

WESTERN CAPE DEPARTMENT OF TRANSPORT AND PUBLIC WORKS

**REPAIR OR REPLACEMENT OF BRIDGES AND CULVERT STRUCTURES ON TRUNK
ROADS 3305, 3501, 5801, DIVISIONAL ROAD 2307 AND MAIN ROAD 584**

ENVIRONMENTAL MANAGEMENT PROGRAMME

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1.0 DETAILS OF EAP WHO PREPARED EMPr

This EMPr was prepared by:

(i) Name of the Practitioner

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(ii) Expertise of the EAP

(1) The qualifications of the EAP

PhD in Environmental Management. Please find proof of qualifications of EAP in Appendix A of the EIA Report.

(2) Summary of the EAP's past experience

(Please refer to Appendix 1 for EAP's curriculum vitae).

The EAP that prepared this report is Dr J Bothma from Chameleon Environmental. The Environmental Assessment Practitioner (EAP) has the appropriate skills and experience to undertake the required studies for the proposed project. Dr Bothma has:

- Experience in undertaking environmental studies for linear development projects. The EAP has specific experience in EIAs for National Roads for the South African National Roads Agency Soc Limited and other clients.
- Experience in environmental studies for borrow pits and quarries.
- The EAP is registered as an Environmental Assessment Practitioner with EAPSA with registration number 0082/06.
- Proven ability to timeously produce thorough, readable and informative documents.
- Adequate recording and reporting systems to ensure the preservation of all data gathered.
- A good working knowledge of all relevant and applicable policies, legislation, guidelines, norms and standards.
- The EAP does not have any links to engineering firms, construction companies, or financial institutions, and would be able sign the required declarations of independence to be submitted to the relevant environmental authorities.

Dr Bothma has a PhD in Environmental Management with extensive experience in the environmental field. She was previously the Environmental Manager for the South African National Roads Agency Soc Limited where she was responsible for the management of the environmental section at the Agency and consequently has gained extensive experience in project management and EIAs for major national road projects. Dr Bothma is a founder member of Chameleon Environmental since August 2006, a specialist environmental consulting company based in Pretoria, South Africa but operates nationwide. The company provides a broad range of environmental consulting services to the public and private sectors.

She has:

- » Thirty-one (31) years' experience in the environmental field;
- » Twenty-one (21) years' experience in Project Management;
- » Project management of large environmental assessment and environmental management projects.

Please see CV in Appendix 1.

2.0 SCOPE

The Western Cape Department of Transport and Public Works proposes to undertake repairs or replacements on bridge and culvert structures located on the following roads:

- TR3305 (N12)
- DR2307,
- MR584,
- TR3501 (R61), and
- TR5801 (R381).

The project falls within the TR3305 (N12), DR2307, MR584, TR3501 (R61) and TR5801 (R381) road reserves.

The structures will be subject to structural repair work and reinstatement or improvement of erosion protection.

The main objective for the repair or replacement of the water crossing structure, as identified and determined by engineers, is to limit the impact of overtopping, erosion, and sedimentation. This will be a positive long-term impact arising from the project on the watercourses.

The Employer recognises environmental management as a key component of road infrastructure development and as part of its environmental policy has developed this Environmental Management Programme (EMPr) as a tool for continual improvement in environmental performance.

This EMPr 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 General Conditions of Contract 2015 (GCC 2015) Clause 4.11.2.

The provisions of this EMPr 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 EMPr and the rest of the project specifications or environmental authorisation, the terms herein shall be subordinate.

The EMPr 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 EMPr and/or environmental authorisation cannot occur without being submitted to the Employer who will manage the process of seeking approval of the change from the relevant authority.

The EMPr 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.

Please see sensitivity map at appropriate scale of the proposed project in Appendix 2.

3.0 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 (CARA), 1983 regulations. Other vegetation deemed to be alien are 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.

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 Environment, Forestry and Fisheries, 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 (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 EMPr 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 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;
- The contractor's and his subcontractors' camp sites.

For the purposes of this EMPr, 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 appurtenant works on the project (e.g. for the provision of protection beams). 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.

4.0 LEGAL REQUIREMENTS

4.1 General

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

4.2 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) Conservation of Agricultural Resources Act (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.

(ii) The Constitution (Act No. 6 of 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.

(iii) Mineral and Petroleum Resources Development Act (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 (NEMA), (Act No. 107 of 1998)

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 (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 (Act No. 10 of 2004)

This act makes provisions to accomplish the objectives of the United Nations' Convention on Biological Diversity. The Employer 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 the Employer may be directed to remedy harm caused by listed invasive species.

(vii) National Environmental Management: Protected Areas Act (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 (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 (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 (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 (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.

5.0 ADMINISTRATION OF ENVIRONMENTAL OBLIGATIONS

Copies of this EMPr 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 EMPr 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.

5.1 The Employer

The Employer is the holder of authorisations issued by the relevant environmental regulating authorities responsible for authorising and enforcing environmental compliance. The Employer and anyone acting on the Employer's behalf is accountable for the potential impacts of the activities that are undertaken and is responsible for managing these impacts.

5.2 The Engineer

The engineer has been appointed by, and acts for, the Employer as its on-site implementing agent and carries the responsibility to ensure that the contractor undertakes its construction activities in such a way that the Employer's environmental responsibilities are not compromised.

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 EMPr, the engineer may, after discussion and agreement with the Employer, exercise his powers under the General Conditions of Contract 2015 (GCC 2015) Clause 4.11.2 and instruct replacement of the DEO in writing and with stated reasons.

5.3 The Contractor

The contractor is responsible for project delivery in accordance with the prescribed specifications, among which this EMPr shall be included.

The contractor shall receive and implement any instruction issued by the engineer relating to compliance with the EMPr 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.

5.4 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 EMPr 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.

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 EMPr. 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 EMPr the DEO shall also provide full cooperation whenever the contractor is subjected to regular environmental audits.

5.5 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 implementation of this EMPr and the EMPr as may be determined by the sensitivity of the project or by conditions of authorisations. These are 'internal' audits and the regularity determined by the environmental approvals, usually once a month. Other ad hoc or 'external' audits ordered by the Employer may be conducted by other environmental specialists.

6.0 TRAINING

6.1 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 shall have been given an induction presentation on environmental awareness. Where possible, the presentation needs to be conducted in the language of the employees.

6.2 Content

Apart from induction 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 and risks, 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 and with the requirement of the Employer's environmental management systems, including emergency preparedness and response requirements; and
- (iv) The environmental benefits of improved personal performance.

6.3 Induction

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.

7.0 IMPACT MANAGEMENT

7.1 ASPECTS CAUSING IMPACTS

The aspects associated with the project causing the impacts were identified in the BAR as the following:

Table 1: ASPECTS AND IMPACTS ASSOCIATED WITH ROAD CONSTRUCTION

PLANNING AND DESIGN PHASE	
Aspect	Impact
Placement and access of construction site camp area.	Change in land use
Designs of bridges and culverts.	Change in flow regime and/or reduction in downstream availability
Relocation of services	Disruption of services
Land acquisition	Loss of land &/or livelihood; change in land use;
Pre-CONSTRUCTION AND CONSTRUCTION PHASE	
Site clearing; earthworks; layer-works; seal works	Change in landform; impact on heritage resources; noise; soil erosion; air pollution, possible impact on mammals and snakes in road reserve, invasion of exotic species, Hydrocarbon spillage Emission from heavy vehicles
Erection of site camp area	Sewage pollution; change in landform; impact on heritage resources; noise; soil erosion; air pollution, possible impact on mammals and snakes in road reserve, invasion of exotic species
Waste generation/storage	Water pollution; nuisance; visual impact
Water use and stormwater discharge	Change in flow regime and/or reduction in downstream availability; soil erosion: water pollution
Vehicle use and maintenance	Hydrocarbon spillage Air pollution (Emission from heavy vehicles) Noise
Chemical/fuel storage	Water/air/soil pollution; health impacts; accidents e.g. slips, fire,

River bridges; installing drainage structures	Water pollution; impact on river flows; noise
OPERATIONAL PHASE (MAINTENANCE PHASE)	
Inadequate maintenance of road reserve	Possible increase in alien vegetation; Possible erosion of slopes.
DECOMMISSIONING AND CLOSURE PHASE	
Inadequate rehabilitation	Compaction of soil, erosion of slopes, increase in alien vegetation, natural vegetation not established.

7.2 DESCRIPTION OF IMPACT MANAGEMENT OBJECTIVES

(a) 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 and shall 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 the 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.

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.

(b) 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.

(c) Water use and control

The contractor's use of water shall take into consideration that it is a scarce commodity, and shall be optimised. Where applicable, 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, no work on stream deviations or diversions can commence without written approval from DWS.

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 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 a 1:5 year severity.

The contractor shall submit to the engineer the results of monthly testing of water samples taken above and below the site of new culvert or bridge construction. No taking-over can be authorised until the water quality is shown to be at pre-construction levels or better.

(d) Vegetation and Alien 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. CARA-listed category 1 and 2 alien species will be removed and replaced with the planting of specified indigenous species.

(e) 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. Dust will be monitored monthly and records kept on site. Internal roads will be watered. All heavy vehicles, excavators and generators used during the construction will be in good working condition and will be serviced regularly.

(f) 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 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.

Vehicles must be driven at a moderate speed (40 kph) on private roads and (25 kph) on site. Noise generated from the heavy vehicles on the project shall only be carried out during normal working hours.

Extended working hours will be in accordance with emergency projects only.

The contractor shall be obligated to maintain vehicles used at the project in a good condition; The contractor will be obliged to ensure that all personnel on site apply occupational health and safety requirements with respect to hearing protection.

(g) 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.

Table 2: Impact Management Objectives

NAME OF ACTIVITY/ASPECT CAUSING IMPACT	POTENTIAL IMPACT	PHASE In which impact is anticipated (e.g. Construction, commissioning, operational Decommissioning, closure, post-closure)	SIGNIFICANCE if not mitigated	MITIGATION TYPE (modify, remedy, control, or stop) through (e.g. noise control measures, storm-water control, dust control, rehabilitation, design measures, blasting controls, avoidance, relocation, alternative activity etc. etc. E.g. Modify through alternative method. Control through noise control through management and monitoring through rehabilitation.	SIGNIFICANCE if mitigated
Placement and access of construction camp site	Change of land use Landowners, Workers Terrestrial ecology and water	Pre-Construction phase	Medium	Control through: -Land acquisition from landowner; - Appropriate housing for workers; - Placing campsite in previously disturbed areas away from watercourses.	Low
Design of bridges and culverts	Design not adequate for water crossing	Pre-Construction phase	High	Modify through proper engineering design for watercourse crossing	Low
Relocation of services	Disruption of services	Pre-construction	Medium	Control through proper proceedings when relocating services	Low
Land acquisition	- Loss of land/livelihood	Pre-construction	High	-Remedy through proper land acquisition and compensation	Medium

	- change in land use			procedure	
Site clearing, Vegetation Stripping, earthworks, erection of site camp	<ul style="list-style-type: none"> - Dust - Impact on heritage resources; - noise; - soil erosion; - air pollution, - possible impact on mammals and snakes in road reserve, - invasion of exotic species, - Hydrocarbon spillage - Emission from heavy vehicles 	Construction phase	Medium	<ul style="list-style-type: none"> - Control through dust suppression - Control measures to prevent soil erosion - Control through noise control measures - Control measures to lower visual intrusion - Control measures to lower impacts on terrestrial ecology - Control measures for uncovering of graves or artefacts - Control measures for eradication of exotic species - Control measures for hydrocarbon spillage - Control measures to lower emissions from heavy vehicles 	Low
Waste Generation	<ul style="list-style-type: none"> - Water Pollution - Nuisance - Visual impact 	Construction phase, Decommissioning, Closure phase	Medium	<ul style="list-style-type: none"> - Control measures to prevent water pollution - Control measures to prevent any nuisance - Control measures to lower visual intrusion 	Low
Water use and stormwater discharge	<ul style="list-style-type: none"> - Change in flow regime and/or reduction in downstream 	Construction phase Operational Phase Decommissioning Closure phase	Medium	<ul style="list-style-type: none"> - Control measures recommended by Specialist to be implemented - Control measures to prevent soil erosion 	Low

	availability; - soil erosion - water pollution				
Vehicle use and maintenance	- Hydrocarbon spillage - Air pollution (Emission from heavy vehicles) - Noise	Construction phase Operational Phase Decommissioning Closure	Medium	- Control through noise control measures - Control measures for hydrocarbon spillage - Control measures to lower emissions from heavy vehicles	Low
Chemical/fuel storage	- Water/air/soil pollution - health impacts - accidents e.g. slips, fire, - Contamination of site due to hydrocarbon spillage	Construction phase Operational Phase Decommissioning Closure	Medium	- Control measures for hydrocarbon spillage - Control measures for water, air, soil pollution - Control measures for emergency preparedness and response	Low
River bridges, installing or widening of culverts	- Water pollution - Impact on river flows; - Noise	Construction phase Operational Phase	Medium	- Control measures recommended by Specialist to be implemented - Control measures to prevent noise pollution	Low
Inadequate maintenance of road reserve	- Possible increase in alien vegetation - Possible erosion of slopes - Culverts not maintained	Maintenance phase	Medium	- Monitoring through removal of alien vegetation - Monitoring measures to prevent soil erosion - Monitoring measures to prevent culverts from blocking	Low
Inadequate rehabilitation	- Compaction of soil - Erosion of Slopes - Increase in alien	Decommissioning and closure phase	Medium	Monitoring measures for proper rehabilitation of area following construction	Low

	vegetation -Natural vegetation not established				
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7.3 IMPACT MANAGEMENT OUTCOMES

Please find a description of the Impact Management Outcomes in table 3.

Table 3: Impact Management Outcomes

ACTIVITY/ASPECTS	POTENTIAL IMPACT	PHASE In which impact is anticipated (e.g. Construction, commissioning, operational Decommissioning, closure, post-closure)	MITIGATION TYPE (modify, remedy, control, or stop) E.g. <ul style="list-style-type: none"> • Modify through alternative method. • Control through noise control • Control through management and monitoring • Remedy through rehabilitation. 	STANDARD TO BE ACHIEVED (Impact avoided, noise levels, dust levels, rehabilitation standards, end use objectives)
Placement and access of construction camp site	Change of land use Landowners, Workers Terrestrial ecology and water	Pre-Construction phase	Control through: -Land acquisition from landowner; - Appropriate housing for workers; - Placing campsite in previously disturbed areas away from watercourses.	- Land owners appropriately compensated - Workers in appropriate housing - Watercourses not disturbed or polluted.
Design of bridges and culverts	Design not adequate for water crossing	Pre-Construction phase	Modify through proper engineering design for watercourse crossing	- Proper engineering designs for watercourse crossings
Relocation of services	Disruption of services	Pre-construction	Control through proper proceedings	-Relocating services without

			when relocating services	disruption to the public
Land acquisition	<ul style="list-style-type: none"> - Loss of land/livelihood - change in land use 	Pre-construction	<ul style="list-style-type: none"> -Remedy through proper land acquisition and compensation procedure 	<ul style="list-style-type: none"> - Land owners appropriately compensated through land acquisition process
Site clearing, Vegetation Stripping, earthworks, erection of site camp	<ul style="list-style-type: none"> - Dust - Impact on heritage resources; - noise; - soil erosion; - air pollution, - possible impact on mammals and snakes in road reserve, - invasion of exotic species, - Hydrocarbon spillage - Emission from heavy vehicles 	Construction phase	<ul style="list-style-type: none"> - Control through dust suppression - Control measures to prevent soil erosion - Control through noise control measures - Control measures to lower visual intrusion - Control measures to lower impacts on terrestrial ecology - Control measures for uncovering of graves or artefacts - Control measures for eradication of exotic species - Control measures for hydrocarbon spillage - Control measures to lower emissions from heavy vehicles 	<ul style="list-style-type: none"> - No dust nuisance or complaints from landowners or public - No soil erosion and complaints from landowners - Noise levels shall be kept to a minimum. The working hours shall be limited to between 07:00 hrs and 18:00 hrs on weekdays, and 07:00 hrs and 17:00 hrs on Saturdays, or as per contract documentation. - Impact to the terrestrial ecology low. Mitigation measures as per specialist study complied with - All alien vegetation eradicated on site - No artefact or grave destroyed - Spillages contained - Low emissions
Waste Generation	<ul style="list-style-type: none"> - Water Pollution - Nuisance - Visual impact 	Construction phase, Decommissioning, Closure phase	<ul style="list-style-type: none"> - Control measures to prevent water pollution - Control measures to prevent any nuisance - Control measures to lower visual 	<ul style="list-style-type: none"> - Impact on watercourses low. Mitigation measures as per specialist study complied with. - No nuisance on site

			intrusion	- No complaints from public regarding visual intrusions.
Water use and stormwater discharge	- Change in flow regime and/or reduction in downstream availability; - soil erosion - water pollution	Construction phase Operational Phase Decommissioning Closure phase	- Control measures recommended by Specialist to be implemented - Control measures to prevent soil erosion	- Impact on watercourses low. Mitigation measures as per specialist study complied with. - No soil erosion on site.
Vehicle use and maintenance	- Hydrocarbon spillage - Air pollution (Emission from heavy vehicles) - Noise	Construction phase Operational Phase Decommissioning Closure	- Control through noise control measures - Control measures for hydrocarbon spillage - Control measures to lower emissions from heavy vehicles	- Noise levels shall be kept to a minimum. The working hours shall be limited to between 07:00 hrs and 18:00 hrs on weekdays, and 07:00 hrs and 17:00 hrs on Saturdays, or as per contract documentation. - Impact to the terrestrial - Spillages contained - Low emissions
Chemical/fuel storage	- Water/air/soil pollution - health impacts - accidents e.g. slips, fire, - Contamination of site due to hydrocarbon spillage	Construction phase Operational Phase Decommissioning Closure	- Control measures for hydrocarbon spillage - Control measures for water, air, soil pollution - Control measures for emergency preparedness and response	- No dust nuisance or complaints from landowners or public - No soil erosion and complaints from landowners - Noise levels shall be kept to a minimum. The working hours shall be limited to between 07:00 hrs and 18:00 hrs on weekdays, and 07:00 hrs and 17:00 hrs on Saturdays, or as per contract documentation.

				<ul style="list-style-type: none"> - Impact to the terrestrial ecology low. Mitigation measures as per specialist study complied with - Spillages contained - Low emissions - Emergency preparedness and response plan in place
River bridges, installing or widening of culverts	<ul style="list-style-type: none"> - Water pollution - Impact on river flows; - Noise 	Construction phase Operational Phase	<ul style="list-style-type: none"> - Control measures recommended by Specialist to be implemented - Control measures to prevent noise pollution 	<ul style="list-style-type: none"> - Impact to the watercourses low. Mitigation measures as per specialist study complied with - Noise levels shall be kept to a minimum. The working hours shall be limited to between 07:00 hrs and 18:00 hrs on weekdays, and 07:00 hrs and 17:00 hrs on Saturdays, or as per contract documentation.
Inadequate maintenance of road reserve	<ul style="list-style-type: none"> - Possible increase in alien vegetation - Possible erosion of slopes - Culverts not maintained 	Maintenance phase	<ul style="list-style-type: none"> - Monitoring through removal of alien vegetation - Monitoring measures to prevent soil erosion - Monitoring measures to prevent culverts from blocking 	<ul style="list-style-type: none"> - All alien vegetation eradicated on site - No soil erosion on site - Culvers regularly checked and cleaned
Inadequate rehabilitation	<ul style="list-style-type: none"> - Compaction of soil - Erosion of Slopes - Increase in alien vegetation -Natural vegetation 	Decommissioning and closure phase	Monitoring measures for proper rehabilitation of area following construction	- Proper rehabilitation as per EMPr.

	not established			
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8.0 IMPACT MANAGEMENT ACTIONS

8.1 PLANNING AND DESIGN PHASE

The contractor shall undertake “good housekeeping” practices during construction as stated in the COLTO Standard Specifications for Roads and Bridges. This will help avoid disputes on responsibility and allow for the smooth running of the contract as a whole. Good housekeeping extends beyond the wise practice of construction methods that leaves production in a safe state from the ravages of 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.

a) Site Establishment

i) 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 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 32 metres of an identified wetland unless the contractor has applied to DWS and DEA 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.

(ii) 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.

(iii) 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 Environment, 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.

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 application process, removal to an onsite nursery for continuous nurturing and protection and later replanting. The contractor should be alert to this procedure and apply to the engineer to approve it even though no allowance has been made in the contract documents. 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. The contractor's staff shall at no time make fires for purposes of keeping out the cold unless they are contained in purpose-built containers capable of preventing runaway fires if knocked over and the ashes collected and safely and environmentally disposed of on a daily basis.

iv) 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.

v) 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.

8.2. CONSTRUCTION PHASE

a) 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.

b) 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.

i) Solid waste

Solid waste shall be stored in an appointed area in covered, tip-proof metal drums or similar container for collection and disposal. 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.

ii) Litter

No littering by construction workers shall be allowed and any locality where motorists are encouraged or forced to stop shall be effectively controlled for litter collection. 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. Measures shall be taken to reduce the potential for litter and negligent behaviour with regard to the disposal of all refuse. At all places of work the contractor shall provide litter collection facilities for later safe disposal at approved sites.

Particular emphasis on litter control measures shall apply at stop/go facilities.

iii) Hazardous waste

Hazardous waste such as oils shall be disposed of at an 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.

iv) 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.

c) Control at the workshop

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

i) Hazardous Material Storage

The transportation of hazardous substances will occur in terms of the contract documentation and SANS 102333. 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.

ii) 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. All fuel shall be stored in a secure area in steel tanks supplied and maintained by the fuel suppliers. 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.

iv) 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.

d) Soil management

i) 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 of topsoil if they are to be left for longer than 6 months, shall be analysed, and if necessary, upgraded before replacement. 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.

ii) 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.

iii) Soil erosion

Whilst in stockpile it shall be maintained free from erosion and weed infestation in the same way as for topsoil stockpile maintenance.

- Bank vegetation should not be removed, if possible, and cover should be monitored to ensure that sufficient vegetation is present to bind the bankside soils and prevent bankside erosion.
- Potential erosion areas to be inspected and corrected where necessary.
- Water used for dust suppression must be used in quantities small enough not to generate run-off and result in soil erosion;
- Other acceptable stabilising methods could also be incorporated as per the Engineer's instructions.

e) Visual

- Keep the site neat, clean and organised (i.e. no littering) in order to portray a tidy appearance.
- In visually sensitive areas screen these areas by enclosing the entire area with a dark green or black shade cloth of no less than 2 m height.
- Rehabilitate disturbed areas as soon as practically possible after construction. This should be done to restrict extended periods of exposed soil.

f) Earthworks and Layer Works

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 EMPr. In addition, the contractor shall take cognisance of the requirements set out below.

g) 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, a Basic Assessment or EIA is required (depending on the size of the mining area) for the establishment, operation and closure of the quarry or borrow pit. It is the responsibility of the contractor to ensure that he is in possession of the authorisation issued by the DMR or a copy thereof, 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 these specifications the former shall apply. The cost of complying with the requirements shall be deemed to be included in existing rates in the Pricing Schedule.

ii) 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 the number of personnel and plant to be used and the 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 from rainfall overnight or over periods when there is no construction activity.

iii) 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 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 hazardous or toxic wastes shall be prohibited unless special measures are taken to prevent leaching of the toxins into the surrounding environment. Such special measures shall require the approval of the relevant

provincial or national authority. The same shall apply for the disposal of solid waste generated from the various camp establishments. The engineer will assist the contractor in obtaining the necessary approval if requested by the contractor.

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 and an engineer's certificate certifying slope stability.

iv) 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, together with the contractor's proposed measures for prevention of environmental damage, containment and subsequent rehabilitation.

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 the relevant national authority 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 detritus of 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.

In all cases, 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.

v) 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. In addition, the contractor shall, prior to any drilling of holes in preparation for blasting, supply the engineer with a risk assessment and locality plan of the blast site on which shall be shown the zones of influence of the ground and air shock-waves and expected limits of fly-rock. The plan shall show each dwelling, structure and service within the zones of influence and record the existing positions and conditions of the dwellings/structures/services including, lengths and widths of cracks, as well as the condition of doors, windows, roofing, wells, boreholes etc. The contractor, alone, shall be responsible for any costs that can be attributed to blasting activities, including the collection of fly-rock

from adjacent lands and fields. The submission of such a plan shall not in any way absolve the contractor from his responsibilities in this regard. The contractor shall also indicate to the engineer the manner in which he intends to notify the adjacent communities and/or road users the times and delays to be expected for each individual blast.

h) On site plant

i) 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 C1007(g)(i) 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 national authority, as shall approval of closure. The engineer will assist the contractor in his submissions 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.

The contractor shall invite the relevant department to inspect the site within 2 months after any plant is commissioned and at regular intervals thereafter, not exceeding 12 months apart.

ii) Asphalt Plant

All legislation pertaining to asphalt plants need to be adhered to. Operation of the plant shall conform to the same requirements as for a crushing plant or concrete batching plant under C1007(h)(i) above.

9.0 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, 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.

a) Heritage 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.

If a grave or midden is uncovered on site, or discovered before the commencement of work, 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.

10.0 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, the employer 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 Mineral 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.

11.0 MONITORING AND RECORD KEEPING

11.1 Monitoring

Dust monitoring will be done daily by the DEO.

b. Inspections

On-going visual inspections will be conducted daily by the DEO. The DEO will spend the bulk of his/her time on site on the lookout for any unsafe acts and activities that transgress the requirements as specified in the EMP to define what action shall be taken to rectify the problem and prevent its reoccurrence.

c. External Audits

External audits will be conducted by an external auditor appointed by the applicant. The external auditor will conduct an in-depth audit so ascertain compliance with the EMP as well as the conditions of the environmental authorisation.

d. Incident Reporting and Remedy

If a leakage or spillage of hazardous substances occurs as a result of activities of the Contractor or other users, the local emergency services will be immediately notified of the incident. The following information must be provided:

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

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

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 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 any authorisations or EMPs (including those for specific borrow pits or quarries used on the project) shall be kept on site and made available for inspection by visiting officials from the employer, relevant environmental departments or internal/external auditors.

Table 4: Monitoring Programme

ISSUE	FREQUENCIES OF MONITORING	RESPONSIBLE BODY/PERSON
AQUATIC		
Protection of riparian vegetation	Daily	Contractor and DEO
Contamination with oils	Daily	Contractor and DEO
Storm water Management.	Weekly in rainy season	Contractor and DEO
Proper functioning of sanitation systems.	Weekly	Contractor and DEO
SOIL		
Surface or gully erosion on site.	Weekly in rainy season	Contractor and DEO
Soil contamination with oils, petrol, paraffin and diesel.	Daily	Contractor and DEO
Monitoring of topsoil to ensure it does not get contaminated with imported materials or subsoil	Monthly	Contractor and DEO
AIR		
Emissions Control	Daily inspection	Contractor and DEO
Control of domestic fires.	Daily inspection	Contractor and DEO
Heavy vehicle emission control.	Monthly	Contractor and DEO

ISSUE	FREQUENCIES OF MONITORING	RESPONSIBLE BODY/PERSON
Dust control– wetting when required.	Daily inspection	Contractor and DEO
NOISE		
Noise and vibration control	Daily inspection	Contractor and DEO
VISUAL		
Visual impacts	Monthly	Contractor and DEO
WASTE		
Efficiency of domestic waste collection i.e. number of collection bins and placement and removal by the municipality or contractor.	Daily	Contractor and DEO
Prevention of burning of solid/liquid wastes on site.	Daily	Contractor and DEO
Proper collection, containment and removal of liquid wastes (petroleum, oils & cooking oils)	Daily	Contractor and DEO
The recycling and/or disposal thereof.	Two weekly	Contractor and DEO
The collection and disposal of construction waste (concrete, steel, industrial waste).	Monthly	Contractor and DEO
WEED AND ALIEN VEGETATION CONTROL	Monthly	Contractor and DEO
Monitoring of vegetation establishment.	Monthly	Contractor and DEO
SOCIAL		Contractor and DEO
Inspect overall appearances of site. (cleanliness & housekeeping)	Weekly	Contractor and DEO
Traffic	Daily	Contractor and DEO
Employment	Monthly	Contractor and DEO
Disruption of services	Daily	Contractor and DEO

12.0 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 agreed procedures of the EMPr and this EMPr is a transgression of the various statutes and laws that define the manner by which the environment is managed and, therefore, any avoidable non-compliance, dependant on severity, may be considered sufficient grounds for contact to be made with relevant provincial or national authorities to invite their sanction.

The engineer's decision with regard to what is considered a violation, its seriousness and the action to be taken against the contractor shall be final. Failure to redress the cause shall be reported to the relevant authority. The responsible provincial or national authority may ensure compliance and impose penalties relevant to the transgression as allowed within statutory powers.

13.0 PROJECT SPECIFIC CONDITIONS

The following mitigating and management measures are recommended. It is important that these measures are implemented and monitored in an effort to reduce the negative impacts on the water environment. The implementation of recommended mitigating measures is necessary if the conclusions and assessments are to remain unchanged.

13.1 Terrestrial Ecological and Aquatic Assessment

The following recommendation and mitigation measures are should be complied with:

- Providing the contractor with a clear set of requirements, to be included in the contractor's works agreement, for the management of activities within the watercourse, protecting the watercourse, and rehabilitating the watercourse,
- No stockpiling of materials and the construction of temporary campsites, field offices, etc. in the watercourses, or within 50m of the edge of any watercourse, including seasonal drainage lines.
- Although no buffer zones have been delineated. A buffer zone (no-go zone) of 32m from the edge of all watercourses must be observed at all times outside of the actual site area / work area involved at the crossing. In other words, upstream and downstream, outside of the work footprint including access path, no activities may take place within 32 metres of the edge of that watercourse. These activities include, but are not limited to, parking of vehicles, stockpiling of materials and equipment, placement of portable toilets, lunchtime / break areas, etc.
- Limiting the use of detours through the watercourses. Only existing roads for access to be used. No new (even temporary) access roads may be constructed across any watercourses as this can trigger the need for a Water Use Licence Application (WULA) process.
- Limiting the clearing of vegetation and topsoil, and
- Limiting the clearing into and the stockpiling of these materials onto areas that do NOT need to be disturbed. This can be done by proper planning of the site layout. The careful clearing of areas that need to be cleared. The careful removal and stockpiling of material.
- An independent specialist must conduct aquatic monitoring of all watercourses during the construction phase of the project. The monitoring does not need to be a full-blown SASS5 (macro-invertebrate monitoring) protocol. The monitoring must include general observation of erosion, siltation, spillage and activities within watercourses and 32m buffer zones. If any serious or problematic direct project related impacts are observed on watercourses then water samples can be taken both upstream and downstream to determine the impacts.
- Any temporary storage, lay-down areas or accommodation facilities to be setup in existing built-up areas or disturbed areas where possible.
- Ensure small footprint during construction phase.
- Proposed buffer areas (no-go zones) along the watercourse must be implemented and strictly controlled.
- Regulated area to be strictly controlled in terms of development and movement of people and vehicles in and through it. Only low levels of development allowed.
- All hazardous materials must be stored appropriately to prevent these contaminants from entering the water environment;
- All excess materials brought onto site for construction to be removed after construction.
- No open trenches or mounds of soils to be left.
- Rehabilitation plan for disturbed areas to be compiled and implemented as part of the construction phase.
- No construction vehicles may drive through any watercourses. Existing roads to be used.
- No concrete or mounds of building sand may be stored temporary during the construction phase within 100 m of the delineated watercourses.

- If possible, only existing access roads may be used to and from construction site (study area).
- Temporary access roads to be rehabilitated after the construction phase.
- Any priority species encountered must be identified and rescue prior to any excavation or construction activities.
- Care must be taken not to interact directly with any wild life encountered.
- Any bird nests encountered in the vegetation or in the watercourses must not be interfered with. If encountered must first be discussed with specialist.
- Care must be taken with heavy machinery used on the project. All access roads and farm roads used must be monitored and maintained.
- Soils and stones excavated may be used in the immediate vicinity and farms as backfill, fixing of roads, filling of dongas, etc.
- Excavated soils and rocks may not be simply dumped in any pristine bushveld, or within 100 m of the edge of watercourses or dams.

13.2 Heritage Report

- The existing heritage features in close proximity of the alignment that were identified in the heritage report must not be disturbed during construction.
- Should archaeological sites or graves be exposed during construction work, it must immediately be reported to a heritage practitioner so that an investigation and evaluation of the finds can be made.

13.3 Palaeontological Report

- Threats to the National Heritage are earth moving equipment/machinery (for example haul trucks, front end loaders, excavators, graders, dozers) during construction, the sealing-in, disturbance, damage or destruction of the fossils by development, vehicle traffic, clearing, and human disturbance.
- Special care must be taken during the clearing, digging, drilling, blasting and excavating of foundations, trenches, channels and footings and removal of overburden not to intrude fossiliferous layers.

CURRICULUM VITAE

DR J BOTHMA

PERSONAL DETAILS

Surname: Bothma
Name: Josephine (Jenine)
Date of Birth: 15 September 1967
Id number: 670915 0116 085
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Language Proficiency: English – Excellent (read, write, speak)
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ACADEMIC QUALIFICATIONS

2002 - **Ph.D in Environmental Management** - University of the Free State
Thesis: The Development of an Environmental Management System for the South African National Roads Agency Limited based on the ISO 14001 Environmental Management System Standard

1997 - **Masters' Degree in Environmental Management** - University of the Orange Free State, RSA
Thesis: "Preliminary National Profile to Assess the National Infrastructure for Management of Chemicals in South Africa"

1988 - BSc University of Pretoria, RSA

CERTIFICATION AS ENVIRONMENTAL ASSESSMENT PRACTITIONER

Dr Bothma is certified as an Environmental Assessment Practitioner with the Environmental Assessment Practitioners Association of South Africa (Registered EAP number: 2019/246).

Additional Courses Completed

Dr Bothma completed the Foundation Course in Environmental Auditing and achieved 90% in the examination. This is an internationally recognised Institute of Environmental Management and Assessment (IEMA) approved course.

PROFESSIONAL EXPERIENCE

Since August 2007

Formed an environmental consulting company called Chameleon Environmental with Mr Paul Bothma. Chameleon Environmental is a specialist environmental consulting company. The company provides a broad range of environmental consulting services to the public and private sectors i.e Environmental Impact Assessments, Basic Assessments, Environmental Management Plans (EMPs) and Environmental Management Programme Reports (EMPRs) for quarries and borrow pits, permitting requirements and public participation. Chameleon Environmental recognises that development needs to proceed in an environmentally sustainable manner. The company aims to provide practical environmental solutions and professional environmental consulting services in order to contribute to the goal of sustainable development in Southern Africa.

January 2006 to August 2007

Formed an environmental consulting company called Enviro-Namic Environmental Consultants with Etienne van der Lith.

1999 to 2005

In 1999 she was appointed as Environmental Manager for the South African National Roads Agency Limited (SANRAL) and is responsible for all environmental matters in the Agency in respect of specific regulatory norms and standards set out by the State.

She was responsible for the management of the total Environmental Management discipline within the South African National Roads Agency Limited (SANRAL).

1989 - 1997

After graduation in 1988, Dr Bothma worked as an Environmental Officer in the Subdirectorate: Hazardous Materials with the national Department of Environmental Affairs and Tourism (DEAT) until 1997 and consequently has acquired extensive skills and exposure relevant to the management and organisation of government departments. She also gained experience regarding the management of hazardous materials and -waste in South Africa including the transportation of hazardous materials and -waste.

As part of the Subdirectorate: Hazardous Materials at the Department of Environmental Affairs and Tourism, Dr Bothma was responsible for compilation of policies and legislation on all aspects regarding the management of hazardous materials and -waste and the distribution of updated information to the private sector in South Africa.

Other:

- Dr Bothma was the South African representative on the World Road Association's (PIARC) Technical Committee 2.1: Sustainable development and road transport.
- Delivered a paper at the International Bridge, Tunnel and Turnpike Association's annual international conference in Spain in 2000 on public involvement as part of the Environmental Impact Assessment process.
- Delivered a paper at International Association for Impact Assessment's Annual Conference in Canada in April 2004 on how development needs were balanced with the needs of the environment to preserve biological diversity (prevent the extinction of the endangered minnow).
- Dr Bothma assisted the Geography Department at Vista University from 1989 to 1999 with external marking of papers.

Appendix 2: Sensitivity Map

