Environmental Management Plan (EMP) for Polihali Western Access Corridor (PWAC)

Volume 2

Lesotho Highlands Development Authority

Contract LHDA No.: 6004

Professional Services for the Environmental & Social Impact Assessment (ESIA) for the Polihali Western Access Corridor

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00	25 Sept 2017	First Draft
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02	10 November 2017	Final Report

Abbreviations and Acronyms

AIDS	Acquired Immunodeficiency Syndrome
ALC	Area Liaison Committee
AoI	Area of Influence
AWDs	Aircraft or Aviation Warning Devices
BID	Background Information Document
BFDs	Bird Flight Diverters
BMP	Biodiversity Monitoring Plan
BOD	Biological Oxygen Demand
BPST	Bulk Power Supply and Telecommunications
BRA	Building Restriction Area (30 m either side of centre line of road)
CALC	Community Area Liaison Committee
CES	Coastal & Environmental Services
CFP	Chance Finds Procedure
CFRD	Concrete Faced Rockfill Dam
CHP	Cultural Heritage Plan
CHS	Cultural Heritage Specialist
CLC	Community Liaison Committee
CLO	Community Liaison Officer
CLS	Community Liaison Structure
CMP	Comprehensive Mitigation Plan
CoC	Code of Conduct
COD	Chemical Oxygen Demand
dB	Decibel, unit of measurement that indicates how loud a sound is
Deg C	degree Celsius, symbol °C
DoE	Department of Environment
Σ	Sum of
EC	Electrical Conductivity
ECO	Environmental Control Officer
e.g.	Exempli Gratia, Latin term which means “for example”
EHS	Environmental, Health and Safety (IFC standards)
EM	Environmental Manager (for Engineer)
EMP	Environmental Management Plan
ERM	Environmental Resources Management Southern Africa (Pty) Ltd
ESIA	Environmental and Social Impact Assessment
ESIS	Environmental and Social Impact Statement
ESMP	Environmental and Social Management Plan
ESMS	Environmental and Social Management System
ESS	Environmental and Social Standards (World Bank)
et al.	Et alia, Latin term means “and others”
etc.	Et cetera, Latin term means “and so on”
FOB	Field Operations Branch (LHDA)
FSL	Full Supply Level
GIS	Geographic Information System
GPS	Geographic Positioning System
hr	Hour
ha	Hectare, a unit of area
HIV	Human Immunodeficiency Virus
HSE	Health, Safety and Environmental
HSO	Health and Safety Officer
i.e.	Id est, Latin term for “that is”
IFC	International Finance Corporation
ILO	International Labour Organisation
IUCN	International Union for Conservation of Nature
kg	Kilogram
km	Kilometre
kN	Kilonewtons
kp	Kilometre point (measured at 1 km intervals along the PWAR)
kV	Kilovolt, a unit of electric potential
kw	Kilowatt

LEC	Lesotho Electricity Company
LHDA	Lesotho Highlands Development Authority
LHWC	Lesotho Highlands Water Commission
LHWP	Lesotho Highlands Water Project
LHWP2	Phase II of the Lesotho Highlands Water Project
LIDAR	Light Detection and Ranging
LTDC	Lesotho Tourism Development Council
m	Meter, unit of length
m^2	Square meter, unit of area
m^3	Cubic metre, unit of volume
m amsl	Metres above mean sea level
masl	Metres above sea level
MTEC	Ministry of Tourism, Environment and Culture
Mg/l	Milligram per litre
ml	Millilitre, unit of volume
mm	Millimetre, unit of length
MSDS	Material Safety Data Sheets
mS/m	milliSiemens per meter
MVA	Mega Volt Amp, unit for the apparent power in an electrical circuit
NAR	Northern Access Road
NGO	Non-government organisation
nMAR	Normal Mean Annual Run-off
NO_2	Nitrogen dioxide
NTS	Non-technical Summary
OPGW	Optic Power Ground Wire
ORASECOM	Orange-Senqu River Commission
ORP	Oxidation Reduction Potential
PAH	Polyaromatic hydrocarbons
PES	Present Ecological State
PLRD	Project Labour Recruitment Desk
PM	Particulate matter
PNEAR	Polihali North East Access Road
PoE	Panel of Experts
PPE	Personal protective equipment
PRAI	Polihali Reservoir and Associated Infrastructure
PS	Performance Standards
PWAR	Polihali Western Access Road
PWAC	Polihali Western Access Corridor
RAP	Resettlement Action Plan
RD	Roads Directorate
SADC	Southern African Development Community
SANS	South African National Standard
SMS	Safety Management System
SO_2	Sulphur dioxide
TDS	Total Dissolved Solids
ToR	Terms of Reference
TP	Turning Point
TSP	Total Suspended Particulate
TSS	Total Suspended Solids
VIP	Ventilated Improved Pit
WGS84	World Geodetic System developed in 1984 and updated in 2004. It is an Earth-centred, Earth-fixed terrestrial reference system and geodetic datum. WGS84 is based on a consistent set of constants and model parameters that describe the Earth's size, shape, and gravity and geomagnetic fields.
WHO	World Health Organisation
WMGA	Wool and Mohair Growers Association

Glossary of Terms

Technical Term	Definition
Biodiversity	The variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems.
Biodiversity Offset	Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from development plans or projects after appropriate prevention and mitigation measures have been taken.
Bund	An impermeable enclosure or structure to contain spillages under or around an area where hazardous substances are stored or handled. Bunds should typically be provided at refuelling stations, under any container with hazardous substances (oil, fuel, paints, chemicals, solvents, etc.) or any piece of machinery, i.e. generators, which may leak fuel, lubricants or hydraulic fluids.
Colluvial sediments	Loose, unconsolidated sediments that have been deposited at the base of hillslopes by rainwash, sheetwash, slow continuous downslope creep, or a variable combination of these processes.
Community engagement	Part of the Social and Environmental Assessment, community engagement is an ongoing process involving disclosure of information, consultation with affected communities, and the establishment of a grievance mechanism.
Compensation	Payment in cash or in kind for an asset or a resource that is acquired or affected by LHWP Phase II activities.
Consultation	Consultation involves interactive communication between the client and the affected communities. The consultation process should be undertaken in a manner that is inclusive and culturally appropriate and that provides the affected communities with opportunities to express their views on project risks, impacts and mitigation measures, and allows the client to consider and respond to them. The consultation process will ensure free, prior and informed consultation.
Contractor	For the purposes of this Management Plan: 'Contractor' refers to the Contractor(s) appointed by the Consultant for the construction of the Project, or portion of the Project. The Contractor(s) are required to adhere to the Environmental Management Plan (EMP) as are all Subcontractors, suppliers and staff. The Contractor is further responsible for ensuring any visitor to a project site complies with the EMP.
Economic displacement	Loss of income streams or means of livelihood resulting from land acquisition or obstructed access to resources (land, water, or forest) due to the construction and operation of LHWP Phase II.
Ecoregion	An ecoregion is defined as a "relatively large unit of land or water containing a characteristic set of natural communities that share a large majority of their species, dynamics, and environmental conditions.
Ecosystem Services	Defined as the benefits that people obtain from nature. These are typically divided into four categories. • Provisioning services are the goods or products obtained from ecosystems, such as food, timber, medicines, fibre, and freshwater. • Regulating services are the benefits obtained from an ecosystem's control of natural processes, such as climate, disease, erosion, water flows, and pollination, as well as protection from natural hazards. • Cultural services are the nonmaterial benefits obtained from ecosystems, such as recreation, spiritual values, and aesthetic enjoyment. • Supporting services are the natural processes that maintain the other ecosystem services, such as nutrient cycling and primary production.
Fen	Being a type of mire, fens are open ended wetland systems (having surface water and groundwater inputs and outputs) that contain peat. In the Highlands of Lesotho characteristic features of the fens are the lawns (meadows) of sedges and grasses, scattered pools and hollows, hummocks and meandering stream channels. In the

	alpine areas of Lesotho fens generally do not occur below an altitude of approximately 2750 mamsl, although exceptions do occur. They are also usually dominated by minerals from surrounding soils.
Fill	Fill is defined as earth material excavated from one location along the corridor or cut excavations and relocated elsewhere as compacted fill. Cut and fill material will generally not be stockpiled, but will be removed from the excavation site and transported directly to the construction face for immediate reuse as compacted fill. Unsuitable excavated material will primarily be transported to identified locations within the road corridor for reuse or, if space is not available, will be stored temporarily off-site for re-use later.
Flashover	Abnormal electrical discharge that can result when bird excretion short circuits the insulator strings or jumper clearances.
Grievance	A grievance is a formal action brought forward by any individual, group of individuals or a community, who allege damage, impact or dissatisfaction as a result of the actions of the Project or its' Contractors. The grievance entails the expectation of a response or a corrective action that may be compensation in the form of cash, services or in kind.
Habitat	The environmental or ecological area in which an animal, plant species or other organism lives.
Hazardous substances / waste	Hazardous substances are substances that are potentially dangerous and may affect human and/or environmental health. This would be because of the substances' inherent chemical and physical composition, which could be toxic, poisonous, flammable, explosive, carcinogenic or radioactive. Hazardous substances include, but are not limited to: human excrement, fuel, lubricating oils, hydraulic and brake fluid, acids, paints, anti-corrosives, insecticides, pesticides, detergents, cement, medical sharps, etc. Hazardous waste is the by-products and wastes associated with the use of hazardous substances, as well as potentially hazardous items such as spent batteries, old oil filters, light bulbs, circuit boards, sharp objects etc. which requires special collection and handling.
Heritage site / artefacts	Any object or site of cultural, historical, archaeological or palaeontological significance found in or on the land.
Household	A group of persons with one family head bound by blood, marital or legal relationship living together in a dwelling (home or homestead).
Humic soil	For a soil to be classified as a humic soil according to Soil Classification: A Taxonomic System for South Africa (1991), the soil must contain 1.8 % or more organic carbon in a soil sample taken between the depths of 250 mm and 450 mm.
Humification	As applied to peat, the humification scale is a representation or indicator of the degree of decomposition of peat (organic material). As applied in this study, the method involved the visual evaluation of freshly extracted peat based on a 10-point humification scale. This *in situ* method gives a rapid description of the peat stratigraphy (analytical order, position and structure of the peat) along a peat profile or core.
Hydrogeomorphic	A combination of hydrology (ie. the nature of movement of water) and geomorphology (i.e. landform characteristics and processes),

Incident	An event or occurrence occurring at work or arising out of or in connection with the activities of persons at work, or in connection with the use of plant or machinery, in which, or in consequence of which:
	• Any person dies, becomes unconscious, suffers the loss of a limb or part of a limb or is otherwise injured or becomes ill to such a degree that he is likely either to die or to suffer a permanent physical defect or likely to be unable for a period of at least 14 days either to work or to continue with the activity for which he was employed or is usually employed;
	• A major incident occurred; or
	• The health or safety of any person was endangered and where:
	  • A dangerous substance was soiled;
	  • The uncontrolled release of any substance under pressure took place; and
	  • Machinery or any part thereof fractured or failed resulting in flying, falling or

	uncontrolled moving objects, or machinery ran out of control.
Invasive alien (plants)	Species are identified as invasive aliens when (i) they are non-native to an ecosystem, and (ii) their introduction is liable to cause environmental harm, or harm to human health and livelihoods, because they spread rapidly and have negative effects on native species through competition, predation, or disease. Invasive species can be flora, fauna, or other organisms (e.g., microbes) but generally refer to plants.
Livelihood restoration	The measures that are required to mitigate the negative impacts on households that will be economically and physically displaced by LHWP Phase II, through loss of shelter and assets, and loss of access to resources, markets and services that support livelihoods. These measures are in addition to compensation, since compensation alone does not guarantee the restoration of livelihoods.
Local communities	Community within the Project's Area of Influence.
Method Statement	An Environmental Method Statement is a document compiled to address the approach and methods required to manage specific construction activities at a site level for use by site management and construction staff.
Peat	Fibrous organic material composed of well-preserved plant remains that are readily identifiable, generally occurring in low energy, permanently saturated conditions in wetlands.
Physical displacement	Relocation of families as a result of loss of or damage to homes / shelter.
Project Area	The Area of Influence within which the majority of impacts of the project are likely to occur. The extent of the area is variable depending on the aspect under consideration.
Rehabilitation	Measures implemented to return a disturbed environment to its former natural state or to imitate as close as possible its former natural state.
Remediation	Measures implemented to: clean-up a polluted environment to a stable state to avoid long-term leaching / spread of pollutants or health risks; or repair an altered / disturbed environment to avoid long-term visual scarring, safety risks, erosion and further degradation and secondary impacts.
Resettlement Action Plan	The document in which a project sponsor or the responsible entity specifies the procedures that it will follow and the actions that it will take to mitigate adverse effects, compensate losses, and provide development benefits to persons and communities affected by an investment project.
Seep Wetland	A wetland area located on gently to steeply sloping land and dominated by colluvial (i.e., gravity-driven), unidirectional movement of water and material downslope.
Sheetrock Wetland	A wetland area located on gently to steeply sloping land dominated by shallow organic soils overlying relatively flat exposed sheetrock which may form shallow pools. These systems can be rain fed or seepage driven. There is generally a unidirectional movement of water and material downslope in these systems but in many cases relatively flat shallow pools can temporarily store water.
Social development	Initiatives to ensure that communities in the Project Area become beneficiaries of the development. It refers to a more open-ended programme of interventions aimed at contributing to social and economic development of Project affected communities. The scope of these interventions typically extends beyond directly affected (physically and economically displaced) households and villages to include other members of the Project Area.
Spoil	Spoil is defined as any earthen or rock material that is surplus to requirements or unsuitable for re-use in fill and embankments (such as unsuitable rock and soil material) or material that is contaminated.
Spring	An area where groundwater emerges at the surface, usually providing a source of permanent surface water which may or may not be flowing.
Threatened	A taxon is Vulnerable (VU) when it is not Critically Endangered (CR) or Endangered (EN) but is facing a high risk of extinction in the wild in the medium-term future, as defined by the IUCN criteria (www.iucnredlist.org).
Toolbox Talk	A daily short discussion of a supervisor to convey safety or environmental related issues, work methods etc. surrounding a specific procedure or task to be done.
Valley Bottom Wetland	A mostly flat wetland area located along a valley floor, often connected to an

	upstream or adjoining river channel.
Vulnerable groups	People who by virtue of age, physical or mental disability, gender, economic disadvantage, or social status may be more adversely affected by resettlement than others and who may be limited in their ability to adapt to the change, claim compensation, or take advantage of resettlement assistance and related development benefits.
Water Quality	Refers to the chemical, physical and biological characteristics of water. It is a measure of the condition of water relative to the requirements of aquatic ecosystems, or to any human need or purpose (e.g., domestic water use, agricultural water use, industrial water use, recreational requirements).
Wetland	The National Water Act 36 of 1998 provides the legal wetland definition used in South Africa: "*land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil*."

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Section 1 Introduction

1.1 Background

On the 11th August 2011, the Governments of Lesotho and South Africa signed an agreement which provides for implementation of Phase II of the Lesotho Highlands Water Project (LHWP2). The Water Transfer component of Phase II will comprise the Polihali Dam downstream of the confluence of the Khubelu and Senqu (Orange) Rivers, and a gravity tunnel that will connect the Polihali Reservoir to the Katse Reservoir. Other Phase II activities include the establishment of Advance Infrastructure (Roads, Camps, Powerline, and Telecommunication facilities), Bridges, Feeder Roads, and implementation of environmental and social mitigating measures, including resettlement action planning and implementation.

Construction of the LHWP Phase II Polihali Dam and Tunnel will require a new road, bulk power supply and telecommunications, the construction and operation of which are the subject of this EMP and are referred to as the Project.

1.2 Scope of Work

This report represents the Environmental Management Plan (EMP) for the construction and operation of the Polihali Western Access Road (PWAR) and Bulk Power Supply and Telecommunications (BPST) which are located within what is referred to as the Polihali Western Access Corridor (PWAC). The project components are summarised in Section 2.

A full Environmental and Social Impact Assessment (ESIA) was conducted between September 2016 and October 2017. This comprised specialist studies on terrestrial ecology, wetlands, birds, fish, cultural heritage, and social aspects, as well as a public participation process. These studies assessed a range of environmental and social impacts, and identified a number of mitigation and monitoring measures, and other recommendations, that were incorporated in the Environmental and Social Impact Statement (ESIS) (Volume 1). These mitigation and monitoring measures were extracted and integrated into this Environmental Management Plan (EMP) (Volume 2 of the ESIS).

This EMP will be implemented in line with the LHDA Environmental Policy and SHEQ Framework, and in compliance with national legislation.

1.3 Details of the Proponent

The proponent for implementation of Phase II of the LHWP is the LHDA. The contact details for the proponent are as follows:

Contact Person:	Refiloe Tlali
Position:	Chief Executive
Postal Address:	Lesotho Highlands Development Authority 10th Floor Lesotho Bank Tower Kingsway St, Maseru, 100
Tel:	+266 22311280 or +266 22 246000
Email:	mail@lhwp2pmu.co.ls

1.4 Purpose and Objectives of the EMP

This EMP has been prepared to cover the activities associated with the proposed road and powerline route of the PWAC during all phases (pre-construction, construction and post construction / operation). The majority of the EMP (specifically Section 6) covers the management measures for implementation by the Contractors for the PWAR and BPST, while additional measures that fall under the responsibility of LHDA (and other government departments are covered in Section 7. Monitoring measures to be undertaken by the Contractor or under the responsibility of LHDA are covered in Section 8.

The purpose of this EMP is to outline appropriate management strategies and actions to mitigate negative impacts and enhance beneficial impacts of the Project through all the project phases. The purpose is also to provide a basis for an on-site environmental and social manual for staff, maintenance personnel, Contractors and Consultants with responsibilities for the Project. The EMP includes the monitoring requirements to measure the efficacy of the mitigation measures and to enable adaptive management to correct mitigation requirements.

Each management action is designed to be practical, measurable and auditable. Given the expected several decades lifespan of the PWAC Project, an EMP for decommissioning is not warranted, as neither the road nor powerline are expected to be decommissioned at any foreseeable time.

The objective of the EMP is to provide:

- Environmental and social management procedures and mitigation measures for the control of Project impacts and to monitor compliance with the environmental and social requirements;
- Environmental and social performance indicators, monitoring requirements and review procedures for the Project activities;
- Government authorities, stakeholders and the proponent (LHDA) with assurance that mitigation measures will be addressed, are achievable, and a common basis for measuring compliance with specific mitigation requirements; and
- Stakeholders with assurance that identified mitigation measures to address impacts are documented evidence and that the environmental and social management of the Project can reduce negative impacts and optimize or enhance positive impacts to acceptable levels.

The measures included in this EMP are designed to manage impacts by:

- Minimising on site construction impacts through appropriate design, layout, construction procedures and compensation;
- Minimising the generation and disposal of waste;
- Managing pollution risks and construction nuisance to local communities;
- Monitoring requirements to measure and ensure environmental compliance; and
- Enhancing social benefits and minimising social and biophysical impacts.

While the majority of construction management measures are the responsibility of the Contractor, LHDA (or its delegated Consultants) will have ultimate responsibility for implementing the EMP and ensuring Contractor compliance.

1.5 Structure of this EMP

This structure of this EMP is as follows:

- **Section 1 (Introduction)** – background and scope of work, details of proponent and purpose and objectives of the EMP as outlined above;
- **Section 2 (Summary of Project Description)** – overview of the Project and other project components, summary of PWAR and BPST specifications and activities.
- **Section 3 (Legal Requirements)** – summary of relevant institutions and legal requirements related to environmental compliance.
- **Section 4 (Key Environmental and Social Sensitivities)** – summary of ecological and social sensitivities along the PWAR and BPST routes to contextualise the key areas for environmental management interventions.
- **Section 5 (Roles and Responsibilities for Implementation of EMP)** – summary of the roles and responsibilities assigned to staff involved with EMP implementation.
- **Section 6 (Environmental and Social Management during Construction)** – describes the objectives, performance requirements/standards, and mitigation requirements relevant to all construction activities separated by environmental and social receptors (e.g., air, noise, water, biodiversity etc.). It also provides separate tables of the buffer requirements and Method Statements required to guide the Contractor in planning the layout and guiding the construction activities.
- **Section 7 (LHDA Environmental and Social Management)** – describes the mitigation measures that fall under the responsibility of LHDA or in collaboration with Government Departments or institutions.
- **Section 8 (Environmental and Social Monitoring Requirements)** - describes the monitoring requirements for air, noise, water, biodiversity etc. for construction and operation phases under Contractor and LHDA responsibilities.
- **Section 9 (Other Recommendations)** – outlines additional recommendations that should be considered and implemented by LHDA.

Appendices include site sensitivity maps showing specific mitigation requirements and selected baseline data that provide useful reference sources for the mitigation measures related to household resettlement, graves, wetlands, as well as a preliminary chance finds procedure.

Section 2 Summary Project Description

2.1 Introduction

This EMP covers activities associated with the construction and operation of the proposed road, powerline and telecommunications facilities within the PWAC, which is required for the construction and operation of the Polihali Dam and water transfer tunnel.

Section 2 provides an overview of the LHWP Phase II Project and a description of other project components for the Polihali Reservoir Advanced Infrastructure (PRAI) Project, for which the road and powerline along the PWAC is required (refer to Section 2.2). Other Project components of the LHWP Phase II Project are briefly described in Section 2.3 and summarised in Table 2.1 as context for understanding the PWAC Project.

The proposed road (referred to as the PWAR) and the proposed powerline and telecommunications infrastructure (referred to as the BPST) are summarised in Sections 2.4 and 2.5, respectively.

2.2 PWAC Project Overview

The following components comprise the infrastructure proposed for the PWAC:

- Polihali Western Access Road (PWAR) that:
  - Comprises a new, paved road link between the A8 in the vicinity of Ha Seshote to the Polihali Reservoir in the vicinity of Masakong. It will be designed in accordance with the Road Directorate's (RD) standards for a Class A road (as a minimum) with due regard to the heavy traffic expected during construction;
  - Has paved junctions to local access roads where required; and
  - Includes associated road infrastructure such as drainage, culverts and bridge structures. A total of three main bridge structures are required for the crossing of the Matsoku, Liseleng and Semenanyane Rivers, and several culverts across the smaller streams traversed by the road.

- Bulk Power Supply and Telecommunications (BPST) Infrastructure (transmission lines and substations) that includes:
  - Upgrade of electrical infrastructure from the existing substation near Ha Lejone to Matsoku Intake substation;
  - New 132kV powerline from the Matsoku Intake substation to a new Polihali substation to supply the Phase II construction sites including the Polihali Dam, tunnel intake, and associated camp and office facilities;
  - Re-alignment of the existing powerline along the A1 that crosses the Khubelu and Senqu Rivers where there is potential inundation of existing electrical infrastructure due to reservoir impoundment; and
  - A telecommunications component that entails the provision of the required levels of telecommunications infrastructure to provide voice and data facilities (including teleconference) to the Phase II project areas.

The BPST ('Power and Telecoms') infrastructure components primarily follow the alignment of the PWAR although the powerline deviates from the PWAR in some locations (see Figure 2.1).

Note: A separate ESIA for the PRAI includes the BPST components for the realignment of the powerline along the A1 over the Khubelu and Senqu Rivers and the new Polihali substation near

the Polihali Advanced Infrastructure area. The western construction camp for the PWAC is expected to fall under a separate EMP.

2.3 Other Project Components

The PRAI for which the road and powerline along the PWAC is required comprises the following components which are assessed under a separate Environmental and Social Impact Assessment (ESIA):

- **Polihali Dam & Saddle Dam**: The proposed Polihali Dam is a 164-m high, concrete-faced rockfill dam (CFRD) with a side channel spillway located approximately 2 km downstream of the confluence of Khubelu and Senqu Rivers, in the vicinity of Malingoaneng village. A 50-m high saddle dam is required to the north of the main Polihali Dam. The Full Supply Level (FSL) for the Polihali Reservoir is 2075 masl.

- **Quarries and Borrow Pits**: Material for the rockfill embankments will be obtained from quarries located on the upstream left and right banks of the Polihali Dam. Material suitable for use as concrete aggregates will be obtained from the Tsilantso quarry on the eastern side of the reservoir.

- **Project Housing and Site Establishment**: The Phase II works will be built under a number of construction contracts, each of which will require accommodation facilities for staff and the labour force, site offices, workshops, plant yards, quarries, explosives stores and other works areas.

- **Polihali to Katse Transfer Tunnel (Eastern Side)**: The Polihali to Katse transfer tunnel comprises the intake works and gate shaft at the Polihali Dam and associated infrastructure for construction purposes such as site access roads, quarries, plant yards, labour accommodation, spoil area and other tunnel works areas.

- **Major Bridges, including the Senqu, Khubelu and Mabunyaneng Bridges, and Associated Road Works**: The Senqu, Khubelu and Mabunyaneng Bridges are all on the existing A1 national road from Oxbow to Mokhotlong. The impounding of water in the Polihali Reservoir will necessitate the replacement of a number of existing roads and tracks. The construction of a pedestrian bridge (Tlhakola Bridge) is proposed across the reservoir at Tlhakola. In addition to the major bridges, the A1 road together with associated structures near the new bridges must be realigned.

All temporary works areas (including bulk services, labour camp and works areas for the tunnel and dam construction, as well as camps for construction of the eastern end of the PWAR road and powerline) are located in the vicinity of the Polihali Dam, and fall under the ESIA for the PRAI. The PRAI ESIS also includes the following electrical and road components associated with the PWAR and BPST that are located in the area of the Polihali advanced infrastructure:

i) new Polihali Substation to be located near Masakong;

ii) realignment of the existing powerline along the A1 crossing of the Khubelu River; and

iii) A new permanent 33kV line from Tlokoeng across the reservoir to the area proposed for the permanent camp and lodge to provide electrical supply for the advanced infrastructure. LEC has requested that this be constructed as a permanent line over the reservoir to provide supply services and villages on the west of the reservoir in future.

A summary of the individual components covered by the different ESIAs are summarised in Table 2.1.

Figure 2.1 Locality Map Showing PWAR and BPST Route in Relation to Polihali Reservoir

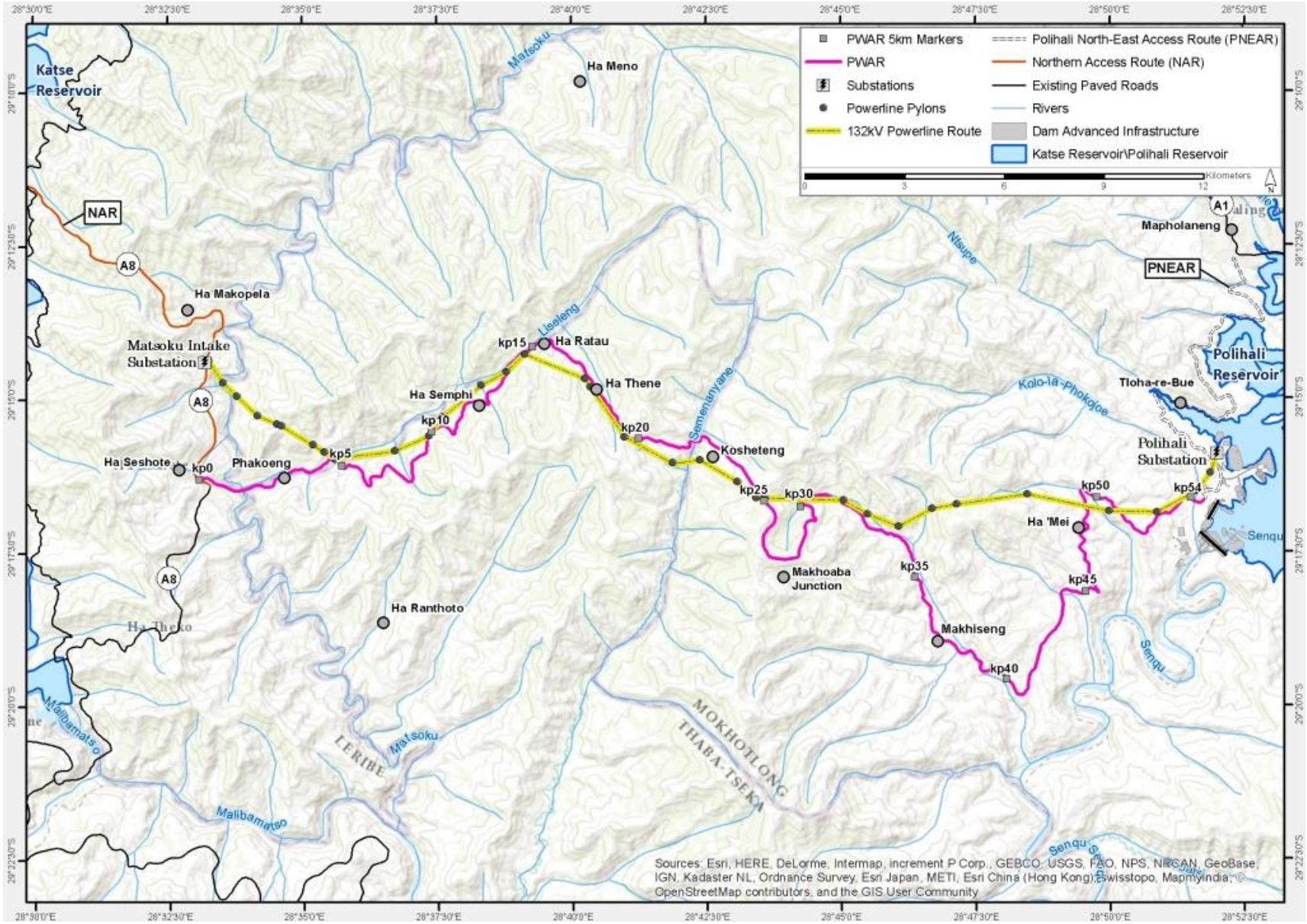


Table 2.1 LHWP Phase 2 Project Components and Environmental Process (EMP or ESIA)

Type of Infrastructure	PWAC ESIA (Covered in This Report)	PRAI (Separate ESIA)	Western Facilities (Separate EMPs)	PNEAR (Separate EMP)	NAR (Separate EMP)	Diversion Tunnels (Separate EMP)	Tunnel Works (Separate ESIA)
Road and Bridge Infrastructure	• 55 km tarred road (PWAR) between Ha Seshote to Polihali Dam • 3 new bridges over Matsoku, Semenanyane and Makhoaba Rivers • New culverts over streams • Paved junctions to villages	• Realignment of existing A1 Road over Khubelu River • New major bridge across reservoir (Khubelu, Senqu)	Construction camp / works area for PWAR near Ha Seshote	Polihali North East Access Road (PNEAR) (Mapholaneng to Masakong at Polihali Dam)	Upgrading of existing Northern Access Road (NAR) (A8: Pitseng - Ha Seshote)		
Powerline Infrastructure	• New 34.5 km 132kV powerline from Matsoku substation (near Ha Seshote) to a new Polihali substation at Masakong • Expansion of Matsoku substation to include two new turbines (to be moved from Ha Lejone substation) • Upgrades at existing substations • Upgrade of existing 66kV lines	• New substation at Masakong, Polihali • New 33kV powerline from Tlokoeng substation across reservoir to permanent Polihali camp /offices / lodge	Construction camp / works area for BPST near Matsoku Substation				
Telecommun - ications Infrastructure	• Telecommunications infrastructure on 132kV pylons	• New telecommunications mast near Polihali Dam site					
Dam (and support) Infrastructure		• Coffer Dam, Main Dam and Saddle Dam walls • New Polihali village with lodge, offices, visitors centre • Eastern Facilities comprising tthe permanent (Polihali Village). Operations & Commercial Centres • Eastern Facilities also includes the required labour camps at the dam wall and near Masokong for PWAR and BPST and tunnel Contractors • Quarries for aggregate supply for dam wall construction • Spoil dumps					
Tunnel Infrastructure		• Opening of tunnel intake at Polihali (lower Khubelu) • Spoil dump • Access roads to tunnel intake and spoil dumps • Tunnel boring machine assembly area • Tunnel works area and offices	• Upgrading of Katse Lodge facilities for management staff			• Dam Wall Diversion tunnels (two tunnels, one of 9 m and 7 m); • Spoil areas; • Office, workshop, camp; • Explosives magazine	• Polihali – Katse (Matsoku) tunnel construction and operation (western end) • Western construction camp for tunnel Contractors (edge of Katse Dam)

Figure 2.2 Locality Map and Infrastructure Layout (see Figure 2.3 for inset box detail)

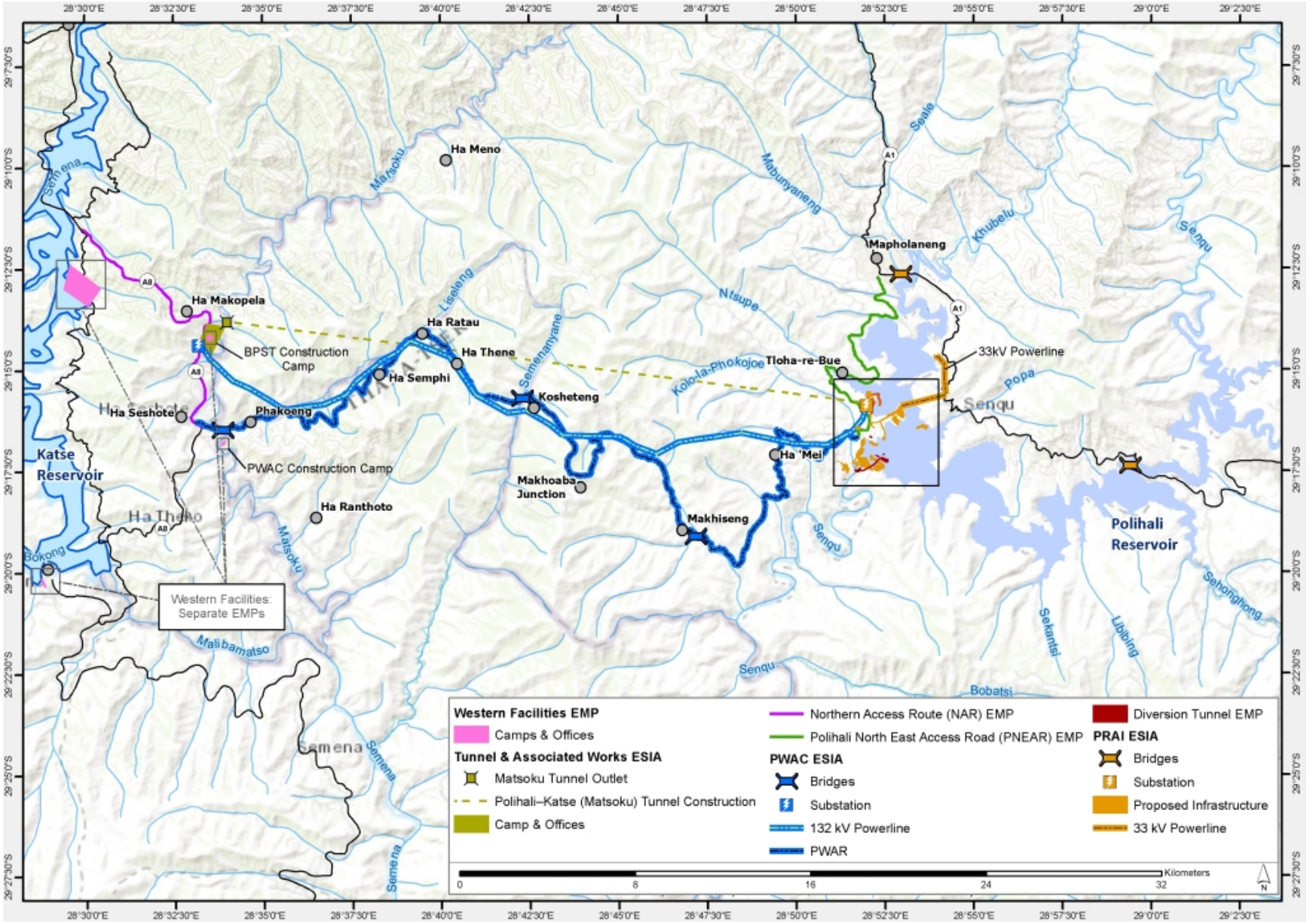
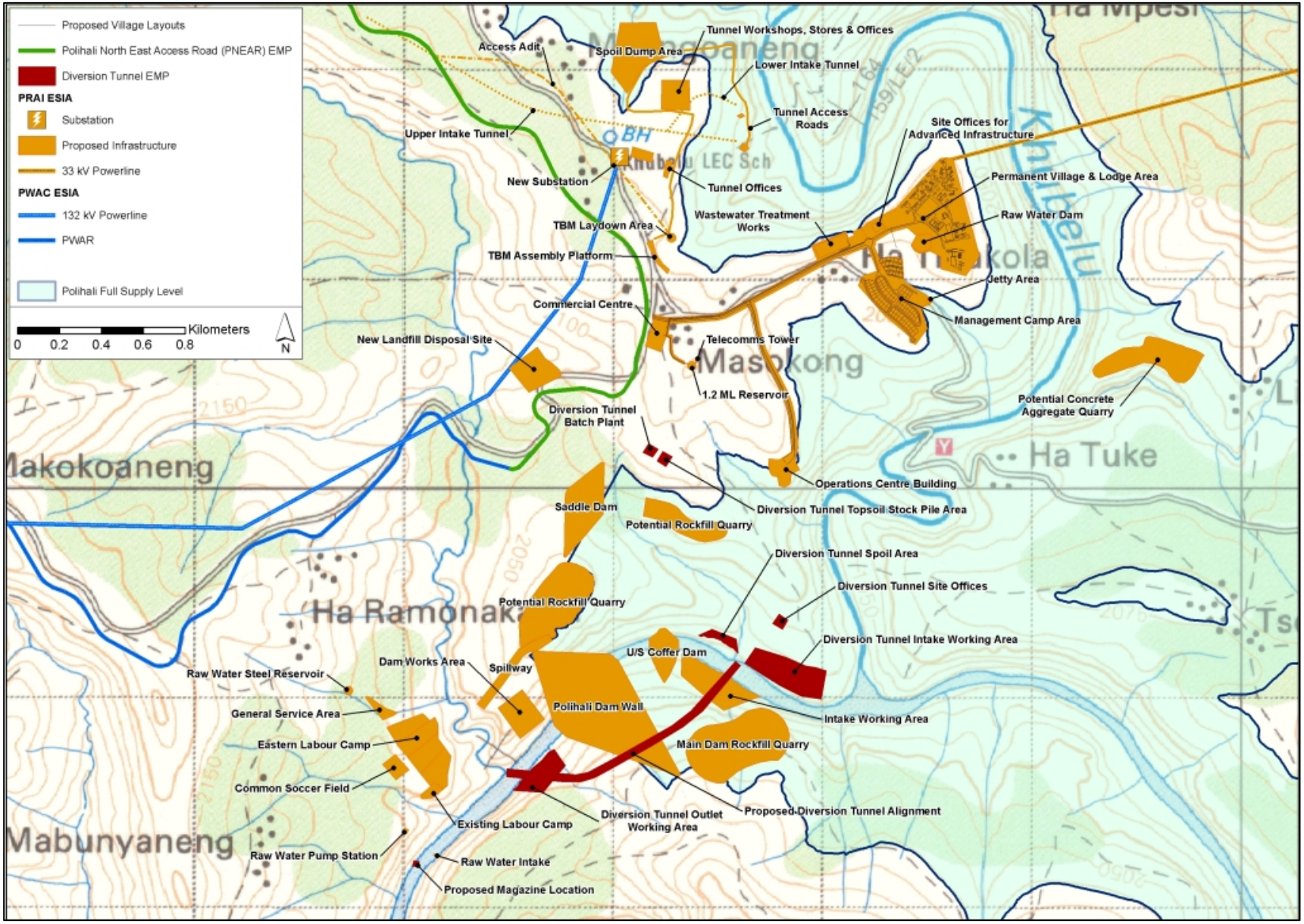


Figure 2.3 PRAI Infrastructure Layout



2.4 Polihali Western Access Road (PWAR)

The location of the PWAR is shown in Figure 2.1.

A summary description of the PWAR is provided in Table 2.2.

Table 2.2 Summary Description of PWAR Design Specifications

Feature	Specification
Construction requirements:	
Construction footprint	The construction of the proposed PWAR will require establishment of site camps (~3.6 ha) and laydown areas at bridges and large culvert construction sites (total area required is 5.0 ha).
Road Design:	
Class	Class A Road (i.e., primary or trunk roads linking major towns and district centres and main border posts)
Design life	20 years
Design speed	Varies along the route to a maximum of 80 km/hr.
Length of PWAR Road	54.5 km
Road Width	10 m comprising the following: • 2 lanes – 3.5 m wide each • 2 surface shoulders – 1.0 m in and 0.5 m wide in restricted areas such as rock cuttings • Drainage channel – 1 m wide side drain with 150 mm grouted stone pitching
Passing lanes	Passing lanes have been added intermittently, mainly on steep climbing grades, but also on flatter slopes to facilitate passing of slower moving vehicles.
Surfacing	• 40 mm asphalt layer
Servitude	• 30 m Road Reserve (15 m from center line) within which no formal structures (buildings) or graves are permitted and all arable, grazing, trees/gardens and structures will be compensated to landowners. A road reserve of 30 m equates to a footprint for the PWAR of 164 ha • 60 m Building Restriction Area (30 m from centre line) within which new houses is restricted
Bridges and Culverts:	
Bridges	3 major bridges, including: • Matsoku River – 60 m length at kp 1.3 (3 spans 20 m length) • Semenanyane River 90 m at kp 21.8 (5 spans of 15-20 m length) • Makhoaba River – 80 m at kp 37.6 (4 spans of 20 m length)
Culverts	• 18 major culverts across streams with catchments of 1 to 38 km^2 • 143 small culverts
Stormwater drainage	183 drainage pipes, placed every 100 m in mountainous terrain
Erosion control measures	Energy dissipaters downstream of culverts
Geometric Parameters:	
Max Gradient (Mountainous)	• 14% is the maximum vertical design gradient • Three sections totaling 1120 m are at 14% gradient. These are at kp 4.8; kp 12.7; and kp 19.6
Minimum Radius for Horizontal Curve	• In general the minimum radius for horizontal curves is 50 m; however, there are two hairpin bends of 35 m and 15 m • Tight curves will be wider to accommodate abnormal articulated trucks • The 15 m hairpin bend will be widened from the standard 8 m road width to 14 m. A 53 m taper will be used along which the grade will be relaxed to 5% to facilitate the movement of large, long, heavy and abnormal vehicles (Note: the same has been applied to the NAR for the construction of the Katse dam and tunnel)
Minimum Vertical Curve K-Value Crest	6

Feature	Specification
Minimum Vertical Curve K-Value Sag	8
Minimum Length of Vertical Curve	60 m
Construction Requirements:	
Cut and Fill	• Earthworks have been designed to accommodate a slope of 1:1.5 for fill embankments. A side slope of 1:1.5 will be used for cuttings in rolling terrain and up to vertical in rock cuttings and 1:0.75 in looser material. Final design slopes for cut and fill will depend on the analyses of the local rock and soil properties • Cut and fill of approximately 950,000 m^3 of each (balanced)
Blasting	• Major rock blasting will be required along certain sections of the PWAR route (between kp 4.7 and kp 8.8) • Blasting will also be required for certain borrow pit areas to extract borrow material. All the necessary permits and precautionary measures (such as the provision of fire-fighting equipment, establishment of fire breaks (where necessary), PPE, blasting plans, etc.) will be in place prior to blasting
Quarry and borrow pits	• The construction of the proposed PWAR will require the establishment of a number of quarries and borrow pit sites (to be confirmed during detailed engineering design)
Road and Community Enhancement Measures	
Proposed view sites	Two view sites are proposed: • Senqu River valley view site proposed at kp 47 • Makhoaba waterfall view site proposed at kp 40 Two additional view sites have been recommended at kp 25 on top of Makhoaba Pass (at proposed quarry site) and at kp 19 on top of Semenanyane Valley (western side).
Intersections	• 37 junctions will be tarred to provide paved intersections at existing tracks to villages
Crossing points	Pedestrian crossing points will be established (e.g., at schools). Pedestrian crossings will include the necessary road signs and a 2 m flat top pedestrian crossing speed hump (zebra crossing).
Side walks	The section of the PWAR between Ha Seshote (kp 0) and the Matsoku Bridge (kp 1.3) will have a 1.5 m paved sidewalk on both sides of the road to accommodate the high pedestrian traffic in this area.
Bus / Taxi stops	Taxi and bus stops or laybys will be provided at or near the village intersections or where passing lanes are located.
Safety Measures	
Snow poles	Snow poles (hazard delineators that act as warning guides for motorists in severe weather) are proposed to be located every 50 m at altitudes above 2700 m.
Guard rails	Guardrails will be placed at sharp curves on steep cross slopes, or above the snow line of 2700 m where dangerous black ice can occur, which can cause vehicles to slide across the road surface.
Painted markings	Road paint markings will consist of retro-reflective white broken or unbroken centrelines and yellow shoulder lines. Retro-reflective beads will be added to paint markings to increase reflectivity. Road studs shall be fixed after painting of the road lines. At junctions stop lines and turning lane indicators will be added where required.
Speed control	Vehicle travel speed on approaches to and through villages will be controlled by speed humps designed for 40 km/h. Speed hump design will comprise an asphalt hump 3.0 m wide and 0.1 m high with a circular vertical curve. Allowance will be made for drainage at the sides of the road so as to not trap water inside the road against the speed hump.

2.5 Bulk Power Supply and Telecommunications (BPST)

A summary description of the BPST specifications is provided in Table 2.3 and shown in Figure 2.1.

Table 2.3 Summary Description of Powerline Design Specifications

Feature	Design / Specification
New 132 kV Powerline	Matsoku Diversion Substation to the new Polihali Dam Substation.
Electrical load	132 kV
Length of 132 kV line	35.4 km
Access roads	Approximately 42.5 km (~16.2 ha) of unpaved access tracks and roads will be required to access the pylons positions. These consist of 9.0 km (4.5 ha) of new permanent common roads and 33.5 km (11.7 ha) of tower access roads. The location of these will be confirmed during detailed design.
Servitude width	The BPST corridor will require a servitude width of 31 m (i.e. 15.5 m either side of centre line) within which no buildings or structures in excess of 3 m in height are allowed. Graves may remain if they are not affected by construction or maintenance requirements.
Land requirements	Permanent and temporary land take includes: ~17.7 ha permanent land required for pylons, local tower access tracks; ~120.3 ha temporary land for powerline servitude, construction laydown.
Earth conductors	7/3.35 type galvanised steel earth wire.
Electrical loading	• **132kV related load** - estimated maximum demand of between 12 and 15MVA for Polihali during the construction phase
Mounting Structures	
132 kV	• Total of 108 pylons required, of which 33 are deviation (bend) points • Bolted lattice steel pylons will be used (Eskom type 247) • Pylon foundations will depend on the geotechnical conditions of the site. Most deviation point pylons occur on hard basalt, which will require drilled root pile foundations into the rock. Pylons in softer rock or where soil is encountered will require concrete foundations • For safety purposes, and to prevent the removal of strength bearing parts of the pylon, breakaway bolts and nuts will be used on all pylons up to a height of 6 m. Anti-climbing devices will be installed to prevent people from climbing the pylon
Minimum Clearances	**132 kV**
Over roads and railway lines	7.5 m
Over ground (outside townships)	6.3 m
Over ground (within townships)	6.3 m
To communication lines, other powerlines or between powerlines and cradles	3.0 m
Buildings, poles and structures not forming part of the powerline	3.8 m
Clearances over final water level of the reservoir	12.8 m
Minimum clearances to pylon steelwork due to swing under maximum wind conditions	Jumper swing (20^{o}): 1430 mm Insulator swing (60^{o}) 1000 mm
Phase to phase earth clearance	2 m
Broken conductor clearances over roads	4.8 m
Avifauna clearances	In order to allow for safe perching for raptors on 132 kV pylon, a 1800 mm phase to phase or phase to earth clearance will be maintained (in accordance with the Eskom Guidelines) for all pylon positions at altitudes greater than 2600 m.
Insulation Requirements	**132 kV**
Nominal system voltage	132 kV
Maximum system voltage	145 kV
Power frequency withstand voltage	275 kV
System BIL at sea level	650 kV

Feature	Design / Specification	
Creepage distance required		2.90 mm
Minimum clearances: (a) Phase to phase (b) Phase to ground		 1.95 m 1.45 m
Minimum working clearance: (a) Vertical (b) Horizontal		 3.9 m 2.5 m
Over open land		6.3 m
Over roads		7.5 m
Over final water level of Polihali Dam		12.8 m
132kV Insulator Sets	Composite silicone rubber insulated type insulators: Minimum creepage distance of 2900 mm & minimum breaking strength of 120kN	
Foundations		
Foundation design densities for 132 kV pylons	• Re-compacted normal soils – 1600 kg/m^2 • Loose cohesion-less materials and soft cohesive soils – 1400 kg/m^2 • Water logged soils – 1000 kg/m^2 • Concrete densities for foundations - 2000 kg/m^2 The type of foundations adopted (drilled root pile foundations versus concrete foundations) will be dependent on the geotechnical conditions of the pylon site.	
Substation Upgrades		
Substation (Ha Lejone)	Expansion of existing substation by 6 m on west side to accommodate a new 132kV feeders switching bay for the control of upgraded 132kV powerline supply to Katse Intake tower and Matsoku diversion substations. Installation of two new 10MVA 132/11kV transformers and removal of two 132/66/11kV transformers to Matsoku substation.	
Substation (Katse Intake)	Expansion of existing substation to convert it to a 132kV/11kV substation.	
Substation (Matsoku)	Expansion of existing substation to accommodate two 132kV/66kV/11kV transformers (to be relocated from Ha Lejone substation).	
Existing Line Upgrades		
Refurbishment and reinsulation of existing 66kv lines to 132kV line	The existing 66kV line from Ha Lejone to Matsoku substation will be reinsulated. This will be limited to the insulator strings with a continuous uniform silicone rubber sheath extruded onto the main glass fibre strength rod.	
Bird Protection Measures		
Bird protection / diverters	A number of bird protection and diversion measures will be put in place along the 132kV line. These include: • Aviation Warning Devices • Bird Diverters, and • Anti-perching Devices.	

Section 3 Legal and Policy Requirements

This section summarises the legal and policy requirements for environmental management of relevance to the PWAC Project.

3.1 LHDA Policies and Plans

LHDA has developed a set of policies and plans for implementation throughout LHWP Phase II.

Contractors are required to comply with the LHDA plans and policies.

These include:

- **Labour Recruitment Guidelines** - requires Contractors to prioritise recruitment of local labour from Lesotho, particularly for unskilled positions. It specifies that all recruitment shall be done through a Project Labour Recruitment Desk (PLRD) to be established at Mapholaneng or Tlokoeng with a satellite office at Ha Lejone. All potential work-seekers will need to be registered at the PLRD in order to be considered for employment.

- **Procurement Guidelines** - requires Contractors to maximise procurement opportunities for Lesotho and South African suppliers; to minimise the utilisation of imported goods, skills and labour, where applicable, within the ambit of the laws governing Lesotho; and to maximise skills and technology transfer through the training of individuals and enterprise development opportunities for Lesotho-based companies and black owned companies in the Republic of South Africa.

- **LHDA Phase II Compensation Policy** - sets out the framework for all compensation aspects and assets that may be affected by the project. In relation to the PWAC it provides for:

    - Compensation for arable land to field owners, household structures and privately owned gardens, trees and bushes within the 30-m wide road reserve or 31-m wide powerline servitude. No payment of compensation to sharecroppers or renters of land. Compensation to be paid as a lump sum or annual basis over 50 years (as agreed with affected owners);
    - Compensation to the community (for implementation of development projects) for
        - communal land permanently affected by access roads and substation development;
        - community assets (e.g., fruit trees or fruit bearing bushes) affected by the road (but not within the powerline servitude).
    - Relocation of graves subject to the wishes of the affected households. No area will be occupied until any graves or ash heaps have been relocated;
    - Reinstatement of alternative water supply where a community's water supply is affected by the project;
    - Communal land in the servitude of a powerline is not compensated for, and land uses such as livestock grazing will be allowed to continue.

- **Livelihood Restoration and Social Development Framework** - outlines LHDA's proposed approach to addressing socio-economic development needs through the development and implementation of a Social Development Master Plan (SDMP). The SDMP will identify the key components for sustainable development based on full participation of the communities living in the Phase 2 areas.

- **LHDA's Environmental Policy** - requires LHDA (and its Subcontractors, staff etc.) to comply with environmental legislation, international safeguards, internal LHDA directives; the LHDA

Order of 1986 and the LHWP Treaty; and to avoid, minimise and mitigate significant impacts and risks through the development and implementation of ESMPs, monitoring plans, and audits. It requires staff and Subcontractors to adopt an integrated waste management approach that extends over the entire waste cycle and addresses generation, storage, reuse, recycling, and recovery and treatment, and final disposal of waste. Further, it requires the implementation of social development initiatives in affected communities and to undertake long term and transparent engagement and partnerships with stakeholders.

In terms of the Environmental Policy, LHDA has committed itself to implementing the following action plans:

- Integrated Catchment Management (ICM) - including range management, soil conservation and wetland protection;
- Biodiversity and Conservation Management Plans - focused on priority species such as Bearded Vulture, Maloti Minnow and Spiral Aloe, and linked to ICM;
- Water Quality and Quantity Monitoring;
- Environmental Flow Monitoring Requirements;
- Waste Management and Pollution Control Plans;
- Cultural Heritage Management Plan;
- Resettlement Action Plans, and
- Social Development Plans.

Additional commitments include Environmental Awareness training of LHDA employees, Contractor staff, and affected communities; environmental auditing of performance, and stakeholder engagement.

3.2 Applicable Legislation

National legislation relevant to the environmental and social protection measures required for the PWAC includes:

- Constitution of Lesotho Act (No. 5 of 1993, as amended up to 2001)
- National Environmental Policy (1998)
- Environment Act (No. 10 of 2008)
- Water Act (No. 15 of 2008)
- Water and Sanitation Policy (2007)
- Water Resources Management Policy (2007)
- Water Resource Regulations (1980)
- Mines and Minerals Act (No. 4 of 2005)
- National Heritage Resources Act (No. 2 of 2012)
- Historical Monuments, Relics, Fauna and Flora Act (No. 41 of 1967)
- Weeds Eradication Act (No. 18 of 1969)
- Public Health Act (No. 12 of 1970) (in relation to exhumation of graves)
- Land Act (No. 8 of 2010)
- Land Regulations (LN 15 of 1980)
- Local Government Act (1997), as Amended (2004)
- Land Administration Authority Act (No. 9 of 2010)
- Chieftainship Act (1968)
- Labour Code Order (No. 24 of 1992), as Amended (2006)
- Workmen's Compensation Act (1977)
- Explosives Act (No. 15 of 2003) (South Africa)
- Lesotho Noise Regulations (Legal Notice No. 137 of 1996)

- Lesotho Electricity Corporation Act (No. 12 of 2002)
- Telecommunications Act (No. 2 of 2000)
- Roads Directorate Act (No. 16 of 2010)
- Lesotho Roads and Bridge Standards (GoL, 1998)

3.3 Permit Requirements

Typical permits required for construction phase activities are summarised in Table 3.1. This list may not be exhaustive and there may be others that the Contractors may be required to obtain.

Table 3.1 Summary of Permit Requirements

Project Activity	Key Legislation	Key Provisions
General Environmental Management (Environmental License)	Environmental Act 10 of 2008	Requirement for ESIA and EMP
Effluent discharge including sewage disposal and industrial effluent (tailings) disposal	s.40(3) Environment Act & Water Act No. 15 of 2008	Effluent Licence
Emissions of gas, dust or smoke, or any other atmospheric pollutant - Incinerator; dust generation etc.	s.44(1) Environment Act	Pollution Licence
Noise	s. 48(1) of Environment Act	Noise Permit
Handling, storage and disposal of general waste	s.76 Environment Act	Waste Licence
Transport & storage of hazardous waste	s.76 Environment Act	Waste Licence
Solid waste site	s.76 Environment Act	Waste Licence
Land Allocation / Expropriation	Land Act No.8 of 2010	Certificate issued for Commercial and Industrial Purposes
Discharge of water	Lesotho Water Act 15 of 2008	Water Use Licence
Abstraction of water	Lesotho Water Act 15 of 2008	Water Use Licence
Sewerage works construction	Lesotho Water Act 15 of 2008	Construction permit
Water Treatment Works	Lesotho Water Act 15 of 2008	Construction Permit
Dams and reservoirs	Lesotho Water Act 15 of 2008	Construction Permit
Mining or Quarrying	Mines and Minerals Act, No 4 of 2005	Mineral Right (for Quarries)
Blasting & Explosives	Mines and Minerals Act, No 4 of 2005	Permit from Police
Building developments	Municipal bylaws	Building Permit
Cut, take or remove forest produce	Forest Act, No 91 of 1998	Licence to cut, take or remove forest produce

3.4 International Standards

The ESIA and EMP of the project is aligned with international good practice, such as the World Bank Environmental and Social Standards (ESS) (World Bank, 2017) and the IFC Environmental, Health and Safety (EHS) Guidelines (IFC, 2007).

World Bank Safeguards of relevance are:

- ESS1: Assessment and Management of Environmental and Social Risks and Impacts
- ESS2: Labour and Working Conditions
- ESS3: Resource Efficiency and Pollution Prevention
- ESS4: Community Health, Safety, and Security
- ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement
- ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources
- ESS8: Cultural Heritage
- ESS10: Stakeholder Engagement and Information Disclosure.

EHS Guidelines (IFC, 2007) of relevance to the PWAC project activities include:

- General EHS Guideline
- EHS Guidelines for Construction Materials Extraction
- EHS Guidelines for Electric Power Transmission and Distribution
- EHS Guidelines for Telecommunications

Relevant standards have been sourced from the General EHS Guideline for air, noise and water quality.

Other international requirements that should be abided by include:

- International Labour Organisation (ILO) conventions (to which Lesotho is a signatory); and
- Voluntary principles on security and human rights (www.voluntaryprinciples.org)

Section 4 Key Sensitivities

The main ESIS document (Volume 1) provides a baseline description of the biophysical, ecological and social (including health, cultural heritage and visual/landscape) aspects of the PWAR, supported by a number of specialist reports in Volume 3 and 4.

Key environmental and social sensitivities along the PWAR are summarised in Table 4.1 to provide contextual overview for defining the environmental management requirements in this EMP.

Sensitivity maps are provided in Appendix A and show areas for site specific mitigation requirements.

Table 4.1 Summary of Key Environmental Sensitivities

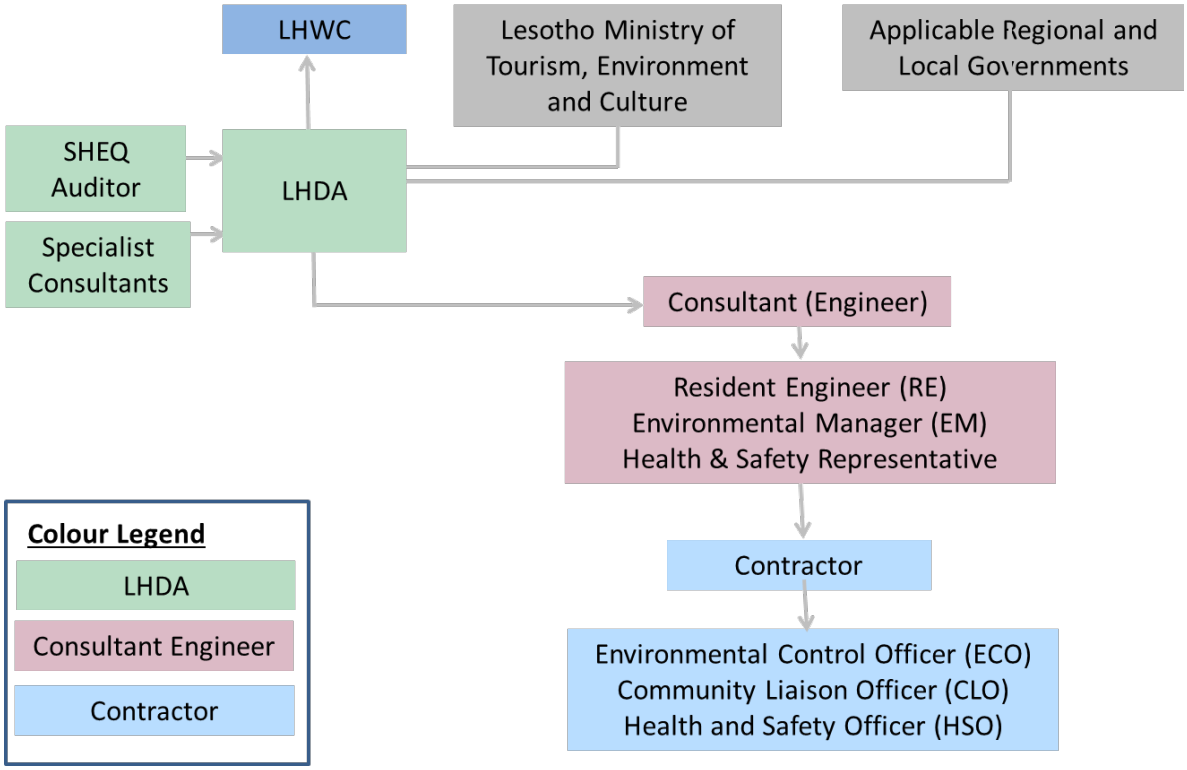
Key Aspect	Description of Sensitive Features	Key Project Sources of Risk	Location
1. Priority Plant areas	Priority plant areas were recorded primarily in areas overlapping with important wetlands areas where more soil moisture is present. Highest priority areas are those in more remote areas at higher altitude above 2600 m. Sensitivity maps in Appendix A.	• Land clearance	kp 7-9 kp 14 kp 25
2. Priority Birds	Highest level of endemic and priority bird species is located at high altitude. Cliff-nesting birds are of highest priority and most sensitive to road construction and powerline collision. Priority cliff-nesting birds include Bald Ibis, Cape and Bearded Vulture (forage in the area); See Bird Sensitivity Map (Appendix B).	• Habitat loss (land clearance) • Blasting (noise disturbance) • Powerline collision risk/mortality	kp 17-30 high altitude pylons 14-16; 16-17; 21-23; 26-28 (collision risk)
3. Aquatic Ecosystems	The road and powerline may affect four main rivers: Matsoku, Liseleng, Semenanyane and Makhoaba Rivers and a number of small streams. No priority fish were recorded but some indigenous fish are likely to occur. Some endemic frogs such as the Maluti Frog and Phofung River Frog may also occur in clean streams such as the Liseleng and Semenanyane. The rivers also provide important social uses for washing, cleaning and livestock watering.	• Bridge and culvert construction • Road embankments close to river courses (bank erosion, (sedimentation, turbidity, pollution)	kp 1.3 kp 21.8 kp 37.6 kp 5.5 kp 15.5-16.5
4. Wetlands	Five types of wetland features occur with most important comprising Sheetrock systems and Fens, mostly located in the central parts of the route. Some of these systems are crossed by the PWAR while some occur down or upslope of the road and may also be affected by powerline access tracks.	• Habitat loss within footprint of PWAR and possibly access tracks for powerline • Interference with subsurface seepage • Concentration of runoff via culverts causing erosion and sedimentation of wetlands	Multiple locations
5. Important Terrestrial Fauna Habitats	Priority terrestrial habitats are located in the more remote central parts of the route at higher altitude, and are typically associated with rocky outcrops, subalpine shrub / grassland, wetlands and streams. No red-listed threatened mammal or reptile species are expected to occur but local priority species may include jackal,	• Blasting (noise / loss of rocky habitats • Human presence (disturbance) • Land clearance (habitat loss)	kp 17-30 (high altitude)

Key Aspect	Description of Sensitive Features	Key Project Sources of Risk	Location
	grysbok, and some cat species.		
6. Landscape / Visual Features	Key landscape features comprise the dramatic mountain ridges, distant views of mountain scenery from high points, and remote sense of place along much of the route. Priority landscapes occur in the central, more remote and high lying parts of the route. Some key scenic view points are recommended along the PWAR for road users. Key receptors will comprise residents in the settlements along the route and future road users of the PWAR.	• Powerline and pylons (interference with skyline views) • Access tracks for powerline access • Borrow pit and quarry excavations (which can create view site/layby opportunities)	Key view points at top of high ridge points with scenic land-scapes: kp 17 (Semenanyane River Valley) and kp 25 (Makhoaba Junction).
7. Community use of Natural resources	Natural resources are widely used by all communities along the route for food, medicine, fuel, grazing etc. Several specific areas were recorded where important medicinal plants occurred close to the road, several of which are also conservation priority species (although not highly threatened.	• Direct loss of habitat for the PWAR or powerline access tracks • Loss from construction works activities/vehicles • Altered surface water runoff and subsurface drainage	kp 7-9 (Ha Salemone); kp 16 Ha Thene; kp 18-26
8. Schools and missions	A number of schools occur in close proximity along the PWAR.	• Blasting, excavation and vehicle passage (noise disturbance) • Human presence (noise and distraction / social disruption)	Ha Seshote; Ha Salemone; Ha Ratau; Ha Semphi; St Martin's Makhiseng Khotsang Ntja Bokone Ha Mei
9. Graves and ash heaps	49 sites with one to several graves or ash heaps were recorded along the route (Appendix D).	• Direct damage from road widening	Multiple locations (Appendix D)
10. Settlements (house-holds)	Approximately 40 structures may be impacted by the road within the road reserve, mostly household structures but also a few corrugated iron shops (Appendix F).	• Direct from road widening within road reserve • Blasting (potential damage)	Multiple locations, (Appendix F)

Section 5 Roles and Responsibilities

The roles and responsibilities for EMP implementation are shown in Figure 5.1, and are discussed at a high level in this section. The staff designation and their responsibilities accord with the same information that will be contained in the tender documentation for prospective Contractors.

Figure 5.1 Institutional Organogram



5.1 The Developer (LHDA)

For the purpose of this document, "the Developer" and its appointed facilitators refers to those to whom permission has been granted to proceed with the Project (i.e., LHDA), and who is thus ultimately responsible for ensuring compliance with all conditions of approval of the Project or any aspect thereof by any authority.

LHDA has appointed a Consultant (represented by the Engineer) with overall responsibility for Project construction and specifically to manage the Contractors appointed to implement the EMP, Method Statements, and any other conditions of approval.

With respect to the Project, the Developer is to:

- Ensure implementation of certain EMP requirements relating to additional studies and social enhancement (as outlined in Section 7);
- Ensure the EMP is aligned with LHDA's Safety Health Environment and Quality (SHEQ) system;
- Ensure that the EMP has been approved by the Department of Environment (DoE) within the Ministry of Tourism, Environment and Culture (MTEC) prior to the start of construction;

- Ensure that the requirements of the EMP form part of the tender documents for Contractors and they have provided appropriately qualified staff and realistic costs for effective implementation of the EMP;
- Ensure that the Ministry and appropriate District Authorities and Traditional Leaders have been notified of the date on which construction activities will be starting, prior to commencement of the activity; and
- Ensure that all conditions of approval have been complied with.

5.2 The Consultant

For the purposes of this document, "The Consultant" refers to the Engineers appointed for the PWAR and BPST components of the Project that are contracted by the Developer (LHDA), or any other person authorised by the Developer, and who will be responsible for the technical and contractual implementation of the Project.

The Consultant's designated staff in relation to environmental and social compliance include the:

- Engineer;
- Resident Engineer (RE);
- Environmental Manager (EM);

5.2.1 The Engineer

The Engineer reports to the LHDA and is responsible for the day-to-day management of environmental performance on the project. The Engineer is ultimately accountable for the implementation of the requirements contained within this EMP and the Environmental Specifications in the tender documents.

The Engineer is responsible for:

- Instructing construction personnel on how to comply with environmental policy and procedures;
- Ensuring the RE, EM and other appropriately informed resources on site are aware of and comply with the environmental obligations as detailed within this EMP and Environmental Specifications;
- Ensuring that employees, Contractors and Subcontractors are aware of, and comply with, the conditions of approval and requirements of the EMP and Environmental Specifications relevant to their respective activities;
- Arranging periodic monitoring and inspection by suitably trained personnel;
- Regular site inspections and the active pursuit of opportunities to enhance environmental outcomes;
- Tracking and reporting environmental performance;
- Tracking and compliance against the conditions of approval for the scope of works being performed;
- Monthly evaluation of how effectively environmental controls are performing;
- Initiating remedial measures when environmental deficiencies are observed or in response to grievances;
- Restriction of construction activities affected by an environmental deficiency until remedial action has been taken;
- Maintaining environmental performance records;
- Engaging consultants where required to provide support in relation to implementing the EMP and Environmental Specifications; and

- Investigating any incidents or grievance and ensuring necessary corrective action is implemented (in consultation with the Environmental Manager for significant incidents / grievances).

5.2.2 The Resident Engineer

The RE is responsible for construction site supervision and quality control during Construction.

The RE shall report to the Engineer and will be responsible for:

- Managing employees / Contractors and construction activities on a daily basis to ensure the appropriate environmental controls are implemented and maintained in accordance with the requirements of the EMP and Environmental Specifications;
- Ensuring all staff receive induction training and participate in daily / weekly toolbox talks;
- Undertake daily site inspections of environmental controls and maintain records of environmental actions;
- Reporting any environmental management concerns or incidents immediately to the Engineer;
- Recommending improvements to the EMP and environmental specifications to the Engineer; and
- Implementing any corrective actions issued as a result of any site inspections, audits or meeting.

5.2.3 The Environmental Manager

The Environmental Manager (EM) must be appointed by the Engineer and is responsible for managing the day-to-day on-site implementation of the environmental aspects of the EMP. In addition, the EM must act as liaison and advisor on all environmental and social related issues and ensure that any complaints received from stakeholders are duly processed and addressed and that conflicts are resolved in an acceptable manner. The EM shall be a full-time dedicated member of the team and will report to the Engineer.

The EM's responsibilities include:

- Liaison with the authorities;
- Monitoring compliance with the environmental requirements set in the EMP and Environmental Specifications;
- Reviewing the environmental reports that are submitted by the Contractor's Environmental Control Officer (ECO);
- Reviewing environmental monitoring data submissions;
- Collating data and submitting monthly reports to the Engineer;
- Advising the Engineer on the interpretation, implementation and enforcement of the EMP;
- Recommending rectification of non-compliances with the EMP and Environmental Specifications before significant impacts occur;
- Reporting any significant environmental incidents to relevant regulatory authorities as may be required;
- Reviewing and providing comment on Environmental Method Statements;
- Inspecting and reporting on the effectiveness of the method statements' management and mitigation requirements;
- Liaising with an archaeologist or heritage resources practitioner in the case of unearthing of artefacts and/or graves;
- Ensuring environmental awareness training is undertaken by all site personnel.

5.3 Contractor

The Contractor is the successful tenderer, appointed by LHDA to undertake the Works as specified in the Contract. It is the responsibility of the Contractor to do whatever is necessary to ensure that he or any appointed advisor are well versed with the environmental conditions of the site so that he/she may accurately and efficiently carry out the requirements of the EMP and Environmental Specifications.

The Contractor shall be liable for any and all remedial work required in terms of the Environmental Specifications resulting from his environmental negligence, mismanagement and / or non-conformance.

The Contractor shall:

- Be responsible for the construction related activities for the duration of the contract (so will Sub-Contractors and contract workers);
- Be responsible for ensuring work conducted is done within the framework of the environmental authorisation, EMP and Environmental Specifications and applicable legislation;
- Ensure that all Sub-Contractors have a copy of and are fully conversant with the contents of the EMP and Environmental Specifications;
- Be required to provide Method Statements setting out, in detail, how management actions contained in the EMP and Environmental Specifications will be implemented;
- Be required to monitor construction related impacts upon the surrounding environment; and
- Appoint an Environmental Control Officer (ECO) and Community Liaison Officer (CLO).

5.3.1 Environmental Control Officer (ECO)

The Environmental Control Officer (ECO) shall be appointed by the Contractor and is responsible for managing the day-to-day on-site implementation of the environmental aspects of the EMP and Environmental Specifications, and for the compilation environmental progress reports. The ECO shall be a full-time dedicated member of the Contractor's Team and must be approved by the Project Manager.

The ECO's responsibilities include:

- Liaising with the Consultant's EM;
- Compiling Method Statements setting out, in detail, how management actions contained in the EMP and Environmental Specifications will be implemented;
- Ensuring a copy of the EMP, Environmental Specifications, all agreed Method Statements, and legislation documents are available on site, as well as the following:
    - Method Statement Register
    - Waste Disposal Register
    - Non-conformance Register
    - Water and Electricity Usage records
    - Communication/Complaints Register (Stakeholder and Authorities)
    - Hazardous Substances Register & Material Safety Data Sheet (MSDS)
    - Environmental Monitoring Reports
- Implementing the Environmental Monitoring Programme (for dust, air and water quality) as per the Environmental Monitoring Method Statements and ensure monitoring reports are submitted to the EM;
- Ensuring the construction work conducted is done within the framework of the EMP and Environmental Specifications and applicable legislation on a daily basis;
- Identifying and assess previously unforeseen, actual or potential impacts on the environment;

- Advising/recommending actions to address issues that have an adverse impact on the environment including the social environment;
- Ensuring appropriate waste management practices are implemented daily;
- Advising the Contractor on the rectification of any pollution, contamination or damage to the construction site, rights of way and adjacent land;
- Attending regular site meetings to report on environmental aspects and bring environmental concerns to the attention of the EM;
- Undertaking daily and weekly site inspections including photographic monitoring to ensure compliance of all employees with the requirements of the EMP;
- Developing and maintaining various registers and checklists;
- Conducting environmental audits of Subcontractors and suppliers;
- Presenting the environmental awareness induction and training to all staff, Contractors and Subcontractors, monitor the environmental awareness training for all new personnel on-site and keep records of attendance. These shall include weekly toolbox talks;
- Conducting environmental education and awareness training of the Contractor and project employees that includes sensitization regarding sensitive areas and 'No Go' areas such as rivers, wetlands, undisturbed areas (indigenous vegetation), cultivated areas (croplands), graves and ash heaps, etc.;
- Establishing and maintaining an environmental incidents register to record incidents that occur on site as a result of the activities associated with the contract. Ensure correct procedures are followed in the event of an environmental incident.
- Compiling weekly reports of all activities, instances of non-compliance, and incidents on site and consolidate weekly reports into a monthly report and submit to the EM for review;
- Compiling a monthly report that shall consolidate the findings of the weekly reports;
- Compiling a final completion checklist for the project, carried out when all construction works related to the project have been completed and the site has been cleared of all construction related-debris, materials or equipment not forming part of the permanent works. This checklist will audit the Contractor's compliance with the EMP throughout the construction phase and this checklist, together with a final written report, will be submitted to the EM to achieve 'environmental closure' for the construction phase of the project.

The ECO shall remain employed until all rehabilitation measures, as required for implementation due to construction damage, are completed and the site is handed over to the Employer.

5.3.2 Community Liaison Officer (CLO)

The Contractor will appoint a Community Liaison Officer (CLO) who is approved by the Engineer and will work in close collaboration with the ECO. The CRO will be responsible for daily liaison with local stakeholders affected by construction activities. His/her tasks will include:

- Keeping local leadership and communities informed at regular and minuted meetings about plans for the Contract and the progress of its implementation;
- Participating in activities aligned with LHDA's Communications Protocol and Community Participation Strategy;
- Developing relationships with key networks within local communities;
- Informing local labour of their conditions of temporary employment to ensure their timeous availability and to inform them timeously of when their contracts will terminate;
- Identifying possible labour disputes, unrest, strikes, etc., in advance and assist in their resolution;

- Implementing a grievance procedure in accordance with the employer's protocol and establishing and maintaining a complaints (grievance) register and document how the complaints are resolved;
- Keeping records (including photographic evidence where appropriate) of all impacts on individually owned property, notably fields, residential and commercial buildings;
- Monitoring, recording and redressing incidents of accidental damage to property in the course of construction, and keeping records of reinstatement;
- Liaising between property owners and LHDA regarding asset registration and compensation arrangements, both of which will be carried out by LHDA; and
- Conducting awareness and liaison activities with local leadership and communities regarding social and health impacts of the construction contract and its labour force, including HIV/AIDS awareness and social incidents that may arise. These activities will be carried out in collaboration with the LHDA and with local authorities.

5.3.3 Health and Safety Officer

The Contractor will appoint a Health and Safety Officer (HSO) who will compile a Health and Safety Management Plan before construction. The Health and Safety Plan will be in line with the Contractor's Tender Specification and in compliance with safety legislation. Responsibilities of the HSO include the following amongst others:

- Carry out daily inspections to monitor all aspects of health and safety performance by the Contractor and any Subcontractors;
- Submit periodic reports to the EM on health and safety performance and compliance with the Health and Safety Plan; and
- Record all health and safety incidents and accidents.

5.4 Communication and Reporting Procedures

This section is derived from, and aligned with, the Generic EMP requirements of LHDA (LHDA, 2017). It describes the communication and reporting procedures that shall include photographic records for environmental incidents and accidents; health and safety incidents and accidents; record keeping; monitoring; inspections, audits and reporting.

5.4.1 Environmental Incidents and Accidents

Environmental incidents constitute all those activities and incidents that may have a negative impact on the surrounding natural and social environment. The environmental incident report will entail an Incident Flash Report that is the initial notice of the incident which should be issued within 24 hours from the time of occurrence.

This is followed by the environmental incident investigation report that must be forwarded to the Contractor and Project Engineer and include details on the cause of the incident and the manner in which the incident was remedied. It should be submitted within 48 hours of occurrence in a format agreed upon with the Engineer. Each environmental incident report must contain as a minimum, a description of the incident, a statement on the severity and significance of the impact, and actions taken to remediate the resultant damage. A similar approach is required by the Contractor when reporting on an accident.

5.4.2 Health and Safety Incidents / Accidents

An initial report of a health and safety incident/accident must be submitted to the Engineer and Client within 24 hours of occurrence and an investigation report must be submitted to the Engineer and Client within 48 hours of occurrence.

In the event of an event causing significant bodily harm or loss of life, the Department of Labour should be notified through the Labour Commissioner as soon as practicable, and within three days of the notice, a report should be sent to the Labour Commissioner in the form set out in the Second Schedule to the Workmen's Compensation Regulations of 1980 or any amendment thereof.

5.4.3 Record Keeping

The ECO is responsible for maintaining all records in relation to the EMP requirements on site. Such records must be made available to the Engineer's representatives on request during any audits, as well as at any time as requested by officials of the DoE and / or the Client. Record keeping must be done in an orderly fashion with the intent of ensuring easy reference.

Examples of records include Registers (e.g., training register or a complaints register) and Checklists (e.g. weekly environmental checklist or a daily environmental log).

The Contractor / ECO's filing system or structure would typically include the following documents:

- Environmental Policy
- Environmental Management Plan (based on this document)
- Construction / Environmental Method Statements
- Procedures
- Work Instructions
- Registers
- Checklists

The ECO and CLO (Contractor's representatives) will contribute to the following:

- Daily logs, checklists or site inspection forms
- Weekly environmental toolbox talks
- Environmental monitoring
- Weekly report to EM and SHEQ Auditor
- Attend monthly SHEQ committee meetings with ECO, SHEQ Auditor etc.

The EM (Engineer's representative) will contribute to the following:

- Upon receipt of weekly report from ECO, compile monthly report to Engineer
- Attend monthly SHEQ committee meetings with ECO, Resident Engineer SHEQ Auditor etc.
- Consolidate info for monthly reports to LHDA
- Attend monthly meetings with Contractor and LHDA

5.4.4 Environmental Monitoring

Monitoring is an integral part of the EMP as it establishes how the project is performing against objectives and targets set in the EMP. A schedule and procedures for monitoring and reporting should be developed by the Contractor at the outset to:

- Identify any negative impacts from construction activities;
- Assess the effectiveness of control measures;
- Demonstrate compliance with regulatory conditions and objectives and targets set in the EMP;

- Identify if further controls/corrective action is required.

Regular monitoring and reporting of aspects such as dust, noise, vibration and water quality are typically required by the regulatory authority (DoE and/or RD). Monitoring may also be required as a result of a complaint, a request by a statutory body or a trigger point in an inspection or checklist being exceeded.

Environmental monitoring requirements for the PWAC are described in Section 8.

5.4.5 Inspections, Audits and Reporting

Regular inspections, audits and reporting will be undertaken by the Contractor's ECO. These inspections will provide a record of site conditions and activities and provide a mechanism by which the Contractor can establish the effectiveness of its EMP.

These checklists and reports should be kept at each site office and should be updated and used in the day to day operation of the site. The Consultant's EM will also develop a schedule of inspections and auditing of the Contractor's EMP to ensure that established standards of environmental controls are being maintained by the Contractor.

Objective:

- Conduct checks on significant environmental risks to ensure that they are adequately managed and control systems are operating effectively.

Management Measures:

- Establish a baseline monitoring programme before construction commences;
- Prepare an inspection, monitoring and auditing programme, designed to match the potential environmental risks identified;
- Ensure that remedial action is taken promptly when monitoring, inspections or audit results reveal a problem in environment management;
- Ensure that all monitoring is conducted by an accredited laboratory, either directly, or under supervision; and
- Arrange for regular independent audits of environmental performance and the environmental management system.

5.5 Non-compliance and Remedial Action

If criteria within the EMP are not fulfilled and appropriate and corrective action is not taken, an environmental non-conformance may be raised by the EM through the Resident Engineer and a non-conformance notice issued. Examples of circumstances where this may arise include:

- Receipt of a complaint regarding pollution or other environmental impacts caused by the project;
- Departure from approved or agreed procedures;
- Non-conformance identified as a consequence of any self-assessment, formal audit or other environmental survey or inspection.

Corrective action may include changes to work instructions (frequency of testing, test method etc.), alterations to a method statement or other procedure, further staff training, etc. Non-conformances should be reviewed by the EM and form part of construction meeting agendas.

An environmental non-conformance / corrective action report can be issued to the Contractor by the Consultant. It is the responsibility of the Contractor to immediately initiate corrective actions and,

once completed, provide details of the actions undertaken on the non-conformance / corrective action report and return it signed to the Consultant's EM within an agreed timeframe. If the non-conformance is considered to breach legislative requirements, the breach should be reported to the appropriate authority.

5.6 Penalties

Penalties for failure to comply with the EMP provisions will be included in the Contractor's Environmental Specifications as part of their contractual documentation.

The Penalties shall be applied to both individuals, companies and all legal entities associated with this contract. In cases where the main Contractor engages Subcontractors the responsibility and resultant liability shall lie with the main Contractor engaged under the contract.

5.7 LHDA Representatives and Community Structures

In the PWAC, LHDA is represented through the Katse Field Operations Branch (FOB) in the western portion, and the Polihali FOB based at Tlokoeng in the eastern portion.

The Katse FOB has played an active role working with communities in the Katse reservoir area, including the area around Matsoku weir and intake tunnel, since the early 1990s. Here, they established Community Area Liaison Committees (CALCs), which continue to function to represent the interests of communities affected by the Phase I (Katse) Dam. The existing ALC in the Matsoku weir area overlaps with the western end of the powerline (including Matsoku substation) and PWAR routes, and include Ha Seshote, Ha Tšehla, Phakoeng, Ha Mpeli and Liseleng.

On the Polihali (eastern) side of the PWAC, LHDA's Tlokoeng FOB has assisted the villages within the Polihali Dam catchment area to form structures that act as liaison bodies between the Project and the community members. These structures are known as Area Liaison Committees (ALCs). According to the LHWP Phase II Community Participation Strategy (2014), ALCs are established in each electoral division which will be affected by the inundation of the Polihali Dam and other construction activities. They are made up of chiefs, community councillors, village representatives and members of Non-Governmental Organisations (NGOs). Also in place within the Polihali Dam catchment area is a Combined Liaison Committee (CLC), which is a committee made up of representatives from all of the ALCs. The CLCs coordinate the activities of the ALCs and makes general decisions on their behalf and represents all of the affected communities and individuals. In addition, there is also the Community Liaison Structure (CLS), which comprises of the whole structure of ALCs and CLC together and it participates in planning, implementation, monitoring and decision-making of the issues which affect the communities and individuals.

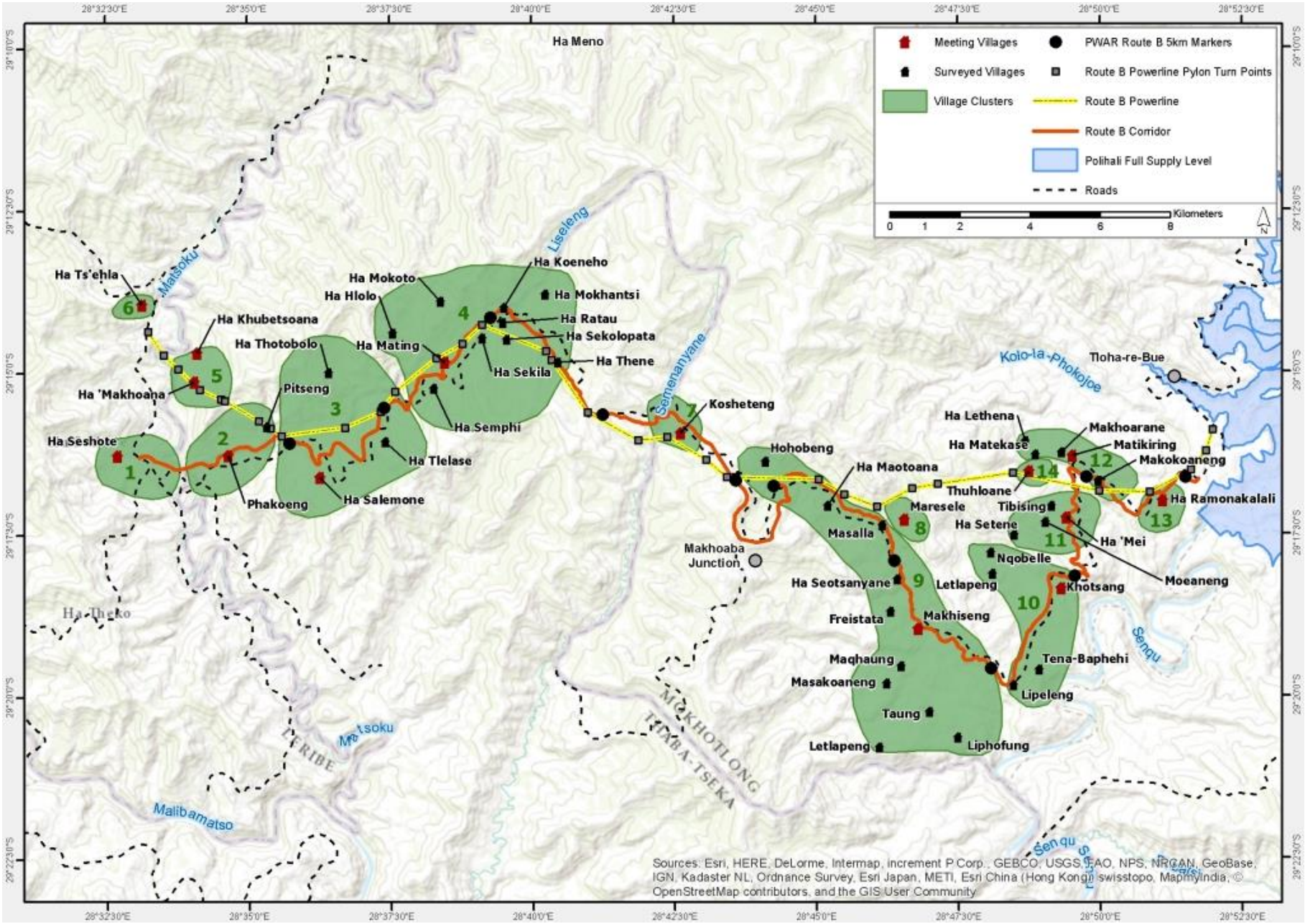
In April 2017, the village of Polihali (Ha Ramonakalali) was the only village along the PWAR that was represented by one of the Polihali Reservoir ALCs, which forms part of the ALC S1 (Malingoaneng/Khubelu). New ALCs covering the rest of the PWAC were established in June/July 2017 with the facilitation of the Tlokoeng FOB (after the stakeholder engagement process for this study). A total of 18 ALCs have been established for the PWAC and Katse Western Facilities Project catchment areas; 16 of these ALCs cover the PWAR. Similarly to the ALCs in the Polihali Dam catchment area the ALCs are made up of chiefs, community councillors and village representatives. A CLC has also been set up for the PWAC and Katse Western Facilities areas and is made up of 37 members drawn from 10 clusters of which eight cover the PWAR areas.

Table 5.1 summarises the ALCs in the PWAC and their overlap with the village clusters (Figure 5.2) consulted during the ESIS stakeholder engagement process.

Table 5.1 Village Clusters, Dates of Meetings, Meeting Villages, Number of People at Meetings, and Area Chiefs and Recently Established ALCs (in grey)

District	Community Council	Date	Meeting Village	Area Chief/Headman	Village Cluster	ALC Village Cluster	ALC Area
Leribe	Matsoku CC	20/4/2017	Ha Seshote	Mofumahali 'Maboitumelo Tau	**Cluster 1**: Ha Seshote	Ha Seshote	Ha Seshote
Leribe	Matsoku CC	25/4/2017	Ha Tšehla	Mofumahali 'Mamosiuoa Rakhojane	**Cluster 5**: Ha Tšehla	Ha Ts'ehla	Ha Seshote
ThabaTseka	Bokong CC	21/4/2017	Phakoeng	Morena Motoena Sekonyela Morena Khoali Sekonyela	**Cluster 2**: Phakoeng, Pitseng, Ha Ranthoto	Phakoeng, Pitseng	Phakoeng
		22/4/2017	Ha Salemone	Morena Motoena Sekonyela	**Cluster 3**: Ha Salemone, Liseleng, Ha Tlelase, Ha Thotobolo, Ha Lekiba	Ha Salemone, Ha Likiba, Liseleng, Ha Tlelase	Liseleng
						Ha Semphi, Bahauleng, Masantising, Khauoaneng	Ha Semphi
		23/4/2017	Ha Mating	Morena Motoena Sekonyela MorenaMoitoiTekane	**Cluster 4**: Ha Mating, Ha Semphi, Ha Sekila, Ha Sekolopata, Ha Ratau, Ha Mokhantsi, Ha Bloem, Khajoaneng, Ha Sekolopata	Ha Mating	Ha Mating
						Ha Ratau, Ha Sekila, Ha Thene, Ha Mohantsi	Ha Ratau
Mokhotlong	Seate CC	24/4/2017	Ha Makhoana/ Ha Khubetsoana	Mofumahali 'Makhalane Khubetsoana	**Cluster 6**: Ha Makhoana, (Ha Khubetsoana is the village of the area chief under which Ha Makhoana is ruled)	Ha 'Makhoana	Leohla
Mokhotlong	Seate CC	26/4/2017	Kosheteng	Councilor Sonjoane Lesoetsa	**Cluster 7**: Kosheteng	Kosheteng	Kosheteng
		26/4/2017	Mareselle	Morena Ntoahaeealala Sekonyela	**Cluster 8**: Maresele	Friestata	Friestata/Ha Jeke
		27/4/2017	Makhiseng	Mofumahali 'Matsobotsi Mathaba	**Cluster 9**: Makhiseng, Masalla, Majakaeng, Masakoaneng, Masaleng, Liphofung, Letlapeng, Taung, Makhoaba, Ha Seotsanyane, Ha Maotoana	Makhiseng, Majakeng, Seotsanyana	Makhiseng
						Makhoaba, Masalla, Maotoana	Makhoaba
		27/4/2017	Khotsang	Morena Ntoahaeealala Sekonyela	**Cluster 10**: Khotsang, Tena-baphehi, Nqobelle, Bahaoleng, Lipeleng	Khotsang, Nqobelle, Bahauleng, Semapong, Koeneng	Khotsang
						Tena-Baphehi, Lipeleng	Tena-Baphehi
		28/4/2017	Ha Mei	Morena Lebatlang Sekonyela	**Cluster 11**: Ha Mei, Tibising, Motse-mocha, Moeaneng, Ha Setene	Ha 'Mei, Ha Thuhloane	Ha 'Mei
		28/4/2017	Makhoarane	Morena Tseliso Sekonyela	**Cluster 12**: Makhoarane, Matikiring, Matekase, Makokoaneng, Ha Letheha	Makhoarane	Makhoarane
		30/4/2017	Ha Polihali	Mofumahali 'Mamoloja Polihali	**Cluster 13**: Ha Polihali / Ha Ramonakalali	(under old ALC S1)	(old ALC S1)
		30/4/2017	Thuhloane	Morena Lebatlang Sekonyela Morena Hlomphang Nkhabu	**Cluster 14**: Thuhloane	(under Cluster 11)	(under Ha Mei ALC)

Figure 5.2 Map of Village Clusters and Identifying the Locations of the Village Meetings



Section 6 Construction EMP

6.1 Introduction

The Environmental and Social Management Measures included in this Section are for the responsibility of the Contractor(s).

LHDA are responsible for implementing the specific management measures included in Section 7.

This section includes the environmental and social management measures for Contractors (and associated Subcontractors) during preconstruction and construction of the PWAR and BPST.

Each management section provides the following details:

- **Project Activities** – Project related activities resulting in the impact;
- **Responsibility** – the party responsible for implementing the management measures;
- **Objectives** – the management objective that applies to each aspect or impact;
- **Performance Criteria** – measurable performance criteria (outcomes) for each element; and
- **Management Measures** – the strategies, tasks or action program (to nominated operational design standards) that will be implemented to achieve the performance criteria.

This Construction EMP covers the following management measures:

- Buffer Zones (Section 6.3)
- Method Statements and Procedures (Section 6.4)
- Environmental Induction and Training Management (Section 6.5.2)
- Air Quality and Dust Management (Section 6.5.3)
- Noise Management (Section 6.5.4)
- Blasting Management (Section 6.5.5)
- Borrow Pits and Quarries (Section 6.5.6)
- Water Management (Section 6.5.7)
- Spill Prevention, Control and Containment Management (Section 6.5.8)
- Waste Management (Section 6.5.9)
- Biodiversity Management (Section 6.5.10)
- Landscape and Visual Management (Section 6.5.11)
- Rehabilitation and Site Clean Up Management (Section 6.5.12)
- Cultural Heritage Management (Section 6.5.13)
- Social Management (Section 6.5.14)

6.2 Phasing of Work Tasks and EMP Implementation

The mitigation measures for the pre-construction and construction phases are contained within the same tables of mitigation measures for different receptors and activities in Sections 6.5 (Contractor responsibility and Section 7 (LHDA Environmental and Social Management Commitments). This is to avoid repetition because many measures are part of a continuum with planning during pre-construction and implementation during construction or measures that begin during pre-construction and continue throughout early operation.

6.2.1 Phasing of Construction and Operation

Construction and operation of the PWAR and BPST is divided into the following phases:

- Pre-construction (detailed design)
- Construction (20 months)
- Post-construction liability phase (1 year) – for checks and corrective actions
- Operation (dam construction (~3 years) and post-dam construction).

The PWAR and BPST Contractors are primarily responsible for the majority of environmental related activities during all the construction phases, while the Contractors appointed to build the Polihali Dam will be responsible for road and powerline maintenance until the dam construction is completed. Thereafter, road maintenance will revert to the Roads Directorate. It is likely that the BPST will remain the responsibility of LHDA or will revert to LEC on completion of the dam construction.

Key environmental management tasks for each of these tasks are summarised in Section 6.2.2.

6.2.2 Key Environmental Management Tasks by Phase

A summary of the key tasks and responsibilities for EMP implementation during the different construction phases and operation phase are summarised in Table 6.1.

Table 6.1 Key Tasks for Pre-Construction, Construction and Post-Construction Liability Phases and Responsibility

No.	Phase	Reference
1	**Pre-Construction – Consultant (Engineers)**	
1.1	Undertake baseline air, noise and water quality monitoring	Section 8.2 (air); Section 8.3 (noise) and Section 8.4 (water quality)
1.2	Obtain relevant permits (e.g., blasting, water abstraction, disposal etc.)	Section 3.3 (Permits)
1.3	Develop Environmental Method Statements	Section 6.4 (Environmental Method Statements)
1.4	Develop Rehabilitation Plans for project activities	Table 6.21 (Rehabilitation & Site Clean-Up)
1.5	Develop Monitoring Plans for construction phase monitoring	Air quality: Table 6.8 & Section 8.2 Noise: Table 6.11 and Section 8.3 Water Quality: Table 6.15 and Section 8.4
1.6	Develop site layout plans (taking buffer zones into account)	Section 6.3 (Buffer Zones)
1.7	Confirm quarry and borrow pits design, location, site plans	Section 6.5.6 (Quarry & Borrow Pits)
1.8	Confirm and source labour requirements	Table 6.25 (Social Management)
1.9	Confirm supplies of goods and services	Table 6.25 (Social Management)
1.10	Undertake asset condition surveys	Section 8.8 (Blasting Monitoring) Table 8.1 (Social Monitoring)
1.11	Confirm and demarcate the location of graves with RAP consultants	Table 6.24 (Cultural Heritage Management)
1.12	Confirm location of community water sources and supplies with RAP consultants	Ref No. 6.12 to 6.16 of Table 6.15 (Water Management)
2	**Pre-Construction – LHDA**	Table 7.2 (LHDA Environmental and Social Commitments)
2.1	Undertake a census of planted spiral aloes at households to be resettled	Ref 1.2 to 1.3 of Table 7.2
2.2	Undertake a census of natural spiral aloe colonies in the PWAC as baseline for monitoring	Ref 1.1 of Table 7.2
2.3	Undertake additional pre-construction ecology surveys for flora and wetlands in focused areas (e.g., new access tracks, quarries, borrow pits etc.)	Ref 2.1 to 2.2 of Table 7.2
2.4	Develop a wetland management plan for sheetrock	Section 3 of Table 7.2

No.	Phase	Reference
	wetlands on Makhoaba Pass (including engagement with members of the Wool and Mohair Growers Association (WMGA) and other livestock owners) to discuss protection options	
2.5	Bird pre-construction surveys to confirm breeding status and additional mitigation needs	Section 4 of Table 7.2
2.6	Support and oversee the planning and design for view sites, including landscaping / aesthetic considerations	Section 5 of Table 7.2
2.7	Demarcate graves within road reserve and powerline servitude (RAP Consultants)	Ref 6.1 of Table 7.2
2.8	Additional cultural heritage surveys of access tracks, borrow pit and construction facility footprints	Ref 6.2 of Table 7.2
2.9	Grave relocation (RAP Consultant)	Ref 6.3 of Table 7.2
2.10	Mark and record graves and ash heaps (RAP Consultant)	Ref 6.4 of Table 7.2
2.11	Compile detailed Chance Finds Procedure (Contract 6025)	Ref 6.5 of Table 7.2
2.12	Implement CFP through appointed LHDA cultural heritage specialist	Ref 6.6 of Table 7.2
2.13	Traffic safety awareness raising at schools	Ref 7.1 of Table 7.2
2.14	Health and safety awareness raising (e.g., HIV/AIDS, STDs, teenage pregnancy etc.)	Ref 7.3 of Table 7.2
2.15	Develop and Implement RAP and Livelihood Restoration and Social Development (LR&SD) projects for physical and economic displacement (aligned with construction phases and into operation)	Section 8 and 9 of Table 7.2
3	**Construction – Consultant (Engineers)**	**Section 6 (Construction EMP)**
3.1	Site clearance	Section 6.5.12 (Rehabilitation) Section 6.5.10 (Biodiversity)
3.2	Top soil recovery and concurrent rehabilitation	Section 6.5.12 (Rehabilitation)
3.3	Borrow pits and quarries	Section 6.5.6 (Borrow pits and quarries)
3.4	Blasting	Section 6.5.5 (Blasting management)
3.5	Rock spoil	Section 6.5.7 (Water management)
3.6	Asphalt plants, cement batching	Section 6.5.8 (Spill prevention)
3.7	Bridge construction	Section 6.5.7 (Water management)
3.8	Social issues (dust, noise, water sources, labour, traffic, health & safety)	Sections 6.5.4 (noise); 6.5.3 (dust); 6.5.7 (water); 6.5.14 (labour, social benefits); 6.5.13 (cultural heritage / graves)
3.9	Waste management, site clean up	Section 6.5.9 (Waste management) Section 6.5.12 (Rehabilitation and site clean-up)
4	**Construction – LHDA**	**Section 7 (LHDA Environmental and Social Commitments)**
4.1	Spiral aloe awareness raising	Section 1.3 of Table 7.2
4.2	Oversee and Monitor Implementation of Chance Finds Procedure by Contractors	Section 6.6 of Table 7.2
4.2	Continue Traffic and Public Health and Safety Awareness raising at schools, clinics and communities	Section 7 of Table 7.2
4.3	Continue RAP and LR&SD roll out	Section 9 of Table 7.2
5	**Post-Construction Liability - Contractors**	**Section 8 and Table 8.1 (Contractor Monitoring)**
5.1	Monitoring of alien invasive plants	Section 9.3 of Table 6.19
5.2	Monitoring of rehabilitation success including erosion, stabilisation and vegetation recovery	Section 6.5.12 Ref No. 4 of Table 8.1

No.	Phase	Reference
6	**Post-Construction Liability through to Operation[1] - LHDA**	**Section 7 (LHDA Environmental and Social Commitments)**
6.1	Liaison with traffic authorities on speed enforcement	Ref No. 7.2 (speed enforcement)
6.2	Monitoring of sand mining (into operation phase)	Ref No. 1.1 in Table 8.2
6.3	Monitoring of spiral aloe harvesting and sale (into operation)	Ref No. 2.2 and 2.3 in Table 8.2
7	**Operation[2] - LHDA**	**Table 8.2 (Monitoring – LHDA)**
7.1	Monitoring of alien plants	Ref No. 2.1 in Table 8.2 Section 8.6.1.1
7.4	Monitoring of plant survival in plant safeguard areas / community gardens	Ref No. 2.4 in Table 8.2
7.5	Monitoring of frogs	Ref No. 2.5 in Table 8.2
7.6	Monitoring of wetlands every five years	Ref No. 3 in Table 8.2
7.7	Monitoring of rehabilitation success	Ref No. 4.1 in Table 8.2
7.8	Monitoring of erosion	Ref No. 4.2 in Table 8.2
7.9	Monitoring and evaluation of RAP implementation and livelihood restoration	Ref No. 5.1 in Table 8.2
7.10	Monitoring checks of view site maintenance	Ref No. 7.1 in Table 8.2

[1] LHDA shall remain responsible for monitoring throughout dam construction (estimated at 3 years after the PWAR and BPST becomes operational

[2] LHDA shall remain responsible for monitoring throughout dam construction (estimated at 3 years after the PWAR and BPST becomes operational

6.3 Buffer Zones

The environmental and social management measures required during construction include a number of setbacks or buffers zones from sensitive areas in which Project activities shall be restricted. These buffer zones shall be included on site layout plans and made known to all Contractor staff through induction training and regular (weekly) toolbox talks. A summary of these is provided in Table 6.2.

Table 6.2 Buffer Zones

Activity	Buffer	Measure	Reference
Dust Emissions	200 m	Dust emissions from unpaved roads situated within 200 m of any communities, school or other gathering point will be reduced (through the application of a surface binding agent and/or watering) especially in windy conditions, where exposed soil may generate significant dust and/or if complaints are received.	Ref No. 2.3 in Table 6.8 (Air Quality and Dust Management)
Storage of Hazardous Materials in sensitive areas	100 m	The containment of fuel, lubricants / oils, chemicals, hazardous waste and hazardous material will not be located within 100 m of any river, stream and/or wetland. Any requirement for storage within these sensitive zones shall be subject to an approved Method Statement.	Ref No. 7.10 in Table 6.16 (Spill Prevention, Control and Containment Management)
Refuelling or Emergency Repairs	50 m	Where refuelling or emergency repair of vehicles or machinery is required, this will not occur within 50 m of river / stream banks, wetlands, or within the 100-year floodline, whichever is applicable.	Ref No. 6.19 in Table 6.15 (Water Management)
Toilet Facilities	100 m	Sanitation facilities shall be limited to mobile chemical toilets and these shall not be located closer than 100 m to any water body (river, stream or wetland).	Ref No. 6.28 in Table 6.15 (Water Management)
Restricted Rock Spoil Zones	• kp 3.5 to 5 (Liseleng River) • kp 14.5 to 15.5 (Liseleng River) • kp 30 to 36 (Makhoaba River) • kp 37.5 to 40.5 (Makhoaba River & waterfall).	Restricted rock spoil areas within these kp buffers are those located in close proximity to streams/rivers and shall be designated as 'restricted rock spoil' zones on site plans, and given to all Contractors. Note: rock spoiling shall not be allowed to fall into river courses causing damage to aquatic ecosystems. Rock spoiling in these specified areas is subject to identification of specific areas where rock spoil will not damage rivers and subject to approval by the EM.	Ref No. 6.7 in Table 6.15 (Water Management)
Deposition of Top Soil	50 m from river or wetland edge	Soil stockpiles to be stored at least 50 m from the edge of wetlands, streams or rivers; areas prone to flooding, or where the flow of water could cause ponding of water or soil erosion.	Ref No. 11.6 in Table 6.21 (Rehabilitation and Site Clean Up)
Demarcation of Graves and Ash Heaps	30 m from centre line of road	Demarcate all graves and ash heaps within 30 m of the road and powerline route or other impact zones with boulders or other suitable means and delineate them on maps with the road alignment. These shall be given to the Contractors to ensure avoidance.	Ref No.6.4 in Table 7.2 (Cultural Heritage Management)

6.4 Environmental Method Statements

Environmental Method Statements shall be compiled by the Contractor and presented to the Engineer for approval prior to commencing certain activities. These will be required for specific activities that are deemed or identified to pose a risk to the environment and/or which require site specific detail beyond that contained in the EMP, or when requested or instructed by the Engineer.

The Contractor shall compile Method Statements as required for the activities included in Table 6.3. They may be updated as work progresses and additional ones may be identified during construction.

Method Statements may be required to be submitted to the DoE for information purposes only.

Method Statements are required to describe the approach and methods to undertaking a specific work activity with the support of supporting information and maps where useful, and how any environmental damage will be rectified. They should include the following type of information:

- The details (method) of the work/activity that is to be undertaken;
- Provide an annotated plan of the extent of the works/activity;
- Details around the how the works/activity will be structured (sequence of tasks) so as to be carried out in a safe/environmentally favourable manner;
- Details around the duration (start and end dates) of the works/activity to be undertaken;
- Identification of the supervisory responsibilities for the job including contact details;
- A clear list of the identified environmental and social hazards and the mitigation/management controls that are in place;
- The methods that will be used to monitor the health and safety and environmental performance of the works/activity;
- Details of any permits / authorisations that will be required prior to the works/activity being undertaken;
- The plant, machinery and/or equipment that will be necessary to perform the works/activity;
- A list of the relevant qualifications and/or competencies required to perform the works/activity;
- Details (e.g., handling, storage and disposal) of the materials that need to be used to perform the works/activity, and identification of materials that have potential health, safety and/or environmental risks; and
- Details of any applicable emergency procedures.

Table 6.3 Activities Requiring Method Statements

Activity	Description	Requirement Reference
Alien Invasive Plants	Covers all measures for preventing and controlling the spread of alien invasive plants, including the importation of soil and landscaping materials; use and washing of equipment prior to entry and monitoring of alien plant spread during construction and the post-construction defects liability phase. (Note: this measure applies to alien invasive plants that may proliferate during construction and not to existing woody tree species that are used for fuel or timber).	Ref No. 9.3 in Table 6.19 (Biodiversity Management)
Blasting	Details of all methods, safety measures, and logistics related to blasting.	Ref No. 4.2 in Table 6.12 (Blasting Management)
Borrow Pits and Quarries	Details relating to the design of borrow pits and quarries (including community safety measures), extraction methods and logistics related to transport of sand and aggregate to active work sites.	Ref No.5.7 in Table 6.13 (Borrow Pits and Quarries)

Activity	Description	Requirement Reference
Bridges and Culverts	Activities and methods to ensure that riverbanks and riverine vegetation; the water table and water quality of the receiving systems, and water users are not unduly affected.	Ref No 6.3 in Table 6.15 (Water Management)
Cement Batching(1), Aggregate Crushing and Asphalt Plants	Methods required to minimise environmental and social risks associated with cement batching, aggregate crushing and asphalt plants (e.g., dust, effluent runoff, waste, noise, etc.).	Ref 9.7 of Table 6.19 (Biodiversity Management)
Clean Up of Work Sites	Measures to ensure sites are cleaned up, tidied and made safe on a daily basis.	Ref No 11.1 and 11.2 in Table 6.21 (Rehabilitation and Site Clean Up)
Community Engagement and Grievance Protocol	Methods and approach to dealing with local residents; designated staff responsible for community engagement; responding to requests for work or compensation; respect for local residents property, crops, animals and water supplies; crossing of fields; removal of rocks from fields, traffic safety, etc.	Ref 13.1 and 13.2 of Table 6.25 (Social Management)
Dust Control Methods	Methods for management of dust during construction, with specific detail where activities are in close proximity to schools, clinics, religious institutions and villages. This should include the need and use of dust suppressants and sources of water.	Ref No. 2.1 in Table 6.8 (Air Quality and Dust Management)
Environmental Awareness	Approach and methods for ongoing environmental awareness raising including frequency, attendance and content of training sessions. All site staff will be made aware of the EMP, environmental license conditions, environmentally and socially sensitive areas and roles and responsibilities in terms of environmental management. This shall include measures to respect the flora and fauna and wetlands (see Table 6.19).	Ref No. 1.2 in Table 6.5 (Environmental Induction and Training Management)
Fire Management	Method Statement should cover all aspects of preventing unplanned fires and control of fires that may occur. It should include aspects ranging from restrictions on staff fires at work sites; disposal of cigarettes, clean up of glass, running vehicle engines (in grass) etc., and the equipment, material and skills required for controlling fires that may occur.	Various clauses throughout document: Ref 1.3 of Table 6.5; Ref 2.7 and 2.20 of Table 6.8; Ref 8.16 of Table 6.18
Grievances	Contractor to develop a grievance procedure in line with LHDA's Grievance Resolution Procedure.	Ref 13.2 in Table 6.25
Hazardous Substances: Storage, Handling and Disposal	Method Statements detailing the substances / materials to be used, together with the storage, handling and disposal procedures of the materials. This will include (but not limited to) methods for refuelling of vehicles, machinery and equipment.	Ref No. 7.14 in Table 6.16 (Spill Prevention, Control and Containment Management)
Induction Training	Method Statement shall describe the scope and frequency of Induction Training to inform staff (and new starters) of the range of environmental and social obligations required under the EMP and Method Statements.	Ref No. 1.1 in Table 6.5 (Environmental Induction and Training Management)

(1) **Note** - it is assumed that any cement batching and asphalt plants will be located at the western and eastern PWAC Construction Camps or along the Northern Access Route (sites to be confirmed), and are outside of this EMP.

Activity	Description	Requirement Reference
Monitoring of Air, Noise and Water Quality, and Aquatic Habitats	Method Statements shall be prepared covering the approach, methods and sites for monitoring dust, noise and water quality during construction as well as the status of aquatic habitats at bridge and major culverts.	See monitoring requirements in Sections 8.2 to 8.5.
Noise Management	Method Statement shall describe all measures required to restrict noise during construction, ranging from disturbance to local residents from construction staff shouting or playing music; unnecessary running of engines; and vehicle and equipment maintenance and servicing.	Ref No. 3.1 in Table 6.11 (Noise Management)
Refuelling and Repairs of Vehicles / Equipment	Method Statement shall describe how and where refuelling and repairs of vehicles and equipment shall be carried out, and what measures will be taken to prevent soil and water pollution, taking into consideration requirement for bunding and maintaining a buffer distance of 50 m from sensitive areas.	Ref No.6.19 of Table 6.15 (Water Management)
Rehabilitation	A method for rehabilitation of disturbed areas and revegetation after construction is complete. This will include details for all construction areas including temporary areas, including construction access tracks, and quarries and borrow pits.	Ref No. 11.4 in Table 6.21 (Site Clean-up and Rehabilitation Management)
Rock Spoil	Define how and where rock spoil will be disposed of, especially where restricted rock spoil zones have been identified to prevent damage to aquatic habitats.	Ref No. 6.7 in Table 6.15 (Water Management)
Site Layout and Clearance	Method to be used during site establishment, and detailing site layout and clearance plan indicating the footprint of site clearance including topsoil stockpile zones.	Ref No. 11.3 in Table 6.21 (Rehabilitation and Site Clean Up)
Spill Emergency Response	Spill emergency response and clean-up procedures for spills, including spills in streams, rivers and/or wetlands.	Ref No. 7.19 in Table 6.16 (Spill Prevention, Control and Containment Management)
Spiral Aloes	Provides methods for removal, labelling, storage, transportation and replanting of Spiral Aloes that occur at homesteads that may be affected by construction.	Ref No.1 in Table 7.2 (LHDA Environmental & Social Commitments)
Stormwater Management and Monitoring	Methods for the management and monitoring of stormwater to minimise the transport of sediment and other pollutants off site and into streams and wetlands as well as prevent the discharge of high velocity flows into downslope wetlands. This should include monthly monitoring of water quality at river and wetland crossings; and observations and fixed point photographs of the stability of embankments and culvert outflows. Water quality parameters will need to be relevant to the type of potential pollutants on-site (e.g., construction camps, asphalt plants, etc.).	Ref No. 6.2 in Table 6.15 (Water Management)
Topsoil Management	Methods for the recovery and stockpiling of top soil, and its reinstatement in a phased approach as construction progresses.	Ref No. 11.5 in Table 6.21 (Rehabilitation and Site Clean Up)
Traffic Management	Traffic management Method Statement will need to involve requirements of construction staff to observe safe driving practices, vehicle maintenance, pedestrian and animal safety, accident protocols and compensation procedures.	Ref No. 13.4 in Table 6.25 (Social Management)

Activity	Description	Requirement Reference
Waste Management	Waste control including waste minimisation, separation of waste streams, recycling, re-use, storage, transport and removal of waste from the Site.	Ref No.8.1 in Table 6.18 (Waste Management)
Waste Transport	Waste control including waste minimisation, separation of waste streams, recycling, re-use, storage, transport and removal of waste from the Site.	Ref No.8.10 in Table 6.18 (Waste Management)
Water Abstraction	Activities relating to the siting of abstraction points, volumes to be abstracted, abstraction frequency and pollution control measures. Specific consideration is required to ensure abstraction is not undertaken during dry, low flow conditions in small streams where flow necessary for the maintenance of sensitive riffle habitats is required. In this regard, no abstraction should be permitted from the upper Liseleng stream or any wetlands, and water sources for abstraction should focus on the Matsoku, Semenanyane and Makhoaba Rivers.	Ref No. 6.4 in Table 6.15 (Water Management)
Wetland Protection	Mitigation / management measures for the protection of wetlands.	Ref No 9.1 in Table 6.19 (Biodiversity Management)

A Method Statement is a "live document" in that modifications are negotiated between the Contractor and the Engineers HSE manager(s), as circumstances unfold. Changes to, and adaptations of, Method Statements can be implemented with the prior consent of all parties. All Environmental Method Statements will form part of this EMP and are subject to the terms and conditions contained within the EMP.

PLEASE NOTE:

A Method Statement is a starting point for understanding the nature of the intended actions to be carried out and allows for all parties to review and understand the procedures to be followed in order to minimise risk of harm to the environment. It describes the scope of the intended work in a step-by-step description, in order for the Engineers HSE Manager and the Engineer to understand the Contractor's intentions. This will enable them to assist in devising any mitigation measures, which would minimise environmental and social impact during these tasks.

For each instance where a Method Statement is requested, the format will clearly indicate the following:

- **What** – a brief description of the work to be undertaken.
- **How** – a detailed description of the process of work, methods and materials.
- **Where** – a description/sketch map of the locality of work (if applicable).
- **When** – the sequencing of actions with due commencement dates and completion date estimates.
- **Who** – the person responsible for undertaking the works described in the Method Statement.
- **Why** – a description of why the activity is required.

All Method Statements must be developed to the satisfaction of the Engineers HSE Manager(s), Engineer and, where practical or stipulated in the Environmental Licence.

6.5 Contractor Management Measures

6.5.1 Content Guide

Section 6.5.2 to 6.5.14 presents the management / mitigation measures that will be implemented by Contractors both pre- and during the construction phase of the Project.

A guide to the content of the Construction EMP management and mitigation measures is presented in Table 6.4.

Table 6.4 Content Guide Construction Management / Mitigation Measures

Management Feature	Reference	Aspect / Activity	Management Measures Reference No's.
Environmental Induction and Training	Section 6.5.2	Awareness	1.4 to 1.5
		Method Statement	1.1 to 1.2
		Training	1.3
Air Quality and Dust	Section 6.5.3	Borrow Pits and Quarries	2.8 to 2.9
		Fire	2.20
		General	2.21 to 2.22
		Grievances	2.2
		Ground Works	2.10 to 2.15
		Hazardous and Dangerous Goods Management	2.19
		Environmental Method Statement	2.1
		Stockpiling	2.16 to 2.18
		Vehicle Management	2.3 to 2.7
Noise	Section 6.5.4	Method statement	3.1
		General	3.7 to 3.12
		Grievances	3.2
		Vehicle Management	3.3 to 3.6
Blasting	Section 6.5.5	Asset Condition Survey	4.1
		Method Statement	4.2
		Grievances	4.3
		Training	4.4
		Hazardous Materials	4.5-4.7
		Blasting Protocol	4.8-4.9
Borrow Pits and Quarries	Section 6.5.6	Location and Siting	5.1
		Plant and Wetland Surveys	5.2
		Bird Surveys	5.3
		Stakeholder Consultation	5.4
		Land Acquisition	5.5
		Future Use & Rehabilitation	5.6
Water	Section 6.5.5	Bridges and Roads	6.1
		Community Water Supply	6.12 to 6.16
		Drainage Pipes	6.6
		Excavations and spoil dumps	6.30
		General	6.25 to 6.29
		Grievances	6.8
		Method Statements	6.2 to 6.5
		Restricted Rock Spoil Zones	6.7

Management Feature	Reference	Aspect / Activity	Management Measures Reference No's.
		Spills	6.17
		Stormwater Management	6.22 to 6.24
		Vehicle Management	6.18 to 6.19
		Waste / Effluent Management	6.20 to 6.21
		Water Use	6.9 to 6.11
Spill Prevention, Control and Containment	Section 6.5.8	Awareness	7.3 to 7.4
		General	7.3 to 7.14
		Method Statement	7.19
		Rivers and Streams	7.8
		Spills and Clean Up	7.20 to 7.24
		Training	7.1 to 7.2
		Transport of Hazardous Materials	7.15 to 7.18
Waste	Section 6.5.9	Hazardous and Dangerous Goods Management	8.8
		Method Statement	8.1
		Waste Containers & Labelling	8.2 to 8.3
		Waste Transport	8.9 to 8.12
		Waste Segregation	8.4 to 8.7
		Waste Management Training	8.8
		Site Clean Up	8.13 to 8.14
		Workforce Eating Areas	8.15 to 8.16
		Sewage Waste	8.17
		Concrete Waste	8.18
Biodiversity	Section 6.5.10	Alien Plant Management	9.3
		Training and Awareness	9.2
		Birds	9.4 to 9.6
		Blasting	9.6
		Borrow Pits and Quarries	9.6 to
		Laydown Areas	9.8
		Method Statement	9.1 and 9.7
		Rock Spoil	9.9
		Powerline	9.6
		Rivers and Streams	9.8 and 9.9
		Vehicle Access	9.7
		Wetlands	9.10 to 9.14
Landscape and Visual	Section 6.5.11	Land Clearance	10.4
		Rehabilitation	10.5 and 10.6
		View sites and visual enhancement measures	10.1 and 10.2
		Vehicle Management	10.3
Site Clean-up and Rehabilitation	Section 6.5.12	Borrow Pits and Quarries	11.10
		Site Clean up	11.2
		Method Statements	11.1, 11.3 and 11.4
		Toil Soil and Stockpiles	11.5 and 11.6
		Cut and Fill Slopes	11.7
		Priority Areas for Rehabilitation	11.8
		Wetland rehabilitation	11.9

Management Feature	Reference	Aspect / Activity	Management Measures Reference No's.
		Borrow Pits and Quarries	11.10 and Section 6.5.6
Cultural Heritage	Section 6.5.13	Induction and Training	12.1
		Graves – Mapping and Demarcation	12.2
		Chance Finds Procedure	12.3
Social	Section 6.5.14	Community Engagement	13.19
		Contractor Camp	13.15
		Dust	13.18
		Employment	13.7
		Grievances	13.2 to 13.3
		HIV/AIDS Management	13.14
		Labour Code of Conduct	13.16, 13.17
		Method Statement for Community Engagement	13.1
		Noise, Blasting	13.9, 13.10
		Open Trenches and Quarries	13.6
		Rocks in Fields	13.13
		Safety awareness	13.13
		Procurement of Goods & Services	13.8
		Traffic Safety	13.4 and 13.5
		Water and Waste Management	13.11

6.5.2 Environmental Induction and Ongoing Training and Awareness

6.5.2.1 Project Activities

The Project will require a workforce that will have direct responsibility for managing the potential risks and impacts of construction activities on the physical, biological and social environments.

Construction staff will require initial induction training as well as ongoing training and awareness sessions during construction (to be covered under separate Method Statements).

6.5.2.2 Responsibility

Primary Contractors appointed for the construction of the PWAR and BPST components.

6.5.2.3 Objectives

Overall objective is to foster skills and knowledge transfer, environmental awareness, health and safety awareness and materials and equipment skills development.

Specific objectives include:

- Comply with the Environmental Policy objectives relating to Environmental Awareness and Education of Contractor Staff.
- Ensure that all site personnel, including Subcontractors, understand the:
    - Environmental and social requirements of the Project and how these will be implemented and monitored on site;
    - Contents and relevant requirements of Project activities and their management contained within the EMP;
    - Environmental and social sensitivities of the Project Area;
    - Procedures to be followed in the event of non-compliance with the environmental and social requirements;
    - Protocols and channels of communication for engaging with communities in the Project Area; and
    - Procedures for responding to the media, unauthorised visitors to the site, and enquiries from the public.

6.5.2.4 Performance Criteria

- All personnel undergo site induction and weekly awareness training (e.g., toolbox talks) that address environmental and social requirements of the Project activities.
- Tests of environmental training and awareness.
- Full compliance with induction and training procedures.

6.5.2.5 Management Measures

The management measures included in Table 6.5 will be implemented to reduce negative impacts associated with workforce exposure / interaction with the physical, biological and social environments.

Table 6.5 Environmental Induction and Training Management

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
1.1	Method Statement for Induction	A Method Statement will be developed for induction training prior to the start of construction. Training will need to explain environmental and social obligations, the purpose of the EMP and any issues new starters (whether permanent staff or Subcontractors) must be aware of. Induction materials shall include an assessment to test the efficacy of the induction material and knowledge learned by staff.	Prior to construction	• Documented proof of training • Induction test results • Induction Method Statement	✓	✓
1.2	Method Statement for Awareness Training	A Method Statement will be developed for ongoing environmental awareness training prior to the start of construction. All site staff will be made aware of the EMP, environmental license conditions, environmentally and socially sensitive areas and roles and responsibilities in terms of environmental management. The Method Statement will clearly list who will require training, the frequency of training and the procedure to document training activities.	Prior to construction	• Proof of training • Training Method Statement	✓	✓
1.3	Training	Environmental training should include, but not limited to, the following: • Awareness-raising of how different construction activities can impact on the environment, why it is important to avoid environmental damage and what steps can be taken to mitigate the impacts of construction activities. • Identification of possible archaeological or historical objects and the requirement to notify the CLO, ECO or Engineer if such an object is found, and to be informed of 'no go' areas, e.g., of cultural heritage sites, springs, etc. • General conduct on site such as noise levels, e.g., shouting and hooting, alcohol consumption, drug use, toilet behaviour, littering, no firearms, no pets, no harvesting of firewood / plants, no trespassing or damage to property, no throwing of cigarette butts or glass into the veld, etc. • Responsible handling of chemicals and spills, and the correct disposal of chemical containers and other waste objects. • Emergency procedures and incident reporting. • Location of fire-fighting equipment and its use. • Prevention of uncontrolled fires and restrictions on making fires in undesignated areas.	Throughout construction	• Documented proof of training	✓	✓
1.4	Awareness	Information posters should be put up in worker eating or recreation areas depicting typical prohibited activities that should be complied with on and off site.	Throughout construction	• Proof of display of posters	✓	✓
1.5		Regular toolbox talks to remind Contractor staff about the various EMP and health and safety requirements.	Throughout construction	• Proof of training • Attendance records at toolbox talks	✓	✓

6.5.3 Air Quality and Dust Management

6.5.3.1 Project Activities Resulting in Impacts to Air Quality

- Exposure of soils during site clearance and construction;
- Crushing of aggregate and extraction of borrow material;
- Vehicle movement over unpaved surfaces;
- Vehicles exhaust emissions;
- Exhaust emissions from diesel powered generators used during construction;
- Transport, handling and stockpiling of friable materials required for construction.

6.5.3.2 Responsibility

Primary Contractors associated with the construction of the PWAR and BPST.

6.5.3.3 Objectives

The overall objective is to preserve air quality levels to the extent that public health, safety and environmental protection are assured.

Meeting this object will require that construction activities are conducted in a manner that minimises impacts on ambient air quality and complies with acceptable good practice standards for dust deposition.

Dust bucket monitoring will be undertaken by the PWAR Contractor at socially sensitive points (e.g., quarries, crushing sites, and near schools/ villages) to verify performance criteria (i.e., air quality standards) are maintained. Air quality monitoring requirements are described in Section 8.2.

6.5.3.4 Performance Criteria

The primary performance criteria associated with air quality and dust emission management for the Project include:

- No undue concerns expressed by surrounding stakeholders in terms of atmospheric emissions;
- Respond to all atmospheric emission related complaints received from surrounding stakeholders and implement mitigation measures.

It must be noted that there are no standards enforced in Lesotho through national legislation that are applicable to ambient air quality and none relate to dust deposition. Therefore, the air quality guidelines advocated by the IFC and dust deposition guidelines from South Africa should be adopted for this Project. Accordingly the Project specific air quality action levels for the Project are as follows:

- The IFC cite ambient air quality standards based upon the World Health Organisation (WHO) Air Quality Guidelines for Europe 2000, and 2005 update. These are the principle air quality standards and guidelines used in this EMP in the absence of specific national standards. These standards are set out in Table 6.6:

Table 6.6 Ambient Air Quality Guidelines

Pollutant	Averaging Period	WHO Guideline Value (µg/m^3)	SANS Limits (1929:2011) (µg/m^3)	SANS Target (1929:2011) (µg/m^3)
SO_2	24-hour maximum	125	125	125
	1 hour average		350	350
	10-minute average	500 [a]	500	500
NO_2	1-year mean	40	40	40
	1-hour maximum	200	200	200
PM_{10}	1-year average	20	50	40

Pollutant	Averaging Period	WHO Guideline Value (µg/m^3)	SANS Limits (1929:2011) (µg/m^3)	SANS Target (1929:2011) (µg/m^3)
	24-hour (assessed as the third highest 24 hour period (99th percentile)	50	120	75
$PM_{2.5}$	1-year mean	10	25, 20, 15	
	24-hour maximum	25	65, 40, 25	
A 10 minute average				

SANS has also published dust deposition standards that are based on the cumulative South African dust-fall levels in SANS 1929:2011. Four bands have been developed against which dust fallout can be evaluated (see Table 6.7). These dust fall-out levels were taken into consideration for the determination of the levels of nuisance in surrounding communities. In the absence of dust fall standards in Lesotho, the dust fall would be measured against the SANS 1929:2005. The acceptable dust fall rate for non-residential areas is between 600-1200 mg / m^2 / day over a 30-day average.

Table 6.7 Bands of Dust Deposition Rates Issued by SANS 1929 of 2011

No	Band Description Level	Dust fallout rate (D) (mg/m^3/day) (30-day average)	Comments
1	Residential	D < 600	Permissible for residential and light commercial.
2	Industrial	600 < D < 1200	Permissible for heavy commercial and industrial
3	Action	1200 < D < 2400	Requires investigation and remediation if two sequential months lie in this band, or more than three occur in a year.
4	Alert	2400 < D	Immediate action and remediation required following the first incidence of the dust fallout rate being exceeded. Incident report to be submitted to the relevant authority.

According to the air quality standards and objectives for South Africa the 1200-mg/m^2 per day threshold level has typically been used in practice to indicate what (if any) action is required. Exceedance of this dust fall rate indicates the need to investigate the specific cause(s) of high dust fall and to take remedial steps.

6.5.3.5 Management Measures

The management measures included in Table 6.8 will be implemented to reduce impacts from the Project on air quality.

Table 6.8 Air Quality and Dust Management

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
2.1	Method Statement	Method Statements will be produced for activities with the potential to generate dust emissions (e.g., those activities included in Section 6.5.3.1). All Method Statements will be produced prior to the start of construction; and updated or new ones developed as needed.	Start of construction	Method Statements provided	✓	✓
2.2	Grievances	The Contractor's CLO shall document any air quality / dust complaints raised by communities along the PWAR and BPST and record them on a grievance register sheet. Any dust related grievances raised shall be investigated.	Start of construction	A grievance procedure to manage complaints received	✓	✓
2.3	Vehicle Management	Dust emissions from unpaved roads situated within 200 m of any communities, school or other social gathering point will be reduced (through the application of a surface binding agent and/or watering techniques), especially during windy conditions or if complaints regarding dust are received. Note: watering to suppress dust should only be permitted should abstraction from rivers not impact sensitive riffle habitats. No water should be abstracted from the Liseleng River, except in high flow conditions.	Throughout construction	Dust related complaints from surrounding communities	✓	✓
2.4		Speed limits on unpaved roads should be suited to the given road condition and should not exceed a maximum of 30 km/hour along the PWAR through villages or past schools to prevent excessive dust emissions (and traffic safety risks). This should be enforced on an ongoing basis.	Throughout construction		✓	✓
2.5		Consideration should be given to covering of vehicles transporting friable materials through villages or past schools, where feasible.	Throughout construction	Records / visual observations	✓	✓
2.6		Vehicles will be regularly serviced (at least annually) and maintained in a reasonable working order to reduce emissions. In particular, exhaust emissions should not emit black exhaust fumes or smoke.	Throughout construction	• Maintenance service record • Visual observations on emissions	✓	✓
2.7		When not in use, vehicles will be switched off, unless impractical for health and safety reasons (for example maintenance of air conditioning) (and to reduce risk of grass fires).	Throughout construction	Records / visual observations	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
2.8	Borrow Pits and Quarries and Aggregate Crushing	Dust suppression must be considered as part of the design and location of borrow pits, quarries and aggregate crushing plants, and other measures will be implemented to restrict dust-related impacts. Dust monitoring should be implemented around aggregate crushing plants, in particular where these are located in proximity to sensitive receptors in order to monitor if dust levels are exceeding standards and to identify additional dust suppression measures. If it becomes evident that dust emissions from aggregate crushing and screening and extraction of borrow or quarry material are resulting in an impact to sensitive receptors within the Project Area then additional dust suppression measures (and wind breaks if feasible) will need to be considered around these crushing, screening and extraction activities. Consideration should be given to scheduling aggregate crushing and hauling activities outside of dry and windy conditions where sensitive receptors may be affected, if feasible.	Throughout construction	Dust related complaints from surrounding communities	✓	
2.9		If a quarry is essential near Kosheteng woolshed, undertake consultation with the Wool and Mohair Growers Association (WMGA), other woolshed users, Makhiseng Agricultural Centre and other district authorities on dust-related impacts to livestock.	Throughout construction	Records / visual observations	✓	☐
2.10	Ground Works / Site Clearance	Within practical limits, the smallest possible area required to be cleared for ground works will be exposed. Clearing of vegetation shall be kept to a minimum.	Throughout construction	Records / visual observations	✓	✓
2.11		The extent and period of exposure of bare surfaces will be minimised.	Throughout construction	Records / visual observations	✓	✓
2.12		Dust emissions during windy conditions will be reduced at active work sites through the use of dust suppression measures, especially during the site preparation phase for occupational exposures.	Throughout construction	Records, visual observations, and dust complaints	✓	✓
2.13		If the use of watering techniques on exposed open earthworks is not feasible and if it becomes evident that dust emissions from these exposed areas are resulting in an impact to local residents then the use of surface binding agents shall be considered.	Throughout construction	Records, visual observations and dust complaints	✓	✓
2.14		Avoid or minimise dust-generating activities (i.e. grading and moving of soil) during very windy conditions as far as possible (within the time constraints for project implementation).	Throughout construction	Records / visual observations	✓	✓
2.15		Stabilise exposed areas prone to wind erosion as soon as practically possible.	Throughout construction	Records / visual observations	✓	✓
2.16	Stockpiling	The stockpiling of friable materials (e.g. sand and soils) in areas close to villages or other sensitive receptors will be kept to a minimum.	Throughout construction	Records / visual observations	✓	✓
2.17		Stockpiles will be located as far away from sensitive receptors or areas as possible and will be designed to retain a low profile with no sharp edges.	Throughout construction	Soil stockpiles in accordance with Method Statement / site layout plan	✓	✓
2.18		Any friable material stores will be enclosed or covered by suitable shade cloth or netting to prevent escape of dust during windy conditions or during loading and transport.	Throughout construction	Records / visual observations	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
2.19	Hazardous Materials	Diesel with the lowest sulphur content (that is commercially available for the Project) will be used to fuel power driven machinery / vehicles / equipment.	Throughout construction	Fuel records	✓	✓
2.20	Fire	A “no unauthorised burning” policy will be implemented.	Throughout construction	Records / visual observations	✓	✓
2.21	General	Diesel generators will be subject to routine maintenance to keep the engines in optimum working order.	Throughout construction	Service record and maintenance on all vehicles and equipment	✓	✓
2.22		Drop heights of material will be minimised and appropriate Personal Protection Equipment (PPE) used.	Throughout construction	Records / visual observations	✓	✓

6.5.4 Noise Management

6.5.4.1 Project Activities Resulting in Noise Impacts

- Activities associated with general construction works.
- Mechanical noise emissions from vehicles, plant and machinery.
- Vehicles handling and transportation of equipment and supplies.
- Aggregate crushing plants and quarries.

6.5.4.2 Responsibility

Primary Contractors associated with the construction of the PWAR and BPST.

6.5.4.3 Objectives

- To undertake activities during construction in a manner that minimises the impact of noise to nearby residents, school children, and other noise sensitive receptors.

6.5.4.4 Performance Criteria

The primary performance criteria associated with noise management for the Project include:

- No undue concerns or complaints expressed by surrounding stakeholders in terms of noise;
- Respond to all noise related complaints received from surrounding stakeholders and implement mitigation measures.

For the purpose of this EMP, the Project specific noise criteria will be drawn from the *IFC EHS Guidelines Noise 1.7 (IFC, 2007) and SANS 10103: 2008* as indicated in Table 6.9 and Table 6.10, respectively:

Table 6.9 IFC Noise Specifications

Receptor	Maximum Allowable Ambient Noise Levels, LAeq,1hr, dB(A) Free field	
	Daytime 07:00 – 22:00	Night-time 22:00 – 07:00
Residential, institutional, educational	55	45

Table 6.10 Acceptable Noise Levels (dBA) for Noise in Rural Districts based on SANS 10103: 2008

Type of District	Day-Night (LR,dn1) 06:00 – 22:00	Night Time (LReq,d2) 22:00 – 06:00
Rural District	45	35

SANS 1013 provides a guideline for estimating community response to an increase in general ambient noise level caused by an intruding noise. In general an increase of 3 dBA or less will not cause a response from a community; an increase of 3 to 5 dBA will elicit little response or only sporadic complaints; while an increase of 5 to 15 dBA will elicit a medium response with widespread complaints, while an increase greater than 15 dBA can be expected to elicit a strong community response. It must be noted however that these responses will more likely apply where communities are located near facilities such as aggregate crushing plants or quarries that will be used over a longer period than road construction which progresses over a shorter period of time.

It must be noted that measurements to confirm these maximum allowable ambient noise levels are to be taken at sensitive noise receptors located near the construction area. The IFC Noise 1.7 guideline (IFC, 2007) also states that noise impacts should not exceed the levels presented in the

Table above or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

6.5.4.5 Management Measures

The management measures included in Table 6.11 will be implemented to reduce noise related impacts from the Project.

Table 6.11 Noise Management

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
3.1	Method Statement	Method Statement shall identify and describe all measures that will be implemented to control and minimise noise and impacts on biodiversity, people and livestock, ranging from: • Vehicle maintenance and servicing (Points 3.3 to 3.6 below); • General measures (Points 3.7 to 3.14); • Blasting (Table 6.12); • Construction staff behaviour (Point 13.9 in Table 6.25)	Start of construction	Method statement for noise management	✓	✓
3.2	Grievances	Contractors will be required to develop a grievance protocol to manage and address any noise complaints received.	Start of construction	Grievance protocol	✓	✓
3.3	Vehicle Management	Less annoying alternatives to conventional audible vehicle reversing alarms will be used (such as visual and/ or broadband noise emitting models i.e. 'squashed duck') that provide a safe system of work.	Throughout construction	Records and visual observations	✓	✓
3.4		A conservative vehicle maintenance schedule will be developed that seeks to reduce any increase in noise / vibration outputs due to 'wear and tear'.	Throughout construction	Service records	✓	✓
3.5		The informal use of truck honking systems will be prohibited (especially when in or passing residential areas or schools) and will only be used to prevent vehicle / pedestrian collision.	Throughout construction	Records / visual observations	✓	✓
3.6		The excessive idling of stationary trucks will be prevented.	Throughout construction	Records / visual observations	✓	✓
3.7	General	Where feasible and reasonable, the dropping of materials (e.g., metallic objects) from height will be avoided.	Throughout construction	Records / visual observations	✓	✓
3.8		Construction activities that generate excessive noise will be limited to daylight hours only. (Note: certain work for bridge construction and concrete work may occasionally extend into evening/night)	Throughout construction	No night-time construction (except essential works)	✓	✓
3.9		Where feasible and reasonable, metal-to-metal contact on equipment will be avoided.	Throughout construction	Records / visual observations	✓	✓
3.10		Suitable and effective silencing devices for pneumatic tools and other plant that would otherwise cause a noise level exceeding 85dB (A) will be used.	Throughout construction	Records	✓	✓
3.11		Where feasible and reasonable, mobile equipment clustering near residences and other sensitive land uses will be avoided.	Throughout construction	Records / visual observations	✓	✓
3.12		Where feasible and reasonable, throttle settings on plant and machinery will be reduced and equipment and plant will be turned off when not being used.	Throughout construction	Records / visual observations	✓	✓
3.13		Where feasible and reasonable, equipment/machinery with lower sound power levels will take preference.	Throughout construction	Equipment inventory	✓	✓
3.14		Machinery, equipment and vehicles will be regularly inspected and maintained to ensure it is in good working order. The condition of mufflers will also be periodically checked.	Throughout construction	Service records	✓	✓

6.5.5 Blasting Management

6.5.5.1 Project Activities

Construction of the PWAR will require the blasting of rock along certain sections of the route where basalt slopes need to be widened. Blasting will also be required at borrow pits and quarries for the supply of aggregate. See Section 6.5.6 for additional measures related to Borrow Pits and Quarries.

6.5.5.2 Responsibility

Primary Contractors associated with the construction of the PWAR, and the Blasting Contractor.

6.5.5.3 Objectives

- Comply with legal requirements (e.g., blasting permit and applicable regulations).
- Undertake blasting activities with no health and safety incidents.
- Undertake blasting activities in an environmentally and socially sensitive manner.

6.5.5.4 Performance Criteria

- No occupational or community health and safety incidents as a result of blasting.
- No complaints from communities along the route of the PWAR.
- Compliance with blasting permit conditions and applicable regulations.

6.5.5.5 Management Measures

The management measures included in Table 6.12 will be implemented to reduce impacts associated with blasting.

Table 6.12 Blasting Management

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
4.1	Asset condition survey	An asset condition survey will be undertaken by Contractors as per LHDA's Asset Condition Survey Protocol.	Prior to construction	Asset condition inventory	✓	✓
4.2	Method Statement	Method Statements will be produced for all activities associated with blasting (transport, handling and use of explosives) together with emergency preparedness procedures, and should be approved by the Engineer prior to commencement of the activity.	Start of construction	Method Statements detailing blasting management activities on site	✓	✓
4.3	Grievances	The LHDA grievance procedure will be expanded to include the PWAR and BPST, and implemented in such way that the Contractors' CLO are able to manage and address any blasting complaints received.	Start of construction	Grievance register	✓	✓
4.4	Training	No person will use any explosive material for blasting purposes unless that person is trained and authorised to use blasting material.	Throughout construction	Training records	✓	✓
4.5	Hazardous Materials	All permit requirements for the storage, use and disposal of explosives will be obtained prior to construction and will be in accordance with the Blasting Regulations.	Prior to construction	Permits obtained and valid	✓	✓
4.6		Explosives will not be stored at the active work areas. Rather these will be stored in appropriate facilities at main construction camps and transported to work sites when needed.	Throughout construction	No storage of explosives at active work sites	✓	✓
4.7		No person will bury, dump, hide or abandon any explosive.	Throughout construction	No unaccounted explosives	✓	✓
4.8	Blasting protocol	Local residents and communities as well as nearby schools or other social gathering areas or areas of livestock concentration (e.g., woolshed) will be advised of the planned blasting schedule ahead of time. Noisy activities (e.g., blasting) are not to be scheduled around critical times (e.g., school exams, religious services/ celebrations). Local leaders, school principals, healthcare workers and religious leaders are to be consulted regarding times that may be negatively affected by noise.	Throughout construction	• No stakeholder complaints or safety incidents • Regular and ongoing communication	✓	✓
4.9		A sufficient number of flagmen will be employed to ensure that livestock herders and livestock do not enter blasting buffer zones during blasting events.	Throughout construction	• Flagmen present • No safety incidents	✓	✓

6.5.6 Borrow Pits and Quarries

6.5.6.1 Project Activities

Several borrow pits and quarries will be required to supply aggregate for the construction of the PWAR and possibly for access roads and substation expansion for the BPST. General blasting requirements are described in Section 6.5.5 under Blasting Management.

6.5.6.2 Responsibility

Primary Contractors associated with the construction of the PWAR, and the Blasting Contractor.

6.5.6.3 Objectives

Overall objective is to design, develop, and excavate borrow pits and quarries with minimum possible footprint and impact on the ecological and social environment, and to rehabilitate them post construction to a safe end land use with minimum scarring through reinstatement of natural vegetation where possible.

6.5.6.4 Performance Criteria

- No occupational or community health and safety incidents at quarries and borrow pits.
- No complaints from communities along the route of the PWAR.
- Compliance with mining permit conditions.

6.5.6.5 Management Measures

The management measures included in Table 6.13 will be implemented to reduce impacts associated with quarries and borrow pits.

Table 6.13 Borrow Pits and Quarries Management

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
5.1	Location and Siting	Avoid (where possible) or minimise the footprint of quarries, borrow pits, or stone crushing plants in high altitude habitats between Ha Thene and Makhoaba Junction between PWAR (kp 16-30). Detailed method statements will be produced for any of these activities in this area, while a method statement for Quarry 7 on Makhoaba Junction and Quarry 12 (west Semenanyane) shall require the inputs of a wetland specialist.	Prior to construction	• Minimum footprint of quarries or borrow pits • Method statements	✓	✓
5.2	Plant and Wetland Surveys **Note**: LHDA to contract surveys but information obtained to inform design plans	• Undertake additional plant and wetland surveys for borrow pits and quarries that must be located in high altitude sections of the route between kp 16 and 30. This refers to any essential requirement for a quarry or borrow pit in the Makhoaba Junction area. • Implement additional mitigation measures identified during these additional surveys, which may include restrictions on use of particularly sensitive areas.	Prior to construction	Plant and wetland surveys undertaken	✓	✓
5.3	Bird Surveys **Note**: LHDA to contract surveys but information obtained to inform design / operation	• Undertake additional bird surveys in vicinity of confirmed quarry and borrow pit sites, especially for any that must be located in high altitude sections of the route between kp 16 and 30 (e.g., Makhoaba Junction area). • Implement additional mitigation measures identified during these additional surveys. • Regulate the timing and frequency of blasting, which may include restrictions on blasting at certain quarry sites during breeding seasons of conservation priority species if confirmed (generally June-November).	Prior to construction	Bird surveys undertaken	✓	✓
5.4	Stakeholder Consultation	• Undertake consultation with the Mohair and Wool Growers Association, Makhiseng Agricultural Centre and other district authorities on mitigation and management of potential quarry and borrow pit impacts to livestock and other Kosheteng woolshed users (with relevance to proposed quarry at Makhoaba Junction).	Planning	Evidence of stakeholder consultation and agreements	✓	✓
5.5	Land Acquisition	• Ensure all protocols are followed with respect to acquisition of land rights for quarries and borrow pits and payment of compensation to communities.	Planning	Evidence of stakeholder consultation and agreements	✓	✓
5.6	Future Use & Rehabilitation of High Altitude Quarries and Borrow Pits	• Consider the design, landscaping and rehabilitation of quarries and borrow pits to optimize future use potential as laybys/ view points where located in scenic areas. • Plan for the rehabilitation / landscaping of quarries on closure at end of construction.	Prior to construction	Rehabilitation plan for quarries and borrow pits	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
5.7	Method Statement / Development Concept Plan	Compile a Method Statement or Development Plan for borrow pits and quarries which will include (but not limited to) the following measures for quarries and borrow pits: • Principles of runoff water management and measures to control pollution / stormwater runoff on surrounding habitats (e.g., wetlands (see note below related to Quarry 7). • Designed in such way that additional work / excavation required for the finishing off the borrow pit is reduced as much as possible. • If any quarry / borrow pit are visible from any viewpoints, ensure that the resultant shaping / forms of the benches and walls are appropriate to the surrounding natural land form in the final operations of the excavation process. • Rehabilitation of quarries and borrow pits will, where possible, be conducted in parallel with the final extraction, or started one month before excavation has been terminated. • Rehabilitation of quarries and borrow pits will include the following measures: - Rehabilitation should be such that quarries and borrow pits blend with the surrounding area and appears as a natural extension to the adjacent, undisturbed ground profiles. - Sharp angles / corners will be avoided and the final rock forms appear natural. - Surface water drains freely from the site and no spoil or other waste is left littering the site. - To ensure safety (and enhanced ability for revegetation), the back walls of the quarry should not be steeper than 1:3, where possible. - All materials in and around the borrow pit, whether rock spoil, excess stockpiled material, oversized material left in the borrow pit, material resulting from clearing operations or excess overburden will be used for shaping or appropriately disposed of. Material not capable of supporting vegetation shall be buried in the borrow pit and covered, if possible, with a minimum of 500 mm of soft material / topsoil (if available). - Impacted areas around the quarry or borrow pit will be ripped with a mechanical ripper to a depth of 250 mm (or until sheet rock is reached). - All access roads made specifically for the quarrying activities, and which are not required by the local communities, will be rehabilitated by ripping the surface crust to facilitate the regrowth of vegetation. - Drainage and runoff will be addressed in such way that runoff is not concentrated where it may cause erosion or wash away of topsoil. This may require the construction of a cut off drain and /or placement of rock berms. **Note**: Quarry 7 is located in a highly sensitive location close to wetlands and will require a separate detailed method statement / development plan that must involve the inputs of a wetland specialist to advise on the design and location of quarry-related infrastructure.	Development concept plan prior to use or opening up of borrow pits or quarries. To be updated once conditions and requirements known. Method statement for closure may be produced during construction.	Method Statements detailing design and rehabilitation of quarries and borrow pits	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
5.8	General	The following measures will be considered when planning quarries/borrow pits: • Minimise the size of quarries and borrow pits to a minimum required footprint. • Designate the boundaries of all quarry and borrow pits and associated works areas and vehicle routes on site layout plans. • Demarcate site boundaries on site with painted rocks / marking tape.	During detailed planning and design	Site layout plans include laydown areas and vehicular use areas		✓
5.9	Blasting	Implement all measures listed in Blasting Management (Section 6.5.5) relating to blasting and use of explosives.	Throughout construction			
5.10	Dust / Air Quality	Implement all measures relating to dust generation from quarries and borrow pits and vehicles in Air Quality and Dust Management (Section 6.5.3).	Throughout construction	As per Section 6.5.3		
5.11	Water	Implement all relevant measures relating to abstraction and use of water sources and diversion of flows listed in Water Management (Section 6.5.7).	Start of construction	Grievance procedure	✓	
5.12	Hazardous materials	Storage of any hazardous materials (e.g., hydrocarbons) at borrow pits or quarries shall be minimised or avoided where possible. Where required, hydrocarbons shall be stored in a safe location on a bermed surface in accordance with requirements specified under Spill Prevention, Control and Containment in Section 6.5.8.	Start of construction	Grievance procedure	✓	
5.13	Safety during use	Borrow pits and quarries shall be access controlled to prevent access by herders or local residents.	Throughout construction and closure	Access controlled during use		
5.14	Safety on closure	Develop a quarry and borrow pit closure plan for each site that shall be approved by the Engineer. This shall include measures such as: • Cut face slopes shall be excavated and stabilised in such a way to reduce the risk of falling rocks. • A rock barrier (e.g., large rocks) shall be placed around the top of any quarries or borrow pits where there is a risk that people or livestock can fall down steep rock faces. This will serve to demarcate this barrier in misty conditions to herders / livestock. This is an alternative to fencing which is unlikely to remain in place. • Any pits that can fill with water and pose a hazard to children shall be filled or levelled to prevent collection of water over 0.75 m depth.	Throughout construction and closure	• Closure plan compiled and approved • Safety barrier installed and excavations made safe on closure		
5.15	Incidents	Any safety or pollution incidents at borrow pits and quarries shall be reported to the Environmental Manager and recorded by the ECO in daily and monthly reports.	Start of construction	A grievance procedure that suitably manages any complaints received.	✓	
5.16	Grievance	A grievance procedure must be implemented in such way that the Contractor's CLO is able to manage and address any complaints received.	Start of construction	Grievance procedure to manages any complaints received	✓	

6.5.7 Water Management

6.5.7.1 Project Activities Resulting in Water Impacts

- Surface- and groundwater quality impacts as a result of spillages and wastage and / or potential runoff of spilled materials.
- Surface water flow interruption due to the construction of the PWAR and associated infrastructure (e.g. bridges and laydown areas).
- Surface water abstraction and resulting impact on social and environmental receptors.

6.5.7.2 Responsibility

Primary Contractors associated with the construction of the PWAR and BPST.

6.5.7.3 Objectives

- To minimise the potential impacts associated with erosion and spills and to prevent the release of contaminants in receiving water environments.
- To ensure compliance with the water quality standards agreed for the Project.
- To ensure the use / abstraction of water resources in the broader Project Area is undertaken in a sustainable manner so as to reduce impacts to the receiving biological and social environments.

6.5.7.4 Performance Criteria

- Meet the specifications for effluent discharge as per Table 6.14. Note: substances highlighted in grey are not typically generated during a road / powerline construction project and do not require monitoring.

Table 6.14 Water Quality Standards based on SANS 241:2015 and Lesotho's Draft Effluent Discharge Standard

Substance / Parameter and Units	SANS 241 General Limit	SANS 241 Special Limit	Lesotho Draft Effluent Discharge Standard[1]
Faecal Coliforms (per 100 ml)	1000	0	0
Chemical Oxygen Demand (mg/l)	75 (i)	30(i)	75 (OA=10)
pH	5,5-9,5	5,5-7,5	5.5-9.5
Ammonia (ionised and un-ionised) as Nitrogen (mg/l)	6	2	10
Nitrate/Nitrite as Nitrogen (mg/l)	15	1,5	**
Chlorine as Free Chlorine (mg/l)	0,25	0	0.1
Suspended Solids (mg/l)	25	10	25
Electrical Conductivity (mS/m)	70 mS/m above intake to a maximum of 150 mS/m	50 mS/m above background receiving water, to a maximum of 100 mS/m	75 mS/m above intake (at 25 deg C)
Ortho-Phosphate as phosphorous (mg/l)	10	1 (median) and 2,5 (maximum)	**
Fluoride (mg/l)	1	1	1
Soap, oil or grease (mg/l)	2,5	0	2.5
Dissolved Arsenic (mg/l)	0,02	0,01	0.5
Dissolved Cadmium (mg/l)	0,005	0,001	0.05
Dissolved Chromium (VI) (mg/l)	0,05	0,02	0.05

[1] Otieno, FAO. 1998. Proposed Wastewater or Industrial Effluent Discharge Standards (Second Draft).

Substance / Parameter and Units	SANS 241 General Limit	SANS 241 Special Limit	Lesotho Draft Effluent Discharge Standard[1]
Dissolved Copper (mg/l)	0,01	0,002	1.0
Dissolved Cyanide (mg/l)	0,02	0,01	0.5
Dissolved Iron (mg/l)	0,3	0,3	-
Dissolved Lead (mg/l)	0,01	0,006	0.1
Dissolved Manganese (mg/l)	0,1	0,1	0.4
Mercury and its compounds (mg/l)	0,005	0,001	0.02
Dissolved Selenium (mg/l)	0,02	0,02	0.05
Dissolved Zinc (mg/l)	0,1	0,04	5.0
Boron (mg/l)	1.0	0,5	1.0
Sodium content			Not to be increased more than 90 mg/l above that of the intake water
Sulphides			1.0
Sulphates			**
Dissolved solids			**

6.5.7.5 Management Measures

The management measures included in Table 6.15 will be implemented by the Contractor to reduce water-related impacts from the Project.

Table 6.15 Water Management

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
6.1	Bridges and Roads	The following will be required during bridge and road design: • Comply with the requirements of Lesotho's Road and Bridge Design Standards (GoL,1998). • Where possible, river crossings will comprise spanned bridge structures with minimal instream piers rather than a box culvert type crossing. • Bridges will be constructed to accommodate 1:100 year flood events. • Bridge abutments shall be designed to minimise bank erosion risks taking into consideration natural changes to riverbanks over time. • Box culverts will be installed in such a way within abutments/embankments to allow for the natural spreading out of flood flows, and to minimise the blocking of flood flows and the deactivation of flood terraces. • Bridge crossings must be aligned along existing corridors of disturbance i.e. where riverbed and banks have already been modified, where possible. • Natural flow of rivers or streams will not be permanently diverted or blocked, where possible, and some downstream flow must be maintained at all times. • Surplus water will be drained away from the construction areas in such a manner that work may proceed and the drainage method does not cause damage to the area. • In-stream bridge and culvert work will, where possible, be prioritized in the drier months (May to September) or during periods of low rainfall and stream flow. • Culvert installation must ensure measures are implemented to prevent erosion of streams and wetlands above or below the culverts.	During detailed planning and design	Adequate designs	✓	✓
6.2	Method Statements for Stormwater Management and Monitoring for Work Sites	Method Statements for stormwater management and monitoring must be developed for specific work sites (e.g., construction camp, asphalt plants, quarries, bridges etc.) and implemented prior to the commencement of any large scale vegetation clearing activities or construction activities, and must be maintained until the end of the construction phase. The Method Statement must aim to minimise the transport of sediment and pollutants off site and into streams and wetlands as well as prevent the discharge of high velocity flows into downslope wetlands. The Method Statement must make provision for : • Installation of sediment traps and sediment barriers such as hay bale barriers in the affected wetland and stream areas. • Protection of stormwater discharge points against erosion and incorporation of energy dissipaters. • Erosion within the construction site must be minimised through the following: - Limit the area of disturbance and vegetation clearing to minimum area. - Optimise construction during the dry season.	Start of construction	Method Statement for management of stormwater provided	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
		- Phase the vegetation clearing activities and limit the time that bare soil is exposed to erosion. - Control stormwater flowing onto and through the site and divert stormwater from upslope around the construction site. - Retention and collection of polluted runoff from asphalt plants for monitoring against standards, and treatment if necessary prior to release. • Protection of slopes: stabilise steeper slopes using geotextiles or any other suitable product designed for the purpose. • Sediment transport from construction sites must be minimised through the following: - Installation of sediment controls around the perimeter of the site through sediment fences along downslope verges of the construction site. Where channeled or concentrated flow occurs, reinforced sediment fences or other sediment barriers such as sediment basins should be used (e.g., US EPA guidelines on Stormwater Pollution Prevention). - Discharge stormwater from the construction site into adjacent grassland rather than directly into wetland habitats. Discharged flows must be slow and diffuse. - Regular inspection and maintenance of sediment controls.				
6.3		A Method Statement for the construction of **bridges and culverts** across rivers, streams and wetland areas will be compiled prior to start of bridge or culvert construction. The Method Statement must include steps that must be taken to ensure that the riverbanks are not significantly damaged and the water table and water quality of these systems are not significantly affected in the long term.	Prior to construction	Method Statement for construction of culverts in wetlands	✓	✓
6.4		A Method Statement for **water abstraction** from water courses will be compiled and approved prior to abstraction. The Method Statement will need to include appropriate siting of abstraction to minimise reduction of flow to shallow riffle habitats and preferably in already disturbed areas. Moreover, the Method Statement will need to demonstrate how abstraction volumes can be reduced during dry / low flow periods.	Prior to construction	Method Statement for water abstraction	✓	✓
6.5		Method Statements will be prepared to define the procedures for **handling and storage of hazardous materials/chemicals** to avoid impacts to the environment, and shall include details on response to and management of hazardous material spills (see Section 6.5.8).	Prior to construction	Method Statement for hazardous materials	✓	✓
6.6	Drainage Pipes	Drainage courses should be piped beneath haul and access roads to prevent the pollution thereof when vehicles are driven over them.	Start of and during construction	Pipes installed under access roads in drainage lines	✓	✓
6.7	Restricted Rock Spoil Zones	Develop a Method Statement that describes the approach to dealing with rock spoil in general (including reference to topsoil recovery, reinstatement, slope stabilisation and rehabilitation) and in specific areas where restricted rock spoil areas have been identified. The following management measures will be implemented for rock spoil disposal to protect	Throughout construction	• Compliance reports from ECO • Restricted rock	✓	

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
		aquatic habitats and biota in which no deposition of rock into rivers shall be permitted: • Zones designed as 'restricted rock spoil' zones shall be designated on site plans and given to Contractors and Subcontractors. These include the following areas in close proximity to streams/rivers: - kp 3.5 to 5 Liseleng River - kp 14.5 to 15.5 Liseleng River - kp 30 to 36 Makhoaba River - kp 37.5 to 40.5 Makhoaba River & waterfall. • Sites for deposition of rock spoil shall be pre-approved by the Engineer. • Recover and rehabilitate construction areas by implementing the measures included in the Rehabilitation and Site Clean Up section (refer to Section 6.5.12).		spoil zones designated on site plans • No evidence of deliberate rock spoil in rivers/streams		
6.8	Grievances	The LHDA grievance procedure will be expanded to include the PWAR and BPST, and implemented in such way that the Contractor's CLO is able to manage and address any water-related complaints received.	Start of construction	A grievance procedure that suitably manages any complaints received	✓	
6.9	Water Use	Water for construction purposes must be used in such a manner that erosion and silting are minimised. If there is a possibility of silting and sedimentation of rivers as a consequence of erosion the construction of sediment capture and settling dams will be considered.	Throughout construction	Silting or sedimentation of rivers within acceptable standards	✓	✓
6.10		Apply for a water abstraction permit with the Department of Water Affairs.	Start of construction	Water abstraction permit from the DWA	✓	✓
6.11		Minimise water consumption, create awareness and encourage all staff to use water sparingly.	Throughout construction	Training records	✓	✓
6.12	Community Water Supply	Conduct a hydrocensus to identify all the community water supply sources (including the natural springs) that may be affected by the road or powerline construction to ensure alternative supply sources are arranged in advance of construction and maintained post construction.	Throughout construction	Hydrocensus completed	✓	✓
6.13		Design and construction management and control measures will be put in place to avoid loss of, or disruption, or contamination to the water sources. This shall include maintaining a buffer distance of 100 m from water supply sources, wetlands and rivers for portable latrines, laydown and storage of fuel and other construction equipment.	Throughout construction	No pollution sources within 100 m of water supply sources	✓	✓
6.14		No use of community water supply points by construction staff without sufficient reason and without authorisation from the village chief or representative. The Contractors should provide drinking water for his staff and workers on site.	Throughout construction	Grievance register. Ongoing consultation with communities	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
6.15		Construction staff shall be made aware of community protocols regarding use of any unprotected springs along the PWAR. All natural springs and seepage of water shall be considered a water supply for local communities and their animals, wherever they are located as many will be important to pedestrians *en route* to and from fields for example.	Throughout construction	Awareness raising of staff	✓	✓
6.16		Where water quality or supply is impacted by construction, an adequate quantity of potable water must be delivered to the affected villages for the duration of the disruption. The quantity and quality of water must be adequate for all regular activities, including water crops.	Throughout construction	• Alternative supplies • Grievance register	✓	✓
6.17	Spills	The Contractor must keep suitable clean up materials available on site at all times; these materials could be absorbent cloths or other materials such as sand and straw in order to quickly attend to any spills that may occur to water resources.	Throughout construction	Spill clean-up materials on site at all times	✓	✓
6.18	Vehicle Management	The washing of Project vehicles in any surface water bodies in and around the Project Area is prohibited. All Project vehicles will be washed at designated wash bays on site (assumed to be located at the western and eastern PWAC Construction Camps). Wash bays on site will include oil/grease and sediment traps for grey water.	Throughout construction	Vehicle wash areas equipped with appropriate drainage to oily water separator	✓	✓
6.19	Method Statement for Refuelling and Vehicle Maintenance	The *ad hoc* maintenance or refuelling of vehicles, machinery and equipment shall be done in accordance with a Method Statement and should be primarily undertaken at a designated workshop at the construction camps equipped with oil and grease trap. Where required, in-field refuelling shall be undertaken on suitably prepared and bunded refuelling sites and in such a manner that no hydrocarbon or other contaminants are released to soil or water sources. Refuelling sites must be located away from sensitive areas such as rivers/streams, wetlands, schools or villages. No refuelling or repair shall be permitted within 50 m of river/stream banks, wetlands or within the 100-year floodline, whichever is applicable (except an emergency repair).	Throughout construction	Vehicle maintenance conducted at workshops with oily water separator designated sites	✓	✓
6.20	Waste / Effluent Management	All active work areas will be maintained in a good and tidy condition. Debris and wastes will be contained in such a way that they cannot become entrained in surface runoff during periods of heavy rain.	Throughout construction	Adequate waste disposal. Records and visual observations	✓	✓
6.21		Temporary toilets are to be emptied on a weekly basis by an approved and suitably qualified person or service provider. Emptied toilet waste will be transported and disposed of at the sewage facilities at the eastern or western PWAR camps. Discharge of untreated waste from toilets into the environment and burial of untreated waste is strictly prohibited.	Throughout construction	Records of toilet cleaning. No pollution events recorded.	✓	✓
6.22	Stormwater Management	Adequate infrastructure will be put in active work areas to ensure that clean water is diverted around the site. Moreover, erosion/sediment control measures such as silt fences, low soil berms or wooden shutter boards must be used to limit sediment runoff from construction sites.	Start of construction	Diversion controls in place	✓	✓
6.23		Stormwater runoff and erosion control measures must be installed on all new access roads (including temporary unpaved roads) and should include the establishment of many small	Prior to and during	Stormwater runoff and erosion	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
		shallow chute type drains and/or berms/cut-off drains at regular intervals along slopes that direct surface runoff from the road into adjacent grassland to avoid rill erosion and gully formation. Many small outlets are favoured over a few large ones and these outlets must be armoured against erosion using dump rock/rip-rap.	construction	control measures in place on all Project roads		
6.24		Sediment traps and culverts will be installed around laydown areas prior to the site clearance and earthworks, so as to prevent any sediment runoff into the surrounding area.	Start of construction	Sediment traps / culverts in place	✓	✓
6.25	General	Washing, whether of the person or of personal effects, and acts of excretion and urination are strictly prohibited other than at the formal facilities provided.	Throughout construction	Records / visual observations	✓	✓
6.26		One toilet is to be provided on site for every 15 contract personnel at each active working area. These toilets must have doors and locks and shall be secured to prevent them blowing over. Toilet paper will be provided.	Throughout construction	• Adequate number of suitable toilets • No evidence of overflow	✓	✓
6.27		Toilets shall be kept in a clean, neat and hygienic condition and regularly serviced by an accredited supplier. Toilets are to be emptied on a weekly basis by an approved and suitably qualified person.	Throughout construction	Service records	✓	✓
6.28		Sanitary facilities shall be limited to mobile chemical toilets located within 100 m from any point of work, but shall not be closer than 100 m to a water body (river, stream or wetland).	Throughout construction	Records / visual observations	✓	✓
6.29		Fines / penalties shall be imposed on Contractors or Subcontractors responsible for spillages from chemical toilets.	Throughout construction	Records / Contract conditions	✓	✓
6.30	Excavation / Spoil Dumps	No rock cut or construction stock pile material shall be placed within 50 m of a water course or wetland (to avoid sedimentation or destabilisation of banks). Proposed areas for material deposits shall be demarcated on site layout plans and include in Method Statements for work in or near water courses.	Throughout construction	Method Statement and site layout plans	✓	✓

6.5.8 Spill Prevention, Control and Containment Management

6.5.8.1 Project Activities Resulting in Spill Impacts

During the construction phase of the Project along the PWAR or BPST, dangerous or hazardous chemicals may accidently be released into the environment in the form of small spills or a major unplanned event (e.g., oil tanker or cement truck accident). Spillages may occur as a result of leakage of containers used to store or transport the following pollutants:

- Hydrocarbons (including diesel, petrol, greases, oils and other lubricants) hydrocarbon to work areas;
- Hazardous chemicals / materials (e.g., paints, batteries, etc.);
- Cement; and
- Sewage (from chemical toilets at works areas).

Note: this section relates to the types of chemicals used and transported on a regular basis to work sites along the PWAR and powerline. It does not cover the requirements for storage, use and disposal of the full range of equipment and materials that are expected to be required at construction camps as these management measures are expected to be covered under a separate EMP. No details of the design and management controls measures for these are currently available.

6.5.8.2 Responsibility

Primary Contractors associated with the construction of the PWAR and BPST.

6.5.8.3 Objectives

- Protect the environment and community members who are dependent on its natural resources through the development of spill response and containment strategies and capabilities.
- Identify the sources of potential land contamination associated with construction activities.
- Categorise potential spill hazards.
- Plan for rapid and efficient response to manage hazardous material spills during construction.
- Identify and document management measures to prevent, control and mitigate spill events during construction.

6.5.8.4 Performance Criteria

- No unplanned release of dangerous goods or hazardous substances.
- All transport, storage and handling of dangerous goods or hazardous and dangerous substances is performed in accordance with the materials data sheets for the chemicals and the management measures included in this EMP.

6.5.8.5 Management Measures

The management measures included in Table 6.16 will be implemented to reduce impacts associated with spills and leakages.

Table 6.16 Spill Prevention, Control and Containment Management

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
7.1	Training - Hazardous Materials	Training regarding proper methods for transporting, transferring and handling hazardous substances that have the potential to impact surface- and groundwater resources.	Throughout construction	Training records	✓	✓
7.2		Train personnel for responsibility with hazardous substances. No untrained staff shall be allowed to handle hazardous substances.	Throughout construction	Training records	✓	✓
7.3	General Management	No smoking will be allowed in the vicinity of fuel, lubricants / oils, chemicals, hazardous waste and hazardous material stores and handling areas. Symbolic safety signs depicting "No Smoking", "No Naked Lights" and "Danger" are to be provided. The volume capacity of storage tanks or containers will be displayed. The product contained within the tank will be clearly identified using the emergency information system. Any electrical or petrol-driven pump will be equipped and positioned, so as not to cause any danger of ignition of the product.	Throughout construction	Presence of no smoking signs and ignition sources	✓	✓
7.4		Hazchem signage used where hazardous goods are being stored, hazardous materials to be clearly labelled and fencing and controlled access to limit unauthorised access.	Throughout construction	Signage and access controls in place	✓	✓
7.5		Prevent the integrity and capacity of the bunded areas being compromised by rainwater and stormwater ingress.	Throughout construction	Records and visual observations	✓	✓
7.6		Provide collection systems (i.e. drip trays or impervious linings) under machinery or equipment that may dispense or leak hydrocarbons / hazardous substances (i.e. generators and pumps).	Throughout construction	Collection systems in place	✓	✓
7.7		Hazardous and dangerous material storage areas will be equipped with emergency spill response equipment.	Throughout construction	Well maintained spill response kits in place at all hazardous and dangerous material storage areas	✓	✓
7.8		Concrete batching/mixing shall only take place at agreed specific areas on site and runoff from the batching area will not be allowed to flow into natural streams and watercourses.	Throughout construction	No concrete batching in non-designated areas	✓	✓
7.9		A preventative maintenance program will be instituted that includes inspection schedules to confirm and maintain the mechanical integrity and operability of storage vessels and associated containment areas and process equipment for fuel, lubricants / oils, chemicals, hazardous waste and hazardous materials.	Throughout construction	Evidence of maintenance	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
7.10		Fuel, lubricants / oils, chemicals, hazardous waste and hazardous material stores and handling areas will be provided with secondary containment capable of holding 110% of the total capacity of the all tanks / vessels. The containment will be checked daily and debris removed. The storage of such substances will not be within 100 m of any stream and/or wetland.	Throughout construction	Bunding of hazardous stores	✓	✓
7.11		The loading and unloading of hazardous materials and fuels will be confined to areas that are provided with secondary containment and in line with hazardous material handling procedures.	Throughout construction	Suitably designed areas for loading and offloading	✓	✓
7.12		Segregation of corrosive substances that are kept in bulk from incompatible goods and goods with which they may react dangerously.	Throughout construction	Suitable segregation of goods	✓	✓
7.13		Maintain an inventory of all dangerous and hazardous goods onsite, together with all relevant Material Safety Data Sheets (MSDS) for all contaminants on-site will be readily available. These will include human health effects of chemicals handled and will be included in the required chemical environmental and safety training for all employees handling or otherwise exposed to the contaminants. All appropriate personal protective equipment, handling and response procedures will also be identified in the MSDS or otherwise recommended by the suppliers/manufacturers and followed by all Project staff.	Throughout construction	Inventory, MSDS, training records and suitable PPE	✓	✓
7.14		For all hazardous substances to be stored on the site, the Contractor will provide Method Statements detailing the substances/ materials to be used, together with the storage, handling and disposal procedures of the materials. This will include (but not limited to) methods for refuelling of vehicles, machinery and equipment.	Start of construction	Method Statements for hazardous materials	✓	✓
7.15	Transport of Hazardous Materials	Transportation vehicles and tanks suitable for the materials being transported will be used. These vehicles and tanks will be maintained in adequate condition to insure proper handling and safety of chemicals.	Throughout construction	Records of all deliveries	✓	✓
7.16		All vehicles will be equipped with spill response kits appropriate to the materials being transported. The Contractor will be required to maintain these in good condition and working order.	Throughout construction	Records of all deliveries	✓	✓
7.17		Drivers will be trained in spill and emergency response and will have a means of communicating with the site, their administrative offices and emergency personnel for the entire transportation route.	Throughout construction	Provision of training records for drivers	✓	✓
7.18		Up-to-date emergency contact information and monitoring sheets and manifests documenting the volume, phase and characteristics of the chemical being transported will be carried with each shipment.	Throughout construction	Records of all deliveries	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
Spill Emergency Response, Control and Countermeasures						
7.19	Method Statement Spills, Emergency Response and Clean Up	Method Statements detailing spill emergency response and clean-up procedures for spills will be developed. Emergency response measures will also include methods for response and clean-up for release into any natural stream, river or wetland. Emergency response procedures will be tested regularly to ensure rapid response to, containment of, and neutralisation of any spillages.	Start of construction	Method Statements	✓	✓
7.20	Spills and Clean up	Areas where spillage of soil contaminants occurs will be excavated (to the depth of contamination) and suitably rehabilitated. If any other minor spillage occurs the spillage will be cleaned immediately and the contaminated area will be rehabilitated. All contaminated material will be suitably disposed of. Clean-up procedures will need to be fully recorded.	Throughout construction	Detailed clean-up (incident) records	✓	✓
7.21		Spill kits will be provided at any fuel or chemical storage location. Spill kits must be maintained.	Throughout construction	Well maintained spill response kits in place	✓	✓
7.22		Designated and qualified staff designated for responsibility to respond to emergencies.	Throughout construction	Training records	✓	✓
7.23		A maintained emergency contact list will be placed at all spill response kit locations.	Throughout construction	Emergency contact list at spill response kit locations	✓	✓
7.24		Development, implementation and regular training and testing of a Project wide Spill Response Plan.	Throughout construction	Training records	✓	✓

6.5.9 Waste Management

PLEASE NOTE:

This EMP only covers waste handling and the temporary storage of waste at active work areas, and transportation of waste from the active work areas through to the western and eastern PWAC Construction Camps. The EMP does not include management measures for waste handling at the said construction camps, nor does it include measures for final recycling, treatment, transport cross-border or disposal. It is assumed that such management measures will be included in a separate EMP.

6.5.9.1 Project Activities Resulting in Waste

Wastes (hazardous and non-hazardous) produced during the construction of the PWAR and BPST are listed in Table 6.17. The most typical hazardous waste likely to be generated during construction will include hydrocarbon contaminated waste (e.g., used oil containers; oil-contaminated soils and rags) as well as chemical toilet sewage waste and solvents used to test asphalt mixes. Non-hazardous waste will include domestic litter and food waste; and wood and plastic packaging material.

Table 6.17 Waste Types Potentially Generated during the PWAR and BPST Construction

Waste Type	PWAR	BPST
HAZARDOUS WASTE		
Used greases	✓	✓
Used batteries and power supplies	✓	✓
Soiled pails and drums	✓	✓
Soiled parts	✓	✓
Soiled rags	✓	✓
Used absorbents	✓	✓
Oil filters	✓	✓
Used Oil	✓	✓
Solvents (including those used in labs to test asphalt mixes)	✓	✓
Acids	✓	✓
Alkalines	✓	✓
Pesticides, Herbicides	✓	✓
Paint	✓	✓
Fluorescents tubes and other mercury containing waste (bulbs)	✓	✓
Hydrocarbon contaminated soils	✓	✓
Obsolete Electronics	✓	✓
Sewage waste (from temporary toilets in active work areas)	✓	✓
Medical wastes	✓	✓
Bituminous mixture containing coal tar	✓	
Creosote waste		✓
Asbestos-based construction materials	✓	✓
NON-HAZARDOUS WASTE		
Scrap copper, brass, bronze and aluminium	✓	✓
Scrap iron and steel including punctured and crushed cans (including spray cans)	✓	✓
Clean drums, pails, boxes	✓	✓
Clean mechanical parts	✓	✓
Hardware (e.g., old tools, fasteners, etc.)	✓	✓
Unsoiled cloth	✓	✓
Ceramics		✓
Wood	✓	✓
Paper and cardboard	✓	✓
Concrete	✓	✓
Gypsum-based construction materials	✓	✓

Waste Type	PWAR	BPST
Glass	✓	✓
Dried paint containers	✓	✓
Plastics	✓	✓
Tyres	✓	✓
Biodegradable food waste	✓	✓
Other biodegradable (green) waste	✓	✓
Discarded PPE	✓	✓
Scrapped line hardware waste	✓	✓

6.5.9.2 Responsibility

Primary Contractors associated with the construction of the PWAR and BPST.

6.5.9.3 Objectives

- To ensure that the waste strategy for the Project complies with Lesotho's legislative requirements and environmental good practice.
- To ensure the approach to waste management is aligned with LHDA's Environmental Policy that includes a commitment to "adopt an integrated waste management approach that extends over the entire waste cycle and addresses the generation; storage; reuse, recycling and recovery; treatment and final disposal of waste".
- Identify and categorise anticipated waste streams and ensure that the waste management hierarchy model (refer to Ref. No. 8.4 in Table 6.17) is adopted for waste management.
- To ensure the end use of waste is as per its waste category assigned.
- Describe mitigation measures to minimise waste-related impacts associated with all construction activities associated with the Project.

6.5.9.4 Performance Criteria

- Zero incidents of illegal dumping of wastes, both general and hazardous.
- No unauthorised access to the waste storage facilities.
- No loss of health to personnel or third parties as a result on inappropriate waste management practices.
- All waste disposal to be carried out by a licensed Waste Contractor.

6.5.9.5 Management Measures

The management measures included in Table 6.18 will be implemented to reduce impacts associated with wastes.

Table 6.18 Waste Management

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
8.1	Method Statement	Method Statements shall be prepared covering all waste activities on site (at active work areas) prior to start of waste generating activities.	Prior to construction	Waste Method Statements	✓	✓
8.2	Waste containers & Labelling	Waste containers will be appropriately designed in terms of volume, composition, and shape. Containers that may react with the waste to produce a harmful substance will not be used.	Throughout construction	Provision of adequate waste containers	✓	✓
8.3		All bulk waste containers on site (skips, bins, drums etc.) shall be appropriately labelled to show what class and type of waste can be disposed of in them.	Throughout construction	Labelling of waste containers	✓	✓
8.4	Waste Segregation	To promote "4Rs" (Reduce, Reuse, Recycle and Reclaim) waste management concept, all waste will be sorted and managed as appropriate, either for reuse, recycling or disposal. The promotion of the 4Rs concept will be included in the Method Statement for waste management.	Throughout construction	Method Statement on waste management	✓	✓
8.5		Waste will be segregated according to their composition, source, and type at source and contained in appropriately labelled and/or colour coded waste containers or waste skips. These bins will be located at all active work areas where waste is generated and will make provision for the sorting of solid waste. Effort shall be made to segregate waste into plastic, tins, glass and paper and dispose of at suitable recycling facilities.	Throughout construction	Waste segregation on site and recycling	✓	✓
8.6		Only one class or type of waste will be stored in each container and all staff shall be instructed to adhere to waste separation.	Throughout construction	Separation of waste	✓	✓
8.7		Solid and liquid wastes will not be mixed.	Throughout construction	No mixing of solid and liquid wastes	✓	✓
8.8	Waste Management Training	All waste will be handled in accordance with its class (hazardous or non-hazardous) and all personnel collecting, handling, transporting or disposing of waste will be trained in the proper procedures for dealing with the said waste class.	Throughout construction	Training records	✓	✓
8.9	Waste Transport	Transport vehicles will cater for the type, class and quantity of waste being transported in terms of its composition, load capacity, covering etc.	Throughout construction	Designated and equipped waste transport vehicles	✓	✓
8.10		Method Statements for loading and unloading and transport of wastes will be developed.	Start of construction	Method Statement: waste management	✓	✓
8.11		Vehicles carrying hazardous wastes shall be labelled appropriately.	Throughout construction	Labelling of waste trucks	✓	✓
8.12		Vehicles carrying hazardous wastes shall be managed per the requirements included in Spill Prevention, Control and Containment Management Section (Section 6.5.8).	Throughout construction	Hazardous waste management as per Section 6.5.8	✓	✓
8.13	Site Clean Up	Domestic solid and hazardous wastes will be transported from the active work areas to the main waste handling facility at the Contractors' camps on a daily basis. No glass, litter or oily / chemical waste to be left at work sites each day.	Throughout construction	Daily waste removal from work sites	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
8.14		No burning of waste at work sites will be permitted.	Throughout construction	No burning of waste at work sites		✓
8.15	Workforce Eating Areas	Workforce eating areas shall be designated and clearly demarcated and provided with sufficient bins that shall be regularly emptied and cleaned.	Throughout construction	Clean/maintained eating areas	✓	✓
8.16		Any cooking on site will be done in a designated area with well-maintained cookers with fire extinguishers present. No open fires will be permitted.	Throughout construction	No cooking at work sites unless designated areas equipped with fire extinguisher	✓	✓
8.17	Sewage Waste	The management of sewage waste will be undertaken per the requirements in the Water Management Section (refer to Section 6.5.5).	Throughout construction	As per Section 6.5.5	✓	✓
8.18	Concrete Waste	A concrete washing area will be set aside for concrete trucks, to avoid build-up of waste concrete on site.	Throughout construction	Concrete washing area. No build-up of waste concrete on site	✓	✓

6.5.10 Biodiversity Management

6.5.10.1 Introduction

Impacts of construction and operation on biodiversity includes all natural ecological features of the Project Area

6.5.10.2 Project Activities Resulting in Biodiversity Impacts

Construction Phase

- Clearance of vegetation associations and constituent flora and topsoil. Loss of vegetation would also include loss of plant resources utilised by surrounding communities for medicinal, food or weaving purposes;

- Cut and fill (including blasting) of rocky slopes to create the required road servitude and the pylon locations and access tracks for powerline construction;

- Planted Spiral Aloes (*Aloe polyphylla*) are present at several villages within the road footprint and could potentially be destroyed during road construction;

- Clearance of vegetation and cut and fill (including blasting) of rocky slopes will have a direct impact on fauna (mammals, birds, herpetofauna) through direct disturbance (noise and vibration), loss of habitat, particularly rocky outcrop and montane shrubland habitat), as well as faunal mortalities or decline in breeding success as a result of blasting (e.g., cliff-nesting birds). Blasting of rocky outcrops will particularly affect burrowing or crevice-dwelling fauna such as lizards, snakes, and rodents/moles. Fauna within the flyrock zone (where blast debris lands) may also be impacted by smothering of habitat;

- Road and bridge construction activities in the study area could potentially affect fish and fish habitat in three ways:

    - Destruction and modification of fish habitat;
    - Modification of flow (which would indirectly affect fish and fish habitat); and
    - Pollution (which would directly affect fish and fish habitat).

Operational Phase

Management of operational phase impacts will be the responsibility of LHDA or the Roads Directorate, and are associated with

- Construction activities involving the movement of vehicles and equipment from other possible alien plant contaminated areas to the PWAC Project Area and the import of weed contaminated soil; aggregate or other road-building materials may encourage the growth and spread of alien invasive plants along the access roads. If control measures are not implemented effectively during road and powerline construction, alien invasive plants may encroach and spread during operation. If allowed to spread and if not monitored and actively managed alien plants may encroach further into areas with low incidence of alien plants, and can, over time, replace indigenous grassland or shrubland, reducing natural biodiversity and available grazing resources.

- The construction of the PWAC would significantly improve access to remnant populations of Spiral Aloes (*Aloe polyphylla*), and facilitate increased opportunities for their sale, potentially leading to the extinction of wild populations within the broader Project Area. Moreover, the PWAR will significantly improve access to natural resources in higher lying areas where access was not previously possible. Control measures for spiral aloe collection and sale will be the responsibility of LHDA and the DoE during road operation.

- Road operation and an increase in vehicles travelling at speed is expected to lead to potential collisions with birds and possibly other animals that cross or use the road for foraging.

- Impacts to aquatic habitat associated with the new road and bridges may occur from the following:
  - Changes in catchment land cover and surface runoff;
  - Modification of surface flows; and
  - Improved access to river channel habitats which may facilitate illegal sand mining causing disturbance and degradation of aquatic habitats and water quality impacts.

6.5.10.3 Responsibility

Primary Contractors associated with the construction of the PWAR and BPST.

6.5.10.4 Objectives

- To conserve the existing biodiversity and minimise the potential loss of habitats, plants and animals through implementation of the project;
- To minimise loss and damage to wetland habitats through direct habitat loss and concentration of flows that can cause erosion; and to maintain hydrological characteristics that support wetland functioning;
- To minimise the potential loss or disruption of ecosystem services of importance to local communities;
- To minimise the risk of increased collection and sale of wild populations of *Aloe polyphylla* through education of Contractor staff.

6.5.10.5 Performance Criteria

International standards (such as World Bank ESS6) discourage the loss of natural habitats and requires that significant adverse impacts to natural habitats aim to achieve a No Net Loss of biodiversity through the avoidance of sensitive features, minimising impacts, rehabilitation and possible compensation. Disruption of ecosystem services are to be avoided and engagement with stakeholders is crucial in understanding these effects.

6.5.10.6 Management Measures

The management measures included in Table 6.19 will be implemented to reduce biodiversity related impacts from the Project.

Figures and maps to support the identification of specific locations where environmental protection activities are required are to be found as follows:

- Maps of sensitive ecological features and specific mitigation requirements (Appendix A)
- Map of bird collision risk sensitivity (Appendix B)
- Maps of specific wetlands where mitigation requirements need to be applied (Appendix C)
- Map of Cultural Heritage sensitivity (Appendix D)
- Map of social structures to be resettled (Appendix F)

Table 6.19 Biodiversity Management

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
9.1	Method Statement for Wetland Protection	A Method Statement for the protection of wetlands will be compiled. The Method Statement will need to include: • The specific wetland mitigation / management measures included in Appendix C. • Demarcation of wetlands on site. • Operation of vehicles in and close to wetland areas. • Location of site facilities (including toilets) at least 100 m from wetlands. • Environmental awareness of staff (this will need to consider the measures included in the Environmental Induction and Training Management – refer to Section 0). • Behaviour of staff in wetland areas (e.g., avoidance of trampling, fires, disposal of waste water, human sanitation). • Restrictions on abstraction of construction water from wetlands. • A rehabilitation plan for the wetlands impacted by the road. • Monitoring of the wetlands and related impact mitigation during construction.	Prior to construction	Method Statement developed covering specified items	✓	✓
9.2	Training and Awareness – Biodiversity	Environmental Induction and Training Management measures included in Table 6.4 will need to include the following aspects related to biodiversity: • Design and placement of posters representing biodiversity of the project area (e.g., wetland types and importance; plants (including alien invasive plants) and fauna) and put up in Contractor staff areas (e.g., canteens, offices). • Develop wetland education and awareness materials to enable Contractors and their employees to identify sensitive wetland features. • Hold regular toolbox talks with staff informing them of the following restrictions: - Prevention of fires, digging, trampling or driving across wetlands; - Avoidance of using wetlands as toilet or for washing; - Harvesting of wetland resources. - Harvesting of plants and picking of flowers; - Recognising and preventing alien plant spread; - Killing of snakes, lizards and other fauna; - Illegal to purchase or harvest spiral aloes. • Instruct staff what to do and where to seek help if snakes or young or injured animals are encountered to ensure they can be live caught and released. • A designated staff member shall be trained and responsible for catching and release of snakes in areas away from villages. Each Contractor will require the same information to be presented to their staff before and	Prior to and throughout construction	• Induction and awareness materials • Posters on biodiversity developed and put up • Toolbox talks on biodiversity • Staff proof of attendance • No damage to wetlands and other biodiversity areas from construction • Trained staff member for removal and release of	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
		during construction. Information will need to be presented in English and Sesotho		snakes		
9.3	Alien Plant Management	The following management measures will be implemented so as to minimise the spread of alien invasive plants: • Develop a Method Statement that describes measures to avoid spread of alien invasive plants. This shall include: - Prevention of spread on machinery and equipment e.g., washing down of machinery / equipment with herbicides prior to use in PWAC Project Area; - Measures to restrict alien spread in transfer of materials from weed-infested areas, (e.g., borrow pits etc.); - Stockpiling of topsoil confirmed to be free or with limited weeds; - Control measures for alien plants, including use of herbicides; - Sources and use of compost and mulch from weed-free suppliers; - Monitoring and eradication of weeds during and post-construction; and - Reporting requirements for monitoring and eradication. • Implement alien invasive plant control measures. • Ongoing monitoring and control of weeds.	At the start, during and post construction liability	Alien invasive plants remain absent or of minimal extent in infrastructure development areas	✓	✓
9.4	Birds – Pre-construction surveys	Pre-construction surveys by ornithologist will be undertaken to inspect the final infrastructure alignments and confirm the status of known and possibly new nest sites and other sensitive locations in proximity to the road and powerline. A survey report will be prepared that provides locations of additional sensitive bird sites if recorded and mitigation measures (e.g., scheduling of blasting around breeding seasons).	Before the start of construction (preferably May-Oct)	Survey report with mitigation recommendations	✓	✓
9.5	Birds - Powerline Collision	The following bird mitigation measures for the 132kV powerline will be incorporated into tender design documents and costs and implemented during construction: • Plan, cost and fit bird flight diverters (BFDs) along entire length of 132 kV powerline from Ha Seshote to Polihali. • Fit BFDs on sections of existing line that will be refurbished from Ha Lejone to Matsoku substation particularly Pylons 6-8, 11-14, 16-20, 46-54, 57-58 (i.e. sections intersecting areas of very high bird collision sensitivity). • Plan, cost and fit Aviation Warning Devices (AWDs) on sections of line at high altitude and in modelled areas of very high sensitivity (see Figure B1 in Appendix B). These are: - Pylons 14-16 (Ridges from Sekolopata to Ha Thene) - Pylons 16.3-17.1 (Semenanyane Valley west) - Pylons 21-22.3 (Makhoaba Junction area) - Pylons 26-28 (Deviation area above Thuhloane) • The number/density of BFDs and AWDs per span should be as high as allowed by the engineering constraints of the line to maximise the conspicuousness of the line to oncoming birds. Recommended interval for BFDs is at least 15 m spacing, as per	During detailed planning and design and construction	Bird mitigation specified in tender documents BFDs and AWDs installed on powerline as specified		✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
		specifications for recommended model.				
9.6	Birds - Borrow Pits and Quarries Blasting	The following management measures will be implemented for blasting and aggregate crushing activities: • Additional recommendations that may be included in preconstruction bird survey report (refer to management measure Ref No. 9.5) will be adhered to. • Regulate the timing and frequency of blasting, which may include restrictions on blasting at certain road or quarry sites during breeding seasons of conservation priority species (generally June-November). • Avoid (if possible) or minimise the footprint of quarries or borrow pits in high altitude sensitive habitats between PWAR kp 16-22 and kp 23-30 as far as possible.	Throughout construction	• Compliance reports from ECO	✓	✓
9.7	Method Statement for: Laydown Areas; Borrow Pits and Quarries Aggregate Crushing & Cement Batching and Vehicle Access	A Method Statement shall be compiled for construction facilities. These will need to describe the following: • Prioritisation of locations in disturbed areas. • Selecting locations at suitable distance from rivers/streams, wetlands, and away from communities to minimize pollution and disturbance risks. • Minimising footprints, including vehicular parking and access routes. • Designating access routes and site boundaries. • Measures to control dust and polluted runoff. • Site clean-up and remediation. Where possible, avoid or minimise the siting of laydown areas or aggregate crushing or cement batching plants in high altitude areas of the route between Ha Thene and Makhoaba Junction between PWAR (kp 16-30) which are of high sensitivity for birds and wetlands (particularly near proposed Quarry 7). Where these facilities are absolutely required in this area, detailed Method Statements that can demonstrate how mitigation measures will minimize risks to biodiversity (particularly wetlands) and to social receptors (including livestock). It is advised that a wetland specialist is consulted on the location, design and layout of such facilities on Makhoaba Junction. These Method Statements shall be subject to review by the EM and approval by the Engineer	During detailed planning and design	• Method Statements for construction facilities. • Site layout plans include laydown areas and vehicular use areas	✓	✓
9.8	Rivers and Streams	Protection measures for rivers and streams are mostly covered under Water Management (Table 6.14) (e.g., restricted rock spoil areas). During bridge and road construction adequate through flows to downstream aquatic ecosystems must be maintained at all times during bridge construction to maintain aquatic biota and habitats.	During construction	• Maintain river flow during bridge construction	✓	
9.9	Rock Spoil	The following management measures will be implemented for rock spoil disposal: • Restrict deposition of rock spoil where it may clog or impact on aquatic habitat or	Throughout construction	• Compliance reports from	✓	

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
		wetlands as summarized in Ref.6.7 under Water Management (Section 6.5.5). • Sites for deposition of rock spoil shall be pre-approved by the Engineer. • Avoid deposition of surplus rock on steep slopes where it will spread over a larger footprint or where rocks will disperse / roll down slopes and into fields. • Recover and rehabilitate construction areas by implementing the measures included in the Rehabilitation and Site Clean Up Section (refer to Section 6.5.12).		ECO		
9.10	Wetlands	Wetland habitats will be protected by: • Demarcating the construction servitude through each wetland prior to construction. • Restricting all disturbance and construction activity to this demarcated servitude.	Throughout construction	Evidence of demarcated working width at wetlands	✓	✓
9.11		The following measures for **general wetland protection** will be included in detailed design: • Location and sizing of culverts sufficient to prevent the concentrated discharge of surface flows into the wetland. • Design of culverts such that flows are spread across the width of the wetland and that flow velocities are kept to a minimum. • Sub-surface drainage maintained for Fens, Seep, Valley Bottom and Seep, and Sheetrock wetlands. • Develop site layout plans for each significant wetland crossing area that designates the boundaries of works areas, including support activities e.g., vehicular access/parking, labour rest and ablution/toilet areas etc. • Surface flow runoff protection measures to prevent erosion of the wetlands immediately below the road crossings. Where required, implement rehabilitation measures such as gabions to stabilise headcuts in wetlands below the road crossings.	Detailed design and construction	Sufficient culverts and erosion protection measures installed - no erosion gullies initiated at outlets or in wetlands areas above and below the outlets	✓	✓
9.12		The following specific measures for **wetland protection of Fens** will be implemented: • Location and sizing of culverts to ensure that flow under the road at the crossing is spread as far laterally as possible to prevent the concentration of flow at any point within the wetland. The design should also be such that it minimises flow velocities across the width of the wetland crossing. • Culvert placement will be designed in such way that they do not cut into the system but rather that the same invert level is maintained at the inlet and outlet (and that the flow is spread across the system to minimise concentration and velocities) and that this is aligned with the slope and shape of the surface profile of the wetland.	Detailed design and construction	Design measures in place and implemented	✓	✓
9.13		The following specific measures for **wetland protection of Sheetrock and Seep wetlands** will be implemented:	Detailed design and construction	Design measures in place and implemented	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
		• Provisions to ensure that interflow (sub-surface seepage) is allowed to pass under the road so as to maintain the wetlands, and in cases where there are water points or springs, to maintain the water supply to these as well. • Sediment protection measures will be implemented during construction (such as the use and placement of hay bales along the edge of the systems immediately below the construction disturbance fronts, across the entire front). • Undertake further wetland investigations with the design Engineers if Quarry 7 is to be permitted on Makhoaba Pass in order to minimise impacts to wetlands.				
9.14		The following specific measures for **wetland protection of Seep with Spring wetlands and springs** will be implemented: • Protection measures for Seep with Spring wetlands and the associated springs located within the build line must be implemented by restricting the construction footprint to the road servitude only and by allowing the sub-surface flows that supply the springs to move under the road.	Prior to construction and post construction	Hydrocensus undertaken and suitable mitigation developed and implemented	✓	✓

6.5.11 Landscape and Visual Management

6.5.11.1 Project Activities Resulting in Landscape and Visual Impacts

Landscape and visual impacts are related to the changes in the physical landscape and how it is experienced, which may affect the perceived value attributed to the landscape and people's response to any changes to visual amenity. Landscape and visual impacts experienced by the construction and operation of the powerline will include:

- Local changes to existing significant landscape views due to the contrasting linear element of both the powerlines and pylons which will interfere with the viewsheds of receptors (including future road users of the PWAR) and local residents along the route.

- Creation of new construction access roads and tracks for the installation of pylons and stringing of the powerline (which are likely to be retained for long term maintenance), and which may result in landscape scarring from exposed soil and soil erosion. These will be of greater visual intrusion where they are located in sensitive mountainous or wetland areas that are difficult to rehabilitate.

- Opportunities to enhance the road users appreciation of the scenic quality of the landscape can be created through appropriate siting of laybys and viewsites along the route.

6.5.11.2 Responsibility

Primary Contractor associated with the construction of the PWAR and BPST.

6.5.11.3 Objectives

- Minimise visual impacts of construction access and works areas.

- Enhance opportunities for road user appreciation of the scenic / visual resources.

6.5.11.4 Performance Criteria

- Detailed design plans incorporate natural stone features in infrastructure and construction design.

- No evidence of construction vehicles transgressing demarcated works area.

- No erosion along new access tracks.

- Rehabilitation Method Statement developed.

- View sites incorporated into detailed site development plans.

- The final land use of the quarry / borrow pit sites are safe / stable, and rehabilitated such that visual scarring is minimised.

- Quarries and borrow pits effectively incorporated into a road layby, enhancing the road user experience.

6.5.11.5 Management Measures

The management measures included in Table 6.20 will be implemented to reduce impacts associated with landscape and visual impacts.

Table 6.20 Landscape and Visual Management

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
10.1	Establishment of View Sites	View sites will be created at prominent viewshed locations to allow road users to pull off and admire the views and scenery. View sites should appear natural in the landscape and be walled with natural stone to provide wind breaks and a ledge to sit on. Moreover, the installation of stone tables and benches for picnicking should be considered at certain sites. Suggested locations include (amongst others): • TP 17 on top of Semenanyane Pass (west side); • TP 29 above Kosheteng at western side of Makhoaba loop. A potential quarry site has been identified in this vicinity and it is suggested that the quarry be rehabilitated and contoured to create a wind break for use as a view site and picnic area towards the east; • PWAR (kp 40) view site overlooking the waterfall on the Makhoaba River (if feasible) or alternative site at 37.6; and • View site over the Senqu River valley at 46.2.	Prior to and during construction	View sites planned, costed and created	✓	✓
10.2	Visual enhancement measures	The aesthetics of the road and powerline infrastructure will be enhanced by incorporating natural stone elements for: • Terracing of embankments for substation expansions (e.g., Matsoku Substation); • New substation buildings (e.g., Polihali Substation); • Rock cladding of bridges and culverts; and • Erosion control structures, supporting walls, gabions and culvert embankments along roadsides.	Detailed design and during construction	Detailed design plans incorporate natural stone features in infrastructure and construction design	✓	✓
10.3	Vehicle Management	To minimise visual impacts associated the route of access tracks from cutting across slopes and erosion the following will be implemented: • As far as possible access tracks will follow existing contours and will avoid cutting across and down steep slopes to minimise erosion risks. • Proposed access tracks will be mapped on the onsite plans. • Routes will be delineated prior to bulldozing or clearing tracks to minimise disturbance footprints and to ensure correct tracks are followed by Contractors. • Vehicular access, parking and turning zones for construction equipment will be demarcated on site plans to minimise multiple tracks and areas of disturbance. • Routings for access / service roads will avoid straight edges and corridors, and rather complement / reflect the physical shape of the landscape through which they pass; • The width of the access roads should be as narrow as technically possible to reduce the extent of cuttings. • Any spoil remaining from the construction of the access roads, as well as the fill areas below the constructed access road will be shaped to reflect the natural terrain and tie into / blend with the surrounding landscape.	Prior to construction	• Mapping of access tracks, construction vehicle work areas on site plans • Delineation of access tracks in field	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
10.4	Land Clearance	To minimise landscape and visual impacts associated with land clearance the following will be implemented: • All construction vehicles will adhere to designated access tracks and other works areas as marked on site plans. • Works areas will be demarcated by means of rocks and/or use of stakes and construction tape. • Any requirement for vehicles to work outside designated works area shall be done only with documented EM approval. • Erosion control measures included in the Water Management Section (Section 6.5.6) will be implemented.	Prior to and during construction	• No evidence of construction vehicles transgressing demarcated works area • No erosion evident along cleared areas	✓	✓
10.5	Rehabilitation	Implement all measures related to site clean-up and restoration to ensure visual scarring of access tracks and works areas can restore to pre-construction baseline condition (as per Section 6.5.12).	Prior to construction	Evidence of progressive rehabilitation	✓	✓
10.6	Rehabilitation of Quarries	The rehabilitation requirements included in the Borrow Pits and Quarries Management Section (Section 6.5.6) will be implemented.	Post-construction	Borrow Pits and quarries rehabilitated.	✓	✓

6.5.12 Rehabilitation and Site Clean-Up Management

6.5.12.1 Project Activities

The Project extends over terrestrial and aquatic habitats. Construction activities will involve the movement of materials, equipment, machinery, vehicles and people along the length of the PWAR and BPST. Construction activities will impact on these habitats either directly or indirectly, through excavation works and exposure of soils to erosion or alien plant invasion; and pollution with construction solid waste, litter and polluted effluent.

6.5.12.2 Responsibility

Primary Contractor associated with the construction of the PWAR and BPST.

6.5.12.3 Objectives

The overall objective of rehabilitation is to restore land damaged during construction to its pre-existing condition as far as reasonably practicable, to enhance social land uses and biodiversity recovery.

Specific objectives will be to:

- Leave a safe environment for humans and animals;
- Make the area stable;
- Prevent soil and surface / groundwater contamination by effectively managing spills during the life of the Project; and
- Comply with regulatory requirements and international good practice.

6.5.12.4 Performance Criteria

- Implementation of progressive rehabilitation measures, beginning during site preparation;
- Rehabilitation and stabilisation of all areas impacted on by construction with no significant erosion events.
- Rehabilitation efforts implemented until natural succession processes take over and restore the species composition to a natural state similar to surrounding or adjacent natural vegetation.
- No invasive plant species introduced to active work areas or adjacent areas.
- Monitoring of rehabilitation effort occurs at a frequency necessary to maximise rehabilitation success.

6.5.12.5 Management Measures

The management measures included in Table 6.21 will be implemented to reduce impacts associated with blasting.

Table 6.21 Rehabilitation and Site Clean-Up

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
11.1	Method Statement for Site Clean-Up	Compile Method Statement for managing works sites to minimise work area footprints, manage storage of materials/equipment and waste, and daily clean-up requirements.	Start of construction	Method Statement for work site management	✓	✓
11.2	Site Clean-Up	• All work sites shall be kept in a tidy and safe condition with minimal spread of rubble and other waste across the site. • Litter, food waste, glass, tins, wire, and packaging materials shall be removed on a daily basis to minimise littering, foraging by residents and spread of pests (e.g., rats). • Each site shall be cleaned up and rubble and other waste removed on completion of construction works in a given area. • All areas disturbed during construction shall be reinstated to a state that approximates or is an improvement on the state they were before construction. • All temporary structures, equipment, materials, waste and facilities used for construction activities are removed upon completion of construction at each work site. • Ground surface shall be levelled and contoured to a near natural profile and scarified to decompact soils in preparation for additional rehabilitation measures, as required.	Start of construction	• Visual observations / photographic records • Site closure report	✓	✓
11.3	Method Statement for Site Layout and Clearance	A Method Statement will be developed documenting the approach to site layout, site clearance, topsoil management within the context of concurrent rehabilitation requirements.	Start of construction	Method Statement	✓	✓
11.4	Method Statement and Rehabilitation Plan	A Method Statement and rehabilitation plan will be developed for rehabilitation of laydown areas, access tracks and all construction disturbed sites taking into account the requirements of Lesotho's Roads and Bridge Design Standards (GoL 1998) (Volume 9). The Contractor is required to consult these standards and should consult the Roads Directorate for additional input, where appropriate. These standards specify: • *Prioritisation of labour intensive methods for clearing vegetation in sensitive areas under instruction of ECO;* • *Removal of weeds and alien vegetation from the road reserve before construction commences (including black wattle trees) and during the post construction liability phase;* • *Avoidance of use of alien plant contaminated road building from borrow areas;* • *Rehabilitation of all areas affected by surveying and construction, including survey lines, borrow areas; haul roads, construction camps, access tracks and spoil areas;* • *The Contractor to submit a rehabilitation plan for approval prior to commencement of operations, and that rehabilitation is included in the Contractor's programme and regular reports must be submitted.*	Start of construction	Method Statements and rehabilitation plan	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
		• *Rehabilitation of vegetation must be undertaken concurrently with construction of the works, taking into consideration seasonal constraints;* • *Rehabilitation shall include topsoil conservation, shaping and tripping of cut and fill slopes; slope stabilization; revegetation (as per Section 3.5.4 and 3.5.5 (seed mixes) of the standards) with focus on indigenous species; and hydroseeding (where appropriate);* • *Monitoring on a monthly basis during the first year with a frequency determined by the results of the first year;* • *Rehabilitation is considered successful where 80% cover of the seeded species has germinated and survived one full growing cycle, including one winter.* Section 3.5.7 of the standards provides an indication of typical revegetation problems experienced. The rehabilitation plan should take these into consideration when developing the rehabilitation plan. Phased rehabilitation as road construction progresses will provide additional time for recovery of vegetation or reinstatement prior to project closure at the end of the one year post construction project liability phase. Specific attention will be required for rehabilitation of wetlands. It is strongly recommended that a wetland engineer (or similar suitably qualified person is consulted in the preparation of the rehabilitation plan. The rehabilitation plan shall identify priority areas for rehabilitation (given limited topsoil availability) (see Point 11.7).				
11.5	Topsoil Management for Rehabilitation	Site clearance shall be conducted with a view to future rehabilitation. Progressive rehabilitation measures will include (but are not limited to): • Minimising the area of site clearance required. • Excavation and stockpiling of vegetated plant sods (where possible) and available topsoil in the road footprint for later rehabilitation. • Rehabilitation in a phased approach concurrent with construction through slope stabilisation, decompaction of soils by ripping, and seeding with an indigenous seed mixture or translocation of plants from the Project Area.	Start of construction	Top soil recovery	✓	✓
11.6	Soil Stockpiles	Measures for stockpiling of topsoil include: • Strip soil only from areas required for the footprint of the road or construction works sites to a depth of 150 mm (where feasible). Different types of topsoil shall be stored separately. • Stockpile hydromorphic (wetland) soils separately from other soils to allow for their reuse in wetland rehabilitation.	At the start and throughout construction	• Documented evidence of topsoil recovery and stockpiling	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
		• Stockpile soils in areas designated by the ECO and where they are protected from construction activities and vehicle movement, human and livestock trampling etc. • Soil stockpiles to be stored at least 50 m from the edge of wetlands, streams or rivers; areas prone to flooding, or where the flow of water could cause ponding of water or soil erosion. • Install surface water diversions to reduce risk of erosion during storm events • Create berms on the downslope side of stockpiles to minimize soil loss or spread. • Topsoil shall be stockpiled in windrows not exceeding 2 m in height (to ensure fertility is retained and reduce windblown loss and dust). • Cover soil stockpiles where practical to prevent dust and soil loss or erosion, and where it can create a social nuisance. This can be done using a mulch or seeded with a fast growing grass (e.g., *Eragrostis* (teff)). • Soil stockpiles will be kept free from alien invasive plants. • Minimise mixing of topsoil from areas with alien weeds and areas without weeds. • Soil stockpiles should be sufficiently graded and stored to allow natural revegetation to protect stockpiles from erosion. • Minimise duration of topsoil stockpiles through implementing ongoing rehabilitation of works areas on completion of construction in each work area. Topsoil stockpiles should not be left for more than 6 months after which they will need upgrading.				
11.7	Cut and Fill Slopes and Slope Stabilisation	Cut and fill slopes should be shaped and trimmed to resemble natural conditions, where possible. Guidelines of the Roads and Bridges standards (GoL 1998) include: • Slopes should not be steeper than a gradient of 1:2, and ideally between 1:3 and 1:4; • Vertical cuts in rock should be cut as roughly as possible leaving ledges for collection of soils to enable rehabilitation. Boulders that do not pose a danger to traffic should be left. • Where the upper slope of the cut face may erode up the slope, suitable stabilization methods must be implemented (such as gabions or shaping soft material to a rounded shape and seeding to prevent erosion.	Throughout construction	Evidence of cut slopes profiles	✓	✓
11.8	Priority Areas for Rehabilitation	• Prioritise rehabilitation interventions in high priority areas where there is a low likelihood of natural revegetation or where areas are prone to erosion from surface runoff. These shall be identified and marked on site rehabilitation plans for approval of the Engineer. • Wetlands shall receive highest priority for rehabilitation using separately stored hydrogeomorphic soils and in accordance with the rehabilitation plan (see point 11.8). • Rock spoil deposits on cut slopes in remote high lying parts of the route shall have priority for spread of some topsoil or loose substrate to infill rock gaps in order to facilitate more rapid recolonization by naturally occurring plants	At the start and throughout construction	Rehabilitation plans	✓	✓
11.9	Wetland Rehabilitation	• Wetland rehabilitation shall be done in accordance with the approved rehabilitation plan prepared by the Contractor and approved by the Engineer.	At end of construction	Method Statements for wetland	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
				rehabilitation		
11.10	Monitoring of Rehabilitation	Monthly inspections of the rehabilitated areas are required during construction and the post-construction defects liability period to monitor the effectiveness of rehabilitation progress and to identify additional measures if required. Ongoing monitoring will include checks and removal of alien invasive plants, in accordance with an approved alien invasive plant management plan.	Post construction	Monthly inspections of rehabilitation	✓	✓
11.11	Borrow pits and quarries	Implement the rehabilitation measures specified in the Method Statement for borrow pits and quarries as described in Borrow Pits and Quarries Management Plan (Section 6.5.6, point 5.7).	On closure	Method Statements detailing design and rehabilitation of quarries and borrow pits	✓	

6.5.13 Cultural Heritage Management

6.5.13.1 Project Activities Resulting in Cultural Heritage Impacts

Construction work to widen and improve the road between Ha Seshote and the Polihali Dam area will impact upon existing graveyards, cemeteries and ash heaps. Some will be directly impacted within the footprint of the road bed and accompanying shoulder, drainage or working area and will require the grave(s), cemetery, and ash heap(s) to be relocated or ceremonies to be held. This will be determined by the RAP Consultant in consultation with affected parties and as agreed in the presence of LHDA.

Graves, cemeteries and ash heaps may be impacted through construction disturbance e.g., cracking from earthworks vibrations or through damage by construction equipment or workers. It is less likely that powerline construction will impact these sites, but due precaution should be taken when planning the location of temporary access roads and the siting of pylons to verify proximity to graves/cemeteries/ash heaps.

Table 6.22 summarises the number of graves, cemeteries and ash heaps confirmed to date within the Road Reserve most or all of which will need to be removed. Notes on burial sites that may be affected are contained in Table 6.23. It is estimated that a total of nine graveyards, 16 ash heaps and one spiritual site (Thakisa) occur within the road reserve. The majority of burial sites occur in the Masalla area on the eastern side of the PWAR (near kp 33 to 34), although significant graveyards also occur close to the PWAR at Ha Seshote, Phakoeng and Makhiseng.

These sites have been provided to the road and powerline design Engineers in order to confirm the extent to which construction can mitigate impacts on them.

Table 6.22 Summary of Confirmed Graves and Ash Heaps at Risk of Construction Damage

Type of site	Within 30 m Road Reserve Possibly affected by construction. require exhumation and reburial
Cemetery / graveyards /	2 (Phakoeng) 5 (Masalla) 1 (Makhiseng) (old graveyard) 1 (Makhoarane)
Ash Heaps	10 (Masalla) 1 (Makhkiseng) 2 (Ha Mei) 2 (Makhorane) 1 Polihali (no burial reported)
Thakisa (medicated stone) (spiritual)	1 (Ha Mei)

Note: it is likely that additional graves and ash heaps may be identified along the PWAR during further consultation with communities or during road construction, while others may be identified along access routes required for powerline construction and still to be determined.

Table 6.23 summarises the graveyards, cemeteries and ash heaps that are expected to be directly or indirectly impacted by construction work, although the degree of risk requires verification with the design Engineers in conjunction with the RAP consultants. The RAP consultants will be responsible for mapping all graves within the road reserve (i.e. 30 m of road centre line) and powerline servitude, and undertaking the required mitigation (e.g., exhumation and reburial, ceremonies) with LHDA.

Coordinates are provided in Appendix D.

Table 6.23 Summary Description of Burial Sites in Close Proximity to PWAR

Site No.	Village	Site Name	Description and Specific Location	Estimated Risk from PWAR
1	Ha Seshote	Seshote graveyard	Old graveyard below blue gum trees on road to Katse in close proximity to junction that goes to Catholic Mission station. It contains many graves and not all are clearly marked or visible.	Located near proposed intersection with PWAR. Confirmation of risk required. Avoidable.
5	Phakoeng	Graveyard 1	It is on the eastern side of village above the current road but very close to it.	Approx. 20 graves may need to be relocated as they fall within the 15 m road reserve (while the other graves will need to be cordoned off to prevent damage).
6	Phakoeng	Graveyard 2	Old small graveyard next to Liseleng River below the abandoned village of Ha Phatsisi and opposite to Pitseng village. Not all graves are clearly marked.	Approx. 2+ graves will need to be relocated as these fall within the 15-m servitude of the new road.
13	Ha Semphi	Graveyard 1	Small graveyard with 4-6 graves on southern side of road.	Confirmation of proximity to road required.
23-29	Masalla / Makhoaba	Ash Heaps Nos (1) – (7)	Located very close to southern side of road. It is not clear if still births / children are buried there – this needs to be determined with family concerned.	Depending on presence of still births / children and wishes of family, it may be necessary to re-locate all of these as they fall within 15-m servitude of the new road.
30	Masalla / Makhoaba	Ash Heap No 8	Located very close to northern side of road. It is not clear if still births / children are buried there – this needs to be determined with family concerned.	Depending on presence of still births / children and wishes of family, it may be necessary to re-locate as it falls within 15-m servitude of the new road.
31-32	Masalla / Makhoaba	Ash Heaps Nos 9-10	Located on the northern and southern sides of the road respectively, these ash heaps contain still births. They are located in close proximity to the road.	It is necessary to re-locate these ash heaps as they fall within 15-m servitude of the new road.
18	Masalla / Makhoaba	Graveyard 1	Large graveyard located close to southern side of road, but hard to see as these are covered with thick growth of lengana.	20 or more of these graves likely to require relocation because of close proximity to road; others to be cordoned off.
19	Masalla / Makhoaba	Graveyard 2	Same as Graveyard 1	20 or more of these graves likely to require relocation because of close proximity to road; others to be cordoned off.
20	Masalla / Makhoaba	Graveyard 3 / 4	Northern side of road, but similar to Site 18 and 19	20 or more of these graves likely to require relocation because of close proximity to road; others to be cordoned off.
21	Masalla / Makhoaba	Masalla graves	A few graves are located between the road and the river behind a shack	About 3 graves to be relocated as these are close to road.
45 / 47	Ha ‘Mei	2 Ash heaps & Thakhisa	Opposite ‘Mei Primary School on south side of road	Likely to require relocation as these are close to road.
46	H ‘Mei	Ash heap	South side of road	Likely to require relocation as

Site No.	Village	Site Name	Description and Specific Location	Estimated Risk from PWAR
				these are close to road.
50-53	Makhoarane	Ash Heaps 1-5	Located close to southern side of road. Nos 2 and 5 have still births.	Owners to be consulted. All are close to road and should be relocated unless owners are not interested.
55	Polihali	Ash heap of Ramalibo Keqe	No still births, but located close to western side of road.	Owners to be consulted. It should be relocated unless owner is not interested.

The location of burial sites in relation to the road alignment / design and construction footprint (including laydown areas) as well as the family ownership and reburial wishes of the affected family will need to be verified through further investigation under the RAP contract (LHDA Contract No. 6006).

At Ha 'Mei, one *Thakhisa (*'medicated stone' in this case, partially buried), that is used to protect the family compound from various forms of harm, is located between two ash heaps. It will probably have to be removed through a ritual at the same time as the ash heaps.

6.5.13.2 Responsibility

Primary Contractors associated with the construction of the PWAR and BPST.

6.5.13.3 Objectives

- Identify cultural heritage mitigation measures to be implemented during construction with the purpose of preserving cultural heritage resources.
- Outline a Chance Finds Program to manage the discovery of Chance Finds during the construction phase.
- To reduce the risk of major Project delays caused by late identification of graves in the construction footprint.
- Establish an appropriate Cultural Heritage Training Program for Project management and staff.

6.5.13.4 Performance Criteria

- Restrict construction footprints to avoid graves where feasible.
- A Chance Find Procedure and documentation of its implementation.

6.5.13.5 Management Measures

The management measures included in Table 6.24 will be implemented to reduce impacts associated with impacts to cultural heritage resources.

Table 6.24 Cultural Heritage Management

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
12.1	Induction and Training	Environmental Induction and Training Management measures included in Section 0 will need to include implementation of education and awareness training of staff on identification of potential 'chance finds' regarding Cultural Heritage, especially graves, open-air sites, and remains of previous settlements and structures. Specific measures include: • Design and put up posters representing possible 'chance finds' at Contractor camps e.g., dining and office areas. • Develop 'chance finds' education and awareness material, including procedures when archaeological material encountered; • Instruct staff (e.g., through toolbox talks, and induction training) what to do and where to seek help if chance finds are encountered.	Prior to and throughout construction	• Induction and awareness materials • Posters on Chance Finds and cultural heritage artefacts • Proof of staff attendance at induction and talks	✓	✓
12.2	Graves – mapping and demarcation	• Investigate options for avoiding identified graveyards wherever possible e.g., minor road realignments or minimising construction footprints. • Mark graves and graveyard boundaries which are not relocated but remain within the road reserve or close to other construction works areas (e.g., with painted stones) to prevent accidental damage. Contractors to obtain mapped information from the RAP Consultants.	Prior to and throughout construction	• Realignments • Mark graves	✓	✓
12.3	Chance Finds Procedure	Implement the Chance Finds Procedure (Appendix D): • Designate the ECO, CLO or other staff member with responsibility for managing the Chance Finds procedure and notifying a qualified Heritage Practitioner, authorities and designated LHDA staff in event of a chance find. • Ensure Chance Finds Procedure is known to ECO and CLO and copies available at site works areas. • Ensure accurate records of Chance Finds kept and maintained and supplied to LHDA and the Department of Culture. • Map and demarcate any cultural heritage sites identified during construction.	Prior to and throughout construction	• Induction and awareness materials • Proof of staff attendance at induction and talks • Designated staff responsible for chance finds • chance finds records	✓	✓

6.5.14 Social Management

6.5.14.1 Project Activities

- Interactions between the workforce / Project activities and local communities.
- Exposure of workforce to health and safety standards incidents.
- Exposure of workforce to insufficient labour and working standards.

6.5.14.2 Responsibility

Primary Contractor associated with the construction of the PWAR and BPST.

6.5.14.3 Objectives

- Optimise opportunities for local communities to secure employment and provide goods or services, or receive training.
- Continuously identify, evaluate and prioritise the risks and impacts of construction activities on the health, safety and security of local communities.
- Proactively prevent and avoid impacts to community health safety and security, and enhance any positive impacts related to community health and safety.
- Identify strategies that provide adequate health related information and prevention measures through which communities can manage their own health and safety in an optimum manner.
- Implement security that protects Project employees, assets and business continuity in a manner that adheres to national legislation, and is consistent with the Voluntary Principles on Security and Human Rights.
- Support the health, safety and wellbeing of the Project workforce.
- Create an environment favourable to the development of healthy worker-management relationships.
- Minimise the risk of discrimination (including for any migrant workers) and promote equal opportunities.
- Manage risks associated with housing for the workforce including construction workers.
- Consider the risks of child or forced labour, or significant safety issues within the supply chain and consider steps to remedy these risks.
- Ensure working hours conform to legal requirements.

6.5.14.4 Performance Criteria

- Comply with LHDA's policies and plans with respect to labour recruitment, procurement of goods and services, grievance resolution management; and community participation strategy.
- Maximise employment of local labour from nearby communities for unskilled positions, and where possible semi-skilled positions.

6.5.14.5 Management Measures

The management measures included in Table 6.25 will be implemented to reduce impacts associated with social management.

Table 6.25 Social Management

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
13.1	Method Statement for Community Engagement	The Contractor shall develop a Method Statement in alignment with LHDA's Community Participation Strategy and Communications Protocol covering all aspects of dealing with community members. These include measures to: • Respond to requests for work or compensation; • Respect for local residents property, crops, animals; ash heaps, burial sites; • Crossing of fields; • Use and protocols related to community water supplies; • Importance of removing rocks from fields, • Traffic safety and accident protocols, etc. Specific measures will need to be incorporated into the Code of Conduct for staff as outlined in point 13.16.	Prior to construction	Grievance management protocol	✓	✓
13.2	Grievance Procedure	The Contractor shall develop a Procedure for Complaints or Grievances Management in alignment with LHDA's Grievance Resolution Procedure. The Contractor will keep a register of all such complaints, together with the following records: • Date and time of complaint. • The method by which the complaint was made, e.g., telephone, letter, meeting, etc. • Name, gender, village, contact telephone number of complainant. If no such details were provided, a note to that effect. • Details of complaint. • Action taken in response including follow up contact with the complainant. • Any monitoring to confirm that the complaint has been satisfactorily resolved. • If no action was taken, the reasons why no action was taken. The Grievance Procedure shall indicate the process of escalating grievances from the Contractor to the EM to LHDA and the manner in which these are reported (e.g., in monthly reports).	Prior to construction	Grievance management protocol	✓	✓
13.3	Grievance Management	Contractor staff shall be informed of the Grievance Procedure and channels for community members to record grievances, and shall follow the required procedure. Grievances raised and how they have been addressed shall be documented in the Contractor's weekly and monthly reports.	Prior to and during construction	• Grievance register • Weekly / monthly reports	✓	✓
13.4	Method Statement for Traffic Management	For the management of project related traffic, Contractor will: • Compile a Method Statement for traffic management prior to construction, and updated as required. • Traffic management measures are to be implemented as specified in the approved Method Statement, which shall be aimed at restricting the travel speed of Contractors and their suppliers / staff and maintenance of vehicles; and provisions for existing road	Prior to and during construction	• Traffic Method Statement • Accident protocol developed	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
		users and pedestrians. • A protocol for handling accidents is to be developed in the case of accidents involving other vehicles, pedestrians, animals or property. • All Contractors to be aware of traffic speeds and protocols in the event of a collision with people or animals through regular toolbox talks. • Speed limits on unpaved roads should be suited to the given road condition and should not exceed a maximum of 30 km/hour along the PWAR (especially through villages and near schools). • The appointed Contractor is to have the necessary insurance/ contingency budget in place for costs incurred with accidents involving other vehicles, people, animals, agricultural land, or infrastructure. • The Contractor shall be required to compensate any affected farmer for injured animals in terms of LHWP protocols.		• Traffic safety included in toolbox talks		
13.5	Traffic Safety	The following measures shall be implemented to improve traffic and pedestrian safety: • Safe crossings are to be provided for pedestrian and animals during construction, especially at open trenches or pits to enable pedestrian access. • Zebra crossings to be located at schools, proposed bus stops, and social gathering points. • Road signage shall include school children and speed signs (particularly in villages).	During construction	• Crossing points provided • Road signage • No traffic related grievances	✓	
13.6	Open Trenches and Quarries	To manage safety impacts from traffic and open trenches and quarries, Contractors will: • Implement management measures included in Ref No. 13.4 and 13.5 associated with traffic management. • Fence off all active construction areas which pose a safety risk (such as trenches and pits, including the quarry sites) and manage these areas to ensure that people and animals cannot access the sites intentionally or unintentionally. • Following completion of construction, ensure measures for human safety at quarry sites are identified and implemented (as fencing around these sites is highly likely to be removed). • Make provision for safe pedestrian access where construction activities block normal pedestrian routes. • Implement all necessary precautions to prevent the risk of flyrock during blasting. • Train the appointed CLO regarding all safety risks and associated protocols. • Erect suitable signage for safety risks and to provide guidance. • Employ security and traffic personnel should to actively manage high risk areas.	Throughout construction	• Protection measures and signage at open pits, trenches and quarries • Safe pedestrian access provided across trenches and along roadsides • Training of security staff as per stated provisions	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST

13.7	Employment	• As per LHDAs Labour Recruitment Guidelines, all Contractors and others hiring unskilled labour will ensure that:
		  • Employment shall ensure that Local people are prioritised for unskilled labour on a rotational basis to maximise opportunities for local employment and all this shall be arranged through the PLRD.
		  • Unskilled staff that receive sufficient training are considered for promotion to semi-skilled positions.
		  • There is no discrimination in recruitment; the workforce should be comprised of men women, disabled and people from different religious / cultural backgrounds, where feasible.
		• Lesotho nationals shall be given preference for semi-skilled and skilled positions. If it can be demonstrated that people with suitable skills and experience are not available, then South Africans, people from SADC member states and other foreigners can be employed; in that order.
		• Prior to the end of each employment contract, the worker will be assessed and considered for reappointment into more skilled positions based on demonstrated skills, willingness and experience.
			Prior to and during construction	• Compliance with Labour Recruitment Guidelines
				• No recruitment undertaken anywhere except at the PLRDs
					✓	✓

13.8	Procurement of Goods and Services	• Adhere to the procurement principals set out in LHDA's Phase 2 Agreement (Article 10 a, b, c) and the Contractor Procurement Framework. This requires Contractors to:
		  • Give preference to suppliers of goods and services from Lesotho, South Africa, SADC member states and then internationally, in that order.
		  • Consultants and Contractors registered in Lesotho and in South Africa shall share the value of all infrastructure works on equal monetary basis, taking into account amongst other things, their shareholder and operational experience.
		  • Optimise engagement and training of small emerging Contractors, where feasible.
		• Contractors shall ensure they comply with the Contractor Procurement Framework to maximise procurement of local goods and services.
			Prior to and during construction	• Compliance with LHDA procurement policy	✓	✓

13.9	Noise control	For the management of noise, Contractors will: • Implement the management measures included in Section 6.5.4 associated with noise management. • Make their workers aware that they need to be considerate regarding noise levels and associated disruption to local people; this is to be outlined in their CoC. • Schedule noisy activities (e.g., blasting) around critical times (e.g., school exams, religious services/ celebrations). Local leaders, School Principles, Healthcare workers and religious leaders are to be consulted regarding times that may be negatively affected by noise.	Throughout construction	• Grievance register • Blasting schedule outside of school exams etc	✓	✓
13.10	Blasting schedule	For the management of blasting and vibration, Contractors will: • Implement the management measures included in Section 6.5.5 associated with blasting management.	Throughout construction	• Present construction schedule to	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
		• Establish a communication protocol with community leaders. Leadership structures are to be informed in advance of blasting, allowing them adequate time to notify communities, including herders. Other mechanisms, such as the use of loud speakers and sirens are to be used to inform communities of blasting events.		key stakeholders		
13.11	Waste and Water Management	For the management of waste and water sources, Contractors will: • Implement management measures included in Section 6.5.7 and Section 6.5.9 for water and waste management respectively. • Implement management / spill response measures included in Section 6.5.8 for spill prevention, control and containment management. • Water management measures shall also include controls on use of community water supply points by construction workers who may not be familiar with protocols of keeping supplies clean and uncontaminated. • No use of community water supply points without authorisation by village chief or representative. • Where water quality or supply is impacted, an adequate quantity of potable water must be delivered to the affected villages for the duration of the disruption. The quantity and quality of water must be adequate for all regular activities, including watering crops (see community water supply in Section 6.5.7).	Throughout construction	• Grievance register • Alternative water supply provided within 8 hours. • No damage to community water supplies	✓	✓
13.12	Rocks in Fields	• Any rocks that roll or fall into fields outside the road reserve shall be removed by the Contractor (to enable communities to plough and cultivate their land). • In the event that rocks cannot be removed for some reason, community members may make additional claims for compensation.	Throughout construction	• Rocks in fields removed • No claims for compensation or grievances	✓	✓
13.13	Safety Awareness	To train and make communities aware of safety risks, the Contractor will carry out the following: • Communication and training about safety during the construction phase on a regular basis with a local Project stakeholders, including school children. • Communication on safety awareness at all community meetings (*pitsos*) and other public events. The appointed CLO will receive training regarding all the risks and associated protocols. • An education and awareness campaign developed and rolled-out in the local schools to ensure that the children are aware of the risks linked to traffic, construction work and workers.	Throughout construction	• Routine safety awareness training held at village *pitsos* and all schools	✓	✓
13.14	HIV/AIDS and STD Management	As per LHDA's SHEQ Framework (April 2017), Contractors will: • Prepare and implement an HIV/AIDS awareness programme, which shall involve voluntary counselling and testing of individuals; HIV/AIDS awareness training and access to ongoing support for affected individuals. • The Contractor shall arrange for, provide a suitable venue, and instruct employees to	Prior to and during construction	• Paid home visits by staff • HIV/AIDS and STI policy for employees	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
		attend HIV awareness programme; ensuring that their employees and their Subcontractor's employees are aware of this programme. • Conduct information, education and communication campaigns, at least every other month, addressed to all project site employees (including Subcontractor personnel and all truck drivers and crew making deliveries to site for construction activities) and to the immediate local communities, concerning the risks, dangers and impact, and appropriate avoidance behaviour with respect to STDs or STIs in general and HIV/AIDS in particular. • Provide male or female condoms for all employees, as appropriate, free of charge; • Provide for voluntary STI and HIV/AIDS screening, diagnosis, counselling and referral to a dedicated national STI and HIV/AIDS programme (unless otherwise agreed) of all employees; and • Monitor outcomes in collaboration with national HIV/AIDS authorities. Additional measures include: • Ensure the content of the HIV/AIDS programme addresses factual health issues as well as behaviour change issues around the transmission and infection of HIV/AIDS. • Ensure that all Project employees receive HIV training as part of their induction and should be encouraged to be regularly tested for HIV. Information packs are to be distributed at the training, and posters are to be displayed in common areas. • Provide healthcare facilities to all Project workers. They are to be equipped with adequate medical staff and resources to handle common diseases (including STIs and HIV) (and other work related injuries). • Ensure that workers from outside the area are working on a rotational basis, allowing them time to return home to visit their families and rest. The cost of their return journey should be covered directly by the Contractor.		and awareness training		
13.15	Contractor Camp Management	All mitigation and management measures proposed by the relevant EMPs regarding Contractor camp management and worker behaviour will be implemented. **Note**: assessment of impacts and mitigation requirements of the PWAC construction camps are not included in this ESIA but are expected to fall under a separate EMP.	Throughout construction	• Grievance register	✓	✓
13.16	Code of Conduct	For the management of labour / work force, all construction staff will agree to a Code of Conduct (CoC) that outlines protocols and standards for working in the Project Area as part of their contract. The CoC should address the following: • Respect for local residents, including being considerate about noise levels, privacy, and local customs. • Respect for existing livelihood activities and the environment. • Respect for community water supplies (to prevent pollution and overuse). • No hunting, snaring or unauthorised taking of any property belonging to someone else, including removal of natural resources. • Zero tolerance of illegal activities by construction personnel including: illegal sale or	Prior to and during construction	• Code of Conduct in place • Awareness raising/ toolbox talks with staff on CoC content • Proof of disciplinary	✓	✓

Ref No.	Aspect / Activity	Management Measure	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
		purchase of alcohol; sale, purchase or consumption of drugs; illegal gambling or fighting. • Compliance with the Traffic Method Statement (to be developed by the Contractors – refer to point 13.4) and all associated regulations, including compliance with drug and alcohol policies and random testing. • Disciplinary measures for not adhering to the CoC. Notably, stock theft and similar crimes conducted by Contractor staff shall be managed as dismissible offences. • Workers found to be in contravention of the CoC will face disciplinary procedures that could result in dismissal. Theft or purposeful damage to property shall be dismissible offences. • Contractors are to put suitable measures in place to control the use of illegal substances on the Project site to maintain acceptable levels of health and safety.		measures taken for anyone contravening the CoC • Traffic Management Plan prepared and implemented		
13.17	Security Personnel	The appointed Security Contractors for the Project are to be adequately trained in the use of force and respect for human rights, the Voluntary Principles on Security and Human Rights should be used as a base guide for all security personnel; proof of suitable training and skills must be provided by the successful tenderer.	Throughout construction	• Trained security staff	✓	✓
13.18	Dust	For the management of dust, Contractors will: • Implement the management measures included in Section 6.3 associated with air quality and dust management. • Devise and implement measures to prevent damage to the quality of wool at the Woolshed, which shall consider scheduling of blasting to non-windy periods with specific precautions during sheep shearing seasons, and dust suppression. These measures are to be developed in collaboration with the Wool and Mohair Growers Association (WMGA).	Throughout construction	• Engage WMGA on dust control measures	✓	✓
13.19	Community Engagement	• Contractor will present the construction schedule and approach to the district authorities and community leadership structures to enable their understanding of the Project roll out.	Prior to and during construction	• Regular engagement	✓	✓

Section 7 LHDA Environmental and Social Management Commitments

Note: The content of this Section is not the Contractor's Responsibility.

This Section expands on the management measures provided in Section 6, and includes the environmental and social management commitments that will be implemented by LHDA during the life of the Project. Some of these commitments require partnership between LHDA and relevant government departments, such as the DoE, Roads Directorate, and Department of Health.

Environmental and social commitments that are LHDA's responsibility to implement are presented in this section, structured as per the content guide in Table 7.1:

Table 7.1 Summary Content Guide to LHDA Environmental and Social Commitments

Management Feature	**Reference** (Table 7.2)	**Aspect / Activity**	**Ref. No.**
Spiral Aloe Protection	Section 1	Spiral aloe census	1.1
		Spiral aloe relocation	1.2
		Spiral aloe awareness raising	1.3
Priority Plant Search and Rescue	Section 2	Priority plant identification and relocation	3.1 to 3.2
Wetland Protection	Section 3	Pre-construction surveys	4.1
Priority Birds	Section 4	Pre-construction surveys	4.1
Visual enhancement	Section 5	View sites	5.1
Cultural Heritage	Section 6	Confirm graves	6.1
		Additional surveys	6.2
		Grave relocation	6.3
		Mark and record graves / ash heaps	6.4
		Chance Find Procedure	6.5 to 6.6
Traffic Management	Section 7	Road safety awareness	7.1
		Speed enforcement	7.2
Social: Maximising Economic Benefits	Section 8	Local labour employment	8.1
		Procurement and maximising local content	8.2
		Partnerships for capacity building and livelihood programmes	8.3
		Grievance procedure	8.4
Physical and Economic Displacement	Section 9	Resettlement planning for physical displacement	9.1
		Economic displacement	9.2
		Community participation strategy	9.3

Table 7.2 LHDA Environmental and Social Commitments

Ref No.	Commitments	Requirements / Specifications	Responsibility	Scheduling / Timing/ Frequency	Performance Indicator(s)
1.	**Spiral Aloe Protection**				
1.1	Spiral aloe Census	Conduct a census of spiral aloes that occur in villages within road footprint that require resettlement.	LHDA : Botanist and/or RAP consultants	Prior to construction	Spiral aloe census report.
1.2	Spiral Aloe Relocation	• Confirm number of spiral aloes that need to be relocated to new settlement sites and identify spiral aloes that can be relocated to proposed safeguard sites (e.g., community gardens, Katse Botanical Garden or possibly a new garden at Polihali). • Prepare a spiral aloe rescue plan that documents the requirements for removal, labelling, storage, transportation and replanting of spiral aloes. • Relocate spiral aloes to new houses for resettlers or to new community gardens, Polihali infrastructure area or other safeguard areas.	LHDA: Botanist contracted to LHDA	Prior to construction	• Confirmation of spiral aloe relocation requirements • Spiral aloe relocation plan • Evidence of spiral aloe relocation
1.3	Spiral Aloe Awareness Raising	• Implement measures to raise awareness of spiral aloe protection status through discussions with DoE. • Design and erect billboards at both ends of the PWAR to raise awareness of the status of spiral aloes and illegality of harvesting or purchasing aloes.	LHDA and DoE	During construction / prior to operation	• Engagement with DoE on spiral aloe protection • Awareness-raising materials distributed
2.	**Plant Search and Rescue and Establishment of Safeguard Plant Protection Areas**				
2.1	Priority Plant Identification and Relocation	• Appoint suitably qualified or experienced botanist to conduct active searches for priority species prior to site clearance. • Conduct foot searches in specific areas of the PWAC footprint and quarry areas to recover priority plants. These should be focused on the areas kp 7-9 near Ha Salemone; kp 15-17 Ha Ratau-Ha Thene); kp 24-30 Makhoaba Pass, as well as borrow pit and quarry sites (particularly those located between kp 15-30). • Bag, store and look after plants in temporary nursery area/s prior to use in landscaping of infrastructure areas or community or other botanical gardens (e.g., community gardens, Katse Botanical Garden or possible new garden at Polihali). • Collect seeds of suitable plants for landscaping and propagation in designated area/s. • Landscaping shall prioritise use of indigenous naturally occurring plants and shall include a list of suitable plants.	LHDA: botanist and support team to be appointed	Prior to site clearance	• Botanist appointed • Proof of active searches (report & retrieved plants • Rescued plants and seeds safely stored in nursery
2.2	Priority Plant Identification and Relocation	• Appoint qualified horticulturalist to guide and plan the siting and layout of community gardens or other plant safeguard areas. Note: it will be important to ensure that genuinely interested community members are trained and guided in setting up gardens to avoid failure.	LHDA: botanist and support team to be appointed	Plan during detailed design phase and implement prior to construction	• Plant safeguard areas / community garden design plan/s prepared • Resources allocated to assist development of community gardens

Ref No.	Commitments	Requirements / Specifications	Responsibility	Scheduling / Timing/ Frequency	Performance Indicator(s)
3.	**Wetland Protection**				
3.1	Wetland Protection – Sheetrock Systems on Makhoaba Junction	• Engage members of the Wool and Mohair Growers Association (WMGA) and users of the Kosheteng sheep shed in dialogue to discuss opportunities for increasing protection of the Sheetrock wetland systems.	LHDA: wetland specialist	Prior to site clearance for quarry or road	• Wetland specialist appointed • Dialogue with WMGA
3.2		• Develop and implement a wetland management plan for improving the protection status of the Sheetrock wetland systems at Makhoaba near kp 25.	LHDA: botanist and support team to be appointed	Plan during detailed design phase and implement throughout construction and operation	• Wetland management plan developed and initiatives implemented
4.	**Birds - Confirm Status of Known and Potential Nest Sites and Other Sensitive Sites**				
4.1	Bird pre-construction surveys	Undertake pre-construction surveys by ornithologist to inspect the final PWAR and BPST alignments and confirm the status of known and possibly new nest sites and other sensitive locations in proximity to the road and powerline.	Bird specialist to be appointed by LHDA	One month before the start of construction	Survey report with additional mitigation recommendations such as scheduling of high-impact activities around bird breeding cycles
5.	**Visual Enhancement Measures**				
5.1	View Sites	LHDA to ensure that view sites have been implemented and appropriately designed and provision and amenities (including signage) installed.	LHDA	Detailed design	• View sites incorporated into detailed site development plans and amenities provided
6.	**Cultural Heritage**				
6.1	Confirm and Demarcate Grave Locations	• Confirm the location of identified graves, ash heaps, and homestead ruins in relation to the Road Reserve and powerline footprint, and including the construction works areas. • Delineate and map the boundaries of graveyards within the road reserve with the help of community members. • Provide updated mapping and register of graves, ash heaps and ruins to Engineers.	LHDA/RAP consultants	Prior to finalising PWAR design and construction	• Site visits and investigations by RAP consultants to confirm and more accurately map grave & cultural site locations • Register of cultural heritage sites that will be affected by PWAR and powerline construction
6.2	Further surveys	• Undertake further surveys to confirm the presence of additional cultural heritage sites that may occur along proposed powerline access roads / tracks and borrow pit/quarry sites. • For sites within the Road Reserve or close to the construction footprint, undertake additional investigations with local communities to confirm the ownership; importance of sites and required mitigation measures. • Obtain written agreement from community members on agreed mitigation requirements.	LHDA, RAP and Cultural Heritage consultants	Prior to finalising PWAR design and construction	• Further site investigations and community consultations by RAP and/or cultural heritage consultants to confirm mitigation requirements • Signed agreements by community members
6.3	Grave relocation	Comply with legal requirements for relocation of graves: (i) Obtain a permit from the Department of Culture and Department of	LHDA, Cultural heritage specialist, and RAP	Prior to construction	• Permit from Dept. of Culture obtained • Approved undertaker is

Ref No.	Commitments	Requirements / Specifications	Responsibility	Scheduling / Timing/ Frequency	Performance Indicator(s)
		Health prior to any alteration or removal of burial sites; (ii) Ensure other relevant authorities are notified of grave exhumation and reburial (e.g., Police, Coroner); (iii) Make a concerted effort to contact and consult communities and individuals with an interest in the site; (iv) Compile a log of graves and family members (grave 'owners') and negotiate and obtain written agreements with community members and other relevant individuals on the future of graves, burial grounds; (v) Where required by communities, undertake grave relocation under the authority of an approved undertaker to supervise / undertake the excavation and re-interment of human remains. This must be done with the full acknowledgement and consent of the families of the individuals whose remains are to be relocated; (vi) Undertake symbolic relocation of affected graves where acceptable to community members - sometimes represented by removal of some soil from the grave site for transportation to the new grave site; and (vii) Provide the necessary funding or other resources required for traditional ceremonies associated with the physical or symbolic relocation of burial sites.	consultants, as relevant		appointed to supervise grave relocation • Log or register of grave sites, location and family 'owners' or responsible stakeholders • Written agreements in place for grave relocation prior to relocation • Signed acceptance by family members or responsible stakeholders at conclusion of reburial ceremonies
6.4	Mark and record graves and ash heaps	• Demarcate all graves and ash heaps within 30 m of the road centre line or other potential construction impact zones (e.g., with painted boulders) and delineate them on maps with the road alignment. • Compile a photographic log/register of all formal graves and other cultural heritage structures close to the construction footprint prior to construction as a basis for monitoring potential damage (e.g., cracking of walls/gravestones). • Inform and provide maps to Contractors to ensure all construction staff is aware of grave relocations and the need to avoid damage to these sites. • Conduct regular checks of graves and other cultural heritage sites during construction to ensure no damage caused. • Closely monitor and respond to any grievances / complaints raised by community members related to cultural resources. • Repair any damage caused to sites during construction after agreements are made with people concerned.	LHDA & RAP Consultant	Prior to and during construction	• Proof of grave demarcation • Photographic log of graves/structures • Maps and briefing given to Contractors of grave locations • Record of checks and condition assessment of graves prior, during and post- construction • Grievance register and complaints addressed and closed out • Damage repaired to written approval of affected community members
6.5	Compile Chance Find Procedure	• Compile a detailed Chance Find Procedure (CFP) as the basis for detection of additional heritage resources during PWAR and powerline construction. • The detailed CFP should include an outline of the type, location of sites and type of evidence that could be encountered with examples and photographs, and instructions as to what to do in the event of a chance	Procedure to be compiled by heritage consultant on behalf of Contractor and approved by LHDA and DoC	Prior to construction	• CFP developed and approved by DoC • Contractor staff trained in requirements for adhering to CFP

Ref No.	Commitments	Requirements / Specifications	Responsibility	Scheduling / Timing/ Frequency	Performance Indicator(s)
		find. This should include a stop work order if suspected archaeological materials, including human bodily remains are found. • The CFP should include contact details of approved or qualified heritage practitioners to be consulted in the event of a suspected chance find.			
6.6	Oversee and Monitor Chance Find Procedure	• To implement the CFP the following will be implemented: • Contact details of approved archaeologists to be included and made known to the Engineer, EM, ECO and CLO. • The EM, ECO, CLO and other relevant Contractor staff are informed or trained in the content of the CFP and in recognizing archaeological material and the process to be followed. • Regular on-site checks by heritage practitioner during on-site excavations, who shall compile a log of findings. • Chance finds material and incidents to be recorded on Chance Finds incident record sheet (to be included in procedure). • Record sheets to be filed and retained. • All incidents to be reported to the DoC.	Procedure to be compiled by heritage consultant LHDA to appoint cultural heritage specialist.	During construction	• Proof of training of Contractor staff • Contact details of approved archaeologists available • Heritage expert appointed to undertake regular checks during excavation activities and compile log of findings • Chance finds incident records kept and filed • Incidents reported to DoC
7.	**Safety Awareness**				
7.1	Road Safety Awareness	• LHDA to develop and implement an education and awareness campaign at all schools and villages along the PWAR on a regular basis prior, during and post-construction. (This should include awareness of the risks linked to traffic, construction work and workers).	LHDA	Prior to and during construction and operation	• Traffic safety awareness at all schools and villages
7.2	Speed Enforcement	• LHDA to liaise with traffic authorities to monitor and enforce traffic speeds and road safety with a focus on high risk areas and to ensure sufficient road signage is installed and maintained.	LHDA	During early operation (during dam construction)	• LHDA liaison with traffic authorities to determine additional speed control and enforcement measures
7.3	Social Risk Awareness	• LHDA to raise awareness of public health risks (e.g., HIV/AIDS, STDs, teenage pregnancy etc.) with local communities. This should include developing awareness raising posters, pamphlets etc.	LHDA (under PHAP)	Prior to and during construction and operation	• Public health and safety awareness sessions and notifications
8.	**Maximising Socio-economic Benefits**				
8.1	Employment	• LHDA shall ensure Contractor compliance with Labour Recruitment Guidelines; national legislation (e.g., Labour Code of 1992); and ILO conventions and Voluntary Principles on Security and Human Rights. • LHDA will continue to inform communities within the broader Project Area of the Labour Recruitment Guidelines and the focus on employing local residents to discourage influx of job seekers.	LHDA	Prior to and during construction	• Maximum recruitment of local labour for unskilled positions
8.2	Procurement and maximising local content	• LHDA will continue to broadcast or create awareness of potential opportunities for local suppliers to tender for provision of goods and services and to facilitate linkages with relevant organisations and institutions to support local suppliers. • LHDA will closely monitor that prospective tenderers comply with the	LHDA	Prior to and during construction	• Information on procurement opportunities distributed to local businesses • Compliance with LHDA's

Ref No.	Commitments	Requirements / Specifications	Responsibility	Scheduling / Timing/ Frequency	Performance Indicator(s)
		Contractor Procurement Framework to maximise procurement of local goods and services prior to and during the contract implementation. • LHDA (based on information provided by Contractors) will disseminate information through the PLRD regarding procurement opportunities and specific health, safety and quality requirements as early as possible and in a manner that is transparent and accessible. • LHDA will implement a grievance resolution procedure to gather and address issues, concerns and other concerns of stakeholders regarding issues related to procurement (see Ref No. 8.4 below).			plans and policies • Grievance procedure to include local suppliers

8.3	Local Business and Social Development	• LHDA will encourage and promote the use local businesses and suppliers as a source of goods and services for the Project and for any livelihood restoration and social development projects.
		• LHDA will collaborate with relevant authorities, organisations, local entrepreneurs and community groups to identify and develop projects that aim to build the capacity of local entrepreneurs in the Project Area.
		• LHDA (and its consultants) will collaborate with relevant authorities and organisations to identify and develop projects that aim to enhance selected livelihood activities amongst the population of the Project Area. This may include, but is not limited to tourism and agricultural initiatives.
		• LHDA shall collaborate with relevant authorities and organisations to initiate and develop projects that aim to enhance agricultural production amongst the population of the Project Area. These should address the application of more effective farming methods, approaches to increase crop yields, and mechanisms to assist farmers in selling their produce at the highest possible prices.
		• LHDA will work in collaboration with the relevant authorities, NGOs and community groups to identify and initiate interventions to alleviate the increase in anti-social impacts caused by an increase in job-seekers to the area. This may include, but is not limited to the need for:
		  • Communication regarding Project benefits as a means of managing expectations;
		  • Additional policing;
		  • Education regarding HIV and other STIs;
		  • Improvement of healthcare services, specifically regarding STI and HIV testing, counselling and treatment;
		  • Neo- and post-natal support for teenagers;
		  • Mentoring of youth to provide them with motivation to complete their schooling;
		  • Assistance with creating a more enabling environment to support school attendance;
			LHDA (in collaboration with GoL)	Prior to and during construction	• LHDAs policies and plans related to procurement of local businesses, and livelihood restoration are fully compliant with stated requirements
					• Collaboration with GoL departments to implement social development projects and improved service delivery

Ref No.	Commitments	Requirements / Specifications	Responsibility	Scheduling / Timing/ Frequency	Performance Indicator(s)
		• Improved schooling facilities; and • Small business development initiatives.			
8.4	Grievance Procedure	LHDA is to implement a Grievance Resolution Procedure that is easily accessible, culturally appropriate and scaled to the potential risks and impacts of the Project. A grievance register must be accessible to all local residents, employees, and other stakeholders. It will be compliant with international standards (such as the World Bank ESS10), easy to use, offer anonymity, and enable follow-up. Key steps of the grievance procedure include: • Circulation of contact details of the assigned 'grievance officer/s' or other key contacts; • Awareness raising among stakeholders regarding the grievance procedure and how it works; and • Establishment of centralised grievance register into which all grievances raised with Contractor CLO; LHDA FOB staff; ALCs and the PLRD will be updated regularly, including all escalation actions, responses and response times. • In the event that a complaint / grievance is not addressed or closed out, there should be an avenue through which the matter is escalated to a higher level of authority.	LHDA	Prior to and during construction	• Grievance mechanism in place • Easily accessible records • Grievances resolved within grievance protocol timelines
9.	**Physical and Economic Displacement**				
9.1	Resettlement planning for physical displacement	For physical displacement impacting housing and business structures and sites of religious and cultural significance, LHDA will: • Develop and implement a Resettlement Action Plan (RAP) in accordance with the agreed scope of work for LHDA Contract No. 6006 and LHDA's Compensation Policy and compensation rates schedule. • Establish and implement a grievance mechanism to facilitate the resolution of affected community concerns and grievances ensuring ongoing interaction with the communities in order to build trust and maintain relationships throughout project implementation. • Ensure the socioeconomic census determines the multiple providers of income and includes a gender analysis as a basis for facilitating different opportunities for employment of women. • Set criteria for the socioeconomic census for determining vulnerability of households to ensure these households are the focus of opportunities for livelihood restoration. • Ensure compensation and other necessary assistance is provided before impacts of the Project on affected households occur (i.e. the resettlement timetable is linked to the phasing of Project implementation).	LHDA	Prior to commencement of construction and ongoing throughout project implementation	• RAP in place • Community consultation on RAP undertaken • Grievance resolution mechanism established • Monitoring and evaluation system established and ongoing

Ref No.	Commitments	Requirements / Specifications	Responsibility	Scheduling / Timing/ Frequency	Performance Indicator(s)
		• Ensure arrangements and resources for resettlement are adequate and assigned. • Ensure physical and economic assistance to households is provided during the relocation process. • Build replacement housing structures to Lesotho's building standards. • Give specific attention to appropriate measures to mitigate displacement impacts on vulnerable groups (e.g., women or child-headed households). • Prepare and implement a Monitoring and Evaluation Plan for resettlement, and conduct mid-term and long-term Monitoring and Evaluation audits.			
9.2	Economic Displacement	For economic displacement impacting agricultural land, grazing land and natural resources: • Economic displacement of subsistence farmers will be a negotiated process through implementation of the RAP. • Community compensation for grazing land should be provided where land take for construction camps, quarries and substations may impact long term grazing productivity (especially where reinstatement is unlikely to restore original land use and condition). • Economic displacement of subsistence farmers will be a negotiated process through the RPI contract. Displaced persons should be meaningfully consulted on decisions that affect their livelihoods and well-being and shall be fully informed of their options and the compensation rates. • The socioeconomic census under the RPI will identify affected persons (especially vulnerable persons), and will be used to inform livelihood restoration requirements and options for those most impacted by the Project. • Livelihood restoration and social development projects shall be extended to the PWAC and should be developed to ensure Project affected people are not left worse-off following displacement. The development of alternative livelihood strategies will be given priority for those negatively affected by the project in order to optimise enhance future income earning and employment opportunities. • Establishment of grievance mechanism prior to Project implementation to facilitate the resolution of affected community concerns and grievances ensuring ongoing interaction with the communities in order to build trust and maintain relationships throughout Project implementation.	LHDA	Prior to commencement of construction and ongoing throughout Project implementation	• Resettlement Action Plan in place • Community consultation on RAP undertaken • Grievance resolution mechanism established • Livelihood restoration and social development plan developed and implemented • Monitoring and evaluation system established to monitor implementation activities and assess quality of life of Project affected people
9.3	Community Participation Strategy for PWAC	• LHDA will regularly review and update the Community Participation Strategy for relevance to the PWAC, which shall be compliant with international best practice and agreed upon by local community structures through the appointed ALCs and CALCs.	LHDA	Prior to and during construction	• Updated Community Participation Strategy

Section 8 Environmental & Social Monitoring

8.1 Introduction

The purpose of the environmental and social monitoring programme is to ensure that management measures, identified and described in Section 6 and Section 7, are implemented and are effective at achieving an acceptable level of compliance with the EMP.

Section 8.2 to 8.13 presents the key aspects that will be monitored during the construction (including post-construction) and operational phases. Monitoring specifics / requirements for Contractors and LHDA are provided in Table 8.1.

Construction activities will be monitored by the ECO on site, with regular audits against the requirements of this EMP. The ultimate target is to achieve 100% compliance with the EMP.

Key aspects to monitor during construction include:

- Dust emissions (refer to Section 8.2)
- Noise emissions (refer to Section 8.3)
- Water and aquatic environments (refer to Section 8.4)
- Spills (refer to Section 8.6)
- Waste (refer to Section 8.7)
- Blasting (refer to Section 8.8)
- Alien plants and spiral aloes (refer to Section 8.9)
- Birds (refer to Section 8.9)
- Wetlands (refer to Section 8.9)
- Progressive and final rehabilitation (refer to Section 8.10)
- Social (refer to Section 8.11)
- Landscape and visual (refer to Section 8.12)
- Cultural heritage (refer to Section 8.13)

Contractor work sites must be monitored during construction, under the guidance of the ECO and CLO who are responsible for reporting the monitoring to the EM, who in turn will be required to report to LHDA. LHDA may undertake independent monitoring of selected parameters to verify the results of the Contractor and to audit the implementation of environmental mitigation measures contained in this EMP and construction contract for the Project.

Lesotho's DoE holds the general responsibility for approval of the Project and verifying that applicable environmental guidelines are adhered to during Project implementation. DoE's role therefore is to evaluate environmental monitoring and environmental compliance documentation submitted to them, and they would not usually be expected to be directly involved in monitoring the Project unless a specific, major environmental issue arose.

8.2 Dust Monitoring

8.2.1 Pre-Construction and Construction Phases

The Consultant (Engineers) is responsible for undertaking pre-construction baseline monitoring of air, noise and water quality on a monthly basis, which will be continued by the Contractors during construction. Limited dust bucket monitoring will be undertaken prior to construction at selected locations along the PWAR to obtain an understanding of ambient dust levels. During construction, dust bucket monitoring will be extended to specific sites with sensitive (social) receptors where dust

generation is expected to occur over a longer period than normal road construction activities (e.g., quarries, crushing plants, blasting areas near schools) with some control sites along the route to monitor ambient conditions during construction. The monitoring data will provide a basis for determining compliance with dust specifications (provided in Table 6.7 in Section 6.5.3.4) and to determine if construction activities may have caused high dust levels that may be claimed where complaints are received.

Results from the dust monitoring programme will conclude whether additional measures will be implemented. Such additional measures will include (but are not limited) to:

- The use of additional dust suppression measures;
- The use of mobile wind breaks immediately around activities to reduce dust dispersion; and
- The temporary cessation of activities during times of excessive wind speeds.

Besides ongoing dust bucket monitoring, the ECO will undertake visual observations of dust conditions emissions on a daily basis, especially where activities are close to sensitive receptors (e.g., villages, schools, etc.). Any significant dust sources observed will be recorded (e.g., top soil dumps or other exposed material heaps). Where there are activities that repeatedly result in significant dust-related issues, further investigations will be undertaken to identify additional measures to reduce these impacts.

Any complaints raised in relation to air quality impacts will be managed in accordance with the Contractor's Protocol for Grievance Management. Records of any complaints associated with air quality will be kept and captured on a grievance register, identifying the nature of the complaint, and documenting the action taken. All complaints will be investigated and feedback provided to the complainant.

Refer to a summary of air quality monitoring measures that will be adopted during the construction phase in Table 8.1.

8.3 Noise Monitoring

8.3.1 Pre-Construction and Construction Phases

Noise monitoring will be undertaken on a quarterly basis prior to and during the construction phase at specific sites, such as crushing and asphalt plants, and around construction camps and possibly quarries in areas where sensitive receptors are located. Noise monitoring results will be compared to the noise performance criteria provided in Section 6.5.4.

Results from the noise monitoring programme will conclude whether additional measures to mitigate noise are required. Other potential noise level reductions considered would aim to achieve noise emission levels to below that of the specified noise performance criteria. However, given the nature of the construction works under assessment, further noise level reductions beyond the measures proposed in this EMP may not be achievable and any exceedances will need to be evaluated based on the duration of activities in a given area.

As with dust (see Section 8.2), the baseline data will provide a basis for addressing noise related complaints that are raised by community members or other stakeholders. Noise complaints will be managed through the formal grievance procedure, whereby records of any noise-related complaints will be captured on a grievance register, identifying the nature of the complaint, and documenting the action taken. All complaints will be investigated and feedback provided to the complainant.

In addition, noise monitoring will be undertaken by the Contractor's ECO and CLO using a portable noise meter at specific construction locations to confirm whether the noise generated is exceeding specified limits and may be posing a high level of discomfort and disturbance for nearby residents

or school children. Where significant noise levels are observed or issues raised by community members these will be recorded. On the basis of the reports, where there are activities that repeatedly result in significant impacts, further investigations will be undertaken to reduce these impacts. This will be the role of the ECO, CLO, or nominated representative.

Refer to a summary of noise monitoring measures that will be adopted during the construction phase in Table 8.1.

8.4 Water Quality Monitoring

8.4.1 Pre-Construction and Construction Phases

Water quality monitoring will be undertaken to establish baseline (pre-construction) conditions at selected river crossings where bridges are proposed and downstream of the proposed PWAC construction camp (on the Matsoku River) and asphalt plant/s. In general, baseline monitoring along the PWAC will check alkalinity, *Escheria coli* (bacteria), pH, electrical conductivity (EC), total dissolved solids (TDS), total suspended solids (TSS), biological oxygen demand (BOD), chemical oxygen demand (COD), and hydrocarbons. Ammonia may be checked at bridge sites depending on the type of explosives to be used, while volatile organic compounds or polynuclear aromatic hydrocarbons may need to be monitoried in water resources located downstream of asphalt plants if there is a risk of pollution.

Additional sites shall be monitored both up and downstream of construction works areas by the Contractor during construction and into the post-construction liability phase, including the PWAR camp, the three main bridges, the 18 major culvert crossings, and at locations where the road is aligned close to or <50 m from the Liseleng River. These include stretches of the PWAR near Pitseng at kp 3.5-5 and at Ha Ratau (kp 14.5 – 15.5). Additional sampling sites should be included downstream of asphalt plants or where other hazardous wastes or materials may be stored. Post-construction liability phase monitoring of water quality would only need to include those sites which have not normalised to baseline conditions after the cessation of construction works.

Construction phase sampling shall be expanded to include poly-aromatic hydrocarbons (PAH) and other variables for which road building chemicals may cause pollution for specific sites where these pollutants are used (to be determined and described in a monitoring Method Statement.

8.4.2 Operational Phase

Water quality monitoring during the operation phase would only be required at localities where pollutants or elevated turbidity were not sufficiently ameliorated by the end of the post-construction liability phase. This could include sites downstream of asphalt plants following remediation (if these are upslope of streams/rivers or wetlands) or where a pollution event (e.g., spill) may have occurred.

8.5 Aquatic Habitat Monitoring

8.5.1 Pre-Construction and Construction Phases

Aquatic habitat monitoring during the construction and post-construction liability phase is required to ensure that rivers affected by the Project are maintained in their current ecological state or improved (where possible), and incur minimal net loss to ecosystem integrity and functionality as a result of construction. Monitoring should pay particular attention to the following aspects:

- Destruction or degradation of habitat outside the construction servitude;
- Erosion of the bed and banks of water resources;

- Signs of intense or excessive erosion (gullies, rills, scouring and head cuts) and/or sedimentation within, along the edge and/or immediately downstream of the construction zone;
- Erosion of disturbed soils and soil stockpiles by surface wash processes;
- Altering the hydrology and flows to downstream habitat during construction across rivers/streams; and
- Poorly maintained and damaged erosion control measures e.g., sand bags, silt fences and silt curtains.

8.5.2 Operational Phase

Monitoring requirements for aquatic habitats during the operation phase would be required where rehabilitation of riverbanks at bridge sites, stream and wetland crossings at culvert sites, and culvert outlets have not sufficiently revegetation and stabilised. In this event, the Contractors would be required to continue monitoring (and possibly undertake additional remedial works), but would focus on the following aspects:

- Erosion of the riverbed and banks and the effectiveness of erosion control measures;
- Water quality downstream of river crossings;
- Sedimentation of aquatic habitats downstream of river crossings.

In addition, LHDA and relevant government departments (e.g., DoE, Roads Department, and/or Ministry of Mines) should monitor the location, incidence and extent of sand mining that may occur along rivers and streams traversed by the PWAR as a result of improved road access, and take steps to enforce legal restrictions.

Refer to a summary of water and aquatic monitoring measures in Table 8.1.

8.6 Spill Monitoring

8.6.1 Construction Phase

High risk spill hazards will be monitored on a frequency to be determined in the appropriate method statements for the identified hazards. Such monitoring will be included into the overall auditing programs developed for the overall Project.

The ECO will monitor (on an ongoing basis) Contractor performance against the measures included in the Spill Prevention, Control and Containment Management section of this EMP (Section 6.5.8). Monitoring will include (but not limited to):

- Periodic site inspections;
- Periodic reporting by Contractors regarding preventative maintenance programs;
- Spill reporting at the time of the incident;
- Spill response drills; and
- Reporting on spill training.

During periodic site inspections any missing response equipment, personal protection equipment, or documentation will be replaced or improved as necessary.

Periodic reporting will identify any upcoming required preventative maintenance required as well as what preventative maintenance has been performed. The ECO will track any outstanding maintenance and require the Contractor to complete it in a timely fashion.

The spill response drills and spill reporting will provide information regarding required revisions to training, or other aspects of the Spill Prevention, Control and Containment Management section of this EMP.

Each spill reported will be reviewed by the ECO and actions identified where possible to improve the site's overall planning. Updates/revisions will be made.

A summary of spill monitoring measures are included in Table 8.1.

8.7 Waste Monitoring

8.7.1 Construction Phase

The main goal of waste monitoring is to provide assurance that the mitigation and management measures outlined in the waste management measures section (Section 6.5.9) are being met and are successful. Specific objectives of verification and monitoring are to:

- Verify that the waste management measures are being implemented;
- Verify the performance of personnel in implementing the waste management measures;
- Monitor the success of the measures stipulated in Section 6.5.9; and
- Evaluate the need for remedial or corrective action to:
  - Improve performance or personnel;
  - Improve success of the management measure; or
  - Introduce new measures to address existing or new waste-related impacts.

Refer to a summary of waste monitoring measures that will be adopted during the construction phase in Table 8.1.

8.8 Blasting Monitoring

8.8.1 Construction Phase

Adherence to the blasting schedule will be monitored throughout the construction phase. All complaints from residents or landholders pertaining to (amongst others) blasting will be audited on a regular basis through regular checks of the Grievance Register. Another key requirement of blasting monitoring is the undertaking of an asset condition survey as per LHDA's Asset Condition Survey Protocol as a basis for comparing complaints or allegations of structural damage to property.

A summary of blasting monitoring measures are included in Table 8.1.

8.9 Biodiversity Monitoring

8.9.1 Pre-Construction and Construction Phases

8.9.1.1 Alien Invasive Plants

The only monitoring requirements for terrestrial flora and fauna during the construction phase relate to monitoring of alien invasive plants, which should be continued throughout the post-construction liability phase and into early operation in accordance with an Alien Invasive Plant Management

Method Statement. It should be continued until alien invasive plant encroachment along the roadside caused by construction is of no or little risk to adjacent habitats or arable land.

8.9.1.2 Spiral Aloes

A pre-construction census of wild spiral aloe colonies along the PWAR should be undertaken to set a baseline for future monitoring of the rate of harvest and loss of these plants as a result of ongoing harvesting which is predicted to be exacerbated by the sale to road users. This census and ongoing monitoring on an annual basis for at least five years into operation should be an LHDA responsibility to execute (under an appointed botanist). The surveys should be conducted in tandem with community awareness-raising of the need to protect spiral aloes and efforts to facilitate community propagation of aloes.

Terrestrial biodiversity monitoring measures are summarised in Table 8.2.

8.9.1.3 Birds

A bird survey of sensitive avian sites located along or close to the final BPST and PWAR alignments is required to be undertaken prior to the start of construction to inform additional mitigation that may be possible during construction (such as avoiding blasting near specific priority bird nesting sites). The requirements of this survey are provided in Table 8.2.

8.9.1.4 Wetlands

Quarterly monitoring inspections must be undertaken by a suitably qualified wetland specialist during the construction phase in order to ensure compliance with the implementation of the wetland mitigation measures and to ensure that the specific wetland mitigation measures are being achieved in to support the general environmental specialist and ECO as necessary.

8.9.2 Operational Phase

8.9.2.1 Terrestrial Ecology

Monitoring measures for vegetation and fauna during the operational phase are specified in Table 8.2, and include ongoing monitoring and management of alien invasive plants, and spiral aloe harvesting and sale. These should fall under the responsibility of LHDA until completion of the Polihali Dam and tunnel construction.

8.9.2.2 Birds

During the operational phase avian mortality rates on the new powerline and avian collision rates on the new road should be monitored, as outlined in Table 8.2. This should be a responsibility of LHDA together with local community members and herders.

8.9.2.3 Wetlands

Wetland monitoring will be required during the operational phase to monitor aspects such as wetland health, any changes in wetland vegetation, peat depth and humification, erosion, visual record of wetland changes, and the presence and abundance of priority plant species. The proposed wetland monitoring measures for the operational phase of the PWAR and BPST are summarised in Table 8.2.

8.10 Site Clean-up and Rehabilitation Monitoring

Site clean-up and rehabilitation monitoring is required to ensure that the mitigation measures are implemented to an acceptable level in order that long term rehabilitation is successful. There is thus a need to carefully monitor the progress of the physical aspects of rehabilitation (soil stripping, overburden handling and landform development, and soil replacement) during the construction and post-construction phases, and the progress of re-establishment of the desired final land use (i.e. to a state where the land use is as close to the pre-construction environment as possible).

Implementing rehabilitation in a phased manner simultaneous with the progression of construction of the PWAR or as access roads or works areas for the BPST are no longer required will provide a longer lead time for monitoring of rehabilitation before the defects liability period is completed.

The list of aspects that will be monitored will vary from site to site, and is usually based on the closure criteria and future land use that have been negotiated for the specific work sites. Post-construction monitoring will be required to ensure rehabilitation is taking place and there are no residual impacts. This monitoring should take place in conjunction with other post-construction monitoring programmes. A summary of site clean-up and rehabilitation monitoring measures are included in Table 8.1.

8.11 Social Monitoring

8.11.1 Construction and Operational Phases

Social monitoring requirements during the construction phase by LHDA will be focussed on ensuring that the scope of the RAP, such as asset registration and socio-economic baseline data gathering, are conducted properly in order to provide a sound basis for monitoring the effectiveness of the RAP implementation. Regular independent monitoring and evaluation audits of the RAP and its implementation are required at intervals throughout the construction and operational phases. These measures will be determined and agreed during the RAP, which is underway as a separate LHDA contract.

In addition, monitoring and evaluation is required to verify the progress and effectiveness of livelihood restoration projects that are implemented along the PWAR and BPST. These will need to be determined by LHDA.

No other specific social monitoring measures are specified in this EMP.

8.12 Landscape and Visual Monitoring

8.12.1 Construction and Post-Construction Liability Phase

No specific monitoring for landscape / visual impacts is required, besides the monitoring of erosion risks and the success of rehabilitation of roadsides, borrow pits / quarries, and other works areas post-construction which is the responsibility of the Contractor.

8.12.2 Operation Phase

During the operational phase LHDA (or the relevant authority, such as the Roads Directorate (once these authorities take over the infrastructure) should undertake periodic checks to ensure the view sites stone walling and other facilities are maintained.

8.13 Cultural Heritage Monitoring

8.13.1 Construction Phase

Monitoring for cultural heritage during the construction phase will be done through implementation of a CFP. This is of particular relevance to graves and possible artefacts associated with previous settlements that may not be visible at the surface. In addition, open air sites associated with previous hunter-gatherer settlements (which are particularly difficult to identify) may also be exposed during excavation/construction work. It is also possible that other human remains may be exposed during excavation / earthworks / other construction activity, related to earlier ancient hunter-gatherer activity or from previous settlements associated with Basotho communities who settled in the area during the past 150 years. All of these should be handled under specified

procedures in the CFP and should be the responsibility of a cultural heritage specialist together with the ECO and CLO.

A preliminary CFP is provided in Appendix E for inclusion in Contractor documentation until such time as a more detailed CFP is compiled under the LHDA Contract No. 6025 (CHP).

Table 8.1 Monitoring Measures – Consultant (Engineer or Contractor)

Ref No.	Monitoring Measure	Responsibility	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
1.	**Dust Monitoring**					
1.1	• Dust bucket monitoring at and around specific dust point source localities (e.g., main quarries near sensitive receptors, blasting areas near schools or close to villages in accordance with Method Statement.	Engineer (pre-construction); Contractor (construction)	Monthly at key dust point source sites pre construction and construction	• Dust bucket records obtained • Dust records during construction within standards (Section 6.5.3.4).	✓	
1.2	• Regular visual inspections at active working areas. • Where high dust levels observed, the ECO or CLO shall notify the EM to identify and implement corrective actions (e.g., dust suppression; no blasting during windy conditions).	Contractor (ECO / CLO) (during construction	On an *ad hoc* basis, particularly during drier and/or windy conditions or if complaints received.	• Corrective actions when high dust levels observed • No or few dust-related complaints raised	✓	
2.	**Noise Monitoring**					
2.1	• Noise monitoring in accordance with Method Statement at key noise-generating locations	Engineer (pre-construction); Contractor (construction)	Quarterly at key noise generating sites pre construction, and monthly during construction	Noise levels within standards (Section 6.5.4.4)	✓	✓
2.2	• Regular noise measurements with portable noise meter at the nearest noise sensitive receptors when conducting noisy activities. • Inspection of vehicle/machinery/equipment maintenance records. • Noise monitoring at nearest noise sensitive receptors if significant complaints received.	Contractor (ECO)	Regular noise level checks will be carried out on an *ad hoc* basis during construction.	• Noise Records • Recommendations and corrective actions taken when high audible incidents are noted • Complaints arising from excessive noise managed through the grievance procedure	✓	✓
3.	**Water Quality and Aquatic Habitats**					
3.1	Monitoring of water quality at bridge and major culverts, and construction camp locations. Variables measured will include *E.coli*, pH, EC, COD, BOD, TSS, TDS, and alkalinity, and ammonia.	Engineer (pre-construction)	Monthly	Water quality standards (Section 6.5.7.4)	✓	✓
3.2	Monitoring of water quality at bridge and major culverts, construction camp and laydown locations (with fuel stores) and road construction sites located close (<50 m) to rivers and streams (kp 3.5-5 and kp 14.5-15.5). Construction monitoring will include up and downstream sites and variables measured will include *E.coli*, pH, EC, COD,	Contractor (construction)	Monthly	Water quality standards (Section 6.5.7.4)	✓	✓

Ref No.	Monitoring Measure	Responsibility	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
	BOD, TSS, TDS, and alkalinity, and ammonia., as well as hydrocarbons.					
3.3	Monitoring of stormwater quality in accordance with Method Statement.	Contractor (construction)	Monthly	Water quality standards (Section 6.5.7.4)	✓	✓
3.4	Implement aquatic habitat monitoring downstream of bridges and culverts (as per Section 8.5) in accordance with an approved Method Statement.	Contractor (construction and post-construction)	Monthly	No bed or bank erosion or scouring around culverts or bridge supports	✓	
4.	**Spill Monitoring**					
4.1	To monitor the effectiveness of spill response control and containment measures. All spills and associated control and containment measures taken will be recorded and the effectiveness of response will be audited.	Contractor (ECO)	During construction	Effective spill response, control and containment	✓	✓
5.	**Waste Monitoring**					

5.1	Visual inspections of all active working areas will be undertaken on an *ad hoc* basis. *Ad hoc* inspections will verify and monitor:
	• That the waste management measures are being implemented;
	• The performance of personnel in implementing the waste management measures;
	• The success of the measures stipulated in Section 6.5.9; and
	• The need for remedial or corrective action to:
	  • Improve performance or personnel;
	  • Improve success of the management measure; or
	  • Introduce new measures to address existing or new waste-related impacts.
		Contractor (ECO)	Visual inspections on an *ad hoc* basis	Well maintained and clean active work areas that are free of litter and other wastes	✓	✓

6.	**Blasting Monitoring**					
6.1	Monitor adherence to blasting schedule and the number of complaints received relating to blasting. Monitoring will take place at all active work areas where blasting is required and near surrounding communities. Undertake Asset Condition Surveys as per LHDA's Asset Condition Survey Protocol.	Contractor	Asset Condition Survey (as per protocol)	No complaints pertaining to blasting	✓	
7.	**Site Clean-up and Rehabilitation Monitoring**					
7.1	Monitoring of the effectiveness of rehabilitation will be undertaken throughout construction as phased rehabilitation is implemented in accordance with the Method Statement and Rehabilitation Plan developed by the Contractor and approved by the Engineer (see Section 6.5.12): Aspects that need to be monitored and corrective action taken include: • Erosion • Surface water drainage • Vegetation basal cover • Vegetation species diversity	Contractor	Monthly monitoring (until acceptable condition verified)	• A safe environment for humans and animals • All areas stable • Progressive rehabilitation implemented • Rehabilitated areas close to the pre-construction baseline	✓	✓

Ref No.	Monitoring Measure	Responsibility	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
	• Presence and abundance of invasive plant species.					
8.	**Cultural Heritage**					
8.1	**Chance Find Procedure (CFP)** – Monitoring of the success of implementation of the CFP to detect and record additional heritage resources during PWAR and BPST construction.	Contractor (ECO)	Upon identification of additional heritage resources during construction	New heritage sites identified during construction of the PWAR and BPST	✓	✓

Table 8.2 Monitoring Measures – LHDA or Government Responsibility

Ref No.	Monitoring Measure	Responsibility	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
1.	**Water / Aquatic Monitoring**					
1.1	**Sand Mining** – mining of sand from riverbeds at the newly established river crossing must be strictly monitored and controlled such that it does not cause erosion of the riverbanks, significant aquatic habitat impacts, or pose a threat to the newly established infrastructure.	Post-construction monitoring by LHDA (until completion of dam construction). Thereafter, by Roads Directorate.	Twice annually	• Monitoring reports. • No new sand mining along PWAR	✓	✓
2.	**Terrestrial Ecology**					
2.1	**Alien Invasive Plant Monitoring** – to monitor the occurrence of alien invasive plants along the PWAR and BPST and laydown areas used by Contractors. Monitoring locations will be confirmed in the pre-construction survey and included under the Biodiversity Management Plan for longer term monitoring. Sites expected to include locations at intervals along the entire routes. Monitoring will include: • Conducting a pre-construction survey to record and map severity of alien plant encroachment, including in areas where currently absent; • Conducting regular spot checks along the PWAR and BPST routes during and after construction to confirm rate of spread of alien plants; • Compiling a photographic record of alien plants at specific localities (recorded with GPS); • Completing an alien invasive plant monitoring data sheet recording location, type and estimated extent of alien plants along the route as a baseline for monitoring.	Post-construction monitoring by LHDA (until completion of dam construction). Thereafter, by the suitable Lesotho Departments.	Twice annually by Contractors until end of project liability phase, then annual monitoring by LHDA (until completion of dam). Thereafter, responsibility for alien invasive plant monitoring should fall to the Roads Directorate on an annual basis.	• Monitoring reports. • No significant risk of alien plants.	✓	✓

Ref No.	Monitoring Measure	Responsibility	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
	This should be the responsibility of LHDA until the completion of dam construction when the management of the PWAR and BPST reverts to the relevant Lesotho Departments. It is recommended that bi-annual annual alien plant clearing be undertaken by the applicant for the first year post-rehabilitation. Thereafter, alien plant clearing should be undertaken annually until such a time that further risks of alien invasion resulting from disturbance factors are negligible.					
2.2	**Spiral Aloe Wild Populations** – to provide a baseline assessment of wild spiral aloe populations within a 5 km distance of the road footprint. Conduct annual surveys of these populations to monitor population dynamics and health. The number of wild populations within the proposed buffer is unknown. At least 5 colonies should be monitored, but preferably all the populations if less than 10 colonies found. Monitoring of spiral aloes should be undertaken as follows: • Employ local residents who know of wild populations to escort a botanist to each of these known populations; • Conduct a count of all plants in each population, including proportion of mature plants (size profile), evidence of recruitment (seedlings, suckers) and evidence of harvesting; and • Photographic record of fixed sites for visual record of population condition.	LHDA, in collaboration with botanist	Annually	• Baseline assessment; • Annual monitoring report. Annual monitoring report to be submitted to LHDA and DoE.	✓	✓
2.3	**Spiral Aloe Harvesting and Sale to Road Users** – conduct six monthly to annual checks along the PWAR to confirm if spiral aloes are being sold to road users or transported to other areas. This should include engagement with local residents to increase awareness of their protected status and prohibitions on sale of wild plants.	LHDA, in collaboration with botanist	Six monthly - annually	• Six monthly to annual checks. Results in monitoring report to be submitted to LHDA and DoE.	✓	✓
2.4	**Plant Survival in Plant Safeguard Areas / Community Nurseries** – to verify the survival rate of plants relocated from the PWAC. Managers of any established nurseries and proposed botanical garden should record the survival rate of relocated plants and species and treatment measures used. This will confirm the effectiveness of management and contribute to knowledge of the propagation and growing of indigenous plants.	LHDA (Nursery / Katse Botanical Garden staff)	Monthly	• Survival rate of relocated and propagated plants. • Monthly reporting to be submitted to LHDA	✓	✓
2.5	**Frog Monitoring** – to monitor the occurrence and survival of indicator frog species such as Maluti River Frog in rivers and streams such as the Liseleng and Semenanyane Rivers. This could be done as an add-on to similar monitoring done for the Polihali Project Area for cost efficiency and comparison. Sampling locations should be confirmed under the Biodiversity Management Plan (BMP), but is expected to include monitoring sites at selected perennial rivers and	LHDA, in conjunction with ecologist	Annually during construction.	To be confirmed in Biodiversity Monitoring Plan (BMP).	✓	✓

Ref No.	Monitoring Measure	Responsibility	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
	streams along the PWAR and BPST routes (for example in the upper Liseleng and Semenanyane Rivers). Monitoring should include sampling using sweep netting, and acoustic recording at sites.					
3.	**Wetlands**					
3.1	**General Assessment of Wetlands** – to check that the mitigation measures are effective at minimising wetland impacts from road construction.	LHDA	Every 5 years post construction	• A summary wetland monitoring report. • Wetland condition relatively stable.	✓	✓
3.2	**Botanical Monitoring of the Important Plant Areas** – to assess the presence and abundance of priority plant species. Monitoring will be undertaken at selected wetlands and areas within the Important Plant Areas (notably kp 7-9; kp 21-22 Makhoaba Junction).	LHDA	Every 5 years post construction	• A summary wetland monitoring report. • Rare and Important plant species presence and abundance stable or increasing.	✓	✓
4.	**Rehabilitation Monitoring**					
4.1	On completion of rehabilitation efforts by the Contractor, LHDA will continue monitoring of the rehabilitation success along the PWAR, new access roads, construction works areas, culvert outlets, and pylon locations. Monitoring will include (but not necessarily limited to) the following items: • Erosion; • Stability of cut slopes (e.g., loose boulders, slumping); • Surface water drainage; • Vegetation basal cover; • Vegetation species diversity; and • Presence and abundance of invasive plant species.	LHDA	After the post-construction liability phase. Bi-annual monitoring (until acceptable condition verified).	• A safe environment for humans and animals. • All areas stable. • Progressive rehabilitation implemented. • Rehabilitated areas restored to close to the pre-construction baseline condition.	✓	✓
4.2	**Erosion** – to determine impact and rates of erosion at river/stream and wetland crossings, and culvert outflow points. After completion of construction and the post-construction liability phase, monitoring will be continued along the PWAR by LHDA (under the dam construction contract) and shall include: • Visual inspections and fixed point photographs of culvert outlets and other sites with potential erosion features; • Record locations of head-cuts with a GPS; and • Measurement of gully width and depth. Records shall be filed and stored in systematic database with dated photographs linked to a GPS position.	LHDA	After the post-construction liability phase. Bi-annual monitoring (until acceptable condition verified).	• Erosion at culverts non-existent or minimal and stable. • Remedial measures implemented timeously and effectively.	✓	✓

Ref No.	Monitoring Measure	Responsibility	Timing and Frequency	Target / Indicator	Project Applicability	
					PWAR	BPST
	• Any erosion gullies or nick points should be rectified timeously to prevent worsening, especially prior to the onset of the summer rainfall season.					
5.	**Social Monitoring**					
5.1	**RAP** - regular independent monitoring and evaluation audits of the RAP and its implementation are required throughout construction and operational phases to compare progress against socioeconomic baseline conditions. In addition, monitoring and evaluation is required to verify the progress and effectiveness of livelihood restoration projects that are implemented along the PWAR and BPST.	LHDA	Pre, during and post-construction.	Proper undertaking of RAP scope and effectiveness of livelihood restoration projects.	✓	✓
6.	**Cultural Heritage**					
6.1	**Chance Find Procedure (CFP)** – Monitoring of the success of implementation of the CFP to detect and record additional heritage resources during PWAR and BPST construction.	LHDA (Cultural Heritage Specialist)	On identification of additional heritage resources during construction.	New heritage sites identified during construction of the PWAR and BPST.	✓	✓
7.	**Landscape and Visual Monitoring**					
7.1	LHDA to liaise with RD on maintenance of view points, and any facilities provided.	LHDA or RD	Post-construction	View sites maintained	✓	

Section 9 References

IFC, 2007. Environmental Health and Safety Guidelines:

- General EHS Guideline
- EHS Guidelines for Construction Materials Extraction (IFC, 2007)
- EHS Guidelines for Electric Power Transmission and Distribution (IFC, 2007)
- EHS Guidelines for Telecommunications (IFC, 2007)

LHDA, 2011: Agreement on Phase II of the Lesotho Highlands Water Project Between the Government of the Kingdom of Lesotho and the Government of the Republic of South Africa, Maseru.

LHDA, 2014. LHWP Phase II Community Participation Strategy.

LHDA, 2014. LHWP Phase II Community Participation Strategy, 29 September 2014

LHDA, 2016. LHWP Phase II Compensation Policy, 25 August 2016

LHDA, 2016. LHWP Phase II Labour Recruitment Guidelines, 25 August 2016

LHDA, 2017. LHWP Phase II Livelihood Restoration and Social Development Framework, August 2017

Otieno, 1998. Proposed Wastewater or Industrial Effluent Discharge Standards (Second Draft).

World Bank. 2017. World Bank Environmental and Social Framework. (www.worldbank.org/safeguards).

Appendix A: Sensitivity Maps with Key Mitigation Measures

Figure A.1 Basemap of PWAC Showing Block Areas of Key Ecological Sensitivity (Refer to Block Maps 1-7 overleaf)

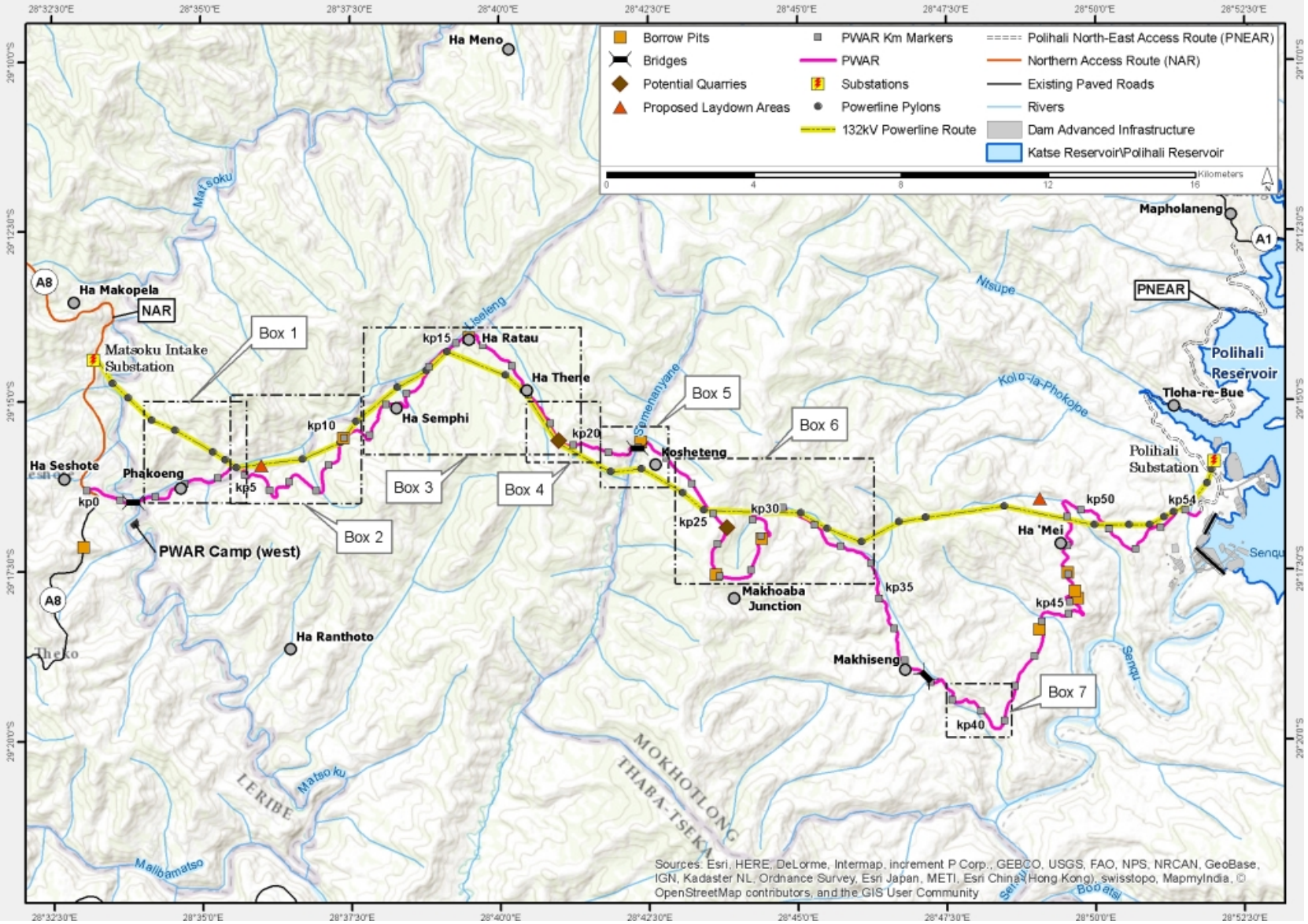


Figure A.2 Box 1 of Key Ecological Sensitivity

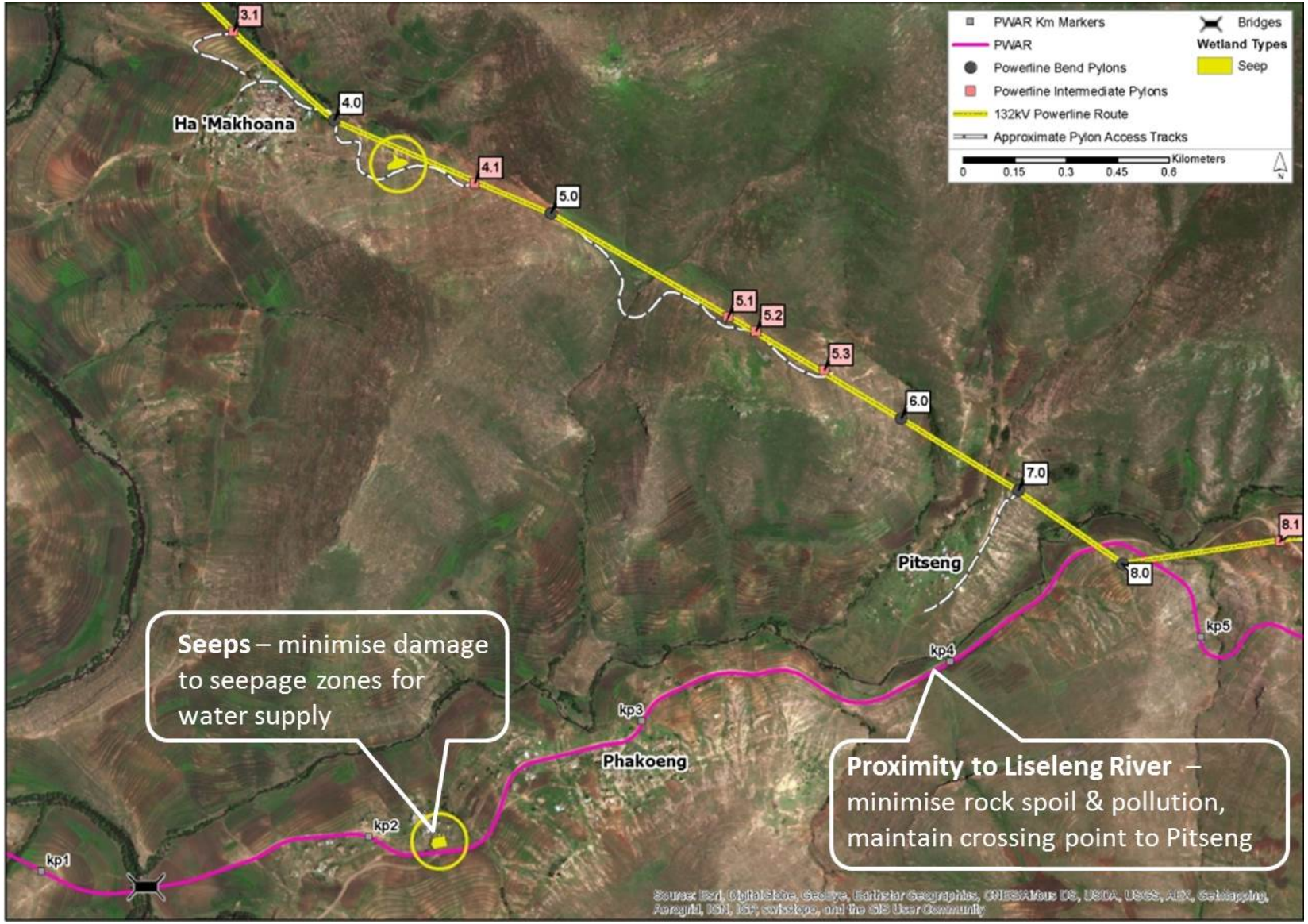


Figure A.3 Box 2 of Key Ecological Sensitivity

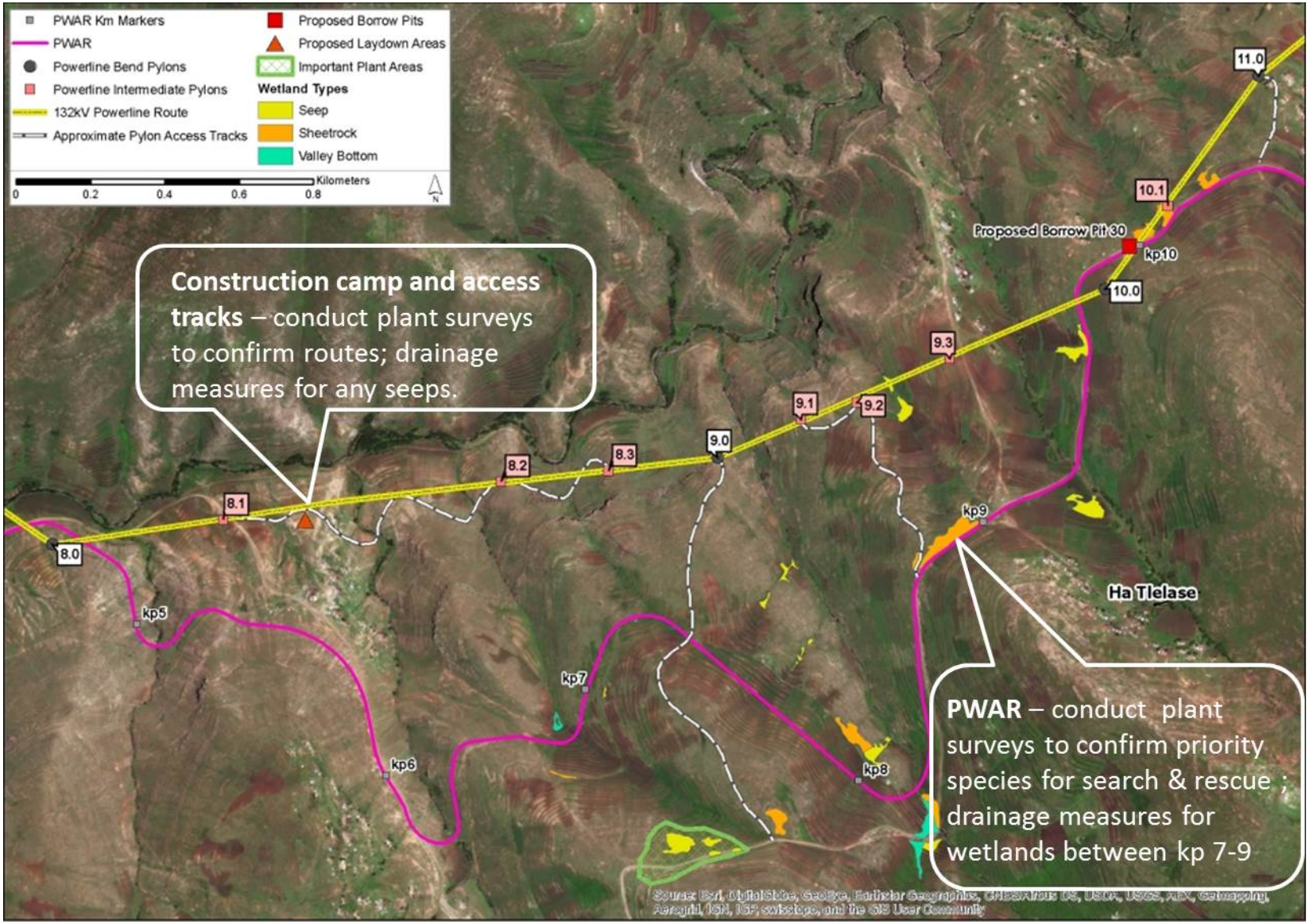


Figure A.4 Box 3 of Key Ecological Sensitivity

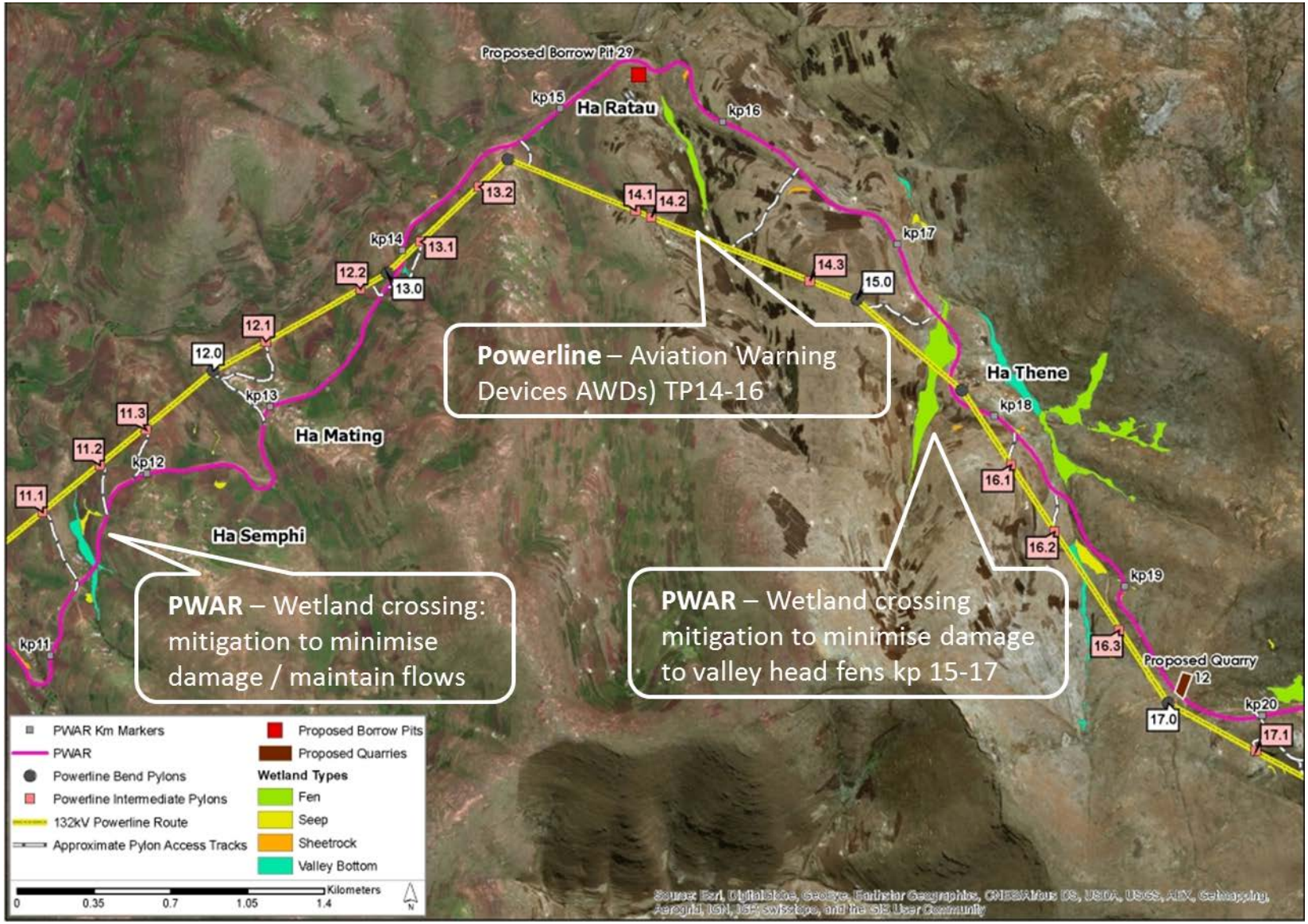


Figure A.5 Box 4 of Key Ecological Sensitivity

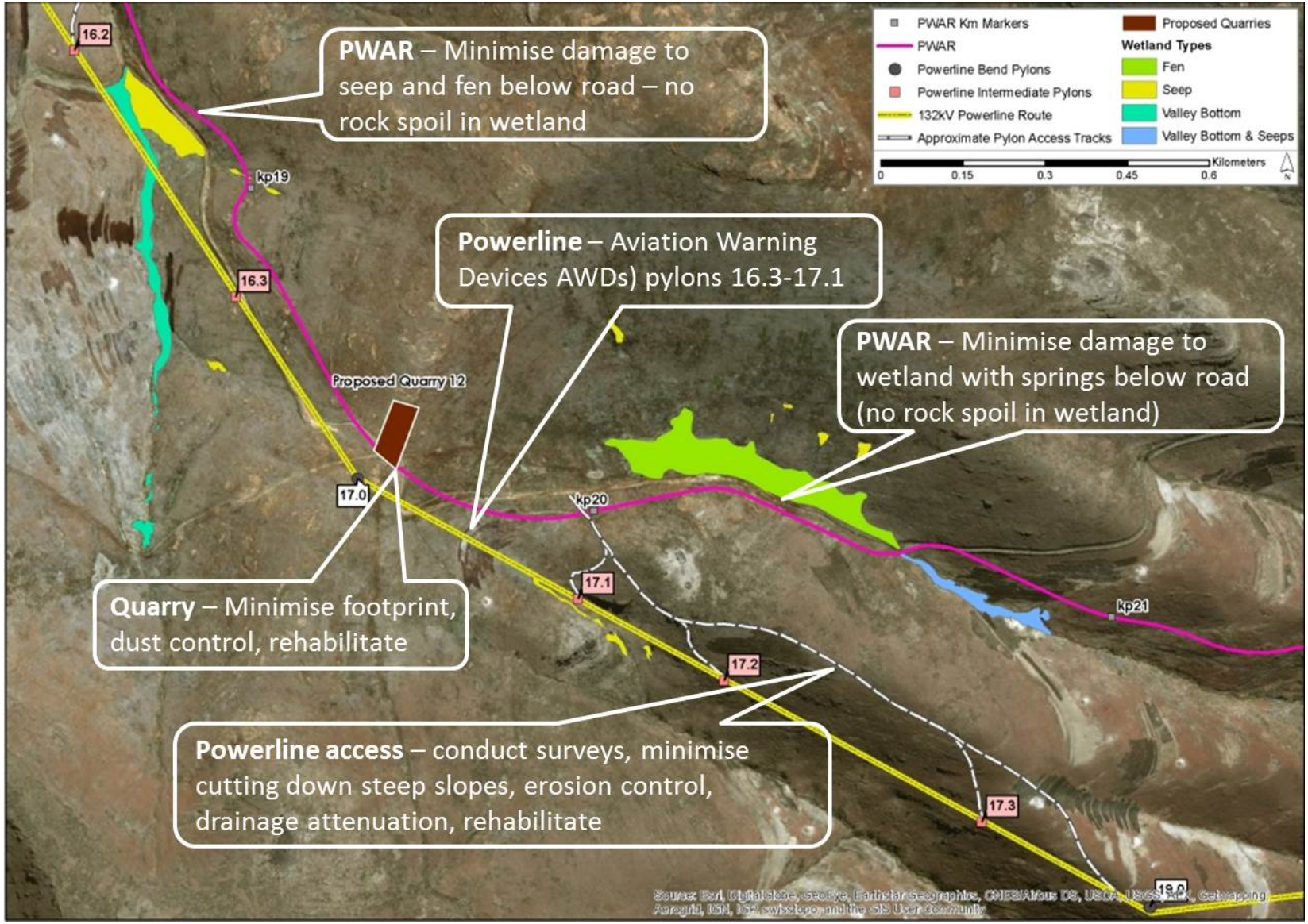


Figure A.6 Box 5 of Key Ecological Sensitivity (Semenanyane River Bridge)

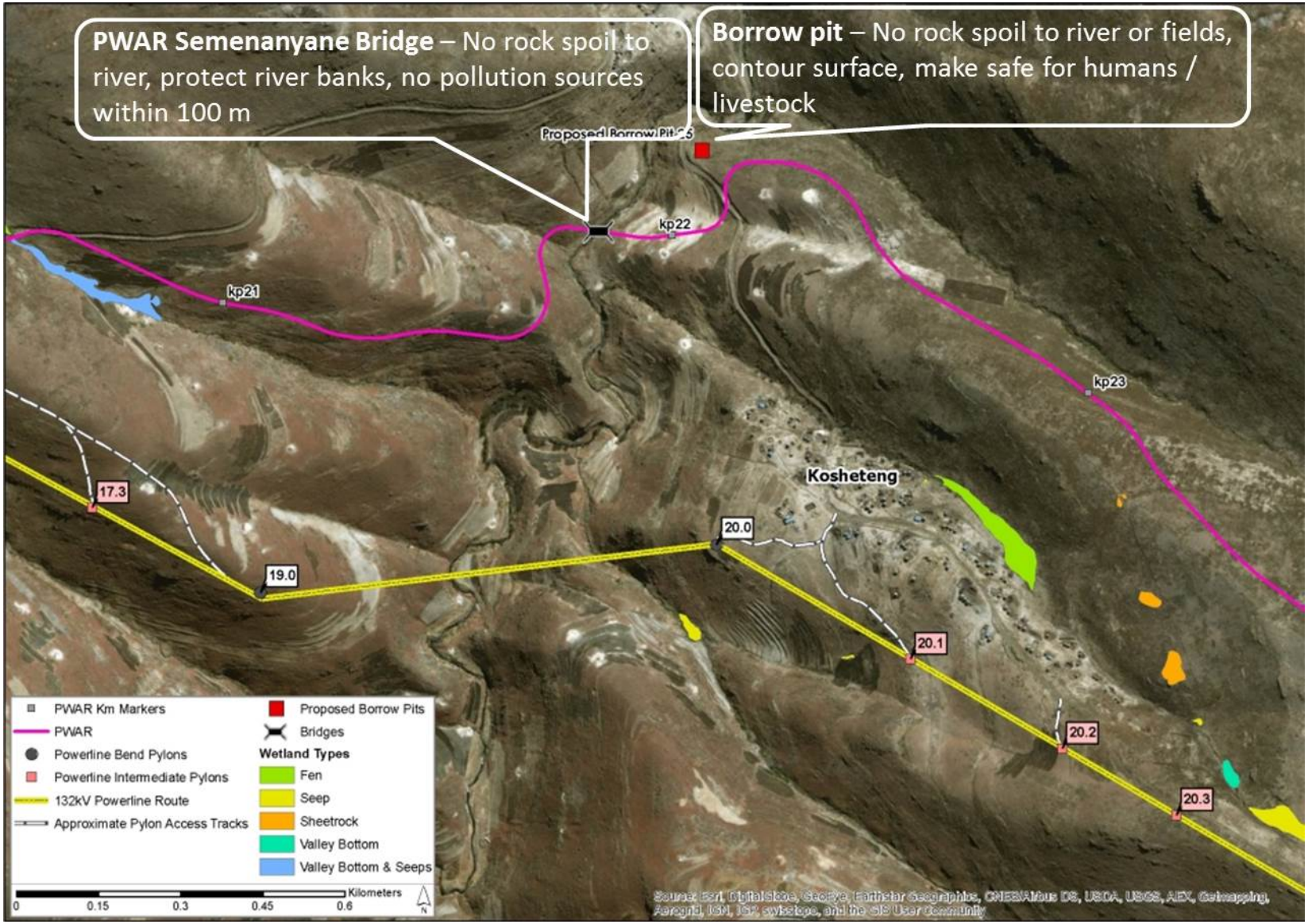


Figure A.7 Box 6 of Key Ecological Sensitivity (Makhoaba Junction)

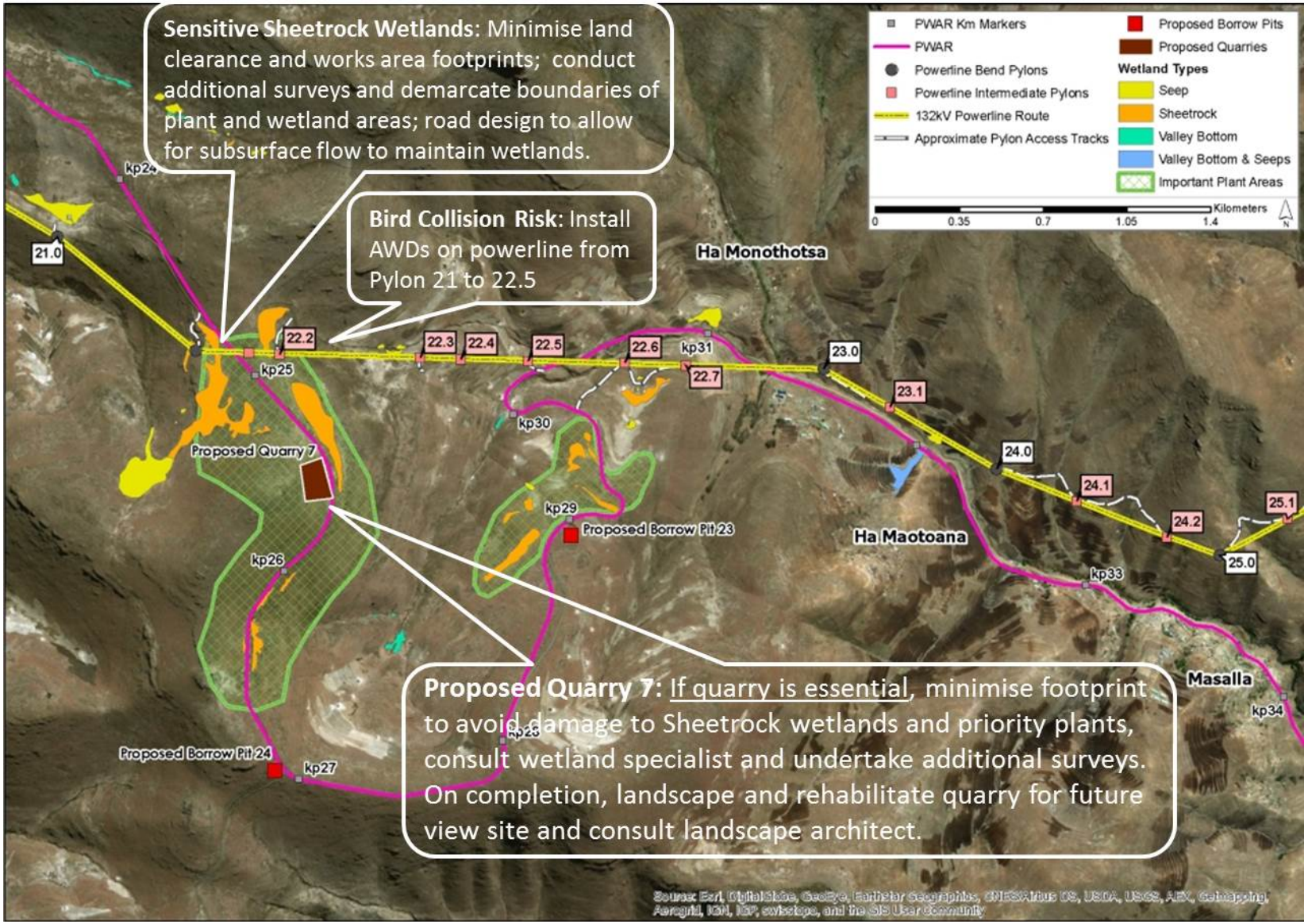
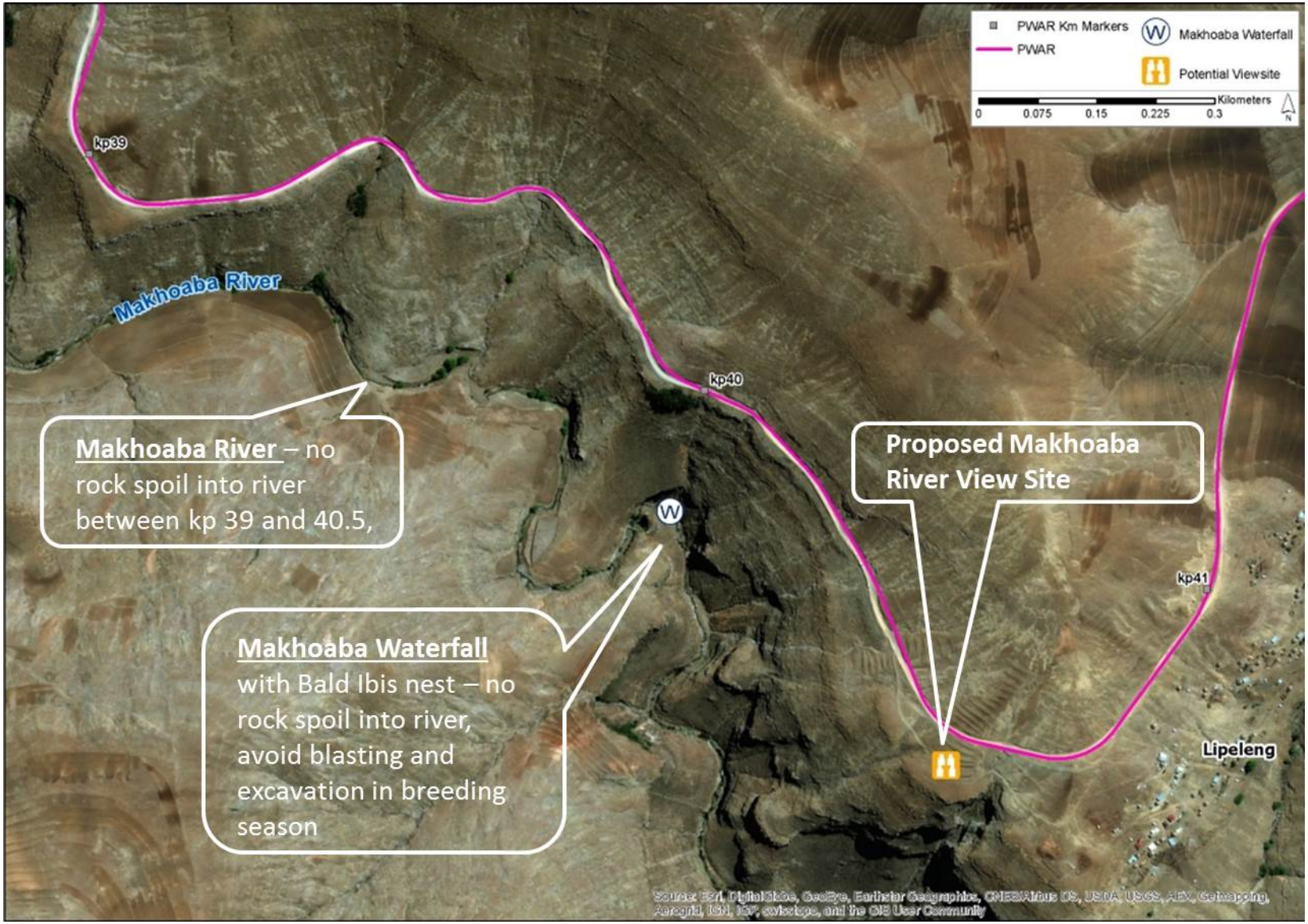


Figure A.8 Box 7 of Key Ecological Sensitivity (Makhoaba River (kp 39-41)

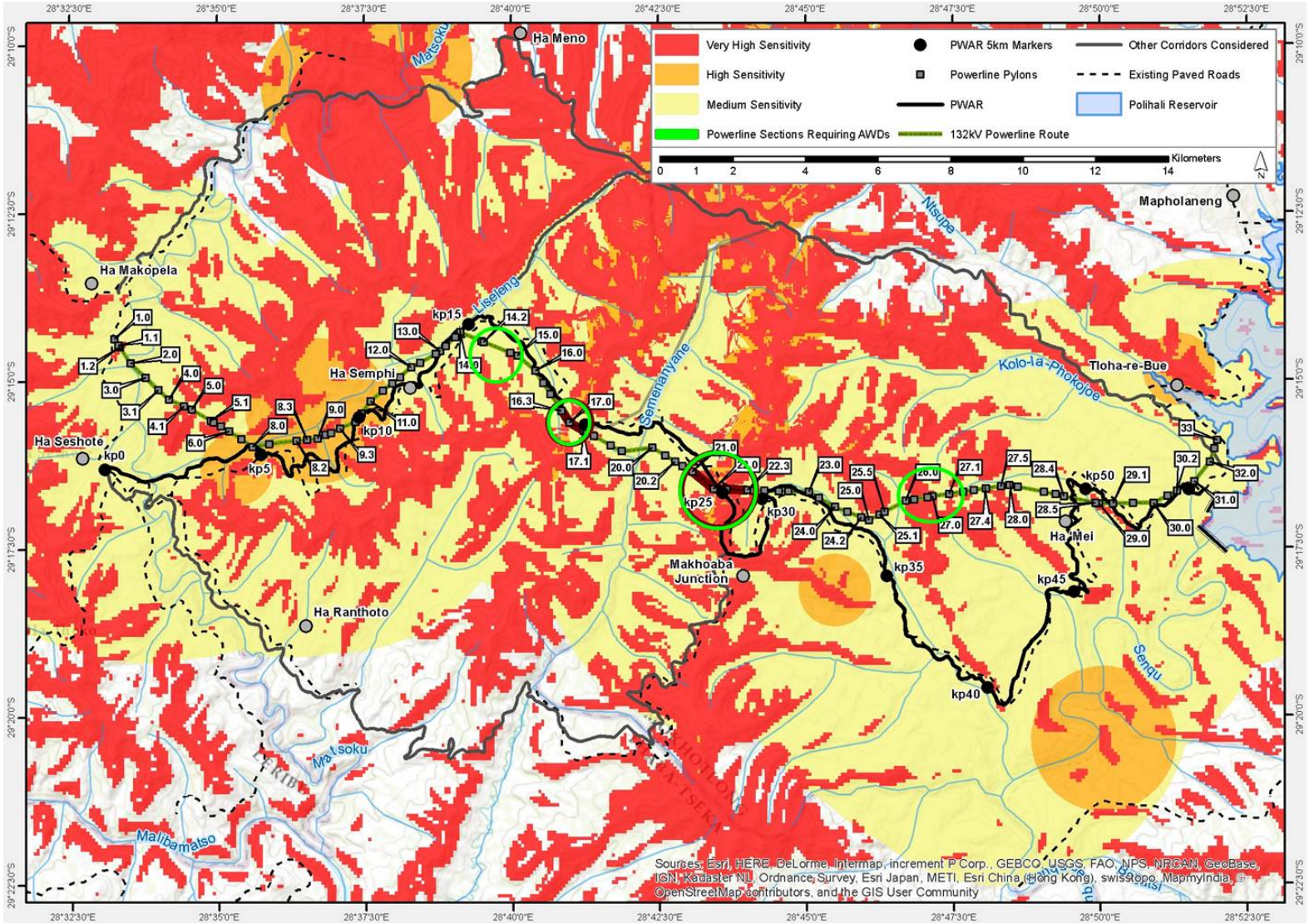


Appendix B: Avian Sensitivity Map

Figure B.1 Avian Impact Sensitivity in Terms of Mortality Risk Along the Proposed PWAC, Assessed in Terms of the Predicted Density of Bearded Vultures Based on Tracking Data, Topography above 2750 masl, and Buffered Nest Site Locations Found During this Study.

Buffers: Bearded Vulture = 2 km Very High, Large Southern Bald Ibis Colonies and Verreaux's Eagle = 2 km High, Lanner Falcon, small Southern Bald Ibis colonies and Black Stork = 1 km High.

Note: Aviation Diverters (AWDs) proposed for powerline sections within green circles; and Bird Flight Diverters (BFDs) on entire line.



Appendix C: Wetland Mitigation and Maps

Table C.1 Likely Impacts and Specific Mitigation Objectives for the Wetlands Indicated in Figure C.1 to Figure C.14

Wetland Name, Type and Approximate Distance Along Road (kp)	Likely Impact and Consequences for the Affected Wetlands	Mitigation Objectives
Wetland 01 (Seep) kp 2.18 to 2.28 (Figure C.1)	There will be a direct impact on the wetland with some habitat loss and indirect impact on interflow. The road will cut off interflow that feeds Wetland 01. This will likely result in the loss of water supply to the village water point located within the wetland. . Likely to be sedimentation of wetlands during construction.	• Allow interflow to move under the road and into the wetland. • Prevent disturbance of wetland habitats and erosion and sedimentation during all phases of the construction and maintenance of the road.
Wetland 02 (Valley Bottom) kp 6.70 to 6.90 (Figure C.2)	Possibly some direct impact but most likely indirect impacts as a result of the concentration of surface flows down the valley into Wetland 02 and sedimentation of the wetland during construction.	• Prevent the concentration of flows above and into the wetland to try to prevent further headcutting of the system. • Prevent disturbance of wetland habitats, and erosion and sedimentation during all phases of the construction and maintenance of the road.
Seep wetlands downslope of the road kp 7.40 to 7.80 (Figure C.2)	There will be an indirect impact on flow as a result of the concentration of surface flows down the two valleys into the seepage systems below.	• Prevent the concentration of flows above and into the wetlands.
Wetlands 06a (Seep) and 06b (Sheetrock) kp 7.85 to 8.10 (Figure C.2)	Possibly some direct impact but most likely indirect impacts as a result of the cutting off of interflow that feeds Wetlands 06a and 06b and the concentration of surface flows into these wetlands. Likely to be sedimentation of wetlands during construction.	• Allow interflow to move under the road and into the wetlands and prevent the concentration of flows above and into the wetlands to try to prevent erosion of the systems. • Prevent disturbance of wetland habitats, and erosion and sedimentation during all phases of the construction and maintenance of the road.
Wetlands 05c (Valley Bottom) and 05d (Sheetrock) kp 8.15 to 8.25 (Figure C.2)	Possible direct loss of wetland habitat in Wetlands 05c and 05d	• Avoid any direct impacts on Wetland 05 and particularly Wetlands 05c and 05d. • Prevent disturbance of wetland habitats, and erosion and sedimentation during all phases of the construction and maintenance of the road.
Wetland 07 (Sheetrock) and Seeps downstream kp 8.75 to 9.05 (Figure C.2)	There will be a direct impact on Wetland 07 with habitat loss and a direct and indirect impact on interflow with the likely cutting off of interflow that feeds the system. Will also be a loss of water supply for livestock as there is a spring located within the wetland. Likely to be sedimentation of the wetland during construction. May also be an impact on flow reaching the Seep wetlands downslope/downstream.	• Protect as much of the remaining wetland habitat as possible and allow interflow to move under the road and into the wetland. Unlikely to be able to protect the spring as it is within the road servitude. • Prevent disturbance of the remaining wetland habitats, and erosion and sedimentation during all phases of the construction and maintenance of the road. • Prevent concentration of stormwater flow down the valley.
Wetland 09 (Seep) kp 9.55 to 9.70 (Figure C.3)	There will be a direct impact on the wetland with habitat loss and a direct and indirect impact on interflow with the likely cutting off of interflow that feeds Wetland 09. Will also be a loss of water supply for livestock as there are springs located within the existing road footprint. The springs appear to be the result of the intersection of the water table due to the existing road cut. Likely to be sedimentation of the wetland during construction.	• Protect as much of the remaining wetland habitat as possible and allow interflow to move under the road and into the wetland. Unlikely to be able to protect the springs as they are located within the road servitude. • Prevent disturbance of the remaining wetland habitats, and erosion and sedimentation during all phases of the construction and maintenance of the road.
Wetlands 10 and 11 (Sheetrock)	There will be a direct impact on the wetlands with habitat loss and a	• Protect as much of the remaining wetland habitat as possible; • Allow interflow to move under the road and into the wetlands.

Wetland Name, Type and Approximate Distance Along Road (kp)	Likely Impact and Consequences for the Affected Wetlands	Mitigation Objectives
kp 9.95 to 10.30 (Figure C.3)	direct and indirect impact on interflow with the likely cutting off of interflow that feeds Wetlands 10 and 11 and Sheetrock 03 in between. May also be a loss of important wet habitat and water supply for livestock as there are seepage pools within the build line of the road. Likely to be sedimentation of the wetland during construction.	• Protect the seepage pools located within the build line by restricting the construction footprint to the road servitude only. • Prevent disturbance of the remaining wetland habitats, and erosion and sedimentation during all phases of the construction and maintenance of the road.
Sheetrock wetland and spring kp 10.60 to 10.85 (Figure C.3)	There will be a direct impact on a Sheetrock system with habitat loss and a direct and indirect impact on interflow with the likely cutting off of interflow that feeds the system. Will also likely be the loss of a spring, which may be used for water supply to the village, within the build line of the road. Likely to be sedimentation of the wetland during construction.	• Protect as much of the remaining wetland habitat as possible. • Allow interflow to move under the road and into the wetland. • Protect the spring located within the build line by restricting the construction footprint to the road servitude only and by allowing the sub-surface flows that supply the spring to move under the road. • Prevent disturbance of the remaining wetland habitats, and erosion and sedimentation during all phases of the construction and maintenance of the road.
Wetland 12 b and 13 (Valley Bottom) kp 11.40 to 11.60 (Figure C.3)	Direct impact on parts of Wetlands 12a, 12b and 13 with some habitat loss and both a direct and indirect impact on surface flow inputs to Wetland 13. The system is already impacted by sedimentation so this is likely to be exacerbated during construction.	• Protect as much of the remaining wetland habitat as possible within the road build line and allow for the spreading of surface flows across the wetland crossing. • Prevent disturbance of wetland habitats and erosion and sedimentation of Wetland 13 during all phases of the construction and maintenance of the road. • Ensure design measures to allow sub-surface flows to Wetland 14.
Wetland 14 (Seep) kp 11.60 to 11.80 (Figure C.3)	Possibly a direct impact on some wetland habitat resulting in habitat loss as well as an indirect impact with the likely cutting off of interflow that feeds Wetland 14.	• Protect the wetland habitat by remaining within the road servitude during construction and avoiding impacts in the build line. • Allow interflow to move under the road and into the wetland. • Prevent erosion and sedimentation during all phases of the construction and maintenance of the road.
Wetlands 15 and 16 (Seeps) kp 12.05 to 12.38 (Figure C.4)	Possibly an indirect impact on flow as a result of the concentration of surface flows off the road into Wetlands 15 and 16 below.	• Prevent the concentration of surface runoff flows from the road into and along the drainage paths above the wetlands. • Prevent the disturbance of wetland habitats, and erosion and sedimentation during all phases of the construction and maintenance of the road.
Spring 02 (Seep with Spring) kp 12.6 (Figure C.4)	Possible disturbance of the spring during construction.	• Avoid disturbing the spring during all phases of road construction.
Wetlands 17 and 18 (Valley Bottom and Seeps) kp 13.10 to 13.30 (Figure C.4)	Direct impact on parts of Wetlands 17 and 18 with some habitat loss and both a direct and indirect impact on surface flow inputs to both systems. Systems are already impacted from sedimentation so this is likely to be exacerbated during construction.	• Protect as much of the remaining wetland habitat as possible within the road build line and allow for the spreading of surface flows across the wetland crossing. • Prevent disturbance of wetland habitats, and erosion and sedimentation of the wetlands during all phases of the construction and maintenance of the road.

Wetland Name, Type and Approximate Distance Along Road (kp)	Likely Impact and Consequences for the Affected Wetlands	Mitigation Objectives
Spring 03 (Seep with Spring) kp 13.5 (Figure C.4)	Loss of the spring as the road servitude goes over the spring.	• Provide for subsurface flow under the road to create a new spring within the wetland habitat below the road servitude (within the build line).
Wetland 19 (Valley Bottom, and Valley Bottom and Seeps) kp 13.88 to 14.02 (Figure C.4)	Direct impact on Wetland 19 with an extensive loss of wetland habitat and both a direct and indirect impact on surface flow inputs to the remaining habitat below. System is already heavily impacted from sedimentation so this is likely to be exacerbated during construction.	• Not much of the wetland habitat will remain within the road build line so it is recommended that the footprint is restricted to the road servitude in this area to try to protect as much of the remaining wetland habitat as possible. • Allow for the spreading of surface flows across the wetland crossing. • Prevent disturbance of the remaining wetland habitats, and erosion and sedimentation of the wetland during all phases of the construction and maintenance of the road. The implementation of rehabilitation measures such as gabions to stabilise the headcut in the wetland immediately below the road crossing is recommended.
Sheetrock wetland kp 15.67 to 15.76 (Figure C.5)	There will be a direct impact on a sheetrock system with the loss of most of the wetland habitat as the road servitude goes over the wetland.	• Protect any important plant species that may be associated with the wetland and associated sheetrock habitats. It is recommended that a botanical assessment is undertaken of this system, and if deemed necessary by the botanical specialist, that a plant recovery programme is implemented for the wetland and surrounding area prior to the start of construction of the road.
Wetland 20 (Fen) kp 15.82 to 16.42 (Figure C.5)	Likely to be an indirect impact on flow as a result of the diversion and possible concentration of surface flows off the road and down the slopes of the north eastern section of the catchment into Wetland 20. Wetland 20 is an important fen with over 3 m of peat having been recorded in the system during field sampling. This system is thus highly sensitive to elevated flows and every attempt should be made to protect the system from concentrated flows from the north eastern section of its catchment.	• Prevent the concentration of surface runoff flows from the road along drainage paths within the north eastern section of the catchment above the wetland. • Prevent the disturbance of wetland habitats, and erosion and sedimentation during all phases of the construction and maintenance of the road.
Wetland 21 16.50 to 16.55 (Figure C.5)	Possibly a direct impact on some wetland habitat resulting in habitat loss in sheetrock Wetland 21.	• Protect the wetland habitat by remaining within the road servitude during construction and avoiding impacts in the build line.
Lower section of Wetland 22 (Fen) and stream habitat kp 17.25 to 17.36 (Figure C.6)	Likely to be an indirect impact on flow as a result of the diversion and possible concentration of surface flows off the road and down the slopes into the lower section of Wetland 22. This system is sensitive to elevated flows and every attempt should be made to protect the system from concentrated flows emanating from the road.	• Prevent the concentration of surface runoff flows from the road along drainage paths into the lower section of the wetland. • Prevent sedimentation and erosion of the lower section of the fen during all phases of the construction and maintenance of the road.
Wetland 22 (Fen) kp 17.37 to 17.46 (Figure C.6)	There will be a direct impact on the lower part of Wetland 22 as a result of the road crossing with some habitat loss and both a direct and indirect impact on surface and sub-surface flow through the system.	• Protect as much of the remaining wetland habitat as possible by restricting the road build line to the road servitude only over the crossing of the wetland. • Allow for the spreading of surface flows across the wetland at the road crossing. • Prevent the development of headcutting below and above the road

Wetland Name, Type and Approximate Distance Along Road (kp)	Likely Impact and Consequences for the Affected Wetlands	Mitigation Objectives
		crossing. • Prevent disturbance of wetland habitats, and erosion and sedimentation of the wetland during all phases of the construction and maintenance of the road.
Wetland 22 (Fen) kp 17.47 to 18.08 (Figure C.6)	There will be a direct impact on the eastern extension of Wetland 22 with some habitat loss and both a direct and indirect impact on surface and sub-surface flow through the system. There is also likely to be an indirect impact on flow as a result of the diversion and possible concentration of surface flows off the road and down the slopes of the north eastern section of the catchment into Wetland 22. Wetland 22 is an important fen with almost 2 m of peat having been recorded in the system during field sampling. This system is thus highly sensitive to elevated flows and every attempt should be made to protect the system from concentrated flows from the north eastern section of its catchment. At the same time it is important to allow interflow from the lower section of the north eastern part of the catchment to move under the road and into the wetland as this helps feed the eastern extension of the wetland that will be directly affected by the road footprint.	• Protect as much of the remaining wetland habitat as possible by restricting the road build line to the road servitude on the western side of the road where it directly impacts the wetland along its eastern extension. • Prevent the concentration of surface runoff flows from the road along drainage paths within the north eastern section of the catchment above the wetland. • Prevent the disturbance of wetland habitats, and erosion and sedimentation during all phases of the construction and maintenance of the road.
Seep and Sheetrock wetland kp 18.10 to 18.15 (Figure C.6)	There will be a direct impact on the small Seep with habitat loss and both a direct and indirect impact on surface and sub-surface flow through the system. This will have an indirect impact on the adjacent Sheetrock system.	• Protect as much of the remaining wetland habitat of the seepage and sheetrock wetland and as possible by restricting the road build line to the road servitude in this area. • Prevent the disturbance of wetland habitat, and erosion and sedimentation of the wetland during all phases of the construction and maintenance of the road.
Wetland 24 (Fen) kp 18.16 to 18.40 (Figure C.6)	Likely to be an indirect impact on flow as a result of the diversion and possible concentration of surface flows off the road and down the slopes into the lower section of Wetland 24. This wetland is already extensively degraded as a result of a headcut along its western margin all along the channel.	• Prevent the concentration of surface runoff flows from the road along drainage paths into the wetland. Prevent erosion and sedimentation of the lower section of the fen during all phases of the construction and maintenance of the road.
Stream feeding part of Wetland 24 (Fen) kp 18.42 to 18.65 (Figure C.6)	There will be a direct impact on the drainage line above Wetland 24 where the road crosses the system. There is also likely to be an indirect impact on flow as a result of the diversion and possible concentration of surface flows off the road and down the slopes into the drainage line that cuts through the western edge of Wetland 24.	• Prevent the concentration of surface runoff flows at the road crossing of the drainage line and from the road which runs parallel with the drainage line, into the wetland. • Prevent erosion and sedimentation of the drainage line above Wetland 24 during all phases of the construction and maintenance of the road.
Wetland 25 (Seep) kp 18.68 to 18.90 (Figure C.7)	Likely to be an indirect impact on flow as a result of the diversion and possible concentration of surface flows off the road and down the slopes into Wetland 25. There may also be a direct impact on Wetland 25 with habitat loss if the construction activities extend into the build line of the road. There is also likely to be an indirect impact on flow as a result of cutting off of sub-surface flows by the road to Wetland 25.	• Prevent the concentration of surface runoff flows from the road into the wetland. • Allow the sub-surface flows that feed Wetland 25 to move under the road. • Prevent erosion and sedimentation the wetland during all phases of the construction and maintenance of the road.

Wetland Name, Type and Approximate Distance Along Road (kp)	Likely Impact and Consequences for the Affected Wetlands	Mitigation Objectives
Wetlands 26 (Seep), 27a and 27b (Sheetrock) kp 18.95 to 19.10 (Figure C.7)	There will be a direct impact on a Wetlands 26, 27a and 27b with the loss of most of the wetland habitat as the road servitude goes over the wetlands.	• Protect as much of the remaining wetland habitat as possible by limiting the construction footprint to the road servitude only, avoiding using the full build line.
Wetland 26 (Valley Bottom) kp 19.14 to 19.55 (Figure C.7)	Likely to be an indirect impact on flow as a result of the diversion and possible concentration of surface flows off the road and down the slopes of the eastern section of the catchment into Wetland 26.	• Prevent the concentration of surface runoff flows from the road along drainage paths within the eastern section of the catchment above, and parallel to, the wetland. • Prevent erosion and sedimentation during all phases of the construction and maintenance of the road.
Wetland 28 (Fen) kp 19.83 to 20.05 (Figure C.8)	Likely to be an indirect impact on flow as a result of the diversion and possible concentration of surface flows off the road and down the slopes of the southern section of the catchment into Wetland 28. There may also be a direct impact on Wetland 28 with some habitat loss if the construction activities extend into the build line of the road. There is also likely to be an indirect impact on flow as a result of cutting off of sub-surface flows by the road where it gets close to Wetland 28 after km 20.	• Prevent the concentration of surface runoff flows from the road along drainage paths within the southern section of the catchment above, and parallel to, the wetland. • Allow the sub-surface flows that feed Wetland 28 from the southern section of the catchment to move under the road after km 20. • Prevent erosion and sedimentation during all phases of the construction and maintenance of the road. • Prevent disturbance of the wetland habitat.
Wetland 28 (Fen) kp 20.52 to 20.63 (Figure C.8)	There will be a direct impact on parts of Wetland 28 as a result of the road crossing with some habitat loss and both a direct and indirect impact on surface and sub-surface flow through the system.	• Protect as much of the remaining wetland habitat as possible by restricting the road construction to the road servitude only and not the build line over the crossing of the wetland. • Allow for the spreading of surface flows across the wetland at the road crossing. • Prevent the development of head-cutting below and above the road crossing. • Prevent disturbance of wetland habitats, and erosion and sedimentation of the wetland during all phases of the construction and maintenance of the road.
Valley Bottom and Seeps forming lower section of Wetland 28 kp 20.65 to 20.89 (Figure C.8)	Likely to be an indirect impact on flow, *albeit* relatively small if earlier flow diversion measures are implemented, as a result of the diversion and possible concentration of surface flows off the road and down the slopes of the lower eastern section of the catchment into the lower section of Wetland 28.	• Prevent the concentration of surface runoff flows from the road along drainage paths within the lower eastern section of the catchment above, and parallel to, the lower section of the wetland. • Prevent erosion and sedimentation during all phases of the construction and maintenance of the road.
Valley Bottom and Wetlands 31 (Fen), 32 (Valley Bottom) and 33 (Seep) kp 23.4 to 24.39 (Figure C.9)	Likely to be an indirect impact on flow as a result of the diversion and possible concentration of surface flows off the road and down the slopes of the upper eastern section of the catchment into Wetlands 32 and 33.	• Prevent the concentration of surface runoff flows from the road along drainage paths within the upper eastern section of the catchment above the wetlands. • Prevent erosion and sedimentation during all phases of the construction and maintenance of the road.
Wetlands 34 and 36 (Sheetrock) kp 24.60 to 25.65	There will be a direct impact on parts of Wetlands 34a and 36 with some habitat loss and a direct and indirect impact on interflow with the likely cutting off of all of the interflow that feeds Wetland 36 in	• Protect as much of Wetland 34 and 36 as possible by restricting construction to the road servitude and not the build line. • It is important that interflow is allowed to continue under the road across

Wetland Name, Type and Approximate Distance Along Road (kp)	Likely Impact and Consequences for the Affected Wetlands	Mitigation Objectives
(Figure C.10)	particular.	this entire length of road in order to protect these highly sensitive and important wetlands. No construction activities, lay down areas, borrow pits or any other related disturbance should be allowed in this area including the moist grassland slopes and flats that lie adjacent to these important wetlands. It is critically important in this area to prevent disturbance of the remaining wetland habitats, and erosion and sedimentation must be prevented during all phases of the construction and maintenance of the road across this section.
Wetlands 37, 38, 39, 40 and 41 (Sheetrock) kp 26.00 to 26.80 (Figure C.11)	There will be a direct impact on Wetlands 38, 39, 40 and 41 with habitat loss and a direct and indirect impact on interflow with the likely cutting off of all of the interflow that feeds Wetlands 37, 38, 39 and 41.	• Protect as much of Wetlands 38 and 39 as possible by restricting construction to the road servitude and not the build line. Wetlands 40 and 41 will likely be lost. It is nevertheless important that: o Interflow is allowed to continue under the road across this entire length of road in order to protect the remaining systems which are highly sensitive and important wetlands as well as the seepage slopes that surround these systems and form the headwaters of the catchment.
Wetland 42 and 43 (Seep with Spring and Valley Bottom) kp26.85 to 28.10 (Figure C.11)	There will likely be an indirect impact on flow across the headwaters of the catchment as a result of the diversion and possible concentration of surface flows off the road and down the slopes of the upper section of the catchment. This has the potential to affect the springs associated with Wetlands 42 and 43 as well as the wetlands themselves. Elevated flows down the catchment slopes as a result of flow concentration and point discharges would likely result in erosion gullies developing on the moist slopes, causing the slopes to drain and changing the hydrology of the upper catchment. This will have negative flow consequences down the valley affecting the streams that drain this area.	• Prevent the concentration of surface runoff flows from the road along drainage paths within the upper section of the catchment. • Prevent erosion and the development of erosion gullies down the steep moist slopes of the upper catchment during all phases of the construction and maintenance of the road.
Wetland 44, 45, 46, 47 and 48 (Sheetrock), Wetland 49 (Seep), Wetland 50 (Sheetrock) and Seeps kp 28.40 to 29.66 (Figure C.12)	There will be a direct impact on Wetland 47 and parts of Wetland 48 with some habitat loss and a direct and indirect impact on interflow with the likely cutting off of some interflow in Wetland 47. There will likely also be an indirect impact on surface flows that may impact Wetlands 44, 46, 49 and 50 as a result of the diversion and possible concentration of surface flows off the road and down the slopes of the upper sections of the catchments that feed these wetlands. Elevated flows down the catchment slopes as a result of flow concentration and point discharges would likely result in erosion gullies developing on the moist slopes, that feed Wetland 49 in particular causing the slopes to drain, changing the hydrology of the upper catchment., and eroding out Wetland 49. What appear to be artesian springs emerge at Wetland 49, likely fed by the moist slopes above which are currently not eroding. Elevated flows from point source discharges off the road	• Protect as much of sheetrock Wetland 47 and the affected parts of Wetland 48 as possible by restricting construction to the road servitude and not the build line. • It is also important that interflow is allowed to continue under the road immediately above Wetland 47 in order to protect the remaining sections of the wetland. No construction activities, lay down areas, borrow pits or any other related disturbance should be allowed in this area including in the flat drier sheetrock areas that lie adjacent to the wetlands. Erosion and sedimentation must also be prevented during all phases of the construction and maintenance of the road across this section.

Wetland Name, Type and Approximate Distance Along Road (kp)	Likely Impact and Consequences for the Affected Wetlands	Mitigation Objectives
	will in turn also have negative flow consequences further down the valley affecting Wetland 50 and the downslope Seeps as well as the stream that drains Wetland 51.	
Stream habitats downstream of Wetland 51 (Valley Bottom) kp 29.69 to 29.92 (Figure C.12)	There is likely to be an indirect impact on flow as a result of the diversion and possible concentration of surface flows off the road and down the slopes into the drainage line (stream) that forms part of Wetland 51.	• Prevent the concentration and discharge of surface runoff flows from the road down the steep slopes above the drainage line/stream below Wetland 51. • Prevent erosion of the steep slopes above the drainage line during all phases of the construction and maintenance of the road.
Wetland 51 (Valley Bottom) kp 30.00 to 30.05 (Figure C.12)	There will be a direct impact on the drainage line below Wetland 51 where the road crosses the system. There is also likely to be an indirect impact on flow as a result of the diversion and possible concentration of surface flows off the road and down the slopes into the drainage line (stream) that forms part of Wetland 51.	• Protect the wetland and stream habitat as far as possible by restricting road construction to the road servitude only and not the build line over the crossing of the drainage line/stream. • Prevent the concentration of surface runoff flows at the road crossing of the drainage line/stream. Allow for the spreading of surface flows across the drainage line at the road crossing. • Prevent erosion and sedimentation of the drainage line below Wetland 51 during all phases of the construction and maintenance of the road.
Stream habitats downstream of Wetland 52 (Seep) kp 30.80 to 31.98 (Figure C.13)	While there is unlikely to be any impact on a Wetland 52 as a result of the road as it is located the other side of the stream, it is nevertheless considered important to point out that provisions should be put in place to protect this system from any indirect or direct road related impacts. There will be a direct impact on a sheetrock system with the loss of the associated wet habitats as the road servitude goes over the system. There will likely be a direct impact on the drainage line below Wetland 52 where the road servitude or build line goes into the drainage line. There is also likely to be an indirect impact on flow as a result of the diversion and possible concentration of surface flows off the road and down the slopes into the drainage line and associated stream habitats.	• For Wetland 52, protect the wetland by not allowing any construction activities close to the system including limiting the construction footprint to the road servitude only, avoiding using the full build line. This will also help protect the stream habitats immediately downslope of the wetland. • For the sheetrock system, ensure the protection of any important plant species that may be associated with the system and associated sheetrock habitats. • Protect the stream habitat below Wetland 52 as far as possible by restricting road construction to the road servitude only and not the build line along the drainage line (on the northern side of the road). • Prevent the concentration of surface runoff flows into the drainage line/stream. Prevent erosion and sedimentation of the drainage line along this section of the road during all phases of the construction and maintenance of the road.
Wetland 53 (Valley Bottom and Seeps) kp 32.00 to 32.05 (Figure C.13)	There will be a direct impact on the lower section of Wetland 53 with some habitat loss and both a direct and indirect impact on surface and sub-surface flow through the system. While there is unlikely to be any impact on a Wetland 54 as a result of the road as it is located the other side of the stream, it is nevertheless considered important to point out that provisions should be put in place to protect this system from any indirect or direct road related impacts.	• Protect as much of the remaining wetland habitat as possible by restricting the road build line to the road servitude only over the crossing of the wetland. • Allow for the spreading of surface flows across the wetland at the road crossing. • Prevent the development of headcutting below and above the road crossing. • Prevent disturbance of wetland habitats and erosion and sedimentation of the wetland during all phases of the construction and maintenance of the road.

Wetland Name, Type and Approximate Distance Along Road (kp)	Likely Impact and Consequences for the Affected Wetlands	Mitigation Objectives
		• Stabilise the erosion gully running down the eastern side of the system. • Protect Wetland 54 by not allowing any construction activities close to the system including limiting the construction footprint to the road servitude only, avoiding using the full build line. This will also help protect the stream habitats immediately downslope of the wetland.
Stream habitats downstream of Wetlands 53 and 54 kp 32.06 to 33.60 (Figure C.14)	There will be a direct impact on the drainage line below Wetlands 53 and 54 where the road servitude or build line goes into the drainage line. There is also likely to be an indirect impact on flow as a result of the diversion and possible concentration of surface flows off the road and down the slopes into the drainage line and associated stream habitats.	• Protect the stream habitat as far as possible by restricting the road construction to the road servitude only and not the build line along the drainage line (on the northern side of the road). • Prevent the concentration of surface runoff flows into the drainage line/stream. • Prevent erosion and sedimentation of the drainage line along this section of the road during all phases of the construction and maintenance of the road.

Figure C.1 Map showing the Location of Wetland 01 and the ~kp Distance Across Which Specific Mitigation Measures are Recommended.
The dark blue arrows indicate surface flow direction from the road where there is risk to wetlands and streams from the concentration of flow and resulting erosion, while the thick light blue arrows indicate possible interflow disruption.

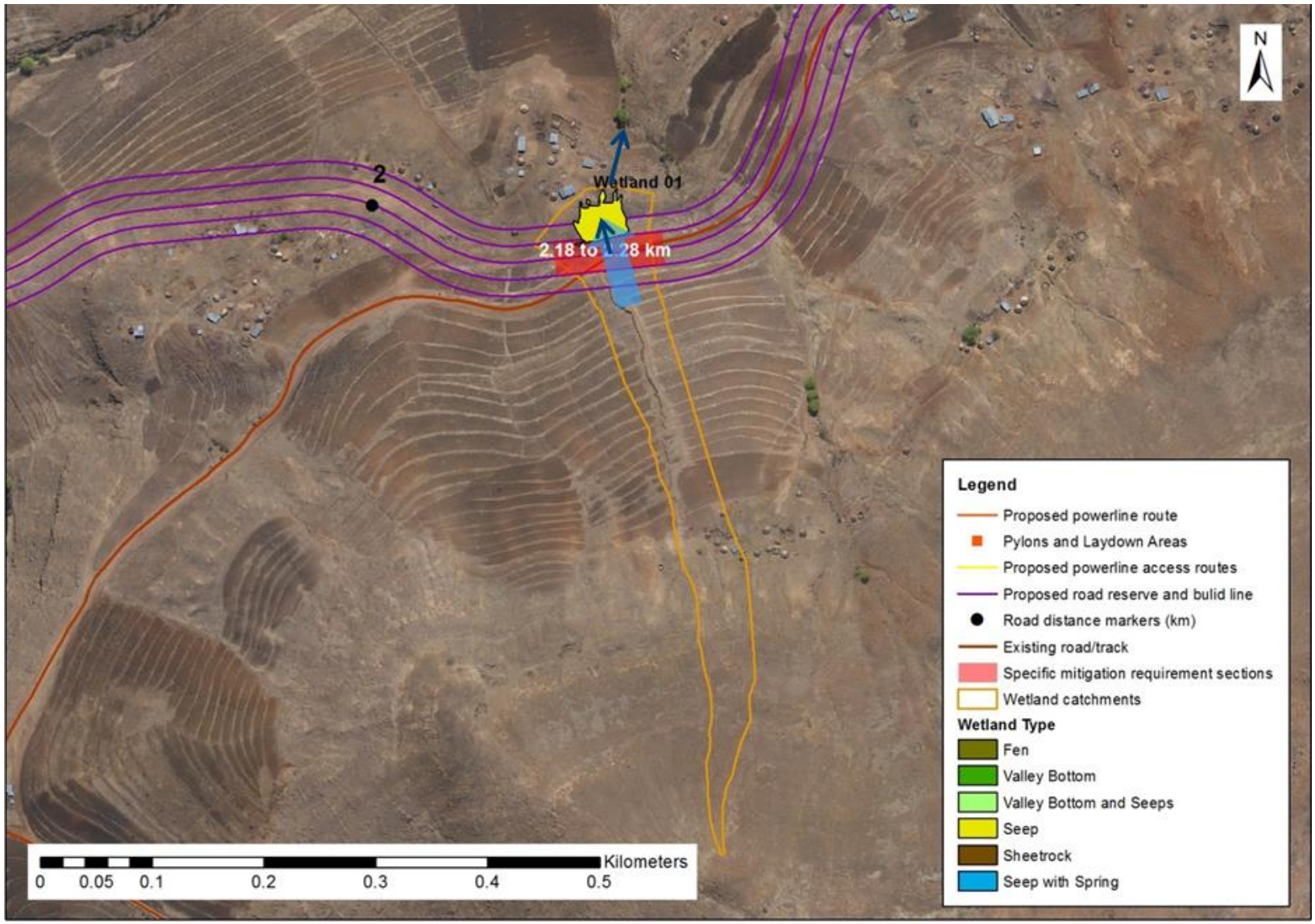


Figure C.2 Map Showing the Location of Wetlands 02 to 08 and the ~kp Distances Across Which Specific Mitigation Measures are Recommended.
The dark blue arrows indicate surface flow direction from the road where there is risk to wetlands and streams from the concentration of flow and resulting erosion, while the thick light blue arrows indicate possible interflow disruption.

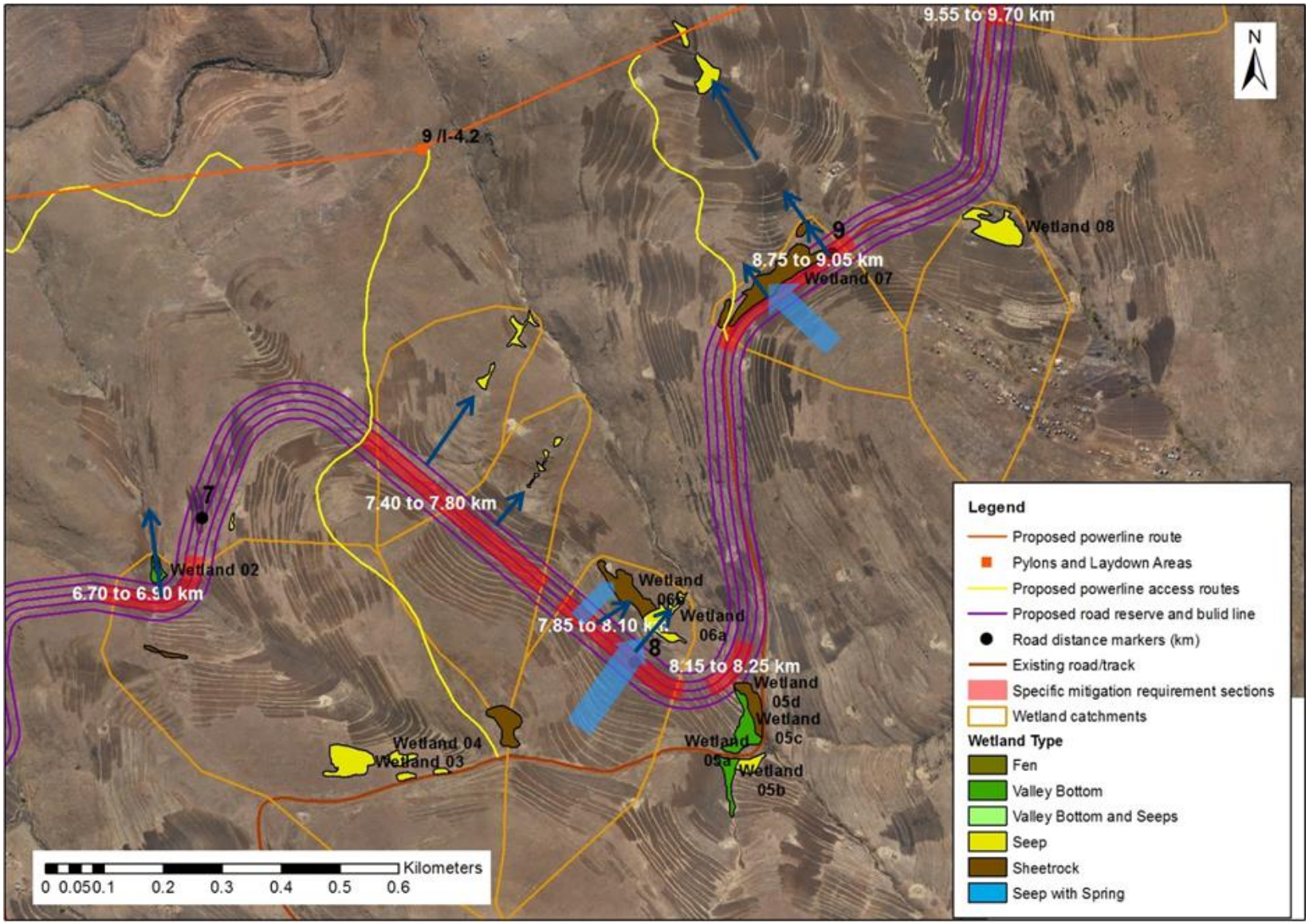


Figure C.3 Map showing the location of Wetlands 09 to 14 and the ~ kp Distances Across Which Specific Mitigation Measures are Recommended.
The dark blue arrows indicate surface flow direction from the road where there is risk to wetlands and streams from the concentration of flow and resulting erosion, while the thick light blue arrows indicate possible interflow disruption.

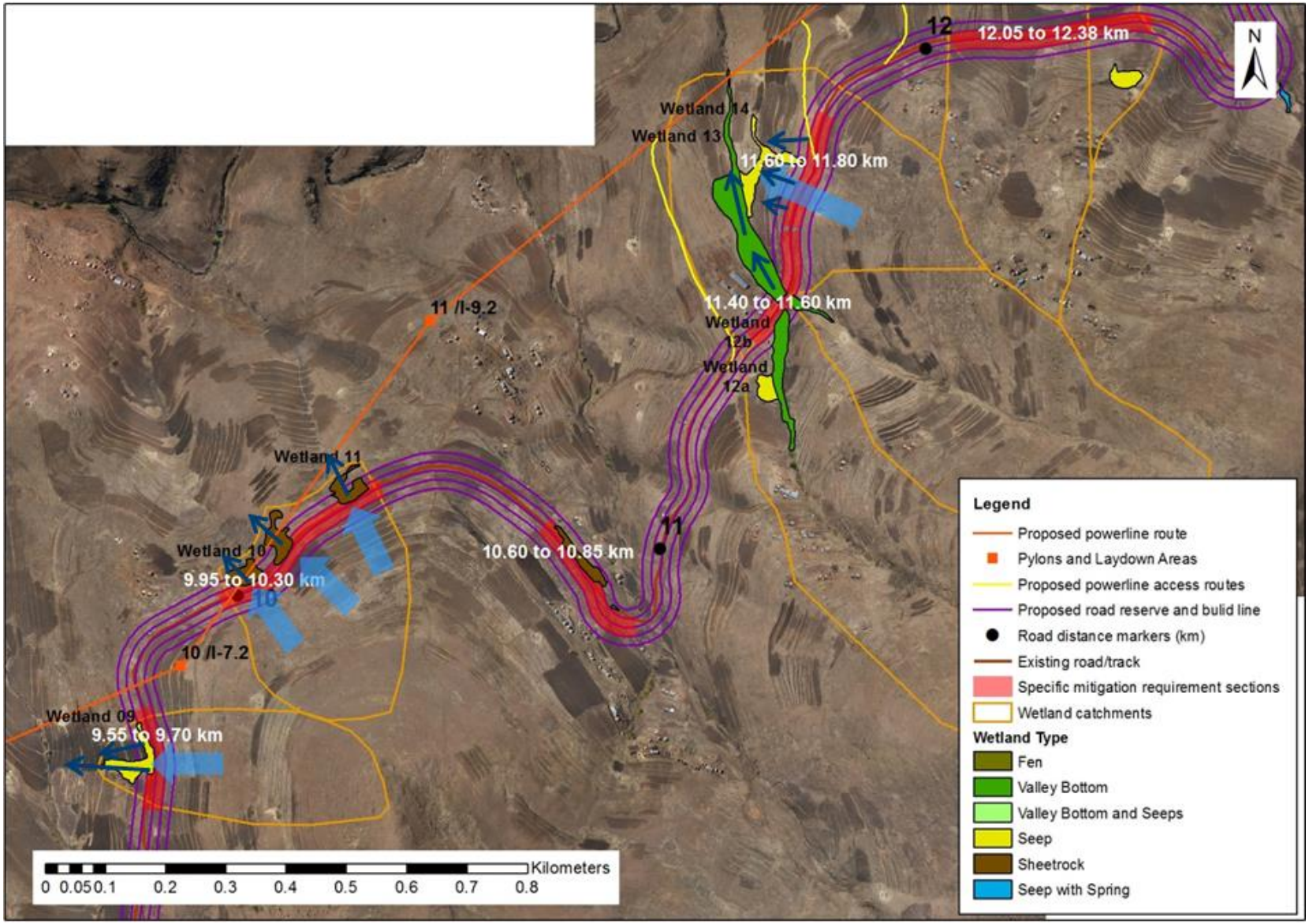


Figure C.4 Map showing the location of Wetlands 15 to 19 and the ~ kp Distances Across Which Specific Mitigation Measures are Recommended.
The dark blue arrows indicate surface flow direction from the road where there is risk to wetlands and streams from the concentration of flow and resulting erosion, while the thick light blue arrows indicate possible interflow disruption.

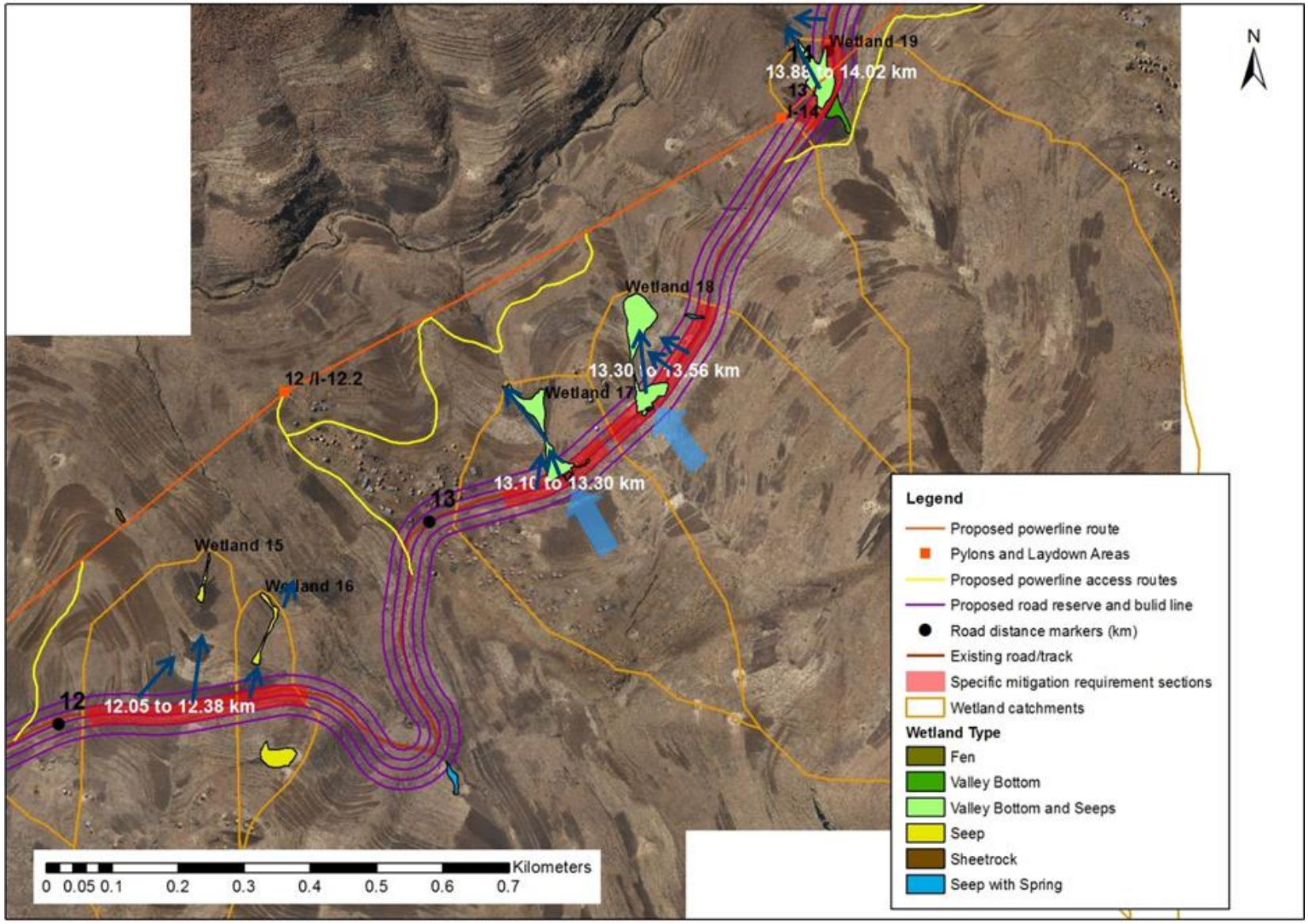


Figure C.5 Map showing the location of Wetlands 20, 21 and a Sheetrock System and the ~ kp Distances Across Which Specific Mitigation Measures are Recommended.

The dark blue arrows indicate surface flow direction from the road where there is risk to wetlands and streams from the concentration of flow and resulting erosion, while the thick light blue arrows indicate possible interflow disruption.

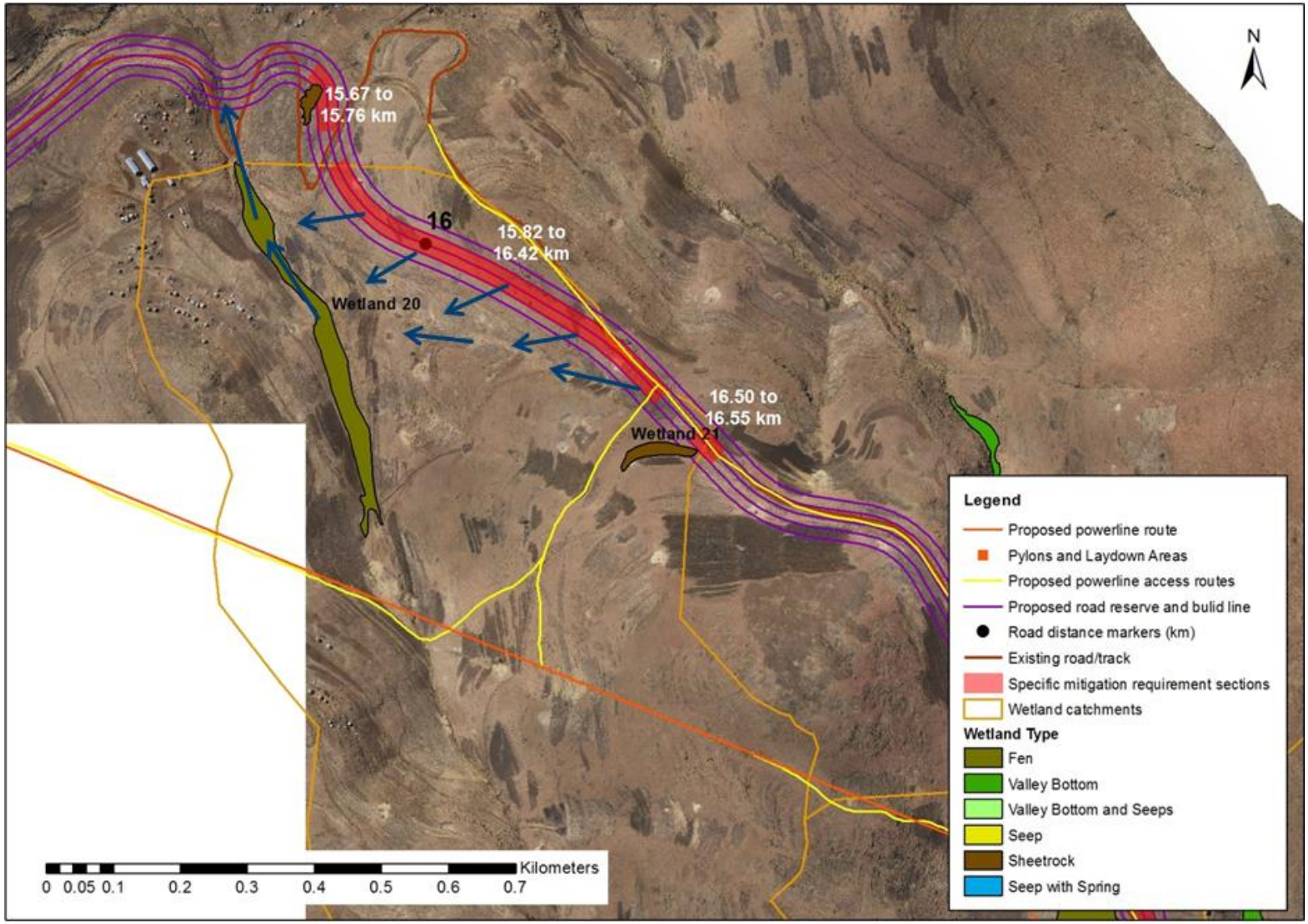


Figure C.6 Map showing the location of Wetlands 22 to 24 and the ~ kp Distances Across Which Specific Mitigation Measures are Recommended.
The dark blue arrows indicate surface flow direction from the road where there is risk to wetlands and streams from the concentration of flow and resulting erosion, while the thick light blue arrows indicate possible interflow disruption.

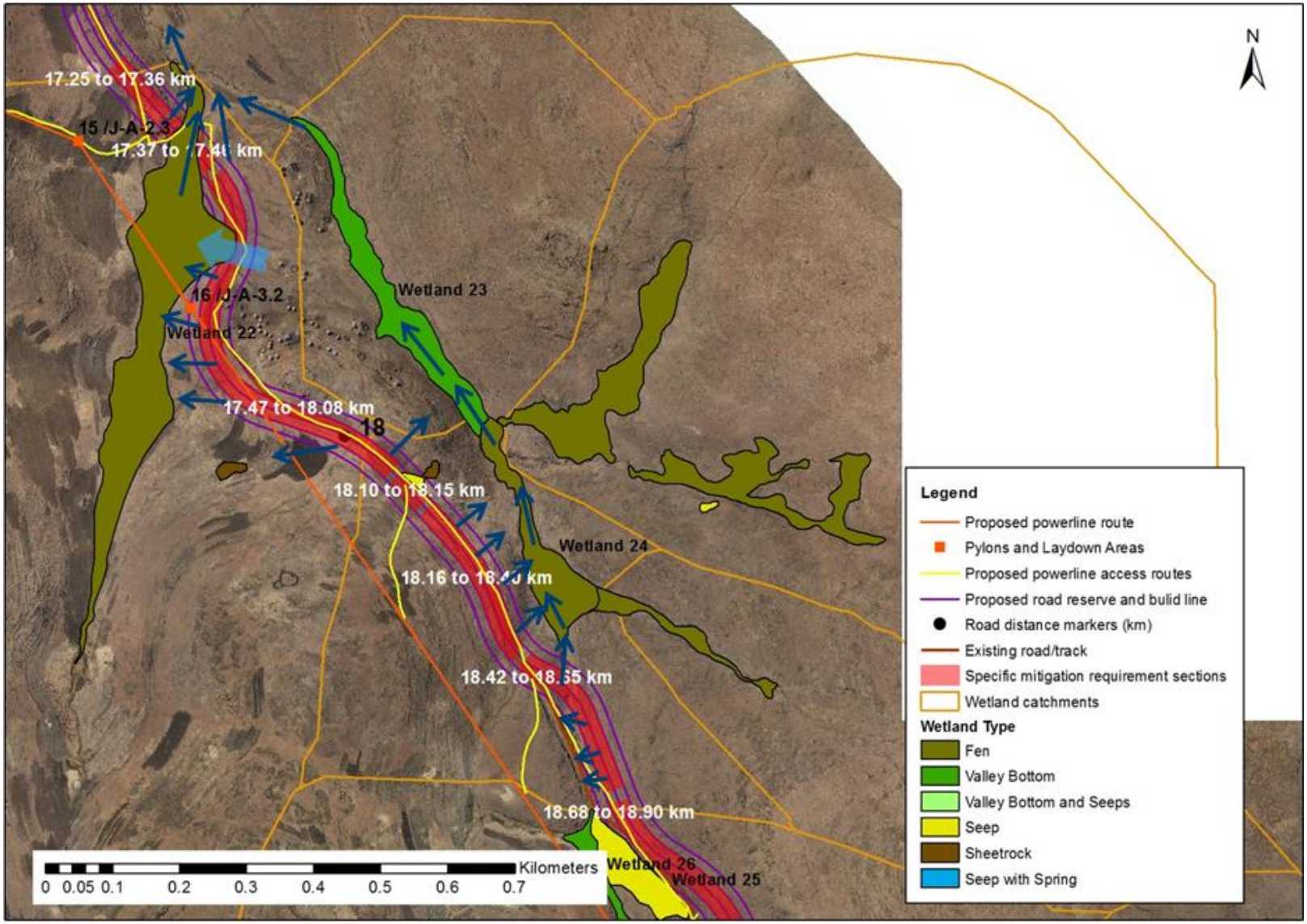


Figure C.7 Map showing the location of Wetlands 25 to 27 and the ~ kp Distances Across Which Specific Mitigation Measures are Recommended.
The dark blue arrows indicate surface flow direction from the road where there is risk to wetlands and streams from the concentration of flow and resulting erosion, while the thick light blue arrows indicate possible interflow disruption.

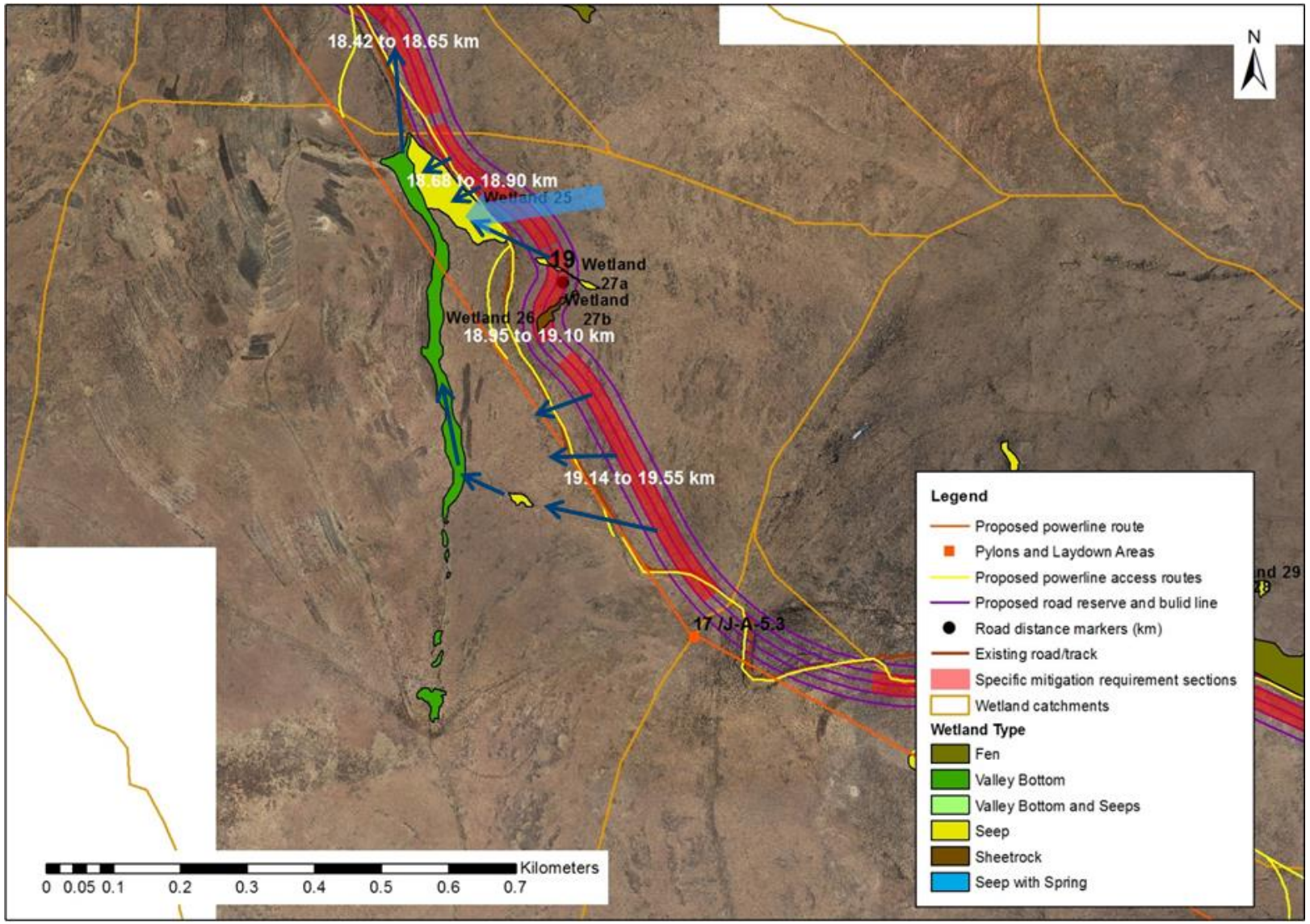


Figure C.8 Map showing the location of Wetlands 28 to 30 and the ~ kp Distances Across Which Specific Mitigation Measures are Recommended.
The dark blue arrows indicate surface flow direction from the road where there is risk to wetlands and streams from the concentration of flow and resulting erosion, while the thick light blue arrows indicate possible interflow disruption.

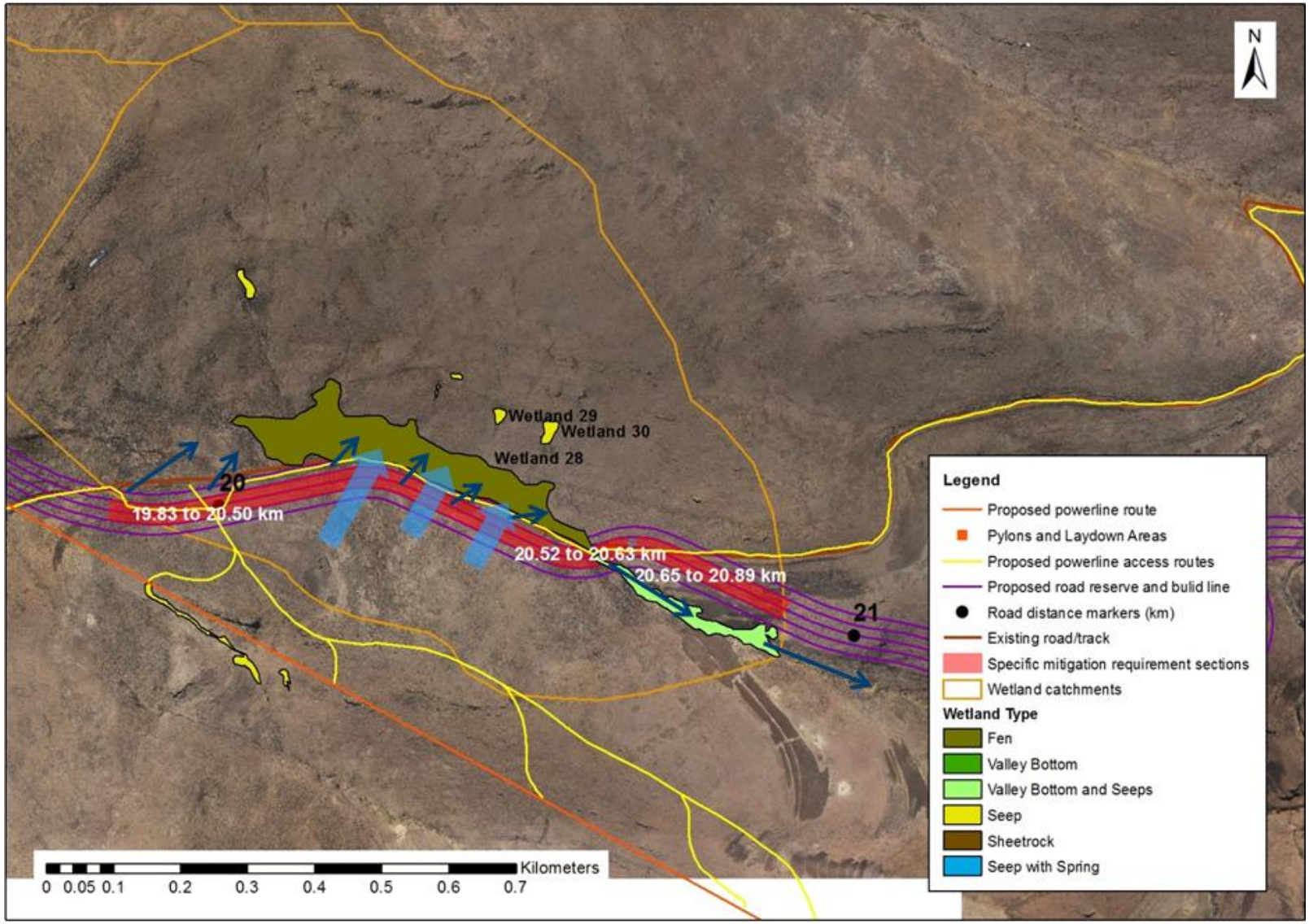


Figure C.9 Map showing the location of Wetlands 31 to 33 and the ~ kp Distances Across Which Specific Mitigation Measures are Recommended.
The dark blue arrows indicate surface flow direction from the road where there is risk to wetlands and streams from the concentration of flow and resulting erosion, while the thick light blue arrows indicate possible interflow disruption.

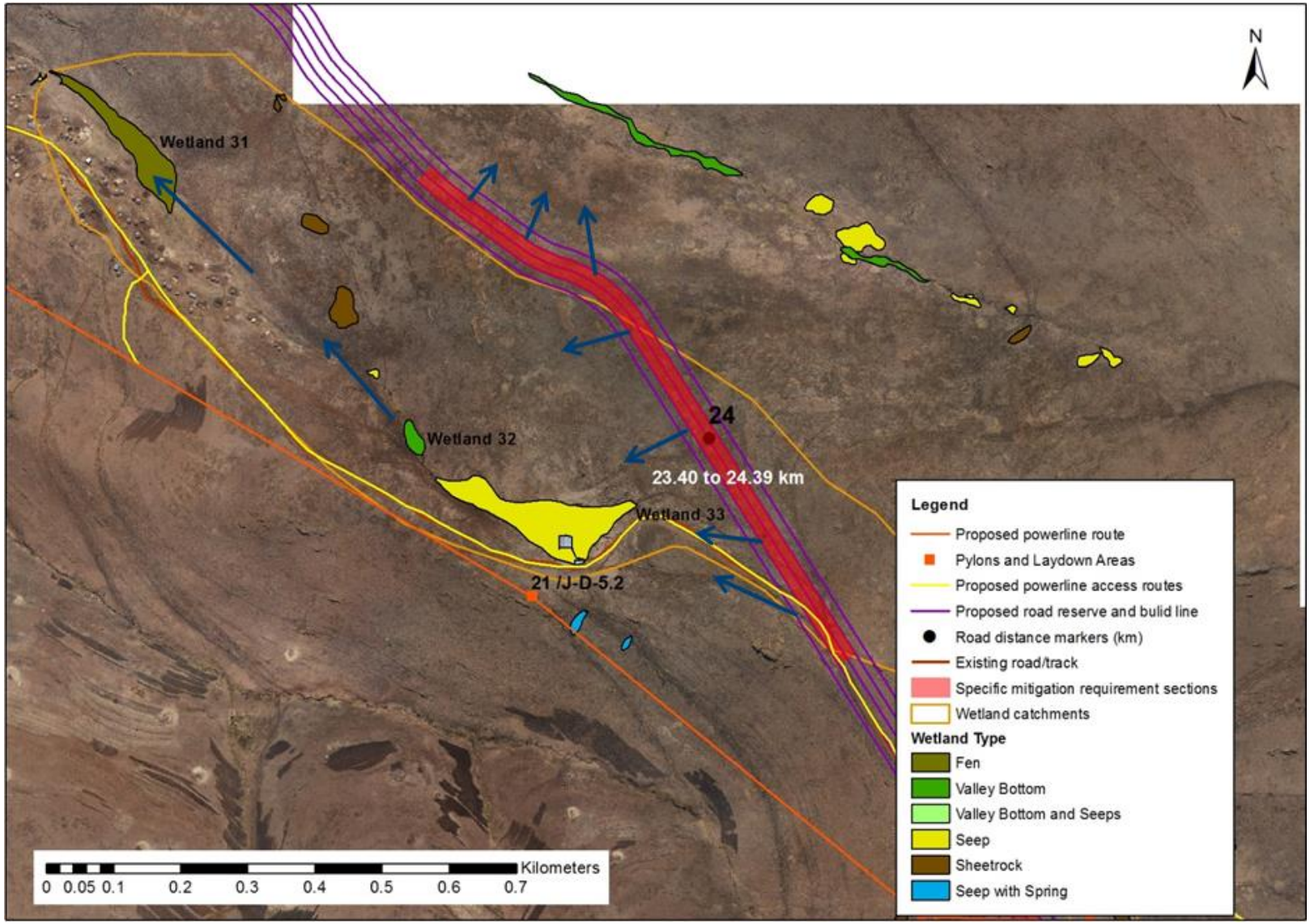


Figure C.10 Map showing the location of Wetlands 34 to 36 and the ~ kp Distances Across Which Specific Mitigation Measures are Recommended.
The dark blue arrows indicate surface flow direction from the road where there is risk to wetlands and streams from the concentration of flow and resulting erosion, while the thick light blue arrows indicate possible interflow disruption.

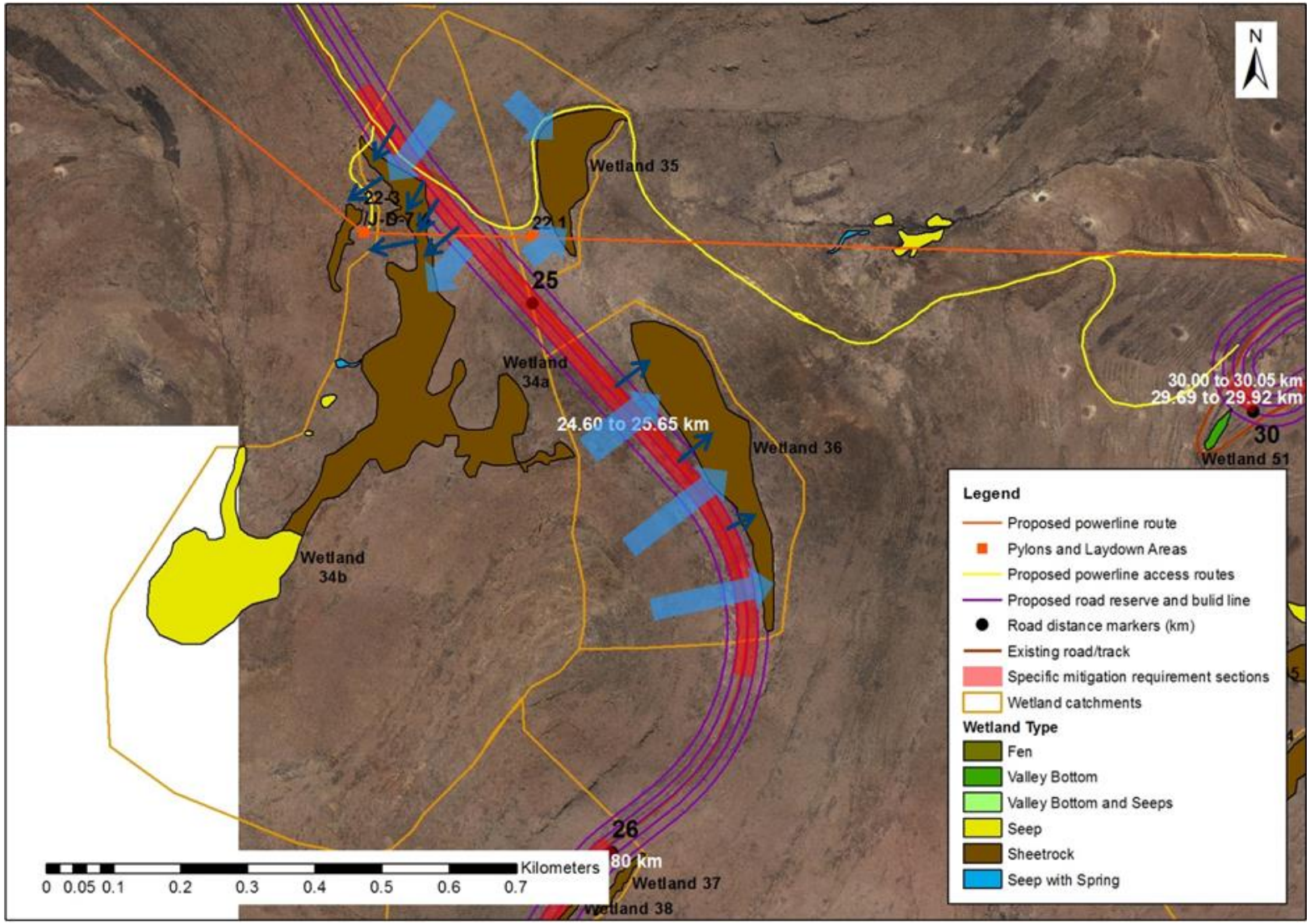


Figure C.11 Map showing the location of Wetlands 37 to 43 and the ~ kp Distances Across Which Specific Mitigation Measures are Recommended.
The dark blue arrows indicate surface flow direction from the road where there is risk to wetlands and streams from the concentration of flow and resulting erosion, while the thick light blue arrows indicate possible interflow disruption.

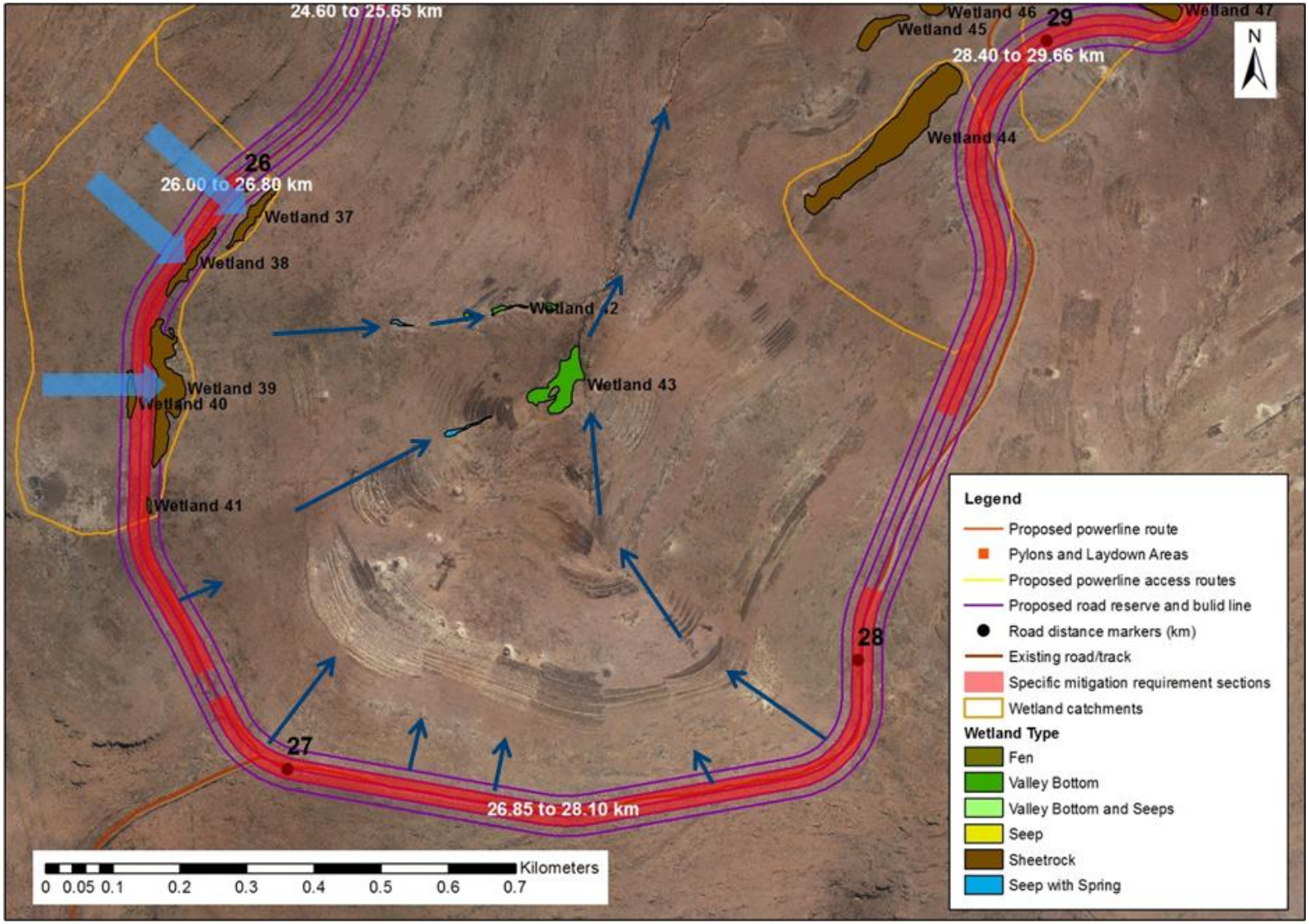


Figure C.12 Map showing the location of Wetlands 44 to 51 and the ~ kp Distances Across Which Specific Mitigation Measures are Recommended.
The dark blue arrows indicate surface flow direction from the road where there is risk to wetlands and streams from the concentration of flow and resulting erosion, while the thick light blue arrows indicate possible interflow disruption.

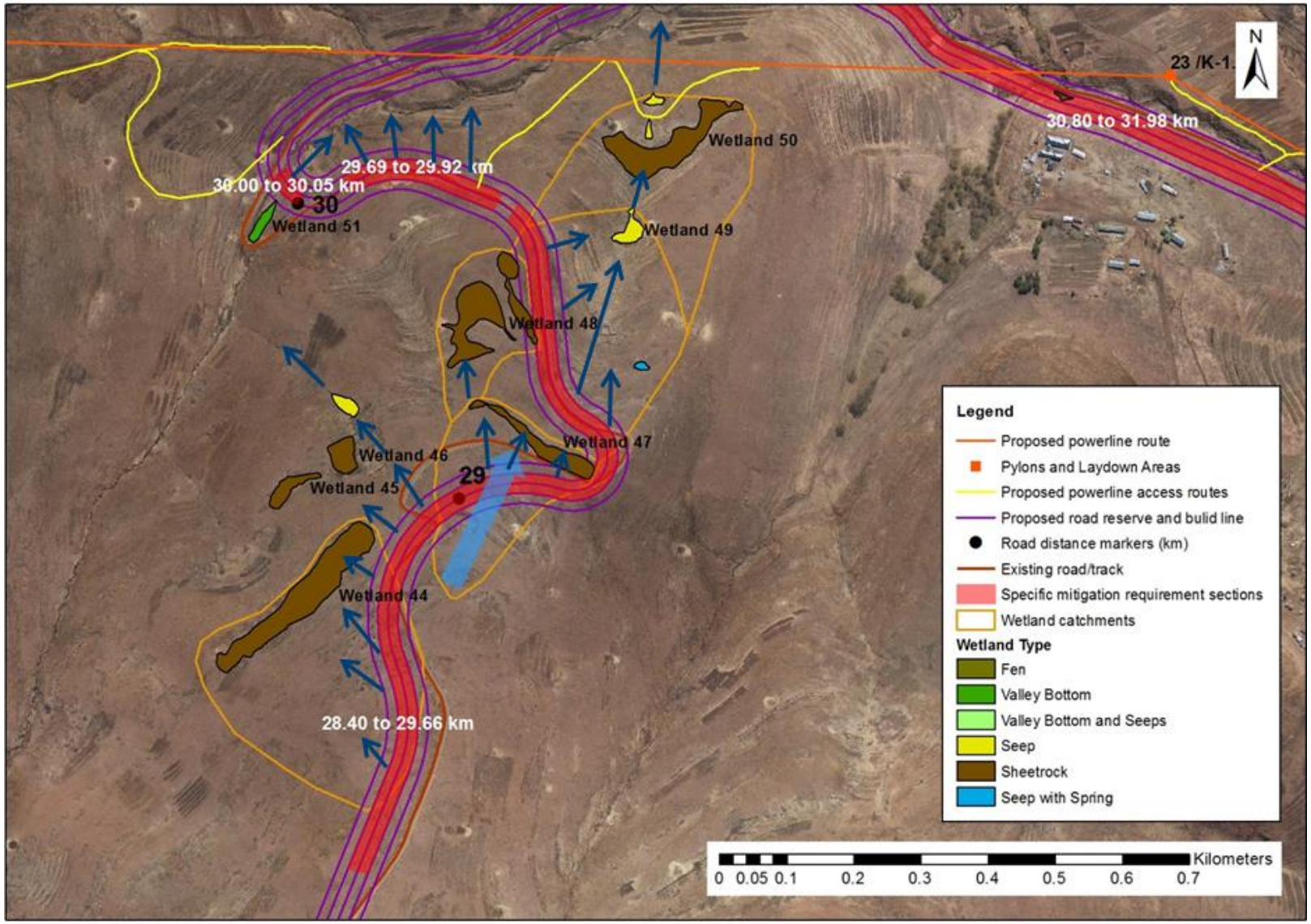


Figure C.13 Map showing the Location of Wetlands 52 to 54 and the ~ kp Distances Across Which Specific Mitigation Measures are Recommended.
The dark blue arrows indicate surface flow direction from the road where there is risk to wetlands and streams from the concentration of flow and resulting erosion, while the thick light blue arrows indicate possible interflow disruption.

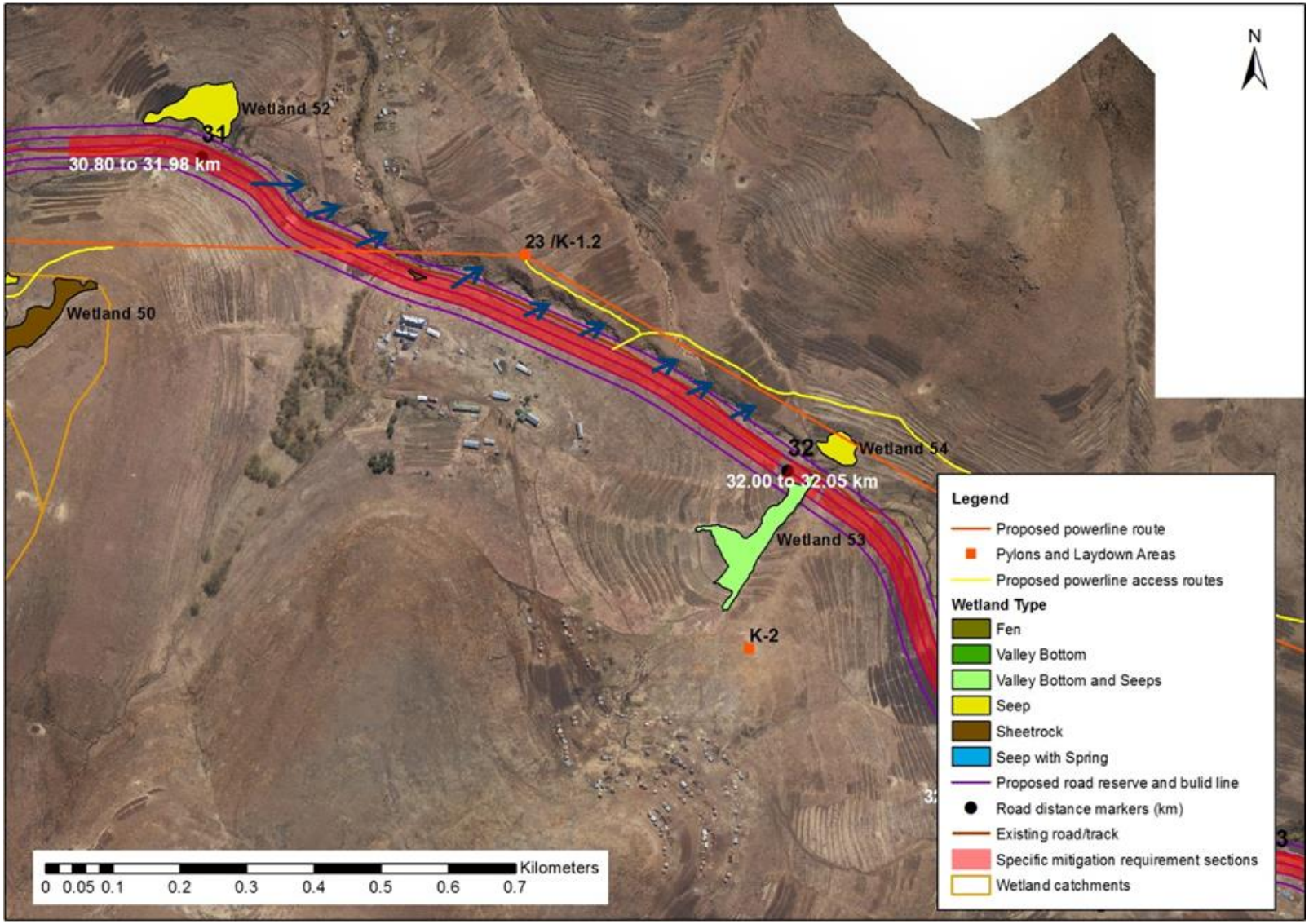
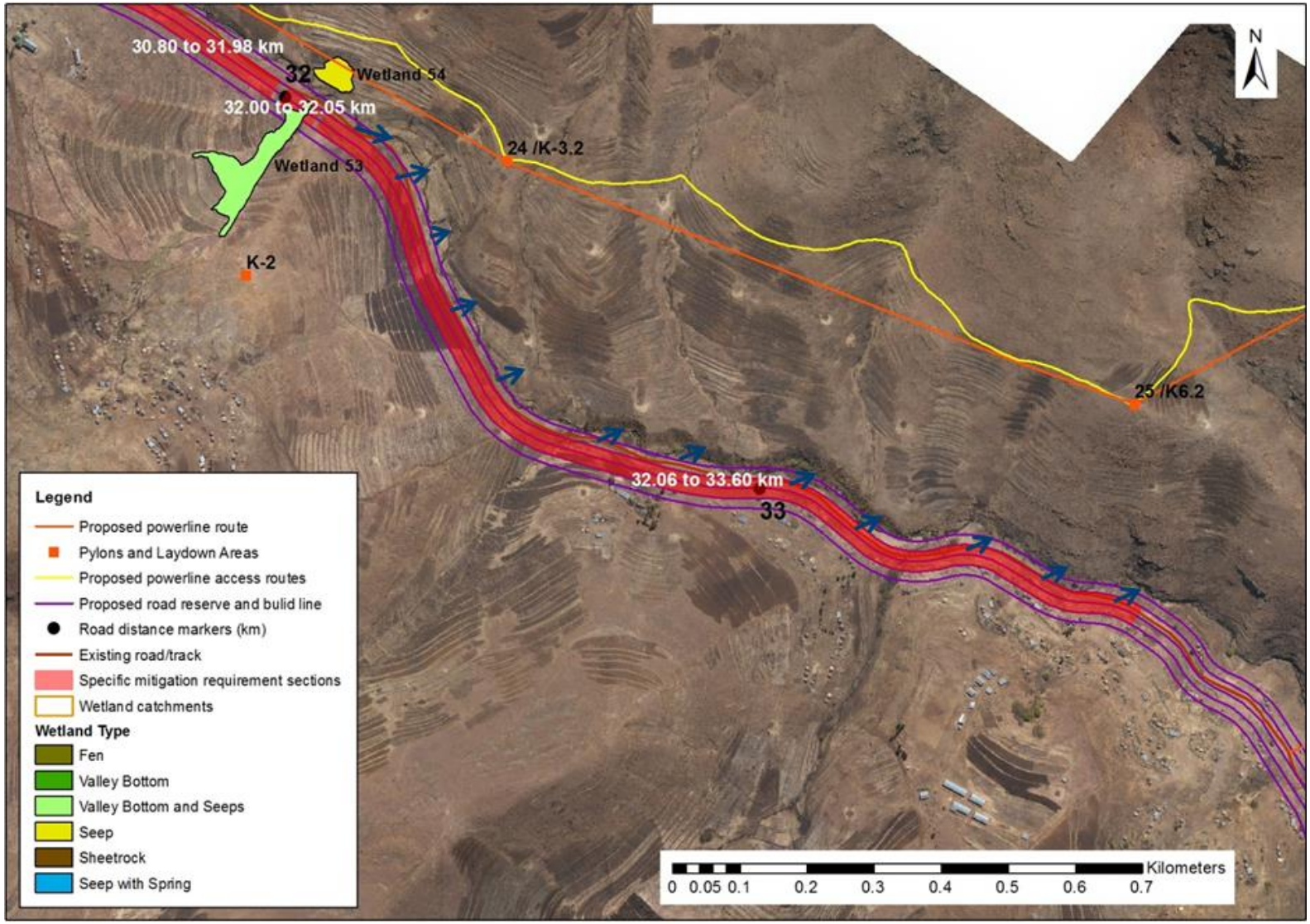


Figure C.14 Map Showing and the ~kp Distances Across Which Specific Mitigation Measures are Recommended to Minimise the Impact of the Road on the Drainage Line and Stream Habitats Associated with, and Downstream of, Wetlands 51 to 54.

The dark blue arrows indicate surface flow direction from the road where there is risk to wetlands and streams from the concentration of flow and resulting erosion, while the thick light blue arrows indicate possible interflow disruption.



Appendix D: Cultural Heritage Confirmed During Surveys (Locations, Map and Photos)

Table D.1 Cultural Heritage Sites Confirmed Along the PWAR and the Estimated Risk from the Project

Reference Numbers			Village / Location	Type of Feature	Importance	Proximity to PWAR	Estimated Risk	Estimated Avoidability	Latitude (WGS84)	Longitude	Altitude	Comment or description
Map No.	Pinto site	Photo Ref										
1		1	Ha Seshote	Graveyard	High	Outside BRA	Low	Avoidable	29°16.339	28°33.072	2189 m	
2	A69	2	Ha Seshote	Graveyard	Very High	Outside BRA	Low	Avoidable	29°16.574	28°33.555	2102 m	Cemetery Ha Seshote catholic mission: at least 20 graves formalised with railings & headstones, near stream.
3		3	Ha Seshote	Graveyard	High	Outside BRA	Low	Avoidable	29°16.582	28°33.357	2119 m	
4		4	Matsoku River (Khopung)	Waterfall	Low	Outside BRA	Low	Not affected	29°20'29.20	28°35'59.62	1980 m	
5	B56	No pic	Phakoeng	Graveyard	High	Within RR	High	Affected	29°16.232	28° 34.715	2120 m	Active cemetery facing NW close to centre of Phakoeng, adjacent to existing road on E side. Site is 42m x 37 m. Has ~80 well marked graves aligned SE-NW. Most graves marked with rocks at each end and dry-stone revetment around the foot or entire edge of grave; some formalised with inscribed headstones, cut-stone blocks, and/ or concrete capping of the grave. Four are recent graves. PWAR located 13 m NW of the cemetery.
6		5	Phakoeng	Graveyard	High	Within RR	High	Affected	29° 16.185	28°35.093	2123 m	
7		6	Phakoeng	Ruins	Low	Outside BRA	None	Avoidable (on old road)	29°16.682	28°34.018	2115 m	
8		7	Phakoeng	Ruins	Low	Outside BRA	None	Avoidable (on old road)	29°16.772	28°33.942'	2115 m	
9		8	Ha Salemone	Graveyard	High	Outside BRA	Low	Avoidable	29°16.818	28°36.438'	2382 m	Graveyard (Bahaoleng)
10		9	Ha Salemone	Graveyard	High	Outside BRA	Medium	Near or in powerline laydown area	29°15.992	28°35.967	2188 m	Graveyard (Ha Lekima)
11		10	Ha Salemone	Useful plants	Moderate	Outside BRA	Low	Avoided by road. May be affected by powerline access	29°16.418	28°36.743	2437 m	Useful plants (Moloballa / Medicinal Plants)

Reference Numbers			Village / Location	Type of Feature	Importance	Proximity to PWAR	Estimated Risk	Estimated Avoidability	Latitude (WGS84)	Longitude	Altitude	Comment or description
Map No.	Pinto site	Photo Ref										
12		11 &12	Ha Semphi	Botanical garden	Moderate	Edge of BRA	Low	Avoidable	29°15.514	28°37.763	2440 m	Rameno botanical garden
13		13	Ha Semphi	Graveyard	High	Beyond BRA	Low	Avoidable	29°15.647	28°37.861	2462 m	
14		14	Ha Ratau	Ruins	Low	Within RR	Low	Probably avoidable	29°14.230	28°39.149	2467 m	Ruins (Makhuleng)
15		No pic	Ha Thene	Useful plants	Moderate	Within RR	Low	Avoidable	29°14.660	28°40.343	2643 m	Useful plants (Roro / grass for weaving)
16	B55	17	Ha Thene	Graveyard	Very High	Outside BRA	Low	Avoidable	29°14.966	28°40.597	2682 m	Cemetery of Ha Theme village: >30 graves marked with boulders, 2 recent. Located on a NE facing slope close to ridge-line. Existing road passes 26 m to the SW.
17		No pic	Semenanyane valley	View site	Moderate			Layby / view site	29°15.528	28°40.979	2804 m	View site
18		19	Masalla (Makhoaba)	Graveyard	High	Within RR	Moderate	Likely to be affected	29°17.258	28°46.076	2318 m	
19	A66	20 & 21	Masalla (Makhoaba)	Graveyard	Very High	Within RR	High	Affected	29°17.234	28°45.984	2321 m	Cemetery of Masalla village: (>40 graves most marked with boulders, 4 with railings)
20		22	Masalla (Makhoaba)	Graveyard	Very High	Within RR	High	Likely Affected	29°17.443	28°46.257	2278 m	
21	A67	23	Masalla (Makhoaba)	Graveyard	Very High	Within RR	High	Affected	29°16.676	28°44.884	2485 m	Cemetery of Masalla village: active cemetery (at least 80 graves marked with rocks; 42x20 m area)
22		24	Masalla (Makhoaba)	Graves	High	Within RR	Moderate	Avoidable	29°17.205	28°45.847	2340 m	
23		25	Masalla (Makhoaba)	Ash heap	Moderate	Within RR	High	Likely to be affected	29°17.169	28°45.774	2347 m	Ash heap (Jalbert Leluka)
24		26	Masalla (Makhoaba)	Ash heap	Moderate	Within RR	High	Likely to be affected	29°17.215	28°45.927	2341 m	Ash heap 2 (Mositsane Khauli)
25		27	Masalla (Makhoaba)	Ash heap	Moderate	Within 10 m	High	Likely to be affected	29°17.235	28°45.971	2325 m	Ash heap 3 (Motseke Tšukulu)
26		28	Masalla (Makhoaba)	Ash heap	Moderate	Within RR	Low	Avoidable	29°17.264	28°46.003	2324 m	Ash heap 4 ('Makhosi Selialia)
27		29	Masalla (Makhoaba)	Ash heap	Moderate	Within RR	High	Likely to be affected	29°17.257	28°46.058	2320 m	Ash heap 5 (Keketso Khutlisi)
28	A54	30	Masalla (Makhoaba)	Ash heap	Moderate	Within RR	High	Likely to be affected	29°17.258	28°46.060	2319 m	Ash heap 6 ('Mahlokomelang Leluka)
29		31	Masalla	Ash heap	Moderate	Within RR	High	Likely to be	29°17.277	28°46.092	2315 m	Ash heap 7 (Mathang Malefane)

Reference Numbers			Village / Location	Type of Feature	Importance	Proximity to PWAR	Estimated Risk	Estimated Avoidability	Latitude (WGS84)	Longitude	Altitude	Comment or description
Map No.	Pinto site	Photo Ref										
			(Makhoaba)					affected				
30		32	Masalla (Makhoaba)	Ash heap	Moderate	Within RR	Moderate	Possibly avoidable	29°17.303	28°46.132	2304 m	Ash heap 8 ('Makhokeho Selialia)
31		33	Masalla (Makhoaba)	Ash heap	Moderate	Within RR	Moderate	Possibly avoidable	29°17.314	28°46.122	2309 m	Ash heap 9 ('Makhethang Malefane)
32		34	Masalla (Makhoaba)	Ash heap	Moderate	Within RR	Moderate	Avoidable	29°17.416	28°46.216	2303 m	Ash heap 10 (Molefi Khutlisi)
33		35	Ha Seotsanyana	Ash heap	Moderate	Within BRA	Moderate	Avoidable	29°18.178	28°46.508	2213 m	Ash heap ('Maleeto Sesioana)
34		36	Ha Seotsanyana	Ash heap	Moderate	Outside BRA	None	Not affected	29°18.199	28°46.506	2212 m	Ash heap (Leeto Sesioana)
35		37	Makhiseng	Ash heap	Moderate	Outside BRA	None	Not affected	29°18.571	28°46.850	2210 m	Ash Heap ('Mantlatseng Selialia)
36		38	Makhiseng	Old graveyard	High	Outside BRA	None	Not affected	29°18.850	28°46.683	2183 m	
37		39	Makhiseng	Old graveyard	High	Within RR	Moderate	Potentially Affected	29°18.772	28°46.704	2178 m	
38		40	Makhiseng	Ash heap	Moderate	Within RR	High	Affected	29°18.883	28°46.816	2152 m	Ash Heap (Morema Lekete)
39		41	Makhiseng	Ash heap	Moderate	Outside BRA	None	Not affected	29°19.013	28°46.840	2182 m	Ash heap ('Matšolo Ramaema)
40		No pic	Makhiseng	Ash heap	Moderate	Outside BRA	None	Not affected	29°18.909	28°46.618	2209 m	Ash heap (Hlalele Motaung)
41		42	Makhiseng	Ash heap	Moderate	Outside BRA	None	Not affected	29°18.803	28°46.650	2210 m	Ash heap (Lenka Selialia)
42		43	Makhiseng	Ash heap	Moderate	Outside BRA	None	Not affected	29°18.748	28°46.639	2213 m	Ash heap (Ramathe-olane Selialia)
43		44	Makhiseng	Waterfall	Moderate	Outside BRA	Low (no spoil to river)	Avoidable - create view site	29°19.677	28°48.030	2035 m	Lets'a-lea-luma waterfall
44		No pic	Tena-Baphehi	New graveyard	High	Outside BRA	None	Not affected	29°19.916	28°48.352	2138 m	New graveyard
45		44	Ha Mei	Ash Heap	Moderate	Within RR	High	Potentially affected	29°17.299	28°49.510	2307 m	Ash Heap
46	A64	45	Ha Mei	Ash heap	Moderate	Within RR	High	Potentially avoidable	028°40.979	28°49.581	2307 m	Ash heap
47		46	Ha Mei	Spiritual	Moderate	Within RR	High	Potentally avoidable	29°17.299	28°49.510	2307 m	Thakhisa (Lulang Letsika)
48		47	Ha Mei	Graveyard	High	Edge of BRA	Low	Avoidable	29°17.242	28°49.484	2301 m	Graveyard
49		48	Makhoarane (Matikiring)	Graveyard	High	Within RR	High	Not affected	29°16.146	28°49.193	2337 m	Graveyard
50	B53	49	Makhoarane	Ash heap	Moderate	Within RR	Low	Not affected	29°16.655	28°49.932	2301 m	Ash heap (Moshoe-shoe Roelane). 3 infants buried.
51		50	Makhoarane	Ash heap	Moderate	Outside RR	Low	Not affected	29°16.673	28°49.952	2300 m	Ash heap ('Mamontoeli Roelane)
52		52	Makhoarane	Ash heap	Moderate	Outside RR	Low	Not affected	29°16.686	28°49.967	2304 m	Ash heap (Dingaan Thulo)
53		53	Makhoarane	Ash heap	Moderate	Within RR	Moderate	Affected	29°16.689	28°49.993	2308 m	Ash heap ('Mantsiki Thulo)

Reference Numbers			Village / Location	Type of Feature	Importance	Proximity to PWAR	Estimated Risk	Estimated Avoidability	Latitude (WGS84)	Longitude	Altitude	Comment or description
Map No.	Pinto site	Photo Ref										
54		54 & 55	Polihali	Graveyard	High	Outside BRA	None	Not affected	29°17.103	28°51.001	2127 m	Graveyard
55		56	Polihali	Ash heap	Moderate	Outside BRA	None	Not affected	29°17.146	28°51.028	2123 m	Ash heaps (Ramalibo Keqe)
56		No pic	Polihali	Ash heap	Moderate	Outside BRA	None	Not affected	29°17.172	28°51.021	2127 m	Ash Heap of Chief
57		No pic	Polihali	Ash heap	Moderate	Outside BRA	None	Not affected	29°17.025	28°51.121	2115 m	Ash Heap
58		No pic	Polihali	Ash heap	Moderate	Outside BRA	None	Not affected	29°17.051	28°51.069	2118 m	Ash Heap
59	A63	No pic	Polihali	Ash heap	Very low	Within RR	Low	Probably affected	-29.280866	28.852259	2102 m	Ash heap (no burials reported)
60		No pic	Hohobeng (Makhoaba loop)	Ruins	Low	Outside BRA	Low-Mod	Affected?	29°16.754,	28°43.862	2745 m	Ash heap (no burials reported)

Note: all graves and cemeteries are considered of High Importance due to the presence of human remains. The importance of ash heaps is considered of Moderate to High importance but the importance of individual ash heaps requires confirmation of whether they include human remains and whether the extent of cultural attachment by the owners

Figure D.1 Location of Cultural Heritage Sites Recorded within the PWAC

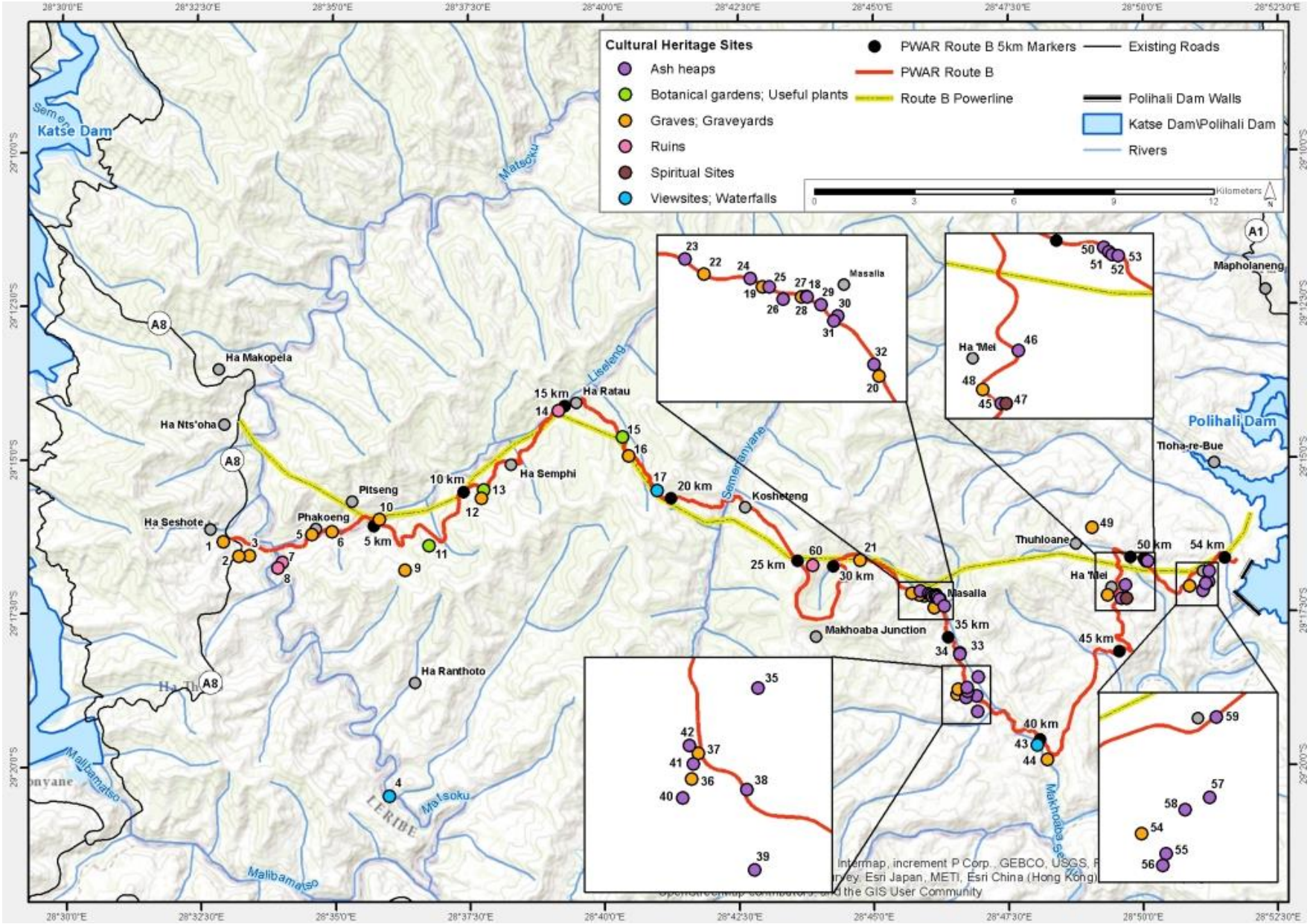


Table D-2 Photo Log of Cultural Heritage Sites

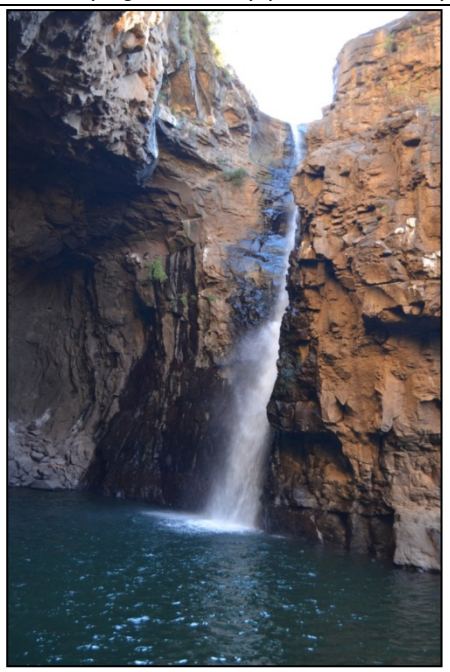
	
Photo 1. Site 1 Graveyard at Ha Seshote	Photo 2. Site 2 Catholic Mission Graveyard No 1 at Ha Seshote (Laghetto RCM) (Source: H Pinto)
	
Photo 3. Site 3 Catholic Mission Graveyard No. 2 at Ha Seshote (Laghetto RCM)	Photo 4. Site 4. Khopung Waterfall and Pool on Matsoku River 11 km downstream of Ha Seshote
	
Site 5 Phakoeng graveyard NOT AVAILABLE	Photo 6. Site 6 Phakoeng graveyard 2

Photo 7. Site 7. Phakoeng Ruins 1 (Ha Mothepu)

Photo 8. Site 8. Phakoeng Ruins 2 (Ha Nyapane Selialia)

Photo 9. Site 9. Ha Salemone – Bahaoleng Graveyard

Photo 10. Site 10. Ha Salemone – Lekima graveyard

Photo 11. Site 11. Ha Salemone – Moloballa Botanical Garden (kp7-8)

Photo 12. Site 12. Ha Semphi – Rameno Botanical Garden

Photo 13. Site 13. Ha Semphi – Graveyard 1

Photo 14. Site 13. Ha Semphi – Graveyard 2

Photo 15. Site 14. Ha Ratau – Ruins

Photo 16. Site 15. Ha Thene – Roro (Sedge)

Photo 17. Site 16. Ha Thene – Graveyard

Photo 18. Site X?. Makhoaba - St Martins RCM Graveyard

Photo 19. Site 18 Masalla / Makhoaba Graveyard 1

Photo 20. Site 19. Masalla / Makhoaba Graveyard 2

Photo 21. Site 19 (?). Masalla graveyard 2 (A66) (H Pinto)

Photo 22. Site 20. Masalla / Makhoaba Graveyard No 3

Photo 23. Site 21. Masalla graveyard 4 (MMA)

Photo 23. Site 24. Masalla graves

Photo 25. Site 23. Masalla / Makhoaba – Jalbert Leluka Ash Heap

Photo 26. Site 24. Masalla / Makhoaba – Mositsane Khauli Ash Heap

Photo 27. Site 25. Masalla / Makhoaba – Motseke Ts'ukulu Ash Heap

Photo 28. Site 26. Masalla / Makhoaba – 'Makhotso Selialia Ash Heap

Photo 29. Site 27. Masalla / Makhoaba – Keketso Khutlisi Ash Heap

Photo 30. Site 28. Masalla / Makhoaba – 'Mahlokomelang Leluka Ash Heap

Photo 31. Site 29. Masalla / Makhoaba – Mathang Malefane Ash Heap

Photo 32. Site 30. Masalla / Makhoaba – 'Makhokeho Selialia Ash Heap

Photo 33. Site 31. Masalla / Makhoaba – 'Makhethang Malefane Ash Heap

Photo 34. Site 32. Masalla - Molefi Khutlisi - Ash Heap

Photo 35. Site 33. Ha Seotsanyana – 'Meleeto Sesioana Ash Heap

Photo 36. Site 34. Ha Seotsanyana – Leeto Sesioana Ash Heap

Photo 37. Site 35. Makhiseng – 'Mantlatseng Selialia Ash Heap (Note: misplaced on map)

Photo 38. Site 36. Makhiseng – Old Graveyard

Photo 39. Site 37. Makhiseng – Old Graveyard 2

Photo 40. Site 38. Makhiseng – Morema Lekete Ash Heap

Photo 41. Site 39. Mats'olo Ramaema Ash Heap

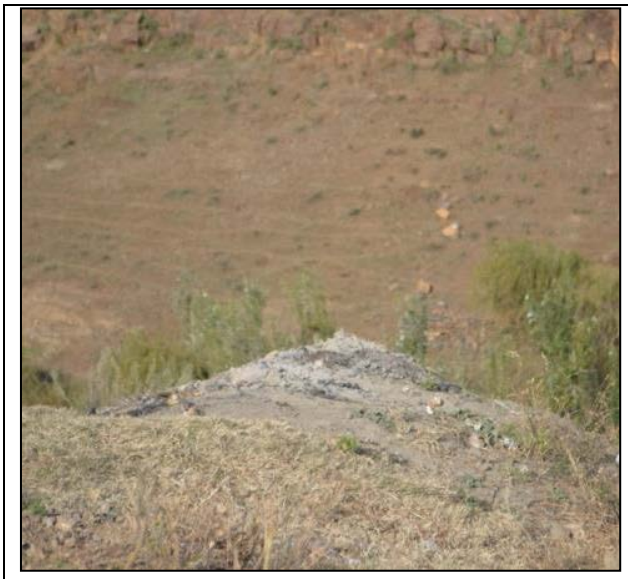


Photo 42. Site 40. Makhiseng – Hlalele Motaung Ash Heap

Photo 43. Site 41. Makhiseng – Lenka Selialia Ash Heap

Site 42 – NOT AVAILABLE

Photo 44. Site 43. Lets'a-lea-luma waterfall (Makhoaba River)

Photo 45. Site 44. Tena-Baphehi – New graveyard

Photo 46. Site 45 & 47. Ha 'Mei – Lulang Letsika Ash Heaps & Thakhisa (stone seen on right side centre)

Photo 47. Site 48. Ha 'Mei – Graveyard

Photo 48. Site 49. Makhoarane – Makokoaneng/Makitiring Graveyard

Photo 49. Site X. Makhoarane – Ash Heap No 1

Photo 50. Site 50. Makhoarane – Moshoeshoe Roelane - Ash Heap No 2

Photo 51. Site 51. Makhoarane – 'Mamontoeli Roelane – Ash Heap No 3

Photo 52. Site 52. Makhoarane – Dingaan Thulo – Ash Heap 4

Photo 53. Site 53. Makhoarane – 'Mantsiki Thulo – Ash Heap 5

Photo 54. Site 54. Polihali – Graveyard

Photo 55. Site 55. Polihali – Ramalibo Keqe – Ash heap

Photo 56. Site 56. Polihali Chief's Ash Heap 1

Photo 57. Site 56. Polihali Chief's Ash Heap 2

Photo 58. Polihali ash heap

Appendix E: Preliminary Chance Finds Procedure

Preliminary Chance Finds Procedure

Background and Objectives

The Project has the potential to disturb or alter unknown archaeological resources (including human remains) inadvertently discovered during construction activities (i.e., Chance Finds). The forthcoming LHWP Contract No. 6025 Cultural Heritage Plan (CHP) is tasked with developing a detailed Chance Finds Procedure (CFP). This document is a preliminary CFP to define the process that governs the management of chance finds that may be discovered during Project construction activities and which shall form part of the Contractors' contractual EMP.

The objectives of the CFP are to:

- Define the procedures to be followed to ensure appropriate management of chance finds, while also minimizing disruption to the construction schedule;
- Provide a consistent approach to chance find management to streamline worker acceptance and compliance; and
- Ensure compliance with relevant Lesotho laws and regulations, and align with local customs and traditional norms.

Identification, Assessment, and Treatment of Potential Chance Finds

Chance finds can be made by anyone on the Project, including archaeologists, non-cultural heritage construction workers, and visitors or guests. The types of cultural heritage that are the most likely to be encountered during construction include.

- Features associated with human occupation, such as ash heaps (middens), hearths, and structural remains, including human habitations, walls. These are typically associated with historical evidence such as pottery, glass, and metal remains;
- Prehistoric or historic human remains found in formal graves, cemeteries, or as isolated occurrences. It must be noted that many graves are often difficult to distinguish to the untrained eye, often appearing as a scatter of rocks in the grassy landscape. However, in practice, they may comprise a stone at one or both ends and often a grassy mound aligned in an east to west direction.
- Artifacts, whole or partial, including ground and chipped stone artifacts, pottery fragments, glass, metal, textiles, and human-modified plant and animal remains; and
- Paleontological resources, including fossilized plant or animal remains or their impressions.

The CFP requires a multi-tiered approach for identifying, assessing, and resolving potential chance finds. The purpose of this approach is to empower a cultural heritage specialist to quickly resolve in the field any finds that are not cultural heritage (i.e., natural objects) and minor chance finds (e.g., modern objects) without necessitating consultations with national level authorities and minimizing construction delays.

All potential chance finds identified by Project personnel will be reported to a Cultural Heritage Specialist (CHS) (appointed by LHDA) who will determine if the potential find is cultural heritage and, if so, assign it to a chance find tier.

Below is a step-by-step description of the CFP to be adhered to in the event of a potential chance find:

- **Stop Work** - In the case of a potential chance find, Contractor will cease work temporarily in the vicinity of the find.
- **Initial Notification** - Construction supervisors, field personnel, and staff will be notified of the stop work. The ECO or CLO will notify the appointed CHS of the potential chance find within 24 hours of the find (if not already aware of it).
- **Demarcation and Site Protection** – Contractor will cordon off an area around the potential chance find, with a minimum buffer of 5 m, and the area will be established as a no-go area / total protection zone to secure the site to prevent disturbance.

  Further measures will be taken to protect the potential chance find, including the installation of warning tape and stakes and/or avoidance signs, as necessary.

- **Notification of Personnel** - All relevant personnel (including Subcontractors) will be notified of the potential chance find if access to any part of the work area is restricted.

- **Evaluation** – A CHS will perform a preliminary evaluation to determine whether the find is cultural and, if so, whether it is a minor chance find, significant chance find, or human remains as defined below. The CHS will also assess whether it is isolated or part of a larger site or feature. A CHS will be required to complete a Site Clearance Form. If the find is not of cultural, archaeological or palaeontological importance, the CHS will authorize the removal of site protection measures and activity can resume. If it is a Minor Chance Find, a CHS will document and collect the find and then authorize the removal of site protection measures and activity can resume.

    - Minor chance Finds: Modern features or objects that do not constitute artifact potential heritage sites or objects under Lesotho law (e.g., modern sites / objects);

    - Significant Chance Finds: Features or objects that constitute artifacts under Lesotho law (e.g., potentially significant prehistoric or historic sites or objects); and

    - Human Remains: Modern, historic, or prehistoric burials, isolated human remains, and/or associated features and/or objects (i.e., grave goods).

- **Notification of Authorities –** If the find is determined to be a Significant Chance Find or Human Remains, the CHS will notify the Department of Culture (through the District Cultural Officer) within 48 hours and consult with them regarding its management. If human remains are found, the Department of Health will also be notified through the District Health Officer. In addition, the CLO will immediately notify relevant village or religious leaders to alert community members to the find (to respect socio-cultural and faith based traditions).

  The Department of Health will nominate an inspector to be sent to the area to catalogue the find and protect it. Costs for transportation and additional expenses will be incurred by the Project. The CHS will provide supporting documentation to the appointed inspector and support as necessary to avoid any delays.

- **Document Find** – The CHS will document the Chance Finds through photography, notes, GPS coordinates, and maps (collect spatial data), as appropriate. Photographs of the artifacts and site photos may be useful for consultation regarding chance finds and should be taken as soon as possible.

- **Chance Find Report** – The CHS will prepare and maintain an initial report for all Chance Finds (including Minor Chance Finds). This will include the data collected in the previous step, including spatial data for use in the Project's GIS database. This report will be updated upon completion of a treatment plan, if required, and will be submitted to the Department of Culture in accordance with agreed timelines.

- **Treatment Plan** – For Significant Chance Finds, the inspector from the National Cultural Heritage Directorate will prepare a report that includes recommendations for the treatment of the find (i.e., treatment plan). The Project may request the modification of these recommendations to safeguard the find if it can be demonstrated that ongoing activity will not damage this or any future finds in the area. The inspector will consider the treatment plan proposed by a CHS.

  The Project will implement the treatment plan as agreed with authorities, with a CHS and/or qualified cultural heritage contractors provided by the Project. LHDA will bear the costs of the treatment plan. Options to be considered include:

    - Avoidance: This option minimizes the impact to the site through partial or complete project redesign or relocation. This is the preferred option from a cultural resource management perspective for significant finds and aligns with international standards. The inspector from the National Cultural Heritage Directorate may declare a Total Protection Zone around the area of the find.

    - In-situ Protection or Management: This option includes the application of site protection measures, such as fencing or barricades, or capping the site area with fill.

- Surface Collection: If a site is assessed as having limited salvage excavation potential but contains significant surface archaeological items, those surface finds may be individually mapped and collected in accordance with a Salvage Protocol.

- Salvage Excavation: This recovery option is site destructive and can delay construction.

- Destruction: If a site is assessed as having limited archaeological significance, it may be destroyed once a complete photographic record has been made and a Site Clearance Form has been completed.

While treatment is ongoing, a CHS will coordinate with on-site personnel to keep them informed as to the status and schedule of investigations and when construction may resume.

- **Resume Work** - After the treatment plan is complete, Project excavation or construction activity will be allowed to resume.

A generic Procedure when a Chance Find is encountered is summarised in Figure C-1.

Management of Chance Finds – Human Remains

If skeletal remains / bones are discovered, the CFP detailed above will apply. An archaeologist will attempt to identify whether the skeletal remains / bones are human remains. If they are determined to be human remains, LHDA (through the CLO) will notify the local community and, subsequently, through the CHS notify the following authorities within 48 hours:

- District Administrator;
- Police; and
- District Department of Health.

According to the Heritage Act of 2011 and Public Health Act 12 of 1970 disturbance or removal of human remains is forbidden without a permit. Construction activities will not resume until all legal requirements and the reasonable requirements of communities and stakeholders have been adequately addressed. Where the relocation of human remains is necessary, the Project will adhere to the requirements for grave relocation which will require the written agreement of any family members. The CLO will play a key role in engaging with next of kin and determining which graves can be retained in situ (with appropriate protection) and which will need to be relocated. For any given grave or ash heap (with human remains) the CLO and CHS will confirm the procedures to be followed for the exhumation, transportation, and re-interment of human remains based on affected family wishes, including the appropriate cultural rituals.

Record Keeping

The CHS, CLO and Contractors Environmental Manager will maintain records on chance finds and the implementation of treatment plans. These will include:

- Monthly reports summarizing reporting period activities, including Chance Finds identified, the results of any Chance Find assessments, internal and external communications and instructions, and supporting photographic documentation (or other reference materials as appropriate); and
- Any additional reports prepared to fulfil specific requirements of the National Department of Culture or other departments of government.

Cultural Heritage Training Program

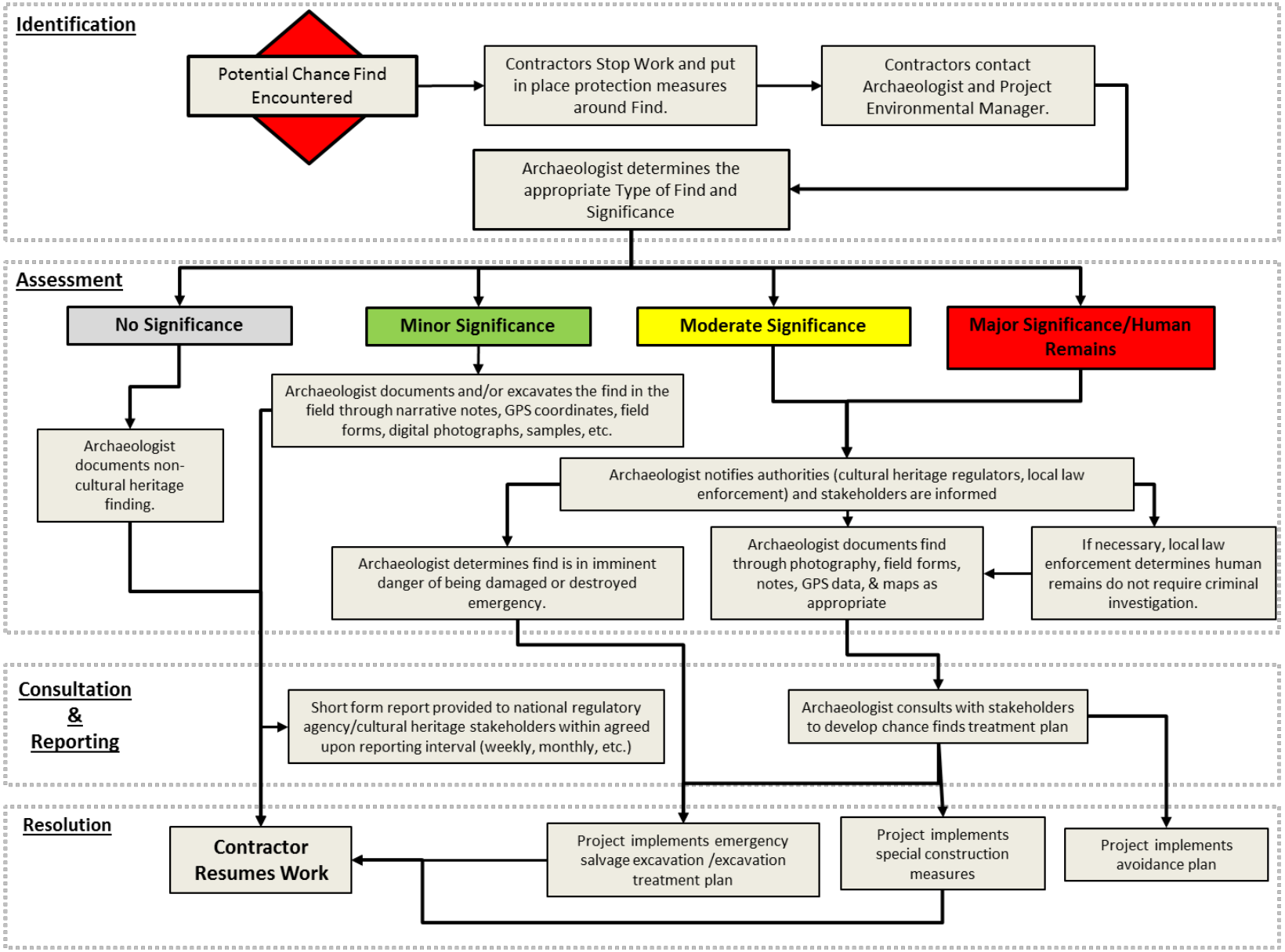
Project personnel will receive training and demonstrate competency in the identification of Chance Finds and Chance Find procedures (i.e., actions that are required in the case of a potential Chance Find). Training requirements and support materials (e.g., reference handbook) will be developed under the LHDA Contract No. 6025 and will be rolled out as part of the overall induction process for Contractor personnel. The CHS will maintain records of all Cultural Heritage Training provided to Project personnel.

All employees must be aware that it is illegal and forbidden to disturb or remove cultural heritage objects for personal gain, or to ignore such finds and proceed with construction as if no further action is required.

Site Protection Program

Known cultural heritage sites will be protected from Project-related damage. This includes sites identified in advance of construction activities and those found during construction (i.e., Chance Finds). Sites may be located in Project areas or adjacent to them. Site protection measures may include warning signs, physical barricades, or other visual indicators of areas of high cultural heritage sensitivity. In some cases, it may be necessary to modify construction techniques to protect sites in work areas. Site information will be provided to Project personnel in written and verbal form in official transmittals, meetings, and toolbox talks as appropriate to ensure that known cultural heritage sites are protected.

Figure C.1 Generic Procedure When Chance Find is Encountered



Appendix F: Social Structures Likely to Require Resettlement

Figure F.1 Main Locations for Physical and Economic Displacement along PWAC (with boxes linked to Figure F.2 and Figure F.3)

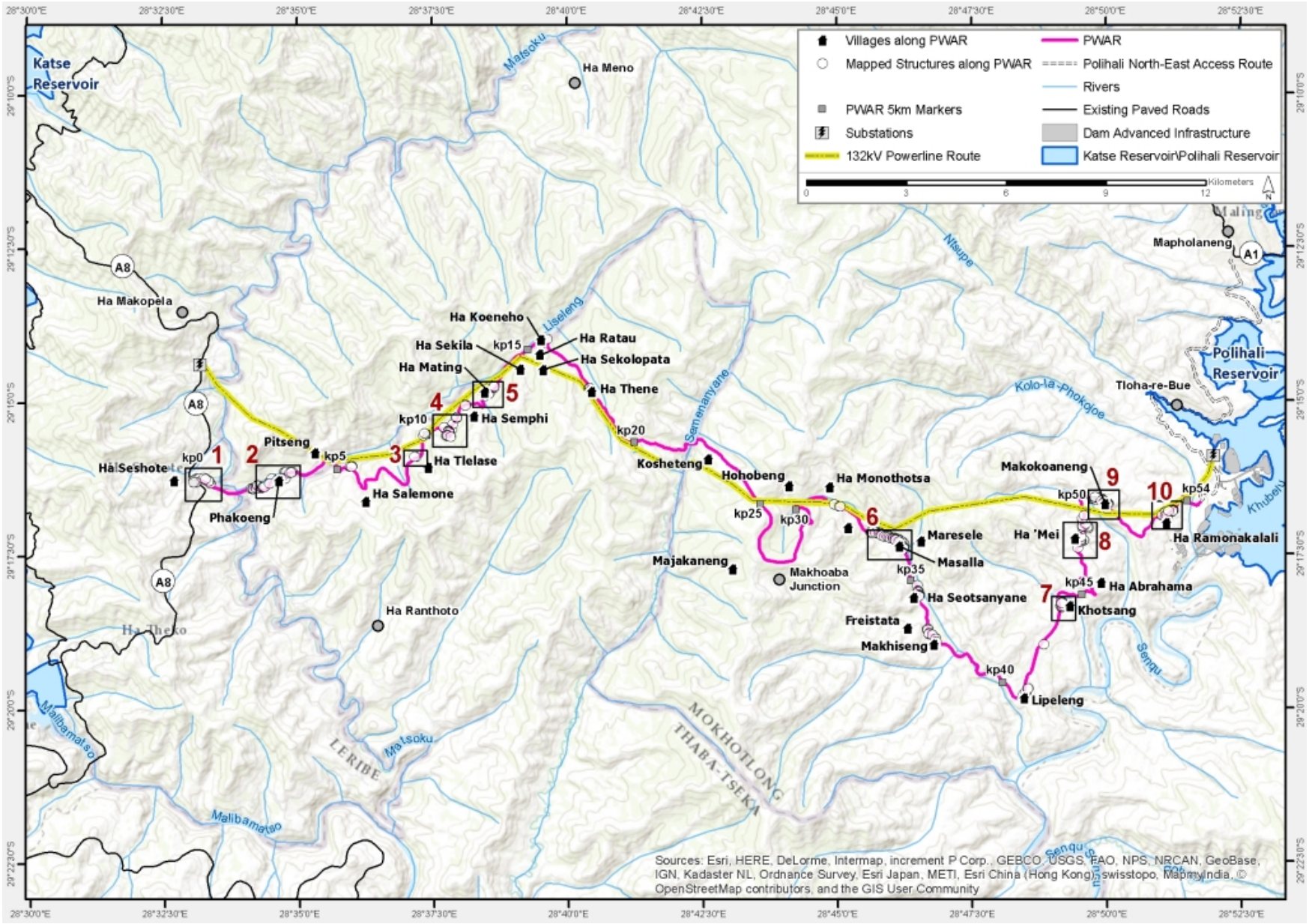


Figure F.2 Aerial Images of Locations 1 to 5 (as shown in Figure F.1) **of Structures Located in Road Servitude**

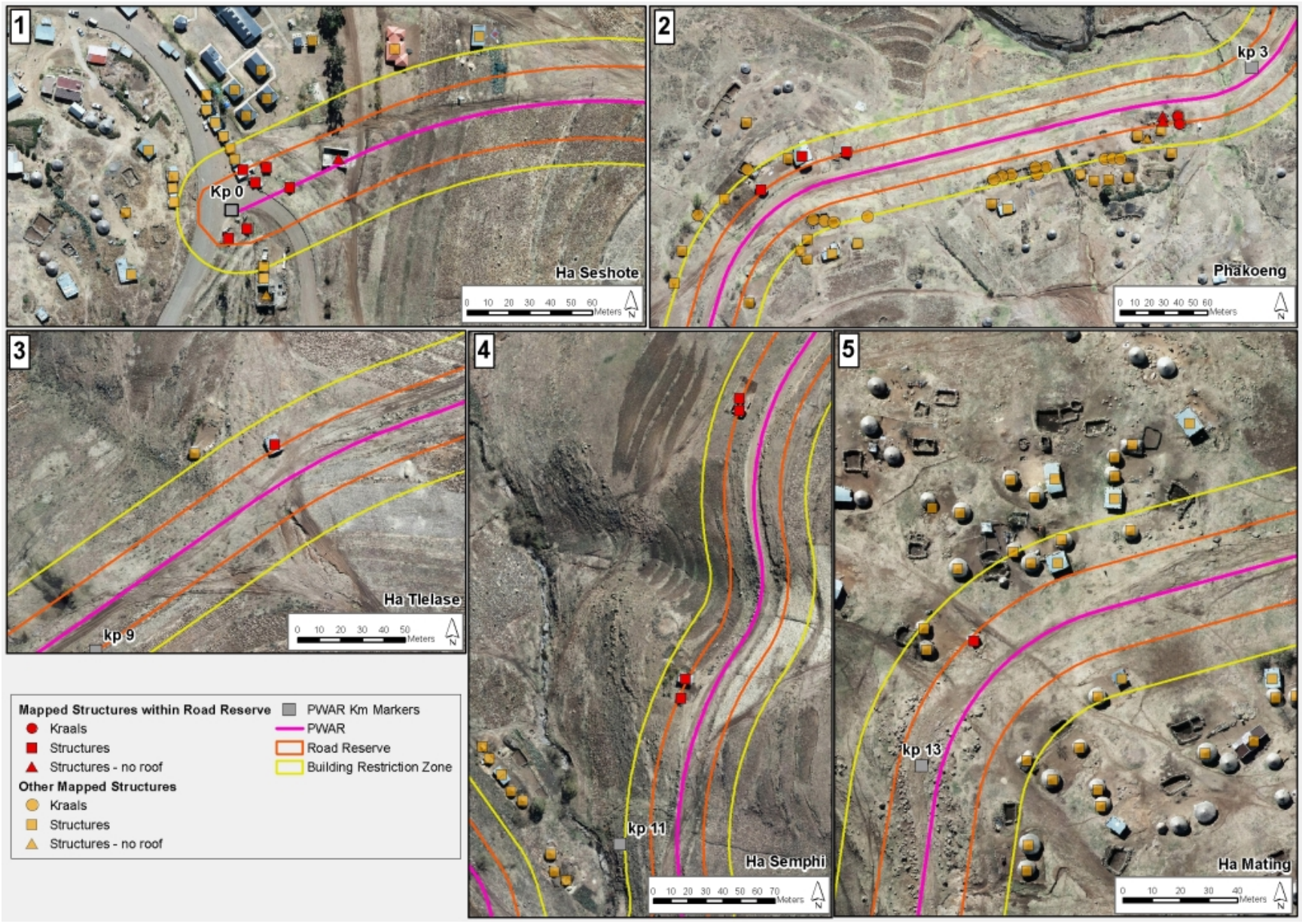


Figure F.3 Aerial Images of Locations 6 to 10 (as shown in Figure F.1) **of Structures Located in Road Servitude**