

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME

IMPROVEMENT OF NATIONAL ROUTE R510 SECTION 2 FROM KM 6.3 AT BIERSPRUIT BRIDGE AND ENDS AT KM 33.4 NEAR THABAZIMBI.

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Prepared for:



Prepared by:



EOH Coastal & Environmental Services

Block D, Gillooly's View Office Park (EOH Business Park),
1 Osborne Lane, Bedfordview, Johannesburg, 2007.

*Also in Cape Town, Grahamstown, East London, Port
Elizabeth and Maputo (Mozambique)*
www.cesnet.co.za | www.eoh.co.za

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ACRONYMS AND ABBREVIATIONS

BAR	Basic Assessment Report
CES	EOH Coastal and Environmental Services (used interchangeably with 'EOH')
DEA	Department of Environmental Affairs
DEADP	Department of Environmental Affairs and Development Planning
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
DEO	Designated Environmental Officer
EA	Environmental Authorisation (former Record of Decision)
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EM	Environmental Monitor (Engineer's Environmental Representative)
EMPr	Environmental Management Programme
ENG	Engineer
EOH	EOH Coastal and Environmental Services(used interchangeably with 'CES')
I&AP	Interested and Affected Party
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
N2	National Road 2
NEMA	National Environmental Management Act, 107 of 1998
PC	Project Coordinator (also knows Project Manager)
PSM	Project or Site Manager (also known as Project Coordinator)
SAHRA	South African Heritage Resource Agency
SANRAL	South African National Roads Agency SOC Ltd
SAPS	South African Policy Service
SM	Social Monitor (Engineer's Social Representative)
WULA	Water Use License Application

DEFINITIONS

Auditing

A systematic and objective assessment of an organisation's activities and services conducted and documented on a periodic basis.

Applicant

A person who advocates a theory, proposal, or course of action.

Contractor

Refers to the person or firm that undertakes a contract to provide materials or labor to perform a service or task.

Environment

The surroundings in which humans exist and which comprise: The land, water and atmosphere of the earth. Micro-organisms, plant and animal life. Any part or combination of a) and b) and the interrelationships among and between them. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that can influence human health and well-being.

Environmental Authorisation

It is a requirement for certain activities that pose environmental risk and therefore require an environmental authorization. It is one of the most important regulatory tools available to them as they set out conditions for activities that threaten the environmental condition.

Environmental Control Officer

The person responsible for supervision, inspection and monitoring of firms in terms of compliance with codes and laws that regulate industrial and commercial processes, as well as equipment.

Environmental Impact

The change to the environment resulting from an environmental aspect (an activity) on the environment, whether desirable or undesirable. An impact may be the direct or indirect consequence of an activity.

Environmental Impact Assessment (EIA)

The process of examining the environmental and social effects of a development in terms of the National Environmental Management Act (108 of 1998 as amended) and the Environmental Impact Assessment (EIA) Regulations, as published in Government Notice R.983 dated 4th December 2014.

Environmental Management Programme

A detailed plan of action prepared in accordance with the requirements of the National Environmental Management Act Environmental Impact Assessment Regulations, 2014, to ensure that recommendations for enhancing positive impacts and /or limiting or preventing negative environmental impacts are implemented during the life-cycle of a project.

Environmental Management Programme Report (EMPr)

The report required to be prepared for all mining activities pursuant to the Minerals and Petroleum Resources Development Act (No 28 of 2002).

Groundwater

Subsurface water in the zone in which permeable rocks, and often the overlying soil are saturated under pressure equal to or greater than atmospheric pressure.

Heritage resource

Any place or object of cultural significance including buildings, structures, landscapes, graves and geological, archaeological and palaeontological sites.

Incidences

The occurrence, rate, or frequency of an undesirable situation.

Monitoring

A systematic and objective observation of an organisation's activities and services conducted and reported on regularly.

Mineral and Petroleum Resources Development Act

The Act which makes provisions for equitable access to and sustainable development of the nation's mineral and petroleum resources.

Non-compliance

Refers to the failure to act in accordance with the relevant legislation and policy.

Pollution

Any change in the environment caused by substances, radioactive or other waves, or noise, odours, dust or heat, emitted from any activity, including the storage or treatment of waste or substances, construction and the provision of services, whether engaged in by any person or an organ of state, where that change has an adverse effect on human health or well-being or on the composition, resilience and productivity of natural or managed ecosystems, or on materials useful to people, or will have such an effect in the future.

Protected plants

Plant species officially listed on the Protected Plants List (each province has one), and which may not be removed or transported without a permit to do so from the relevant provincial authority.

Project Coordinator

The Project Coordinator is an integral member of the project team responsible for delivering building development projects of varying size and complexity. The Project Coordinator is responsible for directing, organizing and controlling project activities, under the direction of a Project Manager & Project Director.

Rehabilitation

Rehabilitation is defined as the return of a disturbed area to a state, which approximates the state (where possible), which it was before disruption. Rehabilitation for the purposes of this specification is aimed at post-reinstatement re-vegetation of a disturbed area and the assurance of a stable land surface. Re-vegetation should aim to accelerate the natural succession processes so that the plant community develops in the desired way, i.e. promote rapid vegetation establishment.

Run-off

The total water yield from a catchment including surface and subsurface flow.

Subsoil

The soil horizons between the topsoil horizon and the underlying parent rock.

Topsoil

This is defined as the A horizon of the soil profile. Topsoil is the upper layer of soil from which plants obtain their nutrients for growth. It is often darker in colour, due to the organic (humic) fraction, but regardless of the fertility appearance, structure, agriculture potential, this profile constitutes the topsoil.

Wastewater

Water contaminated by the project activities.

Watercourse

A geomorphological feature characterized by the presence of a stream-flow channel, a floodplain and a transitional upland fringe seasonally or permanently conveying surface water.

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1 INTRODUCTION

The South African National Roads Agency SOC Ltd. (SANRAL) has appointed Royal Haskoning DHV Engineering (RHDHV) as project managers for the proposed road upgrade of Section 2 of the R510, between Northam and Thabazimbi, Limpopo Province. RHDHV in turn subcontracted EOH Coastal & Environmental Services (EOH CES) as the Environmental Assessment Practitioner (EAP).

The National Route R510, Section 2 is located between Northam and Thabazimbi in the Limpopo Province. The project starts at km 6.3 just before the Bierspruit River Bridge and ends at km 33.4 at the informal Mine intersection. The total length of the project is 27.1 km of single carriageway road with an existing surfaced width of 7 m. Included in the project are five river bridges and two roads-over-rail bridges that must be widened to accommodate the road cross section improvement.

A detailed investigation of the road has confirmed that road pavement layers exhibits signs of distress like cracking and deformation, and that rehabilitation of the pavement is required to meet the demands the expected future traffic for a period of 20 years. The construction phase of the proposed development will necessitate the establishment of a Contractor's and Engineers campsite, in the form of a construction camp.

This Environmental Management Programme (EMPr) has been prepared as part of the Basic Assessment (BA) process to provide specific environmental guidance for the planning, construction and operational phase of the proposed road upgrade of Section 2 of the R510 in Limpopo Province. The competent authority, being the Department of Environmental Affairs (DEA), requires that an environmental management programme (EMPr) be submitted in accordance with Regulation 19 of the NEMA Regulations (2014) and updated in Government Notice No. R. 326 of 07 April 2017, which should be read with Section 24 N of the National Environmental Management Act (NEMA), 1998 (Act 107 of 1998).

1.1 Objectives of this EMPr

The EMPr has been compiled to provide recommendations and guidelines according to which compliance monitoring can be done during the construction of the Section 2 of the R510 upgrade as well as to ensure that all relevant factors are considered to ensure for environmentally responsible development. The purpose of the EMPr is to provide specifications for "*good environmental practice*" for application during construction.

This EMPr informs all relevant parties [the Project Coordinator, the Contractor, the Environmental Control Officer (ECO) and all other staff employed by SANRAL at the site as to their duties in the fulfilment of the legal requirements for the construction, operation and decommissioning of the Section 2 of the R510 with particular reference to the prevention and mitigation of anticipated potential environmental impacts.

All parties should note that obligations imposed by the EMPr are legally binding in terms of the environmental authorisation granted by the relevant environmental permitting authority.

The objectives of an EMPr are to:

- Ensure compliance with regulatory authority stipulations and guidelines which may be local, provincial, national and/or international;
- Ensure that there is sufficient allocation of resources on the project budget so that the scale of EMPr-related activities is consistent with the significance of project impacts;
- Verify environmental performance through information on impacts as they occur;
- Respond to unforeseen events;
- Provide feedback for continual improvement in environmental performance;

- Identify a range of mitigation measures which could reduce and mitigate the potential impacts to minimal or insignificant levels;
- Detail specific actions deemed necessary to assist in mitigating the environmental impact of the project;
- Identify measures that could optimize beneficial impacts;
- Create management structures that addresses the concerns and complaints of I&APs with regards to the development;
- Establish a method of monitoring and auditing environmental management practices during all phases of the activity;
- Ensure that safety recommendations are complied with;
- Specify time periods within which the measures contemplated in the final environmental management programme must be implemented, where appropriate;

1.2 Contents of an EMPr

The content of the EMPr is consistent with the requirements as set out in Appendix 4 of the EIA Regulations (as amended in 2017) stated below, for the construction and operation phases.

According to Appendix 4 of GN R 326, an environmental management programme must include:

- (1) An EMPr must comply with section 24N of the Act and include-
- (a) details of-
 - (i) the EAP who prepared the EMPr; and
 - (ii) the expertise of that EAP to prepare an EMPr, including a curriculum vitae;
 - (b) a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;
 - (c) a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;
 - (d) a description of the impact management outcomes, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including-
 - (i) planning and design;
 - (ii) pre-construction activities;
 - (iii) construction activities;
 - (iv) rehabilitation of the environment after construction and where applicable post closure; and
 - (v) where relevant, operation activities;
 - (-f) a description of proposed impact management actions, identifying the manner in which the impact management outcomes contemplated in paragraphs (d) will be achieved, and must, where applicable, include actions to –
 - (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
 - (ii) comply with any prescribed environmental management standards or practices;
 - (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and
 - (iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;
 - (g) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);
 - (h) the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f);
 - (j) an indication of the persons who will be responsible for the implementation of the impact management actions;

- (j) the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;
- (k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);
- (l) a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;
- (m) an environmental awareness plan describing the manner in which-
 - (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and
 - (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and
- (n) Any specific information that may be required by the competent authority.

(2) Where a government notice gazetted by the Minister provides for a generic EMPr, such generic EMPr as indicated in such notice will apply.

1.3 Legal requirements

Construction must be according to the best industry practices, as identified in the project documents. This EMPr, which forms an integral part of the contract documents, informs the contractor as to his duties in the fulfilment of the project objectives, with particular reference to the prevention and mitigation of environmental impacts caused by construction activities associated with the project. The Contractor should note that obligations imposed by the approved EMPr are legally binding in terms of environmental statutory legislation and in terms of the additional conditions to the general conditions of contract that pertain to this project. In the event that any rights and obligations contained in this document contradict those specified in the standard or project specifications then the latter shall prevail.

The Contractor shall identify and comply with all South African national and provincial environmental legislation, including associated regulations and all local by-laws relevant to the project. Key legislation currently applicable to the design, construction and implementation phases of the project must be complied with. The list of applicable legislation provided below is intended to serve as a guideline only and is not exhaustive:-

- The Constitution of the Republic of South Africa Act 108 of 1996;
- Environment Conservation Act 73 of 1989;
- National Environmental Management Act 107 of 1998;
- National Environmental Management: Protected Areas Act 57 of 2003;
- National Environmental Management: Biodiversity Act 10 of 2004;
- National Water Act 36 of 1998;
- National Road Traffic Act 93 of 1996;
- Conservation of Agricultural Resources Act 43 of 1983;
- Hazardous Substances Act 15 of 1973;
- National Heritage Resources Act 25 of 1999;
- Atmospheric Pollution Prevention Act 45 of 1965;
- National Environmental Management: Air Quality Act 39 of 2004;
- National Environmental Management: Waste Management Act 59 of 2008;
- Health Act 63 of 1977;
- Occupational Health and Safety Act 85 of 1993;
- White Paper on the Conservation and Sustainable Use of South Africa's Biological Diversity;
- All relevant provincial legislation, Municipal by-laws and ordinances.

1.4 Environmental authorisation

In accordance with the requirements of the National Environmental Management Act (Act No 107 of 1998) (NEMA), and relevant EIA Regulations made in terms NEMA EIA Regulations (2014) and updated in the EIA Regulation amendment of April 2017 (Government Notice R 326), and listed activities under (Government Notice R 327 and R 324), the proposed upgrade of the section 2 of R510 between Northam and Thabazimbi, Limpopo Province, was subject to the submission of a Basic Assessment Report as part of the Environmental Impact Assessment (EIA) process to the DEA.

In terms of the EIA process, all reports generated from the environmental studies form part of a series of documents for the project. The BAR identified potentially significant environmental impacts and investigated potentially significant environmental issues and recommended appropriate mitigation measures.

This Environmental Management Programme (EMPr) interprets the findings of the BAR, and prescribes project-specific specifications to be achieved. In addition to the requirements of Appendix 4 of GNR 326, this EMPr is based on the principles of Integrated Environmental Management (IEM).

2 DETAILS OF THE ENVIRONMENTAL ASSESSMENT TEAM

According to Appendix 4 of GN R 326, an environmental management programme must include:

- (a) details of –
 - (i) the person who prepared the environmental management programme; and
 - (ii) the expertise of that person to prepare an environmental management

2.1 Environmental Assessment Practitioner (EAP)

Gideon Raath - M.Sc., Pr.Sci.Nat.
Environmental Consultant
EOH Coastal & Environmental Services

Block D, Gillooly's View Office Park (EOH Business Park),
1 Osborne Lane, Bedfordview, Johannesburg, 2007.
Tel: +27 (11) 607 8389 | Fax: +27 (11) 616 9929 |
gideon.raath@eoh.com | www.eoh.co.za | www.cesnet.co.za
g.raath@cesnet.co.za (alternate)

2.2 Project team

- Dr Ted Avis
- Mr Roy de Kock
- Mr Gideon Raath

EOH COASTAL AND ENVIRONMENTAL SERVICES (EOH CES) specialises in impact assessments and environmental management. We were established in 1990 when we were involved as lead consultants for a large mineral mining Environmental Impact Assessment (EIA) in South Africa. Since then, EOH CES has branched into a variety of sectors by expanding our capacity and expertise. We believe that a balance between development and environmental protection can be achieved by skilful, considered and careful planning. To achieve this, we have in-house experience in terrestrial, marine and freshwater ecology, waste and water resource management, Social Impact Assessments (SIAs) and public engagement, as well as considerable experience in the management and co-ordination of all aspects of the Environmental and Social Impact Assessment (ESIA) process.

In 2013 EOH Mthombo (Pty) Ltd acquired all the shares in CES (Pty) Ltd, and CES now operates as EOH Coastal & Environmental Services (EOH CES). This acquisition has enabled us to combine EOH's great reach and reputation with CES's recognized excellence in environmental and social advisory services. It has allowed us to maximize our strengths and our comprehensive offerings in the environmental and social fields, with the EOH Group providing additional administrative and fiduciary support.

We have a proven track record of successfully managing and completing Full Scoping and EIAs and Basic Assessments for a wide range of projects and activities including (but not limited to):

- Golf estates
- Residential estates;
- Mixed-use developments;
- Tourism/eco-tourism lodges/resorts;
- Coastal developments
- Aquaculture;

- Renewable energy developments (wind and solar, see our Renewable Energy Brochure for more details);
- Waste treatment (see our Infrastructure brochure for more details); and
- Linear infrastructure, such as pipelines, power lines and roads (see our Infrastructure brochure for more details).

Dr A.M (Ted) Avis (*Project Leader*)

Ted Avis is a leading expert in the field of Environmental Impact Assessments, having project-managed numerous large-scale ESIA's to international standards (e.g. International Finance Corporation). Ted was principle consultant to Corridor Sands Limitada for the development of all environment aspects for the US\$1billion Corridor Sands Project. He has managed ESIA studies and related environmental assessments of similar scope in Kenya, Madagascar, Egypt, Malawi, Zambia and South Africa. Ted has worked across Africa, and also has experience in large scale Strategic Environmental Assessments in southern Africa, and has been engaged by the International Finance Corporation (IFC) on a number of projects.

Ted was instrumental in establishing the Environmental Science Department at Rhodes University whilst a Senior lecturer in Botany, based on his experience running honours modules in EIA practice and environmental. He is an Honorary Visiting Fellow in the Department of Environmental Sciences at Rhodes. He was one of the first certified Environmental Assessment Practitioner in South Africa, gaining certification in April 2004. He has delivered papers and published in the field of EIA, Strategic Environmental Assessment and Integrated Coastal Zone Management and has been a principal of CES since its inception in 1990, and Managing Director since 1998.

Ted holds a PhD in Botany, and was awarded a bronze medal by the South African Association of Botanists for the best PhD adjudicated in that year, entitled "Coastal Dune Ecology and Management in the Eastern Cape". Ted is a Certified Environmental Assessment Practitioner (since 2002) and a professional member of the South African Council for Natural Scientific Professionals (since 1993).

Mr Roy de Kock (*Report review*)

Senior Environmental Consultant holds a BSc in Botany and Geology and a BSc Honours in Geology from the Nelson Mandela Metropolitan University in Port Elizabeth. His MSc thesis entitled; Bushclump Rehabilitation Within Couga Bontveld After Strip Mining focused on rehabilitation of mined Bontveld vegetation on limestones of the Nanaga Formation where he attempted to recognise the evolutionary path of the present landscape, as well as focussing on primary ecological processes such as hydrology, energy capture and nutrient cycling and the impact of mining on change in diversity and ecosystem health. Currently he is working on a number of impact assessments for electrical infrastructure projects for Eskom and private wind energy developments at the East London branch. Roy is registered with SACNASP as a Candidate Natural Scientist.

Mr Gideon Raath (*Author*)

Environmental Consultant, holds an MSc (Geography and Environmental Management; SU), a BSc Honours (Ecology and Environmental Studies - Cum laude; Wits) and a BSc (Geography and Environmental Management; UJ). His MSc thesis focussed on the hydrological impact on the spatial distribution of invasive Eucalyptus trees along the Breede River, while his honours thesis evaluated ethnobotanical relationships around the Rio Tinto copper mine in Phalaborwa. Most recently he has worked Monitoring & Evaluation Project Manager for the City of Cape Town's invasive species unit. Gideon works from the Cape Town office, and is interested in invasion ecology and the management of groundwater pollution through phytoremediation.

3 PROPOSED ACTIVITY

According to Appendix 4 of GN R 326, an environmental management programme must include:

- (c) A detailed description of the aspects of the activity that are covered by the draft environmental management programme;

3.1 Description of proposed activity

3.1.1 Project description

The National Route R510, Section 2 is located between Northam and Thabazimbi in the Limpopo Province. The project starts at km 6.3 just before the Bierspruit Bridge and ends at km 33.4 at the informal Mine intersection. The total length of the project is 27.1 km of single carriageway road with an existing surfaced width of 7 m.

Included in the project are five river bridges and two roads-over-rail bridges that must be widened to accommodate the road cross section improvement.

A detailed investigation of the road has confirmed that road pavement layers exhibits signs of distress like cracking and deformation, and that rehabilitation of the pavement is required to meet the demands the expected future traffic for a period of 20 years.

The main items of the work to be undertaken in terms of construction are the roadworks, widening of carriageway to accommodate passing lanes, where required, thus resulting in a carriageway that varies from 13.4 m to 16.8 m surfaced width, with two to four 3.7 m lanes and 3.0 m or 1.0 m surfaced shoulders respectively. Included in the project are four river bridges and two roads over rail bridges that must be widened to accommodate the road cross section improvement.

The construction phase of 36 months will necessitate the establishment of a Contractor's and Engineers camps, in the form of a construction camp.

3.1.2 Timeframe

The proposed works has been assessed to have an approximate construction period of 36 months, with an expected road operational lifespan of 20 years during which it will require frequent maintenance. Maintenance contracts with local partners will be concluded, as is normal for SANRAL, to exercise maintenance works and mandates for the

3.1.3 General Roadworks

The general roadworks include the following:

- General widening of the existing road cross section to a minimum width of 13.4 m, comprising
- 2 x 3.7 m wide traffic lanes and 2 x 3.0 m wide surfaced shoulders;
- Provision of 11.6km (6.4 km northbound and 5.2 km southbound) passing lanes with 3.0 m paved shoulders be provided;
- Exclusive turning lanes are provided at the future brickyard access via R510 at chainage km12.4;
- Strengthening of the existing pavement structure;
- The existing horizontal alignment will be maintained;
- Vertical realignment of the R510 to improve the vertical clearance of the overpass bridge located at km7.182;
- Upgrade of the R510/ Zwartkop intersection to include a dedicated right turning lane and refuge islands;

- Upgrade of the R510/R511 intersection to include a dedicated right turning lane and refuge islands; and
- Structures and major culverts.

3.1.4 Drainage and culverts

The drainage and culvert works include:

- All rivers structures will be widened between 0.325 m – 1.825 m on each side respectively;
- C013 Bierspruit 6 where the inlet and outlet structures, (that have failed structurally) need to be replaced and the culvert will be lengthened at the same time;
- The bridges will receive new New Jersey barriers and will be rehabilitated;
- All of the major culverts will receive new guardrails on top and will be rehabilitated;
- The B3663 Rail over Road Bridge at km7.180 will receive pier protection in the form of New Jersey Barriers;
- All minor culverts that are not able to pass the required flow for a Class 3 road be upgraded;
- All the culverts affected by provision of the 13.4 m – 16.8 m wide cross section be lengthened accordingly; and
- Replacement of side drains due to the new vertical alignment.

3.2 Site Location

Figure 3.1 illustrates the overall project region, i.e. the entirety of the study section. This region contains all the proposed works including intersection upgrades, drainage and rail crossing upgrades, and culvert replacements or lengthening. The entire road section shown here is deemed the study area, in an effort to include all possible environmental considerations for the proposed development.

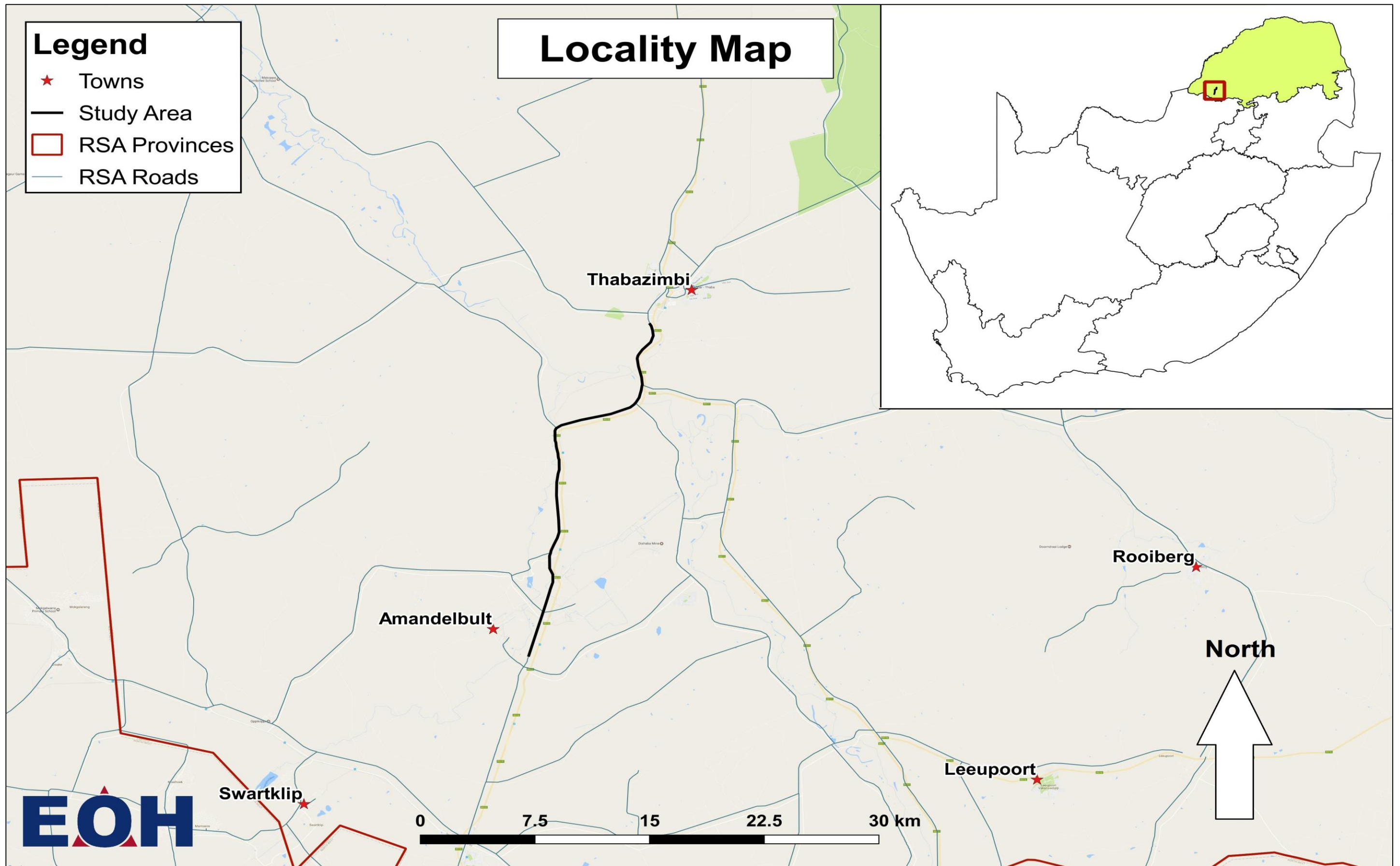


Figure 3.1: Locality map of the proposed road upgrade of Section 2 of R510.

4 SCOPE OF THE EMPr

In order to ensure a holistic approach to the management of environmental impacts during the construction and operation of the proposed roadworks, this EMPr sets out the methods by which proper environmental controls are to be implemented by the Contractor and all other parties involved. The EMPr is a dynamic document subject to influences and changes as are wrought by variations to the provisions of the project specification.

4.1 Layout of the EMPr

The EMPr is divided into three phases of development. Each phase has specific issues unique to that period of the construction and operation of the distribution line and associated infrastructure. The impacts are identified and given a brief description. The three phases of the development are then identified as below:

4.1.1 *Planning and Design Phase*

This section of the EMPr provides management principles for the planning and design phase of the project. Environmental actions, procedures and responsibilities as required from SANRAL during the planning and design phase are specified. These specifications will form part of the contract documentation and therefore the Contractor will be required to comply with these specifications to the satisfactory of the Project Coordinator and Environmental Control Officer.

4.1.2 *Construction Phase*

This section of the EMPr provides management principles for the construction phase of the project. Environmental actions, procedures and responsibilities as required during the construction phase are specified. These specifications will form part of the contract documentation and therefore the Contractor will be required to comply with these specifications to the satisfactory of the Project Coordinator and Environmental Control Officer.

4.1.3 *Operational and Maintenance Phase*

This section of the EMPr provides management principles for the operation and maintenance phase of the project. Environmental actions, procedures and responsibilities as required from SANRAL during the operation and maintenance phase are specified.

5 ROLES AND RESPONSIBILITIES

According to Appendix 4 of GN R 326, an environmental management programme must include:

- (i) An identification of the persons who will be responsible for the implementation of the measures contemplated in paragraph (b);

5.1 South African National Roads Agency – SANRAL (Proponent)

SANRAL is the applicant/proponent and shall therefore be the entity monitoring the implementation of the EMPr and compliance with the authorisation. However, if SANRAL appoints a Contractor to implement the project and hence implement the proposed mitigation measures documented in this EMPr on their behalf, then the successful contractor's responsibilities are outlined in Section 5.2 that follows.

5.2 Contractor

The successful Contractor shall:

- Be responsible for the finalisation of the EMPr in terms of methodologies which are required to be implemented ('method statements') to achieve the environmental specifications contained herein and the relevant requirements contained in the environmental authorisation, if issued by DEA;
- Be responsible for the overall implementation of the EMPr in accordance with the requirements of SANRAL and the environmental authorisation, if issued by DEA;
- Ensure that all third parties who carry out all or part of the Contractor's obligations under the Contract comply with the requirements of this EMPr;
- Be responsible for obtaining any environmental permits which are required for the design, construction and operation of the Section 2 of the R510 upgrade.
- Ensure that the appointments of the Environmental Control Officer (ECO) and Designated Environmental Officer (DEO) are subject to the approval of SANRAL.

5.3 Designated Environmental Officer

The Contractor shall appoint a nominated representative of the contractor as the DEO for the contract. The DEO will be site-based and shall be the responsible person for implementing the environmental provisions of the construction contract.

There shall be an approved DEO on the site at all times. It may be necessary to have more than one DEO employed.

The DEO's duties will include, inter alia, the following:

- Ensuring that all the environmental authorisations and permits required in terms of the applicable legislation have been obtained prior to construction commencing.
- Reviewing and approving construction method statements with input from the ECO and Engineer, where necessary, in order to ensure that the environmental specifications contained within the construction contract are adhered to.
- Assisting the Contractor in finding environmentally responsible solutions to problems.
- Keeping accurate and detailed records of all activities on site.
- Keeping a register of complaints on site and recording community comments and issues, and the actions taken in response to these complaints.
- Ensuring that the required actions are undertaken to mitigate the impacts resulting from non-compliance.

- Ordering the removal of, or issuing spot fines for person/s and/or equipment not complying with the specifications of the EMPr and/or environmental authorisation.
- Reporting all incidences of non-compliance to the ECO and Contractor.

- The DEO shall submit regular written reports to the ECO, but not less frequently than once a month.

The DEO must have:

- The ability to manage public communication and complaints;
- The ability to think holistically about the structure, functioning and performance of environmental systems; and
- The DEO must be fully conversant with the Environmental Impact Report and EMPr for the development and all relevant environmental legislation.
- The DEO must have received professional training, including training in the skills necessary to be able to amicably and diplomatically deal with the public as outlined in bullet point one above.

The ECO shall be in the position to determine whether or not the DEO has adequately demonstrated his/her capabilities to carry out the tasks at hand and in a professional manner. The ECO shall therefore have the authority to instruct the contractor to replace the DEO if, in the ECO's opinion, the appointed officer is not fulfilling his/her duties in terms of the requirements of the construction contract. Such instruction will be in writing and shall clearly set out the reasons why a replacement is required and within what timeframe. The ECO shall visit the development site and in addition to the responsibilities listed in section 5.4 below, review the performance of the DEO and submit regular performance reviews to SANRAL, but not less frequently than once a month.

5.4 Environmental Control Officer (ECO)

For the purposes of implementing the conditions contained herein SANRAL shall appoint an Environmental Control Officer (ECO) for the contract. The ECO shall be the responsible person for ensuring that the provisions of the EMPr as well as the environmental authorisation are complied with during the construction period. The ECO will be responsible for issuing instructions to the contractor and where environmental considerations call for action to be taken. The ECO shall submit regular audit reports to SANRAL at a frequency to be agreed or as required by the issued Environmental Authorisation.

The ECO will be responsible for the monitoring, reviewing and verifying of compliance with the EMPr and conditions of the environmental authorisation. The ECO's duties in this regard will include, inter alia, the following:

- Site audit and to confirm that all the environmental authorisations and permits required in terms of the applicable legislation have been obtained prior to construction commencing.
- Monitoring and verifying that the EMPr, Environmental Authorisation and Contract are adhered to at all times and taking action if specifications are not followed.
- Monitoring and verifying that environmental impacts are kept to a minimum.
- Reviewing and approving construction method statements with input from the DEO and Engineer, where necessary, in order to ensure that the environmental specifications contained within this EMPr and environmental authorisation are adhered to.
- Inspecting the site and surrounding areas on a regular basis regarding compliance with the EMPr, Environmental Authorisation and Contract.
- Monitoring the undertaking by the Contractor to implement environmental awareness training for all new personnel on site.
- Ensuring that activities on site comply with all relevant environmental legislation.
- Undertaking a continual internal review of the EMPr and submitting any changes to SANRAL and/or DEA (in case of major changes) for review and approval.

- Checking the register of complaints kept on site and maintained by the DEO and ensuring that the correct actions are/were taken in response to these complaints.
- Checking that the required actions are/were undertaken to mitigate the impacts resulting from non-compliance.
- Reporting all incidences of non-compliance in audit report that is submitted to SANRAL, stating the level of environmental performance in respect of the activities undertaken relating to the project.
- The ECO shall also submit compliance audit reports to DEA, in accordance with the requirements of the environmental authorisation. Such reports shall be reviewed by SANRAL, prior to submission.
- Keeping a photographic record of progress on site from an environmental perspective. This can be conducted in conjunction with the DEO as the DEO will be the person that will be onsite at all times and can therefore take photographic records weekly. The ECO would need to check and ensure that the DEO understands the task at hand.
- Recommending additional environmental protection measures, should this be necessary.
- Providing report back on any environmental issues at site meetings.

The ECO must have:

- A good working knowledge of all relevant environmental policies, legislation, guidelines and standards;
- The ability to conduct inspections and audits and to produce thorough, readable and informative reports;
- The ability to manage public communication and complaints;
- The ability to think holistically about the structure, functioning and performance of environmental systems; and
- Proven competence in the application of the following integrated environmental management tools:
 - Environmental Impact Assessment.
 - Environmental management plans/programmes.
 - Environmental auditing.
 - Mitigation and optimisation of impacts.
 - Monitoring and evaluation of impacts.
 - Environmental Management Systems.

The ECO must be fully conversant with the Environmental Impact Assessment, EMPr, Environmental Authorisation (should the application succeed) for the Section 2 of the R510 upgrade and all relevant environmental legislation.

SANRAL shall have the authority to replace the ECO if, in their opinion, the appointed officer is not fulfilling his/her duties in terms of the requirements of the EMPr or this specification. Such instruction will be in writing and shall clearly set out the reasons why a replacement is required and within what timeframe.

6 MITIGATION AND/OR MANAGEMENT MEASURES

According to Appendix 4 of GN R 326, an environmental management programme must include:

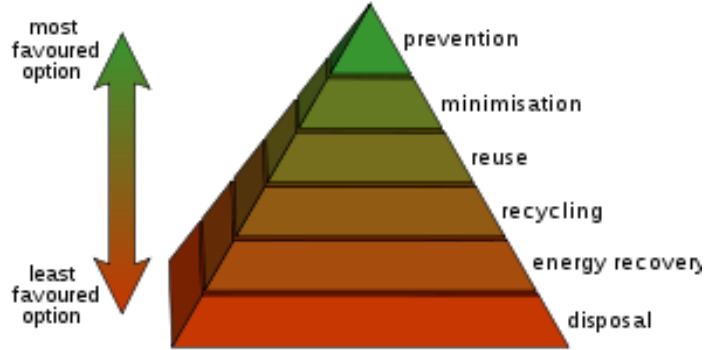
- (e) a description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and (e) will be achieved, and must, where applicable, include actions to –
 - (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;
 - (ii) comply with any prescribed environmental management standards or practices;
 - (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and
 - (iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;

A variety of potential impacts are associated with the construction activities for this project. These impacts can be categorised as general construction related impacts as well as construction impacts specifically related to this site. General best practice rules to construction should be followed at all times. In addition to this the specific mitigation measures and recommendations as highlighted by the BAR and various specialists for this specific site is highlighted below.

CONSTRUCTION PHASE

6.1 Construction Phase

RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
Stormwater Management	<ul style="list-style-type: none"> • The site must be managed in a manner that prevents pollution of drains, downstream watercourses or groundwater, due to suspended solids, silt or chemical pollutants. • Temporary cut-off drains and berms may be required to capture storm water and promote infiltration. • The area must be monitored by an ECO on a regular basis. 	Contractor, ENG	Construction phase
Waste storage (General)	<ul style="list-style-type: none"> • Construction rubble should be disposed of in predetermined, demarcate, licenced spoil dump on a regular basis, where not possible to find a use for, as per the waste management hierarchy. • Design and implement a waste management plan. • Ensure sufficient waste disposal services are engaged for the duration of the construction phase; • Incorporate penalties and fines are imposed on contractors regarding undue litter and waste into the EMPr • Provide sufficient bins at regular intervals throughout the construction region and camp; • Implement a recycling programme and employ as few plastics as feasible in the construction camp and activities; • Contractors must employ the waste management hierarchy when considering disposal of waste. In other words, contractors must ideally prevent waste production. Where not possible to prevent, contractors should minimise waste production as far as possible. Waste produced despite minimisation efforts then must be reused rather than recycled or disposed of. Recycling should then occur with the remainder of the waste, or if not possible to recycle, waste must be used for energy recovery. This may involve selling waste to third part recovery organisations. Should this not be possible, disposal is regarded as the final waste management option. The diagram below graphically illustrates how contractors and the proponent must approach construction waste. <p>Nuisance measures</p> <ul style="list-style-type: none"> • Wetting of exposed soil should be conducted to reduce dust produced during construction; • Regular collection of waste (daily from stop and go's, weekly from collection points) are to be conducted to reduce odours. 	Contractor, ECO	Construction phase

RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
	 <p>The diagram illustrates the waste management hierarchy as a pyramid with six levels, from top to bottom: prevention, minimisation, reuse, recycling, energy recovery, and disposal. A vertical double-headed arrow to the left of the pyramid indicates the preference level, with the top (prevention) being the 'most favoured option' and the bottom (disposal) being the 'least favoured option'.</p> <ul style="list-style-type: none"> • The waste management hierarchy (reduction, re-use and recycling of waste) must be implemented to ensure that the disposal of waste should only be considered as a last resort. • Any waste that cannot be re-used or recycled, must be disposed of at a licensed waste disposal facility. • Temporary stockpiles of inert material such as cut soil and builders' rubble must be stockpiled at designated storage facilities until this waste can be used elsewhere or taken to an authorised waste disposal facility. • General waste or domestic waste generated at the construction camp(s) that will be established at designated areas, will be temporarily stored until it is removed at regular intervals and disposed of. • The storage of general waste in excess of 100m³ and/ or the storage of hazardous waste in excess of 80m³, excluding the storage of waste in lagoons or the temporary storage (i.e. less than 90 days) of such waste, is not permitted. Rather, the removal and disposal of such waste must be conducted prior to 80 days of storage lapsing. • No waste is allowed to be temporarily stored on site for longer than 80 days, including earth stock piled material. <p>Waste storage</p> <ul style="list-style-type: none"> • General domestic waste should be stored in leak-proof containers that must be regularly emptied at least once a week to ensure that odour and vector nuisances are prevented. • If wind, baboons or other scavengers can cause the spread of litter from the containers, the containers must be covered with tamper-proof devices. • Introduce a litter clearance programme where litter is collected at the end of each 		

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RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
	<p>working day within the immediate vicinity of all construction work for that day.</p> <ul style="list-style-type: none"> • Ensure sufficient waste management is available at each stop and go to reduce and limit litter discarded at stop and go site. • Ensure litter collection focusses on stop and go zones, for collection each day. 		
Dust generation	<ul style="list-style-type: none"> • Dust control methods must be employed during clearing and construction, using appropriate techniques such as: sprinkling, vegetation cover, calcium chloride coverings, adhesives, cyclone or filter collectors, mulch, wind breaks, tillage and stones or debris. • Limit vegetation clearing to areas only where and when necessary. • Limit clearing and grubbing activities to days with low wind speeds; • Limit vehicle speeds on-site; • Encourage use of paved routes as alternatives to unpaved roads • Dust generated from all activities related to the improvement of the N2 road sections must comply with the National Dust Control Regulations (GN No. R. 827) of 1 November 2013, promulgated in terms of the National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004). 	Contractor, DEO, ECO	Construction phase
Elevated noise levels	<ul style="list-style-type: none"> • Noise control methods shall be employed where possible. These may include: • Selecting quieter equipment where feasible; • Maintaining all equipment in good working order; • Retro-fit selected equipment with dampening measures; • Erect barriers around the construction camp or work areas; • Employ improved technology where volume gains can be achieved; • Construction activity close to residential and business areas, which includes the movement of construction vehicles, should be restricted to daylight working hours, unless approval is obtained from the community to work later. • Noise generated during construction activities must comply with National and Provincial noise regulations. 	Contractor, DEO, ECO	Construction phase
Hazardous spillage	<ul style="list-style-type: none"> • Hazardous Chemical Substances Regulations promulgated in terms of the Occupational Health and Safety Act 85 of 1993 and the SABS Code of Practice must be adhered to. This applies to solvents and other chemicals possibly used during the construction process. • Contaminated soil must either be excavated or treated on-site, depending on the nature and extent of the spill. • The ECO must determine the precise method of treatment of polluted soil. This could involve the application of soil absorbent materials or oil-digestive powders to the contaminated soil. 	Contractor, DEO, ECO	Construction phase

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RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
	<ul style="list-style-type: none"> • If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent materials. • Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in suitable containers until appropriate disposal. 		
Light pollution	<ul style="list-style-type: none"> • Use lights only where and when required; • If any parts of site such as construction camps must be lit at night, this should be done with low-UV type lights (such as most LEDs), which do not attract insects and which should be directed downwards. 	Contractor, DEO, ECO	Construction phase
Sedimentation associated with earthworks	<ul style="list-style-type: none"> • Develop a stormwater management plan to ensure compliance with regulations and prevent off-site migration of contaminated stormwater and sediment. • The road engineer must ensure that appropriate stormwater structures are included in the road design to manage stormwater and to minimise erosion and sedimentation of watercourses. • The road engineer must ensure that all road sections situated on slopes incorporate stormwater diversion. • The road engineer must ensure that all stormwater structures are designed in line with both SANRAL and DWS requirements. • Appropriate stormwater structures must be designed and implemented. • All road sections situated on slopes must incorporate stormwater diversions. • Attention shall be given to the effect of the road widening on drainage, including the flow of stormwater to the railway line of Transnet Freight Rail. No storm-water will be allowed to discharge onto Transnet Freight Rail land. If storm-water is diverted to cross under the railway line through existing culverts, detailed calculations for a 1 in 50 year flood must be submitted for approval to Transnet to ascertain whether the culverts can manage the increased flow of storm-water. 	Contractor, DEO, ECO	Construction phase
Social – Employment creation	<ul style="list-style-type: none"> • Recruit local labour as far as possible; • Provide skills training schemes in order to upskill staff; • Provide career counselling services, to assist with CV and job profile creation for appropriate employees as far as possible. 	PM, ENG	Construction phase
Social – Security Risks	<ul style="list-style-type: none"> • No open fires are to be allowed on site; • Designated smoking areas are to be demarcated for construction workers; • Members of the construction team should be easily identifiable (through the use of uniforms or name badges) • No firearms, alcohol, drugs or trade should be allowed on site; 	Contractor, DEO, ECO	Construction phase

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RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
	<ul style="list-style-type: none"> • Fines should be given for not adhering to rules and regulations in terms of conduct and safety. • Residents should be informed of the construction activities and schedules prior to the construction workforce entering the property. • Fence and access control to the construction camp site. 		
Traffic impacts	<ul style="list-style-type: none"> • Ensure optimal traffic management systems in place during construction • Reduce traffic impedance to as little as possible • Ensure all road safety signage has been placed at the correct areas • A Traffic Management Plan (TMP) must be implemented during Project construction. Specific elements of the TMP could include the use of flaggers and temporary lane realignments to maintain through traffic, • Concrete barriers, signage to direct traffic movements, and possible reduction of speed limits in construction zones. • The contractor should contact local emergency service providers prior to the start of construction to ensure construction activities would not impede provision of emergency services within the Project area during the construction period. • Signs must be kept clean and well maintained if they are to be effective. • Press and radio releases are often a valuable means of warning drivers of what to expect at a site, thus minimising impatient and dangerous behaviour. • Workers who control traffic must be properly trained. • Traffic controllers must know where to stand, how to slow or stop traffic, and how to coordinate public and construction traffic movements. • Controllers should use two-way radio communication when visual contact between traffic controllers is not possible. Where the site is suitable and they are available, arrangements should be made to use temporary traffic signals to control traffic. • Traffic controllers and general road workers should wear suitable conspicuous clothing to ensure that they can be seen by motorists • Unnecessary traffic control signs or road markings must be removed as they tend to confuse motorists and make them careless. • Where vehicles are held up in queues, a worker might be appointed to talk with motorists, apologise for delays, estimate the length of the delay, and generally keep people informed. • Speed limits should be consistent with safe site operations and traffic movements. Compliance with reasonable speed limits will then be more likely - If motorists perceive a speed limit to be unrealistic, they are likely to disregard it. 	PM, Contractor, DEO, ECO	Construction phase

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RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
	<ul style="list-style-type: none"> • A variety of devices and technology can provide information to motorists, including brighter, bigger electronic signs. These must be employed where reasonable. • A systematic preventative maintenance programme should be established for all trucks, plant, and vehicles. • All access points leading to the area where construction blasting works are carried out must be manned to prevent entry during blasting. • Managers should ensure that new employees are prepared to work in all types of traffic - They should feel comfortable using flagmen - workers who use flags to signal drivers and warn them that they're approaching a work site -and have enough road sense to never turn their back to oncoming traffic. • New workers should be taught how to manoeuvre around massive pieces of equipment and to safeguard a site for optimal security • Use protective equipment and personal protective gear (such as hard hats and steel-toed shoes). • Reflective clothing is also crucial, especially for night shift work. • Noise levels should be monitored at all times to prevent hearing loss - it is suggested that workers wear earmuffs or earplugs to shield their eardrums from high decibels. 		
<p>During construction heritage - impacts to possible Historical Period structures at Site EXIGO-R510UG-HP01</p>	<ul style="list-style-type: none"> • The construction site must be monitored by a qualified ECO during construction. 	ECO	Construction phase
<p>During construction heritage - Impacts to a burial site (Site EXIGO-R510UG-BP01)</p>	<ul style="list-style-type: none"> • Implement a heritage conservation buffer of at least 50m around the cemetery; if necessary redesign the road upgrade alignment to avoid the heritage resource and the proposed conservation buffer. Fence the burial site and apply access control. Implement a site management plan detailing strict site management conservation measures. • Site management (fencing, access control); • The construction site must be monitored by a qualified ECO during construction. • Regular examination of trenches and excavations in this area are required in order to avoid the destruction of previously undetected burials or heritage remains must be conducted by the ESO, or a designated person reporting to the site engineer. 	Contractor, DEO, ECO	Construction phase

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RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
	<ul style="list-style-type: none"> • Grave relocation is required where impact unavoidable. 		
<p>Potential Palaeontological resource impact</p>	<ul style="list-style-type: none"> • In the unlikely event that fossils are found in the soil cover or dolomite in the study area the CEO should take the following steps: • Procedure for change Palaeontological finds: <ul style="list-style-type: none"> ○ 1. Surface excavations should continuously be monitored by the ECO and any fossil material be unearthed the excavation must be halted. ○ 2. If fossiliferous material has been disturbed during the excavation process it should be put aside to prevent it from being destroyed. ○ 3. The ECO then has to take a GPS reading of the site and take digital pictures of the fossil material and the site from which it came. ○ 4. The ECO then should contact a palaeontologist and supply the palaeontologist with the information (locality and pictures) so that the palaeontologist can assess the importance of the find and make recommendations. ○ 5. If the palaeontologist is convinced that this is a major find an inspection of the site must be scheduled as soon as possible in order to minimise delays to the development. ○ From the photographs and/or the site visit the palaeontologist will make one of the following recommendations: <ul style="list-style-type: none"> ▪ a. The material is of no value so development can proceed, or: ▪ b. Fossil material is of some interest and a representative sample should be collected and put aside for further study and to be incorporated into a recognised fossil repository after a permit was obtained from SAHRA for the removal of the fossils, after which the development may proceed, or ▪ c. The fossils are scientifically important and the palaeontologist must obtain a SAHRA permit to excavate the fossils and take them to a recognised fossil repository, after which the development may proceed. ○ 7. If any fossils are found then a schedule of monitoring will be set up between the developer and palaeontologist in case of further discoveries. 	<p>PM, ENG, Contractor, DEO, ECO</p>	<p>Construction phase</p>
<p>General heritage management on</p>	<ul style="list-style-type: none"> • Any fossil remains such as fossil fish, reptiles or petrified wood exposed during construction should be carefully safeguarded and the relevant heritage resources authority (Limpopo-PHRA) should be notified immediately so that the appropriate action 	<p>PM, ENG, Contractor, DEO, ECO</p>	

RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
site	<p>can be taken by a professional palaeontologist.</p> <ul style="list-style-type: none"> • The sites are located in proximity of the project area (>50m) and it is recommended that the sites and any activities in its surrounds be monitored in order to avoid the destruction of previously undetected heritage remains. • The necessary destruction permits should be obtained from the relevant Heritage Resources Authorities prior to the possible destruction of the features. • A cemetery identified within close proximity of the road upgrade alignments - a 50m conservation buffer for all burials must be maintained. • In addition, it is recommended that the cemetery be fenced off and that access control be applied during all phases of construction. • The developer should carefully liaise with the heritage specialist and SAHRA with regards to the management and monitoring of any human grave or cemetery in order to detect and manage negative impact on the sites. • Should impact on any human burial prove inevitable, full grave relocations are recommended for these burial grounds. This measure should be undertaken by a qualified archaeologist, and in accordance with relevant legislation, permitting, statutory permissions and subject to any local and regional provisions and laws and by-laws pertaining to human remains • Considering the localised nature of heritage remains, the general monitoring of the development progress by an ECO or by the heritage specialist is recommended for all stages of the project. • Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately • Burials and historically significant structures dating to the Colonial Period occur on farms in the area and these resources should be avoided during all phases of construction and development, including the operational phases of the development. • If, during construction, any possible archaeological material culture discoveries are made, the operations must be stopped and a qualified archaeologist be contacted for an assessment of the find. Such material culture might include: <ul style="list-style-type: none"> ○ Formal Earlier Stone Age stone tools. ○ Formal MSA stone tools. ○ Formal LSA stone tools. ○ Potsherds ○ Iron objects. ○ Beads made from ostrich eggshell and glass. 		

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RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
	<ul style="list-style-type: none"> ○ Ash middens and cattle dung deposits and accumulations. ○ Faunal remains. - Human remains/graves. - Stone walling or any sub-surface structures. - Historical glass, tin or ceramics. - Fossils. ● If such sites were to be encountered or impacted by any proposed developments, recommendations contained in this report, as well as endorsement of mitigation measures as set out by Limpopo-PHRA, SAHRA, the National Resources Act and the CRM section of ASAPA will be required. ● Cognisance should also be taken of the following: ● As Palaeontological remains occur where bedrock has been exposed, all geological outcrops should be regarded as sensitive. ● Water sources such as drainage lines, fountains and pans would often have attracted human activity in the past. As Stone Age material the larger landscape should be regarded as potentially sensitive in terms of possible subsurface deposits. 		
Loss of least threatened and vulnerable vegetation	<ul style="list-style-type: none"> ● An Environmental Control Officer (ECO) must be appointed to oversee construction activities; 	ECO	Construction phase
Loss of habitat	<ul style="list-style-type: none"> ● Vegetation clearance and aquatic habitats must be avoided as far as possible; ● Should avoidance be impractical, impact to the natural vegetation shall be minimised as far as possible. ● Employ brush cutting rather than ploughing, hoeing or herbicide for fire breaks. ● Prune indigenous tree species using loppers or saws where they pose safety threats. If their presence compromises safety mandates entirely, fell and stump treat with appropriate herbicide; 	Contractor, DEO, ECO	Construction phase
Loss of soil fertility	<ul style="list-style-type: none"> ● Vegetation clearance and aquatic habitats must be avoided as far as possible; ● Should avoidance be impractical, impact to the natural vegetation shall be minimised as far as possible. ● Employ brush cutting rather than ploughing, hoeing or herbicide for fire breaks. ● Prune indigenous tree species using loppers or saws where they pose safety threats. If their presence compromises safety mandates entirely, fell and stump treat with appropriate herbicide; 	Contractor, DEO, ECO	Construction phase
Encroachment and establishment of	<ul style="list-style-type: none"> ● A Rehabilitation and Alien Management Plan must be developed and implemented during the construction phase to reduce the establishment and spread of undesirable alien plant species. 	Contractor, DEO, ECO	Construction phase

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RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
alien vegetation	<ul style="list-style-type: none"> • Alien plants must be removed from the site through appropriate methods such as hand pulling, application of chemicals, cutting, etc. This must be done under the supervision of the ECO. 		
Soil erosion and increase in erosion potential	<ul style="list-style-type: none"> • Ensure that appropriate stormwater structures are designed prior to construction and implemented during construction; • Ensure that all road sections situated on slopes incorporate stormwater diversion; • Ensure that all stormwater structures are designed in line with both SANRAL and DWS requirements; • All the relevant permits must be obtained from DWS prior to commencement of any activities onsite; this includes areas within 50m of a river/stream and areas within 500m of a wetland; • Develop and implement an Erosion Action Plan that aims to monitor and respond to erosion events. • Rehabilitate disturbed areas as soon as possible after construction; • Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance; • All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and vegetation techniques; • All cleared areas (not used for the development footprint) should be vegetated with indigenous perennial shrubs and grasses from the local area as soon as possible. • Natural vegetation (scrubs & trees) that was remove onsite may be uses as soil stabilizer by placing them on cleared areas if natural recovery is slow. • Attention shall be given to the effect of the road widening on drainage, including the flow of stormwater to the railway line of Transnet Freight Rail. No storm-water will be allowed to discharge onto Transnet Freight Rail land. If storm-water is diverted to cross under the railway line through existing culverts, detailed calculations for a 1 in 50 year flood must be submitted for approval to Transnet to ascertain whether the culverts can manage the increased flow of storm-water. 	Contractor, DEO, ECO	Construction phase
Animal fatalities	<ul style="list-style-type: none"> • Train all staff on site regarding the proper management and response should animals be encountered; • Search and clear the construction region prior to work commencing, relocating animals where found; • No animal shall be killed or hurt where possible; • No hunting, baiting or trapping shall be allowed; 	Contractor, DEO, ECO	Construction phase

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RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
Disturbance of local fauna	<ul style="list-style-type: none"> Limit traffic speed on-site; Search and clear construction area prior to work commencing, relocating animals where necessary. 	Contractor, DEO, ECO	Construction phase
Poor rehabilitation of moderate and high sensitive areas	<ul style="list-style-type: none"> Construction activities must be limited to the designated footprint of the road upgrade route i.e. construction materials, vehicular storage, construction camps etc., should occur in an area that has already been disturbed or of low sensitivity and is at least 50m (but preferably 100m) from a watercourse. The surveyed construction footprint must be approved by an ECO to ensure that natural vegetation is not unnecessarily damaged. Where vegetation has been cleared, site rehabilitation in terms of soil stabilisation and re-vegetation must be undertaken. A Rehabilitation and Alien Management Plan must be developed and implemented during the construction phase to reduce the establishment and spread of undesirable alien plant species. Alien plants must be removed from the site through appropriate methods such as hand pulling, application of chemicals, cutting, etc. This must be done under the supervision of the ECO. 	Contractor, DEO, ECO	Construction phase
Loss of animal SCC	<ul style="list-style-type: none"> The development area must be surveyed prior to topsoil removal in order to locate and capture any animal SCC and relocate them. Provide training for construction workers on the contents of the EMPr; The contractor's workers must not poach or trap wild animals. 	Contractor, DEO, ECO	Construction phase
	<ul style="list-style-type: none"> The road upgrade route must be surveyed prior to topsoil removal in order to locate plant SCC and transplant them into the neighbouring undeveloped environment. There should be minimal disturbance to sensitive vegetation areas as successful vegetation recovery will depend on the remaining vegetation. Where vegetation has been cleared, site rehabilitation in terms of soil stabilisation and re-vegetation must be undertaken as soon as possible; 	Contractor, DEO, ECO	Construction phase
Loss of plant SCC	<ul style="list-style-type: none"> The road upgrade route must be surveyed prior to topsoil removal in order to locate plant SCC and transplant them into the neighbouring undeveloped environment. There should be minimal disturbance to sensitive vegetation areas as successful vegetation recovery will depend on the remaining vegetation. Where vegetation has been cleared, site rehabilitation in terms of soil stabilisation and re-vegetation must be undertaken as soon as possible; 	Contractor, DEO, ECO	Construction phase
General Aquatic	<ul style="list-style-type: none"> Any invasive alien plants occurring within the road reserve should be monitored and removed on an ongoing basis according to methods as provided by the Working for 	Contractor, DEO, ECO	Construction phase

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RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
	<p>Water Programme.</p> <ul style="list-style-type: none"> • Construction within the river and wetland channels should as far as possible take place during the drier months of the year. This is of particular importance where the schedule of work over the three year period should be planned to avoid critical construction work during high flow events. • Once construction is complete, the disturbed areas should be rehabilitated to resemble that of the surrounding bed and banks and where necessary vegetated with suitable local indigenous plants as occur at the site. • Rubble and debris from existing structures and construction activities should be removed after construction is complete so as not to impede flow in the rivers and wetlands. • Sufficient precaution should be applied to prevent erosion of the road embankment during high flow events in the Bierspruit. • The channel upstream of the crossings should be kept free of debris and sediment build-up, particularly at the culvert where it might impede flows. • The culvert structures should also be inspected and maintained regularly to proactively address blockages and erosion within the river channels. • The culverts may not be removed and new culverts should preferably be enlarged for wetland 6 and on both the southern and northern ends of wetland 7. • The disturbed areas will need to be monitored and managed for a period of at least 3 years post construction to ensure that alien plants do not invade these areas. • The new culvert structures should not be placed higher than the base level of the stream channel to ensure that low flows are not impeded. • The road between km 18.9 and 19.4 is in very close proximity of the river. The road expansion should preferably not take place in a westerly direction in this section of the road. • The size of culverts should not be reduced. • Work within the river and wetland channels or wetland areas should be limited as far as possible and the disturbed areas rehabilitated immediately afterwards. 		
<p>Aquatic habitat modification or loss</p>	<ul style="list-style-type: none"> • Work within the river channels or wetland areas should be limited as far as possible and the disturbed areas rehabilitated immediately afterwards. • Construction within the river channels should as far as possible take place during the drier months of the year. • Once construction is complete, the area should be rehabilitated to resemble that of the surrounding bed and banks and where necessary vegetated with suitable local indigenous plants as occur at the sites (sweet thorn <i>Vachellia karroo</i>, <i>Ziziphus</i> 	<p>Contractor, DEO, ECO</p>	<p>Construction phase</p>

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RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
	<p><i>mucronata</i> and common reeds <i>Phragmites australis</i>, mat sedge <i>Cyperus textilis</i> and other sedges and rushes within the instream habitat).</p> <ul style="list-style-type: none"> • Any invasive alien plants or waste material within the river channels at the river crossings should be removed from the channels. • The widening of the road along the Crocodile River should take place in an easterly direction away from the river at the junction between the R511 and R510 roads (between km 28.4 and 28.9). • The impact of the proposed road upgrade works can be mitigated as long as the flow into these wetland areas and the drainage out of the wetland areas during higher flow events are not modified. The culverts may not be removed and new culverts should preferably be enlarged for wetland 6 and on both the southern and northern ends of wetland 7 (between km 26.4 and 27.5). • The section of the R510 along the Bierspruit at km mark 19.0 and 19.2 should not be filled in towards the river as it might result in erosion of the road in the future. • In general work within the river / stream channels should be limited as far as possible and the river bed and banks rehabilitated immediately afterwards. Construction within the river channels should preferably take place during the drier months of the year. Disturbed areas should be rehabilitated once construction is complete. • The new culvert structures should not be placed higher than the base level of the stream channel to ensure that low flows are not impeded. The size of culverts should not be reduced. • The disturbed areas will need to be monitored and managed for a period of at least 3 years post construction to ensure that alien plants do not invade these areas. The culvert structures should also be inspected and maintained regularly to proactively address blockages and erosion within the river channels. 		
<p>Water Quality Impacts</p>	<ul style="list-style-type: none"> • Contaminated runoff from the construction site(s) should be prevented from entering the rivers, tributaries and associated wetland areas. • The laydown area and main construction site(s) for the road upgrade should be located away (at least 30m) from the rivers and associated wetland areas. • If the construction site(s) need to be located near the rivers/streams, all materials on the construction site(s) should be properly stored and contained. • Disposal of waste from the site(s) should also be in accordance with a waste management plan or EMP conditions. • Construction workers should be given ablution facilities at the construction works that are located away from the river systems (at least 30m) and regularly serviced. • These measures should be addressed, implemented and monitored in terms of the 	<p>Contractor, DEO, ECO</p>	<p>Construction phase</p>

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RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
	<p>Environmental Management Plan for the construction phase.</p> <ul style="list-style-type: none"> Increased sedimentation or turbidity at each of the construction works within the river channels should be mitigated as far as possible by making use of sandbags, settling ponds or screens to minimise the load of sediment being washed downstream of the works. Contaminated runoff from the construction site(s) should be prevented from entering the rivers/streams. All materials on the construction sites should be properly stored and contained. Disposal of waste from the sites should also be properly managed. Construction workers should be given ablution facilities at the construction sites that are located away from the river (at least 30m) and regularly serviced. These measures should be addressed, implemented and monitored in terms of the EMP for the construction phase. Sediment loads to river from construction activities should be prevented or minimized. 		
Potential for Erosion	<ul style="list-style-type: none"> The widening of the road along the Crocodile River should take place in an easterly direction away from the river at the junction between the R511 and R510 roads (between km 28.4 and 28.9). The impact of the proposed road upgrade works can be mitigated as long as the flow into these wetland areas and the drainage out of the wetland areas during higher flow events are not modified. The culverts may not be removed and new culverts should preferably be enlarged for wetland 6 and on both the southern and northern ends of wetland 7 (between km 26.4 and 27.5). The section of the R510 along the Bierspruit at km mark 19.0 and 19.2 should not be filled in towards the river as it might result in erosion of the road in the future. The riparian vegetation cover associated with the watercourses should be disturbed as little as possible during the construction phase. Any disturbed areas should be rehabilitated as soon as possible after construction is completed and planted with suitable indigenous plants (sweet thorn <i>Vachellia karroo</i>, <i>Ziziphus mucronata</i> and <i>Combretum erythrophyllum</i> within the riparian zones and common reeds <i>Phragmites australis</i>, mat sedge <i>Cyperus textilis</i> and other sedges and rushes such as <i>Juncus kraussii</i> within the instream habitat) where necessary. Storm water runoff from the road into the river channels may also need to be mitigated to prevent erosion at the crossings. 	Contractor, DEO, ECO	Construction phase
Flow modification	<ul style="list-style-type: none"> Activities within the river channels during the construction phase should be limited as far as possible in terms of their spatial and temporal extent. They must be demarcated and construction activities limited to this extent. Construction work within the river channel should preferably take place before the onset of the rainfall period to ensure minimal impact on flow. If flow occurs, flow in the river 	Contractor, DEO, ECO	Construction phase

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RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
	<p>should be diverted around the construction works. In particular the low flow should not be impeded during construction.</p> <ul style="list-style-type: none"> • Rubble and debris from existing structures and construction activities should be removed after construction is complete so as not to impede flow in the rivers. • Each site, once completed be rehabilitated. • Ongoing monitoring and management of invasive alien plants within the disturbed areas along the road on an annual to twice yearly basis for a period of at least three years is recommended to ensure that the river corridor does not become invaded with alien invasive plants. 		

OPERATIONAL PHASE

6.2 Operational Phase

RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
Control of alien plant species	<ul style="list-style-type: none"> • Alien plants must be regularly removed from site through appropriate methods such as hand pulling, application of chemicals, cutting, etc. • Development and implementation of a Vegetation Management Plan for all road reserves • Development and implementation of an Alien Vegetation Management Plan for all road reserves • An Alien Management Plan must be developed and implemented during the operational phase to reduce the establishment and spread of undesirable alien plant species. • Alien plants must be removed from the site through appropriate methods such as hand pulling, application of chemicals, cutting etc. as in accordance to the NEMBA: Alien Invasive Species Regulations. 	Contractor, DEO, ECO	Operational phase
Aquatic habitat modification or loss	<ul style="list-style-type: none"> • Any regrowth of invasive alien plants within the road reserve should be monitored and removed on an ongoing basis. • Any signs of erosion within the river channels at the road crossings, particularly as a result of storm water runoff to the watercourse should be identified and addressed as soon as possible. Regular monitoring of the culvert structures should also be undertaken to ensure that they do not become block with sediment and debris but remain open. 	Contractor, DEO, ECO	Operational phase
Potential for erosion	<ul style="list-style-type: none"> • The widening of the road along the Crocodile River should take place in an easterly direction away from the river at the junction between the R511 and R510 roads (between km 28.4 and 28.9). • The impact of the proposed road upgrade works can be mitigated as long as the flow into these wetland areas and the drainage out of the wetland areas during higher flow events are not modified. • The culverts may not be removed and new culverts should preferably be enlarged for wetland 6 and on both the southern and northern ends of wetland 7 (between km 26.4 and 27.5). • The section of the R510 along the Bierspruit at km mark 19.0 and 19.2 should not be filled in towards the river as it might result in erosion of the road in the future. • The riparian vegetation cover associated with the watercourses should be disturbed as little as possible during the construction phase. Any disturbed areas should be rehabilitated as soon as possible after construction is completed and planted with 	Contractor, DEO, ECO	Operational phase

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RISK	MITIGATION MEASURES	RESPONSIBILITY	TIMEFRAMES
	<p>suitable indigenous plants (sweet thorn <i>Vachellia karroo</i>, <i>Ziziphus mucronata</i> and <i>Combretum erythrophyllum</i> within the riparian zones and common reeds <i>Phragmites australis</i>, mat sedge <i>Cyperus textilis</i> and other sedges and rushes such as <i>Juncus kraussii</i> within the instream habitat) where necessary.</p> <ul style="list-style-type: none"> • Storm water runoff from the road into the river channels may also need to be mitigated to prevent erosion at the crossings. 		
Flow modification	<ul style="list-style-type: none"> • In the longer term, the upgraded structures and the box culverts/pipes should not impede the flow and in particular the low flow in the rivers. In particular, the new culvert structures should not be placed higher than the base level of the river channels to ensure that low flows are not impeded. • In addition, the culvert structures must be placed within the natural drainage line of the rivers. The structures should also not impede the migration of biota. • The channel upstream of the river crossings should be kept free of debris, intrusive growth of invasive alien plants and sediment build-up, particularly at the culverts where it might impede flows. 	Contractor, DEO, ECO	Operational phase

7 ENVIRONMENTAL MONITORING

According to Appendix 4 of GN R 326, an environmental management programme must include:

- (k) the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);

7.1 General environmental monitoring

A monitoring programme will be implemented for the duration of the construction of the Section 2 of the R510 upgrade between Northam and Thabazimbi. This programme will include:

- All project related monitoring are to be implemented as stipulated in the issued Environmental Authorisation for the development;
- Establishing a baseline through the taking of photographs of identified environmental aspects and potential impact sites along the routes prior to construction;
- Documenting pictures of key compliance controls (specifically relating to water use) at each audit inspection;
- Regular site monitoring and auditing will be conducted by the DEO throughout the duration of the construction phase to ensure compliance to the EMPr conditions, and where necessary make recommendations for corrective action. These audits are to be vetted by the ECO who may conducts audits as required;
- The ECO audit report should include compilation of an audit report with a rating of compliance with the EMPr;
- The ECO shall document photographic records of any damage to areas outside the demarcated site and construction area. The date, time of damage, type of damage and reason for the damage shall be recorded in full to ensure the responsible party is held liable;
- All claims for compensation emanating from damage should be directed to the ECO for appraisal. The Contractor shall be held liable for all unnecessary damage to the environment;
- A register shall be kept, on site, of all complaints from the Landowner or community. All complaints / claims shall be handled immediately to ensure timeous rectification / payment by the responsible party.

8 ENVIRONMENTAL AWARENESS

According to Appendix 4 of GN R 326, an environmental management programme must include:

- (M) An environmental awareness plan describing the manner in which –
- (i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and
 - (ii) risks must be dealt with in order to avoid pollution or the degradation of the environment;

Contractors shall ensure that its employees and any third party who carries out all or part of the Contractor's obligations are adequately trained with regard to the implementation of the EMPr, as well as regarding environmental legal requirements and obligations. Training shall be conducted by the DEO where necessary.

Environment and health awareness training programmes should be targeted at three distinct levels of employment, i.e. the executive, middle management and labour. Environmental awareness training programmes shall contain the following information:

- The names, positions and responsibilities of personnel to be trained.
- The framework for appropriate training plans.
- The summarised content of each training course.
- A schedule for the presentation of the training courses.

The DEO shall ensure that records of all training interventions are kept in accordance with the record keeping and documentation control requirements as set out in this EMPr. The training records shall verify each of the targeted personnel's training experience.

The Developer shall ensure that adequate environmental training takes place. All employees shall have been given an induction presentation on environmental awareness and the content of the EMPr. The presentation needs to be conducted in the language of the employees to ensure it is understood. The environmental training shall, as a minimum, include the following:

- The importance of conformance with all environmental policies.
- The environmental impacts, actual or potential, of their work activities.
- The environmental benefits of improved personal performance.
- Their roles and responsibilities in achieving conformance with the environmental policy and procedures and with the requirement of the Agency's environmental management systems, including emergency preparedness and response requirements.
- The potential consequences of departure from specified operating procedures;
- The mitigation measures required to be implemented when carrying out their work activities.
- Environmental legal requirements and obligations.
- Details regarding floral/faunal species of special concern and protected species, and the procedures to be followed should these be encountered during the construction of the bridge, main access roads, approach roads or construction camps.
- The importance of not littering.
- The importance of using supplied toilet facilities.
- The need to use water sparingly.
- Details of and encouragement to minimise the production of waste and re-use, recover and recycle waste where possible.
- Details regarding archaeological and/or historical sites which may be unearthed during construction and the procedures to be followed should these be encountered.

Recommended Environmental Education Material is provided in Appendix 1 or this report.

8.1 Monitoring of environmental training

Toolbox talks are recommended to implement regular training of staff. The appointed DEO should monitor the performance of construction workers to ensure that the points relayed during their induction and training are understood and are followed adequately. If necessary, the DEO and / or a translator should be called to the site to assist in explaining aspects of environmental or social requirement that are unclear.

9 COMPLIANCE WITH THE EMPr

According to Appendix 4 of GN R 326, an environmental management programme must include:

(G) the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);

A copy of the EMPr, including all issued Licences and Permits, must be kept on site at all times during the construction period. The EMPr will be binding on all contractors operating on the site and must be included within the Contractual Clauses.

It should be noted that in terms of the National Environmental Management Act No 107 of 1998 (Section 28) those responsible for environmental damage must pay the repair costs both to the environment and human health and the preventative measures to reduce or prevent further pollution and/or environmental damage (The '*polluter pays*' principle).

9.1 Non-compliance

The contractors shall act immediately when notice of non-compliance is received and correct whatever is the cause for the issuing of the notice. Complaints received regarding activities on the construction site pertaining to the environment shall be recorded in a dedicated register and the response noted with the date and action taken. The ECO should be made aware of any complaints.

Any non-compliance with the agreed procedures of the EMPr is a transgression of the various statutes and laws that define the manner by which the environment is managed. Failure to redress the cause shall be reported to the relevant authority for them to deal with the transgression, as it deems fit.

The Contractor is deemed not to have complied with the EMPr if, *inter alia*:

- There is evidence of contravention of the EMPr and Environmental Authorisation specifications within the boundaries of the construction site, site extensions and roads;
- There is contravention of the EMPr Environmental Authorisation specifications which relate to activities outside the boundaries of the construction site.
- Environmental damage ensues due to negligence;
- Construction activities take place outside the defined boundaries of the site; and/or

It is recommended that the engineers/contractors institute adequate measures, including penalties, for the following less serious violations and any others determined during the course of work as detailed below:

- Littering on site.
- Lighting of illegal fires on site.
- Persistent or un-repaired fuel and oil leaks.
- Any persons, vehicles or equipment related to the Contractor's operations found within the designated "NO-GO" areas.
- Excess dust or excess noise emanating from site.
- Possession or use of intoxicating substances on site.
- Hunting or baiting of animals in or around the work areas and construction camp.
- Any vehicles being driven in excess of designated speed limits.
- Removal and/or damage to fauna, flora or cultural or heritage objects on site.
- Urination and defecation anywhere except at designated facilities.

9.2 Emergency preparedness

The Contractor shall compile and maintain environmental emergency procedures to ensure that there will be an appropriate response to unexpected or accidental actions or incidents that will cause environmental impacts, throughout the construction period. Such activities may include, *inter alia*:

- Accidental discharges to water and land.
- Accidental exposure of employees to hazardous substances.
- Accidental fires.
- Accidental spillage of hazardous substances.
- Accidental toxic emissions into the air.
- Vehicular collision and accident.
- Specific environmental and ecosystem effects from accidental releases or incidents.

These plans shall include:

- Details of emergency organisation (manpower) and responsibilities, accountability and liability.
- A list of key personnel and contact details. Details of emergency services available (e.g. the fire department, spill clean-up services, etc.).
- Internal and external communication plans, including prescribed reporting procedures where required by legislation.
- Actions to be taken in the event of different types of emergencies.
- Incident recording, progress reporting and remediation measures required to be implemented.
- Information on hazardous materials, including the potential impact associated with each, and measures to be taken in the event of accidental release.
- Training plans, testing exercises and schedules for effectiveness.

The Contractor shall comply with the emergency preparedness and incident and accident-reporting requirements, as required by the Occupational Health and Safety Act, 1993 (Act No 85 of 1993), the NEMA, 1998 (Act No 107 of 1998), the National Water Act, 1998 (Act No 36 of 1998) and the National Veld and Forest Fire Act, 1998 (Act No 101 of 1998) as amended and/or any other relevant legislation.

In particular, the proponent and contractor shall adhere to all requirements of Section 30A of the National Environmental Management Act EIA regulations (2014, as amended) relating to emergency control procedures. These shall include, amongst others:

- Having been made aware of an incident, the responsible person (as per definitions in NEMA) shall report the nature of the incident, risks posed by the incident to public health and the environment, the toxicity of the substances or by-products released by the incident, as well as any steps that should be taken to avoid or minimise the effects of the incident on public health and the environment. This shall all be communicated to the Director-General, the South African Police Service and the relevant fire prevention service, the provincial head of department or municipality as well as all persons whose health may be impacted.
- Furthermore, the responsible person shall take all reasonable measures to contain and minimise the effects of the incidents on human health, safety and property of persons, as well as the environment. This person will also undertake clean-up procedures, remedy the effects of the incident, assess the immediate and long-term effects of the incident on public health and the environment.
- All relevant information must be communicated to the Director-General, provincial head of department and the municipality within 14 days, including the nature of the incident, the substances involved and estimation of the quantity released, as well as their acute effects on personal and the environment, and the data needed to assess these effects. This information must further include the initial measures taken to minimise the impacts, caused of the incident, and the measures taken to avoid a recurrence of such an incident.

9.3 Incident reporting and remedy

If a leakage or spillage of hazardous substances occurs on site, the local emergency services must be immediately notified of the incident, in accordance with Section 30 (control of incidents) of the National Environmental Management Act EIA regulations (2014, as amended). The following information must be provided:

- The location;
- The nature of the load;
- The extent of the impact; and
- The status at the site of the accident itself (i.e. whether further leakage is still taking place, whether the vehicle or the load is on fire).

Written records must be kept on the corrective and remedial measures decided upon and the progress achieved therewith over time. Such progress reporting is important for monitoring and auditing purposes. The written reports may be used for training purposes in an effort to prevent similar future occurrences.

9.4 Penalties

Where environmental damage is caused or a pollution incident, and/or failure to comply with any of the environmental specifications contained in the EMPr, the developer and/or contractor shall be liable.

The following violations, and any others determined during the course of work, should be penalised:

- Hazardous chemical/oil spill and/or dumping in non-approved sites.
- Damage to sensitive environments.
- Damage to cultural and historical sites.
- Unauthorised removal/damage to indigenous trees and other vegetation, particularly in identified sensitive areas.
- Uncontrolled/unmanaged erosion.
- Unauthorised blasting activities (if applicable).
- Pollution of water sources.
- Unnecessary removal or damage to trees.

10 CLOSURE PLANNING

Final site cleaning - the contractor shall clear and clean the site and ensure that everything not forming part of the permanent works is removed from site before issuing the completion certificate or as otherwise agreed.

Rehabilitation - the contractor (landscape architect/horticulturist) shall be responsible for rehabilitating and re-vegetation of all areas disturbed/areas earmarked for conservation during construction to the satisfaction of the engineer and ECO.

10.1 Post-Construction environmental audit

A post-construction environmental audit must be carried out and submitted to DEA at the expense of the developer so as to fulfil conditions of the Environmental Authorisation granted. Objectives should be to audit compliances with the key components of the EMPr, to identify main areas requiring attention and recommend priority actions. The audit should be undertaken annually and should cover a cross section of issues, including implementation of environmental controls, environmental management and environmental monitoring.

Results of the audits should inform changes required to the specifications of the EMPr or additional specifications to deal with any environmental issues which arise on site and have not been dealt with in the current document.

10.2 Management review and revision of the EMPr

The EMPr is to be reviewed annually for the first four years and then once every five years thereafter, by an independent environmental consultant, unless otherwise specified by the authorities. The auditor is to highlight issues to be addressed in the EMPr or changes required during the annual audit. These points are to be included as an annexure to the EMPr and to be considered during the review process. Recommended changes to the EMPr must be forwarded to DEA for approval and comment, before subsequently being incorporated into the EMPr.

10.3 General review of EMPr

The EMPr will be reviewed by the ECO on an on-going basis. Based on observations during site inspections and issues raised at site meetings, the ECO will determine whether any procedures require modification to improve the efficiency and applicability of the EMPr on site.

Any such changes or updates will be registered in the ECO's record, as well as being included as an annexure to this document. Annexure of this nature must be distributed to all relevant parties.

11 REPORTING

11.1 Administration

Before the contractor begins each construction activity, the Contractor shall give to the ECO and engineer a written method statement setting out the following:

- The type of construction activity.
- Locality where the activity will take place.
- Identification of impacts that might result from the activity.
- Identification of activities or aspects that may cause an impact.
- Methodology and/or specifications for impact prevention for each activity or aspect.
- Methodology and/or specifications for impact containment for each activity or aspect.
- Emergency/disaster incident and reaction procedures.
- Treatment and continued maintenance of impacted environment.

The contractor may provide such information in advance of any or all construction activities provided that new submissions shall be given to the ECO and/or engineer whenever there is a change or variation to the original.

The ECO and/or engineer may provide comment on the methodology and procedures proposed by the Contractor but he shall not be responsible for the contractor's chosen measures of impact mitigation and emergency/disaster management systems. However, the contractor shall demonstrate at inception and at least once during the contract that the approved measures and procedures function properly.

11.2 Good housekeeping

The contractor shall undertake “good housekeeping” practices during construction. This will help avoid disputes on responsibility and allow for the smooth running of the contract as a whole. Good housekeeping extends beyond the wise practice of construction methods that leaves production in a safe state from the ravages of whether to include the care for and preservation of the environment within which the site is situated.

11.3 Record keeping

The engineer and the ECO will continuously monitor the contractor's adherence to the approved impact prevention procedures and the engineer shall issue to the contractor a notice of non-compliance whenever transgressions are observed. The ECO should document the nature and magnitude of the non-compliance in a designated register, the action taken to discontinue the non-compliance, the action taken to mitigate its effects and the results of the actions. The non-compliance shall be documented and reported to the engineer in the monthly report. These reports shall be made available to DEA when requested.

The Contractor shall ensure that an electronic filing system identifying all documentation related to the EMP is established.

A list of reports likely to be generated during all phases of Section 2 of the R510 upgrade project is provided below, and all applicable documentation must be included in the environmental filing system catalogue or document retrieval index.

- Final Environmental Impact Assessment Report (BAR).
- Environmental Management Plan (this document).
- Final design documents and diagrams issued to and by the Contractor.
- All communications detailing changes of design/scope that may have environmental implications.

- Daily, weekly and monthly site monitoring reports.
- Complaints register.
- Medical reports.
- Training manual.
- Training attendance registers.
- Incident and accident reports.
- Emergency preparedness and response plans.
- Copies of all relevant environmental legislation.
- Permits and legal documents, including letters authorising specific personnel of their duties as part of emergency preparedness teams e.g. fire teams, etc.
- Crisis communication manual.
- Disciplinary procedures.
- Monthly site meeting minutes during construction.
- All relevant permits.
- Environmental Authorisation on the EIA from the DEA.
- All method statements from the Contractor for all phases of the project.

11.4 Document control

The Contractor and resident engineer shall be responsible for establishing a procedure for electronic document control. The document control procedure should comply with the following requirements:

- Documents must be identifiable by organisation, division, function, activity and contact person.
- Every document should identify the personnel and their positions, who drafted and compiled the document, who reviewed and recommended approval, and who finally approved the document for distribution.
- All documents should be dated, provided with a revision number and reference number, filed systematically, and retained for a five year period.

The Contractor shall ensure that documents are periodically reviewed and revised, where necessary, and that current versions are available at all locations where operations essential to the functioning of the EMPr are performed. All documents shall be made available to the independent external auditor.

12 CONCLUSIONS

Although all foreseeable actions and potential mitigations or management actions are contained in this document, the EMPr should be seen as a day-to-day management document. The EMPr thus sets out the environmental and social standards, which would be required to minimise the negative impacts and maximise the positive benefits of the Section 2 of the R510 as detailed in the BAR and specialist reports. The EMPr could thus change daily, and if managed correctly lead to a successful construction and operational phases.

Further guidance should also be taken for any conditions contained in the Environmental Authorisation, if the project is granted approval, and that these DEA conditions must be incorporated into the final EMPr.

All attempts should be made to have this EMPr available, as part of any tender documentation, so that the engineers and contractors are made aware of the potential cost and timing implications needed to fulfil the implementation of the EMPr, thus adequately costing for these.

WHAT IS THE ENVIRONMENT?

- Soil
- Water
- Plants
- People
- Animals
- Air we breathe
- Buildings, cars and houses



WHY MUST WE LOOK AFTER THE ENVIRONMENT?

- It affects us all as well as future generations
- We have a right to a healthy environment
- A contract has been signed
- Disciplinary action (e.g. construction could stop or fines issued)

HOW DO WE LOOK AFTER THE ENVIRONMENT?

- Report problems to your supervisor/ foreman
- Team work
- Follow the rules in the EMP



WORKING AREAS

Workers & equipment must stay inside the site boundaries at all times



RIVERS & STREAMS

- Do not swim in or drink from streams
- Do not throw oil, petrol, diesel, concrete or rubbish in the stream
- Do not work in the stream without direct instruction
- Do not damage the banks or vegetation of the stream



ANIMALS

- Do not injure or kill any animals on the site
- Ask your supervisor or Contract's Manager to remove animals found on site



TREES AND FLOWERS

- Do not damage or cut down any trees or plants without permission
- Do not pick flowers



SMOKING AND FIRE

- Put cigarette butts in a rubbish bin
- Do not smoke near gas, paints or petrol
- Do not light any fires without permission
- Know the positions of fire fighting equipment
- Report all fires
- Do not burn rubbish or vegetation without permission



PETROL, OIL AND DIESEL

- Work with petrol, oil & diesel in marked areas
- Report any petrol, oil & diesel leaks or spills to your supervisor
- Use a drip tray under vehicles & machinery
- Empty drip trays after rain & throw away where instructed



DUST

Try to avoid producing dust -
Use water to make ground &
soil wet



NOISE

- Do not make loud noises around the site, especially near schools and homes
- Report or repair noisy vehicles



TOILETS

- Use the toilets provided
- Report full or leaking toilets



EATING

- Only eat in demarcated eating areas
- Never eat near a river or stream
- Put packaging & leftover food into rubbish bins



RUBBISH

- Do not litter – put all rubbish (especially cement bags) into the bins provided
 - Report full bins to your supervisor
 - The responsible person should empty bins regularly
-



TRUCKS AND DRIVING

- Always keep to the speed limit
 - Drivers – check & report leaks and vehicles that belch smoke
 - Ensure loads are secure & do not spill
-



EMERGENCY PHONE NUMBERS

Know all the emergency phone numbers:

- **Ambulance:**

- **Fire:**

- **Police:**

O R Tambo District Municipality:



FINES AND PENALTIES

- **Spot fines of between**

To be confirmed by Engineer

- **Your company may be fined**
- **Removal from site**
- **Construction may be stopped**



PROBLEMS - WHAT TO DO!

- Report any breaks, floods, fires, leaks and injuries to your supervisor
- Ask questions!



14 APPENDIX 2

PRO-FORMA: PROTECTION OF THE ENVIRONMENT

To be signed by Contractors

PRO FORMA

Employer _____
Contract No _____
Contract title _____

PROTECTION OF THE ENVIRONMENT

The Contractor will not be given right of access to the site until this form has been signed.

I/ we _____ (Contractor) record as follows:

1. I/ we, the undersigned, do hereby declare that I/ we am/ are aware of the increasing requirement by society that construction activities shall be carried out with due regard to their impact on the environment.
2. In view of this requirement of society and a corresponding requirement by the Employer with regard to this Contract, I/ we will, in addition to complying with the letter of the terms of the Contract dealing with protection of the environment, also take into consideration the spirit of such requirements and will, in selecting appropriate employees, plant, materials and methods of construction, in so far as I/ we have the choice, include in the analysis not only the technical and economic (both financial and with regard to time) aspects but also the impact on the environment of the options. In this regard, I/ we recognise and accept the need to abide by the "precautionary principle" which aims to ensure the protection of the environment by the adoption of the most environmentally sensitive construction approach in the face of uncertainty with regard to the environmental implications of construction.
3. I/ we acknowledge and accept the right of _____ to deduct, should they so wish, from any amounts due to me/us, such amounts (hereinafter referred to as fines) as the Resident Engineer and Environmental Site Officer shall certify as being warranted in view of my/ our failure to comply with the terms of the Contract dealing with protection of the environment, subject to the following:
 - 3.1 The Resident Engineer and Environmental Officer, in determining the amount of such fine, shall take into account *inter alia*, the nature of the offence, the seriousness of its impact on the environment, the degree of prior compliance/non-compliance, the extent of the Contractor's overall compliance with environmental protection requirements and, in particular, the extent to which he considers it necessary to impose a sanction in order to eliminate/reduce future occurrences.
 - 3.2 The Resident Engineer and Environmental Officer shall, with respect to any fine imposed, provide me/ us with a written statement giving details of the offence, the facts on which the Resident Engineer and Environmental Officer has based his assessment and the terms of the Contract (by reference to the specific clause) which has been contravened.

Signed _____
CONTRACTOR

Date _____

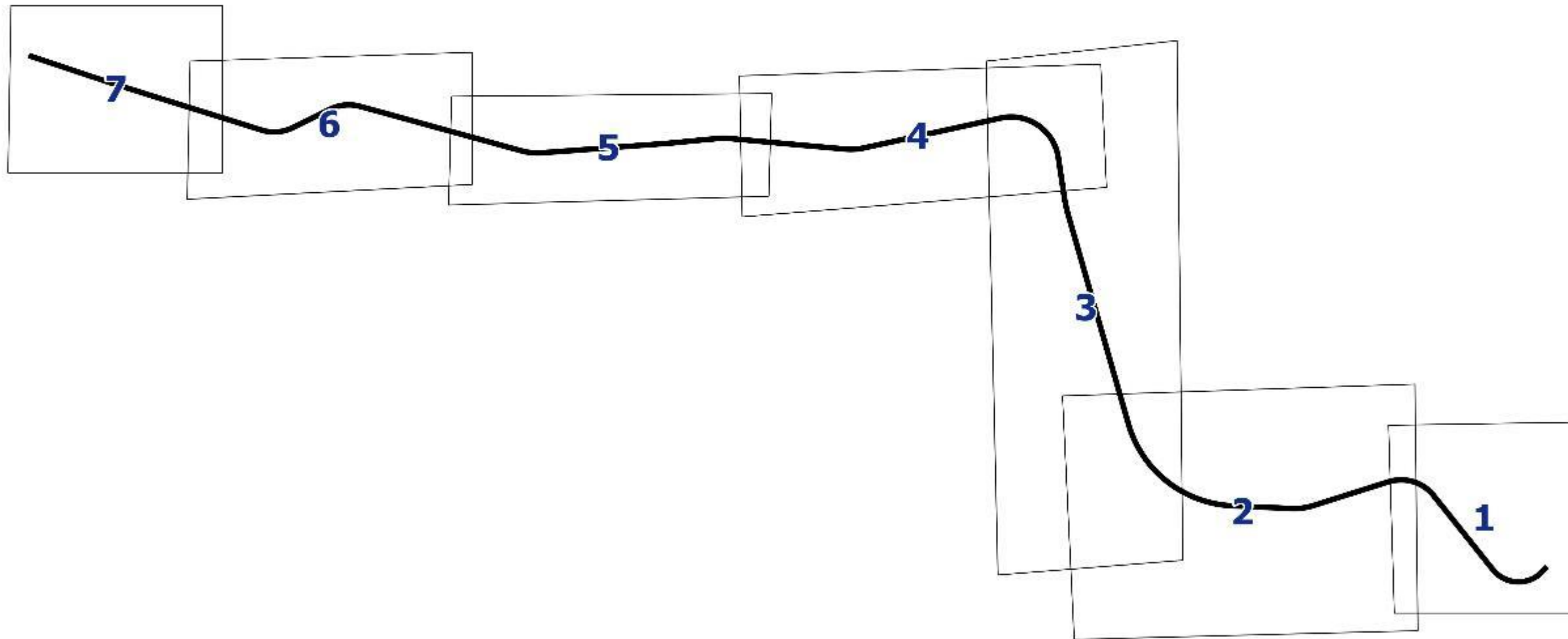


Figure 15.1: Divider section for the R510 road upgrade project. Section 1 is adjacent to Thabazimbi, and Section 7 nearest Northam.

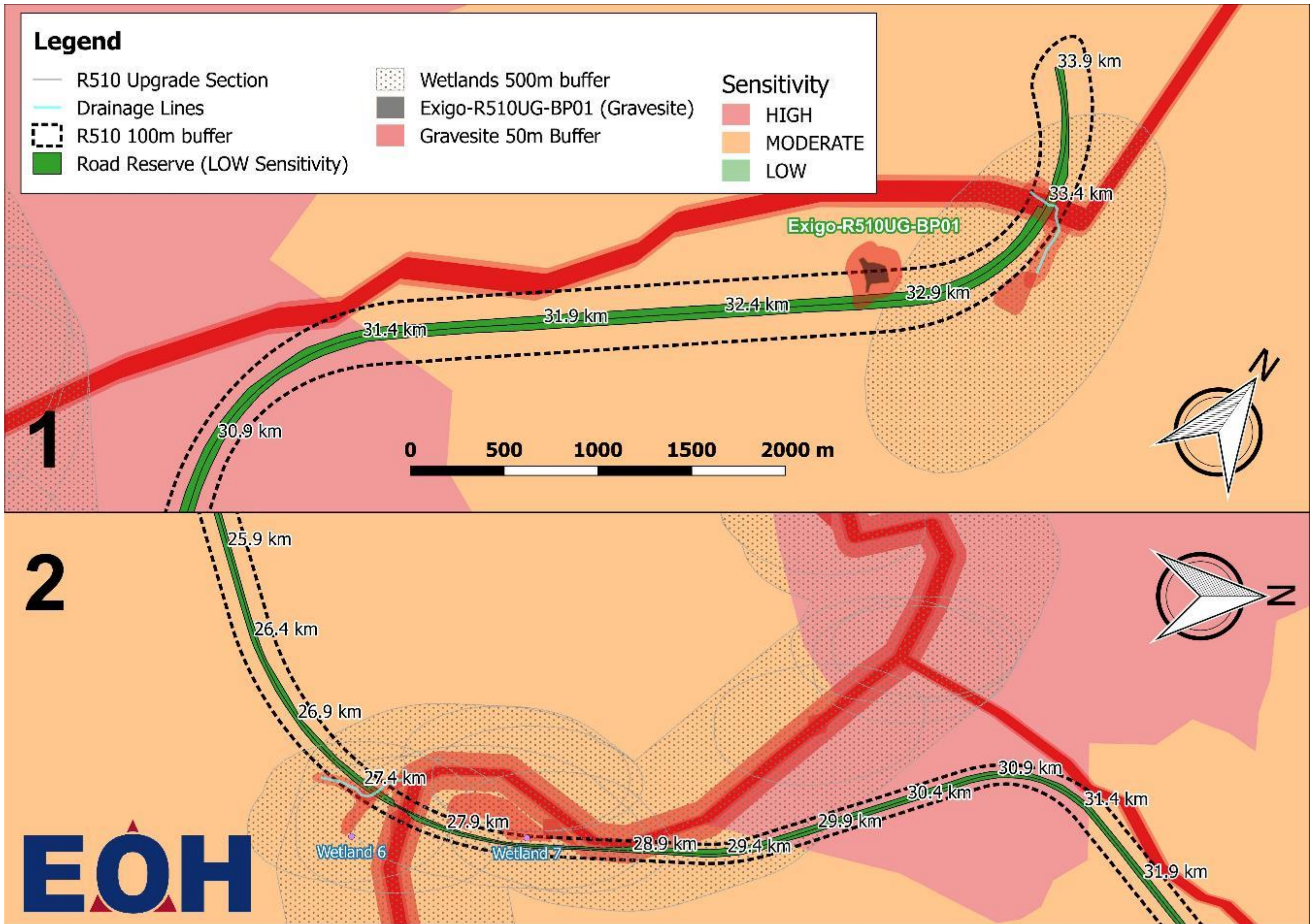


Figure 15.2: Sensitivity map for the project regions 1 and 2.

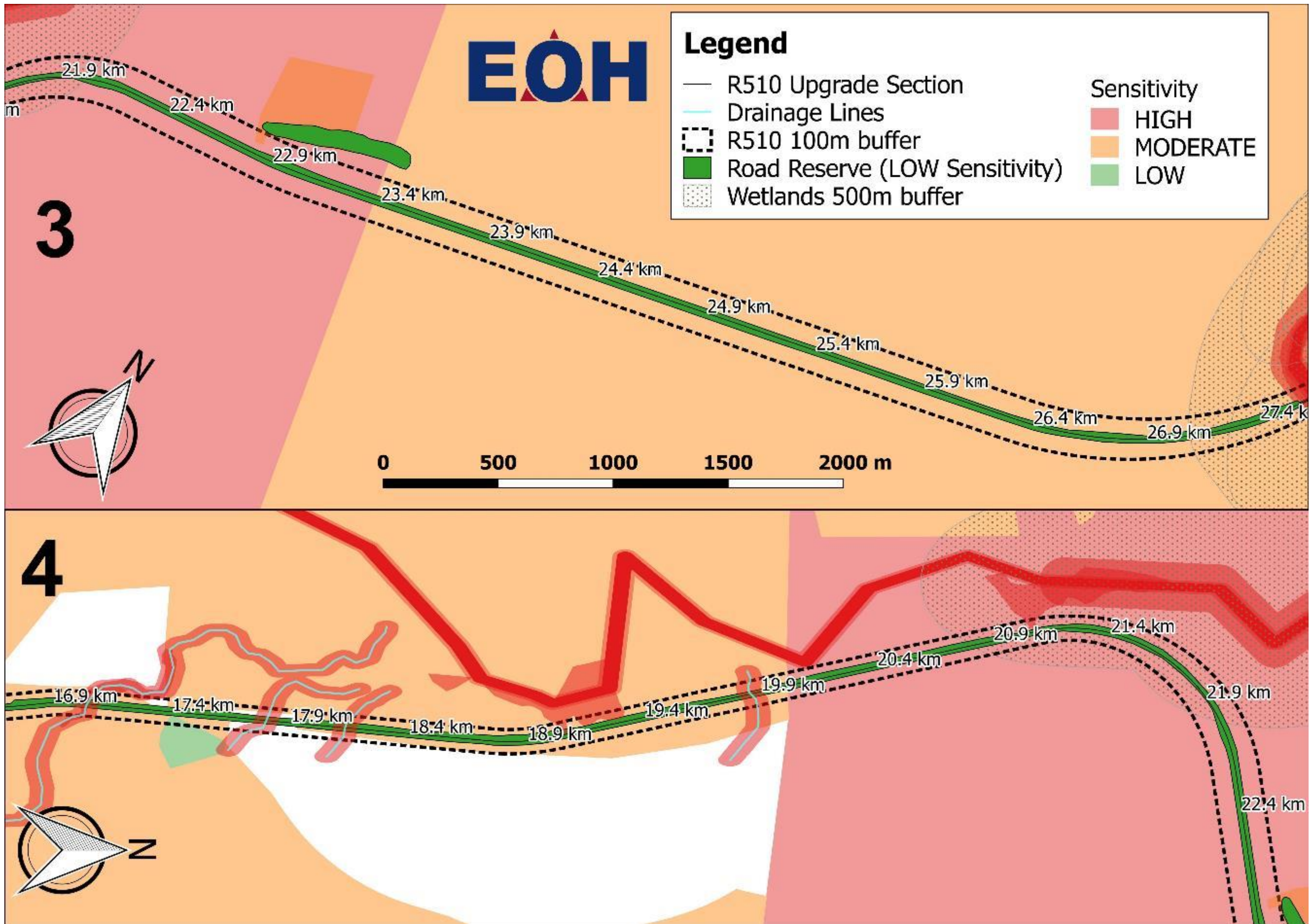


Figure 15.3: Sensitivity map for the project regions 3 and 4.

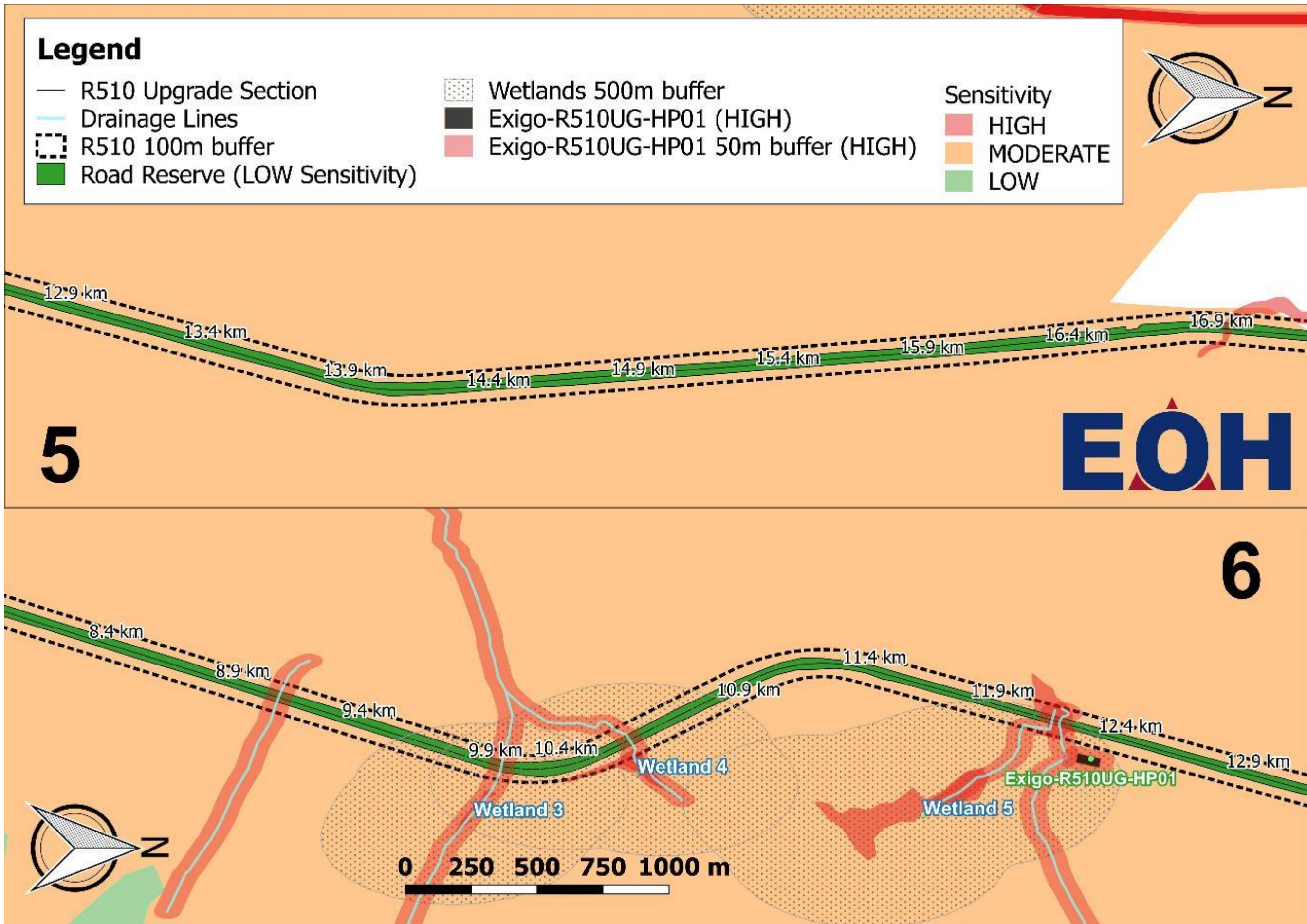


Figure 15.4: Sensitivity map for the project regions 5 and 6.

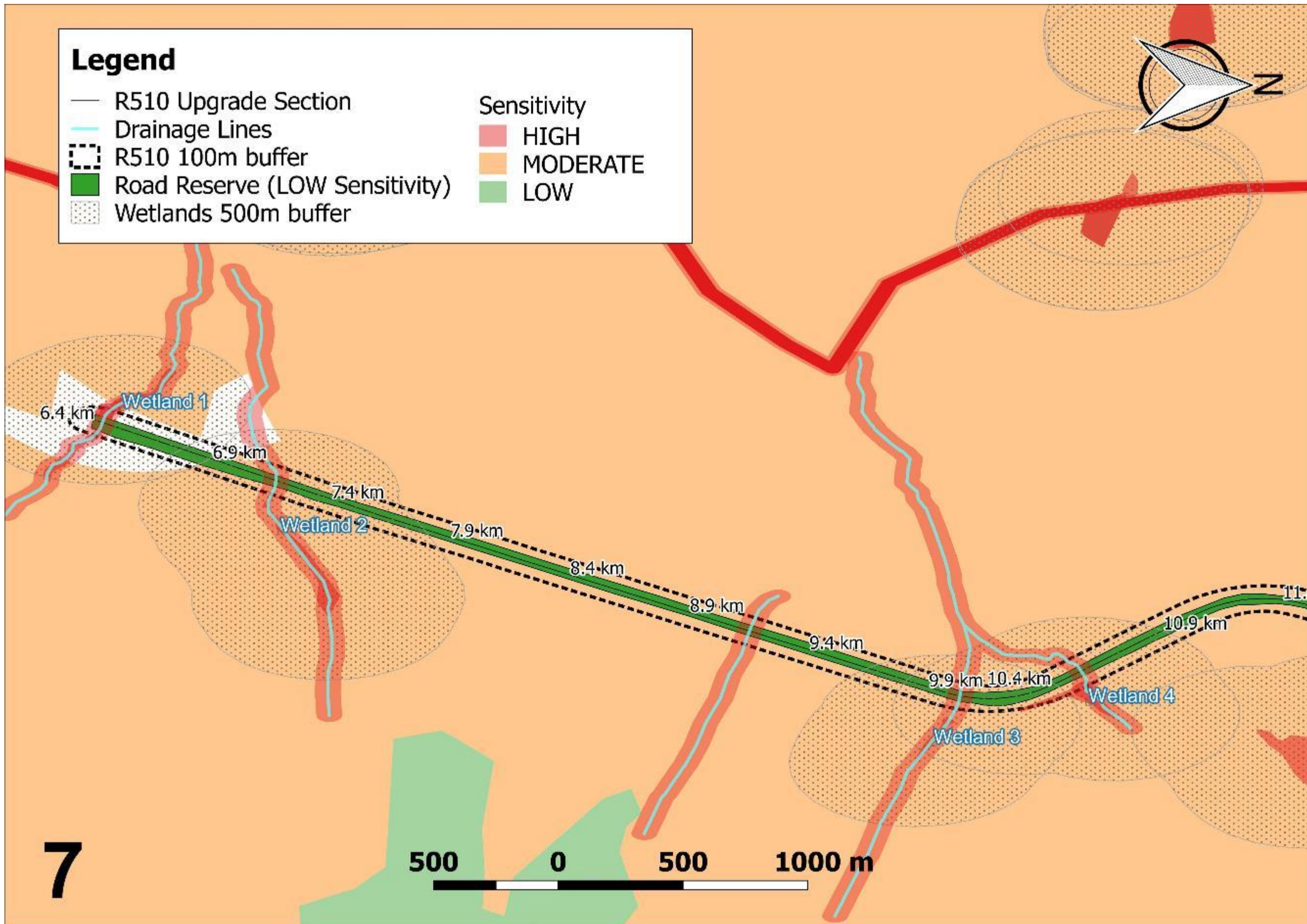


Figure 15. 5: Sensitivity map for the project region 7.

CRITERIA USED TO ANALYSE THE SENSITIVITY OF THE PROPOSED SITE

CRITERIA		LOW SENSITIVITY	MODERATE SENSITIVITY	HIGH SENSITIVITY
1	Topography	Level, or even	Undulating; fairly steep slopes	Complex and uneven with steep slopes
2	Vegetation <i>Extent or habitat type in the region</i>	Extensive	Restricted to a particular region/zone	Restricted to a specific locality / site
3	Conservation status <i>Fauna, flora and habitats</i>	Well conserved independent of conservation value	Not well conserved, moderate conservation value	Not conserved – has a high conservation value
4	SSC <i>Presence and quantity</i>	None, although occasional regional endemics	No endangered or vulnerable species, some indeterminate or rare endemics	One or more endangered and vulnerable species, or more than 2 endemics or rare species
5	Habitat fragmentation <i>loss of viable populations</i>	Extensive areas of preferred habitat present elsewhere in region not susceptible to fragmentation	Reasonably extensive areas of preferred habitat elsewhere and habitat susceptible to fragmentation	Limited areas of this habitat, susceptible to fragmentation
6	Biodiversity Contribution	Low diversity, or species richness	Moderate diversity, and moderately high species richness	High species diversity, complex plant and animal communities
7	CBA & ESA	No CBA or ESA within project region	ESA found within project region	CBA found in project regions. In this case, both CBA and ESA were found in the project area.
8	Erosion potential <i>Instability of the region</i>	Very stable and an area not subjected to erosion.	Some possibility of erosion or change due to episodic events.	Large possibility of erosion, change to the site or destruction due to climatic or other factors.
9	Rehabilitation <i>Potential of the area or region</i>	Site is easily rehabilitated.	There is some degree of difficulty in rehabilitation of the site.	Site is difficult to rehabilitate due to the terrain, type of habitat or species required to reintroduce.
10	Disturbance <i>Caused by human habitation or other influences (Alien invasives)</i>	Site is very disturbed or degraded.	There is some degree of disturbance of the site.	The site is hardly or very slightly impacted upon by human disturbance.
11	Water bodies	No water bodies found	No water bodies found	Includes all water bodies (e.g. wetlands, perennial rivers, non-perennial rivers, drainage systems etc.)
12	Heritage sites <i>Identified within 50 meters of the development</i>	No sites of heritage importance were found.	No sites of heritage importance were found, but the immediate area should be noted for containing potential heritage sites.	The area contains a site of heritage importance as identified by the Heritage specialist
	Areas of high sensitivity include process areas such as rivers and streams (including a 50m buffer), and wetlands (500m buffer) that are important for ecosystem functioning, including surface and ground water as well as animal and plant dispersal. All Nature Reserves, Protected Areas, Conservancies and Parks are considered as highly sensitive as well as areas with 1 or more endangered species, and areas containing heritage sites as identified by the Heritage specialist (none were found in the desktop assessment). CBA regions are also categorised as high sensitivity.			
	Moderate sensitivity is given to areas that have moderate species richness and are not hugely impacted by current land use and are not degraded. Medium sensitivity areas contain intermediate or rare endemics. Medium sensitivity is also given to areas that, despite being somewhat degraded, still provide a valuable contribution to biodiversity and ecosystem functioning as they are pristine or semi-pristine and have a relatively high species richness, these areas may also contain SSC. Medium sensitivity is given to areas that have the potential to contain heritage sensitive sites, such as unmarked graves. ESA regions are categorised as medium sensitivity.			
	Low sensitivity is given to areas that are highly impacted by current land use and thus highly degraded and provide limited value to the ecosystem and are not likely to harbour any SSC. Low sensitivity is also given to areas that do not contain any sites of heritage importance.			