THE PROPOSED UPGRADE OF DIVISIONAL ROAD (DR) 1400 FROM KM 8.20 - KM 10.21, NUY STATION, WESTERN CAPE.

FINAL ENVIRONMENTAL MANAGEMENT PROGRAMME

DEA&DP Ref : 16/3/3/1/B2/32/1010/22

(INCLUDING THE WASTE, WATER USE AND ELECTRICITY CONSUMPTION MINIMIZATION AND MANAGMENT PLAN)

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Date: 27 May 2022

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ABREVIATIONS

DEA&DP ..... Department of Environmental Affairs and Development Planning
DEAT ..... Department of Environmental Affairs and Tourism
DWS..... Department of Water and Sanitation
EA .....Environmental Authorisation
EAP..... Environmental Assessment Practitioner
ECO ..... Environmental Control Officer
EIA ..... Environmental Impact Assessment
EMPr ..... Environmental Management Programme
EO.....Environmental Officer
ER ..... Employer's Representative
ESO .....Environmental Site Officer
GNEC.....Guillaume Nel Environmental Consulting
I&AP..... Interested and Affected Parties

DEFINITIONS

Alien species - Plants and animals which do not arrive naturally in an area - they are brought in by humans. Alien plants often force indigenous species out of the area. Rooikrans is a good example of alien species in the Cape.

Alternative - A possible course of action, in place of another, that would meet the same purpose and need defined by the development proposal. Alternatives considered in the EIA process can include location and/or routing alternatives, layout alternatives, process and/or design alternatives, scheduling alternatives or input alternatives.

Aspect – Element of an organisation's activities, products or services that can interact with the environment.

Auditing - A systematic, documented, periodic and objective evaluation of how well the environmental management programmme is performing with the aim of helping to safeguard the environment by: facilitating management control which would include meeting regulatory requirements. Results of the audit help the organisation to improve its environmental policies and management systems.

Biodiversity - The rich variety of plants and animals that live in their own environment. Fynbos is a good example of rich biodiversity in the Cape.

Built environment - Physical surroundings created by human activity, e.g. buildings, houses, roads, bridges and harbours.

Conservation - Protecting, using and saving resources wisely, especially the biodiversity found in an area.

Contamination - Polluting or making something impure.

Corrective (or remedial) action - Response required to address an environmental problem that is in conflict with the requirements of the EMPr. The need for corrective action may be determined through monitoring, audits or management review.

Degradation - The lowering of the quality of the environment through human activities, e.g. river degradation, soil degradation.

Ecology - The scientific study of the relationship between living things (animals, plants and humans) and their environment.

Ecosystem - The relationship and interaction between plants, animals and the non-living environment.

Environment - Our surroundings, including living and non-living elements, e.g. land, soil, plants, animals, air, water and humans. The environment also refers to our social and economic surroundings, and our effect on our surroundings.

Environmental Impact Assessment (EIA) - An Environmental Impact Assessment (EIA) refers to the process of identifying, predicting and assessing the potential positive and negative social, economic and biophysical impacts of a proposed development. The EIA includes an evaluation of alternatives; recommendations for appropriate management actions for minimising or avoiding negative impacts and for enhancing positive impacts; as well as proposed monitoring measures.

Environmental Management System (EMS) - Environmental Management Systems (EMS) provide guidance on how to manage the environmental impacts of activities, products and services. They detail the organisational structure, responsibilities, practices, procedures, processes and resources for environmental management. The ISO14001 EMS standard has been developed by the International Standards Organisation.

Environmental policy - Statement of intent and principles in relation to overall environmental performance, providing a framework for the setting of objectives and targets.

Fynbos - Low-growing and evergreen vegetation found only in the south Western Cape. Fynbos is known for its rich biodiversity.

Habitat - The physical environment that is home to plants and animals in an area, and where they live, feed and reproduce.

Hazardous waste – Waste, even in small amounts, that can cause damage to plants, animals, their habitat and the well-being of human beings, e.g. waste from factories, detergents, pesticides, hydrocarbons, etc.

Impact - A description of the potential effect or consequence of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.

Indigenous species - Plants and animals that are naturally found in an area.

Infrastructure - The network of facilities and services that are needed for economic activities, e.g. roads, electricity, water, sewerage.

Integrated - Mixing or combining all useful information and factors into a joint or unified whole. See Integrated Environmental Management.

Integrated Environmental Management (IEM) - A way of managing the environment by including environmental factors in all stages of development. This includes thinking about physical, social, cultural and economic factors and consulting with all the people affected by the proposed developments. Also called "IEM".

Land use - The use of land for human activities, e.g. residential, commercial, industrial use.

Mitigation - Measures designed to avoid, reduce or remedy adverse impacts

Natural environment - Our physical surroundings, including plants and animals, when they are unspoiled by human activities.

Over-utilisation - Over-using resources - this affects their future use and the environment.

Policy - A set of aims, guidelines and procedures to help you make decisions and manage an organisation or structure. Policies are based on people's values and goals. See Integrated Metropolitan Environmental Policy.

Process - Development usually happens through a process - a number of planned steps or stages.

Proponent – Developer. Entity which applies for environmental approval and is ultimately accountable for compliance to conditions stipulated in the Environmental authorisation (EA) and requirements of the EMPr.

Recycling - Collecting, cleaning and re-using materials.

Resources - Parts of our natural environment that we use and protect, e.g. land, forests, water, wildlife, and minerals.

Scoping Report - A report presenting the findings of the scoping phase of the EIA. This report is primarily aimed at reaching closure on the issues and alternatives to be addressed in the EIA (in the case of a full EIA process).

Stakeholders - A subgroup of the public whose interests may be positively or negatively affected by a proposal or activity and/or who are concerned with a proposal or activity and its consequences. The term includes the proponent, authorities and all interested and affected parties.

Storm water management – Strategies implemented to control the surface flow of storm water such that erosion, sedimentation and pollution of surface and ground water resources in the immediate and surrounding environments are mitigated. This is specifically important during the construction and decommissioning phases of a project.

Sustainable development - Development that is planned to meet the needs of present and future generations, e.g. the need for basic environmental, social and economic services. Sustainable development includes using and maintaining resources responsibly.

Sustainability - Being able to meet the needs of present and future resources.

Waste Management – Classifying, recycling, treatment and disposal of waste generated during construction and decommissioning activities.

Wetlands - An area of land with water mostly at or near the surface, resulting in a waterlogged habitat containing characteristic vegetation species and soil types e.g. vleis, swamps.

Zoning - The control of land use by only allowing specific type development in fixed areas or zones

REFERENCES

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Lochner, P. 2005.Guideline for Environmental Management Plans. CSIR Report No ENV-S-C 2005-053 H. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

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SECTION 1 - INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION AND BACKGROUND

The Western Cape Government: Department of Transport and Public Works, as proponent of the proposed upgrade will use this Planning, Construction and Operational Phase Environmental Management Programme (EMPr) as a tool in managing the impacts of the Upgrading of DR1400, after environmental approval from the Department of Environmental Affairs and Development Planning (DEA&DP) in terms of the **NEW** Environmental Impact Assessment Regulations (GN R. No. 983, GN R. No. 984 and GN R. No. 985 [4 December 2014, as amended 07 April 2017]) under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), is obtained.

This document is based on the EMPr Guideline provided by DEA&DP which was compiled in accordance with the Integrated Environmental Management (IEM) philosophy which aims to achieve a desirable balance between conservation and development (DEAT, 1992). IEM is a key instrument of the National Environmental Management Act [NEMA] (Act No. 107 of 1998). NEMA promotes the integrated environmental management of activities that may have a significant effect on the environment, while IEM prescribes a methodology for ensuring that environmental management principles are fully integrated into all stages of the development process. It advocates the use of several environmental and management tools that are appropriate for the various levels of decision-making. One such tool is an Environmental Management Programme (EMPr).

The IEM guidelines intend encouraging a pro-active approach to sourcing, collating and presenting information in a manner that can be interpreted at all levels. The basic principles underpinning IEM are that there be:

- informed decision-making;
- accountability for information on which decisions are taken;
- accountability for decisions taken;
- a broad meaning given to the term environment (i.e. one that includes physical, biological, social, economic, cultural, historical and political components);
- an open, participatory approach in the planning of proposals;
- consultation with interested and affected parties;
- due consideration of alternative options;
- an attempt to mitigate negative impacts and enhance positive aspects of proposals;
- an attempt to ensure that the 'social costs' of development proposals (those borne by society, rather than the developers) be outweighed by the 'social benefits' (benefits to society as a results of the actions of the developers);
- democratic regards for individual rights and obligations;

- compliance with these principles during all stages of the planning, implementation and decommissioning of the proposals (i.e. from 'cradle to grave'), and
- The opportunity for public and specialist input in the decision-making process.

These principles are in line with NEMA, which has repealed a number of the provisions of the Environment Conservation Act, 1989 [ECA] (Act No. 73 of 1989), and is focussed primarily on co-operative governance, public participation and sustainable development. The Environmental Impact Assessment Regulations that took effect in July 2006 regulate the procedures and criteria for the submission, processing, consideration and decision on applications for environmental authorisation of listed activities.

1.2 SCOPE AND TERMS OF REFERENCE

The general principles contained within this document apply to all **PRE-CONSTRUCTION, CONSTRUCTION AND OPERATIONAL** activities.

Principles of this EMPr

This EMPr is compiled using the following concepts and implementation requirements so that the higher principles of sustainable development are realised:

- ***Continuous improvement***. The project proponent (or implementing organisation) must be committed to review and to continually improve environmental management, with the objective of improving overall environmental performance.
- ***Broad level of commitment***. A broad level of commitment will be required from all levels of management as well as the workforce in order for the development and implementation of this EMPr to be successful and effective.
- ***Flexible and responsive***. The implementation of the EMPr must be responsive to new and changing circumstances, i.e. rapid short-term responses to problems or incidents. The EMPr is a dynamic "living" document and thus regular planned review and revision of the EMPr must be carried out.
- ***Integration across operations***. This EMPr is integrated across existing line functions and operational units such as health, safety and environmental departments in a company/project. This is done to change the redundant mindset of seeing environmental management as a single domain unit.
- ***Legislation***. It is understood that any development project during its construction phase is a dynamic activity within a dynamic environment. The Developer, Engineer, Contractor and sub-contractor must therefore be aware that certain activities conducted during construction may require further licensing or environmental approval, e.g. river or stream diversions, bulk fuel storage, waste disposal, etc. The Contractor must consult the ER, EO and ECO on a regular basis in this regard.

SECTION 2 – SITE SPECIFIC INFORMATION

2.1 PROPOSED ACTIVITY AND LOCAL CONTEX

The proposed development site is located within the Breede Valley Municipality area of jurisdiction. The proposed site is currently an existing gravel road. Divisional Road (DR) 1400 spans from the R60 through the Nuy Station until the N1 highway. The road is mainly used for agricultural and tourism purposes. It should be noted that the majority of the road is an existing surfaced road, with a small section (approximately 2 Kilometres) of the road still consisting of gravel.

Guillaume Nel Environmental Consultants (GNEC) has been appointed by the Western Cape Government: Department of Transport and Public Works (applicant) to facilitate the Environmental Impact Assessment (EIA) process in terms of the National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998) EIA Regulations (2014, as amended) for the proposed upgrade of Divisional Road 1400 from Km 8.20 to Km 10.21, Nuy Station, Western Cape (hereafter referred to as the proposed development site).

The gravel road spans though an area primarily used for agricultural activities, with some of the properties also being used for tourism as well as recreation activities. It should be noted that approximately 2 km of the road will be upgraded and therefore this application will focus on Km 8.20 to Km 10.21 as only this section of the road is an existing gravel road. Please refer to Figure 1 for the Locality Map of the proposed development site. It is important to note that the proposed upgrading of the gravel road will remain within the existing registered road reserve. This has been confirmed by the Western Cape Government: Department of Transport and Public Works Road. The reserve/proclaimed width of the roadway is determined according to the Road Ordinance 19/1975 Section 5.

Some of the crops adjacent to the road were not positioned according to the proclaimed road reserve width. Note should therefore be made that a small section of crops will be impacted, however, the proposed development will transpire within the existing road reserve. The entirety of the proposed road upgrade will therefore be located within the statutory 20m road reserve. Therefore, no expropriation will be required.

The existing gravel road be will widened, kindly refer to specifications below:

- Km 8.230 to Km 8.400 - 7.1m (2 x 3.1m lanes + 0.3m shoulder + 0.6m shoulder)
- Km 8.400 to Km 10.207 - 8m (2 x 3.4m lanes + 0.6m shoulder + 0.6m shoulder)

Additionally, as part of the proposed development, new stormwater structures will be constructed as well as the upgrading of existing culverts. These culverts will consist of both access culverts and crossing culverts.

No.	Km	Diameter Size (mm)	No. of culverts	Comments	Type	Coordinates of Culvert
1	8.428	600	1	Access	Pipe	33°38'20.82"S 19°37'49.78"E
2	8.526	600	1	Access	Pipe	33°38'19.25"S 19°37'46.39"E
3	8.745	450	1	Access	Box	33°38'15.81"S 19°37'38.92"E
4	8.810	450	1	Access	Box	33°38'15.06"S 19°37'36.52"E
5	9.136	600	1	Crossing	Pipe	33°38'11.82"S 19°37'24.55"E
6	9.68	600	2	Crossing	Pipe	33°38'09.18"S 19°37'03.84"E
7	9.67	450	1	Access	Box	33°38'09.03"S 19°37'04.44"E
8	10.18	600	1	Access	Pipe	33°37'59.23"S 19°36'49.15"E

At present, there is an existing 450mm culvert at Km 9.136. However, this culvert is completely blocked and effectively not functional. This will be removed and a new 600mm culvert will be placed at Km 9.136. A 2 x 600mm culvert will also be placed at Km 9.68. It should be noted that all access culverts will result in the construction of new structures.

Flow from the upstream reach of one of the episodic drainage lines is intercepted by a borrow pit located upgradient of the DR 1400 which has interrupted/diverted the original flow path of the episodic drainage line. A crossing culvert is therefore proposed at the access point to the borrow pit (at km marker 9.68) where runoff from the episodic drainage line has been noted to pond. The side drains that will be constructed on both the eastern and western edges of the roadway, will serve to also channel runoff into the culvert.

Additionally, the crossing culvert proposed at km marker 9.136 is located downgradient of an episodic drainage line. The proposed culvert will convey surface runoff from the northern catchment area including from the upgradient episodic drainage line to the downgradient areas.

Both of the abovementioned culverts will therefore be located within episodic drainage lines.

The proposed upgrade will result in the road being widened to the North of the existing road. Cut & fill will take place as indicated on the layout.

The proposed upgrade will result in the road being widened to the North of the existing road. Cut & fill will take place as indicated on the layout.

Vegetation

The majority of the site's vegetation is mapped as being Breede Alluvium Renosterveld (FRa1), with a small section also being mapped as Breede Shale Renosterveld (FRs8) (Cape Farm Mapper, 2021).

Breede Alluvium Renosterveld is classified as a Vulnerable vegetation type according to Section 52 of the National Environmental Management: Biodiversity Act (NEMBA) List of Ecosystems that are Threatened and in Need of Protection, 2011.

Breede Shale Renosterveld has been excluded from Section 52 of the NEMBA.

Due to the proposed development site being historically developed as an existing gravel road and due to the surrounding agricultural land use, the proposed development site has been transformed from its natural state.

A botanical assessment was conducted by Capensis Ecological Consulting (Pty) Ltd to confirm if any natural vegetation will be impacted by the proposed development. A site visit was undertaken on the 29th of September 2021.

The report confirmed the presence of two vegetation types, being Breede Alluvium Renosterveld and Breede Shale Renosterveld. According to the National List of Ecosystems that are Threatened and in Need of Protection (Government Gazette, 2011), Breede Alluvium Renosterveld is listed as **Vulnerable**, with Breede Shale Renosterveld being listed as **Least Threatened**.

The vegetation condition found on the proposed development site ranges from Transformed to Highly Degraded. The greater part of the Study area is classified as Degraded to Semi-intact. The areas adjacent to the road have been impacted by traffic and road maintenance.

No species of conservation concern (SCC) were found within the development footprint. One species of conservation concern (SCC) was found adjacent to the proposed development site which is likely to be impacted by the development. This species found is the velvet skeletonfig (Mesembryanthemum varians) and is classified as Vulnerable.

The botanist indicated that most of the impacts would occur during the construction phase since it would involve clearing the vegetation where the road is proposed to be widened. The total area of indigenous vegetation that would be lost is approximately 1.5 ha. The greater part of the vegetation that would be lost is of **medium sensitivity**. The remainder of the areas that would be lost are of **Low or Very low sensitivity**.

All mitigations proposed by the Botanist will be implemented by the proposed upgrade. This will reduce the overall impact to **Low negative**.

If the recommended mitigation measures are implemented, the upgrade of the DR1400 is supported from a botanical perspective.

Freshwater

Freshwater Ecologist Network (FEN) Consulting (Pty) Ltd was appointed to conduct a Freshwater Ecological Assessment of the proposed upgrade of Divisional Road 1400 from Km 8.20 to Km 10.21, Nuy Station, Western Cape. A field assessment was undertaken in September 2021, in order to ground truth, the watercourses mapped with the section of the DR 1400 to be upgrade.

The Department of Water and Sanitation (DWS) Risk Assessment Matrix was applied to determine the significance of the impacts associated with the proposed DR 1400 upgrade activities and mitigation measures are proposed to minimise the potential impacts of the proposed development.

A riparian drainage line was identified traversing the DR 1400 west of the section of road that will be upgraded. This drainage line does however not form part of the section of the road that will be upgraded. Therefore, no upgrade activities will transpire within the riparian drainage line.

Numerous episodic drainage lines (EDL) were identified towards the North and upgradient of the proposed development site. Several artificial impoundments associated with the surrounding agricultural activities were noted within close proximity to the proposed development site. It should be noted that the episodic drainage lines lack in wetland or riparian characteristics.

It was found that an episodic drainage line, flowing from the upgradient catchment area, traverses the proposed development site at Km 9.70 until its intersection with the larger riparian drainage line. The EDL's convey catchment runoff into the downstream riparian drainage line and therefore contribute to the hydrological importance in the landscape and was considered in the risk assessment conducted by the freshwater specialist.

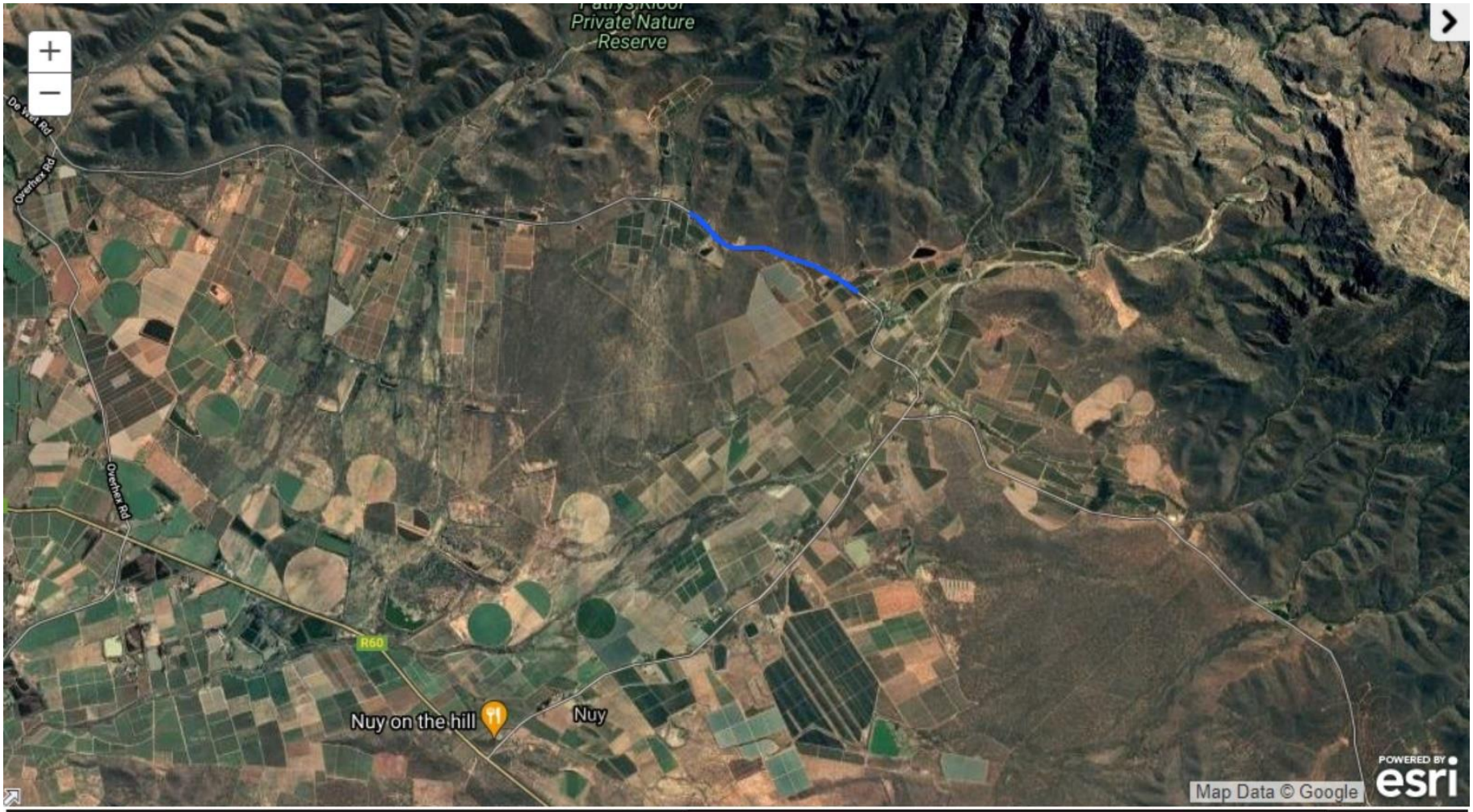
Despite their hydrological functioning, these episodic drainage lines do not meet the definitions of a watercourse from an ecological perspective (as defined by the National Water Act, 1998 (Act No. 36 of 1998)). Recommendation is made that the Breede Gouritz Catchment Management Agency be consulted to ensure agreement of excluding these features from any legislative protection.

It was indicated by Breede Gouritz Catchment Management Agency a Water Use License Application (WULA) in terms of The National Water Act, 1998 (Act No. 36 Of 1998) will be required. A WUL Application has therefore been lodged with BGCMA.

Note should be made that no activities will be undertaken at the existing culvert within the riparian drainage line. The proposed development therefore poses **a low risk** to the riparian drainage line and episodic drainage lines.

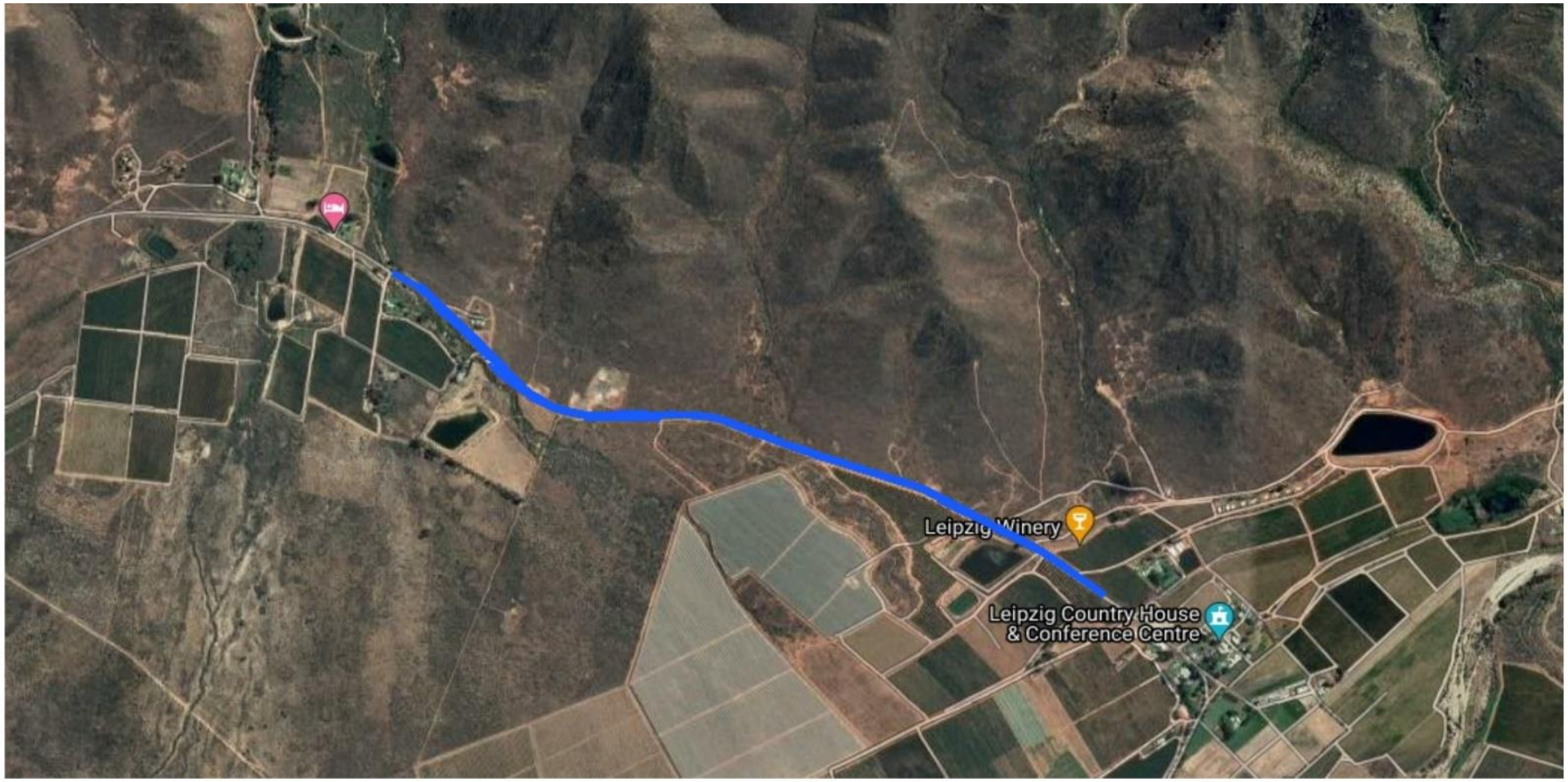
It is the opinion of the freshwater ecologist that the proposed development is considered acceptable, provided that the mitigation measures as proposed by the report are implemented.

Note should however be made that the majority of the recommendations/ mitigations as proposed by the Freshwater Ecologist will be implemented.



Locality Map of the proposed development site on DR 1400.	Guillaume Nel environmental consultants	N
Source: Cape Farm Mapper	Tel: (021) 870 1874 | Fax: 086 6933 802 | Cell: 072 1571 321	

Figure 1: *Locality Map of the proposed development site (Divisional Road 1400).*



Aerial Image of the proposed section of DR 1400 that will be upgraded.	Guillaume Nel environmental consultants	N
Source: Cape Farm Mapper	Tel: (021) 870 1874 | Fax: 086 6933 802 | Cell: 072 1571 321	

Figure 2: *Aerial Image of the realignment section of Divisional Road 1400 between Km 8.20 and Km 10.21, Nuy Station, Western Cape*

2.1.1 SUMMARY OF IMPACTS ASSOCIATED WITH THE PROPOSED ACTIVITY

Freshwater Resources:

As previously indicated, numerous episodic drainage lines (EDL) were identified towards the North and upgradient of the proposed development site. Several artificial impoundments associated with the surrounding agricultural activities were noted within close proximity to the proposed development site. It should be noted that the episodic drainage lines lack in wetland or riparian characteristics. It was found that an episodic drainage line, flowing from the upgradient catchment area, traverses the proposed development site at Km 9.70 until its intersection with the larger riparian drainage line. The EDL's convey catchment runoff into the downstream riparian drainage line and therefore contribute to the hydrological importance in the landscape and was considered in the risk assessment conducted by the freshwater specialist.

Despite their hydrological functioning, these episodic drainage lines do not meet the definitions of a watercourse from an ecological perspective (as defined by the National Water Act, 1998 (Act No. 36 of 1998)). Recommendation is made that the Breede Gouritz Catchment Management Agency be consulted to ensure agreement of excluding these features from any legislative protection.

It was indicated by Breede Gouritz Catchment Management Agency a Water Use License Application (WULA) in terms of The National Water Act, 1998 (Act No. 36 Of 1998) will be required.

The episodic drainage lines are therefore seen as watercourses in terms of The National Water Act, 1998 (Act No. 36 Of 1998).

Note should be made that no activities will be undertaken at the existing culvert within the riparian drainage line. The proposed development therefore poses **a low risk** to the riparian drainage line and episodic drainage lines.

It is the opinion of the freshwater ecologist that the proposed development is considered acceptable, provided that the mitigation measures as proposed by the report are implemented.

Impact on flora:

The majority of the site's vegetation is mapped as being Breede Alluvium Renosterveld (FRa1), with a small section also being mapped as Breede Shale Renosterveld (FRs8) (Cape Farm Mapper, 2021).

Breede Alluvium Renosterveld is classified as a Vulnerable vegetation type according to Section 52 of the National Environmental Management: Biodiversity Act (NEMBA) List of Ecosystems that are Threatened and in Need of Protection, 2011. Breede Shale Renosterveld has been excluded from Section 52 of the NEMBA.

The Botanist confirmed that according to the National List of Ecosystems that are Threatened and in Need of Protection (Government Gazette, 2011), Breede Alluvium Renosterveld is listed as Vulnerable, with Breede Alluvium Renostereld being listed as Least Threatened.

The vegetation condition found on the proposed development site range from Transformed to Highly Degraded. The greater part of the Study area is classified as Degraded to Semi-intact. The areas adjacent to the road have been impacted by traffic and road maintenance.

No species of conservation concern (SCC) were found within the development footprint. One species of conservation concern (SCC) was found adjacent to the proposed development site which is likely to be impacted by the development. This species found is the velvet skeletonfig (Mesembryanthemum varians) and is classified as Vulnerable.

All mitigations proposed by the Botanist will be implemented by the proposed upgrade. This will reduce the overall impact to **Low negative.**

If the recommended mitigation measures are implemented, the upgrade of the DR1400 is supported from a botanical perspective.

Heritage impact:

No impacts are expected on any heritage or visual resources on site. The site is zoned for transport purposes and has been previously disturbed due to activities such as the initial construction of DR1400. No heritage resources were identified on site.

A Notice of Intent to Develop (NID) application was submitted to Heritage Western Cape in terms of Section 38 of the National Heritage Resources Act, 1999 (Act No. 25 of 1999). Please refer to Appendix G for the formal confirmation from HWC that no further studies will be required.

Visual impact:

Minimal and temporary visual impacts are expected to occur during the construction phase on the proposed development site.

It should be noted that the proposed project entails the surfacing of existing gravel road. The proposed development will therefore have no visual impact on the surrounding environment as no high buildings will be constructed and hence the views of the surrounding landscape will not be impacted on.

Noise pollution:

Some noise impacts can be expected as a result of the proposed construction activities. However, these impacts are not expected to be significant, given the temporary nature of the construction activities. No significant impact related to noise is expected during the operational phase of the project proposal.

No odour impacts are expected during the construction or operational phases.

Socio-Economic:

The surfacing of the existing gravel road will have a positive socio-economic impact.

The land uses of the properties surrounding the proposed development site include tourism and agricultural practices. The proposed development will ensure the creation of employment opportunities during the construction phase of the proposed site. The proposed upgrade of the road will therefore significantly contribute towards the socio-economic value of the area. Access to sufficient infrastructure and service delivery is a basic right and the creation of more job opportunities in the area is of high importance, especially in a rural environment and community. This project will have a positive effect on the economic state for the specific area.

2.1.2 Proposed development's environmental management policy and commitments

The proponent understands the importance of conserving the environment and will endeavour to apply all necessary mitigation measures to conserve and maintain sensitive areas and prevent environmental degradation.

2.1.3 Interpretations

The implementation of the EMPr is not an additional or "add on" requirement. The EMPr is legally binding through NEMA and the relevant EA. This EMPr is to be used during the planning, construction and operational phases of the proposed project. The Environmental Control Office, appointed by the developer after environmental approval, must use this EMPr during the ECO audits to determine the developer's compliance to it.

Further on, the proponent is to ensure that through the project tender process the EMPr forms part of the Project Construction Contract Document to be incorporated in line with:

- General project specifications; and
- SANS 1200 A or SANS 1200 AA, as applicable.

The proponent is also to ensure that through any tender or appointment process, the operational EMPr forms part of the management contract with all service providers and contractors, for a period of time as stipulated by the DEA&DP during which the development will be audited for compliance to the operational EMPr. This EMPr is compiled in line with relevant legislation and general construction project specifications. However, to ensure sound environmental practice, the measures as described in the operational EMPr should be implemented for the full operational life of the development.

2.1.4 Project phase

The first part of this EMPr is specifically compiled for the ***period of time prior to commencement of and activities associated with construction of the above-mentioned activity***, and for the ***operational phase*** of the proposed development.

If and when applicable, where specific activities of the proposed development fall outside of the general principles contained herein, the Department will attach further 'activity – specific' EMPr's as appendices to this document.

2.1.5 Role players and responsibility matrix

In order for the EMPr to be successfully implemented, all the role players involved in the project need to co-operate. For this to happen, role players must have a clear understanding of their roles and responsibilities in the project, must be professional, form respectful and transparent relationships, and maintain open lines of communication. The EMPr therefore clearly defines the role players involved and indicates their role in the implementation of the generic EMPr.

Typically, these role players or the project team may include the Authorities (A), Other Authority (OA), Developer/Proponent (D), Consulting Engineers (CE), Resident Engineer (RE), Environmental Officers (EO), Environmental Site Officer (ESO), Environmental Control Officer (ECO), Project Manager (PM), Contractors (C), and Environmental Assessment Practitioner (EAP). Further, landowners, interested and affected parties and the relevant environmental and project specialists are also important role players.

Figure 3 below indicates the proposed reporting channels and highlights the relationships that need to be established between these role players to ensure that the EMPr is effectively implemented.

SECTION 3 – ENFORCEMENT, MONITORING AND AUDITING

3.1 PRE-CONSTRUCTION AND CONSTRUCTION PHASE

The applicant must appoint, at his own cost, an **ECO** and full time EO (as part of the construction team) who will oversee the implementation of the EMPr.

The Breede Valley Municipality as well as DEA&DP must be informed of the appointment of the ECO prior to construction activities. Please note that the responsibility of the particular ECO may end at the end of the construction period. In the event that an ECO is appointed during the operational phase, it must be noted that this ECO may be different from the original ECO and both DEA&DP as well as the Breede Valley Municipality must be notified of this appointment again.

The independent ECO is responsible for Biweekly audits (site inspections) on compliance to relevant environmental legislation, conditions of the Environmental Authorisation (EA), and the EMPr for the project.

The ECO shall conduct fortnightly independent environmental audits (site inspections). **Formal Monthly Audit reports** are to verify the projects compliance with the EMPr and conditions of the Environmental Authorisation (EA). Fortnightly site visits are to be undertaken, with an Informal Audit Report in the middle of each month and a Formal Audit Report at the end of each month.

Before any construction activities commence, the ECO must compile, for the approval by the Department, an audit checklist based on the contents of this EMPr and conditions of the Environmental Authorisation (EA). The ECO shall at the request of the Department forward audit reports to the Department and Breede Valley Municipality at a frequency determined by the Department which shall be stipulated in the Environmental Authorisation (EA).

Evidence of the following as **key performance indicators,** must be included in the audit reports:

- Complaints received from landowners and actions taken.
- Environmental incidents, such as oil spills, concrete spills, etc. and actions taken (litigation excluded).
- Incidents leading to litigation and legal contraventions.
- Environmental damage that needs rehabilitation measures to be taken.

A copy of all ESO and EO monitoring reports, contractor method statements and pro forma documentation must be held by the ESO and/or the EO on site and be made available to the Department and or the ECO upon request.

3.2 OPERATIONAL PHASE

A suitably qualified independent person shall conduct, at a frequency as determined by the DEA&DP and stipulated in the relevant Environmental Authorisation (EA) for the project, conduct independent environmental audits. The audits are to verify the developments compliance with the operational EMPr and conditions of the Environmental Authorisation (EA).

A suitably qualified independent person must compile, for the approval by the DEA&DP, an audit checklist based on the contents of this EMPr and conditions of the Environmental Authorisation (EA). A suitably qualified independent person shall at the request of the DEA&DP forward audit reports to the Department at a frequency determined by the Department which shall be stipulated in the Environmental Authorisation (EA).

The following **Key Performance Indicators** must be included in the audit reports:

- Complaints received from landowners and actions taken.
- Environmental incidents, such as oil spills, fires etc. and actions taken.
- Incidents possibly leading to litigation and legal contraventions.
- Environmental damage that needs rehabilitation measures to be taken.

The minutes of site meetings, to which the suitably qualified independent person will have unrestricted access to, shall be the official record of environmental activities, complaints and communications. These minutes will be circulated to the entire project team. A copy of the standard site meeting agenda is available on request.

3.3 FORMAL ENVIRONMENTAL COMMUNICATION CHANNELS

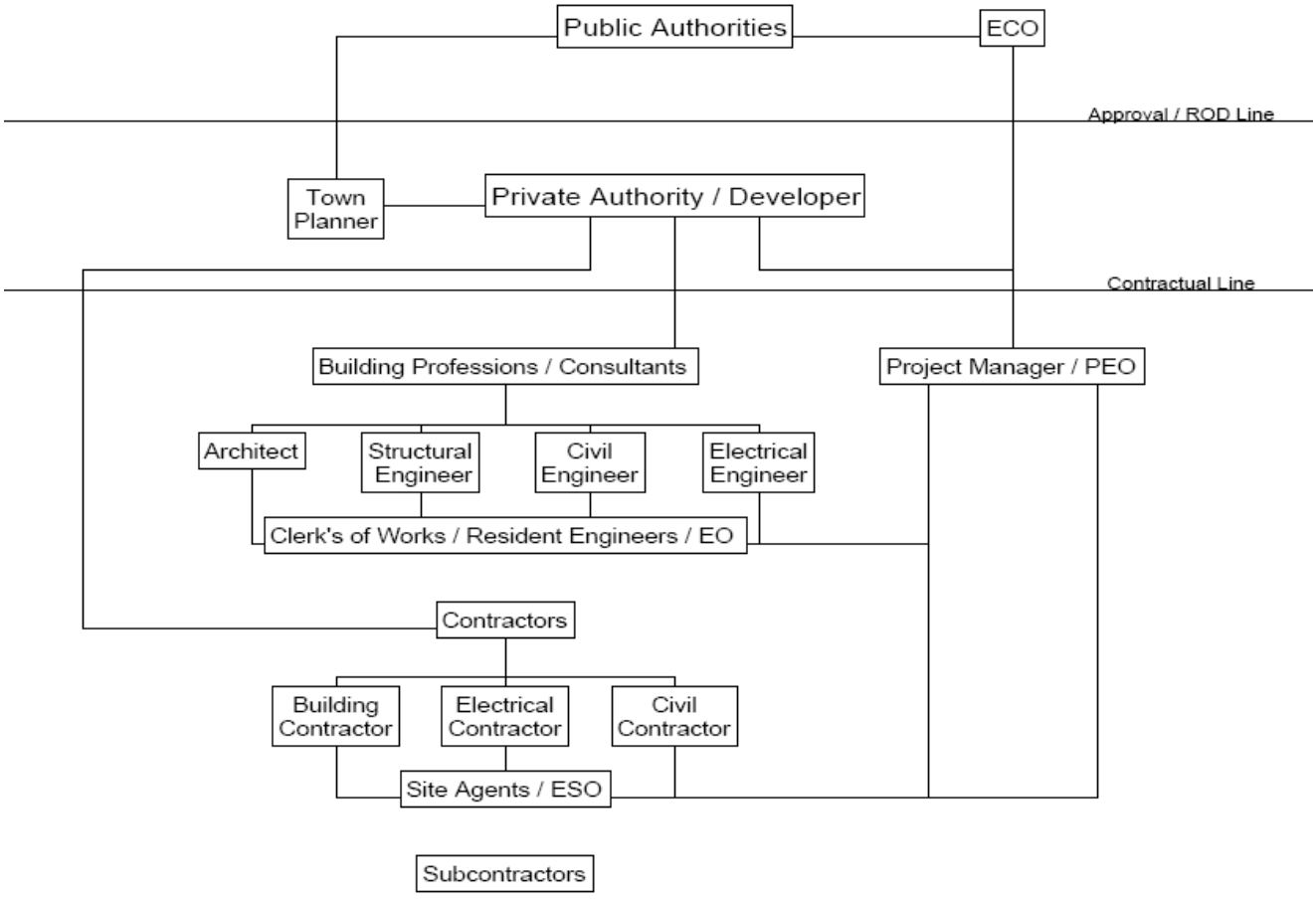


Figure 3: Reporting structure and role players involved in the proposed upgrade of Divisional Road 1400 from Km 8.20 to Km 10.21, Nuy Station, Western Cape.

Please note that due to the timeline of the development as well as the coming and leaving of consultants and contractors, as well as the many crossed channels of communication in the DEAD&DP EMPr Guideline, it was decided by the project team to use the GACP-channels of communication whereby the Project Manager remains the central pivot between all the disciplines. All instructions and reports shall flow through the Project Manager (PM). In the environmental matters the PM becomes the Project Environmental Officer (PEO).

3.4 MEASUREMENT AND PAYMENT

It is understood that environmental requirements included in this EMPr will entail costs over and above those of the civil requirements. These include provision for: mitigation and enhancement actions; training and environmental awareness requirements; monitoring; auditing; and corrective actions. The proponent shall recognise this and make provision for it in the tender. Costing for management action should be done with inputs and advice from appropriate technical members of the project team and relevant EAP who have knowledge of the management actions being recommended as well as practical experience in implementing similar measures and techniques.

A lump sum must be allocated for the management of Environmental Specifications where it is not possible to cost requirements of the EMPr.

3.6 GENERAL GUIDELINES

Guidelines as per standardised construction documentation must be used.

3.7 AWARENESS (INDUCTION) TRAINING

3.7.1 Construction Phase

The EO or ESO, or ECO are responsible in ensuring everyone on site is given an environmental awareness induction session which not only clearly defines what the environment is and specifics detailing the local environment but outlines the requirements of the EMPr as a management tool to protect the environment.

Refresher courses must be conducted as and when required. The EO or ESO must ensure daily toolbox talks include alerting the workforce to particular environmental concerns associated with the tasks for that day or the area/habitat in which they are working. Awareness posters and a handout must be produced to create awareness throughout the site.

3.7.2 Operational Phase

The ECO is responsible in ensuring everyone involved in the operation of the development at ground level receives an environmental awareness induction which not only clearly defines what the environment is and specifics detailing the local environment but outlines the requirements of the EMPr as a management tool to protect the environment.

Awareness posters and a handout must be produced to create awareness throughout the site.

3.8 SITE DOCUMENTATION

3.8.1 Construction Phase

The following is a list of documentation that must be held on site and must be made available to the ECO and/or DEA&DP on request.

- Access negotiations and physical access plan
- Site daily diary /instruction book
- Records of all remediation / rehabilitation activities
- Copies of EO reports (management and monitoring)
- Environmental Management Programme (EMPr)
- Complaints register.

3.8.2 Operational Phase

The following is a list of documentation which must be held on sight and must be made available to the ECO and/or DEA&DP on request.

- Environmental monitoring reports (if required)
- Records of all remediation / rehabilitation activities (if required)
- Environmental Management Programme (EMPr)

- Complaints register

3.8.3 Pro forma documentation

3.8.3.1 Prior to the commencement of construction activities

The following attached pro forma documentation is to be filled out and is binding to the EMPr and project contract and includes, but not limited to, the following:

- Declaration of understanding by the Developer
- Declaration of understanding by the Contractor

3.8.3.2 During construction activities

The following attached pro forma documentation is to be filled out and maintained. These are binding to the EMPr and project contract. They include, but are not limited to, the following:

- Environmental incidents
- Records of all remediation / rehabilitation activities

3.8.3.2 During the Operational Phase

The following attached pro forma documentation is to be filled out and is binding to the EMPr and project contract and includes, but not limited to, the following:

- Declaration of understanding by the Proponent
- Environmental incidents

3.9 TOLERANCES AND NON-COMPLIANCE

The independent ECO is responsible for fortnightly audits on compliance to relevant environmental legislation, conditions of the Environmental Authorisation (EA), and the EMPr for the project.

The ECO shall conduct fortnightly independent environmental audits. **Monthly Audit reports** are to verify the projects compliance with the EMPr and conditions of the Environmental Authorisation (EA).

Should the contractor show repeated non-compliance in terms of the audits, a range of fines may be issued to the contractor. These fines are included as part of the Construction EMPr (Table 6).

The Engineer, in conjunction with the ECO, shall be the judge as to what constitutes a transgression in terms of this clause, subject to the General Conditions of Contract.

SECTION 4 - GENERIC CONSTRUCTION PHASE EMPR - IMPLEMENTATION

4.1 PREAMBLE

The point of departure for the proposed development EMPr is to empower a pro-active rather than re-active approach to environmental performance by addressing potential problems before they occur. This will limit corrective measures needed during the construction phase of the project. Therefore, the purpose of this EMPr is to provide management measures that must be implemented by the Western Cape Government: Department of Transport and Public Works and all contractors and sub-contractors alike to ensure that the potential impacts of the proposed development of the proposed maintenance project of the mentioned roads are minimised. It must also be ensured that the *EMPr is maintained and upheld as a dynamic document* in order for the *project team to add or improve on issues* that might be considered left out or not relevant to the project. In such instances the DEA&DP may authorise the ECO to make such changes.

The following tables form the core mitigation measures appropriate to the pre-construction and construction phase. The tables present, the objectives to be achieved and the management actions that needs to be implemented in order to mitigate the negative impacts and enhance the benefits of the project. Associated responsibilities, criteria/targets and timeframes are clearly specified.

The **'pre-construction'** section of this generic EMPr, refers to the period of time leading up to and prior to commencement of construction activities, and is included to ensure pro-active environmental management measures with the goal of identifying avoidable environmental damage at the outset and sustain optimal environmental performance throughout the construction phase. Most impacts will occur during the construction phase and must be mitigated through the contingency plans identified in the pre-construction phase.

The bulk of environmental impacts will have immediate effect during the 'construction' phase (e.g. noise, dust, and water pollution). If the site is monitored on a continual basis during the construction phase, it is possible to identify these impacts as they occur. These impacts will then be mitigated through the measures outlined in this section, together with a commitment to sound environmental management from the project team.

The "construction" section refers to all construction and its operation-related activities that will occur within the approved area and access roads, until the project is completed. This "construction" section is divided into three functional areas, namely "materials"; "plant"; and "construction". Each of these functional areas within the EMPr contains specific generic mitigation requirements and requested contractor method statements stipulated where required.

Many potential environmental impacts will have immediate or long-term effects during the 'operational' phase (e.g. noise, waste management, and water pollution). If the development is monitored on a continual basis during operations, it is possible to identify these impacts as they occur. These impacts will then be mitigated through the measures outlined in this section, together with a commitment to sound environmental management from the proponent and management team.

It must be noted that the responsible party for the majority of the mitigation measures is that of the Management body, unless otherwise stipulated. The names of the responsible parties must be made available to DEA&DP for record purposes.

The management body must ensure that a maintenance team is employed with the correct equipment and skill to maintain boardwalks, pathways, fences etc. The following tables will refer to the responsible party as “Management body: ‘to be announced’ and “maintenance crew”.

4.2 STRUCTURE AND CONTENTS OF THE TABLES

The table consists of seven parts as follows:

“Phase of development” - This row will identify either pre-construction (planning) or actual construction phase.

“Impact / issue” - This row will identify the issue being addressed, e.g. Materials, site demarcation, heritage, etc.

Mitigation Measure - This column will include all the necessary mitigation measures for each impact/issue’.

Management objectives - This column will indicate what the management objectives to be achieved for each mitigation measure are.

Measurable targets - This column will indicate what evidence is to be used as an indication to whether or not the ‘Management objectives’ have been implemented and hence achieved.

Responsible party - This column will provide information as to which role player, e.g. ECO, RE, etc. is responsible for the implementation and or management of each mitigation measure.

Frequency of action - These columns provide time guidelines for the ‘Responsible party’ by which he/she is to action or manage the required mitigation.

4.2.1 SPECIALIST RECOMMENDATIONS

4.2.1.1 Pre-Construction and Construction Phases

The last part of the table provides space for the EAP to add specialist recommendations that need to be addressed during the pre-construction and construction phases.

4.2.1.2 Operational Phase

Additional requirements may need to be added to the table pending conditions required in the Environmental Authorisation (EA). The last part of the table provides space for such conditions, which must be added before the “declaration of understanding” is signed by the proponent and ECO.

Table 1: THE PROPOSED UPGRADE OF DIVISIONAL ROAD (DR) 1400 FROM KM 8.20 - KM 10.21, NUY STATION, WESTERN CAPE, PRE-CONSTRUCTION (PLANNING) PHASE EMPr

Phase of development	**PRE-CONSTRUCTION (PLANNING)**			
Impact / issue	**GENERAL**			
MITIGATION MEASURE	**MANAGEMENT OBJECTIVES**	**MEASURABLE TARGETS**	**RESPONSIBLE PARTY**	**FREQUENCY OF ACTION**
Visual Impact • Light output is to be confined within property boundaries through using specifically designed luminaries such as full cut-off luminaries to minimize upward spread of light near to and above the horizontal (Figure 4); • Spotlight luminaries to be tilted in order to direct the light to the intended spot, instead of allowing it to light areas outside its purpose (Figure 4– B2); • Outdoor spot lights to be mounted on the appropriate pole height. Higher mounting heights allow lower main beam angles which can reduce glare (Figure 4–); • Utilize control systems to reduce light levels during inactive periods or at predetermined times while maintaining sufficient lighting for safety and security (NEMA, 2000). Where vertical surfaces are illuminated, such as advertising signs or buildings façades, luminaries must light downwards. (Figure 4).	• Unnecessary visually visible impacts are avoided. • Ensure exact implementation of EMPr guidelines with regards to light and lighting.	• Contract records. • Signed declaration pro forma's.	Project team.	Design and implementation.

Phase of development	PRE-CONSTRUCTION (PLANNING)			
Impact / issue	GENERAL			
MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION

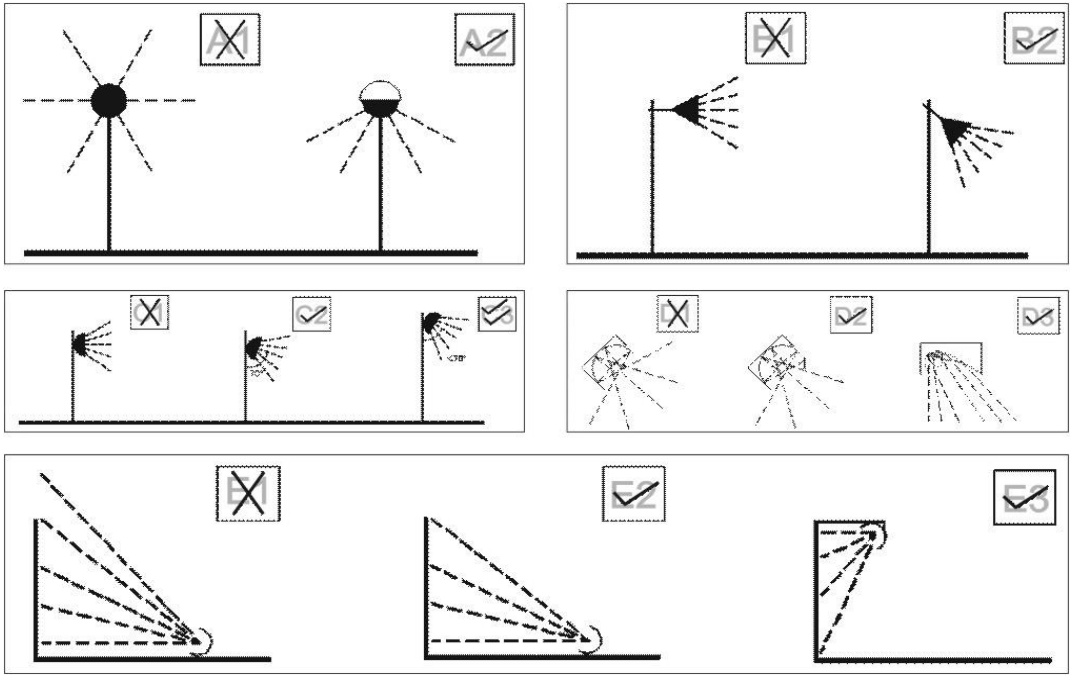


Figure 4 Guidelines for the reduction of obtrusive lighting (Source: ILE, 2005)

Phase of development	**PRE-CONSTRUCTION (PLANNING)**			
Impact / issue	**GENERAL**			
MITIGATION MEASURE	**MANAGEMENT OBJECTIVES**	**MEASURABLE TARGETS**	**RESPONSIBLE PARTY**	**FREQUENCY OF ACTION**
Traffic Impact Comply with Breede Valley Municipality Road rules and signs. The Standards and Guidelines to ensure access to Municipal Waste trucks will also have to be met with regards to turning circles and internal roads.	• To reduce possible traffic impact to expectable standards.	• The existing level of traffic.	Project team.	Design and implementation.
Project contract and programme The EMPr must be included as part of the tender documentation thereby making it part of the enquiry document to make the recommendations and constraints, as set out in this document, enforceable under the general conditions of contract. A copy of this EMPr must be available on site. The Contractor shall ensure that all the personnel on site, sub-contractors, suppliers, etc. are familiar with and understand the specifications contained in the EMPr. It is considered imperative that all works be undertaken during the dry period to limit surface water contamination and the need for any surface water diversion during the construction works. Construction should be undertaken in the dry season and permitted working areas for the entire section of road must be clearly demarcated.	• Contingencies for minimising negative impacts anticipated to occur during the construction phase. • Ensure environmental awareness and formalise environmental responsibilities and implementation.	• Contract records. • Signed declaration pro forma's.	Project team.	-
Site demarcation and development The surveys for the overall project area and construction footprint as approved in the Environmental Authorisation (EA) must be clearly demarcated before the	• Contingencies for minimising negative impacts anticipated to occur during the	• Demarcated areas. • Filled in	EAP specialist, Engineer, contractor.	As and when required.

Phase of development	**PRE-CONSTRUCTION (PLANNING)**			
Impact / issue	**GENERAL**			
MITIGATION MEASURE	**MANAGEMENT OBJECTIVES**	**MEASURABLE TARGETS**	**RESPONSIBLE PARTY**	**FREQUENCY OF ACTION**
contractors set up their crew camps or start with construction. Minimization of the disturbances due to the road upgrade must be ensured by marking out and fencing off the development footprint prior to construction. This must be overseen by and Environmental Control Officer (ECO) The ECO must be present for the vegetation clearing period of the construction. No construction personnel or vehicles are to be allowed on the north side of the construction area in the natural vegetation. The existing transformed areas and borrow pits are to be used to storing of construction equipment and vehicles.	construction phase.	section of this document.		
Emergencies, non-compliance and communication The contractor **must provide method statements** on the protocols to be followed, and contingencies to be put in place for the following, before construction may begin: • Emergency spills procedures for the contamination of soils from spills and fire. • Handling & storage of oils and chemicals. • Cement and concrete batching, which includes the storage, washing & disposal of cement, packaging, tools and plant. • Diesel tanks and refuelling procedures. • Crew camps and construction lay down areas.	• Contingencies for minimising negative impacts anticipated to occur during the construction phase.	• Method statements.	Contractor, Engineer.	As and when required.

Phase of development	**PRE-CONSTRUCTION (PLANNING)**			
Impact / issue	**GENERAL**			
MITIGATION MEASURE	**MANAGEMENT OBJECTIVES**	**MEASURABLE TARGETS**	**RESPONSIBLE PARTY**	**FREQUENCY OF ACTION**
• Workshop maintenance and cleaning of plant. Communication in emergencies must follow the suggested lines of communication as stipulated figure 3.				
Freshwater Impact Assessment (FEN, 2021). <u>Site preparation prior to commencement of construction activities:</u> Contractor laydown areas and stockpiles to be established outside of the riparian drainage line and the 32 m NEMA ZoR in consultation with the appropriate authority; All footprint areas must remain as small as possible and vegetation clearing to be limited to what is absolutely essential; All works must remain within the existing road servitude; Retain as much indigenous vegetation as possible; Vehicles to be serviced at the contractor laydown area and all re-fuelling is to take place outside of riparian drainage line and 32 m NEMA ZoR as well as outside of the delineated episodic drainage lines; Utilize existing roads only to gain access to the construction site; and The riparian drainage line and 32 m NEMA ZoR as well as the episodic drainage lines should be clearly demarcated with danger tape by an ECO and marked as a 'no-go' area where no construction activities are planned.	•	•		

Phase of development	**PRE-CONSTRUCTION (PLANNING)**			
Impact / issue	**GENERAL**			
MITIGATION MEASURE	**MANAGEMENT OBJECTIVES**	**MEASURABLE TARGETS**	**RESPONSIBLE PARTY**	**FREQUENCY OF ACTION**
Botanical Impact Assessment (Capensis, 2021). A 'search and rescue' must be undertaken for the Mesembryanthemum varians plants found within the construction area. This species can be propagated via cuttings, or the entire plants can be dug up and planted in bags during the construction period. They can be replanted in the road verge post construction. This must be done by a suitably qualified restoration ecologist. The ECO must be present for the vegetation clearing period of the construction. Minimization of the disturbances due to the road upgrade must be ensured by marking out and fencing off the development footprint prior to construction. This must be overseen by and Environmental Control Officer (ECO).				

Table 2: ADDITIONAL CONDITIONS FOR THE PROPOSED UPGRADE OF DIVISIONAL ROAD (DR) 1400 FROM KM 8.20 - KM 10.21, NUY STATION, WESTERN CAPE, EMPr.

Phase of development	**PLANNING**	**EA reference number**	
Impact / issue	**EA Conditions**		

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION

Table 3: THE PROPOSED UPGRADE OF DIVISIONAL ROAD (DR) 1400 FROM KM 8.20 - KM 10.21, NUY STATION, WESTERN CAPE, CONSTRUCTION PHASE EMPr (Materials)

Phase of development	**CONSTRUCTION**
Impact / issue	**Materials**

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION
Handling				
Stockpiles All stockpiled material must be easily accessible on site without any environmental damage of the surrounding properties. All temporarily stockpiled material must be stockpiled in such a way that the spread of materials are minimised. In the case of strong wind and/or rain all stockpile material must be covered with a tarpaulin in order to prevent erosion. The stockpiles may only be placed within the demarcated areas, the location of which must be approved by the RE, EO or ECO. Stockpiles may not exceed 2 metres in height and their footprint should be kept to a minimum. Stockpiling of removed materials may only be temporary and should be disposed of at a registered waste disposal facility. All exposed soils must be protected for the duration of the construction phase with a suitable geotextile (e.g. Geojute or hessian sheeting) in order to prevent erosion and sedimentation of the watercourses in close proximity to these stockpiles.	• Minimise scarring of the soil surface and land features. • Minimise disturbance and loss of soil. • Minimise construction footprint. • Minimise contamination of storm water run-off.	• No visible erosion scars once construction is completed. • The footprint has not exceeded the agreed site in terms of EA etc. • Minimal invasive weed and grass growth. • No signs of sedimentation and erosion.	Contractor	Daily

Phase of development	CONSTRUCTION
Impact / issue	Materials

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION
Stormwater runoff from the stockpile sites and other related areas must be directed into the storm water system. Stockpiles are to be stabilised if signs of erosion are visible. Stockpiles may not exceed 2 m in height, and their footprint should be kept to a minimum. Stockpiling of removed materials may only be temporary (may only be stockpiled during the period of clearing at a certain crossing point) and should be disposed of at a registered waste disposal facility. Contractor stockpiles to be established outside of the riparian drainage line and the 32 m NEMA ZoR in consultation with the appropriate authority.				
Topsoil Management All topsoil must be removed prior to the commencement of any construction activities. Topsoil must be stockpiled. **Stockpiled topsoil must be regarded as no-go areas**. Stockpiled topsoil must be monitored for invasive exotic vegetation growth. Contractors must remediate as and when required in consultation with the EO, RE and ECO.	• Maintain the integrity of topsoil for rehabilitation. • Containment of invasive plant growth by means of topsoil monitoring.	• No loss of topsoil.	Contractor	Daily

Phase of development	CONSTRUCTION
Impact / issue	Materials

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION
No plant, workforce or any construction related activities may be allowed onto the stockpile topsoil. All topsoil must be replaced during the rehabilitation phase to ensure the re-establishment of natural vegetation. Handling of the topsoil should be minimised and should therefore only be handled before construction (to be stockpiled) and after construction (topsoil to be replaced). No stockpiling of topsoil is to take place within the recommended buffer zone around the watercourses, and all stockpiles must be protected with a suitable geotextile to prevent sedimentation of the wetland.				
Oil and chemicals The contractor **must provide method statements** for the "handling & storage of oils and chemicals", "fire", and "emergency spills procedures". These substances must be confined to specific and secured areas within the contractor's camp, and in a way that does not pose a danger of pollution even during times of high rainfall. Drip trays (minimum of 10cm deep) must be placed under all machinery and vehicles. The surface area of the drip trays will be	• Prevention of pollution of the environment. • Minimise chances of transgression of the acts controlling pollution.	• No pollution of the environment. • No litigation due to transgression of pollution control acts. • No complaints from I & AP's. • Method statements.	Contractor.	Daily.

Phase of development	CONSTRUCTION
Impact / issue	Materials

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION
dependent on the vehicle and must be large enough to catch any hydrocarbons that may leak from the vehicle while standing. The depth of the drip tray must be determined considering the total amount / volume of oil in the vehicle. The drip tray must be able to contain the volume of oil in the vehicle. Any spills larger than 100ℓ should be reported to all local authorities. Spill kits must be available on site and in all vehicles that transport hydrocarbons for dispensing to other vehicles on the construction site. Spill kits must be made up of material/product that is in line with environmental best practice (sunsorb is a recommended product that is environmentally friendly). All spilled hazardous substances must be contained in impermeable containers for removal to a General & Hazardous Waste Landfill site, (this includes contaminated soils, and drenched spill kit material).				

Phase of development	CONSTRUCTION
Impact / issue	Materials

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION
Vehicles to be serviced at the contractor laydown area and all refuelling to take place outside of the watercourses and the applicable setback zone. In the event of a vehicle breakdown, maintenance of vehicles must take place with care and the recollection of spillage should be practiced near the surface area to prevent ingress of hydrocarbons into topsoil and subsequent habitat loss; All spills should they occur, should be immediately cleaned up and treated accordingly.				
Concrete **It is suggested that ready-mix concrete be used as far as possible to minimize the possible impact on the surrounding environment.** <u>Control measures specific to concrete works:</u> Concrete and cement-related mortars can be toxic to aquatic life. Proper handling and disposal should minimise or eliminate discharges into watercourses. High alkalinity associated with	• Minimise the possibility of cement residue entering into the surrounding environment. • Minimise pollution of soil, surface and ground water resources.	• No evidence of contaminated soil on the construction site. • No evidence of contaminated water resources. • Method statement.	Contractor.	Monitored daily.

Phase of development	CONSTRUCTION
Impact / issue	Materials

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION
cement can dramatically affect and contaminate both soil and ground water. The following measures must be adhered to: Fresh concrete and cement mortar should not be mixed near the watercourses. Mixing of cement may be done within the construction camp, however it may not be mixed on bare soil, and must be within a lined, bound or bunded portable mixer. Consideration must be taken to use ready mix concrete; No mixed concrete shall be deposited directly onto the ground within associated riparian habitat, outside of the designated area (i.e. the concrete aprons associated with culverts); No mixed concrete shall be deposited directly onto the ground within associated riparian habitat, outside of the designated area (i.e. the concrete aprons associated with the culverts). All concrete for the apron must be brought in via a cement mixing truck which must remain within the road reserve,				

Phase of development	CONSTRUCTION
Impact / issue	Materials

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION
and cement must be piped down to the apron. Any areas that require manual application of cement require that mixed cement be placed on a batter board or other suitable platform/mixing tray until it is deposited. A washout area should be designated outside of the watercourses, and wash water should be treated on-site or discharged to a suitable sanitation system. At no point may batter boards/mixing trays or cement trucks be rinsed off on site and run-off water be allowed into the watercourse. Cement bags (if any) must be disposed of in the demarcated hazardous waste receptacles and the used bags must be disposed of through the hazardous substance waste stream. Spilled or excess concrete must be disposed of at a suitable landfill site. Chain of custody documentation must be provided.				

Phase of development	CONSTRUCTION
Impact / issue	Materials

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION
DANGEROUS AND TOXIC MATERIALS **Provision of storage facilities** Materials such as fuel, oil, paint, herbicide and insecticides must be sealed and stored in beamed areas or under lock and key, as appropriate, in well-ventilated areas. Storage facilities should be bunded, roofed, secure, rain, wind and tamper proof. Storage areas shall display the required safety signs depicting “no smoking”, “No Naked lights” and “Danger” containers shall be clearly marked to indicate contents as well as safety requirements. Sufficient care must be taken when handling these materials to prevent pollution. Training on the handling of dangerous and toxic materials must be conducted for all staff prior to the commencement of construction. In the case of pollution of any surface or groundwater, the Regional Representative of the **Breede Gouritz Catchment Management Agency (BGCMA)** must be informed immediately. Empty containers shall be removed to a General	• Prevention of pollution of soil, surface and ground water resources in the immediate and surrounding environments. • Minimise chances of transgression of the acts controlling pollution.	• No visible signs of pollution. • No litigation due to transgression of pollution control acts.	Contractor.	Monitor daily.

Phase of development	CONSTRUCTION
Impact / issue	Materials

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION
& Hazardous Waste Landfill site. **Material Safety Data Sheets (MSDS)** must be prepared for all hazardous substances on site and supplied by the supplier where relevant. MSDS's must be updated as required.				
Bulk storage of fuels and oils The contractors must **provide and maintain a method statement** for "Diesel tanks and refuelling procedures". Bulk fuel storage tanks on the site shall be on an impervious surface that is bunded and able to contain at least 110% of the volume of the tanks. A Flammable Liquid License must be obtained for diesel volumes greater than 200 litres. As no application was lodged for this activity, it should be noted that Environmental Authorisation is required for the storage of Diesel and/or Petrol with volumes greater than 30 000 litres. Bulk fuel storage tanks shall be located in a portion of the construction camp where they do not pose a high risk in terms of water pollution. Bulk fuel storage tanks shall be placed so that	• Prevention of pollution of soil, surface and ground water resources in the immediate and surrounding environments. • Minimise chances of transgression of the acts controlling pollution.	• No visible signs of pollution. • No litigation due to transgression of pollution control acts. • Method statement.	Contractor.	Once off, as required.

Phase of development	CONSTRUCTION
Impact / issue	Materials

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION
they are out of the way of traffic, so that the risk of the tanks being ruptured or damaged by vehicles is minimised. Bulk fuel storage should be covered during the rainy season.				
Use of dangerous and toxic materials. The contractor shall keep the necessary materials and equipment on site to deal with spills/ fire of the materials present should they occur. The contractor shall set up a procedure for dealing with spills/ fire, which will include notifying the ECO and the relevant authorities prior to commencing with construction. These procedures must be developed in consultation and approval by the appointed EO. All staff should receive some form of fire training. Fire buckets and hoses shall be in good working order and easily accessible on site. A record must be kept of all spills and the corrective action taken.	• Prevention of pollution of soil, surface and ground water resources in the immediate and surrounding environments. • Minimise chances of transgression of the acts controlling pollution.	• No pollution of the environment. • No litigation due to transgression of pollution control acts.	Contractor.	As required.

Table 4: THE PROPOSED UPGRADE OF DIVISIONAL ROAD (DR) 1400 FROM KM 8.20 - KM 10.21, NUY STATION, WESTERN CAPE, CONSTRUCTION PHASE EMPr (Plant)

Phase of development	**CONSTRUCTION**			
Impact / issue	**GENERAL**			
MITIGATION MEASURE	**MANAGEMENT OBJECTIVES**	**MEASURABLE TARGETS**	**RESPONSIBLE PARTY**	**FREQUENCY OF ACTION**
Eating areas and camp followers The contractors must **provide and maintain a method statement** for "Crew camps and construction lay down areas". The Contractor shall, in conjunction with the EO, designate the restricted eating area for eating during normal working hours. Two refuse bins with lids must be provided and cleaned on a daily basis. The bins are to be secure, wind, weather and scavenger proof. Designated areas for smoking must be provided. No fires are to be lit outside of a facility designed to contain fires. The adequacy and positioning of these structures must be determined in consultation with the EO and ECO. No animals, domestic or otherwise are allowed on the premises. The feeding, or leaving of food, for stray or other animals in the area is strictly prohibited. Camp followers/informal traders must not be allowed to congregate on pavements or outside the construction site. However, at the contractor's discretion facilities can be made available within the designated eating area. Litter (even if originating outside the camp) and concrete bags etc. must be picked up and put into suitably closed bins.	• Control potential influx of vermin and flies. • Neat workplace and hygienic environment. • Minimise negative social impacts to local businesses and residences.	• No visual sign of vermin and flies. • No complaints from I & AP's.	Contractor, EO.	Once off, monitor daily.

Phase of development	CONSTRUCTION			
Impact / issue	GENERAL			
MITIGATION MEASURE	**MANAGEMENT OBJECTIVES**	**MEASURABLE TARGETS**	**RESPONSIBLE PARTY**	**FREQUENCY OF ACTION**
Toilets and ablution facilities The contractor will be responsible for providing all sanitary arrangements for his and the sub-contractors team. It is proposed that that **one toilet for 15** people will be established on site. Sanitary arrangements shall be to the satisfaction of the ECO and the local authority. The contractor shall keep the toilets in a clean, neat and hygienic condition. The **contractor shall supply toilet paper at all toilets at all times**. Toilet paper dispensers shall be provided in all toilets. Toilets provided by the contractor must be easily accessible and a maximum of 150m from the works area to ensure they are utilised. All toilets will be located within the contractor's camp. Should toilets be needed elsewhere, their location must first be approved by the RE, EO or ECO. The contractor (who must use reputable toilet-servicing company) shall be responsible for the cleaning, maintenance and servicing of the toilets. The contractor (using reputable toilet-servicing company) shall ensure that all toilets are cleaned and emptied before the builders' or other public holidays. Toilets out on site must be secured to the ground and have a sufficient locking mechanism operational at all times.	• Ensure proper sanitation is achieved which will encourage the workforce to utilise toilets provided and not the surrounding habitat. • Minimise potential of diseases on site. • Minimise potential to pollute soils, water resources and natural habitats.	• Workforce use toilets provided. • No complaints received from I & AP's as well as members of the workforce. • No visible or measurable signs of pollution of the environment (soils, ground and surface water).	Contractor, RE or EO.	As and when required.

Phase of development	CONSTRUCTION			
Impact / issue	GENERAL			
MITIGATION MEASURE	**MANAGEMENT OBJECTIVES**	**MEASURABLE TARGETS**	**RESPONSIBLE PARTY**	**FREQUENCY OF ACTION**
Waste management Please refer to the waste minimization plan herewith attached.	• Sustainable management of waste by recycling. • To keep the site neat and tidy. • Minimise litigation and complaints by I&AP's. • Reduce visual impact. • Control potential influx of vermin and flies thereby minimising the potential of diseases on site and the surrounding environment. • Minimise potential to pollute soils, water resources and natural habitats.	• Disposal of rubble and refuse in an appropriate manner with no rubble and refuse lying on site. • Site is neat and tidy. • No complaints from surrounding industries and businesses. • Sufficient containers available on site. • No visible or measurable signs of pollution of the environment (soils, ground and surface water).	Contractor, EO	Daily

Phase of development	CONSTRUCTION			
Impact / issue	GENERAL			
MITIGATION MEASURE	**MANAGEMENT OBJECTIVES**	**MEASURABLE TARGETS**	**RESPONSIBLE PARTY**	**FREQUENCY OF ACTION**
Dust It is imperative that method statements regarding dust control be supplied to the ECO by the contractor prior to the commencement of any construction activities. Dust management and dust suppression during the construction phase is deemed very important. The method statement must provide information on the proposed source of water to be utilised and the details of the licenses acquired for such usage. **Potable water may not be used as a means of dust suppression**, alternative measures must be sourced. The use of 'grey' water must be investigated as an alternative. The contractor will be responsible to source this water and obtain the required approvals. Dust mitigation measures to include the use of chemical dust suppressants, such as Lignosulphonates; and the use of soil stabilisers such as straw for large open ground areas. The construction camp shall be treated with dust suppression during dry and windy conditions to control dust fallout. Dust production must be controlled by regular dust suppression of roads and works area, should the need arise. (**NB:** Concrete dust is toxic and damages soil properties. Therefore, dust suppression to prevent dust spread must not be done where concrete dust has fallen, or it will infiltrate into the soil. Concrete bags must not be allowed to blow around the site and spread cement dust.)	• Reduce dust fall out. • Reduce visual impact. • Minimise loss of valuable soil material.	• No visible signs of dust. • No complaints from Interested and Affected parties. • No incidences reported to ECO. • No visible evidence of dust contamination on the surrounding environment. • Method statement. • Baseline targets not exceeded during regular monitoring of dust counts.	RE, Contractor, EO	Monitored daily

Phase of development	CONSTRUCTION			
Impact / issue	GENERAL			
MITIGATION MEASURE	**MANAGEMENT OBJECTIVES**	**MEASURABLE TARGETS**	**RESPONSIBLE PARTY**	**FREQUENCY OF ACTION**
At the end of construction, the site camp must be fully rehabilitated by removing the temporary surface, ripping the area to loosen the soil. All vehicles transporting material that can be blown off (e.g. soil, rubble etc.) must be covered with a tarpaulin, and speed limits of 20 km/h must be adhered to.				

Phase of development	CONSTRUCTION			
Impact / issue	GENERAL			
MITIGATION MEASURE	**MANAGEMENT OBJECTIVES**	**MEASURABLE TARGETS**	**RESPONSIBLE PARTY**	**FREQUENCY OF ACTION**
Workshop equipment, maintenance and storage The contractors **must provide and maintain a method statement** for "workshop maintenance and cleaning of plant". All maintenance and washing of vehicles and equipment shall be done off-site as far as possible. During servicing of vehicles or equipment, a suitable drip tray shall be used to prevent spills onto the soil. Leaking equipment shall be repaired immediately or be removed from site to facilitate repair. Workshop areas shall be monitored for oil and fuel spills and such spills shall be cleaned and remediated to the satisfaction of the EO or RE. Cleaning and remediation must be done with products or similar approved products that are in line with best environmental practice i.e. Sunsorb, or similarly approved. The Contractor shall be in possession of an emergency spill kit that must be complete and available at all times on site. The Contractor must ensure that senior and the other relevant members of the workforce are trained in dealing with spills by using emergency spill kits. All spills of hazardous substances must be reported to the ESO, EO, RE or ECO. The contractor must comply with the regulations of the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) as well as specific specifications set forth by the health and safety agent. The existing transformed areas and borrow pits are to be used to storing of construction equipment and vehicles.	• Prevent pollution of the environment. • Minimise chance of transgression of the acts controlling pollution. • Disposal of hazardous substances to a General & Hazardous Waste Landfill site.	• No pollution of the environment. • No litigation due to transgression of pollution control acts. • Method statement.	RE, Contractor, EO.	Monitor daily.

Phase of development	CONSTRUCTION			
Impact / issue	GENERAL			
MITIGATION MEASURE	**MANAGEMENT OBJECTIVES**	**MEASURABLE TARGETS**	**RESPONSIBLE PARTY**	**FREQUENCY OF ACTION**
Noise All construction vehicles must be in a good working order to reduce possible noise pollution. Work hours during the construction phase shall be strictly enforced unless permission is given (07H00 – 18H00). Permission shall not be granted without consultation with the local industries and businesses by the EO. No work to be done on Sundays. Noise reduction is essential, and Contractors shall endeavour to limit unnecessary noise, especially loud talking, shouting or whistling, radios, sirens or hooters, motor revving, etc. The use of silent compressors is a specific requirement. All machinery to be muffled where possible. Noisy activities shall take place only during working hours. The EO must inform the residents of houses and businesses adjacent to the development in writing 24 hours prior to any planned activities that will be unusually noisy or any other activities that could reasonably have an impact on the adjacent sites. These activities could include, but are not limited to use of pneumatic jack-hammers and compressors etc. No noise louder than 70dB from the ambient noise level. Machinery and equipment on site must be maintained so as to avoid any unnecessary noises.	• Maintain noise levels below "disturbing" as defined in the National Noise Regulations. • Minimise the nuisance factor of the development.	• No complaints from surrounding landowners or I&APs.	Contractor, EO.	As and when required.

Table 5: THE PROPOSED UPGRADE OF DIVISIONAL ROAD (DR) 1400 FROM KM 8.20 - KM 10.21, NUY STATION, WESTERN CAPE, CONSTRUCTION PHASE EMPr (Construction)

Phase of development	**CONSTRUCTION**
Impact / issue	**CONSTRUCTION**

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION
Crew camps Accommodation for members of the workforce will not be permitted on site unless authorisation has been given in terms of the Environmental Authorisation issued for the site. If accommodation is to be provided for workers, details need to be provided as to the location and facilities to be provided for the workers. Dedicated wash areas must be situated away from surface water sources. The contractor's camp shall be monitored for dust fallout and dust suppression applied as required. This may include the laying of gravel; the use of grey water can be considered as an option if the required permits have been acquired. The contractor's camp, offices and storage facilities shall be located within the site boundaries. If this is not feasible an alternative should be designated in consultation with the ECO. The contractor shall provide labourers to clean up the contractor's camp and construction site on a daily basis. These areas shall then be inspected by the contractor or his/her ESO to ensure compliance with this requirement. Crew camps must be established outside of the delineated watercourse. The contractor shall be responsible for cleaning the contractor's camp and construction site of all structures, equipment, residual litter and	• Minimise water pollution. • Minimise dust fallout. • Minimise unwarranted environmental damage outside the footprint. • Maintain a clean and healthy working environment. • Minimise visual impact to surrounding environment.	• No signs of water or soil pollution. • No complaints from surrounding landowners or I&APs. • No visible signs of litter. • Method statements.	Contractor, EO, ESO.	Monitor daily.

building materials at the end of the construction period and, the topsoil restored in areas where landscaping is to take place.				
Visual Impact The site must be kept tidy at all times. Building material stockpiles must be protected from dispersion into the surrounding area by wind or water.	• Minimise visual impact.	• No unacceptable visual impacts.	Contractor, EO, ESO.	Monitor, daily
Fires The contractors **must provide and maintain a method statement** for "fires", clearly indicating where and for what fires will be utilised plus details on the fuel to be utilised in creating the fire. Fire training and equipment to be nearby to put fires out. No wood is to be collected from private or public property. Fires must be within designated areas and must be in small scale. Absolutely no burning of waste is permitted. Fires will only be allowed in facilities especially constructed for this purpose within fenced Contractor's camps. Wood and/or charcoal are the only fuels permitted to be used for fires. The contractor must provide sufficient wood (fuel) for this purpose. Fires in the designated areas must be small in scale so as to prevent excessive smoke being released into the atmosphere. Heavy smoke may not be released into the air. No felling of trees or wood collection is allowed from private or public property. **The Contractor shall ensure that there is appropriate fire-fighting equipment available on site at all times.** The construction should comply with SANS 10400 of 2011 and the Community Fire Safety By-Law, Provincial Gazette 5832 (as amended 29 June 2007 and 21 August 2015), with reference to:	• Minimise risk of veldt fires. • Minimise destruction of natural fauna and flora. • Maintain safety on site.	• No veldt fires started by the contractor's workforce. • No claims from landowners for damages due to veldt fires. • Method statement.	Contractor, EO, ESO.	Monitor daily.

• Detailed fire protection plans should be submitted by a competent person – fire engineer for perusal of future building plan submissions; • Fire hydrants to be provided as per SANS 100400 T4.35; • No window, door or unprotected openings shall be closer than 3 m of an open space stair as per SANS 10400 T4.27.2; • Access for emergency vehicles as per Chapter 3 Section 12 of the Community Fire Safety By-law.				
Erosion and sedimentation To reduce the loss of material by erosion, the contractor shall ensure that disturbance on site is kept to a minimum. The disturbance especially includes the movement of heavy vehicles. In the case of strong wind and/or rain all stockpile material must be covered with a tarpaulin in order to prevent erosion. Any erosion or gully formation must be identified on an ongoing basis and re-profiled and revegetated accordingly. A monitoring plan for the development and the immediate zone of influence should be implemented to prevent erosion and incision. Areas where bank failure is observed as a result of construction works should be immediately repaired, by infilling the erosion gully with in situ material, compacting it to a suitable density to still allow for revegetation, and ensuring the slope of the embankment is 3:1. All exposed soil must be protected for the duration of the construction phase with a suitable geotextile (e.g. Geojute or hessian sheeting) to prevent erosion and sedimentation of the riparian drainage line. The soil surrounding the upgraded culvert structures must be suitably loosened on completion of construction activities and revegetated to prevent erosion. The soil surrounding the constructed culvert structures must be	• Minimise erosion damage. • Minimise scarring of the soil surface and land features. • Minimise disturbance and loss of topsoil. • Re-growth of disturbed areas.	• No erosion scars. • No loss of topsoil. • No interference with the natural flow of water. • No visible erosion scars once construction is completed. • The footprint has not exceeded the agreed boundaries.	Contractor, EO, ESO.	As and when required.

suitably loosened on completion of construction activities and revegetated to prevent erosion.				
Fauna <u>All activities on site must comply with:</u> The regulations of the Animal Protection Act, 1962 (Act No. 71 of 1962); and Marine Living Resources Act, 1998 (Act No. 18 of 1998). All construction workers must be informed that the intentional killing of any animal is not permitted as faunal species are a benefit to society. Poaching is illegal and it must be a condition of employment that any employee caught poaching will be dismissed. Employees must be trained on how to deal with fauna species as intentional killing will not be tolerated. In the case of a problem animal e.g. a large snake a specialist must be called in to safely relocate the animal if the EO or ECO is not able to.	• Minimise disturbance to animals. • Minimise destruction of habitat.	• No complaints from Nature Conservation. • No litigation concerning applicable animal protection acts. • No measurable or visible signs of habitat destruction.	RE, Contractor, EO, ESO.	Monitor daily.
Flora <u>The following mitigation measures were identified by the botanist (Capensis, 2021):</u> The ECO must visit the site twice a week after the initial clearing has been completed to ensure no unnecessary loss of vegetation occurs. The ECO must be present for the vegetation clearing period of the construction. Rehabilitation to take place in accordance with the Rehabilitation Plan compiled by GNEC. An Alien Management Plan has also been compiled by GNEC. Please refer to Subsection 6 within this report. Clearing of plant material and debris in the identified drainage line which the road crosses must be done by hand as far as possible and if	• Encourage natural habitat fauna. • Minimise scarring of the soil surface and land features. • Minimise disturbance and loss of topsoil. • Minimise risk of veldt fires. • Minimise risk of fauna and flora destruction.	• No visible erosion scars once construction is completed. • The footprint has not exceeded the agreed boundaries. • All damaged areas successfully rehabilitated. • No veldt fires started by contractor's work force. • No claims from	Contractor, EO, ESO.	As and when required.

machinery is required it should not be permitted to drive within the stream but should operate from the banks.		landowners for damages due to veldt fires.		
Heritage In terms of the National Heritage Act, 1999 (Act No. 25 of 1999), should any archaeological artefacts be exposed during construction activities, work on the area where the artefacts were found shall cease immediately and the ECO as well as the Local Council shall be notified within 24 hours. Finds of human remains must be treated as a crime scene. Upon receipt of such notification, the ECO will arrange for the excavation to be examined by an Archaeologist. Under no circumstances shall archaeological artefacts be removed, destroyed or interfered with. Any archaeological sites exposed during demolition or construction activities must not be disturbed prior to authorisation by the Heritage Western Cape and/or the South African Heritage Resources Agency or the appropriate provincial heritage resource agency.	• Limit the destruction of the country's heritage resources. • The preservation and appropriate management of new archaeological finds should these be discovered during construction.	• No destruction of or damage to known archaeological sites.	Contractor, EO, RE, ESO.	Monitor Daily.
No-go / sensitive areas Stockpiled topsoil should be demarcated with danger tape and seen as no-go areas. Minimization of the disturbances due to the road upgrade must be ensured by marking out and fencing off the development footprint prior to construction. No construction personnel or vehicles are to be allowed on the north side of the construction area in the natural vegetation. The riparian drainage line and 32 m NEMA ZoR as well as the episodic drainage lines should be clearly demarcated with danger tape by an ECO and marked as a 'no-go' area where no construction activities are planned.	• Minimise the potential for the spread of the construction footprint. •	• Containment of footprint.	RE, Contractor, ESO, EO.	Monitor daily.

All construction activities must remain within the boundaries of the development area, as demarcated at the start of the construction phase. The construction footprint must be kept to a minimum by constructing boundaries and demarcation around areas not to be disturbed. These No-go areas must be **demarcated with fencing / warning tape** and signs before any construction activities commence. The EO and ECO must be on site in order to make sure the correct areas are fully demarcated.				
Access route/haul roads Any authorised clearing for access roads must be done under the supervision of the ECO. Access roads for earthmoving-equipment must be clearly designated and be positioned as close as possible to the proposed development site. No driving off from the marked roads is permitted and designated parking areas must be identified and demarcated with applicable signage. Neither the site nor its access roads must be allowed to be utilised for recreational activities, this includes but is not limited to quad bikes, 4x4's and dirt bikes. Security personnel ensure that this is enforced. No unauthorised access is permitted. Utilize existing roads only to gain access to the construction site.	• Minimise loss of topsoil and enhancement of erosion. • Minimise fauna displacement by destruction of natural habitats.	• No erosion on access roads after completion of construction. • No loss of topsoil due to runoff water on access roads.	Contractor, RE or EO.	As required, monitor daily.
Crime, safety and security No site staff, other than security personnel and skeleton staff shall be housed on site unless otherwise stipulated in the Environmental authorisation. Security personnel and skeleton staff shall be supplied with adequate protective clothing, ablution facilities, water and refuse collection facilities. A boundary fence will serve to prevent public access to the site office, for public safety and security reasons. The access to the site must be controlled so as to restrict unauthorised personnel from entering the site. The workers on site must retain	• Reduce the risk of potential incidences. • Minimise the potential impact on the environment. • Reduce the risk of possibly fatal incidents occurring on site.	• No incidences reported.	RE, Contractor, ESO, EO.	Monitor daily.

some means of identification. The ESO and the contractor are responsible for ensuring that only authorised personnel are on site at all times. The site and crew are to be managed in strict accordance with the Occupational Health and Safety Act, 1993 (Act No. 85 of 1993) and the National Building Regulations. Site specific conditions and regulations as set forth by the health and safety agent should also be adhered to. The contractor shall ensure that all emergency procedures are in place prior to commencing work. Emergency procedures shall include (but not be limited to) fire, spills, contamination of the ground, accidents to employees, use of hazardous substances and materials, etc. The contractor shall ensure that lists of all emergency telephone numbers / contact persons are kept up to date and that all numbers and names are posted at relevant locations throughout the construction site. The nearest emergency service provider must be identified during all phases of the project as well as its capacity and the magnitude of accidents it will be able to handle. The contact details of this emergency centre, as well as the police and ambulance services must be available at prominent locations around the construction site and the construction crew camps.				
Visual impact Shade cloth must be utilised to conceal and minimise the visual impact of contractor camps, lay down and storage areas. Rubble and litter must be removed every two weeks or more often as the need arises and be disposed of at a registered landfill site as designated by the Breede Valley Municipalities Solid Waste removal department.	• Minimise visual impact.	• No complaints from I & AP's.	Contractor, landscape contractor, ESO.	Monitor daily.

Hydrology FEN Ecological Consulting (2021): All footprint areas must remain as small as possible and vegetation clearing to be limited to what is absolutely essential. Retain as much indigenous vegetation as possible. Vehicles to be serviced at the contractor laydown area and all re-fuelling is to take place outside of riparian drainage line and 32 m NEMA ZoR as well as outside of the delineated episodic drainage lines. All construction works for the proposed upgrade activities should be undertaken during the drier periods, to minimise any impact on the hydrological functioning of the downstream watercourse Areas where bank failure is observed as a result of construction works should be immediately repaired, by infilling the erosion gully within situ material, compacting it to a suitable density to still allow for revegetation, and ensuring the slope of the embankment is 3:1. All alien and invasive vegetation species, debris and litter removed from the DR 1400 road reserve must be removed from site. Removed materials must be stockpiled outside the delineated extent of the riparian drainage line and must be disposed of at a registered disposal facility. All maintenance footprint areas to remain as small as possible and vegetation clearing to be limited to what is essential and may not extend beyond the road reserve. Contractor laydown areas and stockpiles to be established outside of the riparian drainage line and the 32 m NEMA ZoR in consultation with the appropriate authority; It is considered imperative that all works be undertaken during the dry period to limit surface water contamination and the need for any surface water diversion during the construction works;	• Minimise pollution of soil, surface and ground water resources in the immediate and surrounding environments. • Minimise impeding the natural flow of water. • Minimise the impact on natural water flow dynamics. • Minimise scarring of the soil surface and land features.	• No visible signs of pollution. • No signs of siltation of water courses. • No visible erosion scaring once construction is completed. • Minimum loss of topsoil.	RE, Contractor, EO.	As and when required, monitor daily.

All construction footprint areas to remain as small as possible and vegetation clearing to be limited to what is essential and may not extend beyond the road reserve; The clearing activities should be limited to only what is necessary; Limit construction equipment within the watercourses to what is essential; Stockpiles may not exceed 2 m in height, and their footprint should be kept to a minimum. Stockpiling of removed materials may only be temporary (may only be stockpiled during the period of clearing at a certain crossing point) and should be disposed of at a registered waste disposal facility; All exposed soil must be protected for the duration of the construction phase with a suitable geotextile (e.g. Geojute or hessian sheeting) to prevent erosion and sedimentation. The soil surrounding the upgraded culvert structures must be suitably loosened on completion of construction activities and revegetated to prevent erosion. Ensure alien and invasive plant species are managed post rehabilitation activities until suitable basal cover is achieved. The construction footprint must be limited to the road reserve and the width of the culvert crossing and an additional 5 m construction area (to allow for the stockpiling and movement of personnel). The area must be rehabilitated after the completion of the construction phase, including revegetation thereof with suitable terrestrial vegetation of the Breede Alluvium Renosterveld and Breede Shale Renosterveld vegetation types (Mucina and Rutherford, 2010) at the proposed culverts. In addition, AIP eradication surrounding the culverts must be undertaken. All outlets must be designed to allow stormwater to disperse across the outlet channel before releasing into the downgradient systems. This will prevent incision and scouring. The outlet channel of the proposed culverts must be lined with cobbles				

and revegetated with indigenous species to assist with water dispersal and reduction of water velocities as they flow to downgradient areas. Avoid unnecessary trampling of vegetation irrespective of the vegetation being associated with the watercourses or the surrounding terrestrial area. The soil surrounding the constructed culvert structures must be suitably loosened on completion of construction activities and revegetated to prevent erosion. Ensure alien and invasive plant species are managed post construction until suitable basal cover is achieved. Material used as rip rap or to fill the gabion baskets should be in situ material preferably originating from the surrounding area, however, it must be sustainably sourced. Alternatively, any imported material must be weed free and not be contaminated by any potential pollutants. Once gabions are constructed and/or the rip rap installed, the surrounding natural embankments should be reprofiled and revegetated with indigenous species as soon as possible. The gabion structures (where applicable) should be monitored for erosion and structural integrity after each rainfall event (especially during the rainy winter season) until suitable basal vegetation cover has re-established. Use of biodegradable hessian sheeting must be made to prevent sedimentation of downgradient resources. Construction personnel must be limited to the existing road reserve only, and no movement within the delineated riparian drainage line or episodic drainage lines may be permitted; In instances where the road reserve needs to be widened (i.e. between km marker 8.19 and 10.15) in order to accommodate adequate sloping of areas requiring cut and fill, the area to be impacted must be adequately demarcated and all personnel must be made aware to not impact the riparian drainage line further;				

Where necessary, all embankments must be adequately sloped, ripped, topsoil reinstated and vegetated with indigenous riparian vegetation species. During resurfacing/painting, it must be ensured that no foreign materials (i.e. tar from the resurfacing activities) enter the riparian drainage line or episodic drainage lines which could result in the contaminants being washed downstream; Care must be taken while painting and all personnel must receive training on the risks of chemical contamination of the watercourses; and If any solid materials do enter the watercourse, they should be immediately removed and disposed at a registered waste disposal facility. Paint spills on soil within and surrounding the riparian habitat should be immediately remediated.				

Soil Topsoil must be stripped from all areas that are to be utilized during the construction period and where permanent structures and access is required. These areas will include comprising the permanent works, pipeline trenches, stockpiles, access roads, construction camps and lay down areas. Topsoil must be deemed to be the top layer of soil containing organic material, nutrients and plant grass seed. For this reason it is an extremely valuable resource for the rehabilitation and vegetation of disturbed areas. At the beginning of the construction phase, topsoil removed for vegetation clearance must be stripped to a minimum depth of 300 mm and windrowed. All topsoil must be removed and stockpiled on the site. However, the use of topsoil for rehabilitation contaminated by the seed of alien vegetation must not be permitted unless a programme to germinate the seed and eradicate the seedlings is drawn up and approved, or some other mitigatory feature is found. This must be approved by the ECO. Single handling is recommended. Stockpiles must not be higher than 2m to avoid compaction. The soils surrounding the wingwalls and concrete aprons must be suitable loosened on completion of construction activities. Dust suppression is necessary for stockpiles older than a month – with either water or a biodegradable chemical binding agent. Backfill will require contouring to ensure that it blends in with the surrounding environment.	• Minimise scaring of the soil surface and land features. • Minimise disturbance and loss of soil. • Minimise construction footprint. • Maintain the integrity of topsoil's for future rehabilitation. • Containment of invasive plant growth.	• No visible erosion scars once construction is completed. • The footprint has not exceeded the agreed site in terms of EA etc. • Minimal invasive weed growth. • No signs of sedimentation and erosion. • Method statement.	Contractor.	Daily.

Phase of development	**CONSTRUCTION**
Impact / issue	**TOLERANCES**

MITIGATION MEASURE	**RESPONSIBLE PARTY**	**FREQUENCY OF ACTION**
Fines Environmental management is concerned not only with the final results of the Contractor's operations, but also to the standard of the day-to-day operations required to complete the works. Penalties may be instituted for non-compliance. The penalty is over and above the cost of rectifying the problem and / or damage. Penalties will vary on a sliding scale from **R 1 000 to R 5 000** for non-serious issues as determined by the Engineer / RE / ECO. For each subsequent similar offence, the fine shall be doubled in value to a maximum value of **R 20 000.** The Engineer together with the ECO will decide how the penalties, if any, are to be spent on measures improving the environment. Such fines will be issued in addition to any remedial costs incurred as a result of non-compliance with the environmental specifications. The Engineer will inform the Contractor of the contravention and the amount of the fine, the amount will be deducted from the monies due in payment certificates issued under the Contract. Maximum fines for the following contraventions by either the Contractor and / or his subcontractors may be imposed by the Engineer / ECO, as follows: **a)** Any persons, vehicles, plant, or material related to the Contractors operation within the designated boundaries of a "no-go" area. **R 5 000** **b)** Persistent failure to demarcate "no-go" areas. **R 2 000** c) Damage to trees not specified to be removed. **R 3 000** **d)** Persistent and unrepaired oil leaks from machinery / not using a drip tray to collect waste oil and other lubricants / not using specified absorbent material to encapsulate hydrocarbon spillage / using inappropriate methods of refuelling. **R 3 000** **e)** Litter on site associated with construction activities. **R 2 000** **f)** Deliberate lighting of illegal fires on site. **R 1 000** **g)** Burning of waste without a permit. **R 2 000** **h)** Any employee eating meals on site, outside of defined eating area. **R 500** i) Employees not making use of the site ablution facilities. **R 2 000** j) Failure to implement specified noise controls. **R 1 000**	Engineer	Monitor Daily

k) Failure to empty waste bins/skips/litter structures on a regular basis. **R 2 000** **l)** Inadequate dust control or failure to apply dust suppression. **R 2 000** **m)** Any water abstraction activities from a watercourse without approval. **R 5 000** **n)** Inadequate handling of bitumen. **R 3 000** **o)** Inadequate handling of concrete. **R 2 000** Any activity, that in the reasonable opinion of the Engineer, RE and ECO, constitutes a deliberate contravention of the requirements of the specifications relating to environmental matters. **R 4 000**	Engineer	Monitor daily

Table 6: THE PROPOSED UPGRADE OF DIVISIONAL ROAD (DR) 1400 FROM KM 8.20 - KM 10.21, NUY STATION, WESTERN CAPE, *OPERATIONAL* PHASE EMPr (General)

Phase of development	**OPERATIONAL**
Impact / issue	**General**

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION
Waste management Please refer to the waste Minimization Plan Herewith attached.	• Sustainable management of waste by recycling. • To keep the development neat and tidy. • Minimise litigation and complaints by I&AP's. • Reduce visual impact. • Control potential influx of vermin and flies thereby minimising the potential of diseases at the site and the surrounding environment.	• Disposal of refuse in an appropriate manner with no refuse polluting the development. • Development is neat and tidy. • No complaints from surrounding industries and businesses. • Sufficient containers available on site. • No visible or measurable signs of pollution of the environment (soils, ground	ECO.	6 Monthly.

Phase of development	**OPERATIONAL**
Impact / issue	**General**

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION
		and surface water).		
Stormwater Management Storm water, wherever possible, must be allowed to soak into the land in the area on which the water has been discharged. The storm water system and the discharge points must be inspected, and damaged areas must be repaired if required. Discharge points should further be inspected for blockages of any kind; these must be removed timeously to ensure the efficient operation of the storm water management system. No waste or refuse must be allowed to access the storm water infrastructure. In the event that silt runoff occurs off the development site, the cause of this must be investigated and suitable mitigation measures employed. This may include the vegetation of bare areas, installing flow diversion channels in consultation with an engineer, installing velocity reducing structures etc. For all maintenance undertaken reference must be made to recommendations in the engineer's reports. All maintenance activities must be monitored to ensure that no environmental damage occurs. All damage must be mitigated immediately.	• Minimise pollution of soil, surface and ground water resources. • Minimise the potential loss of topsoil. • Minimise the potential of flooding of the development, or its neighbouring properties.	• No evidence of pollution at the discharge points. • No evidence of silt build-up at the discharge points. • No complaints from I & AP's.	ECO.	As and when required. Monitor seasonally.

Phase of development	**OPERATIONAL**
Impact / issue	**General**

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION
Dust Surface dust should be minimized during the operational phase of the development in order to prevent the dust from being blown to adjacent properties.	• No dust blown from the development to adjacent properties.	• No complaints from I&AP's.		
Rehabilitation Rehabilitation must be conducted in line with the Rehabilitation Plans compiled by GNEC.	• Ensure re-establishment of natural vegetation. • Prohibit the loss of wetland habitat	• Re-growth of natural vegetation		
Atmospheric pollution **Air pollution** All forms of dust/air pollution must be managed in terms of the Air Quality Act No. 39 of 2004 and Dust Regulations of 2013, this includes the control of noxious and offensive gases, smoke, dust and vehicular emissions. Under no circumstances may heavy smoke be released into the air.	• Reduce visual impact. • Minimise chances of transgression of the acts controlling pollution.	• No visible signs of pollution. • No litigation due to transgression of pollution control acts. • No complaints from surrounding residents and businesses.	ECO.	Monitor daily.

Phase of development	**OPERATIONAL**
Impact / issue	**General**

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION
Noise pollution Noise levels shall be kept within acceptable limits, these are determined in terms of the relevant local by laws. Operation activities will remain within normal working hours (07:00am – 18:00pm).				
Traffic management All traffic management must be done in accordance with the **National Road Traffic Act No. 93 of 1996.**	• Minimise chances of transgression of the acts controlling traffic. • Minimise traffic backlog.	• No litigation due to transgression of traffic control acts. • No complaints from surrounding industries and businesses.	ECO.	Monitored continually.
Flora Monitoring of the construction area and adjacent vegetation must be undertaken every six months for three years after the construction. Any exotic or invasive alien plants found must be removed and controlled.				

Phase of development	**OPERATIONAL**
Impact / issue	**General**

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION
Freshwater Ecology <u>Freshwater Ecological Network (FEN) Consulting (Pty) Ltd., 2021:</u> The riparian drainage line and episodic drainage lines are to be considered "off limits" to any vehicular activity; Existing access roads must be used for monitoring purposes. No indiscriminate movement of vehicles is allowed as this would result in the compaction of soil and potential loss of riparian and instream habitat; Hot spots for the build-up of debris and excess sediment must be identified and when necessary, debris/excess sediment must be removed by hand to prevent future flooding and potential damage to infrastructure. In this regard, special mention is made of periods following high rainfall and subsequent high instream water volumes. Removal of debris must be undertaken in line with the above listed construction mitigation measures; The episodic drainage lines must be monitored for alien and invasive vegetation encroachment and all alien vegetation/weeds must be removed according to a suitable alien vegetation control plan. Annual follow up should be undertaken to all watercourses for at least 3 years post construction; and Any erosion or gully formation must be identified on an ongoing basis and re-profiled and revegetated accordingly.				

Table 7: THE PROPOSED UPGRADE OF DIVISIONAL ROAD (DR) 1400 FROM KM 8.20 - KM 10.21, NUY STATION, WESTERN CAPE, OPERATIONAL PHASE EMPr (EA conditions)

Phase of development	OPERATIONAL	GNEC-Guillaume Nel	
Impact / issue	EA Conditions		……

MITIGATION MEASURE	MANAGEMENT OBJECTIVES	MEASURABLE TARGETS	RESPONSIBLE PARTY	FREQUENCY OF ACTION
	•	•		

THE PROPOSED UPGRADE OF DIVISIONAL ROAD (DR) 1400 FROM KM 8.20 - KM 10.21, NUY STATION, WESTERN CAPE.

DEA&DP Ref: 16/3/3/1/B2/32/1010/22

(INCLUDING THE WASTE, WATER USE AND ELECTRICITY CONSUMPTION MINIMIZATION AND MANAGMENT PLAN)

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REFERENCES

DEA&DP, 2003. A Waste Minimization Guideline Document for Environmental Impact Assessments (2003) by Common Ground in association with deVilliers Brownlie Associates.

National Environmental Management Act 107 of 1998 (NEMA)

National Environmental Management: Waste Act 59 of 2008 (NEM:WA)

Stellendale Village DRAFT Green Building Guidelines by Steadfast Greening, 2008

SUB SECTION 1 - INTRODUCTION

1.1 INTRODUCTION

The Western Cape Government: Department of Transport and Public Works, proponent of the proposed maintenance, will use this WASTE, WATER USE AND ELECTRICITY CONSUMPTION MINIMIZATION AND MANAGMENT PLAN to minimize and manage waste and wastage, electricity consumption and water use in the design, construction and operational phase of the proposed development as a tool in managing the impacts of the proposed development after environmental approval from the Department of Environmental Affairs and Development Planning (DEA&DP) in terms of the **NEW** Environmental Impact Assessment Regulations (GN R. No. 983, GN R. No. 984 and GN R. No. 985 [4 December 2014], as amended 07 April 2017) under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA), is obtained.

This document is based on the Waste Minimization Guideline Document on the DEA&DP website (by Common Ground in association with deVilliers Brownlie Associates) and the Stellendale Village DRAFT Green Building Guidelines by Steadfast Greening.

The regulation of activities that have a significant impact on the environment as well as the protection of the environment itself, have improved significantly in the last decade and a half with the promulgation of the Constitution, and general environmental legislation, such as the National Environmental Management Act (NEMA) and the National Water Act. One of the main impacts of human activities on the environment is that of waste disposal (Common Ground & deVilliers Brownlie Associates, 2003).

Waste may be in solid, liquid or gaseous form. It may be benign, toxic, or hazardous. The management of hazardous waste, with associated negative impacts on the environment, is generally covered by legislation. The longer term, cumulative impacts of relatively benign waste disposal is poorly addressed by our laws (DEA&DP Waste Minimization Guideline, 2003).

“Waste” in this document is primarily interpreted as solid waste. Waste minimization per se is not specifically legislated in South Africa at present. Similarly, there are no legal instruments that can be used to enforce reduction in wastage of electricity and water although the National Water Act No 36 of 1998 prohibits wastage of water without specifying what wastage means and how this section will be enforced. However, there are a number of laws and overarching policies that are aimed at sustainable development and sound environmental management, and which are relevant to waste and wastage minimisation.

Wastage is defined in the Oxford Dictionary as “expend or employ to no purpose or for inadequate result, use extravagantly or ineffectually, squander”. Part of the obligation to protect the environment would be to limit wastage of resources. Thus, limiting wastage of water would fall within this obligation. So too would be limiting the wastage of electricity that results in pollution at the site of electricity generation (Common Ground & deVilliers Brownlie Associates, 2003).

SUB SECTION 2 – LEGAL & POLICY REQUIREMENTS AND GUIDELINES

National legislation, as well as numerous local policies, govern waste management and it is therefore important to understand the requirements of these legal documents. The list of legislation relating to waste management in South Africa is listed below:

- The Constitution of the Republic of South Africa, 1996 (Act No. 108 of 1996)
- National Environmental Management: Waste Act (NEM:WA), 2008 (Act No. 59 of 2008)
- National Environmental Management: Waste Amendment Act, 2014 (Act 26 of 2014)
- National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998)
- National Water Act, 1998 (Act No. 36 of 1998)
- Hazardous Substances Act, 1973 (Act No. 5 of 1973)
- Health Act, 1977 (Act No. 63 of 1977)
- NEM:WA National Waste Management Strategy, 2012
- NEM:WA National Norms and Standards for the Storage of Waste, 2013
- City of Cape Town Integrated Waste Management By-Law, 2009
- City of Cape Town Integrated Waste Management Policy, as amended

On-site activities should, at all times, be compliant with the abovementioned legislation and policies. An overview of the NEM:WA, 2008 general duty principle is provided below.

2.1 NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008 (ACT 59 OF 2008)

The National Environmental Management: Waste Act (NEM:WA), 2008 (Act No. 59 of 2008) was promulgated and enforced to reform the law that regulates waste management in order to protect health and the environment.

The general duty in respect of waste management is stipulated in NEM:WA (2009) as follows:

"A holder of waste must, within the holder's power, take all reasonable measures to-

(a) avoid the generation of waste and where such generation cannot be avoided to minimise the toxicity and amounts of waste that are generated;

(b) reduce, re-use, recycle and recover waste;

(c) where waste must be disposed of, ensure that the waste is treated and disposed of in an environmentally sound manner;

(d) manage the waste in such a manner that it does not endanger health or the environment or cause a nuisance through noise, odour or visual impacts;

(e) prevent any employee or any person under his or her supervision from contravening this Act; and

(f) prevent the waste from being used for an unauthorised purpose".

It is recommended that an integrated waste management approach be followed on site. This approach should be followed during all phases of the proposed development. Important objectives to keep in mind throughout the project life cycle is the reduce, re-use, recycling and recovery of waste.

SUB SECTION 3 – MONITORING MECHANISMS

The following mitigation measures have been identified in order to ensure that proper waste handling takes place on site.

3.1 GENERAL WASTE MITIGATION MEASURES

1. No waste may be burned on site and should instead be disposed of at a licensed landfill site. Cleared vegetation will also not be allowed to be burned on site. The site has been largely altered from its natural state and therefore cleared vegetation will largely consist of alien invasive species. A dedicated area should be identified on site where all cleared vegetation can be stored in order to prohibit the seeds of alien invasive species to disperse on site. This storage area should not be located within close proximity to the watercourse and wetlands area. The appointed ECO should be consulted in order for a suitable area to be identified.
2. Cement bags must be disposed of in the demarcated hazardous waste receptacles and the used bags must be suitably disposed of.
3. The visible remains of concrete, either solid, or from washings, shall be physically removed immediately and disposed of as waste to a Licensed Landfill site.
4. Rubble and litter must be removed every two weeks or more often as the need arises and be disposed of at a registered landfill site as designated by the Breede Valley Municipality Solid Waste removal department.
5. Adequate waste collection bins must be provided on site. Separate bins must be provided for general and hazardous waste.
6. Any solid waste or litter generated as part of the construction activities must be disposed of within suitable waste bins.
7. No waste or refuse must be allowed to access the stormwater infrastructure.
8. Material Safety Data Sheets (MSDS) must be prepared for all hazardous substances on site and supplied by the supplier where relevant. MSDS's must be updated as required.
9. Waste must be collected by the local municipality or a municipal service provider that is authorised to collect waste.

3.2 STORAGE OF WASTE

The following mitigation measures apply to the storage of waste. The storage of waste on site must be in line with the general requirements for the storage of waste as stipulated in Section 21 of the NEM:WA, 2008 (Act No. 59 of 2008).

General requirements for the storage of waste (as specified in terms of NEM:WA, 2008):

"Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that-

(a) the containers in which any waste is stored, are intact and not corroded or in any other way rendered unfit for the safe storage of waste;
(b) adequate measures are taken to prevent accidental spillage or leaking;
(c) the waste cannot be blown away;
(d) nuisances such as odour, visual impacts and breeding of vectors do not arise; and
(e) pollution of the environment and harm to health are prevented."

Storage of Waste (as specified in terms of NEM:WA, 2008)

"Any person who generates general waste that is collected by a municipality must place the waste in a container approved, designated or provided by the municipality for that purpose and in a location approved or authorised by the municipality."

If the volumes of waste stored on site exceed 80 m^3 for hazardous waste and/or 100 m^3 for general waste, the NEM:WA National Norms and Standards for the Storage of Waste in terms of Government Notice (GN) No. 926 of 29 November 2013 must be adhered to.

SUB SECTION 4 - WASTE REDUCTION

4.1 BACKGROUND TO WASTE REDUCTION

A key element of environmentally friendly buildings is to promote awareness and change behaviour around all aspects of waste management.

Waste minimisation can therefore be assessed as a component of waste management that aims to reduce the amount of waste, which has to be disposed of. In this regard waste minimisation is aimed at tackling the causes and sources of waste rather than just trying to address and mitigate the symptoms (e.g. through treatment). Waste management can be depicted as a hierarchy, as shown in Figure 5 below. In the hierarchy, source reduction options are considered as a priority, followed by re-use and recycling options. Treatment options are considered only when acceptable waste minimisation techniques have been investigated. As a "last resort" disposal should be considered.

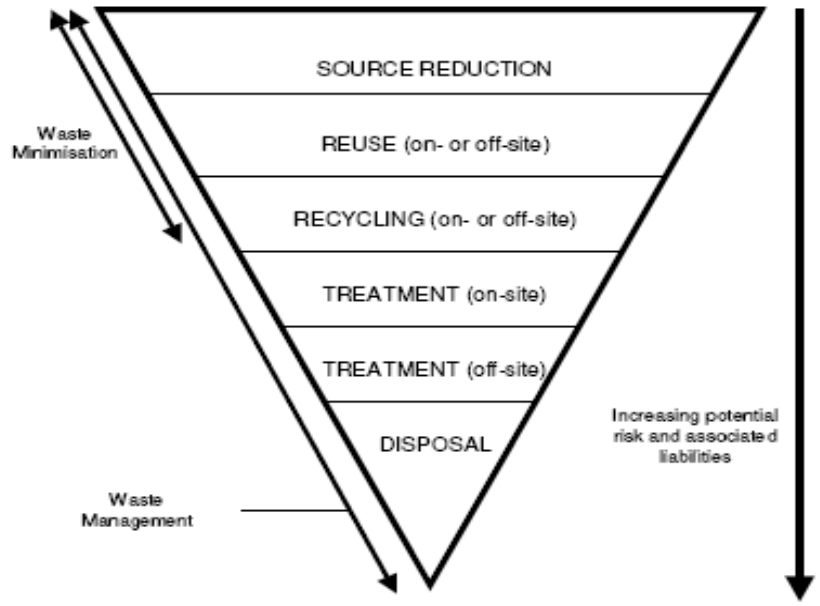

Figure 5 Waste Management Hierarchy (Common Ground & deVilliers Brownlie Associates, 2003).

Waste Management, therefore, involves interventions to minimize waste generation in the planning, operation, management and maintenance of the built environment, and includes waste prevention, waste reduction, waste re-use, and recycling.

A further aspect is minimizing the environmental and health impacts by reducing toxicity and ensuring environmentally sound treatment and disposal of remaining waste. The ultimate is however to promote a zero-waste concept where all the related materials can be used again over the longer term with life-cycle assessments, cradle to cradle.

Zero Waste is a goal, a process, a way of thinking that is different to the way we think about products and processes. Not only is Zero Waste about recycling and avoiding waste going to landfill, it also changes production and distribution systems to prevent waste from being manufactured in the first place. It is a way of changing how materials flow through society in such a way that, as in nature, they flow in a closed loop – resulting in efficient use of material and other resources, such as energy and water (Steadfast Greening, 2008).

Zero Waste therefore aims to:

- Prevent rather than manage waste.
- Turn resource that would normally be thrown away into economic value instead of loss.
- Support sustainable development.
- Follows natural processes where everything is recycled.
- Promote the efficient flow of energy and materials.

It is thus essential to ensure that waste avoidance is built into the process at a design phase, referring to the construction and maintenance of the building. This will be done through selection of the appropriate building materials and managing the construction process in a responsible manner.

Opportunities for the separation of waste at source must also be built into the design of the building to encourage people to recycle their waste.

4.2 BENEFITS OF WASTE REDUCTION

The benefits of waste reduction as described in the DEA&DP Waste Minimization Guideline (Common Ground & deVilliers Brownlie Associates, 2003) include the following benefits.

4.2.1 Financial benefits

- Reduced transportation costs for waste materials (less transportation because of less material wasted). This includes transportation to and from the site and disposal.
- Reduced disposal costs of waste materials (disposal costs are likely to rise significantly in the near future)
- Reduced purchase quantity and price of raw materials by waste minimisation.

- Reduced purchase price of new materials when considering reuse and recycling (depending on materials).
- Increased returns can be achieved by selling waste materials to be reused.

4.2.2 Environmental benefits

Some of the environmental benefits are:

- Reduced quantity of waste generated.
- Efficient use of waste generated.
- Minimised amounts of waste disposed of at landfills, which therefore extend the lifespan of landfills.
- Reduced environmental effects as a result of disposal, e.g. noise, pollution.
- Reduced transportation of waste to be disposed of (hence less noise, vehicle emission pollution, and energy used).

4.2.3 Social benefits

- Increased site safety.
- Increased work efficiency.
- Enhanced company image.
- Job creation through recycling initiatives.

4.3 GENERATED WASTE

4.3.1 Examples of waste generated during construction:

- Waste wood from cutting structural elements, broken structural elements and damaged elements from incorrect storage
- Damaged or off-cut steel components
- Off-cut electrical wiring and cabling
- Broken or off-cut tiles
- Packaging
- Off-cut and broken bricks
- Surplus material from cut and fill activities
- Spoil from cut and fill activities
- Off-cut, or broken conduit and plumbing
- Off-cut or damaged insulation elements

- Surplus paint and paint containers
- Broken or redundant plant and equipment
- Surplus concrete, cement and grouting
- General waste

SUB SECTION 5 - WASTE MINIMIZATION PLAN

5.1 WASTE MINIMIZATION DURING CONSTRUCTION

Issue	Minimization Plan
General Considerations	
Standardization of dimensions	The developer will for as far as it is economically feasible design the buildings to maximise the use of standard dimensions in order to minimize the amount of cutting waste during construction. They include but are not limited to: • The size of rooms and roofs to ensure minimal cutting of tiles; • The size of roofs to make use of standard roof trusses.
Material Selection	The developer will, for as far as it is economically feasible select: • materials for least waste generation during preparation and use during construction, • materials used in the construction which are durable in order to minimise maintenance or replacement, • standard materials to increase re-use/ recycling potential, • materials which are sourced locally.
Pre-Fabrication	The developer will, for as far as it is economically feasible make use of pre-fabricated components in order to minimise waste on site and permit re-use by the manufacturers of any waste generated during construction of the units.
Hazardous Substances	The developer will, for as far as it is economically feasible make use of non hazardous substances to replace hazardous substances such as replacing asbestos with fibre glass etc.
Maintenance	The developer will, for as far as it is economically feasible design the structure of buildings in such as way that it minimizes but facilitates maintenance, in order to prolong the life-span of the structure and reduce the amount of waste resulting from demolition. The developer will, for as far as it is economically feasible design the structure of buildings in such a way that maintenance does not require the use of hazardous or toxic substances. This will ensure that minimal waste will be un-recyclable due to contamination.

Ordering	The developer will strive to order materials “just-in-time” to avoid deterioration/ breakage during storage The developer will strive to (as far as reasonably possible) order materials only from suppliers which will take back any unused/ off-spec or broken materials favoured. The developer will strive to (as far as reasonably and economically possible) order materials in bulk to reduce packaging but without over-ordering resulting in waste generation. Suppliers which take back the packaging will be favoured by the developer.
Load and unloading of materials	The construction site staff will be trained to load and unload materials correctly to avoid breakage and wastage.
Storing of materials	Care will be taken to ensure that materials are stored appropriately according to supplier specifications to reduce the risk of damage or deterioration.
The use of temporary structures	The developer will attempt to keep temporary structures on site to a minimum. Where unavoidable the temporary structures used on this site, will be re-used on other sites.
General	The **contractors must provide and maintain a method statement** for “solid waste management”. The method statement must provide information on the proposed licensed facility to be utilised and details of proposed record keeping for auditing purposes. For the disposal of clean building rubble, a General & Hazardous Waste Landfill sites can be utilized. • Waste shall be separated into recyclable and non-recyclable waste, and shall be separated as follows: Hazardous waste: including (but not limited to) old oil, paint, etc, • General waste: including (but not limited to) construction rubble, • Reusable construction material. Recyclable waste shall preferably be deposited in separate bins. The contractor is advised that “Collect-a-Can” collect tins, including paint tins, chemical tins, etc. and “Consol” collect glass for recycling. Any illegal dumping of waste will not be tolerated. Proof of legal dumping must be able to be produced on request. Bins must be clearly marked for ease of management. All refuse bins must have a lid secured so that animals cannot

	gain access. Under no circumstances may any waste be burnt. All waste must be managed in accordance with the Minimum Requirements for waste disposal by landfill 2nd ed 1998. The minimum requirements for easy access by waste disposal service trucks will be met in order for vehicles to effectively access the waste. All waste must be disposed of at a registered site. It is the management bodies' responsibility to ensure that the contracted party responsible for waste disposal disposes of the waste at the correct facility. This facility refers to a General & Hazardous Waste Landfill site as referred to by both the Breede Valley Municipality and Solid Waste management Department. These landfill sites are permitted by Department Water and Forestry with operating numbers in place.
	The use of building materials which result in least amount of waste generated (e.g. pre-fabrication as opposed to on-site construction/ fabrication) will be favoured by the developer as far as economically feasible. Materials will be re-used on site wherever possible. Off-cuts and equipment will be re-used on other jobs wherever possible.

5.2 WASTE MINIMIZATION DURING OPERATION

Issue	Minimization Plan
General Considerations	
General	Owners of properties will be encouraged to separate waste into recyclable and non-recyclable waste, and shall be separated as follows: • Hazardous waste: including (but not limited to) old oil, paint, etc, • General waste: including (but not limited to) domestic refuse, non- recyclable waste; • Recyclable waste shall preferably be deposited in separate bins. The owners will be advised that "Collect-a-Can" collect tins, including paint tins, chemical tins, etc. and "Consol" collect glass for recycling. Bins must be clearly marked for ease of management. All refuse bins must have a lid secured so that animals cannot gain access. Sufficient closed containers must be strategically

	located around the development to handle the amount of litter, wastes, rubbish, debris generated by the development. Under no circumstances must any waste be burnt. All waste must be managed in accordance with the Minimum Requirements for waste disposal by landfill 2nd ed 1998. The minimum requirements for easy access by waste disposal services must also be met in order for vehicles to effectively access the waste. All waste must be disposed of at a registered site. It is the management bodies' responsibility to ensure that the contracted party responsible for waste disposal disposes of the waste at the correct facility. This facility refers to a General & Hazardous Waste Landfill site as referred to by both the Breede Valley Municipality Solid Waste Management Department. These landfill sites are permitted by Department Water and Sanitation with operating numbers in place.

SUB SECTION 6 – WATER USE AND MANAGEMENT PLAN

6.1- WATER USE MINIMIZATION AND MANAGEMENT DURING CONSTRUCTION AND OPERATION

CONSTRUCTION PHASE	
Issue	Management Plan
General Considerations	
DUST SUPPRESSION	Potable water cannot (as far as possible) be used as a means of dust suppression, alternative measures must be sourced. The use of 'grey' water must be investigated as an alternative. The contractor will be responsible to source this water and obtain the required approvals.
ABLUTIONS	The developer will reuse as much of the water from wash basins on site as possible.
CONCRETE AND CEMENT PREPARATION	The developer/contractor will order concrete and cement from supplier for as far as possible. The mixing area should contain any liquids to prevent contamination of soil and storm water
GENERAL CLEANSING OPERATIONS	All hoses will be fitted with trigger gun spray nozzles to limit wastage. Dry sweeping will be used (for as far as possible) in preference to washing of areas and equipment. **Wherever possible** biodegradable and non-toxic detergents, soaps and degreasers will be used. Regular Maintenance of equipment will be conducted in order to prevent wastage.

OPERATIONAL PHASE	
WATER WISE LANDSCAPING	The developer will focus on the use of indigenous water wise planting and irrigation methods (if necessary), such as drip irrigation, which can drastically reduce garden water consumption. If biodegradable, non-toxic soaps, shampoos and detergents are used exclusively in the structure, these waste water streams can

	be directed to catch ponds for re-use as irrigation.
WATER SOURCES	The capture and use of rainwater from gutters and roofs will be promoted amongst owners of the new erven
ABLUTIONS	Washbasin taps should be fitted with flow reduction devices or aerators. Toilets will be fitted with dual flush systems.

SUB SECTION 7 – ELECTRICITY MANAGEMENT PLAN

7.1 ELECTRICITY CONSUMPTION REDUCTION OPERATION

Using energy efficient electrical installations is one of the cheapest and easiest ways to reduce energy costs and thus improve the economic and environmental performance of existing developments. Newer equipment is often more energy efficient than old equipment.

Choosing appliances such as energy efficient Geysers, stoves, Zero CFC based refrigerators; may initially be more expensive, although in the longer term it would reduce electrical costs and thus has a positive effect on the environment.

OPERATIONAL PHASE	
General Considerations	
AIRCONDITIONING	The buildings will as far as possible be positioned or orientated to optimise use of ambient weather and climate conditions for heating and cooling. Solar glazing or energy efficient windows to reduce need for air-conditioning will be promoted. Insulation to reduce the need for air-conditioning will be promoted. Natural air flow must be used in preference to air-conditioning wherever possible.
LIGHTING	Natural light will be used wherever possible during the day in preference to artificial light (trade off between using large windows for use of sunlight but this may require additional air-conditioning) Low voltage or compact fluorescent and/or High Pressure Sodium lights will be used in place of incandescent globes.
REFRIGERATION	**Should it be used** on the premises, consideration must be given to fit cold rooms and freezers with counter-weight doors to ensure that they cannot be left open unnecessarily.
HEATING	The use of solar heating will be investigated and utilized as far as economically feasible.

SUB SECTION 8- REHABILITATION AND ALIEN CLEARING MANAGEMENT PLAN

REHABILITATION AND ALIEN CLEARING MANAGEMENT PLAN

REHABILITATION AND ALIEN CLEARING MANAGEMENT PLAN FOR THE NON-PERENNIAL DRAINAGE LINES ALONG DR 1400, NUY VALLEY, WESTERN CAPE PROVINCE.

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25 November 2021

Contents

1. INTRODUCTION

Guillaume Nel Environmental Consultants (GNEC) were appointed by Arun Projects (Pty) Ltd to facilitate the Environmental Impact Assessment (EIA) process required by the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) for the proposed project.

As part of the Environmental Impact Assessment a Rehabilitation and an Alien Clearing Management Plan needs to be compiled for the episodic drainage lines along DR1400.

As per Freshwater Impact Assessment report

Several episodic drainage lines (lacking in either wetland or riparian characteristics) were identified upgradient of the section of the DR 1400 to be upgraded. One of these episodic drainage lines was noted to be traversed by the section of DR 1400 to be upgraded at approximately km marker 9.70. A culvert is thus proposed at the access point to the borrow pit (at km marker 9.684) where runoff from the upgradient catchment (and flow from the episodic drainage line) has been noted to pond.

Another culvert is proposed at km marker 9.136, located downgradient of an episodic drainage line. The proposed culvert will thus convey surface runoff from the northern catchment area including from the upgradient episodic drainage line to the downgradient areas.

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2. SITE LOCATION AND STUDY AREA

The study area falls within the Breede Valley Municipality approximately 12 km east of Worcester in the Nuy Valley area.

The Western Cape Government: Department of Transport and Public Works: Road Network Management Branch is planning to upgrade a section of road along the DR 1400 between km marker 8.190 and 10.207 in Nuy Valley, Western Cape Province

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Another culvert is proposed at km marker 9.136, located downgradient of an episodic drainage line. The proposed culvert will thus convey surface runoff from the northern catchment area including from the upgradient episodic drainage line to the downgradient areas.

Please refer to Figure 1 below: Digital satellite imagery of the section of the DR 1400 to be upgraded and investigation area in relation to the surrounding environment..

Please refer to Figure 2 below: The locality of the delineated riparian drainage line and episodic drainage lines associated with the section of the DR 1400 to be upgraded and the associated investigation area.

Please refer to Figure 3 below: Proposed new culvert at non perennial drainage line at Km 9.684.

Please refer to Figure 4 below: Proposed new culvert down gradient of the non-perennial drainage line at Km 9.136.

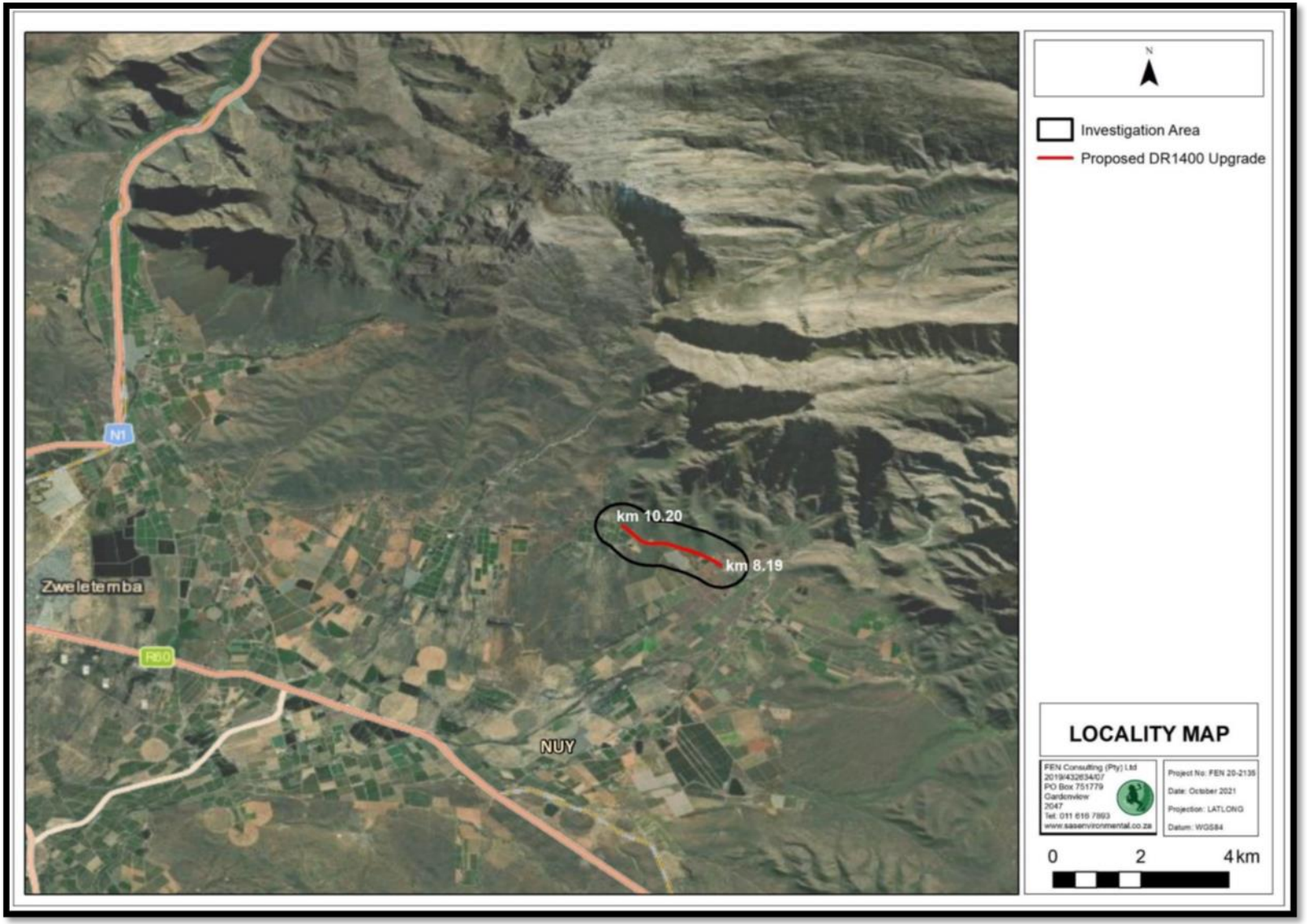

Figure 3: Locality map; Digital satellite imagery of the section of the DR 1400 to be upgraded and investigation area in relation to the surrounding environment.

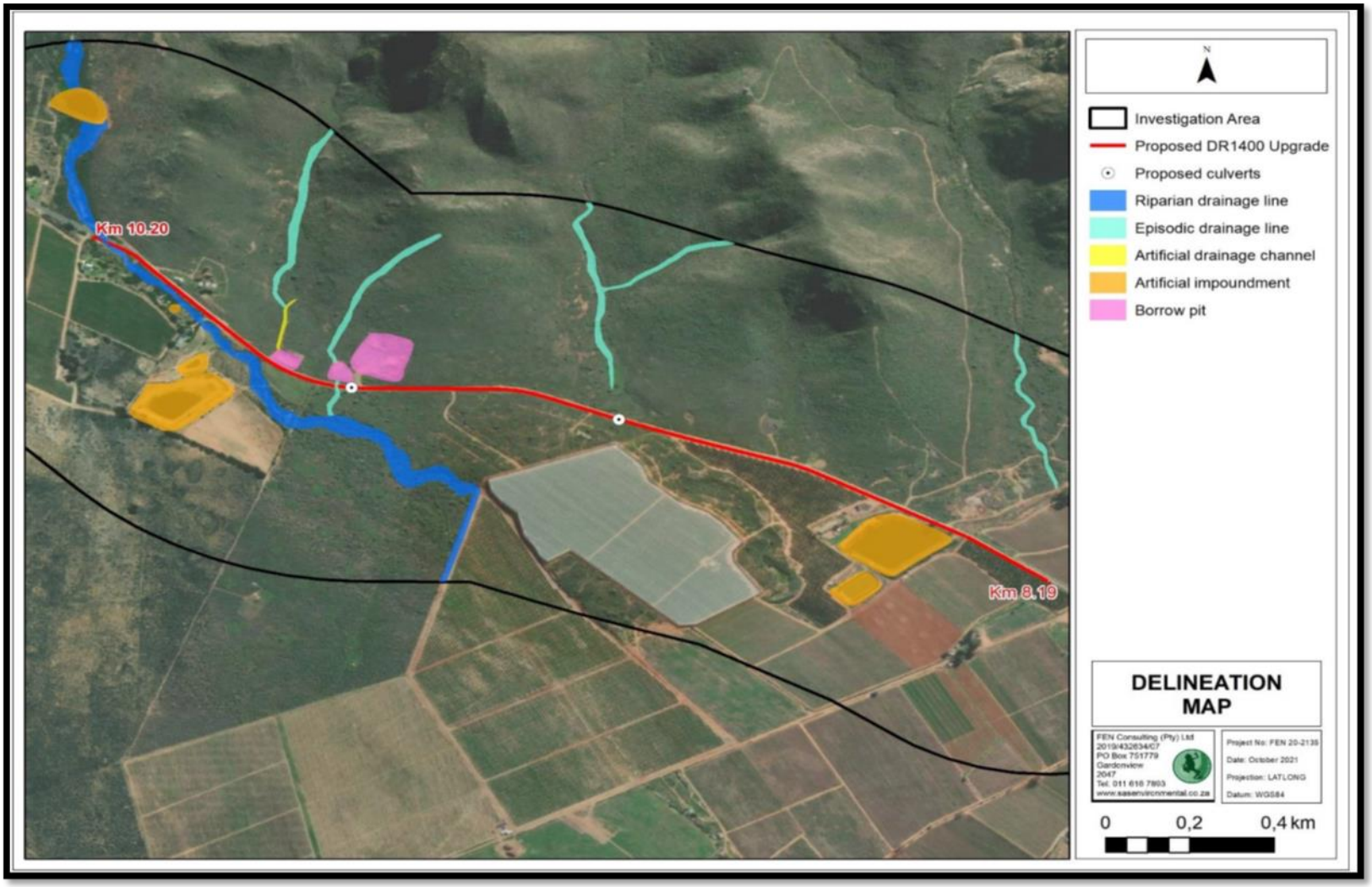

Figure 4: The locality of the delineated riparian drainage line and episodic drainage lines associated with the section of the DR 1400 to be upgraded and the associated investigation area.

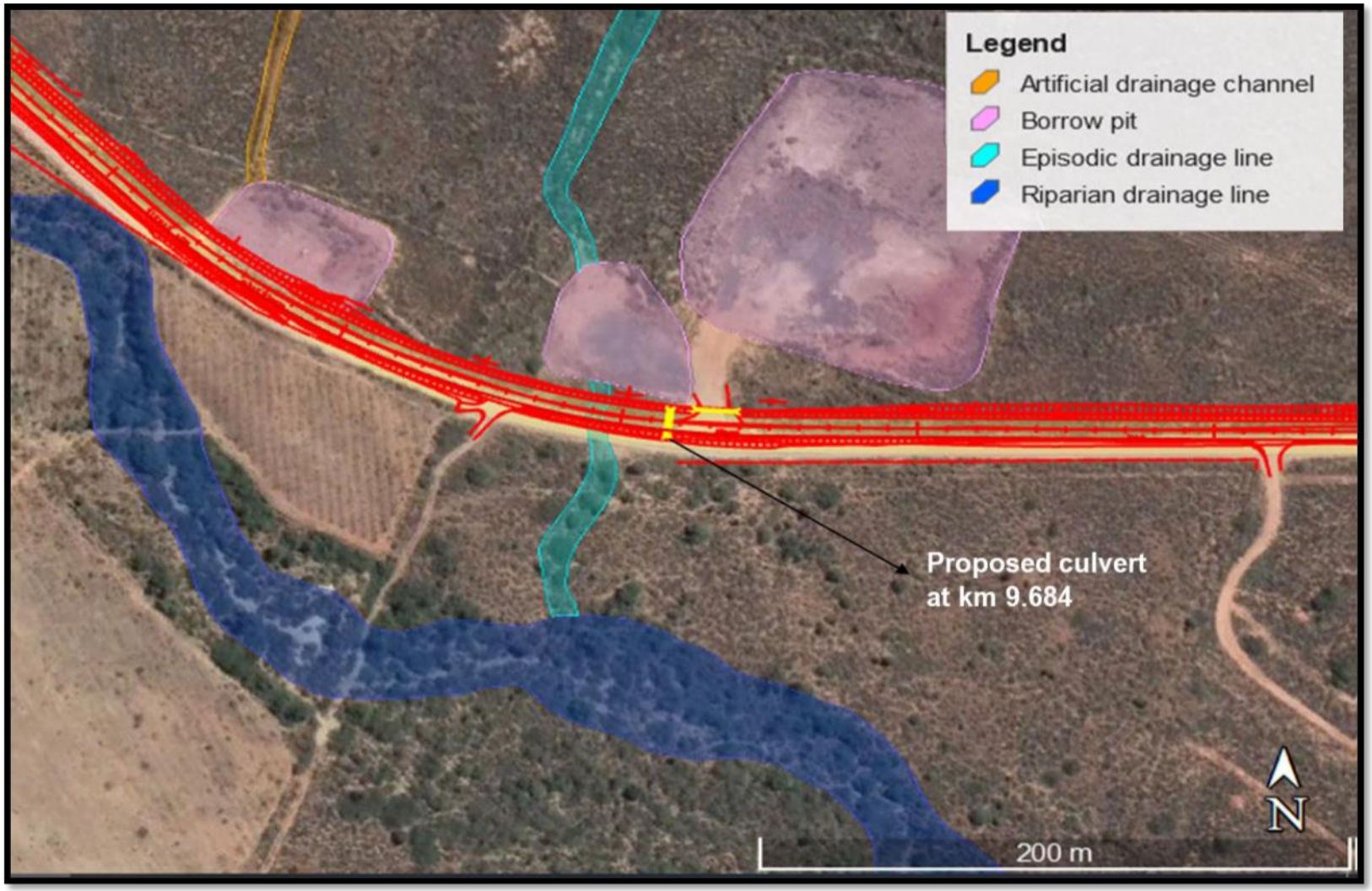

Figure 3: **Proposed new culvert at non perennial drainage line at Km 9.684.**

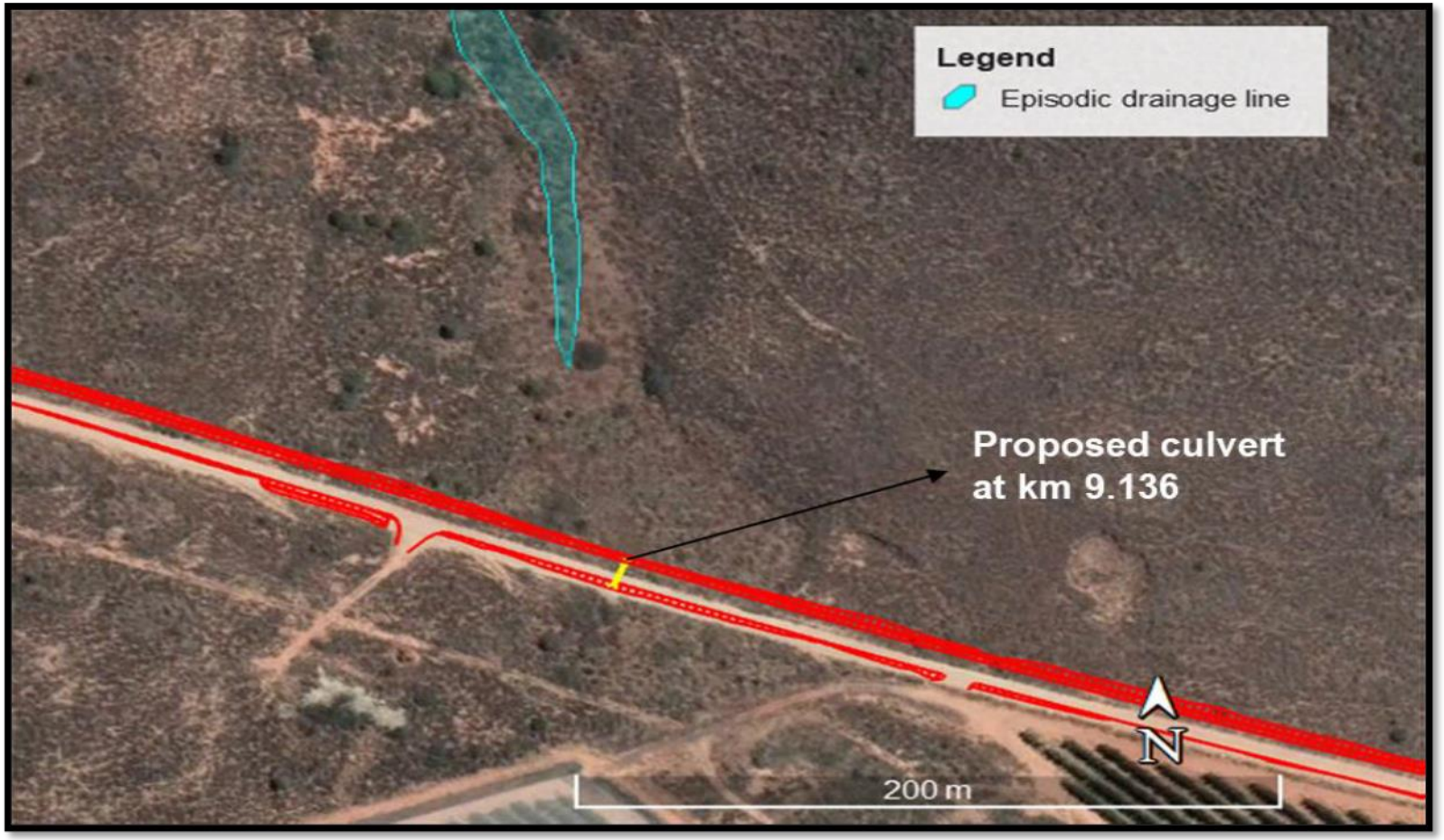

Figure 4: Proposed new culvert down gradient of the non-perennial drainage line at Km 9.136.

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3. THE VEGETATION

3.1 Vegetation of study area:

With reference to the Botanical Impact Assessment report:

According to the Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018) (VEGMAP), the vegetation types occurring in the study area are Breede Shale Renosterveld and Breede Alluvium Renosterveld.. The vegetation and landscape features of the ecosystems are described below as per Mucina and Rutherford (2006):

Please refer to Figure 5 below: Vegetation map of the study area.

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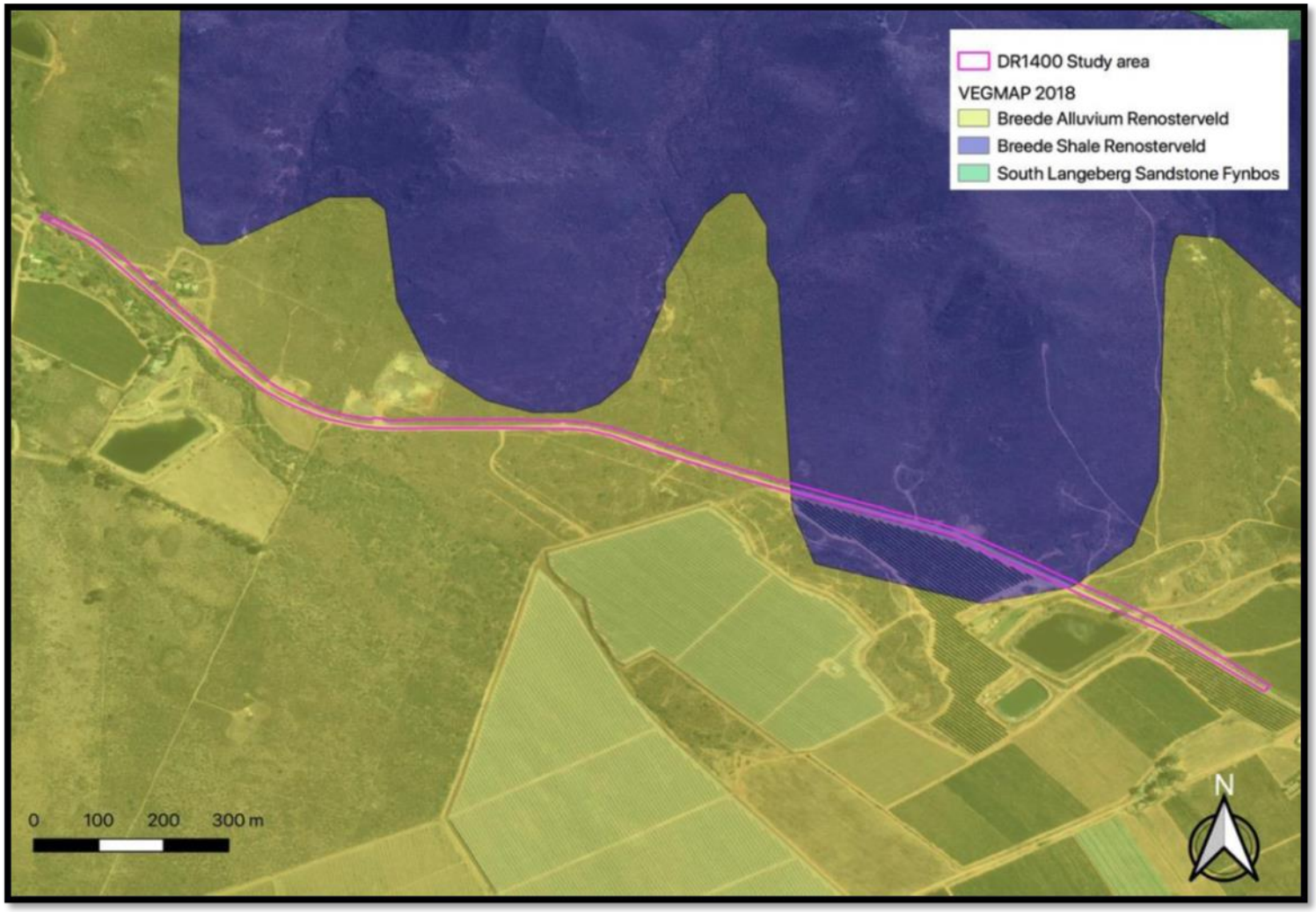

Figure 5: VEGETATION MAP: The study area superimposed on a portion of The Vegetation Map of South Africa, Lesotho and Swaziland (SANBI, 2018) overlaid on a Google Earth ™ aerial image.

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4. REHABILITATION MEASURES

4.1 Alien Clearing Management Plan

An alien clearing management plan need to be implemented for at least 3 year after rehabilitation to manage the aliens that might germinate within the rehabilitated area. It is suggested that follow up alien clearing practices be conducted every 6 months for at least three year after rehabilitation.

Alien clearing practices that can be implemented according to the sizes of invasive species:

4.1.1 List of invasive species identified on site for eradication

Invasive species identified for alien clearing:

Acacia longifolia (Long leaf Wattle)

Acacia mearnsii (Black Wattle)

Antriplex inflate (Salt Bush)

Avena fatua (Wild Oats)

Raphanis raphanistrum (Wild Radish)

4.1.2 Cutting and painting of medium size individuals

Applicable where the invasive species are too difficult for hand pulling. Invasive trees need to be cut leaving a stem of 10cm. The remaining stem needs to be painted using a brush with a systemic herbicide. The systemic herbicide need to be coloured to ensure that all the cut stems be treated. Care should be taken not to spill systemic poison when painting the stems. The systemic poison will infiltrate the stem killing the roots, and prevent the invasive tree from re-sprouting again. Cut down invasive trees need to be removed from site to the nearest licensed landfill site to prevent the spread of seeds.

Systemic Poison, Enviro - Glyphosate; 2% Application. (Registered for use near waterbodies)

Figure 6: Example of a cut down stem treated with a coloured systemic herbicide.

4.1.3 Hand pulling of smaller invasive species

It is suggested that smaller invasive species be hand pulled with manual labour. This is the most effective and environmental friendly way to eradicate smaller invasive vegetation.

Figure 7: Example of smaller species ideal for hand pulling.

4.1.4 Storage and Removal of invasive vegetation

- During alien eradication an area needs to be identified for temporary stockpiling of the invasive vegetation;
- Only one area to be identified to prevent the spread of seeds and to prevent contamination of adjacent natural areas;
- The area identified should not be in close proximity of the non-perennial drainage line to prevent seeds from entering and spreading along the watercourse;
- Invasive vegetation left on site is a fire hazard;
- Invasive vegetation left on site inhibit the germination of Fynbos seeds;
- All invasive vegetation to be removed immediately from site to the identified stockpile area ones clearing has been completed;
- Alien vegetation to be transported in preferably a closed truck to prevent the seeds from spreading along the road. Alternatively the alien vegetation can be covered with a biddem material during transport;
- The invasive vegetation at the stockpile area needs to be removed on a regular basis and be dispose to the nearest licensed landfill site; and
- No burning of invasive vegetation on site allowed.

4.1.5 Non-perennial drainage line management measures during alien clearing practices

- The contractor needs to make sure that excessive quantities of sand and silt do not enter the non-perennial drainage line;
- The contractor needs to take cognisance of weather forecast. No clearing activities allowed during times of high rainfall;
- Alien clearing to be conducted within non-perennial drainage line, need to be done by manual labour, no heavy machinery allowed;
- All potential pollutants should be kept away from the non-pernnial drainage line habitat including:

    - Oil, diesel or petrol used for machinery during alien clearing activities;
    - Any chemicals for the control of alien vegetation; and
    - Sanitation structures.

- No spoil material should be placed in close proximity to the non-perennial drainage line habitat, dumped on riparian or bank habitats, spread out around trees, used to fill hollows and other irregularities in the non-perennial drainage line, or be used for erosion control, but must be removed to approved dumping site; and
- No spraying of herbicide allowed in close proximity to any water bodies.

4.1.6 Burning

Burning of cleared invasive vegetation on site is strictly prohibited. Cleared invasive vegetation needs to be taken to the nearest licensed landfill site. Should burning of invasive vegetation on example a farmers land be considered, the necessary permits need to be applied for and in place. Burning without the necessary permits are a criminal offence and a fire hazard.

4.1.7 Protective gear

Working in a dangerous environment, operators need to have the necessary protective gear:

- Safety boots, steel cap;
- Safety gloves;
- Face mask to prevent herbicide inhalation;
- Safety glasses for eye protection;
- Reflector vests to ensure visibility; and
- PPE for chainsaw operators.

4.1.8 Frequency of Alien Clearing

Prior to commencement for rehabilitation the study area must be cleared of invasive vegetation.

An alien clearing management plan must be implemented for at least three years after rehabilitation to manage the aliens that might germinate in the rehabilitated areas. Follow-up alien clearing practices must be conducted every 6 months for three years after rehabilitation.

Reasons for follow up:

- Due to the disturbance of soil, invasive seeds within the seedbank of the soil will start to germinate. These germinated species need to be removed before they produce seed to prevent ongoing infestation.
- Cut down and treated trees also tend to re-sprout. A 2nd application of herbicide will be necessary for these species.

4.2 Search and Rescue

Prior to construction a search and rescue for endemic species need be conducted within the construction footprint of the culverts at the non-perennial drainage lines.

Search and rescue to be conducted under the supervision of a qualified horticulturists/rehabilitation specialist.

Rescued endemic need to be taken to rehabilitation nursery.

The searched and rescue species will be bagged, grown and multiplied under the supervision of a Horticulturist/Rehabilitation Specialist for rehabilitation purposes.

After construction the disturbed areas at the culvert can be planted with the search and rescued species.

4.3 Management of topsoil

Topsoil is the most crucial element for rehabilitation for the following reasons:

- Act as growing medium for planted species; and
- Contains all the endemic vegetation seed for natural rehabilitation.

Prior to commencement of activities:

- 200mm of topsoil needs to be carefully stripped;
- The topsoil needs to be safely windrowed/stored outside the construction footprint in the exact location it was stripped from. This will ensure that the correct topsoil be placed back in the correct location after construction;
- The topsoil needs to be clearly seen as no go areas and protected;
- The topsoil needs to be clearly demarcated with danger tape as well as the necessary signage erected;
- ECO needs to inspect and monitor the topsoil and include the findings within the ECO audit reports;
- Topsoil may not be higher than 2m; and
- Topsoil needs to be monitored for invasive vegetation and cleared as required.

It was found that windrow of topsoil is the most effective for the following reasons:

- It limits the handling of topsoil; and
- Ensure that topsoil is replaced within the exact location is was removed from.

4.4 Preparation of soil prior to rehabilitation

Prior to planting/rehabilitating the disturbed and affected areas of the non-perennial drainage lines, soil preparation is crucial for effective rehabilitation.

4.4.1 Ripping and shaping

All compacted areas need to be ripped/loosened, protected topsoil need to be spread, and area needs to be shaped in such a way that it blends in with the natural contour and drainage lines of the site.

Ripping and shaping will ensure:

- That all compacted areas be loosened and aerated;
- Will ensure better infiltration of precipitation and less erosion;
- Will make planting during rehabilitation easier;
- Will stimulate natural rehabilitation by means of seed germination; and
- Will positively contribute to the visual and aesthetic value of the site.

Figure 8: Example of a previously compacted area that has been ripped, shaped and topsoil spread over the affected area prior to rehabilitation.

4.4.2 Embankment Stabilization

Should an embankment be too steep for planting, erosion control, along with preservation of the topsoil would be very important for rehabilitation. Stabilization should be done by

ensuring that the velocity of surface runoff is reduced through naturally aligned terracing. Terracing can be done by using hand labour to create natural horizontal terraces. If necessary biodegradable sausages can be placed within the created naturally aligned terraces to help with slope stabilization.

Figure 9: Example of horizontal terracing to reduce down slope erosion.

Figure 10: Example of horizontal terracing with biodegradable sausages to reduce down slope erosion.

4.5 Timing of rehabilitation

Planting:

Due to the fact that there will be no irrigation to help the plants to settle and strengthen, the best time for planting will be at the beginning of the rainy season. This will help the plants to settle and preparing them for the summer to follow. All plants (even water wise plants) need water in the establishment phase. Should planting be done during the summer months, the planted areas need to be water at least once a week.

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4.6 Rehabilitation of the non-perennial drainage lines;

The non-perennial drainage lines need to be rehabilitated for the following reasons:

- Enhance the visual and aesthetic appearance of the disturbed areas;
- Will re-introduce endemic species to the disturbed area;
- Improve the ecological and biodiversity value and functioning of the disturbed non-perennial drainage line;
- Will stabilize bare soil and prevent further erosion of the disturbed area; and
- Will stabilize bare soil and prevent siltation of the watercourse.

Plants for rehabilitation has been carefully selected using the following criteria:

- An on-site survey has been conducted to identify the locally indigenous vegetation naturally occurring on site and surrounding areas;
- The national vegetation Book (Mucina *et al*. 2005, Mucina & Rutherford 2006) has been consulted and species carefully selected for rehabilitation which naturally occur in areas under discussion; and
- The botanical and freshwater reports compiled by the specialists have been consulted.

Rehabilitation must take place with endemic species from the Breede Shale Renosterveld and Breede Alluvium Renosterveld
Rehabilitation practices must be done by a qualified Botanist/Horticulturist/Rehabilitation specialist.

Please refer to Figure 11 below: Rehabilitation Plan for the culverts at the non-perennial drainage lines.

Rehabilitation needs to be done with a selection of the following endemic species:
Shrubs: x1 per square meter.
Fillers; x2 per square meter.
Ground covers; x3 Plugs per square meter.

Shrubs

Dodonaea viscosa subs angustifolia

Searsia angunstifolia

Athanasia trifurcata

Carissa haematocarpa

Euphorbai burmannii

Aloe microstigma

Tylecodon paniculatus

Fillers

Bulbine frutescens

Cotyledon orbiculata

Felicia filifolia

Ground Covers:

Drosanthemum aureopurpureum

Ruschia caroli

Carpobrotus acinaciformis

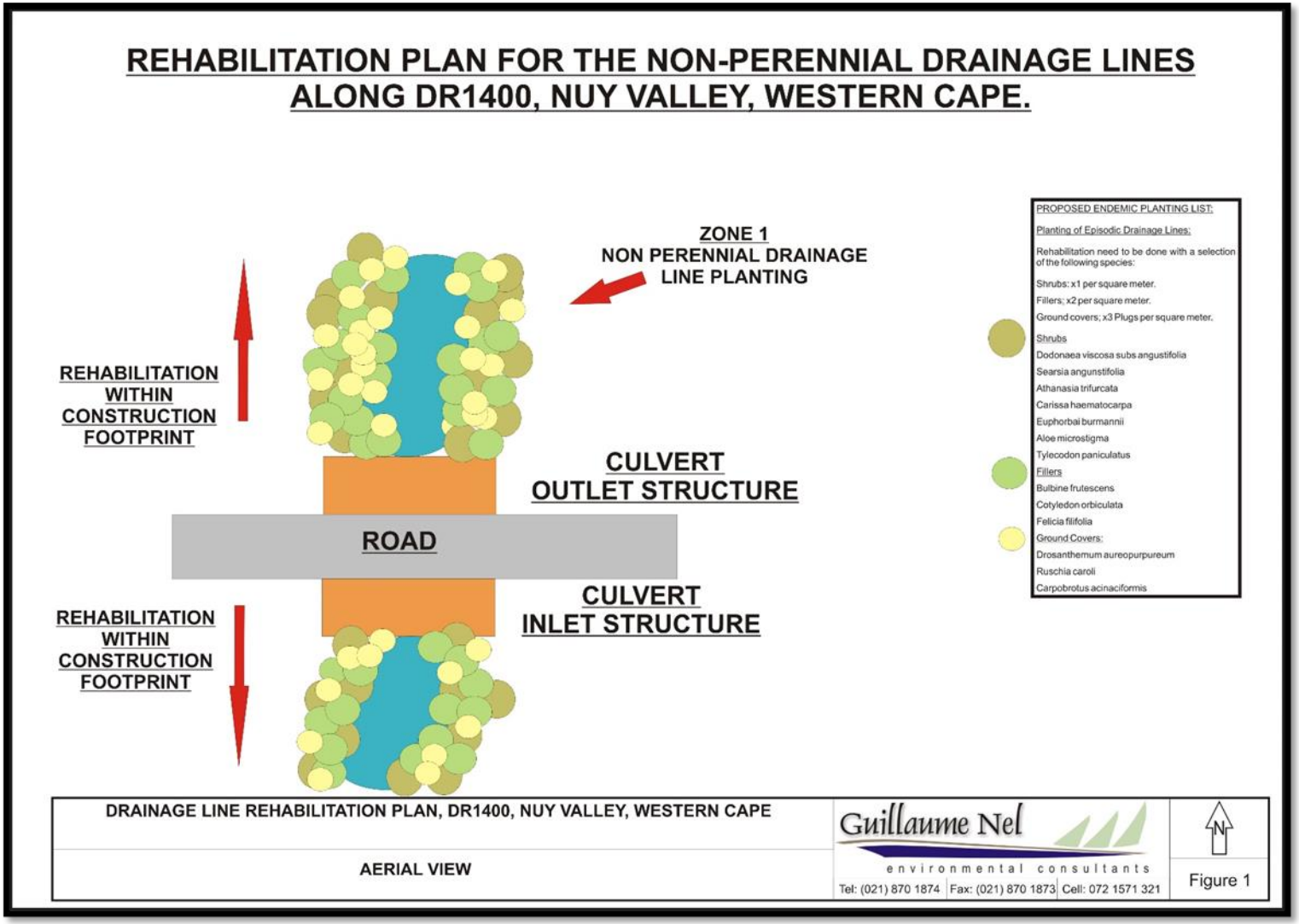

Figure 12: Rehabilitation Plan for the culverts at the non-perennial drainage lines.

4.7 Cordoning off rehabilitated area

After rehabilitation the area need to be clearly cordoned off to ensure that no damage is done to the rehabilitated area. Trampling of the areas will:

- Inhibit the successful growth and germination of plants.
- Lead to compaction of soil, poor water infiltration and erosion.

5. CONCLUSION

GNEC in our professional capacity as rehabilitation specialists strongly feel that the above-mentioned rehabilitation will:

- Enhance the visual and aesthetic appearance of the disturbed areas;
- Will re-introduce endemic species to the disturbed area;
- Improve the ecological and biodiversity value and functioning of the disturbed non-perennial drainage line;
- Will stabilize bare soil and prevent further erosion of the disturbed area; and
- Will stabilize bare soil and prevent siltation of the watercourse.

Rehabilitation must take place with endemic species.
No species, plant material and seed form areas outside the study area must be introduced to the study area.
Rehabilitation practices must be done by a qualified Botanist/Horticulturist/Rehabilitation specialist.

ANNEXURE 1 DECLARATION OF UNDERSTANDING BY THE DEVELOPER

I, _____

Representing _____

Declare that I have read and understood the contents of the Environmental Management Programme for:

Contract _____

I also declare that I understand my responsibilities in terms of enforcing and implementing the Environmental Specifications for the aforementioned Contract.

Signed: _____

Place: _____

Date: _____

Witness 1: _____

Witness 2: _____

ANNEXURE 2 DECLARATION OF UNDERSTANDING BY THE ENGINEER

I, _____

Representing _____

Declare that I have read and understood the contents of the Environmental Management Programme for:

Contract _____

I also declare that I understand my responsibilities in terms of enforcing and implementing the Environmental Specifications for the aforementioned Contract.

Signed: _____

Place: _____

Date: _____

Witness 1: _____

Witness 2: _____

ANNEXURE 3 DECLARATION OF UNDERSTANDING BY THE CONTRACTOR

I, _____

Representing _____

Declare that I have read and understood the contents of the Environmental Management Programme for:

Contract _____

I also declare that I understand my responsibilities in terms of enforcing and implementing the Environmental Specifications for the aforementioned Contract.

Signed: _____

Place: _____

Date: _____

Witness 1: _____

Witness 2: _____

ANNEXURE 4 INCIDENT AND ENVIRONMENTAL LOG

ENVIRONMENTAL INCIDENT LOG				
Date	**Env. Condition**	**Comments** *(Include any possible explanations for current condition and possible responsible parties. Include photographs, records etc. if available)*	**Corrective Action Taken** (*Give details and attach documentation as far as possible)*	*Signature*