INTRODUCTION

The proposed Ethemba Dam will be located on the Mkhondvo River (Lower Mkhondvo Water Management Area) within the Ethemba Gorge and will be situated downstream of the Heyshope Dam.

The proposed dam will have a holding capacity of 368 million m$^3$ of water delivering 93 million m$^3$ annually. The Ethemba Dam project will be comprised of the following components:

- The Ethemba Dam
- A dolerite quarry
- Irrigation areas
- Potable water supply pipeline to Hlathikhulu
- Access road to the dam construction site from the MR-9 road
- Small scale hydro-power plant
The Environmental and Social Impact Assessment (ESIA) for the Ethemba Dam Project has been completed, with the only remaining component being the stakeholder consultation to provide feedback on the ESIA.

**Purpose of this Background Information Document:** This document presents the methodology which was used to assess the potential environmental and social impacts associated with the Ethemba Dam. The most significant potential impacts and their respective mitigations are also summarised.

### IMPACT ASSESSMENT METHODOLOGY

The assessment of the significance of impacts was determined by rating the probability of the impact multiplied by the consequence of a particular impact, according to the following equation:

\[
\text{Significance of Environmental Impact} = \text{Consequence} \times \text{Probability}
\]

The consequence of an impact can be derived from the following factors:

- **Magnitude of impact**
  Related to the severity of the impact on the site and surrounding area

- **Reversibility**
  The ability of the site to recover after an impact has occurred

- **Duration of impact**
  How long the impact may be prevalent

- **Spatial extent**
  Physical area which could be affected by an impact.

The overall probability of the impact relates to the likelihood of such an impact occurring.
The environmental impacts were rated, taking into account the perceived magnitude, reversibility, duration, spatial extent and probability that the impact will occur. Only those environmental and social impacts which were rated as **HIGH significance** are presented in this document, their respective mitigation measures (if applicable) are also provided.

### PROJECT IMPACTS AND MITIGATION

**Socio-economic**

The inundation of Ethemba Gorge will result in the loss of 1 225.2 ha of Swazi Nation Land (SNL); which is currently held under the jurisdiction of traditional authorities. The loss of land will severely impact traditional land administration in the area; this impact of change in land administration is rated as *high* before mitigation and *moderate* after mitigation.

- In consultation with affected Chiefs, develop a Chiefdom Development Plan that aims to facilitate and promote service delivery within the affected Chiefdoms and in partnership with central government to reduce the potential for land disputes.

There will be a direct and negative impact of physical displacement of households in the inundation area and is rated as *high* and *moderate* after mitigation.

- Prepare a Resettlement Action Plan (RAP) that ensures that resettlement and compensation are carried out in accordance with IFC, World Bank, and national guidelines
- Ensure host site negotiations include the office of Regional Administrator and the Ministry of Tinkundla.
- Engage with Chiefs, affected households and host communities to manage host site selection and preparation
- Identify communities and households affected by physical displacement
- Establish a Resettlement Working Group to assist with preparing a RAP
• Undertake a census and asset inventory
• Prepare an entitlement matrix and compensation framework
• Identify host site options
• Appoint an architect to design and prepare plans for replacement housing.
• Secure a host site
• Build social infrastructure at host site, including a secondary school and clinic.

There will be an increased pressure on natural resources by the local communities due to the loss of access and/or availability. This will have a definite, permanent impact on numerous households’ way of life. The significance and degree of confidence if this impact is rated high both before and after mitigation.

• Where possible, reduce the impact on natural resource use through Project design (minimising Project footprint and disturbance on ecosystems)
• Where economic displacement occurs due to the loss of household income, the Project should compensate households through the RAP
• The host site should be similar in nature to the Project affected site, to ensure that similar ecosystem services are available to the affected households
• Provide training in alternative livelihood activities through the Chiefdom Development Plan
• Identify alternative livelihood activities i.e. tourism related businesses, bakeries and brick-making SMMEs
• Partner with local NGOs specialising in SMMEs
• Provide training in alternative livelihood activities
• Provide training in improved farming methods.

There may be an increase in road accidents and injuries during construction and operational phases. The significance of this impact is high and with the implementation of mitigation measures this can be rated as moderate.

• Prepare a Community Health and Safety Plan to manage traffic safety. This might include the provision of footpaths in villages and near schools, the...
erected road signs and speed bumps, as well as facilitating road safety training and education programmes with employees and communities.

- Careful design can also assist with mitigating the potential impacts of road accidents by bypassing communities.
- Speed controls must be implemented and communicated to all personnel.
- Ensure contractors prepare similar procedures.

Chieftainship and land disputes may occur at the host site. The significance of this impact is **high** and was determined as **moderate** after mitigation measures.

- In consultation with affected Chiefs develop a Chiefdom Development Plan that aims to facilitate and promote service delivery within the affected Chiefdoms and in partnership with central government to reduce the potential for land disputes.

Increased pressure on social infrastructure and natural resources at the host site: The significance of this impact is **high** and rated as **low** after mitigation.

- Identify a suitable host site in consultation with affected communities
- Rehabilitate and construct social infrastructure for lost social services at the host site
- Ensure equal access to social services and infrastructure developed to replace lost communal assets
• Develop a land use management plan that aims to assist the host community with managing communal assets including grazing land and forests.

There will be an influx of people to the host site because of the improved access to social amenities. This impact has a significance rating of high, decreasing to a moderate significance after mitigation.

• Consult with traditional authorities to assist with influx management.

• In order to prevent informal settlements, restricted areas and other potentially hazardous areas should be demarcated and monitored.

The potential increase in waterborne diseases such as; cholera, bilharzia, blackfly and malaria caused by poor water quality. The significance of this impact before mitigation is rated as high and decreases to low after mitigation.

• Undertake a health risk assessment for waterborne diseases and the proliferation of vectors of malaria and other insects.

• Prepare a Community health and Safety Plan that aims to prevent waterborne diseases.

There will be a potential influx of people during the operational phase in search of employment and access to improved service delivery. The significance of this impact is rated high and after mitigation as low.

• Consult with traditional authorities to assist with identifying project affected persons, and distinguishing between in-migrants and long-term residents

• Discourage foreigners from settling in the area by adopting and disseminating labour and recruitment policies that prioritise the employment, in order of preference, of:
  o Community members in Mkhitsini and Hlobane
  o Local residents in neighbouring communities in the Sishelweni Region
  o Swazi nationals from neighbouring regions
  o Foreigners should only be recruited from neighbouring countries if the skills cannot be procured locally
Ensure that similar labour and recruitment policies are adopted during operations.

In order to prevent informal settlements, restricted areas and other potentially hazardous areas should be demarcated and monitored.

The Ethemba Dam Project proposes to construct water reservoirs which will supply water to communities around the reservoir and to Hlathikhulu. This positive impact is rated as *moderate* and with the implementation of enhancement measures remains as a *high positive impact*.

- Maximise potential project benefits by ensuring affected households in close proximity to the reservoirs are provided with access to water supply
- Develop a set of criteria to identify and select beneficiaries
- Consult with traditional authorities to prevent influx
- Install a wastewater treatment facility to maintain water quality
- Regularly monitor the water quality from the reservoirs to ensure that it is suitable and safe for domestic purposes.

The development of Ethemba Dam will result in the establishment of a hydropower station, thereby increasing electricity supply to the national grid. The significance of increased electricity supply to the national grid was considered *high* significance. No mitigation measures are applicable.

**Heritage resources**

The disturbance of gravesites is considered of *high* significance, due to the local communities’ close affinity to these sites and the fact that the impact is definite, and will remain *high* after the mitigation measures proposed below:

- Avoid any grave sites indicated by the local community by routing the pipeline and other infrastructure around such features
- Relocate graves within the dam full supply level and those affected by the relocation of next-of-kin to a registered cemetery or additional chiefdom land as per the request of the chief and family.
There would be a negative impact on the accessibility of culturally important structures and some of the structures will need to be relocated and/or moved, the significance for this impact is rated *high* and remains *high* after mitigation.

- Relocate structures of cultural importance to areas that can be easily accessed by the local people that deem these structures important
- Ensure that access to these culturally important structures is possible.

*Land use and soil*

The current land use of the Ethemba Dam area will be unavailable for communal grazing and small scale agricultural purposes due to the inundation of the area. The significance of the inundation on land use is considered *high*. This impact cannot be mitigated.

The establishment of the potable water supply line and associated pump stations will change the current land use within the pipeline alignment and is rated as a *high* significance. This impact cannot be mitigated.

Soil cover will be disturbed at the dam wall site and completely inundated during the operational phase of the dam. The loss of soils is rated as *high* significance, mostly
due to the irreversibility and permanent nature of the impact. No mitigation measures are applicable.

The small scale farming activities in the irrigation scheme area will make way for commercial irrigation farming, thereby resulting in a significant change in land use rated as high. However, even after the following mitigation measures, the impact will remain as a high significance.

- Disturbed areas should be kept to a minimum. Only remove vegetation when soil stripping is required and limited to areas required for surface infrastructure. Adequate demarcation of these areas must be undertaken.
- Demarcate (with acceptable buffer) sensitive areas such as watercourses, heritage sites and important habitat on the ground and declare these as ‘no go’ areas.
- Keep the corridor for laying irrigation pipes to a minimum, do not allow construction activities outside of this corridor, including access and material logistics and clearly demarcate the corridor.

The construction of the linear infrastructure (roads and pipeline) will disrupt the soil profile. The overall impact of the proposed linear infrastructure on the soil profile is regarded as high before mitigation and moderate after the implementation of mitigation measures:

- Clean up spills immediately, treat contaminated soil as hazardous waste and dispose accordingly.
- Rehabilitate borrow pits, ensure they are revegetated with indigenous species and free draining where possible.
- Install soil erosion protection measures and do not allow overgrazing.

**Biodiversity**

The dam construction will result in a loss of key threatened species. Loss of rare population such as *Bowiea volubilis*, the near threatened Half-collared Kingfisher and the vulnerable African Finfoot will be negatively impacted upon by the loss of
riparian vegetation. The significance of this impact is rated as high with no mitigation possible.

The impoundment of the Mkhondvo River would result in loss of Riparian Woodland and Riparian Forest habitat, as well as Closed Woodland and Scrub Forest on the lower slopes of the hills flanking the river. This impact has a high significance with no mitigation possible.

Most of the plains habitat that would be lost through the irrigation scheme has already been transformed through agriculture and has a low biodiversity value. However, numerous strips of riparian vegetation along seasonal drainage lines are still present. If development of fields is permitted to destroy the vegetation in these drainage lines, there will be loss of riparian habitat on the plains and concomitant effects such as soil erosion. The significance of this impacted is rated as high and no suitable mitigation exists.

The impact of the increase in utilisation of natural resources due to the influx of people from other areas has a significance rating considered high and no reasonable mitigation are possible.

The negative impact of altered water temperatures on the aquatic ecosystem during the operational stage of the project may cause a reduction in biodiversity; the environmental significance of this impact is therefore rated high. No mitigation is possible.

There will be a loss of protected plant species, where forty protected plants were confirmed to occur in the project area. Species with habitats in the inundation area will be most affected. These include Breonadia salicina, Ekebergia capensis, Olea europaea and Trichilia emetica. The significance of this impact is rated as high, reduced to moderate with mitigation.

- Identify and mark threatened and protected species occurring in the area of inundation prior to the dam filling. Where possible, translocate these species to suitable, adjacent habitat under the supervision of a botanist with horticultural experience. Priority should be given to relocating species to
habitat as close to their original location as possible. Seed of the population of *Streptocarpus* species should also be collected in order for some ex situ cultivation to take place.

Reduced biodiversity during operation: Operation of the proposed dam is expected to have direct negative impacts on the downstream aquatic ecosystem because of alterations in flow patterns. The impact of modified flows on the biodiversity is seen as a *high* significance and with mitigation measures as a *moderate* mitigation. Possible mitigation measures include:

- Minimise construction activities in riparian zones and undertake all support operations outside the riparian zone. Demarcate a buffer zone of at least 20 m from the edge of the riparian zone for all activities that are not needed within the riparian zone.
- Rehabilitation of disturbed areas should aim to recreate the same mix of habitats, including stream substrates that were present prior to disturbance. Seeding of grasses is a priority, particularly along drainage lines, streams and river banks.
- All employees and contractors involved with the development must be made aware of the requirements of the Environmental Management Plan and the relevant prohibitions (e.g. no hunting, no fishing etc.).
environmental education awareness training among all contractors and subcontractors on site for the duration of construction activities.

Migration barrier: The proposed diversion weir and dam will have a direct negative impact on upstream migration of eels and fish such as the Longfin eel (*Anguilla mossambica*), Largescale yellowfish (*Labeobarbus marequensis*) and Labeo (*Labeo molybdinus*). The Mkhondvo River is one of a few remaining east-flowing rivers which has no barriers between it and the sea, and is therefore environmentally sensitive. The impact is rated as a high significance which can be reduced to low with the implementation of mitigation measures.

- A weir downstream of the dam should be designed to buffer daily flow variations. Include a fish ladder in the design of the weir to ensure migration of fish into the gorge downstream of proposed the dam
- Incorporate an effective eelway into the design of the spillway
- Capture migrating fish and elvers downstream of the dam annually in October/November, and release them in the river upstream of the impoundment. Keep a record of the species and numbers translocated on each occasion.

Inundation of Aquatic Habitat: The inundation of the aquatic habitat will have a direct negative impact on all flow-dependent fish species, such as Mountain Catfish (*Amphilius uranoscopus*), various Suckermouths (*Chiloglanis spp.*), and the Near-Threatened Lowveld Chiselmouth (*Varicorhinus nelspruitensis*). All flow-dependent invertebrate taxa will be permanently eliminated and replaced with taxa that occur in standing water. The environmental context of this impact is therefore rated as sensitive with a high significance reduced to moderate after mitigation.

- Incorporate an EWR as detailed in the Maputo Basin Study into the operational rules for the dam.

Introduction of Alien Fish: The proposed impoundment is expected to have an indirect negative impact on indigenous fish species through the introduction of alien fishes species such as predaceous Largemouth Bass (*Micropterus salmoides*),
predaceous Bluegill Sunfish (*Lepomis macrochirus*), habitat-modifying carp (*Cyprinus carpio*), and invasive Nile Tilapia (*Oreochromis niloticus*). There are currently no records of alien fish species in the Mkhondvo River, so the significance is *high* and reduced to *moderate* after mitigation.

- Awareness of the potential problems of introducing alien species should be fostered among staff working at the dam as well as the irrigation scheme. The aim of the awareness programme should be to prevent introduction of unwanted aliens taking place.

**Surface water**

The construction of Ethemba Dam will add to the water loss rate in the area through evaporation and will recharge the underlying aquifer through infiltration. The overall significance of the impact is rated as *high* with no mitigation possible.

**COMPREHENSIVE MITIGATION PLAN**

The measures described above and a wide range of additional management measures are contained in a Comprehensive Management Plan (CMP) that forms part of the ESIA. The CMP will be executed during further project planning and implementation.

**WHAT HAPPENS NEXT?**

The feasibility study is being completed, but project implementation is likely to be delayed. The project is foreseen to commence in the next five to ten years.
FOR FURTHER INFORMATION PLEASE CONTACT:

South Africa
Amelia Briel
Knight Piésold House
4 De La Rey Road, Rivonia
Johannesburg
+ 27 11 806 7045
abriel@knightpiesold.com

Swaziland
Mathokoza Manana
Swazi Supply Centre
Corner Makhosi-Khosi and Sheffield Roads
Mbabane
+268 2404 3151
mmanana@knightpiesold.com

Project website: www.knightpiesold.com/Ethemba