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MAINTENANCE MANAGEMENT PLAN

FOR THE

PERIODIC MAINTENANCE OF TR03105 FROM LADISMITH TO CALITZDORP (KM 0.9 TO KM 47.63) WESTERN CAPE

PREPARED FOR:

Deputy director
Western Cape Government:
Department of infrastructure
PO Box 2603
Cape Town
8000

DATE: 18 November 2025

DEADP REF NO:

SES PROJECT REF NO:

11/MMP/TR3105/LDC/25

-
- Environmental Impact Assessments • Basic Assessments • Environmental Management Planning
 - Environmental Control & Monitoring • Water Use License Applications • Aquatic Assessments



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PROJECT INFORMATION

Project Ref. No:	11/MMP/TR3105/LDC/25
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Expertise

Sharples Environmental Services cc Since 1998, SES has been actively engaged in the fields of environmental planning, assessment and management. We advise private, corporate and public enterprises on a variety of differing land use applications ranging from large-scale residential estates and resorts to golf courses, municipal service infrastructure installations and the planning of major arterials. Our consultants have over 40+ years of combined experience and we operate in the Southern, Eastern and Western Cape regions.

MICHAEL BENNETT (Director, Report Writer):

Michael studied at the University of Cape Town completing a Bachelor of Science degree majoring in Environmental and Geographic Science and Ocean and Atmospheric Science. Michael joined SES in 2014 and has extensive experience in assessments and monitoring and has worked on a variety of technical projects. See Appendix C for his curriculum vitae. Michael is registered with EAPASA as a certified Environmental Practitioner (EAPASA # 2021/3163).

Onela Mhobo (Candidate Environmental Practitioner)

Onela graduated from the University of South Africa completing her BSc honours degree in Environmental Management and also holds a BSc in Botany and Geography from the Nelson Mandela University. She is well versed in the technicalities associated with Monitoring (EAPASA 2022/4522)

LIST OF ABBREVIATIONS

CBA	Critical Biodiversity Area
DEA&DP	Western Cape Government: Department of Environmental Affairs and Development Planning
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
km	Kilometre
m	Metre
m ²	Square metre
MMP	Maintenance Management Plan
NEMA	National Environmental Management Act, Act No. 107 of 1998, as amended
NFEPA	National Freshwater Ecosystem Priority Areas (2011)
SES	Sharples Environmental Services cc
TOR	Terms of Reference

1. INTRODUCTION AND BACKGROUND

Sharples Environmental Services cc (SES) has been appointed by Bergstan South Africa Consulting and Development Engineers (Pty) Ltd, on behalf of the Western Cape Government: Department of Transport and Public Works to compile this Maintenance Management Plan (MMP) for the Maintenance of TR03105 from Ladismith to Calitzdorp (KM 0.9 to KM 47.63).

Trunk Road 31 is more commonly known as Route 62 and is a popular scenic alternative to the N2. The project is located between Ladsimith and Calitzdorp in the Garden Route District Municipality of the Western Cape. The road as indicated below all fall within the Kannaland Municipality which is the local municipality. It passes through farmlands and along river valleys in generally rolling to flat terrain.

The Department of Transport and Public Works will be undertaking routine maintenance on the Route from km 0.9 to km 47.63 (TR03105). The specific objective of this project is to extend the functional life of this section of pavement by a Periodic Maintenance intervention in the form of pre-treatment and the application of a new surfacing and appurtenant works, i.e. pre-treatment of road repairs (surfacing / base repairs), drainage structures (minor culverts and side drains), minor repairs to structures (major culverts and bridges), cleaning and clearing of minor and major culverts, fencing repairs, guardrail repairs, replacement of road signs (where applicable) etc.

2. NEMA LEGISLATIVE REQUIREMENTS

NATIONAL ENVIRONMENTAL MANAGEMENT ACT, NO. 107 OF 1998, AS AMENDED AND THE ENVIRONMENTAL IMPACT ASSESSMENT REGULATIONS, 2014 (AS AMENDED)

The periodic maintenance of TR31/5 will be undertaken within the existing road reserve and will consist of maintenance/upgrades of the road surface, cross sections, intersections, existing access roads, associated damaged drainage structures, road signage and erosion occurring to road embankments and drainage structures.

The following listed activities contained in the National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations, 2014 (as amended 2017), defined in Government Notice No. 324(as amended) are identified as falling within the ambit of the management and maintenance of roads and drainage structures.

Activity 19: Government Notice No. R 327 (Listing Notice 1)

The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse;

but excluding where such infilling, depositing, dredging, excavation, removal or moving—

- a) will occur behind a development setback;
- b) is for maintenance purposes undertaken in accordance with a maintenance management plan;
- c) falls within the ambit of activity 21 in this Notice, in which case that activity applies;
- d) occurs within existing ports or harbours that will not increase the development footprint of the port or harbour; or
- e) where such development is related to the development of a port or harbour, in which case activity 26 in Listing notice 2 of 2014 applies.

Activity 27: Government Notice No. R 327 (Listing Notice 1)

The clearance of an area of 1 hectares or more, but less than 20 hectares of indigenous vegetation, except where such clearance of indigenous vegetation is required for—

- (i) the undertaking of a linear activity; or
- (ii) maintenance purposes undertaken in accordance with a maintenance management plan.

Activity 12: Government Notice No. R 324 (Listing Notice 3)

The clearance of an area of 300 square meters or more of indigenous vegetation except where such clearance of vegetation is required for maintenance purposes undertaken in accordance with maintenance management plan.

- (iii) Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEM:BA or prior to the publication of such a list, within an area that has been identified as critically endangered in the National Spatial Biodiversity Assessment 2004
- (iv) Within critical biodiversity areas identified in bioregional plans
- (v) Within the littoral active zone or 100 meters inland from high water mark of the sea or an estuarine functional zone, whichever distance is greater, excluding where such removal will occur behind the development setback line or even in urban areas;
- (vi) On land, where, at the of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning; or
- (vii) On land designated for protection or conservation purposes in an Environmental Management Framework adopted in the prescribed manner, or a Spatial Development Framework adopted by the MEC or Minister.

It must be noted that all activities undertaken in accordance with this MMP should remain within the road reserve however if disturbance outside of the road reserve is required (for stabilising, shaping or erosion protection measures, etc) the above listed activities and their thresholds will be applicable.

To avoid the requirement to undertake an Environmental Impact Assessment, SES has been requested to compile a Maintenance Management Plan to ensure that activities are undertaken in regard to 'Duty of Care' and in order to mitigate and/or minimise detrimental impacts to the environment as a result of the maintenance activities.

3. PURPOSE AND SCOPE OF THE MMP

The purpose of this MMP is to define the parameters for the periodic maintenance activities required to up keep TR31/5 from km 0.9 to km 47.63 and its associated road signage, drainage structures and road embankments. This maintenance plan also provides guidelines, which set out steps and actions and when taken, will ensure that the environment degradation is kept to an absolute minimum if not completely mitigated. This will ensure the sustainable management of the environment, whilst avoiding and/or mitigating any environmental damage during the operational phase.

This document only applies to the maintenance of the Trunk Road 31 Section 5 from km 0.9 to km 47.63 from Ladismith to Calitzdorp and the associated infrastructure/structures within the road reserve and does not apply to any other maintenance of infrastructure which fall outside the current maintenance activities. Any repair and maintenance activities on any other infrastructure must be applied for and authorised prior to commencement of any repair and / or maintenance activities if any of those activities trigger a listed activity in terms of the amended EIA Regulations (2014).

4. TERMS OF REFERENCE

The following Terms of Reference (ToR) have been set for the compilation of the MMP:

- Consideration of existing and historic approvals
- Ensure compliance with relevant NEMA legislation, policies and guidelines;
- Provide a methodology for compliance with the environmental constraints for working near and in the drainage lines or river
- Detail potential impacts to ensure that the MMP covers future maintenance activities of the repairs;
- Address potential current and future impacts associated with future maintenance activities through appropriate management measures;
- Detail the responsibilities of the various parties who will do the monitoring; and
- Detail any reporting and monitoring that needs to be done.

5. LOCATION

5.1 LOCATION OF THE SITE

The town of Ladismith is approximately 47.7 km north west from the town of Calitzdorp. The route which the proposed routine maintenance is set to be undertaken on will extend from Ladismith to Calitzdorp along Trunk Road 3/5 (R62). Maintenance work will be undertaken to the areas and/or structures associated with TR31/5 between km 0.9 and km 47.63. Maintenance work will be limited to within the existing road reserve. Please refer to Figures 1 and 2 for the locality of TR31/5.

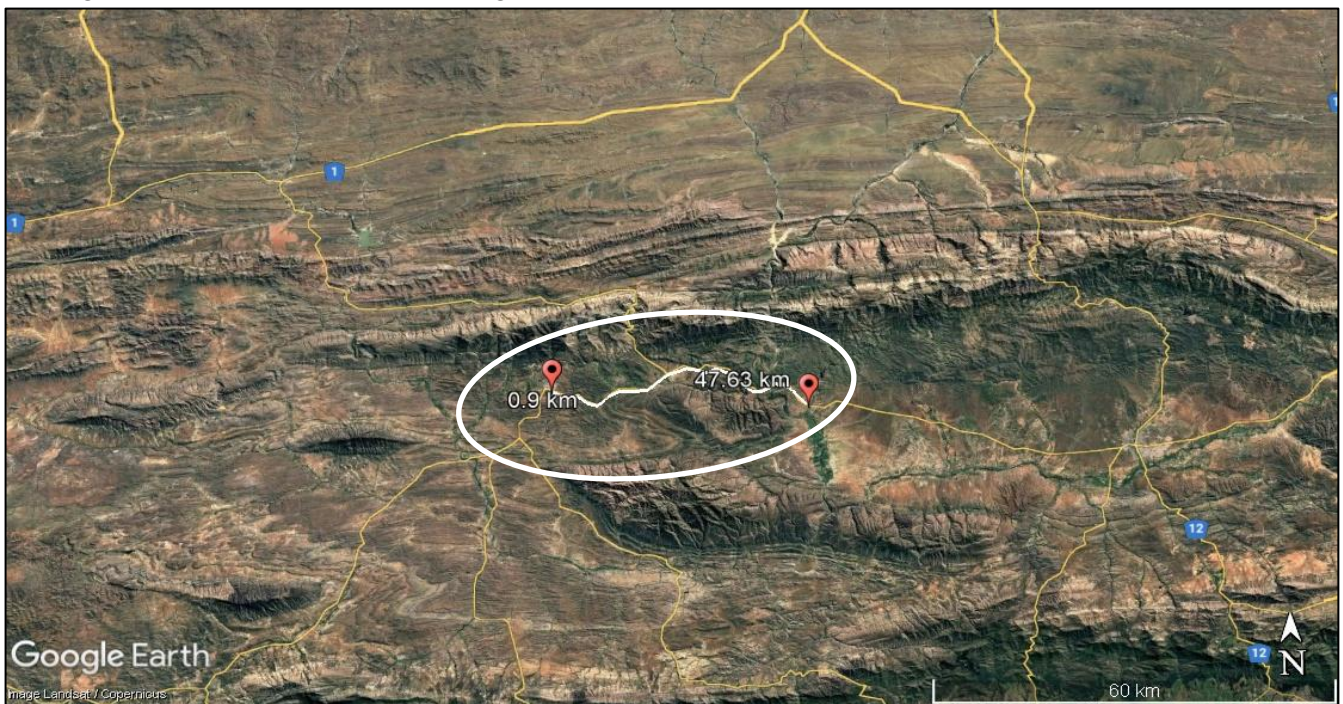


Figure 1: Google earth Image indicating the locality of TR31/5 and km 0.9 and km 47.63



Figure 2: Google earth image indicating the maintenance route between km 0.9 and km 47.63

6. DESCRIPTION OF THE RECEIVING ENVIRONMENT

6.1 Aquatic Environment

The proposed maintenance activities and repair works is likely to impact upon the following watercourses namely the Nels River, Huis River 1 & 2, Gamka River, Nels river, Vaarwel River, Wilge river and the Seven Weeks Port River. This is due to repair work required on the bridges as well as clearance of debris and sediment within the culverts. All maintenance work is to be located within the road reserve and not all work requires encroachment into the river habitat at every location.

6.2 Freshwater Assessment.

A Freshwater Assessment report was compiled by Dr. James Dabrowski from confluent Environmental Pty (Ltd) on the 14th of November 2025. The findings of the report are as follows:

NATIONAL FRESHWATER ECOSYSTEM PRIORITY ATLAS (NFEPA)

The majority of the road alignment is located within sub-quaternary catchments (SQC), that, according to the National Freshwater Ecosystem Priority Atlas (NFEPA, Nel et al., 2011), have been classified as Fish Support Areas (FSAs). FSAs are SQCs that are not necessarily in a good ecological condition but are still essential for protecting threatened or near-threatened freshwater fish species that are indigenous to South Africa. The management goal of FSAs is to prevent additional fish species from becoming threatened or to prevent threatened or near-threatened species from becoming extinct. In order to achieve these objectives, there should be no further deterioration in river condition. Important fish species that are known to occur in the SQCs include:

Scientific Name	Common Name	Threat Status	Description
<i>Pseudobarbus asper</i>	Smallscale redfin	Vulnerable	Endemic to South Africa, restricted to the Gouritz and Gamtoos River systems
<i>Pseudobarbus tenuis</i>	Slender redfin	Near-threatened	Endemic to Western Cape, restricted to Gouritz River system
<i>Galaxias zebratus</i>	Cape galaxias	Data Deficient	Largely restricted to Western Cape, several distinct genetic lineages recently

			discovered, many of which are likely to be novel species
<i>Labeobarbus aeneus</i>	Smallmouth yellowfish	Least Concern	Occurs naturally in the Vall-Orange system, extra-limital in the Western Cape
<i>Enteromius anopolus</i>	Chubbyhead Barb	Least Concern	Widespread throughout South Africa

WESTERN CAPE BIODIVERSITY SPATIAL PLAN

According to the WCBS the major perennial rivers (Nels, Huis, Gamka and Nels (at Calitzdorp) crossed by the TR31/5 have been categorized as natural aquatic CBAs. The Seweweekspoort River and all minor non-perennial rivers crossing the TR31/5 have been categorized as natural ESAs. The management objectives for ESAs allow for some habitat loss provided that the ecological function of these watercourses is not compromised. Low impact activities within CBAs are considered acceptable. Maintenance of existing road infrastructure (including maintenance or extension of culverts) can therefore be considered as an acceptable activity within the context of these objectives.

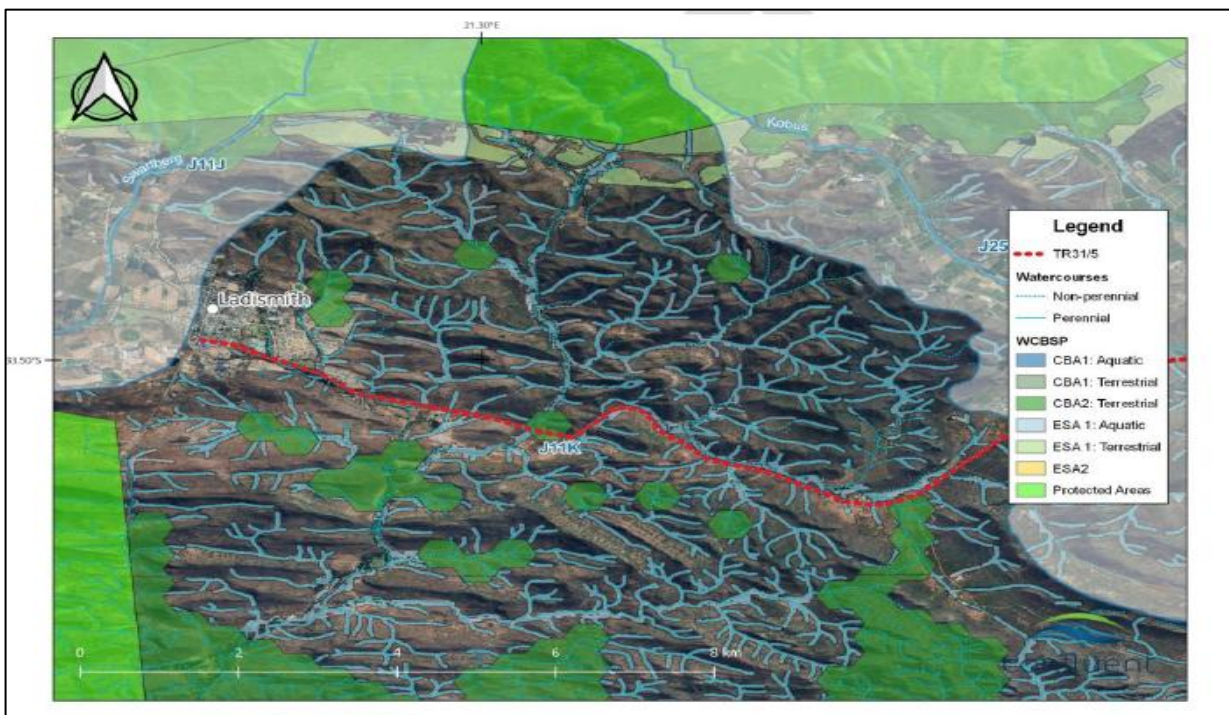


Figure 3: Map of the section of the Western Cape Biodiversity Spatial Plan (WCBS) in quaternary catchment J11K.

WATERCOURSE CLASSIFICATION

Travelling in the direction of Ladismith to Calitzdorp (in an easterly direction) the road generally passes through valleys and plains with higher hills and mountains to the north and south. Numerous non-perennial watercourses originate from these areas of higher elevation and cross the road and converge with the larger perennial rivers further downstream. Without exception, all of these watercourses can be classified as non-perennial rivers, with clearly discernible bed and banks, that are characterised by a highly intermittent hydroperiod.

All watercourses identified in the field cross the TR31/5 road via formalised culverts and ultimately flow into the larger perennial systems draining each of the catchments.

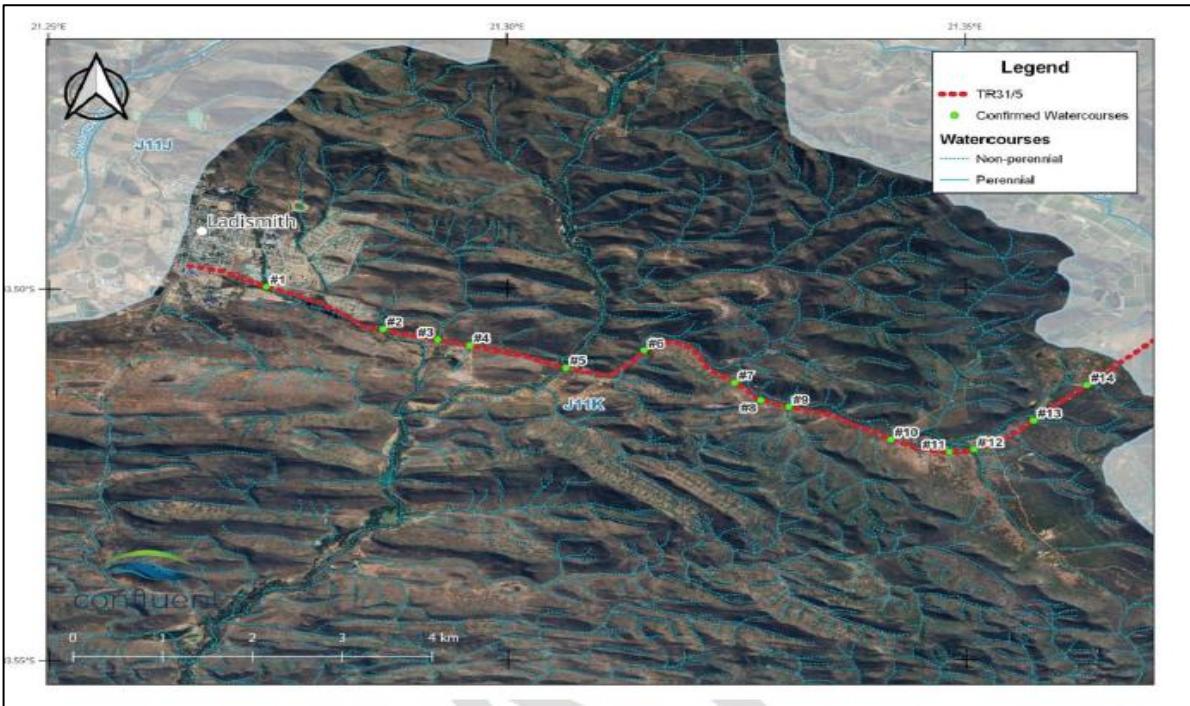


Figure 4: Confirmed watercourses in quaternary J11K where maintenance of culverts or bridges could be required.

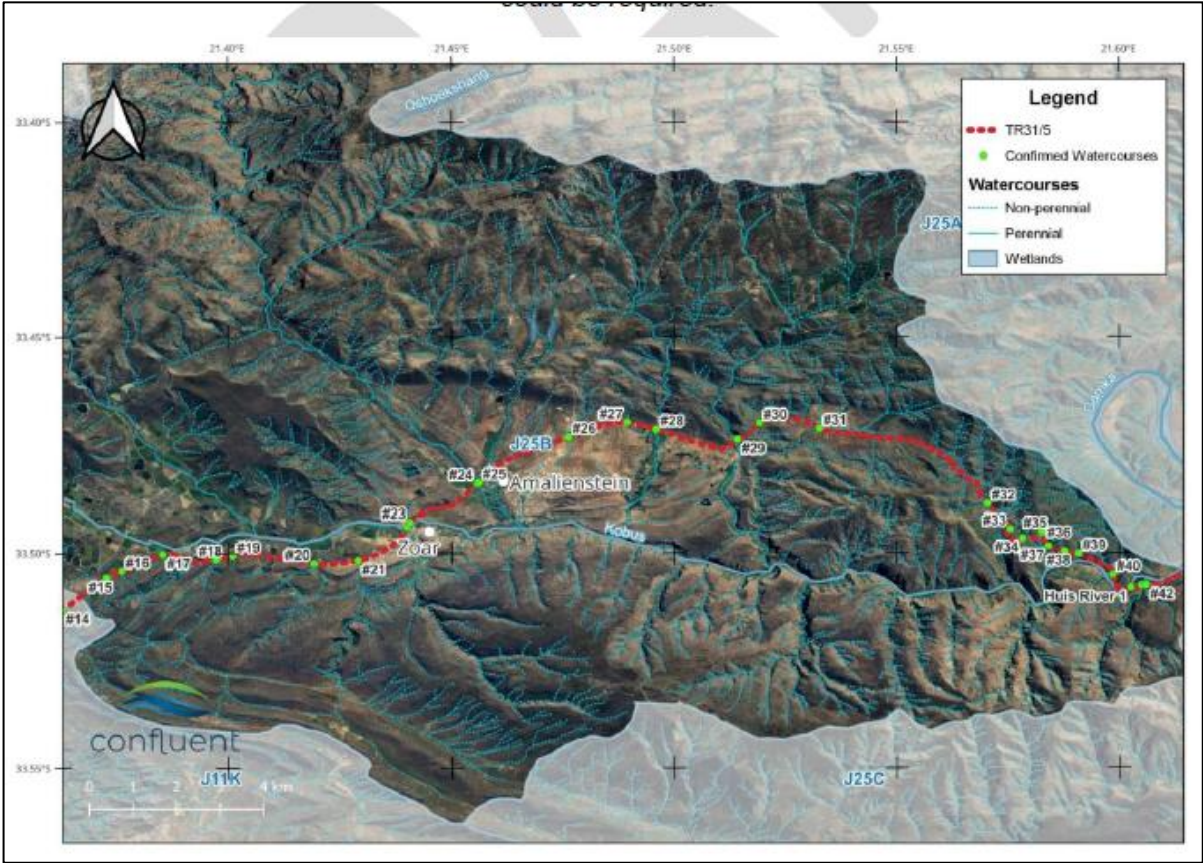


Figure 5: Confirmed watercourses in quaternary J25B where maintenance of culverts or bridges could be required.



Figure 6: Confirmed watercourses in quaternaries J25A and J25D where maintenance of culverts or bridges could be required.

PRESENT ECOLOGICAL STATE (PES)

The PES of watercourses varied from pristine and largely natural (PES: A) to largely modified (PES:D). Natural and largely natural watercourses originate mainly from undisturbed mountains and hills, where natural vegetation is largely intact and agricultural activities are not present or are very limited in scale (relative to the larger catchment area). Modifications in these watercourses are mainly related to evidence of minor erosion in the catchment area (presumably due to grazing). Moderately and largely modified streams were mainly impacted either by intensive agricultural activities (e.g. instream dams, diversion of streams into furrows, removal of riparian vegetation etc.) or more serious signs of erosion in the catchment (mainly in quaternary J25B) where soils are highly erodible.

ECOLOGICAL IMPORTANCE & SENSITIVITY

Given the non-perennial and highly intermittent flow characteristics of all watercourses, they are not important with respect to hosting a diverse aquatic assemblage that is dependent on permanently flowing water. The main function of these watercourses is to supply intermittent surface flows to downstream perennial rivers as opposed to hosting instream aquatic fauna and flora. Similarly, the intermittent flows and geomorphological characteristics limits the diversity of aquatic habitat features and refuge and migration options for aquatic biota. They are however relatively important in terms of maintaining corridors for migration of riparian biota (mainly terrestrial fauna) through quaternary catchments and connecting terrestrial CBAs to larger perennial river systems. Overall, the EIS of these watercourses is considered to be **Low**.

MAJOR RIVERS.

Nels river (Quaternary)

Classification: Fourth order perennial river system that originates from the Swartberg Mountains. Upper, mid and lower reaches are named as the Kobus, Nels and Huis river, respectively. At the bridge crossing, the river is a moderately steep gradient system, consistent with an Upper Foothills (or D) geomorphological zonation, characterised by cobble-bed substrate with a variety of instream biotopes including plane bed, pool-riffle or pool-rapid. A narrow floodplain of sand, gravel or cobble is present.

PES: Upper-most reaches are pristine while mid to upper and lower most reaches are adjacent to intensive agriculture, with high rates of abstraction for irrigation. Several, relatively large instream dams in tributaries also regulate flows through the river system and flow had been reduced to a trickle at the time of the site visit. Low flows have encouraged growth of instream vegetation (e.g. *Typha capensis*

and *Phragmites australis*) in lower gradient reaches. Alien invasive tree species in the riparian zone are synonymous with agricultural activity. Physical habitat along the middle reaches (as the river passes through the narrow, steep gorges of the Paardeberg Mountains) is relatively unimpacted, although regulation of flows in the upper agricultural areas does influence the diversity and quality available of instream aquatic habitat. Here riparian habitat is prominent and is characterised by well vegetated kloofs. Riparian zone is dominated by *Vachelia karoo* and *Salix mucronate*, however, regulated flows in the catchment area have favoured the establishment of reedy species within the channel of the river. The PES is D (Largely Modified).

Huis River 1 & 2

Classification: Sixth order, perennial river. Site located at lower most reach of Huis River (forms part of the same system as the Nels River). The geomorphological zonation is Upper Foothills (or D), and the river channel is dominated by cobbles, boulders and bedrock outcrops. Pool-riffle or pool-rapid habitat is common along these lower reaches.

PES: This site is situated downstream of an agricultural area and the riparian zone is densely vegetated with alien invasive species (predominantly *Eucalyptus* sp.) – reed beds of invasive *Arundo donax* are also prevalent along the channel. High rates of water abstraction occur to sustain irrigated agriculture. Irrigated agricultural fields are located immediately adjacent to the river, which is poorly buffered against agricultural impacts. The riparian zone is densely vegetated with alien invasive species (predominantly *Eucalyptus* sp.) and the channel and banks are heavily invaded by the invasive *Arundo donax*. The PES is D (Largely Modified).

Gamka River

Classification: Large 6th order, perennial river, consistent with a Lower Foothill (E) geomorphological zonation, characterised by a low gradient, mixed-bed alluvial channel 9 (bed dominated by sand and gravel. Reach biotopes are dominated large pools, interspersed with riffles and rapids. River forms part of a channelled valley bottom wetland system – the margins of the river are dominated by a mixture of riparian and wetland vegetation which becomes seasonally inundated during flood peaks and include *Vachelia karoo*, *Salix mucronate*, *Cliffortia strobilifera*, *Melianthus comosus*, *Eligia capensis*, *Cyperus textilis*.

PES: Flow through the entire SQC is regulated by the Gamkapoort Dam which was constructed primarily for flood control. Large areas of the SQC run through mountainous areas, that are largely in a natural state. Floodplain areas in the lower reaches of the SQC are cultivated. Overall, impacts are moderate and the PES is C (Moderately Modified).

Nels River (Quaternary J25D).

Classification: Large 6th order, perennial river. At the bridge, the river is a moderately steep gradient system, consistent with an Upper Foothills (or D) geomorphological zonation, characterised by cobble-bed substrate with a variety of instream biotopes including plane bed, pool-riffle or pool-rapid. A narrow floodplain of sand, gravel or cobble often present. The river is associated with a large floodplain wetland area.

PES: Almost the entire extent of the floodplain has been cultivated, and wetland habitat is restricted to the margins of the main channel of the river that flows through this cultivated area. Infilling to expand agricultural fields restricts the river to a narrow channel that has been heavily invaded by *Arundo donax* and interspersed with *S. mucronate*. Any signs of the natural Muscadel Riviere vegetation type are largely absent. High rates of abstraction in combination with the Calitzdorp Dam located further upstream, regulate flows through the river and no flow was visible along the river at the time of the site visit. The PES is D (Largely Modified).

6.3 CURRENT CONDITION OF THE SITE

The site was visited on the on the 10th of September 2025.

The shoulders of the road vary from to steeply sloped areas, dependent on the surrounding topography. The vegetation of the road reserve varies from barely vegetated in the areas between the watercourses and on the slopes along R62, to densely vegetated (Acacia Karroo) in the areas surrounding/within the watercourses and drainage lines. The region has a generally poor veld condition due to prolonged drought conditions compounding the effects of poor land use and resource management (such as over grazing, over abstraction and the clearance of riparian). The roadside have been invaded by aliens species. Figures 1- 40 shows the current conditions of a variety of river crossings located within the study area of the TR31/5.

BRIDGE B4942: Nels River



Figure 7 and 8: Nels River Bridge.



Figure 9 and 10: Nels River Bridge

Gamka River



Figure 11 and 12: Gamka River bridge

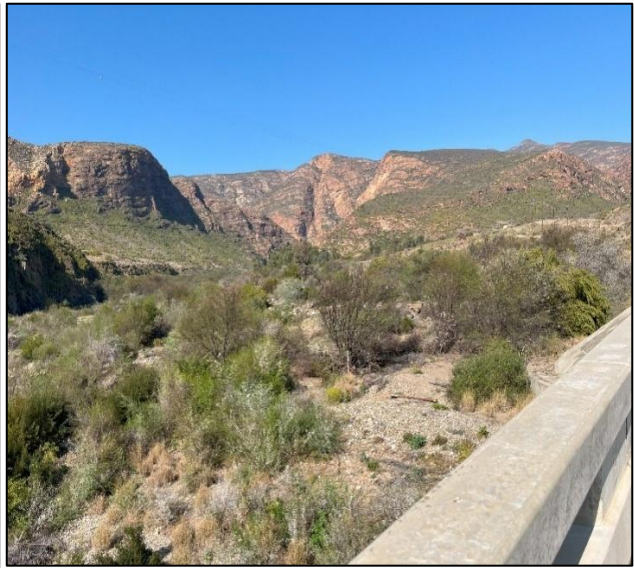


Figure 13 and 14: Gamka River bridge

Huis River No. 1



Figure 15 and 16: Huis River 1 Bridge



Figure 17 and 18: Huis River 1 Bridge.

Huis River No.2

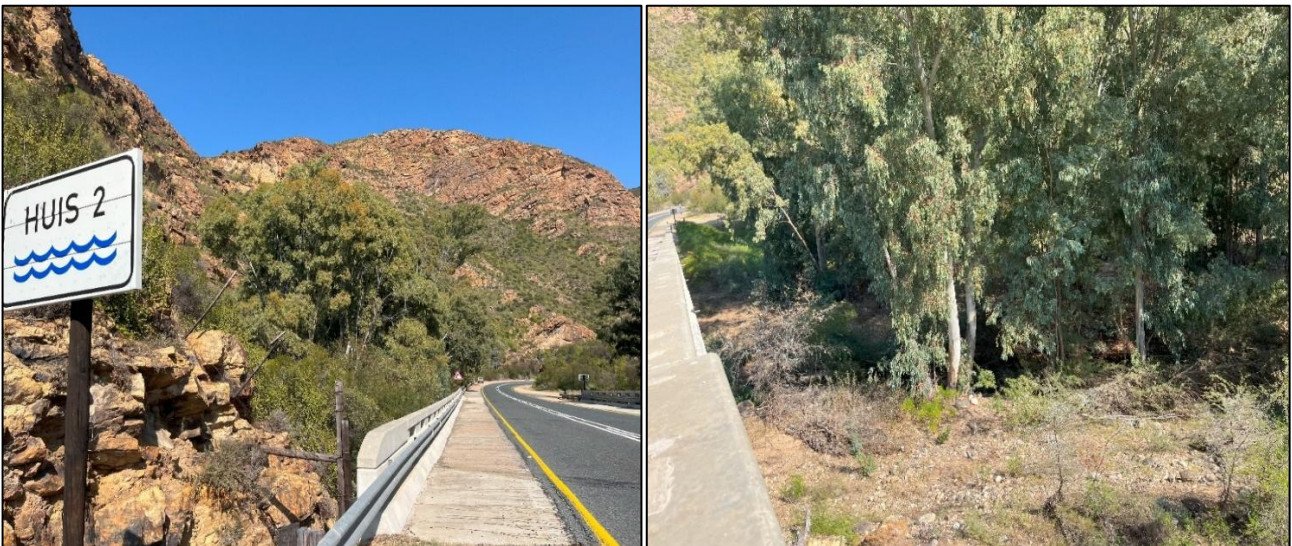


Figure 19 and 20: Huis River Bridge.



Figure 21 and 22: Huis River 2 Bridge.

Bridge B6095 Vaarwel River



Figure 23 and 24: Vaarwel River Bridge.

Wilge river



Figure 25 and 26: Wilge River Bridge.



Figure 27 and 28: Wilge River Bridge.

Seven Weeks Port River



Figure 29 and 30: Seven Weeks Port River Bridge.

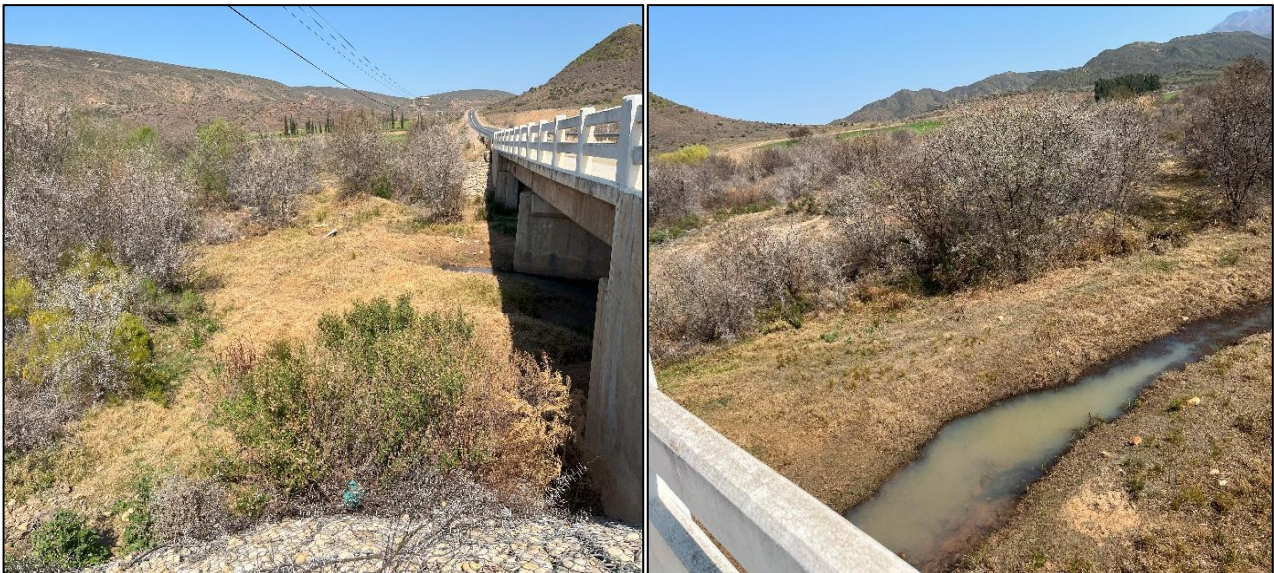


Figure 31 and 32: Seven weeks port River Bridge.

Nels river at Zoar:

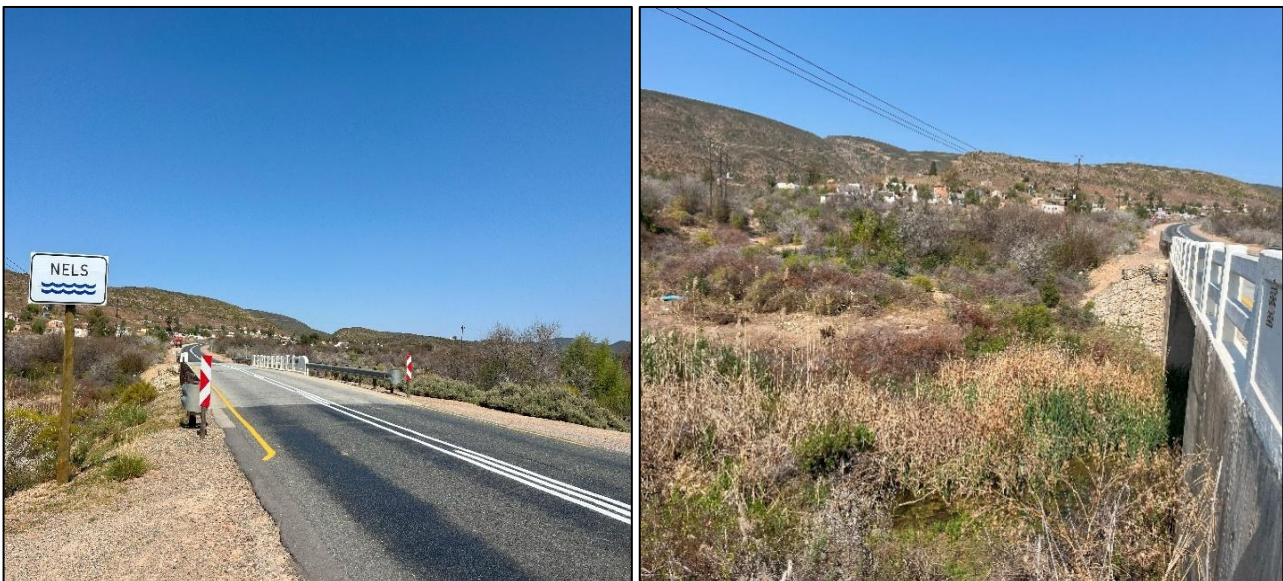


Figure 33 and 34: Nels River Bridge at Zoar

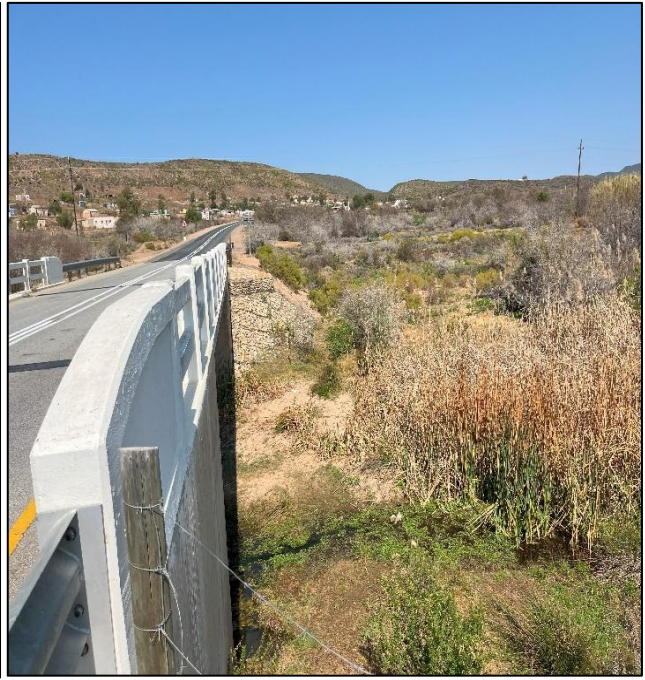


Figure 35 and 36: Nels River Bridge at Zoar

Major culverts



Figure 37: C10939



Figure 38: C10938



Figure 39: C11034

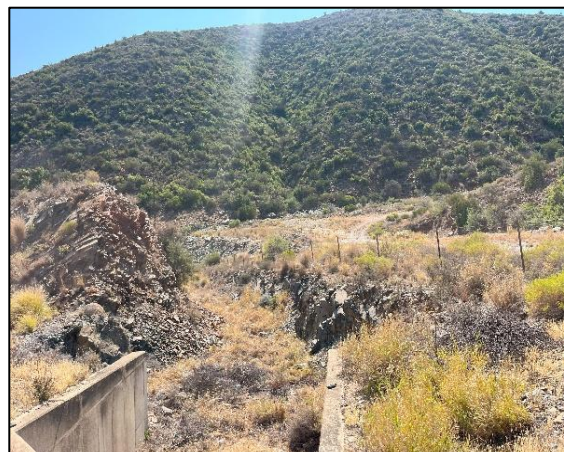


Figure 40: C11036

7. DESCRIPTION OF THE ACTIVITY

7.1 DESCRIPTION

The periodic maintenance of Trunk Road 31 Section 5 between km 0.9 and km 47.63 will consist of the following aspects

Boundaries of the Site(s)

The site of the works shall consist of the entire road reserve, intersections, construction camp, any storage area on the site which the Contractor may require in addition to the area required for construction of the works and special works.

7.1.1 Road works

The periodic maintenance includes the reseal from km 0.9 to km 47.63 using a 14mm pre-coated aggregate, using a bitumen rubber modified binder followed by a fog spray. It is proposed that the intersections with heavy turning movements receive a 40mm asphalt surface.

7.1.2 Structural Works

Each bridge structure with key feature

The following eight bridges exist on this section of TR31/5.

- B2664 Nels River at Zoar at 18.53 km
- B2665 Seven weeks Poort River at 20.48 km
- B6094 Wilge River at 24.63 km
- B6095 Vaarwel River at 26.5 km
- B4940 Huis River No.1 at 37.52 km
- B4941 Huis River No.2 at 39.68 km
- B4342 Gamka River at 40.15 km
- B4942 Nels river at 47.87 km

General works on bridges include clearing vegetation, crack sealing, guardrail replacement, balustrade repair and paint where required. Repair of wingwalls and apron slab where required. Erosion protection using gabion mattresses and boxes.

Bridge B2664

Bridge No B2664 at the Nels River at Zoar at km 18.53 has 1 span, for a total length of 12.8 m. The structure is generally in a sound condition. The following defects have been noted and described along with proposed rehabilitation measures for this contract:

- Clear vegetation and reeds in waterway.
- Gabion basket damaged and loss of gabion stone. Local erosion between gabion and wingwall.
- Seal "gap" between all return walls and abutting grouted stone pitching.
- Localised cracking at return wall upstream.
- Concrete surface erosion to return walls, local spalling of concrete and exposed reinforcement at return wall.
- Missing bolts at guardrail bridge adapter. Washers at guardrail bridge adaptor indicating signs of corrosion.
- Clear blocked drainage scuppers.
- Local concrete spalling at abutment and exposed reinforcement.
- Reinstate bridge number by retrofitting the structure numbers to the inside elevation of the end blocks as per current standard plans
- Replace Thorma bridge expansion joint in bridge and sidewalk.

Bridge B2665

Bridge No 2665 over the Seven Weeks Poort River at km 20.48 has a simply supported deck with 2 spans, for a total length of 26 m. The structure is generally in a sound condition. The following defects have been noted and described along with proposed rehabilitation measures for this contract:

- Clear vegetation and reeds in waterway
- Local spalling of bridge deck at intersection with abutment.
- Reinstate fence at bridge.
- Concrete surface erosion at return walls.
- 0.3mm crack width measured on return walls.
- Loss of fines at end block, crack in asphalt surface.
- Local spalling and exposed reinforcement at parapets.
- Clear blocked drainage scuppers.
- Missing bolts and reflectors at guardrail, height of guardrail to be rectified.
- Replace Thorma bridge expansion joint in bridge and sidewalk.
- Reinstate bridge number by retrofitting the structure numbers to the inside
- elevation of the end blocks as per current standard plans.

Bridge B6094

Bridge No 6094 over the Wilge River at km 24.63 has a simply supported deck of 1 Span, for a total length of 5.95 m. The structure is generally in a sound condition. The following defects have been noted and described along with proposed rehabilitation measures for this contract:

- The Clear trees and vegetation below all spans.
- Guardrails corroded, missing reflectors, missing spacer blocks, height to be rectified to align with required height.
- Terrain and vegetation do not enable access to bridge.
- Reinstate bridge number by retrofitting the structure numbers to the inside elevation of the end blocks as per current standard plans.

Bridge B2658

Bridge No 6095 over the Vaarwel River at km 26.5 has a simply supported deck with 1 span, for a total length of 6.63 m. The following are the proposed rehabilitation/ maintenance measures:

- Clear trees and vegetation below all spans.
- Guardrails corroded, missing reflectors, missing spacer blocks, height to be rectified to align with required height.
- Terrain and vegetation does not enable access to bridge.
- Reinstate bridge number by retrofitting the structure numbers to the inside elevation of the end blocks as per current standard plans.

At the time of inspection, the bridge was inaccessible. The BMS report shows the following to be repaired:

- Major Crack in wingwall needs to be repaired
- Cracks in the walls
- Debris on apron slab
- Severe Scour at outlet

Bridge 4940

Bridge No 4940 over the Huis River 2 at km 37.52 has a simply supported deck with 3 spans for a total length of 58.8 m. The structure is generally in a sound condition. The following defects have been noted and described along with proposed rehabilitation measures for this contract:

- River board at bridge refers to Huis 2, road logs indicate section labelled Huis 1.
- Clear trees and vegetation below all spans.
- Local concrete crack (0.3mm) at return wall.

- Local spalling of concrete and exposed reinforcement of parapets.
- No agreement plate on bridge.
- Shrinkage cracks on bridge where remedial work has previously been undertaken.
- Guardrails missing reflector plates, missing bolts and spacer blocks to be corrected.
- Replace expansion joints
- Reinstate bridge number by retrofitting the structure numbers to the inside elevation of the end blocks as per current standard plans.

Bridge B4941

Bridge No B4941 over the Huis River No.1 at km 39.68 has a simply supported deck with 3 spans, for a total length of 45m. The following defects have been noted and described along with proposed rehabilitation measures for this contract:

- River board at bridge refers to Huis 1, road logs indicate section labelled Huis 2.
- Clear trees and vegetation below all spans.
- Crack to soffit of bridge deck.
- Concrete spalling to pier.
- No agreement plates.
- Replace expansion joint.
- Reinstate bridge number by retrofitting the structure numbers to the inside elevation of the end blocks as per current standard plans.

Bridge 4342

Bridge No 4342 over the Gamka River at km 40.15 has a simply supported deck with 5 spans for a total length of 96 m. The structure is generally in a sound condition. The following defects have been noted and described along with proposed rehabilitation measures for this contract:

- Clear trees and vegetation below all spans.
- Vertical cracks (0.65mm and 0.75mm) on return wall.
- Loose bolts at guard rail bridge adapter.
- Clear blocked drainage scuppers.
- Local spalling of concrete on parapets and exposed reinforcement.
- Replace expansion joints
- Reinstate bridge number by retrofitting the structure numbers to the inside elevation of the end blocks as per current standard plans.

Bridge 4942

Bridge No 4942 over the Nels River at km 47.87 has a simply supported deck with 5 spans for a total length of 96 m. The structure is generally in a sound condition. The following defects have been noted and described along with proposed rehabilitation measures for this contract:

- Clear thick reeds below all spans.
- No agreement plate displayed on bridge.
- No river sign board placed at bridge.
- Replace expansion joints
- Retrofit the structure numbers to the inside elevation of the end blocks as per current standard plans.

Culverts with key features

Major culverts

There are nineteen major culverts along this section of the TR31/5. In general, all major culverts need clearing and silt build up to be removed. The general condition of the culverts is fair to good with repairs

required to the cracking and spalling. Exposure of the rebar needs treatment in accordance with standard methods.

CHAINAGE (km)	STRUCTURE NO.	SPAN	OBSERVATIONS	REMEDIAL ACTIONS
4.14	C10939	4.6m	<ul style="list-style-type: none"> Minor siltation in cell Concrete surface erosion on culvert walls and headwall Horizontal crack on abutment on downstream Mound of sediment and tree hinders flow downstream Missing reflector plates and missing bolts on guardrails 	<ul style="list-style-type: none"> Clear siltation Clean and prepare the eroded surfaces and Apply a suitable concrete repair mortar to restore the eroded areas. Seal the crack with epoxy resin to prevent water ingress. Vegetation Clearing and removal of sediment mound Replace missing reflector plates and bolts
5.1	C10938	2/4.6m	<ul style="list-style-type: none"> Minor siltation in cell Concrete surface erosion on culvert wall and wingwall Vertical hairline crack on culvert wall Mound of sediment and vegetation hinders flow downstream Missing reflector plates on guardrails Height of guardrail 	<ul style="list-style-type: none"> Clear siltation Clean and prepare the eroded surfaces and apply a suitable concrete repair mortar to restore the eroded areas. Seal the crack with epoxy resin to prevent water ingress. Replace missing reflector plates Realignment of guardrail

CHAINAGE (km)	STRUCTURE NO.	SPAN	OBSERVATIONS	REMEDIAL ACTIONS
6.99	C10937	4.6m	<ul style="list-style-type: none"> Excessive siltation in cell (average of 1.1m of clear height to soffit of culvert slab at inlet) Concrete surface erosion on culvert wall and wingwall Missing reflector plates on guardrails 	<ul style="list-style-type: none"> Clear siltation Clean and prepare the eroded surfaces and Apply protective sealants to reduce future erosion caused by water flow or chemical exposure. Replace missing reflector plates
9.01	C10947	4.6m	<ul style="list-style-type: none"> Mound of sediment at inlet of structure Vegetation at inlet structure Concrete surface erosion to culvert walls and wingwall Localized reinforcement exposed on headwall Erosion of soil behind wingwall at outlet structure Missing and damaged reflector plates on guardrails Height of guardrail 	<ul style="list-style-type: none"> Clear mound and remove obstructions Apply a rust inhibitor to the cleaned reinforcement to prevent further corrosion Apply a repair mortar to damaged area Erosion protection Replace missing and damaged reflector plates Realignment of Guardrail
9.74	C10946	4.6m	<ul style="list-style-type: none"> Vegetation and mound of sediment at inlet and outlet structure Terrain and vegetation inhibiting access, wingwalls at outlet structure inaccessible. Vegetation and sediment covering section of weepholes. Guardrails – spacer blocks, missing/damaged reflectors and height of guardrail 	<ul style="list-style-type: none"> Clear vegetation at inlet and outlet structure and remove vegetation Replace missing and damaged reflector plates Clear vegetation from weepholes Realignment of Guardrail

CHAINAGE (km)	STRUCTURE NO.	SPAN	OBSERVATIONS	REMEDIAL ACTIONS
14.2	C10945	4.6m	<ul style="list-style-type: none"> Vegetation and sediment to be cleared upstream and downstream. Sediment and litter to be cleared in culvert. Localized spalling of concrete at headwall of outlet structure. Minor diagonal crack in culvert wall. Guardrails – Missing/damaged reflectors and height of guardrail 	<ul style="list-style-type: none"> Clear vegetation, litter and sediment Clean and prepare the eroded surfaces and Apply protective sealants to reduce future erosion caused by water flow or chemical exposure. Seal the crack with epoxy resin to prevent water ingress. Replace missing reflector plates Realignment of guardrail
16.24	C10944	4.6m	<ul style="list-style-type: none"> Vegetation and sediment to be cleared below culvert, upstream and downstream. Concrete surface erosion to headwall. Guardrails – Missing/damaged reflectors, delineator obstructed by vegetation. 	<ul style="list-style-type: none"> Clear vegetation, litter and sediment Clean and prepare the eroded surfaces and Apply protective sealants to reduce future erosion caused by water flow or chemical exposure. Replace missing reflector plates Realignment of guardrail
17.17	C10936	4.6m	<ul style="list-style-type: none"> Accumulation of sediment downstream impeding flow of waterway. Cracked and spalled concrete at headwall downstream. Cracked and spalled concrete at headwall downstream inclusive of exposed reinforcement. No culvert number at outlet structure. Guardrails – Missing/damaged reflectors, spacer blocks. 	<ul style="list-style-type: none"> Clear all sedimentation Clean and prepare the spalled area and Apply protective sealants to reduce future erosion caused by water flow or chemical exposure. Apply a repair mortar to damaged area Replace missing reflector plates Realignment of guardrail and replace spacer blocks

CHAINAGE (km)	STRUCTURE NO.	SPAN	OBSERVATIONS	REMEDIAL ACTIONS
18.66	C10943	3.1m	<ul style="list-style-type: none"> No culvert number visible on outlet and inlet structure. Terrain and vegetation impeded access to culvert. Guardrails – Missing/damaged reflectors, spacer blocks. 	<ul style="list-style-type: none"> New culvert number Clear vegetation Replace missing reflector plates Realignment of guardrail and replace spacer blocks
20.43	C10942	3.1m	<ul style="list-style-type: none"> Concrete surface erosion to inlet and outlet structures. Vegetation and terrain impedes inspection lower down to culvert. Spalling and cracked concrete at headwall upstream and downstream. No culvert number visible at inlet and outlet structure. Guardrails – Missing/damaged reflectors, missing bolts, spacer blocks, height of guardrail. 	<ul style="list-style-type: none"> Clean and prepare the eroded surfaces and apply a suitable concrete repair mortar to restore the eroded areas. Crack repair to be undertaken, methodology relative to crack width measured. Spalled concrete to be removed, reinforcement to be inspected for corrosion. Appropriate methodology to be undertaken for treatment of reinforcement and reinstatement of concrete surface. Vegetation Clearing. New culvert number Replace missing reflector plates and bolts, realignment of guardrail and replace spacer blocks.
27.14	C11029	2.5m	<ul style="list-style-type: none"> Vegetation and terrain does not enable for access to culvert. Guardrails are very inadequate (rusted, no spacer blocks at posts, etc.) 	<ul style="list-style-type: none"> Vegetation Clearing. Replace existing guardrails with new.

CHAINAGE (km)	STRUCTURE NO.	SPAN	OBSERVATIONS	REMEDIAL ACTIONS
28.48	C11030	3.1m	<ul style="list-style-type: none"> Vegetation and terrain does not enable for access to culvert. Damaged guardrails, missing bolts, damaged and missing reflectors, height of guardrail inadequate, missing spacer blocks. 	<ul style="list-style-type: none"> Vegetation Clearing. Replace damaged guardrails with new, replace missing reflector plates and bolts, realignment of guardrail and replace spacer blocks.
32.84	C11031	3.1m	<ul style="list-style-type: none"> Vegetation and terrain does not enable for access to culvert. Dense vegetation and trees in upstream and downstream waterway Damaged and rusted guardrails, damaged and missing reflectors, missing spacer blocks. 	<ul style="list-style-type: none"> Vegetation Clearing. Replace existing guardrails with new.
32.98	C11032	2/3.0m	<ul style="list-style-type: none"> Vegetation and terrain does not enable for access to culvert. Dense vegetation and trees in upstream and downstream waterway Damaged and rusted guardrails, damaged and missing reflectors, missing spacer blocks. 	<ul style="list-style-type: none"> Vegetation Clearing. Replace existing guardrails with new.
33.16	C11033	2/3.1m	<ul style="list-style-type: none"> Vegetation, terrain and fence does not enable for access to culvert. Dense vegetation and trees in upstream and downstream waterway Guardrails: Missing bolts, damaged and missing reflectors, spacer blocks to be rectified. 	<ul style="list-style-type: none"> Vegetation Clearing. Replace existing guardrails with new.

CHAINAGE (km)	STRUCTURE NO.	SPAN	OBSERVATIONS	REMEDIAL ACTIONS
37.75	C11034	3.0m	<ul style="list-style-type: none"> 0.7mm crack width to wing wall at outlet structure Sediment to be removed in culvert. 0.3mm crack width measured to soffit of culvert deck. 0.8mm crack width measured to wingwall at inlet structure. Dense vegetation at inlet structure. Guardrails: Missing bolts, damaged and missing reflectors, spacer blocks to be rectified. 	<ul style="list-style-type: none"> Clear vegetation and sediment. Crack repair to be undertaken, methodology relative to crack width measured. Replace missing reflector plates and bolts, realignment of guardrail and replace spacer blocks.
40.43	C11035	3.5m	<ul style="list-style-type: none"> Localised cracking at headwall at inlet and outlet structure. 1.6mm crack width on wingwall at outlet structure. Vegetation and rock to be removed from upstream and downstream section of culvert. Guardrails: Damaged reflectors, spacer blocks to be rectified. 	<ul style="list-style-type: none"> Crack repair to be undertaken, methodology relative to crack width measured. Clear vegetation and rock. Replace missing reflector plates, realignment of guardrail and replace spacer blocks.

CHAINAGE (km)	STRUCTURE NO.	SPAN	OBSERVATIONS	REMEDIAL ACTIONS
40.56	C11036	3.5m	<ul style="list-style-type: none"> Localised cracking at headwall at inlet and outlet structure. Concrete surface erosion and localised spalling of concrete to outlet structure. Concrete surface erosion to inlet structure. Localised spalling of concrete at culvert wall. Vegetation and trees to be removed from waterway. Guardrails: Damaged reflectors, spacer blocks to be rectified. 	<ul style="list-style-type: none"> Crack repair to be undertaken, methodology relative to crack width measured. Clean and prepare the eroded surfaces and apply a suitable concrete repair mortar to restore the eroded areas. Spalled concrete to be removed, reinforcement to be inspected for corrosion. Appropriate methodology to be undertaken for treatment of reinforcement and reinstatement of concrete surface. Clear vegetation. Replace missing reflector plates, realignment of guardrail and replace spacer blocks.
44.17	C11037	3.0m	<ul style="list-style-type: none"> Vegetation to be removed from waterway. Terrain and slope of embankment impedes access to culvert. Guardrails: Damaged reflectors, spacer blocks to be rectified. 	<ul style="list-style-type: none"> Clear vegetation. Replace missing reflector plates, realignment of guardrail and replace spacer blocks.

Proposed Remedial Actions:

- Clear siltation
- Clear litter and sedimentation
- Clean and prepare the eroded surfaces and apply a suitable concrete repair mortar to restore the eroded areas.
- Seal the crack with epoxy resin to prevent water ingress.

- Vegetation Clearing and removal of sediment mound.
- Replace missing reflector plates and bolts.
- Realignment of guardrail.
- Clear mound and remove obstructions.
- Apply a rust inhibitor to the cleaned reinforcement to prevent further corrosion.
- Apply a repair mortar to damaged area.
- Clear vegetation at inlet and outlet structure and remove vegetation.
- Clean and prepare the eroded surfaces and apply protective sealants to reduce future erosion caused by water flow or chemical exposure.
- Replace spacer blocks
- New culvert number
- Spalled concrete to be removed, reinforcement to be inspected for corrosion. Appropriate methodology to be undertaken for treatment of reinforcement and reinstatement of concrete surface.
- Replace guardrails.
- Crack repair to be undertaken methodology relative to crack width measured.

Minor culverts summarised according to type, purpose and size

There are 236 minor culverts along the route of which 208 are pipe culverts and 28 are concrete box culverts. Furthermore, the general condition of all minor culverts can be summarised as below:

1. There 62 pipe culverts with stone pitched inlets and outlets, of which
 - 27 are functional and in fair condition.
 - 20 not functional as they are blocked (sedimented > 50%)
 - 7 are not functional due to damage to either the inlets and/ or outlets.
 - 8 inlets/ outlets are not functional or inaccessible.
2. There are 146 pipe culverts with concrete headwalls, of which
 - 76 are functional and in fair condition
 - 17 not functional as they are blocked (sedimented >50%)
 - 9 are not functional due to damage to the headwalls of the inlet/outlet (spalling/cracking)
 - 19 culverts are inaccessible not functional, or they no longer exist
 - 15 inlets/outlets are non-functional and inaccessible
3. There are 10 box culverts with stone pitched headwalls, of which
 - 5 are in fair condition
 - 5 are failing due to cracking or stone debonding from the wall.
4. There are 18 box culverts with concrete headwalls, of which
 - 6 are in fair condition
 - 1 is not functional due to damage to the inlet
 - 11 are inaccessible from the roadside
5. There are 2 lesser culverts not indicated on the bridge management system:
 - 23.47 - Access drainage
 - 25.57 – Access drainage

Proposed remedial work

In general, the following remedial work is proposed to the minor culverts:

1. Siltation and vegetation in the culverts, inlet and outlet must be removed.
2. The culverts listed on RNIS which could not be found or assessed due to
3. vegetation encroachment (or non-existence must be cleaned and
4. assessed for functionality).
5. The damaged concrete inlet/outlet structures are to be repaired.
6. The non-functional stone pitched inlet and outlet structures must be
7. replaced with WCG standard concrete inlet and outlet structures
8. All culverts are to have functional apron slabs at the inlet and outlet. The

9. condition during visual assessment was inhibited by siltation.
10. Scour protection works are to be constructed where evidence of damage due to scour.

7.2 IMPACTS ON THE RECEIVING ENVIRONMENT

The following impacts are expected to occur during the periodic maintenance of TR31/5:

7.2.1 Vegetation clearance and vegetation brush-cutting

Vegetation disturbance in two forms will likely be undertaken as part of the routine maintenance. Vegetation clearance within the drainage lines on the inlet and outlet sides of the structures to ensure the unobstructed drainage of runoff through the structures. Vegetation brush-cutting will likely also be required at some locations for site access for labourers, construction vehicles and machinery.

Mitigation

- Clearance of vegetation should only be undertaken as a last resort if the vegetation will or is damaging a given structure and/or if the vegetation is completely blocking the flow of water through the structure. Vegetation root systems provide unmatched soil stability and should not be cleared purely for aesthetic purposes.
- Where vegetation clearance is unavoidable, clearance should be undertaken by cutting the plants at their stems/trunk bases and treating the stumps with an herbicide to prevent them re-growing. Cleared vegetation's root systems should be left intact as far as possible to provide much needed stability to the ground material and decrease the areas' vulnerability to erosion.
- Where practical, the maintenance areas must be properly demarcated prior to activities being undertaken. The areas outside these demarcated areas must be regarded as a No-Go area;
- Only the minimum practical amount of vegetation must be cleared to effectively undertake the required maintenance activities;
- All vegetation clearance should be undertaken by means of manual labour;

7.2.2 Removal, Moving / Excavation of Ground Material

Clearing of silt from within the culverts is required. Disturbance to the ground material may also result from the creation of temporary access to maintenance areas.

Mitigation

- The area of maintenance and site access must be properly demarcated. The area outside this area must be regarded as the No – go area.
- Access routes should be created as a last resort, where practically possible, existing two track or other access routes should be utilised.
- Only the minimum number of excavations to be undertaken for the required activities.
- Where practical and feasible, excavations should be done by means of manual labour;
- Use can be made of a Tractor – Loader – Backhoe (TLB) where excavation of large amounts of material needs to be excavated, removed, moved and deposited.

7.2.3 Activities within or within close proximity to a watercourse

A number of construction activities can result in negative impacts to the watercourses that traverse the TR31/5: The following impacts may result due to road maintenance activities:

- Sedimentation and erosion can be caused by earth works that are associated with construction activities. These impacts can result in the deterioration of aquatic ecosystem integrity and a reduction/ loss of habitat for aquatic dependent flora and fauna.
- The indirect impacts of flow modification will cause deterioration in aquatic ecosystem integrity, a reduction of habitat for aquatic dependent biota, and a reduction in the provisioning of ecosystem services. The existing road and bridges have already modified the distribution of flows

within the rivers. The footprint of the structures is not increasing and the flow will not be permanently modified. However, in order to work on the infrastructure within the river bed (such as the abutments) temporary flow impedance or diversion may be required (depending on flow). Additionally, the clearance of sediment and vegetation upstream and downstream of culvert openings will have a localised impact upon flow pattern. However, during large flood events, such modifications will not alter the flow direction due to their magnitude.

- Water and soil pollution cause negative changes in the physical, chemical and biological characteristics of water resources. This can result in possible deterioration in aquatic ecosystem integrity and a reduction in, or loss of species of conservation concern. Litter indirectly decreases the aesthetic value of the rivers.
- Erosion to the working area as a result of no storm water provisions.
- The uncontrolled interaction of construction workers with the watercourses that could lead to the pollution of the watercourses i.e. washing off equipment in the watercourses;
- Inadequate stormwater management during rain events could lead to erosion and contamination of the watercourses.
- Incorrect positioning and maintenance of the portable chemical toilets and use of the surrounding environment as ablution facilities may result in sewage and chemicals entering the systems.
- Leakage of hazardous materials (i.e. oils, fuels, etc.) into the watercourses due to incorrect use or leaking construction vehicles; and
- Construction related wastes that blow / fall into the watercourses

Mitigation

- Where at all possible, existing access routes should be used. In cases where none exist, a route should be created through the most degraded area avoiding sensitive/indigenous vegetation areas.
- Ablution facilities must be situated away from watercourses to prevent possible pollution if the facility leak or blow away.
- Provisions for storm water management must be undertaken during maintenance activities (i.e. maintenance work must be undertaken keeping in mind that a rainfall event could occur during maintenance activities, resulting in stream flow of the watercourses).
- Stormwater must be diverted away from the construction site by means of berms
- No equipment should be left unattended within a watercourse.
- Workers must receive necessary training to make them aware of the possible pollution they may cause by the actions in close proximity to the watercourse.
- The construction area must be demarcated to deter labourers from entering the watercourses unnecessarily.
- The area beyond the demarcation must be regarded as a no-go area
- Stockpiles of materials must not be placed in close proximity to the watercourse.
- Construction vehicles must be inspected on a daily basis to check for leaks.
- No refuelling of vehicles in close proximity to the watercourses. This must be done in the site camp on an impermeable surface to prevent pollution of the soil.
- A spill kit must be available at all times in the event of spillage. Polluted soil must be removed and disposed of at an appropriately licensed disposal facility.
- An integrated waste management approach must be adopted on site. Waste management is discussed in further depth in Section 10.4 of this MMP. This includes an integrated waste management approach such as re-use, recycling, etc. and the provision of waste bins on site.
- Adequate bins must be provided at all active construction sites along the maintenance route. These bins must be fitted with lids to prevent the waste from blowing into the watercourses or surrounding vegetation.
- Sedimentation must be minimised with appropriate measures.

- Use of the smallest possible working corridor.

7.2.4 General construction nuisances

The construction activities will cause possible noise, dust, visual and traffic disturbances to road users. This impact cannot be avoided; the following mitigation measures must be implemented to minimise the effect of the impact:

- Put measures in place to allow for the maximum available flow of traffic.
- Noise generating activities will be limited to normal working hours.
- Equipment must be in good working condition in order to minimise noise generation and prevent contamination as a result of fluid leaks.
- Labourers and site agents should be educated on how to control activities that have the potential to become disturbances.
- The construction site must be kept clean and tidy throughout the contract.

7.3 SITE RE-VEGETATION / REHABILITATION

is in our experience that vegetation encroaching on roads and associated drainage structures are undesirable for the longevity of roads and associated drainage structures. However, after areas within the road reserve, including embankments can be effectively stabilised using vegetation and/or jute geotextile. No search and rescue has been recommended within this MMP because the likelihood of transplanting any worthwhile species is very low considering the need for it to be watered for the first few months to ensure it is able to grow. In terms of rehabilitation of disturbed areas within the dry climate of the Klein Karoo and with the current water shortages faced by the Western Cape, it is not deemed practical to attempt to re-vegetate disturbed areas. The end goal with regards to rehabilitation of the disturbed areas is to stabilise the slopes to prevent erosion and damage to structures, this may only be possible through physical/mechanical methods such as gabions or stone pitching within the maintenance areas. The use of jute geotextile could also be used but the likelihood of success with this material is low considering the climate. No biological rehabilitation methods are therefore recommended.

7.4 WORKING WITH HAZARDOUS SUBSTANCES

Appropriate mitigation measures must be in place when bitumen is applied to the road surface that measures are in place to prevent the substances from running down road embankments or pooling alongside the road. These pools become fatal traps for any fauna traversing the road. If at any stage bitumen does rundown the embankments or pools anywhere along the route the spillage must be rectified immediately to prevent any trapping of fauna.

7.5 DEMARCATION AND SITE ACCESS

Demarcation of access routes is required to ensure that vehicle operators and labourers do not disturb more ground material than what is needed to undertake the required activities.

Large bridge crossings, major and minor culverts associated with embankments: The embankments approaching the larger culverts/bridges are somewhat higher in elevation relative to the surrounding topography when compared to the smaller/lower culverts. Because of this access to the site will require greater disturbance for the larger culverts than the smaller ones. Access to the larger bridges/culverts must be undertaken to create the least possible amount of disturbance and to leave steep slopes as undisturbed as possible. Furthermore, it must be noted that access must be created from one side only. Maintenance activities should not block access to the site, if the site is accessed from the left, maintenance activities should start on the right of the structure so that the site will not need to be accessed once activities on the left of the structure has concluded.

8. MITIGATION TABLES

	ACTIVITY	MITIGATION MEASURES	TIMEFRAME	RESPONSIBLE PARTY
CONSTRUCTION PHASE	8.1: Site establishment camp	<ul style="list-style-type: none"> The area chosen for the office and / or site camp must be the minimum reasonably required, which will involve the least disturbance to the environment. The contractor's camp must be approved by ECO and Engineers. A site layout plan must be submitted to the Engineer for approval. The contractor's camp may not be situated within a flood plain, on slopes greater than 1:3(v:h), or within 32m of a watercourse The site layout plan should make provision for site access, parking facilities, site offices, ablution facilities, designated first aid area, hazardous substance storage areas, batching plant, refuelling area (if necessary), and a maintenance area The total area of the intended site camp should be stripped of all topsoil (as may be present) before any of the contractor's infrastructure or machinery is stored within the site camp. The site camp would need to be adequately fenced off along the boundary (preferably with 2m high fence and shade netting) and secured to prevent non-construction staff wandering around the site camp and possibly getting injured or posing a safety and security risk. Adequate signage needs to be in place, designating the site office / camp as a restricted area to non-construction people. 	Before site establishment	Construction contractor
	8.2: Site access	<ul style="list-style-type: none"> The existing road network, where possible, should be used to access the construction site. All construction vehicles need to adhere to traffic laws. The speed of construction vehicles and other heavy vehicles must be strictly controlled to avoid dangerous conditions for other road users As far as possible care should be taken to ensure that the local traffic flow pattern is not be too significantly disrupted and all vehicle operators therefore need to be educated in terms of "best-practice" operation to minimise unnecessary traffic congestion or dangers. Construction vehicles should therefore not unnecessarily obstruct the access point or traffic lanes used to access the site. Construction vehicles also need to consider the load carrying capacity of road surfaces and adhere to all other prescriptive regulations regarding the use of public roads by construction vehicles. To prevent the dispersal of alien seeds, it is advised that construction vehicles and machinery be washed regularly and away from any watercourses. 	Ongoing / when required	Construction contractor

8. MITIGATION TABLES

	ACTIVITY	MITIGATION MEASURES	TIMEFRAME	RESPONSIBLE PARTY
	8.3: Toilet facilities	<ul style="list-style-type: none"> • Chemical toilet facilities or other approved toilet facilities (1 for every sex of 20 workers) must be used and located on the site in such a way that the toilets do not cause any form of pollution of the site. This is especially important in close proximity to any drainage lines. The toilets must be easily accessible and shall be secured to prevent them from blowing over or being pushed over. Toilets should be placed within the site camp as well as within reasonable proximity to working areas where construction teams are operating. • The contractor shall ensure that no spillage occurs when chemical toilets are cleaned. The toilet shall be placed on level, bare ground. Performing ablutions outside toilet facilities are strictly prohibited. • The toilets must be serviced regularly and kept in an orderly state. 	Ongoing / when required	Construction contractor
	8.4: Waste Management	<ul style="list-style-type: none"> • An integrated waste management approach should be adopted. Emphasis must be put on waste minimisation such as reduction, recycling and re-use, where possible. The appointed ECO must regularly inspect the waste storage and removal facilities to guarantee that the waste levels are acceptable and that an adequate waste management is implemented. • Recycling bins for the various categories (paper, glass, plastic, etc.) should be provided. These bins must be emptied on a weekly basis and dropped off at a collection point for recycling by recycling companies. If this is not possible and no recycling takes place in this district then this clause will not apply. • Bins must also be provided for builder's waste. These bins should be emptied on a regular basis and solid waste must be disposed of at a landfill licensed in terms of section 20 of the Environment Conservation Act, 1989 (Act No. 73 of 1989) or the National Environmental Management: Waste Act (Act No. 59 of 2008). Any builder's waste which can be reused can be stockpiled in an area identified by the ECO. These areas must demarcated for the duration of the project. • All bins shall not be allowed to overflow, since waste may blow around on site and into the surrounding environment. The bins must be water tight, windproof and scavenger proof and be clearly marked for the purpose of waste disposal. • Biodegradable refuse generated from the office / site camp, construction areas, vehicle yard, storage area or any other area shall be handled as indicated above. Adequate waste receptacles, bins and skips should be available for the collection and removal of waste. 	Ongoing / when required	Construction contractor

8. MITIGATION TABLES

	ACTIVITY	MITIGATION MEASURES	TIMEFRAME	RESPONSIBLE PARTY
	<p>8.5: Storage and management of hazardous and construction materials</p>	<ul style="list-style-type: none"> No spoil material must be pushed downslope or discarded on site. Storage areas must be designated and demarcated, and no unauthorised access shall be permitted. Storage areas should be secure as to minimise the risk of crime, or access by children or animals. Storage areas must be kept neat and orderly at all times All mixing of chemicals and hazardous substances must be undertaken over material safety data sheets on site and within the storage areas Hazardous storage and refuelling areas must be bunded with an impermeable liner to protect groundwater quality. The bunding shall be capable of handling a volume 150% the volume of the container storing the substance. The Contractor shall submit a method statement to the Engineer for approval. Storage areas containing hazardous substance / materials must be clearly sign posted. Contractors shall submit a method statement and plans for the storage of hazardous materials and emergency procedures. Firefighting equipment should be present on site at all times as per OHSWA, when undertaking hot works. No materials are to be stored in unstable or high-risk areas such as in floodplains, watercourses or on steep slopes. 	<p>Ongoing / when required</p>	<p>Construction contractor</p>
	<p>8.6: The clearance of vegetation and vegetation brush-cutting</p>	<ul style="list-style-type: none"> Clearance of vegetation should only be undertaken as a last resort if the vegetation will or is damaging a given structure and/or if the vegetation is completely blocking the flow of water through the structure. Where vegetation clearance is unavoidable, clearance should be undertaken by cutting the plants at their stems/trunk bases and treating the stumps with an herbicide to prevent them re-growing. By leaving the cleared vegetation's root systems in tact the soil stability provided by the root systems will provide much needed stability to the ground material and decrease the areas' vulnerability to erosion. In addition, any use of herbicides in removing alien plant species is required to be investigated by the ECO before use, for necessity, type proposed to be used, effectiveness and impacts of the product on the aquatic biota. Where practical, the maintenance areas must be properly demarcated prior to activities being undertaken. The areas outside these demarcated areas must be regarded as No-Go areas; 	<p>Ongoing / when required</p>	<p>Construction contractor</p>

8. MITIGATION TABLES

	ACTIVITY	MITIGATION MEASURES	TIMEFRAME	RESPONSIBLE PARTY
		<ul style="list-style-type: none"> Only the minimum amount of vegetation necessary to maintain the road, culverts and verge integrity must be cleared; All vegetation clearance must be done by means of manual labour, if possible No rubble must be placed aside during construction as it alters the sediment composition of the area, allowing alien plants to encroach 		
	8.7: Removal, Moving / Excavation of Ground Material	<ul style="list-style-type: none"> The maintenance area and site access must be properly demarcated. The area outside this demarcated area must be regarded as a "No-Go" area Where practically possible, existing two track or other access routes should be utilised and only as a last resort should temporary access routes be created Contaminated material must be disposed of at an appropriate registered facility Only the minimum amount of excavations must be undertaken Where practical and feasible, excavations should be done by means of manual labour; Use can be made of a Tractor-Loader-Backhoe (TLB) where excavation of large amounts of material needs to be excavated, removed, moved and deposited. 	Ongoing / when required	Construction contractor
	8.8: Storage of excavated material	<ul style="list-style-type: none"> All excavated material must be stored on a flat surface away from any drainage line or area susceptible to erosion. The location should be decided upon in consultation with the ECO Stored material should be protected from wind and water erosion and this may entail covering the material with suitable shade cloth material (if and when necessary). Any excavated material not be used by the contractor must be disposed of at an appropriate registered facility. 	Ongoing / when required	Construction contractor
	8.9: Activities within or within close proximity to a watercourse	<ul style="list-style-type: none"> Supply adequate sanitation and ablution facilities. These facilities must however be situated away from the watercourses to prevent possible pollution if the facilities leak or are blown over. Workers must receive to necessary training to make them aware of the possible pollution they may cause by the actions in close proximity to the watercourse. Use the smallest possible working corridor The construction area must be demarcated to deter labourers from entering the watercourse. The area beyond the demarcation must be regarded as a no-go area Vehicles must be inspected on a daily basis to check for leaks. 	Ongoing / when required	Construction contractor

8. MITIGATION TABLES

	ACTIVITY	MITIGATION MEASURES	TIMEFRAME	RESPONSIBLE PARTY
		<ul style="list-style-type: none"> • No refuelling of vehicles in close proximity to the watercourse. This must preferably be done in the site camp on an impermeable surface to prevent pollution of the soil. • A spill kit must be available at all times in the event of spillage. Polluted soil must be removed and disposed of at an appropriately licensed disposal facility. • Waste management is discussed in depth in Section 11.3 of this MMP. This includes an integrated waste management approach such as re-use, recycling, etc. and the provision of waste bins on site. If this is not possible and no recycling takes place in this district then this clause will not apply • Adequate bins must be provided at all active construction sites along the road route. These bins must be fitted with lids to prevent the waste from blowing into the watercourses or surrounding vegetation. • Preferably utilise existing access paths or access through disturbed/invaded vegetation before considering the clearing of vegetation • Access roads must be one-way, limited to 4m width and adequate turning areas outside of the riparian areas may need to be identified and demarcated in conjunction with the ECO. • All freshwater habitats outside the demarcated construction area must be considered 'No – go" areas for the duration of the construction period • Where construction is to take place within a river channel, if flowing, temporary diversions must be undertaken to divert water away from the construction activities • No permanent walls, berms or dams may be installed within rivers. All diversions must be removed to restore natural flow patterns • Sedimentation must be minimised for the duration of the construction activities • Construction must have contingency plans for high rainfall events during construction • Excavated rock and sediments from the construction zone, and including any foreign materials, should not be placed within the delineated rivers and riparian areas in order to reduce the possibility of material being washed downstream. • Cement/concrete batching is to be located in an area of low environmental sensitivity away from the river channels. No batching activities shall occur on 		

8. MITIGATION TABLES

	ACTIVITY	MITIGATION MEASURES	TIMEFRAME	RESPONSIBLE PARTY
		<p>the unprotected ground. Adequate surface protection will be required. Concrete batching should be restricted to a level and bunded/sealed surface above the riverbanks</p> <ul style="list-style-type: none"> Contaminated water containing fuel, oil or other hazardous substances must never be released into the environment. It must be disposed of at an appropriate registered landfill facility 		
	<p>8.10: Erosion Control</p>	<p>Small scale erosion and storm water control measures:</p> <ul style="list-style-type: none"> These control measures will entail the use of shade netting barriers (or similar) or geo-fabric barriers in areas susceptible to erosion. These storm water control measures are usually placed directly across the path of flow of storm water. Poles and logs, staked in along the contours of a slope susceptible to erosion may also be used. <p>Medium scale erosion and storm water control measures:</p> <ul style="list-style-type: none"> Small berms and benches cut into the slope as well as poles and logs, placed along the contours of the slope can be used for medium-scale erosion and storm water control. <p>Large scale erosion and storm water control measures</p> <ul style="list-style-type: none"> Large-scale erosion control is mainly accomplished with the use of temporary retention dams / settling ponds and large berms. The mode of operation is to undertake the maintenance activities while bearing in mind the possibility that a heavy rainfall event could occur at any moment. There may therefore be a need for larger berms to ensure that water does not have an unobstructed run from the top of a drainage line to the bottom. 	<p>Ongoing / when required</p>	<p>Construction contractor</p>
	<p>Rehabilitation</p>	<ul style="list-style-type: none"> All hazardous waste, spoil material and construction litter must be removed from the site camp, on site and within temporary storage areas and disposed of at an appropriate registered landfill facility. All compacted areas must be scarified and ripped at the end of the construction period All disturbed areas must be rehabilitated as soon as practically possible The longitudinal gradient must not be altered in a way that results in erosion downstream or impoundment of flows upstream. The cross sectional profile of the bed and banks must also be restored as far as possible 	<p>Ongoing / when required</p>	<p>Construction contractor</p>

8. MITIGATION TABLES				
	ACTIVITY	MITIGATION MEASURES	TIMEFRAME	RESPONSIBLE PARTY
	8.11: General Construction phase nuisances	<ul style="list-style-type: none"> Put measures in place to allow for the maximum available flow of traffic; Noise generating activities will be limited to normal working hours; Equipment must be in good working condition in order to minimise noise generation. Labourers and site agents will be educated on how to control activities that have the potential to become disturbances. Keep the construction site clean and tidy 	Ongoing / when required	Construction contractor

9. Environmental Impact Maintenance Phase

A number of potential environmental impacts may arise during the maintenance phase of the development. These impacts have been identified and assessed during the compilation of this MMP. Environmental Management objectives and actions that will prevent the identified potential impacts from arising – or where avoidance is not possible, that will minimise and mitigate the impact – are provided in this section.

The environmental management actions and mitigation measures prescribed in this section must be implemented throughout the maintenance phase and must be implemented in conjunction with the general management measures specified in Chapter 7 and 8 of this MMP as well as any other conditions stated in the Environmental Authorisation. The Environmental Control Officer must monitor and report on the implementation of the relevant environmental management measures and may provide guidance on the implementation of these environmental management measures as and when required.

The environmental management objectives (goals) for the Maintenance phase are:

- Disturbance of aquatic habitat
- Erosion & sedimentation
- Flow modification
- Water pollution

The environmental management actions that must be implemented in order to achieve the desired objectives and avoid/minimise potential impacts are discussed in more detail in the sections below.

Objective 1: Disturbance of aquatic habitat

<i>Impact Management Objective: To limit physical disturbances of aquatic habitat</i>	
Potential impact to avoid	<ul style="list-style-type: none"> Operation of personnel, vehicles and machinery and execution of maintenance activities (e.g. vegetation clearing) in and in close proximity to watercourses can lead to physical disturbance of aquatic habitat (riparian vegetation and the bed and banks of the watercourse).

	<ul style="list-style-type: none"> Maintenance activities will however be restricted to the road reserve and areas where existing infrastructure is in place. Impacts will therefore be restricted to very limited areas and the nature of maintenance activities is not likely to lead to deterioration in the ecological health or function of watercourses. 	
Impact Management Outcome	Physical disturbances of the aquatic habitat are limited.	
IMPACT MANAGEMENT ACTIONS		
Mitigation measure	Responsible party	Time period
<ul style="list-style-type: none"> Where at all possible, existing access routes should be used. In cases where none exist, a route should be created through the most degraded area avoiding sensitive/indigenous vegetation areas. Vehicle access roads to maintenance areas must not cross watercourses. Vehicles must be diverted back to the existing road at these points (i.e. watercourses must not become traffic thoroughfares). Access to the watercourse is only for work specifically being conducted to maintain existing structures. In these areas, access must be limited to essential equipment only. Clearance of sediment from culverts must be restricted to the culvert only and the channel of the watercourse must not be widened or deepened. Clearing of riparian/instream vegetation at bridges must be restricted to the bridge span only. Clearing of vegetation at culverts must be limited to culvert openings only and must not extend upstream or downstream of the culvert. When practicable, prune or top the vegetation instead of grubbing/uprooting All rubble and waste (including excavated sediment and cleared vegetation) must be removed from the watercourse and be disposed at an appropriate waste facility. Sediment removed from culverts may: <ul style="list-style-type: none"> be utilised for the purpose of in-filling or other related maintenance actions related to managing erosion, which form part of this MMP; 	Contractor	Maintenance phase

<ul style="list-style-type: none"> ○ not be deposited anywhere within the watercourse or anywhere along the banks of a watercourse. Material that cannot be used for maintenance purposes must be removed out of the riparian area to a suitable stockpile location or disposal site. ○ On completion of the maintenance action, the condition of the site in terms of relative topography should be similar to the pre-damaged state (i.e. the shape of the river bank should be similar or in a state which is improved to manage future damage). This ultimately dictates that the channel, banks and bed cannot be made narrower, higher or deepened respectively. 		
Performance Indicator	Physical disturbances of the aquatic habitat are limited.	

Objective 2: Erosion and sedimentation

<i>Impact Management Objective: To limit physical disturbances of aquatic habitat</i>		
Potential impact to avoid	<ul style="list-style-type: none"> • Maintenance and rehabilitation activities could lead to localised disturbance of soil which can lead to increased erosion and sedimentation of watercourses and/or modifications to the bed and banks of watercourses • In addition, excessive clearing of sediment from stream channels can lead to localised scouring of the bed and banks caused long-term erosion of the watercourse. • 	
Impact Management Outcome	Deterioration of permanent and temporary instream aquatic habitat due to erosion and sedimentation is limited.	
IMPACT MANAGEMENT ACTIONS		
Mitigation measure	Responsible party	Time period
<ul style="list-style-type: none"> • Clearance of sediment from culverts must be restricted to the culvert only and the channel of the watercourse must not be widened or deepened. • Following the completion of maintenance, disturbed areas must be cleared of rubble, excavated sediment material and any cut/cleared vegetation. 	Contractor	Maintenance phase

<ul style="list-style-type: none"> Any disturbed banks or channels must be reshaped to free-draining and non-erosive contours where possible. Disturbed banks must be re-vegetated with indigenous vegetation suitable to the area. Excavated material (e.g. sediment) or rubble must not be stockpiled within the river channel or within riparian vegetation adjacent to the channel. Stockpiling of materials must be restricted to level areas safe from flood prone areas. 		
Performance Indicator	Deterioration of permanent and temporary instream aquatic habitat due to erosion and sedimentation is limited.	

Objective 3: Flow Modification

Impact Management Objective: To limit physical disturbances of aquatic habitat		
Potential impact to avoid	<ul style="list-style-type: none"> Flow modification, such as impeding and diverting flows, refers to any direct alterations in the quantity, timing and distribution of water inputs and flows within a river. Culverts and bridges are designed to be free-flowing structures and blockage of culverts caused by vegetation and build up sediment and can impede or divert flows around structures which can cause unanticipated erosion and scouring in and around structures. This in turn can lead to erosion of the bed and banks of watercourses and associated degradation of instream and riparian habitat. In this respect, clearance and maintenance of culvert structures is viewed as essential not only for protecting infrastructure, but also for maintaining the ecological function and health of watercourses. Some repair of concrete structures at bridges may require flowing water to be temporarily diverted in order to establish dry working conditions. 	
Impact Management Outcome	Unanticipated erosion and scouring in and around structures is limited.	
IMPACT MANAGEMENT ACTIONS		
Mitigation measure	Responsible party	Time period
<ul style="list-style-type: none"> Where construction is to take place within a river channel, if flowing, temporary diversions may need to be put in place to temporarily divert water away from activities and ensure a dry work area. Any diversions must be temporary in nature and no permanent walls, berms or dams may be installed within the rivers. Upon 	Contractor	Maintenance phase

completion of the construction at the site, the diversions shall be removed to restore natural flow patterns.		
Performance Indicator	Unanticipated erosion and scouring in and around structures is limited.	

Objective 4: Water Pollution

Impact Management Objective: To limit physical disturbances of aquatic habitat

Potential impact to avoid	<ul style="list-style-type: none"> • Water and/or soil pollution cause negative changes in the physical, chemical and biological characteristics of water resources (i.e. water quality). This can result in possible deterioration in aquatic ecosystem integrity and a reduction in, or loss of, species of conservation concern (i.e. rare, threatened/ endangered species). Additionally, litter indirectly decreases the aesthetic value of the rivers. Maintenance activities could potentially pollute watercourses through a variety of sources, including: <ul style="list-style-type: none"> ○ Surface runoff of bitumen into watercourses caused by rainfall shortly after application. ○ Hydrocarbons including petrol/diesel and oils/grease/lubricants associated with spillages, leaks or refueling of vehicles/machinery may potentially pollute watercourses. ○ Raw cement entering the systems through incorrect batching procedure and/or direct disposal. ○ The incorrect positioning and maintenance of the portable chemical toilets and use of the surrounding environment as ablution facilities may result in sewage and chemicals entering the systems. ○ Spills caused by poor storage and handling of pollutants (e.g. fuel, oil, bitumen, paint, cement etc.)
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Impact Management Outcome	Unanticipated erosion and scouring in and around structures is limited.
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IMPACT MANAGEMENT ACTIONS

Mitigation measure	Responsible party	Time period
<ul style="list-style-type: none"> • Application of bitumen to road surface must be strictly planned according to reliable weather forecasts. No bitumen may be applied within 24 hours of a predicted rainfall event. • Application of bitumen to road surface must be strictly planned according to reliable weather forecasts. No bitumen may be applied within 24 hours of a predicted rainfall event. • Provide portable chemical toilets on-site (1 toilet per 10 workers). Waste from toilets is to be disposed of regularly, at least weekly, in a responsible manner by a registered waste 	Contractor	Maintenance phase

<p>contractor. Toilets must be located more than 30 m away from watercourses.</p> <ul style="list-style-type: none"> • All maintenance personnel must be briefed that no waste is to be disposed of in the environment. • Fuel storage and vehicle refuelling areas must be located at least 50 m from any watercourse. • Discontinue maintenance activities during periods of high rainfall. • Vehicles and machinery must be inspected for leaking fuel before accessing the site, and leaking vehicles must not be permitted to work at the site. • Construction camps, equipment and material lay down areas must be located at least 30 m from any watercourse. • Concrete or cement mixing is not permitted at or in the vicinity of the watercourse. Any cement mixing cannot take place on bare ground. An impermeable or bunded area must be established in a way that cement slurry will not run off into the surrounding environment. • Concrete or cement mixing is not permitted at or in the vicinity of the watercourse. Any cement mixing cannot take place on bare ground. An impermeable or bunded area must be established in a way that cement slurry will not run off into the surrounding environment. • Excess cement or other materials must be left to dry out before being removed and disposed of at an appropriate facility. 		
Performance Indicator	Unanticipated erosion and scouring in and around structures is limited.	

10. IMPLEMENTATION MANAGEMENT

The following recommendations (in addition to those tabulated in Section 8 and 9) must be implemented to ensure that maintenance / repair activities do not have a detrimental impact on the environment.

10.1 SITE CAMP

The site camp must be located on a previously transformed area. It must be located in such a way that it will cause the least disturbance to the general public and the environment. The ECO must be consulted with regards to the proposed location of the site camp prior to the site camp establishment.

Equipment, machinery, raw materials (wire / fencing / wood, nails), and plants will be temporarily stored in a dedicated area. The following general management measures pertaining to the set-up, operation and closure of a site camp should be applied wherever reasonable and practicable:

Fencing & Security: The site camp area must be secured preferably with 2m high fence and shade netting or similar, to prevent any un-authorized individuals from entering the site camp and possibly getting injured or posing a safety and/or security risk. Adequate signage must be displayed, designating the site office / camp as a restricted area to non-personnel.

Fire Fighting Equipment: Fire extinguishers must be present at the site camp. The extinguishers must be in a working condition and recently serviced. It is recommended that all construction workers receive basic training in fire prevention and basic fire-fighting techniques, and are informed of the emergency procedure to follow in the event of accidental fires. No open fires may be made on site.

Waste Storage Area: Sufficient bins for the temporary storage of construction related waste must be provided inside the site camp and / or at the working area. Construction-related waste must be managed as specified in Section 8.4.

Potable Water: An adequate supply of potable water must be provided to construction workers at the site camp.

Ablution Facilities: Chemical toilet facilities or other approved toilet facilities (at least 1 toilet for each sex and for every 30 workers) must be provided and located on the site in such a way that the toilets will not cause any form of pollution of the site. Toilets must be placed within the site camp and at the construction site. The toilets must be placed on a level surface and secured to prevent them from blowing over. The toilets must be serviced regularly (by the appointed service provider) and kept in an orderly state. The contractor must ensure that no spillage occurs when the toilets are cleaned, serviced or moved. Performing ablutions outside of the provided toilet facilities is strictly prohibited.

Eating Area & Rest Area: A dedicated area within which construction workers can rest and eat during breaks must be provided within the site camp. Seating and shade should be provided.

Vehicle & Equipment Maintenance Yard: Where possible, construction vehicles and equipment that require repair must be removed from site and taken to a workshop for servicing. If emergency repairs and/or basic maintenance of construction vehicles or equipment are necessary on site, such repair work must be undertaken within the designated maintenance yard area away from the watercourses. Repairs must be conducted on an impermeable surface, and/or a tarpaulin and/or drip trays must be laid down prior to emergency repairs taking place, to prevent any fuel, oil, lubricant or other spillages from contaminating the environment.

House-keeping: The site camp and related site camp facilities must be kept neat and orderly at all times, to prevent potential safety risks and to reduce the visual impact of the site during construction.

Spill kit: A spill kit to neutralise/treat spills of fuel/ oil/ lubricants must be available on site. Soil contaminated by spilled oil/ fuel/ lubricant must be excavated and disposed of in the hazardous waste bin.

Spoil material: Spoil material must be temporarily stored in accordance with Section 8.8 of this MMP. Spoil material should be removed without delay once maintenance activities have concluded. Spoil material produced from maintenance activities will be removed from site and disposed of at an appropriately registered facility.

Rehabilitation: Any contaminated soil must be removed and disposed at an appropriately registered disposal site. Any areas that have been compacted should be ripped to allow for the establishment of vegetation, if required by the Engineer. This ripping must not result in the mixing of sub- and topsoil. No imported soil material may be utilised for rehabilitation. No biological rehabilitation measures are recommended for disturbed areas, instead areas vulnerable to erosion should be physically stabilised using mechanical methods such as gabions, stone pitching or jute geotextile. Once maintenance activities have concluded the site camp and associated facilities must be removed and all waste material must be disposed of at an appropriate registered facility.

10.2 SITE ACCESS

Where at all possible, existing access routes should be used. In cases where none exist, a route should be created through the most degraded area avoiding sensitive/indigenous vegetation areas. Vehicle access roads to maintenance areas must not cross watercourses. Vehicles must be diverted back to the existing road at these points (i.e. watercourses must not become traffic thoroughfares).

Should some sites require construction of temporary access routes for machinery and labourers to access a said site as described in Section 8.2 of this MMP. A method statement outlining the proposed access, for those sites which require it, must be approved by the Engineer and ECO.

10.3 WASTE MANAGEMENT

An integrated waste management approach must be adopted on site. This approach must include reduction, re-use and recycling. Recycling bins for the various categories (paper, glass, plastic, etc.) should be provided (as seen in figure 41 and 42). These bins must be emptied on a weekly basis and dropped off at a collection point for recycling-by-recycling companies. If this is not possible and no recycling takes place in this district then this clause will not apply. Bins must also be provided for builder's waste. These bins should be emptied on a regular basis and solid waste must be disposed of at a landfill licensed in terms of section 20 of the Environment Conservation Act, 1989 (Act No. 73 of 1989) or the National Environmental Management: Waste Act (Act No. 59 of 2008). Any builder's waste which can be reused can be stockpiled in an area identified by the ECO. Biodegradable refuse generated from the office / site camp, construction areas, vehicle yard, storage area or any other area shall be handled as indicated above. Adequate waste receptacles, bins and skips should be available for the collection and removal of waste.



Image 41: Example of marked recycling bins within a site camp



Image 42: Example of marked recycling skips within a site camp

10.4 METHOD STATEMENTS

The contractor must compile and submit method statements to the Resident Engineer (RE) and ECO for approval prior to the commencement of work on that specific activity. The method statement must describe the scope of the work in a step-by-step manner. This will enable the RE and ECO to assist with the identification of any mitigation measures which will minimise the impact of these activities on the environment. Approved method statements must be kept on file at the site camp for the duration of the maintenance / repair period. Any amendments to a method statement must be approved by the RE and ECO prior to be implemented.

Method statements for the following activities must be submitted:

- Establishment of the site camp and storage areas along the TR31/5
- The proposed access to drainage structures
- The proposed re-shaping of embankments adjacent to drainage structures
- Removal of vegetation within the watercourses

11. RESPONSIBLE PARTIES / ROLES AND RESPONSIBILITIES

The Western Cape Government: Department of Transport and Public Works will be the implementing agent and will ultimately be responsible for compliance with this MMP. The Department of Transport and Public Works must ensure that each party acting on its behalf (contractors and sub-contractors) adheres to the requirements of this MMP.

11.1 NAMES AND DETAILS OF RELEVANT PARTIES

The Western Cape Government: Department of Transport and Public Works - Proponent

Department of Transport and Public Works	
Contact person	Johannes Neethling
Postal Address	PO Box 2603, Cape Town, 8000
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Bergstan South Africa (Pty) Ltd - Consulting Engineers

Bergstan South Africa (Pty) Ltd	
Contact person	Carmen Lawrence

Physical Address	7 th floor, Thomas Pattula Building, 19 Jan Smuts Street, Cape Town, 8001
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Tel:	021 487 4900
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E-mail	carmen@bergstan.co.za

Environmental Control Officer

An Environmental Control Officer (ECO) must be appointed to monitor the maintenance activities to Trunk Road 31 Section 5 and associated drainage structures. The duties of the ECO will be to:

- Ensure compliance with all the mitigatory measures proposed in this MMP;
- Assist in finding environmentally acceptable solutions to maintenance problems;
- Establishing an environmental awareness program to educate contractors & labourers;
- Inspecting all aspects of the maintenance / repair process;
- Keeping detailed records of all site activities that may pertain to the environment;
- Must ensure that all labours have attended environmental training sessions, which cover the basic requirements of sound environmental practices on construction sites;
- Liaise with site contractors, engineers and other members of the development team with regards to the requirements of the MMP;
- Recommend that the engineer furnish errant contractors with pre-determined fines, when verbal and / or written warnings are ignored;
- Examining method statements, and;
- Check additional environmental protection measures, should this be necessary.

The ECO must visit the site twice per month to monitor compliance with the recommendations of this MMP. The ECO would have the discretion to undertake additional visits, after consulting with the client, if he / she feels this is justified due to the actions of the contractors and to make ad hoc visits to ensure compliance. The ECO should ensure that the correct earthwork practices are adhered to.

The ECO must undertake Environmental Awareness Training before commencement of any work on site. During the training, the ECO will explain the MMP and the recommendations contained therein. The following actions must be taken to ensure that all relevant parties are aware of their environmental role and duties:

1. This MMP must be kept on site at all times.
2. The provisions of this MMP must be explained in detail to all staff during Awareness Training.
3. Training booklets will be handed out to all labourers and must be explained to them.
4. Inspections should be done twice per month by the applicant's environmental representative (where applicable) who must be on site at all times
5. Environmental inspections must be conducted twice a month by the Environmental Control Officer

The Construction Contractor must make allowance for all construction site staff, including all subcontractors that will be working at the site, to attend environmental awareness training sessions (undertaken by the ECO) before commencing any work on site. During this training, the ECO will explain the MMP and the conditions contained therein. Attention will be given to the construction process and how the MMP fits into this process. Other items relating to sound environmental management which must be discussed and explained during the environmental awareness training sessions include:

- The demarcated "No-Go" areas;
- General do's and don'ts of the site;
- Making of fires;
- Waste management, use of waste receptacles and littering;

- Use of the toilets provided;
- Use and control of construction materials and equipment etc.;
- Control, maintenance and refuelling of vehicles;
- Methods for cleaning up any spillage;
- Access and road safety;
- Emergency procedures (e.g. in case of fire, spillage etc.)
- General "best practice" principles, with regards to the protection of environmental resources.

Environmental awareness training and education must be ongoing throughout the construction phase, and must be undertaken regularly if deemed necessary (especially if it becomes apparent that there are repeat contraventions of the conditions of the MMP), or as new workers come to site. Translators must be utilised where needed.

12. MONITORING PROGRAMME

WHAT SHOULD BE MONITORED	FREQUENCY OF MONITORING	MONITORING PROCEDURE	HOW RESULTS ARE ANALYSED AND PRESENTED
The clearance of vegetation	Inspections by the ECO prior to the commencement of clearing activities and during the clearing activities to provide advice to the constructor. May require site visits of twice per month	Inspect the site and take photographic evidence.	ECO must compile a checklist for completion during each site visit. Data must be used to compile an audit report as/if requested by the client.
The excavations and/or disturbance of ground material	Inspections by the ECO prior to the commencement of activities. ECO to advise on where stockpiles may be located. May require site visits of twice per month	Inspect the site and take photographic evidence.	ECO must compile a checklist for completion during each site visit. Data must be used to compile an audit report as/if requested by the client.
Implementation of 'Duty of Care'	Inspections by the ECO to ensure that pollution prevention measures (such as drip trays, etc) are in place and that maintenance activities are not causing detrimental impacts to the environment. May require site visits of twice per month	Inspect the site and take photographic evidence.	ECO must compile a checklist for completion during each site visit. Data must be used to compile an audit report as/if requested by the client.

13. CONCLUSION

This MMP is binding to the Western Cape Government: Department of infrastructure for any future maintenance work and the conditions contained herein must be adhered to. The periodic maintenance of Trunk Road 31 Section 5, between km 0.9 and km 47.63 will not result in any detrimental impacts on the receiving environment if all mitigation measures are adhered to. This MMP and the proposed maintenance work will be limited to with the existing road reserve only.

The recommendations and mitigation measures prescribed in this MMP have been formulated with the intention of addressing potential pre-maintenance and maintenance phase impacts on the environment. It is likely that if the conditions, requirements and recommendations of the above MMP are implemented as described and the relevant stakeholders adhere to the various mitigation measures, then the periodic maintenance will be conducted without unforeseen negative environmental impacts

14. REFERENCES

DEADP. Guideline for compiling a Maintenance Management Plan

Dabrawoski.J. 2025. Freshwater Assessment for the maintenance of the Road TR03105 from Ladismith to Calitzdorp (km 0.9 to km 47.63), Western Cape. Confluent Environmental Pty (Ltd).