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# **PROJECT: LESOTHO HIGHLAND WATER PROJECT PHASE (LHWP II)**

## **ENVIRONMENTAL & SOCIAL IMPACT ASSESSMENT SUMMARY**

**FOR**

**POLIHALI RESERVOIR & ASSOCIATED INFRASTRUCTURE**

**COUNTRY: LESOTHO**

***Date: March 2019***

## Abbreviations and Acronyms

AC	Area Chiefs
AIDS	Acquired Immune Deficiency Syndrome
ALC	Area Liaison Committee
AoI	Area of Influence
BID	Background Information Document
BMP	Biodiversity Management Plan
BPST	Bulk Power Supply and Telecommunications
CES	Coastal & Environmental Services
CFRD	Concrete-Faced Rock Dam
CHAL	Christian Health Association of Lesotho
CHP	Cultural Heritage Plan
CIA	Cumulative Impact Assessment
CP	Compensation Policy
CR	Critical Endangered
DA	District Administrator
DAC	Drakensberg Alpine Centre
DOC	Department of Culture
DoE	Department of Environment
DoT	Department of Tourism
DRRM	Department of Range Resources Management
DWA	Department of Water Affairs
ECCD	Early Childhood Care and Development
EHS	Environmental, Health, and Safety (Guidelines of World Bank)
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMP	Environmental Management Plan
EN	Endangered (relates to species on the IUCN Red Data Species List)
ESIA	Environmental and Social Impact Assessment
FGD	Focus Group Discussion
FOB	Field Operations Branch
FSL	Full Supply Level
GIS	Geographic Information System
GPS	Global Positioning System
HIV	Human Immunodeficiency Virus
ICMP	Integrated Catchment Management Plan
IFC	International Finance Corporation
IFR	Instream Flow Requirements
INR	Institute of Natural Resources
IUCN	International Union for Conservation of Nature
IWRM	Integrated Water Resource Management
KII	Key Informant Interview
KZN	KwaZulu-Natal
kV	kilo Volt
LAA	Land Administration Authority
LDS	Lesotho Demographic Survey
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
LRP	Livelihood Restoration Plan
MAR	Mean Annual Run-off
MAFS	Ministry of Agriculture and Food Security
masl	Metres above sea level
MDTP	Maloti Drakensberg Transfrontier Project
MEMWA	Ministry of Environment, Meteorology and Water Affairs
MFRSC	Ministry of Forestry, Range and Soil Conservation
MM&A	Morija Museum and Archives
MoET	Ministry of Education and Training
MTEC	Ministry of Tourism, Environment and Culture
NAR	Northern Access Road
NGO	Non-government organisation
ORASECOM	Orange-Senqu River Basin Commission
PC	Principal Chiefs
PES	Present Ecological State
PHAP	Public Health Action Plan
PNEAR	Polihali North East Access Road
PRAI	Polihali Reservoir and Associated Infrastructure
PS	Performance Standard
PWAC	Polihali Western Access Corridor
PWAR	Polihali Western Access Road
RAP	Resettlement Action Plan
RD	Roads Directorate
RoD	Record of Decision
RSAP	Regional Strategic Action Plan
SADC	Southern African Development Community
SDMP	Social Development Master Plan
SEP	Stakeholder Engagement Plan
TCTA	Trans-Caledon Tunnel Authority
ToR	Terms of Reference
VEC	Valued Environmental (and Social) Components
VIP	Ventilated Improved Pit (Latrine)
WB	World Bank

# 1. Introduction

## 1.1 Lesotho Highlands Water Project

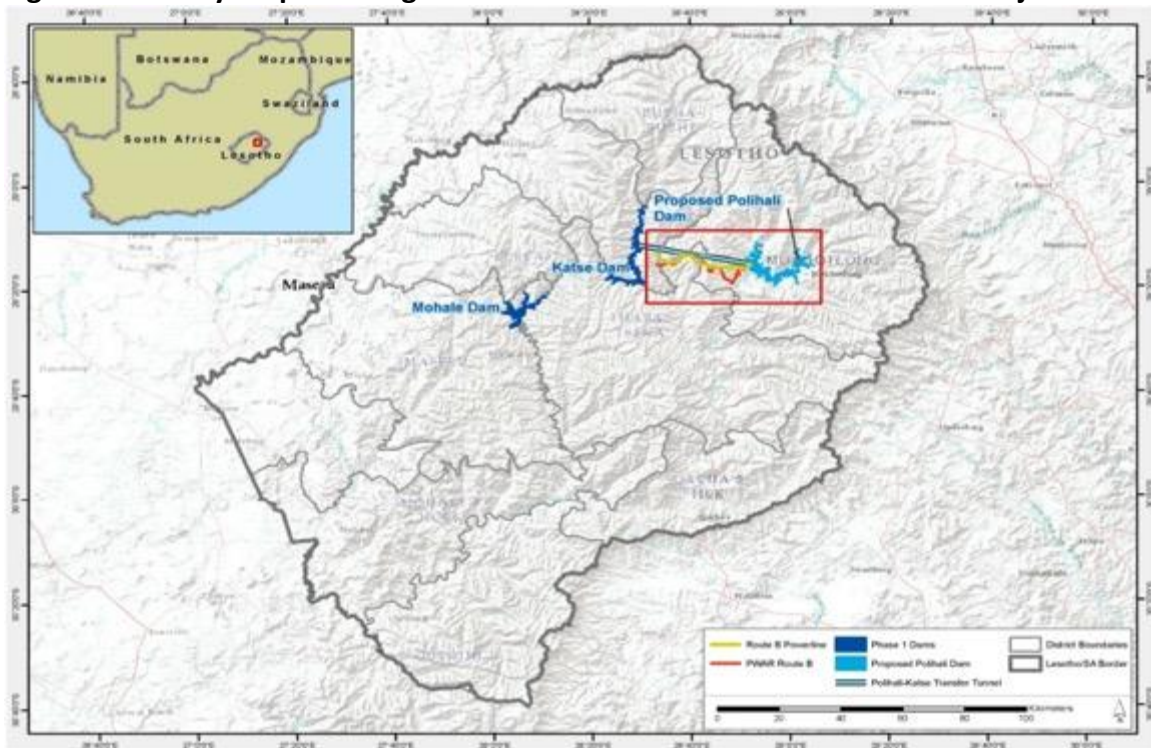
The LHWP is a multi-phased project aimed at providing water to South Africa (Gauteng) and generating hydro-electricity for Lesotho. It was established by the 1986 Treaty signed by the governments of the Kingdom of Lesotho and the Republic of South Africa. The project entails harnessing the waters of the Senqu/Orange River in the Lesotho Highlands through the construction of a series of dams for the mutual benefit of the two countries.

Phase I of the LHWP, consisting of the Katse and Muela Dams, the 'Muela hydropower station and associated tunnels was completed in 2003 and inaugurated in 2004. Phase II of the LHWP is currently in progress and consists of two separate but related components: water transfer and hydropower generation. Feasibility studies are currently being completed for the hydropower component of Phase II.

## 1.2 Phase II Project Components

The water transfer component of Phase II comprises a 163.5 m high concrete faced rockfill dam (CFRD) and an associated saddle dam at Polihali downstream of the confluence of the Khubelu and Senqu (Orange) Rivers (this project) and an approximately 38 km long concrete-lined gravity tunnel connecting the Polihali Reservoir to the Katse Reservoir.

**Figure 1: Locality Map Showing the location of the overall LHWP Phase II Project Area**



Phase II also includes the construction and establishment of advance infrastructure, without which the main components (dam and tunnel) could not be built, i.e. construction

of access roads, bridges, bulk utilities (power, water supplies, wastewater treatment works and telecommunications), establishment of quarries and borrow pits, site camps, laydown areas, spoil areas, project housing and site offices (the last two components include both temporary and permanent structures).

### 1.3 Phase II Project ESIA and EMP studies and reports

According to the Lesotho Environment Act No. 10 of 2008 and associated Guidelines, the Phase II components must obtain environmental authorisation through completion of an ESIA process for development to proceed; or, in agreement with the DoE, through the approval of an EMP. As such, LHDA has packaged the LHWP Phase II project into separate components (type of infrastructure), which have been subject either to an ESIA or an EMP (Table 1, Figure 2).

### 1.3 PRAI ESIA Summary

This report presents the summary of the Environmental and Social Impact Statement (ESIS) mainly for dam and support infrastructure, road and bridge, power line, telecommunication and tunnel, as well as the construction work areas in the PRAI.

The ESIA Report excludes the following: i) the Polihali Western Access Corridor (PWAC) comprising the Polihali Western Access Road (PWAR) and Bulk Power Supply and Telecommunications (BPST) which are being assessed through separate ESIA; ii) upgrading of the Polihali North East Access Road (PNEAR) and the North Access Road (NAR) (including their associated quarries and borrow pits) which are both being addressed through separate EMPs; iii) transportation of construction materials through the border posts and along the PNEAR, NAR and PWAR; and, iv) the full length of the Polihali to Katse Transfer Tunnel (including impacts associated with transfer of water between catchments). The project components are summarised in more detail under the Project Description.

Figure 2: LHWP Phase II Component Overview Map

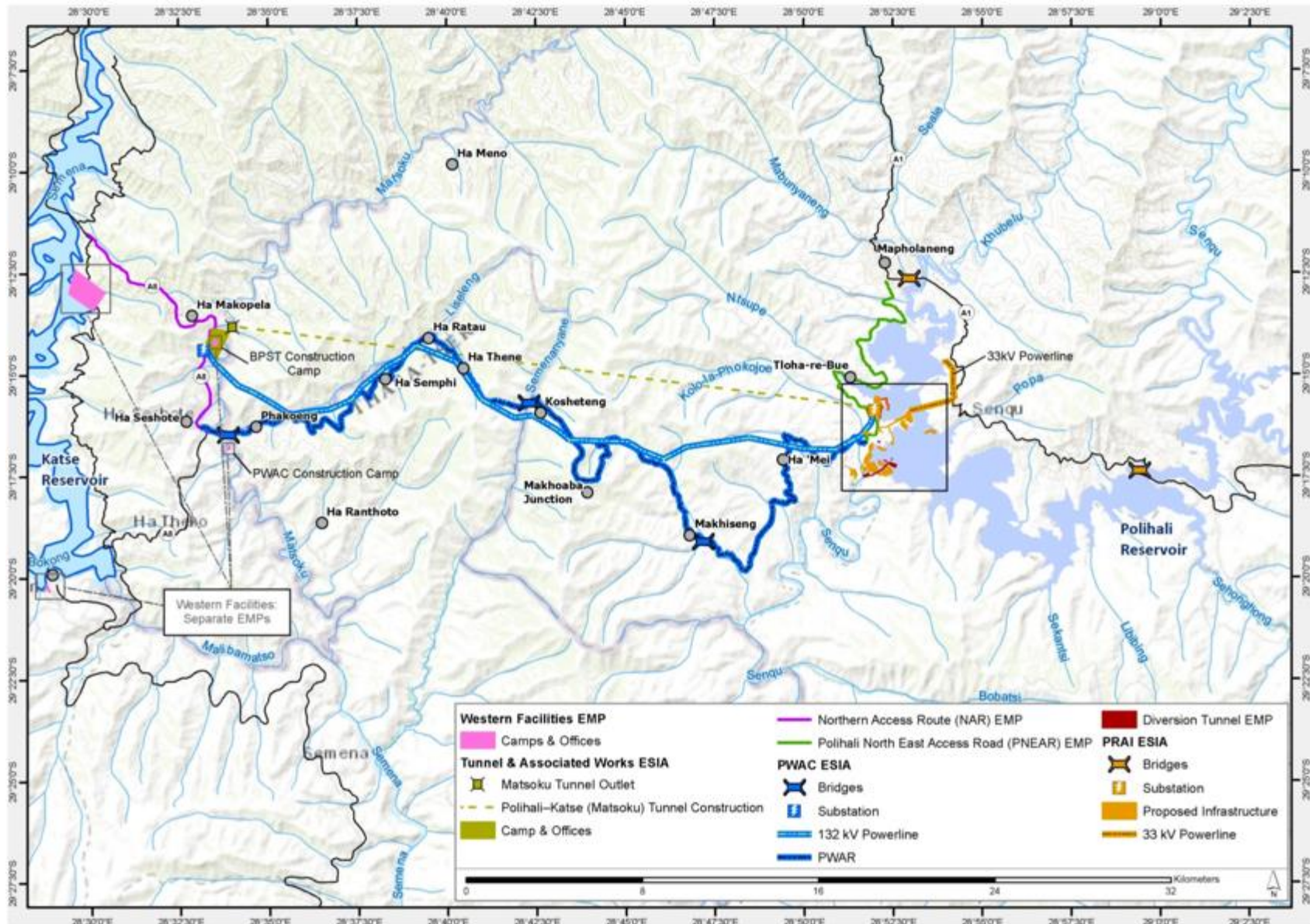
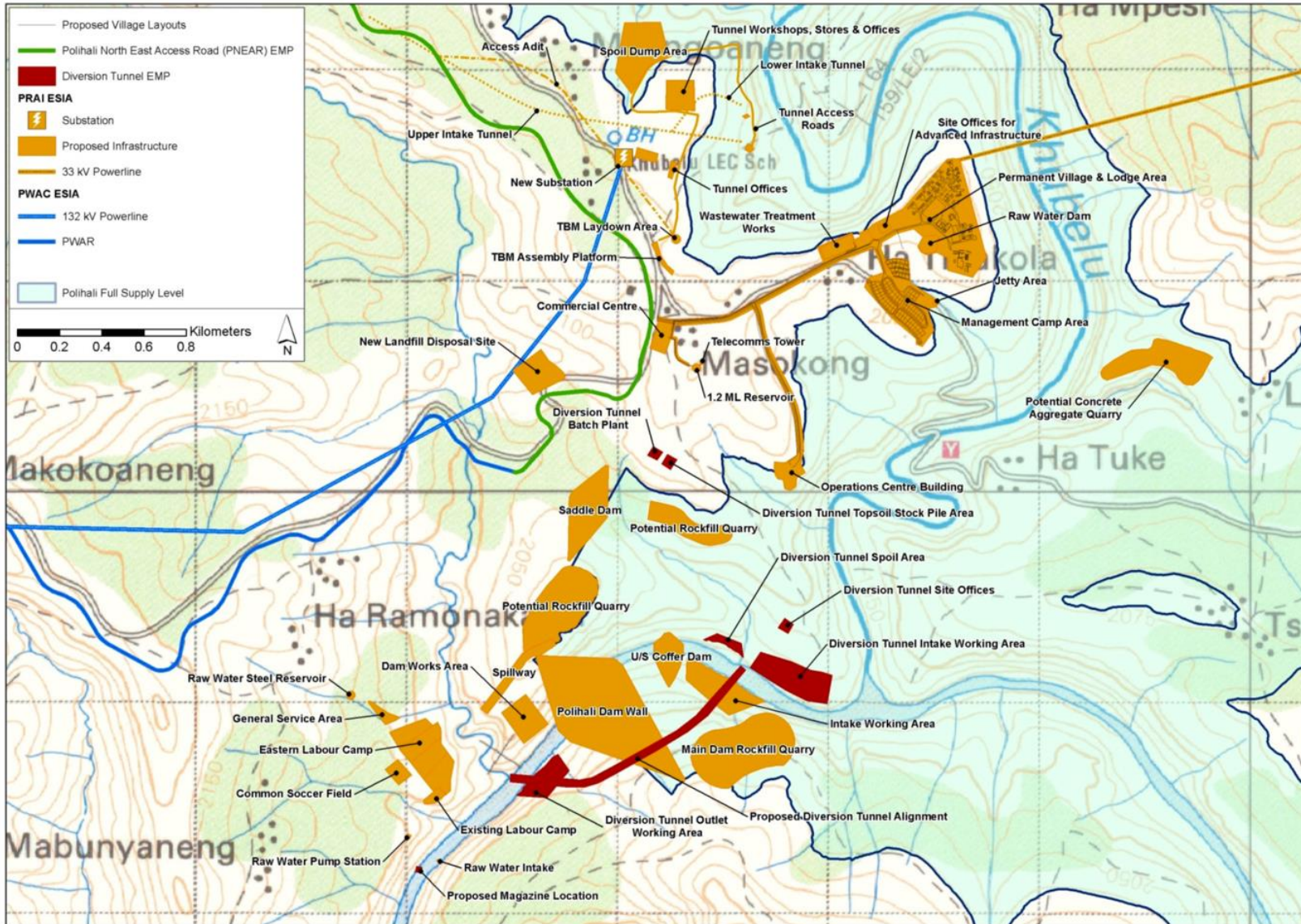


Figure 3: PRAI Components



**Table 1: LHWP II Project Components**

Type of Infrastructure	Poliwali Reservoir & Associated Infrastructure (PRAI) ESIA (Covered in This Report)	Poliwali Western Access Corridor (PWAC) ESIA	Western Facilities EMP & Katse Upgrade EMP	Poliwali North East Access Road (PNEAR) EMP	Northern Access Road (NAR) EMP	Diversion Tunnels EMP	Tunnel & Associated Works ESIA
Road and Bridge Infrastructure	<ul style="list-style-type: none"> <li>Realignment of existing A1 Road over Khubelu River;</li> <li>New major bridge across the Reservoir (Senqu, Khubelu and Mabunyaneng); and</li> <li>Pedestrian bridge crossing the Reservoir at Tlhakola.</li> </ul>	<ul style="list-style-type: none"> <li>55 km tarred road (Poliwali Western Access Road (PWAR)) between Ha Seshote and Poliwali Dam;</li> <li>Three new bridges over Matsoku, Semenanyane and Makhoaba Rivers;</li> <li>New culverts over streams; and</li> <li>Tie-ins to villages.</li> </ul>	Construction camp / works area for PWAR near Ha Seshote.	Poliwali North East Access Road (PNEAR) (Mapholaneng to Masakong at Poliwali Dam).	Upgrading of existing NAR (A8 from Pitseng - Ha Seshote).		
Powerline Infrastructure	<ul style="list-style-type: none"> <li>New substation at Masakong;</li> <li>New 33kV powerline from Tlokoeng substation across Reservoir to permanent Poliwali camp /offices / lodge. The powerline will be housed in a sleeve along the Tlhakola Bridge to be constructed across the reservoir; and</li> <li>Realignment of the powerline along the A1 in areas where the existing line falls below the Full Supply Level (FSL).</li> </ul>	<ul style="list-style-type: none"> <li>New 34.5 km 132kV powerline from Matsoku substation (near Ha Seshote) to a new Poliwali substation at Masakong;</li> <li>Expansion of Matsoku substation to include two new transformers (to be moved from Ha Lejone substation);</li> <li>Upgrades at existing substations; and</li> <li>Upgrade of existing 66kV lines.</li> </ul>	Construction camp / works area for BPST near Matsoku Substation.				
Telecommunications	<ul style="list-style-type: none"> <li>New telecommunications mast in Masakong near the Poliwali Dam site.</li> </ul>	Telecommunications infrastructure on 132kV pylons.					
Dam (and support) Infrastructure	<ul style="list-style-type: none"> <li>Main dam, saddle dam and spillway, and coffer dams;</li> <li>New Poliwali village with lodge, offices, visitors centre;</li> <li>Eastern Facilities which comprise the permanent (Poliwali Village), Operations Centre and Commercial Centre;</li> <li>Eastern Facilities also includes the required labour camps at the dam and near Masakong for PWAR and BPST and tunnel contractors;</li> <li>Quarries for aggregate supply for dam construction;</li> <li>Spoil dumps; and</li> <li>Explosives magazine (established under Diversion Tunnels contract and transferred to Dam and Tunnel contractors on completion of the Diversion Tunnels contract).</li> </ul>						
Tunnel Infrastructure	<ul style="list-style-type: none"> <li>Inlet of tunnel intake at Poliwali (lower Khubelu);</li> <li>Eastern half of tunnel;</li> <li>Spoil dump;</li> <li>Access roads to tunnel intake and spoil dumps;</li> <li>Tunnel boring machine assembly area;</li> <li>Tunnel works area and offices; and</li> <li>Explosives magazine (established under Diversion Tunnels contract and transferred to Dam and Tunnel contractors on completion of the Diversion Tunnels contract).</li> </ul>		Upgrading of Katse Lodge facilities for management staff.			<ul style="list-style-type: none"> <li>Diversion tunnels (two tunnels, one of 9m and 7m);</li> <li>Spoil area;</li> <li>Office, workshop, camp; and</li> <li>Explosives magazine.</li> </ul>	<ul style="list-style-type: none"> <li>Poliwali – Katse (Matsoku) tunnel construction and operation (from approx. midway to the Katse end);</li> <li>Western construction camp for tunnel contractors (edge of Katse Dam);</li> <li>Labour camp;</li> <li>Explosives magazine;</li> <li>Spoil dump; and</li> <li>Access road.</li> </ul>



## 2. Scope, Approach and Methodology

The scope of work for the PRAI Project required the preparation and submission of an ESIA Report that meets Lesotho’s environmental legislation and guidelines; policies of the LHDA; relevant international treaties and agreements to which both Lesotho and South African are parties, and to address international standards (such as those of the World Bank).

The ESIA involved the following ESIA related tasks: Inception; Specialist Studies; Stakeholder Engagement; and Compilation of the ESIA Report and EMPs.

### 2.2 Specialist Studies

Eight specialist studies were compiled for the ESIA Table 2. In general, all the specialist studies involved:

- **Data review and gap analysis** (Inception Phase)—assembly and review of available data for the Project Area during the Inception Phase to identify gaps and to confirm survey focus areas;
- **Field/data gathering surveys**—most of which were undertaken in summer to collect field data and make site observations within the PRAI Area of Influence (AoI). A summary of the scope of the field surveys is contained in Table 1;
- **Data assembly and mapping of field data/observations**—field data comprising sampling areas and key findings were collated into Excel spreadsheets; GPS coordinates of survey areas and priority findings (e.g. species, habitats, etc.) were mapped in a Geographical Information System (GIS), and photographs collated; and
- **Specialist Reports**—the baseline data from desktop review and field surveys were collated into the specialist report and used as the basis for the identification and assessment of impacts, and the formulation of management (mitigation and monitoring) measures of construction and operational phases of the PRAI, and additional recommendations.

**Table 2 Summary of Specialist Study Fieldwork**

Specialist Study	Scope of Surveys	Survey Period
Social	<ul style="list-style-type: none"> <li>· Focus Group Discussions and Key Informant Interviews with District Authorities and Community Members in 39 village clusters identified as the basis for stakeholder engagement.</li> <li>· Field observations, GPS coordinates and photographs of specific socially important features and resources (e.g. water points).</li> </ul>	January to March 2017
Archaeology and Cultural Heritage	<ul style="list-style-type: none"> <li>· Foot searches and GPS records and photographs of cultural heritage features (mainly graves, and culturally important plant areas).</li> <li>· Focus Group Discussions with community members on cultural heritage features.</li> </ul>	January to March 2017
River Ecosystems	<ul style="list-style-type: none"> <li>· No allowance was made for additional baseline collection in the scope as it was believed that the data collected in 2013 and 2014 (CES, 2014c; INR, 2014) would be sufficient. However, the aquatic specialist undertook a 5-day reconnaissance site visit to provide context to the available data and the proposed developments.</li> </ul>	January 2017

<p>Terrestrial Ecology (plants, mammals &amp; herpetofauna)</p>	<ul style="list-style-type: none"> <li>·Foot searches (including turning over rocks) in representative habitats within the Aol for priority plant, mammal and herpetofauna (reptiles and amphibians).</li> <li>·No pitfall trapping was undertaken.</li> <li>·Ad hoc discussions were held with informants on the use of natural resources.</li> <li>·Data obtained on plants by the wetland team were also integrated.</li> </ul>	<p>January/February 2017</p>
<p>Wetlands</p>	<ul style="list-style-type: none"> <li>·Pre-identification and mapping of wetlands using LIDAR and Google Earth imagery to guide field survey effort.</li> <li>·Data were collected to allow for the delineation and classification of wetland types using hydrogeomorphic characteristics and assessment of present ecological state (PES) and ecological importance and sensitivity (EIS).</li> <li>·Auger-based peat sampling of fens to confirm the depth of peat. The classification of peat was according to the Von Post humification scale.</li> </ul>	<p>January/February 2017</p>
<p>Birds</p>	<ul style="list-style-type: none"> <li>·Focused binocular and telescope based surveys of cliffs to identify presence and nesting of priority cliff-nesting birds during two survey periods.</li> <li>·Foot-based transects of grassland bird diversity and abundance in habitats below and above the Full Supply Level (FSL) (Jan/Feb 2017 only) were undertaken to allow comparison between high altitude areas (subalpine) and lower lying grassland sites.</li> </ul>	<p>26 September - 5 October 2016 31 January - 6 February 2017</p>
<p>Rangelands</p>	<ul style="list-style-type: none"> <li>·Sampling was undertaken at representative grazing areas using techniques typically used by the Department of Range Resources Management in Lesotho; specifically, Metric Belt Transect and Point (disc-meter) Methods.</li> <li>·The collected data were analysed to determine veld condition, stocking rates and carrying capacities of each grazing area.</li> <li>·Cattle post dwellers (livestock owners/herders) were interviewed to determine grazing patterns, livestock species composition, areas of origin by village and ownership status.</li> </ul>	<p>January/February 2017</p>
<p>Soils &amp; land use and land capability</p>	<ul style="list-style-type: none"> <li>·Fieldwork were undertaken to verify the key landscapes and land uses identified from aerial imagery and verification of areas where some anomalies were detected.</li> <li>·Reconnaissance surveys along selected transects were conducted to collect soils information for the representative landscapes. Samples were sent to the laboratory for analyses. Areas considered to be of significant importance were those that were extensively cultivated and those used for grazing of livestock. Information collected was used in the land capability classification.</li> <li>·The majority of the surveys were conducted in late January/early February, which is the peak of the growing season and also the time when the area receives the majority of its rainfall. It was a good time to observe production and land use patterns, and to also determine what major land and soil processes were taking place that will impact soil and land utilisation planning in the future.</li> </ul>	<p>January/February 2017</p>

## 2.3 ESIA Process

### ***Initial Steps***

The Consultant held an initial meeting (12 September 2016) with the DoE to inform them of the Project and met with the relevant line departments in February and March 2017 to discuss the ESIA process; The DoE approved the ToR for the ESIA.

### ***Risk Identification and Prioritisation***

Initial risk and impact identification were undertaken based on the site visit, information review and gap analysis, and was based on the key project activities anticipated. The specialist studies focussed on these issues with emphasis placed on specific areas not covered in previous studies in order to understand the significance of the impacts relative to the current status of the environment.

Certain aspects (e.g. waste, air quality, water quality, noise/vibration, traffic, geophysical risks, visual and tourism) were not subject to specialist investigation but were assessed qualitatively, as these are already the subject of existing (geotechnical and tourism) or planned studies. The scope of works for the consulting engineers appointed to design the various components of the PRAI included the need to commence with baseline data collection for water quality, air quality and noise levels within their component areas. This will be continued through the construction phase by the contractors appointed to construct the components. The consulting engineers for the Main Dam and Appurtenant Works will also be commissioning a Sedimentation study.

### ***Environmental & Social Impact Assessment***

The ESIA task involved the collation and integration of the specialist studies and other data to develop a full ESIA Report. The key activities involved in this stage are:

- Assessment of alternatives
- Identification and evaluation of impacts
- Identifying options for mitigation and enhancement
- Assessment of post-mitigation impact
- Management and Monitoring plan
- Compilation of ESIA Report
- Submission of ESIA Report for Client review
- Circulation of ESIA Report for stakeholder comment
- Submission of ESIA Report to DoE for decision

### ***Evaluating Significance***

Once the magnitude of an impact and the sensitivity/vulnerability/importance of the resource or receptors were characterised, the significance of the impact was assigned using the impact significance matrix detailed in Table 3.

For impacts resulting from unplanned events (typically accidents, such as a major oil spill or other event that cannot be reasonably foreseen), the above methodology is applied but the likelihood is also considered when assigning the magnitude designation.

**Table 3 Impact Significance**

Evaluation of Significance		Sensitivity/Vulnerability/Importance of Resource/Receptor		
		Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Critical
	Positive Impacts			
	Positive	Minor	Moderate	Major

***Separation of Phase II Project Components into Different ESIA's and EMPs***

The LHWP Phase II comprises a number of different project components, not all of which have been assessed in the ESIA, and some of which have been assessed under separate EMPs. These are described in Table 1. The Scope of Work for this ESIA was limited to the construction and operation of the advance infrastructure, Polihali and saddle dams (with appurtenant works), the Polihali to Katse transfer tunnel (intake, opening and eastern portion), major bridges, A1 Road realignment and power line realignment.

A separate ESIA has been compiled for the PWAR and BPST. However, certain project components for the LHWP Phase II are excluded from both these ESIA and have not yet been assessed or are assessed under separate EMPs. Some of these components were expected to be assessed under a separate Western Facilities ESIA, including new construction camps near Ha Seshote for the PWAR and BPST; new buildings at Katse Dam; construction works areas for the tunnel outlets at Matsoku and Katse Dam, and the actual transfer of water between the two reservoirs. Environmental assessment and development of EMPs for these latter components have not yet been commissioned and is expected to be done soon for separate authorisation. Separate EMPs were completed for the construction of the diversion tunnels and upgrading of the PNEAR. The splitting of the different project components across multiple ESIA's and EMPs have had the following implications:

Separation of the different Phase II project components under different EMPs or ESIA's may cause confusion to stakeholders and the decision-making authorities who will need to understand how all the different Project elements fit together and the overall environmental implications. However, it was beyond the scope of this ESIA to quantify or assess the impacts of each of these project components, which have been designed and assessed under different contracts. The lack of one overarching ESIA covering all aspects of Phase II may be of concern to decision makers. However, in general, most of these

individual components (e.g. road upgrades and construction camps) can be adequately assessed and managed under separate EMPs as the environmental and social impacts of each are considered to be relatively minor, especially for the road upgrades.

### 3. Administrative and Legal Framework

#### 3.1 Administrative and Institutional Framework

##### ***National Government***

The Government of Lesotho is a constitutional monarchy with two spheres of government: central and local. The Head of State is King Letsie III whose role is predominately ceremonial. The two houses that make up the Parliament are the elected National Assembly (lower house) and the hereditary and appointed Senate (upper house).

The ministries of relevance to the PRAI include Tourism, Environment and Culture (MTEC); Forestry, Range and Soil Conservation (MFRSC); Agriculture and Food Security (MAFS); Small Business, Cooperatives and Marketing; Energy, Meteorology and Water Affairs (MEMWA); Mining; Health; and Education.

Within these ministries, the following departments have a review and/or permitting involvement with the Project, Environment (DoE) (under MTEC); Culture (DoC) (under MTEC); Tourism (DoT) (under MTEC); Range Resources Management (DRRM) (under MFRSC); Water Affairs (DWA) (under MEMWA); Lesotho Electricity Corporation (LEC); Roads Directorate (RD); and Land Administration Authority (LAA).

##### ***Local Government***

Local government structures are headed by the Principal Secretary who sits at the national government level. Each district is headed by a District Administrator (DA). The DA represents the interests of Central Government at a District level and is responsible for the administrative decentralization and integration of government activities. The DA is supported by heads of departments of various government ministries. The Project Area crosses the districts of Mokhotlong and Thaba-Tseka while there is one Urban Council—Mokhotlong—and four Community Councils—Bokong, Seate, Mphokojoane and Menoaneng.

##### ***Traditional Governance***

Traditional leadership in the country is through the chieftainship, which is hereditary. This leadership is hierarchical consisting of the King, Principal Chiefs (PC), Area Chiefs (AC) and Village Chiefs (or headmen). Each one of these Chiefs levels is represented in the DCs and CCs. The Principal Chiefs are responsible for overseeing all issues of traditional governance in their respective areas. In turn, the ACs take orders and advice from the PCs. ACs tend to administer a smaller administrative area compared to that of the PCs. Lastly, the Village Chiefs or headmen function as assistants to the ACs and manage the daily administration of their villages. Over and above the customary functions that chiefs play

are the civil responsibilities. The PCs in the Project Area are those of Mokhotlong and Malingoaneng.

### ***The LHWP Organisational Arrangement***

The Lesotho Highlands Water Commission (LHWC), LHDA and the TCTA work together to implement the projects within each phase of the LHWP. LHWC has a monitoring, advisory and approval function with regard to the project implementation in Lesotho. The LHWC is responsible for a bi-national body consisting of three delegates per country that advises LHDA on design, technical acceptability, tender procedures and documents, cash flow forecasts, allocation of costs and financing arrangements. LHWC is also responsible for liaising with parties such as ORASECOM, the Lesotho DWA and the South African Department of Water and Sanitation with respect to LHWP developments.

LHDA was set up to manage that part of the Project that falls within Lesotho's borders, i.e. the construction, operations and maintenance of all dams, tunnels, power stations and infrastructure, as well as secondary developments such as relocation, resettlement, compensation, supply of water to resettled villages, irrigation, fish hatcheries and tourism.

LHDA reports to the LHWC on all matters concerning the Project, but the TCT is only responsible to the LHWC with regard to operations and maintenance issues.

### ***Other Institutions/Organisations***

#### ***Orange-Senqu River Commission (ORASECOM)***

ORASECOM was established by the Governments of Botswana, Lesotho, Namibia and South Africa through the "Agreement for the Establishment of the Orange-Senqu Commission" on 3 November 2000 in Windhoek, Namibia (Earle et al., 2005). The goals of ORASECOM are to:

- Develop a comprehensive perspective of the basin;
- Study the present and planned future uses of the river system; and
- Determine the requirements for flow monitoring and flood management.

ORASECOM comprises a Council, which is supported by a Secretariat and a series of Task Teams who manage projects. The Council serves as technical advisor on matters related to development, utilisation and conservation of the water resources of the basin. It consists of delegations comprised of three representatives from the respective government agencies responsible for water affairs from each of the member states.

#### ***SADC Water Division***

The SADC Water Division, within the SADC Directorate of Infrastructure & Services, is tasked with overall coordination and management of the SADC Water Programme.

The SADC Protocol on Shared Watercourse Systems (2000) promotes the establishment of shared watercourse agreements and institutions and enshrines the principles of

reasonable use and environmentally sound development of the resource. It supports Integrated Water Resource Management (IWRM) and the Regional Strategic Action Plan for Integrated Water Resources Development and Management (RSAP-IWRM). The SADC Protocol supports strengthening the principles of integrated management of shared basins with specific provisions for equitable utilisation, planned measures, no significant harm, and emergency situations.

### 3.2 Legislation, Guidelines and Policies

#### ***Lesotho Legislation and National Plans***

ESIA provides a summary of legislation and national plans, policies and strategies of specific relevance to the ecological and social environment. The relevance to the PRAI ESIA is specified for each of the documents highlighted.

#### ***LHDA Policies, Strategies and Guidelines***

The framework governing LHDA's obligations with respect to environmental protection and social management include a number of overarching agreements and frameworks under which various guidelines and policies have been developed.

### 3.3 Initiatives, Protocols and Conventions

Lesotho is signatory to a number of initiatives and protocols, as well as conventions which are relevant to the planning and future management of the Project Area. ESIA Report identifies those initiatives, protocols and conventions considered to be of relevance to the PRAI, excluding those initiatives related to rangeland and integrated catchment management. No initiatives (by parties external to LHDA) related to environmental protection are known to have been implemented or are currently planned within the PRAI catchment.

### 3.4 International Standards

#### ***World Bank ESS and IFC PS***

The ESIA was required primarily to meet the requirements of the Lesotho Environment Act 10 of 2008, the national Environmental Impact Assessment (EIA) Guidelines (2009) and other relevant national legislation, but was also required to align with international good practice. World Bank and IFC Performance Standards (PS) apply throughout the life cycle of a project and are not only applicable to an ESIA level of assessment. There is also numerous environmental, health and safety (EHS) guidelines developed by the IFC and which the Project (through its appointed design engineers and contractors) should take into account.

#### ***International Good Practice for Public Participation***

Public consultation, disclosure and stakeholder engagement are key requirements of the IFC's Policy on Social and Environmental Sustainability that are embodied within the Performance Standards (PS) guidelines. It must be noted that the IFC PSs are not prescriptive requirements but are considered to be guidelines for good international

practice which developers should strive to align with, where possible. These guidelines were applied in the development of the Stakeholder Engagement Plan for the ESIA.  
*Consultation with Sensitive or Vulnerable Groups.*

The IFC Performance Standards outline requirements for engagement with vulnerable/marginalised groups, which should include differentiated measures to allow for the effective participation of these people. These requirements have been taken into account in the Stakeholder Engagement Plan.

#### ***Voluntary Principles on Security and Human Rights***

The voluntary principles on security and human rights should be taken into account during both the construction and operational phases of the Project in order to protect the rights of people working on the project or who are affected by the Project.

## 4. Project Description

### 4.1 Project Components

The development will comprise the following components (Figure 3).

**Polihali Dam:** The proposed Polihali Dam is a 163.5 m high, concrete-faced rockfill dam with a side channel spillway located approximately 2 km downstream of the confluence of the Khubelu and Senqu Rivers. The cofferdams and two diversion tunnels will be constructed to facilitate the construction of the main dam (the diversion tunnels do not form part of this ESIA).

**Saddle Dam:** The Saddle Dam is a 50 m high, concrete-faced rockfill dam.

**Reservoir:** The FSL for Polihali Reservoir is 2075 metres above sea level (masl). The flood demarcation level is 2080 masl and exceeds the 1:100 year flood level in the upper reaches of Polihali Reservoir. The Reservoir will inundate an area of approximately 5,042 ha upstream of the dam at the 2075 FSL. The reservoir is anticipated taking between 24 and 36 months to reach the FSL.

**Quarries and Borrow Pits:** It is proposed that material for the rockfill embankments will be obtained from the quarries located on the upstream left and right banks of the Senqu River. It is also proposed that material suitable for use as concrete aggregates will be obtained from the Tsilantso quarry.

**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 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. PRAI ESIA does not include the construction of new feeder roads and minor bridges.



BPST infrastructure to be located at the Polihali Reservoir that is included in this ESIA Report are:

- A new substation at Masakong near the advanced infrastructure area;
- A new telecommunications mast in Masakong; and
- A new 33 kV power line from Tlokoeng across the reservoir to the permanent camp area (for future electrical distribution by the LEC on the west side of the reservoir).

Construction of a new 132 kV power line from Katse to Polihali and a new paved road from Ha Seshote to Polihali falls under a separate ESIA for the Polihali Western Access Corridor.

**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, explosive stores and other work areas. In general, all temporary accommodation, offices and buildings needed for a particular construction contract will be provided by the relevant construction contractor and will be removed at the end of construction.

The permanent facilities include:

- Staff accommodation at the Polihali Reservoir area built as a village with all communal services. This will be the accommodation for the Employer, Engineer and Contractor's staff during construction of the Main Works and for operations staff following the completion of dam and tunnel construction;
- A visitors' lodge at the staff village, which will become a tourist facility; and
- The Employer's and Engineer's offices at the dam site, which will become the operations staff offices and visitor centre.

Temporary construction areas include labour camps and work areas for construction of the eastern sections of the PWAR; BPST component, and Polihali-Katse transfer tunnel, and for the Polihali Dam and saddle dam, and bridges.

#### 4.2 Land Acquisition

The project will result in the acquisition of approximately 5,600 ha (up to the 2080 masl level) with the land take affecting four Community Councils (Seate, Bokong, Malingoaneng, and Mphokojoane) and one Urban Council (Mokhotlong). The acquisition of land for the Project will result in both physical and economic displacement of people, and households. The main Project components that will result in displacement of households are the site establishment area, dam and tunnel works areas, as well as the inundation area. The land acquisition will occur in three phases (over a five-year period). These phases are as follows:

- **Phase 1:** Temporary and permanent acquisition in the site establishment area for the Advance Infrastructure. These activities will affect the villages of Masakong and Ha Tlhakola, as well as households from Ramonakalali, Mabunyaneng, Makalong and

Tsekong, Masakong and Ha Tlhakola will be affected by physical and economic displacement and the remainder by economic displacement.

- **Phase 2:** Permanent land acquisition in the inundation area around Tloha-re-Bue and the remainder of the site establishment area. Tloha-re-Bue is partly affected by physical and economic displacement.
- **Phase 3:** The remainder of the inundation area and all households in surrounding villages that will not be physically displaced but will be affected by economic displacement. The villages of Ha Jobere, Koung Ha Phohla, Tsekong and Litsotsong, and Ha Sekants'i, which are all affected to varying degrees by physical and economic displacement, will be addressed in this phase.

The land that will be affected is currently used for grazing, collection of natural resources, cultivation of crops, and settlements; with land used for grazing, the primary land use, being most affected.

#### 4.3 Recruitment

LHDA has published a set of Labour Recruitment Guidelines which provide specific requirements for contractors around the recruitment of labour, including a need to prioritise the hire of labour in Lesotho. Unskilled labour can be drawn from any part of Lesotho, but priority shall be given to residents from the Project Area.

## 5. Analysis of Alternatives

### 5.1 Selection of the Dam Site

During the initial Stage 1 studies of the LHWP Feasibility Study, existing and potential dams were identified and assessed. Possible delivery points for the transfer of water to the Ash River, via Katse or via Muela, Elands and Klipspruit Rivers were identified, and tunnel routes were developed. Once the potential dam sites and alternative conveyance routes had been identified, they were combined into layouts with 21 water only layouts identified. The dams, tunnels, pump stations and infrastructure for each layout were designed and costed as part of the study. In the hydrology and system analysis task, an allowance of 15% of the Natural Mean Annual Run-off (MAR), as prescribed in the relevant Request for Proposals, was allowed as releases to meet the Instream Flow Requirements (IFR) when determining the yield of each layout. Following two multi-criteria analysis workshops, the construction of a CFRD to create the Polihali Reservoir with a transfer tunnel to Katse was identified as the preferred option for Phase II.

### 5.2 Polihali to Katse Transfer Tunnel Route

The 38.2 km Polihali—Katse Tunnel is proposed to transfer water from the Polihali Reservoir to Katse Reservoir. Three possible tunnel alignments (Southern, Northern and Mashai Outlet) were identified and investigated during the Feasibility Study. While the

Feasibility Study did not conclusively identify a preferred option, it has been clarified by the LHDA that the Southern alignment is the preferred option that will be taken forward to the detailed design stage.

### 5.3 Power Supply

Initially, five alternative locations and two technologies were identified for the construction of the substation. The selection of the preferred site was based on location as well as site topography, ease of access and length of the incoming 132 kV power line. It was initially proposed that the construction power supply to the dam site would be through the use of generators. However, an alternative of constructing a new 33 kV power line from Tlokoeng to the Polihali dam site was identified. It was subsequently decided that the line will be retained for the operational phase. As the alignment used during construction will fall below the FSL, alternative alignments were considered for the operational phase line. These included a line across the reservoir or an underwater cable. However, based on the costs of the underwater cable, and the bird risk and visual impact of a line across the reservoir, a third option was developed. This option involves housing the power line in a sleeve attached to the Tlhakola footbridge and has been confirmed as the preferred option.

### 5.4 Communications

Two options were considered for the provision of telecommunications to the Polihali Dam, namely an optic fibre cable from Mapholaneng to Polihali Dam or via a cable housed in a sleeve attached to the proposed bridge at Tlhakola village. Although longer, the preferred option is the route from Mapholaneng as it will allow for local connections to be developed by the service provider at a later date (as required). The optic fibre cable will support voice, data and video with a terminal building provided at the project site and a mast to transmit signals to various areas.

### 5.5 Construction Camps Locations

Three alternative locations were considered for the construction camp sites, namely Mokhotlong town (for senior management), Ha Lebeola and an area near the Polihali Dam site (latter two sites for middle management and labour). The key criteria used to determine the preferred location included financial considerations and limiting the impact that extended travel times might have on the completion of the dam. Camp sites away from the project construction sites, i.e. Mokhotlong and Ha Lebeola, would affect the critical path in terms of timelines. This resulted in the site “near the Polihali Dam” being identified as the preferred option for locating construction camp infrastructure.

### 5.6 Landfill Site

LHDA will need to develop a new landfill site as part of their solid waste management for the construction and operational phases. The site selection process therefore considered the impact of the site during both construction and operational phases. According to the Site Selection Summary—Polihali Village Landfill Site, there were only a minimal number

of sites that could be considered as alternatives for the landfill site location due to the topography of the development site as well as preserving the ambience of the new Polihali Village. The candidate sites were evaluated in terms of economic, environmental and public acceptance criteria with Option 7 (to the west of the PNEAR) being selected as the final location.

### 5.7 Senqu and Khubelu Bridge Realignments on the A1

The inundation of the reservoir will require the realignment of the A1 road where it falls below the FSL. This will require the construction of major bridges across the Khubelu and Senqu Rivers. Three alignment options were considered for each river. Two of the options in the vicinity of the Khubelu River require a second structure across the Mabunyaneng River. These options would decrease the overall length of the bridge required compared to having a single bridge across the Khubelu and therefore one of these options has been identified as the preferred alignment. The preferred option for the Senqu River Bridge has the longest overall length but features the shortest bridge structure.

### 5.8 Dam Construction Site Access Roads

The Butha-Buthe-Oxbow-Mokhotlong corridor and alternative routes in the corridor from Ha Seshote to Polihali Dam were considered during the Phase II Feasibility Study. A number of critical aspects (economic, ecological and social) were considered in the alternatives assessment, with the ultimate route selected being that from Ha Seshote to Polihali across what was defined as the PWAR Route B Option. The PWAR

## 6. Description of the Environment

### 6.1 Physical Environment

**Climate:** The study area is situated in the Lesotho Highlands immediately to the west of the Drakensberg Mountains. In the alpine belt (above 2,700 masl), the climate is severe with a mean annual temperature of 5.7 °C, and the coldest recorded temperature is -20.4 °C. The climate in the area is temperate and strongly seasonal with dry winters and wet summers. Winter air temperatures at Mokhotlong typically range between -2 and 12 °C, while summer air temperatures typically range between 12 and 24 °C. Snow usually occurs in July, and heavy frost is frequent in winter. The Upper Senqu River Catchment is located in a rainfall shadow that is characterised by a strong rainfall gradient, with highest annual rainfall (1044 mm) occurring in the upper Moremoholo and Bafali River Catchments, and lowest annual rainfall (600 mm) occurring at the confluence of the Senqu and Malibamatso Rivers. Rainfall occurs mostly between October and March, but heavy unseasonal rains also occur from time to time.

**Geology:** The Phase II layout is situated in the Drakensberg Group, in basaltic formations. Strata boundaries here are generally sealed and open jointing is normally scarce. The geology of the dam basin is suitable to contain the reservoir and the geology at the dam

site is suitable for the foundations of, and providing construction materials for, the main and saddle dams (CFRDs).

**Topography:** The main topographical features of the area are highly incised mountains with elevations varying between 2,400 and 3,300 masl, comprising steep slopes, and deep elongated valleys and generally shallow soils. The valley bottoms are typically v-shaped, but tend to widen and become flatter in the lower Senqu catchments. Steep slopes and shallow soils tend to favour run-off.

**Soils:** The high plateau (above the 2,500 m contour) represents the Stormberg Basalt erosion surface and soils consists of the basalt derived Popa-Ralebese-Fusi Association, with a shallow soil layer on steep slopes which is partly cultivated. These are interspersed by much steeper uncultivated slopes. At the lower elevations, below around 2000 m contour, the Association consists of deeper soil formations and alluvial terraces, which are deep enough to encourage intense cultivation by the local communities. As a result of the high relief, low ambient temperatures and high rainfall, soil formation in the Lesotho Highlands has been influenced by moderate weathering and leaching. Denudation of areas often results in erosion, which in turn has been aggravated by the high relief, climate and erosive nature of some soils. Plant recolonisation on denuded areas tends to be slow, especially where top soil has been lost through erosion and by micro-climatic in-hospitality at high elevations.

## 6.2 Biological Environment

**River ecosystems:** The Project Area falls within the Drakensberg-Maloti Highlands Freshwater

**Ecoregion.** This ecoregion encompasses the Lesotho Highlands and small parts of South Africa above 1850 masl. The upper reaches of the Senqu River Catchment form part of the Maloti Drakensberg Transfrontier Park (MDTP), which is a global priority area for conservation. The Drakensberg-Maloti Highlands Ecoregion is characterised by Afroalpine and Afroalpine wetlands, streams and rivers that are ecologically unique and internationally valued because of high water yield and excellent water quality. The diversity of aquatic biota in the ecoregion is low because of extreme climatic and flow conditions, but ten species of indigenous fish have been recorded in the ecoregion, and one, the Maloti minnow *Pseudobarbus quathlambae*, is endemic to the Highlands and classified by the IUCN as Endangered (EN).

**Wetlands:** A total of 184.6 ha of wetland habitat were delineated within the local catchment of the PRAI, consisting of five different wetland types, namely Seep, Sheet-rock Seep, Valley-head Seep, Valley-bottom, and Valley-head Seep Fens. The most abundant and extensive wetlands were the seeps and sheet-rock seeps, which are predominantly concentrated in two large clusters within the local catchment, one cluster being located along a mid-slope bench in the south of the Project Area, and the second

cluster located in the central northern section of the Project Area. Both these clusters fall outside the proposed reservoir FSL.

**Terrestrial ecoregion:** The Project Area is situated within the Drakensberg Montane Grasslands, Woodlands and Forests Ecoregion, which is the ecoregion comprising most of the Drakensberg Mountain range between 1800 and 2,500 masl in KZN, Lesotho and the eastern Free State. The eastern boundary of the Project Area borders on the Drakensberg Alti-montane Grasslands and Woodlands ecoregion, which is the alpine part of the Drakensberg Mountains above 2,500 masl but is not actually represented within the PRAI area.

**Vegetation:** Lesotho Highland Basalt Grassland covers the entire Project Area, while Drakensberg Afroalpine Heathland is present in the higher-lying mountains to the west and south-east of the Project Area, where Lesotho Mires and Drakensberg Wetlands are also present. Senqu Montane Shrubland is present in the Senqu River Valley downstream of the dam. Although spiral aloes were anticipated to occur in the Project Area, none was recorded in the wild. However, there are numerous Spiral Aloes, which have been planted outside households, above and below the FSL.

**Centres of Endemism:** The Project Area is situated within the Drakensberg Alpine Centre of plant endemism (DAC) which covers approximately 40,000 km<sup>2</sup> of the Drakensberg Mountain Range in Lesotho and South Africa, and comprises six floristic regions, with the alpine region of the Lesotho Maloti Mountains and KwaZulu-Natal Drakensberg summit being the region in which the Project Area is located. The DAC has the fourth richest flora of any regional centre of endemism in South Africa; with an estimated 2,618 species of vascular plants present.

**Fauna—Mammals:** Some of the large mammals known to occur in this ecoregion are Eland (*Taurotragus oryx*), Southern Reedbuck (*Redunca arundinum*), Mountain Reedbuck (*Redunca fulvorufula*), Grey Rhebok (*Pelea capreolus*), Black Wildebeest (*Connochaetes gnou*) and Oribi (*Ourebia ourebi*), although most of these have their strongholds in South Africa and are absent or very scarce in Lesotho. Two mammals are endemic to the ecoregion, namely Thin Mouse Shrew (*Myosorex tenuis*) and Gunning's Golden Mole (*Neamblysomus gunningi*), neither of which occur in Lesotho, while Natal Red Rock Hare (*Pronolagus crassicaudatus*) is near-endemic and does occur in eastern Lesotho.

The Lesotho Highlands also falls within the Montane Bioregion, which is the mountainous region above 1800 masl, most of which is located within Lesotho. They list 47 mammal species for this bioregion in KwaZulu-Natal, with the diagnostic species being Grey Rhebok, Sclater's Golden Mole (*Chlorotalpa sclateri*) and Sloggett's (Ice) Rat (*Otomys sloggetti*).

**Fauna—Herpetofauna:** The Drakensberg Montane Grassland, Woodland, and Forest ecoregion is home to five endemic frog species, three of which occur in fast-flowing

streams at high altitudes in Lesotho, namely Maluti River Frog (*Amietia vertebralis*), Phofung River Frog (*Amietia hymenopus*) and Natal Cascade Frog (*Hadromophryne natalensis*). Two endemic species occur at lower altitudes in KwaZulu-Natal but have not been recorded in Lesotho (Poynton's Caco *Cacosternum poyntoni*, Long-toed Tree Frog *Leptopelis xenodactylus*). Four reptile species are strictly endemic to this ecoregion, namely the poorly known Cream-spotted Mountain Snake (*Montaspis gilvomaculata*), Lang's Crag Lizard (*Pseudocordylus langi*), Cottrell's Mountain Lizard (*Tropidosaura cottrelli*) and Essex's Mountain Lizard (*T. essexi*), as well as numerous near-endemics such as Drakensberg Crag Lizard (*Pseudocordylus melanotus subviridis*), Drakensberg Flat Gecko (*Afroedura nivaria*) and Spiny Crag Lizard (*P. spinosus*). Minter *et al.* (2004) provide an overview of the zoogeographical affinities of the amphibian fauna of South Africa, Lesotho and Swaziland, and place eastern Lesotho within the Sweet Grasslands assemblage of the Central District, a species-poor assemblage with a relatively low proportion of endemics.

Even though the reptile fauna of Lesotho is poorly known, it is clear that diversity is low, particularly in the Lesotho Highlands in the east. Ambrose (2006) lists 45 reptiles for Lesotho, of which one species is now considered extinct in the country (Southern African Python *Python natalensis*). In addition, many species are also restricted to the lower, western part of the country. Bates & Haacke (2003) documented 23 amphibian species for Lesotho, many of which are confined to the western lowlands, listing only seven species for Mokhotlong District. Branch listed 10 species that potentially occur in the Lesotho Highlands, two of which have not been recorded in Mokhotlong District (Phofung River Frog, Natal Cascade Frog) and another which is poorly known within the district (Plaintive Rain Frog *Breviceps verrucosus*).

**Fauna—Birds:** The bird life of the Polihali area features a relatively low diversity of species with <130 species recorded on site or expected to occur, but high levels of endemism with 26 species or 21% of total avifauna considered regionally or locally endemic. The area also supports important populations of several threatened species (12 species or 10% of total avifauna is regionally or globally red-listed).

There are a number of important cliff-nesting birds within the immediate impact area of the dam, including:

- Over 40 Southern Bald Ibis nesting colonies, comprising >180 active nest sites/breeding pairs, spread throughout the inundation area. The upper Senqu Valley around Mokhotlong is a core nesting area for this regionally "Vulnerable" species, with densities probably higher than anywhere else in its range.
- At least one occupied and active Bearded Vulture nest in the central Senqu Valley. This is one of very few pairs of this regionally Critically Endangered (CR) species (and globally listed Vulnerable species) remaining at lower elevations in the Lesotho Highlands, and only one of an estimated 100 nesting pairs left in the southern African population of the sub-Saharan race *Gypaetus barbatus meridionalis*.

- An occupied and active Cape Vulture nesting colony on the Moremoholo River just above the FSL. This is not a large colony (six active nests in 2016), but it is one of few remaining at lower elevations in the Lesotho Highlands, and still contains reasonable numbers of breeding pairs. The status of this colony is not known.
- At least four nest sites (and probably more) of the regionally “Vulnerable” Black Stork, spread throughout the inundation area. Thought to be dependent on healthy, shallow freshwater systems carrying good fish and amphibian populations, the remote areas of the Lesotho Highlands are considered to be an important stronghold for this species.
- At least one occupied and active Verreaux’s Eagle nest in the central Senqu Valley. This is a scarce species in the Lesotho Highlands—perhaps because of persecution and/or depletion of its prey base by rural communities.
- At least 20, and probably more Lanner Falcon nest sites, spread throughout the inundation area. This regionally “Vulnerable” species may be decreasing in some parts of its southern African range, making populations in remote, rural areas particularly important.
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**Rangelands:** Rangelands in Lesotho are nominally categorised into “A”, “B”, and “C” grazing designations for the purpose of management. To date there are no maps to depict these classifications, however, these are generally described according to the boundaries/jurisdictions of the Village Chiefs, Local Councils and Principal Chiefs, and climatic factors influencing grazing patterns.

The “A”/summer grazing includes those rangelands (usually at higher altitude and very far from the villages) that are grazed during summer months (November to March). Traditionally, these areas are under the control of the Principal Chief and it is he/she that issues permits for the area under his/her jurisdiction. The “B”/winter grazing is usually not far from the villages (and is occupied during April to June/July to October). These areas may be under the Principal Chief’s or Area Chief’s control. The “C”/village grazing is the area around the villages and is usually the responsibility of the Village Chief. The majority of the rangelands within the Project Aol fall within the C grazing areas.

The rangelands in the Project Aol are generally degraded with the exception of the Phutha Sheep Stud and to a degree, the rangelands sampled in the Matieeng Catchment.

### 6.3 Socio-economic Environment

**Demography, Migration and Religion:** The PRAI Aol traverses the administrative districts of Thaba—Tseka and Mokhotlong. According to the Socio-Economic Baseline Study, the population of the Project Area was estimated to be 46,371 people between 2013 and 2014, with an average of 5.2 people per household.



The majority of the residents are Basotho. Most people follow a Christian religion but also follow traditional beliefs and customs.

The official languages are Sesotho, which is spoken by the majority of the population, and English (as the language of business). Other commonly spoken languages are isiZulu, followed by Phuthi, isiXhosa and Mandarin.

The extended family system is widely practised, where family members share livestock, and mutually assist each other with farming, house building, rituals and dispute arbitration. Social networks and financial saving schemes are widespread.

The communities in the PRAI Aol are relatively vulnerable given their isolation, lack of income-earning opportunities and harsh conditions for reliable food supply and poor access to services. As a result, levels of education are low and diseases, such as HIV/AIDS and Sexually Transmitted Diseases (STDs), are high; as a result of poor socioeconomic conditions and education levels.

**Land Tenure:** According to the 2011 Lesotho Demographic Study (LDS) (Bureau of Statistics, 2013), the most prominent form of land tenure in Lesotho was allocation by chiefs (61%), followed by inheritance/gift (29%) and purchase from somebody (7%). A similar scenario was true for the Mokhotlong District where 66% had land allocated by the chiefs, followed by those who had inherited the land (32%). Only 2% of Mokhotlong land owners had acquired land through purchasing it from somebody.

The most prominent form of land tenure in the Project Area is through inheritance (31%), followed by traditional/customary tenure (29%) and title deed (25%). Of the people residing in Mokhotlong Town 38% have title deeds because it is a more urban area compared to the residents in the downstream and catchment areas (42% and 37%, respectively). The “traditional” tenure is the most predominant in both the catchment and downstream areas. Land allocation in the Project Area follows the same principles as elsewhere in the country.

**Land Use:** Land is a major source of livelihoods in Lesotho, and Mokhotlong and the Project Area in particular; with the majority of households engaging in crop farming and extensive animal farming. The Project Area is situated in the mountain zone and is characterised by high-ranging mountains. The total area of the Project Catchment is roughly 37,510 ha. Rangelands make up the greatest proportion of the area at 52% (19,366 ha), followed by croplands at 35% (13,176 ha). The high mountains make up 7% (2,687 ha), while settlements make up 6% (2,280 ha) of the area.

**Livelihood and Economic Activities:** Mokhotlong District has a largely agrarian economy consisting of livestock rearing and cropping. Animal husbandry in the District is undertaken mainly for commercial purposes. The sheep and goats are reared primarily for wool and mohair; for the sole purpose to sell to national and international markets

(mostly South Africa). Crop production is mainly for household subsistence purposes, and surplus is often sold or bartered with neighbours.

**Household Income and Expenditure:** Approximately half of the surveyed population can be classified as “poor” by accepted national and international standards. High levels of variability of income were found within villages, highlighting the need for diverse resettlement recovery strategies, even at village level. Seasonal patterns of the sources of cash that households’ access was noted; these patterns impact poorer and wealthier households differently regarding stress and opportunity, and also resilience to shocks.

Food insecurity emerged as a key vulnerability of, particularly, the poorest households in this study. The results show high levels of dependence on purchased food among the most impoverished, and therefore a concomitant vulnerability to food price increases.

Social ties and networks, as indicated by evidence of gifts originating at multiple levels, from within villages to the district level to South Africa, make a significant contribution to household income and food security. Donations of food and clothing are especially common in the poorer households, while gifts of cash were more common in wealthier households.

Household spending in the Project Area consists of animal purchase, cropping expenses, groceries, non-food groceries, irregular expenses, livestock husbandry, other ongoing monthly expenses, and non-business costs.

**Access and Utilisation of Natural Resources:** There are a wide variety of natural resources found in the Project Area, and most of these are communally owned and utilized. These include edible plants, medicinal plants, grazing land, thatching grass, river reeds, *mosea* (craft grass) water, rocks, fish, sand, trees/shrubs and small wild animals. The collection and utilisation of natural resources are managed by the Chiefs and their respective Councils. Findings from the FGDs indicate that people also have to go to the chief and the counsellor to request use of roofing grass, fuel wood, medicinal plants and other natural grasses such as *mosea* and *loli*. The areas where natural resources are collected vary, for instance, rocks which are mostly used in the construction of housing walls and kraals are readily available everywhere across the Project Area, and people do not have to walk far to collect and utilise. However, the majority of the natural resources are found in the hill/mountainous locations and river banks.

**Health Care:** There are seven health centres within the Project Area, four of which belong to the government, the Christian Health Association of Lesotho (CHAL) owns two and one is privately owned. There is only one hospital that serves as the main referral hospital for the health centres. This hospital has 100 beds and a single doctor servicing the emergency room and the outpatient department.

**Education:** In the Project Area, the education system follows the national and district system. The Ministry of Education and Training (MoET) through the Inspectorate is expected to support and supervise schools. Following the pattern of a number of schools in the Mokhotlong District, there are also more primary schools in the Project Area and very few Secondary schools. Early Childhood Care and Development (ECCD) schools are also available in the Project Area. A few NGOs work in the education sector in the Districts and provide support in the form of school fees, uniforms, school shoes, toiletries and sanitary towels to children. These include Sentebale, Hlokomela Bana and World Vision. Sentebale and Hlokomela Bana operate in Mokhotlong and the Project Area.

**Public Services and Infrastructure—Water:** In the Project Area water is mostly collected from communal taps that are scattered through the area. Access to such communal taps is at 72% in the catchment area and 42% in the downstream area. For Mokhotlong town, the use of taps includes both communal taps and piped water into the dwelling. The population in the downstream area further relies on wells as a second source of water (40%). The government installed the communal taps that the communities use through the Department of Rural Water Supply. However, the communities complained that there were not enough communal taps to service their water needs. In some communities, the water taps were non-functional, this was as a result of faulty pipes or broken taps or solar panels that supply the water pump with power. Villages whose taps were no longer functioning returned to collecting water from unprotected sources such as springs or wells.

**Public Services and Infrastructure—Sanitation Facilities:** In the Project Area, the majority of the respondents indicated having no access to sanitation facilities. This was observed mostly in the downstream area where 80% of the households had no access to toilets, followed by 12% with access to Ventilated Improved Pit (VIP) toilets, 5% with access to pit latrines and the remaining 3% having access to other forms of sanitation facilities. In turn, the population in the catchment area reported that 59% had no access to toilets, 27% had VIP and 11% pit latrines and the remaining 3% had access to other forms of sanitation facilities. In Mokhotlong town, the most common toilet facilities that the population has are VIP toilets (56%), followed by 31% being without any form of sanitation facilities, 9% used pit latrine and 3% had access to other forms of sanitation facilities. A small number of households had flush toilets (1%).

#### 6.4 Cultural Heritage

Many sites of medicinal plants and plant/animal species used for cultural purposes will be permanently impacted by inundation. Part or all of eight (8) villages (all but one in the Tlokoeng Ward) and a small portion of Mokhotlong town will need to be relocated as a result of inundation. Within the town of Mokhotlong, the Old Prison as well as one of the first two trading stations in the area will be impacted. Other cultural heritage to be impacted directly includes:

- A number of graveyards and grave sites;

- Caves used as Initiation Lodges and others connected with national historical incidents (like that of Langalibalele);
- Sacred pools used in rituals by spiritual and other types of healers;
- Deep pools which are said to contain “water snakes”;
- Beautiful cultural landscapes;
- Sites of regional historic significance (like the ford which Qatsa was said to have “doctored” so as to prevent Seeiso from capturing him);
- “Teropong ea lononyana” (bird town) in Ntlholohetsane; and
- Many other sites of stories/other forms of intangible heritage still to be documented.

## 7. Stakeholder Engagement

### 7.1 The Engagement Process

The stakeholder engagement process is summarised in Figure 2. Stakeholder engagement was carried out in alignment with international good practice in line with the principles of:

- Start as early as possible in the project lifecycle;
- Continue throughout the life of the project;
- Be free of external manipulation, interference, coercion, or intimidation;
- Enable meaningful community participation (including vulnerable groups); and
- Be conducted on the basis of timely, relevant, understandable, and accessible information in a culturally appropriate format.

#### ***Inception***

During the inception task, a preliminary SEP including stakeholder database (national and district authorities, and NGOs and CBOs) was developed. This provided a framework for the rollout of the stakeholder engagement process throughout the ESIA. A Background Information Document (BID) and public notice were developed and approved by LHDA for release and distribution during the Sensitisation phase.

#### ***Sensitisation***

**District Level:** Sensitisation meetings with District officials, Community Councils, and Chiefs took place between the 12th of September and 14th December 2016 in Mokhotlong District, and the 13th of February and 5th April 2017 in the Thaba-Tseka District. Representatives from the Tlokoeng Field Operations Branch (FOB) were present at the meetings.

**National Level:** Separate meetings were held with relevant national authorities in Maseru. Meetings were held with the following ministries: Department of Water Affairs and Wetlands Unit; Roads Directorate; Lesotho Electricity Company (LEC); Lesotho Communications Authority; Lesotho Tourism Development Corporation; DoE; Department of Culture and Department of Tourism; Ministry of Mines; Department of Agriculture and Food Security: Livestock Unit; and the Ministry of Forestry, Range and Soil Conservation: Department of Soil Conservation.

**Public Notification** involved the following:

- Newspaper advertisements were posted in four National newspapers. The English advertisements were placed in the Public Eye (16 December 2016) and Lesotho Today (11 to 17 January 2017) and a Sesotho advertisement in the Moeletsi oa Basotho (18–25 December 2016) and Lentsoe la Basotho (11 to 17 January 2017); refer to Appendix B of Annexure K: Stakeholder Engagement Report for proof of advertisements; and
- Two radio stations ran the project announcements (Radio Lesotho and Harvest FM), in both English and Sesotho over a period of two weeks at peak times in January 2017.

### ***Community Engagement***

A total of 39 community meetings were held in the 39 clusters. Over 3,100 people were engaged between 18 January and 16 March 2017. During the community meetings, over 600 BIDs (in Sesotho) were left with the Chiefs and/or Councillors to distribute to the community members. All issues and concerns raised at the meetings and through other forums have been captured into an Issues Log.

Focus Group Discussions (FGDs) and Key Informant Interviews (KIIs) were primarily aimed at obtaining information for the social and cultural heritage baselines and impact assessments but also served as opportunities for stakeholders to raise additional issues, concerns and suggest mitigation measures for further investigation by the relevant specialists. FGDs were held immediately after pitsos with men, women and youth.

## 7.2 Key Issues Raised

All issues raised by stakeholders are recorded in the form of summary issues logs and summarised below.

### ***District and Traditional Authorities***

The main issues identified by the district and traditional authorities included:

- Employment opportunities during the ESIA;
- The ESIA process and team;

- Potential loss of natural resources;
- Potential impacts on the downstream flows;
- Impacts on current access routes/bridges; and
- Compensation for loss of natural resources.
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#### ***National Authorities***

The key issues pertaining to the PRAI that were discussed with national authorities include:

- Resettlement and compensation;
- Mining, in terms of borrow pits and quarries; gravel/sand mining and mineral right applications in the Project Aol;
- Stakeholder engagement, including capacity building of project affected people (PAP);
- The need to protect significant cultural heritage resources; and
- Tourism, in terms of local and regional opportunities linked to the development of the Polihali Dam.
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#### ***Community Issues***

Many of the issues raised by the local communities were common across the 39 clusters and included the following:

- Current and ongoing communication with the LHDA;
- Distribution and management of employment opportunities;
- Physical and economic resettlement;
- Payment of compensation for loss of communal and household assets;
- Impeded access as a result of inundation;
- Community benefits (improved road access, jobs, businesses, public services);
- Loss of areas of cultural and heritage significance; and
- Impacts on the biophysical environment.

## **8. Impact Assessment**

### **8.1 Introduction**

Following completion of field surveys and the preparation of the baseline descriptions, impacts of the Project on the environmental and social aspects were identified by the

specialist team and assessed in accordance with the Impact Assessment Methodology. The impacts were reviewed and cross-checked in an iterative process to ensure the correct application and interpretation of the methodology. Impacts of negligible or minor significance are indicated under the screening of insignificant or negligible impacts.

## 8.2 Identification of Project Risks

To provide context to the type and level of risk identified and assessed in this ESIA, a risk assessment matrix was prepared, which shows the level of interaction between project activities and physical, ecological and socio-economic aspects. The risk assessment process was informed by the depth of experience gained by the team during field surveys and on other dam projects in Lesotho, and from information available on lessons learned during Phase I Dams. The level of interaction between project activities and the identified aspects was used to guide the impact identification and screening out of impacts.

## 8.3 Impact Assessment

The impacts on the biophysical environment and the key mitigation measures proposed have been summarised in Table 5.

Note: Green blocks are positive impacts.

**Table 5: Biophysical Impacts and Key Mitigation Measures**

Impacts	Pre-Mitigation Impact Significance	Summary of Key Mitigation	Residual Impact Significance
<b>CONSTRUCTION - INUNDATION PHASE</b>			
<b>Soils, Land Use and Land Capability</b>			
Erosion of soils on steep terrain	<b>Major*</b>	<ul style="list-style-type: none"> <li>· Stockpiles located away from waterways and water flow paths;</li> <li>· Geo-textiles used to stabilize soil stockpiles;</li> <li>· Implement Erosion Control and Revegetation Plan;</li> <li>· Minimise area of disturbance;</li> <li>· Control site access points;</li> <li>· Progressive rehabilitation of cleared sites;</li> <li>· Minimize and eliminate unnecessary vegetation removal;</li> <li>· Implement storm water control plan.</li> </ul>	<b>Moderate</b>
Erosion of moderately deep soils on near level terrain	<b>Major*</b>		<b>Moderate</b>
Compaction of soils on steep terrain; and on near level terrain	<b>Moderate</b>	<ul style="list-style-type: none"> <li>· Avoid off-road driving;</li> <li>· Minimize footprint of project and therefore required site clearance;</li> <li>· Use existing roads as far as possible.</li> </ul>	<b>Minor</b>
Chemical pollution impact on soils on steep terrain and on near level terrain	<b>Moderate</b>	<ul style="list-style-type: none"> <li>· High level maintenance of all vehicles, plant and equipment to prevent hydrocarbon spills;</li> <li>· Impermeable, bunded areas for storage tanks;</li> <li>· Site surface water and wash water to be collected and treated prior to release;</li> <li>· Waste segregation, recycling and trucking out of waste; and</li> <li>· Immediate clean-up of accidental spills.</li> </ul>	<b>Minor</b>
<b>Terrestrial Ecology</b>			
Site clearance on flora: grassland and rocky ridges & cliffs	<b>Moderate</b>	<ul style="list-style-type: none"> <li>· Pre-construction surveys; search and rescue to adjacent suitable areas, including community gardens;</li> <li>· Appropriate storage of removed topsoil and vegetation; and</li> <li>· Alien invasive plant control measures.</li> </ul>	<b>Minor</b>
Loss of community plant resources	<b>Moderate</b>	<ul style="list-style-type: none"> <li>· Pre-construction surveys;</li> <li>· Harvesting of resources prior to construction; and</li> <li>· Search and rescue of plants to gardens.</li> </ul>	<b>Minor</b>
Site clearance and disturbance on mammals, reptiles and amphibians	<b>Moderate</b>	<ul style="list-style-type: none"> <li>· Raise biodiversity awareness of staff (no killing of snakes and other animals); and</li> <li>· Train at least one staff member to handle snakes and lizards.</li> </ul>	<b>Minor</b>



Impact of blasting on mammals and herpetofauna on grassland	<b>Minor</b>	<ul style="list-style-type: none"> <li>Not possible to mitigate (however, impact will be localised and temporary).</li> </ul>	<b>Minor</b>
Impact of blasting on mammals and herpetofauna on rocky ridges & cliffs	<b>Minor to Moderate</b>		<b>Minor to Moderate</b>
Impact of inundation on vegetation: grassland and rocky ridges & cliffs	<b>Major</b>	<ul style="list-style-type: none"> <li>Pre-inundation surveys; search and rescue of conservation-important plants; and</li> <li>Plan and establish community gardens for the relocation of conservation priority species and medicinal plants. Fence off the area to protect from grazing.</li> </ul>	<b>Moderate</b>
Impact of inundation on the vegetation in wetland seeps	<b>Minor</b>		<b>Negligible</b>
Impact of inundation on important plant resources – grasslands including seeps and rocky ridges & cliffs	<b>Moderate</b>	<ul style="list-style-type: none"> <li>Identify populations of important species within the inundation zone;</li> <li>Local traditional medicinal practitioners encouraged to harvest plant resources from these areas;</li> <li>LHDA to support establishment of medicinal plant nurseries around the reservoir; and</li> <li>Local communities should be given the opportunity to harvest and stockpile firewood and other plant resources from entire inundation zone.</li> </ul>	<b>Minor</b>
Impact of inundation on important plant resources - Spiral aloes in villages	<b>Major*</b>	<ul style="list-style-type: none"> <li>Census of spiral aloes located in villages to be inundated;</li> <li>Homesteads to be relocated should be encouraged to translocate spiral aloes; and</li> <li>Aloes not translocated to be rescued for community gardens.</li> </ul>	<b>Negligible</b>
Impact of inundation on mammals and herpetofauna – grassland and rocky ridges & cliffs	<b>Moderate</b>	<ul style="list-style-type: none"> <li>Limited mitigation possible, apart from search and rescue of animals from islands that form in the reservoir; and</li> <li>Consideration should be given to installation of pit fall traps in focused areas below villages around the reservoir where frogs, snakes and reptiles are more likely to occur and to move out of the inundation area as it fills.</li> </ul>	<b>Moderate</b>
Impact of inundation on mammals and herpetofauna – seeps	<b>Minor</b>		<b>Minor</b>
<b>River Ecosystems</b>			
Impact of advance works, site preparation and construction on transitional streams and upper foothills	<b>Negligible</b>		<b>Negligible</b>

Impact of Advance Works, site preparation and construction on lower foothills	<b>Minor</b>	<ul style="list-style-type: none"> <li>· Pollution control;</li> <li>· Stormwater control; and</li> <li>· Riparian vegetation protection.</li> </ul>	<b>Negligible</b>
Impact of bridge construction on upper foothills	<b>Minor</b>		<b>Minor</b>
Impact of bridge construction on lower foothills	<b>Moderate</b>		<b>Moderate</b>
Impact of human influx on riverine resources in transitional streams	<b>Negligible</b>	<ul style="list-style-type: none"> <li>· No fishing, harvesting of timber, vegetation, grains and other plant material in the riparian zones by contractors; and</li> </ul>	<b>Negligible</b>
Impact of human influx on riverine resources in upper and lower foothills	<b>Minor</b>	<ul style="list-style-type: none"> <li>· No worker recruitment near site to limit influx.</li> </ul>	<b>Negligible</b>
<b>Wetlands</b>			
Impact of dam inundation on wetlands in the PRAI (seeps and sheetrock)	<b>Minor to Moderate</b>	<ul style="list-style-type: none"> <li>· Minimal wetlands lost. No mitigation for loss. Opportunity to rehabilitate other wetlands in the upper catchment.</li> </ul>	<b>Minor to Moderate</b>
<b>Rangelands</b>			
Impact of site clearance for advance works on rangelands	<b>Moderate</b>	<ul style="list-style-type: none"> <li>· Short-term mitigation:</li> <li>· Limit area for site clearance;</li> <li>· Restrict site access routes to existing tracks where possible; and</li> <li>· Rehabilitate temporary access roads following construction completion.</li> <li>· Long-term mitigation:</li> <li>· Develop and implement grazing management plan;</li> <li>· Implement fodder production to supplement grazing;</li> <li>· Develop and implement alternative livelihood coping strategies; and</li> <li>· Manage introduction and spread of alien invasive plant species.</li> </ul>	<b>Minor</b>
Impact of inundation on rangeland resources: “C” (village) grazing within the reservoir	<b>Major</b>	<ul style="list-style-type: none"> <li>· Develop and implement a grazing management plan;</li> <li>· Implement fodder production to supplement grazing;</li> <li>· Develop and implement rangeland improvement interventions in association with the DRRM;</li> <li>· Promote and support community-based Grazing Associations;</li> <li>· Promote alternative livelihood coping strategies;</li> <li>· Develop and implement an integrated catchment management plan (that incorporates the above- mentioned actions); and</li> <li>· Manage (prevent) the introduction and spread of alien invasive species.</li> </ul>	<b>Major*</b>

Impact of inundation on rangeland resources: “C” (village) grazing within the reservoir	<b>Major</b>	<ul style="list-style-type: none"> <li>· Develop and implement a grazing management plan;</li> <li>· Implement fodder production to supplement grazing;</li> <li>· Develop and implement rangeland improvement interventions in association with the DRRM;</li> <li>· Promote and support community-based Grazing Associations;</li> <li>· Promote alternative livelihood coping strategies;</li> <li>· Develop and implement an integrated catchment management plan (that incorporates the above- mentioned actions); and</li> <li>· Manage (prevent) the introduction and spread of alien invasive species.</li> </ul>	<b>Major*</b>
<b>Birds</b>			
Impact of site clearance for advance works on birds	<b>Moderate</b>	<ul style="list-style-type: none"> <li>· Limit area for site clearance.</li> </ul>	<b>Minor</b>
Installation of telecommunications mast and powerlines across the reservoir	<b>Major</b>	<ul style="list-style-type: none"> <li>· Regular (seasonal) monitoring of bird populations around the reservoir and likely to be impacted by the Polihali Dam Project to fully determine actual, immediate impacts of the project, to confirm long-term effects, to evaluate the efficacy of mitigation and identify additional mitigation or enhancement measures, if appropriate.</li> <li>· Ideally, no powerlines should be installed across obvious avian fly- ways such as deep valleys or steep-sided areas of open water. Alternatively, the largest possible line marking devices – aviation balls – should be fitted to the full extent of the line as it crosses the dam. The line from Tlokoeng across to Masakong to supply the Polihali Village will be placed in a sleeve attached to the Tlhakola Bridge, which will reduce the impact of this line. However, there will be realignment of the existing powerline along the A1, which will need to be reviewed in terms of flight paths.</li> <li>· Undertake further investigations on the viability of installing newly- developed flight diverters that light up at night, to reduce collision risk for crepuscular and nocturnal species.</li> </ul>	<b>Moderate</b>

		<ul style="list-style-type: none"> <li>· All live components should be fully insulated and configured to prevent even the largest birds from being electrocuted while perching on utility structures supporting the line.</li> <li>· Install bird flight diverters on all telecommunication mast support lines or guy wires.</li> </ul>	
Impact of blasting and construction disturbance on birds	Moderate	<ul style="list-style-type: none"> <li>· Bird specialist to inspect the areas around each site where high-impact clearing and blasting activities to occur to check for nearby, active nest sites of priority bird species. If such nest sites deemed sufficiently important and sufficiently susceptible to negative impacts, timing of blasting to be postponed until end of breeding season;</li> <li>· Alternatively, occupied nests should be monitored to determine actual behavioural response and these responses inform additional, mitigation requirements as part of Biodiversity Management Plan (BMP); and</li> <li>· Keep extent of affected areas, noise levels and movement disturbance to a reasonable and practical minimum.</li> </ul>	Minor
Impact of inundation on birds: grassland and wetland species	Moderate	<ul style="list-style-type: none"> <li>· Regulate access and grazing, prevent hunting on islands created by inundation; and</li> <li>· Additional surveys should be conducted to more fully determine the baseline waterbird population to establish baseline for monitoring change during and post-inundation.</li> </ul>	Minor
Impact of inundation on birds: cliff-nesting species	Critical	<ul style="list-style-type: none"> <li>· May be possible to establish artificial nest sites for cliff-nesting birds such as Southern Bald Ibis and Lanner Falcon on the dam (and possibly in quarries and on other high, vertical structures resulting from the development activities; and</li> <li>· Additional bird survey work should be undertaken to improve the baseline estimates of bird populations likely to be impacted by the Polihali Dam project.</li> </ul>	Critical
<b>OPERATIONAL PHASE</b>			
<b>Soils, Land Use and Land Capability</b>			

Pressure on the remaining soils by displaced communities and livestock: soils for crop and animal production	<b>Major</b>	<ul style="list-style-type: none"> <li>An Integrated Catchment Management (ICM) Plan that will incorporate the social, economic and ecological components. The Plan should clearly integrate components of development, management, protection and use of land, with an understanding that it is not only an asset but also inheritance; and</li> <li>A participatory engagement process that engages all the stakeholder groups needs to be arranged. This should be in the form of regular involvement, not only of those whose land and soil will be used, but those likely to be sharing whatever land will be available during the operation of the different types of infrastructure.</li> </ul>	<b>Moderate</b>
<b>River Ecosystems</b>			
Impact of Inundation on Riverine Ecosystems in the Polihali Reservoir: transitional streams (6 km)	<b>Negligible</b>	<ul style="list-style-type: none"> <li>No interventions can avoid or reduce impact of permanent inundation of riverine habitats; and</li> <li>Indirect interventions required that could partially offset the impacts such as identifying and protecting areas of the upper catchment to compensate for impacts of the dam on aquatic ecosystems and biodiversity.</li> </ul>	<b>Negligible</b>
Impact of Inundation on Riverine Ecosystems in the Polihali Reservoir: upper foothills (16 km)	<b>Moderate</b>		<b>Moderate</b>
Impact of Inundation on Riverine Ecosystems in the Polihali Reservoir: lower foothills (97 km)	<b>Major</b>		<b>Major</b>
Impact of altered water quality on downstream river ecosystem: lower foothills (Senqu River to Malibatso (62 km)	<b>Moderate</b>	<ul style="list-style-type: none"> <li>Monitoring of inflow to the reservoir at proposed new gauges on the main feeder rivers to inform the required environmental flow releases;</li> <li>Implementation of the environmental flow releases in accordance with an operational flow management plan that takes into account the IFR for Katse and Mohale.</li> <li>Consideration should be given to increasing the magnitude and frequency of short duration, high flow events; and</li> <li>The impacts of existing man-made instream barriers on fish migrations within the Senqu River Catchment should be assessed, both upstream and downstream of the proposed dam, and remedial actions taken, where appropriate (CES, 2014c). This could include the construction of fishways or modifying the design of existing barriers to allow natural fish migrations to take place (CES, 2014c).</li> </ul>	<b>Moderate</b>
Impact of altered flows on downstream river ecosystem: lower foothills (Senqu River to confluence with Malibatso (62 km))	<b>Major</b>		<b>Major</b>
Impact of altered flows on river ecosystem services: lower foothills (Senqu River to confluence with Malibatso (62 km))	<b>Moderate</b>		<b>Moderate</b>

Impact of increased fish predation on aquatic ecosystems: lower foothills (Senqu River to confluence with	<b>Minor</b>	<ul style="list-style-type: none"> <li>· Fish spawning bed improvement;</li> <li>· Assessment of fish migration barriers.</li> </ul>	<b>Minor</b>
Impact of increased fisheries potential: new impoundment	<b>Minor</b>	<ul style="list-style-type: none"> <li>· Development of a Reservoir Zonation Plan (enhance the benefit).</li> </ul>	<b>Moderate</b>
<b>Wetlands</b>			
Impacts of land use displacement on seeps and sheetrock wetlands; Valleyhead bottom and Valleyhead seeps; and	<b>Major</b>	<ul style="list-style-type: none"> <li>· An ICM plan should be developed and implemented for the entire Polihali Reservoir catchment. This should include considerations from multiple interlinked perspectives including rangeland management, terrestrial biodiversity, wetland and socio-cultural aspects, as well as allow for expected impacts from climate change.</li> </ul>	<b>Major</b>
Impacts of land use displacement on Valleyhead fens	<b>Critical</b>		<b>Major</b>
<b>Terrestrial Ecology</b>			
Increased pressure on natural resources by displaced communities: rocky outcrop/ grassland mosaic	<b>Major</b>	<ul style="list-style-type: none"> <li>· Increased protection status for the Phutha Sheep Stud (possibly proclaim as nature reserve);</li> <li>· Creation of community gardens;</li> <li>· Develop an integrated catchment management plan.</li> </ul>	<b>Moderate</b>
Increased pressure on natural resources by displaced communities: Phutha Sheep Stud	<b>Critical</b>		<b>Negligible</b>
<b>Birds</b>			
Impact of maintenance and leisure activities on birds	<b>Major</b>	<ul style="list-style-type: none"> <li>· Regular (seasonal) monitoring continued to fully determine actual, immediate impacts of the project, to monitor long-term effects, and to gauge the efficacy of mitigation and possibility for additional mitigation;</li> <li>· Identification of key, remaining areas of avian habitat that should be set aside for special protection and management;</li> <li>· Minimise areas required for maintenance and leisure activities; and</li> <li>· Recreational boating on the dam should avoid areas in close proximity to known cliff-nesting or roosting areas.</li> </ul>	<b>Moderate</b>

<p>Impact on birds of increased pressure on natural resources by displaced communities</p>	<p><b>Critical</b></p>	<ul style="list-style-type: none"> <li>· Regular (seasonal) monitoring of these populations should be continued to fully determine the actual, immediate impacts of the project, to monitor long-term effects, and to gauge the efficacy of mitigation. Ongoing monitoring will allow for the identification of sites where increasing pressure from changes in patterns of human settlement and activities may be problematic, and could inform appropriate mitigation strategies;</li> <li>· The extent of remote, mid- and upper-level catchment areas affected by displaced and expanding human settlement and activities should be kept to a reasonable and practical minimum; and</li> <li>· In collaboration with DoE, implement awareness raising measures about birds.</li> </ul>	<p><b>Major</b></p>
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The impacts on the socio-economic environment and the key mitigation measures proposed have been summarised in Table 6.

**Table 6: Socio-economic Impacts and Key Mitigation Measures**



Impacts	Pre-Mitigation Impact	Summary of Key Mitigation	Residual Impact
<b>CONSTRUCTION - INUNDATION PHASE</b>			
<b>Socio-economic</b>			
Physical displacement of households	<b>Critical</b>	<ul style="list-style-type: none"> <li>· Compensation &amp; relocation; and</li> <li>· Livelihood restoration and social development projects.</li> </ul>	<b>Moderate-Major</b>
Economic displacement	<b>Critical</b>	<ul style="list-style-type: none"> <li>· Compensation &amp; relocation; and</li> <li>· Livelihood restoration and social development projects.</li> </ul>	<b>Major</b>
Increased risk of road traffic accidents	<b>Major</b>	<ul style="list-style-type: none"> <li>· Traffic management plan;</li> <li>· Awareness campaigns; and</li> <li>· Signage and traffic calming measures.</li> </ul>	<b>Moderate</b>
Increased ambient noise levels	<b>Moderate</b>	<ul style="list-style-type: none"> <li>· Appointed engineers are collecting data on ambient noise levels prior to construction (baseline). Contractors will collect ambient noise level data during construction. These data will be compared to the baseline data to determine the change in noise levels as a result of construction activities. Noise mitigation measures will be adjusted, as required, to minimise the increased noise levels as far as practicable; and</li> <li>· Blasting protocol</li> </ul>	<b>Minor</b>
Increased nuisance factors: highly sensitive receptors	<b>Major</b>	<ul style="list-style-type: none"> <li>· Apply the LHDA Recruitment Guidelines and the mitigation</li> </ul>	<b>Moderate</b>
Increased nuisance factors: less sensitive receptors	<b>Moderate</b>	<ul style="list-style-type: none"> <li>· measures described in Section 8.6.3.1.to enhance local employment. This will serve to reduce the number of general workers from outside the area, and discourage influx.</li> </ul>	<b>Minor</b>
Increased prevalence of sexually transmitted infections and HIV/AIDS	<b>Major</b>	<ul style="list-style-type: none"> <li>· Collaboration with Local Health Care Services;</li> <li>· HIV Workplace Policy and Programme;</li> <li>· Risk Planning, Management and Communication; and</li> <li>· Employee Code of Conduct.</li> </ul>	<b>Moderate</b>
Increased anti-social behaviour	<b>Major</b>	<ul style="list-style-type: none"> <li>· Local labour recruitment;</li> <li>· Employee Code of Conduct;</li> <li>· Awareness-raising of community/ staff; and</li> <li>· Collaboration of LHDA / GoL Depts.</li> </ul>	<b>Moderate-Major</b>
Creation of employment opportunities	<b>Moderate</b>	<ul style="list-style-type: none"> <li>· Local labour recruitment.</li> </ul>	<b>Major</b>
Procurement of goods and services	<b>Minor-Moderate</b>	<ul style="list-style-type: none"> <li>· Local procurement; and</li> <li>· Facilitate development of local MSMEs.</li> </ul>	<b>Moderate</b>

<b>Cultural Heritage (including Archaeology)</b>			
Blasting impact on cultural heritage	<b>Negligible to Critical</b>	<ul style="list-style-type: none"> <li>Asset condition assessment prior to and after blasting; and</li> <li>Alternative blasting methods where feasible to avoid damage.</li> </ul>	<b>Negligible to Moderate</b>
Inundation impact on cultural heritage: heritage sites	<b>Major</b>	<ul style="list-style-type: none"> <li>Confirm location of burial sites and avoidance measures;</li> <li>Agree and implement relocation and / or ceremonies with affected families prior to construction disturbance; and</li> <li>Demarcate graves to avoid damage.</li> </ul>	<b>Minor</b>
Inundation impact on cultural heritage: intangible heritage	<b>Moderate</b>	<ul style="list-style-type: none"> <li>Capture cultural heritage of villages to be relocated; and</li> <li>Identify opportunities for conservation of cultural and natural heritage features outside of FSL.</li> </ul>	<b>Minor</b>
<b>OPERATIONAL PHASE</b>			
<b>Socio-economic</b>			
Increased government revenue	<b>Major</b>	N/A	<b>Major</b>
Economic opportunities and diversification	<b>Minor-Moderate</b>	<p><i>Required Enhancement Measures</i></p> <ul style="list-style-type: none"> <li>For all employment and procurement requirements during the operational phase, implement all enhancement measures described in Sections 8.6.3.1 and 8.6.3.2 to enhance local employment and procurement.</li> <li>Implement all measures described in Section 8.6.3.2 and to build the</li> </ul>	<b>Moderate</b>
		<p>capacity of local entrepreneurs to take up the business opportunities that arise.</p> <p><i>Recommended Enhancement Measures</i></p> <ul style="list-style-type: none"> <li>As per Section 8.6.3.2, LHDA will support MSME development through collaboration with service providers such as BEDCO, which should include all affected parts of the extended Project Area, as part of LHDA's commitment to social development under the SDMP.</li> </ul>	
Increased cost of living	<b>Moderate</b>	<p><i>Required Mitigation Measures</i></p> <ul style="list-style-type: none"> <li>Implement all required and recommended measures described in Section 8.6.3.3.</li> </ul> <p><i>Recommended Mitigation Measures</i></p> <ul style="list-style-type: none"> <li>Implement social development projects under the SDMP, as outlined in the LHWP Phase II LR&amp;SDF as a means of delivering socio-economic benefits to assist in combatting some of the challenges households may experience.</li> </ul>	<b>Moderate</b>

Growth of local tourism sector	<b>Minor-Moderate</b>	<ul style="list-style-type: none"> <li>· Collaboration between LHDA and LTDC to develop a local tourism plan for the Project Area linked to current (e.g. Sani Top) and potential initiatives (pony trekking, cultural heritage tours, etc.); and</li> <li>· Implementation of Tourism Master Plan.</li> </ul>	<b>Moderate</b>
Continuation of anti- social behaviour and spread of STIs and HIV/AIDS (long- distance truck drivers, work-seekers) (	<b>Moderate</b>	<ul style="list-style-type: none"> <li>· During the operational phase there are limited interventions that can be implemented directly by LHDA. However, LHDA should assist by motivating and supporting relevant departments in the GoL to identify potential projects and interventions that could result in improvements to anti-social behaviour. These are likely to include improved education and training, recreational facilities and activities, crime awareness and management interventions, improved health awareness campaigns (specifically linked to sexual health and well-being).</li> </ul>	<b>Moderate</b>

## 9. Cumulative Impacts

Cumulative impacts of the PRAI are broadly described in the context of the LHWP Phase I Dams (Katse and Mohale), and other known major projects that exist or are planned for the Senqu Catchment and which will interact or combine with impacts of Polihali Dam. This section is not a detailed assessment of all elements of the LHWP on the different environmental components for the whole Senqu/Orange catchment, or even the Senqu catchment in Lesotho. The former would require significant in-depth analysis of hydrology data for all dams on the Senqu/Orange River in the context of recent or forecast climatic changes, while the latter would require detailed analysis of LHWP Phase I flow data and monitoring results. Instead, this assessment identifies and describes the most likely key cumulative impacts, based largely on available information and team experience on LHWP Phase I.

The high-level cumulative impact assessment is divided into two primary sections. The first (Section 9.2) describes the overall setting of the Polihali Dam in the context of the Senqu/Orange River Catchment and outlines the flow-related implications of the dam on the downstream system. The second section (Section 9.3) focusses on describing the cumulative effects of Polihali Dam in the context of Katse and Mohale Dams in terms of ecological and social features of the Lesotho environment.

This high-level cumulative assessment highlights the wide range of cumulative impacts associated with the Polihali Dam in the context of other projects. Cumulative impacts of

Phase I and II of the LHWP combined with other abstraction for the Eastern Cape in South Africa will further reduce river flows down the length of the Orange River, with increased consequences for the sustainability of the Orange River Estuary, a Ramsar site and IBA. This is expected to intensify under the prevailing drought periods experienced by Lesotho and South Africa. Further investigations and planning to augment flows in the Orange River will need to be pursued to address this issue, including consideration of periodic releases from the LHWP to mitigate extended low flow periods in the Senqu / Orange River. However, augmentation options to improve supply to the lower Orange River are unlikely to be achievable to make a material difference to downstream water supply given increasing water demand pressures on the basin. Implementing more effective water demand strategies to reduce consumption will be essential in balancing the competing needs of the Orange River.

Within Lesotho, flow-related impacts associated with Polihali Dam will attenuate with distance along the Senqu River. While releases from Mohale and Katse will ameliorate the flow reduction associated with Polihali Dam to some extent, there will be a significant cumulative reduction in the Senqu River within Lesotho from all three dams. Changes in fish and riparian habitats have been recorded downstream of Katse and Mohale Dams, with similar impacts expected downstream of Polihali.

Cumulative impacts of the estimated 113 km<sup>2</sup> direct footprint of the LHWP Dams and associated infrastructure on biodiversity, rangelands, natural resources and social livelihoods in the Highlands are extensive. Indirect impacts associated with land use and livestock displacement from the reservoirs further extends the AoI of the LHWP. Monitoring results have confirmed significant expansion of cultivation and land use degradation around the dams, although this is difficult to attribute directly to the LHWP. To date, compensation for ecology and rangeland impacts from Phase I Dams are limited to the protection of the Bokong and Tsehlanyane reserves occupying 7,228 ha, but these do not adequately offset some of the priority biodiversity features impacted by the LHWP, such as spiral aloes, cliff-nesting birds, and Maluti Minnow. The cumulative impacts of reservoir inundation and powerlines on globally threatened bird species, such as Cape and Bearded Vultures, Southern Bald Ibis and Black Stork, in particular, are considered significant and will require concerted effort to identify and proclaim offset areas to enhance protection of these species.

Direct and indirect impacts on communities and cultural heritage are also extensive: almost 1000 households will have been resettled for Phase I and II. Many more people will be directly affected from the loss of fields and grazing, which are in increasingly short supply as the population grows and drought periods increase in frequency and duration, resulting in food insecurity for much of the population of Lesotho. Further, the indirect impacts of large-scale infrastructure development in remote rural areas of the Highlands and the associated influx of thousands of mainly single male workers over three-year periods is expected to have contributed to the increased incidence of HIV/AIDS in the region.

The sale of water and electricity for the LHWP has generated significant revenues for the country (totalling M8.9 billion for Phase I to date), and the project has led to a much improved road network in the Highlands (of ~570 km); has expanded delivery of community infrastructure, and supported several communal projects (e.g. agricultural and grazing cooperatives). However, while investment in social infrastructure and service delivery is not LHDA's responsibility there is a concern that the benefits of the project at national level have not been adequately invested in the districts and communities most adversely affected by the project. Concerted, long-term effort is required to work with communities and invest in sustainable community projects as well as initiatives to support implementation of holistic approaches to ICM to improve and maintain livelihoods.

## 10. Summary

The LHWP Phase II is expected to increase Lesotho's national revenues and contribution to GDP from the sale of water and electricity, which currently amounts to M750 million per year or 6% of GDP and which provides a major contribution to government spending. The project will also expand the road network, generate additional power supply for Lesotho, and facilitate improvements in additional social and health infrastructure, and assist with establishing community development projects. In addition, the project will generate 3500–4000 construction jobs phased over a five-year time frame, most of which is expected to be allocated to Basotho labour. In future, the presence of the dam can be expected to attract increased numbers of tourists, depending on the additional activities created (although tourism opportunities may still remain limited). This will, to some extent, increase local level benefits for local residents, particularly if provided with the skills and support to capitalise on the opportunities presented.

South Africa, on the other hand, stands to gain significant economic benefits from the industrial growth and wider spin-offs created from increased water security, which will support increased trade and industry and electricity generation from water-cooled power stations in Mpumalanga.

There are a number of negative socio-economic impacts as summarised in Table 5, especially with respect to physical and economic displacement (loss of land, access to resources, need for livelihood restoration, etc.). Impacts related to the construction phase include increased risk of traffic accidents, increased nuisance factors, increased noise levels, influx of work seekers and issues related to anti-social behaviour. However, there are also positive impacts related to job creation and opportunities for business/supplier development.

The biophysical impacts have been summarised in Table 4. The main negative impacts are related to the loss of cliff habitat for cliff-nesting bird species, increased pressure on natural resources (rangelands, wetlands) resulting from displacement of communities out

of the inundation zone and impacts on downstream communities and environments as a result in decreased flows.

Mitigation measures have been identified and described in the impact assessment section (Section 8) and collated into a Construction EMP and Operational EMP.

LHDA has conceptualised and is in the process of developing or refining a number of environmental and social action plans designed to address the range of impacts on the livelihoods of local communities who will lose a significant proportion of their arable land and rangelands in the lower lying valleys of the Polihali Reservoir. These include Livelihood Restoration Plans, a Social Development Master Plan, Integrated Catchment Management Plan, Biodiversity Management Plan, Public Health Action Plan, and a Cultural Heritage Plan. A robust Compensation Policy has been drafted for LHWP Phase II that will be applied through a comprehensive RAP that is underway in a phased approach.

Significant residual Project impacts are those that are expected to be the most difficult to mitigate effectively and are assigned Major significance ratings after mitigation (based on the precautionary principle). These include:

- The loss of arable and grazing land on local livelihoods, given the lack of alternative land available;
- Ongoing degradation of rangelands and wetlands higher in the catchment due to livestock and land use pressure displacement from the reservoir;
- The loss of extensive habitat of priority birds, and
- The impacts on the downstream river associated with altered flows.

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