilisation of affected riverbank/drainage lines. • Potential loss of sensitive environmental features. • Erosion and siltation of watercourse. • Construction impacts related to poor management of waste and hazardous substances (spills, leaks etc affecting Crocodile River).

Listing Notice	Activity	Description of Listed Activity (Summary- please refer to Section 4.2. for full wording including exclusions.	Interpretation	Potential Impacts
		(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans; *(hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation.*		
	18 (f)(i) (ee) (gg)	*The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre.* *f. Mpumalanga* *i. Outside urban areas:* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation.*	The proposed new Montrose Interchange aims to replace the existing at-grade intersection of Maputo Development Corridor (MDC) sections 6N (known as N4 Schoemanskloof (R539) Route) and 6E (known as Elands Valley). As part of, a section of the existing N4 toll route via Ngodwana will be widened by more than 6m to accommodate undivided 4-lane cross-section. This widening will take place in area identified as a Critical Biodiversity Area (CBA).	• Clearance of vegetation resulting in potential loss of sensitive species • Disturbance to fauna and avifauna during construction. • Loss of sensitive vegetation related to the CBA • Loss of available habitat and associated impacts on fauna that depends on the habitat. • Potential for erosion. • Increased invasive alien species in road reserve. • Construction impacts related to poor management of waste and hazardous substances (spills, leaks etc).
	23 (ii)(f)(i) (ee) (gg)	*The expansion of –* *(i) dams or weirs where the dam or weir is expanded by 10 square metres or more; or* *(ii) infrastructure or structures where the physical footprint is expanded by 10 square metres or more; where such expansion occurs –* *(a) within a watercourse;* *(b) in front of a development setback adopted in the prescribed manner; or*	The proposed interchange development involves the upgrade of the existing bridge over the Crocodile River which will be widened to accommodate an undivided 4-lane cross-section. This will result in the expansion of infrastructure by more than 100m2 within a watercourse. This will result in an expansion of	• Potential adverse effects to resource quality of the Crocodile River due to the expansion of the Crocodile River bridge (e.g. impacts to flow, in-stream and riparian habitat, aquatic biota and water quality).

Listing Notice	Activity	Description of Listed Activity (Summary- please refer to Section 4.2. for full wording including exclusions.	Interpretation	Potential Impacts
		(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse; excluding the expansion of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. *f. Mpumalanga* *i. Outside urban areas:* *(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;* *(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve, where such areas comprise indigenous vegetation.*	infrastructure within the watercourse and within 32m of the watercourse. This widening will take place in area identified as a Critical Biodiversity Area (CBA).	• Destabilisation of affected riverbank. • Potential loss of sensitive environmental features. • Erosion and siltation of watercourse. • Construction impacts related to poor management of waste and hazardous substances (spills, leaks etc affecting Crocodile River).

10.2.2 Environmental Activities

In order to understand the impacts related to the project it is necessary to unpack the activities associated with the project life cycle as described below:

- Feasibility Studies
    - Technical, economic and environmental screening of alternatives;
    - Development of Preliminary Design Report;
    - Geotechnical Assessment;
    - Discussions with landowner; and
    - Environmental Authorization and WULA process.
- Pre-construction Phase
    - Detailed layouts and services designs;
    - Procurement process for Contractors;
    - Land acquisition;
    - Procurement of other necessary materials.
    - Obtaining necessary permits for removal of Protected trees and sensitive plant species (as required)
    - Appoint Environmental Control Officer;
- Construction Phase
    - Appointments and site camp set up:
        - Set up site camp with temporary offices and administrative facilities;
        - Set up ablutions;
        - Set up access control, security; signage and lighting;
        - General materials storage and laydown areas
        - Construction employment;
        - Change-houses, chemical toilets and showering facilities (linked to conservancy tanks – removal of contents by exhauster vehicle and disposal at permitted facility); and
        - Temporary waste storage areas; these shall be established and managed in accordance with EMPr requirements to be developed in the EIA phase.
    - Sourcing of construction materials and equipment:
        - All bulk materials (aggregate, cement, steel etc.) will be sourced from existing lawful commercial sources; or should it be necessary separate applications for mining permits to allow for borrow pits will be undertaken prior to use.
    - Excavation and earthworks
        - Removal of existing surfacing material where necessary (concrete, asphalt etc.) which could involve excavation below ground level;
        - Levelling and compaction using heavy machinery / earthmoving equipment.
        - Cut and fill activities
            - From the centre line soils investigation, the gravels found in the vicinity of the new road alignment can be used in the selected subgrade layers or as fill with

careful selection of materials. From the initial modelling of cut and fill it was found that the construction of the new alignment would yield surplus cut material and therefore none to limited additional material would be required from other sources for the selected and fill layers.

- Therefore, such of the fill material will be sourced from the cuts undertaken and will therefore be crushed on site.
- A multistage crusher will be established on site.
- Potential for excavations and trenching in order to lay of below ground level equipment (cables, pipes, sumps, drainage etc.);
- Relocation or protection of existing services
- Potential for excavation dewatering in the event of water-table interception;
- Use of general mechanical equipment within construction areas (generators, cutting and welding equipment, compressors etc.).

- Storage
  - Storage of aggregate and materials required for road construction (bitumen etc.)
  - Storage of topsoil and sub soil
  - Storage of hazardous material
  - Storage of waste
- Expansion of Crocodile Bridge
  - To achieve the required roadway widening, a second bridge will be constructed alongside the existing structure. The decks of the existing and new bridge will be stitched together by means of a reinforced concrete connection
  - New piers found on bedrock will be constructed to support the new deck (existing piers founded similarly)
  - The new abutments will be perched and founded into bedrock by piling through the constructed road approach fills. These road embankments will spill through the abutments and will require gabion protection at fill toes
  - Span by span construction will be undertaken and the streamflow will be accommodated within unaffected spans during construction
  - Conventional ground supported staging will be used to construct the new bridge deck
- New N4 Schoemanskloof (R539) through drainage lines
  - The re-aligned N4 Schoemanskloof (R539) Route crosses a number of small drainage lines. The same drainage paths were crossed by the existing N4-6Y alignment and so the stormwater will be handled in much the same way:
  - Earth embankments/ berms will be constructed at the top of the cuttings to channel stormwater runoff for a short distance to inlet structures at the top of the cuttings.
  - The water will then be conveyed beneath the realigned N4-6Y in concrete pipes with a minimum diameter of 600 mm.
  - The stormwater will then discharge from these culverts into existing open, unlined channels or into newly constructed open earth channels.

- The aim is to reinstate the existing flow paths and to not increase the discharge flows at any of the existing culverts where possible.

- **Operation Phase:**
  - Maintenance of infrastructure.
- **Decommissioning Phase**
  - Decommissioning of the development and associated services is not envisioned. However, should decommissioning be required the activity will need to comply with the appropriate environmental legislation and best practices at that time.

Related to the project life cycle is a number of project activities and secondary environmental activities. These are tabulated in **Table 10-9.**

Table 10-9: Project Activities

Pre-Construction	**Project Activities**
	Detailed layouts and services designs
	Procurement process for Contractors
	Procurement of other necessary materials
	Environmental Activities
	Appointment of Environmental Control Officer (ECO)
	Approval of site camp/construction layout to minimise impact to the
	Obtaining necessary permits for Protected Trees and other sensitive features as required
	Barricading of sensitive environmental features
Construction	**Project Activities**
	Appointments and site camp set up: • Set up site camp with temporary offices and administrative facilities; • Set up ablutions • Set up access control, security; signage and lighting • General materials storage and laydown areas • Construction employment • Change-houses, chemical toilets and showering facilities (linked to conservancy tanks – removal of contents by exhauster vehicle and disposal at permitted facility) • Temporary waste storage areas; these shall be established and managed in accordance with EMPr requirements
	Sourcing of construction materials and equipment: • All bulk materials (aggregate, cement, steel etc.) will be sourced from existing lawful commercial sources; or should it be necessary separate applications for mining permits to allow for borrow pits will be undertaken prior to use.
	• Excavation and earthworks • Removal of existing surfacing material where necessary (concrete, asphalt etc.) which could involve excavation below ground level; • Levelling and compaction using heavy machinery / earthmoving equipment. • Cut and fill activities o From the centre line soils investigation, the gravels found in the vicinity of the new road alignment can be used in the selected subgrade layers or as fill with careful selection of materials. From the initial modelling of cut and fill it was found that the construction of the new alignment would yield surplus cut material and therefore none to

limited additional material would be required from other sources for the selected and fill layers. • Therefore, such of the fill material will be sourced from the cuts undertaken and will therefore be crushed on site. • A multistage crusher will be established on site. • Potential for excavations and trenching in order to lay of below ground level equipment (cables, pipes, sumps, drainage etc.); • Relocation or protection of existing services • Potential for excavation dewatering in the event of water-table interception; • Use of general mechanical equipment within construction areas (generators, cutting and welding equipment, compressors etc.).
• Storage • Storage of aggregate and materials required for road construction (bitumen etc.) • Storage of topsoil and sub soil • Storage of hazardous material • Storage of waste
• Expansion of Crocodile Bridge • To achieve the required roadway widening, a second bridge will be constructed alongside the existing structure. The decks of the existing and new bridge will be stitched together by means of a reinforced concrete connection • New piers found on bedrock will be constructed to support the new deck (existing piers founded similarly) • The new abutments will be perched and founded into bedrock by piling through the constructed road approach fills. These road embankments will spill through the abutments and will require gabion protection at fill toes • Span by span construction will be undertaken and the streamflow will be accommodated within unaffected spans during construction • Conventional ground supported staging will be used to construct the new bridge deck
• New N4 Schoemanskloof (R539) through drainage lines • The re-aligned N4 Schoemanskloof (R539) Route crosses a number of small drainage lines. The same drainage paths were crossed by the existing N4-6Y alignment and so the stormwater will be handled in much the same way: • Earth embankments/ berms will be constructed at the top of the cuttings to channel stormwater runoff for a short distance to inlet structures at the top of the cuttings. • The water will then be conveyed beneath the realigned N4-6Y in concrete pipes with a minimum diameter of 600 mm. • The stormwater will then discharge from these culverts into existing open, unlined channels or into newly constructed open earth channels. • The aim is to reinstate the existing flow paths and to not increase the discharge flows at any of the existing culverts where possible.
Environmental Activities
Diligent compliance monitoring of the EMPr, environmental authorisation and other relevant environmental legislation
Monitoring of water quality as per the requirements of the GA
Continued consultation with I&APS (as required).
Environmental awareness creation and training

Operation	**Project Activities**
	Maintenance of infrastructure;
	Environmental Activities
	Monitoring as and when required by the EMPr. Please note this will be limited during the operational phase.

10.2.3 Environmental Aspects

Environmental aspects are regarded as those components of an organisation's activities, products and services that are likely to interact with the environment and cause an impact. The following environmental aspects have been identified for the proposed development which are linked to the project activities (note that only high-level aspects are provided):

Table 10-10: Environmental Aspects

Pre-Construction	**Aspects**
	Inadequate consultation with I&APs
	Inadequate environmental and compliance monitoring
	Inadequate or lack of detailed designs and studies.
	Poor construction site planning and layout
	Absence of relevant permits (e.g. for species of conservation importance, heritage resources) – if required
	Lack of barricading of sensitive environmental features
	Poor waste management
	Absence of ablution facilities
Construction	**Aspects**
	Inadequate consultation with I&APs
	Inadequate environmental and compliance monitoring
	Lack of environmental awareness creation
	Indiscriminate site clearing
	Poor site establishment
	Lack of necessary construction stormwater management resulting in impacts to resource quality of Crocodile River and drainage lines
	Poor management of storage of materials resulting in contamination
	Poor management of concrete batching and crushing of aggregate resulting in dust
	Clearing or activities in sensitive areas (not linked to activities that are authorised).
Operation	**Aspects**
	Inadequate consultation with I&APs
	Inadequate environmental and compliance monitoring
	Lack of environmental awareness creation
	Lack of maintenance
	Poor management of access to sensitive areas
	Poor management of stormwater
	Poor management of litter and waste.

10.2.4 Issues raised by Environmental Authorities and IAPs

The issues raised by authorities (both regulatory and commenting) and I&APs received to date during the execution of the Scoping and EIA process are captured and addressed in the Comments and Responses Report (**Appendix 14.5.6**). No objections have been received to date.

The following potential impacts were identified:

- Impacts related to the high tower lighting;
- Potential traffic impacts during the construction of the interchange which may affect logistics and travels of large haul trucks transporting timber;

- Loss of business and revenue due to changes in access;

These issues helped identify specialist and technical studies required and thus contributed to the assessment of impacts in **Section 10.3**.

10.2.5 Issues raised during the EIA Phase

During the EIA Phase, I&APs raised the following issues.

These were incorporated into the Impact Assessment in the following ways:

10.3 Quantitative Impact Assessment

Table 10-11 below provides a summary of the identified impacts and significance ranking (WOM = Without Mitigation) for the construction and operational phases of development. Impacts for each alternative (both Additional Piers and Pier head addition) are also provided. Brief comments and/or management measures have been provided for the purposes of assessing whether the implementation of recommended management measures may be sufficient to decrease the significance ranking (WM = With Mitigation).

Where possible, the impact assessments undertaken by the specialists have been integrated into the impact assessment below so to allow a comprehensive and collated assessment of impacts.

The full impact assessment is appended in **Annexure 14.7**.

Table 10-11: Summary of impact assessment for the construction phases

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
CONSTRUCTION PHASE											
Atmospheric Emissions	Negative	Dust emissions	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	*Low-Medium*	Dust emissions are similar between both alternative 1 and 2. '• A speed limit of 20km/h must be maintained on all dirt roads by heavy vehicles.. • Dust suppression by means of either water or biodegradable chemical agent is required. • Adherence to the prescribed dust fallout rates for non-urban areas from the National Dust Control Regulations, 2013 (600 < D <1200 mg/m2/day – 30 day average) • Dust monitoring spot checks (with hand held devices) should be undertaken by the ECO to ensure dust does not exceed allowable levels. • Activities such as crushing of aggregate should be halted in high wind speeds (i.e. during storms) • Where possible, fine aggregate material should be covered to reduce potential for dust. • Any soil excavated, and not utilised for rehabilitation, must be removed from site or covered and no large mounds of soil may be left behind after construction.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low-Medium*		*Low*	*No Loss*	*Reversible*
			No-Go Option	N/A	Yes	Direct	*Low-Medium*	Although the no-go option will not result in new emissions, the site is currently home to old batching plant which is no longer in use but is not properly rehabilitated. Dust impacts are therefore already felt but are not currently mitigated.	*Low-Medium*	*No Loss*	*Reversible*
	Negative	Emissions from vehicles and equipment as well as materials required for the upgrade (CO2, NOx, SOx, VOC's etc.) (and associated potential Climate change implications)	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	*Low*	• In terms of transportation of workers and materials, collective transportation arrangements should be made to reduce individual car journeys where possible. • All vehicles used during the project should be properly maintained and in good working order. • All vehicles and other machinery should comply with road worthy requirements and comply with legislation in terms of allowable emissions. '• Road closures and staging of construction to be planned as far as possible to reduce traffic disruptions (as traffic disruptions are a large source of emissions in road construction projects). '• The proposed interchange has incorporated as much of the existing road and alignment as possible thereby reducing the need for materials '• Much of the material required for the interchange development will be sourced from cuts on site and will thus reduce transportation of materials (and related emissions). '• Design to minimize use of materials where possible (for example, with the ramp bridge utilizing slender deck and arch designs)	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option	N/A	Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
	Negative	Climate Change (Impacts on Construction timeframes and design requirements)	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	*Low*	• Construction planning should take into account weather patterns as well potential changes to these due to climate change (for example, extreme events, flooding etc.) '• Design to take into account relevant floodlines to ensure infrastructure will not be impacted by potential for increased extreme events.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low*		*Low*	*No Loss*	*Reversible*

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
CONSTRUCTION PHASE											
	N/A		No-Go Option	N/A	Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
	Negative	Noise	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	No	Direct	*Low*	• Equipment and/or machinery which will be used must comply with the manufacturer's specifications on acceptable noise levels. • Construction activities should be limited to daytime only. • Spot checks using hand held noise monitoring devices should be undertaken to ensure minimal noise pollution during construction.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A	No	Direct	*Low*		*Low*	*No Loss*	*Reversible*
	N/A		No-Go Option	N/A	Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
Impacts to Drainage lines	Negative	Water quality	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	**Appendix 14.6.3. - Wetland Assessment**	No	Direct	*Low*	• The following mitigation measures suggested by the wetland specialist apply: Rehabilitation of construction impacted area, continuous monitoring. Storm water management. Erosion control. Waste management (litter). As the alternatives do not impact the drainage lines, the study found no preference for either.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low*		*Low*	*No Loss*	*Reversible*
	N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required.	*None*	Not Applicable	Not Applicable

IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
CONSTRUCTION PHASE										
Negative	Flow regime	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		No	Indirect	*Low-Medium*	• The following mitigation measures suggested by the wetland specialist apply: Stock piling outside the drainage line, stormwater management and diversion structures, dry season construction, filtration. **As the alternatives do not impact the drainage lines, the study found no preference for either.** In addition, the following general measures should be implemented: • Instability and erosion of steep slopes must be stabilised immediately. Re-vegetation in consultation with landscape architect and ECO should be done if and where required. • To reduce the loss of material by erosion, disturbance must be kept to a minimum. • Where possible, natural vegetation should be retained to reduce the risk of erosion. • Silt fences must be used to stabilise the site, reduce erosion and silt entering the natural environment. No unchecked silt may enter the natural environment. • Proper stormwater management as per the approved stormwater management plan. • Increased run-off during construction should be managed using berms, temporary cut-off drains, attenuation ponds or other suitable structures, in consultation with the ECO and resident Engineer. • Stormwater management system is to be installed as soon as possible following site establishment, to attenuate stormwater during the construction phase, as well as during the operational phase. • Surface-water run-off and stormwater must be directed away from trenches and areas of excavation.	*Low*	*No Loss*	*Reversible*
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low-Medium*		*Low*	*No Loss*	*Reversible*
N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required.	*None*	Not Applicable	Not Applicable
Negative	Habitat	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		Yes	Indirect	*Low-Medium*	• The following mitigation measures suggested by the wetland specialist apply: minimal ingress and egress. As the alternatives do not impact the drainage lines, the study found no preference for either.	*Low*	*No Loss*	*Reversible*
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low-Medium*		*Low*	*No Loss*	*Reversible*
N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required.	*None*	Not Applicable	Not Applicable
Negative	Biota	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		No	Indirect	*Low*	• The following mitigation measures suggested by the wetland specialist apply: Stock piling outside the drainage line area, erosion control, stormwater management, dry season construction, silt barriers and filtration. **As the alternatives do not impact the drainage lines, the study found no preference for either.** In addition, the following general measures should be implemented: • The wetland area should be declared 'no-go' area's during the construction and must be demarcated prior to construction; • Waste management must be a priority and all waste must be collected and	*Low*	*No Loss*	*Reversible*

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
CONSTRUCTION PHASE											
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low*	stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site; • No trapping, killing or poisoning of any wildlife should be allowed on site; • Staff should be educated about the sensitivity of faunal species and measures should be put in place to deal with any species that are encountered during the construction process. The intentional killing of any animals including snakes, insects, lizards, birds or other animals should be strictly prohibited.	*Low*	*No Loss*	*Reversible*
	N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
	Negative	Geomorphology	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		No	Direct	*Low-Medium*	• The following mitigation measures suggested by the wetland specialist apply: Stormwater management design and erosion control measures. **As the alternatives do not impact the drainage lines, the study found no preference for either.** In addition, the following general measures should be implemented: • Instability and erosion of steep slopes must be stabilised immediately. Re-vegetation in consultation with landscape architect and ECO should be done if and where required. • To reduce the loss of material by erosion, disturbance must be kept to a minimum. • Where possible, natural vegetation should be retained to reduce the risk of erosion. • Proper stormwater management as per the approved stormwater management plan. • Increased run-off during construction should be managed using berms, temporary cut-off drains, attenuation ponds or other suitable structures, in consultation with the ECO and resident Engineer. • Stormwater management system is to be installed as soon as possible following site establishment, to attenuate stormwater during the construction phase, as well as during the operational phase. • Surface-water run-off and stormwater must be directed away from trenches and areas of excavation.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low-Medium*		*Low*	*No Loss*	*Reversible*
	N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
Impacts to Crocodile River	Negative	Water quality	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	**Appendix 14.6.2. - Aquatic Assessment**	Yes	Direct	*Medium*	• The following mitigation measures suggested by the aquatic specialist: Preventative and remedial methods for chemical spillages, soil erosion, harmful conditions for aquatic biodiversity, resuspension of sediment/benthic materials, and hazardous, human and/or general waste introduction. Stormwater management. See Appendix C of the Aquatic Assessment for detailed measures. Discussions with the Aquatic specialist indicate that whilst the pier head addition would have lesser impact prior to mitigation, taking into account the implementation of mitigation measures which lowers the significance of the impact of the Additional piers (Alternative 1) together with the safety implications and challenges related to the pier head addition, Alternative 1 is preferred. In addition, the general measures as discussed under impacts to drainage lines above should be implemented.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low-Medium*		*Low*	*No Loss*	*Reversible*
	N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required.	*None*	Not Applicable	Not Applicable

IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
Nature	**Description**	**Alternative**	**Link to Specialist Study**	**Cumulative**	**Type**	**Significance (A + B + C) X P**	**Description and/or Mitigation and Management Measures (if applicable)**	**Significance**	**Loss of Resources**	**Reversibility**
CONSTRUCTION PHASE										
Negative	Flow regime	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		Yes	Indirect	*Low*	• The following mitigation measures suggested by the aquatic specialist: Flow modification measures to prevent reduction and significant increase of flow. Stormwater management. See Appendix C of the Aquatic Assessment for detailed measures. Discussions with the Aquatic specialist indicate that whilst the pier head addition would have lesser impact prior to mitigation, taking into account the implementation of mitigation measures which lowers the significance of the impact of the Additional piers (Alternative 1) together with the safety implications and challenges related to the pier head addition, Alternative 1 is preferred. In addition, the general measures as discussed under impacts to drainage lines above should be implemented.	*Low*	*No Loss*	*Reversible*
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low*		*Low*	*No Loss*	*Reversible*
N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required. However, it should be noted that the existing Crocodile Bridge does modify flow already.	*None*	Not Applicable	Not Applicable
Negative	Habitat	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		Yes	Indirect	*Low-Medium*	• The following mitigation measures suggested by the aquatic specialist: Preventative and remedial methods for habitat loss, chemical spillages, soil erosion, harmful conditions for aquatic biodiversity, resuspension of sediment/benthic materials, and hazardous, human and/or general waste introduction. Rehabilitation methods to restore favourable habitat. See Appendix C of the Aquatic Assessment for detailed measures. The Aquatic specialist found that the impacts related to the new Pier heads was lower than that of the pier head addition and as such, Alternative 1 is preferred. In addition, the general measures as discussed under impacts to drainage lines above should be implemented.	*Low*	*No Loss*	*Reversible*
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low*		*Low*	*No Loss*	*Reversible*
		No-Go Option		Not Applicable	Not Applicable	*Low*	None required.	*None*	Not Applicable	Not Applicable
Negative	Biota	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		Yes	Indirect	*Medium*	• The following mitigation measures suggested by the aquatic specialist: Preventative and remedial methods for habitat loss, chemical spillages, soil erosion, harmful conditions for aquatic biodiversity, resuspension of sediment/benthic materials, and hazardous, human and/or general waste introduction. Rehabilitation methods to restore favourable habitat. See Appendix C of the Aquatic Assessment for detailed measures. Discussions with the Aquatic specialist indicate that whilst the pier head addition would have lesser impact prior to mitigation, taking into account the implementation of mitigation measures which lowers the significance of the impact of the Additional piers (Alternative 1) together with the safety implications and challenges related to the pier head addition, Alternative 1 is preferred. In addition, the general measures as discussed under impacts to drainage lines above should be implemented.	*Low*	*No Loss*	*Reversible*
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low-Medium*		*Low*	*No Loss*	*Reversible*
N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
CONSTRUCTION PHASE											
Waste Generation	Negative	Geomorphology	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		Yes	Direct	*Medium*	• The following mitigation measures suggested by the aquatic specialist: Preventative and remedial methods for habitat loss, chemical spillages, soil erosion, harmful conditions for aquatic biodiversity, resuspension of sediment/benthic materials, and hazardous, human and/or general waste introduction. Rehabilitation methods to restore favourable habitat. See Appendix C of the Aquatic Assessment for detailed measures. Discussions with the Aquatic specialist indicate that whilst the pier head addition would have lesser impact prior to mitigation, taking into account the implementation of mitigation measures which lowers the significance of the impact of the Additional piers (Alternative 1) together with the safety implications and challenges related to the pier head addition, Alternative 1 is preferred. In addition, the general measures as discussed under impacts to drainage lines above should be implemented.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low-Medium*		*Low*	*No Loss*	*Reversible*
	N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
	Negative	Domestic waste	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	*Low-Medium*	• Waste recycling to be put in place. • Solid waste shall only be stored in the designated general waste storage area which must be enclosed and impermeable. •All solid waste shall be disposed of by a certified contractor, off-site, at an approved landfill site. The Contractor shall supply the ECO with a certificate of disposal for auditing purposes. • Waste separation and recycling must be undertaken as part of construction as much as possible.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low-Medium*		*Low*	*No Loss*	*Reversible*
	N/A		No-Go Option	N/A	Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
	Negative	Construction waste	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	*Low-Medium*	• Litter (from outside the camp included) and concrete bags etc. must be collected and put into suitable closed bins on a daily basis. • Construction rubble must be disposed of at a registered site if required. • Waste separation and recycling must be undertaken as part of construction and operation	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low-Medium*		*Low*	*No Loss*	*Reversible*
	N/A		No-Go Option	N/A	Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
CONSTRUCTION PHASE											
Soil Alteration	Negative	Hazardous waste	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	*Low-Medium*	• The classification of waste determines the handling methods and the ultimate disposal of the material. The contractor shall manage hazardous waste that are anticipated to be generated by his operations as follows: Characterise the waste to determine if it is general or hazardous. Obtain and provide an acceptable container with a label. Place hazardous waste material in the container. Inspect the container on a regular basis Haul the full container to the licenced and correct disposal site. Provide documentary evidence of proper disposal of the waste. • Only temporary storage of waste is allowed (once of storage of waste for a period less than 90 days). The volume of material should be limited to less than 80m3 of hazardous waste. Should this be exceeded the Norms and Standards for the Storage of Waste will need to be complied with.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A	Yes	Direct	*Low-Medium*		*Low*	*No Loss*	*Reversible*
	N/A		No-Go Option	N/A	Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
	Negative	Loss of topsoil	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	*Medium*	• Topsoil should be separated and re-used where possible.	*Low-Medium*	*Partial*	*High Degree*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Medium*		*Low-Medium*	*Partial*	*High Degree*
			No-Go Option	N/A	Yes	Direct	*Low-Medium*	The site is degraded by historic land use. It is likely that there will be a continued loss of topsoil should the development not proceed as the site will remain in its degraded state.	*Low-Medium*	*Partial*	*High Degree*
	Negative	Loss of land capability	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	*Low-Medium*	• Please note that according to the Land Capability data available from DEFF, the site has a very low to moderate land capability with some sections showing a high land capacity. Photographs from the site visit however indicate that the site is altered by anthropogenic use or is more indicative of veld/ riparian area. This is further corroborated by information in the City of Mbombela SDP which notes that the land with a low agricultural capability is located in the Kruger National Park, Schoemanskloof, Ngodwana, at Pienaar, Matsulu, Daantjie, north-east of Legogote, Hilltop areas along the R40, and the western & southern escarpments of the municipality. The site is currently degraded by historical use and is not used for agriculture. Therefore, it is not expected to be a significant loss.	*Low-Medium*	*Partial*	*High Degree*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low-Medium*		*Low-Medium*	*Partial*	*High Degree*
	N/A		No-Go Option	N/A	Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable

IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
Nature	**Description**	**Alternative**	**Link to Specialist Study**	**Cumulative**	**Type**	**Significance (A + B + C) X P**	**Description and/or Mitigation and Management Measures (if applicable)**	**Significance**	**Loss of Resources**	**Reversibility**
CONSTRUCTION PHASE										
Negative	Alteration of topography	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	No	Direct	*Medium-High*	Extensive cuts will be put in place to allow for the re-alignment of the N4 Schoemanskloof (R539). In order to ensure the change in topography does not impact stormwater, the following must be implemented: • Stormwater management measures must be implemented to ensure these designs do not impact on stormwater. • Erosion control measures to be implemented. • Remediation of development footprint.	*Low*	*Partial*	*High Degree*
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Medium-High*		*Low*	*Partial*	*High Degree*
N/A		No-Go Option	N/A	Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
Negative	Soil Erosion	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	No	Indirect		• Stormwater management measures must be implemented to ensure these designs do not impact on stormwater. • Erosion control measures to be implemented. • Remediation of development footprint.			
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A							
N/A		No-Go Option	N/A	Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
Negative	Soil pollution	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	No	Direct	*Low*	• Drip trays must be placed under all vehicles when immobile for longer than 24 hours. Vehicles suspected of leaking must be monitored and conduct a pre start-up inspection checklist. '• All vehicle/equipment maintenance and washing must be done in the workshop area, equipped with a bund wall and grease trap oil separator. • Workshop area must be monitored for fuel and oil spills. • Drip trays must be checked and replaced for vehicles standing (parked) for prolonged periods. • Drip trays must be of a sufficient size and volume to collect any hydrocarbon leakages from a stationary vehicle. • Spill kits (absorbent material) must be available on site and in all vehicles that transport hydrocarbons for dispensing to other vehicles on the construction site. • Spilled substances must be contained in impermeable containers for removal to a licensed hazardous waste site. • Significant spills should be reported to the Project Manager or Contractors Manager and ECO who should report this to the relevant authority. • Waste must be managed in line with the requirements of the EMPr (see above).	*Low*	*No Loss*	*Reversible*
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low*		*Low*	*No Loss*	*Reversible*
N/A		No-Go Option	N/A	Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
CONSTRUCTION PHASE											
Resource Consumption	Negative	Electricity consumption	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	*Low*	•During the construction phase the contractors will mainly make use of generators or connect to existing services. The requirements will not be extensive and the impact will therefore be low. '•Energy saving measures should be put in place and environmental awareness training regarding this should be undertaken to ensure compliance.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low*		*Low*	*No Loss*	*Reversible*
	N/A		No-Go Option	N/A	Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
	Negative	Water consumption	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	*Low-Medium*	• Enforce water saving strategies. • Environmental awareness training. • Should it be necessary to abstract water, the necessary licences must be in place.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low-Medium*		*Low*	*No Loss*	*Reversible*
	N/A		No-Go Option	N/A	Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
	Negative	Fuel consumption	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	*Low-Medium*	• Record and monitor fuel consumption regularly • Reduce theft of fuel (increase security) '• Environmental awareness training regarding this should be undertaken to ensure compliance.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low-Medium*		*Low*	*No Loss*	*Reversible*
	N/A		No-Go Option	N/A	Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	**Description**	**Alternative**	**Link to Specialist Study**	**Cumulative**	**Type**	**Significance (A + B + C) X P**	**Description and/or Mitigation and Management Measures (if applicable)**	**Significance**	**Loss of Resources**	**Reversibility**
CONSTRUCTION PHASE											
Effects on Biodiversity	Negative	Raw materials consumption	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	**Appendix 14.6.6. - Preliminary Design Report**	Yes	Direct	*Low-Medium*	There is a small difference in intensity between the alternatives in terms of raw material usage as the pier head addition, reduces the volume of material. However, due to safety considerations Alternative 2 is not preferred as even taking into account the difference in intensity, the overall significance of the impact is the same between the two alternatives and does not overcome the additional safety risks related to Alternative 2. The following general measures apply: '• Promote effective use of raw material. '• Designs of new interchange to utilize existing infrastructure as far as possible. '• Material from cuts to be utilized to reduce need for additional materials to be imported to the site.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low-Medium*		*Low*	*No Loss*	*Reversible*
	N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
	Negative	Loss of sensitive vegetation habitat (Threatened Ecosystem and CBA) and associated impact to flora	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	**Appendix 14.6.1. Ecological Assessment**	Yes	Direct	*Low-Medium*	The upgrade of the interchange will result in the removal of natural vegetation, associated with a threatened vegetation unit on a regional scale and Critical Biodiversity Area on a provincial scale, however taking in consideration the extent of the area involved, of less than four hectares, it cannot be considered that it would contribute significantly to habitat loss, whether for plants or animals within the immediate landscape. The following mitigation measures were recommended by the specialist: '• A vegetation scientist specialising in vegetation ecology should do a walkthrough prior construction commencing during the summer season, optimally January/ February to identify and mark protected plants for which permits are required. Those plants small enough to translocate could be temporarily stored in a nursery for re-introduction post construction. '• It is strongly recommended that the topsoil from the natural areas be stored and used in the subsequent rehabilitation of the road reserve once construction had ended. The topsoil should be stored in low (1 m high), levelled stockpiles which would reduce the establishment of alien invasive species, as well as facilitate the control alien invasive species which could establish.	*Low*	*Partial*	*High Degree*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low-Medium*		*Low*	*Partial*	*High Degree*
	N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required. However, it should be noted that the specialist found that part of the site was modified by historic use.	*None*	Not Applicable	Not Applicable
	Negative	Impact to Fauna	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		Yes	Direct	*Low-Medium*	Impacts to fauna relate to loss of vegetation. The upgrade of the interchange will result in the removal of natural vegetation, associated with a threatened vegetation unit on a regional scale and Critical Biodiversity Area on a provincial scale, however taking in consideration the extent of the area involved, of less than four hectares, it cannot be considered that it would contribute significantly to habitat loss, whether for plants or animals within the immediate landscape. The following mitigation measures were recommended by the specialist: '• A vegetation scientist specialising in vegetation ecology should do a walkthrough prior construction commencing during the summer season, optimally January/ February to identify and mark protected plants for which	*Low*	*Partial*	*High Degree*

IMPACTS							RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
CONSTRUCTION PHASE											
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low-Medium*	permits are required. Those plants small enough to translocate could be temporarily stored in a nursery for re-introduction post construction. '• It is strongly recommended that the topsoil from the natural areas be stored and used in the subsequent rehabilitation of the road reserve once construction had ended. The topsoil should be stored in low (1 m high), levelled stockpiles which would reduce the establishment of alien invasive species, as well as facilitate the control alien invasive species which could establish. '• The upgrade of the interchange allows for an opportunity to increase the permeability of the road infrastructure to facilitate animal movement in the landscape. Therefore, culverts should be designed to allow movement for small to medium size mammals to and from a water source such as the Crocodile River, this is especially relevant for the section towards the west	*Low*	*Partial*	*High Degree*
	N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required. However, please note that the site is highly disturbed and degraded in parts.	*None*	Not Applicable	Not Applicable
Incidents, accidents and potential emergency situations	Negative	Pollution incidents	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	No	Direct	*Low*	• Spill kits to be located in strategic areas for when needed • Regular site and plant inspection must be conducted • Environmental awareness training • Measures recommended by the Aquatic specialist (Annexure C) should be implemented to reduce pollution impacts.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low*		*Low*	*No Loss*	*Reversible*
	N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
	Negative	Health and safety - General	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		No	Direct	*Low*	• 24-hour security and access control. • Health and Safety awareness training. • Contractor to submit a Health and Safety Plan, prepared in accordance with the Health and Safety Specification, for approval prior to the commencement of work. • A Safety Agent should be appointed • A Dedicated Occupational Health and Safety system to be implemented by Contractor's Safety Officer. To be monitored and audited by the Client's Safety Agent, in terms of the Construction Regulations (2003).	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low*		*Low*	*No Loss*	*Reversible*
	N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable

IMPACTS							RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
CONSTRUCTION PHASE										
Negative	Health and safety - Construction risk	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	**Appendix 14.6.6.- Preliminary Design Report**	No	Direct	*Low*	Additional pier heads are preferred from a safety perspective as the potential construction risks are much lower: • No excessive drilling or additional loads will be applied to the already slender existing piers. • The construction procedure will not be complex, resulting in standard staging and formwork. No pre-stressing processes will be required. • The additional piers provide a simple, direct load path supporting the widening. • Construction is simple with one column type that can be utilized at all of the piers. • Lower risks are achieved from a design and a construction point of view. Whilst as with all projects, there will be some health and safety risks, these can be mitigated through the implementation of the following: • Health and Safety awareness training. • Contractor to submit a Health and Safety Plan, prepared in accordance with the Health and Safety Specification, for approval prior to the commencement of work. • A Safety Agent should be appointed • A Dedicated Occupational Health and Safety system to be implemented by Contractor's Safety Officer. To be monitored and audited by the Client's Safety Agent, in terms of the Construction Regulations (2003).	*Low*	*No Loss*	*Reversible*
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Medium*	Based on the Preliminary Design Report, **this is not the preferred option**: • Specialized temporary works and access will be required to work at the top of the existing piers. • Complex construction procedures will be required, such as pre-stressing at height • Significantly higher risks in design and construction.	*Medium*	*No Loss*	*Reversible*
N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
Negative	Storage of hydrocarbons resulting in spillages	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	No	Direct	*Low*	• Best practice regarding storage of substances o Hazardous substances must be stored and handled in accordance with the appropriate legislation and standards, which include the Hazardous Substances Act (Act No. 15 of 1973), the Occupational Health and Safety Act (No. 85 of 1993), relevant associated Regulations, and applicable SANS and international standards. o Any hazardous materials (apart from fuel) must be stored within a lockable store with a sealed floor. Suitable ventilation to be provided. o All storage tanks containing hazardous materials must be placed in bunded containment areas with impermeable surfaces. The bunded area must be able to contain 110% of the total volume of the stored hazardous material. • Spillages o In the event of spillages of hazardous substances, the appropriate clean up and disposal measures are to be implemented. o The contractor must ensure that necessary materials and equipment are available on site to deal with spills of any hazardous materials present o The ECO and Project Manager must be notified of all significant spillages.	*Low*	*No Loss*	*Reversible*
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low*		*Low*	*No Loss*	*Reversible*
N/A		No-Go Option	N/A	Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
Negative	Fire	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	No	Direct	*Low*	• Adhere to the appropriate emergency procedures • Firefighting equipment must be accessible on site at all times. • Display of emergency numbers • In addition, designated smoking areas should be provided and there should be zero tolerance to smoking outside these areas. Cooking over open flames is not allowed.	*Low*	*No Loss*	*Reversible*

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
CONSTRUCTION PHASE											
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option	N/A	No	Direct	*Low*	The site is currently unoccupied and the risk for fire remains.	*Low*	*No Loss*	*Reversible*
Social	Negative	Visual impact - Construction	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	**Appendix 14.6.4. - Visual Impact Assessment**	Yes	Direct	*Low-Medium*	A Visual Impact Assessment was undertaken and most impacts relate to operation. The following was noted and recommended: During the construction phase the short-term visual disturbance is kept to a minimum that any such disturbance is adequately rehabilitated such that no long term disturbance remains. General mitigation measures include the following: • Erosion: special attention to erosion control is important as erosion tends to develop long term scars in the landscape. • Clearing of vegetation: Clearing of any vegetation that would provide a screening effect should be avoided. Generally, the overall area has abundance vegetation which could be utilised as a shield. • Access Roads: Use existing roads and tracks as far as possible • Rehabilitation: Any temporary disturbance should be rehabilitated as soon as possible to reduce the effects of erosion In addition, the following general measures apply: • Suitable screening to be put in place during construction to minimise visual impacts. • No littering to be allowed. • Good housekeeping practices to be followed	*Low*	*No Loss*	*#N/A*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low-Medium*		*Low*	*No Loss*	*#N/A*
			No-Go Option		Yes	Direct	*Medium*	The site is already affected by existing and historical uses and is not pristine.	*Medium*	*No Loss*	*#N/A*
	Negative	Safety and security	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	No	Direct	*Low*	• 24-hour access control to the site and 24 hour security. • Workers found to be engaging in activities such as excessive consumption of alcohol, drug use or selling of any such items on site must be disciplined.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option	N/A	No	Direct	*Low*	The site is currently unoccupied. Should the develop not take place, there may be further safety and security issues in the area.	*Low*	*No Loss*	*Reversible*
	Negative	Traffic disruptions	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	**Appendix 14.6.6. - Preliminary Design Report**	No	Direct	*Low-Medium*	A number of measures will be put in place to reduce the impact to traffic during construction. These include the following necessary deviations: •At the deviation of N4-6Y from the existing alignment, where a temporary deviation is planned to align with the proposed service road. •At the position where Ramp B crosses over the existing N4-6Y, where a temporary deviation will be required to accommodate traffic from Schoemanskloof to Mbombela. • Along the Crocodile River bridge, including a distance of around 200 m north and south of the bridge.	*Low*	*No Loss*	*Reversible*

IMPACTS							RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
CONSTRUCTION PHASE										
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low-Medium*	• At the new bridge over the N4, including the widening of N4-7X for the Ramp D acceleration lane and the Ramp C off-ramp. This length is approximately 350 m. The following will also be implemented to reduce impacts to road users during construction: '• Traffic calming measures and appropriate signage to be implemented. '• Speed limits on all existing roads must be adhered to at all times. '• Delivery of materials should not take place during peak times. '• Access for affected landowners to their properties must always be available	*Low*	*No Loss*	*Reversible*
N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
Negative	Loss of cultural and palaeontological heritage	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	**Appendix 14.6.5 - Phase 1 Heritage Impact Assessment**	No	Direct	*Medium*	'A Heritage Impact Assessment was undertaken and the following mitigation measures recommended: • Documentation of the enclosures that includes scaled drawings upon which a destruction permit must be applied for from SAHRA. The sites will have to be monitored during construction • Chance Find Procedure should be implemented for the project should any heritage resources be identified during the construction phase of the project. There was no preference between either the proposal or alternative	*Low*	*Partial*	*High Degree*
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Medium*		*Low*	*Partial*	*High Degree*
N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
Negative	Loss of sense of place	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	No	Direct	*Low*	'• Suitable screening to be put in place during construction to minimise visual impacts. • No littering to be allowed. • Good housekeeping practices to be followed	*Low*	*No Loss*	*Reversible*
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low*		*Low*	*No Loss*	*Reversible*
N/A		No-Go Option	N/A	Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
Negative	Change of land use	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	*Low-Medium*	The site is currently mostly developed and largely altered by anthropogenic activity. The site is located around the existing roads T-junction of the N4 Toll route via Ngodwana and the N4 Schoemanskloof (R539) Route. The T-junction itself is in an area known as Montrose. An old cement batching plant site is in the centre of the proposed interchange. This site was also where the old Montrose Hotel was situated some decades ago. To the east of this site and across the N4 road, an existing construction plant park area and agricultural sheds of Jouberts & Sons are situated that has also largely altered the land from its natural state. The site also includes the expansion of the	*Low*	*Partial*	*High Degree*

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
CONSTRUCTION PHASE											
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low-Medium*	existing Crocodile River Bridge. Therefore, the change in land use is not expected to be significant as the land is adjacent to the current N4 and falls within the City of Mbombela transportation corridor. General measures should be implemented such as: • Suitable screening to be put in place during construction to minimise visual impacts. • No littering to be allowed. • Good housekeeping practices to be followed	*Low*	*Partial*	*High Degree*
	N/A		No-Go Option	N/A	Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
Economic	**Positive**	Decline/increase in economy	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	***+ Medium***	The proposed development will cost approximately R165 million and will provide a significant boost to the local economy. The following measures are applicable: • Local contractors and suppliers to be used during the construction phase as far as possible. • Local bed and breakfasts/hotels/resorts etc. should be utilized as far as possible during construction.	*+ Medium- High*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			***+ Medium***		*+ Medium- High*	*No Loss*	*Reversible*
	Negative		No-Go Option	N/A			*Medium-High*	Should the development not proceed, the benefits to the local community will be long term and negative. Firstly, there will be a loss of the injection of cash in the area. Secondly, A grade separated intersection is required in terms of the Concession Contract to alleviate safety issues at the existing intersection and to prioritise the east-west movements between Schoemanskloof and MDC Section 7A. The MDC is an important route between South Africa and Mozambique, the lack of necessary upgrades may have a significant negative impact to the country.	*Medium-High*	*Partial*	*High Degree*
	Negative	Construction impacts on existing businesses on N4 Schoemanskloof (R539)	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	No	Indirect	*Low-Medium*	The proposed re-alignment of the N4 Schoemanskloof (R539) may negatively impact on existing businesses which are currently located on the current alignment during construction due to noise, traffic disruptions etc. This could have a negative economic impact on these businesses. Mitigation measures related to noise, traffic disruptions etc. are vital and must be stringently applied. Adequate signage should be put in place where applicable.	*Low*	*No Loss*	*#N/A*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low-Medium*		*Low*	*No Loss*	*#N/A*
			No-Go Option	N/A			*None*	None required.	*None*	Not Applicable	Not Applicable

IMPACTS							RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
CONSTRUCTION PHASE										
Positive	Construction costs (affordability)	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	**Appendix 14.6.6.- Preliminary Design Report**	No	Direct	***+ Medium***	Affordability is an important consideration as the SANRAL and its implementing agents have limited budgets which need to be utilized for a multitude of projects. Additional Pier Heads is preferred from an affordability perspective.	***+ Medium***	*No Loss*	*Reversible*
Negative		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low-Medium*	Due to complexity of construction works required to the do pier head addition, this alternative is costly and therefore not preferred.	*Low-Medium*	*No Loss*	*Reversible*
Negative		No-Go Option				*Medium-High*	Although the no-go option will require direct capital investment, overall, it will result in a negative impact to the economy and therefore is not the affordable option.	*Medium-High*	*No Loss*	*Reversible*
Positive	Employment	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	***+ Medium***	The proposed development will result in approximately 300 construction related employment opportunities for the local community. Local labour should be utilised as far as possible.	***+ Medium***	*No Loss*	*Reversible*
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			***+ Medium***		***+ Medium***	*No Loss*	*Reversible*
Negative		No-Go Option	N/A			*Medium-High*	Should the development not proceed, the benefits to the local community will be long term and negative as potential employment opportunities will be lost. No mitigation measures are available.	*Medium-High*	*No Loss*	*Reversible*

Table 1010-12: Summary of impact assessment for the operational phases

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
OPERATIONAL PHASE											
Atmospheric Emissions	N/A	Dust emissions	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Not Applicable	Not Applicable	*None*	The existing redundant cement batching site will be developed to accommodate Ramp C and Ramp D of the interchange i.e. road embankments will be shaped and vegetated replacing most of the existing cement batch plant site and its open areas for sources of dust. Therefore, taking into account proper remediation after construction, dust impacts during operation are not expected.	*None*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*None*		*None*	*No Loss*	*Reversible*
	Negative		No-Go Option	N/A			*Low-Medium*	The site is affected by an existing redundant cement batching site as well as large sections of cleared land. With the no-go options, this will remain and dust in the area is expected. **The no go option is therefore not preferred.**	*Low-Medium*	*No Loss*	*Reversible*
	Negative	Emissions from vehicles and equipment (CO2, NOx, SOx, VOC's etc.) (and associated potential Climate change implications)	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	*Low*	The proposed interchange will be used by cars however the impact in terms of emissions is expected to be lower than in comparison to the no-go option because vehicles and large trucks would not need to decelerate and accelerate as much as the current T-junction scenario and therefore less fuel will be burned resulting in less exhaust emissions. There is however no difference between the two alternatives.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option	N/A	Not Applicable	Not Applicable	*Low-Medium*	Existing potential sources of air pollution on and around the study area include: • Exhaust emissions from vehicles on the N4 toll route via Ngodwana and N4 Schoemanskloof (R539) Route at and around the existing T-junction at Montrose; and • Dust created by the redundant cement batching plant site at the T-junction of Montrose. **With the no option, the status quo will remain and vehicles and trucks will be required to decelerate and accelerate more due to the current road configuration. The no go option is therefore not preferred.**	*Low-Medium*	*No Loss*	*Reversible*

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
OPERATIONAL PHASE											
	Negative	Climate Change (Impacts on infrastructure)	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	*Low-Medium*	In terms of climate change models in South Africa, data suggests that temperatures will be hotter and there will be more extreme events (for example, similar levels of rain but in a shorter period). '• Detailed designs to consider impact of heat on materials. '• Design to take into account relevant floodlines to ensure infrastructure will not be impacted by potential for increased extreme events.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low-Medium*		*Low*	*No Loss*	*Reversible*
			No-Go Option	N/A	Not Applicable	Not Applicable	*Low-Medium*	In terms of climate change models in South Africa, data suggests that temperatures will be hotter and there will be more extreme events (for example, similar levels of rain but in a shorter period). These impacts will be felt on the no-go option as the road and bridge are existing but as they are already constructed, no mitigation is available.	*Low-Medium*	*No Loss*	*Reversible*
	Negative	Noise	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	No	Direct	*Low*	It is expected that the proposed road interchange may even result in reduced (in comparison to the no-go option) road noise levels due to the free-flowing nature of an interchange's very design and purpose with less deceleration and acceleration of vehicles and trucks. Less accidents are also expected. Some noise impacts will remain. '• Employ speed limits on road • Employ mechanisms to ensure that road users stick to the speed limit, such as speed traps etc. • Road surface will be layered with asphalt and materials to minimize noise impacts	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option	N/A	No	Direct	*Low-Medium*	Existing noise in the area is mostly originating from the road traffic along the N4 toll route via Ngodwana and N4 Schoemanskloof (R539) Route. The existing T-junction at Montrose is a source of elevated noise levels due to the deceleration and acceleration of vehicles, and especially large trucks from all directions. **Therefore, from a noise perspective, the no-go option is not preferred.**	*Low-Medium*	*No Loss*	*Reversible*
Impacts to Drainage lines	Negative	Water quality	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	**Appendix 14.6.3. - Wetland Assessment**	No	Indirect	*Low*	• The following mitigation measures suggested by the wetland specialist apply: Rehabilitation of construction impacted area, continuous monitoring. Storm water management. Erosion control. Waste management (litter). As the alternatives do not impact the drainage lines, the study found no preference for either.	*Low*	*No Loss*	*Reversible*

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
OPERATIONAL PHASE											
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option		No	Direct	*Low*	The current N4 Schoemanskloof (R539) affects the drainage lines and therefore the same impacts in terms of water quality apply. The existing stormwater management system reduces these impacts.	*Low*	*No Loss*	*Reversible*
	Negative	Flow regime	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		Yes	Direct	*Low-Medium*	• The following mitigation measures suggested by the wetland specialist apply: Rehabilitation of construction impacted area, continuous monitoring and maintenance. Storm water management. Design requirements to mitigate impacts. As the alternatives do not impact the drainage lines, the study found no preference for either.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low-Medium*		*Low*	*No Loss*	*Reversible*
			No-Go Option		No	Direct	*Low*	The current N4 Schoemanskloof (R539) affects the drainage lines and therefore the same impacts in terms of flow regime already apply. The existing stormwater management system reduces these impacts.	*Low*	*No Loss*	*Reversible*
	Negative	Habitat	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		Yes	Direct	*Low*	• The following mitigation measures suggested by the wetland specialist apply: Rehabilitation of construction impacted area, continuous monitoring, storm water management. As the alternatives do not impact the drainage lines, the study found no preference for either.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option		No	Direct	*Low*	The current N4 Schoemanskloof (R539) affects the drainage lines and therefore the same impacts in terms of habitat already apply. The existing stormwater management system reduces these impacts.	*Low*	*No Loss*	*Reversible*

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
OPERATIONAL PHASE											
	Negative	Biota	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		No	Indirect	*Low*	• The following mitigation measures suggested by the wetland specialist apply: Rehabilitation of construction impacted area, continuous monitoring and maintenance. Storm water management. Design requirements to mitigate impacts. As the alternatives do not impact the drainage lines, the study found no preference for either.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option		No	Indirect	*Low*	The current N4 Schoemanskloof (R539) affects the drainage lines and therefore the same impacts in terms of biota already apply. The existing stormwater management system reduces these impacts.	*Low*	*No Loss*	*High Degree*
	Negative	Geomorphology	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		No	Direct	*Low*	• The following mitigation measures suggested by the wetland specialist apply: Rehabilitation of construction impacted area, continuous monitoring and maintenance. Storm water management. Design requirements to mitigate impacts. As the alternatives do not impact the drainage lines, the study found no preference for either.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option		Not Applicable	Not Applicable	*Low*	The current N4 Schoemanskloof (R539) affects the drainage lines and therefore the same impacts in terms of geomorphology already apply. The existing stormwater management system reduces these impacts.	*Low*	*No Loss*	*High Degree*
Impacts to Crocodile River	Negative	Water quality	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	**Appendix 14.6.2. - Aquatic Assessment**	Yes	Direct	*Low*	• The following mitigation measures suggested by the aquatic specialist: Rehabilitation of construction impacted area, continuous monitoring. Stormwater management. Discussions with the Aquatic specialist indicate that in terms of operation, there is no significant difference between alternatives in terms of water quality.	*Low*	*No Loss*	*Reversible*

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
OPERATIONAL PHASE											
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option		Yes	Direct	*Low*	There is an existing bridge over the Crocodile river, therefore in terms of operation, the no-go option has similar impacts to water quality.	*Low*	*No Loss*	*Reversible*
	Negative	Flow regime	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		Yes	Indirect	*Low*	• The following mitigation measures suggested by the aquatic specialist: Preventative and remedial methods for flow modification, resuspension and introduction of sediment/materials. Rehabilitation of construction impacted area, continuous monitoring and maintenance. Storm water management. Discussions with the Aquatic specialist indicate that in terms of operation, there is a slight difference between the alternatives in terms of the intensity of the impact. However, overall, both alternatives result in low significance of the impact and therefore due to potential long term safety issues, Alternative 1 is preferred.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option		Not Applicable	Not Applicable	*Low*	There is an existing bridge over the Crocodile river, therefore in terms of operation, the no-go option has similar impacts to flow regime.	*Low*	*No Loss*	*Reversible*
	Negative	Habitat	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		Yes	Indirect	*Low*	• The following mitigation measures suggested by the aquatic specialist: "Preventative and remedial methods for habitat loss, chemical spillages, soil erosion, harmful conditions for aquatic biodiversity, resuspension of sediment/benthic materials, and hazardous, human and/or general waste introduction. Rehabilitation methods to restore favourable habitat. See Appendix C of the Aquatic Assessment for detailed measures. Discussions with the Aquatic specialist indicate that in terms of operation, there is no significant difference between alternatives in terms of habitat.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option		Yes	Yes	*Low*	There is an existing bridge over the Crocodile river, therefore in terms of operation, the no-go option has similar impacts to habitat.	*Low*	*No Loss*	*Reversible*
	Negative	Biota	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into		No	Direct	*Low*	• The following mitigation measures suggested by the aquatic specialist: Preventative and remedial methods for habitat loss, chemical spillages, soil erosion, harmful conditions for aquatic biodiversity, resuspension of sediment/benthic materials, and hazardous, human and/or general waste introduction. Rehabilitation methods to restore favourable habitat. See Appendix C of the Aquatic Assessment for detailed measures.	*Low*	*No Loss*	*Reversible*

IMPACTS							RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
OPERATIONAL PHASE											
		account **Alternative 1 - Additional Piers**					Discussions with the Aquatic specialist indicate that in terms of operation, there is no significant difference between alternatives in terms of biota.			
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low*		*Low*	*No Loss*	*Reversible*
		No-Go Option		No	Direct	*Low*	There is an existing bridge over the Crocodile river, therefore in terms of operation, the no-go option has similar impacts to biota.	*Low*	*No Loss*	*Reversible*
		New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**				*Low*	• The following mitigation measures suggested by the aquatic specialist: 'Preventative and remedial methods for soil erosion, resuspension and introduction of sediment/materials. Stormwater management. Rehabilitation of impacted bed and banks. See Appendix C of the Aquatic Assessment for detailed measures. Discussions with the Aquatic specialist indicate that in terms of operation, there is no significant difference between alternatives in terms of biota.	*Low*	*No Loss*	*Reversible*
	Negative	Geomorphology	New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**		No	Direct	*Low*		*Low*	*No Loss*	*Reversible*
		No-Go Option		No	Direct	*Low*	There is an existing bridge over the Crocodile river, therefore in terms of operation, the no-go option has similar impacts to geomorphology.	*Low*	*No Loss*	*Reversible*
		New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A			*Low*		*Low*	*No Loss*	*Reversible*
Waste Generation	Negative	Domestic waste	New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A	Yes	Direct	*Low*	• As part of management of the road, litter should be collected and disposed of at an approved landfill site.	*Low*	*No Loss*	*Reversible*
		No-Go Option		N/A	Not Applicable	Not Applicable	*Low*	As the road is existing, similar impacts in relation to domestic waste (litter) apply for the no-go option. '• As part of management of the road, litter should be collected and disposed of at an approved landfill site.	*Low*	*No Loss*	*Reversible*

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
OPERATIONAL PHASE											
	N/A	Construction waste	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Not Applicable	Not Applicable	*None*	Impacts not applicable to the operational phase. No mitigation required.	*None*	Not Applicable	Not Applicable
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*None*		*None*	Not Applicable	Not Applicable
			No-Go Option	N/A			*None*	None required	*None*	Not Applicable	Not Applicable
	Negative	Hazardous waste	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Not Applicable	Not Applicable	*Low*	The only hazardous waste expected is through incidents/accidents resulting in oil/fuel spillages. Should this occur, the following process must be followed: • Characterise the waste to determine if it is general or hazardous (Use the Appendix 1 of the Norms and Standards for the Classification of Waste for landfill to determine whether additional classification is required). Obtain and provide an acceptable container with a label. Place hazardous waste material in the container. Inspect the container on a regular basis Haul the full container to the licenced and correct disposal site. Provide documentary evidence of proper disposal of the waste.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option	N/A			*Low-Medium*	As the road is existing, impacts in relation to hazardous waste (spillages due to accidents) are expected. Further, the likelihood of these events is greater in the no option as the current interchange results in higher number of accidents. '• The same mitigation as above applies. **The no option is therefore not preferred.**	*Low*	*No Loss*	*Reversible*
Soil Alteration	N/A	Loss of topsoil	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Not Applicable	Not Applicable	*None*	Impacts not applicable to the operational phase. No mitigation required.	*None*	Not Applicable	Not Applicable
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*None*		*None*	Not Applicable	Not Applicable
	Negative		No-Go Option	N/A	Yes	Direct	*Low-Medium*	The site is highly degraded by historic land use. It is likely that there will be a continued loss of topsoil should the development not proceed as the site will remain in its degraded state,	*Low-Medium*	*Partial*	*High Degree*

IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
OPERATIONAL PHASE										
N/A	Loss of land capability	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Not Applicable	Not Applicable	*None*	Impacts not applicable to the operational phase. No mitigation required.	*Medium*	*No Loss*	*Reversible*
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*None*		*Medium*	*No Loss*	*Reversible*
		No-Go Option	N/A			*None*	None required	*None*	Not Applicable	Not Applicable
N/A	Alteration of topography	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Not Applicable	Not Applicable	*None*	Impacts not applicable to the operational phase. No mitigation required.	*None*	*No Loss*	*Reversible*
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*None*		*None*	*No Loss*	*Reversible*
		No-Go Option	N/A			*None*	None required	*None*	Not Applicable	Not Applicable
Negative	Soil erosion	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Not Applicable	Not Applicable	*Low*	During operation, some erosion may occur in proper rehabilitation and stabilization measures are not implemented and due to poor stormwater management. The following must be undertaken: • Stormwater management • Proper stabilization and erosion control measures to be put in place.	*Low*	*No Loss*	*Reversible*
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low*		*Low*	*No Loss*	*Reversible*
		No-Go Option	N/A			*Low*	The site is impacted by historic use and erosion is ongoing.	*None*	Not Applicable	Not Applicable

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
OPERATIONAL PHASE											
	Negative	Soil pollution	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	No	Direct	*Low*	The only soil pollution expected is through incidents/accidents resulting in oil/fuel spillages. Should this occur, the following process must be followed: • Characterise the waste to determine if it is general or hazardous (Use the Appendix 1 of the Norms and Standards for the Classification of Waste for landfill to determine whether additional classification is required). Obtain and provide an acceptable container with a label. Place hazardous waste material in the container. Inspect the container on a regular basis Haul the full container to the licenced and correct disposal site. Provide documentary evidence of proper disposal of the waste.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option	N/A	No	Direct	*Low-Medium*	As the road is existing, impacts in relation to soil pollution (spillages due to accidents) are expected. Further, the likelihood of these events is greater in the no option as the current interchange results in higher number of accidents. '• The same mitigation as above applies. **The no option is therefore not preferred.**	*Low*	*No Loss*	*Reversible*
Resource Consumption	Negative	Electricity consumption	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	*Low-Medium*	Electricity consumption will be required to provide the necessary lights at the interchange. In order to reduce consumption, the following is recommended '• Promote effective electricity consumption. '• Investigate possible sustainable options to supplement electrical requirements (solar etc).	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low-Medium*		*Low*	*No Loss*	*Reversible*
	N/A		No-Go Option	N/A	Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
	N/A	Water consumption	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Not Applicable	Not Applicable	*None*	Impacts not applicable to the operational phase. No mitigation required.	*None*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*None*		*None*	*No Loss*	*Reversible*
			No-Go Option	N/A			*None*	None required	*None*	Not Applicable	Not Applicable

IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
OPERATIONAL PHASE										
	Negative	Fuel consumption	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Direct	*Low*	The proposed interchange will be used by cars however the impact in term of fuel consumption is expected to be lower than in comparison to the no-go option because vehicles and large trucks would not need to decelerate and accelerate as much as the current T-junction scenario and therefore less fuel will be burned. There is however no difference between the two alternatives.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option	N/A	Not Applicable	Not Applicable	*Low-Medium*	With the no option, the status quo will remain and vehicles and trucks will be required to decelerate and accelerate more due to the current road configuration. The no go option is therefore not preferred.	*Low-Medium*	*No Loss*	*Reversible*
	N/A	Raw materials consumption	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Not Applicable	Not Applicable	*None*	Impacts not applicable to the operational phase. No mitigation required.	*None*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*None*		*None*	*No Loss*	*Reversible*
			No-Go Option	N/A			*None*	None required	*None*	Not Applicable	Not Applicable
Effects on Biodiversity	N/A	Loss of sensitive vegetation habitat (Threatened Ecosystem and CBA) and associated impact to flora	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	**Appendix 14.6.1. Ecological Assessment**	Yes	Direct	*None*	Impacts not applicable to the operational phase. No mitigation required.	*None*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*None*		*None*	*No Loss*	*Reversible*
			No-Go Option		Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
OPERATIONAL PHASE											
	Negative	Impact to Fauna (roadkill etc.)	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		Yes	Direct	*Low*	Due to the existing road infrastructure, it is highly unlikely that the upgrade of the interchange would significantly contribute to incidents of roadkill as the animals present in the landscape is used to the existing road infrastructure and traffic volumes. The mitigation measures recommended by the specialist include: '• The upgrade of the interchange allows for an opportunity to increase the permeability of the road infrastructure to facilitate animal movement in the landscape. Therefore, culverts should be designed to allow movement for small to medium size mammals to and from a water source such as the Crocodile River, this is especially relevant for the section towards the west	*Low*	*Partial*	*High Degree*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low*		*Low*	*Partial*	*High Degree*
			No-Go Option		Not Applicable	Not Applicable	*Low*	None required. However, please note that the site is highly disturbed and degraded in parts.	*Low*	*Partial*	*Medium Degree*
Incidents, accidents and potential emergency situations	Negative	Pollution incidents	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		No	Direct	*Low*	The only pollution events expected are through incidents/accidents resulting in oil/fuel spillages. Should this occur, the following process must be followed: • Characterise the waste to determine if it is general or hazardous (Use the Appendix 1 of the Norms and Standards for the Classification of Waste for landfill to determine whether additional classification is required). Obtain and provide an acceptable container with a label. Place hazardous waste material in the container. Inspect the container on a regular basis Haul the full container to the licenced and correct disposal site. Provide documentary evidence of proper disposal of the waste.	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option		Not Applicable	Not Applicable	*Low-Medium*	As the road is existing, impacts in relation to pollution incidents (spillages due to accidents) are expected. Further, the likelihood of these events is greater in the no option as the current interchange results in higher number of accidents. '• The same mitigation as above applies. **The no option is therefore not preferred.**	*Low-Medium*	*No Loss*	*Reversible*
	Negative	Health and Safety	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	No	Direct	*Low*	During operation, routine maintenance will be required (for example, grass cutting etc.). All health and safety requirements in terms of legislation and TRAC N4 policies must be adhered.	*Low*	*No Loss*	*#N/A*

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
OPERATIONAL PHASE											
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low*		*Low*	*No Loss*	*#N/A*
			No-Go Option	N/A			*Low*	As there is an existing structure in place, routine maintenance is also required and the same health and safety risks apply.	*None*	Not Applicable	Not Applicable
	Negative	Health and safety	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		No	Direct	*Low*	• From a safety risk perspective, there are more risks related to the pier head addition and thus the probability of incidents is higher (although still not expected). **<u>For this reason, the Alternative 2 is not preferred.</u>**	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option		No	Direct	*None*	Not Applicable.	*None*	Not Applicable	Not Applicable
	N/A	Storage of hydrocarbons	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		No	Direct	*None*	Impacts not applicable to the operational phase. No mitigation required.	*None*	Not Applicable	Not Applicable
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*None*		*None*	Not Applicable	Not Applicable
			No-Go Option		Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
	Negative	Fire	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		No	Direct	*Low*	•Maintenance of road reserve (e.g. grass cutting) to prevent high fire load and to act as a firebreak. '• Signs / environmental awareness regarding fires (in line with TRAC N4 current policy)	*Low*	*No Loss*	*Reversible*

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
OPERATIONAL PHASE											
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Low*		*Low*	*No Loss*	*Reversible*
			No-Go Option		No	Direct	*Low*		*Low*	*No Loss*	*Reversible*
Social	Negative	Visual impact	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	**Appendix 14.6.4. - Visual Impact Assessment**	Yes	Direct	*Medium*	The VIA found that that the overall visual impact is expected to be moderate. The following mitigation measures were recommended: • The most important mitigation measure is planning and design in such that the structures are placed is such a manner that the visual intrusion is either avoided or limited as far as possible. General mitigation measures include the following: • Existing linear features: Placing new linear structures alongside existing linear features will reduce the overall impact. • Erosion: special attention to erosion control is important as erosion tends to develop long term scars in the landscape. • Rehabilitation: Any temporary disturbance should be rehabilitated as soon as possible to reduce the effects of erosion.	*Low-Medium*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Medium*		*Low-Medium*	*No Loss*	*Reversible*
			No-Go Option		Yes	Direct	*Low-Medium*	The existing road and bridge already have a visual impact although due to the size, is less intense than what is expected for the new interchange.	*Low-Medium*	*No Loss*	*Reversible*
	Negative	Visual impact - Lighting	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**		Yes	Direct	*Medium*	The VIA modelled light pollution, due to the sensitivity of the environment (classified as dark night sky with many bright and faint stars visible), the impact of the lighting of lighting on the new interchange has a medium-high impact. However, the models show that the intrusion of light at night it expected to be significantly reduced by shielding the lights. The following mitigation applies: • Lights must be shielded such than no light is visible above 10° below horizontal • The colour temperature of the lights used should be lower than 3000 K (warm white opposed to too much blue light)	*Low*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*Medium*		*Low*	*No Loss*	*Reversible*
	N/A		No-Go Option		Not Applicable	Not Applicable	*None*	None required	*None*	Not Applicable	Not Applicable
	Positive	Traffic incidents and accidents (safety)	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	**Appendix 14.6.6.- Preliminary Design Report**	No	Direct	*+Medium-High*	The proposed interchange will drastically improve the safety of motorists.	*+Medium-High*	*No Loss*	*Reversible*

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
OPERATIONAL PHASE											
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*+Medium-High*		*+Medium-High*	*No Loss*	*High Degree*
	Negative		No-Go Option		No	Direct	*Medium*	Currently, unsafe conditions and a high number of road accidents are experienced at (and in close proximity) to this existing T-junction which can be attributed to a few factors such as confusion at the right turn made (east to west bound) by motorists to the N4 Schoemanskloof (R539) Route, vehicles colliding with stationery vehicles waiting to turn right (east to west bound), blind rise just before the T-junction for motorists travelling on the N4 from west to east bound and a blind rise and sharp corner currently posing a hazard to motorists travelling on the N4 Schoemanskloof (R539) Route after taking the T-junction right turn (east – west bound). **The no-go option is therefore not preferred.**	*Medium*	*No Loss*	*High Degree*
	Positive	Traffic disruptions	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	**Appendix 14.6.6.- Preliminary Design Report**	No	Direct	***+ Medium***	The proposed new interchange will improve traffic flow speeds and therefore decrease traffic disruptions on the route which is a main transportation corridor.	***+ Medium***	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				***+ Medium***		***+ Medium***	*No Loss*	*Reversible*
	N/A		No-Go Option		No	Direct	*Medium*	The current status is such that due to the existing interchange configuration, there is a lot of acceleration and deceleration which in high traffic volumes can result in traffic disruptions. Further, disruptions also occur due to accidents. **The no-go option is therefore not preferred.**	*Medium*	*No Loss*	*High Degree*
	Not Applicable	Loss of cultural heritage	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	**Appendix 14.6.5 - Phase 1 Heritage Impact Assessment**	Not Applicable	Not Applicable	*None*	Impacts not applicable to the operational phase. No mitigation required.	*None*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*None*		*None*	*No Loss*	*Reversible*
			No-Go Option				*None*	None required	*None*	Not Applicable	Not Applicable

	IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
	Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
OPERATIONAL PHASE											
	Negative	Loss of sense of place	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Not Applicable	Not Applicable	*None*	Impacts to sense of place are not expected during operation, as the proposed upgrade occurs in close proximity to the existing road and interchange.	*None*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*None*		*None*	*No Loss*	*Reversible*
			No-Go Option	N/A			*None*	None required	*None*	Not Applicable	Not Applicable
	Negative	Change of land use	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Not Applicable	Not Applicable	*None*	Impacts not applicable to the operational phase. No mitigation required.	*None*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*None*		*None*	*No Loss*	*Reversible*
			No-Go Option	N/A			*None*	None required	*None*	Not Applicable	Not Applicable
Economic	**Positive**	Decline/increase in economy	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	**Appendix 14.6.6.- Preliminary Design Report**	Yes	Indirect	*+Medium-High*	The proposed development will ensure safe and efficient transport along the MDC between South Africa and Mozambique and thus has indirect benefits at a national level.	*+Medium-High*	*No Loss*	*Reversible*
			New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**				*+Medium-High*		*+Medium-High*	*No Loss*	*Reversible*

IMPACTS						RANKING WITHOUT MITIGATION	IMPLEMENTATION OF MANAGEMENT MEASURES	RANKING WITH MITIGATION	DEGREE REVERSABILITY & LOSS OF RESOURCE (AFTER MITIGATION)	
Nature	Description	Alternative	Link to Specialist Study	Cumulative	Type	Significance (A + B + C) X P	Description and/or Mitigation and Management Measures (if applicable)	Significance	Loss of Resources	Reversibility
OPERATIONAL PHASE										
Negative		No-Go Option				*Medium*	Should the development not proceed, the benefits to the local community will be long term and negative. A grade separated intersection is required in terms of the Concession Contract to alleviate safety issues at the existing intersection and to prioritise the east-west movements between Schoemanskloof and MDC Section 7A. The MDC is an important route between South Africa and Mozambique, the lack of necessary upgrades may have a significant negative impact to the country. T**he no-go option is therefore not preferred.**	*Medium*	*Partial*	*High Degree*
Negative	Decrease in visibility of current businesses on existing N4 Schoemanskloof (R539)	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	No	Indirect	*Low-Medium*	The proposed re-alignment of the N4 Schoemanskloof (R539) may reduce visibility of existing businesses which are currently located on the current alignment. It is expected that this will have a medium intensity as these businesses have an existing customer base. The significance can be further reduced by the implementation of necessary signage on the new alignment (as access will be reinstated).	*Low*	*No Loss*	*#N/A*
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*Low-Medium*		*Low*	*No Loss*	*#N/A*
		No-Go Option	N/A			*None*	None required.	*None*	Not Applicable	Not Applicable
Positive	Employment	New Montrose Interchange including re-alignment of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 1 - Additional Piers**	N/A	Yes	Indirect	*+ Medium*	The proposed development will ensure safe and efficient transport along the MDC between South Africa and Mozambique and thus has indirect benefits at a national level. Although no direct employment will be undertaken during the operational phase, the development is necessary to improve the current status of the MDC. This will likely have a number of positive multiplier effects in terms of employment in the region.	*+ Medium*	*No Loss*	*Reversible*
		New Montrose Interchange including re-alignment\ of N4 Schoemanskloof (R539), Expansion of the National N4 toll route via Ngodwana, and extension of the existing Crocodile Bridge taking into account **Alternative 2 - Pier Head Addition**	N/A			*+ Medium*		*+ Medium*	*No Loss*	*Reversible*
Negative		No-Go Option	N/A			*Medium*	Should the development not proceed, the benefits to the local community will be long term and negative as potential employment opportunities will be lost. No mitigation measures are available. **The no-go option is therefore not preferred.**	*Medium*	*No Loss*	*Reversible*

10.4 Description of Impacts

A discussion of impacts to various aspects is provided below. Impacts that have been identified as having a low-medium impact significance rating and higher (before mitigation) are discussed in more detail within the subsection in terms of their risks or concerns affecting the environment. A discussion on how mitigation measures are expected to decrease/increase the significance rating is also provided as well as input from specialists where this input was used to assess impacts.

In addition, it is important to assess the natural environment using a systems approach that will consider the cumulative impact of various actions. A Cumulative impact refers to "*the impact on the environment, which results from the incremental impact of the actions when added to other past, present and reasonably foreseeable future actions regardless of what agencies or persons undertake such actions*". Cumulative impacts can result from individually minor, but collectively significant actions or activities taking place over a period of time. Cumulative effects can take place frequently and over a period of time that the effects cannot be assimilated by the environment. Cumulative impacts are also discussed in the subsections that follow.

10.4.1 Atmospheric Emissions

10.4.1.1 Overview

In terms of atmospheric emissions, two potential impacts were identified during both construction and operation, namely, dust emissions and emissions from vehicles and equipment (and resultant impact on Climate Change). These impacts are not expected to differ between the alternatives.

For construction, dust emissions were expected to have a low-medium significance however with the implementation of mitigation measures (for example, maintaining speed limits on dirt roads, dust suppression and covering aggregate material), this significance could be reduced to low. In terms of the emissions from construction vehicles, impacts were expected to be low prior to mitigation. With the addition of mitigation measures, the impact will be further reduced. Mitigation includes ensuring that all vehicles and other machinery comply with road worthy requirements and legislation in terms of allowable emissions Furthermore, studies suggest that traffic disruptions are a large source of emissions during road project (Hanson & Noland, 2015). Planning must be undertaken to minimise traffic disruptions and reduce emissions related to this. Lastly, transportation of material can be an additional source of emissions. Material should be sourced from cuts to reduce the need for importing material. The design should also take into account minimisation of materials where possible.

During operation, it is not expected that there will be any impacts related to dust as the site will be remediated after construction. Further, there is a redundant cement batching plant as well as historically utilized (and no bare) sections. These areas are a source of dust currently. With the no go option, the area will remain as is and thus the impact in terms of dust will remain.

In term of vehicle emissions, the interchange will be utilized by cars who will emit Greenhouse gases. However, these emissions are expected to be lower than in comparison to the no-go option. This is due to the fact that vehicles and trucks will be able to keep a more constant speed and will therefore burn less fuel with the new interchange as opposed to the no-go option (current interchange) which results in acceleration and deceleration and therefore increased emissions. Furthermore, as vehicle numbers increase on the route (which is expected regardless of whether the interchange is upgraded or not), the expected emissions will be higher should there be more traffic disruptions (Hanson & Noland, 2015). More traffic disruptions would be expected with the current T-junction.

In summary, from an atmospheric emissions perspective, the impacts of the development mainly relate to construction and are therefore short term and can be mitigated to a low significance. In contract, impacts related to the no-go option are in the operational phase and are therefore longer term. The No-Go option is therefore not preferred.

10.4.1.2 Cumulative Impacts:

Both dust emissions and emissions from vehicles and equipment are cumulative in nature as they are compounded by existing activities in the environment. However, during the construction phase, these impacts are short term in nature and are of a low-medium to medium intensity. Regardless, mitigation measures to reduce these impacts are vital and must be implemented. For vehicle emissions in the operational phase, the proposed development should reduce the current state of emissions by allowing for less acceleration and deceleration and reducing traffic disruptions due to incidents.

10.4.2 Noise

10.4.2.1 Overview

Noise impacts will occur throughout construction but will be of a low significance. These impacts are not expected to differ between the proposals and alternatives. Mitigation measures will further reduce the significance of this impact and include:

- Ensuring that all equipment and machinery comply with the manufacturer's specifications; and
- Ensuring that construction activities must be limited to the day.

From an operational perspective, it should be noted that existing noise in the area is mostly originating from the road traffic along the N4 toll route via Ngodwana and N4 Schoemanskloof (R539) Route. The existing T-junction at Montrose is a source of elevated noise levels due to the deceleration and acceleration of vehicles, and especially large trucks from all directions. With the implementation of the development, it is expected that the proposed road interchange may result in reduced road noise levels due to the free-flowing nature of an interchange's very design and purpose with less deceleration and acceleration of vehicles and trucks. Therefore, the impact prior to mitigation is expected to be low (in comparison to the low medium significance of the no-go alternative). In addition, a number of mitigation measures will be implemented

including ensuring the necessary speed limits on the road and ensuring the road is constructed with asphalt to minimise noise impacts.

10.4.2.2 Cumulative Impacts:

It is not expected that this will be a cumulative impact as the area around the site is already affected by the N4 Schoemanskloof (R539) but the proposed plans may result in reduce noise levels during operation.

10.4.3 Impacts to Drainage Lines

10.4.3.1 Overview

A Wetland assessment was undertaken to confirm whether any wetland habitat was affected by the proposed development. The study concluded that no natural wetland unit could be recorded as per the DWAF, 2005 guidelines. However, three drainage areas are affected. These naturally occurring drainages are not streams, as they do not have the morphological structure, nor the duration of water retention or links to the adjacent aquatic zones, such as floodplains or riparian wetlands. They are simply temporary drainage lines acting as temporary flow paths. They also resemble the adjacent terrestrial zones.

Regardless, the drainage lines recorded were assessed and the following results were attained:

- The drainage lines attained a moderate overall PES (Present Ecological State)
    - The drainage lines are all largely natural with few moderate modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place. They can all be classified as falling into the category B/C. The trajectory of change will remain stable over the next five years should no activity take place and no intervention in terms of rehabilitation is implemented.
- The drainage lines attained a Moderate Ecological Importance and Sensitivity (EIS) score.
    - An assessment based on the principles of the ecological importance and sensitivity assessment were conducted according to the guidelines as discussed by DWAF (1999). It was found that the drainage lines are considered ecologically important and sensitive on local scale. The biodiversity of these drainage lines is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers. The drainage lines were classified to fall in the moderate class: EIS = C.
- • The drainage lines Recommended Ecological Classification (REC) classification was rated as:
    - The drainage lines will be impacted by the proposed development activities. This impact will be localised and at the transitional point leading from the development and infrastructure installations into the drainage lines. It will in all likelihood regress slightly in terms of its current Ecological Category if not managed in specific during the construction period. Stormwater management for the site is required in specific the construction phase. This will mitigate the impact on the drainage lines. Rehabilitation of the impacts and maintenance of the system will further mitigate the impacts and could improve the sustainability of the system. It is thus rated that the Recommended Ecological Category (REC) will fall into: Category C

Potential impacts to the drainage lines in the development site include the following:

- Water Quality;
- Flow regime;
- Habitat;
- Biota; and
- Geomorphology.

For most of the above, these impacts range from 'low' to low-medium' in significance (without mitigation) and are similar for both proposals and alternatives. With mitigation, these impacts decreased to a 'low' significance. Mitigation measures recommended by the specialist included:

- Resource drivers should be protected as far as possible.
- Water quality preservation is key. Silt protection measure to be implemented in consultation with the wetland specialist (ECO).
- On site storm water management must be implemented.
- On site filtration must be adopted (hay bales can be used affectively)
- Ingress and Egress must be managed to minimise impacts in respect of compaction of the soils.
- Single entry and exit points must be established.
- These areas must be scarified with the contours in mind as part of the rehabilitation plan.
- Stock piling must be located outside the delineated drainage line and buffer boundaries.
- An approved stormwater management plan must be implemented.
- Velocity dissipation structures and sheet flow structures (such as reno mattresses) must also be installed to prevent water flowing through culverts to gain velocity and be released uncontrolled.
- Dispersed flow must be attained post formal structures.
- Removal of alien and invasive plant species during the construction and operational phases.
- Stabilisation of gullies and drainage lines to prevent erosion.
- Implementation of topsoil management (stockpiling, topography shaping) and erosion control (berms, geotextiling, silt fences, hay bales and gabion structures).
- Re-vegetation with indigenous plant species.

During operation (as with construction), potential impacts to water quality, flow regime, habitat, biota and geomorphology may occur. These impacts are expected to have a low to low-medium significance for either alternatives. These impacts were reduced to low with the implementation of the necessary mitigation measures. Of particular importance is the proper rehabilitation of the construction impacted area ad proper stormwater management.

10.4.3.2 Cumulative Impacts:

- Due to the fact that the drainage lines are already impacted by the current alignment of the N4 Schoemanskloof (R539), some of the impacts are considered to be cumulative. However, due to the fact that the impacts are expected to be low, the overall cumulative impact is reduced.
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10.4.4 Impacts to the Crocodile River

10.4.4.1 Overview

An Aquatic Impact Assessment was undertaken and determined that the only aquatic resource affected by the proposed development was the Crocodile River. The study also found that the PES for the stream scored in the middle ranges as the aquatic resource (Crocodile River) is moderately modified and impacted on by surrounding agricultural, recreational, and storage activities/facilities, as well as existing roads and crossings. The EIS falls in the high range and has functionality in respect of moderating water quality and supporting intolerant fish species and sensitive aquatic macroinvertebrates. Rehabilitation may be required to enhance the ecological function of riparian areas affected by the road and bridge upgrades. The aquatic resource under study was considered to be a highly sensitive river, more specifically in respect of flow, water quality and biodiversity.

Potential impacts to the aquatic resource include the following:

- Water Quality;
- Flow regime;
- Habitat;
- Biota; and
- Geomorphology.

Due to construction related to the Crocodile River bridge expansion, the potential construction impacts ranged between low-medium to medium. In particular, more significant impact were expected with water quality, biota and geomorphology (medium significance – prior to mitigation). Impacts to habitat and flow regime were assessed to be low-medium and low respectively (before mitigation). In all cases, these impacts were more pronounced for Alternative 1 due to the fact that the construction of new pillars in the river is required. The aquatic study provided very detailed mitigation measures (Appendix of Appendix 14.6.2.) In summary these include:

- Preventative and remedial methods for habitat loss, chemical spillages, soil erosion, harmful conditions for aquatic biodiversity, resuspension of sediment/benthic materials, and hazardous, human and/or general waste introduction.
- Rehabilitation methods to restore favourable habitat.
- See Appendix C of the Aquatic Assessment for detailed measures.

With the implementation of the required mitigation measures, impacts for both Alternative 1 and Alternative 2 could be reduced to **low** in all cases.

Discussions with the Aquatic specialist were undertaken and indicate that whilst the pier head addition (Alternative 2) would have lesser impact prior to mitigation, taking into account the implementation of mitigation measures which lowers the significance of the impact of the Additional piers (Alternative 1) together with the safety implications and challenges related to the pier head addition, **Alternative 1 is preferred.**

From an operational perspective (as with construction), potential impacts to water quality, flow regime, habitat, biota and geomorphology may occur. These impacts are expected to have a low significance for both alternatives. These impacts were reduced to low with the implementation of the necessary mitigation measures.

The specialist also noted that the interchange development can be supported that the road upgrade and bridge construction may proceed on condition of the implementation of the necessary mitigation measures. A summary of these measures is provided below:

- Soil erosion prevention
    - Control measures should be in place to minimise the spread of suspended sediment and limit it as far as feasibly possible to the direct area of influence. Ensure that control measures are in place to control erosion (e.g. access road drainage) and additional sediment inputs into the aquatic resource. Excavation methods must also be in line with environmental best practises.
- Chemical spillage prevention
    - Control measures to prevent chemical spillages prevention includes a number of best practice measures such as ensuring changing, servicing and repairs don't take place near the watercourse and that specific storage areas are designated for storage of hazardous chemicals.
- Protection of aquatic biodiversity
    - Prevent alteration in water quality and a further decline to the aquatic community structures through the prevention and reduction of impacts, and ensuring the rehabilitation of the construction site to the condition pre-construction, equivalent to neighbouring sections of the river, or better, whichever will maintain and protect aquatic biota. Implementing and managing these mitigation measures for impacts related to water quality will largely mitigate the expected impacts on aquatic biota.
- Habitat loss and clearing of vegetation
    - Habitat plays an integral role in species richness, hence any reduction/deviation from the optimal vegetation, stones, gravel, sand, mud, and/or differential flow availability may reduce biodiversity. Therefore, measures to ensure stabilisation of the river bank should be implemented at sections of the river with a high probability of being affected by the construction activities. The stabilisation methods should ensure that adequate marginal vegetation is available for aquatic biota. Re-vegetation, de silting may also be required.
- Contamination – hazardous, general and human waste

  - Hazardous, general and/or human waste may contribute to poor, and even toxic, water quality with the potential to eradicate aquatic biota on a regional scale. It is therefore imperative that these types of waste do not enter the water course and riparian area.
- Resuspension and introduction of sediment/materials
  - An increase in turbidity, due to suspended sediment/materials during construction activities may result in reduced photosynthetic capacity of primary producers, increased bacterial activity and a decrease in oxygen saturation. The suspended matter could interfere with the reproduction, growth and survival of aquatic organisms according to Hill and Kleynhans (1999), which would ultimately compromise biotic integrity. Stormwater management during construction must be implemented.
- Hazardous, human and general waste introduction
  - Personnel should not use watercourses for sanitation purposes. Ablution facilities should be made available in close proximity to active work areas, but outside the riparian/wetland buffer boundaries. Proper waste management must also be implemented.
- Flow modification
  - The design of the storm water system should ensure that no adverse impacts on the natural systems in terms of increased velocity of storm water. Effective and sustainable stormwater management.

10.4.4.2 Cumulative Impacts:

As the aquatic resource (Crocodile River) is moderately modified and impacted on by surrounding agricultural, recreational, and storage activities/facilities, as well as existing roads and crossings, all further impacts can be seen as cumulative. However, due to the fact these impacts to water quality, flow regime, habitat, biota and geomorphology can all be mitigated to low levels, this cumulative impact is not seen to be significant.

10.4.5 Waste Generation

10.4.5.1 Overview

The proposed development will mainly produce waste during the construction phase (domestic, construction and hazardous waste). During construction, impacts are expected to be 'low-medium' (before mitigation). Impacts will be further reduced through the implementation of the Waste Management Plan included in the EMPr. Mitigation measures related to the construction phase include:

- Waste recycling to be put in place.
- Solid waste shall only be stored in the designated general waste storage area which must be enclosed and impermeable.
- All solid waste shall be disposed of by a certified contractor, off-site, at an approved landfill site if no municipal services is available. The Contractor shall supply the ECO with a certificate of disposal for auditing purposes.

- Litter (from outside the camp included) and concrete bags etc. must be collected and put into suitable closed bins on a daily basis.
- Construction rubble must be disposed of at a registered landfill site
- General wastewater on site to be collected and disposed of at a registered communal facility.
- The classification of waste determines the handling methods and the ultimate disposal of the material. The contractor shall manage hazardous waste that are anticipated to be generated by his operations as follows: Characterise the waste to determine if it is general or hazardous (Use the Appendix 1 of the Norms and Standards for the Classification of Waste for landfill to determine whether additional classification is required). Obtain and provide an acceptable container with a label. Place hazardous waste material in the container. Inspect the container on a regular basis Haul the full container to the licenced and correct disposal site. Provide documentary evidence of proper disposal of the waste.
- Only temporary storage of waste is allowed (once of storage of waste for a period less than 90 days). The volume of material should be limited to less than 80m3 of hazardous waste. Should this be exceeded the Norms and Standards for the Storage of Waste will need to be complied with.

During operation, some domestic waste from littering is expected from road users. In addition, due to accidents, some hazardous waste (spillages of fuel caused by an accident) may also occur but will be incidental. Both these impacts are expected to be low prior to mitigation. The significance can be further reduced by mitigation measures to properly manage waste (as above). No construction related waste is expected.

10.4.5.2 Cumulative Impacts:

All waste generated will add to the waste generated by existing and future developments as such waste generation is cumulative in nature. Minimization and recycling of waste must be undertaken to reduce this impact.

10.4.6 Soil Alteration

10.4.6.1 Overview

In terms of soil alteration, impacts related to loss of topsoil, loss of land capacity, alteration of topography, soil erosion and soil pollution were assessed.

10.4.6.1.1 Loss of Topsoil

The construction of the new interchange development will result in the removal of topsoil to allow for necessary foundations. This impact is expected to be of medium significance prior to mitigation. In order to reduce this impact, all topsoil will be separated and re-used where possible (especially as part of rehabilitation measures). With the implementation of this measure, the impact significance is reduced to low-medium. During operation, impacts to topsoil are not expected.

10.4.6.1.2 Alteration of Topography

During construction, extensive cuts will be put in place to allow for the re-alignment of the N4 Schoemanskloof (R539). This will result in extensive changes to the topography at a site level. This impact was assessed as medium-high prior to mitigation due to the possible changes to stormwater and resultant erosion. However, with the implementation of proper stormwater management practices, which has a high mitigation efficiency, the extent of this impact is reduced to low. During operation, impacts to topography are not expected

10.4.6.1.3 Loss of Land Capability

Land capability is defined as the inherent capacity of land to be productive under sustained use and specific management methods. By developing the area will result in a loss of land capability in terms of the natural area and soil. According to the Land Capability data available from DEFF, the site has a very low to moderate land capability with some sections showing a high land capacity. Photographs from the site visit however indicate that the site is altered by anthropogenic use or is more indicative of veld/ riparian area. This is further corroborated by information in the City of Mbombela SDP which notes that the land with a low agricultural capability is located in the Kruger National Park, Schoemanskloof, Ngodwana, at Pienaar, Matsulu, Daantjie, north-east of Legogote, Hilltop areas along the R40, and the western & southern escarpments of the municipality. The site is currently degraded by historical use and is not used for agriculture. Therefore, based on this, the impact is seen to be of a 'low-medium' significance. Impacts are not expected during operation.

10.4.6.1.4 Soil Erosion

Soil erosion is another potential impact and is closely related to topography and stormwater management. However, with proper mitigation, this impact can be sufficiently mitigated to a low level. During construction stormwater measures will be put in place. During operation, low significance of impacts is also expected as stormwater has been designed with erosion control measures. The site will also be rehabilitated after construction to prevent erosion.

10.4.6.1.5 Soil Pollution

Lastly, in terms of soil pollution, impacts may occur but would be incidental in nature and if cleaned properly, will result in a very low significance impact. Mitigation measures include:

- All vehicle/equipment maintenance and washing must be done in the workshop area, equipped with a bund wall and grease trap oil separator.
- Workshop area must be monitored for fuel and oil spills.
- Spills must be cleaned up immediately and remediated to the satisfaction of the ECO; and
- Spill kits must be comprehensive and available on site at all times. An adequate supply of absorbent material must be available to accommodate emergency spills.

10.4.6.2 Cumulative Impacts:

Loss of land capability and loss of topsoil can be seen to be cumulative due to the numerous developments in the Country. However, the activity is in line with the surrounding land use, the MDC and the City of Mbombela spatial planning. Further, the site is already impacted and has a low agricultural potential and thus these impacts are not seen to be highly significant.

10.4.7 Resource Consumption

10.4.7.1 Overview

Four types of resource consumption were assessed, namely, water, electricity, raw materials and fuel. During construction, all resource consumption was assessed to be at a 'low-medium' level except electricity which was expected to a minimal impact as generators would likely be used in conjunction with existing services. Mitigation measures during construction include the following:

- Enforce water saving strategies;
- Should it be necessary to abstract water, the necessary licences must be in place.
- Environmental awareness training;
- Record and monitor fuel consumption regularly;
- Reduce theft of fuel (increase security); and
- Promote effective use of raw material.
- Designs of new interchange to utilize existing infrastructure as far as possible.
- Material from cuts to be utilized to reduce need for additional materials to be imported to the site.

Based on these mitigation measures, the impacts are expected to decrease to a 'low' level.

For all cases except raw material consumption, there was no difference between alternatives. However, for raw materials, there is a small difference in intensity as the pier head addition (Alternative 2), reduces the volume of material. However, due to safety considerations Alternative 2 is not preferred as even taking into account the difference in intensity, the overall significance of the impact is the same between the two alternatives and does not overcome the additional safety risks related to Alternative 2.

During operation, there is no difference between the two alternatives. Impacts in terms of raw material consumption and water consumption are not expected. There will be electricity consumption in order to provide the necessary lighting however with the implementation of mitigation measures, the impact is reduced to low. Mitigation recommended includes:

- Promote effective electricity consumption.
- Investigate possible sustainable options to supplement electrical requirements (solar etc).

In addition, the proposed interchange will be used by cars however the impact in term of fuel consumption is expected to be lower than in comparison to the no-go option because vehicles and large trucks would not need to decelerate and accelerate as much as the current T-junction scenario and therefore less fuel will be burned. Overall, this impact was assessed having significance whilst the no-go option has a low medium significance. The no go option is therefore not preferred from an operational fuel consumption perspective.

10.4.7.2 Cumulative Impacts:

All four types of resource consumption (water, electricity, raw materials and fuel) have a cumulative impact as they add to the existing and future use of resources.

10.4.8 Effects on Biodiversity

10.4.8.1 Overview

In order to assess the various potential impacts on ecology, an Ecological Assessment was undertaken. The specialist found that the upgrade of the interchange will result in the removal of natural vegetation, associated with a threatened vegetation unit on a regional scale and Critical Biodiversity Area on a provincial scale, however taking in consideration the extent of the area involved, of less than four hectares, it cannot be considered that it would contribute significantly to habitat loss, whether for plants or animals within the immediate landscape. The impact was therefore identified as low medium and was further reduced to low through the implementation of necessary mitigation measures.

Further, due to the existing road infrastructure, it is highly unlikely that the upgrade of the interchange would significantly contribute to incidents of roadkill as the animals present in the landscape is used to the existing road infrastructure and traffic volumes. Similarly, to the impact to natural vegetation, the impact to fauna was also identified as low medium and was also further reduced to low through the implementation of necessary mitigation measures.

The following mitigation measures are recommended:

- A vegetation scientist specialising in vegetation ecology should do a walkthrough prior construction commencing during the summer season, optimally January/ February to identify and mark protected plants for which permits are required. Those plants small enough to translocate could be temporarily stored in a nursery for re-introduction post construction.
- It is strongly recommended that the topsoil from the natural areas be stored and used in the subsequent rehabilitation of the road reserve once construction had ended. The topsoil should be stored in low (1 m high), levelled stockpiles which would reduce the establishment of alien invasive species, as well as facilitate the control alien invasive species which could establish.
- The upgrade of the interchange allows for an opportunity to increase the permeability of the road infrastructure to facilitate animal movement in the landscape. Therefore, culverts should be designed

to allow movement for small to medium size mammals to and from a water source such as the Crocodile River, this is especially relevant for the section towards the west.

10.4.8.2 Cumulative Impacts:

Impacts to ecology can be seen to be cumulative in nature as the development occurs within Legogote Sour Bushveld which is greatly transformed. However, the specialist found that due to the size of the development footprint, this would not contribute significantly to habitat loss.

10.4.9 Incidents, accidents and potential emergency situations

10.4.9.1 Overview

Five main impacts were assessed linked to incidents, accidents and potential emergency situations. These included:

- Pollution incidents
- Health and safety
- Health and safety - Construction risk (related to construction only)
- Structural safety (related to operation to only)
- Storage of hydrocarbons resulting in spillages
- Fire

During construction, it was found that these impacts would have a low significance as they are incidental in nature. In addition, several mitigation measures will be implemented which will reduce the significance of these impacts even further. These include ensuring that a Safety Agent is appointed and that all staff undergo health and safety awareness training. In addition, pollution incidents and impacts associated with the storage of hydrocarbons will be mitigated through the proper storage of materials and by ensuring that spill kits are available to deal with any spills. In addition, hydrocarbons and hazardous material will be stored properly (in bunded areas) to ensure that any pollution incidents are contained.

However, in contract, the construction risk for Alternative 2 (Pier Head addition) was found to be of medium significance. This is due to the following:

- Specialized temporary works and access will be required to work at the top of the existing piers.
- Unique and differing designs will be required for the piers supporting the tapering bridge superstructure.
- Complex construction procedures will be required, such as pre-stressing at height
- Significantly higher risks in design and construction.

This impact could not be satisfactorily mitigated, and this is one of the main reasons that Alternative 2 (Pier Head Addition) is not preferred.

During operation, impacts related to storage of hydrocarbons is not expected. Pollution impacts related to potential traffic accidents resulting in spillages. This was assessed to have a 'low' significance as it would be incidental in nature. In terms of general health and safety, impacts were also expected to be low. Although, routine maintenance will be required (for example, grass cutting etc.), all health and safety requirements in terms of legislation and TRAC N4 policies will be adhered to and will reduce this risk. Further, this risk is existing and also occurs with the no-go option.

From a structural safety point of view, there is more risk related to Alternative 2 (Pier Head Addition) as it is more complex. However, considering that incidents would be highly unlikely, this impact was assessed as low for both alternatives.

During both construction and operation, fires are possible but would be incidental and limited to the neighbouring areas. Whist the intensity would be low-medium, the overall significance would be 'low'. In addition, a number of mitigation measures will be implemented. These include:

- Adhere to the appropriate emergency procedures
- Firefighting equipment must be accessible on site at all times.
- Display of emergency numbers

10.4.9.2 Cumulative Impacts:

Impacts relating to incidents, accidents and potential emergency situations are not seen to be cumulative as they are limited to the specific site in question.

10.4.10 Social

10.4.10.1 Overview

From a social perspective, impacts to the following attributes were assessed:

- Construction
    - Visual impact - Construction
    - Safety and security
    - Traffic disruptions
    - Loss of cultural and palaeontological heritage
    - Loss of sense of place
    - Change of land use
- Operation
    - Visual impact
    - Visual impact - Lighting
    - Traffic incidents and accidents (safety)
    - Traffic disruptions

These are discussed below.

10.4.10.1.1 Visual Impact

There are three main components related to visual impacts. The first is general construction visual impacts which only apply during construction. These are temporary in nature and were therefore found to be of a low medium significance. A Visual Impact Assessment was undertaken and most impacts relate to operation. The following was noted and recommended from a construction point of a view:

- During the construction phase the short-term visual disturbance is kept to a minimum that any such disturbance is adequately rehabilitated such that no long term disturbance remains. General mitigation measures include the following:
- Erosion: special attention to erosion control is important as erosion tends to develop long term scars in the landscape.
- Clearing of vegetation: Clearing of any vegetation that would provide a screening effect should be avoided. Generally, the overall area has abundance vegetation which could be utilised as a shield.
- Access Roads: Use existing roads and tracks as far as possible
- Rehabilitation: Any temporary disturbance should be rehabilitated as soon as possible to reduce the effects of erosion

In addition, the following general measures apply:

- Suitable screening to be put in place during construction to minimise visual impacts.
- No littering to be allowed.
- Good housekeeping practices to be followed

The impact is therefore expected to be reduced to low.

The second and third component relate to the visual impact of the interchange itself as well as the impact of the lighting which are both related to operation.

In terms of the former, the Visual Impact Assessment found that that the overall visual impact is expected to be moderate (medium). The following mitigation measures were recommended:

- The most important mitigation measure is planning and design in such that the structures are placed is such a manner that the visual intrusion is either avoided or limited as far as possible. General mitigation measures include the following:
- Existing linear features: Placing new linear structures alongside existing linear features will reduce the overall impact.
- Erosion: special attention to erosion control is important as erosion tends to develop long term scars in the landscape.
- Rehabilitation: Any temporary disturbance should be rehabilitated as soon as possible to reduce the effects of erosion.

Taking into account this mitigation together with the fact that the area is not pristine but affected by the existing interchange and historic uses, the impact can be expected to be lowered to a low-medium significance.

In terms of lighting, the Visual Impact Assessment found that from a lighting perspective, the sensitivity of the environment was high as it was classified as dark night sky with many bright and faint stars visible. The lights would be visible at a local level and therefore, lighting of lighting on the new interchange has an assessed to have a medium impact. However, the models show that the intrusion of light at night it expected to be significantly reduced by shielding the lights. The following mitigation applies:

- Lights must be shielded such than no light is visible above 10° below horizontal
- The colour temperature of the lights used should be lower than 3000 K (warm white opposed to too much blue light)

As the mitigation recommended is highly efficient, the impact is reduced to a low significance.

10.4.10.1.2Safety and Security

During construction, crime may increase due to the influx of workers into the area. This impact would be short-term in nature (i.e. limited to construction) and would potentially impact neighbouring properties. Without mitigation, the potential impact would be 'medium'. However, a number of mitigation measures will be implemented. These include:

- 24-hour access control to the site and 24-hour security; and
- Workers found to be engaging in activities such as excessive consumption of alcohol, drug use or selling of any such items on site must be disciplined.

Based on the above, and the fact that the construction employment will be managed by the relevant contractor (i.e. there will not be an employment desk on site), the impact is seen to be 'low'.

This impact is not applicable to operation as there is already an existing road in place.

10.4.10.1.3Traffic Disruptions and Traffic incidents and accidents (safety)

In terms of traffic, there will be traffic disruptions during the construction phase. This was assessed as low-medium prior to mitigation as these impacts will be short-term (limited to construction). Further, a number of deviations will be put in place including:

- At the deviation of N4-6Y from the existing alignment, where a temporary deviation is planned to align with the proposed service road.
- At the position where Ramp B crosses over the existing N4-6Y, where a temporary deviation will be required to accommodate traffic from Schoemanskloof to Mbombela.
- Along the Crocodile River bridge, including a distance of around 200 m north and south of the bridge.

- At the new bridge over the N4, including the widening of N4-7X for the Ramp D acceleration lane and the Ramp C off-ramp. This length is approximately 350 m.

The following will also be implemented to reduce impacts to road users during construction:

- Traffic calming measures and appropriate signage to be implemented.
- Speed limits on all existing roads must be adhered to at all times.
- Delivery of materials should not take place during peak times.
- Access for affected landowners to their properties must always be available

Based on this, the impact will be 'low' during construction.

During the operation of the proposed interchange is expected to reduce traffic disruptions (as there will be reduced need for accelerations and de-acceleration). Therefore, there is a **positive benefit** of medium significance in regard to traffic disturbances.

In contrast, the current status (no-go alternative) is such that due to the existing interchange configuration, there is a lot of acceleration and deceleration which in high traffic volumes can result in traffic disruptions. Further, disruptions also occur due to accidents. **The no-go option is therefore not preferred.**

In terms of traffic safety, the no go option has unsafe conditions and a high number of road accidents are experienced at (and in close proximity) to this existing T-junction which can be attributed to a few factors:

- confusion at the right turn made (east to west bound) by motorists to the N4 Schoemanskloof (R539) Route,
- vehicles colliding with stationery vehicles waiting to turn right (east to west bound),
- blind rise just before the T-junction for motorists travelling on the N4 from west to east bound and
- a blind rise and sharp corner currently posing a hazard to motorists travelling on the N4 Schoemanskloof (R539) Route after taking the T-junction right turn (east – west bound).

The impact of the no-go option is medium and cannot be suitably mitigated. It is therefore not recommended.

'The proposed interchange will drastically improve the safety of motorists and thus there is a **positive benefit** of medium-high significance in regard to traffic safety.

10.4.10.1.4Loss of Cultural Heritage

In terms of heritage, the Heritage Impact Assessment was undertaken and found that the study area was extensively disturbed by road developments, an existing Asphalt plant, old quarry and modern buildings and although the larger area is known for Iron Age stonewalled sites the extensive developments in the area would have impacted on surface indications of archaeological sites. This was confirmed during the

field survey and finds were limited to two small stone enclosures recorded as Feature 1 & Feature 2. Further, according to the SAHRIS paleontological sensitivity map the area is of low paleontological sensitivity and no further studies are required. No burials or graves were identified although it was noted that they may occur. The specialist concluded that the impact of the project on heritage resources can be mitigated to an acceptable level and it is recommended that the proposed project is approved on the condition that the following recommendations are implemented as part of the EMPr and based on approval from SAHRA:

- Documentation of the enclosures that includes scaled drawings upon which a destruction permit must be applied for from SAHRA;
- These features will have to be monitored during construction;
- Implementation of a chance find procedure for the project (archaeology and palaeontology) as outlined in EMPr.

During operation, no impacts are envisioned.

10.4.10.1.5Loss of Sense of Place

'The site is currently mostly developed and largely altered by anthropogenic activity. The site is located around the existing roads T-junction of the N4 Toll route via Ngodwana and the N4 Schoemanskloof (R539) Route. The T-junction itself is in an area known as Montrose. An old cement batching plant site is in the centre of the proposed interchange. During construction, impacts are not expected to be significant as the site is currently vacant and disturbed and does not contribute to the sense of place. The following mitigation measures are recommended:

- Suitable screening to be put in place during construction to minimise visual impacts.
- No littering to be allowed.
- Good housekeeping practices to be followed.

As the proposed interchange occurs adjacent to and includes existing road, changes during operation are not expected.

10.4.10.1.6Change in Land Use

'The site is currently mostly developed and largely altered by anthropogenic activity. The site is located around the existing roads T-junction of the N4 Toll route via Ngodwana and the N4 Schoemanskloof (R539) Route. The T-junction itself is in an area known as Montrose. An old cement batching plant site is in the centre of the proposed interchange. This site was also where the old Montrose Hotel was situated some decades ago. To the east of this site and across the N4 road, an existing construction plant park area and agricultural sheds of Jouberts & Sons are situated that has also largely altered the land from its natural state. The site also includes the expansion of the existing Crocodile River Bridge. Therefore, the change in

land use is not expected to be significant as the land is adjacent to the current N4 and falls within the City of Mbombela transportation corridor. General measures should be implemented such as:

- Suitable screening to be put in place during construction to minimise visual impacts.
- No littering to be allowed.
- Good housekeeping practices to be followed

Based on these mitigation measures, the impact is expected to have low significance.

10.4.10.2 Cumulative Impacts:

Safety and security, traffic disruptions and change in land use are all cumulative in nature. However, with the implementation of the recommended mitigation measures, the impacts are not seen to be significant.

10.4.11 Economic

10.4.11.1 Overview

From an economic perspective, there are three main aspects that were assessed

- Decline/increase in economy;
- Construction costs (affordability);
- Impacts on existing businesses (construction/visibility); and
- Employment.

10.4.11.1.1 Decline/increase in economy

During construction, the proposed development will cost approximately R165 million and will provide a significant boost to the local economy. The following measures are applicable:

- Local contractors and suppliers to be used during the construction phase as far as possible.
- Local bed and breakfasts/hotels/resorts etc. should be utilized as far as possible during construction.

Therefore, there is a **positive benefit** of medium significance.

In contrast, should the development not proceed, the benefits to the local community will be long term and negative. Firstly, there will be a loss of the injection of cash in the area. This impact is of negative medium-high significance and cannot be satisfactorily mitigated. **The no-go option is therefore not recommended from an economic standpoint.**

In addition, during operation, the proposed development will ensure safe and efficient transport along the MDC between South Africa and Mozambique and thus has indirect benefits at a national level. **This has a significance positive (medium-high benefit).**

Should the development not proceed, the benefits to the local community will be long term and negative. A grade separated intersection is required in terms of the Concession Contract to alleviate safety issues at the existing intersection and to prioritise the east-west movements between Schoemanskloof and MDC Section 7A. The MDC is an important route between South Africa and Mozambique, the lack of necessary upgrades may have a significant negative impact to the country. **The no-go option is therefore not preferred.**

10.4.11.1.2Construction costs (Affordability)

Affordability is an important consideration as the SANRAL and its concessionaires have limited budgets which need to be utilized for a multitude of projects. Additional Pier Heads (Alternative 1) is preferred from an affordability perspective and therefore has a positive medium benefit. Alternative 2 is not preferred as it is more costly. Although the no-go option will require direct capital investment, overall, it will result in a negative impact to the economy and therefore is not the affordable option.

10.4.11.1.3 Impact on existing businesses

'The proposed re-alignment of the N4 Schoemanskloof (R539) may negatively impact on existing businesses which are currently located on the current alignment during construction due to noise, traffic disruptions etc. This could have a negative economic impact on these businesses. Mitigation measures related to noise, traffic disruptions etc. are vital and must be stringently applied. Adequate signage should be put in place where applicable. With the implementation of these measures, the significance of this impact is thought to be low.

Further, the proposed re-alignment of the N4 Schoemanskloof (R539) may reduce visibility of existing businesses which are currently located on the current alignment. It is expected that this will have a medium intensity as these businesses have an existing customer base. The significance can be further reduced by the implementation of necessary signage on the new alignment (as access will be reinstated).

10.4.11.1.4Employment

'The proposed development will result in approximately 300 construction related employment opportunities for the local community (**positive medium significance**). Local labour should be utilised as far as possible. Should the development not proceed, the benefits to the local community will be long term and negative as potential employment opportunities will be lost. No mitigation measures are available and therefore the no go option is not preferred.

During operation, there will be an indirect benefit: 'the proposed development will ensure safe and efficient transport along the MDC between South Africa and Mozambique and thus has indirect benefits at a national level. Although no direct employment will be undertaken during the operational phase, the development is necessary to improve the current status of the MDC. This will likely have a number of positive multiplier effects in terms of employment in the region (**positive medium significance).** 'Should the development

not proceed, the benefits to the local community will be long term and negative as potential employment opportunities will be lost. No mitigation measures are available. **The no-go option is therefore not preferred.**

10.4.11.2 Cumulative Impacts:

Increases in economy and employment are both cumulative in nature and will thus have a compounded positive impact. In light of the fact that the fact that there is a high unemployment in the area, this is very important.

10.5 Mitigation

According to the EIA Regulations, 2014, "mitigation" means to "*anticipate and prevent negative impacts and risks, then to minimise them, rehabilitate or repair impacts to the extent feasible*". Based on this definition, it possible to see that a mitigation hierarchy exists.

At the bottom of this hierarchy is the most preferred option which includes **prevention (1).** These mitigation measures aim to avoid impacts completely. Some mitigation measures suggested for the proposed development are at this level (for example, designing the development around the wetland and 32m wetland buffer area).

The second level of mitigation is **reduction (2)** which involves mitigation measures that minimise impacts. Most of the mitigation measures suggested for the proposed development fall into this level.

Mitigation measures for the proposed development also include **remediation measures (3)** for environmental impacts. These measures focus on remediating or rehabilitating areas after they have been impacted.

Compensation (4) involves compensating the loss of an entire feature. In the case for the environment, this usually means consideration of an off set associated with rehabilitation and mitigation. No offsets or compensation measures are included in the mitigation measures for the proposed development.

Figure 10-1: Mitigation Hierarchy

An EMPr will be developed based on the findings of the impact assessment of the EIA and in line with the requirements of Appendix 4 of GN 982 of 4 December 2014. The EMPr represents a detailed plan of action and includes site-specific mitigation measures for all medium to high (significant) impacts. The mitigation and management measures will include a combination of the following:

- Physical environmental management structures.
- Monitoring and compliance of pollution and regulatory requirements.

All liability for the implementation of the EMPr (as well as the EIA findings and environmental authorisation) lies with the project applicant which in this case is the **SANRAL SOC Ltd.**

10.6 Assessment of Alternatives

According to the EIA Regulations, 2014, alternatives can be defined as:

> *"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; or*
>
> *(e) operational aspects of the activity;*
>
> *and includes the option of not implementing the activity;*

The EIA Regulations, 2014 also require that the EIA Report undertake "*a ranking process of all the identified development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment"*. The aim of this process is to identify the most ideal location for the activity within the preferred site based on the "*lowest level of environmental sensitivity"* identified during the assessment.

10.6.1 Comparative Assessment based on Receiving Environment and Impact Assessment

In line with the above, this section aims to provide a comparative analysis of the alternatives based on the receiving environment and impact assessment (Section 5 and Section 10.3. respectively). The aim of this comparative assessment is to identify the Best Practicable Environmental Option (BPEO). Münster (2005) defines BPEO as the alternative that "*provides the most benefit or causes the least damage to the environment as a whole, at a cost acceptable to society, in the long term as well as in the short term*".

Table 10-13 provides the comparative analysis of layout alternatives and shows that the

Table 10-13: Comparative Analysis Between Layout Alternatives (green shaded blocks show preference, if any)

	Alternative 1 Additional Piers	**Alternative 2 Pier Head Addition**	**Reason**
Atmospheric Emissions	*No preference*		• In terms of dust and vehicle and equipment emissions, there is no difference between the two alternatives.
Noise	*No preference*		• In terms of noise there is no difference between the two alternatives.
Surface Water	*No preference*		• Alternative 2 (Pier head Addition) does not require construction of piers in the river (although extensive form work and scaffolding will be required). Taking into account the existing infrastructure as well as the mitigation measures, both alternatives could be mitigated to a low level. Therefore, there is no preference between the two.
Waste Generation	*No preference*		• Both alternatives will result in waste being generated. As such, there is no difference between alternatives.
Soil Alteration	*No preference*		• Both alternatives will result in soil alteration.
Resource Consumption	*No preference*		• Both alternatives require resources. There is therefore no preference.

Effects on Biodiversity	*No preference*		• Both alternatives relate to the bridge expansion and will have similar impacts in terms of biodiversity.
Incidents and Accidents	✓	X	• Alternative 1 - (Additional Piers) are preferred from a safety perspective as the potential construction risks are much lower: ○ No excessive drilling or additional loads will be applied to the already slender existing piers. ○ The construction procedure will not be complex, resulting in standard staging and formwork. No pre-stressing processes will be required. ○ The additional piers provide a simple, direct load path supporting the widening. ○ Construction is simple with one column type that can be utilized at all of the piers. – Lower risks are achieved from a design and a construction point of view.
Social	*No preference*		• Both alternatives are similar and will have similar impacts.
Economic	✓	X	• Affordability is an important consideration as the SANRAL and its implementing agents have limited budgets which need to be utilized for a multitude of projects. Alternative 1 (Additional Pier Heads) is preferred from an affordability perspective.

10.6.2 Input from Specialist Studies

Specialist studies are an important aspect of the EIA process. In the case of the proposed Montrose Interchange, a number of specialist studies were undertaken, and the reports considered in the compilation of the impact assessment. The specialist studies also had numerous requirements for the proposed development. In order to identify the BPEO, the alternatives were assessed in terms of how well they meet these requirements (**Table 10-14**). Both environmental and technical specialist inputs are included.

Based on general requirements from the specialists that have been interpreted by the EAP in light of the alternatives, the following alternative is preferred and has been identified as the BPEO:

- **Alternative 1** – Additional Piers

Table 10-14: Comparative Analysis Between Alternatives taking into account Specialist Requirements (green shaded blocks show preference, if any)

	Specialist Study Requirements	Alternative 1 Additional Piers	Alternative 2 Pier Head Addition
Ecological Assessment	• A number of mitigation measures recommended and included in the EMPr. As the alternatives do not impact on the footprint, the specialist did not have any preference.	*No preference*	
Wetland Assessment	• Only drainage lines identified. Alternatives do not affect these drainage lines and therefore no preference. A number of mitigation measures have been included in the EMPr:	*No preference*	
Aquatic Assessment	• Due to the significance of the alternatives to the Aquatic environment, the aquatic specialist provided a specific assessment of the alternatives and noted: ○ Two (2) design alternatives were assessed, with both designs presenting a similar post-mitigation impact significance. ○ Alternative 2, although more ecologically appropriate, may result in compromising the strength of the existing pillars and may lead to safety issues (according to discussions with the Engineer). ○ Alternative 1, albeit with a slightly larger ecological impact, can be mitigated to result in a low overall impact. It is therefore the opinion of the specialist that this together with existing bridge infrastructure, the higher risk and cumulative impact of for Alternative 2, and the absence of safety concerns favours Alternative 1.	✓	*X*
Visual Impact Assessment	• A number of mitigation measures recommended and included in the EMPr. As the alternatives do not impact on the footprint, the specialist did not have any preference.	*No preference*	
Phase 1 Heritage Impact Assessment	• A number of mitigation measures are recommended including: ○ Documentation of the enclosures that includes scaled drawings upon which a destruction permit must be applied for from SAHRA; ○ These features will have to be monitored during construction; ○ Implementation of a chance find procedure for the project (archaeology and palaeontology) as outlined below. • No preference between alternatives.	*No preference*	

	Specialist Study Requirements	Alternative 1 Additional Piers	Alternative 2 Pier Head Addition
Preliminary Design Report	• Alternative 1 is preferred for the following reasons: ○ No excessive drilling or additional loads will be applied to the already slender existing piers. ○ The construction procedure will not be complex, resulting in standard staging and formwork. No pre-stressing processes will be required. ○ The additional piers provide a simple, direct load path supporting the widening. ○ Construction is simple with one column type that can be utilized at all of the piers. ○ Lower risks are achieved from a design and a construction point of view. ○ This is a cost-effective solution. ○ This is an aesthetically pleasing option.	✓	X
Geotechnical Assessment	• N/A	*No preference*	

10.6.3 "No-Go" Option

As standard practice and to satisfy regulatory requirements, the option of not proceeding with the project is included in the evaluation of the alternatives. The 'no go' alternative is not supported due to the following reasons:

- The proposed development involves the introduction of a new interchange at the intersection between the N4 Schoemanskloof (R539) and the N4 via Ngodwana. The aim of this new interchange is to improve traffic flow speeds and drastically improve the safety of motorists. The no-go option therefore involves the current status quo which is an existing T-junction between the N4 Schoemanskloof (R539) and the N4 via Ngodwana.
- The main implication of the no go option is that of motorist safety: currently, unsafe conditions and a high number of road accidents are experienced at (and in close proximity) to this existing T-junction which can be attributed to a few factors such as:
    - Confusion at the right turn made (east to west bound) by motorists to the N4 Schoemanskloof (R539) Route,
    - Vehicles colliding with stationery vehicles waiting to turn right (east to west bound);
    - Blind rise just before the T-junction for motorists travelling on the N4 from west to east bound and;
    - A blind rise and sharp corner currently posing a hazard to motorists travelling on the N4 Schoemanskloof (R539) Route after taking the T-junction right turn (east – west bound).
    - Should the interchange development not go ahead, there will be continued traffic safety issues resulting in continued high numbers of road accidents.
- In addition, the proposed interchange also improves traffic flows. As part of the Preliminary Design Report, an traffic assessment was undertaken and found that In the final year of the Concession (2028), the traffic volumes are expected to reach a peak of 813 vehicles per hour in the eastbound direction and 710 vehicles per hour in the westbound direction in the 30th highest peak hour. The new interchange will involve the development of four ramps which will accommodate traffic in free-flow movements in all directions. The achieved design speed of the ramps ranges from 40 km/h (on the loop ramp only) to 100 km/h. Further, the existing Crocodile River Bridge is widened to accommodate two eastbound lanes of traffic and three westbound lanes of traffic. With the no-go option, the current T-junction will remain and will not be able to accommodate the increased number of vehicles per hour. **Therefore, should the interchange development not go ahead, the current T-junction will not be able to accommodate increased numbers of vehicles.**
- Related to impacts to traffic flows is that of air emissions. Studies show that traffic disruptions are a large source of emissions. With the expected increase in vehicle numbers (expected regardless of whether the interchange is upgraded or not), the expected emissions will be higher should there be more traffic disruptions (Hanson & Noland, 2015). **Therefore, should the interchange not go ahead, more traffic disruptions would be expected and would result in higher emission levels**.
- Further, another important implication of the No Go Option is that should the development not proceed, there will be a loss of the economic benefits of the investment of approximately R165 million in the

area. There will also be a loss of the 300 construction related employment opportunities. This would be a significant negative impact as 24.8% of people in the Municipality are unemployed. **The no-go alternative would result in a loss of these positive economic benefits.**

- In addition, the proposed development will ensure safe and efficient transport along the MDC between South Africa and Mozambique and thus has indirect benefits at a national level. Although no direct employment will be undertaken during the operational phase, the development is necessary to improve the current status of the MDC. This will likely have a number of positive multiplier effects in terms of employment in the region. **The no-go alternative would result in a loss of these positive economic benefits.**

The no go option is therefore not preferred.

10.7 Motivation for the Preferred Development Footprint/Best Practicable Environmental Option (BPEO)

The EIA Regulations, 2014 require that the EIA Report include a "*a concluding statement indicating the preferred alternative development location within the approved site*" as well as a "*a motivation for the preferred development footprint within the approved site*". In line with this, the recommendations of specialists, technical considerations and the concept of the BPEO, the recommended alternative is as follows:

- **Alternative 1**: Additional Piers

Alternative 1: Additional Piers was selected for the following reasons:

- From an ecological, wetland (drainage lines), heritage and visual impact perspective, there was no difference between the two alternatives.
- However, from a technical perspective there are a number of advantages associated with this alternative. Many of these have important safety implications including:
    - No excessive drilling or additional loads will be applied to the already slender existing piers.
    - The construction procedure will not be complex, resulting in standard staging and formwork. No pre-stressing processes will be required.
    - The additional piers provide a simple, direct load path supporting the widening.
    - Construction is simple with one column type that can be utilized at all of the piers.
    - Lower risks are achieved from a design and a construction point of view.
    - This is a cost-effective solution.
    - This is an aesthetically pleasing option.
- From an aquatic perspective, the specialist found that both designs presented a similar post-mitigation impact significance. Therefore, taking into account existing bridge infrastructure, and the higher risk and cumulative impact of for Alternative 2, **Alternative 1 was preferred**.

Based on the above, the proposed design associated with Alternative 1: Additional Piers is provided the Development is provided in **Figure 10-2.**

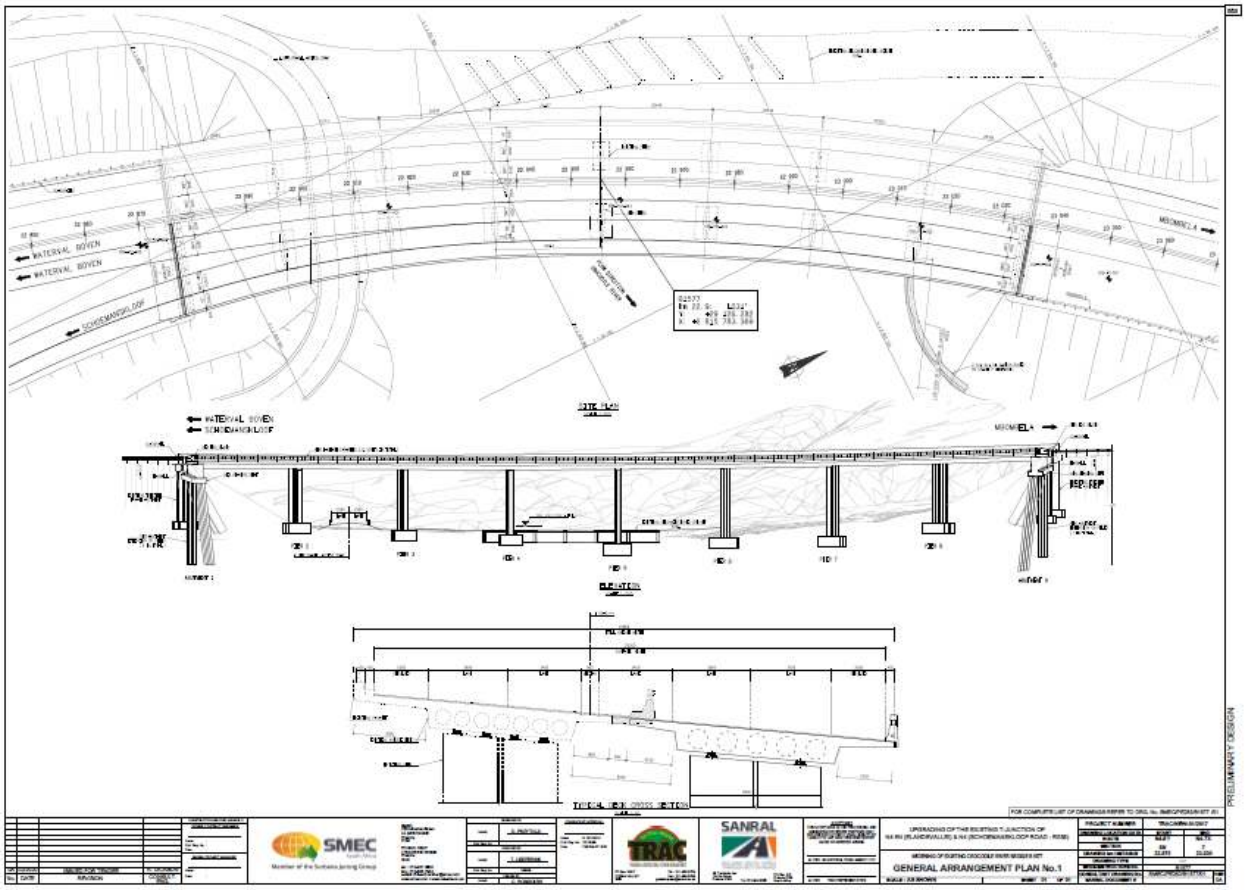

Figure 10-2: Alternative 1: Additional Piers

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11 ENVIRONMENTAL IMPACT STATEMENT

The EIA Regulations 2014 require that the EIA Report include an Environmental Impact Statement that includes the following:

- A map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers;
- A summary of the key findings of the environmental impact assessment; and
- A summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.

In addition, the EIA Report must include the following:

- Based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management objectives, and the impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorization.
- The final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;
- 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.
- A description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;
- 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;
- 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;
- Where applicable, details of any financial provisions for the rehabilitation, closure, and ongoing post decommissioning management of negative environmental impacts;
- Any specific information that may be required by the competent authority; and
- Any other matters required in terms of section 24(4)(a) and (b) of the Act.

In order to ensure that the Impact Statement is comprehensive and includes all the requirements of the Regulations, this section aims to meet the abovementioned requirements.

11.1 Sensitive Environmental Features

Figure 11-1 provides an overview of sensitive features that should be taken into account during construction and operation of the Development. These sensitive features have been identified from the findings of specialists together with an assessment of Google Earth. These features include:

- **Riparian Area and associated 32m and 50m buffer**– this area must be demarcated and only construction related to authorized infrastructure can occur within this area. The sensitivity is given as **Medium** for the 32m and 50m buffer and **Medium-high** for the delineated riparian area (Crocodile River). Rehabilitation of this resource must be undertaken as per the Appendix C of the Aquatic Impact Assessment (Prism EMS, 2020a)
- **Drainage Lines and associated 32m buffer** - this area must be demarcated and only construction related to authorized infrastructure can occur within this area. The sensitivity is given as **Low-Medium** for the 32m buffer and **Medium** for the delineated drainage lines. Mitigation measures as per the Wetland Assessment must be implemented (Prism EMS, 2020b)
- **Legogote Sour Bushveld** – the proposed interchange is located within this vegetation type which was identified as having a **Medium** sensitivity. Only construction related to authorized infrastructure can occur within this area. Site camps and storage areas are not permitted in this area and should be located within historically disturbed areas. It is important to note that whilst this area is sensitive, the specialist noted that the taking in consideration the extent of the area involved it cannot be considered that it would contribute significantly to habitat loss, whether for plants or animals within the immediate landscape. The following mitigation measures must be undertaken in regards to this area:
    - A vegetation scientist specialising in vegetation ecology should do a walkthrough prior construction commencing during the summer season, optimally January/ February to identify and mark protected plants for which permits are required. Those plants small enough to translocate could be temporarily stored in a nursery for re-introduction post construction.
    - It is strongly recommended that the topsoil from the natural areas be stored and used in the subsequent rehabilitation of the road reserve once construction had ended. The topsoil should be stored in low (1 m high), levelled stockpiles which would reduce the establishment of alien invasive species, as well as facilitate the control alien invasive species which could establish.
- **Heritage** - two, small ephemeral stone-walled enclosures were identified (). These would have formed part of a larger settlement complex that has been destroyed by earthmoving activities relating to quarries and road construction in the study area. The necessary destruction permits will be required from SAHRA.
- **Noise and Visual**_- Martin's Place is a resort in close proximity to the development (). Due to the nature of business, the resort is sensitive to noise and visual disturbances and all measures included in the EMPr must be implemented.
- The rest of the site was identified as having a **low** sensitivity as it is transformed by existing roads, agriculture, and historical uses.

Figure 11-1: Sensitivity Map

11.2 Summary of Impacts

A detailed discussion on impacts is provided in **Section 10.3** and **10.4** however in summary, all impacts can be satisfactorily mitigated to low or low-medium significance. A summary of impacts is provided in **Table 11-1.**

Table 11-1: Summary of Impacts

	Potential Impacts
Atmospheric Emissions	• In terms of atmospheric emissions, three potential impacts were identified during construction, namely, dust emissions, emissions from vehicles and equipment and impact of climate change on the construction. • During construction, impacts could be reduced to 'low' through the implementation of mitigation measures. • During operation, dust emissions are not expected. Further, whilst emissions from vehicles will take place these are of a lower significance than the no-go option. Lastly, in terms of the impact of climate change on infrastructure, the impact could be mitigated to low with the mitigation of ensuring the design takes into account probable changes.
Noise	• During construction, noise impacts will be associated with construction equipment and vehicles. Activities will be limited to the day and all equipment must comply with manufacturers specifications. Based on this, the impact would be low. • During operation, there will be some noise impacts from the intersection however these are expected to be lower than for the no-go option as the new intersection will improve traffic flows and decrease the need for acceleration and deceleration. It will also reduce traffic accidents.
Impacts to Drainage Lines	• Construction impacts to the drainage lines affected by the re-alignment of the N4 Schoemanskloof (R539) include Water Quality; Flow regime; Habitat; Biota; and Geomorphology. These impacts range from 'low' to low-medium' in significance (without mitigation) and are similar for both proposals and alternatives. With mitigation, these impacts decreased to a 'low' significance. • During operation (as with construction), potential impacts to water quality, flow regime, habitat, biota and geomorphology may occur. These impacts are expected to have a low to low-medium significance, but this can be mitigated to a low level with appropriate mitigation.
Impacts to the Crocodile River	• Potential construction impacts to the aquatic resource include Water Quality; Flow regime; Habitat; Biota; and Geomorphology. • Due to construction related to the Crocodile River bridge expansion, the potential construction impacts ranged between low-medium to medium. In particular, more significant impacts were expected with water quality, biota and geomorphology (medium significance – prior to mitigation). Impacts to habitat and flow regime were assessed to be low-medium and low respectively (before mitigation). With the implementation of the required mitigation measures, impacts for both Alternative 1 and Alternative 2 could be reduced to **low** in all cases. • Taking into account the implementation of mitigation measures which lowers the significance of the impact of the Additional piers (Alternative 1) together with the safety implications and challenges related to the pier head addition, **Alternative 1 is preferred.** • From an operational perspective (as with construction), potential impacts to water quality, flow regime, habitat, biota and geomorphology may occur. These impacts are expected to have a low significance for both alternatives. These

	Potential Impacts
	impacts were reduced further with the implementation of the necessary mitigation measures.
Waste Generation	• The proposed development will produce waste during both the construction and operational phases. During construction, impacts are expected to be 'low-medium' (before mitigation). Impacts will be reduced to a low significance through the implementation of the Waste Management Plan included in the EMPr. • During operation, incidental domestic waste from littering as well as hazardous waste from traffic accidents could occur. However, this impact has a low significance (due to the incidental nature of the occurrence) and can be further reduced with the implementation of necessary mitigation measures.
Soil Alteration	• In terms of soil alteration, loss of topsoil, loss of land capacity, alteration of topography, soil erosion and soil pollution were assessed. During construction, impacts ranged from low to medium-high before mitigation. • The construction of the new interchange development will result in the removal of topsoil to allow for necessary foundations. This impact is expected to be of medium significance prior to mitigation. In order to reduce this impact, all topsoil will be separated and re-used where possible (especially as part of rehabilitation measures). With the implementation of this measure, the impact significance is reduced to low-medium. During operation, impacts to topsoil are not expected. • During construction, extensive cuts will be put in place to allow for the re-alignment of the N4 Schoemanskloof (R539). This will result in extensive changes to the topography at a site level. This impact was assessed as medium-high prior to mitigation due to the possible changes to stormwater and resultant erosion. However, with the implementation of proper stormwater management practices, which has a high mitigation efficiency, the extent of this impact is reduced to low. During operation, impacts to topography are not expected • The site is currently degraded by historical use and is not used for agriculture. Therefore, based on this, the impact is seen to be of a 'low-medium' significance. Impacts are not expected during operation. • Soil erosion is another potential impact and is closely related to topography and stormwater management. However, with proper mitigation, this impact can be sufficiently mitigated to a low level. During construction stormwater measures will be put in place. During operation, low significance of impacts is also expected as stormwater has been designed with erosion control measures. The site will also be rehabilitated after construction to prevent erosion. • Lastly, in terms of soil pollution, impacts may occur but would be incidental in nature and if cleaned properly, will result in a very low significance impact.
Resource Consumption	• Four types of resource consumption were assessed, namely, water, electricity, raw materials and fuel. During construction, all resource consumption was assessed to be at a 'low-medium' level except electricity which was not expected to have a large impact as generators would likely be used together with existing connections. Based on a number of recommended mitigation measures, the impacts are expected to decrease to a 'low' level. • During operation, impacts in terms of raw material consumption and water consumption are not expected. There will be electricity consumption in order to provide the necessary lighting however with the implementation of mitigation measures, the impact is reduced to low. • In addition, the proposed interchange will be used by cars however the impact in term of fuel consumption is expected to be lower than in comparison to the no-go option because vehicles and large trucks would not need to decelerate and accelerate as much as the current T-junction scenario and therefore less fuel will be burned. Overall, this impact was assessed having significance whilst the no-go option has a low medium significance.

	Potential Impacts
Effects on Biodiversity	• In order to assess the various potential impacts on ecology, an Ecological Assessment was undertaken. The specialist found that the upgrade of the interchange will result in the removal of natural vegetation, associated with a threatened vegetation unit on a regional scale and Critical Biodiversity Area on a provincial scale, however taking in consideration the extent of the area involved, of less than four hectares, it cannot be considered that it would contribute significantly to habitat loss, whether for plants or animals within the immediate landscape. The impact was therefore identified as low medium and was further reduced to low through the implementation of necessary mitigation measures. • Further, due to the existing road infrastructure, it is highly unlikely that the upgrade of the interchange would significantly contribute to incidents of roadkill as the animals present in the landscape is used to the existing road infrastructure and traffic volumes. Similarly, to the impact to natural vegetation, the impact to fauna was also identified as low medium and was also further reduced to low through the implementation of necessary mitigation measures.
Incidents and Accidents	• Five main impacts were assessed linked to incidents, accidents and potential emergency situations. These included Pollution incidents, Health and safety, Health and safety - Construction risk (related to construction only), Structural safety (related to operation to only), Storage of hydrocarbons resulting in spillages and Fire. • During construction, it was found that these impacts would have a low significance for Alternative 1: Additional Piers as they are incidental in nature. In addition, several mitigation measures will be implemented which will reduce the significance of these impacts even further. • However, in contract, the construction risk for Alternative 2 (Pier Head addition) was found to be of medium significance. This is due to the fact that Specialized temporary works and access will be required to work at the top of the existing piers. Further, unique and differing designs will be required for the piers supporting the tapering bridge superstructure. Complex construction procedures will also be required, such as pre-stressing at height and therefore, there are significantly higher risks in design and construction. **This impact could not be satisfactorily mitigated, and this is one of the main reasons that Alternative 2 (Pier Head Addition) is not preferred.** • During operation, impacts related to storage of hydrocarbons is not expected. Pollution impacts related to potential traffic accidents resulting in spillages. This was assessed to have a 'low' significance as it would be incidental in nature. In terms of general health and safety, impacts were also expected to be low. Although, routine maintenance will be required (for example, grass cutting etc.), all health and safety requirements in terms of legislation and TRAC N4 policies will be adhered to and will reduce this risk. Further, this risk is existing and also occurs with the no-go option. • From a structural safety point of view, there is more risk related to Alternative 2 (Pier Head Addition) as it is more complex. However, considering that incidents would be highly unlikely, this impact was assessed as low for both alternatives. • During both construction and operation, fires are possible but would be incidental and limited to the neighbouring areas. Whist the intensity would be low-medium, the overall significance would be 'low'. In addition, a number of mitigation measures will be implemented.
Social	• During construction, the following impacts were assessed: Visual impact – Construction, Safety and security, Traffic disruptions, Loss of cultural and palaeontological heritage, Loss of sense of place and Change of land use. In addition, during operation, Visual impact and Visual impact – Lighting and Traffic incidents and accidents (safety) were also assessed.

	Potential Impacts
	• There are three main components related to visual impacts. The first is general construction visual impacts which only apply during construction. These are temporary in nature and were therefore found to be of a low medium significance. With mitigation, the impact is therefore expected to be reduced to low. • The second and third component relate to the visual impact of the interchange itself as well as the impact of the lighting which are both related to operation. • In terms of the former, the Visual Impact Assessment found that that the overall visual impact is expected to be moderate (medium. A number of mitigation measures were recommended. Taking into account this mitigation together with the fact that the area is not pristine but affected by the existing interchange and historic uses, the impact can be expected to be lowered to a low-medium significance. • In terms of lighting, the Visual Impact Assessment found that from a lighting perspective, the sensitivity of the environment was high as it was classified as dark night sky with many bright and faint stars visible. The lights would be visible at a local level and therefore, lighting of lighting on the new interchange has an assessed to have a medium impact. However, the models show that the intrusion of light at night it expected to be significantly reduced by shielding the lights. As the mitigation recommended is highly efficient, the impact is reduced to a low significance. • In terms of safety and security, during construction, crime may increase due to the influx of workers into the area. This impact would be short-term in nature (i.e. limited to construction) and would potentially impact neighbouring properties. Without mitigation, the potential impact would be 'medium'. However, a number of mitigation measures will be implemented. Based on these, the impact is seen to be 'low'. • In terms of traffic, there will be traffic disruptions during the construction phase. This was assessed as low- medium prior to mitigation as these impacts will be short-term (limited to construction). Further, a number of deviations will be put in place together with a number of mitigation measures. Based on this, the impact will be 'low' during construction. • During the operation of the proposed interchange is expected to reduce traffic disruptions (as there will be reduced need for accelerations and de-acceleration). Therefore, there is a positive benefit of medium significance in regard to traffic disturbances. In contrast, the current status (no-go alternative) is such that due to the existing interchange configuration, there is a lot of acceleration and deceleration which in high traffic volumes can result in traffic disruptions. Further, disruptions also occur due to accidents. • In terms of traffic safety, the no go option has unsafe conditions and a high number of road accidents are experienced at (and in close proximity) to this existing T-junction. The impact of the no-go option is medium and cannot be suitably mitigated. In contrast, the proposed interchange will drastically improve the safety of motorists and thus there is a positive benefit of medium significance in regard to traffic safety. • In terms of heritage, the Heritage Impact Assessment was undertaken and found that the study area was extensively disturbed by road developments, an existing Asphalt plant, old quarry and modern buildings and although the larger area is known for Iron Age stonewalled sites the extensive developments in the area would have impacted on surface indications of archaeological sites. This was confirmed during the field survey and finds were limited to two small stone enclosures recorded as Feature 1 & Feature 2. Further, according to the SAHRIS paleontological sensitivity map the area is of low paleontological sensitivity and no further studies are required. No burials or graves were identified although it was noted that they may occur. The specialist concluded that the impact of the project on heritage resources can be mitigated to an acceptable level and it is recommended that the proposed project is approved on the condition the

	Potential Impacts
	implementation of a number of recommendations. Further, during operation, no impacts are envisioned. • The site is currently mostly developed and largely altered by anthropogenic activity. During construction, impacts are not expected to be significant as the site is currently vacant and disturbed and does not contribute to the sense of place. Impacts are expected to be of a low level and mitigation measures have been included in the EMPr. Further, as the proposed interchange occurs adjacent to and includes existing road, changes during operation are not expected. • 'The site is currently mostly developed and largely altered by anthropogenic activity. Therefore, the change in land use is not expected to be significant as the land is adjacent to the current N4 and falls within the City of Mbombela transportation corridor. A number of mitigation measures are recommended. Based on these mitigation measures, the impact is expected to have low significance.
Economic	• From an economic perspective, there are three main aspects that were assessed which included Decline/increase in economy; Construction costs (affordability); and Employment. • During construction, the proposed development will cost approximately R165 million and will provide a significant boost to the local economy. Therefore, there is a positive benefit of medium significance. • In contrast, should the development not proceed, the benefits to the local community will be long term and negative. Firstly, there will be a loss of the injection of cash in the area. This impact is of negative medium-high significance and cannot be satisfactorily mitigated. The no-go option is therefore not recommended from an economic standpoint. • In addition, during operation, the proposed development will ensure safe and efficient transport along the MDC between South Africa and Mozambique and thus has indirect benefits at a national level. This has a significance positive (medium-high benefit). • Should the development not proceed, the benefits to the local community will be long term and negative. A grade separated intersection is required in terms of the Concession Contract to alleviate safety issues at the existing intersection and to prioritise the east-west movements between Schoemanskloof and MDC Section 7A. The MDC is an important route between South Africa and Mozambique, the lack of necessary upgrades may have a significant negative impact to the country. The no-go option is therefore not preferred. • Affordability is an important consideration as the SANRAL and its concessionaires have limited budgets which need to be utilized for a multitude of projects. Additional Pier Heads (Alternative 1) is preferred from an affordability perspective and therefore has a positive medium benefit. Alternative 2 is not preferred as it is more costly. Although the no-go option will require direct capital investment, overall, it will result in a negative impact to the economy and therefore is not the affordable option. • The proposed development will result in approximately 300 construction related employment opportunities for the local community (positive medium significance). Should the development not proceed, the benefits to the local community will be long term and negative as potential employment opportunities will be lost. No mitigation measures are available and therefore the no go option is not preferred. • During operation, there will be an indirect benefit: 'the proposed development will ensure safe and efficient transport along the MDC between South Africa and Mozambique and thus has indirect benefits at a national level. Although no direct employment will be undertaken during the operational phase, the development is necessary to improve the current status of the MDC. This will likely have a number of positive multiplier effects in terms of employment in the region (positive medium significance). 'Should the development not proceed, the benefits to the

	Potential Impacts
	local community will be long term and negative as potential employment opportunities will be lost. No mitigation measures are available. The no-go option is therefore not preferred.

11.3 Recommendations from Specialist Reports

An overview of the recommendations of the various environmental and technical specialists are provided in **Table 11-2**. Please note that only the main mitigation measures are provided. All mitigation measures are however included in the EMPr.

Table 11-2: Specialist recommendations

	Recommendations	Development to proceed
Ecological Assessment	• A vegetation scientist specialising in vegetation ecology should do a walkthrough prior construction commencing during the summer season, optimally January/ February to identify and mark protected plants for which permits are required. Those plants small enough to translocate could be temporarily stored in a nursery for re-introduction post construction. • It is strongly recommended that the topsoil from the natural areas be stored and used in the subsequent rehabilitation of the road reserve once construction had ended. The topsoil should be stored in low (1 m high), levelled stockpiles which would reduce the establishment of alien invasive species, as well as facilitate the control alien invasive species which could establish. • The upgrade of the interchange allows for an opportunity to increase the permeability of the road infrastructure to facilitate animal movement in the landscape. Therefore, culverts should be designed to allow movement for small to medium size mammals to and from a water source such as the Crocodile River, this is especially relevant for the section towards the west.	✓
Wetland Assessment (Drainage Lines)	• Resource drivers should be protected as far as possible. • Water quality preservation is key. Silt protection measure to be implemented in consultation with the wetland specialist (ECO). • On site storm water management must be implemented. • On site filtration must be adopted (hay bales can be used affectively) • Ingress and Egress must be managed to minimise impacts in respect of compaction of the soils. • Single entry and exit points must be established. • These areas must be scarified with the contours in mind as part of the rehabilitation plan. • Stock piling must be located outside the delineated drainage line and buffer boundaries. • An approved stormwater management plan must be implemented. • Velocity dissipation structures and sheet flow structures (such as reno mattresses) must also be installed to prevent water flowing through culverts to gain velocity and be released uncontrolled. • Dispersed flow must be attained post formal structures.	✓

	Recommendations	Development to proceed
	• Removal of alien and invasive plant species during the construction and operational phases. • Stabilisation of gullies and drainage lines to prevent erosion. • Implementation of topsoil management (stockpiling, topography shaping) and erosion control (berms, geotextiling, silt fences, hay bales and gabion structures). • Re-vegetation with indigenous plant species.	
Aquatic Impact Assessment (Crocodile River)	• **Soil erosion prevention** - Control measures should be in place to minimise the spread of suspended sediment and limit it as far as feasibly possible to the direct area of influence. Ensure that control measures are in place to control erosion (e.g. access road drainage) and additional sediment inputs into the aquatic resource. Excavation methods must also be in line with environmental best practises. • **Chemical spillage prevention** - Control measures to prevent chemical spillages prevention includes a number of best practice measures such as ensuring changing, servicing and repairs don't take place near the watercourse and that specific storage areas are designated for storage of hazardous chemicals. • **Protection of aquatic biodiversity -** Prevent alteration in water quality and a further decline to the aquatic community structures through the prevention and reduction of impacts, and ensuring the rehabilitation of the construction site to the condition pre-construction, equivalent to neighbouring sections of the river, or better, whichever will maintain and protect aquatic biota. Implementing and managing these mitigation measures for impacts related to water quality will largely mitigate the expected impacts on aquatic biota. • **Habitat loss and clearing of vegetation** - Habitat plays an integral role in species richness, hence any reduction/deviation from the optimal vegetation, stones, gravel, sand, mud, and/or differential flow availability may reduce biodiversity. Therefore, measures to ensure stabilisation of the riverbank should be implemented at sections of the river with a high probability of being affected by the construction activities. The stabilisation methods should ensure that adequate marginal vegetation is available for aquatic biota. Re-vegetation, de silting may also be required. • **Contamination – hazardous, general and human waste** Hazardous, general and/or human waste may contribute to poor, and even toxic, water quality with the potential to eradicate aquatic biota on a regional scale. It is therefore imperative that these types of waste do not enter the water course and riparian area. • **Resuspension and introduction of sediment/materials -** An increase in turbidity, due to suspended sediment/materials during construction activities may result in reduced photosynthetic capacity of primary producers, increased bacterial activity and a decrease in oxygen saturation. The suspended matter could interfere with the reproduction, growth and survival of aquatic organisms according to Hill and Kleynhans (1999), which would ultimately compromise biotic integrity. Stormwater management during construction must be implemented.	

	Recommendations	Development to proceed
	• **Hazardous, human and general waste introduction -** Personnel should not use watercourses for sanitation purposes. Ablution facilities should be made available in close proximity to active work areas, but outside the riparian/wetland buffer boundaries. Proper waste management must also be implemented. • **Flow modification** - The design of the storm water system should ensure that no adverse impacts on the natural systems in terms of increased velocity of storm water. Effective and sustainable stormwater management.	
Visual Impact Assessment	• The most important mitigation measure is planning and design in such that the structures are placed is such a manner that the visual intrusion is either avoided or limited as far as possible. • Secondarily, it is important that during the construction phase the short-term visual disturbance is kept to a minimum that any such disturbance is adequately rehabilitated such that no long term disturbance remains. General mitigation measures include the following: ○ Lights must be shielded such than no light is visible above 10° below horizontal ○ The colour temperature of the lights used should be lower than 3000 K (warm white opposed to too much blue light) ○ Existing linear features: Placing new linear structures alongside existing linear features will reduce the overall impact. ○ Erosion: special attention to erosion control is important as erosion tends to develop long term scars in the landscape. ○ Clearing of vegetation: Clearing of any vegetation that would provide a screening effect should be avoided. Generally, the overall area has abundance vegetation which could be utilised as a shield. ○ Access Roads: Use existing roads and tracks as far as possible ○ Rehabilitation: Any temporary disturbance should be rehabilitated as soon as possible to reduce the effects of erosion.	✓
Heritage Impact Assessment	• Documentation of the enclosures that includes scaled drawings upon which a destruction permit must be applied for from SAHRA; • These features will have to be monitored during construction; • Implementation of a chance find procedure for the project (archaeology and palaeontology) as outlined in EMPr.	✓
Preliminary design report	• Designs provided by both reports must be implemented to ensure that required services are in place.	N/A
Geotechnical Assessment	• N/A	N/A

11.4 Impact Management Objectives and Outcomes

Impact management objectives and outcomes will be provided in the EMPr to ensure that the proposed development is sustainable and has not significantly negative impacts. A summary of these management objectives is provided below:

- To maintain levels of fallout dust emissions below 1200 mg/m3.
- No unpleasant or offensive odours are experienced on site.
- The level of greenhouse gas emissions emanating from plant and vehicles on site is kept to a minimum.
- Design incorporates potential climate changes
- Damage caused to lungs and eyes is prevented.
- The extent of the contactor's construction footprint and spoil storage footprint, as well as remainder inside sensitive areas is kept to a minimum.
- Adequate protection of soil and soil remediation measures in case of spills is ensured.
- To prevent any erosion and to provide adequate erosion control measures where required.
- Alien plants / seeds are prevented from being introduced on site and spreading to surrounding areas.
- Alien plants are eradicated and removed from site.
- All possible impacts on faunal movement are kept to a minimum.
- Consideration is given to faunal movements before demarcation of areas and habitat clearing.
- The unnecessary harvesting of wood from the surrounding area is prevented.
- No pollutants are being released to the aquatic environments.
- Wastewater is appropriately managed.
- Erosion is prevented.
- Turbidity is appropriately managed during instream works.
- Management of activities within the watercourse to ensure impacts to aquatic biota are minimized.
- Full compliance to the limits provided by the IUCMA for abstraction volumes from a watercourse.
- Wastewater generated from construction activities is as far as possible recycled for reuse.
- The design of the storm water system should ensure that no adverse impacts on the natural systems in terms of increased velocity of storm water.
- Construction and operational activities should not impact negatively on the flow of the aquatic resource.
- Re-use and recycling of waste is promoted where prevention thereof is not possible.
- The disposal of waste to local waste disposal sites is limited.
- The required number of portable toilets are provided and serviced on a regular basis.
- Hazardous spills are prevented, mitigated if occurred and no incidents to human health.
- Level of noise generation kept to a minimum.
- Identified subterranean habits prior to blasting and compaction activities are considered.
- The effects of blasting and compaction activities are limited.
- Preserve sites and artefacts of archaeological interest, unearthed during construction as well as ensure that the correct protocols for potential grave relocation (should it be required) are adhered to.
- Accidents are prevented.

- The surface quality of the road is not negatively impacted by the construction activities.
- The presence of construction activities and vehicles is continually clearly indicated thereby minimising the potential for accidents.
- Sections of existing road surfaces which have been impacted on by the construction activities are remediated.
- No uncontrolled fires are created.
- The disruption of the natural and existing landscape characteristics is limited.
- Disruption of all major services to the affected area is prevented.
- Surrounding landowners, business owners and communities have been consulted with prior to and during construction.
- Local labour where applicable and as far as possible have been employed.
- Development of unskilled, semi-skilled and skilled personnel recruited from the Project Area, and wider Mpumalanga Province respectively.
- The construction site is demarcated.
- The influx of job-seekers is minimised and the risk of their presence leading to negative social impacts is reduced.
- Local people are encouraged not to leave current employment for temporary work on the project.
- The safety of all personnel on site during the construction phase is ensured.
- Visual impacts are suitably mitigated as required by the specialist study.
- Proper rehabilitation is undertaken

11.5 Assumptions, Uncertainties and Gaps in Knowledge

The following potential uncertainties have been identified:

- The Impact Assessment undertaken is influenced heavily by the findings of the specialist studies. Some assumptions, gaps and uncertainties are applicable to these Specialist Studies (refer to Section 9.8). These are therefore inherent to the impact assessment and associated Environmental Impact Assessment. That said, the assumptions, gaps and uncertainties are minimal and are not expected to affect the outcome of this assessment.
- It must be noted that, during the process of converting spatial data from the various specialist studies, to final output drawings, several steps are followed that may affect the accuracy of the sensitivity map. Due care has been taken to preserve accuracy. Printing or other forms of reproduction may also distort the scale indicated in maps. As per the requirements of the various specialist studies, the delineations should be pegged in consultation with the specific specialist.

11.6 Reasoned Opinion of EAP

11.6.1 Summary of EIA Report Findings

The **SANRAL** is proposing road upgrades by introducing a road interchange at the existing T-junction of the National N4 toll route via Ngodwana between eMgwenya (Waterval Boven) and Mbombela (Nelspruit)

with the alternative N4 Schoemanskloof (R539) Route, Mpumalanga Province of South Africa. The aim of this new interchange is to improve traffic flow speeds; and drastically improve the safety of motorists.

The proposed interchange development involves:

- A grade separated intersection is required in terms of the Concession Contract to alleviate safety issues at the existing intersection and to prioritise the east-west movements between N4 Schoemanskloof (R539) Route and MDC Section 7A.
- To be able to accommodate the proposed directional ramps, without constructing an entirely new bridge across the Crocodile River, N4 Schoemanskloof (R539) Route is realigned to a position approximately 100 m parallel to the south of the existing road. The design speed of the re-aligned N4 Schoemanskloof (R539) is 100 km/hour.
- In terms of the N4-7X south of the Crocodile River Bridge (MDC Section 6E), the existing road is being retained, however all four of the proposed ramps tie into this section of the road. Further, the existing at-grade intersection will fall away. The cross-section is being standardised at the at-grade intersection to a 3.7 m lane in each direction with 2.5 m surfaced shoulders, with the turning lanes being removed. A parallel acceleration lane from Loop D is added through the cutting underneath the proposed Ramp A/ Loop D bridge over the N4, requiring widening of the existing cutting to accommodate a new concrete drainage channel. The existing cross-fall, which is less than 2% in some areas, is being retained.
- With the N4-7X north of the Crocodile River Bridge (MDC Section 7A), the cross-section is a very narrow four-lane undivided road with lane widths of approximately 3.3 m, shoulder widths of 0.3 m, and a 0.8 m painted median. Gravel shoulders make up the remainder of the cross-section, with stormwater channels and guardrails having been positioned for the 19.8 m cross-section. This section includes the widening of the Crocodile River Bridge.
    - The existing bridge over the Crocodile River (B1577) has a total length of 160 m with a roadway width of 11.8 m and a cross-fall ranging between 6 and 9.6%. In terms of designs, the voided deck option was considered the most suitable for this type of widening due to having a similar appearance and the same structural behaviour as the existing structure. The proposed new typical road cross-section across the bridge includes five (5) lanes in total together with two (2) shoulder lane and will be approximately 24.86m in width.
- Four ramps will be put in place and include.
    - **Ramp A** carries the traffic movement from Mbombela to Schoemanskloof. The proposed cross-section will have a 4.0 m lane width and 2.0 m surfaced shoulders where there is only a single lane. The lane width reduces to a typical 3.7 m and the surfaced shoulders fall away when adjacent to Ramp C or Loop D's lanes.
    - **Ramp B** carries the traffic movement from Schoemanskloof to Mbombela. Ramp B is a continuation of the eastbound core lane of N4 Schoemanskloof (R539) Route and continues on to form the left-hand lane of N4-7X.Ramp B is designed for 100 km/h as it will for part of the future prioritised N4-6Y. The vertical alignment of Ramp B is designed to tie into the vertical alignment of the realigned Schoemanskloof Road at km 63 100 and to tie in to the level of the

existing Schoemanskloof Road to minimise the cost and duration for accommodation of traffic. The proposed cross-section will have a 4.0 m lane width and 2.0 m surfaced shoulders.

- **Ramp C** carries traffic from the Elands Valley to Schoemanskloof. The ramp begins with a 1:15 taper off of the N4 and continues on in an auxiliary lane parallel to the lane from Ramp A. This auxiliary lane serves an additional function as a passing opportunity for the Schoemanskloof route as a whole. The proposed cross-section is a 4.0 m lane width and 2.0 m surfaced shoulders. The lane width reduces to a typical 3.7 m wide and the right-hand shoulder falls away where Ramp C joins Ramp A's alignment.
- **Ramp D** carries traffic from Schoemanskloof to Waterval Boven. The loop component of the ramp is designed for 40 km/h while the directional component is designed for 70 km/h. The loop ramp enters the N4 with a parallel acceleration lane with a length of 185 m required to accelerate from 40 km/h to 100 km/h. The proposed cross-section is a 4.0 m lane and 2.0 m shoulders. The right-hand surfaced shoulder falls away where Loop D runs parallel to Ramp A, returning when Loop D diverges from the Ramp A alignment.
- As part of this, a new interchange bridge will be put in place and will be a new overpass structure located at km 22.31 over N4-7X. The bridge will carry the new Ramps A and D over the existing cutting.

- The new Montrose Interchange Bridge (B0571) will be a new structure to accommodate the new interchange Ramps A and D over the existing N4-7X. The proposed design makes use of the existing rock faces for founding and will be approximately 47.9 m from deck end to end. As part of the design, the superstructure will consist of a 600 mm thick, continuous slender slab deck 47.9 m from expansion joint to expansion joint. The deck has substantial cantilevers and is supported by a slender arch under the deck which springs off spread footings in the rock cutting. The deck ends are supported on shallow abutments with spread footings on rock.
- There are a number of properties that currently get direct access to the national road network that are affected by the proposed interchange. The proposed access reinstatement is detailed below:
  - Access to Remainder of Portion 19 of the farm Elandshoek 302 is retained by formalising the existing shared access. A farm access-type intersection is proposed because the median for the realigned N4 Schoemanskloof (R539) Route is opened up immediately to the east of this access. A lower-standard access may be considered as an alternative.
  - Remainder of the farm Montrose 573 is divided into three portions by the existing N4-7X and now the Montrose Interchange. Existing access is retained via the existing N4 Schoemanskloof (R539) Route and two new farm accesses along N4-7X.
  - Portion 8 of the farm Mooifontein 292, through Remainder of Portion 19 of the farm Elandshoek 302 (shared access, as described above).
  - Remainder of Portion 2 of the farm Montrose 290. Should access be required, it is proposed that the defunct alignment of Road P154/6 be reformalised and access to this portion be provided via a new private gravel road passing underneath the Crocodile River Bridge. The proposed access road will link from the old bridge B381 to the property.
- In terms of stormwater, the following minor stormwater drainage systems are proposed:
  - Cut-off berms or drains on top of deep cuts;

  - Type F concrete side drains and grid inlets to intercept road surface runoff;
  - Type A concrete side drains in high fills; where run-off will be discharged by downpipes / chutes;
  - Minimum size of 900 mm diameter for new cross drainage culverts discharging stormwater in accordance with SANRAL standards for culverts longer than 30 m;
  - Existing side drains to be reconstructed to suit the proposed geometric layout and resized based on the most recent SANRAL design standards;
  - Erosion protection measures to be implemented along the route; and
  - Subsoil drains to be provided under all concrete side drains.
- The re-aligned N4 Schoemanskloof (R539) Route crosses a number of small drainage lines. The same drainage paths were crossed by the existing N4-6Y alignment and so the stormwater will be handled in much the same way:
  - Earth embankments/ berms will be constructed at the top of the cuttings to channel stormwater runoff for a short distance to inlet structures at the top of the cuttings.
  - The water will then be conveyed beneath the realigned N4-6Y in concrete pipes with a minimum diameter of 600 mm.
  - The stormwater will then discharge from these culverts into existing open, unlined channels or into newly constructed open earth channels.
- The aim is to reinstate the existing flow paths and to not increase the discharge flows at any of the existing culverts where possible.

The Proposed Development triggered a number of activities from Listing Notice 1, 2 and 3 of the EIA Regulations, 2014 As such a Scoping and EIA process was undertaken to assess the impacts of the proposed development and to ensure that the development was in line with the concept of sustainable development captured in NEMA. In addition, a General Authorisation is in process.

Public Participation was undertaken throughout the process and includes two notification and registration periods (September and November 2019), two public open days (November 2019) and public review of the Scoping Report (September/October 2020). To date no objections have been raised. During the initial notification period, a number of requests to be registered were noted. SAPPI Ngodwana have raised a concern regarding the potential traffic impacts the construction of the interchange might have on their logistics and travels of large haul trucks transporting timber. Martin's Haven have raised their concern over potentially losing much business and revenue when the interchange replaces the existing R539 last section of road which also form current access to the resort.

Further, as part of the Scoping Report review, formal comments were received from the DEFF on 12 October 2020. In addition, a number of smaller comments were also received and included:

- An email from SAHRIS was received and requested that the Scoping Report and associated annexures to be added to the existing case and the additional case be deleted.
- An email was received from the Local Municipality requesting a site visit.
- An email was sent noting that the I&AP was not in close proximity to the Montrose Interchange and would thus not be providing comments.

- An email was sent requesting registration and noting support of the project. The I&AP also requested interest is providing accommodation to contractor employees.
- An email was sent to note issues with the website.

Based on the concerns raised, listed activities and potential impacts associated with the development and desktop assessment of environmental sensitivity, a number of specialist studies were undertaken to assess the impacts associated with the development. Several technical studies were also undertaken and informed the EIA process. Specialist and technical studies included:

- Ecological Assessment;
- Wetland Assessment;
- Aquatic Impact Assessment;
- Visual Impact Assessment;
- Phase 1 Heritage Impact Assessment;
- Preliminary Design Report; and
- Geotechnical Assessment.

An Ecological Assessment was undertaken and determined that from a desktop perspective, the site falls within a threatened ecosystem, Legogote Sour Bushveld, as well as a Critical Biodiversity Area. Taking in consideration the extent of the area involved, the study found that the proposed interchange would not contribute significantly to habitat loss, whether for plants or animals within the immediate landscape. Impacts to these sensitive features were therefore identified as low medium and was further reduced to low through the implementation of necessary mitigation measures. Further, due to the existing road infrastructure, it is highly unlikely that the upgrade of the interchange would significantly contribute to incidents of roadkill as the animals present in the landscape is used to the existing road infrastructure and traffic volumes. Similarly, to the impact to natural vegetation, the impact to fauna was also identified as low medium and was also further reduced to low through the implementation of necessary mitigation measures. A number of mitigation measures were recommended by the specialist and have been incorporated into the EMPr. On the basis of the implementation of these mitigation measures, the specialist recommended the proposed development be authorised.

The Wetland Assessment was undertaken to confirm whether any wetlands would be affected by the development. The study found that no wetlands occur in the study area but that the proposed interchange could cross a number of drainage lines. The specialist noted that these drainage lines are all largely natural with few moderate modifications and impacts by historical and ongoing anthropogenic activities. The PES for the drainage lines were scored in the mid-high ranges. The EIS falls in the moderate range and some functionality in respect of biodiversity conservation and play a small role in moderating the quantity and quality of water of major rivers. The REC for the drainage lines were categorised as moderate. It will thus require some rehabilitation to enhance the ecological function of the system. The specialist therefore supported that the development should the design requirements include measures to preserve the major resource drivers, i.e. flow and water quality. He further noted that the rehabilitation of the areas is vital to

recover some ecological function. The resource drivers must be enhanced as part of the rehabilitation of the affected areas. In respect of the construction phase, it is important to ensure that the required erosion protection measures linked to the crossing sections be carefully designed and installed.

An aquatic assessment was undertaken and identified one aquatic resource which was affected by the proposed development. The PES for the stream scored in the middle ranges as the aquatic resource (Crocodile River) is moderately modified and impacted on by surrounding agricultural, recreational, and storage activities/facilities, as well as existing roads and crossings. The EIS falls in the high range and has functionality in respect of moderating water quality and supporting intolerant fish species and sensitive aquatic macroinvertebrates. Rehabilitation may be required to enhance the ecological function of riparian areas affected by the road and bridge upgrades. The aquatic resource under study was considered to be a highly sensitive river, more specifically in respect of flow, water quality and biodiversity. A number of specific measures were recommended and the specialist noted the project can be supported, should all the mitigation measures be implemented and monitored against to ensure compliance. Furthermore, the specialist assessed both alternatives and found that both designs presented a similar post-mitigation impact significance. Whilst Alternative 2, was found to be more ecologically appropriate, due to the fact that it may negatively impact the strength of the existing pillars and may lead to safety issues, together with the fact that the proposed development involves existing bridge infrastructure, Alternative 1 was identified as the preferred alternative.

A Heritage Impact Assessment was undertaken and found that the study area was extensively disturbed by road developments, an existing Asphalt plant, old quarry and modern buildings and although the larger area is known for Iron Age stonewalled sites the extensive developments in the area would have impacted on surface indications of archaeological sites. This was confirmed during the field survey and finds were limited to two small stone enclosures recorded as Feature 1 & Feature 2. Further, according to the SAHRIS paleontological sensitivity map the area is of low paleontological sensitivity and no further studies are required. No burials or graves were identified although it was noted that they may occur. The specialist concluded that the impact of the project on heritage resources can be mitigated to an acceptable level and it is recommended that the proposed project is approved on the condition that the recommendations included in the report are implemented as part of the EMPr and based on approval from SAHRA:

In terms design, a Preliminary Design Report has been compiled and found that the proposed construction of the Montrose Interchange is required and is feasible from a technical engineering and safety perspective. Alternative 1: Additional Piers was recommended as the preferred alternative from a technical perspective. A Geotechnical Assessment was also undertaken and inform the design of the interchange. Important to note that is that the extensive cuts proposed will provide necessary material required for the development.

A detailed impact assessment was undertaken as part of the EIA Report, and included a qualitative and quantitative approach was followed. From a qualitative perspective, impacts related to listed activities and raised by I&APs were assessed. This was then followed by a more detailed quantitative assessment which incorporated the findings of the specialists where possible. Overall, all impacts could be mitigated

satisfactorily. Alternatives were then compared and assessed based on their impact to environmental attributes as well as how well they incorporated the requirements of the various specialists. Based on this assessment, the recommended alternative is as follows:

- Alternative 1: Additional Piers

The no-go option/alternative was not supported for a number of reasons, the most of important of which being that should the development not proceed, there will be continued traffic safety issues resulting in continued high numbers of road accidents. Further, the current T-junction will not be able to accommodate increased numbers of vehicles and will result in further disruptions. Another important implication of the No Go Option is that should the development not proceed, there will be a loss of the economic benefits of the investment of approximately R165 million in the area. There will also be a loss of the 300 construction related employment opportunities. This would be a significant negative impact as 24.8% of people in the Municipality are unemployed. In addition, the proposed development will ensure safe and efficient transport along the MDC between South Africa and Mozambique and thus has indirect benefits at a national level. Although no direct employment will be undertaken during the operational phase, the development is necessary to improve the current status of the MDC. This will likely have a number of positive multiplier effects in terms of employment in the region. The no-go alternative would result in a loss of these positive economic benefits.

11.6.2 Reasons for Decision

Based on the findings of the specialist studies and impact assessment and taking into account the successful implementation of the EMPr, it is felt that the Proposed Montrose Interchange Development should proceed. In summary, the following reasons form the basis of this opinion.

- The proposed development involves the introduction of a new interchange at the intersection between the N4 Schoemanskloof (R539) and the N4 via Ngodwana. The aim of this new interchange is to improve traffic flow speeds and drastically improve the safety of motorists.
- Currently, unsafe conditions and a high number of road accidents are experienced at (and in close proximity) to this existing T-junction which can be attributed to a few factors such as:
    - Confusion at the right turn made (east to west bound) by motorists to the N4 Schoemanskloof (R539) Route,
    - Vehicles colliding with stationery vehicles waiting to turn right (east to west bound);
    - Blind rise just before the T-junction for motorists travelling on the N4 from west to east bound and;
    - A blind rise and sharp corner currently posing a hazard to motorists travelling on the N4 Schoemanskloof (R539) Route after taking the T-junction right turn (east – west bound).
    - The proposed development is supported as it provides the necessary new intersection which will improve the abovementioned factors and thus improve unsafe conditions.

- In addition, as part of the Preliminary Design Report, an traffic assessment was undertaken and found that In the final year of the Concession (2028), the traffic volumes are expected to reach a peak of 813 vehicles per hour in the eastbound direction and 710 vehicles per hour in the westbound direction in the 30th highest peak hour. The new interchange will involve the development of four ramps which will accommodate traffic in free-flow movements in all directions. The achieved design speed of the ramps ranges from 40 km/h (on the loop ramp only) to 100 km/h. Further, the existing Crocodile River Bridge is widened to accommodate two eastbound lanes of traffic and three westbound lanes of traffic. **The proposed development is supported as it improves traffic flows and will accommodate increased vehicle numbers (which will occur regardless of whether the interchange is upgraded or not).**
- Related to impacts to traffic flows is that of air emissions. Studies show that traffic disruptions are a large source of emissions. With the expected increase in vehicle numbers (expected regardless of whether the interchange is upgraded or not), the expected emissions will be higher should there be more traffic disruptions (Hanson & Noland, 2015). **Therefore, the proposed development will reduce traffic disruptions and is expected to reduce emission levels**.
- Further, another important implication is the economic benefits associated with the development. According to the Preliminary Design Report, the proposed development will involve an investment of approximately R165 million in the area. **The proposed development is supported as it will have important economic benefits in the area.**
- The proposed development will also create 300 construction related employment opportunities. This is significant as 24.8% of people in the Municipality are unemployed. **The proposed development is supported as it would have an important employment implication in the area.**
- In addition, the proposed development will ensure safe and efficient transport along the MDC between South Africa and Mozambique and thus has indirect benefits at a national level. Although no direct employment will be undertaken during the operational phase, the development is necessary to improve the current status of the MDC. This will likely have a number of positive multiplier effects in terms of employment in the region. **The proposed development is supported as it will enable a number of important positive economic benefits.**
- The site is historically impacted upon and is in close proximity to the existing interchange. It is also falling within the MDC transportation corridor identified in the City of Mbombela SDF. **The development is supported as using this site reduces the need for greenfields development and is in line with spatial planning for the area.**
- No environmental or technical specialist study identified any fatal flaws related to the site selection for the proposed development
- In addition, all impacts identified as part of specialist studies and the impact assessment could be satisfactorily mitigated to 'low' or 'low-medium'. As such no significantly negative impacts are expected.
- The assumptions, uncertainties and gaps are such that the impact assessment is expected to be accurate.
- The mitigation measures included in the EMPr are thought to adequately mitigate impacts so that the impact management objectives can be met.

- The comparison of alternatives resulted in the selection of the BPEO for the site:
    - Alternative 1: Additional Piers

11.6.3 Proposed Conditions

A number of critical mitigation measures accompany this recommendation and should be included as conditions of the environmental authorisation (should it be granted). These include:

- Alternative 1: Additional Piers to be authorised.
- Proposed Interchange as per Figure 4-4.
- Site camp and storage areas must be located on historically impacted areas or areas that will be developed as part of the road infrastructure.
- An Environmental Control Officer (ECO) should be appointed to ensure compliance to the authorization and EMPr. Quarterly inspections and quarterly reports are recommended unless specific requirements are called for a specific activity or incident to be rehabilitated at short notice.
- A professionally registered ecologist specialising in vegetation ecology should do a walkthrough prior construction commencing during the summer season (before the month of May) to identify and mark protected plants for which permits are required. Those plants small enough to translocate could be temporarily stored in a nursery for re-introduction post construction.
- Topsoil from natural areas must be separated and stored and used in the subsequent rehabilitation of the road reserve once construction had ended. The topsoil should be stored in low (ideally 1 m, up to a maximum of 2m high), levelled stockpiles which would reduce the establishment of alien invasive species, as well as facilitate the control alien invasive species which could establish.
- Silt protection measure to be implemented in consultation with the ECO.
- On site storm water management must be implemented.
- On site filtration must be adopted (hay bales can be used affectively)
- Stock piling must be located outside the delineated drainage line and buffer boundaries.
- Velocity dissipation structures and sheet flow structures (such as reno mattresses) must also be installed to prevent water flowing through culverts to gain velocity and be released uncontrolled.
- Removal of alien and invasive plant species during the construction and operational phases.
- Stabilisation of gullies and drainage lines to prevent erosion.
- Implementation of topsoil management (stockpiling, topography shaping) and erosion control (berms, geotextiling, silt fences, hay bales and gabion structures).
- Re-vegetation with indigenous plant species.
- Implementation of all mitigation measures recommended by the Aquatic Impact Assessment in Annexure C of his report.
- Lights must be shielded such than no light is visible above 10° below horizontal
- The colour temperature of the lights used should be lower than 3000 K (warm white opposed to too much blue light).

- Documentation of the enclosures that includes scaled drawings upon which a destruction permit must be applied for from SAHRA;
- These features will have to be monitored during construction;
- Implementation of a chance find procedure for the project (archaeology and palaeontology) as outlined in by the Heritage Impact Assessment

11.6.4 Authorisation Validity

The proposed development includes operational activities and thus once construction has commenced, the authorization will be viewed to be permanently valid. The proposed period for which the environmental authorization should be valid prior to operation is 10 years with an option to extend if necessary. Should construction not commence within this period, the authorization will lapse and new authorization process would be required.

11.6.5 Management of Rehabilitation/Decommissioning

Decommissioning of the proposed Development and associated services is not envisioned. However, should decommissioning be required the activity will need to comply with the appropriate environmental legislation and best practices at that time.

Remediation and rehabilitation of the construction footprint will be undertaken prior to operation. Mitigation measures to ensure proper rehabilitation are included in the EMPr.

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12 EAP UNDERTAKING

I, Vanessa Stippel, as the Environmental Assessment Practitioner managing this application provide the following affirmation in relation to -

- the correctness of the information provided in the reports;
- the inclusion of comments and inputs from stakeholders and I&APs;
- the inclusion of inputs and recommendations from the specialist reports where relevant; and
- 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;

Stippel

Designation: Senior Environmental Assessment Practitioner

Prism Environmental Management Services

Company

14 December 2020

Date

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13 REFERENCES

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14 APPENDICES

14.1 Curriculum Vitae of EAP

14.2 Alternatives

14.3 Layout and Designs

14.4 A3 Maps and Drawings

14.5 Public Participation

14.5.1 Interested and Affected Party Database

14.5.2 Proof of Initial Notification

14.5.2.1 Newspaper Notices

14.5.2.2 Site Notices

14.5.2.3 Background Information Document

14.5.2.4 Proof of Initial Notification

14.5.3 Proof of Notification | Additional Registration

14.5.3.1 Newspaper Notice

14.5.3.2 Site Notice

14.5.3.3 Background Information Document

14.5.3.4 Proof of Notification

14.5.3.5 Public Open Day Attendance Registers

14.5.4 Proof of Notification of Review of Scoping Report

14.5.4.1 Proof of Notification

14.5.5 Proof of Notification of Review of the EIA Report

14.5.5.1 Proof of Notification of Registered I&APs

Proof will be included in the finalised document submitted to the Department.

14.5.5.2 Proof of Delivery to Authorities

14.5.5.3 Proof of Reminder Emails

14.5.6 Comments and Responses Report

14.5.7 Comments Received

14.5.7.1 Comments during Initial Notification and Additional Notification

14.5.7.2 Comments received during Scoping Report Review

14.5.7.3 Comments received during EIR Review

14.5.8 DEFF Approval of Scoping

14.5.9 Site Visit Attendance Register

14.6 Specialist and Technical Studies

14.6.1 Ecological Assessment

14.6.2 Aquatic Assessment

14.6.3 Wetland Assessment

14.6.4 Visual Impact Assessment

14.6.5 Phase 1 Heritage Impact Assessment

14.6.6 Preliminary Design Report

14.6.7 Geotechnical Assessment

14.6.8 Specialist Declarations

14.7 Impact Assessment

14.8 Environmental Management Programme