



Olifants Management Model Programme Bulk Raw Water Study Phase (OMMP-BRWSP)

OLIFANTS MANAGEMENT MODEL PROGRAMME BULK RAW WATER STUDY PHASE (OMMP-BRWSP): PROPOSED PHASE 2F PIPELINE RE-ALIGNMENT AND ASSOCIATED INFRASTRUCTURE, IN THE FETAKGOMO TUBATSE AND LEPELLE NKUMPI LOCAL MUNICIPALITIES, WITHIN THE CAPRICORN AND SEKHUKHUNE DISTRICT MUNICIPALITIES, IN THE LIMPOPO PROVINCE.

DRAFT ENVIRONMENTAL MANAGEMENT PROGRAMME (EMPR)

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CONTENTS

1 OVERVIEW	9
1.1 PURPOSE OF THIS EMPR	9
1.2 LEGAL REQUIREMENTS OF AN EMPR	10
1.3 SPECIFICATIONS.....	11
1.4 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER	11
1.5 PROJECT PHASING.....	11
1.5.1 PLANNING AND DESIGN PHASE	11
1.5.2 PRE-CONSTRUCTION PHASE/ACTIVITIES	12
1.5.3 CONSTRUCTION PHASE	12
1.5.4 OPERATIONAL PHASE.....	12
1.5.5 DECOMMISSIONING PHASE	13
2 INTRODUCTION	14
2.1 PROJECT OVERVIEW	14
2.2 DESCRIPTION OF PHASE 2F	16
2.3 NEED FOR THE PROJECT	19
2.3.1 REGIONAL CONTEXT.....	19
2.4 PROJECT LOCATION	20
2.5 DESCRIPTION OF THE AFFECTED AREA.....	23
2.5.1 SOCIAL BASELINE.....	23
2.5.2 CLIMATE	23
2.5.3 SURFACE WIND FIELD	23
2.5.4 TEMPERATURE AND HUMIDITY	23
2.5.5 PRECIPITATION	24
2.5.6 TOPOGRAPHY AND LANDUSE	25
3 PROJECT DESCRIPTION	26
3.1 DESCRIPTION AND COMPONENTS OF THE PREFERRED ALTERNATIVE	26
3.1.1 ACCESS ROADS	28
4 LEGAL FRAMEWORK	30
4.1 RELEVANT LEGISLATION.....	30
4.2 LISTED ACTIVITIES IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, NO. 107 OF 1998 (NEMA)	36
4.3 LISTED ACTIVITIES IN TERMS OF THE NATIONAL WATER ACT, NO. 36 OF 1998 (NWA).....	40
4.4 NATIONAL HERITAGE RESOURCES ACT, NO. 25 OF 1998 (NHRA).....	41
5 ENVIRONMENTAL MANAGEMENT APPROACH AND POLICY	42
5.1 ENVIRONMENTAL MANAGEMENT APPROACH	42
5.1.1 ENVIRONMENTAL POLICY	44
5.1.2 PLANNING	44
5.1.3 IMPLEMENTATION.....	44
5.1.4 CHECKING.....	44
5.1.5 MANAGEMENT REVIEW	45
6 RESOURCES, ROLES, RESPONSIBILITIES AND AUTHORITIES	46
6.1 PROJECT PROPONENT	46
6.2 CLIENT	46
6.3 ENGINEER – ZNJV.....	46
6.4 ENVIRONMENTAL MONITOR	47
6.5 SOCIAL MONITOR	47
6.6 CONTRACTOR	47
6.7 ENVIRONMENTAL OFFICER.....	48
6.8 SOCIAL OFFICER.....	48
6.9 ENVIRONMENTAL CONTROL OFFICER	48
6.10 ENVIRONMENTAL MONITORING COMMITTEE	49
7 COMPETENCE, TRAINING AND AWARENESS	50

7.1	INDUCTION TRAINING	50
7.2	ENVIRONMENTAL AWARENESS TRAINING	50
7.3	TOOLBOX TALKS	50
8	COMMUNICATION PROCEDURES ON SITE	51
8.1	SITE INSTRUCTION ENTRIES	51
8.2	ECO DIARY ENTRIES	51
8.3	SITE MEETINGS	51
8.4	NON-CONFORMANCE REPORTS	51
9	OPERATIONAL CONTROL	52
9.1	METHOD STATEMENTS	52
10	EMERGENCY PREPAREDNESS	53
10.1	CONTACT NUMBERS	53
10.2	SPILL KITS	53
10.3	FIRE EXTINGUISHERS	53
11	NON-CONFORMITY, CORRECTIVE ACTION AND PREVENTIVE ACTION	54
11.1	NON-CONFORMANCE REPORTING	54
11.2	PENALTIES	54
11.2.1	RETENTION SYSTEM	54
11.2.2	PENALTY SYSTEM	55
12	ENVIRONMENTAL ASPECTS	59
12.1	AGRICULTURE	59
12.2	AIR QUALITY	60
12.2.1	ADMINISTRATIVE MEASURES	60
12.2.2	BEST AVAILABLE INDUSTRY TECHNIQUES	61
12.3	CIVIL AVIATION	61
12.4	DEFENCE	61
12.5	HERITAGE AND ARCHAEOLOGY	61
12.5.1	IMPACT ASSESSMENT	65
12.5.2	MANAGEMENT RECOMMENDATIONS AND GUIDELINES	66
12.6	PALAEONTOLOGY	69
12.7	FRESHWATER AQUATICS	70
12.8	TERRESTRIAL BIODIVERSITY	78
12.8.1	FLORAL COMPONENT	78
12.8.2	FAUNA COMPONENT	78
12.8.3	RECOMMENDATIONS	81
12.9	SOCIAL IMPACTS	82
12.10	VISUAL AND LANDSCAPE	89
12.10.1	MITIGATION MEASURES AND RECOMMENDATIONS	89
12.11	TRAFFIC	91
12.11.1	ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT PLAN	91
12.12	NOISE	97
12.13	HYDROLOGY	98
12.13.1	FLOOD RISK FOR PIPE RE-ALIGNMENT	98
12.13.2	ACCESS ROADS	99
13	SUMMARY OF IMPACTS AND ASSOCIATED MITIGATION MEASURES	102
13.1	PRE-CONSTRUCTION AND CONSTRUCTION SITE ENVIRONMENTAL MANAGEMENT	103
13.2	MATERIALS	105
13.3	WASTE	107
13.4	SURROUNDING PROPERTIES	108
13.5	FAUNA, FLORA, AIR QUALITY, NOISE, WATER AND OTHER ENVIRONMENTAL ASPECTS	109
13.6	REHABILITATION	111
13.7	PLANNING AND ENGINEERING CONSIDERATIONS	112

14 OPERATIONAL PHASE	113
14.1 ALIEN AND INVASIVE PLANT MANAGEMENT	113
14.2 EROSION CONTROL	113
14.3 WASTE MANAGEMENT	113
15 REHABILITATION	114
15.1 REMOVAL OF STRUCTURES AND INFRASTRUCTURE	114
15.2 INERT WASTE AND RUBBLE	114
15.3 HAZARDOUS WASTE AND POLLUTION CONTROL	114
15.4 FINAL SHAPING	114
15.5 TOPSOIL REPLACEMENT AND SOIL AMELIORATION.....	115
15.6 RIPPING AND SCARIFYING	115
15.7 PLANTING.....	115
15.7.1 TRANSPLANTED PLANTS.....	115
15.7.2 GRASSING.....	116
15.8 MAINTENANCE	116
15.9 ERADICATION OF WEEDS.....	116
15.10 CONTROL OF WEEDS.....	116
16 DECOMMISSIONING PHASE	117
17 CONCLUSION	118
18 REFERENCES.....	119

ANNEXURES

ANNEXURE A: ENVIRONMENTAL ASSESSMENT PRACTITIONER DETAILS

ANNEXURE B: AUTHORITY CORRESPONDENCES

ANNEXURE C: REVISED RECORD OF DECISION (REF: 12/12/20/553) ISSUED IN 2006

ANNEXURE D: SITE MAPS

ANNEXURE E: PROJECT SIP STATUS

FIGURES

Figure 2-1: Map indicating the alignment of the different pipelines for the various Phases. The Northern Limb includes Phases 2B and 2B+ while the Eastern Limb consists of the phases in the east section of the project (i.e., Phases 2H, 2F, 2E and 2D).

Figure 2-2: Map indicating the location and alignment of the previously authorised Phase 2F (2017) vs the new proposed alignment.

Figure 2-3: Pipeline realignment.

Figure 2-4: Locality Map of the current Phase 2F pipeline alignment.

Figure 2-5: Sealane Average Temperature and Precipitation for the Period 1993 – 2023 (EHRCON, 2024).

Figure 2-6: Sealane Average Monthly Rainfall for the Period 1993 – 2023 (EHRCON, 2024)

Figure 3-1: Proposed pipeline realignment.

Figure 3-2: Proposed deviation along the D4190.

Figure 3-3: Proposed servitude deviation close to Ditobeleng settlement.

Figure 3-4: Access Route Points.

Figure 5-1: The Deming Cycle

Figure 5-2: The Basic EMPr rationale based on the Deming Cycle.

Figure 5-3: The Specific EMPr rationale based on the Deming Cycle.

Figure 6-1: Staffing arrangements.

Figure 12-1: Heritage Resources identified within the Phase 2F Project Study Area (PGS Heritage, 2025).

Figure 12-2: Access 2F2-33.

Figure 12-3: Access 2F2-34.

TABLES

Table 1-1: Requirements of an EMP as detailed in Appendix 4 of the NEMA EIA Regulations 2014.

Table 1-1: Requirements of an EMP according to Section 24N (2) and (3) of the NEMA.

Table 2-1: Water-related challenges across the wards that the pipeline traverses (source: FTLM IDP, 2024).

Table 3-1: Existing Roads status quo.

Table 4-1: Relevant legislation and the applicability thereof.

Table 4-2: Listed activities triggered by the preferred alternative for the proposed project.

Table 4-3: Triggered water uses in terms of Section 21 of the NWA

Table 11-1: Breakdown of environmental penalties.

Table 12-1: Dustfall Monitoring Reporting Programme.

Table 12-2: CAA Impact Rating Assessment.

Table 12-3: Heritage Resources Identified during the Field Survey of the Phase 2F Project Area.

Table 12-4: Summary of the Impact Assessment on Heritage Resources of High Significance.

Table 7-16: Lead times for permitting and mobilisation.

Table 7-17: HMP for EMP implementation.

Table 12-5: Loss of fossil heritage.

Table 12-6: Summary of the results of the impact assessment matrix applied to the freshwater ecosystems associated with the construction of the proposed project.

Table 12-7: Summary of the results of the impact assessment matrix applied to the freshwater ecosystems associated with the operation of the proposed project.

Table 12-8: Construction Alternatives to Trenching.

Table 12-9: Summary of social impacts and recommended mitigation measures.

Table 12-10: Summarised impacts: Landscape character and sense of place.

Table 12-11: Summarised impacts: Visual intrusion and Visual Absorption Capacity (VAC).

Table 12-12: Summarised impacts: Visual exposure and visibility.

Table 12-15: Typical hazards and Environmental Conditions.

Table 7-69: Impacts, significance and Proposed Mitigation Measures

Table 13-1: Pre-construction and construction site environmental management.

Table 13-2: Handling Materials.

Table 13-3: Handling Waste.

Table 13-4: Surrounding properties.

Table 13-5: Flora, fauna, air quality, noise, water and other.

Table 13-6: Rehabilitation.

Table 13-7: Planning and Engineering Considerations.

LIST OF ABBREVIATIONS

ACC	Authorities Coordinating Committee
AEL	Atmospheric Emissions License
AIP	Alien Invasive Plant
AMSL	Above Mean Sea Level
ATS	Air Traffic Service
BA	Basic Assessment
BAR	Basic Assessment Report
BOQ	Bill of Quantities
CA	Competent Authority
CARA	Conservation of Agricultural Resources Act, No. 43 of 1983
CBA	Critical Biodiversity Area
CB	Critical Biodiversity
CDM	Capricorn District Municipality
CoGHSTA	Cooperative Governance, Human Settlements and Traditional Affairs
COLTO	Committee of Land Transportation Officials
CR	Critically Endangered
DFFE	National Department of Forestry, Fisheries and the Environment
DALRRD	Department of Agriculture, Land Reform and Rural Development
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning
DEAT	Department of Environmental Affairs and Tourism
DMRE	Department of Mineral Resources and Energy
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EAPASA	Environmental Assessment Practitioners' Association of South Africa
ECA	Environmental Conservation Act, No. 73 of 1989
ECO	Environmental Compliance/Control Officer
EE	Engineers Environmental
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EM	Environmental Monitor
EMC	Environmental Monitoring Committee
EMPr	Environmental Management Programme
EMS	Environmental Management System
EO	Environmental Officer
ESA	Ecological Support Area
ES	Engineers Social
ESO	Environmental Safety Officer
FTLM	Fetakgomo Tubatse Local Municipality
FPO	Fire Protection Officers
FPA	Fire Protection Association
GA	General Authorisation
GDP	Gross Domestic Product
GG	Government Gazette
GN	Government Notice / General Notice
I&APs	Interested and Affected Parties
IFC	International Finance Corporation
ISO	International Organization for Standardization
LED	Local Economic Development
LEDET	Limpopo Department of Economic Development, Environment and Tourism
LEMA	Limpopo Environmental Management Act, No. 7 of 2003
LIHRA	Limpopo Provincial Heritage Resources Authority
LNLM	Lepelle Nkumpi Local Municipality
LWUA	Lebalelo Water User Association
MPRDA	Mineral and Petroleum Resources Development Act, No. 28 of 2002
NCR₁	Noise Control Regulations
NCR₂	Non-conformance Record

NCW	Not Conservation Worthy
NDP	National Development Plan
NEC	New Engineering Contract
NEMA	National Environmental Management Act, No. 107 of 1998
NEM: AQA	National Environmental Management: Air Quality Act, No. 39 of 2004
NEM:BA	National Environmental Management: Biodiversity Act, No. 10 of 2004
NEM:PAA	National Environmental Management: Protected Areas Act, No. 57 of 2003
NEM:WA	National Environmental Management: Waste Act, No. 59 of 2008
NFA	National Forests Act, No. 84 of 1998
NHRA	National Heritage Resources Act, No. 25 of 1999
NPAES	National Protected Areas Expansion Strategy (2008)
NRTA	National Road Traffic Act, No. 93 of 1996
NWA	National Water Act, No. 36 of 1998
OSH	Occupational Safety and Health
OMM	Olifants Management Model
OMMP - BRWSP	Olifants Management Model Programme Bulk Raw Water Study Phase
ORWRDP-2	Olifants River Water Resources Development Project
PDCA	Plan, Do, Check and Act
PPE	Personal protective equipment
PPP	Public Participation Process
PS	Performance Standard
PSDF	Provincial Spatial Development Framework
PTO	Permissions to Occupy
RAL	Roads Agency Limpopo
RAP	Resettlement Action Plan
RoD	Record of Decision
RRoD	Revised Record of Decision
SACAA	South African Civil Aviation Authority
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANRAL	South African National Roads Agency
SAPS	South African Police Service
SCC	Species of Conservation Concern
SDF	Spatial Development Framework
SDM	Sekhukhune District Municipality
SEIR	Scoping and Environmental Impact Reporting
SIP	Strategic integrated Project
SM	Social Monitor
SMME	Small, Medium and Micro Enterprise
SMP	Social Monitoring Plan
SO	Social Officer
SSV	Site Sensitivity Verification
SUDS	Sustainable Urban Drainage Systems
SWMP	Stormwater Management Plan
TCTA	Trans-Caledon Tunnel Authority
VAC	Visual absorption capacity
VU	Vulnerable
WCMR	Waste Classification and Management Regulations
WML	Waste Management License
WMP	Waste Management Plan
WSA	Water Service Authority
WTW	Water Treatment Works
WUL	Water Use Licence
WULA	Water Use License Application
ZNJV	Zutari Ndodana Joint Venture

REQUIREMENTS OF ENVIRONMENTAL MANAGEMENT PROGRAMMES

Appendix 4 of the National Environmental Management Act, No. 107 of 1998 (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014 [General Notice (GN) R982 of 2014] specifies the requirements of an Environmental Management Programme (EMPr). The table below serves as a map of how the requirements detailed in Appendix 4 have been adhered to.

Table 1-1: Requirements of an EMPr as detailed in Appendix 4 of the NEMA EIA Regulations 2014.

Requirement		Reference
1(a)	(i) details of the EAP who prepared the EMPr; and	Section 1.4 and Appendix A
	(ii) details of the expertise of that EAP to prepare an EMPr, including a curriculum vitae	Section 1.4 and Appendix A
1(b)	a detailed description of the aspects of the activity that are covered by the EMPr as identified by the project description;	Section 1.3 and Section 3
1(c)	a map at an appropriate scale which superimposes the proposed activity, its associated structures, and infrastructure on the environmental sensitivities of the preferred site, indicating any areas that should be avoided, including buffers;	Appendix E
1(d)	a description of the impact management objectives, including management statements, identifying the impacts and risks that need to be avoided, managed and mitigated as identified through the environmental impact assessment process for all phases of the development including -	Section 5 through to Section 16
	(i) planning and design;	Section 13
	(ii) pre-construction activities;	Section 12
	(iii) construction activities;	Section 12 and Section 13
	(iv) rehabilitation of the environment after construction and where applicable post closure;	Section 12 through to Section 16
	(v) where relevant, operation activities;	Section 12, 13 and 14
1(e)	a description and identification of impact management outcomes required for the aspects contemplated in paragraph (d)	Section 5, 6, 8 & 9
1(f)	a description of proposed impact management actions, identifying the manner in which the impact management objectives and outcomes contemplated in paragraphs (d) and (e) will be achieved, and must, where applicable, include actions to -	Section 12 through to Section 16
	(i) (i) avoid, modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation;	Section 12 through to Section 16
	(ii) (ii) comply with any prescribed environmental management standards or practices;	Section 2 through to Section 16
	(iii) (iii) comply with any applicable provisions of the Act regarding closure, where applicable; and	Section 12 through to Section 16
	(iv) (iv) comply with any provisions of the Act regarding financial provisions for rehabilitation, where applicable;	N/A
1(g)	the method of monitoring the implementation of the impact management actions contemplated in paragraph (f);	Section 5 through to Section 11
1(h)	the frequency of monitoring the implementation of the impact management actions contemplated in paragraph (f)	Section 13
1(i)	an indication of the persons who will be responsible for the implementation of the impact management actions;	Section 5 and 6, and Section 13
1(j)	the time periods within which the impact management actions contemplated in paragraph (f) must be implemented;	Section 12 through to Section 16
1(k)	the mechanism for monitoring compliance with the impact management actions contemplated in paragraph (f);	Section 8 and Section 12 through to Section 16
1(l)	a program for reporting on compliance, taking into account the requirements as prescribed by the Regulations;	Section 5, 6 and Section 8
1(m)	an environmental awareness plan describing the manner in which -	Section 7
	(i) the applicant intends to inform his or her employees of any environmental risk which may result from their work; and	Section 7
	(ii) risks must be dealt with in order to avoid pollution or the degradation of the environment; and	Section 5 through to Section 11 and Section 12 through to Section 16
1(n)	any specific information that may be required by the Competent Authority.	None to date.

1 OVERVIEW

This chapter provides a general overview of this Environmental Management Programme (EMPr) and a summary of the purpose of the document and its structure. Relevant legislation pertaining to this document is also briefly discussed.

1.1 PURPOSE OF THIS EMPr

This document aims to provide environmental management practices and recommendations to ensure that the known and possible impacts associated with the proposed Phase 2F re-alignment, and its associated infrastructure are avoided, managed, mitigated, and/or kept to acceptable levels. This EMPr is thus intended for use by all role players in the development of the project, but most importantly will form part of the contract documentation for all Contractors pertaining to the construction and operation of the project. The recommendations included herein apply to the following stages of the proposed development:

- ▶ Planning and design;
- ▶ Pre-construction and construction;
- ▶ Rehabilitation and Operation; and
- ▶ Closure and decommissioning.

This EMPr aims to provide for long-term management of the project area, through measures to address, *inter alia*, control and eradicate alien and invasive species, manage stormwater, control erosion, rehabilitate and restore ecosystems and mitigate other environmental impacts that would allow for the monitoring and control of activities associated with the Project. This EMPr aims for alignment and optimisation of environmental management processes with conditions of authorisations that may arise. Any conditions of authorisation contained in the Environmental Authorisation (EA) that contradict the recommendations made in this EMPr, supersedes the recommendations of this document.

Note: This EMPr should be read in conjunction with the approved October 2016 EMPr (Ref: Report No. **112007-EF-00-RP-ES-0001**), which was approved for the entire Phase 2F alignment.

This document shall be seen as part of the contract. The EMPr together with appropriate enabling clauses will thus be part of the enquiry document to make recommendations and constraints, as set out in this document, enforceable under the general conditions of the contract. It must be ensured that relevant environmental management specifications as contained in the EMPr are incorporated into the tender and contract documentation. Relevant payment items must be incorporated into the bill of quantities (BOQ). During the tender evaluations, the ability of the potential contractors to adequately manage the environmental issues must be assessed.

The EMPr has a long-term objective to ensure that:

- i) Environmental management considerations are implemented from the start of the project;
- ii) Precautions against damage and claims arising from damage are taken timeously; and
- iii) The completion date of the contract is not delayed due to avoidable environmental issues arising that could be mitigated through a well-structured EMPr.

The intention is also that the document is dynamic, and that improvements and inclusions can be added as the project progresses and as the need arises, granted the necessary authorisations for such amendments are acquired.

A hard copy of the EMPr must always be in the site office and made available to officials upon request.

1.2 LEGAL REQUIREMENTS OF AN EMPr

The content of EMPrs must meet the requirements in Section 24N (2) and (3) of NEMA and Appendix 4 of the NEMA EIA Regulations of 2014 [General Notice (GN) of 2014]. Appendix 4 of the EIA regulations specifies the required contents of an EMPr.

The Department of Environmental Affairs & Development Planning (DEA&DP)'s Guideline for Environmental Management Plans (2005) aims to inform and guide the preparation and implementation of EMPrs. The conditions of the guideline and requirements specified in Appendix 4 of the EIA Regulations of 2014 have been considered in compiling this document. The DEA&DP guideline defines an EMPr as:

“an environmental management tool used to ensure that undue or reasonably avoidable adverse impacts of the construction, operation and decommissioning of a project are prevented; and that the positive benefits of the project are enhanced”

The EMPr must address the potential environmental impacts of the proposed activity on the environment throughout the project life cycle, including an assessment of the effectiveness of monitoring and management arrangements after implementation. EMPrs must be submitted together with the Environmental Impact Report (EIR) so that they can be considered simultaneously.

Section 24N (2) and (3) of the NEMA lists the requirements of an EMPr presented in **Table 1-1**.

Table 1-1: Requirements of an EMPr according to Section 24N (2) and (3) of the NEMA.

24N. (2) the environmental management programme must contain-

- (a) *information on any proposed management, mitigation, protection or remedial measures that will be undertaken to address the environmental impacts that have been identified in a report contemplated in subsection 24(1A), including environmental impacts or objectives in respect of –*
 - i) *planning and design.*
 - ii) *pre-construction and construction activities.*
 - iii) *the operation or undertaking of the activity in question.**the rehabilitation of the environment; and*
closure, where relevant.
- (b) *details of –*
 - (i) *the person who prepared the environmental management programme; and*
 - (ii) *the expertise of that person to prepare an environmental management programme*
- (c) *a detailed description of the aspects of the activity that are covered by the draft environmental management plan.*
- (d) *information identifying the persons who will be responsible for the implementation of the measures contemplated in paragraph (a).*
- (e) *information in respect of the mechanisms proposed for monitoring compliance with the environmental management programme and for reporting on compliance.*
- (f) *as far as is reasonably practicable, measures to rehabilitate the environment affected by the undertaking of any listed activity or specified activity to its natural or predetermined state or to a land use which conforms to the generally accepted principle of sustainable development; and*
- (g) *a description of the manner in which it intends to-*
 - (i) *modify, remedy, control or stop any action, activity or process which causes pollution or environmental degradation.*
 - (ii) *remedy the cause of pollution or degradation and mitigation of pollutants; and*
 - (iii) *comply with any prescribed environmental management standards or practices.*
- (3) *the environmental management programme must, where appropriate-*
 - (a) *set out time periods within which the measures contemplated in the environmental management programme must be implemented.*

- (b) *contain measures regulating responsibilities for any environmental damage, pollution, pumping and treatment of extraneous water or ecological degradation as a result of prospecting or mining operations or related mining activities which may occur inside and outside the boundaries of the prospecting area or mining area in question; and*
- (c) *develop an environmental awareness plan describing the manner in which-*
- (i) *the applicant intends to inform his or her employees of any environmental risk which may result from their work; and*
 - (ii) *risks must be dealt with in order to avoid pollution or the degradation of the environment.*

1.3 SPECIFICATIONS

The EMPr has been structured to include the following sections to address environmental management throughout the project life cycle:

- **Chapter 1:** Overview of the Project
- **Chapter 2:** Introduction to the Project
- **Chapter 3:** Project Description
- **Chapter 4:** Legal Framework
- **Chapter 5:** Environmental Management Approach and Policy
- **Chapter 6:** Resources, Roles, Responsibilities and Authorities
- **Chapter 7:** Competence, Training and Awareness
- **Chapter 8:** Communication Procedures on site
- **Chapter 9:** Operational Control
- **Chapter 10:** Emergency Preparedness
- **Chapter 11:** Non-conformity, Corrective Action and Preventive Action
- **Chapter 12:** Environmental Aspects
- **Chapter 13:** Summary of Impacts and Associated Mitigation Measures
- **Chapter 14:** Operational Phase
- **Chapter 15:** Rehabilitation
- **Chapter 16:** Decommissioning Phase
- **Chapter 17:** EAP concluding statement

1.4 DETAILS OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

The compilation of this EMPr was prepared by Ms. Zinzi Portia Xakayi and reviewed by Mr. Deon Esterhuizen and Mrs. Natanya Whitehorn of Zutari Ndodana Joint Venture (ZNJV). For a detailed description of the expertise and previous project experience of the author and reviewers, please refer to **Annexure A** for the curriculum vitae of the environmental assessment practitioners (EAPs).

1.5 PROJECT PHASING

1.5.1 PLANNING AND DESIGN PHASE

This phase includes applications for environmental, town planning, and other relevant authorisations. The planning and design phase investigates the possible impact of the proposed development on the receiving environment and recommends mitigation measures. This phase would have been concluded once the contractor views this document.

1.5.2 PRE-CONSTRUCTION PHASE/ACTIVITIES

The pre-construction phase includes activities such as the appointment of an Environmental Control Officer (ECO), pre-construction environmental workshop/induction training (conducted by the ECO), site demarcation, establishment of a site camp, demarcation of areas such as fuel storage and plant and animal rescue. Specifications for these activities are included in this EMPr. This phase also includes the application processes to obtain permits e.g., permits required to remove any protected tree(s) or plant/animal species of conservation concern (SCC).

1.5.3 CONSTRUCTION PHASE

The construction phase commences with earthworks and includes all activities relating to the construction of the proposed Phase 2F alignment, as well as the associated auxiliary infrastructure.

The typical activities for the construction of the pipeline and associated infrastructure are as follows:

- ▶ Establishment of access roads: During the construction period, internal roads need to be established; however, these roads will only be temporary. There are a number of permanent roads that need to be established for operation and will be gravel based. Existing roads will be used, where possible.
- ▶ Site preparation: Vegetation would need to be cleared for the footprint of the pipeline as well as for the access roads to the site/internal roads, and the laydown areas, etc. Topsoil stripped from the construction of access roads and the pipeline would need to be stockpiled and used to rehabilitate areas of the construction footprint.
- ▶ Transportation of equipment and components to the site: The main components of Phase 2F would be transported by road to the site. Excavators, graders, trucks, and compacting equipment will need to be brought to the site.
- ▶ Establishment of workshops, temporary laydown areas, and equipment camps: Once all the equipment has been brought to the site, dedicated laydown and equipment camps will be established within the temporary construction servitudes. Fuel¹ will most likely be stored on site during construction; appropriate mitigation measures must be employed to ensure no pollution occurs as a result.
- ▶ Open trench excavations: Open trench excavations will be the primary method for installing the pipeline. The construction activities will involve the excavation of trenches along the designated pipeline route to accommodate the pipeline. This process will include site preparation, clearing, and excavation to the required depth and width for the pipeline. Additional activities will involve the installation of pipes, backfilling of trenches, and compaction to ensure stability. Environmental management practices will be implemented to minimise disruption to the surrounding area, including dust control and proper waste disposal. These activities will be carried out in phases, with careful coordination to ensure minimal disruption to local communities and the environment. All excavation work will comply with safety and environmental regulations, with necessary mitigation measures in place.
- ▶ Site rehabilitation: Removal of all construction equipment from the site and rehabilitation of areas where reasonable and practical.

1.5.4 OPERATIONAL PHASE

The operational phase commences when the proposed development is being used for its intended purpose (i.e., bulk transportation of raw bulk water through the proposed Phase 2F pipeline). There may

¹ The combined capacity of fuel or diesel stored on site must not exceed **30 m³**, as this would trigger **Activity 10 of Listing Notice 3**. Furthermore, a combined capacity exceeding **80 m³** would trigger **Activity 14 of Listing Notice 1**, thereby requiring an **EIA** to be undertaken by means of a **Basic Assessment (BA) process** in order to authorise these listed activities.

be a period in the project life cycle where the construction and operational phases will overlap. This phase will include ongoing operation, monitoring, and maintenance of the bulk raw water pipeline, and continuing environmental management requirements (e.g., removal of alien and invasive plant species).

1.5.5 DECOMMISSIONING PHASE

The decommissioning phase for this project is not foreseeable in the near future, as access to clean potable water remains an ongoing necessity. However, should the facility undergo expansion or significant upgrading in the future, an EA may be required at that time, in accordance with the prevailing legislation.

2 INTRODUCTION

The Lebalelo Water User Association (LWUA) appointed the ZNJV for the provision of professional services for the Olifants Management Model Programme Bulk Raw Water Study Phase (OMMP-BRWSP).

2.1 PROJECT OVERVIEW

Phase 2 of the Olifants River Water Resources Development Project (ORWRDP-2) is a Department of Water and Sanitation (DWS) project, which underwent an environmental impact assessment (EIA) process and obtained a positive Record of Decision (RoD) from the Department of Environmental Affairs (DEA)² in 2006 in terms of the Environmental Conservation Act, No. 73 of 1989 (ECA). After many appeals by large organisations, including the Kruger National Park, the Minister decided to grant the Revised RoD (RRoD) (ref: **03/2/4** and **12/12/20/553**), dated 16 October 2006 (refer to **Annexure C**).

The approved ORWRDP-2 consists of various phases as defined below (refer to **Figure 2-1**). These were previously implemented by the Trans-Caledon Tunnel Authority (TCTA). The phases are designed and implemented in a phased manner, depending on need and availability of finances. For this reason, phase specific EMPs are developed and submitted for approval to the Competent Authority (CA).

- ▶ **Phase 2A:** Construction of De Hoop Dam
- ▶ **Phase 2B:** Pipeline from Flag Boshielo Dam to Pruissen near Mokopane (72 km)
- ▶ **Phase 2B+:** Consists of a raw water pipeline from Pruissen Reservoir to the proposed Sekuruwe Water Treatment Works (WTW), including offtakes to the proposed Mokopane WTW and two commercial user offtakes.
- ▶ **Phase 2C:** Pipeline from De Hoop Dam to Mooihoek
- ▶ **Phase 2D:** Pipeline from Steelpoort to Mooihoek (24 km)
- ▶ **Phase 2E:** Pipeline from Mooihoek to Havercroft Junction (14 km)
- ▶ **Phase 2F:** Pipeline from Havercroft Junction to Olifantspoort (44 km)
- ▶ **Phase 2G:** Possible second pipeline parallel to Phase 2B
- ▶ **Phase 2H:** Changes and additions to the current Phase 2H (Lebalelo Network); and
- ▶ **Phase 2I:** Pipeline from the De Hoop Dam to the proposed Eskom Tubatse Pump-storage Hydro-electric Scheme.

The ORWRDP-2 has since been reconstituted to become the OMMP-BRWSP in recent years, with the LWUA acting as the implementing agent for the following portions of the project, with the focus of this EMP being on Phase 2F:

- ▶ Phase 2B
- ▶ Phase 2B+
- ▶ Phase 2D³; and
- ▶ Phase 2F

Furthermore, since inception, the project has acquired the status of strategic importance, and recently on 05 March 2023 the project was classified as a Strategic Integrated Project (SIP) under the SIP 19 (i.e., Water and Sanitation Infrastructure Portfolio). As such, it is critical that the project must be expedited in terms of Schedule 2 [Section 17(2)] of the Infrastructure Development Act, No. 23 of 2014. The purpose of this piece of legislation is to provide facilitation and coordination of public infrastructure development which is of economic significance or social importance in South Africa and to ensure that infrastructure development in the country is given priority in planning, approval, and implementation.

² Now referred to as the Department of Forestry, Fisheries and the Environment (DFFE).

³ Changes in this phase will be administratively implemented as Phase 2H.

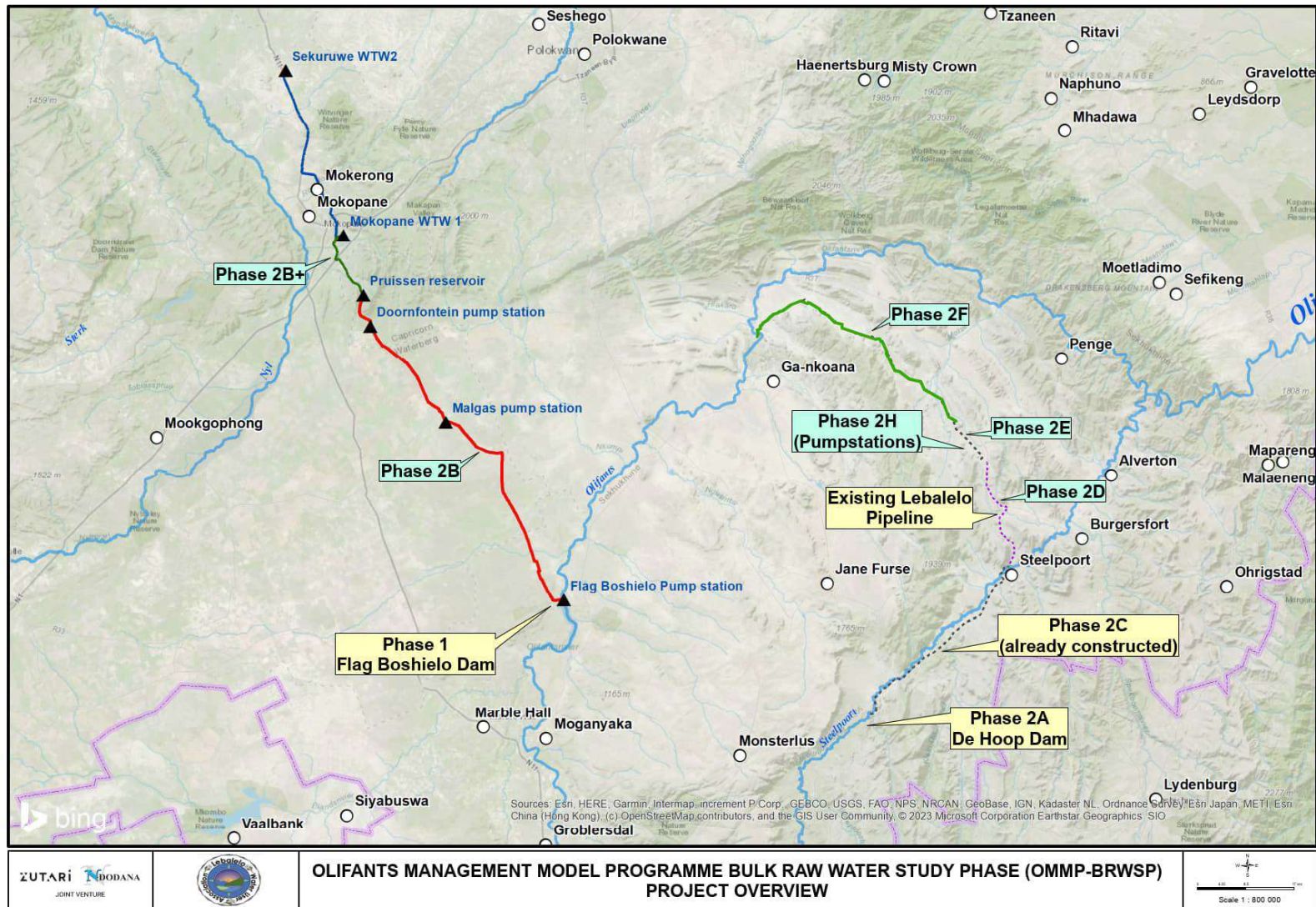


Figure 2-1: Map indicating the alignment of the different pipelines for the various Phases. The Northern Limb includes Phases 2B and 2B+ while the Eastern Limb consists of the phases in the east section of the project (i.e., Phases 2H, 2F, 2E and 2D).

2.2 DESCRIPTION OF PHASE 2F

Phase 2F comprises approximately 44 km of pipeline intended to convey water to the Olifantspoort WTW, thereby augmenting the water supply to Polokwane and surrounding rural areas. The alignment of Phase 2F starts near Havercroft Junction, deviating from the R37 to take a more direct route to the Olifantspoort WTW, following existing gravel roads along part of the way. The pipeline starts as a 1,200 mm diameter over 18.5 km, reducing to a 1,000 mm diameter over 25.6 km, originating at the Klipfontein Balancing Dam (or Break Pressure Dam) with a projected capacity of 21 ML.

An EA (ref: **14/12/16/3/3/1/1626**) was obtained for Phases 2E & 2F in May 2017, for the alignment illustrated in **Figure 2-2**, from the National Department of Forestry, Fisheries and the Environment (DFFE). This authorisation was valid for five (5) years and lapsed in June 2022. Following an interactive public participation process (PPP) in April 2022, facilitated by the DWS and the ZNJV, Condition 7 of the EA was amended on 2 May 2017 (ref: **14/12/16/3/3/1/1626/AM1**). The revised condition stipulates that the activity must commence within ten years of the authorisation issue date (i.e., by 2 May 2027), after which the authorisation will lapse, necessitating a new application for EA to proceed with the activity.

A general layout of all the project phases and pipeline alignments is illustrated in **Figure 2-1** above. Phase 2F, is the easterly pipeline alignment indicated by the green line. For this application, LWUA, on behalf of the DWS, seeks authorisation for the approximately 3.35 km (~3,350 m) pipeline realignment (refer to **Figure 2-3**), as well as the required access and internal roads necessary for the construction and operation of the entire Phase 2F alignment.

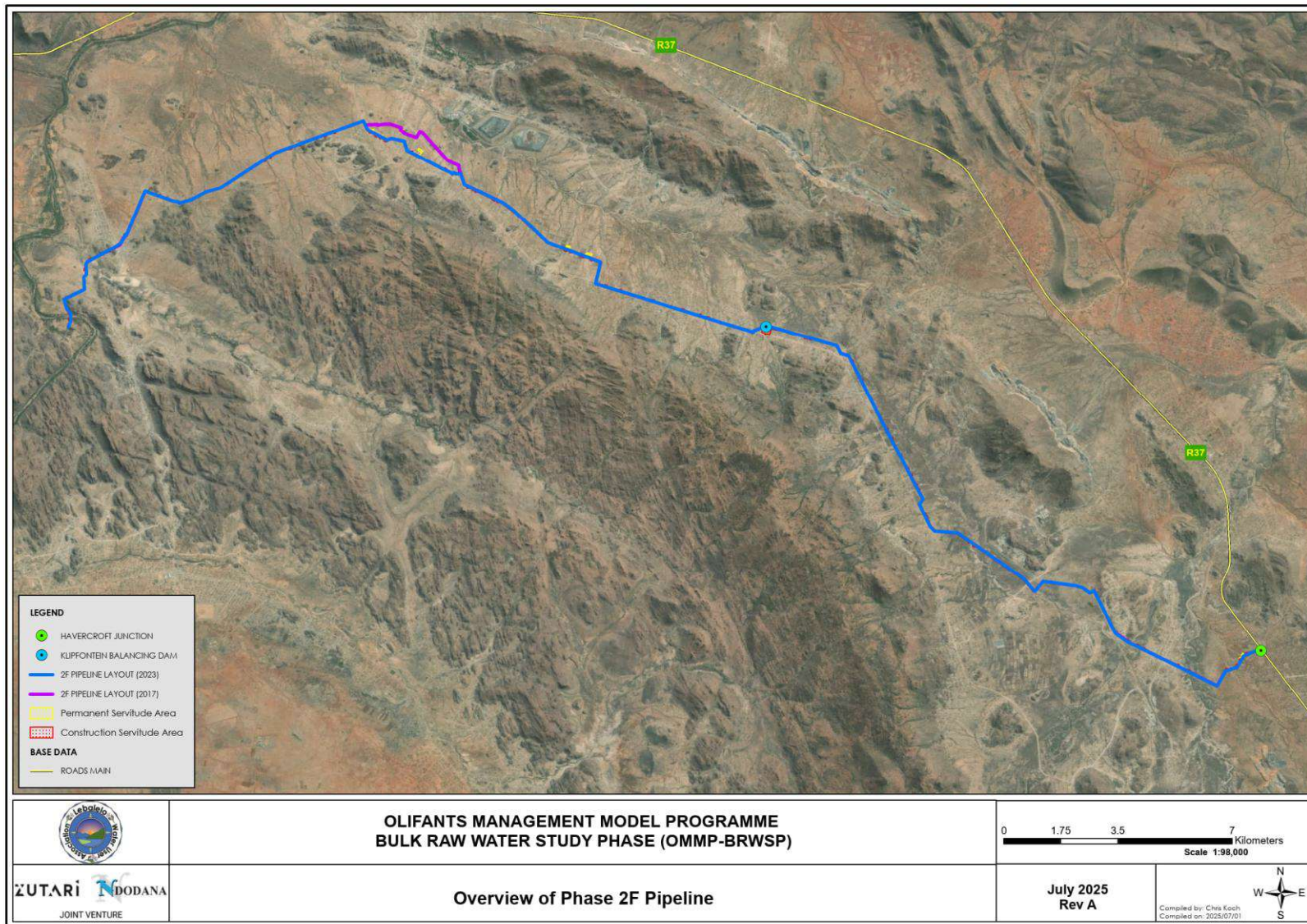


Figure 2-2: Map indicating the location and alignment of the previously authorised Phase 2F (2017) vs the new proposed alignment.

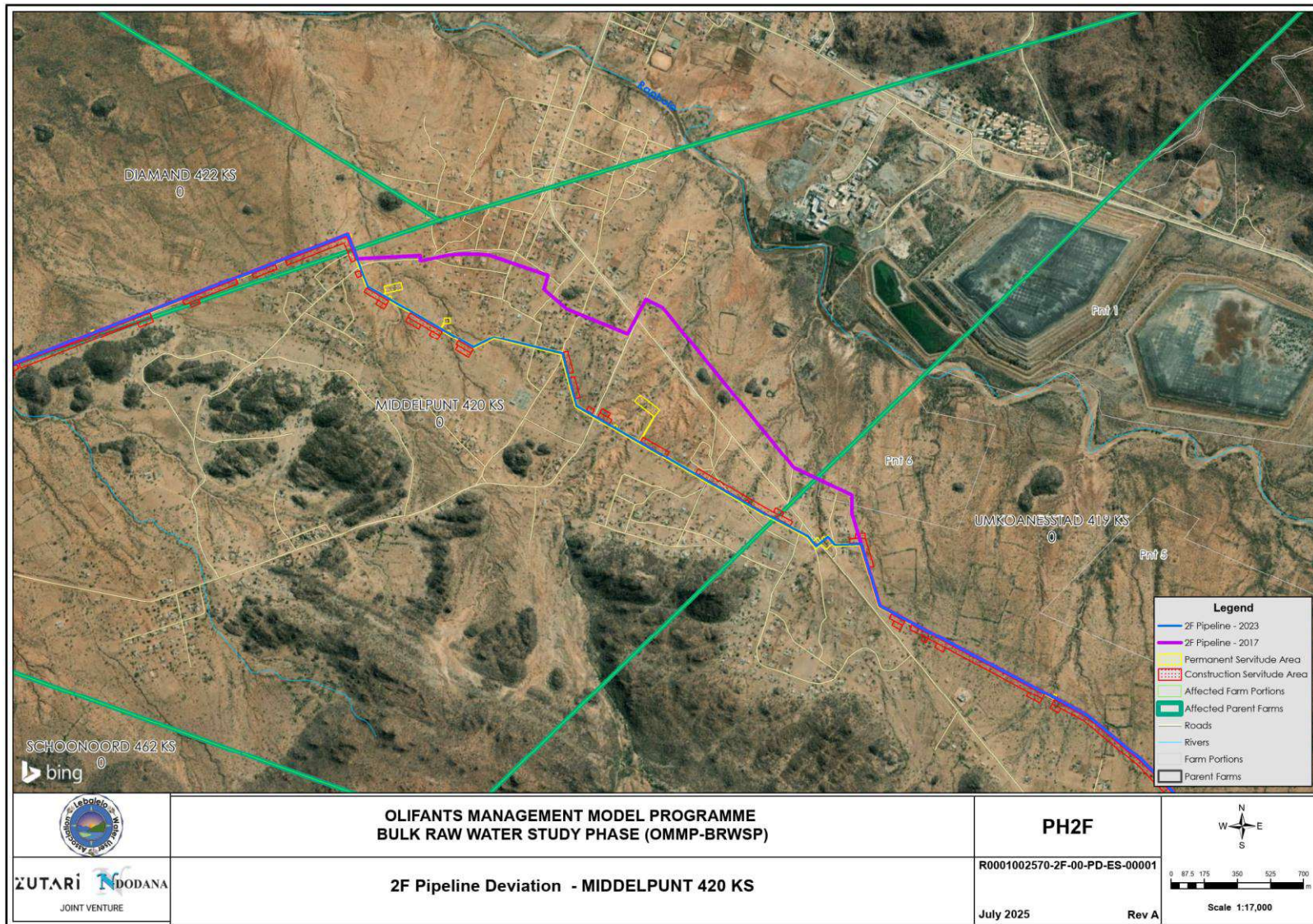


Figure 2-3: Pipeline realignment.

2.3 NEED FOR THE PROJECT

The OMMP-BRWSP (and previously the ORWRDP) was initiated to reduce the water demands on the Flag Boshielo Dam in the Limpopo province, which is the key water resource in the region. The project also aimed to meet the increasing water demand of the City of Polokwane and allow the respective Water Service Authorities (WSAs) to have surplus water to meet their water demands. The project bulk infrastructure plan allows for the construction of raw water pipeline systems to the identified target areas.

The revised scope of the project will prioritise the following key aspects (of the OMMP-BRWSP):

- ▶ Abstract the LWUA scheme water primarily from the De Hoop dam instead of the Olifants River to relieve pressure on the already over-allocated Flag Boshielo Dam;
- ▶ Re-sequence the construction of OMMP-BRWSP bulk raw water infrastructure to meet revised water needs;
- ▶ Support existing potable WSAs and develop potable water infrastructure in defined areas in the Northern and Eastern Limb to address the immediate and long-term social water needs of the WSAs.

Phase 2 of the project consists of four major components, namely, bulk water pipeline from De Hoop to Steelpoort; bulk distribution system comprising pipelines and pump stations from Steelpoort linking with the existing Olifants-Sand transfer scheme; bulk distribution system from the Flag Boshielo dam to Mokopane; and acquisition of the LWUA infrastructure for incorporation into the project. A bulk distribution system means that the Flag Boshielo and De Hoop dams will be able to function as a single system, thereby enabling a higher water supply level to the target areas.

Importantly, the WSAs have been unable to realise the ambitions (i.e. to reduce water demands on the Flag Boshielo Dam, meet the increasing water demands of the City of Polokwane, and allow the respective WSAs to have surplus water to meet their water demands) of the project on their own and the DWS has since appointed the LWUA to implement the most critical aspects of the scheme on their behalf. The DWS along with other stakeholders are working together to meet the following objectives:

- ▶ Delivering raw water and potable water to the region;
- ▶ Meeting the required water demand in the region; and
- ▶ Realising the socio-economic development expectations in the region.

In addition, the project must proceed urgently to stabilise the region. Moreover, the need for clean drinking water is well documented and reasons for access to potable water include, and are not limited to:

- ▶ Safe drinking water that is not harmful to human health;
- ▶ Reduce the reliance of rural communities (generally low-income households) on raw surface or groundwater water (i.e., often unsafe for human consumption);
- ▶ Improved livelihood and quality of life;
- ▶ Prevent, combat, or reduce the risk of contracting waterborne diseases;
- ▶ Safe and readily available water is important to public health, whether it is used for drinking, domestic use, food production, or recreational; and
- ▶ Provision of adequate (clean) water supply infrastructure means less expenditure on health, as people are less likely to fall ill and incur medical costs (as a result of contracting waterborne disease), and importantly are better able to remain economically productive.

2.3.1 REGIONAL CONTEXT

The responsibility for providing clean and safe drinking water to the Lepelle Nkumpi Local Municipality (LNLN) rests with Capricorn District Municipality (CDM) as the WSA. Water and sanitation infrastructure in the local municipality is generally in poor condition, and the municipality is currently experiencing high water losses due to aging infrastructure [CDM Integrated Development Plan (IDP), 2024]. The

Sekhukhune District Municipality (SDM) is the water authority responsible for bulk water supply, reticulation, and sanitation management in the Fetakgomo Tubatse Local Municipality (FTLM). The FTLM plays a role in identifying water backlogs and sanitation challenges within its jurisdiction, liaising with the district municipality, and facilitating service delivery (FTLM IDP, 2024). The majority of the Phase 2F components and infrastructure are concentrated within the FTLM.

The water infrastructure within the municipality is primarily concentrated along the R37 and R555 roads. Approximately one-third (36%) of the population lacks access to water, which is largely due to the limited reach of water infrastructure in rural areas, compounded by South Africa’s general water scarcity (FTLM IDP, 2024). Additionally, there has been a lack of operation and maintenance of existing water infrastructure, exacerbated by reduced fiscal and labour capacity. This has left infrastructure in relatively well-serviced areas unable to meet the demand created by an influx of people seeking employment and services. Specifically, 34.40% of the population in FTLM has no access to piped water, 24.20% have access to piped water inside their dwellings, 21.80% have access to piped water within their yards, and 19.60% have access to water at communal stands (FTLM IDP, 2024).

In its IDP, FTLM has emphasised the need to engage with the LWUA and SDM, in consultation with the Office of the Olifants Management Model (OMM), to mitigate potential failures associated with attempts to export raw water through dry villages.

The table below highlights the water challenges across the wards that the pipeline traverses.

Table 2-1: Water-related challenges across the wards that the pipeline traverses (source: FTLM IDP, 2024).

Ward No	Challenges
15	All villages do not have proper water infrastructure.
10	
33	
34	No water at Mafeane, Maruping, Bogalatladi.
35	New pipeline at Madithame new stand, Malogeng new stand, extension of water pipes from existing boreholes.

2.4 PROJECT LOCATION

The Phase 2F project area spans two local municipalities— Fetakgomo Tubatse and Lepelle Nkumpi— and two district municipalities—Capricorn and Sekhukhune—within the Limpopo Province (see **Figure 2-4**). However, the pipeline realignment and the proposed access roads are located within the FTLM, which is part of the SDM. The project area is recognised as part of the Critical Biodiversity Area (CBA) and situated within the Sekhukhuneland Centre of Floristic Endemism, known for its diverse plant life and habitat suitable for endemic species. The pipeline route begins in Ward 15 of the FTLM, passing through Wards 10, 33, 34, 35, and terminating in Ward 25 of the LNLN.

Key settlements along the route, within a 2 km radius of the pipeline include Ditobeleng, Ga-Kgoete, Makgake, Makoba-Koba, Morapaneng, Sealane, Motlamotshe, Ga-Selepe, Malogeng, Maropeng and Malomanye. The entire Phase 2F pipeline route also crosses the jurisdiction of ten Traditional Authorities: Nareng Thokwane Traditional Authority, Magadimane Traditional Authority, Roka Mashabela (Ga Mongatane) Traditional Authority, Roka Phashaskraal Traditional Authority, Baroka ba Nkoana Traditional Authority, Maisela Manotoane Traditional Authority, Baroka ba Selepe Traditional Authority, Nareng Thokwane Traditional Authority, Magadimane Traditional Authority and Ngwanamohube Traditional Authority (Bakgaga ba Mphahlele).

The realignment for which we are applying affects the jurisdiction of the Baroka ba Nkoana Traditional Authority (Middelpunt 420 KS, Umkoanesstad 419 KS, and Blauwbloemetjieskloof 428 KS) and Magadimane Traditional Authority (Surbiton 115 KT). Additionally, several mines are located along the

pipeline route, including RPM Twickenham, Cromex Mining Mecklenburg, Sefateng Chrome Mines, and ARM Bokoni Platinum Mine (Atok), previously owned by Anglo Platinum.

The primary access routes for Phase 2F will be the D4131, D4182, D4180, D4197, and R37. The R37 is a national road under the jurisdiction of the South African National Roads Agency (SANRAL), while the other roads are provincial roads maintained by the Roads Agency Limpopo (RAL).

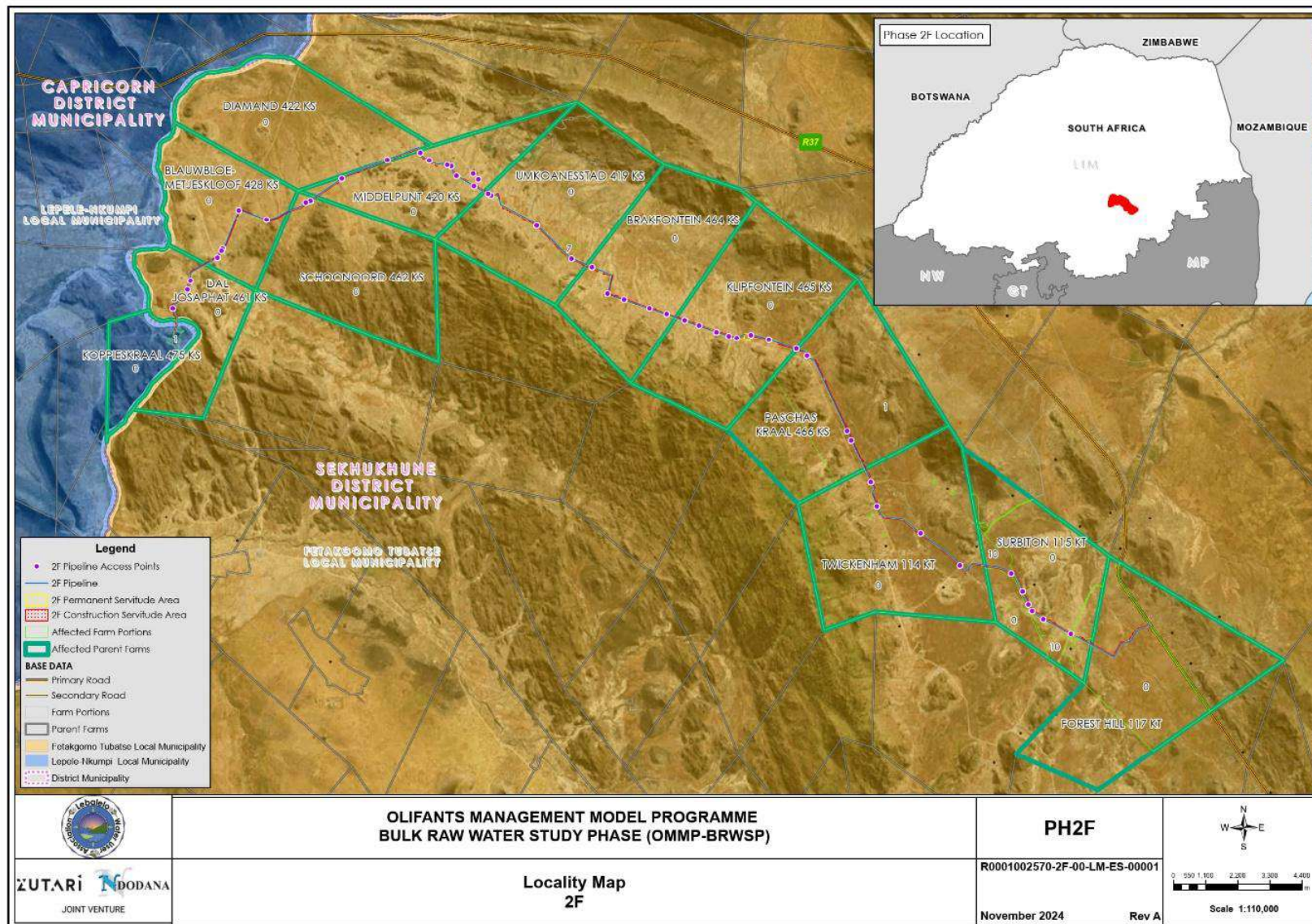


Figure 2-4: Locality Map of the current Phase 2F pipeline alignment.

2.5 DESCRIPTION OF THE AFFECTED AREA

The description of the environmental and social baseline has been informed by the specialist studies undertaken.

2.5.1 SOCIAL BASELINE

The proposed realignments, along with the internal and access roads for the entire Phase 2F authorised pipeline, are situated in the FTLM and the LNLM, which fall within the SDM and the CDM in Limpopo Province. Limpopo is South Africa's northernmost province, covering an area of 125,754 km². It shares international borders with Mozambique, Zimbabwe, and Botswana and also borders the Gauteng, Mpumalanga, and North West Provinces.

FTLM was established in 2016 following the amalgamation of the Greater Tubatse Local Municipality and the Fetakgomo Local Municipality. FTLM is classified as a category C municipality, with a jurisdictional area of approximately 4,550 km². The municipality is largely rural, with only six proclaimed townships and 342 villages. It faces challenges such as inadequate infrastructure, significant service backlogs, a weak economic base, dispersed human settlements, and high levels of poverty (The Final IDP/Budget – 2024/2025 FTLM). The region is also characterised by a strong presence of TAs, which are responsible for the day-to-day management of these areas.

According to the FTLM IDP (2024/2025), the municipal region hosts substantial mining activities along the R37 and R555 roads. In particular, the mining sector is concentrated in Burgersfort, where approximately 60% of the mines are operational within the municipality.

The LNLM, as described in its IDP (2024/2025), is located in the southern part of the CDM and is one of four local municipalities in the district. LNLM is predominantly rural, with 95% of the municipality's land under the jurisdiction of Traditional Authorities. The municipality spans 3,464 ha, which represents 16% of the district's total land area and includes 94 settlements, divided into 30 wards. Zebediela has been identified as an intervention area for rural development and potential rural tourism, as the municipality lacks a strong tourism destination area (LNLM IDP 2024/2025).

According to the LNLM IDP (2024/2025), the municipality is strategically located along several provincial roads, including the Dilokong Provincial Corridor between Polokwane and Burgersfort. The R37 and R519 provide residents with access to neighbouring African countries to the north and Gauteng to the south.

2.5.2 CLIMATE

The climate of the study area can be described as semi-arid, lying in the rain shadow of the escarpment which has an annual rainfall of 400 mm and a mean temperature of 22°C.

2.5.3 SURFACE WIND FIELD

The SDM experiences an average monthly wind speed of 0.72 m/s. Wind patterns are predominantly from the south-south-west (30.6%) and south-west (20.4%). The CDM generally observes wind speeds of between 4 – 6 m/s. The predominant wind direction is from the north-east (18%) and south (15%).

2.5.4 TEMPERATURE AND HUMIDITY

The average monthly temperature in the SDM ranges between 4 and 32°C. The average maximum daytime temperature of 32°C occurs in January with the lowest average minimum temperature of 4°C

occurring in July. Temperatures in the CDM are generally mild to warm in summer with an average summer maximum of 26°C. Winters are generally cool (average minimum temperature of 6°C; average maximum of 16°C) although low temperatures do occur.

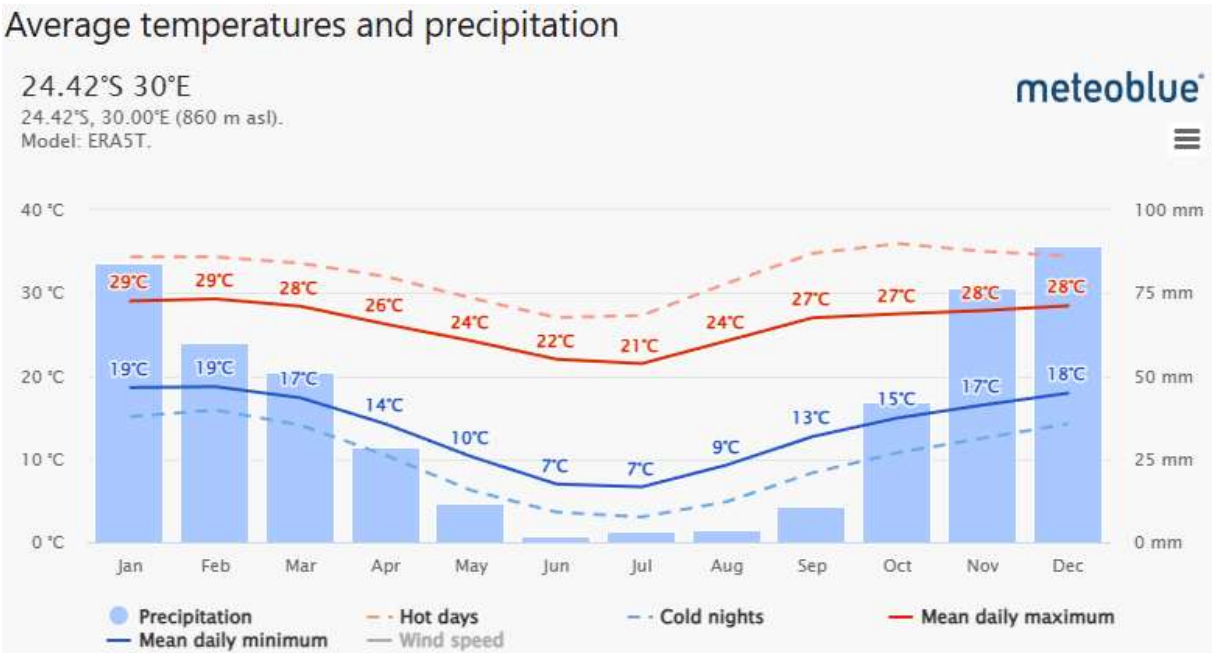


Figure 2-5: Sealane Average Temperature and Precipitation for the Period 1993 – 2023 (EHRCON, 2024).

2.5.5 PRECIPITATION

The average annual rainfall for the SDM is 551 mm and the average maximum monthly rainfall in the summer month of December/January/February is 267 mm. Little rainfall occurs during the winter month of July with an average monthly precipitation of 3 mm. The average annual rainfall in the CDM ranges from 300 mm in the north to 1 000 mm in the south. The district has a semi-arid climate with hot, wet summers and cool, dry winters.

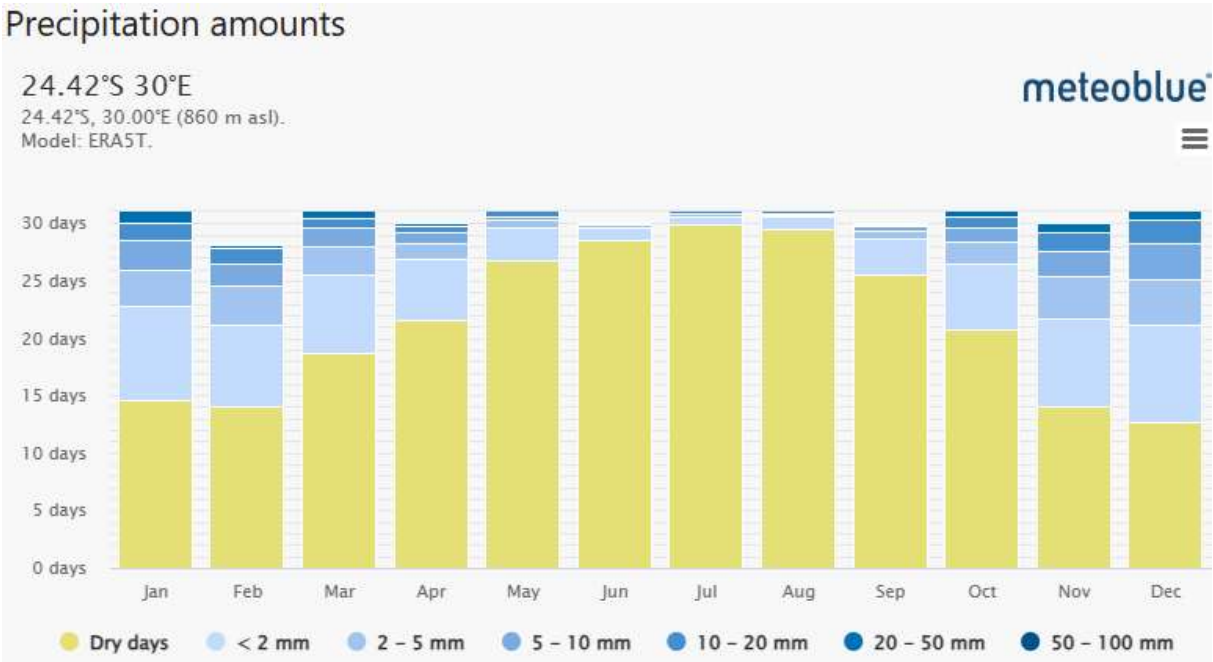


Figure 2-6: Sealane Average Monthly Rainfall for the Period 1993 – 2023 (EHRCON, 2024)

2.5.6 TOPOGRAPHY AND LANDUSE

The main economic activities in Sekhukhune are mining and irrigated agriculture. Platinum, Chrome, Gold, and Palladium mines situated in the eastern part of the district, around the Leolo Mountains. The rocks and soils of the Sekhukhuneland region hold some of the highest concentrations of heavy metals in the world including chromium, platinum, titanium, and vanadium. This has led to enormous growth in the mining sector, with many more mines planned for the area.

Development of the Dilokong Corridor, an area rich in mineral deposits that stretches northeast of Sekhukhune through Fetakgomo and Tubatse, is expected to provide increased economic opportunity in the district. There are commercial irrigated farms near Groblersdal and Marble Hall in the southwest and Zebediela in the north; however, only 30% of the district's land area is under commercial farming.

In 2014, the sectors that contributed the most to CDM's economy were Community services (33.0%), Finance (20.8%), and Trade (21.6%). The Agricultural sector contributed the least to the economy at 1.9%. At present, agriculture besides farming includes forestry, fruit cultivation, dairy, poultry, mushroom, and beekeeping.

The topography of the entire Phase 2F alignment ranges from 740 m to 950 m Above Mean Sea Level (AMSL).

3 PROJECT DESCRIPTION

3.1 DESCRIPTION AND COMPONENTS OF THE PREFERRED ALTERNATIVE

This application involves an approximately 3.35 km pipeline realignment from chainage 14220, reconnecting with the originally approved 2017 route at chainage 10580, a section southwest of Bokoni Platinum mine, close to the rural settlement of Zeekoegat (refer to **Figure 3-1**). Other deviations along the pipeline alignment, which do not trigger listed activities on their own, are shown in **Figure 3-2** (a section along the D4190, close to the settlement of Malogeng) and **Figure 3-3** (a section southwest of the Ditobeleng settlement) below. The pipeline is anticipated to have a diameter of 1,200 mm and an estimated throughput of 1.563 m³/s (equivalent to 1,563 l/s). A 40 m servitude is proposed, consisting of a temporary construction servitude of 25 m and a permanent servitude of 15 m.

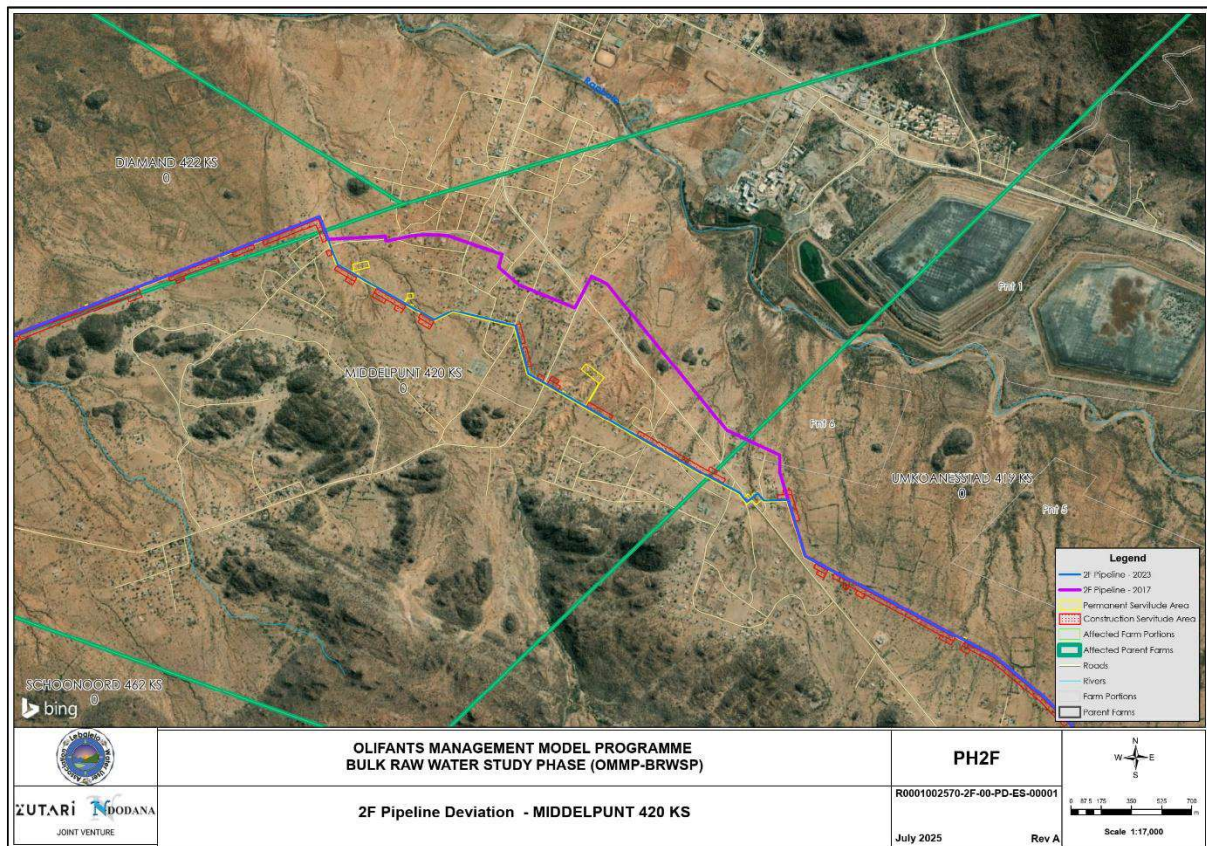


Figure 3-1: Proposed pipeline realignment.

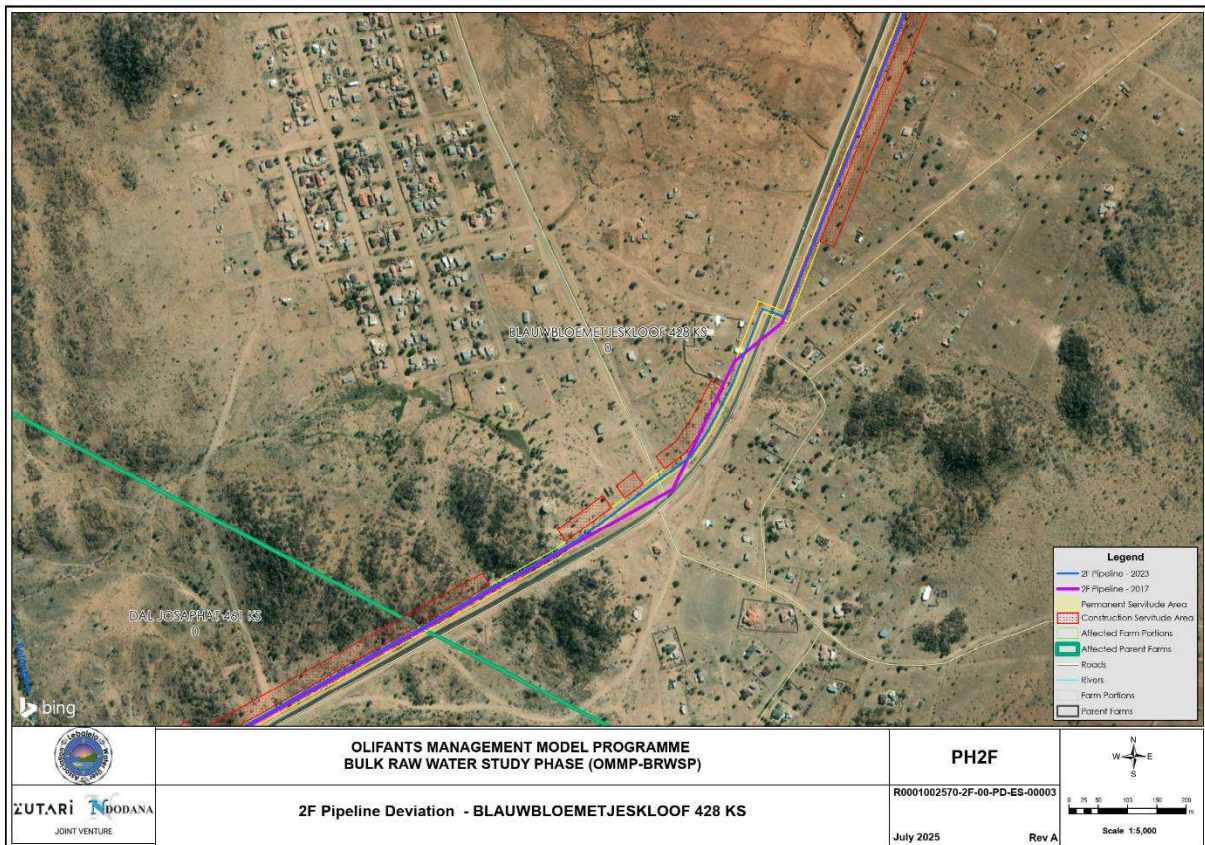


Figure 3-2: Proposed deviation along the D4190.

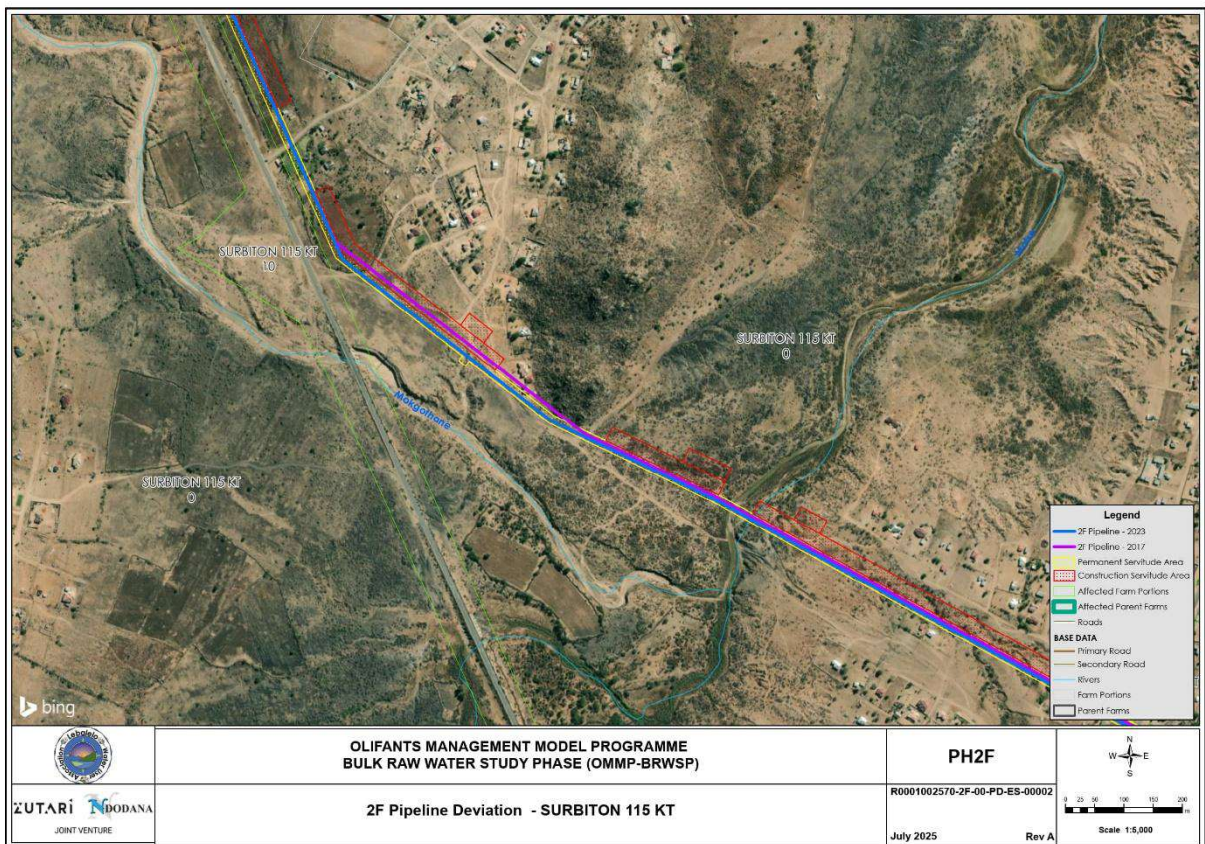


Figure 3-3: Proposed servitude deviation close to Ditobeleng settlement.

3.1.1 ACCESS ROADS

The primary access routes for Phase 2F will be the D4131, D4182, D4180, D4197, and R37. The R37 is a national road under the jurisdiction of the SANRAL, while the other roads are provincial roads maintained by the RAL. The proposed access roads, required specifically during construction and potentially for operation during maintenance, are listed in **Table 3-1** and shown in **Figure 3-4** below.

The access roads are 7 m wide, with lengths varying depending on the specific road segment.

The current status quo of each access road (39 in total) and the associated access number is given in the table below.

Table 3-1: Existing Roads status quo.

Existing status quo	Access number
Existing road/footpath	2F-01, 2F-02, 2F-03, 2F-04, 2F-05, 2F-07, 2F-08, 2F-11, 2F-14, 2F-15, 2F-17, 2F-2-1, 2F-2-2, 2F-2-3, 2F-2-4, 2F-2-5, 2F-2-6, 2F-2-7, 2F-2-8, 2F-2-9, 2F-2-13, 2F-2-14, 2F-2-15, 2F-2-16, 2F-2-17, 2F-2-18, 2F-2-20, 2F-2-21, 2F-2-23, 2F-2-24, 2F-2-25a, 2F-2-25, 2F-2-26, 2F-2-27, 2F-2-28, 2F-2-29, 2F-2-33, 2F-2-34.
New road/ Green fields/Unused Road	2F-2-22.

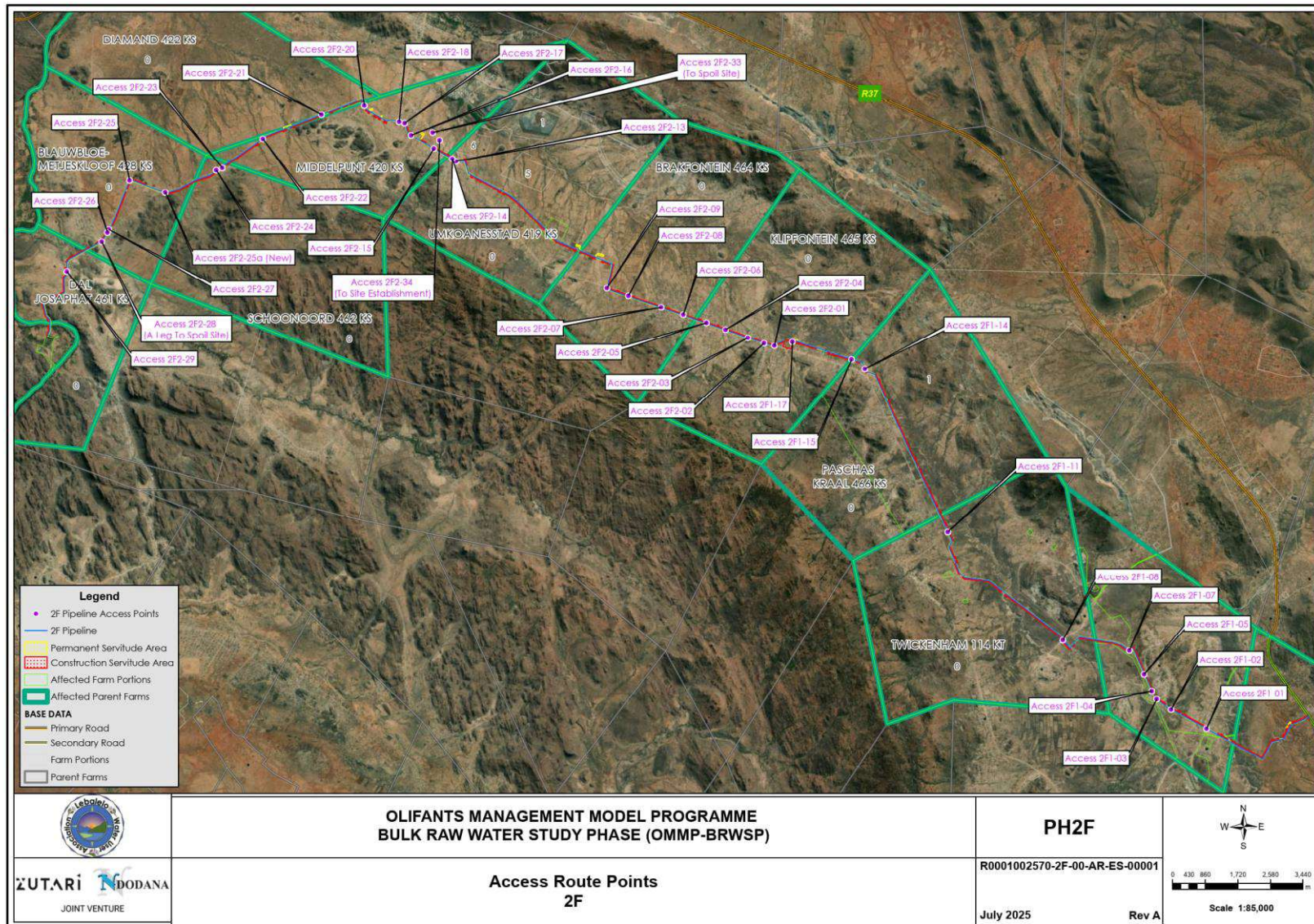


Figure 3-4: Access Route Points.

4 LEGAL FRAMEWORK

Legal and policy requirements applicable to the project are discussed in the sections below.

4.1 RELEVANT LEGISLATION

An overview of the relevant legislation is provided below in **Table 4-1**.

Table 4-1: Relevant legislation and the applicability thereof.

Legal Requirements		
Legislation considered	Relevant Organ of State / authority	Aspect of Project
The Republic of South Africa Constitution Act, No. 108 of 1996 (“the Constitution”)	The Constitutional Court	The environmental right contained in Section 24 of the Constitution provides that everyone is entitled to an environment that is not harmful to his or her well-being.
National Development Plan: A Vision for 2030	National Government	The South African Government through the Presidency has published a National Development Plan (NDP). The Plan aims to eliminate poverty and reduce inequality by 2030. The Plan has the target of developing people's capabilities to improve their lives through education and skills development, health care, better access to public transport, jobs, social protection, rising income, housing and basic services, and safety. It proposes the following strategies to address the above goals: 1. Creating jobs and improving livelihoods; 2. Expanding infrastructure; 3. Transition to a low-carbon economy; 4. Transforming urban and rural spaces; 5. Improving education and training; 6. Providing quality health care; 7. Fighting corruption and enhancing accountability; and 8. Transforming society and uniting the nation. Important, one of the enabling milestones was to ensure that all South Africans have access to <u>clean running water in their homes</u> by 2023. One of the proposed critical actions is public infrastructure investment at 10% of gross domestic product (GDP), financed through tariffs, public-private partnerships, taxes and loans focus on transport, energy and water.
Fetakgomo Local Municipality: Integrated Development Plan (IDP), Final 2024/2025	FTLM	The IDP outlines the strategies and goals for future development within the FTLM. The Municipality's IDP emphasises the urgent need for proper water treatment, particularly through the active monitoring of water sources, due to the high levels of contaminants present in the water used by rural communities. This is especially concerning as approximately 39% of households rely on rivers and other natural sources for water. Additionally, around 22.2% of households depend on piped water within their yards, while 21.5% rely on piped water at community standpipes.
Lepelle-Nkumpi Local Municipality: Integrated Development	LNLM	The IDP references the Olifantspoort supply scheme and the intervention by the Minister of DWS, who established the Olifants Management Model to address the challenges associated with the Olifantspoort project. The objective of the project is to

Plan (IDP), Draft 2024/2025		ensure the sustainable provision of water to approximately 534,000 households within the Lepelle Nkumpi and Polokwane Local Municipalities.
Aviation Act, No. 74 of 1962	South African Civil Aviation Authority (SACAA)	The DFFE Screening Tool report identifies the project area as a high-sensitivity site from a Civil Aviation perspective and, per the “Protocol for The Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Civil Aviation Installations” (GN 320 of 20 March 2020) only a specialist compliance statement is required. The report further states that the project footprint falls within a dangerous and restricted airspace area, as demarcated, and is within 8 km of other civil aviation aerodromes. As these new changes involve an approximately 3.35 km pipeline realignment, along with other deviations along the pipeline alignment that do not trigger listed activities on their own, as well as access roads for the <u>entire</u> Phase 2F alignment, the EAP does not consider any further assessment necessary. No tall structures that could pose constraints to flight are planned. The proposed changes will not restrict flight operations, particularly with regard to restricted airspace or nearby civil aviation aerodromes. Furthermore, there are no concerns regarding height restrictions, as the proposed structures will not exceed 10 m, remaining below the minimum altitudes of any obstacle limitation surfaces. The CAA will, however, still be consulted as a stakeholder.
Civil Aviation Act, No. 13 of 2009 (CAA)		
Conservation of Agricultural Resources Act, No. 43 of 1983 (CARA)	Department of Agriculture, Land Reform and Rural Development (DALRRD)	The purpose of this Act is to ensure that the natural agricultural resources of South Africa are conserved through maintaining the production potential of land, combating, and preventing erosion, preventing the weakening or destruction of water sources, protecting vegetation, and combating weeds and invader plants. As such, as part of the BA process, recommendations will be made to ensure that measures are implemented to maintain the agricultural production of land, prevent soil erosion, and protect any water bodies and natural vegetation on site. The DFFE Screening Tool report identified the proposed project footprint as having very high sensitivity from an agricultural perspective. Although the majority of the servitudes have been encroached upon by settlements, the Applicant must, as a precautionary measure, ensure the control of undesirable invasive alien plants listed in the regulations.
Environmental Conservation Act, No. 73 of 1989 (ECA)	DFFE	Noise impacts associated with the construction of the pipeline, the BPR and associated infrastructure are generally confined to the construction phase. In terms of section 25 of the ECA, the national Noise Control Regulations (GN R154 in GG No. 13717 dated 10 January 1992) (NCR) were promulgated. The NCRs were revised under GN Number R55 of 14 January 1994 to make it obligatory for all authorities to apply the regulations, unless provincial noise control regulations exist. No approval is required under the national NCRs. Furthermore, noise mitigation measures are to be included in the EMPr. Refer to Annexure D12 of the BAR for a detailed assessment of noise impacts.

		NB: The ORWRDP-2 received a positive RoD in 2006 in terms of ECA. A RRoD (ref no.: 03/2/4 and 12/12/20/553) was granted on 16 October 2006 (refer to Annexure C).
Mineral and Petroleum Resources Development Act, No. 28 of 2002 (MPRDA)	Department of Mineral Resources and Energy (DMRE)	Section 53 of the MPRDA, states that any person who intends to use the surface of any land in a manner which may be contrary to the objectives of the MPRDA or is likely to impede such objects must apply to the Minister for approval in the prescribed manner. As per the requirements of the MPRDA, all mining activities, including the extraction of material from borrow pits and quarries also require authorisation from DMRE. <u>No mining permits for borrow pits</u> have been included in this application. Several mines are located along the pipeline route, including RPM Twickenham, Cromex Mining Mecklenburg, Sefateng Chrome Mines, and ARM Bokoni Platinum Mine (Atok), previously owned by Anglo Platinum. Only one planned access road falls within a property where Twickenham Mine holds mineral rights, specifically Twickenham No. 114 KT. However, no mining activities are planned for this site that would marginalise or impact the proposed project. Note: A Section 53 approval from the DMRE is currently underway, separate from this application. This process serves to confirm that the proposed activities will not result in the sterilisation of any mineral resources within the proposed project area.
National Environmental Management Act, No. 107 of 1998 (NEMA)	▶ DFFE – CA ▶ LEDET – Commenting Authority	NEMA establishes the principles for decision-making on matters affecting the environment. Section 2 of the Act sets out the National Environmental Management principles, which apply to the actions of organs of state that may significantly affect the environment. Section 28(1) states that “<i>every person who causes or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring</i>”. If such pollution or degradation cannot be prevented, then appropriate measures must be taken to minimise or rectify such pollution or degradation. Chapter 6 (IEM) includes sections that provide for making regulations to deal with EA of specified types of activities through EIA processes. Several listed activities in terms of NEMA Listing Notice 1 (GN R983 of 2014) and Listing Notice 3 (GN R985 of 2014), are anticipated to be triggered for the proposed activities of Phase 2F, and these need to be authorised. Based on the listed activities triggered, the application for EA will have to follow a BA process as set out in Regulations 19 - 20 of the EIA Regulations of 2014 (GN R982 of 2014).
National Environmental Management: Air Quality Act, No. 39 of 2004 (NEM:AQA)	Local Municipality (FTLM) or National Air control officer when affected ambient air is trans-boundary (trans-provincial).	The Act aims to regulate and protect the environment by providing reasonable measures for the prevention of air pollution and ecological degradation and for securing ecologically sustainable development while promoting justifiable economic and social development; to provide for national norms and standards regulating air quality monitoring, management, and control by all spheres of government; for specific air quality measures; and for

		matters incidental thereto. No activities that would require an Atmospheric Emissions License (AEL) are envisaged. Specific to the project are the regulations about the control of fugitive noise and dust emissions that may arise from the project activities.
National Environmental Management: Biodiversity Act, No. 10 of 2004 (NEM:BA)	DFFE	The act calls for the management of all biodiversity within South Africa. Phase 2F is situated in Sekhukhune land Centre of Floristic Endemism and it also forms part of an Ecological Support Area (ESA) and Terrestrial CBAs. These areas are considered to be sensitive, and it is possible Red Data Species may occur in these areas. Permit applications must be made to the relevant authority for the removal of any Red Data or Protected Species found in the proposed alignment and construction areas. These permit applications must be made in conjunction with requirements of the Limpopo Environmental Management Act, No. 7 of 2003 (LEMA) as well as the National Forests Act, No. 84 of 1998 (NFA). In this context, the DFFE screening tool report lists 12 plant SCC whose presence or suitable habitat had to be verified during the site visit. The identity of four of the 12 species cannot be disclosed due to potential threat to them. The one species is an herbaceous climber with a rootstock, two are succulent shrubs and the fourth is a herbaceous perennial (geophyte). The other eight species are <i>Asparagus foutei</i>, <i>Asparagus hirsutus</i>, <i>Asparagus sekukuniensis</i>, <i>Combretum petrophilum</i>, <i>Plectranthus venterii</i>, <i>Polygala sekhukhuniensis</i>, <i>Raphionacme villicorona</i> and <i>Seersia batophylla</i>. Only one of the twelve species listed is not endemic to Sekhukhuneland, while 11 of the species are classified as being threatened Red Data plants, specifically Vulnerable (VU) (10) and Critically Endangered (CR) (1). During the site visit, only one of the twelve species was verified, namely the shrub <i>Seersia batophylla</i>. It was recorded within three of the plots surveyed, but not specifically along the 2F proposed servitude. Removal and control of all alien invasive plant species needs to be done in accordance with the Invasive Species Regulations, GN R1020 of 2020: Alien and Invasive Species Regulations, 2020.
Limpopo Environmental Management Act, No. 7 of 2023 (LEMA)	LEDET	Flora rescue and relocation permits are required as discussed under NEM:BA. Plant permits for protected species under the LEMA must be obtained accordingly prior to removal or relocation.
National Environmental Management: Waste Act, No. 59 of 2008 (NEM:WA)	▶ LEDET – General Waste ▶ DFFE - Hazardous Waste	The NEM:WA provides for the regulation of waste and its responsible management and disposal. The List of Waste Management Activities specifies activities that require a Waste Management License (WML). These activities, together with the listed activities in terms of the NEMA EIA Regulations of 2014, may be authorised through an integrated EIA process. Due to the nature of the proposed activities, it is anticipated that a WML will not be required. The following notices should be considered: ▶ GN R634 of 2013: Waste classification and Management Regulations (WCMR)

		► GN R635 and GN R636 of 2013: National Norms and Standards for Disposal of Waste to Landfill
National Forests Act, No. 84 of 1998, as amended (NFA)	DFFE	The NFA provides protection to tree species that may not be cut, destroyed, damaged or removed unless a permit has been granted by the DFFE. In this context, the following national protected trees were observed within the proposed temporary disturbance servitude and surrounding landscape: 1. <i>Sclerocarya birrea</i> subsp. <i>caffra</i> (Marula tree). 2. <i>Balanites maughamii</i> subsp. <i>maughamii</i> (Torchwood). 3. <i>Boscia albitrunca</i> (Shepard's Tree). 4. <i>Combretum imberbe</i> (Leadwood). Tree permit applications will be compiled for removing and/or relocating any protected trees.
National Heritage Resources Act, No. 25 of 1999 (NHRA)	► South African Heritage Resources Agency (SAHRA) ► Limpopo Provincial Heritage Resources Authority (LIHRA) – provincial heritage authority	In terms of the NHRA, any person who intends to undertake “any development which will change the character of a site exceeding 5,000 m² in extent, or involving three or more existing erven or subdivisions thereof”, “the construction of a road, powerline, pipeline exceeding 300 m in length” or “the rezoning of site larger than 10,000m² in extent...” must at the very earliest stages of initiating the development notify the responsible heritage resources authority, namely SAHRA or the relevant provincial heritage agency (LIHRA in this case). These agencies would, in turn, indicate whether or not a full Heritage Impact Assessment (HIA) would need to be undertaken. Section 38(8) of the NHRA specifically excludes the need for a separate HIA where the evaluation of the impact of a development on heritage resources is required in terms of an EIA process. Since the pipeline realignment segment is expected to span over 300 m in length (approximately 3,350 m), a HIA will be required. There are significant heritage resources along the pipeline alignment as a result of the rich ethnology and history of the area. The features resulting from this activity are displayed as stone and Iron Age tools, remnants of old buildings and structures and a number of graves.
National Protected Areas Expansion Strategy (2008) (NPAES) & National Environmental Management: Protected Areas Act, No. 57 of 2003 (NEM:PAA)	DFFE	The NPAES for South Africa sets out targets for protected area expansion, identifies possible expansion areas and recommends a mechanism for protected area expansion. Protected areas in terms of the NEM:PAA are considered ‘formal’ protected areas in terms of the NPAES. The NPAES further identifies ‘National Parks’, ‘informal protected areas’ and ‘focus areas’. Some proposed access roads are located within Terrestrial CBAs and the endangered Sekhukhune Plains Bushveld. Additionally, the proposed pipeline realignment is within ±5 km of a protected area, the Potlake Nature Reserve.
National Road Traffic Act, No. 93 of 1996 (NRTA)	► SANRAL – national roads ► RAL ► Limpopo Department of Transport and Community Safety	Certain vehicles and loads cannot be moved on public roads without exceeding the limitations in terms of the dimensions and/or mass as prescribed in the Regulations of the NRTA. SANRAL, RAL and the Limpopo Department of Transport and Community Safety should be provided with an opportunity to review and comment on the EIA process.

National Veld and Forest Fire Act, No. 101 of 1998	DFFE	The purpose of the Act is to prevent and combat veld, forest and mountain fires throughout South Africa. The Act applies to the open countryside beyond the urban limit and puts in place a range of requirements. Fire protection has been considered in the EMP. The Act sets out the responsibilities of landowners or persons in control of the land which includes: 1. Prepare firebreaks on their side of the boundary if there is a reasonable risk of wildfire. 2. Have such equipment, protective clothing and trained personnel for extinguishing fires as are: • prescribed (in the regulations) • if there are no regulations, reasonably required in the circumstances 3. Take all reasonable steps to notify the Fire Protection Officers (FPO) of the local Fire Protection Association (FPA) (if there is one) when a fire breaks out. 4. Do everything in their power to stop the spread of the fire.
National Water Act, No. 36 of 1998 (NWA)	DWS	The NWA provides for the sustainable and equitable use and protection of water resources. It is founded on the principle that the National Government has overall responsibility for and authority over water resource management, including the equitable allocation and beneficial use of water in the public interest, and that a person can only be entitled to use water if the use is permissible under the NWA. Section 21 of the NWA specifies the water uses which require authorisation from the DWS in terms of the NWA before they may commence. Particular forms of development within a watercourse or wetland or within a specified distance of a wetland must be authorised through a General Authorisation (GA) or a Water Use Licence (WUL). LWUA is currently applying for a WUL to authorise the triggered water uses resulting from the construction of Phase 2F and the associated infrastructure, as required under Section 21 of the NWA.
Traditional Leadership and Governance Framework Amendment Act, No. 23 of 2009	▶ Limpopo Department of Cooperative Governance, Human Settlements and Traditional Affairs (CoGHSTA) ▶ SDM ▶	The Act provides for the establishment and recognition of Traditional Councils, defines the roles and powers of traditional leaders, and provides for dispute resolution and the establishment of a Commission on Traditional Leadership Disputes and Claims. The authority of the Tribal Authorities in the project area, in terms of acting on behalf of communities in their area of jurisdiction during land acquisition negotiations and granting access for construction work, therefore derives from the provisions of this Act. The authorised pipeline route also crosses the jurisdiction of ten Traditional Authorities: Nareng Thokwane Traditional Authority, <u>Magadimane Traditional Authority</u>, Roka Mashabela (Ga Mongatane) Traditional Authority, Roka Phashaskraal Traditional Authority, <u>Baroka ba Nkoana Traditional Authority</u>⁴, Maisela Manotoane Traditional Authority, Baroka ba Selepe Traditional Authority, Nareng

⁴ The pipeline realignments affect the Farm Middelpunt 420 KS, Farm Umkoanesstad 419 KS, Farm Surbiton 115 KT, and Farm Blauwbloemetjieskloof 428 KS, which fall under the Baroka ba Nkoana Traditional Authority and the Magadimane Traditional Authority.

		Thokwane Traditional Authority, Magadimane Traditional Authority and Ngwanamohube Traditional Authority (Bakgaga ba Mphahlele). Therefore, these Tribal Authorities will have to be consulted during the PPP and when construction commences.
Restitution of Land Rights Act, No. 22 of 1994	Commission on Restitution of Land Rights.	The Act provides a legal framework for the restitution of land to people who were forcibly removed from their land or dispossessed of it under previous discriminatory laws or practices. The Act allows for claims to be made by individuals, communities, or families who were dispossessed of their land after 19 June 1913. It establishes a Commission on Restitution of Land Rights to investigate and assess claims, and to recommend the restoration of land or alternative forms of compensation. The Act was amended in 2014 to extend the deadline for lodging claims to 30 June 2019 and to provide for the appointment of a Chief Land Claims Commissioner to oversee the process of restitution. The amendment also provides for the reopening of the lodgement period for certain claims that were previously rejected, as well as the introduction of a special dispensation for farm dwellers and labour tenants. There are parcels of land claimed by individuals on the footprint of the proposed Phase 2F infrastructure.
Prevention of Illegal Eviction from and Unlawful Occupation of Land Act, No. 19 of 1998	Department of Rural Development and Land Reform	As we are developing in peri urban areas and rural and informal settlements, we are to ensure we do not encourage illegal occupation on the projects land and also, we do not develop on the land until a formal agreement has been implemented. Additionally, caution must be taken to ensure that no person is evicted illegally from occupying the project servitudes.

Other relevant South African legislation must be adhered to during all life cycles of the proposed Phase 2F project, including Provincial Legislation and Local By-laws applicable to this project.

4.2 LISTED ACTIVITIES IN TERMS OF THE NATIONAL ENVIRONMENTAL MANAGEMENT ACT, NO. 107 OF 1998 (NEMA)

The NEMA provides the framework for environmental decision-making in the country and specifically the EIA Regulations [GN R982 in the Government Gazette (GG) of 8 December 2014]] serve as the instrument through which development decisions are made.

South Africa has rigorous and comprehensive environmental legislation aimed at preventing the degradation of the environment. Section 28(1) of NEMA places a “duty of care and remediation of environmental damage” on every person who causes, has caused, or may cause significant environmental degradation. This is a far-reaching obligation, and accordingly, those parties responsible for the degradation of the environment have a legal duty to avoid, minimise or mitigate such impacts.

This has resulted in a set of Listed Activities that can be triggered by developments taking place in sensitive environments, e.g., watercourses. If a development triggers a Listed Activity, it is required to undergo an EIA through a BA process or Scoping and Environmental Impact Reporting (SEIR) in terms of the EIA Regulations (GN R982 of 2014).

The following listed activities, as shown in **Table 4-2**, have been identified as being applicable to this proposed project:

Table 4-2: Listed activities triggered by the preferred alternative for the proposed project.

Activity No(s):	Listed Activity	Description of how the proposed project applies to the listed activity relates
BA Activity(ies) as set out in Listing Notice 1 (GN983 of 2014) of the EIA Regulations, 2014		
LN 1 Act 9 (i)(ii)	The development of infrastructure exceeding 1 000 metres in length for the bulk transportation of water or storm water— <u>(i) with an internal diameter of 0,36 metres or more; or</u> <u>(ii) with a peak throughput of 120 litres per second or more.</u>	The pipeline realignment is estimated to exceed 1,000 m (approximately 3,359 m) in length, with an internal diameter of 1.2 m. The daily water transfer through the pipeline will be 1.563 m ³ /s (equivalent to 1,563 l/s). This is all raw water under gravity flow.
LN 1 Act 12 (a)(ii)(c)	The development of— (i) dams or weirs, where the dam or weir, including infrastructure and water surface area, exceeds 100 square metres; or <u>(ii) infrastructure or structures with a physical footprint of 100 square metres or more;</u> where such development occurs— <u>(a) within a watercourse;</u> <u>(b) in front of a development setback; or</u> <u>(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse.</u>	Access roads 1-08, 1-10, and 1-13 in the Motse River catchment, as well as access roads 1-17, 2-6, 2-8, and 2-9 in the Rapholo River catchment - located in the central part of the 2F alignment - are situated within 32 m of a watercourse, delineated as non-perennial by the freshwater biodiversity specialist. Similarly, drainage lines in the Rapholo River catchment, located in the north-western central part of the 2F alignment and associated with the proposed pipeline deviation and access roads 2-13 and 2-22, also fall within 32 m of a watercourse classified as non-perennial. Collectively, these access roads are expected to exceed a physical footprint of 100 m ² . Furthermore, as highlighted in the Hydrology Impact Assessment report, certain sections of the alignment, including the access roads, intersect the floodlines and, in some instances, are located within 32 m of these floodlines. The combined physical footprint of these deviations is expected to exceed 100 m ² .
LN1 Act 19	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.	The proposed development, including associated infrastructure such as the pipeline and the access proposed access roads, will be located within a watercourse or within 32 m of a watercourse. This may require infilling or excavation, and as such, the relevant listed activity may be triggered.
LN 1 Act 24 (ii)	The development of a road— (i) for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or <u>(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 metres.</u>	The proposed development will require the development of new roads for construction and operation. The current access roads layout is conceptual. Detailed road networks will be designed later. However, roads are likely to have dimensions that fall within the ambit of the activity. NB: The proposed access road alternatives, individually, do not exceed 8 m in width. However, collectively - when considering all access roads associated with this project - the combined width exceeds this threshold, thereby triggering the relevant listed activity. Each access road is proposed to have an individual width of 7 m.

LN1 Act 56	The widening of a road by more than 6 metres, or the lengthening of a road by more than 1 kilometre — (i) where the existing reserve is wider than 13,5 meters; or <u>(ii) where no reserve exists, where the existing road is wider than 8 metres; excluding where widening or lengthening occur inside urban areas.</u>	The project area is located within farms with existing farm roads. The Applicant may need to widen the identified access roads that are existing farm roads by more than 6 m. Each access road is proposed to have an individual width of 7 m.
BA Activity(ies) as set out in Listing Notice 3 (GN985 of 2014) of the EIA Regulations, 2014		
LN3 Act 4(e)(i)(ee)(gg)	The development of a road wider than 4 metres with a reserve less than 13,5 metres. <u>e. Limpopo</u> <u>i. Outside urban areas:</u> (aa) A protected area identified in terms of NEMPAA, excluding disturbed areas; (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an international convention; <u>(ee) Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</u> (ff) Core areas in biosphere reserves; or <u>(gg) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core areas of a biosphere reserve, excluding disturbed areas.</u>	The proposed development will require the development of new roads (construction and operational phase) that are wider than 4 m (the access road widths are anticipated to be 7 m wide). These roads will be located within Terrestrial CBAs, and will require vegetation clearance or disturbance within these areas. The northern section of the focus area, including access points 2F2-29, 2F2-28, 2F2-27, 2F2-26, 2F2-25, 2F2-25a, 2F2-24, and 2F2-23, falls within areas classified as CBA 1. Similarly, the central section of the alignment, along with access points 2F2-09, 2F2-08, 2F2-03, 2F2-02, and 2F1-17, is also designated as CBA 1. The southern section of the alignment, including access points 2F1-02, 2F1-03, and 2F1-04, is classified as CBA 2. Additionally, several of the proposed access roads along the pipeline realignment section are located within approximately 5 km of the Potlake Nature Reserve, a protected area.
LN3 Act 12 (e)(i)(ii)	The clearance of an area of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. <u>e. Limpopo</u> <u>i. Within any critically endangered or endangered ecosystem listed in terms of section 52 of the NEMBA 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;</u> <u>ii. Within critical biodiversity areas identified in bioregional plans; or</u> <u>iii. On land, where, at the time of the coming into effect of this Notice or thereafter such land was zoned open space, conservation or had an equivalent zoning.</u>	The proposed development <i>may</i> require vegetation clearance of indigenous vegetation within the Sekhukhune Plains Bushveld, which is classified as “Endangered” in the Revised National List of Ecosystems that are Threatened and in need of Protection (GN R2747 of 2022) under the NEM:BA. The development of the proposed access roads may require the clearing of indigenous vegetation, which will take place in areas classified as Terrestrial CBAs. The anticipated vegetation clearance is expected to exceed 300 m². The northern section of the focus area, including access points 2F2-29, 2F2-28, 2F2-27, 2F2-26, 2F2-25, 2F2-25a, 2F2-24, and 2F2-23, falls within areas classified as CBA 1. Similarly, the central section of the alignment, along with access points 2F2-09, 2F2-08, 2F2-03, 2F2-02, and 2F1-17, is also designated as CBA 1. The southern section of the alignment, including access points 2F1-02, 2F1-03, and 2F1-04, is classified as CBA 2.
LN 3 Act 14 (ii)(a)(c)(e)(i)(ff)(hh)	The development of— (i) dams or weirs, where the dam or weir,	Access roads 1-08, 1-10, and 1-13 in the Motse River catchment, as well as access roads 1-17, 2-6, 2-8, and 2-9 in the Rapholo River catchment - located in the central part of the 2F alignment - are situated within 32 m of

	including infrastructure and water surface area exceeds 10 square metres; or <u>(ii) infrastructure or structures with a physical footprint of 10 square metres or more;</u> where such development occurs— <u>(a) within a watercourse;</u> (b) in front of a development setback; or <u>(c) if no development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse;</u> excluding the development of infrastructure or structures within existing ports or harbours that will not increase the development footprint of the port or harbour. <u>e. Limpopo</u> <u>i. Outside urban areas:</u> (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) World Heritage Sites; (dd) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (ee) Sites or areas identified in terms of an international convention; <u>(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</u> (gg) Core areas in biosphere reserves; or <u>(hh) Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve.</u>	a watercourse, delineated as non-perennial by the freshwater biodiversity specialist. Similarly, drainage lines in the Rapholo River catchment, located in the north-western central part of the 2F alignment and associated with the proposed pipeline deviation and access roads 2-13 and 2-22, also fall within 32 m of a watercourse classified as non-perennial. Collectively, these access roads are expected to exceed a physical footprint of 10 m². Furthermore, as highlighted in the Hydrology Impact Assessment report, certain sections of the alignment, including the access roads, intersect the floodlines and, in some instances, are located within 32 m of these floodlines. The combined physical footprint of these deviations is expected to exceed 100 m². The pipeline and associated infrastructure is located outside urban areas, with areas of the development site identified as Terrestrial CBAs. Additionally, some of the proposed access roads along the pipeline realignment section are located within approximately 5 km of the Potlake Nature Reserve, a protected area.
LN3 Act 18(e)(i)(ee)(gg)(hh)	The widening of a road by more than 4 metres, or the lengthening of a road by more than 1 kilometre. <u>e. Limpopo</u> <u>i. Outside urban areas:</u> (aa) A protected area identified in terms of NEMPAA, excluding conservancies; (bb) National Protected Area Expansion Strategy Focus areas; (cc) Sensitive areas as identified in an environmental management framework as contemplated in chapter 5 of the Act and as adopted by the competent authority; (dd) Sites or areas identified in terms of an international convention;	There are existing roads along the proposed footprint of the proposed pipeline. These roads will be incorporated into the design as far as possible. Upgrades to these roads will be required. The roads may need to be widened by more than 4 m. The pipeline is located outside urban areas, with areas of the development site identified as Terrestrial CBAs. Additionally, some of the proposed access roads along the pipeline realignment section are located within approximately 5 km of the Potlake Nature Reserve, a protected area. Furthermore, access roads 1-08, 1-10, and 1-13 in the Motse River catchment, as well as access roads 1-17, 2-6, 2-8, and 2-9 in the

(ee) <u>Critical biodiversity areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;</u> (ff) <u>Core areas in biosphere reserves;</u> (gg) <u>Areas within 10 kilometres from national parks or world heritage sites or 5 kilometres from any other protected area identified in terms of NEMPAA or from the core area of a biosphere reserve; or</u> (hh) <u>Areas within a watercourse; or within 100 metres from the edge of a watercourse.</u>	Rapholo River catchment - located in the central part of the 2F alignment - are situated within 32 m of a watercourse, delineated as non-perennial by the freshwater biodiversity specialist. Similarly, drainage lines in the Rapholo River catchment, located in the north-western central part of the 2F alignment and associated with the proposed pipeline deviation and access roads 2-13 and 2-22, also fall within 32 m of a watercourse classified as non-perennial.
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Note that the commencement of any listed activities that are not authorised may attract significant criminal and administrative penalties in terms of the NEMA.

4.3 LISTED ACTIVITIES IN TERMS OF THE NATIONAL WATER ACT, NO. 36 OF 1998 (NWA)

The NWA requires all water uses to be licensed with the CA, the DWS in this case. Water use is defined broadly, and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation.

In accordance with GN 509 of 2016, a regulated area of a watercourse in terms of water uses as listed in Section 21 (c) and 21(i) is defined as:

- the outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam;
- in the absence of a determined 1 in 100-year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first identifiable annual bank fill flood bench; or
- a 500 m radius from the delineated boundary (extent) of any wetland or pan in terms of this regulation.

The ZNJV is currently undertaking a Water Use License Application (WULA) for the entire Phase 2F infrastructure, which includes the already authorised pipeline. The following water uses, as outlined in Section 21 of the Act, are triggered by the proposed project activities:

Table 4-3: Triggered water uses in terms of Section 21 of the NWA

Notice No.	Activity No.	Description of Water Use
NWA, No. 36 of 1998	Section 21 (b)	Storage of water • Storing of water from Klipfontein Break Pressure Dam.
NWA, No. 36 of 1998	Section 21 (c)	Impeding or diverting the flow of water in a watercourse • Pipeline crossings of rivers, streams, and dongas.
NWA, No. 36 of 1998	Section 21 (i)	Altering the bed, banks, course, or characteristics of a watercourse. • Energy Dissipaters for storm water control. • Reno Mattresses for storm water control.
NWA, No. 36 of 1998	Section 21 (f)	Discharging of water containing waste into a surface water resource.

		• Discharge of pipe pressure testing water through scours as well as for intermittent maintenance purposes. • Discharging wastewater from the Olifantspoort WTW. • Septic tank at Klipfontein Pump Station.
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4.4 NATIONAL HERITAGE RESOURCES ACT, NO. 25 OF 1998 (NHRA)

The NHRA provides an integrated system for the management of national heritage resources and empowers civil society to conserve heritage resources for future generations. Section 38 of NHRA provides a list of activities that require the undertaking of a HIA.

Section 38: Heritage Resources Management

1. *"Subject to the provisions of subsection (7), (8) and (9), any person who intends to undertake a development categorised as –*
 - a. *the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 30m in length.*
 - b. *the construction of a bridge or similar structure exceeding 50m in length.*
 - c. *any development or other activity which will change the character of a site –*
 - i) *exceeding 5,000m² in extent; or*
 - ii) *involving three or more existing erven or subdivisions thereof; or*
 - iii) *involving three or more erven or divisions thereof which have been consolidated within the past five years; or*
 - iv) *the costs of which will exceed a sum set in terms of regulations by SAHRA or a provisional heritage resource authority.*
 - d. *the re-zoning of a site exceeding 10 000 m² in extent; or*
 - e. *any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority.*

must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development."

Section 38(8) does not require approval from the heritage authority if an evaluation of the impact of such development on heritage resources is required in terms of any other legislation (such as NEMA), provided that the consenting authority ensures that the evaluation of impacts fulfils the requirements of the relevant heritage resources authority in terms of Section 38 (3) and any comments and recommendations of the relevant resources authority with regard to such development have been taken into account prior to the granting of the consent. However, should heritage resources of significance be affected by the proposed development, a permit is required to be obtained prior to disturbing or destroying such resources as per the requirements of Section 48 of the NHRA, and SAHRA Permit Regulations (GN R668).

Section 38(8) of the NHRA specifically excludes the need for a separate HIA where the evaluation of the impact of a development on heritage resources is required in terms of an EIA process. Since the pipeline realignment segment is expected to span over 300 m in length (approximately 3,350 m), a HIA will be required.

There are significant heritage resources along the pipeline alignment as a result of the rich ethnology and history of the area. The features resulting from this activity are displayed as stone and Iron Age tools, remnants of old buildings and structures and a number of graves.

During this BA process, consultations will be conducted with SAHRA and the LIHRA.

5 ENVIRONMENTAL MANAGEMENT APPROACH AND POLICY

5.1 ENVIRONMENTAL MANAGEMENT APPROACH

The environmental management approach is based on the Deming Cycle rationale (**Figure 5-1**) which is a simplified continuous improvement model consisting of four main iterative steps, namely: Plan, Do, Check and Act (PDCA). PDCA can be briefly described as follows:

- ▶ **Plan:** Establish the objectives and processes necessary to deliver results in accordance with the applicable organisation's environmental policy.
- ▶ **Do:** Implement the process.
- ▶ **Check:** Monitor and measure processes against environmental policy objectives, legal, and other requirements and report the results.
- ▶ **Act:** Take actions to continually improve environmental performance.

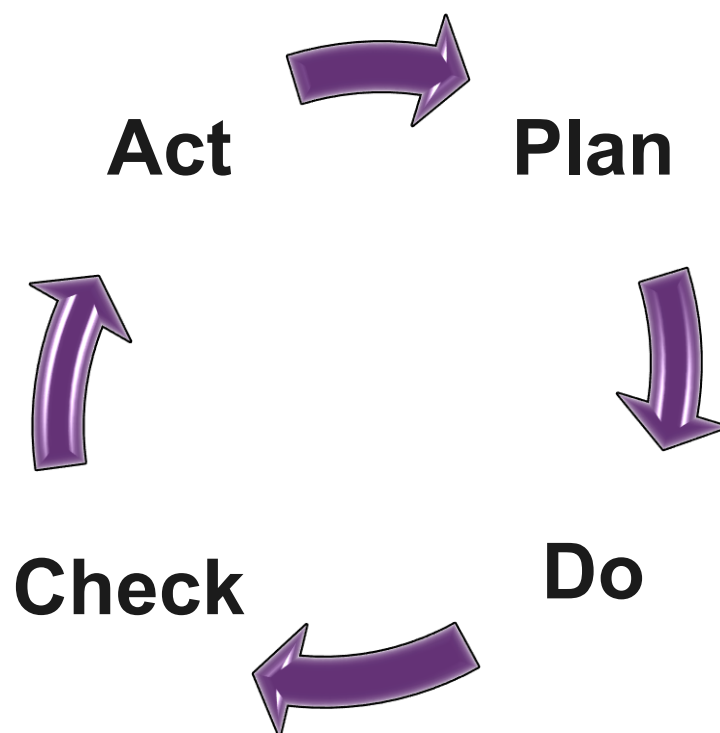


Figure 5-1: The Deming Cycle

By basing the Environmental Management approach on the PDCA rationale, the EMPr in essence adopts the approach of the internationally recognised International Organization for Standardization (ISO) 14001 Environmental Management System (EMS) standard. This standard is also based on the PDCA approach which is adaptive and based on continual improvement (**Figure 5-2**). Continual improvement is achieved by periodic monitoring and review of the EMPr and the subsequent implementation of corrective actions when required. **Figure 5-3** illustrates the various components of the approach and directs the reader to the relevant chapters of the EMPr that address each component. This EMPr is therefore a living document that should be continuously updated and possibly improved.

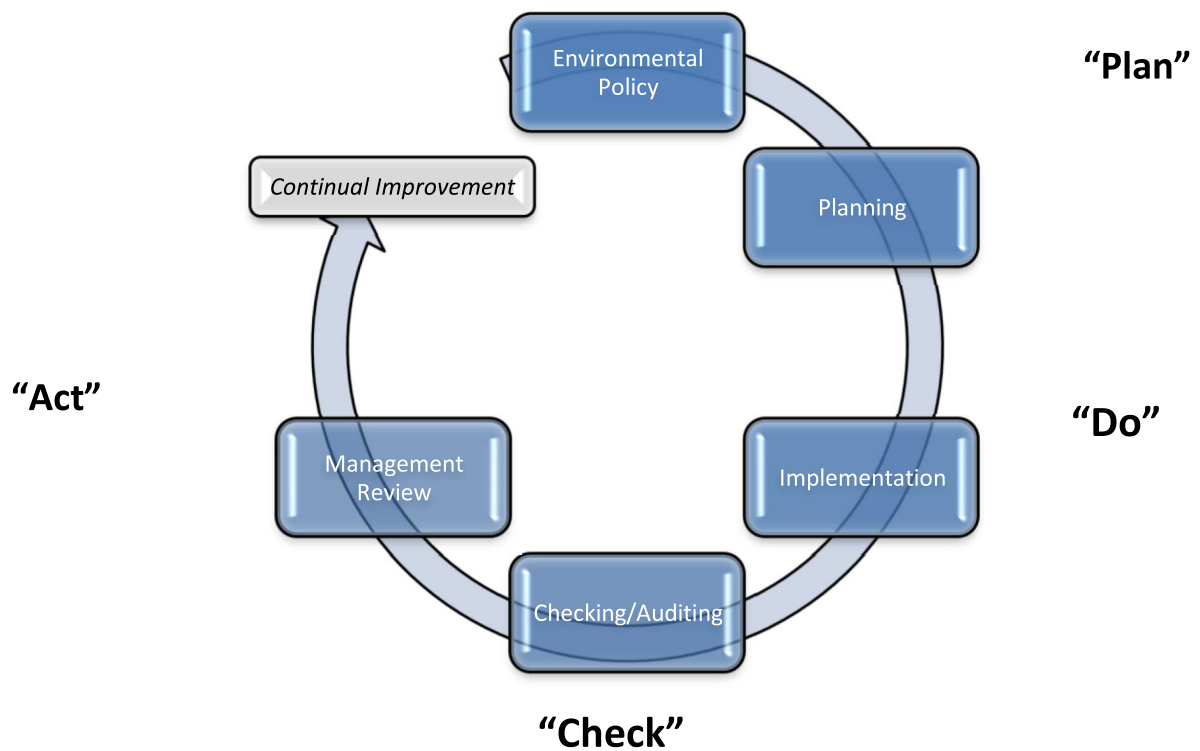


Figure 5-2: The Basic EMPr rationale based on the Deming Cycle.

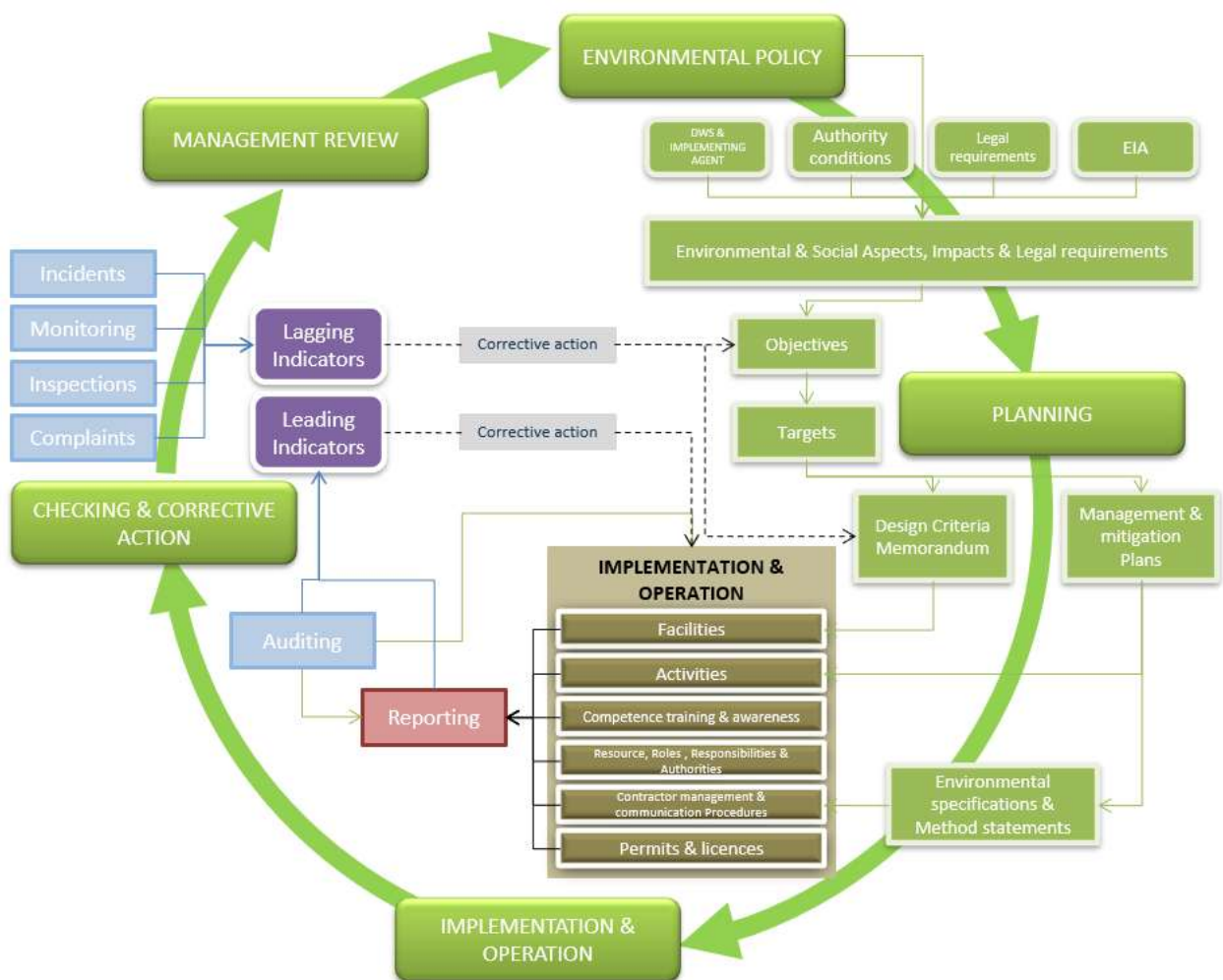


Figure 5-3: The Specific EMPr rationale based on the Deming Cycle.

The EMPr approach based on the EMS rationale is summarised and mapped as follows:

5.1.1 ENVIRONMENTAL POLICY

As part of an EMS, the environmental policy is the driver for implementing and improving the system so that it can maintain and potentially improve its environmental performance. The policy forming part of this EMPr reflects the commitment of the implementing agent, to comply with applicable legal and other requirements, to prevent pollution, and to continually improve. The policy forms the basis for the set environmental objectives and needs to be communicated to all individuals working for, or on behalf of the Project. The appointed project implementer should have relevant and signed environmental policies in place, for implementation, prior to implementation of the project.

5.1.2 PLANNING

The “planning” component of an EMS (and therefore this EMPr) involves the identification of environmental aspects, legal and other requirements applicable to the organisation and those applicable to the Project are described in **Section 4**. Another important requirement of the planning component is the establishment of objectives and targets taking into account the policy, legal requirements, and the principal objective of continual improvement. These objectives and targets should be specified in an EMPr.

Section 13 of this EMPr is the documented plan in which the objectives are set and the means by which they are to be met. The Project’s activities and associated environmental aspects are identified in **Sections 12 and 13**.

5.1.3 IMPLEMENTATION

The “doing” component of an EMS includes the availability of resources, roles, and responsibilities to implement, maintain, and improve the system. It logically follows in the EMS standard that these resources are appropriately trained. In addition to this, the implementation stage requires that the organisation allow for formal internal and external communication. Operational control and emergency preparedness and response also form part of this stage. All of these components forming part of this EMPr are dealt with between **Sections 6– 10**.

5.1.4 CHECKING

The “checking” component of an EMS essentially involves monitoring, self-evaluation of compliance, incident reporting, and corrective action as well as control of records. These components forming part of this EMPr are dealt with under **Sections 9 and 11**.

Checking and corrective action forms the fourth component of the EMPr and serves to ensure that the:

- ▶ Required environmental management activities are being implemented; and
- ▶ Objectives are being achieved as indicated by meeting the stated targets.

A key underpinning principle for checking action is the concept of *leading* and *lagging* indicators. Leading indicators serve to pre-emptively indicate whether the required management actions are in fact being implemented, while lagging indicators present a measure of performance. It is simply inadequate to track only lagging indicators because they will always reflect only what has been achieved (or not).

As such checking and corrective action includes four key lagging indicators. These are:

- ▶ Incident recording and review;
- ▶ Monitoring selected environmental quality variables as defined in the objectives and targets;

- ▶ Monitoring and review of complaints and complaints management; and
- ▶ Ongoing inspections of the facilities and activities to identify potential non-compliances.

Leading indicators derive from direct reporting from the Implementer on what has and has not been implemented and are supplemented by an auditing regime that serves to verify the validity of that reporting.

5.1.5 MANAGEMENT REVIEW

The management review component of an EMS is the “Do” stage of the system. For this Project, a management review requirement is built into the EMPr requirements.

6 RESOURCES, ROLES, RESPONSIBILITIES AND AUTHORITIES

A project the magnitude and intricacy of the OMMP–BRWSP, which includes the development of the proposed Phase 2F component, inevitably requires the assistance and active management of numerous role players. Due to the Project's environmental obligations, it is important to clarify the roles and responsibilities required to successfully implement the Project in an environmentally responsible and sound manner (**Figure 6-1**).

The Section below, as well as **Sections 7 – 10** is the “Do” component of the Deming Cycle and therefore this EMPr.

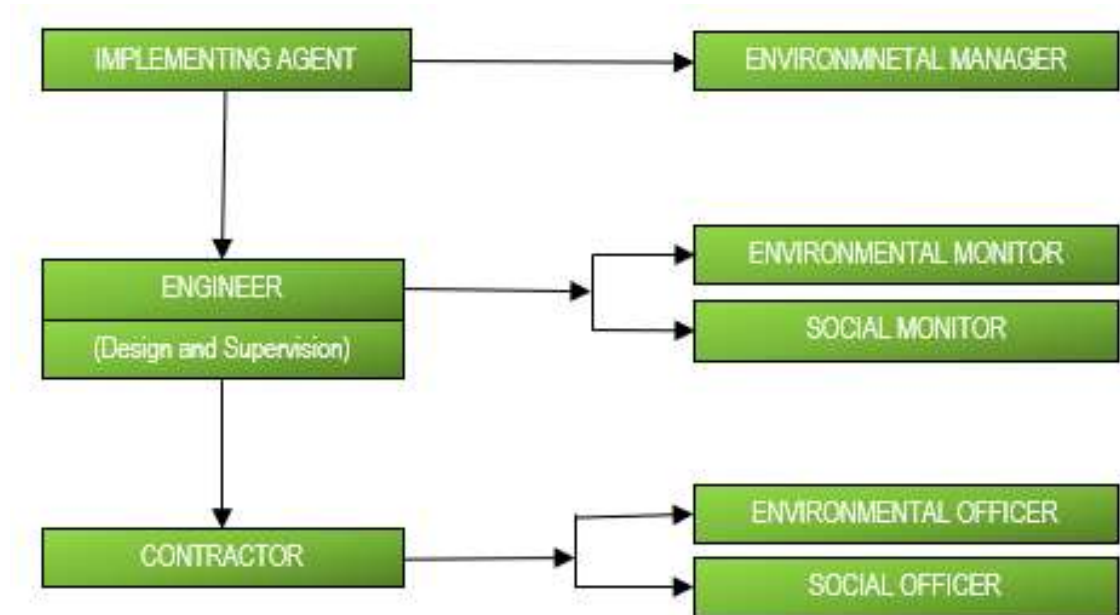


Figure 6-1: Staffing arrangements.

6.1 PROJECT PROPONENT

DWS will be the Project Proponent for the proposed Phase 2F re-alignment and associated infrastructure, including the proposed access roads for the entire alignment. An Implementing Agent is appointed to implement and oversee the development of the Phase 2F alignment. Ultimately, the liability associated with environmental non-compliance rests with the Project Proponent, as they are held accountable for all legal requirements related to the project.

6.2 CLIENT

The Implementing Agent acting on behalf of DWS has been appointed to implement the Project. As implementers, part of their responsibilities is to oversee the overall implementation of the construction of the Phase 2F alignment as well as the compliance with the applicable legislation, the authorised EA, and approved EMPr.

6.3 ENGINEER – ZNJV

The ZNJV is the appointed Engineer responsible for the design of the Phase 2F alignment and associated infrastructure. It will be the responsibility of the Engineer to ensure that the Contractor adheres to construction specifications, the EA and EMPr. The Engineer has the authority to stop any

construction activity that is in contravention of any of the specifications within the documents mentioned above after consultation with the ECO. All major decisions which may affect the programme or costs of the project with regard to the environmental procedure or protocols must be approved by the Employer via the Engineer.

6.4 ENVIRONMENTAL MONITOR

The Environmental Monitor (EM) is employed by the Engineer and is responsible for overseeing the daily implementation of the EMPr and relevant specifications for the duration of the project. The EM should have a clear understanding of the project as well as all the environmental matters pertaining to the project and should have a good knowledge of the applicable environmental legislation and processes.

Responsibilities of the EM include:

- ▶ To advise and provide recommendations to the Environmental Officer (EO) on all environmental and related issues based on the requirements of the EMPr.
- ▶ To record and forward complaints received from the public to the Engineer and Employer.
- ▶ Resolve conflicts.
- ▶ Keep detailed and accurate records of the EMPr-related activities on site.
- ▶ Report to the ECO on the monitoring of environmental issues.

6.5 SOCIAL MONITOR

The Social Monitor (SM) will act on behalf of the Engineer in all social matters pertaining to the project.

Responsibilities of the SM are:

- ▶ Resolve conflicts.
- ▶ Ensure the implementation of the Social Monitoring Plan (SMP) as well as social-related requirements in the EMPr.
- ▶ Monitor the progress, impact, and sustainability of the project.
- ▶ Ensure that all community and landowner complaints are reported to the Engineer and Project Implementer, recorded, and dealt with in a timeous manner.

6.6 CONTRACTOR

In order to carry out the requirements of this EMPr, the Contractor must make sure that he has a clear understanding of all environmental matters relating to the project.

The responsibilities of the Contractor will include:

- ▶ The implementation of and adherence to the applicable environmental contract specifications in accordance with the requirements of the EMPr.
- ▶ Compliance with all national, provincial, and local legislation related to the management of environmental aspects, including ensuring all applicable and required site-specific permits, authorisations, and licenses that are triggered by the Contractor's activities are applied for and obtained timeously. Examples of such permits include the removal of protected plant species and the storage of flammables and hazardous materials.
- ▶ To ensure all Subcontractors under his supervision adhere to the applicable environmental contract specifications in accordance with the requirements of the EMPr.
- ▶ Report any incident to the Engineer immediately and follow the initial notification with a flash report within 12 hours of the event occurring. The flash report will include details of the incident, which includes the extent, reasons, preventative actions, and corrective actions taken.

- ▶ To ensure that all employees and Subcontractors attend Environmental Awareness Training provided by the EO.
- ▶ To conduct any remedial work required in terms of this EMPr as a result of environmental negligence, mismanagement, and/or non-compliance.

6.7 ENVIRONMENTAL OFFICER

A suitably qualified senior employee of the Contractor stationed full-time on site shall be responsible for implementing the EMS, environmental monitoring, and control. This position shall be designated the EO.

The EO shall be responsible for:

- ▶ Aiding the Contractor to comply with all the project environmental requirements, objectives and targets;
- ▶ Facilitating environmental activities and environmental awareness training of all personnel on site; and
- ▶ Implementing an internal EMS.

6.8 SOCIAL OFFICER

In addition to the EO, a suitably qualified (social sciences degree with at least 5 years working experience) employee of the Contractor who is stationed full-time on site, shall be responsible for social environmental monitoring and control. This position shall be designated the Social Officer (SO).

The duties of the SO will include:

- ▶ Aiding of the Contractor with liaison with landowners and other interested and affected parties (I&APS),
- ▶ Facilitating the resolution of potential and actual challenges experienced during construction where these relate to landowners and their special requirements, and
- ▶ Aiding the Contractor in keeping accurate records pertaining to issues, complaints and the associated corrective actions.

6.9 ENVIRONMENTAL CONTROL OFFICER

The Project Implementer must appoint a suitably qualified and experienced independent ECO who will be responsible for the monthly monitoring of the project compliance with the EA, EMPr, and applicable environmental legislation. The contract for the ECO will extend from the commencement of the Construction Phase to the handover of the site by the Project Implementer to DWS for operation. During this time the ECO will also report to and be held accountable by the Environmental Monitoring Committee (EMC) of the overall OMMP-BRWSP project.

The responsibilities of the ECO include but are not limited to:

- ▶ Undertaking a due diligence audit at least a month prior to the commencement of construction. The audit will include a site visit and a qualitative survey of the status of the area prior to construction.
- ▶ Review and analyse the monitoring data which will include but not be limited to water, dust and noise monitoring, complaints and pollution incidents, and non-conformances against the limits that have been set in the environmental specifications and/or the EA.
- ▶ Site inspections will be conducted in such a way that all the construction activities are covered in the month. The site inspection will include a physical visit to the construction sites. The ECO will inform the client of the visit and will commence the visit with an opening meeting on site to gather

- information regarding the level of operations and a closing meeting to provide feedback to the Resident Engineer and Project Implementer. A report will be compiled to summarise the findings.
- ▶ Every second month the ECO will also provide a monitoring report to the DFFE based on the data gathered by the Contractor and evaluate the information against the performance targets set out in the EMPr.

As part of the ECO's contractual responsibilities, an internal six-monthly audit will be undertaken to provide guidance to the project. This will require a compliance audit at six monthly intervals. The audit will be a more in-depth compliance audit than the monthly site inspections and will include a review and report of the Contractor's implemented systems/measures to determine the effectiveness of the implementation of the EMPr and EA. The audit will systematically review and evaluate the progress of the EMPr implementation.

It is further expected that the ECO will maintain open communications with the Project Implementer to ensure that non-conformances are addressed as soon as possible on site. The ECO will also be expected to report on how issues were resolved with the Stakeholders.

6.10 ENVIRONMENTAL MONITORING COMMITTEE

According to the RRoD issued on 13 October 2006, it is the responsibility of the DWS (and ultimately that of the Project Implementer) to establish an EMC, for the overall OMMP-BRWSP project, before the commencement of any construction activities, which will meet on a bi-monthly basis (every second month). Phase 2F is a component of the larger OMMP-BRWSP project. The frequency of these meetings may be varied should the need arise. As stipulated in the RRoD, the EMC as far as reasonably possible should consist of the following people listed below:

- ▶ An independent chairperson with the appropriate people and project management skills;
- ▶ Representatives of the affected residents, mines, farmers associations; rate payers associations;
- ▶ Ward Councillors;
- ▶ Community Leaders;
- ▶ Non-Governmental Organisations;
- ▶ Representatives of Farmers Associations;
- ▶ The independent ECO; as well as
- ▶ The Implementer's representatives;

The purpose of the EMC will be to:

- ▶ To monitor the construction of the project to the specific and general conditions of the RRoD, EIA, and EMPr as well as all applicable environmental legislation.
- ▶ The EMC will report to the Director General of DFFE where recommendations will be made relating to issues identified pertaining to the monitoring and auditing of the project.

7 COMPETENCE, TRAINING AND AWARENESS

Prior to the commencement of construction activities on site and before any person commences with work on site thereafter, adequate environmental awareness and responsibility are to be appropriately presented to all staff present onsite clearly describing their obligations towards environmental controls and methodologies in terms of this EMP. This training and awareness will be achieved in the following ways:

7.1 INDUCTION TRAINING

Environmental induction training must be presented to all persons who are to work on the Phase 2F alignment – be it for short or long durations; Contractor's or Engineer's staff; administrative or site staff; subcontractors or visitors to the site. This induction training should include discussing the Implementer's environmental policy and values, the function of the EMP and Contract Specifications and the importance and reasons for compliance to these. The induction training must highlight overall dos and don'ts on site and clarify the repercussions of not complying with these. The non-conformance reporting system must be explained during the induction as well. Opportunity for questions and clarifications must form part of this training. A record of attendance of this training must be maintained by the EO on site.

7.2 ENVIRONMENTAL AWARENESS TRAINING

Environmental Awareness Training will take the form of on-site talks and demonstrations by the EO before the commencement of site establishment as well as throughout the construction of the pipeline and associated infrastructure. The education/awareness programme should be aimed at all levels of management and construction workers within the contractor team. A record of attendance of this training must be maintained by the EO on site.

7.3 TOOLBOX TALKS

Toolbox talks should be held on a scheduled and regular basis (at least twice a month) where foremen, environmental and safety representatives of different components of the Works and sub-consultants hold talks relating to environmental practices and safety awareness on site. These talks should also include discussions on possible common incidents occurring on site and the prevention of reoccurrence thereof. Records of attendance and the awareness talk subject must be kept on file.

8 COMMUNICATION PROCEDURES ON SITE

To ensure effective on-site communication and maintained environmental performance, copies of all documentation described in the EMPr must be maintained on site at all times and be available to both the Engineer, the EM, and ECO, and will be provided on request to authorities or stakeholders for inspection.

8.1 SITE INSTRUCTION ENTRIES

The Site Instruction journal entries will be used for the recording of instructions as they relate to the implementation of the EMPr. Entries could also include stoppage of work orders for the purposes of immediately halting any particular activities of the contractor.

8.2 ECO DIARY ENTRIES

The purpose of these entries will be to record the comments of the ECO as they relate to activities on the site. Both the Site Instruction journal and ECO Diary must be available on the site at all times. These documents will be made available to all relevant authorities for inspection if requested.

8.3 SITE MEETINGS

Regular site meetings will be held between the Contractor and its EO, the Engineer and its EM, and the ECO (optional). The purposes of the meetings shall be to:

- ▶ establish the suitability of the Contractor's methods and machinery in an effort to lower the environmental, social and health risks involved;
- ▶ discuss and resolve non-conformance to environmental legislation/policies or the EMPr;
- ▶ assess the general state of the environment on site and discuss any environmental problems which may have arisen;
- ▶ act as a forum for input into the nature and environmental performance of the construction works;
- ▶ accommodate all stakeholders in the decision-making process regarding social and environmental issues on site.

8.4 NON-CONFORMANCE REPORTS

All supervisory staff including Foremen, Resident Engineers, and the ECO must be provided with the means to be able to submit non-conformance reports to the EO and EM. The EO and EM may also report non-conformances. Non-conformance reports will describe, in detail, the cause, nature and effects of any environmental non-conformance by the Contractor. Records of penalties imposed may be required by the relevant authority.

The non-conformance report will be updated on the completion of the corrective measures indicated on the finding sheet. The report must indicate that the remediation measures have been implemented timeously as well as the effectiveness of the remediation measure in order for the non-conformance to be closed-out at the satisfaction of the EM and ECO.

9 OPERATIONAL CONTROL

The Implementer is required to ensure that the Contractor identifies those operations that are associated with the identified environmental aspects consistent with the Policy and Objectives in order to ensure that they are carried out under specified conditions by establishing documented procedures to control situations where their absence could lead to deviation from the Policy and Objectives. These procedures should be developed in the form of Method Statements and must clearly state the operating criteria required to comply with Policy and Objectives.

9.1 METHOD STATEMENTS

The Implementer must ensure that Method Statements are developed by the Contractor which sets out the exact methods to be followed during construction to address specific requirements of the Policy and Objectives i.e., ultimately this EMPr. These method statements must be approved by the Engineer prior to the applicable activities being undertaken on site.

A method statement describes the scope of the intended work in a step-by-step description in order for the ECO and Engineer to understand the Contractors intentions. This will enable them to assist in devising any mitigation measures, which would minimise environmental impact during these tasks. For each instance wherein it is requested that the Contractor submit a method statement to the satisfaction of the ECO, the format should clearly indicate the following:

- What - Brief description of the activity to be undertaken;
- How - Detailed description of the process of work, methods and materials;
- Where - Description/sketch map of the locality of work (if applicable); and
- When - Sequencing of actions with commencement dates and completion date estimates.

The Contractor must submit the method statement prior to the commencement of any particular construction activity. Work may not commence until the method statement has been approved and signed by the ECO, Contractor and Engineer.

Method statements must be prepared for all work planned in the environment and socially sensitive areas, such as stream crossings and grave sites.

10 EMERGENCY PREPAREDNESS

The Contractor must ensure that the following elements are present and easily accessible on site for the management of any emergency or accidents which may occur.

10.1 CONTACT NUMBERS

The Contractor must ensure that the numbers of the following persons are always displayed at a prominent place on site:

- ▶ The local Police Stations
- ▶ The nearest Ambulance
- ▶ Doctors
- ▶ Snake Handler
- ▶ Representative of the Engineer, for example, the Resident Engineer
- ▶ Representative of the Contractor

10.2 SPILL KITS

The Contractor must ensure that spill kits and associated equipment are present onsite and easily accessible for the potential occurrence of hazardous waste and/or material spills. Staff should be trained in the use thereof.

10.3 FIRE EXTINGUISHERS

Adequate and well-maintained firefighting equipment - according to the fire hazard strategies and safety requirements set out in the Contract Specifications, must be maintained at the Contractor's camp as well as on the construction site during the entire project.

11 NON-CONFORMITY, CORRECTIVE ACTION AND PREVENTIVE ACTION

Failure to comply with all of the relevant legislation, conditions of the EA (the one that we are currently applying for) and EMPr may result in one of the following measures being taken by DFFE, the CA:

- ▶ The withdrawal of the authorisation;
- ▶ The issuing of directives to either address the non-compliances identified, including an order to cease the activity; and
- ▶ The instituting of criminal and/or civil proceedings to enforce compliance.

11.1 NON-CONFORMANCE REPORTING

It is thus important that all non-conformances be reported and recorded in order for them to formally be addressed and closed out. Non-conformances will be recorded on a standard Non-conformance Record (NCR) developed by the Engineer's EM. NCR's may be submitted by any employee on site. NCR's are submitted to the Contractor's EO after which he/she will investigate the cause of the incident and ensure that the incident is appropriately closed out and prevented in future.

11.2 PENALTIES

Penalties or fines must be issued at the discretion of the Engineer as per the penalty agreement between the Engineer and Contractor. The ECO is to take up any non-compliance issues that may result in a fine or penalty with the Engineer.

The Contractor must not have the misimpression that adherence to the Environmental Specifications or EMPr is optional (i.e., persistent non-compliance will not only result in the Contractor forfeiting the retention amount but will also be penalised).

All such penalty and retention funds must be used to improve environmental conditions on the site (or others) under development, either during or post-construction, and may not be used to recoup losses incurred as a result of overspent construction items.

11.2.1 RETENTION SYSTEM

For this system, a cost estimate will be determined by the Engineer. This system will entail calculating the total value of the outstanding penalties, as per the BOQ, the project specification and the penalty system. If the value exceeds 10% of the environmental items BOQ, the project retention value of 10% will be retained until the performance certificate has been issued and all the matters have been resolved.

The value of each non-compliance and penalty (according to the BOQ and the penalty system) will be added together. Once all the penalties and non-compliances have been paid or closed out (in physical remediation, project director man hours or a monetary contribution) the value of the retention will be released to be paid out once the performance certificate has been issued at the completion of the contract's defects and liability phase. If the environmental monitoring process reveals persistent and/or wilful non-compliance with any aspect of the Environmental Specifications and EMPr, then the retention associated with that particular item will be withheld permanently from the payment certificate.

The Engineer may then utilise these retained funds to rectify the problem on site making use of other resources at his disposal. The remainder of the retention funds will then be paid out to the Contractor (pending approval by the Engineer's Environmental Representatives and the ECO, confirming compliance with the relevant specifications and EMPr).

11.2.2 PENALTY SYSTEM

The penalty system will be based on two procedures, a stipulated community service task (calculated as project director man hours or days) or a monetary liquidation liability. Should the environmental monitoring process reveal acts of persistent and/or wilful non-compliance with the Environmental Specifications or EMPr, then the Contractor will be penalised according to the specified value of that item (see **Table 11-1**).

A stipulated community service task is any task in the local region that will improve the environment or prevent further environmental degradation identified by the Engineers Environmental Representative and the ECO. Examples could include repairing erosion dongas, implementing an alien invasive plants eradication program, grading rural school access roads, planting indigenous trees in the community, establishing food gardens at the local schools, planting non-invasive fruit trees in the community, installing rainwater systems at the local schools, set up a recycling system in the community (where the community benefits from the program), establish waste infrastructure in the community etc.

Should the local authorities in conjunction with the Engineers Social (ES) and Environmental (EE) Representatives and the ECO, identify any practical tasks available at any point during the contract, this task will form part of the penalty system. These allocated tasks will then take precedence over the monetary liquidation liability system. Non-compliance to the Environmental Specifications and/or EMPr will accumulate project directors man hours and/or days of community service work. The completion certificate will only be issued once the Contractor has completed these tasks to the satisfaction of the Engineer.

Should practical tasks not be available, the monetary system will apply. Time and monetary values will be, but are not necessarily limited to the following:

Table 11-1: Breakdown of environmental penalties.

Non-compliance	First time offence (community service task (hours) or monetary liquidation liability (R))	Subsequent offences (community service task (hours) or monetary liquidation liability (R))
Access into designated no-go areas	4 hours; or R10 000	16 hours per subsequent offence; or R20 000 per subsequent offence
Vehicles, plant, equipment or material outside of the demarcated site	2 - 8 hours; or R10 000	16 hours per subsequent offence; or R10 000 per subsequent offence
Persistent un-repaired machinery leaks	hours; or R1 500	hours per subsequent offence; or R2 000 per subsequent offence
Litter on site	1 hour; or R500	2 hour per subsequent offence; or R800 per subsequent offence
Lighting of fires outside of designated areas	6 hours; or R2 500	8 hours per subsequent offence; or R3 500 per subsequent offence
Eating meals outside of designated areas	2 hours; or R500	2 hours per subsequent offence; or R500 per subsequent offence
Individual not making use of site ablution facilities	2 hours; or R1 000	3 hours per subsequent offence; or R1 500 per subsequent offence
Persons, vehicles, items or plant causing a public nuisance	4 hours; or R1 000	4 hours per subsequent offence; or R1 000 per subsequent offence
Erosion	Cost to repair / rehabilitate	Cost to repair / rehabilitate plus 20% per subsequent offence
Oil spills	Cost to clean plus 4 hours; or Cost to clean plus 20%	Cost to clean plus 4 hours per subsequent offence; or Cost to clean plus 20% per subsequent offence.
Unauthorised damage to the environment	Cost to rehabilitate	Cost to rehabilitate plus 20% per subsequent offence
Unauthorised damage to cultural historical sites and/or artefacts of archaeological significance	To a maximum of R120 000	R200 000.
Unauthorised damage or deformation of small trees (smaller than 75mm girth diameter @ a height of 1m)	2 hours; or R2 000 per tree, if the tree is indigenous, an additional 8 hours or R6000 will be added to the penalty. If the plant is protected the relevant authority is to be notified of this act	The permits will be obtained, if needed and 3 hours per subsequent offence; or R3 000 per subsequent offence. If the tree is indigenous, an additional 10 hours or R8000 will be added to the penalty. If the plant is protected the relevant authority is to be notified of this act
Unauthorised damage or deformation of medium trees (75 – 200mm girth diameter @ height of 1m)	4 hours ; or R3 500 per tree, if the tree is indigenous, an additional 10 hours or R8000 will be added to the penalty. If the plant is protected the relevant authority is to be notified of this act	6 hours per subsequent offence; or R4 500 per subsequent offence. If the tree is indigenous, an additional 12 hours or R10 000 will be added to the penalty. If the plant is protected the relevant authority is to be notified of this act
Unauthorised damage or deformation of large trees (larger than 200mm girth diameter @ a height of 1m)	2 days; or R10 000 per tree, if the tree is indigenous, an additional 12 hours or R10 000 will be added to the penalty. If the plant is protected the relevant authority is to be notified of this act	3 days per subsequent offence ; or R20 000 per subsequent offence If the tree is indigenous, an additional 14 hours or R14 000 will be added to the penalty. If the plant is protected the relevant authority is to be notified of this act

Non-compliance	First time offence (community service task (hours) or monetary liquidation liability (R))	Subsequent offences (community service task (hours) or monetary liquidation liability (R))
Pick, cut, uproot, break, damage or destroy indigenous plants	4 hours per plant; or R1 500 per plant If the plant is protected the relevant authority is to be notified of this act	6 hours per subsequent offence; or R5 000 per subsequent offence to a maximum of R2 500 If the plant is protected the relevant authority is to be notified of this act
Pick, cut, uproot, break, damager, destroy or have in possession (and unable to give a satisfactory account of such possession) a protected plant	5 hours per plant; or R2 000 per plant	5 hours per subsequent offence; or R2 500 per subsequent offence
Kill, capture or disturb an animal or take or destroy any egg, larva or nest	2 days; or R5 000	3 days per subsequent offence; or R6 000 per subsequent offence
Setting a snare / trap or hunting / capturing any animal by means of a trap, snare or poison, or with the aid of a light, or by means of a veld fire, or from a vehicle	2 days; or R5 000	3 days per subsequent offence; or R6 000 per subsequent offence
No action within 7 working days days on ECO / EM findings	Cost of the corrective action plus R2000 per non-compliance or 4 hours	4 hours for every subsequent event and Cost of the corrective action plus R4000 per subsequent offence or 4 hours
No action within delequidation liability period on NCRs issued	8 hours or R4000	16 hours per subsequent offence; or R6000 per subsequent
No storm water control measures	2 hours or R1000 per silt fence/ turbidity curtains	4 hours per subsequent offence or R2000 per silt fence/ turbidity curtains per subsequent offence.
Exceeding water quality discharge standards, air quality, noise standards, etc	16 hours/ R6000 per offence	22 hours/ R10 000 per subsequent office.
Spotting any alien plant with seeds on the servitude	4 hours/R1000 per 100 m ²	8 hours or R2000 per 100 m ² Per-subsequent offence
Mixing topsoil and subsoil	Value to replace the contaminated topsoil	Value to replace the contaminated topsoil plus 20%per subsequent offence
Mismanagement of topsoil	Value to replace the contaminated topsoil	Value to replace the contaminated topsoil plus 20% per subsequent offence
Mismanagement of toilets, breeding vectors or nauseous smell	4 hours/ R1000 per toilet	6 hours / R2000 per toilet and subsequent offences
Spill kits un-stocked	2 hours/ R500 per 5 kits	4 hours / R1000 per 5 kits for subsequent offences
Mixing of waste	2 hours/R500 per 5 bins	4 hours / R1000 per 5 bins per subsequent offences
Overflowing of waste skips	2 hours / R500 per skip	4 hours / R1000 per skip per subsequent offences
Dust clouds	If exceedances are evident in the monitoring report it will be addressed accordingly	If exceedances are evident in the monitoring report it will be addressed accordingly plus 20% for subsequent offences

Non-compliance	First time offence (community service task (hours) or monetary liquidation liability (R))	Subsequent offences (community service task (hours) or monetary liquidation liability (R))
Securing the servitude	2 hours/ R500 per 50 m	4 hours/ R1000 per 50 m per subsequent offences
Water structures such as settlement ponds leaking, or causing damage to the environment	Cost to rectify	Cost to rectify plus 20% of the cost for subsequent offences
Sedimentation of water courses and abstraction from an unauthorised water body	Cost to rectify	Cost to rectify plus 20% of the cost for subsequent offences
Undertaking rehabilitation out of sequence and using unauthorised materials/ fertilisers/ seeds/ composts	Cost to rectify	Cost to rectify plus 20% of the cost for subsequent offences

12 ENVIRONMENTAL ASPECTS

During the BA process, the following specialist studies were undertaken:

- ▶ Agricultural Compliance Statement
- ▶ Heritage and Archaeological Impact Assessment
- ▶ Palaeontological Impact Assessment
- ▶ Freshwater Biodiversity Assessment
- ▶ Terrestrial Impact Assessment
- ▶ Social Impact Assessment
- ▶ Visual and Landscape Impact Assessment
- ▶ Civil Aviation Impact Assessment (CAA) (compliance report)
- ▶ Defense Impact Assessment (compliance report)
- ▶ Air Quality Impact Assessment
- ▶ Traffic Impact Assessment
- ▶ Noise Impact Screening
- ▶ Hydrology Impact Assessment

The various specialists identified a number of impacts to be assessed and proposed mitigatory measures to manage the various potential impacts. The outcome, and intent, of the impact management recommendations i.e., mitigation measures, is to reduce the level of an impact on the environment to acceptable levels. The preferred method would be to avoid impacts; however, this is not always possible.

The various identified impacts were assessed as part of the BA process and were assigned an anticipated impact rating (significance) for both pre-and post-mitigation. The significance ratings are summarised according to environmental impact and project phase in the following tables.

Provided below is a summary of the specialists' impacts and their recommended mitigation measures as detailed in the BA specialist studies. These mitigation measures must be implemented together with the mitigation measures as set out in the Construction, Operational and Decommissioning Environmental Management Chapters below.

12.1 AGRICULTURE

Where construction related disturbances have any potential to lead to channelling of runoff water with consequent erosion, the water runoff must be safely controlled by way of bunds and ditches to be safely disseminated downstream.

The following steps must be implemented for mitigation of impact on soil capability along the excavated trench for the pipeline:

1. When excavating for the pipeline, the upper 150 mm (15 cm)⁵ of topsoil - as recommended in the project and contract specifications — must be excavated first and stockpiled.
2. The subsoil must then be excavated and stockpiled separately from the topsoil stockpile.
3. When the trench is refilled after the pipeline is installed, the subsoil must first be backfilled into the trench.
4. Thereafter, the stockpiled topsoil must be evenly spread at the surface on top of the subsoil.
5. The soil should be backfilled to be raised approximately 650 mm (30 cm) above the surface - as per contract specifications- because it will settle over time and potentially create a water flow path with consequent erosion if it settles to form a depression.

⁵ Recommended by the specialist.

12.2 AIR QUALITY

12.2.1 ADMINISTRATIVE MEASURES

In view of the predicted ambient pollutant concentrations resulting from emissions from the Phase 2F project, the following is recommended:

- Ambient monitoring in combination with modelling and emission inventory to assess the effectiveness of control measures at source and receivers, on an annual basis.

The recommended performance assessment and reporting programme for continued dustfall monitoring during the Phase 2F project are provided in **Table 12-1**.

Table 12-1: Dustfall Monitoring Reporting Programme.

Criteria	Dustfall Monitoring
Monitoring objectives	Assessment of compliance with dustfall limits within the main impact zone of the project. Facilitate the measurement of progress against environmental targets within the main impact zone of the operation. Temporal trend analysis to determine the potential for nuisance impacts within the main impact zone of the operation. Tracking of progress due to pollution control measure implementation within the main impact zone of the project. Informing the public of the extent of localised dust nuisance impacts occurring in the vicinity of the operation.
Monitoring location(s)	Four (4) single buckets should be installed around the Klipfontein Balancing Dam site and at least one (1) single bucket should be installed per kilometre of the alignment. The following factors can severely affect the validity of data from a monitoring site: • Sites with restricted air flows in the vicinity of the monitor: Sites should not be adjacent to walls, buildings or trees that impede or distort the air flow. In general, the site should be in an open area, free of structures higher than 1 m within a 20 m radius of the gauge. • Obstacles between source to be monitored and the gauge. • Local sources of pollution and extraneous contamination that can affect the gauge. • Accessibility and security from vandalism are major considerations in the selection of a site.
Sampling techniques	Single bucket dust gauges measure the fallout of windblown settleable dust. Instruments to be deployed in accordance with ASTM D1739.
Accuracy of sampling technique	Margin of accuracy given as $\pm 200 \text{ mg/m}^2/\text{day}$.
Sampling frequency and duration	On-going, continuous monitoring to be implemented facilitating data collection over 30-day averaging period. Monitoring may be suspended after the first six months of operation.
Commitment to QA/QC protocol	Comprehensive QA/QC protocol implemented.
Interim environmental targets (i.e. receptor-based performance indicator)	Relevant dust deposition standards not to be exceeded more than twice per annum and not in consecutive months.
Frequency of reviewing environmental targets	Annually (or may be triggered by changes in air quality regulations).
Action to be taken if targets are not met	Source apportionment and review of standard control measures and implementation of contingency measures where applicable.
Procedure to be followed in reviewing environmental targets and other elements of the monitoring strategy (e.g. sampling technique, duration, procedure)	Procedure to be drafted in liaison with interested parties considering: (i) trends in local and international ambient particulate guidelines and standards and/or compliance monitoring requirements, (ii) best practice regarding monitoring methods, (iii) current trends in local air quality, i.e. is there an improvement or deterioration, (iv) future development plans within the air shed (etc.)
Progress reporting	At least annually to the necessary authorities.

12.2.2 BEST AVAILABLE INDUSTRY TECHNIQUES

12.2.2.1 Fugitive Emissions from Unpaved Surfaces

Unpaved roads will most possibly be significant sources of dust emissions. Three types of measures may be taken to reduce emissions from unpaved roads:

- Measures aimed at reducing the extent of unpaved roads such as paving. Permanent improvements in road surfaces results in continuous control efficiencies
- Traffic control measures aimed at reducing the entrainment of material by restricting traffic volumes and reducing vehicle speeds.
- Measures aimed at binding the surface material or enhancing moisture retention, such as wet suppression and chemical stabilisation. The control efficiencies obtained by wet suppression and chemical stabilisation are cyclic. As efficiency decays over time, periodic re-application is required.

12.2.2.2 Fugitive Emissions from Paved Surfaces

The following measures are aimed at reducing fugitive dust emissions from paved surfaces:

- Construction integrity of all paved areas should be regularly inspected and frequently repaired if required.
- Set an acceptable speed limit for all onsite vehicles (30 kilometers per hour for construction vehicles and 40 kilometers per hour for light and passenger vehicles).
- Minimise travelling distance and unnecessary traffic.
- Measures which entail periodic removal of deposited material, i.e., broom and vacuum sweeping, may also be adopted to reduce dust generation.

12.3 CIVIL AVIATION

Based on the findings of the civil aviation impact assessment, the proposed development has minimal to no impact on nearby airstrip or airspace operations:

- a. Winterveldt Airstrip: No impact is anticipated at FAWT as the development is beyond 25 km.
- b. Restricted Airspace: No impact.
- c. Steelpoort Airstrip: No impact on operations at FASO.

Overall, the development does not affect airstrip operations or require any changes to airspace.

12.4 DEFENCE

Based on the DFFE screening tool report, a site sensitivity verification (SSV) conducted through desktop analysis, and other relevant information, the sensitivity rating for the site is confirmed as Medium in accordance with the Defence Protocol. The vertical extent of the proposed infrastructure will not exceed 10 m above ground level. Furthermore, an impact assessment has determined that the proposed development will not have any adverse effect on defence-related activities in the surrounding area. Overall, the development is anticipated to have a very low impact on nearby defence installations.

12.5 HERITAGE AND ARCHAEOLOGY

Error! Reference source not found. and Error! Reference source not found. below presents the heritage resources identified during this survey.

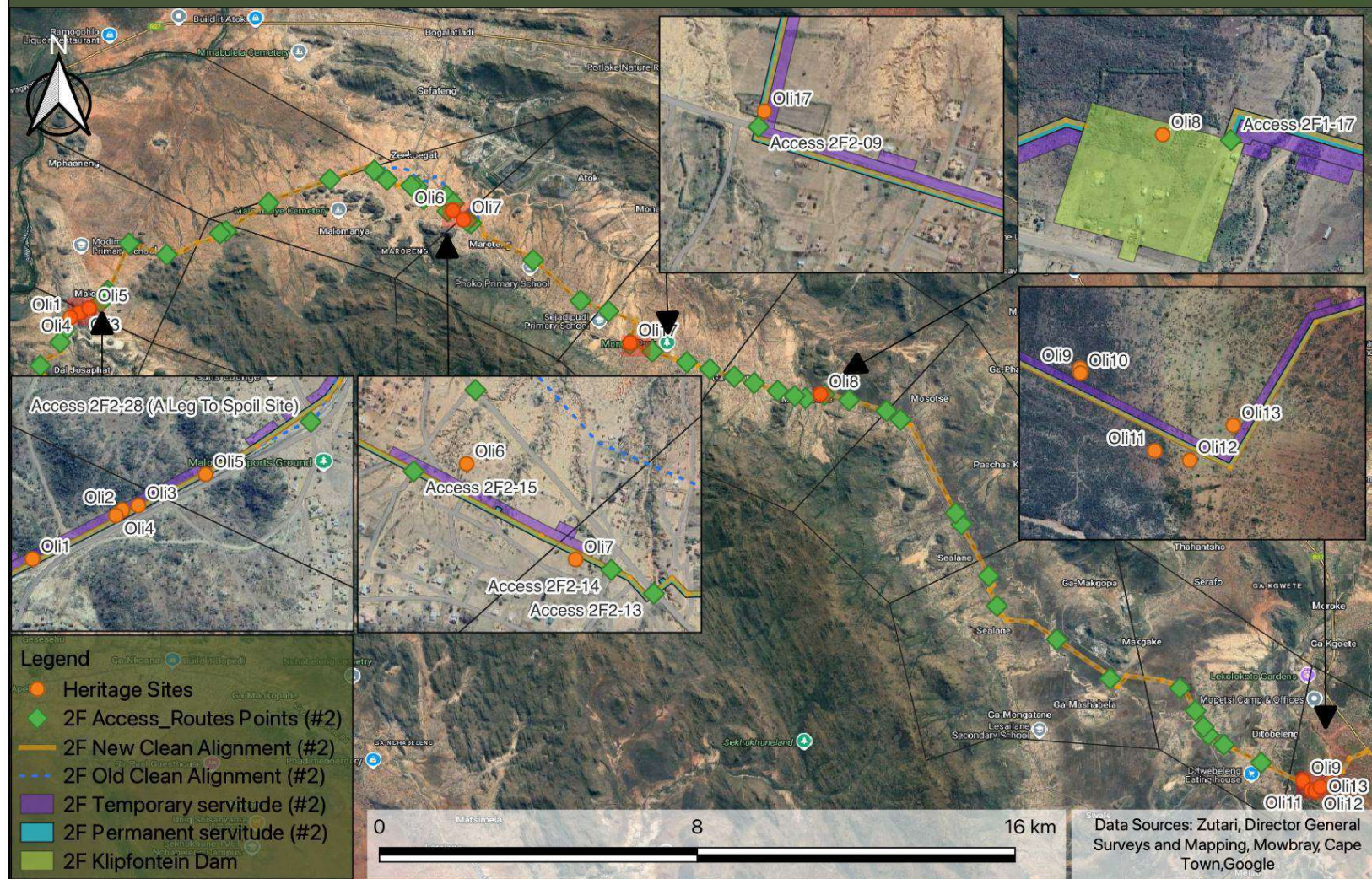


Figure 12-1: Heritage Resources identified within the Phase 2F Project Study Area (PGS Heritage, 2025).

Table 12-2: Heritage Resources Identified during the Field Survey of the Phase 2F Project Area.

Site No	Site Co-ordinates		Time Period	Brief Site Description	Grading	Heritage Significance
	X	Y				
Oli1	-24.33314	29.76694	Historical / Modern	This site is likely a recent structure with concrete stairs at the front, concrete flooring and large flat and rounded sandstones mixed with concrete to form the base. Only the base remains. The location correlates with the location of a hut feature noted on the 1964 topographical map. The modern structure was likely built over what remained of the structure noted in the topographical map.	High	Grade 3 - A (IIIA ⁶)
Oli2	-24.33182	29.76936	Modern	The site appears to be a concrete slab. However, it is heavily overgrown and mostly destroyed and as such no other indicators of what it could be are present.	N/A	Not Conservation Worthy (NCW ⁷)
Oli3	-24.3317	29.76979	Modern	Appears to be a rectangular sand/mudbrick structure with four rooms. The sand has been compacted and mixed with small stones. The outside walls are possibly made from mudbrick. The structure has mostly been destroyed and only some wall bases remain.	N/A	NCW
Oli4	-24.33196	29.76918	Modern	Two recent standalone structures both with single stone coursing represents this site. All that presently remains are the stonewall bases and there appears to only be one compartment for both. Both are heavily overgrown.	N/A	NCW
Oli5	-24.33086	29.7716	Modern	This site comprises a large recent mudbrick structure with a red cement base. There are 6 compartments with most of the compartments being almost totally destroyed except for one section which has semi-intact mudbrick walling.	N/A	NCW
Oli6	-24.30656	29.8619	Historical / modern	A cemetery with approximately 230 graves is present comprising of 14 rows with approximately 20 graves in each row. Most of the graves are formally-dressed and indicated with headstones. Some graves include metal 'cages' or fences and others are marked by soil mounds. The oldest identified headstone is 1889 and the youngest 2019, although the soil mounds may be more recent. The Local Guide indicated that the cemetery is still in use.	High	Grade 3 - A (IIIA)

⁶ High significance: Such a resource must be an excellent example of its kind or must be sufficiently rare. These are heritage resources which are significant in the context of an area.

⁷ No research potential or other cultural significance: A resource that, after appropriate investigation, has been determined to not have enough heritage significance to be retained as part of the National Estate.

Site No	Site Co-ordinates		Time Period	Brief Site Description	Grading	Heritage Significance
	X	Y				
Oli7	-24.30889	29.86455	Modern	An old church with an associated structure to its right and associated “decorations” to the south is present at this site. The Local Guide identified this site and provided some information, indicating that it is no longer in use. The church is constructed of bricks and cement with metal lintels while the structure to the right has been largely demolished. A possible grave was observed near the church. Additional graves are potentially present.	High	Grade 3 - A (IIIA)
Oli8	-24.35223	29.95323	Historical / modern	This site comprises a low line of stones indicating a farm boundary. This boundary may still be indicating the boundary between neighbouring houses.	N/A	NCW
Oli9	-24.44822	30.07299	Modern	Dual lowlines of stones forming a platform to keep harvested wood off the wet ground and away from termites are present here. Members of the community harvesting firewood across the Project area commonly construct such features. A similar structure is situated just to the east of this feature.	N/A	NCW
Oli10	-24.44836	30.073	Iron Age	Half of a lower grinding stone.	Negligible	NCW
Oli11	-24.45056	30.07511	Iron Age	A complete upper grinding stone.	Negligible	NCW
Oli12	-24.45083	30.07609	Iron Age	A lower grinding stone.	Negligible	NCW
Oli13	-24.44985	30.07733	Iron Age	Lower grinding stone.	Negligible	NCW
Oli17	-24.33955	29.90592 ⁸	Modern	A graveyard of at least 2 visible graves located in a maize field. The Local Guide contacted the Next-of-Kin to arrange access, but the landowner had locked the access gate at the time of the survey and could not be contacted to provide access. Due to this lack of access, the fieldwork team could not confirm the age or the size of this burial ground.	High	Grade 3 - A (IIIA)

⁸ This location is approximate, as access to the property on which the graves are located could not be arranged at the time of the survey.

12.5.1 IMPACT ASSESSMENT

Oli7 is located outside the proposed infrastructure footprints, and no impact (direct or indirect) to this site is foreseen. Similarly, **Oli9**, **Oli10**, **Oli11**, **Oli12**, and **Oli13** are located outside the proposed infrastructure footprints. No impacts to these sites are foreseen.

Oli2, **Oli3**, **Oli4**, and **Oli5** are located within the proposed pipeline footprints – **Oli5** is located within the proposed pipeline itself, and the other sites are within the temporary servitudes. **Oli8** is located in the proposed Klipfontein Dam footprint. As such, the development is expected to directly negatively impact (i.e. destroy) these sites.

No additional actions are required in terms of the NHRA for a heritage resource that is NCW or which has negligible heritage value. The recording of such sites and including these records in an HIA report are considered appropriate mitigation to conserve data through these records. As such, the HIA report does not consider the potential impacts to heritage resources that are NCW.

Table 12-3: Summary of the Impact Assessment on Heritage Resources of High Significance.

IMPACT DESCRIPTION: Direct Impact on Heritage Resources Oli1, Oli6 and Oli17				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
PRE-MITIGATION				
Dimension	Rating	Motivation		
Duration	Long-term	A direct or indirect impact on these heritage sites would be permanent.	Consequence: Extremely detrimental	Significance: Very high - negative
Extent	Regional	The effects of a direct impact on the burial grounds or individual graves may attract negative attention from a wider region, including (at a minimum) Next-of-Kin living outside the study area.		
Intensity	Very high - negative	Given the significance of these sites, any impact to these features will be of very high intensity.		
Probability	Certain	Given the location of the identified heritage sites in relation to the proposed footprint, the Project will directly impact these resources.		
MITIGATION:				
PGS recommends OMMP-BRWSP implement a 30 m ⁹ no-go buffer zone around all four sites to avoid the potential direct impact to these heritage resources. This may require changes to the proposed infrastructure footprints. These sites must be conserved in situ through the development and implementation of a Heritage Management Plan (HMP).				
Where the in-situ conservation and implementation of the 30 m buffer zone is not feasible for either or both sites, OMMP-BRWSP must undertake a stakeholder engagement process to determine:				
- The feasibility of undertaking a Grave Relocation Process to relocate the graves included in Oli6 and/or Oli17 to avoid impacting them. Such a process must be completed following the requirements of Section 36 of the NHRA, as well as other applicable laws and by-laws; and - The owners or residents of the original hut feature (or historical homestead) at Oli1, and to confirm the presence or absence of graves or infant burials at this site. Where the family confirms the absence of any graves at this site (such as through a police affidavit), the significance of this structure can be revised to NCW. Where the presence of graves is confirmed (or where the absence cannot be confirmed) Oli1 must be treated in the same manner as Oli6 and Oli17.				

⁹ Please refer to **Section 8.1.1** of the draft Basic Assessment Report (BAR) for information regarding the appropriate buffer for the project. The EAP has recommended that a **5 m buffer** be maintained around areas of heritage significance, as identified by the specialist.

POST-MITIGATION				
Dimension	Rating	Motivation		
Duration	Medium-term	<i>In situ</i> conservation and management of these sites would produce benefits that will extend to the medium term, at a minimum.	Consequence: Slightly beneficial	Significance: Low - positive
Extent	Site-specific	The <i>in situ</i> conservation and management of the sites will affect only the affected sites.		
Intensity	Low positive -	The <i>in situ</i> conservation of these sites will constitute a small, but positive, change to these sites.		
Probability	Fairly likely	Should the abovementioned mitigations be put into place, it is likely that the benefits to the heritage sites will occur.		

12.5.2 MANAGEMENT RECOMMENDATIONS AND GUIDELINES

The following section must be read in conjunction with **Table 12-5** of this report.

12.5.2.1 Construction and Operational Phases

The project will encompass a range of activities during the construction phase, including ground clearance, establishment of construction camp areas, and small-scale infrastructure development associated with the project.

It is possible that cultural material will be exposed during construction and may be recoverable, keeping in mind that delays can be costly during construction, and as such must be minimised. Development surrounding infrastructure and construction of facilities results in significant disturbance; however, foundation holes do offer a window into the past, and it thus may be possible to rescue some of the data and materials. It is also possible that substantial alterations will be implemented during this phase of the project, and these must be catered for. Temporary infrastructure developments, such as construction camps and laydown areas, are often changed or added to the project as required. In general, these are low impact developments as they are superficial, resulting in little alteration of the land surface, but still need to be catered for.

During the construction phase, it is important to recognise any significant material being unearthed, making the correct judgment on which actions should be taken. It is recommended that the following Chance Find Procedure must be implemented.

12.5.2.2 Chance Find Procedure

- A heritage practitioner / archaeologist should be appointed to develop a heritage induction program and conduct training for the Environmental Control Officer (ECO) as well as team leaders in the identification of heritage resources and artefacts **during the implementation of the EMP**.
- An appropriately qualified heritage practitioner / archaeologist must be identified to be called upon in the event that any possible heritage resources or artefacts are identified.
- Should an archaeological site or cultural material be discovered during construction (or operation), the area should be demarcated, and construction activities halted.
- The qualified heritage practitioner / archaeologist will then need to come out to the site and evaluate the extent and importance of the heritage resources and make the necessary recommendations for mitigating the find and the impact on the heritage resource.
- The contractor therefore should have some sort of contingency plan so that operations could move elsewhere temporarily while the materials and data are recovered.

- Construction can commence as soon as the site has been cleared and signed off by the heritage practitioner / archaeologist.

12.5.2.3 Possible Finds During Construction

The study area occurs within a generally disturbed and developed area, which includes burial grounds and graves as identified during the desktop and fieldwork phase. Soil or vegetation clearance for infrastructure as well as the proposed construction activities, could uncover the following:

- Unmarked burial grounds and graves; and
- Archaeological resources with information potential.

12.5.2.4 Timeframes

It must be kept in mind that mitigation and monitoring of heritage resources discovered during construction activity will require permitting for collection or excavation of heritage resources and lead times must be worked into the construction time frames. **Table 12-4** gives guidelines for lead times on permitting.

Table 12-4: Lead times for permitting and mobilisation.

Action	Responsibility	Timeframe
Preparation for field monitoring and finalisation of contracts	The contractor and service provider	1 month
Application for permits to do necessary mitigation work	Service provider – Archaeologist and SAHRA	3 months
Documentation, excavation and archaeological report on the relevant site	Service provider – Archaeologist	3 months
Handling of chance finds – Graves/Human Remains	Service provider – Archaeologist and SAHRA	2 weeks
Relocation of burial grounds or graves affected by the development	Service provider – Archaeologist, SAHRA, local government and provincial government	6 months

12.5.2.5 Heritage Management Plan for EMP Implementation

Table 12-5: HMP for EMPr implementation.

Area and site no.	Mitigation measures	Phase	Timeframe	The responsible party for implementation	Monitoring Party (frequency)	Target	Performance indicators (monitoring tool)
General project area	Implement the Chance Find Procedure in cases where possible heritage finds are uncovered.	Construction	During construction	• Applicant • ECO • Heritage Specialist	ECO (monthly / as or when required)	Ensure compliance with relevant legislation and recommendations from SAHRA under Sections 34-36 and 38 of NHRA.	ECO Monthly Checklist/Report
Burial grounds and graves	All burial grounds and graves must be retained and avoided with a buffer zone of 30 m as per SAHRA guidelines. If this is not possible, the graves could be relocated after completion of a detailed grave relocation process, that includes a thorough stakeholder engagement component, adhering to the requirements of Section 36 of the NHRA and its regulations as well as the National Health Act and its regulations and any provincial legislation.	Pre-construction Construction	During Construction	• Applicant • ECO • Heritage specialist	ECO (monthly)	Ensure compliance with relevant legislation and recommendations from SAHRA under Section 36 and 38 of NHRA.	ECO Monthly Checklist/Report

12.6 PALAEONTOLOGY

Desktop research (published data) concluded that fossil heritage of scientific and conservational interest in the development area is rare. This is in agreement with the Low Sensitivity allocated to the development area by the South African Heritage Resources Information System (SAHRIS) Palaeosensitivity Map and Medium Sensitivity of the DFFE screening tool report. A low Palaeontological Significance has been allocated for the construction phase of the Project pre-mitigation and a Very Low significance post mitigation. The construction phase will be the only development phase impacting Palaeontological Heritage and no significant impacts are expected to impact the operational and decommissioning phases.

The table below provides a summary of the impact assessment regarding the loss of fossil heritage.

Table 12-6: Loss of fossil heritage.

IMPACT DESCRIPTION: Loss of Fossil Heritage				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
PRE-MITIGATION				
Dimension	Rating	Motivation		
Duration	Long-term	Fossils are irreplaceable	Consequence: Slightly detrimental	Significance: Low - negative
Extent	Site-specific	Only the site will be affected		
Intensity	Low - negative	Palaeontological Sensitivity is Low to Zero		
Probability	Fairly likely	Palaeontological Sensitivity is Low to Zero		
MITIGATION:				
Chance Find Procedure: • If a chance find is made the person responsible for the find must immediately stop working and all work that could impact that finding must cease in the immediate vicinity of the find. • The person who made the find must immediately report the find to his/her direct supervisor which in turn must report the find to his/her manager and the ECO / Environmental Safety Officer (ESO) or site manager. The ESO or site manager must report the find to the relevant Heritage Agency (South African Heritage Research Agency, SAHRA). (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za). The information to the Heritage Agency must include photographs of the find, from various angles, as well as the GPS co-ordinates. • A preliminary report must be submitted to the Heritage Agency within 24 hours of the find and must include the following: 1) date of the find; 2) a description of the discovery and a 3) description of the fossil and its context (depth and position of the fossil), GPS co-ordinates. • Photographs (the more the better) of the discovery must be of high quality, in focus, accompanied by a scale. It is also important to have photographs of the vertical section (side) where the fossil was found. • Upon receipt of the preliminary report, the Heritage Agency will inform the ECO / ESO (or site manager) whether a rescue excavation or rescue collection by a palaeontologist is necessary. • The site must be secured to protect it from any further damage. No attempt should be made to remove material from their environment. The exposed finds must be stabilized and covered by a plastic sheet or sandbags. The Heritage agency will also be able to advise on the most suitable method of protection of the find. • If the fossil cannot be stabilized the fossil may be collected with extreme care by the ECO / ESO. Fossils finds must be stored in tissue paper and in an appropriate box while due care must be taken to remove all fossil material from the rescue site. • Once the Heritage Agency has issued the written authorisation, the developer may continue with the development on the affected area.				
POST-MITIGATION				
Dimension	Rating	Motivation		
Duration	Long-term		Consequence: Negligible	Significance: Very low
Extent	Site-specific			
Intensity	Negligible			
Probability	Very likely			

Recommendations:

- If Palaeontological Heritage is uncovered during surface clearing and excavations the Chance find Protocol attached should be implemented immediately. Fossil discoveries ought to be protected, and the ECO/site manager must report to SAHRA (Contact details: SAHRA, 111 Harrington Street, Cape Town. PO Box 4637, Cape Town 8000, South Africa. Tel: 021 462 4502. Fax: +27 (0)21 462 4509. Web: www.sahra.org.za) so that mitigation (recording and collection) can be carried out.
- Preceding any collection of fossil material, the specialist would need to apply for a collection permit from SAHRA. Fossil material must be curated in an accredited collection (museum or university collection), while all fieldwork and reports should meet the minimum standards for palaeontological impact studies suggested by SAHRA.

12.7 FRESHWATER AQUATICS

There are four key ecological impacts on freshwater ecosystems that could occur as a result of the proposed development, namely,

- Loss of freshwater ecosystem habitat and ecological structure;
- Changes to the sociocultural and service provision;
- Impacts on the hydrology and sediment balance of the freshwater ecosystems; and
- Impacts on water quality

A summary of the Impact Assessment applied to the **construction and operation** of the Phase 2F infrastructure development, is provided in the tables below.

Table 12-7: Summary of the results of the impact assessment matrix applied to the freshwater ecosystems associated with the construction of the proposed project.

Impact	Pre-mitigation:					Recommended mitigation	Post-mitigation:						
	Duration	Extent	Intensity	Consequence	Probability		Significance	Duration	Extent	Intensity	Consequence	Probability	Significance
Construction of the pipeline deviation - potential sedimentation of downgradient drainage lines due to site clearing, poor stockpile control related to pipeline excavation and poor stormwater management	Short-term	Local	Moderate negative	Slightly Detrimental	Fairly Likely	Low - negative	- It is imperative that construction occurs during the drier winter months when the lowest chance of rainfall and resultant stormwater will be present; - Vegetation clearing must be limited to the pipeline construction servitude and as much indigenous vegetation as possible must be retained (if applicable); - Implementation of construction-phase stormwater controls - e.g. use of silt curtains, berms etc., as part of a multi-phase Stormwater Management Plan (SWMP) for the development; - Stockpiles may not exceed a 2 m height and must be covered with a suitable geotextile (e.g. Geotextile or hessian sheeting) to prevent contamination by hydrocarbons/fuel and to prevent alien invasive encroachment until the excavation trench can be backfilled.	Short-term	Site-specific	Low Negative	Negligible	Unlikely	Very low - negative
Construction of the pipeline deviation - potential pollution of downgradient drainage lines due to poor cement mixing / batching practices and poor management of hazardous materials such as paint, hydrocarbons	Short-term	Local	Moderate negative	Slightly Detrimental	Unlikely	Very low - negative	- Mobile Machinery must be equipped with drip trays to prevent pollutant spillage on site; - Contractor laydown areas and equipment/material/vehicular storage are to remain at least 100 m outside of all delineated freshwater ecosystems and the precise location must be informed by an ECO in line with creating the least disturbance; - Storage of hazardous materials in a bunded contained space; - Immediate remediation of hazardous material spills; - Mixing of cement must only be undertaken within the construction camp and may not be mixed on bare soils; - Mixing of cement is also to be strictly undertaken within a lined, bound or bunded portable mixer. Ready mix concrete must preferably be used;	Short-term	Site-specific	Low Negative	Negligible	Unlikely	Very low - negative

Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
	Duration	Extent	Intensity	Consequence	Probability	Significance		Duration	Extent	Intensity	Consequence	Probability	Significance
							- A batter board or other suitable platform/mixing tray is to be provided onto which any mixed concrete can be deposited whilst it awaits placing; - Cement bags must be disposed of in the demarcated hazardous waste receptacles; - Liquid cement spillage outside of the demarcated area must be promptly removed and taken to a suitably licenced waste disposal site.						
Construction of the pipeline deviation - potential sedimentation of downgradient drainage lines due to poorly executed reinstatement and rehabilitation that could lead to erosion of soils	Short-term	Local	Moderate negative	Slightly Detrimental	Fairly Likely	Low - negative	- The topsoil layer of the soil stockpile must be separated from the lower layers and protected from moisture loss and alien vegetation encroachment, using a geotextile such as hessian sheeting, for use during the rehabilitation phase of the river banks; - Backfilled soil must be suitably loosened on completion of construction activities and revegetated to prevent erosion.	Short-term	Site-specific	Low Negative	Negligible	Unlikely	Very low - negative
Construction of the pipeline deviation - direct impacts on riparian habitat related to crossings of four drainage lines that would further degrade the drainage lines through substrate disturbance related to open trenching	Short-term	Local	High negative	Moderately Detrimental	Very Likely	Moderate negative	- As the key mitigation measure related to the pipeline crossings of the four drainage lines, it is very strongly recommended that horizontal directional drilling be utilised as the pipeline construction method. This is due to the highly incised nature of certain of the drainage lines and the very steep valley slopes of the areas surrounding certain of the drainage lines which would render the risk of erosion, slumping of excavated substrate and thus sedimentation of the downgradient riparian area highly likely; - Should horizontal directional drilling not be technically feasible, a detailed pipeline crossing method statement for each of the four drainage line crossings that details mitigation measures and construction techniques must be compiled and be approved by a freshwater specialist;	Short-term	Site-specific	Low Negative	Negligible	Unlikely	Very low - negative

Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
	Duration	Extent	Intensity	Consequence	Probability	Significance		Duration	Extent	Intensity	Consequence	Probability	Significance
							- A construction right of way must be established to which all construction activities (footprint) must be restricted; this construction right of way must be clearly demarcated; - Establish a formal construction waste control system that is properly controlled and enforced. - It is imperative that construction occurs during the drier winter months when the lowest chance of rainfall and resultant stormwater will be present.						
Access road construction - potential slumping of / dumping of construction waste and excavated material into downgradient drainage lines	Short-term	Local	Moderate negative	Slightly Detrimental	Fairly Likely	Low - negative	- A construction right of way must be established to which all construction activities (footprint) must be restricted; this construction right of way must be clearly demarcated; - Establish a formal construction waste control system that is properly controlled and enforced; - It is imperative that construction occurs during the drier winter months when the lowest chance of rainfall and resultant stormwater will be present; - Vegetation clearing must be limited to the access road construction servitude and as much indigenous vegetation as possible must be retained (where applicable); - Implementation of construction-phase stormwater controls - e.g. use of silt curtains, berms etc., as part of a multi-phase SWMP for the development; - Stockpiles may not exceed a 2 m height and must be covered with a suitable geotextile (e.g. Geotextile or hessian sheeting) to prevent contamination by hydrocarbons/fuel and to prevent alien invasive encroachment until the excavation trench can be backfilled; - All stockpiling of excavated / construction material must be located on the upgradient side of the road	Short-term	Site-specific	Low Negative	Negligible	Unlikely	Very low - negative

Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
	Duration	Extent	Intensity	Consequence	Probability	Significance		Duration	Extent	Intensity	Consequence	Probability	Significance
							construction right of way and not on the downgradient side.						
Access road construction - potential pollution of downgradient drainage lines by sediment and other pollutants such as paint / bitumen and cement	Short-term	Local	Moderate negative	Slightly Detrimental	Fairly Likely	Low - negative	- Mobile Machinery must be equipped with drip trays to prevent pollutant spillage on site; - Contractor laydown areas and equipment/material/vehicular storage are to remain at least 100 m outside of all delineated freshwater ecosystems and the precise location must be informed by an ECO in line with creating the least disturbance; - Storage of hazardous materials in a bunded contained space; - Immediate remediation of hazardous material spills. - Mixing of cement must only be undertaken within the construction camp and may not be mixed on bare soils; - Mixing of cement is also to be strictly undertaken within a lined, bound or bunded portable mixer. Ready mix concrete must preferably be used; - A batter board or other suitable platform/mixing tray is to be provided onto which any mixed concrete can be deposited whilst it awaits placing; - A washout area¹⁰ must be designated within the part of the development site that is located outside of a 100 m buffer of the delineated riparian zone boundary;	Short-term	Site-specific	Low Negative	Negligible	Unlikely	Very low – negative

¹⁰ Concrete washouts are performed at the end of each workday to prevent concrete from hardening inside the trucks, wheelbarrows, and chutes that handle concrete. The area in which this is done is known as a washout area. Usually, water is injected into chutes and tools to remove the concrete mixture, with the resulting mess being placed inside a special bin for disposal.

Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
	Duration	Extent	Intensity	Consequence	Probability	Significance		Duration	Extent	Intensity	Consequence	Probability	Significance
							- Cement bags must be disposed of in the demarcated hazardous waste receptacles; - Liquid cement spillage outside of the demarcated area must be promptly removed and taken to a suitably licenced waste disposal site.						
Proliferation of Alien Invasive Plants (AIPs) in the construction footprint that could encroach into adjacent freshwater ecosystems	Long-term	Local	Moderate negative	Slightly detrimental	Fairly Likely	Low negative	All existing and emergent alien invasive vegetation must be removed. All such material must be disposed of at a registered garden refuse site and may not be burned or mulched on site.	Short-term	Site-specific	Low Negative	Negligible	Unlikely	Very low – negative

Table 12-8: Summary of the results of the impact assessment matrix applied to the freshwater ecosystems associated with the operation of the proposed project.

Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
	Duration	Extent	Intensity	Consequence	Probability	Significance		Duration	Extent	Intensity	Consequence	Probability	Significance
Operation - potential alteration of hydrology and geomorphology of adjacent / downgradient drainage lines due to poor operational stormwater management and rehabilitation and thus potential development of erosion in the pipeline deviation servitude	Long-term	Local	Moderate negative	Moderately detrimental	Fairly Likely	Low negative	- The use of stone pitching to reduce velocity of stormwater is strongly recommended; - Rehabilitation and revegetation must by timed to occur at the end of the dry season to limit the potential for sediment runoff during rehabilitation activities and to allow newly planted vegetation to be assisted by rainfall; - Revegetation and protection of the soils in the pipeline servitude must occur, especially in sloping areas more prone to erosion. Hydroseeding may be required for this purpose; and - It is strongly recommended that the reinstated areas by fenced or livestock be prevented from accessing these areas off for a period (at least 6 months) following reinstatement to prevent livestock from accessing the rehabilitated areas thereby allowing vegetation to become established.	Long-term	Site Specific	Low negative	Slightly detrimental	Unlikely	Very low – negative
Operation - potential alteration of the hydrology of downgradient drainage lines due to stormwater discharge from access roads	Long-term	Local	Low negative	Moderately detrimental	Fairly Likely	Low negative	- Design measures such as flow breakers to slow the velocity of stormwater must be included in the design of the road at the drainage line crossing point; - The principles of Sustainable Urban Drainage Systems (SUDs) must be incorporated into stormwater discharge off the access roads; - Any developing erosion at stormwater discharge points must be immediately rehabilitated.	Long-term	Local	Low negative	Moderately detrimental	Unlikely	Low – Negative

Impact	Pre-mitigation:						Recommended mitigation	Post-mitigation:					
	Duration	Extent	Intensity	Consequence	Probability	Significance		Duration	Extent	Intensity	Consequence	Probability	Significance
Operation - potential pollution of downgradient drainage lines due to spills and other road / pipeline maintenance activities, such as emergency excavations which could result in sediment transport into downgradient areas	Long-term	Local	Low negative	Moderately detrimental	Unlikely	Low negative	- In the event of the need for emergency excavations, all construction-related mitigation measures must be implemented and adhered to; - An operational monitoring programme that checks for development of erosion within the pipeline servitude must be implemented and adhered to; - All vehicles and machinery involved in operational maintenance must be in good working order and must not be leaking; - All spills of potential pollutants on the road surface must be immediately remediated.	Long-term	Site Specific	Low negative	Slightly detrimental	Unlikely	Very Low – negative
Proliferation of AIPs and poor operational control of AIPs in the project footprint that could encroach into adjacent freshwater ecosystems	Long-term	Local	Moderate negative	Moderately detrimental	Fairly Likely	Low negative	AIP proliferation is likely to occur within the pipeline servitude and the road reserve of the access roads and as such AIP control must be regularly implemented throughout the operational phase as part of an Alien Plant Control Management Plan.	Long-term	Site Specific	Low negative	Slightly detrimental	Unlikely	Very Low – negative

Note: It is recommended that horizontal directional drilling be employed for the four drainage line crossings related to the 2F alignment deviation. The use of horizontal directional drilling will eliminate the need for direct excavation and trenching within the riparian zones of the drainage lines and their immediate surroundings. In the case of the drainage line located east of access 2-16, this area is characterised by very steep, unconsolidated slopes. Although very limited intact riparian habitat remains to be physically modified, the combination of slope and unconsolidated substrate significantly increases the risk of slumping and erosion, leading to large volumes of substrate moving down the slope and into the drainage lines. This would represent a major impact with high significance on the reach and the downstream drainage system. Accordingly, a construction method that avoids these potential impacts must be utilised when crossing the drainage lines.

12.8 TERRESTRIAL BIODIVERSITY

12.8.1 FLORAL COMPONENT

The topsoil must be stored separately from the subsoils and placed on top of the subsoils. The removed topsoil should be replaced in the same vicinity from which it had been removed.

Once the topsoil has been replaced within the same area, the servitude can be maintained with local labour and soft water infiltration techniques. If effective and disciplined topsoil management can be implemented, then the system should effectively restore over time because of the seed bank and soil micro-organisms present in the system. Use of non-regionally indigenous species and fertiliser should be limited, as it results in local livestock concentrating on these areas. In the absence of fertiliser, the domestic animals utilise the areas as normal and move on once they have removed the above-ground biomass.

12.8.1.1 Impact Assessment

The following expected impacts have been evaluated:

1. Loss of flora diversity in natural areas.
2. Loss of endemic plant species in natural areas.
3. Loss of threatened plant species in natural areas.
4. Alien invasive plant encroachment.
5. Removal of regionally indigenous woody species.
6. Removal of National Protected Trees with the servitude footprint.
7. Loss of floristic microhabitat associated with outcrops.

12.8.2 FAUNA COMPONENT

12.8.2.1 Loss of Habitat and Displacement of Fauna Taxa

The proposed construction of the pipe will result in the loss and clearing of natural vegetation. The only option within the mitigation hierarchy that could reduce the impact significance on habitats of high importance (e.g. donga structures and wetland features) would be avoidance, which would reduce the impact significance.

Recommended Mitigation measures

No plausible mitigation is possible to prevent the direct loss of habitat and subsequent loss and displacement of faunal SCC. The only viable option within the Mitigation Hierarchy is Avoidance and or by placing the pipeline above ground on sensitive areas.

Mitigation of residual impacts persisting after Avoidance:

- Implement a rehabilitation management plan with the objective of managing rehabilitated sections after construction through conservative grazing, fire management and continual eradication of alien plant species. Sustainable grazing at conservative stocking rates (by domestic livestock or game) is an essential environmental factor in maintaining veld condition and floristic diversity. Overgrazing can however be detrimental to the vegetation, and the carrying capacity of such areas of the rehabilitated areas should be estimated to ensure that overgrazing is prevented.
- Landscaping should make use of indigenous plant species, preferably of species native to the project area and immediate surroundings. The plant species selected should strive to represent habitat types typical of the ecological landscape prior to construction.
- If any faunal SCC (especially *Kinixys lobatsiana*) are exposed during the construction phase, a natural scientific professional registered in the field of zoological science and/ or ecological science who specialises in the species of concern should be appointed to assist with its capture, translocation and safe release to nearby suitable habitat with the relevant permits obtained from the authority.
- Screen sections of the pipeline prior to construction for individuals of *Kinixys lobatsiana* - if found these should be released into suitable habitat adjacent to the pipeline property.
- All domestic waste generated (if present) during construction should be removed from the project area as soon as possible and be disposed at an authorised landfill to reduce the risk of colonisation by feral mammals, scavengers or competitively superior bird species (e.g. Pied Crows *Corvus albus*).
- Personnel and staff should be advised by means of environmental awareness training on the biodiversity importance of the area. The intentional killing of any faunal species (in particular invertebrates, reptiles and snakes) should be avoided by means of awareness programmes presented to the labour force. The labour force should be made aware of conservation issues pertaining to the taxa occurring in the project area.

12.8.2.2 Disruption of Ecological Connectivity and Faunal Dispersal

Construction activities could aggravate fragmentation and the disruption of natural ecological corridors in the area, thereby impeding the dispersal of faunal species as well as the potential for re-colonisation and recruitment of fauna species to the project area during rehabilitation. It is especially sub-populations of large-bodied mammal species that are at risk of becoming fragmented if natural connectivity is disrupted and when the surface area of natural corridors is reduced to the point that these animals can no longer disperse across the project area.

Recommended Mitigation measures

- Ensure that construction activities do not overspill onto adjacent natural habitats to provide displaced fauna with the opportunity to disperse into suitable habitats (although potential dispersal by small animals is highly limited).
- The construction area should be barricaded with permeable fencing to allow for the free movement of animal species.
- It is recommended before the commencement of barricading, to ensure that no animal species are trapped within any fenced area.

12.8.2.3 Illegal Utilisation of Faunal Resources

The presence of labour within the project area will increase the risk of illegal utilisation of fauna resources, such as hunting of small antelope and trapping of small mammals and birds. It is assumed that labour will be accommodated in nearby towns/villages and not on site, which would lower this risk of hunting and poaching considerably.

In addition, the project may also result in increased utilisation of natural resources due to potential human encroachment and accessibility to the project area owing to people seeking jobs. This could result in the establishment of illegal settlements in areas consisting of natural habitats in the project area where active construction is absent.

Recommended Mitigation measures

- Contractors and labour should be accommodated off-site (in other words not in the project area), reducing the risk of illegal harvesting of natural resources.
- Labour supervisors and Health and Safety Representative officials should monitor the activities of labourers when working away from infrastructure in a natural habitat.
- Personnel and staff should be advised by means of environmental awareness training on the biodiversity importance of the area. The intentional killing of any faunal species (in particular invertebrates, reptiles and snakes) should be avoided by means of awareness programmes presented to the labour force. The labour force should be made aware of conservation issues pertaining to the taxa occurring in the project area.
- Regular monitoring of the project area, especially areas of natural habitat where active construction/rehabilitation activities are absent, is advised to identify areas where illegal settlement may occur. If any illegal erecting of housing occurs, the developer's or contractor's public liaising officer should immediately advise on a resolution, which may involve a relocation strategy.

12.8.2.4 Direct Faunal Mortalities

Construction of the pipeline will result in the creation of deep trenches that could result in “death” traps for smaller less mobile animals (e.g. reptiles and frogs). Any animal that may have fallen into the pipeline trench could perish over time if not rescued.

Recommended Mitigation measures

- Implement daily (preferably in the morning) checks of exposed trenches for animal species that may have fallen into the trench. If so, such animals should be captured and safely released into suitable adjacent habitat by the ECO.
- If any venomous snake species are trapped within the pipeline trench, then the services of a certified snake handler should be sought for the safe capture and release of the snake.
- Personnel and staff should be advised by means of environmental awareness training on the biodiversity importance of the area. The intentional killing of any faunal species (in particular invertebrates, reptiles and snakes) should be avoided by means of awareness programmes presented to the labour force. The labour force should be made aware of conservation issues pertaining to the taxa occurring in the project area.
- Regular monitoring of the project area, especially areas of natural habitat where active construction/rehabilitation activities are absent, is advised to identify areas where illegal settlement may occur. If any illegal erecting of housing occurs, the developer's or contractor's public liaising officer should immediately advise on a resolution, which may involve a relocation strategy.

The main areas where high impacts or negative consequences can occur are associated with outcrops (boulders or sheets) and existing eroded areas with a high presence of SCC. Alternative construction methods, as highlighted in **Table 12-9**, should be considered to minimise these impacts.

Table 12-9: Construction Alternatives to Trenching.

Construction Method	Description	Suitable Pipe Diameters	Specific Application
Above-Ground Installation	Pipes are laid on supports above ground, avoiding trenching.	600 mm - 1,200 mm	Rocky outcrops and eroded zones (e.g., Karoo, Kalahari).
Horizontal Directional Drilling	Subsurface drilling beneath obstacles like rivers or rocky terrain.	800 mm - 1,600 mm	Under waterbodies, ephemeral rivers (e.g. Limpopo River crossings).
Bridge-Supported Pipelines	Pipes mounted on or integrated with bridge structures.	400 mm - 1,000 mm	Crossing eroded valleys, dry rivers (e.g., Steelpoort).
Pipe Jacking /	Pipes pushed through pre-	800 mm - 1,400	Beneath major rivers or

Micro tunnelling	drilled tunnels under obstacles.	mm	infrastructure, particularly in Limpopo.
Elevated Pipelines (Standoff Poles)	Lightweight pipes mounted on poles, avoiding contact with uneven terrain.	300 mm - 800 mm	Loose soils in semi-arid areas (e.g., Kalahari sand dunes).
Rock Anchoring Systems	Pipes anchored to rocky surfaces with clamps and brackets.	400 mm - 1,000 mm	Richtersveld or Namaqualand granite outcrops.
Controlled Blasting and Trenching	Blasting rock for trenches to partially bury pipes.	600 mm - 1,200 mm	Karoo and Northern Cape areas with hard bedrock.
Flexible/Collapsible Pipelines	Temporary or flexible pipelines for rapid deployment in the emergency water supply.	200 mm - 600 mm	Emergency or seasonal water needs in arid zones (e.g., isolated rural communities in Limpopo).

Note: This table integrates practical construction alternatives with pipe diameter ranges typical for high-capacity bulk water supply projects in South Africa, including the specifications suggested by the OMMP BRWSP.

12.8.3 RECOMMENDATIONS

12.8.3.1 Flora Component

The following recommendations are made:

1. A detailed rehabilitation plan should be compiled, showing areas where topsoil management is critical and non-negotiable, such as natural areas, potential critical habitats (e.g., eroded areas), and outcrops (boulders and sheet). The plan should be compiled by a registered scientific professional in botanical science and/ or ecological sciences, with at least 10 years of experience in botany and plant rehabilitation/ restoration. This will require detailed mapping at a scale of 1:10,000 or larger along the approved pipeline servitude.
 - a. The mapping should form part of the pre-construction baseline, and the following areas within the natural areas should be highlighted:
 - i. Eroded areas
 - ii. Stream/ river crossing
 - iii. Wetlands
 - iv. Steep areas – more than 8% or 5° slopes
 - v. Outcrops – boulders and sheets
 - b. The mapping should be done during the optimal flowering time from January to March.
 - c. The rehabilitation plan should incorporate the results of the soil assessment with regards to soil form, soil texture and soil depth.
2. To apply for the removal of nationally protected trees, a registered scientific professional in ecological science with a minimum of 5 years' experience should conduct surveys along the approved pipeline servitude using plotless methods. These surveys should document the height of the individual trees in the following height classes, up to a distance of 50 m along the centre of the permanent servitude:
 - Seedlings: 0 – 0.5 m
 - Juveniles: 0.5 – 1 m
 - Young adults: 1 – 3 m
 - Mature adults: 3 – 6 m (Fire tolerant)
 - Reproductive adults: 6 m > (Fire tolerant)

The survey should be done during the optimal flowering time from January to March. The survey plots should be at least 250 m apart within natural areas or at least one plot per 2 ha of remaining natural vegetation within the approved temporary and permanent servitude

3. Areas with permanent footprints (valve chambers, scour chambers) exceeding 1 ha **within natural areas** should be surveyed in detail for species of concern as indicated in the screening report during the optimal flowering time from January to March.

12.8.3.2 Fauna Component

The following recommendations are made:

1. Implement a rehabilitation management plan with the objective of managing rehabilitated sections after construction through conservative grazing, fire management, and continual eradication of alien plant species. Sustainable grazing at conservative stocking rates (by domestic livestock or game) is an essential environmental factor in maintaining veld condition and floristic diversity. Overgrazing can however be detrimental to the vegetation, and the carrying capacity of such areas of the rehabilitated areas should be estimated to ensure that overgrazing is prevented.
2. Landscaping should make use of indigenous plant species, preferably of species native to the project area and immediate surroundings. The plant species selected should strive to represent habitat types typical of the ecological landscape prior to construction.
3. If any faunal SCC (especially *Kinixys lobatsiana*) are exposed during the construction phase, a natural scientific professional registered in the field of zoological science and/ or ecological science who specialise in the species of concern should be appointed to assist with its capture, translocation and safe release to nearby suitable habitat with the relevant permits obtained from the authority.

12.9 SOCIAL IMPACTS

The socio-economic impact assessment revealed a number of impacts that are anticipated to arise during the life cycle (i.e., construction, operation, rehabilitation and decommission phase) of the proposed sections of the Phase 2F alignment, as well as the associated infrastructure and proposed access roads. Key impacts determined during the assessment, as well as recommended mitigation measures are summarised in **Table 12-10** below.

Table 12-10: Summary of social impacts and recommended mitigation measures.

PROJECT PHASE	IMPACT DESCRIPTION	MITIGATION MEASURES
Pre-construction and Construction	Land Acquisition Certain sections of the pipeline requiring realignment, as well as the access and internal roads for the entire Phase 2F authorised alignment, affect several farm portions. Some of these affected farm portions are privately owned, while others are owned or controlled by TAs on behalf of the National Government of the Republic of South Africa. Consequently, it is anticipated that the developer will need to secure land access prior to the construction of the proposed development. Land access will be negotiated and obtained through consultation with the affected parties. This process is currently underway.	As per International Finance Corporation (IFC) Performance Standard (PS) 5, Land should always be accessed or acquired in consultation and negotiation with the affected people. LWUA has already initiated the process with the TA and private landowners.
	Temporal Disturbance to Grazing Land During the site visit, it was observed that livestock, including cattle and goats, were grazing along the project area. As such, during the construction phase of the underground water pipeline, grazing land may be temporarily disturbed due to excavation activities, movement of machinery, and restricted access. These disruptions may affect livestock grazing patterns and the availability of forage. However, upon completion of construction, the affected land can be rehabilitated and restored to its original use, thereby ensuring minimal long-term impact on livestock farming.	It is recommended that the contractor take the following measures; • Engage with livestock owners in advance to communicate construction timelines and potential disruptions; • Implement a phased construction schedule to minimise the extent of land disturbance at any time; • Maintain access routes to grazing areas where feasible and implement controlled crossing points for livestock. Should grazing be deemed as not feasible during construction phase, alternative grazing arrangements should be in place, such as identifying and providing temporary alternative grazing areas for affected livestock owners; and • Restoring disturbed land after construction by regrading, reseeding with native grass species, and ensuring soil stabilisation to promote regrowth of forage.
	Resettlement of Households In 2018, the construction of the pipeline initially required the resettlement of approximately 40 households along the proposed route. However, following a realignment of the pipeline to minimise displacement, the number of affected households has been significantly reduced to nine (9), based on aerial imagery and specialist observations conducted during site visits. While the revised route has successfully mitigated large-scale displacement, the resettlement of these nine households will still result in social and economic impacts. Affected families may face disruptions to their livelihoods, access to services, social networks, and cultural ties to the land. As the affected structures are located on tribal land, it is assumed that PTO certificates have been issued to land rights holders—residential PTOs for homestead occupants and business PTOs for business owners. These	It is recommended that resettlement be guided by international best practices and accompanied by a comprehensive Resettlement Action Plan (RAP). This approach goes beyond simply meeting legislative compensation requirements. According to best practices, the IFC PS 5 encourages project sponsors to plan and implement involuntary resettlement as a development initiative, ensuring that the livelihoods and living standards of affected people are improved.

	arrangements suggest the presence of informal land rights. The developer will be required to engage with the affected TA, in collaboration with the Department of Agriculture, to identify suitable alternative land for the resettlement of the affected households.	
	Employment Opportunities It is anticipated that employment opportunities will arise for skilled, semi-skilled, and unskilled workers during the construction phase. This is expected to have a positive socio-economic impact, particularly for the local population, by providing income-generating opportunities and promoting skill development. The number of locally employed individuals during the construction phase will depend on the developer's project activities and recruitment policy. It is further anticipated that certain skilled and specialised positions will be sourced nationally.	It is recommended that the contractor should carry out the recruitment process in accordance with South African laws that regulate labour rights, working conditions, and employer responsibilities. Additionally, to maximise local employment benefits, the IFC PS 2 recommends that: • Preference should be granted to qualified local workers. • Local sourcing should be prioritised. • Skills development, such as training, should be planned and facilitated for selected people who will be employed during the construction phase. • Equal opportunities should be granted to both males and females. • Compensation should be competitive, and a safe working environment should be ensured. • Establish a system of addressing labour concerns.
	Procurement of Goods and Services During the construction phase, development projects typically require the procurement of various goods and services. It is anticipated that this project will similarly require the procurement of goods and services, including equipment and building supplies. This requirement is expected to create economic opportunities for existing and new Small, Medium and Micro Enterprises (SMMEs) in the area. The proposed development may lead to the establishment of new SMMEs. However, certain goods and services may need to be sourced from outside the project area, which could result in the developer procuring goods and services from SMMEs beyond the local area.	Procurement of goods and services will be done as per the existing OMM Procurement Policy which aims to support and develop local communities, suppliers, and previously disadvantaged groups for economic upliftment. Furthermore, the procurement of goods and services will be guided by the Preferential Procurement Policy Framework Act, No. 5 of 2000. The contractor will need to implement quality control measures, to ensure that all goods and services are of required quality. It is essential that the contractor notes that The IFC Performance Standards require responsible procurement by ensuring fair, transparent, and competitive sourcing, prioritising local suppliers, and managing social and environmental risks in supply chains. Companies must prevent forced labour, child labour, and unsafe working conditions, promote ethical labour practices, and ensure contractor compliance with environmental and social standards while supporting sustainable local economic development (LED).
	Community Expectations Development projects often raise high expectations within local communities, particularly regarding employment opportunities during the construction phase. It is anticipated that nearby communities will have heightened expectations related to both employment and business opportunities. If these expectations are	To manage community expectations, project information should be made readily available to the community. This information should include detailed requirements for employment, procurement, and other project-related opportunities. An information centre should be strategically placed to house project-related information and provide

	not met, there is a risk that individuals or community groups may mobilise against the project, or in some cases, hold the project office accountable if employment demands are not satisfied.	space where community members can log their project-related grievances through a grievance mechanism. The contractor should also seek information on wages paid to the locals on previous projects in the area and clearly communicate the proposed wages and benefits to the community. This communication should take place before the recruitment process commences, to better manage community expectations regarding wages and benefits associated with the project.
	Damage to Local and Key Intersections During this phase, the transportation of machinery, construction materials, and construction workers will take place via the existing road network. As a result, an increase in traffic is anticipated, which may subject the road infrastructure and key intersections to wear and potential reduction in capacity. Heavy-duty trucks and construction vehicles are likely to contribute to road surface deterioration, increased dust levels, and traffic congestion. During peak hours, it is expected that social receptors located along Intersection 2 will be affected by the movement of construction materials. This intersection passes through a residential area and is in proximity to a primary school, a secondary school, and the access route leading to the Twickenham Substation.	The contractor is required to conduct a condition assessment of the road both prior to the commencement of construction and upon completion of the works. Additionally, the contractor shall design and construct the access roads in accordance with the <i>Standard Specifications for Roads and Bridge Works for State Road Authorities</i> (1998), as prepared by the Committee of Land Transportation Officials (COLTO). It is recommended that the mitigation measures outlined in the Traffic Impact Assessment (TIA) report be implemented by the contractor throughout the construction phase.
	Health, Safety and Security Construction projects are generally known to have negative impacts on the health and safety of both communities and employees, and it is anticipated that similar impacts will arise from the proposed development. During the construction phase, nearby communities and workers may be exposed to increased dust, noise, visual disturbances, and other nuisances, as well as risks related to construction vehicles and man-machine interfaces. Dust will likely be generated by activities such as excavation, cement mixing, and the transportation of materials or waste, potentially affecting the respiratory health of those exposed. Construction noise, generated by machinery and transport vehicles, is unlikely to damage hearing but will likely reach nuisance levels. Additionally, an influx of job seekers and opportunity seekers, particularly if the influx is male dominated, can result in higher health risks, including an increased burden of disease and a rise in HIV/AIDS rates (Daniel Owens, <i>et al.</i>). Furthermore, construction activities may attract criminal elements to the area, thereby compromising the security of nearby farms, communities, and	Impact related to health and safety will be managed as per the recommendations made in other specialist studies such as the defence compliance statement and TIA, and as per the duties as defined in the Construction Regulations (Occupational Health and Safety Act). It is recommended that the contractor should: • Implement safety measures such as having appropriate signage and fencing/barricades on site to keep local community members and livestock away from falling into the dugout ditches. • Use flaggers and barriers to separate work zones from public areas • Implement dust and noise control measures • Implement traffic management plans to prevent accidents with construction vehicles Plan and facilitate a community health and safety workshop, including a similar workshop for employees • Develops an Emergency Prevention and Response Plan for potential fire, flooding, cave-ins and hazardous material spills • Appoint a Health & Safety Officer to oversee compliance, including conducting regular inspections and audits to identify and correct hazards

	employees. It is anticipated that criminal activities, including trespassing, will increase during the construction phase.	- Deploys Security personnel stationed at the project site to avoid vandalism/ site specific criminal activities, protecting the broader community will remain the responsibility of the South African Police Service (SAPS). - Engage with the Provincial commissioner to assist with handling potential construction mafia.¹¹.
	Modification of the Sense of Place During the construction phase, potential displacement is likely to trigger a modification of the "sense of place" impact. This impact is closely linked to social networks, community structures, social cohesion, and household ties to family groups. The loss of these connections, as described above, can have a significant effect on households, particularly for the head of the household, especially those who fall within vulnerable groups. The dismantling of these social ties due to displacement is expected to have a greater impact on women compared to men. Women are particularly dependent on social networks, as these networks provide essential forms of support.	The contractor should aim at minimising disruption during construction by involving the community in the planning process and ensuring that the landscape is restored to its original state after construction to preserve the community's sense of place. The households which are likely to experience resettlement should be supported during livelihood restoration to help preserve their connection to the land.
Operation	Access to Potable Water for Defined Communities LNLM is one of the three local municipalities that are water service providers and are responsible for revenue collection. Serious water shortages may lead to chronic illnesses, putting pressure on local healthcare facilities. A reliable water supply helps reduce health-related costs within a society. In many developing countries, people spend a significant portion of their income—often a third—on medical expenses, with water-related diseases such as malaria and diarrhea being the primary contributors. Furthermore, access to clean water is essential for everyday activities, including drinking, cooking, bathing, and cleaning.	An experienced and qualified service provider should be appointed to construct the pipeline. The SDM Water Master Plan and Water Sector Plan to be updated with defined communities which will benefit from the OMM Programme to receive potable water.
	Access to Bulk Raw Water for Mine Members During the operational phase, it is anticipated that mine¹² personnel will have access to a reliable supply of bulk raw water, which is essential for maintaining efficient operations. A consistent water supply enables mines to optimise production, minimise potential financial losses, and mitigate environmental	An experienced and qualified service provider should be appointed to construct the pipeline. The SDM Water Master Plan and Water Sector Plan to be updated and include the mine members of the OMM Programme to receive bulk raw water supply for their mine operations

¹¹ Construction mafias, also known as business forums, are networks that employ violence and other illegal means to control access to public sector procurement opportunities. These groups invade construction sites, demanding money or a stake in development projects. They are often involved in systemic extortion.

¹² The OMM Programme Mine members include; African Rainbow Minerals, Anglo American Platinum, Assore (Dwars River), Bushveld Minerals, Cheetah Chrome, Corridor Resources, Glencore-Merafe, Implats (Marula), Ivanplats, Modkiwa Platinum Mine, Northam Platinum, Sibanye-Stillwater, Sylvania Platinum, Tameng Mining & Exploration, Two Rivers Platinum, Vanadium Resources and Zijin Platinum.

	impacts. However, water for industrial use is becoming increasingly scarce in Southern Africa (Mining Industry Association of Southern Africa, 2022). While the mining industry has faced criticism for perceived water wastage, mines contend with a range of water management challenges. These challenges may arise from environmental, climatic, and geopolitical factors encountered throughout the mine's life cycle. As a result, effective water management has evolved from being merely an operational necessity to a strategic imperative.	
	Employment Opportunities During the operational phase, employment opportunities will be limited, as the project will require only a small workforce to carry out routine inspections, maintenance, and repairs. In contrast to the construction phase, which demands a larger labour force, the operational phase will primarily involve specialised roles such as pipeline monitoring, technical maintenance, and occasional rehabilitation work. Consequently, the project is not expected to generate substantial long-term employment for local communities. However, where feasible, priority should be given to local workers for available maintenance activities. Additionally, implementing skills development programmes during the construction phase could help equip local labourers with the necessary competencies to qualify for these operational roles.	Employment opportunities for locals during this phase can be enhanced by prioritising local workers for maintenance roles and engaging local businesses for pipeline maintenance contracts, ensuring that the community benefits from long-term employment opportunities.
	Health and Safety During the operational phase, some activities associated with the maintenance of the pipeline will rely on human labour, which may expose the workforce to health and safety risks. It is anticipated that injuries could occur due to improper handling of equipment and materials.	It is recommended that the developer develop a health and safety plan that outlines the safety measures and procedures implemented when undertaking maintenance at the project's infrastructure.
Decommissioning	No Access to Potable Water Social water users will not have access to potable water should the proposed development be decommissioned. Specifically, the selected defined communities. This could likely have severe consequences for households, schools, healthcare facilities, businesses, and agricultural activities that depend on the pipeline as their primary or sole water source. The decommissioning could lead to increased water insecurity, forcing affected communities to seek alternative and potentially less reliable or unsafe water sources, which may result in health risks, higher costs, and social strain.	Prior to the decommissioning of the potable water supply, beneficiaries should be notified. Additionally, the municipality should ensure that an alternative source of potable water is available to the affected communities.
	No Access to Bulk Raw Water Mine members will no longer have access to bulk raw water should the proposed development be decommissioned. This could likely have severe consequences	Prior to the decommissioning of the bulk raw water the mine members should be notified. The district municipality should have an alternative source of bulk raw water.

	for the operations of the mine members and could lead to significant financial losses which include a loss on the return of investment.	
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12.10 VISUAL AND LANDSCAPE

12.10.1 MITIGATION MEASURES AND RECOMMENDATIONS

The following recommended mitigation measures are primarily intended to minimise the intensity of the landscape and visual impacts but will in some of the cases not necessarily lower the overall significance.

12.10.1.1 Planning and Construction Phase

The most significant landscape and visual impacts will result during the construction phase and are likely to be from erosion and visual scarring of the landscape from clearing areas for access roads and work areas. Where access roads will not be used on a permanent basis clean-up from site and rehabilitation monitoring is required to ensure that the mitigation measures are implemented to an acceptable level so that long-term rehabilitation is successful.

12.10.1.1.1 New/Widening of Access Roads

a. Natural form and shape

- New access roads should avoid straight edges and corridors, and rather complement/reflect the physical shape of the landscape through which they pass; and
- Any spoil remaining from the construction of the access roads, as well as the fill areas below the constructed road should be suitably shaped to reflect the natural terrain/contours and tie into/ blend with the surrounding landscape.

b. Minimising the risk of erosion

- Avoid cutting across and down steep slopes;
- Develop a method statement for post-construction rehabilitation that includes aspects such as:
 - Land restoration;
 - Topsoil storage and replacement;
 - Erosion control through feasible sediment and erosion control devices;
 - Alien plant control; and reseeding or revegetation (if applicable) as well as post-construction monitoring of erosion and rehabilitation; and
 - The use of indigenous species for restoration.
- The use of heavy machinery in areas that are outside of the access road area must be avoided to protect soils from erosion and compaction;
- Reduce slope gradients as far as possible along road cuts and disturbed areas to gradients at or below the angle of repose of those disturbed surfaces; and
- Use drainage control measures and culverts to manage the natural flow of surface runoff.

c. Routing

- Delineate routes prior to clearing tracks to minimise disturbance footprints and to ensure correct tracks followed by contractors; and
- Route access roads around larger vegetation patches, especially where it is located close to a village settlement.

12.10.1.1.2 All Work Areas

a. Protection of natural features

- The contractor shall not deface, paint, damage or mark any natural feature (e.g., rocks, etc.) situated on or around the site for survey or any other purposes unless agreed beforehand with

the Engineer/ECO. Any features affected by the contractor in contravention to the above shall be rehabilitated/restored to the satisfaction of the Engineer /ECO).

- Develop a site layout and clearance plan that indicates the footprint of site clearance including topsoil stockpile zones, areas for vehicular access, and parking and turning zones for construction equipment in order to minimise multiple tracks and areas of disturbance. Access to areas outside of the demarcated areas should be treated as no-go areas;
- Demarcate works areas by means of rocks and/or use of stakes and construction tape; and
- All existing large trees which fall out of the works area must be retained, these will assist in softening forms and obscuring views.

b. Protection of topsoil

- Retain and reuse soils for reinstatement and rehabilitation of disturbed areas, topsoil must be separated from subsoil during excavation and replaced as the topsoil layer upon backfilling or reused elsewhere for rehabilitation.
- Monitoring of the effectiveness of rehabilitation will be undertaken throughout construction as phased rehabilitation is implemented in accordance with the proposed Method Statement and/or Rehabilitation Plan developed by the contractor and approved by the ECO/ Engineer. Aspects that need to be monitored and corrective action taken include:
 - Erosion
 - Surface water drainage
 - Vegetation basal cover
 - Vegetation species diversity
 - Presence and abundance of invasive plant species
- To minimise compaction associated with stockpile creation, it is recommended that the height of stockpiles be restricted to 2 m maximum; and
- Locate all topsoil stockpiles in areas where they will not have to be relocated prior to replacement for final rehabilitation. All stockpiles should be clearly demarcated and protected.

c. Housekeeping

- Active work areas should be well maintained and clean, they must be free of litter and other wastes; and
- Temporary construction signs and barricading must be removed as soon as the particular activity or set of activities are complete and in accordance with health and safety requirements.

12.10.1.2 Operational Phase

Mitigation for operational impacts is ensuring long-term erosion risks from construction areas, especially along steeper topographical areas. Additional measures such as low stone walls or gabions may need to be implemented in order to reduce these risks.

12.10.1.2.1 Ongoing Rehabilitation

- All disturbed areas need to be rehabilitated as soon as possible after construction;
- Additional long term mitigation measures of the pipeline servitude include the reinstatement of the of the backfilled pipeline trenched to its original soil condition, with shaping and re vegetation of the topsoil; and
- The pipeline servitude must be periodically monitored in order to determine if the reinstatement of the rehabilitated areas is effective. Problem areas must be addressed, and proper maintenance should be undertaken on an on-going basis.

12.11 TRAFFIC

12.11.1 ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT PLAN

12.11.1.1 Typical Hazards and Environmental Conditions

Table 12-11 details common road hazards and environmental conditions, identified through data collection and site visits, that may pose safety risks and potentially lead to incidents along the routes to be used by development traffic during construction and operation. The risks outlined are applicable to the conditions anticipated across the various routes.

Table 12-11: Typical hazards and Environmental Conditions.

Category	Hazards
Road Conditions	Potholes: Potholes can cause vehicle damage and contribute to poor road conditions, reducing road rideability and capacity.
	Poor road conditions: The routes have unpaved access roads which also creates challenges for drivers if not well maintained.
	Dust: Although the greater portion of the route is paved, dust from the gravel roads will impact both road safety and adjacent communities.
	Dust is also likely to be a concern for road visibility, especially when considering the use of trucks.
	Faded road markings: Some road sections and intersections have faded road markings, which may create confusion and lead to erratic decision-making and thus increase road safety risk.
Human Activity	Protest actions in communities along major roads usually lead to the barricading of roads. This causes traffic jams and increases the journey times. Some protests turn violent and lead to the loss of life and property.
	Several vehicles travel at dangerous speeds along the R37, D4182, D4180, D4185, and D4190: where vehicles are observed to be travelling both above and abnormally below the speed limit. These vehicles cause dangerous conditions for other road users, resulting in unsafe passing manoeuvres done by speeding drivers and drivers trying to pass a slow-moving vehicle.
	Drivers need to be aware of the school crossings along the route, especially during the morning and afternoon peak periods. It is common for children to run across the road, which poses a safety hazard as heavy vehicles pass through communities.
	Since the route passes through communities, it is important to ensure that there are adequate safe pedestrian crossings within populated areas and that adequate signage is provided in areas that have gravel roads. This helps drivers to be aware of pedestrian movements along the roads.
Animal hazards	The route passes through areas that are predominantly rural. Therefore, drivers need to take caution as they travel through communities. It is also important that they are aware of stray animals from the populated areas. Animals such as cattle, sheep, goats, pigs, and stray dogs were a common sight along all of the routes.
Other Hazards	Vehicle Failure: Vehicle failure can lead to delays and congestion due to stationary heavy vehicles blocking the route, particularly on narrower roads.
	Driver Fatigue: poses a significant risk of drowsiness, which can lead to crashes, resulting in injuries, vehicle damage, and loss of goods.
	Floods pose a risk to vehicles and drivers along the route. Heavy flooding may block roads and sweep away vehicles, leading to loss of life or property. Numerous culverts were also observed to be in poor condition on the D4180, indicating that surface runoff is high.
	Hijacking: a serious threat to driver safety and the security of vehicular assets. Financial implications are to be expected if assets are not recovered in their original state.
	Sun Glare: Reduces driver visibility.
	Inadequate lighting may cause low visibility, this may be an issue in the winter months, where peak hour occurs under low light conditions. It is also a safety concern for pedestrians who travel to school and to work in the early mornings.
	Fog/Smog: Reduces visibility on the road and surrounding elements.
	Informal roads and accesses may be a concern as the irregular nature of the layout is not consistent and may cause unexpected conditions for the drivers.

Addressing these hazards requires a multifaceted approach, including regular maintenance and inspections, strict enforcement of traffic regulations, comprehensive driver training, and robust emergency response plans.

Additionally, effective stakeholder engagement and continuous monitoring are essential to adapt to changing conditions and mitigate risks. By understanding and proactively managing these risks, stakeholders can enhance safety, reduce delays, and improve the overall reliability of transport along these critical routes.

12.11.1.2 Environmental Impact Assessment Matrix

Table 12-12: Impacts, significance and Proposed Mitigation Measures

Impact	Description	Mitigation Description	Pre-Mitigation	Post-Mitigation
Speeding	Excessive speeds reduce reaction time and increase the severity of accidents, endangering both drivers and pedestrians.	Implement speed humps, rumble strips, and raised intersections in collaboration with RAL and SANRAL to enhance road safety.	Moderate negative	Moderate positive
Potholes	Damaged road surfaces can cause drivers to lose control, especially at high speeds, and pose risks to pedestrians if vehicles swerve unexpectedly.	Establish a strong working relationship with RAL and SANRAL to ensure road maintenance protocols are followed throughout all phases of the project.	Low negative	Very low
Vehicle Failure	Mechanical issues like brake failure or tire blowouts can result in collisions, threatening nearby road users and pedestrians.	Conduct regular inspections and maintenance of all vehicles. Drivers should report failures immediately, and incidents along the route must be communicated to the relevant road authority.	Moderate negative	Low negative
Driver Fatigue	Drowsy driving leads to slower reaction times and a higher likelihood of accidents, putting all road users at risk.	Enforce regulated work hours, mandatory rest breaks, and task rotations to prevent monotony. Provide training on fatigue signs and encourage drivers to report when they feel tired.	Moderate negative	Low negative
Hijacking	Sudden attacks can cause erratic driving, leading to collisions or harm to pedestrians in the vicinity	Install trackers on construction machinery and encourage private vehicle owners to undertake defensive driving courses.	Moderate negative	Low positive
Driving through urban areas	High traffic density and mixed road usage in urban areas increase the likelihood of conflicts with pedestrians and other road users.	Install adequate road signage to alert drivers to speed reductions, especially in pedestrian zones.	Moderate negative	Low positive
Protest Action	Unpredictable protests on roads can obstruct traffic, leading to accidents or confrontations, endangering drivers and bystanders.	Ensure safety personnel are informed promptly about protest action and coordinate with contractors and employees to manage risks.	Low negative	Moderate negative
Cattle/Stray Animals	Animals crossing roads can cause sudden braking or swerving, increasing the risk of collisions or hitting pedestrians.	Enforce lower vehicle speeds in rural areas with high cattle and stray animal movement. Install signage to alert drivers to potential crossings.	High negative	Moderate negative
School and pedestrian zones	Areas with high pedestrian activity, especially children, are vulnerable to accidents if drivers are inattentive or speeding.	Reduce speed limits during school hours with visible signage and flashing lights. Mark pedestrian crossings clearly, install speed bumps, and station an official to assist children crossing the road.	High negative	Low negative
Pedestrian Crossings and Signage	Poorly marked crossings or inadequate signage can confuse drivers and pedestrians, increasing the risk of accidents.	Improve rural gravel road safety by installing reflective signs, visible road markings, and speed reduction measures near high-traffic pedestrian zones. Conduct public awareness campaigns on road safety.	Very high negative	Moderate positive
Poor Road Conditions	Uneven surfaces, loose gravel, or water accumulation can lead to vehicle instability, creating dangers for everyone on the road.	Regularly grade gravel roads, apply binding agents, and ensure proper drainage to maintain smooth surfaces and minimize hazardous conditions.	Low negative	High positive

Poor Lighting	Insufficient illumination reduces visibility, increasing the likelihood of hitting obstacles, vehicles, or pedestrians.	Install solar-powered lights at intersections and crossings, complemented by reflective markers along road edges to improve nighttime visibility.	Low negative	High positive
Road Geometry and Terrain	Sharp curves, steep inclines, or narrow roads make navigation challenging and increase accident risks, especially for larger vehicles.	Address risks on sharp curves, steep inclines, and narrow roads by installing warning signs and implementing speed reductions.	Low negative	Moderate positive
Dust	Dust clouds impair visibility, making it harder for drivers to see pedestrians or obstacles.	Apply dust suppressants like water or calcium chloride, regularly grade gravel roads, and enforce lower speed limits in dusty areas to minimise airborne dust.	High negative	Low positive
Vegetation	Overgrown plants near roads can block sightlines, hide pedestrians, or encroach on driving paths.	Trim or remove vegetation that blocks sightlines, obstructs pedestrians, or encroaches on roads to enhance visibility and safety.	Moderate negative	Moderate positive
Fog/Smog	Reduced visibility due to fog or pollution hampers a driver's ability to see other vehicles, pedestrians, and road signs.	Install clear, reflective road signs, improve street lighting, and enforce lower speed limits in foggy or dim conditions. Encourage drivers to use fog lights and workers to wear high-visibility clothing.	Low negative	Moderate positive
Flooding	Waterlogged roads can obscure potholes or debris, cause vehicles to hydroplane, and limit safe pedestrian access.	In case of flooding, drivers must stop the vehicle, report to the safety operator, and avoid using new routes unless directed by a traffic marshal or police officer.	High negative	Low positive
Infrastructure Failure	The D4180 exhibited severe road and culvert deterioration due to poor stormwater management and maintenance.	Prioritize repairs and upgrades for dilapidated culverts and gravel roads through regular inspections, proper drainage systems, and timely interventions to prevent erosion and instability.	High negative	Low negative
Sun Glare	Bright sunlight at certain times of the day can temporarily blind drivers, increasing the risk of accidents with other vehicles or pedestrians.	If visibility is critically low, drivers must reduce speed and stop in a safe location, reporting the situation to the safety operator.	Very low	Low negative

12.12 NOISE

Noise design requirements and criteria were covered in **section 4.2.2** of the Design Criteria Memorandum, and included:

- Pump stations should not be sited closer than 300 m to houses or within 200 m of schools.
- As the internal noise levels in the pump stations are high, the buildings housing the pumps should be adequately designed to limit the transmission of the pump-generated noise and other internal equipment noise to the outside of the building. Insertion losses for the building of at least 30dBA must be achieved.
- Where there are external sources of noise such as ventilation intake fans, appropriate measures will need to be taken. Typical measures such as the following should be taken:
 - Fan intakes to be low mounted (preferably ground-mounted).
 - Fans to have a low sound power output.
 - Fan intakes to be effectively screened off by an appropriately designed noise attenuation barrier (wall) with an insertion loss capability of at least 20 dBA.

It is recommended that the project proponent consider a number of general management measures to ensure that noise annoyance with the project is minimised, which could include:

- If possible, construction camps should not be located within 200 m of communities (*that will reduce noise levels and reduce potential annoyance with the activities [the probability of a noise impact occurring]*);
- When selecting the equipment to be used for this project, the project proponent should consider the sound power levels and select the quietest equipment for the purpose (*that will reduce noise levels and reduce potential annoyance with the activities [the probability of a noise impact occurring]*);
- If possible, main construction activities (site clearing, excavation, pipelaying, and trench backfilling) should be separated in time (different days) and space (at least 200 m from different activities) to minimise cumulative effects (*will reduce noise levels and reduce potential annoyance with the activities [the probability of a noise impact occurring]*);
- Receptors in the area should be notified when construction activities will take place, including details of the activities as well as the projected duration of the activities (*that will reduce the potential annoyance with the activities [the probability of a noise impact occurring]*);
- No construction activities should be permitted closer on Sundays (*will reduce noise levels and reduce potential annoyance with the activities [the probability of a noise impact occurring]*);
- No construction activities should take place during the night-time period in the communities (*will reduce potential annoyance with the project*);
- All employees and contractors should receive Health and Safety induction that includes an environmental awareness component about noise. This is to allow employees and contractors to the potential noise risks that activities pose to the surrounding environment (*will reduce potential annoyance with the project*);
- The project proponent must investigate any reasonable and valid noise complaint if registered by a receptor staying within 200 m from the location where construction activities are taking place. If noise complaints are registered, the project proponent should investigate the complaint and implement routine noise monitoring (*will reduce potential annoyance with the project*);
- The project proponent must ensure that equipment is well maintained and fitted with the correct and appropriate noise abatement measures if available. Engine bay covers over heavy equipment could be pre-fitted with sound-absorbing material. Heavy equipment that fully encloses the engine bay should be considered, ensuring that the seam gap between the hood and vehicle body is minimised (*will reduce potential annoyance with the project*); and
- The project proponent should investigate the use of white-noise alarms instead of tonal reverse alarms on heavy vehicles operating on roads and on the project (*will reduce potential annoyance with the project*)

12.13 HYDROLOGY

12.13.1 FLOOD RISK FOR PIPE RE-ALIGNMENT

The aim of the mitigation measures was to address the hydrological impacts where the pipelines are affected by a watercourse. For this reason, the proposed mitigation measures can be divided into two main options:

- a. Placing the pipeline below ground at these areas
- b. Provide a pipe bridge to span the watercourse where feasible

These options are discussed in further detail below:

Mitigation measures (a):

It is understood that the current design intent is to place the pipeline underground which significantly mitigates the overall hydrological impacts of the pipeline when compared to an above ground pipeline. It is therefore anticipated that only structures protruding from the natural ground level may cause adverse hydrological impacts. If these structures are located within the 1 in 100-year floodline boundaries, they may locally alter the natural flow regime which may induce erosion. These structures will mainly include scour valve chambers which are generally located at low points along the alignment of the pipeline.

To mitigate the hydrological impacts of these structures, the following measures can be applied:

- ▶ Ensure that structures near watercourses and within floodlines do not impede/obstruct flow.
- ▶ Ensure that erosion control measures are implemented so that the protrusions do not exacerbate localised erosion in the area.
- ▶ Should the structure be situated in an area which is already subject to significant erosion, soil conservation measures (gabion baskets, silt fences, etc.) should be implemented in an attempt to stabilise the area.
- ▶ The hydrological impact during construction should be managed and must consider both downstream and upstream effects.

Additionally, due to the high erosion potential, it is essential that additional precautions be taken at pipeline crossings over watercourses. Over time, ground cover above the pipeline may erode, potentially exposing the pipeline and increasing the risk of hydrological impacts. These may need to be managed in future, similar to the retrofitted erosion protection measures observed in the area. This natural variability should be accounted for during the detailed design phase, and it is therefore recommended that the following considerations be incorporated into the detailed design:

- ▶ Cover and backfill requirements:
 - This may be informed by sediment transport and erodibility assessments coupled with flow velocity determinations.
- ▶ Maximum undermined pipeline span (should excessive erosion be experienced):
 - An undermined pipeline will be subject to gravitational forces, as well as significant drag forces imparted by the flow of water. These forces have the potential to damage the pipeline, which may in turn cause significant downstream damage in the event of sudden pipeline failure. The potential for, and consequences of, such a sudden failure should be assessed.
- ▶ Erosion protection and soil conservation structures:
 - Construct erosion protection measures at all pipeline-watercourse crossings. These structures should be designed based on local flow velocities, flow depths, and soil erosivity conditions.
 - Construct soil conservation structures in erosion prone areas, such as dongas and gullies near the pipeline, to mitigate the progression of head-cuts in these areas.
 - Both structures should aim to reduce the flow velocity upstream of the structure, effectively promoting sedimentation.

- Allowance should also be made for a key wall on the downstream side to intercept any potential head-cuts from progressing upstream which will allow the downstream reach to reach equilibrium in terms of sediment transport.

It is anticipated that by implementing the recommendations mentioned above, an overall improvement to risk of erosion in the area can be achieved. The mitigation measures will improve the stability of the watercourses and promote sedimentation in the upstream of the control structures essentially improving the overall hydrological impacts in the area. Ongoing maintenance and the surveying of donga growth should be monitored annually post construction.

Mitigation measures (b):

Alternatively, another approach that may be considered is to place the pipeline above the 1 in 100-year floodline by means of a pipe bridge in areas where excessive velocities and erosion is anticipated. The following may be considered:

- ▶ Ensure that portions of the pipeline that spans across the floodline boundary are above the water surface elevation of the 1 in 100-year flood.
- ▶ Locate the pipe supports outside the regulated boundaries where possible.
- ▶ Should pipe supports be required within the 1 in 100-year floodline boundary, appropriate erosion protection measures should be incorporated to reduce the risk of erosion compromising the supports.

Although this may reduce the immediate need of large erosion control measures and soil conservation structures at crossings, this does not prevent the propagation of head-cuts and there may be an increased risk for a local point failure at bridge supports. Consequently, erosion protection measures at the footing locations must be managed accordingly. In areas where long spans and multiple footings within the floodline are required, pipe bridges are not suggested due to the risk of failure.

As this assessment was prepared to reference design level as per New Engineering Contract (NEC), revised post-construction floodlines should be delineated as part of the final design and the detail design must ensure that the impact of these post-construction floodlines is fully mitigated, including the risk of inundation of property and infrastructure, and the risk of the exacerbation of erosion and sedimentation.

12.13.2 ACCESS ROADS

12.13.2.1 Detailed Mitigations

12.13.2.1.1 Access 2F2-33

It is understood that access 2F2-33 provides access to a spoil area as shown in **Figure 12-2**. It is recommended that the existing unpaved road indicated in **Figure 12-2** be used instead of developing a new road which will have an influence on drainage lines and will be sensitive to erosion. Provisions will need to be made for erosion and siltation management.

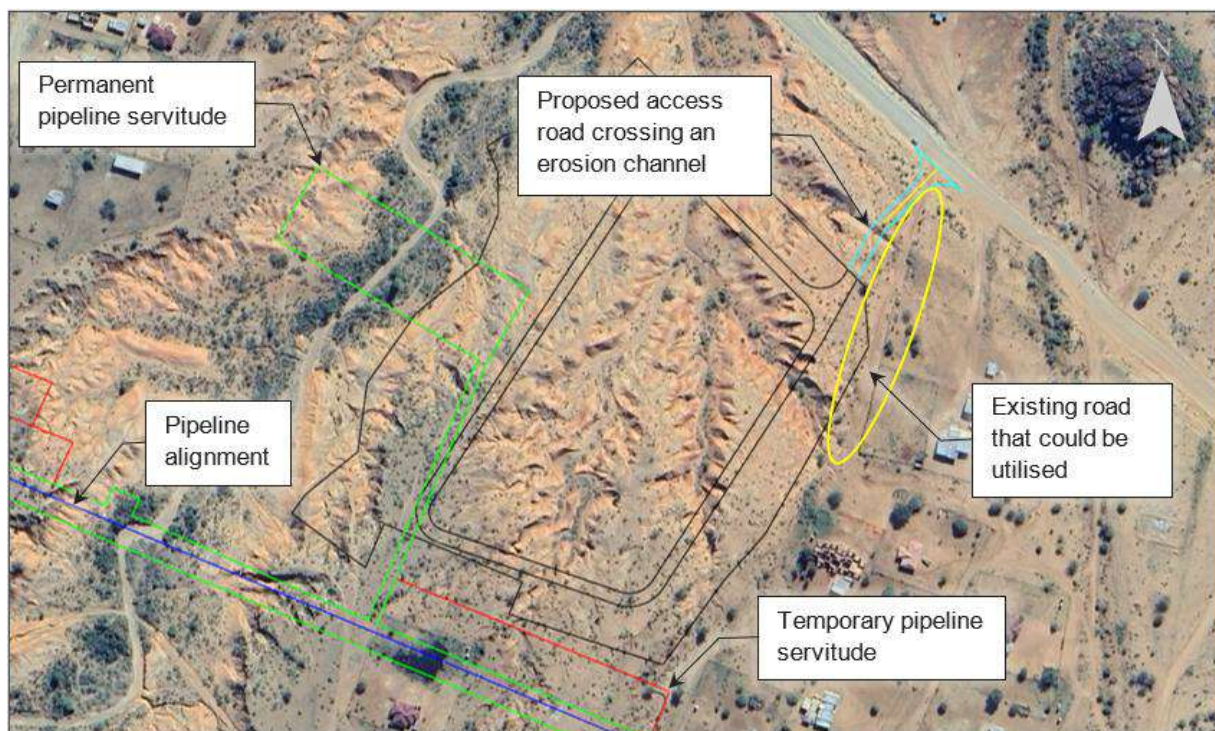


Figure 12-2: Access 2F2-33.

12.13.2.1.2 Access 2F2-34

It is understood that access 2F2-34 provides access to a site establishment area as per **Figure 12-3**. It is advisable to position this access road further north, as shown on **Figure 12-3** to increase its distance from the watercourse. Review of the hydrological impacts of the site establishment area itself does not form part of the scope of this assessment.

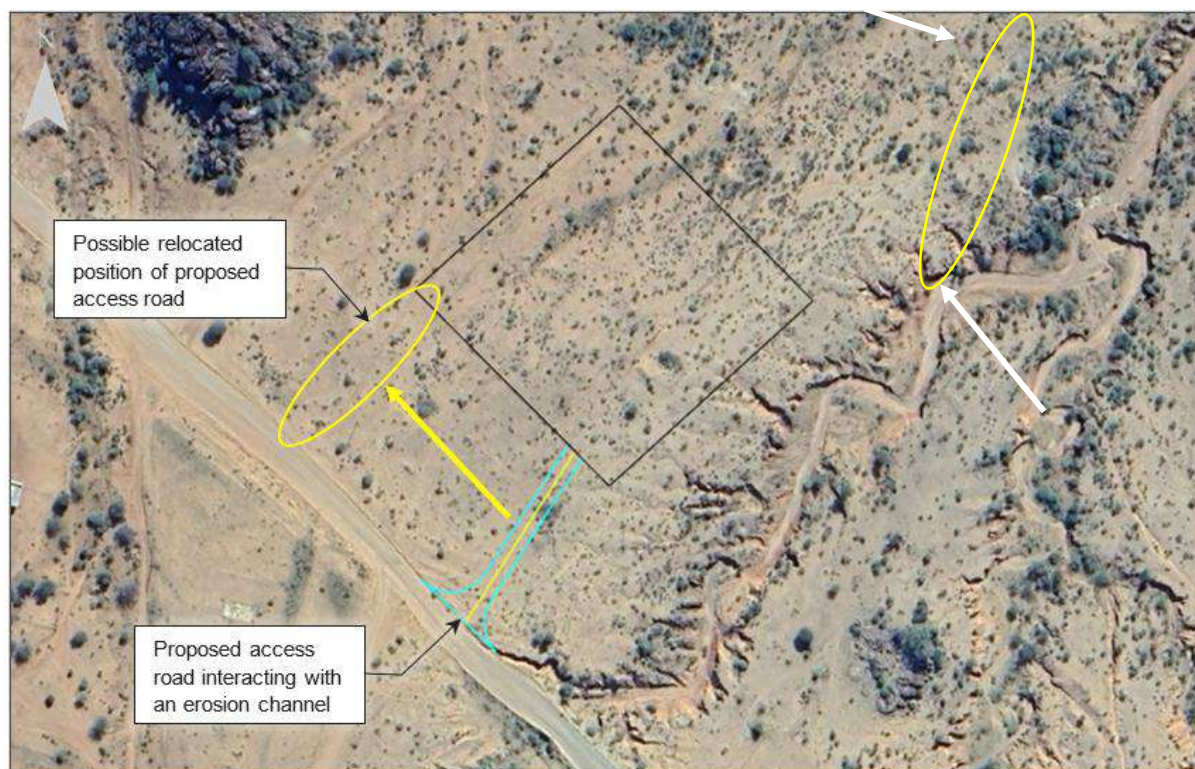


Figure 12-3: Access 2F2-34.

12.13.2.2 General Mitigations

To minimise erosion and ensure long-term functionality of access roads, particularly where they interact with natural or man-made drainage paths, the following general mitigation measures are recommended:

- ▶ Install drifts or culverts at locations where access roads intersect with natural watercourses to facilitate uninterrupted flow and reduce the risk of overtopping.
- ▶ Construct side drains along the upstream side of access roads to collect and safely convey stormwater along the road alignment, preventing water accumulation and surface erosion.
- ▶ Protect road embankments against erosion by lining the toe with semi-flexible materials such as Reno mattresses or stone pitching.
- ▶ Erosion protection should also be provided at culvert inlets and outlets using durable materials such as stone pitching, reno mattresses, or Armorflex to prevent scour and undermining.
- ▶ At junctions where access roads meet paved roads with existing drainage infrastructure, ensure that surface drainage patterns are preserved, if possible, and that flow continuity is maintained.

The following stormwater interventions are also proposed:

- ▶ Drift or culverts should be installed where access roads cross natural flow paths to allow for uninterrupted water movement.
- ▶ Side drains should be constructed along the upstream side of the road to collect and convey stormwater water along the road alignment.
- ▶ Erosion protection should be implemented by lining the toe of the road embankments with semi-flexible materials such as reno mattresses or stone pitching.
- ▶ Culvert inlets and outlets should be protected against erosion using durable materials like stone pitching, reno mattresses or Armorflex.
- ▶ Where access roads connect to paved roads where side drainage is present, the relevant surface drainage should be maintained by the access road.

13 SUMMARY OF IMPACTS AND ASSOCIATED MITIGATION MEASURES

The following tables cover the construction activities and associated environmental impacts that will occur during the development of the Phase 2F pipeline alignment.

The tables consider the expected impacts during the different phases of the project, as well as the mitigation measures and environmental management procedures required to effectively manage the expected impacts. The following sections are dealt with in the table:

- ▶ **Section 13.1:** Pre-construction and construction site environmental management
- ▶ **Section 13.2:** Materials
- ▶ **Section 13.3:** Waste
- ▶ **Section 13.4:** Surrounding properties
- ▶ **Section 13.5:** Flora, fauna, air quality, noise, water and other
- ▶ **Section 13.6:** Rehabilitation
- ▶ **Section 13.7:** Planning and engineering considerations

13.1 PRE-CONSTRUCTION AND CONSTRUCTION SITE ENVIRONMENTAL MANAGEMENT

Table 13-1: Pre-construction and construction site environmental management.

ACTIVITY	ASPECT	POTENTIAL IMPACT	IMPLEMENTATION			MONITORING		
			RESPONSIBLE PERSON	MITIGATORY MEASURE (OBJECTIVES AND TARGET)	TIMEFRAME	RESPONSIBLE PERSON	FREQUENCY	PERFORMANCE INDICATOR
13.1.1 Engineering Design	All aspects listed in the EMPr	Incompatibility between the design and the receiving environment	Developer	Objective: To ensure the design of the Project considers environmental sensitivities. Target: Assimilate requirements of the EMPr in the design and construction management giving special attention to the environmental sensitivities identified by the EIA specialists.	During the tender, design and design review stages	DWS and/or relevant Project Implementer in consultation with appointed specialists.	Throughout design phase	The design meets objectives and does not degrade the receiving environment.
13.1.2 Establishment of the construction site	Construction site	Construction activities infringing on no-go areas.	Developer, Contractor and EM with the inputs from appointed specialists	Objective: Ensure the establishment of the construction site does not infringe on or damage/pollute the no-go (buffer zone) areas. Target: - Adequately fence off all no-go areas according to the specialist reports conducted as part of the EIA process. - Erect no-go signage on the fences of these areas. - Ensure all appointed staff and visitors are aware of these areas.	Pre-construction phase	Developer, Contractor, and ECO in consultation with appointed specialists.	- Throughout the pre-construction phase until targets are met. - Monitor during the construction phase.	No trespassing within or damage to the no-go areas.
13.1.3 Establishment of the construction site	Construction site	Undue damage to or loss of vegetation	DWS and/or relevant Project Implementer and EM	Objective: To prevent and mitigate the undue damage or loss of natural vegetation outside the boundaries of The Project footprint. Targets: - Site establishment shall take place in an orderly manner and all amenities shall be installed or be available before the onset of construction. Where such amenities are not available, chemical toilets shall be provided. - A method statement is required from the Contractor that includes the layout of the site, management of facilities and wastewater management. - A site plan of the construction site must be provided indicating waste areas, storage areas and placement of facilities. - The Contractor shall inform all site staff of the use of supplied ablution facilities and under no circumstances shall indiscriminate excretion and urinating be allowed other than in supplied facilities. - The Contractor shall supply sealable waste collection bins and all solid waste collected shall be disposed of at a registered waste facility. - Certificates of disposal shall be obtained by the Contractor and kept on file. - Where a registered waste site is not available close to the construction site, the Contractor shall provide a method statement with regard to waste management. Under no circumstances may solid waste be burned on site or illegally dumped. - Refuse bins will be emptied and secured. - The construction site office and other areas must be placed on already disturbed land as far as possible. - Fences and security access must be maintained, throughout the project. - Emergency and contact numbers of the contractors must be available and prominently displayed on a signage board that is clearly visible.	Pre-construction phase	Engineer and ECO	Once off, unless the site area changes in which case the method statement and layout plan must be updated.	Establishment of a construction site in compliance with objectives and no evidence of environmental degradation.
13.1.4 Establishment of the construction site	Construction site	Loss of soil fertility	Contractor and EM	Objective: Whilst establishing the construction site the footprint of disturbance is to be minimised thereby preventing the undue degradation and loss of soil. Targets: - Protect stockpiles of topsoil and subsoil material with silt fences that should be maintained during the entire construction phase on site. - Locate stockpiles outside of any buffer zones as indicated in the specialist reports and not on slopes with a gradient greater than 1:3. - Identify and clearly demarcate existing infrastructure within the study area in order to avoid damage throughout the construction phase.	Design phase and site establishment	Engineer and ECO	Once-off	Established construction camp in compliance with objectives and no evidence of environmental degradation.

13.1.5 Temporary closure of the construction site	Construction site	Potential impacts associated with the closure of the construction site.	Contractor and EM	Objective: To limit potential impacts on the environment for periods during which the construction site is closed. Targets: - Should the construction site be closed for a period of more than one week, a report on compliance will be lodged with the Engineer and Project Manager confirming the following: - No persons allowed other than project employees. - Minimal materials are kept stored. - Materials will be stored in leak-proof, sealable containers or packaging. - The store area is secure and locked. - Fire extinguishers will be serviced and accessible. - The area is secure from accidental damage through vehicle collisions, etc. - Emergency and contact numbers of the contractor will be available and prominently displayed. - Chemical toilets are emptied, kept hygienically clean and secured. 24-hour security will be on-site during this period.	Closure of construction site (for example over holiday breaks)	Engineer and ECO	Whenever the construction camp is closed for longer than a week.	Closure of the construction camp in line with the requirements of the EMPr.
13.1.6 Construction of site buildings during site establishment	Materials used to construct site buildings	Soil pollution and permanent alternation to the receiving environment.	Contractor and EM	Objective: To ensure the material for site buildings, used by the Contractor during the construction of the project, are removable and to minimise the impacts of the construction of the buildings on the environment. Targets: - No permanent structures will be permitted at the construction site. - Temporary structures shall be founded on a platform, either subsoil or screed slab. - Buildings should preferably be prefabricated or constructed of re-usable/recyclable materials. - All temporary structures must be soundly built and not pose a danger to workers. - All structure footprints are to be rehabilitated and landscaped after construction is complete.	Site establishment	Engineer and ECO	Once off, unless the site area changes and/or new buildings are required, in which case additional inspections will be required.	On-site buildings constructed according to the requirements of the EMPr.
13.1.7 Operation of sanitation systems	Sanitation systems	- Unpleasant odours on site. - An inadequate number of latrines on site. - Position of latrines. - Mismanagement of wastewater.	Contractor and EM	Objective: To ensure good sanitation systems and management throughout the construction period. Targets: - Adequate toilets must be provided for all staff. - Chemical toilets must be emptied/serviced on a regular basis to prevent them from overflowing. Proof of this must be provided to the ECO. - A minimum of one toilet must be provided per 15 persons.	Pre-construction and site establishment	Engineer and ECO	Once off, unless the site area changes and/or new buildings are required, in which case additional inspections will be required.	- Adequate toilets will be positioned at the right places as per the EMPr and ECO. - Absence of odours, erosion and build-up of detergents.
13.1.8 Vehicle parking. Storage of equipment.	- Vehicle parking and parking area(s). - Storage of equipment.	- Pollution of soils. - Disturbance of soils due to parking of vehicles outside of designated areas.	Contractor and EM	Objective: Ensure vehicles are parked according to the specifications in the EMPr and that equipment is handled appropriately. Targets: - No storage of vehicles or equipment will be allowed outside of the designated area. - Drip trays or any form of oil-absorbent material must be placed underneath vehicles and equipment when not in use.	- Throughout the construction period. - Planning to be done during the site establishment phase.	Engineer and ECO	Whenever there are stationary vehicles or equipment present on site.	- No incidents of soil pollution due to spills from stationary vehicles and equipment. - No undue disturbance of soils. - No incidents of vehicles being parked outside the designated parking area.
13.1.9 Servicing and washing of vehicles and machinery	Workshop and equipment storage areas	- Water contamination. - Soil contamination. - Noise pollution.	Contractor and EM	Objective: Ensure that the environment is not polluted by ensuring that service areas and wash bays for vehicles and machinery are made available and utilised. Targets: - No servicing of equipment on site. - Leaking equipment shall be repaired immediately or removed from the site to facilitate repair.	Whenever servicing or maintaining vehicles or equipment throughout the construction period.	Engineer and ECO	Daily monitoring by EM and monthly inspections by ECO.	- Evidence of prescribed servicing and washing services. - No incidents of soil or water contamination. - No complaints from neighbours of noise

				- All potentially hazardous and non-degradable waste shall be collected and removed to a registered waste site. - The Contractor shall be in possession of an emergency spill kit that must be complete and available at all times on site. - Only emergency repairs shall be allowed on site and a drip tray shall be used to prevent oil spills. - The contractor must ensure that delivery drivers and plant operators are informed of all relevant procedures and restrictions required to ensure compliance with this document. - Noise levels to be maintained in compliance with Occupational safety and health (OSH) requirements. - All vehicles and equipment must be well maintained to ensure that there are no oil or fuel leakages. - The following shall apply: - All contaminated soil/yard stone shall be removed and placed in containers. - Contaminated material can be taken to one central point where bioremediation can be done. - A specialist Contractor shall be used for the bioremediation of contaminated soil where the required remediation material and expertise are not available on-site. - All spills of hazardous substances must be reported to the ECO.				pollution due to servicing and washing of vehicles.
13.1.10 Personnel conduct	Personnel	Infringement of the EMPr requirements by personnel on site.	Contractor, EM and labourers.	Objective: To ensure that personnel are adhering to the EMPr requirements. Targets: - The Contractor will adhere to all requirements of the Occupational Health and Safety Act, No. 56 of 2004, including the drafting of a suitable Health and Safety Plan which will be implemented during the construction phase. - All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. - Toolbox talks to include aspects of the EMPr, especially specialist mitigation measures. - Warning signs must be placed on and around the site as per the Occupational, Health and Safety requirements. - Adequate first aid services must be provided by the contractor. - The contractor will be responsible for his own security arrangements and shall comply with all site security instructions. - Basic fire-fighting equipment must be available on site. - Personal Protective Equipment (PPE) to be provided and well maintained. - All incidents should be reported to ECO, investigated, documented and kept in safety file.	Approved PPE must be issued to all employee's pre-construction but must be used for the duration the construction phase	Engineer and ECO	Daily monitoring by EM and SOs.	- Personnel wearing proper safety uniform. - Absence of trespassers on site.

13.2
MATERIALS

Table 13-2: Handling Materials.

ACTIVITY	ASPECT	POTENTIAL IMPACT	IMPLEMENTATION			MONITORING		
			RESPONSIBLE PERSON	MITIGATORY MEASURE (OBJECTIVES AND TARGET)	TIMEFRAME	RESPONSIBLE PERSON	FREQUENCY	PERFORMANCE INDICATOR
13.2.1 Transportation of materials	Material transport	- Traffic congestions. - Production of dust during transportation. - Excessive noise.	Contractor and EM.	Objective: To ensure that whilst the material is transported, it cannot be of negative influence on the surrounding environment. Target: - The contractor should note that existing roads are sufficient to facilitate access to the new office site and that the following should be adhered to: - Adequate and appropriate traffic warning signage must be erected where applicable, along transport routes and access roads.	Targets are to be implemented prior to the start of construction and continually implemented throughout the construction phase.	Engineer and ECO.	Throughout construction phase	- Covering of material during transportation. - No complaints received. - Emergency reaction plans (for spills/accidents) must always be readily available on-site.

				- The Contractor shall take preventative measures e.g. screening, muffling (where possible), timing, and pre-notification of affected parties to minimise complaints regarding noise and vibration nuisance from construction activity sources. - Fine materials such as sand must be covered during transportation. - Appropriate response plans must be prepared by the contractor to ensure the fastest possible reaction to spills or accidents. - Deliveries must be scheduled for off-peak hour traffic times where practical. - All trucks and vehicles removing spoil from the site must have load areas and must be covered by a tarpaulin (plastic / synthetic sheets/covers) to prevent rocks and spoil from falling onto the road surfaces. - Vehicle speeds on site should not exceed 40 km/hr. - All drivers are to have licences for driving and operating the plant on site - All road vehicles are to be road worthy. - Temporary road signs and traffic control booms must be erected at the start of the temporary construction access road.				
13.2.2 Storage and handling of hazardous materials.	Hazardous material handling and storage.	- Contamination of soil, water and groundwater by hazardous material. - Inadequate remediation measures for spills.	Contractor and EM	Objective: To ensure adequate protection of soil and soil remediation measures in case of spills. Targets: - Hazardous materials – such as paint, cement, fuels, bitumen, fuel, oil, herbicides, battery acid or detergents – must be stored in sealed, lockable containers when not in use. - A register shall be kept of all substances and be available for inspection at all times. Areas shall be monitored for spills and any spills shall be contained, cleaned and rehabilitated immediately. - No decantation into unmarked containers or containers with incorrect labels. - No decanted fuel is to be left unattended in the sun. - When handling hazardous materials, the manufacturer's specifications must be complied with. The 16-point Material Safety Data Sheet is available on-site. - Drip trays must be used when handling hazardous substances. No hazardous substance containers may be placed on the soil. - All spills (minor and major) must be cleaned and remediated to the satisfaction of the ECO and EM within 24 hours of occurrence. - The contractor must ensure that there is a supply of absorbent material (e.g. Drizit) and clean-up materials readily available to absorb, breakdown and, where possible, encapsulate minor hazardous material spillages. - No material may be stacked higher than 2m unless agreed to by the SE and Health and SO. - All products are to be stored with compatibility in mind. - Storage areas shall display the required safety signs depicting "No smoking", "No naked lights" and "Danger". Containers shall be clearly marked to indicate contents as well as safety requirements. - The contractor shall supply a method statement to the engineer for approval for the storage of hazardous materials prior to site preparation. - Appoint appropriate contractors to remove any residue from spillages from the site. Handling, storage and disposal of excess or containers of potentially hazardous materials shall be in accordance with the requirements of pertinent Regulations and Acts (e.g. Hazardous Substances Act, No. 15 of 1973); NWA.	Construction period	Engineer and ECO	The duration of the construction period is dependent on the presence of hazardous material on site.	- Storage of hazardous materials in sealed and lockable containers. - No evidence of spills on site. - Absorbent and clean-up material are readily available on site.
13.2.3 Storage of fuel	Storage areas	- Contamination of soil by fuel. - Inadequate remediation	Contractor and EM	Objective: To ensure that there is optimum environmental protection (especially soil) from fuel spills. Targets:	Pre-construction phase and site establishment.	ECO	Once-off	Established fuel storage areas in compliance with the objectives of the EMPr.

		measures for spills.		- Fuel must be stored in above-ground storage tanks or sealed containers, contained within a bunded area with sump drainage. - All bunds must be designed to contain at least 110% of the tank or drum storage capacity (this shall apply to above-ground storage, and include fuels). - No drainage from fuel storage areas shall be permitted. - Any other hazardous substances stored in bulk will require bunding.				
13.2.4 Use of cement	Cement	- Contamination of soil and surrounding environment. - Decrease in ambient air quality.	Contractor and EM	Objective: Ensure that the environment is protected from the cement that will be used on site. Targets: - Cement must be delivered in sound and properly secured bags or in approved bulk containers, - Cement products in bags must be stored in storage containers to be provided at the construction camp and should only be opened when needed. - The storage facility and surrounding area must be swept and cleaned regularly as required to ensure that cement products do not pollute the surrounding environment. - Cement bags are not to be burnt on site but should be disposed of at a registered hazardous waste disposal site, as mandated by the manufacturer and the applicable legislation. - No concrete batching on bare soil.	As long as cement is in use on site.	ECO	Weekly monitoring and monthly audits	Cement delivery, storage and use will be in line with the EMPr requirements.

13.3 WASTE

Table 13-3: Handling Waste.

ACTIVITY	ASPECT	POTENTIAL IMPACT	IMPLEMENTATION			MONITORING		
			RESPONSIBLE PERSON	MITIGATORY MEASURE (OBJECTIVES AND TARGET)	TIMEFRAME	RESPONSIBLE PERSON	FREQUENCY	PERFORMANCE INDICATOR
13.3.1 Storage, removal and disposal of construction waste	Construction waste	- Land pollution. - Compaction of soil by rubble. - The decreased aesthetic integrity of the site.	Contractor and EM.	Objective: To ensure that waste is correctly stored and disposed of, decreasing the visual impact during the construction and post-construction period. Disposal of rubble and refuse in an appropriate manner. Minimise litigation. Minimise public complaints. Target: - Surplus concrete, sludge, silt, rubble or any other construction waste may not be dumped indiscriminately on site but shall be disposed of in a registered waste landfill site or recycled as per the approved contractor's Waste Management Plan (WMP). - Concrete trucks shall not be washed on site after depositing concrete unless it is within an appropriate wash bay. - Any spilt concrete shall be cleaned up immediately. - Bins and containers/skids must be made available by the contractor for the storage of construction waste and the bins to be removed from the site as required. - Temporary storage of construction waste will take place within the site, and within areas designated by the ECO and the Contractor according to the approved site layout plan. - The Contractor will be responsible to remove and transport all construction waste material off-site to a registered waste disposal or recycling facility (proof of this as well as a copy of the site's Registration Permit, must be provided by the Contractor to the ECO). - No burning of waste is permitted on site. - No waste is permitted to pollute the watercourses.	- Waste bins/skids must be available prior to construction. - Removal of waste throughout the construction period.	ECO.	Throughout the construction phase and at a frequency agreed upon in the approved WMP.	Construction waste is stored, collected, and disposed of as per the requirements of this EMPr.

13.3.2 Storage, removal and disposal of domestic waste.	Domestic waste	- Land pollution. - Unpleasant odours. - The decreased aesthetic integrity of the site.	Contractor and EM	Objective: To ensure that waste is correctly stored and disposed of, decreasing the visual and possible environmental impact during the construction and post-construction period. Targets: - The Contractor must supply sealable waste bins at the construction camp for the storage of domestic waste. - Clearly marked waste bins are to be provided for the separation of waste according to the WMP. - Recyclable waste, including glass, paper and plastic must be separated at the construction camp, stored and recycled, where economically feasible. - Personnel must be informed about the necessity of using the waste drums. - The Contractor must do site clean-ups of litter other than construction waste on a daily basis and dispose of it in the designated refuse bins provided. - The contractor must ensure that general site-wide litter clean-up will occur at least once a week. - The Contractor must dispose of all domestic refuse generated by his staff and Subcontractors on a weekly basis at a registered waste disposal facility. The Contractor must provide proof of this to the ECO in the form of a safe disposal certificate. - Sealable waste drums should be provided in close proximity to all working areas during the construction of the new office building. The waste storage area must not be allowed to overflow with waste.	- Waste bins/ skips must be available prior to construction. - Removal of waste throughout the construction period. - Regular removal of waste from waste storage area to registered disposal site.	Engineer and ECO	- Waste bins/ skips must be available prior to construction. - Throughout the construction phase and at a frequency agreed upon in the approved WMP.	Evidence of domestic waste stored, removed and disposed of according to the requirements indicated in this EMPr.
13.3.3 Storage, removal and disposal of hazardous waste	Hazardous waste	Soil and water pollution	Contractor and EM	Objective: To ensure that soil and the rest of the surrounding environment on site are protected from hazardous waste. Targets: - The Contractor is required to refer to the Hazardous Substances Act, No. 15 of 1973 act to determine whether any substance (new or waste) stored on site is subject to controls contained within the act. - All hazardous waste must be stored in sealed and suitably marked containers for removal to a registered hazardous waste disposal facility. - Any oil spillage on site will be excavated to a depth of 150 mm and disposed of for removal to a registered hazardous waste disposal site. Excavated areas are to be refilled with suitable replacement material. Alternative in-situ remediation techniques could be used if approved by the ECO. - Contaminated water must be stored in sealable marked containers and disposed of with other wastewater from the construction works. - Refer and adhere to the approved WMP as compiled by the Contractor and approved by the ECO.	Throughout the construction phase.	ECO	Old hydrocarbons and other hazardous materials must be removed on a regular basis (at least every 30 days).	All mitigation measures with regard to Hazardous waste mentioned in the EMPr are implemented.

13.4
SURROUNDING PROPERTIES

Table 13-4: Surrounding properties.

ACTIVITY	ASPECT	POTENTIAL IMPACT	IMPLEMENTATION			MONITORING		
			RESPONSIBLE PERSON	MITIGATORY MEASURE (OBJECTIVES AND TARGET)	TIMEFRAME	RESPONSIBLE PERSON	FREQUENCY	PERFORMANCE INDICATOR
13.4.1 Use of existing roads	Access roads	- Damage to access roads. - Damage to environment - Erosion.	Contractor and EM.	Objective: To minimise damage to existing roads. Target: - Care to be taken to prevent damage to existing access roads. - Adhere to traffic signs and road markings.	Implement during site establishment and monitor throughout the construction phase.	ECO.	Daily	- No claims from Landowners due to further damage on existing access roads. - No damage visible on access roads

				Ensure that open trucks are covered with tarpaulins (plastic liners) to ensure no transported materials fall onto the road surface.				
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13.5 FAUNA, FLORA, AIR QUALITY, NOISE, WATER AND OTHER ENVIRONMENTAL ASPECTS

Table 13-5: Flora, fauna, air quality, noise, water and other.

ACTIVITY	ASPECT	POTENTIAL IMPACT	IMPLEMENTATION			MONITORING		
			RESPONSIBLE PERSON	MITIGATORY MEASURE (OBJECTIVES AND TARGET)	TIMEFRAME	RESPONSIBLE PERSON	FREQUENCY	PERFORMANCE INDICATOR
13.5.1 Vegetation clearing	Vegetation	- Damage to vegetation. - Erosion and sedimentation.	Contractor and EM.	Objective: Minimise damage to vegetation. Target: - The objective of vegetation clearing is to trim, cut or clear the minimum number of trees and vegetation necessary for the safe construction and operation of the proposed Phase 2F alignment. - No vegetation shall be pushed into heaps or left lying on the site for extended periods. - Where possible, do not clear vegetation in areas where construction activities are only planned for a later period (i.e., implement a phased approach). - All topsoil removed is to be stored for future use during rehabilitation.	- Plan vegetation clearing according to construction timeframes during the pre-construction phase. - The clearing is to be done during the construction phase as required.	ECO	Weekly monitoring	No unnecessary loss of vegetation.
13.5.2 Vegetation clearing	Conservation and protection of flora	Unnecessary removal of flora. Removal of vegetative matter for firewood.	Contractor and EM.	Objective: Minimise the extent of vegetation removal. Target: - Only eradicated or trimmed-down vegetation matter may be removed from the site. - No vegetative matter may be removed for firewood – this is strictly prohibited unless approved by the ECO (i.e., disposal of Eucalyptus and Wattle invasives may be considered). - No open fires are permitted. - No material storage or lay down is permitted under trees.	During the establishment of the construction site.		Weekly monitoring	No unnecessary loss of vegetation.
13.5.3 Protection and handling of possible fauna on site.	Protection of fauna	- Intentional or unintentional killing of fauna on site. - Loss of fauna due to habitat disturbance.	Contractor and EM	Objective: To ensure that fauna found on site are protected and not interfered with. Target: - The contractor must ensure that the site is kept clean and free of rubbish that could potentially attract animal pests and that rubbish bins are scavenger-proof. - The contractor must report problem animals or vermin to the ECO. - Ensure that domesticated animals belonging to the local community are kept away from the construction works. - The contractor may under no circumstances make use of pesticides or poison to control unwanted animals. - Animals (incl. snakes, tortoises and lizards) must be removed from the site should they be directly threatened by vegetation clearance or construction activities. The EM or ECO must be contacted for assistance in this regard. Snake handling must be done by an appropriately trained individual. - Excavations and trenches must be inspected daily (first thing in the morning) to check whether any animals have been trapped. Any trapped animals must be removed and relocated to a safe location outside of the development footprint.	Throughout the construction and post-construction period.	ECO	Continuous	- No evidence of domestic animals on site. - The site is kept clean and does not attract pests or local fauna.

				In terms of fencing and movement of fauna, the following must be implemented: • Small ground-level openings, 20 - 30 cm in height, should be kept clear in electrical fencing, at least at strategic places, to facilitate the movement of small mammals and reptiles to move through the site. • Fencing (e.g., palisade) must provide an appropriate opening for animals to pass through – bars placed 20 cm apart should provide sufficient space for the movement of small animals whilst deterring humans; and • If not electrified, the bottom wire of the perimeter fence must be at least 15 cm from the ground, 20 cm if electrified (tortoises retreat into shells when shocked).				
13.5.4 Earthworks	Dust control	Air pollution	Contractor and EM	Objective: To reduce the generation of dust on the construction site. Target: • Dust suppression is to be conducted during construction, or as complaints are received • The Contractor is to take appropriate measures to minimise the generation of dust as a result of excavation works (such measures include frequent spraying during low rainfall periods or by using chemical dust binding agents approved by the ECO).	Throughout the construction period.	ECO	During periods of low rainfall or as required by the ECO.	Dust is kept within the dust control regulatory levels on site.
13.5.5 Use of construction vehicles and equipment	Construction vehicles, plant and machinery.	Noise and vibration.	Contractor and EM	Objective: Noise levels are kept to a minimum on-site. Target: • Should construction have to continue after hours, all affected stakeholders must be notified. • All machinery and equipment must be maintained in good working order and fitted with approved and specified muffler systems (where possible). • The contractor shall have updated complaints register on-site.	Throughout the construction period.	Engineer and ECO	Continuous	No complaints received from affected communities/stakeholders.
13.5.6 Water use and protection of the watercourse	Water management	• Water wastage. • Pollution of the watercourse. • Degradation of the downstream water resource.	Contractor and EM	Objective: To prevent the pollution of water, any long-term degradation of the area's watercourses and the unnecessary wastage of water. Target: • Comply with all requirements of the approved WUL and aquatic assessments. • Maintain all required buffer zones as per specialist assessments. • During the execution of the works, appropriate measures to prevent pollution and contamination of the riparian environment must be implemented e.g., including ensuring that construction equipment is well maintained, and drip trays must be used at all times. • The use of silt fences is more important during summer months (rainy seasons) and would require more regular maintenance during this time. • Where earthwork is being undertaken in close proximity to any watercourse, slopes must be stabilised using suitable materials, i.e., sandbags or geotextile fabric, to prevent sand and rock from entering the watercourses. • Appropriate rehabilitation and re-vegetation measures for the watercourse banks must be implemented timeously. In this regard, the banks should be appropriately and incrementally stabilised as soon as development allows.	Construction phase	Engineer and ECO	Continuous when these activities are taking place.	Activities undertaken near watercourses must be in-line with and consider the specified environmental controls.

				- All water used on site must be done so sparingly. Toolbox talks must include the conservation of water. - Avoid unnecessary vehicle crossings and access into the watercourse. - Any dewatering that needs to be done from excavated areas during the construction phase should be released into a silt bay that is maintained in order to trap and remove sediments before they enter the watercourse habitat.				
13.5.7 Protection of heritage resources	Heritage resources	Damage to heritage resources on site.	Contractor and EM.	Objective: To prevent any damage to heritage resources on site. Target: - In the event that any sub-surface heritage resources or graves are unearthed, all work has to be stopped until an assessment as to the significance of the site (or material) in question has been made by a heritage practitioner. - No archaeological material that has been uncovered may be removed. This applies to graves and cemeteries as well. In the event that any graves or burial places are located during the development, the procedures and requirements pertaining to graves and burials will apply. If human remains are uncovered, or previously unknown graves are discovered, a qualified archaeologist needs to be contacted and an evaluation of the finds made. If the remains are to be exhumed and relocated, the relocation procedures as accepted by SAHRA need to be followed. - If any archaeological material is uncovered during the course of development, then work in the immediate area should cease. The find will need to be reported to SAHRA or an archaeologist. - If any area that contains stone artefacts in reasonable numbers (e.g., more than 10 within a few metres of one another) or in high concentrations is noted during the proposed developments this should be inspected by an archaeologist prior to any disturbance.	Continuous monitoring throughout the construction phase.	ECO	Daily monitoring by EM and weekly inspections by ECO	No damage to heritage resources on site.

13.6 REHABILITATION

Table 13-6: Rehabilitation.

ACTIVITY	ASPECT	POTENTIAL IMPACT	IMPLEMENTATION			MONITORING		
			RESPONSIBLE PERSON	MITIGATORY MEASURE (OBJECTIVES AND TARGET)	TIMEFRAME	RESPONSIBLE PERSON	FREQUENCY	PERFORMANCE INDICATOR
13.6.1 Rehabilitation of disturbed areas	Rehabilitation	- The visual impact of construction sites due to poor or no rehabilitation. - Risks of erosion and sedimentation of watercourse due to poor or no rehabilitation. - Potential dust impact due to poor or no rehabilitation.	Contractor and EM	Objective: To ensure adequate rehabilitation of the entire construction site upon completion of construction activities. Target: - Completed areas are to be rehabilitated as soon as possible by following a phased approach. - Rehabilitated areas are to be demarcated as no-go areas to prevent further disturbance during the construction phase. - Indigenous species are to be used where feasible, especially when considering the planting of new trees. - Where indigenous species are not considered, the contractor shall ensure that, at a minimum, the area is rehabilitated back to its original state. - All waste, storage areas, bunds, toilets, temporary roads, buildings, etc. shall be removed from the site and legally and appropriately disposed of.	Implement during the construction phase as and when sections of the works are completed.	Engineer and ECO.	Daily	- The areas along the pipeline alignment are adequately rehabilitated after construction completion. - No complaints from the Project Proponent or stakeholders.

13.7 PLANNING AND ENGINEERING CONSIDERATIONS

Table 13-7: Planning and Engineering Considerations.

ACTIVITY	ASPECT	POTENTIAL IMPACT	IMPLEMENTATION			MONITORING		
			RESPONSIBLE PERSON	MITIGATORY MEASURE (OBJECTIVES AND TARGET)	TIMEFRAME	RESPONSIBLE PERSON	FREQUENCY	PERFORMANCE INDICATOR
13.7.1 Construction activities	Existing infrastructure	Disruption of services, damage to installations, damage or loss of the plant.	Contractor and EM	Objective: To prevent disruption or damage to existing infrastructure or services. Target: - Telephone lines, power lines and fibre lines shall be identified during the construction operations. - Possible known pipelines must be considered during planning and construction. - Where pipelines are found, the depth of the pipes under the surface shall be determined to ensure that proper protection is afforded to such structures. - Repairs to any damaged pipelines shall be prioritised and undertaken as soon as possible. - All existing access roads used for construction purposes shall be maintained at all times to ensure that neighbours have free access to and from their properties. - Speed limits shall be enforced in such areas and all drivers shall be sensitised to this effect.	Prior to construction and during construction.	Engineer and ECO.	Continuous	- No unplanned disruptions of services - No damage to any plant or installations. - No complaints from authorities or Landowners regarding disruption of services. - No litigation due to losses of plant, or installations.

14 OPERATIONAL PHASE

The operational phase commences when the proposed development is being used for its intended purpose i.e., bulk raw water pipeline. It is possible that there will be a period in the project life cycle where the construction and operational phase will overlap. This phase will include ongoing operation, monitoring and maintenance of the bulk raw water pipeline, as well as continuing environmental management requirements (e.g., removal of alien and invasive vegetation).

14.1 ALIEN AND INVASIVE PLANT MANAGEMENT

According to the Terrestrial biodiversity impact assessment report, declared alien invasive species are present in the landscape and were documented within the plots surveyed. The prominent species identified are *Cactaceae* and *Datura* species. If the topsoil is effectively managed, and only topsoil that has been locally removed is returned, few alien invasive species will germinate, particularly if the use of fertilisers is avoided. These species can be removed using manual methods and labour. In areas with dense seedlings, spraying with a drone is recommended to ensure an even and controlled application of herbicide. If the infestation becomes severe, it is advised that an alien invasive species management plan be developed and implemented for the duration of the construction phase and one year post-construction.

14.2 EROSION CONTROL

Areas surrounding the bulk raw water pipeline, particularly the identified drainage lines must be monitored for signs of erosion and remedial actions implemented where required. The erosion management specifications described under the construction phase EMP must be fully implemented, where applicable.

14.3 WASTE MANAGEMENT

The incorrect management of solid waste can result in the pollution of soil, groundwater, and the general environment. Windblown litter can contribute to negative visual impacts and if consumed by grazing animals could result in fatality.

15 REHABILITATION

The landscaping and rehabilitation of disturbed areas shall occur as soon as practically possible following the completion of the work in a specific area. Therefore, the rehabilitation process will immediately be executed, per phase, upon the completion of the work within a specific area, utilising specified methods and species.

15.1 REMOVAL OF STRUCTURES AND INFRASTRUCTURE

The removal of all construction facilities and materials from the construction camp will be required and rehabilitation will have to be carried out, including the removal of the following:

- ▶ Removal of construction site and/or camp as sections of work is completed.
- ▶ Clear and completely remove from site all construction plant, equipment, storage containers, temporary fencing, temporary services, fixtures, concrete and compact earth platforms, fuel storage tanks and bund areas, chemical toilets and any other temporary works.
- ▶ Materials that will not be used again must be removed by the Contractor.
- ▶ Ensure that all access roads utilised during construction (which are not earmarked for closure and rehabilitation) are returned to a usable state and/or a state no worse than prior to construction.
- ▶ Ensure that all access roads earmarked for closure and rehabilitation are ripped and that all imported material is removed. Rehabilitation should follow the first out; last in principle (i.e. rehabilitation should occur as follows subsoil, topsoil, hydro seeding).

15.2 INERT WASTE AND RUBBLE

- ▶ Clear site of all inert waste and rubble, including surplus rock, foundations, batching plant aggregate and soil crete. After the material has been removed, the site shall be re-instated and rehabilitated.
- ▶ Remove from site all domestic waste and dispose of in the approved manner at a registered waste disposal site. Proof of this must be provided by the Contractor to the Engineer.

15.3 HAZARDOUS WASTE AND POLLUTION CONTROL

- ▶ Remove from site all pollution containment structures such as temporary sanitary infrastructure, waste water disposal systems and oil separators. Take care to avoid leaks, overflows and spills and dispose of any waste in the approved manner.

15.4 FINAL SHAPING

- ▶ Make sure all dangerous excavations are safe by backfilling and grading as required.
- ▶ In general, no slopes steeper than 1(V):3(H) are permitted, unless otherwise specified by the Engineer, in consultation with the Engineer. Steeper slopes require protection.
- ▶ Programme the backfill of excavations so that subsoil is deposited first, followed by the topsoil. Compact in layers for best results.
- ▶ A deficiency in backfill should not be made up by excavating haphazardly within the Work Site.
- ▶ Additional fill may only be imported from approved borrow areas as indicated by the Engineer.
- ▶ Monitor backfilled areas for subsidence (as the backfill settles) and fill depressions using available material.
- ▶ Shape all disturbed areas to blend in with the surrounding landscape.
- ▶ To avoid double haulage trucks should remove spoil from the construction site as they deliver bedding material.
- ▶ Ensure that no excavated material or stockpiles are left on site and that all material remaining after backfill is removed to a dedicated spoil area.

15.5 TOPSOIL REPLACEMENT AND SOIL AMELIORATION

- ▶ The principle of “progressive reinstatement” must be followed as determined by the EM and Contractor. This includes the reinstatement of disturbed areas on an on-going basis, immediately after the specified construction activities for that area are concluded.
- ▶ Execute top soiling activity prior to the rainy season or any expected wet weather conditions.
- ▶ Execute topsoil placement concurrently with construction where possible and as agreed by the Engineer.
- ▶ Redistribute stockpiled topsoil. Replace herbaceous vegetation and reinstate grass in all areas cleared by the Contractor for the construction site, including temporary access routes and roads. Replace topsoil to the original depth.
- ▶ Place topsoil in the same area from where it was stripped. If there is insufficient topsoil available from a particular soil zone to produce the minimum specified depth, topsoil of similar quality may be brought from other areas of similar quality. Ensure that the soil brought in undergoes both physical and chemical tests and is to the satisfaction of the Landowner and Engineer.
- ▶ The suitability of substitute material will be determined by means of a soil analysis addressing soil fraction, fertility, pH and drainage.
- ▶ Topsoil suspected to be contaminated with the seed of weeds must be sprayed with specified herbicides.
- ▶ Herbicides should be for selective broad leafed weeds as approved by the Engineer.
- ▶ Ensure that storm water run-off is not channelled parallel to the prevailing contours.
- ▶ After topsoil placement is complete, spread available stripped vegetation randomly by hand over the top-soiled area.
- ▶ Soil samples should be taken from the B1/2 horizon, typically at a depth of approximately 300 mm. This position in the soil horizon is where the nutrient levels are most available to plant roots, and is where the soil moisture/water content (TAWM) is best assessed. Recommendations as made by an accredited soil lab should be adhered to.

15.6 RIPPING AND SCARIFYING

- ▶ Rip and/or scarify all areas following the application of topsoil to facilitate mixing of the upper most layers. Whether ripping and/or scarifying is necessary will be based on the site conditions immediately before these works begin.
- ▶ All soil to be rehabilitated shall be ripped with a mechanical ripper to a depth of 300 mm or as agreed by the Engineer. No section of ground shall remain undisturbed after ripping.
- ▶ Rip and/or scarify all disturbed (and other specified) areas of the construction site, including temporary access routes and roads, compacted during the execution of the Works.
- ▶ Rip and/or scarify along the contour to prevent the creation of down-slope channels.
- ▶ Do not rip and/or scarify areas under wet conditions, as the soil will not break up.

15.7 PLANTING

15.7.1 TRANSPLANTED PLANTS

- ▶ All planting work is to be undertaken by suitably experienced personnel, making use of the appropriate equipment.
- ▶ Trees to be transplanted must be carefully removed from the soil so as to retain as large a root ball as practically possible. Use the tree's driplines as an indicator: the larger the tree the larger the root ball (and subsequently the planting hole).
- ▶ Minimise disturbance of the soil and the remaining roots in the root ball during the lifting, moving and or transportation of all species.

- ▶ Plant trees and shrubs so that their stems or trunks are at the same depth as in their original position.
- ▶ Orientate trees and shrubs in the same direction as in their original position.
- ▶ Plant aloe and bulbs in similar soil conditions and to the same depth as in their original position.
- ▶ The plant must be planted into the specified hole size with the approved soil, compost and fertiliser mix used to refill the plant hole and must cover all the roots and be well firmed down to a level equal to that of the surrounding in situ material, as per the rehabilitation specification.
- ▶ After planting, each plant must be well watered, adding more soil upon settlement if necessary.
- ▶ Fence all rehabilitated areas to exclude livestock, and to prevent grazing of germinating plant species.

15.7.2 GRASSING

- ▶ Suitably trained personnel must undertake grassing by making use of the appropriate equipment and using grass species as specified by the Engineer pending availability.
- ▶ Trim areas to be grassed to the required level.
- ▶ Hydroseeding with a winter mix will only be specified where re-grassing is urgent, and cannot wait for the summer.
- ▶ Depending on soil texture and slope stability, it may be necessary to establish a temporary (annual) grass cover consisting of artificial composition to aid soil binding.

15.8 MAINTENANCE

- ▶ Fence all rehabilitated areas to exclude livestock, and to prevent grazing of germinating species. Fences may only be removed when basal cover has sufficiently recovered, and density values are proximal to those assessed in the Ecological Baseline study.
- ▶ Cordon off areas that are under rehabilitation as no-go areas using danger tape and steel droppers (or other approved method). If necessary, these areas should be fenced off to prevent vehicular, pedestrian and livestock access.
- ▶ Re-vegetation must match the vegetation type, which previously existed, unless otherwise indicated in the Contract Specifications or specified by the Engineer.
- ▶ Control invasive plant species and weeds by means of extraction, cutting or other approved methods.
- ▶ For planted areas that have failed to establish, replace plants with the same species as originally specified.
- ▶ A minimum grass cover of 80% of the planted area sown, hydro-seeded or planted shall be covered with live plants of the specified species measured as basal cover, and that there shall not be any bare patches larger than 500 mm maximum in diameter.
- ▶ Individual plants must be strong and healthy growers at the end of the Defects Notification Period.
- ▶ The entire process of rehabilitation shall be meticulously documented so that the methods used on a specific part of the alignment can be replicated on other parts or even other future projects.

15.9 ERADICATION OF WEEDS

All weeds spreading over the entire construction footprint must be removed, irrespective of its existence prior to construction. Chemical removal shall be used in accordance with manufacturer's specification for weeds. All chemicals used must be approved by the ECO. Once the weeds have perished, they shall be removed mechanically by use of an offset disk plough thereby digging up the vegetation including the root ball.

15.10 CONTROL OF WEEDS

The remainder of the site including the re-vegetated areas shall be kept free of all weeds.

16 DECOMMISSIONING PHASE

- a) The decommissioning phase for this project is not foreseeable in the near future, as access to clean potable water remains an ongoing necessity. However, should the facility undergo expansion or significant upgrading in the future, an EA may be required at that time, in accordance with the prevailing legislation.
- b) Decommissioning refers to the discontinuation of the bulk raw water pipeline and the removal of all associated infrastructure. This would entail the dismantling and removal of all bulk infrastructure such as access roads, stormwater, water pipes as well as electrical supply. Rehabilitation of the site to a suitable end use would also form part of the decommissioning phase and would be associated with the decommissioning of the individual sites and structures yet to be developed as part of the Phase 2F alignment. However, it is highly unlikely that the bulk raw water pipeline would be demolished and returned to pre-construction conditions.

A Closure Plan for decommissioning is not applicable to this project as it is not anticipated that the proposed project will be closed. In case there is a need to close the Phase 2F alignment, a closure plan should be developed at the time of closure. This would likely take place during the closure of the entire alignment footprint, comprising all infrastructure authorised as part of this development. All the relevant authorisations relating to closure should be granted before closure activities commence. Any closure plan developed should take into consideration all impacts and proposed mitigations identified in this EMP and subsequent authorisations and should ensure the ongoing protection of all identified no-go areas.

17 CONCLUSION

The EMPr must be regarded as a living document and changes must be made to this EMPr as required as when the project evolves, while retaining the underlying principles and objectives on which the document is based. The compilation of the EMPr has incorporated environmental management best practice principles, impacts and mitigation measures from the draft EIA Report and all environmental specialist assessment reports (i.e., included as **Appendix D** of the BAR).

This EMPr should be read in conjunction with the approved October 2016 EMPr (Ref: Report No. **112007-EF-00-RP-ES-0001**), which was approved for the entire Phase 2F alignment.

18 REFERENCES

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ANNEXURE A: ENVIRONMENTAL ASSESSMENT PRACTITIONER DETAILS

ANNEXURE B: AUTHORITY CORRESPONDENCES

ANNEXURE C: REVISED RECORD OF DECISION (REF: 12/12/20/553)
ISSUED IN 2006

ANNEXURE D: SITE MAPS

ANNEXURE E: PROJECT SIP STATUS

In diversity there is beauty and there is strength.

MAYA ANGELOU

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