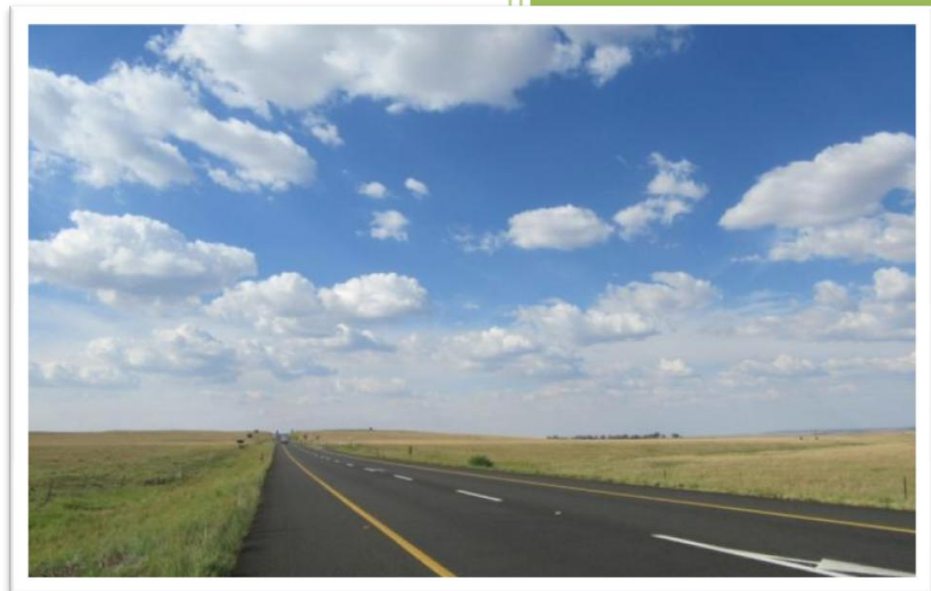


2019

ENVIRONMENTAL MANAGEMENT PLAN



**NATIONAL ROUTE 1
SECTION 16 (N1-16)
BETWEEN WINBURG
STATION (km 89.8) AND
VENTERSBURG (km
133.53)**

ENVIROMATRIX

12/12/2019

PROJECT DETAILS

PROJECT TITLE: ENVIRONMENTAL SUB-SERVICES ON THE UPGRADING OF NATIONAL ROUTE 1 SECTION 16 BETWEEN WINBURG STATION (km 89,8) AND VENTERSBURG (km 133,53)

REFERENCE NO: CONTRACT NRA N001-160-2018/2F-ENV

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TABLE OF CONTENT

1.	INTRODUCTION.....	1
2.	OVERALL PURPOSE OF THE EMP.....	2
3.	SCOPE.....	4
4.	DEFINITIONS.....	5
5.	LEGAL REQUIREMENTS	6
5.1	General.....	6
5.2	Statutory and other applicable legislation.....	6
6.	ADMINISTRATION OF ENVIRONMENTAL OBLIGATION.....	8
6.1	SANRAL.....	8
6.2	The Engineer	8
6.3	The Contractor	9
6.4	The Designated/Dedicated Environmental Officer (DEO).....	9
6.5	Environmental Control Officer (ECO).....	10
6.6	Approval for construction/work to commence	11
7.	TRAINING	12
7.1	Qualifications	12
7.2	Content.....	12
7.3	Induction training.....	13
8.	ACTIVITIES / ASPECTS CAUSING IMPACTS	13
8.1	General approach.....	13
8.2	Spillages.....	14
8.3	Water use and control	15
8.4	Vegetation management	15
8.5	Dust control.....	16
8.6	Noise control	16
8.7	Energy consumption	16
9.	ENVIRONMENTAL MANGEMENT OF CONSTRUCTION ACTIVITIES	16
9.1	Site establishment.....	17
9.1.1	Site Plan.....	17
9.1.2	Vegetation.....	17
9.1.3	Water management.....	18
9.1.4	Heating and cooking fuel	18

9.2	Sewage management.....	18
9.3	Waste management.....	19
9.3.1	Solid waste	19
9.3.2	Litter	19
9.3.3	Hazardous waste	19
9.3.4	Construction and demolition waste.....	19
9.4	Control at the workshop	20
9.4.1	Hazardous Material Storage	20
9.4.2	Fuel and gas storage	20
9.4.3	Oil and lubricant waste	20
9.5	Clearing the site	21
9.6	Drainage	21
9.7	Soil management	21
9.7.1	Topsoil.....	21
9.7.2	Subsoil	22
9.8	Earthworks and layerworks.....	22
9.8.1	Quarries and borrow pits	22
9.8.2	Excavation, hauling and placement	22
9.8.3	Spoil sites	23
9.8.4	Stockpiles	23
9.8.5	Blasting activities.....	24
9.9	On site plants	24
9.9.1	Crusher, screening plants and concrete batching plants.....	24
9.9.2	Asphalt Plant	24
10	AREAS OF SPECIFIC IMPORTANCE.....	24
10.1	Archaeological sites.....	25
10.2	Graves or Middens	25
11	REHABILITATION	25
12	RECORDKEEPING AND REPORTING.....	26
13	COMPLIANCE AND PENALTIES	26
14	PROJECT SPECIFIC CONDITIONS.....	26
15.	LOCALITY AND SENSITIVITY MAPS	36

LIST OF TABLES

Table 1: Aspects and Impacts Associated with Road Construction	13
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LIST OF FIGURES

Figure 1: Project locality	1
Figure 2: N1-16 Road Upgrade – Overall Sensitivity Map.....	36
Figure 3: N1-16 Road Upgrade – Map 1.....	37
Figure 4: N1-16 Road Upgrade – Map 2.....	38
Figure 5: N1-16 Road Upgrade – Map 3.....	39
Figure 6: N1-16 Road Upgrade – Map 4.....	40
Figure 7: N1-16 Road Upgrade – Map 5.....	41
Figure 8: N1-16 Road Upgrade – Map 6.....	42
Figure 9: N1-16 Road Upgrade – Map 7.....	43
Figure 10: N1-16 Road Upgrade – Map 8.....	44
Figure 11: N1-16 Road Upgrade – Map 9.....	45
Figure 12: N1-16 Road Upgrade – Map 10.....	46
Figure 13: N1-16 Road Upgrade – Map 11.....	47
Figure 14: N1-16 Road Upgrade – Map 12.....	48
Figure 15: N1-16 Road Upgrade – Map 13.....	49

LIST OF ABBREVIATIONS

ABBREVIATION	DESCRIPTION
CARA	Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)
COLTO	Committee of Land Transport Officials
DEA	National Department of Environmental Affairs
DEO	Designated/dedicated Environmental Officer
DMR	Department of Mineral Resources
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
FIDIC	Federation Internationale des Ingenieurs-Conseils
LPG	Liquid Petroleum Gas
N1-16	Upgrading project of National Route 1 Section 16 between Winburg Station (km 89.8) and Ventersburg (km 133.53)
NEMA	National Environmental Management Act, 1998 (Act No 107 of 1998)
SAHRA	South African Heritage Resource Agency
SAPS	South African Police Services
SANRAL	South African National Roads Agency SOC Limited

1. INTRODUCTION

EnviroMatrix has been appointed as the Independent Environmental Consultants by the South African National Roads Agency SOC Limited (SANRAL) as part of the Aurecon Engineering Consulting Team, for Environmental Authorisation application processes in terms of the National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA), pertaining to the construction work for the upgrading of National Route 1 Section 16 (N1-16) between Winburg Station (km 89.8) and Ventersburg (km 133.53). The N1-16 road upgrading project is therefore located within the Free State Province, within the Lejweleputswa and Thabo Mofutsanyana District Municipalities, and the Masilonyana Local Municipality, Matjhabeng Local Municipality and Setsoto Local Municipalities.



Figure 1: Project locality

A complete locality and sensitivity map is available in Chapter 15.

The new road will be parallel to the existing road and has an approximate length of 44 km. An access management plan will also be implemented to reduce the number of locations with direct access to the N1-16 through the construction of new service roads approximately 46 Km in length. The construction of four (4) bridges over the Erasmus Spruit, Koolspruit, Sand Rivier and Venterspruit is envisaged as well as seventeen (17) major culverts plus ±160 smaller culverts and storm water pipes are also planned along the road.

The major aspects of the project include the following:

- rehabilitation of the existing road N1-16 carriageway;
- construction of a new carriageway;
- upgrading of the vertical alignment (over approximately 14% of the road section);
- cross-section configuration (per direction) comprising 2 x 3.7m wide lanes, 3.0m wide outside shoulder (of which 2.5m is surfaced), 1.6m wide inside shoulder (of which 1.0m is surfaced) and a 7.4m wide median;
- installation of new median drainage between the existing carriageway and the new carriageway;
- replacement of the majority of the existing minor culverts;
- demolition and replacement of existing major culverts (6 locations);
- widening and/or lengthening of existing major culverts (11 locations);
- construction of 4 new road-over-river bridges adjacent to the existing road-over-river bridges;
- retaining two of the four existing bridges and demolishing and raising the other two remaining bridges;
- widening of existing cuttings (especially the cutting along the "pass" section between km 113.800 and km 114.100); and
- implementation of an access management plan where the number of locations with direct access to the N1-16 is reduced.

A high level schedule, with preliminary dates, as it is currently indicated is given below:

- Start of road construction January 2029
- End of construction December 2034

It is currently envisaged that the entire road section will be in full use by the public by January 2035 with a post construction monitoring period until December 2036.

2. OVERALL PURPOSE OF THE EMP

In accordance to National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) section 24N an Environmental Management Programme (EMPr) must be included in the Environmental Authorisation application and is part of the Authorisation issued and is therefore binding to the project.

An Environmental Management Programme (EMPr) or Environmental Management Plan (EMP) sets out the methods by which proper environmental controls are to be implemented by the contractor

and all parties relevant to the project during all the project phases from the design phase right through to the decommissioning phase. The EMP is a dynamic document subject to changes as required by changes to the project specification, authorisation conditions and site requirements. Any substantial changes shall be submitted to the South African National Roads Agency SOC Limited (SANRAL) in writing for approval

The EMP identifies the following:

- Obligations and responsibilities
- Construction activities that will impact on the environment.
- Mitigation and Management specifications with which the contractor shall comply in order to protect the environment from the identified impacts.
- Training and environmental awareness
- Actions that shall be taken in the event of non-compliance.

This EMP is a compiled from the South African National Roads Agency SOC Limited (SANRAL) approved Environmental Management Plan (EMP)¹ and any site or project specific requirements. The SANRAL EMP (GENERIC EMP_5 JULY 2017.DOC) is fully incorporated into this document in order to have one comprehensive EMP and not two documents dealing with the environmental management plan for the project. The contractor will still be bound by the terms of the SANRAL approved EMP regardless whether some of its terms may have been changed or excluded from this EMP. It is the intent of the SANRAL approved EMP to be the base document for the development of the draft of each EMP that is to accompany each application to the relevant competent authority.

Project specific requirements are provided in Chapter 14 based on the recommendations made by the Specialist Studies conducted to protect the environment specifically such features as streams, rivers etc..

The EMP also adheres to the requirements of Appendix 4 of the Environmental Impact Assessment Regulations (2014) as indicated in the following table.

Appendix 4	Description	EMP
1 (a)	Details of EAP	Pages iii
1 (b)	Detailed description of the aspects of the activity	Chapter 1
1 (c)	Map of proposed activity with environmental sensitivities	Chapter 15
1 (d)	Description of the impact management outcomes that need to be avoided, managed and mitigated	Chapter 8 and 9
1 (f)	Description of proposed impact management actions and how they will be achieved	Chapter 8 and 9
1 (g)	Method of monitoring the implementation of the management actions	Chapters 6, 12 and 14
1 (h)	Frequency of monitoring the implementation of the management actions	Chapters 6, 12 and 14
1 (i)	Indication of persons who will be responsible for the implementation of management actions	Chapters 6, 12 and 14
1 (j)	Time periods within which the management	Chapter 1

¹ http://www.etenders.gov.za/sites/default/files/tenders/02_App%20C_Standard%20EMP.pdf

	actions must be implemented	
1(k)	Mechanism for monitoring compliance	Chapter 12
1 (l)	Program for reporting compliance	Chapter 6, 12 and 13
1 (m)	Environmental awareness plan	Chapter 7
1(n)	Requirements by Competent Authority (DEA)	
	Include all recommendations from BAR and Specialist Studies	Chapter 14
	Environmental Sensitivity Map	Chapter 15
	Measures to protect hydrological features	Chapters 8.2, 8.3, 9.6, and 14

3. SCOPE

SANRAL recognises environmental management as a key component of road infrastructure development and as part of its environmental policy has developed their standard Environmental Management Plan (EMP) as a tool for continual improvement in environmental performance.

This EMP prescribes the methods by which proper environmental controls are to be implemented by the contractor. The duration over which the contractor's controls shall be in place cover the construction period of the project as well as the limited time after contract completion defined by the Conditions of Contract for Construction for Building and Engineering Works Designed by the SANRAL (1999 edition) published by the Federation Internationale des Ingenieurs-Conseils (FIDIC) as the Defects Notification Period (maintenance period).

The provisions of this EMP are binding on the contractor during the life of the contract. They are to be read in conjunction with all the documents that comprise the suite of documents for this contract, particularly the conditions of any environmental authorisation and associated Environmental Management Programme (EMPr). In the event that any conflict occurs between the terms of the EMP and the project specifications or environmental authorisation, the terms herein shall be subordinate.

The EMP is a dynamic document subject to similar influences and changes as are brought by variations to the provisions of the project specification. Any changes to the EMP and/or environmental authorisation cannot occur without being submitted to the SANRAL who will manage the process of amending the EMP.

The EMP identifies the following:

- Relevant parties and their responsibilities;
- Construction activities that will impact on the environment;
- Specifications with which the contractor shall comply in order to protect the environment from the identified impacts; and
- Actions that shall be taken in the event of non-compliance.

This EMP should also be read in conjunction with the Environmental Method Statement and the Environmental Rehabilitation Plan.

4. DEFINITIONS

Alien Vegetation: undesirable plant growth which includes, but is not limited to all declared category 1 and 2 listed invader species as set out in the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA) regulations. Other vegetation deemed to be alien is those plant species that show the potential to occupy in number, any area within the defined construction area and which are declared to be undesirable.

Construction Activity: any action taken by the contractor, his sub-contractors, suppliers or personnel during the construction process as defined in the contract documents and the South African National Roads Agency and National Roads Act, 1998 (Act No. 7, 1998).

Environment: the surroundings within which the contract exists and comprises land, water, atmosphere, micro-organisms, plant and animal life (including humans) in any part or combination thereof as well as any physical, chemical, aesthetic or cultural inter-relationship among and between them.

Environmental Aspect: any component of a contractor's construction activity that is likely to interact with the environment.

Environmental authorisation: a written statement from the National Department of Environmental Affairs, (DEA), with the general and specific conditions and the EMPr recording its approval of an application for a planned undertaking that triggers listed activities in the Environmental Impact Assessment (EIA) regulations of the National Environmental Management Act, 1998 (Act No 107 of 1998) (NEMA).

Environmental Impact: any change to the environment, whether desirable or undesirable, that will result from the effect of a construction activity. An impact may be the direct or indirect consequence of a construction activity.

Environmental Impact Assessment (EIA): a systematic process of identifying, assessing and reporting environmental impacts associated with an activity and includes basic assessment and scoping and environmental impact reporting.

Environmental Management Programme (EMPr): the embodiment of this EMP to ensure that undue or reasonably avoidable adverse impacts of a development are prevented, and to ensure that positive impacts are enhanced. It thus addresses the how, when, who, where and what of integrating environmental mitigation and monitoring measures through identified projects.

Road Reserve: a corridor of land, defined by co-ordinates and/or proclamation, within which the road, including access intersections or interchanges, is situated. A road reserve may, or may not, be bounded by a fence.

Site: the site is defined in the FIDIC Conditions of Contract and in the scope of works. It is bound by the limits of construction as shown in the drawings or the title of the project and extends to also include the following:

- Areas outside the construction zones where accommodation of traffic is placed;

- All borrow pits defined in the applications approved by the relevant Department of Mineral Resources (DMR);
- All haul roads constructed by the contractor for purposes of access;
- Any non-adjacent sites specified in the contract documentation; and
- The contractor's and his subcontractors' camp sites;

For the purposes of this EMP "sites" includes areas outside of, but adjacent to, the road reserve that may be affected by construction activities;

Spoil material: is material unsuitable for construction of the road pavement and for which no other useful purpose can be found in additional works on the project (e.g. for the provision of protection berms). Such material is considered as waste material that requires spoiling at convenient areas to be identified by the engineer and/or contractor within the Site. Spoil material does not require removal to a designated landfill site unless it contains identifiable hazardous contaminants.

5. LEGAL REQUIREMENTS

5.1 General

Construction shall be according to the best industry practices, as identified in the project documents. This EMP, 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 EMP are legally binding in terms of this contract. In the event that any rights and obligations contained in this EMP contradict those specified in the standard or project specifications then the latter shall prevail.

5.2 Statutory and other applicable legislation

The contractor is deemed to have made himself conversant with all legislation pertaining to the environment, including provincial and local government ordinances, which may be applicable to the contract.

Major environmental legislation, as amended from time to time, includes but is not limited to the following:

(i) The Constitution (1996)

The Constitution states that everyone has the right to an environment that is not harmful to their health or well-being, and to have the environment protected through reasonable legislative and other measures to prevent pollution and ecological degradation; promote conservation and ensure ecologically sustainable development and use of natural resources.

(ii) Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983)

This act provides for control over the utilisation of the natural agricultural resources of South Africa in order to promote the conservation of soil, water sources and vegetation, as well as combating weeds and invader plants.

(iii) Mineral and Petroleum Resources Development Act, 2002 (Act No. 28 of 2002)

This act makes provision for equitable access to, and sustainable development of, minerals and petroleum resources.

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

This act supports the Bill of Rights within the Constitution and highlights principles of sustainable development including preservation of ecosystems and biological diversity and avoidance, minimisation and remediation of pollution and environmental degradation. It also sets the stage for the EIA Regulations.

(v) National Environmental Management: Air Quality Act, 2004 (Act No. 39 of 2004)

This act provides reasonable measures for the prevention of pollution and ecological degradation; and provides for specific air quality measures; for national norms and standards regulating air quality monitoring, management and control by all spheres of government.

(vi) National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)

This act makes provisions to accomplish the objectives of the United Nations' Convention on Biological Diversity. SANRAL may be required to apply for permits to conduct certain listed activities which, together with the listed threatened or protected species, may be identified by the Minister.

Section 73 (3) of this act empowers a competent authority to direct a person to take steps to remedy any harm to biodiversity resulting from the actions of that person or as a result of occurrence of listed invasive species occurring on land on which that person is the owner. Thus SANRAL may be directed to remedy harm caused by listed invasive species.

(vii) National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003)

This act provides for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity, natural landscapes and seascapes.

(viii) National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)

This act aims to regulate waste management practices through provision of national norms and standards, specific waste measures, licensing and control of waste activities, remediation of contaminated land as well as providing for compliance and law enforcement.

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

This act makes provision for promoting the sustainable management and development of forests, and for the protection of certain forests and trees for environmental, economic, educational, recreational, cultural, health and spiritual purposes.

(x) National Heritage Resources Act, 1999 (Act No. 25 of 1999)

This act provides for an integrated and interactive system for identification, assessment and management of South Africa's heritage resources, and empowers civil society to nurture and conserve their heritage resources.

(xi) National Water Act, 1998 (Act No. 36 of 1998)

This act makes provision for the protection of surface water and groundwater and their sustainable management for the prevention and remediation of the effects of pollution, as well as for the management of emergency situations.

(xii) The South African National Roads Agency Limited and National Roads Act (Act No. 7 of 1998)

This Act makes provision for a national roads agency for the Republic to manage and control the Republic's national roads system and take charge, amongst others, of the development, maintenance and rehabilitation of national roads within the framework of government policy.

(xiii) Other relevant legislation (where applicable and not limited to)

- Occupational Health and Safety Act, 2003 (Act No. 85 of 2003)
- Free State Nature Conservation Act, 2009, (Act No. 9 of 2009)
- Hazardous Substances Act, 1973, (Act No. 15 of 1973)
- Mine Health and Safety Act, 1996 (Act No. 29 of 1996)
- Explosives Act, 2003 (Act No. 15 of 2003)
- Road Traffic Act, 1996, (Act No. 93 of 1996)

6. ADMINISTRATION OF ENVIRONMENTAL OBLIGATION

Copies of this EMP shall be kept at the site office and must be distributed to all senior contract personnel who shall familiarise themselves with its contents.

Implementation of this EMP requires the involvement of several stakeholders, each fulfilling a different but vital role as outlined herein, to ensure sound environmental management during the construction phase of a project.

6.1 SANRAL

SANRAL and anyone acting on SANRAL's behalf is accountable for the potential environmental impacts of any activities that are undertaken and is responsible for managing these impacts.

SANRAL shall also ensure that this EMP forms an integral part of any contract documents entered into with all consulting engineers and all contractors.

6.2 The Engineer

The engineer has been appointed by, and acts for, SANRAL as its on-site implementing agent and carries the responsibility to ensure that the contractor undertakes its construction activities in such a way that SANRAL's environmental responsibilities are not compromised. It is the Engineers responsibility to ensure that the project is executed in compliance with this EMP, relevant legislation and any authorisation documents from a competent authority. This includes the responsibility to

ensure that all the necessary environmental authorisations and permits have been obtained before the commencement of any activity.

The engineer will, within seven days of receiving a contractor's request for approval of a nominated Designated Environmental Officer (DEO), approve, reject or call for more information on the nomination. The engineer will be responsible for issuing instructions to the DEO where environmental considerations call for action to be taken.

If in the opinion of the engineer the DEO is not fulfilling his/her duties in terms of this EMP, the engineer may, after discussion and agreement with SANRAL, exercise his powers under FIDIC general condition of contract and instruct replacement of the DEO in writing and with stated reasons.

The Engineer shall assist the Contractor and DEO in finding environmentally responsible solutions to problems with input from the ECO where necessary. The Engineer shall also assist the ECO in the compliance audit and monitoring of the project activities.

6.3 The Contractor

The contractor is responsible for project delivery in accordance with the prescribed specifications, among which this EMP shall be included. The contractor should ensure that professional staff is provided to give effect to the environmental management commitments contained in this EMP and any authorisation documents from a competent authority.

The contractor shall receive and implement any instruction issued by the engineer relating to compliance with the EMP including the removal of personnel or equipment.

Compliance with the provisions contained herein or any condition imposed by the environmental approvals shall become the responsibility of the contractor through an approved Designated Environmental Officer (DEO). The contractor shall nominate a person from among his site personnel to fulfil this function and submit to the engineer for his approval the *curriculum vitae* of the proposed DEO. This request for approval shall be given, in writing, at least fourteen days before the commencement of any construction activity clearly setting out reasons for the nomination, and with sufficient detail to enable the engineer to make a decision.

The contractor shall undertake "good housekeeping" practices during construction.

6.4 The Designated/Dedicated Environmental Officer (DEO)

Once a nominated representative of the contractor has been approved he/she shall become the DEO and shall be the responsible person for ensuring that the provisions of this EMP are complied with during the life of the contract. The DEO shall submit regular written reports to the engineer, but not less frequently than once a month.

Before the contractor begins each construction activity the DEO shall give to the engineer a written statement setting out the following:

- The type of construction activity.
- Locality where the activity will take place.
- Identification of the environmental aspects and impacts that might result from the activity.

- Methodology for impact prevention for each activity or aspect.
- Methodology for impact containment for each activity or aspect.
- Emergency/disaster incident and reaction procedures.
- Treatment and continued maintenance of impacted environment.

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

The DEO may undertake other construction duties unless the Appendix to Tender prescribes this position as 'dedicated' as opposed to the standard position being 'designated'. However, the DEO's environmental duties shall hold primacy over other contractual duties and the engineer has the authority to instruct the contractor to reduce the DEO's other duties or to replace the DEO if, in the engineer's opinion, he/she is not fulfilling his/her duties in terms of the requirements of this EMP. Such instruction will be in writing clearly setting out the reasons why a replacement is required.

As a minimum the DEO shall have an accredited diploma qualification in environmental or natural sciences or equivalent. Alternatively, the DEO shall have a minimum of 2 years' experience in a similar role in construction or other environmental regulatory field.

In addition to the compliance duties relating to EMP the DEO shall also provide full cooperation whenever the contractor is subjected to regular environmental audits.

The duties of the DEO will include (not limited to):

- Daily site inspections and reporting
- Supervision of work where environmental management is a key aspect (e.g. in sensitive areas, areas or activities with high environmental risk etc.)
- The education of all personnel, tenants, contractors and visitors with regards to the environmental requirements for the project.
- Monitor and conduct internal EMP compliance inspections on a regular basis and report to the Engineer and Contractor
- Keeping of incidents and accidents records, photographic records, register of compliance and non-compliance and register of community comments, complaints or issues.
- Ensure that the following documentation is available at the site-office:
 - Copy of the Environmental Basic Assessment Report
 - Copy of this Environmental Management Plan (EMP)
 - Copy of all environmental authorisations applicable
 - Copy of the approved Work Method Statement
 - Copy of the Integrated Water Use License Report

6.5 Environmental Control Officer (ECO)

The Environmental Control Officer (ECO) is an independent environmental specialist appointed by the Engineer to objectively and regularly monitor the contractor's compliance with the conditions of the authorisations issued for the project and the approved EMP (that is this EMP augmented with specifics of the project). These are external audits and the regularity is determined by the environmental authorisations.

6.6 Approval for construction/work to commence

Method statements from the Contractor will be required for specific sensitive actions on request of the authorities, Engineer or ECO. A specific environmental method statement forms the base line information on which environmentally sensitive area work takes place and is thus considered a “live document” in that modifications can be negotiated between the Contractor and DEO/ECO if or as required.

All method statements will form part of the EMP documentation and are subject to all terms and conditions contained within the EMP main document. A method statement describes the scope of the intended work in a step-by-step description in order for the DEO/ECO or Site Manager to understand the Contractor’s intentions. This will enable them to assist in devising any mitigation measures, which would minimise environmental impact during these tasks. The method statement should also clearly stipulate mitigation methods of the intended works, against which the contractor’s performance will be measured. For each instance wherein it is requested that the Contractor submit a method statement to the satisfaction of the ECO, the format should clearly indicate the following:-

- **What** - a concise, description of the task/work to be undertaken;
- **How** - a detailed description of the process of work, methods, materials and mitigation strategies;
- **Where** - a description/sketch map of the locality of work (if applicable); and
- **When** - the sequencing of actions with due commencement dates and completion date estimates.

The Contractor must submit the method statement two weeks before any particular construction activity is due to start, especially with respect to impacts on sensitive ecosystems. Work may not commence until the method statement has been accepted by the ECO and clearly communicated to the workforce by the DEO. All records related to the Method Statement should be kept on file by the DEO.

METHOD STATEMENTS SHALL BE PREPARED BY THE CONTRACTOR AT THE REQUEST OF THE ENGINEER FOR MOST TASKS THAT RELATE TO THE CONSTRUCTION OF THE ROAD. THE METHOD STATEMENTS SHALL BE APPROVED BY THE ENGINEER BEFORE ANY WORK ON THAT TASK IS COMMENCED. THE ECO WILL MONITOR AND AUDIT THE PROGRESS OF THE PROJECT AGAINST THE METHOD STATEMENTS FOR COMPLIANCE.

An approved Method Statement shall not absolve the Contractor from any of his obligations or responsibilities in terms of the contract. However, any damage caused to the environment through activities undertaken without an approved Method Statement shall be rehabilitated at the Contractor’s expense. The Method Statements shall cover relevant details with regard to:

- Construction procedures and location of the construction site.
- Start date and duration of the procedure.
- Materials, equipment and labour to be used.
- How materials, equipment and labour would be moved to and from the site as well as on site during construction.

- Storage, removal and subsequent handling of all materials, excess materials and waste materials of the procedure.
- Emergency procedures in case of any reasonably potential accident/incident which would occur during the procedure.
- Compliance/non-compliance with the EMP specification and motivation if non-compliant.

Based on the project definition and the EMP, the following Method Statements are required (but not limited to):

1. Site clearing
2. Site layout and establishment
3. Hazardous substances
4. Cement and concrete batching (for each operation)
5. Traffic accommodation
6. Solid waste control system
7. Wastewater control system
8. Erosion remediation and stabilisation
9. Bridge demolition and construction (for each operation)
10. Culvert demolition and construction over non-perennial streams
11. Permanent or construction access over wetlands
12. Fire control and emergency procedures
13. Alien vegetation clearing programme
14. Vegetation rehabilitation plan

7. TRAINING AND AWARENESS PLAN

7.1 Qualifications

The (DEO) shall have the minimum qualifications as prescribed above, and must be conversant with all legislation pertaining to the environment applicable to the contract. He/she must be appropriately trained in environmental management and possess the skills necessary to impart environmental management skills to all personnel involved in the contract.

The contractor shall ensure that adequate environmental training takes place. All employees (compulsory) shall have been given an induction presentation on environmental awareness. Where possible, the presentation needs to be conducted in the language of the employees.

7.2 Content

Including induction environmental training, all environmental training should, as a minimum, include the course content below and no induction or course should be given until the engineer has been afforded the opportunity to appraise it and provide comment.

- i. The importance of conformance with all environmental policies and the consequences of departure from standard operating procedures;
- ii. Environmental impacts, actual or potential, caused by work activities, prevention measures to avoid them and mitigation measures when they occur;

- iii. Work force roles and responsibilities in achieving conformance with the environmental policy and procedures, including emergency preparedness and response requirements; and
- iv. The environmental benefits of improved personnel performance.

7.3 Induction training

The contractor shall ensure that adequate environmental training takes place. Proof of all environmental training provided with attendance registers must be kept by the DEO. All employees and contractors (compulsory) shall have been given an induction presentation on environmental awareness before any construction activity commences. In the case of permanent staff the contractor shall provide evidence that such induction courses have been presented. In the case of new staff (including contract labour) the contractor shall inform the engineer when and how he intends concluding his environmental training obligations.

8. ACTIVITIES / ASPECTS CAUSING IMPACTS

Typical environmental aspects and impacts associated with road construction are listed in Table 1: Aspects and Impacts Associated with Road Construction. Actual impacts will differ from project to project and, therefore, so may the mitigation measures employed. The commonest aspects and impacts are addressed separately and typical avoidance and/or mitigation measures described. The list and descriptions are not by any means exhaustive and they shall be used for guideline purposes only.

Table 1: Aspects and Impacts Associated with Road Construction

Water use and stormwater discharge	Change in flow regime and/or reduction in downstream availability; soil erosion; water pollution
Vehicle use and maintenance	Air pollution; noise
Chemical/fuel storage	Water/air/soil pollution; health impacts; accidents e.g. slips, fire
Site clearing; earthworks; layer-works; seal works	Change in landform; impact on heritage resources; noise; soil erosion; air pollution
River bridges; installing drainage structures	Water pollution; impact on river flows; noise
Land acquisition	Loss of land &/or livelihood; change in land use;
Acquisition of building material from borrow pits	Change in landform and use

The contractor shall identify likely aspects before commencing with any construction activity. The list of the impacts and mitigation measures identified in the Basic Assessment Report for the project are provided in Chapter 14 of this report.

8.1 General approach

The role of the DEO cannot be underestimated and once approved he/she shall be on the site at all times, and before the contractor begins each construction activity he/she shall give to the engineer a written statement setting out the following:

- i. The type of construction activity about to be started.
- ii. Locality where the activity will take place.
- iii. Identification of the environmental aspects and impacts that might result from the activity.
- iv. The methodology of impact prevention for each activity or aspect.
- v. The methodology of impact containment for each activity or aspect.
- vi. Identification of the emergency/disaster potential for each activity (if any) and the reaction procedures necessary to mitigate impact severity.
- vii. Treatment and continued maintenance of impacted environment.

The contractor shall programme his work in such a way that each cause and effect of a construction activity is also identified and the activity planned so as to prevent any impact from happening. If prevention is not practicable, or in the event of mishap or misapplication, the contractor shall provide plans and measures for the engineer's approval, which will limit and contain the magnitude, duration and intensity of the impact. The contractor shall also demonstrate that he is capable of carrying out any repair and reinstatement of the damaged environment. These requirements shall be concurrent with the time constraints to produce method statements for each construction activity in compliance with the provisions of these project specifications.

The contractor shall provide such information in advance of any or all construction activities provided that new submissions shall be given to the engineer whenever there is a change or variation to the original. General good construction practice will play an important role in avoiding the occurrence of an Impact.

The Engineer may provide comment on the methodology and procedures proposed by the DEO, 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.

8.2 Spillages

Streams, rivers and dams shall be protected from direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels, oils, aggregate, tailings, wash water, organic materials and bituminous products. In the event of a spillage, the contractor shall be liable to arrange for professional service providers to clear the affected area.

Responsibility for spill containment and treatment (whether hazardous or not) lies with the contractor. The individual causing a spill, or who discovers a spill, must report the incident to his/her DEO or to the engineer. The DEO will assess the situation in consultation with the engineer and act as required. In all cases, the immediate response shall be to contain the spill. The exact treatment of polluted soil / water shall be determined by the contractor in consultation with the DEO and the engineer. Areas cleared of hazardous waste shall be re-vegetated according to the engineer's instructions.

Should water downstream of the spill be polluted, and fauna and flora show signs of deterioration or death, specialist hydrological or ecological advice will be sought for appropriate treatment and remedial procedures to be followed. The requirement for such input shall be agreed with the

engineer. The costs of containment and rehabilitation shall be for the contractor's account, including the costs of specialist input as well as the sampling and testing of the water quality upstream and downstream of the spill. Water quality sampling and testing, and further treatment shall continue until upstream and downstream results correspond with each other.

8.3 Water use and control

The contractor's use of water shall take into consideration that it is a scarce commodity, and shall be optimised. Authorisation shall be obtained from the Department of Water and Sanitation (DWS) before water is drawn from streams or new boreholes developed.

The contractor shall also ensure that any stream deviations or diversions are undertaken in such a manner that the impact on the environment is minimised. Method statements shall be submitted to the engineer for comment, detailing how the work will be undertaken, what risks are foreseen and what measures will be employed to minimise such risks. Notwithstanding any comments by the engineer, work on stream deviations or diversions shall be undertaken in accordance with the General Authorisation.

The quality, quantity and flow direction of any surface water runoff shall be established prior to disturbing any area for construction purposes. Cognisance shall be taken of these aspects and incorporated into the planning of all construction activities. Before a site is developed or expanded, it shall be established how this development or expansion will affect the drainage pattern. Recognised water users / receivers shall not be adversely affected by the expansion or re-development. No water source shall be polluted in any way due to proposed changes.

Streams, rivers, pans, wetlands, dams, and their catchments shall be protected from erosion and flooding by dredging, daylighting, removal of debris and vegetation, etc. These shall also be protected from direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels, oils, aggregate, tailings, wash water, organic materials and bituminous products..

The contractor shall submit to the engineer his proposals for prevention, containment and rehabilitation measures against environmental damage of the identified water and drainage systems that occur on the site. Consideration shall be given to the placement of sedimentation ponds or barriers where the soils are of a dispersive nature or where toxic fluids are used in the construction process. The sedimentation ponds must be large enough to contain runoff so that they function properly under heavy rain conditions up to 1:5 year severity.

The contractor shall submit to the engineer the results of the baseline water quality test taken above and below the site of the proposed activity; and thereafter monthly testing results or at the frequency as may be specified by the Water Use Licence / General Authorisation where applicable.

No taking-over can be authorised until the water quality is shown to be at pre-construction levels or better.

8.4 Vegetation management

The contractor shall be responsible for the management of vegetation by protection of indigenous vegetation, especially identified protected species, and the prevention of alien vegetation

germinating in areas disturbed by road construction activities within and outside the road reserve. This includes, for example, service roads, stockpile areas, stop/go facilities, windrows and wherever material generated for or from road construction has been stored temporarily. This responsibility shall continue for the duration of the defects notification period. The project specification may instruct the removal of CARA and/or NEM:BA listed category 1 and 2 alien species and planting of specified indigenous species.

8.5 Dust control

Dust caused by construction activities shall be controlled by means such as water spray vehicles and applied at sufficient frequency so as not to cause nuisance to adjacent habitation or affect farming activities or natural vegetation. Vegetation cover should also be kept for as long as possible to reduce the area of exposed surfaces. Dust emissions from batching and screening plants shall be subject to the relevant legislation and shall be the subject of inspection by the relevant authorities.

8.6 Noise control

The contractor shall endeavour to keep noise generating activities to a minimum. Noises that could cause a major disturbance, for instance blasting and crushing activities, should only be carried out during the hours prescribed by the conditions of contract (i.e. normal working hours).

Should such noise generating activities have to occur at any time outside normal hours the people in the vicinity of the noise-generating activity shall be warned about the noise well in advance and the activities kept to a minimum. Relevant legislation shall also be taken into consideration, and any practical mitigation measures adopted. No noise generating activity outside of normal hours, regardless of its proximity to residences, can take place without application to the engineer for approval. The application shall be accompanied by the noise containment measures proposed.

8.7 Energy consumption

The contractor shall take into consideration the impacts of high energy consumption, both from a cost and emissions point of view. Energy use shall be minimised, and where possible, alternative energy sources such as solar utilised.

Furthermore, the contractor shall undertake a study of the consumption of carbon units his chosen method of construction produces in the execution of his programme. In conjunction with the engineer who will provide complete cooperation in this study, a month by month output shall be compiled and efforts made to see how these outputs can be curtailed and reduced.

9. ENVIRONMENTAL MANGEMENT OF CONSTRUCTION ACTIVITIES

The contractor shall undertake “good housekeeping” practices during construction as stated in the COLTO Standard Specifications for Roads and Bridges and the FIDIC conditions of contract. This will help avoid disputes on responsibility and allow for the smooth running of the contract as a whole. It is the responsibility of the contractor to be fully knowledgeable and compliant to this EMP, COLTO and FIDIC requirements. Good housekeeping extends beyond the wise practice of construction methods that leaves production in a safe state from the ravages of weather to include the care for and preservation of the environment within which the site is situated.

The construction activities addressed below shall become part of the contractor's obligations regarding his programme of work and incorporated into the required method statements for workmanship and quality control.

9.1 Site establishment

9.1.1 Site Plan

The site refers to an area with defined limits on which the project is located. The contractor shall establish his construction camps, offices, workshops, staff accommodation and testing facilities on the site in a manner that does not adversely affect the environment. However, before any site establishment can begin, the contractor shall submit to the ECO for his/her comments and to the engineer for his approval, plans of the exact location, extent and construction details of these facilities and the impact mitigation measures the contractor proposes to put in place.

The plans shall detail the locality as well as the layout of the waste management facilities for litter, kitchen refuse, sewage and workshop-derived effluents. The site offices should not be sited in close proximity to steep areas, as this will increase soil erosion. Preferred locations would be flat areas along the route. If the route traverses water courses, streams and rivers, it is recommended that the offices, and in particular the ablution facilities, aggregate stockpiles, spoil areas and hazardous material stockpiles are located as far away as possible from any water course. No camp establishment, including satellite camps, can be placed within 150 metres of an identified wetland unless the contractor has applied to DWS and received authorisation to do so. Regardless of the chosen site, the contractor's intended mitigation measures shall be indicated on the plan. The site plan shall have been submitted and approved before establishment commences. Detailed, electronic colour photographs shall be taken of the proposed site before any clearing may commence. These records are to be kept by the ECO and the engineer for consultation during rehabilitation of the site in order that rehabilitation is, as a minimum, done to a standard similar to pre-construction activities.

9.1.2 Vegetation

The contractor has a responsibility to inform his staff of the need to be vigilant against any practice that will have a harmful effect on vegetation.

The natural vegetation encountered on the site is to be conserved and left as intact as possible. Vegetation planted at the site shall be indigenous and in accordance with instructions issued by the engineer. Only trees and shrubs directly affected by the works, and such others as may be indicated by the engineer in writing, may be felled or cleared. In wooded areas where natural vegetation has been cleared out of necessity, the same species of indigenous trees as were occurring shall be re-established. Protected trees may not be removed without a permit from the Department of Agriculture, Forestry and Fisheries.

Contravention of a notice of listed protected tree species under the National Forests Act, 1998 is regarded as a first category offence that may result in a fine or imprisonment for a period up to three years, or to both a fine and imprisonment. The DEO must be conversant with the latest gazette of declared protected trees.

Rehabilitation shall be undertaken using only indigenous tree, shrub and grass species. Special attention shall be given to any search and rescue operation identified during the environmental assessment process, and any removal to an on-site nursery for continuous nurturing and protection and later replanting.

Any proclaimed weed or alien species that propagates during the contract period shall be cleared by hand before seeding.

Fires shall only be allowed in facilities or equipment specially constructed for this purpose. The need for a firebreak shall be determined in consultation with the Engineer and the relevant authorities, and if required a firebreak shall be cleared and maintained around the perimeter of the camp and office sites.

9.1.3 Water management

Water for human consumption shall be available at the site offices and at other convenient locations on site.

All effluent water from the camp / office sites shall be disposed of in a properly designed and constructed system, situated so as not to adversely affect water sources (streams, rivers, pans, dams etc). Only domestic type wastewater shall be allowed to enter this system.

9.1.4 Heating and cooking fuel

The contractor shall provide adequate facilities for his staff so that they are not encouraged to supplement their comforts on site by accessing what can be taken from the natural surroundings. The contractor shall ensure that energy sources are available at all times for construction and supervision personnel for heating and cooking purposes.

9.2 Sewage management

Particular reference in the site establishment plan shall be given to the treatment of sewage generated at the site offices, site laboratory and staff accommodation and at all localities on the site where there will be a concentration of labour. Sanitary arrangements should be to the satisfaction of the engineer, the local authorities and legal requirements.

Safe and effective sewage treatment will require one of the following sewage handling methods: septic tanks and soak-aways, dry-composting toilets such as “enviro loos”, or the use of chemical toilets which are supplied and maintained by a specialist service provider.

The type of sewage management will depend on the geology of the area selected, the duration of the contract and proximity (availability) of providers of chemical toilets. Should a soak-away system be used, it shall not be closer than 800 metres from any natural water course or water retention system. The waste material generated from these facilities shall be serviced on a regular basis. The positioning of the chemical toilets shall be done in consultation with the engineer.

Toilets and latrines shall be easily accessible and shall be positioned within walking distance from wherever employees are employed on the works. Use of the veld for this purpose shall not, under any circumstances, be allowed.

Outside toilets shall be provided with locks and doors and shall be secured to prevent them from blowing over. The toilets shall also be placed outside areas susceptible to flooding. The contractor shall arrange for regular emptying of toilets and shall be entirely responsible for enforcing their use and for maintaining such latrines in a clean, orderly and sanitary condition to the satisfaction of the Engineer.

9.3 Waste management

The contractor's intended methods for waste management shall be outlined and implemented at the outset of the contract, and shall be to the satisfaction of the engineer.

Opportunities for avoiding, reducing, reusing and recycling of materials should be identified upfront, as should constraints for their implementation. All personnel shall be instructed to dispose of all waste in the proper manner.

9.3.1 Solid waste

Solid waste shall be stored in an appointed area in covered, tip-proof metal drums or similar container for collection and disposal. A refuse control system shall be established for the collection and removal of refuse to the satisfaction of the engineer. Disposal of solid waste shall be at a licensed landfill site or at a site approved by the relevant authority in the event that an existing operating landfill site is not within reasonable distance from the project area.

No waste shall be burned or buried at or near the project area.

9.3.2 Litter

No littering by construction workers shall be allowed and particular emphasis on litter control measures shall apply at stop/go facilities.

During the construction period, the various contractor's facilities shall be maintained in a neat and tidy condition and the site shall be kept free of litter. At all places of work the contractor shall provide litter collection facilities for later safe disposal at approved sites.

9.3.3 Hazardous waste

Hazardous waste such as bitumen, tar, oils etc. shall be disposed of at a DEA approved landfill site. Special care shall be taken to avoid spillage of bitumen products such as binders or pre-coating fluid to avoid water-soluble phenols from entering the ground or contaminating surface water.

Under no circumstances shall the spoiling of bituminous products on the site, over embankments, in borrow pits or any burying, be allowed. Unused or rejected bituminous products shall be returned to the supplier's production plant. Any spillage of bituminous products shall be attended to immediately and affected areas shall be promptly reinstated to the satisfaction of the engineer.

9.3.4 Construction and demolition waste

The opportunity for recycling and reuse of construction and demolition waste as fill for road embankments, land reclamation and drainage control must first be explored and take priority before the option of declaring these materials a 'waste'.

The contractor is encouraged to actively engage with authorities and landowners adjacent to the site and identify where such 'waste' materials can be usefully deployed to repair existing environmentally damaged areas such as erosion dongas.

9.4 Control at the workshop

The contractor's management and maintenance of his plant and machinery will be monitored according to the criteria given below, regardless whether it is serviced on the site (i.e. at the place of construction activity or at a formalised workshop).

9.4.1 Hazardous Material Storage

Petrochemicals, oils and identified hazardous substances shall only be stored under controlled conditions. All hazardous materials such as bitumen binders shall be stored in a secured, appointed area that is suitably fenced, bunded and has restricted entry. Storage of bituminous products shall only take place using suitable containers to the approval of the ECO and the engineer.

The contractor shall provide proof to the engineer that relevant authorisation to store such substances has been obtained from the relevant authority. In addition, hazard signs indicating the nature of the stored materials shall be displayed on the storage facility or containment structure. Before containment or storage facilities can be erected the contractor shall furnish the engineer with details of the preventative measures he proposes to install in order to mitigate pollution of the surrounding environment from leaks or spillage. The preferred method shall be a concrete floor that is bunded. Any deviation from the method will require proof from the relevant authority that the alternative method proposed is acceptable to that authority. The proposals shall also indicate the emergency procedures in the event of misuse or spillage that will negatively affect an individual or the environment.

9.4.2 Fuel and gas storage

The contractor shall take cognisance of the limits set by legislation for the storage of fuels and acquire the necessary authorisation for storage capacity beyond these. An adequate bund wall, 110% of volume, shall be provided for fuel and diesel areas to accommodate any leakage spillage or overflow of these substances. The area inside the bund wall shall be lined with an impervious lining to prevent infiltration of the fuel into the soil. Any leakage, spillage or overflow of fuel shall be attended to without delay.

Gas welding cylinders and LPG cylinders shall be stored chained in a secure, well ventilated area exterior to any building wall.

9.4.3 Oil and lubricant waste

Used oil, lubricants and cleaning materials from the maintenance of vehicles and machinery shall be collected in a holding tank and sent back to the supplier. Water and oil should be separated in an oil trap. Oils collected in this manner, shall be retained in a safe holding tank and removed from site by a specialist oil recycling company for disposal at approved waste disposal sites for toxic/hazardous materials. Oil collected by a mobile servicing unit shall be stored in the service unit's sludge tank and discharged into the safe holding tank for collection by the specialist oil recycling company.

All used filter materials shall be stored in a secure bin for disposal off site. Any contaminated soil shall be removed and replaced. Soils contaminated by oils and lubricants shall be collected and disposed of at a facility designated by the local authority to accept contaminated materials.

9.5 Clearing the site

In all areas where the Contractor intends to, or is required to clear the natural vegetation and soil, either within the road reserve, or at designated or instructed areas outside the road reserve, a plan of action shall first be submitted to the Engineer for his approval. Working areas shall be clearly defined and demarcated on site to minimise the construction footprint. 'No-go- areas' and other sensitive areas shall also be clearly demarcated on site, and staff must be made aware of them.

The plan of action shall contain a photographic record and chainage/land reference of the areas to be disturbed. This shall be submitted to the engineer for his records before any disturbance/stockpiling may occur. The record shall be comprehensive and clear, allowing for easy identification during inspections.

9.6 Drainage

The quality, quantity and flow direction of any surface water runoff shall be established prior to disturbing any area for construction purposes. Cognisance shall be taken of these aspects and incorporated into the planning of all construction activities. Before a site is developed or expanded, it shall be established how this development or expansion will affect the drainage pattern. Recognised water users / receivers shall not be adversely affected by the expansion or re-development. No water source shall be polluted in any way due to proposed changes.

Streams, rivers, pans, wetlands, dams, and their catchments shall be protected from erosion and from direct or indirect spillage of pollutants such as refuse, garbage, cement, concrete, sewage, chemicals, fuels, oils, aggregate, tailings, wash water, organic materials and bituminous or tar products.

The contractor shall submit to the engineer his proposals for prevention, containment and rehabilitation measures against environmental damage of the identified water and drainage systems that occur on the site. Consideration shall be given to the placement of sedimentation ponds or barriers where the soils are of a dispersive nature or where toxic fluids are used in the construction process. The sedimentation ponds must be large enough to contain runoff so that they function properly under heavy rain conditions.

9.7 Soil management

9.7.1 Topsoil

Topsoil shall be removed from all areas where physical disturbance of the surface will occur and shall be stored and adequately protected. The contract will provide for the stripping and stockpiling of topsoil from the site for later re-use. Topsoil is considered to be the natural soil covering, including all the vegetation and organic matter. Depth may vary at each site. The areas to be cleared of topsoil shall include all storage areas. All topsoil stockpiles and windrows shall be maintained throughout the contract period in a weed-free condition. Weeds appearing on the stockpiled or windrowed topsoil shall be removed by hand. Soils contaminated by hazardous substances shall be disposed of at an approved waste disposal site. The topsoil stockpiles shall be stored, shaped and sited in such a

way that they do not interfere with the flow of water to cause damming or erosion, or itself be eroded by the action of water. Stockpiles shall be protected against infestation by weeds.

The Contractor shall ensure that no topsoil is lost due to erosion – either by wind or water. Areas to be top-soiled and grassed shall be done so systematically to allow for quick cover and reduction in the chance of heavy topsoil losses due to unusual weather patterns. The Contractor's programme shall clearly show the proposed rate of progress of the application of topsoil and grassing. The Contractor shall be held responsible for the replacement, at his own cost, for any unnecessary loss of topsoil due to his failure to work according to the progress plan approved by the Engineer. The Contractor's responsibility shall also extend to the clearing of drainage or water systems within and beyond the boundaries of the road reserve that may have been affected by such negligence.

9.7.2 Subsoil

The subsoil is the layer of soil immediately beneath the topsoil. It shall be removed, to a depth instructed by the engineer, and if not used for road building it shall be stored and maintained separately from the topsoil so that neither stockpile is contaminated by the other. This soil shall be used for rehabilitation purposes by first spreading it over the excavated slopes without interfering with or contaminating the stockpiled topsoil. Whilst in stockpile it shall be maintained free from erosion and weed infestation in the same way as for topsoil stockpile maintenance.

9.8 Earthworks and layerworks

This section includes all construction activities that involve the mining of all materials, and their subsequent placement, stockpile, spoil, treatment or batching, for use in the permanent works, or temporary works in the case of deviations. Before any stripping prior to the commencement of construction, the Contractor shall have complied with the requirements of this EMP. In addition, the Contractor shall take cognisance of the requirements set out below.

9.8.1 Quarries and borrow pits

The Contractor's attention is drawn to the requirement of the Department of Mineral Resources, that before entry into any quarry or borrow pit, an Environmental Authorisation for the establishment, operation and closure of the quarry or borrow pit shall have been approved by the Department. It is the responsibility of the Contractor to ensure that he is in possession of the authorisation prior to entry into the quarry or borrow pit. The conditions imposed by the relevant authorisation are legally binding on the Contractor and may be more extensive and explicit than the requirements of this specification. In the event of any conflict occurring between the requirements of the specific authorisation and this EMP the former shall apply.

9.8.2 Excavation, hauling and placement

The Contractor shall provide the ECO and the Engineer with detailed plans of his intended construction processes prior to starting any cut or fill or layer. The plans shall detail measures by which the impacts of pollution (noise, dust, litter, fuel, oil and sewage), erosion, vegetation destruction and deformation of landscape will be prevented, contained and rehabilitated. Particular attention shall also be given to the impact that such activities will have on the adjacent built environment. The Contractor shall demonstrate his "good housekeeping", particularly with respect to closure at the end of every day so that the site is left in a safe condition.

9.8.3 Spoil sites

The Contractor shall be responsible for the safe siting, operation, maintenance and closure of any spoil site he uses during the contract period, including the defects notification period. This shall include existing spoil sites that are being re-entered. Before spoil sites may be used proposals for their locality, intended method of operation, maintenance and rehabilitation shall be given to the ECO for his/her comments and to the Engineer for his approval. The location of these spoil sites shall have signed approval from the affected landowner before submission to the ECO and the Engineer. No spoil site shall be located within 500m of any watercourse. A photographic record shall be kept of all spoil sites for monitoring purposes. This includes before the site is used and after re-vegetation.

The use of approved spoil sites for the disposal of any waste shall be prohibited.

Spoil sites will be shaped to fit the natural topography. Depending on availability, these sites shall receive a minimum of 75mm topsoil and be grassed with the recommended seed mixture. Appropriate grassing measures to minimise soil erosion shall be undertaken by the Contractor. This may include both strip and full sodding. The Contractor may motivate to the Engineer for other acceptable stabilising methods. The engineer may only approve a completed spoil site at the end of the defects notification period upon receipt from the Contractor of a landowner's clearance notice. .

9.8.4 Stockpiles

The contractor shall plan his activities so that materials excavated from borrow pits and cuttings, in so far as possible, can be transported direct to and placed at the point where it is to be used. However, should temporary stockpiling become necessary, the areas for the stockpiling of excavated and imported material shall be indicated and demarcated on the site plan submitted in writing to the Engineer for his approval. The contractor's proposed measures for prevention of environmental damage, containment and subsequent rehabilitation, shall also be submitted.

The areas chosen shall have no naturally occurring indigenous trees and shrubs present that may be damaged during operations. Care shall be taken to preserve all vegetation in the immediate area of these temporary stockpiles. During the life of the stockpiles the Contractor shall at all times ensure that they are positioned and sloped to create the least visual impact, constructed and maintained so as to avoid erosion of the material and contamination of surrounding environment and kept free from all alien/undesirable vegetation.

After the stockpiled material has been removed, the site shall be re-instated to its original condition. No foreign material generated / deposited during construction shall remain on site. Areas affected by stockpiling shall be landscaped, top soiled, grassed and maintained at the Contractor's cost until clearance from the Engineer and land owner is received.

Material milled from the existing road surface that is temporarily stockpiled in areas approved by the Engineer within the road reserve, shall be subject to the same condition as other stockpiled materials. Excess materials from windrows, in situ milling or any leftover material from road construction activities may not be swept off the road and left unless specifically instructed to do so in the contract documentation or under instruction from the Engineer.

The ECO shall comment on and the engineer shall approve the areas for stockpiling and disposal of construction rubble before any operation commences and shall approve their closure only when they have been satisfactorily rehabilitated.

9.8.5 Blasting activities

Wherever blasting activity is required on the site (including quarries and/or borrow pits) the Contractor shall rigorously adhere to the relevant statutes and regulations that control the use of explosives.

9.9 On site plants

9.9.1 Crusher, screening plants and concrete batching plants

Crushing plants and concrete batching plants, whether sited inside or outside of defined quarry or borrow pit areas, shall be subject to the requirements of the applicable industrial legislation that governs gas and dust emissions into the atmosphere. Such sites will be the subject of regular inspections by the relevant authorities during the life of the project. In addition, the selection, entry onto, operation, maintenance, closure and rehabilitation of such sites shall be the same as for those under section 9.8.1 "Quarries and borrow pits" of this EMP, with the exception that the Contractor shall provide additional measures to prevent, contain and rehabilitate against environmental damage from toxic/hazardous substances. In this regard the Contractor shall provide plans that take into account such additional measures as concrete floors, bunded storage facilities, linings to drainage channels and settlement dams. Ultimate approval of these measures shall be from the relevant authority, as shall approval of closure. The Engineer will assist the Contractor in his applications to the relevant authority.

Screening activities shall be undertaken so that dust and noise is minimised. This can be done by carefully choosing the site for the activity, and by using slightly damp material.

Effluent from concrete batch plants and crusher plants shall be reused where possible or treated in a suitable designated sedimentation dam to the legally required standards to prevent surface and groundwater pollution. The designs of such a facility should be submitted to the engineer for approval.

9.9.2 Asphalt Plant

Asphalt plants shall be subject to the applicable legislation that governs establishment and operation of batching plants. The Contractor shall be responsible to obtain the necessary permit from the relevant authority.

Operation of the plant shall conform to the same requirements as for a crushing plant or concrete batching plant under section 9.9.1 Crusher, screening plants and concrete batching plants above.

10 AREAS OF SPECIFIC IMPORTANCE

Any area, as determined and identified within the project documents as sensitive or of special interest within the site shall be treated according to the express instructions contained in these specifications or the specific environmental authorisation as well as the approved EMP. The Contractor may offer alternative solutions to the Engineer in writing should he consider that

construction will be affected in any way by the hindrance of the designated sensitive area or feature. However, the overriding principle is that such defined areas requiring protection should not be changed. Every effort to identify such areas within the site will have been made prior to the project going out to tender. The discovery of other sites with archaeological or historical interest that have not been identified shall receive ad hoc treatment.

10.1 Archaeological sites

If an artefact on site is uncovered, work in the immediate vicinity shall be stopped immediately. The Contractor shall take reasonable precautions to prevent any person from removing or damaging any such article and shall immediately upon discovery thereof inform the engineer of such discovery. The South African Heritage Resource Agency (SAHRA) is to be contacted, and a SAHRA-registered archaeological consultant may undertake the necessary work involved in confirming the find and advising on how it should be preserved or removed. Work may only resume once clearance is given in writing by the archaeologist. (Read with FIDIC condition of contract clause 4.24 as).

10.2 Graves or Middens

If a grave or midden is uncovered on site, or, then all work in the immediate vicinity of the graves/middens shall be stopped and the engineer informed of the discovery. The South African Heritage Resource Agency and the South African Police Services (SAPS) should be contacted and in the case of graves, arrangements made for an undertaker to carry out exhumation and reburial. The undertaker will, together with SAHRA, be responsible for attempts to contact family of the deceased and for the place where the exhumed remains can be re-interred.

11 REHABILITATION

The Contractor shall be responsible for the re-establishment of grass within the road reserve boundaries for all areas disturbed during construction. This includes, for example, service roads, stockpile areas, stop/go facilities, windrows and wherever material generated for, or from, construction has to be stored temporarily, and designated or instructed areas outside the road reserve. It also includes the area where site offices were erected which may require rehabilitation at the end of the contract. All construction material, including concrete slabs and barbecue (braai) areas shall be removed from the site on completion of the contract unless written approval from the relevant landowner demonstrates it is to be left in place.

Responsibility for re-establishment of vegetation shall extend until expiry of the defects notification period. However, SANRAL reserves the right to continue holding retention monies (or not releasing guarantees in lieu of retention) depending upon the state of cover at the end of the defects notification period. Such extension may continue until closure of the relevant quarry or borrow pit has been secured,

Rehabilitation of affected areas should be undertaken as early as possible when the relevant activities are done in order to reduce further environmental damage. All re-vegetation should be undertaken using indigenous vegetation. The standard of rehabilitation should be to the satisfaction of the Engineer and the relevant authorities. The Department of Minerals Resources will only issue closure certificates for borrow pits and quarries when they are satisfied with the rehabilitation

undertaken. It should also be noted that in some cases there is a requirement for a final environmental audit covering the extent of the project.

Also refer to the Rehabilitation Plan document for more details and the Contractor must ensure that this is incorporated in their planning and execution of the project.

12 RECORDKEEPING AND REPORTING

The Engineer and the DEO will continuously monitor the contractor's adherence to the approved impact prevention procedures and the DEO shall submit regular written reports to the ECO and to the Engineer, at least once a month. The DEO will report the environmental compliance performance of the project at regular site meetings. The Engineer shall issue to the Contractor a notice of non-compliance whenever transgressions are observed. The DEO shall 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.

Copies of all authorisations shall be kept on site and made available for inspection by visiting officials from SANRAL, relevant authorities or internal/external auditors.

13 COMPLIANCE AND PENALTIES

The Contractor shall act immediately when a 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. This record shall be submitted with the monthly reports and an oral report given at the monthly site meetings.

Any non-compliance with the procedures in this EMP, environmental authorisations and approved EMPr constitute a breach of the Conditions of Contract.

14 PROJECT SPECIFIC CONDITIONS

This EMP should also be read in conjunction with the Environmental Method Statement and the Environmental Rehabilitation Plan.

Potential environmental impacts that may arise due to project activities have been identified in the table below together with the management/mitigation measures, monitoring/compliance reporting requirements and responsible party.

The bulk of the impacts during the construction and operational phase will have direct and immediate effect (i.e. dust-, noise- and water pollution) with some indirect impacts identified. The site and project specific impacts and mitigation measures are included in this section of the EMP (Table 2) and are just as relevant to the project as any of the other specifications, if not more.

The map indicating the environmental sensitivity areas within a 500m buffer zone is indicated in Figures 2 to 15 in Chapter 15 of this EMP.

Table 2: Project specific conditions

IMPACT	MITIGATION / MANAGEMENT ACTIONS	IMPLEMENTATION	MONITORING
<p>Changes to the hydrological regime of the streams / rivers from trenching of soil or stream bank/beds.</p>	<ul style="list-style-type: none"> • Any activities that take place within 32 meters of a wetland or watercourse or the 1:100 year flood lines will require authorisation in terms of the relevant regulations of NEMA, however as far as possible infrastructure should be placed outside of wetlands and / or buffer lines. • No stockpiling should take place within a watercourse or the 32m buffer. • All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds • Erosion and sedimentation into channels must be minimised through the effective stabilisation (gabions and Reno mattresses) and the re-vegetation of any disturbed stream banks; • Ensure that erosion management and sediment controls are strictly implemented from the beginning of site clearing activities, particularly as the soils in the study area are prone to erosion; • All areas should be re-sloped and top-soiled where necessary and reseeded with indigenous grasses to stabilise the loose material; • Edge effects such as erosion must be strictly monitored and managed; • A sensitivity map has been developed for the study area, indicating the drainage lines and riparian systems, and their relevant buffer zones. It is recommended that this sensitivity map be considered during all phases of the development and with special mentioning of the planning of infrastructure, in order to aid in the conservation of and minimise impact on the riparian and aquatic habitat and resources within the study area; • Rehabilitation must ensure that the wetland structure and function are reinstated in such a way as to ensure the ongoing functionality of the larger wetland systems at construction levels. • Any areas where bank failure is observed, due to the construction impacts, should be immediately repaired; • As far as possible the existing road network should be utilised, minimising the need to develop new access routes resulting in an increased impact on the local 	<p>Contractor</p>	<p>DEO / ECO to monitor through visual site visits the implementation of the requirements by the Contractor</p> <p>Monitoring on a daily to weekly basis during construction</p> <p>Monitoring surveys of the site and footprint: Monthly for the defects notification period.</p>

IMPACT	MITIGATION / MANAGEMENT ACTIONS	IMPLEMENTATION	MONITORING
	<p>environment. Should temporary roads or access routes be necessary and unavoidable, proper planning must take place and the site sensitivity plan must be taken into consideration. If additional roads are required, then wherever feasible such roads should be constructed a distance from the more sensitive riparian areas and not directly adjacent thereto. If crossings are required they should cross the systems at right angles, as far as possible to minimise impacts in the receiving environment;</p> <ul style="list-style-type: none"> • The duration of impacts on the drainage line should be minimised as far as possible by ensuring that the duration of time in which flow alteration and sedimentation will take place is minimised; • Stabilisation of banks by employing one of the individual techniques below or a combination thereof, is essential, given the inherent susceptibility of the soils to erosion. Such measures include: <ul style="list-style-type: none"> ○ Re-sloping of banks to a maximum of a 1:3 slope; ○ Revegetation of re-profiled slopes; ○ Temporary stabilisation of slopes using geotextiles; and ○ Installation of gabions and reno-mattresses. ○ To prevent the further erosion of soils, management measures may include berms, soil traps, hessian curtains and storm water diversion away from areas particularly susceptible to erosion; • Install erosion berms during construction to prevent gully formation: <ul style="list-style-type: none"> ○ Berms every 50m should be installed where any disturbed soils have a slope of less than 2%, ○ Berms every 25m where the track slopes between 2% and 10%, ○ Berms every 20m where the track slopes between 10% and 15% and ○ Berms every 10m where the track slope is greater than 15%; • Sheet runoff from access roads should be slowed down by the strategic placement of berms and/or sandbags; • All soils compacted as a result of construction activities falling outside of project areas should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas. Alien and invasive vegetation control 		

IMPACT	MITIGATION / MANAGEMENT ACTIONS	IMPLEMENTATION	MONITORING
	<p>should take place throughout all construction and rehabilitation phases to prevent loss of floral habitat;</p> <ul style="list-style-type: none"> • As far as possible, all rehabilitation activities should occur in the low flow season, during the drier winter months. • Trenches and deep excavations should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are exposed should contain soil ramps allowing fauna (vertebrates & invertebrates) to escape the trench. 		
<p>Impact of changes to water quality from sewage, sediments or hydrocarbons (i.e. diesel, oils, fuels etc.)</p>	<ul style="list-style-type: none"> • All vehicles must be regularly inspected for leaks. Re-fuelling must take place on a sealed surface area to prevent entry of hydrocarbons into topsoil and groundwater; • All spills, should they occur, should be immediately cleaned up and treated accordingly. • Chemicals used for vehicle maintenance and construction must be stored safely on site but outside the 32m buffer and surrounded by bunds. Chemical storage containers must be regularly inspected so that any leaks are detected early. • Littering and contamination of water sources during construction must be prevented by effective site management. • Emergency plans must be in place in case of spillages especially in the watercourse. • No stockpiling should take place within a watercourse. • All stockpiles must be protected from erosion, stored on flat areas where run-off will be minimised, and be surrounded by bunds. • Stockpiles must be located away from river channels. • Erosion and sedimentation into channels must be minimised through the effective stabilisation (gabions and Reno mattresses) and the re-vegetation of any disturbed riverbanks. • The construction camp and necessary ablution facilities meant for construction workers must be beyond the 32m buffer described previously. 	<p>Contractor</p>	<p>DEO / ECO to monitor through visual site visits the implementation of the requirements by the Contractor</p> <p>Monitoring on a daily to weekly basis during construction</p> <p>Monitoring surveys of the site and footprint: Monthly for the defects notification period.</p>
<p>Loss of riparian</p>	<ul style="list-style-type: none"> • As far as possible, all rehabilitation activities should occur in the low flow 	<p>Contractor</p>	<p>DEO / ECO to monitor</p>

IMPACT	MITIGATION / MANAGEMENT ACTIONS	IMPLEMENTATION	MONITORING
<p>vegetation, aquatic habitat and stream continuity (migration corridors) from trenching in the water courses</p>	<p>season, during the drier winter months.</p> <ul style="list-style-type: none"> ● Trenches and deep excavations should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are exposed should contain soil ramps allowing fauna to escape the trench. ● The duration of impacts on the riverine and drainage line systems should be minimised as far as possible by ensuring that the duration of time in which flow alteration and sedimentation will take place is minimised; ● Rehabilitation must ensure that riparian structure and function are reinstated in such a way as to ensure the ongoing functionality of the larger riparian systems at pre-construction levels. ● Stabilisation of banks by employing one of the individual techniques below or a combination thereof, is essential, given the inherent susceptibility of the soils to erosion. Such measures include: <ul style="list-style-type: none"> ○ Re-sloping of banks to a maximum of a 1:3 slope; ○ Revegetation of re-profiled slopes; ○ Temporary stabilisation of slopes using geotextiles; and ○ Installation of gabions and reno-mattresses. ○ To prevent the further erosion of soils, management measures may include berms, soil traps, hessian curtains and storm water diversion away from areas particularly susceptible to erosion; ● Install erosion berms during construction to prevent gully formation: <ul style="list-style-type: none"> ○ Berms every 50m should be installed where any disturbed soils have a slope of less than 2%, ○ Berms every 25m where the track slopes between 2% and 10%, ○ Berms every 20m where the track slopes between 10% and 15% and ○ Berms every 10m where the track slope is greater than 15%; 		<p>through visual site visits the implementation of the requirements by the Contractor</p> <p>Monitoring on a daily to weekly basis during construction</p> <p>Monitoring surveys of the site and footprint: Monthly for the defects notification period.</p>
<p>Spread of alien invasive species. From the disturbance of the soil, loss of riparian and in-stream</p>	<ul style="list-style-type: none"> ● Alien invasive species must be controlled throughout the entire site during the construction process. ● Any no-go areas (such as wetlands) should be demarcated and workers should be informed that no activities are to occur in these areas. ● Clearing of alien species must be organized, planned and approved 	<p>Contractor</p>	<p>DEO / ECO to monitor through visual site visits the implementation of the requirements by the Contractor</p>

IMPACT	MITIGATION / MANAGEMENT ACTIONS	IMPLEMENTATION	MONITORING
<p>habitat and or water quality changes that could possibly result in the colonisation of the degraded habitats by alien species.</p>	<ul style="list-style-type: none"> • All manually cleared alien plants must be disposed of carefully and must not be dumped in any areas of indigenous vegetation, even temporarily. • No mass clearing of vegetation should be done, but rather vegetation should be cleared as work progresses. No large areas should be cleared unless surfacing occurs immediately after. • Cleared areas that will not be surfaced for an extended period of time (over 2 weeks) should be stabilized with packed brush (from indigenous plants cleared from the site), or with jute pegged over the area. • Proliferation of alien and invasive species is expected within any disturbed areas particularly as there are some alien and invasive species within the study area at present. These species should be eradicated and controlled to prevent further spread beyond the study area; • It is suggested that an alien plant removal program be initialised within the study area in order to help reinstate more natural hydrological and ecological functions to within the project site; • Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, has to be controlled; • Cleared areas that will not be surfaced for an extended period of time (over 2 weeks) should be stabilized with packed brush (from indigenous plants cleared from the site), or with jute pegged over the area. • Care should be taken with the choice and use of herbicide to ensure that no additional impact and loss of indigenous plant species occurs due to the herbicide used; • Footprint areas should be kept as small as possible when removing alien plant species; • No vehicles should be allowed to drive through designated sensitive drainage lines and riparian areas during the eradication of alien and weed species. • All alien vegetation in the riparian zone should be removed upon completion of construction activities and reseeded with indigenous grasses as specified by a suitably qualified specialist (ecologist); • Any soil stockpiles that have become invaded should be cleared through manual 		<p>Monitoring on a daily to weekly basis during construction</p> <p>Monitoring surveys of the site and footprint: Monthly for the defects notification period.</p>

IMPACT	MITIGATION / MANAGEMENT ACTIONS	IMPLEMENTATION	MONITORING
	<p>control methods (weeding).</p> <ul style="list-style-type: none"> • Areas that will be vegetated though rehabilitation must be done so through the rehabilitation plan. No organic matter from outside the site should be used to encourage re-growth of vegetation. • Surveys of the site for alien invasive species must be conducted throughout the life of the project. These include new invasions by recorded species as well as new invader species on site. • To prevent increased invasion in areas cleared for construction but not needed for operation, rehabilitation of the natural vegetation should be done. This should follow the prescribed Rehabilitation Plan. • Areas where vegetation is required to be kept low, should be managed using weedeaters above the soil line to maintain the indigenous vegetation and reduce invasion potential. 		
Loss of riparian vegetation, aquatic habitat from construction and vehicle movement	<ul style="list-style-type: none"> • All construction vehicles should adhere to a low speed limit (<30km/h) to avoid collisions with susceptible species such as snakes and tortoises. • All construction footprint areas should remain as small as possible and should as far as possible not encroach into surrounding areas. It must be ensured that where possible the riparian and drainage line systems, and their associated buffer zones are off-limits to construction vehicles and personnel; • The boundaries of footprint areas are to be clearly defined and it should be ensured that all activities remain within defined footprint areas; • Ensure that as far as possible all infrastructure are placed outside of drainage lines and riparian areas and their respective buffer zones. Where this is not possible, construction footprints must be kept as small as possible and impacts must be minimized as far as possible. 	Contractor	<p>DEO / ECO to monitor through visual site visits the implementation of the requirements by the Contractor</p> <p>Monitoring on a daily to weekly basis during construction</p> <p>Monitoring surveys of the site and footprint: Monthly for the defects notification period.</p>
Impact on historical resources	<ul style="list-style-type: none"> • Sand River, excavations into overbank sediments will require monitoring by a professional palaeontologist in order to map and remove Quaternary fossil remains that may be impacted during the construction phase of the project. The palaeontologist must apply for a valid permit from SAHRA for the collection / 	Contractor	DEO / ECO to monitor through visual site visits the implementation of the requirements by the

IMPACT	MITIGATION / MANAGEMENT ACTIONS	IMPLEMENTATION	MONITORING
	<p>removal of fossils.</p> <ul style="list-style-type: none"> • Sand River Convention Memorial site to be demarcated as a “no-go” area. • Grave sites identified at the following location to be demarcated as “no-go” areas if not relocated. All identified graves and cemeteries within 50m of the expanded alignment must be securely fenced with minimally, steel fence posts and 5 strands of barbed wire. During construction these should be draped with ski-netting. <ul style="list-style-type: none"> ○ 28° 18' 20.65" S 27° 03' 55.35" E. ○ 28°21'51.80"S 27° 3'16.79"E. ○ 28°20'28.86"S 27° 3'57.84"E. • Archaeological heritage site at the following co-ordinates to be demarcated as “no-go” areas. <ul style="list-style-type: none"> ○ 28° 15' 18.84" S 27° 04' 39.66" E. ○ 28°15'20.36"S 27° 4'49.63"E. 		<p>Contractor</p> <p>Monitoring on a daily to weekly basis during construction</p>

PROTOCOL FOR THE IDENTIFICATION, PROTECTION AND RECOVERY OF HERITAGE RESOURCES DURING CONSTRUCTION AND OPERATION

- 1) It is possible that sub-surface heritage resources could be encountered during the construction phase of this project. The environmental control officer and all other persons responsible for site management and excavation should be aware that indicators of sub-surface sites could include:
 - Ash deposits (unnaturally grey appearance of soil compared to the surrounding substrate);
 - Bone concentrations, either animal or human;
 - Ceramic fragments, including potsherds;
 - Stone concentrations that appear to be formally arranged (may indicate the presence of an underlying burial, or represent building/structural remains); and
 - Fossilised remains of fauna and flora, including trees.

- 2) In the event that such indicator(s) of heritage resources are identified, the following actions should be taken immediately:
 - All construction within a radius of at least 20m of the indicator should cease. This distance should be increased at the discretion of supervisory staff if heavy machinery or explosives could cause further disturbance to the suspected heritage resource.
 - This area must be marked using clearly visible means, such as barrier tape, and all personnel should be informed that it is a no-go area.
 - A guard should be appointed to enforce this no-go area if there is any possibility that it could be violated, whether intentionally or inadvertently, by construction staff or members of the public.
 - No measures should be taken to cover up the suspected heritage resource with soil, or to collect any remains such as bone or stone.
- 3) If a heritage practitioner has been appointed to monitor the project, s/he should be contacted, and a site inspection arranged as soon as possible.
- 4) If no heritage practitioner has been appointed to monitor the project, SAHRA or FSPHRA should be contacted.
- 5) The South African Police Services should be notified by a SAHRA/FSPHRA staff member or an independent heritage practitioner if human remains are identified. No SAPS official may disturb or exhume such remains, whether of recent origin or not.
- 6) All parties concerned should respect the potentially sensitive and confidential nature of the heritage resources, particularly human remains, and refrain from making public statements until a mutually agreed time.

Any extension of the project beyond its current footprint involving vegetation and/or earth clearance should be subject to prior assessment by a qualified heritage practitioner, considering all information gathered during the initial assessment.

15.LOCALITY AND SENSITIVITY MAPS

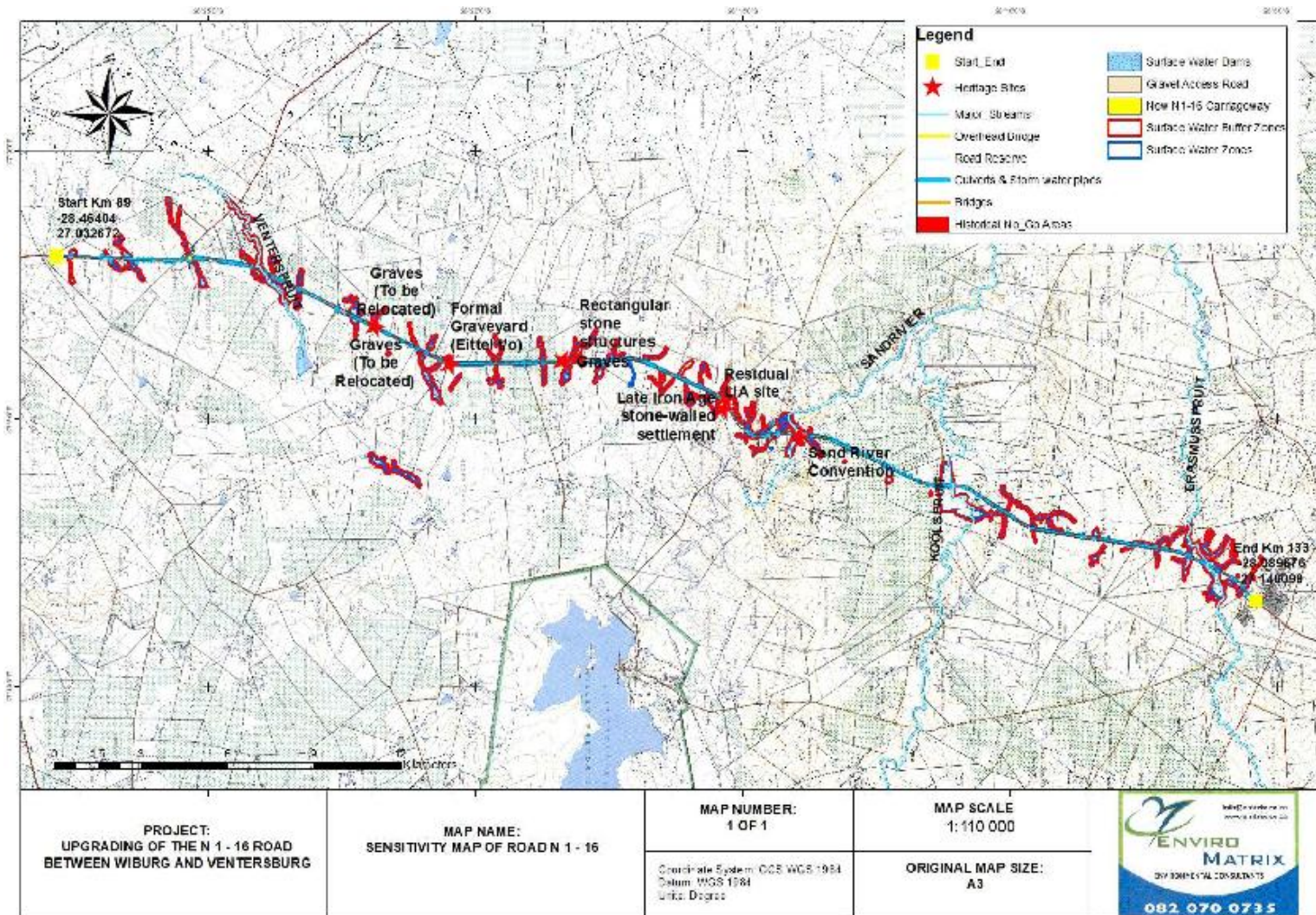


Figure 2: N1-16 Road Upgrade – Overall Sensitivity Map

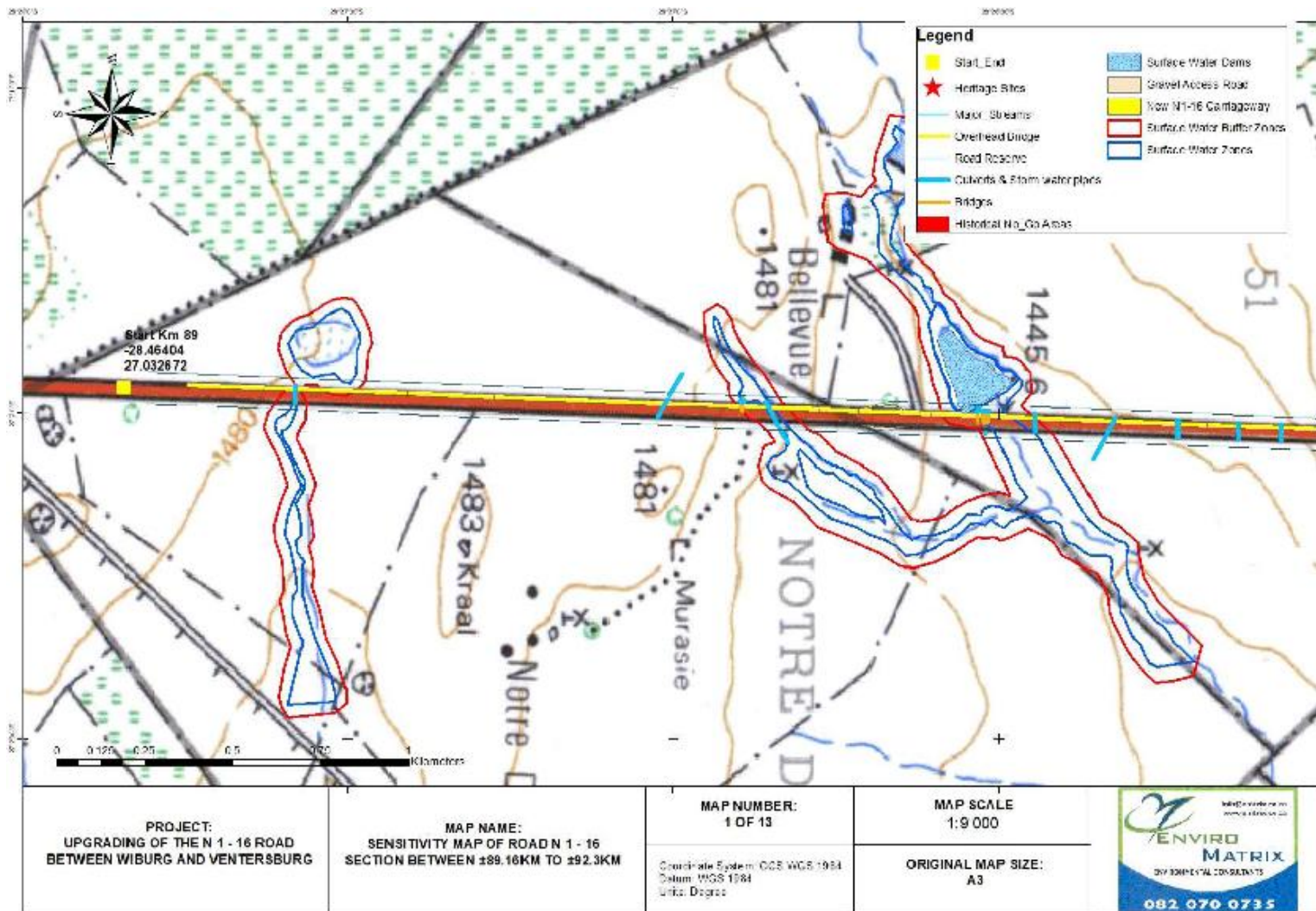


Figure 3: N1-16 Road Upgrade – Map 1

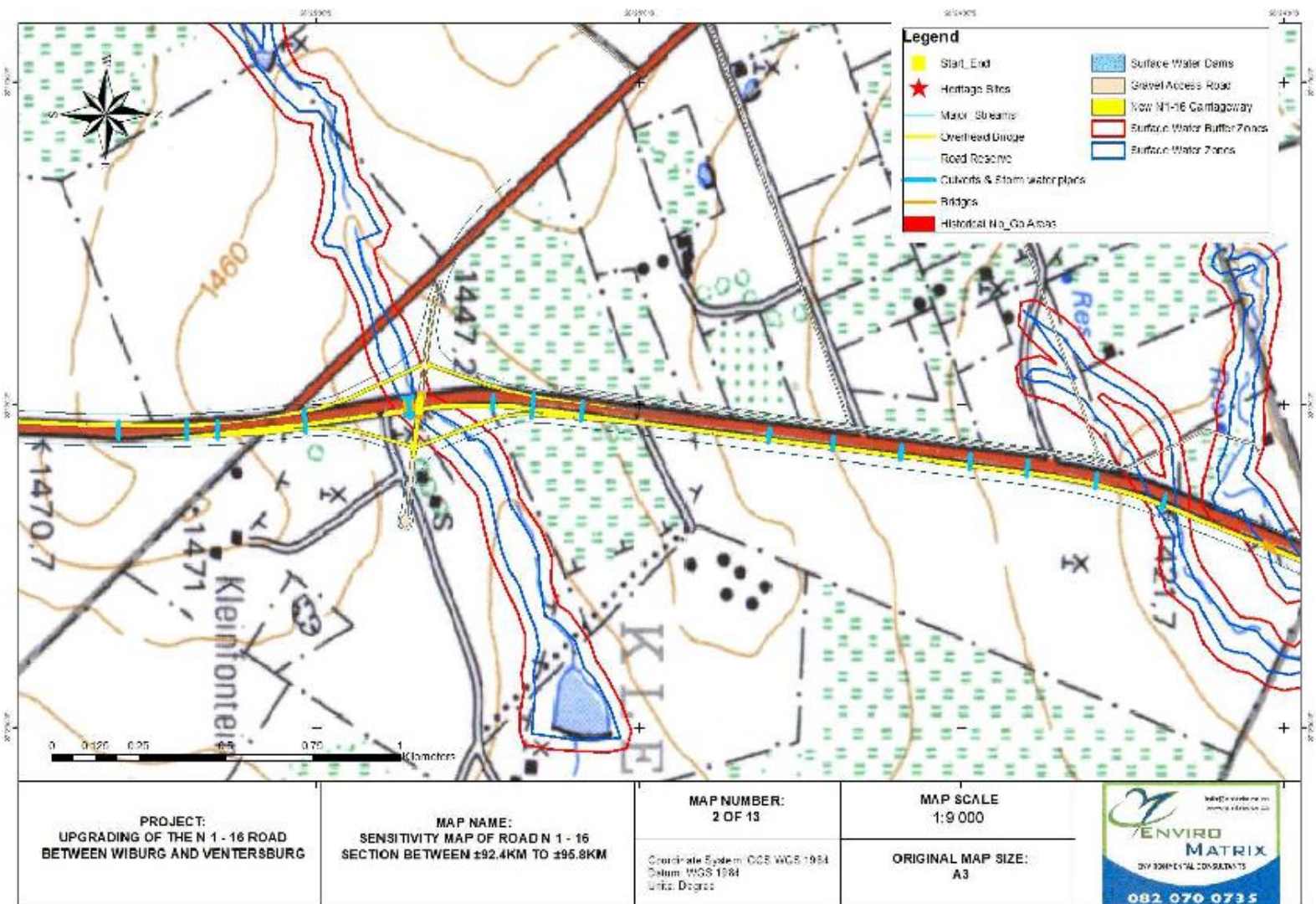


Figure 4: N1-16 Road Upgrade – Map 2

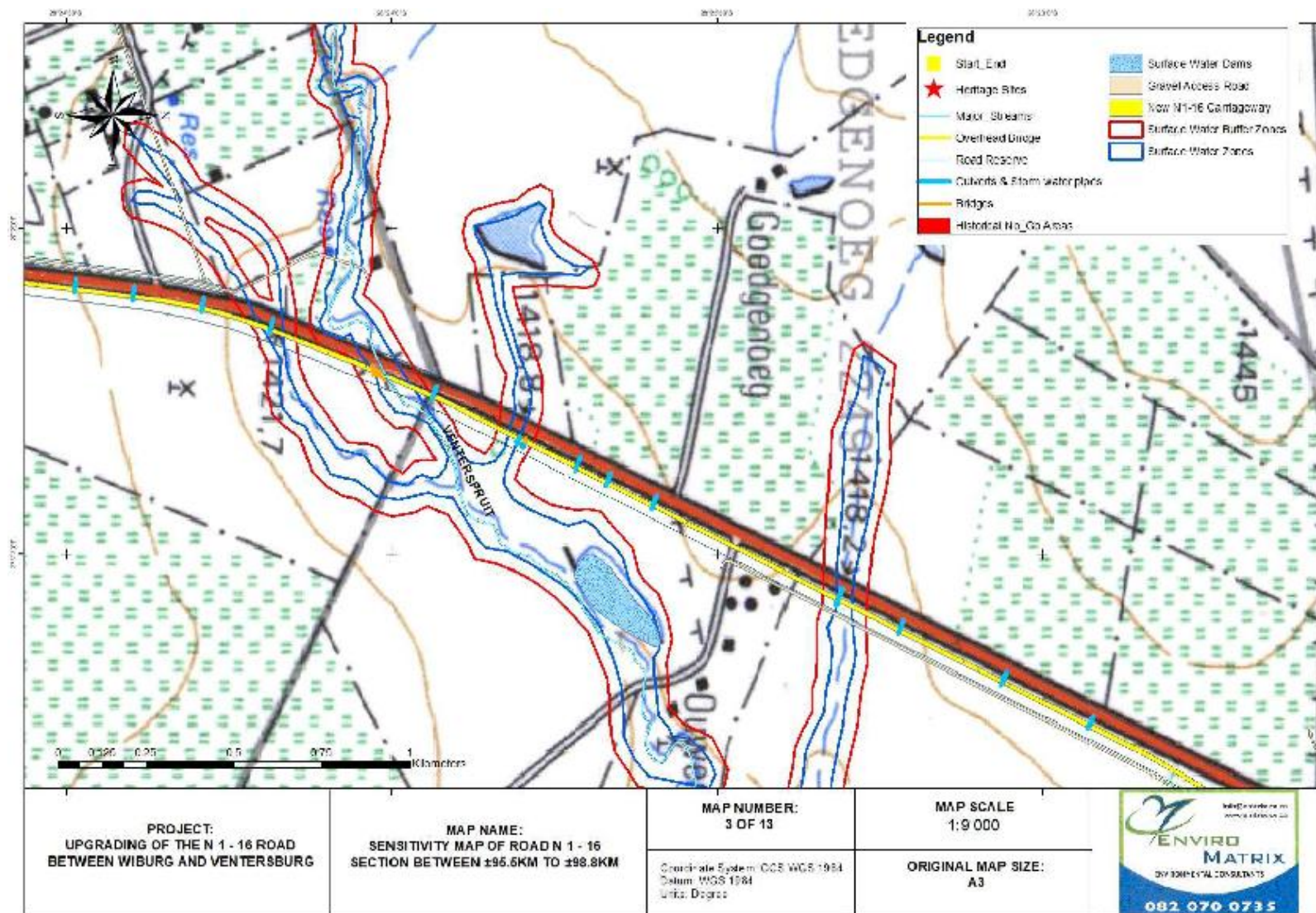


Figure 5: N1-16 Road Upgrade – Map 3

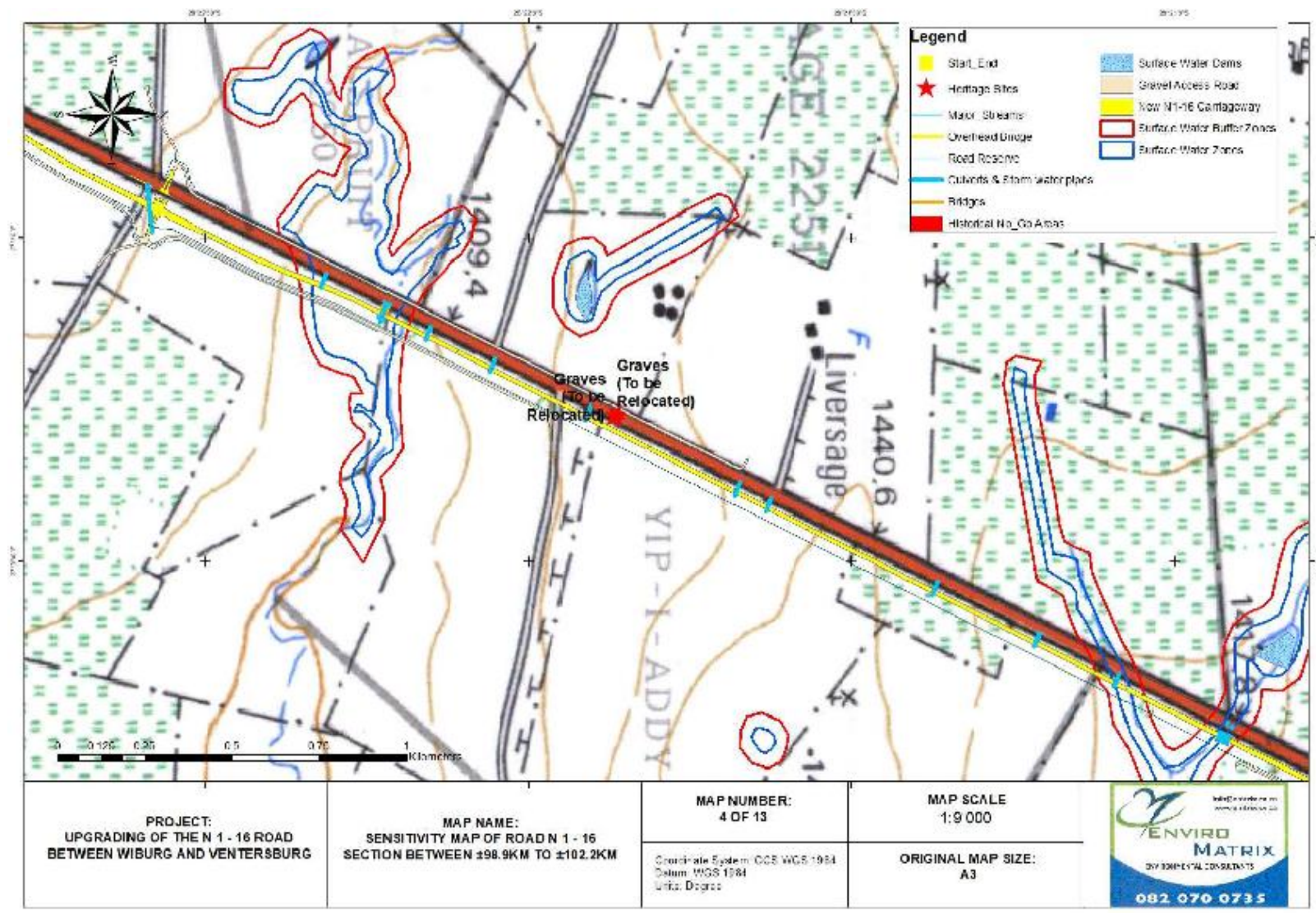


Figure 6: N1-16 Road Upgrade – Map 4

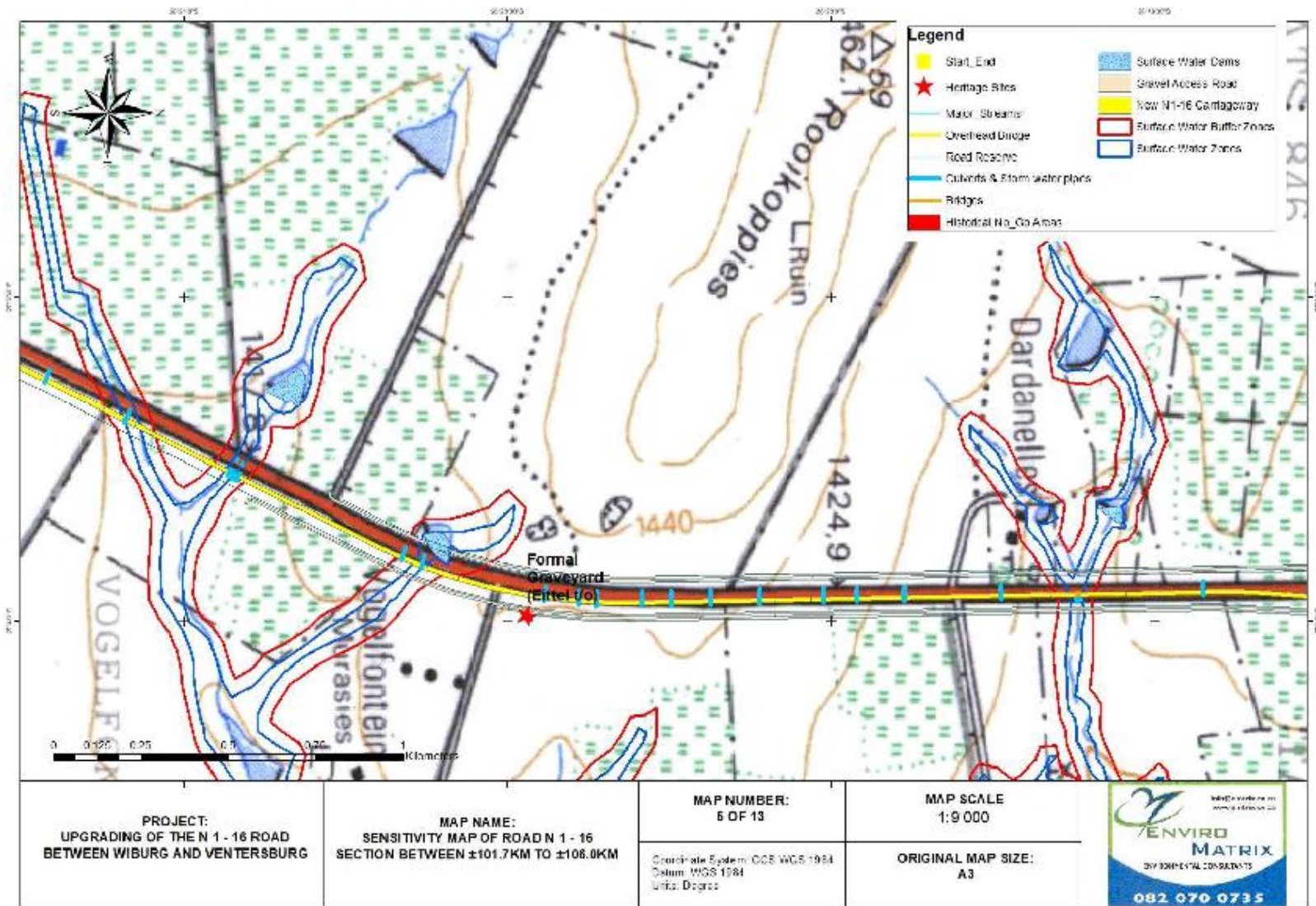


Figure 7: N1-16 Road Upgrade – Map 5

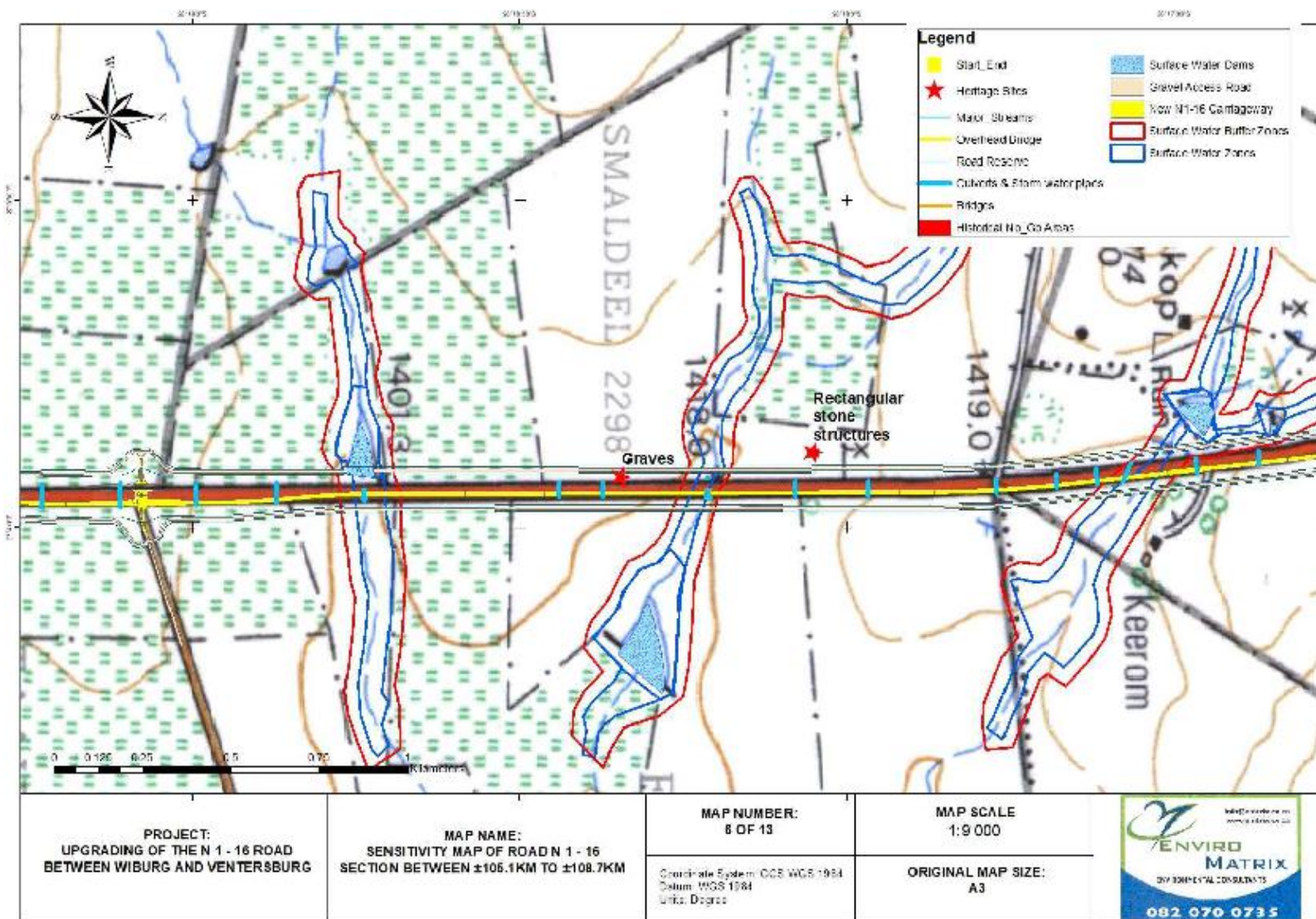


Figure 8: N1-16 Road Upgrade – Map 6

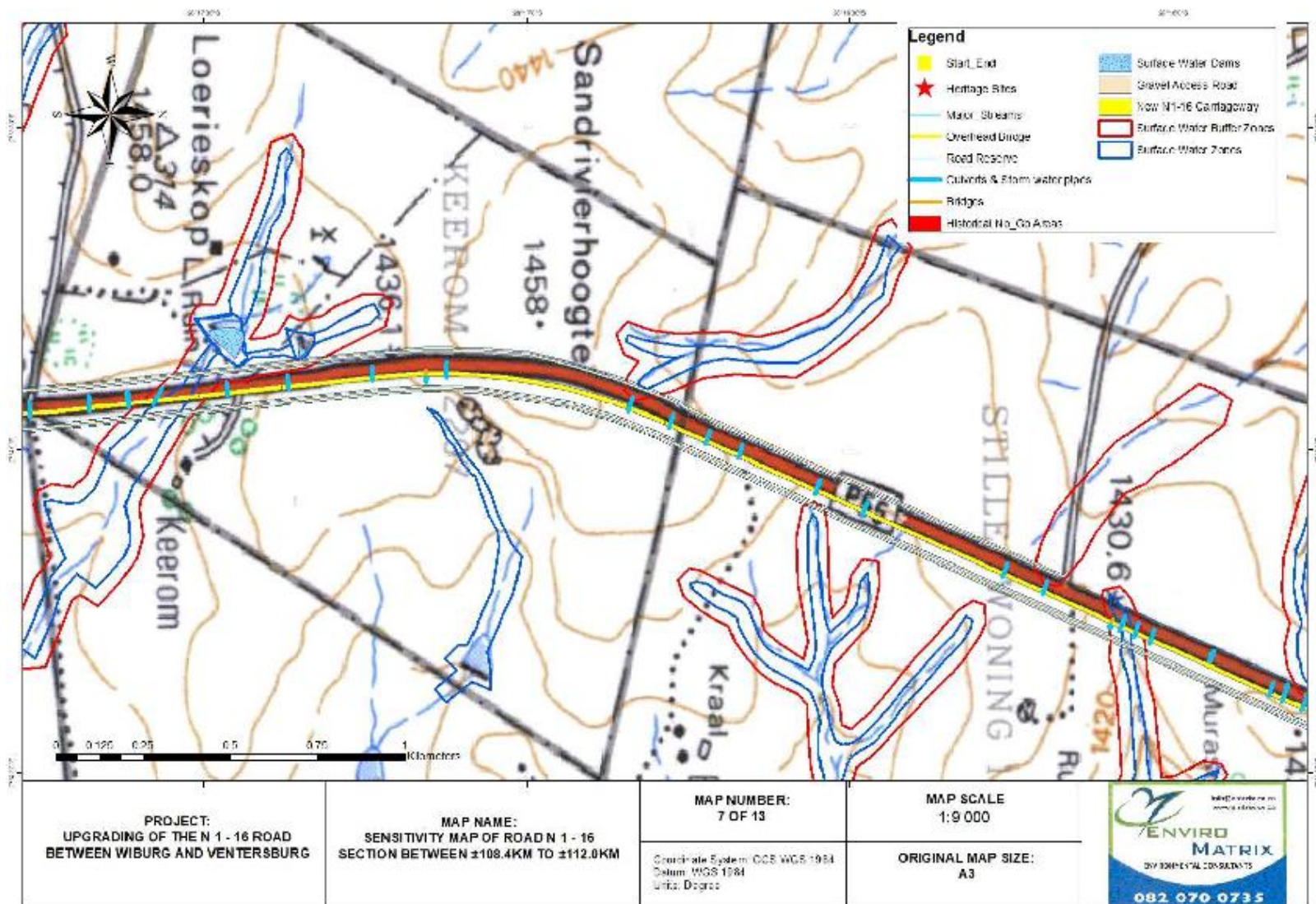


Figure 9: N1-16 Road Upgrade – Map 7

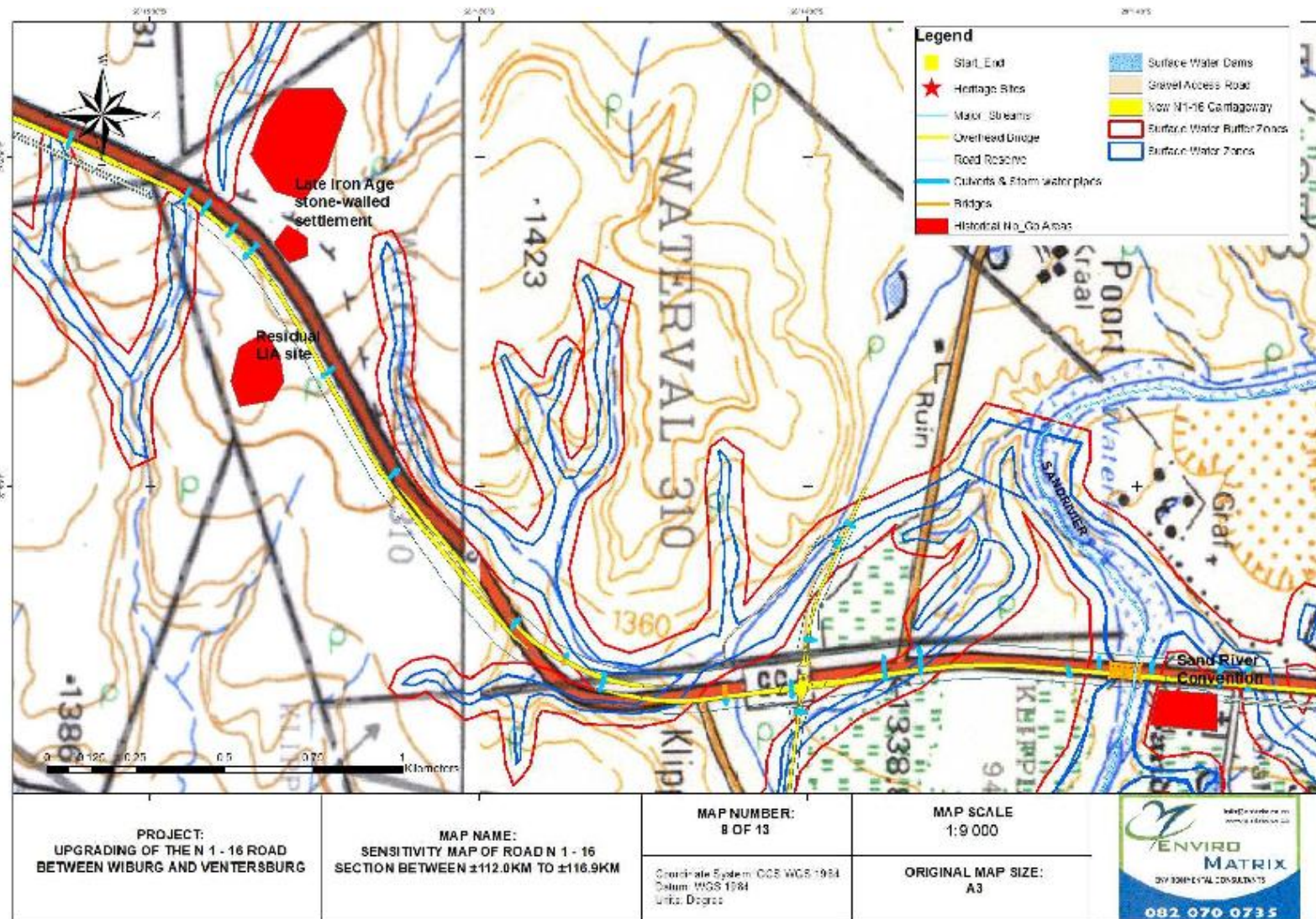


Figure 10: N1-16 Road Upgrade – Map 8

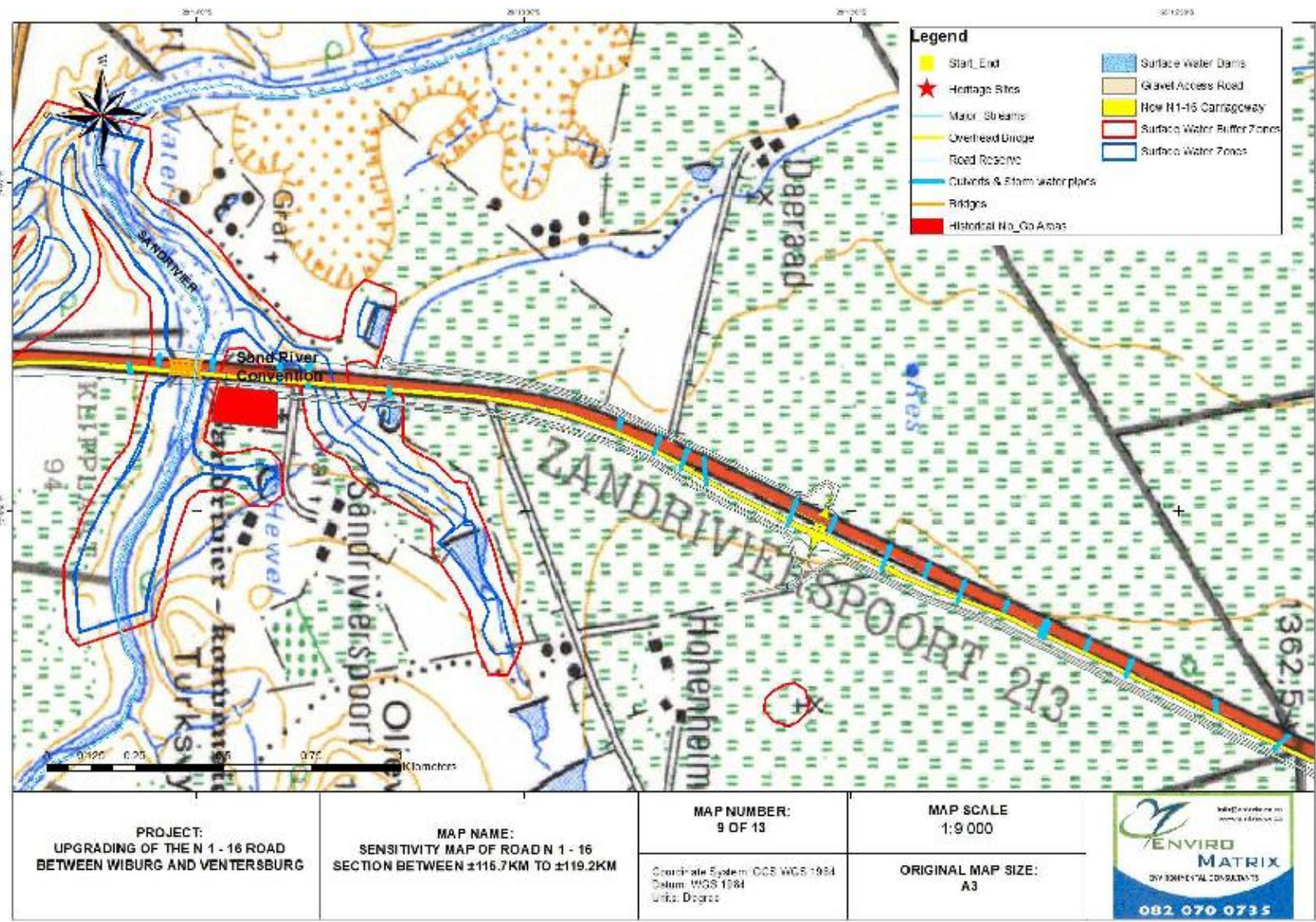


Figure 11: N1-16 Road Upgrade – Map 9

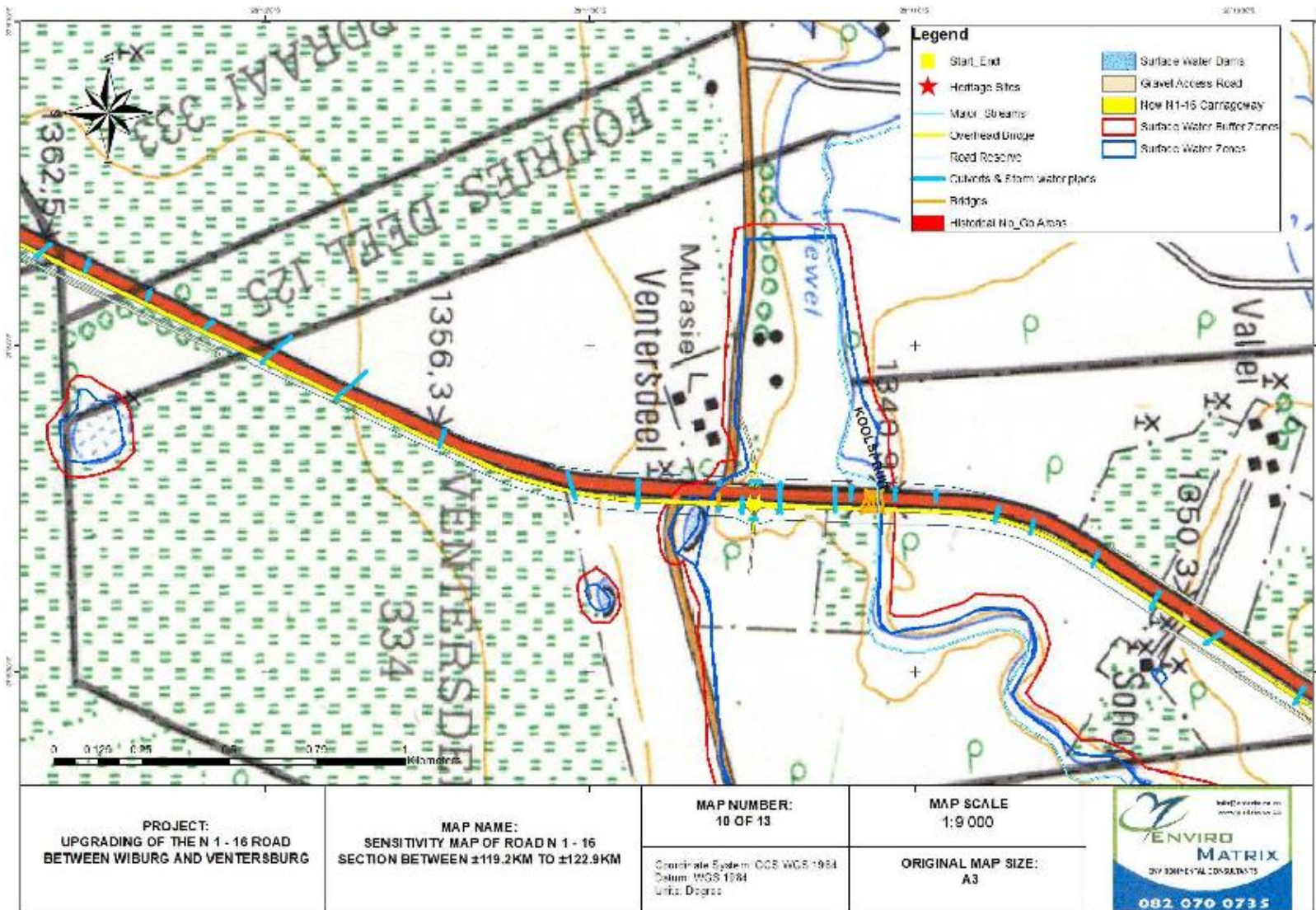


Figure 12: N1-16 Road Upgrade – Map 10

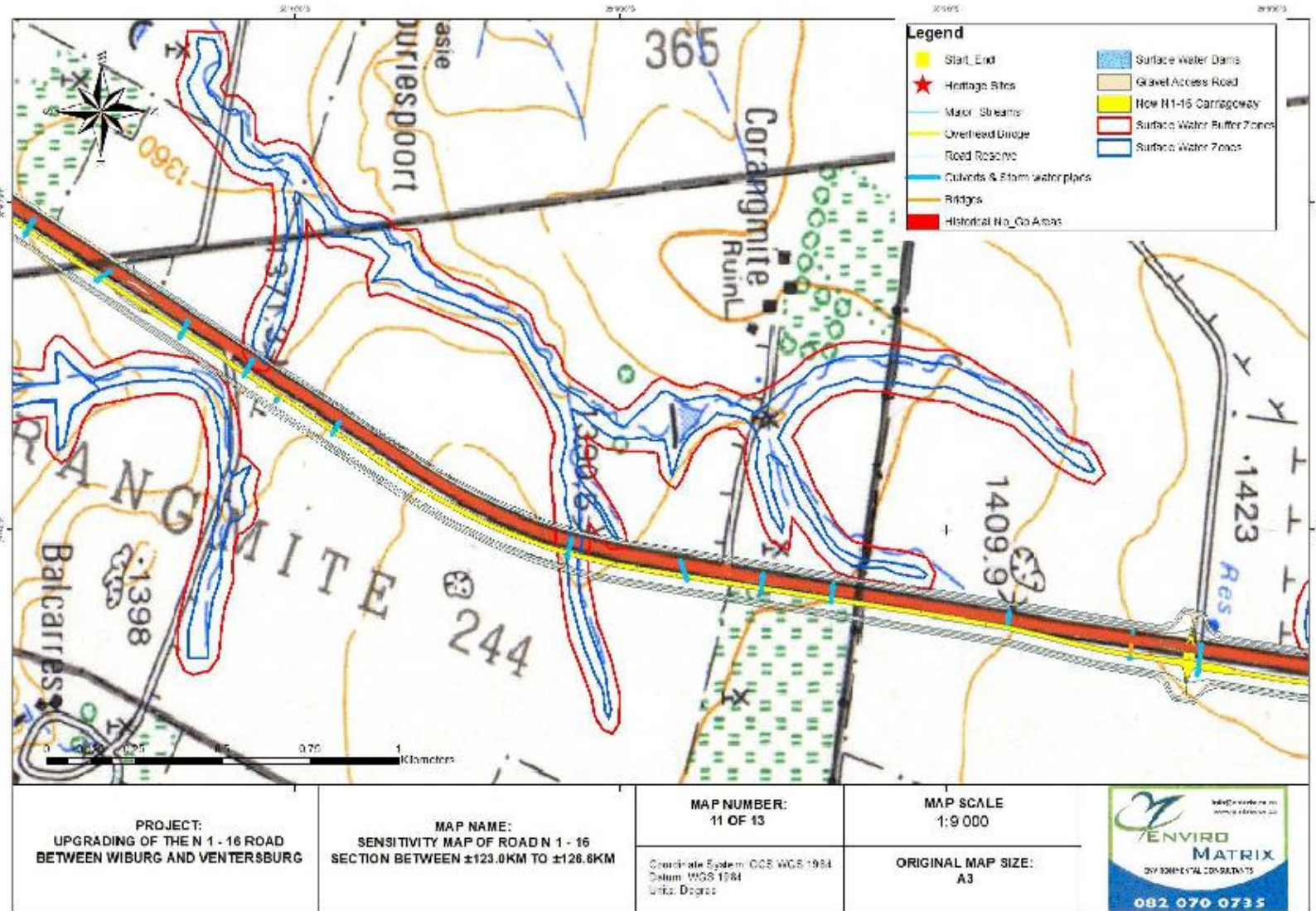


Figure 13: N1-16 Road Upgrade – Map 11

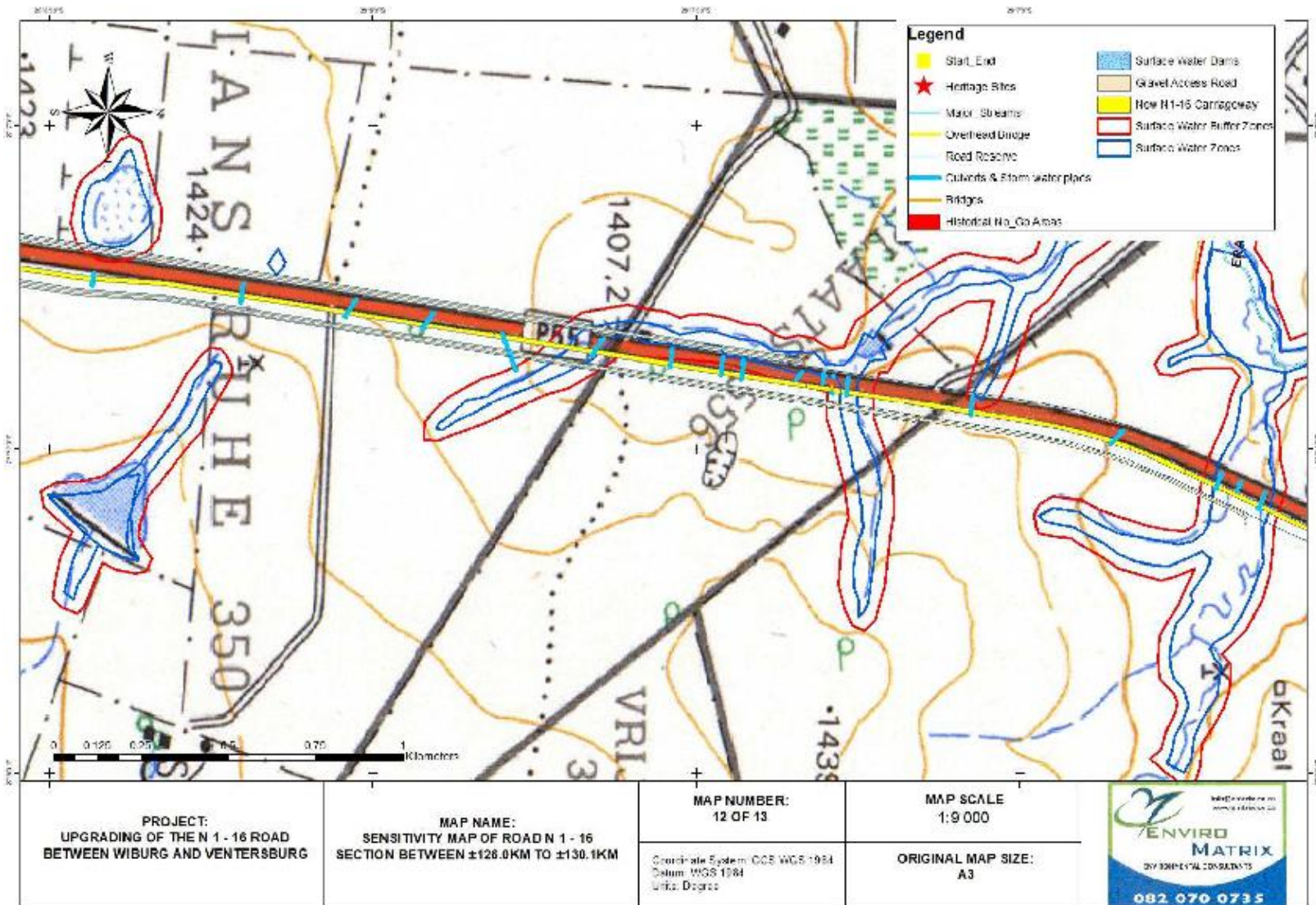


Figure 14: N1-16 Road Upgrade – Map 12

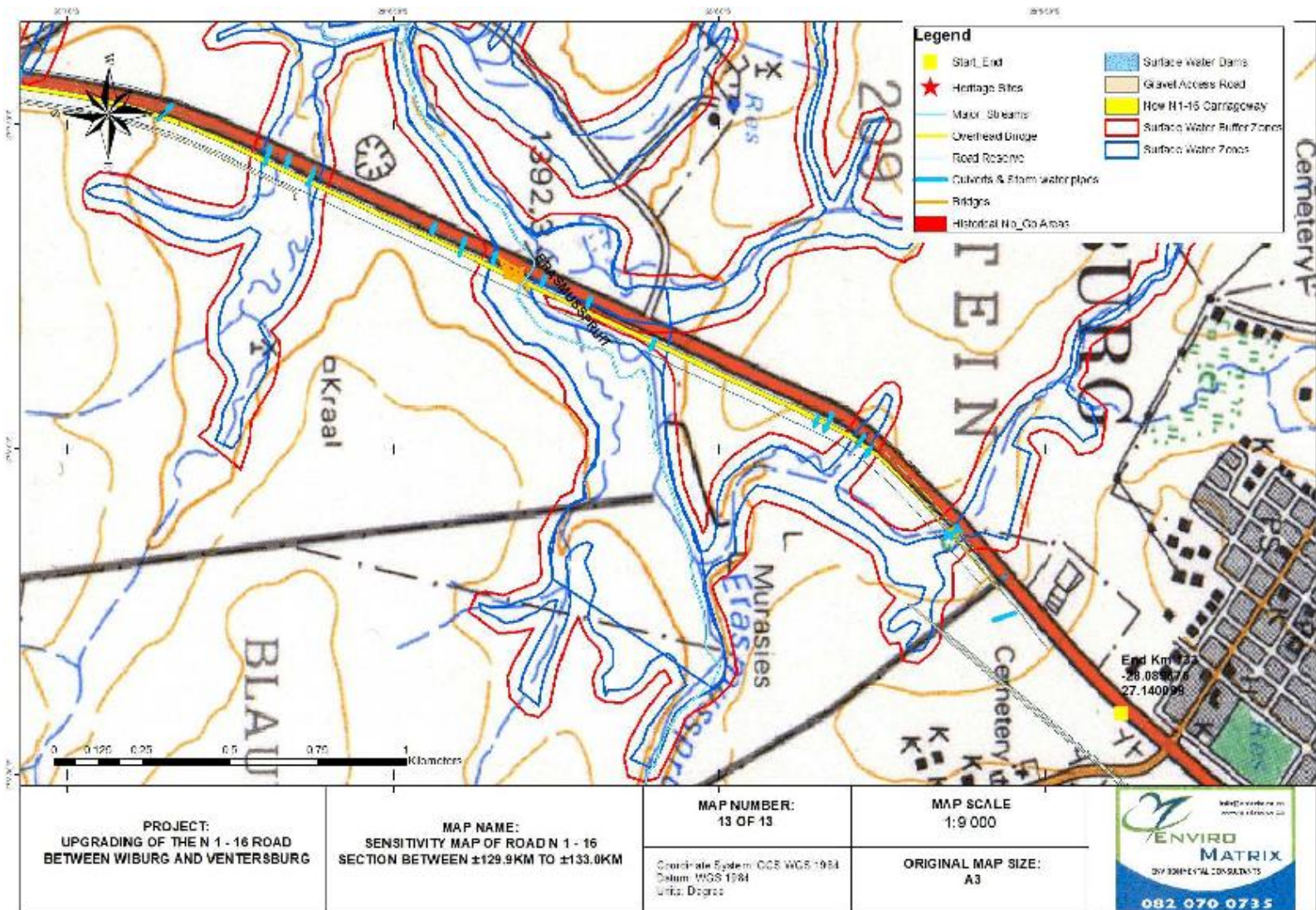


Figure 15: N1-16 Road Upgrade – Map 13