A Tourism Impact Assessment for a Proposed Hydro-Power Project at Ngonye Falls, near Sioma, Western Province, Zambia

November 2019

Report prepared by:

Graham Muller Associates
CLOSE CORPORATION CK NO 1997/005924/23

DH ENGINEERING CONSULTANTS

Version	Date	Author	Status	Approved
01	24th June 2019	GAM	1st Draft	
02	1st July 2019	GAM	2nd Draft	
03	18th November 2019	GAM	3rd Draft	

THIS PAGE INTENTIONALLY LEFT BLANK

Contents

Section 1. Introduction....6

1.1 Background....6

1.2 Project Description....6

1.3 Socio-Economic Profile of Western Province....8

Section 2. Objectives, Scope and Methodology....8

2.1 Objectives....8

2.2 Scope and Methodology....8

Section 3. Project Site Visit and Assessment....9

Section 4. Stakeholder Consultations and Findings....11

4.1 Consultation Activities....11

4.2 Existing and Planned Tourism Activities at and near to Ngonye Falls....12

4.3 Perceived Impact of the Hydro-Power Project on Tourism Activities....15

4.3.1 Negative Impacts during the Construction Phase....15

4.3.2 Negative Impacts during the Operational Phase....17

4.3.3 Positive Impacts during the Construction Phase....18

4.3.4 Positive Impacts during the Operational Phase....18

4.4 Suggested Mitigation....19

4.4.1 Mitigation of Negative Impacts during the Construction Phase....19

4.4.2 Mitigation of Negative Impacts during the Operational Phase....20

4.4.3 Enhancement of Positive Impacts during the Construction Phase....22

4.4.4 Enhancement of Positive Impacts during the Operational Phase....23

Section 5. Impact Assessment and Mitigation....25

5.1 Background and Method....25

5.1.1 Activities and Areas of Influence....25

5.1.2 Economic Assessment Parameters....25

5.1.3 Sensitivity....26

5.1.4 Determination of Significance....26

5.2 Tourism Impact Assessment....26

5.2.1 Impacts of Permanent Project Features 27

5.2.2 Impacts of Construction Phase Activities 30

5.2.3 Impacts of Operations 32

5.2.4 Impact Assessment Summary 34

Section 6. Tourism Impacts Management Plan 36

Section 7. Monitoring Plan 38

7.1.1 Photo-monitoring Points 38

Section 8. Conclusions 46

Appendix 1: 48

Indicative Budgets for the Development of Tourism Infrastructure At Ngonye Falls Community Partnership Park (NFCPP) 48

Appendix 2 57

Examples of Hydro-Power Plants with Tourism Facilities 57

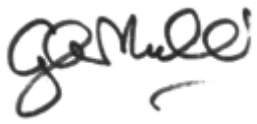
NOTE TO THE READER:

The subject matter of this document is researched and presented by Graham Muller Associates CC, a firm of economists located in Durban, KwaZulu-Natal, South Africa. Graham Muller Associates CC is appointed as an independent professional tourism impact practitioner to facilitate this TIA. The firm was assisted in certain aspects of this work by DH Engineering Consultants

This document was prepared by the following person:

Graham Muller	Proprietor, Graham Muller Associates CC	BA (Hons) (Economics), MSc (Economics – Statistics), ACMA, CGMA

Signed



Graham Arthur Muller
BA (Hons) (Economics), MSc (Economics – Statistics), ACMA, CGMA

Section 1. Introduction

1.1 Background

This tourism impact assessment (TIA) relates to the anticipated consequences for the tourism industry in Sioma District of western Zambia resulting from the developing, financing, constructing, owning, operating, managing and maintaining of an approximately 180 MW installed capacity hydro-electric power run-of-river generating facility situated at or near the Ngonye Falls on the Zambezi River (the "Project"). The Project is sponsored by Western Power Company Ltd., Zambia (WPC).

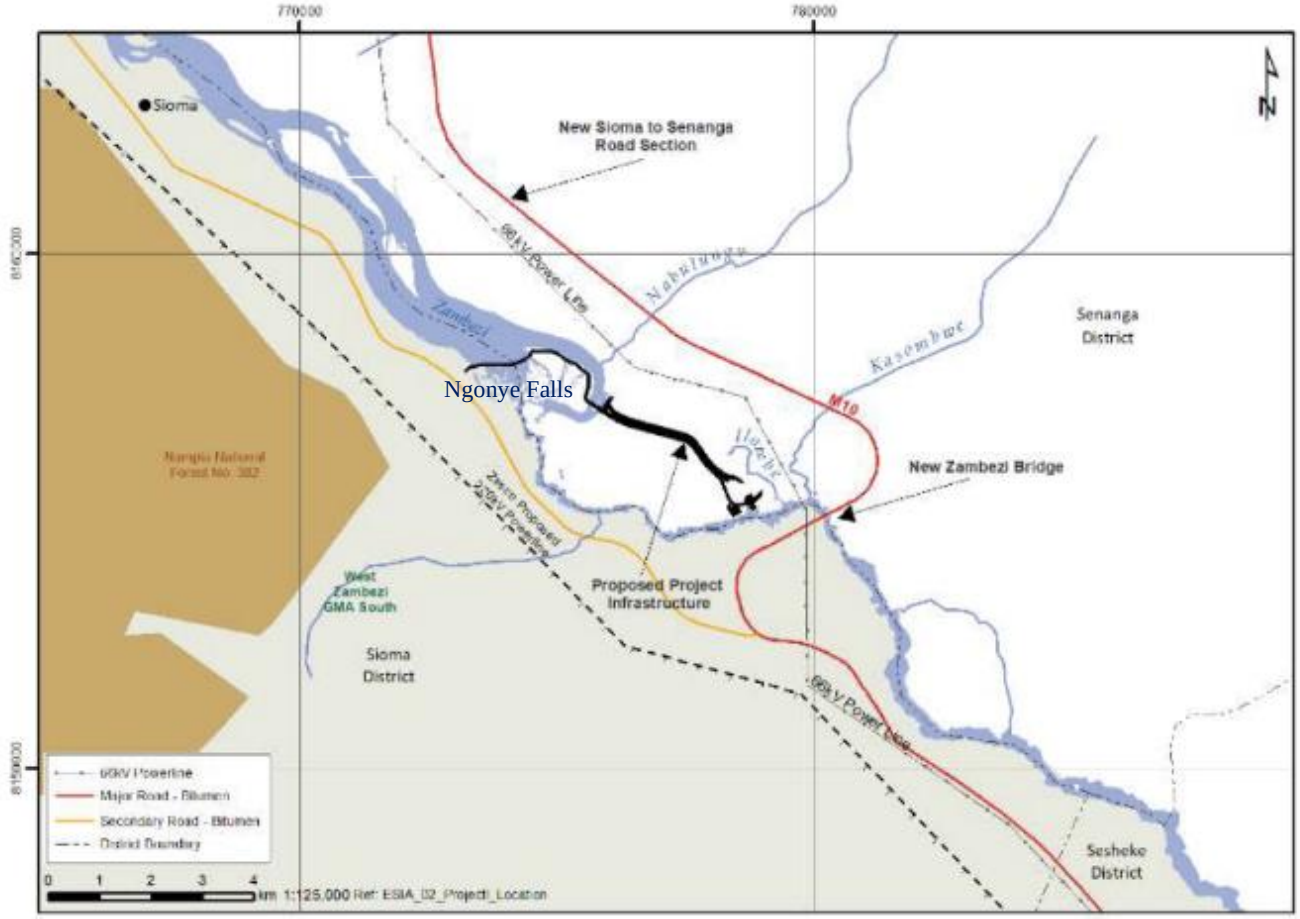
The Project is expected to have an impact on tourism activities at or near the Ngonye Falls on the Zambezi River, Zambia. In order to understand and assess the anticipated tourism industry impacts and to explore and recommend any mitigation measures considered appropriate to minimising any negative consequences of such impacts, WPC has appointed Graham Muller Associates CC ("the Consultant") to undertake a TIA and to furnish the findings and recommendations arising from the TIA in a written report. This is the report that arises from the said appointment of the Consultant.

1.2 Project Description

Western Power (Pty.) Ltd. (WPC) is a Zambian independent power producer based in Lusaka and is the developer of the Project. WPC is majority owned by African Power Projects, the Zambian founders of the Project. The other main shareholder is InfraCo Africa, a member of the Private Infrastructure Development Group, a donor funded organisation that finances infrastructure projects in low-income countries. Together, these shareholders own 94% of the Project.

The other shareholders are the communities of the Western Province. WPC signed a Community Participation Agreement in 2015 with the Barotse Royal Establishment (**"BRE"**) for a 6% equity in the Project held in trust on behalf of the community shareholders. This is in recognition of the contribution by the community of the natural resources (water and land) to be used by the Project.

The proposed Ngonye Falls Hydro-electric Project comprises a 180 MW run-of-river hydro-electric power station on the Zambezi River in the Western Province of Zambia, near the town of Sioma. The project is located near to the Ngonye Falls on the upper Zambezi River, approximately 120 km upstream of the town of Sesheke and some 300 km upstream of the Victoria Falls at Livingstone. The geographical co-ordinates that pinpoint the location of the project are 16°40' S, 23°37 E. The following map provides an indication of the infrastructure build for the project in relation to Ngonye Falls:



Map 1: Location of the Project

1.3 Socio-Economic Profile of Western Province

The Western Province is essentially a rural community with a mix of commercial farms and traditional rural settlements. Some processing of rural products takes place in the area notably, timber production, charcoal production and production of manketti oil and so called essential oils. There are also some stone quarries and sand-winning schemes. Apart from the usual government services and retail activities, the only other economic activity worthy of note is tourism, which centres around the Ngonye Falls, the Zambezi River for sport fishing and the nearby Sioma-Ngwezi National Park.

Section 2. Objectives, Scope and Methodology

2.1 Objectives

The objectives of this TIA are as follows:

1. To assess the potential adverse or positive economic impact of the Ngonye Falls hydro-electric power project on the tourism industry in the project area for a range of scenarios;
2. To propose, in consultation with tourism stakeholders and the client, mitigation measures to limit any adverse impacts identified; and
3. To recommend a framework for monitoring anticipated positive and negative impacts during both the construction and operating phases of the Ngonye Falls hydro-electric power project.

2.2 Scope and Methodology

The tourism impact study comprises of the following tasks:

1. Preparation

a) Review existing documentation on the tourism industry and plans in the area, including the Ngonye Falls Community Partnership Park (NFCPP) Tourism Development Master Plan (2016).

b) Design of a questionnaire for the purposes of an interview survey for tourism-related businesses, and discussions on the survey with the client. Obtain contact details of hotel / lodge operators and other stakeholders from the client.

2. Site Visit and Survey

a) Visit the Ngonye Falls area to conduct the interview survey in person with hotel / lodge operators, discuss the tourism industry with key stakeholders such as NFCPP, and view the Ngonye Falls.

b) Identify photo-monitoring points, and take photos to begin to establish the photo-monitoring baseline.

3. Analysis and Preparation of Survey Results

a) Preparation of an impact assessment, conveying predicted impacts, and alternative options for project mitigation measures.

b) Positive and adverse impacts of the project will be predicted. This will distinguish impacts during the construction and operational stages. Additional mitigation measures may be proposed and integrated into revised scenarios in an iterative process.

c) Preparation of a draft report on survey results, baseline, and impact assessment, and discussion of the report with the client.

d) Analysis of the interview survey responses and photo-monitoring point suggestions.

e) Preparation of the final report, incorporating all outputs.

Section 3. Project Site Visit and Assessment

A site visit and assessment of tourism attractions and assets at the project development location was undertaken by Graham Muller of Graham Muller Associates CC on Sunday 25th May 2019. Almost all of the infrastructure associated with the construction of the proposed hydro-power project at Ngonye Falls will be located on the eastern bank of the Zambezi River. Consequently, the visit on

Sunday 25th May 2019 focused on the eastern bank of the river. Mr Muller was accompanied by Mr Eric Silumesi, an employee of WPC with extensive local knowledge of the site.

During the site visit tourism attractions and assets on the eastern bank of the Zambezi River were visited. These included:

1. The main falls which are located on the eastern-most channel of the Zambezi River. The main falls are typically viewed by tourists from an island opposite the main channel of the falls, which viewpoint is accessed over broken and rocky terrain and requires the fording of a number of shallow streams.

2. The Chief's Tree, a combination of two tree species growing together, where a Lozi chief reputedly planted his walking stick into the original tree trunk. The walking stick rooted and grew within the trunk of the original tree. The trees are a feature that is of cultural significance to the local community and that is visited by tourists.

3. The Litunga's Canal. This is an historical relic of an abandoned project by the Lozi King to create a canal link with locks for navigation of river craft between the lower reaches of the Zambezi River below the Ngonye Falls to the upper reaches of the river and *vice versa*. The plan failed due to lack of investment capital, but an impressive amount of infrastructural work was undertaken before abandonment of the project. The infrastructure includes excavations of extensive canal works, which extended almost the full route of the planned canal, but not at sufficient depth before funds and the impetus for the project ran out. The incomplete canal is a feature that is of cultural significance to the local community and that is visited by tourists.

4. A view site on the eastern bank of the main Zambezi channel that affords a vista of the confluence of the five main channels of Ngonye Falls. From this site, that is visited by tourists, a clear view of the four western-most main channels can be gained. The main falls is largely obscured by trees, but the channel flowing form the main falls is clearly visible.

Section 4. Stakeholder Consultations and Findings

4.1 Consultation Activities

As described, an *in situ* site visit was undertaken to gain insight as to the context of both the existing and potential tourism local industry as well as the location and footprint of the proposed hydro-power station and associated infrastructure. Consultation activities with tourism stakeholders included the following:

1. A meeting at a venue close to the project site to which registered tourism industry stakeholders were invited, where information regarding the proposed hydro-power station project was disseminated and where concerns regarding the impact of the project could be aired by attendees. A questionnaire inviting written submissions from stakeholders was handed to all attendees.

2. Follow-up one-on-one meetings were scheduled with each tourism industry stakeholder requesting these. The purpose of the one-on-one meetings was to afford tourism industry stakeholders an opportunity to voice concerns privately which they may have been reluctant to air in public for reasons of commercial sensitivity or for other reasons.

3. Tourism industry stakeholders were also asked at the meeting referred to in 1. above whether there were any photo-monitoring points where stakeholders would like project management to arrange regular monthly photographs to be taken for the purpose of monitoring the actual flow of water in the Zambezi River before construction commences, during the construction phase of the project and during the subsequent operational phase of the project. The purpose of such photo-monitoring would be to provide evidence or otherwise of the impact of the project on the river water level and on the tourism value of the river views at the key points so identified.

Using the information shared at the meeting referred to in 1. above; in the responses to the tourism stakeholder questionnaire and obtained through independent research, Graham Muller Associates will prepare a tourism impact assessment (TIA) with recommended mitigations (as appropriate), the findings of which will be summarised in a written report. This is the said report.

4.2 Existing and Planned Tourism Activities at and near to Ngonye Falls

Historically, tourism activities at and near to Ngonye Falls have been very limited and highly seasonal. On the other hand, over the past few years and especially since the recent improvements to road and river crossing infrastructure, the volume of tourism activities has been growing at a fast pace from this low base. This view is based on the responses to the tourism stakeholder questionnaire received by Graham Muller Associates. Six completed questionnaires were received. In terms of undertakings given to respondents the identities of those submitting questionnaires is to be kept confidential. The broad respondents included a mix of accommodation providers, sport fishing operators, sightseeing service providers, new tourism investors (not yet operating) and tourism development planners. Some of the respondents fall into more than one of these categories.

The following picture of the state and extent of the tourism industry in the study area is based on the answers received together with secondary sources supplied:

1. Tourism footfall at and near to Ngonye Falls has approximately doubled from year-to-year over the past five years.

2. During the twelve months to May 2019, the turnover of tourism industry operators from guests accommodated at or near to Ngonye Falls and sightseeing or sport fishing at or near to Ngonye Falls amounted to a minimum of US$ 100 000.00 represented by approximately 1000 bed nights sold. This estimate only takes account of tourism business turnover reported by the six respondents to the survey. Due to the non-response of a number of known accommodation providers this can be regarded as a conservative estimate of the true turnover figure. Nonetheless, it is likely that most of the tourism business occurring in the

area is captured in this estimate as the non-respondents are understood to be small operators and / or potential investors whose businesses have not yet commenced operating.

3. This tourism spending is representative of private sector salaried job creation and economic value added in a region where there is very little in the way of alternative private sector salaried employment opportunities nor small business opportunity. Moreover, it is clear that tourism is growing at a high rate, albeit from a small base.

This conclusion is backed up by evidence from certain published sources to which Graham Muller Associates has been afforded access. This evidence is summarised below.

The Zambia Department of National Park and Wildlife Tourism Development Master Plan for Ngonye Falls Community Partnership Park published in 2016 records the following growth in tourism numbers visiting the park over the years 2012 to 2015:

Year	Zambians	South Africans	Other	Total
2012	52	378	207	637
2013	333	353	187	873
2014	532	380	168	1080
2015*	677	288	227	1192

* for 2015 the figures for the first 10 months of the year have been annualised

It is thus clear that the strong growth (from a low base) in visitor numbers to the area has been occurring since 2012.

The response to this strong growth has been for a number of new tourism service providers to open new establishments serving the area. Two lodges that have opened in the past three years are Whispering Sands and Ngonye River Camp.

In addition, a number of investors and development planners have plans for future expansion of tourism facilities at or near to Ngonye Falls. The most ambitious plan is that prepared for the

Ngonye Falls Community Partnership Park (NFCPP). A map the proposed investment in tourism facilities at the Ngonye Falls Community Partnership Park (NFCPP) is provided below:

Map of Ngonye Falls Community Partnership Park (NFCPP) Proposed Tourism Developments

This comprises several facilities on both banks of the Zambezi River just below the falls. On the western bank a 36 bed camp site is planned together with 30 bed overland safari camp and adventure hub with 30 beds. On the eastern bank a 32 bed self catering chalet development is planned together with a 16 bed luxury lodge development. In addition to the afore-mentioned supporting infrastructure such as access roads, services, walkways, view decks and picnic and braai sites are planned.

The NFCPP initiative will be supported by another major tourism development plan for Western Zambia that is in the process of being rolled out. The Peace Parks Foundation (PPF) is working in a joint management arrangement with Zambia's Department of National Parks (DNPW) and the World

Wide Fund for Nature (WWF) in the landscape of Sioma Ngwezi National Park, near to Ngonye Falls, and the lower west Zambezi Game Management Area (GMA) which incorporates the west bank of Ngonye Falls. The objective of the joint management arrangement is to reintroduce wildlife to the park, manage it appropriately and develop infrastructure to support wildlife and tourism. This objective will shortly be formalised in a General Management Plan for Sioma Ngwezi National Park, which has been jointly developed by the organisations listed above. A general management plan for the GMA was completed in 2016. The General Management Plans envisages the development of eco-tourism in the national park and hunting in the surrounding GMA areas. Ngonye Falls is outside the national park, but close by and the number of visitors to Ngonye Falls is anticipated to increase in line with visitors to the park, from less than 1,000 tourists per year currently to more than 10,000 per year by the mid-2030s.

Collectively, these plans, should they come to fruition will represent a significant increase in both tourism capacity and tourism visitation at Ngonye Falls.

4.3 Perceived Impact of the Hydro-Power Project on Tourism Activities

Although some positive potential impacts are anticipated by some respondents, the general view of the respondents to the tourism stakeholder questionnaire regarding the impact of the proposed Ngonye Falls hydro-power project on the tourism industry is that the impact will be negative. It is recognised that the impact will be different during the construction phase and during the operational phase. Typical concerns expressed include:

4.3.1 Negative Impacts during the Construction Phase

1. A current negative impact is that knowledge of the project has caused uncertainty and a loss of confidence amongst tourism investors in and around Ngonye Falls. This will not diminish until the impacts of the Project and / or the likely and / or known success of planned mitigations are better understood.

2. Introduction to the area of considerable noise, light, dust and other air pollution and litter nuisance. The presence of an estimated 3,100 temporary workers and contractors during the construction phase is likely to result in significant pressure on the local eco-system, which may in turn make the area less attractive to current and future tourists. These pressures include:

    - Traffic movements, leading to noise and air pollution around the falls
    - Demand for food, water and fuel, which will accelerate deforestation for charcoal and may encourage illegal harvesting of wildlife and fish in the area
    - Demand for construction materials, which may include sand dredged from the river or water pans, wood and forest products
    - Waste products from construction and human activity, including sewage
    - Light pollution at night that will destroy the sense of "wilderness" that is sought by tourists to the area.

    Housing workers and contractors in purpose-built accommodation will not be sufficient to mitigate these risks as local businesses, including informal businesses, are likely to expand to provide services to the workforce, which will in turn increase demand for water, fuel, construction materials and encourage further migration to the area, many of whom will be unsuccessful job seekers struggling to eke out a living and turning to local eco-systems for survival.

3. Introduction of traffic congestion, particularly from heavy vehicles, which will also contribute to air pollution – see 2. above.

4. An increase in petty crime due to an influx of new residents seeking to work on the construction project and struggling to survive until such work is secured.

5. Downgrading of the tourism value of views of Ngonye Falls and Zambezi River due to the insensitive location of infrastructure such the weir wall, worker accommodation, and power lines. At night light pollution may also be a factor – see 2. above.

4.3.2 Negative Impacts during the Operational Phase

1. Concern that many of the 3100 or more workers employed during the construction phase will not leave Sioma after the end of the construction phase, creating a rural slum with high unemployment levels and a high incidence of poverty, and a possible resulting increase in petty crime.

2. Noise from the turbines will diminish the peaceful rural atmosphere.

3. Fish will be sucked into the turbines and killed impacting local eco-systems and negatively impacting sport fishing activities.

4. Reduced water levels flowing over the Ngonye Falls during the dry season will reduce the tourism value of the falls from a sightseeing perspective.

5. Reduced river water levels between the intake point above Ngonye Falls and the outflow point at the site of the proposed powerhouse will inhibit fish breeding and reduce the success rate for fish catches for sport anglers. Fishing for trophy tigerfish between the newly constructed bridge across the Zambezi river at Sioma and the Ngonye Falls Community Partnership Park in particular is reported as exceptional but very water level dependent. Too high and the fishing is poor, too low and the rocks make it dangerous for boats and without boats, you cannot successfully target trophy tigerfish. The aesthetic value of this part of the river we refer to as 'the gorge' is also vitally important for our growing numbers of international visitors as they require a visually pure and dramatic environment to compensate for the lack of wildlife on this piece of river which is offered by other parts of the Zambezi. At night, light pollution may also be a factor – see 2. in paragraph 4.3.1, above.

6. The increased presence of machinery, buildings, access roads and power lines will reduce the 'wilderness value' of the site, negatively impacting on tourism activities and future tourism potential. At night, light pollution may also be a factor – see 2. in paragraph 4.3.1, above.

4.3.3 Positive Impacts during the Construction Phase

1. The presence of more than 3000 construction workers at the Ngonye Falls Hydro-power plant site during construction activities will boost business at restaurants and bars at and near to Ngonye Falls.

2. Visits by consultants and project management will provide business for accommodation establishments

4.3.4 Positive Impacts during the Operational Phase

1. Operational staff at the Ngonye Falls Hydro-power plant site will patronise restaurants and bars at and near to Ngonye Falls but not as extensively as during the construction phase

2. Visits by consultants and project management will provide business for accommodation establishments but not to the same extent as during the construction phase

3. The hydro-power plant will itself be a tourism draw card, provided visits to the plant by tourists are encouraged by Western Power

4. Tourists could potentially visit the power station as an additional tourist attraction. However, dams and power stations are considered sensitive installations in Zambia and this would need discussion and clearance from government, the police and potentially the military authorities.

5. If the water flow over Ngonye falls is always maintained at environmentally sustainable levels in dry months to support sport fishing in these months and the high water months of January

to June experience artificially lowered water levels, this could extend the sport fishing season as currently, sport fishing is not offered during periods when the water levels are too high.

4.4 Suggested Mitigation

4.4.1 Mitigation of Negative Impacts during the Construction Phase

1. Noise and dust nuisance. The construction contracts should stipulate that tenderers must include measures designed to minimize the generation of noise and dust especially during times when this will impact on tourists visiting Ngonye Falls.

2. The threat of visual and light pollution. The construction of the switchyard and powerhouse needs to occur in an extremely sensitive and visually appealing way. Light pollution at night will destroy the "sense of place" – tourist expect a "wilderness" type experience. Lights need to be low-level and face away from the river and from planned and existing tourist facilities.

3. Traffic congestion, especially from heavy vehicles. Care must be taken to avoid heavy duty traffic on public roads to the extent that this is possible. The tourism access roads to the falls view sites and camp sites should be kept completely free of heavy vehicle traffic. Separate access roads to the project site must be built for construction vehicles.

4. Litter accumulation. An environmentally sound landfill site must be established for the project in a location that does not impact on tourism activities. As a contribution to the community, this landfill site should be made available for the dumping of refuse from the wider community after the project construction phase is completed should be handed over to the community for their ongoing management and use.

5. The planned of the location of infrastructure such the weir wall, worker accommodation, and power lines must be sensitive to existing and planned tourism sites and infrastructure and avoid intruding on such sites in any way that would diminish the tourism value or experience.

In particular, power lines must be located away from vistas that are enjoyed by tourists and must not cross any properties that are used for tourism or nature conservation.

6. At present most supplies to the tourism industry in the area are sourced from Katima, Mongu or further afield. During the construction phase if WPC works with local farmers to supply meat, maize, vegetables and other locally produced supplies to caterers at the construction site this would stimulate the development of a local supply industry that could serve the tourism industry immediately and in the future.

7. WPC should consider providing electric or LPG cookstoves in all staff housing and hostels so as to reduce the demand for local wood and charcoal as fuels

8. Set up local waste collection and recycling facilities for waste, including sewage and domestic solid waste.

9. Engage with local authorities and traditional leaders to ensure that settlement is restricted to areas designated for temporary living areas or recyclable as tourism facilities.

10. Ensure that 'illegal development and settlements' do not occur near to or within sight of Ngonye Falls or in the area of the partnership parks on the western and eastern banks of the Zambezi River.

11. Payment of compensation to tourism service providers who can prove to have suffered financial loss as a result of Project activities during the construction phase of the Project.

4.4.2 Mitigation of Negative Impacts during the Operational Phase

1. Accommodation provided for workers during the construction phase should either
    a. be portable in nature so that this can be removed to locations that will not impact on the tourism experience at Ngonye Falls after the construction phase ends, or

b. be located and designed in such a way that the accommodation can be successfully repurposed as tourism accommodation after the construction phase ends.

2. Noise from the turbines must be masked by the sound of water flowing and / or spraying out of the powerhouse. A further advantage of having water exit the powerhouse in a spray is that the water will be oxegenated, to the benefit of river life downstream of the outlet point.

3. Fish will be sucked into the turbines and killed.

4. Reduced river water levels between the intake point above the falls and the outflow point at the powerhouse will inhibit fish breeding and reduce the success rate for fish catches for sport anglers. Conduct a detailed hydrological modelling exercise to ascertain the flow of water through different channels of the river at different times of year. The model should include both a current scenario and one that takes into account changes after the weir is completed, for example as a result of sediment deposition upstream and changing flow patterns downstream. Maintain a minimal (ecological) flow of water over the channels of the falls at all times, based on the modelling exercise and agreed with stakeholders. For example, in a similar projects an environmental flow was recommended that corresponded to the lowest 7-day-average flow over a 10-year period. If practical, establish a schedule for temporary restriction to the flow of water through the channel, and communicate this to tour operators so they can time their visits for high or low water flows over the falls, depending on their preferences in this regard. Establish a schedule of fines to be charged if flows fall below the designated minimum flow level. These fines should be administered and paid to an entity that is being established for tourism management in the Ngonye Falls area such as the NFCPP.

5. To protect the sport fishing industry there always needs to be a water flow over Ngonye Falls equivalent at the least to the lowest water levels months naturally (October and November). WPC must engage on an ongoing basis with sport fishing service providers who confirm they are in a position to advise on the extent of impact by the water levels we find in our boats as well as by the catch and release records of our angling activities.

6. Visually, Project operations should happen far enough from the river so as not to be visible from the river nor create offensive levels of light pollution.

7. Payment of compensation to tourism service providers who can prove that they have suffered financial loss as a result of Project activities during the operational phase of the Project.

4.4.3 Enhancement of Positive Impacts during the Construction Phase

1. During the construction phase the presence of engineers, artisans and other personnel together with machinery and materials creates a once-off opportunity to build tourism infrastructure cost effectively, that permits tourists and local residents access to Ngonye Falls and key view sites without intrusive security, to the general benefit of the tourism industry in the area. As an expression of goodwill towards tourism stakeholders at Ngonye Falls, WPC should consider sponsorship of the construction of improved tourist access, including access roads, gatehouse facilities, basic camp sites, ablution facilities, boardwalks, concrete and / or stone pathways and viewing decks at key points both on the western and eastern banks of the Zambezi River near to Ngonye Falls would provide a boost to tourism in the area. Cost estimates for certain of such facilities exist in the NFCPP development plan and the details are provided in appendix A of this report. The proposed network of walkways and / or footbridges should be designed and positioned sensitively so as not to impede views or interfere with wildlife crossing the river.

2. Construct tourism friendly facilities that will permit tourists to visit the re-purposed Litunga Canal and the Project powerhouse on a guided tour.

3. WPC should partner with local tour operators to offer game drives and fishing trips to workers and contractors at a discounted rate

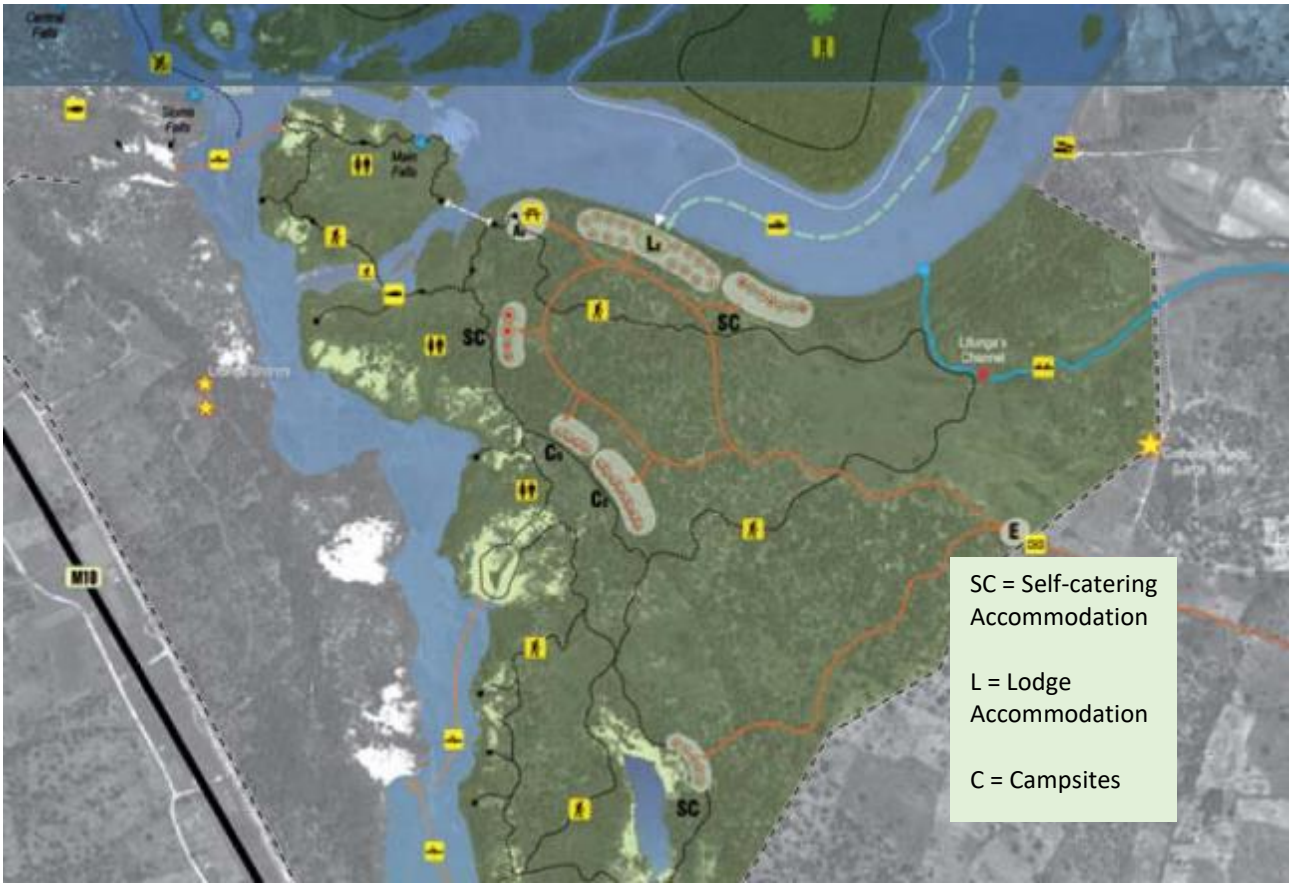
4.4.4 Enhancement of Positive Impacts during the Operational Phase

1. WPC should consider providing financial assistance with the costs of maintaining, in good condition, basic tourism infrastructure at and around Ngonye Falls during the operational phase of the Project.

2. Set up a programme to visit the re-purposed Litunga Canal and the Project powerhouse on a guided tour.

3. Ensure the visual and noise pollution and other impacts are minimised, especially light pollution after dark which may be visible from tourism facilities located near Ngonye Falls

4. Develop temporary facilities for construction staff in an environmentally friendly way that could allow them to be repurposed for other uses afterwards, e.g., as tourist facilities. Some of the NFCPP plans for the western bank of the Zambezi River lend themselves to such an initiative. The map on the following page indicates self catering and lodge accommodation that is planned by NFCPP in an area that would be convenient and suitable for housing of senior personnel during the construction phase of the Project and could readily be repurposed as tourism accommodation once the construction phase of the Project is completed:



Map indicating (*inter alia*) planned Self-Catering and Lodge Tourism Accommodation on the Eastern Bank of the Zambezi River near to the Project Site

5. Develop informative, directional and robust signage along both main roads (east and west) and tourism information signage at the falls.

6. Upgrade access roads from the main (tar) roads (both east and west)

7. Develop entrance gates, reception and ablution facilities and camping and picnic / braai areas on both east and west sides, with care taken to dispose of waste responsibly

8. WPC should consider providing ongoing financial support for regular monitoring of deforestation, illegal fishing, waste collection and disposal (litter, construction, sewerage and other) and drinking water availability in the area surrounding the project.

Section 5. Impact Assessment and Mitigation

5.1 Background and Method

This section considers the potential impacts of the Project on the tourism industry in the Project area.

5.1.1 Activities and Areas of Influence

Potential impacts on tourism arise from the permanent installation of project infrastructure, disturbance during construction, and the reduction in flows downstream of the headworks. The activities that have been assessed are as follows:

Permanent Project Features

- Creation of a permanent headpond; and
- Installation of project infrastructure (headworks and power canal).

Construction Phase

- Heavy construction activities throughout the site;
- Mobilisation and employment of 3,100 people; and
- Outside lighting.

Operations and Maintenance

- Reduction in flows downstream of the headworks;
- Power plant operations and maintenance;
- Employment of 100 people; and
- Outside lighting.

The area of impact of these activities is within the Project Area.

5.1.2 Economic Assessment Parameters

This impact assessment uses a number of economic parameters of the tourism industry in the area, to define clearly what is understood by 'impact on the tourism industry'. For example, if the creation of the headpond resulted in higher tiger fish abundance, that isn't necessarily a positive impact for

the tourism industry unless it resulted in increased visitor numbers or visitor expenditure. These parameters include:

- Visitor numbers and length of visits (total annual number of visitor-days);
- Average visitor expenditure per day;
- Investment in tourism enterprises;
- Capacity (number of beds) of the hotel industry;
- Profitability of tourism enterprises; and
- Number of employees (expressed as full-time equivalent, FTE) from local communities that are employed in the tourism industry.

5.1.3 Sensitivity

The tourism industry in the area is limited and in a very early stage of development. Therefore, for the purposes of determining significance, the sensitivity of the tourism industry is considered to be High.

5.1.4 Determination of Significance

The significance of potential impacts on tourism has been determined using the impact evaluation matrix presented in Section 3 of the main ESIA report, which defines significance according to the magnitude of impact and sensitivity of a receptor.

5.2 Tourism Impact Assessment

The impacts resulting from the activities listed above are identified as follows:

Permanent Project Features

These may result in the following impacts on the tourism industry:

- Creation of a permanent headpond:
  - Increase in visitor-days or visitor expenditure arising from the use of the headpond, including for sport fishing.
- Installation of project infrastructure (headworks and power canal):
  - Reduced visitor-days due to a perception amongst potential visitors that the presence of the Project infrastructure impairs the visitor's experience;
  - Permanently lower investment due to a perception that the presence of the Project infrastructure impairs tourism.

Construction Phase

Construction activities may result in the following impacts on the tourism industry:

- Heavy construction activities throughout the site / Mobilisation and employment of 3,100 people / Outside lighting:
  - Reduced visitor-days due to a perception amongst potential visitors that heavy construction activities, the presence of a large workforce, and outside lighting impair the visitor's experience;
  - Delay in investment as potential investors put off their investment until construction is complete.

Operations and Maintenance

Operations and maintenance may result in:

- Reduction in flows downstream of the headworks:
  - Reduced visitor days and expenditure due to a reduction in the visual amenity of Ngonye Falls in the dry season;
  - Increased visitor days and expenditure due to an extension of the visual amenity of Ngonye Falls into the wet season;
  - Reduced visitor days and expenditure due to a decline in fish available for sport fishing;
  - Increased visitor days and expenditure due to an extension of the sport fishing season into the wet season.

5.2.1 Impacts of Permanent Project Features

5.2.1.1 Creation of a permanent headpond

5.2.1.1.1 Increase in visitor-days or visitor expenditure arising from the use of the headpond, including for sport fishing

The creation of the headpond may increase the availability of nursery areas for fish fry of some species in the margins, including *Hydrocynus vittatus* (Tigerfish, a popular sport fishing species). However, because the headpond is relatively small and has virtually no storage capacity, the conversion of lotic (flowing) to lentic (ponding) habitat is limited, and a relatively small portion of the floodplain swamp will be permanently inundated. In addition, it is unlikely that the headpond would be used very much for other tourism activities. Therefore, the significance of any positive impact of an increase in visitor-days or visitor expenditure arising from the use of the headpond is considered **Negligible**.

5.2.1.2 Installation of project infrastructure (headworks and power canal)

5.2.1.2.1 Reduced visitor-days due to a perception amongst potential visitors that the presence of the Project infrastructure impairs the experience

Potential visitors to the area may choose to visit alternative areas if they consider that the presence of the Project impairs the visitor experience. For example, this may be because of the visibility of the weir, canal and transmission lines, noise or light pollution from the power plant, or the loss of the undisturbed or wilderness character of the area.

Visitors that have been to the area may distribute feedback or reviews on these factors to potential visitors. Tourism operators that complain to their visitors that the area was more attractive before the hydropower project, create the risk that these visitors discourage others from coming to the area, with impacts on their own and others' businesses.

This may reduce the number of visitors coming to the area and the length of time that they stay, and total visitor-days, visitor expenditure, investment in the tourism industry, profitability of tourism enterprises, and employment would all reduce.

The magnitude of this impact is considered Medium, and the sensitivity of the tourism industry is High, therefore significance is **Major**.

Mitigation Measures

Mitigation measures addressing these issues directly are addressed elsewhere in the main ESIA report: visual impact; noise; external lighting and traffic.

Additional measures will be taken to mitigate impacts that directly concern tourism management. These must focus on the maintenance of existing or creation of new attractions for tourism, the marketing of these attractions amongst potential visitors, and the enhancement of the experience of those that do visit so they recommend the experience to others.

The creation of new attractions can include the preserved section of the Litunga's canal, other sites of cultural interest and importance, and the hydropower plant itself. The history of the Litunga's canal is of significant cultural interest, and complements the possible granting of World Heritage Status to the Barotse floodplain and its network of historical canals.

Proposed measures are:

- Construction and maintenance of viewing platforms, pathways and walkways (across parts of the river) for viewing Ngonye Falls (see details below);
- Construction and maintenance of a visitor centre, and accompanying walkways and viewing platforms (e.g. of the machine floor) and tours, at the hydropower plant;
- Protection of the eastern portion of the Litunga canal, construction of walkways to allow visitors to reach the site, detailed photos and documentation of the portions of the canal that

will be lost for project infrastructure, and the creation of an interpretation centre to be included in the hydropower plant visitor centre;

- Inclusion of details on other cultural sites and practices such as maungwe and limbelo fishing in the interpretation centre; Development of marketing messages that convey the breadth of attractions in the area, and identify the main potential visitor groups and how to reach them; training for tourism businesses in these messages; establishment of a tourism operator network that can discuss shared marketing messages and efforts that are of common interest;
- Training of local people to enable them to take up employment in the tourism industry, including basic literacy and numeracy, knowledge of items of cultural and historical interest, and how to conduct guided tours;
- Develop informative, directional and robust signage along both main roads (east and west) and tourism information signage at Ngonye Falls and other sites of interest;
- Support to the implementation of the NFCPP development plan including upgrading of access roads from the main (tar) roads (both east and west), and construction of entrance gates, reception, sanitation facilities, camping and picnic areas, and the like (see details in Appendix 1).

Current and without-project visitor numbers are very low. With the implementation of these measures, the adverse impact on visitor numbers will be eliminated, and a positive impact of higher visitor numbers will result. The magnitude of this positive impact will be Medium, and as sensitivity of the tourism industry is High, this results in a **Major positive** residual impact.

5.2.1.2.2 Permanently lower investment due to a perception that the presence of the Project infrastructure impairs tourism

Investment in the tourism industry drives employment, for example in construction, and extends the range of investors and operators that are actively marketing the area as a tourism opportunity. The volume of investment attracted to the area may be reduced, if potential investors assume that the presence of the Project infrastructure impairs tourism.

The magnitude of this impact is considered Medium, and the sensitivity of the tourism industry is High, therefore significance is **Major**.

Mitigation Measures

In addition to the measures described above, measures could be taken to directly address levels of investment in the area. These may include:

- Convening of investor forums to showcase the possibility of investing in tourism in the area;
- Establishment of a tourism operator network or association that can collectively approach potential investors for larger investments e.g. in NFCPP.

With the implementation of these measures, the adverse impact on reduced investment will be reduced to negligible, and therefore the residual impact is **negligible**.

5.2.2 Impacts of Construction Phase Activities

5.2.2.1 Heavy construction activities throughout the site; mobilisation and employment of 3,100 people; outside lighting

5.2.2.1.1 Reduced visitor-days due to a perception amongst potential visitors that construction activities impair the visitor's experience

Potential visitors to the area may choose to visit alternative areas during construction, or may delay their visits, if they consider that construction activities impair the visitor experience. For example, this may be because of the presence of a large camp of workers, heavy construction traffic, or dust, noise and lighting. In-stream construction activities may result in a higher sediment content of the Falls, reducing its visual appeal.

Visitors that have been to the area may distribute feedback or reviews on these factors to potential visitors. Tourism operators that complain to their visitors that the area was more attractive before construction, create the risk that these visitors discourage others from coming to the area, with impacts on their own and others' businesses.

This may reduce the number of visitors coming to the area and the length of time that they stay, and total visitor-days, visitor expenditure, investment in the tourism industry, profitability of tourism enterprises, and employment would all reduce.

The magnitude of this impact is considered Medium as it is for the duration of the construction stage only, and the sensitivity of the tourism industry is High, therefore significance is **Major**.

Mitigation Measures

A wide range of construction-stage mitigation measures addressing these issues directly are addressed elsewhere in the main ESIA report: management of camp-followers; visual impact and external lighting; noise; sediment and traffic.

Additional measures will be taken to mitigate impacts that directly concern tourism management. These will be more limited in range than the measures during operations, owing to the constraints of

the construction stage. They focus on the maintenance of Ngonye Falls as the main attraction, and the enhancement of the experience of those that do visit so they recommend the experience to others. They include:

- Construction and maintenance of viewing platforms, pathways and walkways (across parts of the river) for viewing Ngonye Falls (see details below);
- Maintenance of viewing platforms with information posters for visitors of major construction sites of interest e.g. the barrage, weir, canal
- Provision of key information for tourism operators, that flows of Ngonye Falls will not be reduced during the construction stage;
- Provision of key information for tourism operators and their customers on the hydropower plant design, benefits of the Project, construction sequence and timing;
- Repurposing of some temporary accommodation and facilities as tourism facilities, especially within NFCPP that already plans self-catering and lodge accommodation that is planned by NFCPP[1] as tourism accommodation once the construction phase of the Project is completed.

To address impacts on the profitability of tourism enterprises and employment specifically, the following measures are proposed:

- Promotion amongst WPC and Contractor employees of game drives and fishing trips by tourism operators, and advance bulk purchase of these or other tourism services by WPC;
- Financial compensation to tourism service providers based on agreed parameters, such as number of nights sold, or return per unit.

With the implementation of these measures, the adverse impact on reduced visitor days will be reduced to Negligible, and therefore the residual impact is **Negligible**.

5.2.2.1.2 Delay in investment as potential investors put off their investment until construction is complete

The volume of investment attracted to the area may be reduced or delayed, if potential investors assume that construction stage activities impair tourism.

The magnitude of this impact is considered Medium, and the sensitivity of the tourism industry is High, therefore significance is **Major**.

[1] In an area that would be convenient and suitable for housing of senior personnel during the construction phase of the Project and could readily be repurposed.

Mitigation Measures

This impact would be mitigated by implementing the measures under section 5.2.1.2.2 (permanently lower investment) earlier, prior to the construction phase. With the implementation of these measures, the adverse impact on reduced investment will be reduced to low, and therefore the residual impact is **Moderate**.

5.2.3 Impacts of Operations

5.2.3.1 Reduction in flows downstream of the headworks

5.2.3.1.1 Reduced visitor days and expenditure due to a reduction in the visual amenity of Ngonye Falls in the dry season

The diversion of flows for generation will reduce volumes of flow in the reaches between the weir and the tailrace, including flows in the various channels and pools of Ngonye Falls.

In the dry season, without the implementation of EFlows, the visual appeal of Ngonye Falls would be eliminated. This would result in fewer potential visitors coming to the area, and shorter visits. The magnitude of this impact is High, and the sensitivity of the tourism industry is High, therefore significance is **Major**.

Mitigation Measures

The Project will maintain minimum flows (EFlows) through the Ngonye Falls channels throughout operation. The EFlows have been determined on the basis of biological, social and visual values.

Additional measures will be taken to mitigate impacts that directly concern the Falls as a visitor attraction. These focus on enhancement of the Falls as an accessible attraction for visitors, and include:

- Infrastructure (walkways, pathways and viewing platforms) that enable visitor to access Ngonye Falls and key view sites securely and easily (for example passing over shallow water), at key points on both the western and eastern banks;[2]
- Access roads, gatehouse facilities, basic camp sites, sanitation facilities; and
- Organised tours such as sunrise and sunset tours.

In the lowest flow months, with the planned EFlows and the additional mitigation measures described above, it is likely that there will continue to be a residual impact on visitor-days in that part of the year. In addition, there are uncertainties in the exact movement of water that will result with

[2] The proposed network of walkways and / or footbridges will be designed and positioned sensitively to avoid impeding views or interfering with wildlife crossing the river.

lower flows. The magnitude could be reduced to low. As sensitivity is considered High, the residual impact is of **Moderate** significance.

5.2.3.1.2 Increased visitor days and expenditure due to an extension of the visual amenity of Ngonye Falls into the wet season

Currently in the highest flow months, Ngonye Falls has no visual appeal as they are entirely submerged in the river. The diversion of flows for generation will reduce volumes of flow in the reaches between the weir and the tailrace throughout the year, thereby extending the season in which Ngonye Falls will be most visually appealing. Currently the season of highest visual appeal is from June to January, but with the Project, this season will be extended notably during March, April and May.

This may increase the number of visitors coming to the area and the length of time that they stay, and the annual total visitor-days. Visitor expenditure, investment in the tourism industry, profitability of tourism enterprises, and employment would all *increase*. The magnitude of this positive impact is High, and the sensitivity of the tourism industry is High, therefore significance is **Major positive**.

Enhancement Measures

In addition to the above-described infrastructure to enhance the visitor experience of Ngonye Falls, the attraction of Ngonye Falls will be promoted through a marketing initiative, targeting potential visitors that may visit in the extended visitor season.

5.2.3.1.3 Reduced visitor days and expenditure due to a decline in fish available for sport fishing

The diversion of flows for generation will reduce flows in the reaches between the weir and the tailrace, which will result in the modification of aquatic in-stream habitat. This will result in declines in the abundance of aquatic species in the reduced-flow reaches, some of which are valued for sport fishing. The migration upstream for spawning of adult Tigerfish (*Hydrocynus vittatus*) may be restricted by lower flows, and the physical barrier of the weir. The high-risk period will be from December to February, when early wet season breeders including Tigerfish migrate upstream to suitable spawning sites in the Barotse Floodplain. In addition, fish abundance may decline due to the entrainment of fish into the canal and power house.

Without the implementation of EFlows and the installation of fish passage structures, the magnitude of the impact on the fish is High. This may in turn result in a decline in visitor-days and expenditure, and the magnitude of the impact is assumed to be High. The sensitivity of the tourism industry is High, therefore significance of the impact is **Major.**

Mitigation Measures

EFlows and fish passage structures are described in detail in the Project Description which will ensure the continued maintenance of fish migration, habitat and recruitment. In addition, a sustainable fisheries programme will be undertaken to ensure that fisheries are managed sustainably, to preserve and enhance their value for local livelihoods and tourism (see ESMMP).

These measures will maintain the fishery as a resource for sport fishing, and, with continued marketing of sport fishing as a tourist attraction, the magnitude of the residual impact on visitor days and expenditure will be reduced to Negligible. The significance of the residual impact will be **Negligible**.

5.2.3.1.4 Increased visitor days and expenditure due to an extension of the sport fishing season into the wet season

Currently in the highest flow months, the level of the river in the gorge is too high to allow for sport fishing. The diversion of flows for generation will reduce volumes of flow in the gorge between the weir/barrage and the power house tailrace, lowering river levels, and thereby extending the season that is suitable for sport fishing. Currently the season that is most suitable for sport fishing in the gorge is generally from September to beginning December (when the annual fish ban comes into effect), but with the Project, this season will start earlier and extend from June to December (this coincides with the main tourism season which takes place over the second half of the year).

This may increase the number of visitors coming to the area and the length of time that they stay, and the annual total visitor-days. Visitor expenditure, investment in the tourism industry, profitability of tourism enterprises, and employment would all *increase*. The magnitude of this positive impact is High, and the sensitivity of the tourism industry is High, therefore significance is **Major positive**.

Enhancement Measures

In addition to the above-described measures to promote tourism, the attraction of Ngonye Falls will be promoted through a marketing initiative, targeting potential visitors that may visit in the extended visitor season.

5.2.4 Impact Assessment Summary

See Table 51: Tourism Impact Assessment Summary on the following page.

Table 52: Tourism Impact Assessment Summary

Project Activity	Impact	Intensity	Spatial Extent	Duration	Scale	Magnitude	Sensitivity	Significance	Residual Impact
Permanent Project Features									
Creation of a Permanent Headpond	Increase in visitor-days or visitor expenditure arising from the use of the headpond, including for sport fishing	Low	Local	Long-term	Low	Negligible	High	**Negligible Beneficial**	**Negligible Beneficial**
Permanent installation of headworks, canal, forebay and power plant	Reduced visitor-days due to a perception amongst potential visitors that the presence of the Project infrastructure impairs the visitor's experience	Medium	Regional	Long-term	Low	Medium	High	**Major**	**Major Beneficial**
	Permanently lower investment due to a perception that the presence of the Project infrastructure impairs tourism	Medium	Regional	Long-term	Low	Medium	High	**Major**	**Negligible**
Construction Phase Activities									
Heavy Construction Activities Throughout the Site / Mobilisation and employment of 3,100 people / Outside Lighting	Reduced visitor-days due to a perception amongst potential visitors that heavy construction activities, the presence of a large workforce, and outside lighting impair the visitor's experience	Medium	Regional	Medium-term	Low	Medium	High	**Major**	**Negligible**
	Delay in investment as potential investors put off their investment until construction is complete.	Medium	Regional	Medium-term	Low	Medium	High	**Major**	**Moderate**
Operational Phase Activities									
Reduction in Flows Downstream of the Barrage and Weir	Reduced visitor days and expenditure due to a reduction in the visual amenity of Ngonye Falls in the dry season	High	Regional	Long-term	Medium	High	High	**Major**	**Moderate**
	Increased visitor days and expenditure due to an extension of the visual amenity of Ngonye Falls into the wet season	High	Regional	Long-term	Medium	High	High	**Major Beneficial**	**Major Beneficial**
	Reduced visitor days and expenditure due to a decline in fish available for sport fishing	High	Regional	Long-term	High	High	High	**Major**	**Negligible**
	Increased visitor days and expenditure due to an extension of the sport fishing season into the wet season	High	Regional	Long-term	Medium	High	High	**Major Beneficial**	**Major Beneficial**

Section 6. Tourism Impacts Management Plan

Measures to mitigate impacts on the tourism industry, and to enhance positive effects on the industry will focus on economic parameters such as: visitor numbers and length of visits (total annual number of visitor-days); average visitor expenditure per day; investment in tourism enterprises; and the number of employees from local communities that are employed in the tourism industry.

A range of mitigation measures addressing issues that affect tourism will be addressed through other plans, for example: plans to manage noise, external lighting, and visual impact; and a wide range of construction-stage mitigation measures addressing camp-followers, noise, traffic, visual impact, and external lighting. The EFlows Management Plan and Sustainable Fisheries Plan are particularly pertinent to tourism (see ESMMP).

Additional measures that directly concern tourism management will be taken to mitigate impacts. These must focus on the maintenance of existing or creation of new attractions for tourism, the marketing of these attractions amongst potential visitors, and the enhancement of the experience of those that do visit so they recommend the experience to others. The creation of new attractions can include the preserved section of the Litunga's canal, other sites of cultural interest and importance, and the hydropower plant itself. The history of the Litunga's canal is of significant cultural interest, and complements the possible granting of World Heritage Status to the Barotse floodplain and its network of historical canals.

Mitigation measures must begin prior to the construction phase and be taken through construction. During this time, the measures will be more limited in range than the measures during operations, owing to the constraints of the construction stage. They focus on the maintenance of Ngonye Falls as the main attraction, and the enhancement of the experience of those that do visit so they recommend the experience to others. The following table sets out the key mitigation measures to be taken.

Table 2: Mitigation Measures for Tourism

#Ref	Topic/Impact to be Addressed	Mitigation Measures
5.2.2.1.1	Reduced visitor-days during construction	• Construction and maintenance of viewing platforms, pathways and walkways (across parts of the river) for viewing Ngonye Falls (see details below); • Provision of key information for tourism operators, that flows of Ngonye Falls will not be reduced during the construction stage; • Provision of key information for tourism operators and their customers on the hydropower plant design, benefits of the Project, construction sequence and timing.
5.2.2.1.1	Reduced profitability of tourism enterprises and employment during construction	• Promotion amongst WPC and Contractor employees of game drives and fishing trips by tourism operators, and advance bulk purchase of these or other tourism services by WPC; • Financial compensation to tourism service providers based on agreed parameters, such as number of nights sold, or return per unit.
5.2.1.2.1	Reduced visitor-days due to the	• Construction and maintenance of viewing platforms, pathways and walkways (across parts of the river) for viewing Ngonye Falls;

	presence of the Project	• Construction and maintenance of a visitor centre, and accompanying walkways and viewing platforms (e.g. of the machine floor) and tours, at the hydropower plant; • Protection of the eastern portion of the Litunga canal, construction of walkways to allow visitors to reach the site, detailed photos and documentation of the portions of the canal that will be lost for project infrastructure, and interpretation of the canal to be included in the hydropower plant visitor centre; • Inclusion of interpretation on other cultural sites and practices such as maungwe and limbelo fishing in the visitor centre; • Development of marketing messages that convey the breadth of attractions in the area, and identify the main potential visitor groups and how to reach them; training for tourism businesses in these messages; establishment of a tourism operator network that can discuss shared marketing messages and efforts that are of common interest; • Access roads, gatehouse facilities, basic camp sites, sanitation facilities; • Organised tours such as sunrise and sunset tours. • Training of local people to enable them to take up employment in the tourism industry, including basic literacy and numeracy, knowledge of items of cultural and historical interest, and how to conduct guided tours; • Develop informative, directional and robust signage along both main roads (east and west) and tourism information signage at the Falls; • Support to the implementation of the NFCPP development plan including upgrading of access roads from the main (tar) roads (both east and west), and construction of entrance gates, reception, sanitation facilities, camping and picnic areas, etc. • Re-purposing of some temporary accommodation and facilities as tourism facilities, especially within NFCPP that already plans self-catering and lodge accommodation that is planned by NFCPP as tourism accommodation once the construction phase of the Project is completed.
5.2.1.2.2 and 5.2.2.1.2	Delays in tourism investment during construction, and permanently lower investment thereafter	• Convening of investor forums to showcase the possibility of investing in tourism in the area; • Establishment of a tourism operator network or association that can collectively approach potential investors for larger investments e.g. in NFCPP.
5.2.3.1.1 and 5.2.3.1.3	During operations, reduced visitor days and expenditure due to a reduction in the visual amenity of Ngonye Falls, and a decline in fish available for sport fishing	• Maintain minimum flows (EFlows) through the Ngonye Falls channels throughout operation (for details see Section 6.3.2 of the main ESMMP); • A sustainable fisheries program to ensure that fisheries are managed sustainably, to preserve and enhance their value for local livelihoods and tourism (sport fishing) (see Section 6.2.7 of the main ESMMP); • Vertical slot fish passages are included in the project design to maintain connectivity for spawning migrations of fish (see Section 5.2.4 of the ESMMP) • Attraction of Ngonye Falls and sport fishing will be promoted through a marketing initiative, targeting potential visitors that may visit in the extended visitor season; • Infrastructure (walkways, pathways and viewing platforms) that enable visitor to access Ngonye Falls and key view sites securely and easily (for example passing over shallow water), at key points on both the western and eastern banks.

Section 7. Monitoring Plan

7.1.1 Photo-monitoring Points

The concept of identifying photo-monitoring points where regular monthly photographs could be taken for the purpose of monitoring the actual flow of water in the Zambezi River before construction commences, during the construction phase of the project and during the subsequent operational phase of the project was broadly supported by tourism stakeholders who responded to the questionnaire. The purpose of such photo-monitoring would be to provide evidence or otherwise of the impact of the project on the river water level and on the tourism value of the river views at the key photo-monitoring points so identified.

The following is a list of the photo-monitoring points agreed with tourism stakeholders together with the co-ordinates of these points and a photograph taken from each PMP during the period 27th May 2019 to 30th May 2019:

Western Bank of the Zambezi River:

1. NFCPP Visitor Centre PMP Latitude: -16.654254°S; Longitude: 23.570457°E

2. NFCPP Camp Site PMP Latitude: -16.657919°S; Longitude: 23.572072°E

3. NFCPP Conservation Area PMP No. 1 Latitude: -16.660643°S; Longitude: 23.574405°E

4. NFCPP Conservation Area PMP No. 2 Latitude: -16.663737°S; Longitude: 23.574859°E

5. NFCPP Conservation Area PMP No. 3 Latitude: -16.664458°S; Longitude: 23.574542°E

6. Whispering Sands Bar PMP Latitude: -16.673720°S; Longitude: 23.591919°E

7. Whispering Sands Campsite PMP Latitude: -16.674126°S; Longitude: 23.593194°E

8. Kashabati Farm PMP Latitude: -16.675436°S; Longitude: 23.610869°E

9. Mazauli Camp PMP Latitude: -16.673570°S; Longitude: 23.614409°E

10. Ngonye River Lodge PMP Latitude: -16.672212°S; Longitude: 23.620393°E

Eastern Bank of the Zambezi River:

11. Project Water Intake PMP Latitude: -16.653630°S; Longitude: 23.586689°E

12. Top of Ngonye Falls PMP Latitude: -16.654604°S; Longitude: 23.576838°E

13. Ngonye Falls Main Channel PMP Latitude: -16.653532°S; Longitude: 23.575401°E

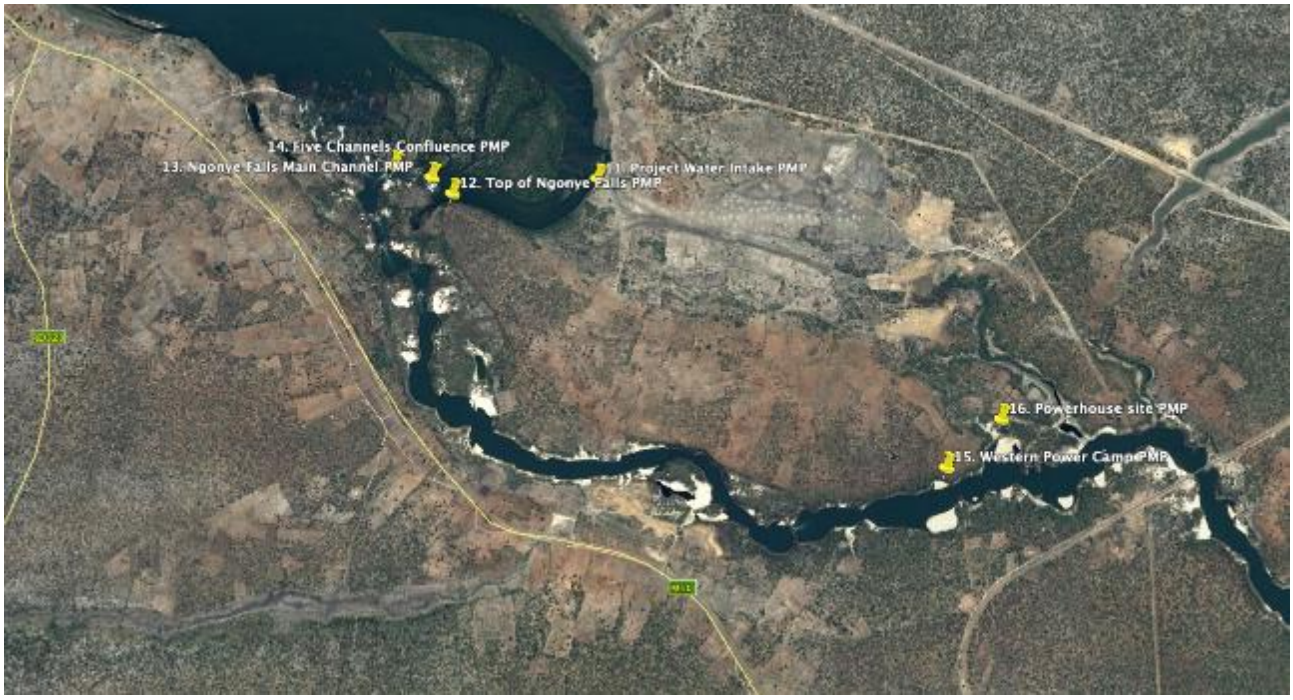
14. Five Channels Confluence PMP Latitude: -16.652778°S; Longitude: 23.572824°E

15. Western Power Camp PMP Latitude: -16.672388°S; Longitude: 23.610059°E

16. Powerhouse Site PMP Latitude: -16.669296°S; Longitude: 23.613778°E

It is recommended that photo-monitoring at these 16 PMPs should take place on a monthly basis (say on the 15th of each month) starting as soon as is practical and continuing on a monthly basis throughout the construction phase of the Project and for at least the first two years of the operational phase of the Project. Two maps indicating the location of these recommended photo-monitoring points are provided below:

Map showing Photo-Monitoring Points (PMPs) on the Western Bank of the Zambezi River



Map showing Photo-Monitoring Points (PMPs) on the Eastern Bank of the Zambezi River

Section 8. Conclusions

One unavoidable impact that the Project will have on Ngonye Falls is that the flow of water passing over the falls between the intake point above the falls and the outlet point below the falls will be reduced. In order to minimise, and hopefully avoid, negative consequences of this reality, WPC have consulted with environmental specialists to determine the minimum level of water flow that must be released over the falls at all times. This minimum release will be an undertaking to which WPC is irrevocably committed. Should the flow of water threaten to drop below the prescribed minimum level, generation of electricity at the powerhouse will stop. And all available water flowing towards Ngonye Falls from upstream will be allowed to flow over the falls.

It is the conclusion of Graham Muller Associates that the consequences for the tourism industry in the Sioma district of western Zambia resulting from the developing, financing, constructing, owning, operating, managing and maintaining of an approximately 180 MW installed capacity hydro-electric power run-of-river generating facility situated at or near the Ngonye Falls on the Zambezi River (the "Project") will (with the implementation of appropriate mitigation measures to neutralise anticipated negative impacts that may result for the tourism industry) be positive.

Not only does the hydro-power facility add an attractive local tourism asset in itself, but the impact of the construction and operation of such a plant can be undertaken in such a way that effective mitigation measures can be implemented that will ensure that no lasting negative impact is sustained by the eco-tourism industry in the Ngonye Falls area. It is recommended that the negative impacts possibly foreseen and listed in Section 5 of this report be diligently monitored during both the construction and operational phases of the Project. Should negative impacts arise, these should be immediately identified and effective mitigation measures should be put in place.

It is further recommended that anticipated positive impacts for the tourism industry, many of which have been identified in Section 4 and 5 of this report should be financially supported by Western Power (Pty.) Ltd., Zambia (WPC) in order that such positive impacts can be enhanced to the maximum extent possible. To this end it is recommended that a budget be prepared in consultation with

tourism industry stakeholders and approved by the directors of WPC to initially cover the construction phase of the Project. On commissioning an annual budget for tourism industry support should be prepared and approved.

Appendix 1:

Indicative Budgets for the Development of Tourism Infrastructure At Ngonye Falls Community Partnership Park (NFCPP)

(*Source: Ngonye Falls Community Partnership Park:*
Tourism Development Phase I & II
Draft, December 2017)

NGONYE FALLS COMMUNITY PARTNERSHIP PARK

ESTIMATED CONSTRUCTION COST

PARK AUTHORITY DEVELOPMENT COMPONENT

PROJECT	**NGONYE FALLS**
PHASE 1	**WESTERN & EASTERN SIDE**
CLIENT	**NGONYE FALLS COMMUNITY**
COST REVISION	**3**
DATE	**14-Dec-17**
DRAWING REFERENCE	**Ngonye Falls Concept Masterplan**

Preliminary Cost Estimate

NGONYE FALLS - PHASE 1 CAMPSITE UPGRADES

A. ADDITIONAL SINGLE CAMP SITES (WESTERN & EASTERN SIDE OF ZAMBEZI RIVER)

1 Preliminary and General

ITEM	DESCRIPTION	UNIT	QUANT.	RATE ®	PRICE ®	PRICE (€)
1.1	Site establishment	sum	1		19,886.85	€ 1,252.87
1.2	Guarantees	sum	1		4,971.71	€ 313.22
1.3	Insurances	sum	1		4,971.71	€ 313.22
1.4	Safe guarding of works	sum	1		4,971.71	€ 313.22
1.5	Rubble Removal	m³	5	500.00	2,500.00	€ 157.50
1.6	Soil test	No.	2	600.00	1,200.00	€ 75.60
1.7	Density test	No.	3	700.00	2,100.00	€ 132.30
	Sub total				**40,601.99**	**€ 2,557.93**

2 Earthworks

ITEM	DESCRIPTION	UNIT	QUANT.	RATE	PRICE ®	PRICE
2.1	Picking / ripping and levelling of sites	m^2	1471	20.00	29,420.00	€ 1,853.46
2.2	Imported fill material for levelling of camp site	m³	74	250.00	18,387.50	€ 1,158.41
	Sub total				**47,807.50**	**€ 3,011.87**

3 Hard Landscaping

ITEM	DESCRIPTION	UNIT	QUANT.	RATE	PRICE ®	PRICE
3.1	**Compaction and base preparation for natural pathway**	m^2	550	15.00	8,250.00	€ 519.75
3.2	**Stabilized in-situ natural pathway surface [av. 1m width]**	m^2	550	40.00	22,000.00	€ 1,386.00
3.3	**Camping Space 2 pax**	no	3	**67,585.00**	202,755.00	€ 12,773.57
3.3.1	*Compaction and base preparation for parking / covered area*	m^2	41	70.00	2,870.00	€ 180.81
3.3.2	*Paving of covered / parking area*	m^2	41	200.00	8,200.00	€ 516.60
3.3.3	*Headercourse paver around covered area*	m	24	90.00	2,160.00	€ 136.08
3.3.4	*In situ concrete braai & tap structures*	m^2	11	200.00	2,200.00	€ 138.60
3.3.5	*Space defining walls / seating walls 500mm high*	m	48	750.00	36,000.00	€ 2,268.00
3.3.6	*Nomadic stretch tent covering*	m^2	22	400.00	8,800.00	€ 554.40
3.3.7	*Nomadic tent covering fixing posts [6 x 4.2m]*	no	6	150.00	900.00	€ 56.70

3.3.8	*Water supply and tap connection to site*	no	1	500.00	500.00	€ 31.50
3.3.9	*Solar power supply and inverter connection to site*	no	1	2,500.00	2,500.00	€ 157.50
3.3.10	*Drainage pipe from tap connection*	m	10	25.00	250.00	€ 15.75
3.3.11	*Fixed braai structure*	no	1	1,600.00	1,600.00	€ 100.80
3.3.12	*Harvesting river sand for camp sites*	m^3	13	125.00	1,605.00	€ 101.12
3.4	**Camping Space 4 pax**	no	2	**91,490.00**	182,980.00	€ 11,527.74
3.4.1	*Compaction and base preparation for parking / covered area*	m^2	67	70.00	4,690.00	€ 295.47
3.4.2	*Paving of covered / parking area*	m^2	67	200.00	13,400.00	€ 844.20
3.4.3	*Headercourse paver around covered area*	m	30	90.00	2,700.00	€ 170.10
3.4.4	*In situ concrete braai & tap structures*	m^2	11	200.00	2,200.00	€ 138.60
3.4.5	*Space defining walls / seating walls 500mm high*	m	60	750.00	45,000.00	€ 2,835.00
3.4.6	*Nomadic stretch tent covering*	m^2	38	400.00	15,200.00	€ 957.60
3.4.7	*Nomadic tent covering fixing posts [6 x 4.2m]*	no	6	150.00	900.00	€ 56.70
3.4.8	*Water supply and tap connection to site*	no	1	500.00	500.00	€ 31.50
3.4.9	*Solar power supply and inverter connection to site*	no	1	2,500.00	2,500.00	€ 157.50
3.4.10	*Drainage pipe from tap connection*	m	10	25.00	250.00	€ 15.75
3.4.11	*Fixed braai structure*	no	1	1,600.00	1,600.00	€ 100.80
3.4.12	*Harvesting river sand for camp sites*	m^3	20	125.00	2,550.00	€ 160.65
3.5	**Camping Space 6 pax**	no	3	**101,850.00**	305,550.00	€ 19,249.65
3.5.1	*Compaction and base preparation for parking / covered area*	m^2	71	70.00	4,970.00	€ 313.11
3.5.2	*Paving of covered / parking area*	m^2	71	200.00	14,200.00	€ 894.60
3.5.3	*Headercourse paver around covered area*	m	32	90.00	2,880.00	€ 181.44
3.5.4	*In situ concrete braai & tap structures*	m^2	11	200.00	2,200.00	€ 138.60

3.5.5	*Space defining walls / seating walls 500mm high*	m	68	750.00	51,000.00	€ 3,213.00
3.5.6	*Nomadic stretch tent covering*	m^2	42	400.00	16,800.00	€ 1,058.40
3.5.7	*Nomadic tent covering fixing posts [6 x 4.2m]*	no	6	150.00	900.00	€ 56.70
3.5.8	*Water supply and tap connection to site*	no	1	500.00	500.00	€ 31.50
3.5.9	*Solar power supply and inverter connection to site*	no	1	2,500.00	2,500.00	€ 157.50
3.5.10	*Drainage pipe from tap connection*	m	10	25.00	250.00	€ 15.75
3.5.11	*Fixed braai structure*	no	1	1,600.00	1,600.00	€ 100.80
3.5.12	*Harvesting river sand for camp sites*	m^3	32	125.00	4,050.00	€ 255.15
3.6	**Refuse bins**	no	8.0	3,500.00	28,000.00	€ 1,764.00
3.7	**Signage**	no	10.0	500.00	5,000.00	€ 315.00
3.8	**Single Enviro solution ablution facility [covered] 16m²**	no	3.0	40,000.00	120,000.00	€ 7,560.00
3.9	**Double Enviro solution ablution facility [un-covered] 20m²**	no	2.0	36,000.00	72,000.00	€ 4,536.00
	Sub total				**946,535.00**	**€ 59,631.71**

4	**Maintenance**					
ITEM	**DESCRIPTION**	**UNIT**	**QUANT.**	**RATE**	**PRICE ®**	**PRICE**
4.1	Maintenance	month	6	4,500.00	27,000.00	€ 1,701.00
	Sub total				**27,000.00**	**€ 1,701.00**

5	**Contingencies**					
ITEM	**DESCRIPTION**	**UNIT**	**QUANT.**	**RATE**	**PRICE ®**	**PRICE**
5.1	Allowance for additional items per instruction (5%)	Sum	1	49,717.13	49,717.13	€ 3,132.18
	Sub total				**49,717.13**	**€ 3,132.18**

6	**Summary**		
ITEM	**DESCRIPTION**	**PRICE ® Euro = R15.94**	**PRICE (€) ROE = 0.063**
1	Preliminary and General	40,601.99	€ 2,557.93
2	Earthworks	47,807.50	€ 3,011.87
3	Hard Landscaping	946,535.00	€ 59,631.71
4	Maintenance	27,000.00	€ 1,701.00
5	Contingencies	49,717.13	€ 3,132.18
TOTAL		**1,111,661.61**	**€ 70,034.68**
VAT @ 14%		**155,632.63**	**€ 9,804.86**
TOTAL INC. VAT		**1,267,294.24**	**€ 79,839.54**

	Assumptions					
	Costing is an estimate based on current going rates. Tender prices may vary.					
	Ground conditions are suitable for compaction and at appropriate levels for pedestrian pathways					
	Permits for water extraction from the river is in place					
	Potable water will be supplied where required					
	10% escalation per annum to the rates will apply project is phased, assuming phases commence annually					
	Exclusions					
	Bulk earthworks					
	Access road grading and compaction - 2080m					
	Mooring points for river crossings by boat					
	Boats for river crossing					
	CALCULATIONS					
1	*Preliminary and General*					
	Site establishment (2% of cost, excl P&G's, maintenance & contingencies)	R	994,342.50	2.00	**19,886.85**	€ 1,193.21
	Guarantees (0.5% of cost, excl P&G's, maintenance & contingencies)	R	994,342.50	0.50	**4,971.71**	€ 298.30
	Insurances (0.5% of cost, excl P&G's, maintenance & contingencies)	R	994,342.50	0.50	**4,971.71**	€ 298.30
	Safeguarding (0.5% of cost, excl P&G's, maintenance & contingencies)	R	994,342.50	0.50	**4,971.71**	€ 298.30
5	*Contingencies*					
	Allowance (% of cost, excl P&G's, maintenance & contingencies)	R	994,342.50	5.00	**49,717.13**	€ 2,983.03

NGONYE FALLS COMMUNITY PARTNERSHIP PARK
ESTIMATED CONSTRUCTION COST
PARK AUTHORITY DEVELOPMENT COMPONENT

PROJECT	**NGONYE FALLS**
PHASE	**WESTERN SIDE - PATHWAYS**
CLIENT	**NGONYE FALLS COMMUNITY**
COST REVISION	**3**
DATE	**14-Dec-17**
DRAWING REFERENCE	**Ngonye Falls Concept Masterplan**

B. RECEPTION, PICNIC & PATHWAY NETWORK (WESTERN SIDE OF ZAMBEZI RIVER)

1	**Preliminary and General**					
ITEM	**DESCRIPTION**	**UNIT**	**QUANT.**	**RATE ®**	**PRICE (R)**	**PRICE (€)**
1.1	Site establishment	sum	1		9,129.40	€ 575.15
1.2	Guarantees	sum	1		2,282.35	€ 143.79
1.3	Insurances	sum	1		2,282.35	€ 143.79
1.4	Safe guarding of works	sum	1		2,282.35	€ 143.79
1.5	Rubble Removal	m^3	5	500.00	2,500.00	€ 157.50
	Sub total				**18,476.45**	**€ 1,164.02**

2	**Hard Landscaping**					
ITEM	**DESCRIPTION**	**UNIT**	**QUANT.**	**RATE®**	**PRICE®**	**PRICE**
2.1	**Compaction and base preparation for paved areas**	m^2	290	30.00	8,700.00	€ 548.10
2.2	**Compaction and base preparation for natural pathway areas [av. 1m width]**	m^2	25	15.00	375.00	€ 23.63
2.3	**In situ concrete paving**	m^2	290	200.00	58,000.00	€ 3,654.00
2.4	**Stabilized in-situ natural pathway surface [av. 1m width]**	m^2	25	50.00	1,250.00	€ 78.75
2.5	**Retaining walls for ramp down to pathways**					
2.5.1	Strip footing [1000 x 400]	m	157	1,250.00	196,250.00	€ 12,363.75
2.5.2	Reinforced stone wall - 350mm thick	m^2	55	1,860.00	102,300.00	€ 6,444.90
2.5.3	Backfill & compacted against structures	m^3	128	165.00	21,120.00	€ 1,330.56
2.5.4	Subsoil drain with agri pipe bidum and gravel	m	55	245.00	13,475.00	€ 848.93
2.6	**Refuse bins**	no	2.0	3,500.00	7,000.00	€ 441.00
2.7	**Signage**	LS	1.0	8,000.00	8,000.00	€ 504.00
2.8	**Single Enviro solution ablution facility [covered] 16m²**	no	1.0	40,000.00	40,000.00	€ 2,520.00
	Sub total				**456,470.00**	**€ 28,757.61**

3	**Contingencies**					
ITEM	**DESCRIPTION**	**UNIT**	**QUANT.**	**RATE®**	**PRICE®**	**PRICE**
3.1	Allowance for additional items per instruction (5%)	Sum	1	22,823.50	22,823.50	€ 1,437.88
	Sub total				**22,823.50**	**€ 1,437.88**

4	Summary					
ITEM	DESCRIPTION				PRICE ® Euro = R15.94	PRICE (€) ROE = 0.063
1	Preliminary and General				18,476.45	€ 1,164.02
2	Hard Landscaping				456,470.00	€ 28,757.61
3	Contingencies				22,823.50	€ 1,437.88
TOTAL					**497,769.95**	**€ 31,359.51**
VAT @ 14%					**69,687.79**	**€ 4,390.33**
TOTAL INC. VAT					**567,457.74**	**€ 35,749.84**

	Assumptions
	Costing is an estimate based on current going rates. Tender prices may vary.
	Ground conditions are suitable for compaction and at appropriate levels for pedestrian pathways
	Permits for water extraction from the river is in place
	Potable water will be supplied where required
	10% escalation per annum to the rates will apply if phased, assuming phases commence annually

	Exclusions
	Bulk earthworks
	Access road grading and compaction - 2080m
	Suspension bridge for high water crossing - spanning +/- 85m
	Park parameter fencing on Western side - 2320m
	Entrance Gate facility
	Only 25m of the required 7100m of pathways can be constructed in this phase
	No bridge to cross side channels of the Zambezi River to access the view sites

CALCULATIONS

1	*Preliminary and General*					
	Site establishment (2% of cost, excl P&G's, maintenance & contingencies)	R	456,470.00	2.00	**9,129.40**	€ 547.76
	Guarantees (0.5% of cost, excl P&G's, maintenance & contingencies)	R	456,470.00	0.50	**2,282.35**	€ 136.94
	Insurances (0.5% of cost, excl P&G's, maintenance & contingencies)	R	456,470.00	0.50	**2,282.35**	€ 136.94
	Safeguarding (0.5% of cost, excl P&G's, maintenance & contingencies)	R	456,470.00	0.50	**2,282.35**	€ 136.94
3	*Contingencies*					
	Allowance (% of cost, excl P&G's, maintenance & contingencies)	R	456,470.00	5.00	**22,823.50**	€ 1,369.41

NGONYE FALLS COMMUNITY PARTNERSHIP PARK

ESTIMATED CONSTRUCTION COST

PARK AUTHORITY DEVELOPMENT COMPONENT

PROJECT	**NGONYE FALLS**
PHASE	**EASTERN SIDE - PATHWAYS**
CLIENT	**NGONYE FALLS COMMUNITY**
COST REVISION	**3**
DATE	**14-Dec-17**
DRAWING REFERENCE	**Ngonye Falls Concept Masterplan**

C. PATHWAY NETWORK (EASTERN SIDE OF ZAMBEZI RIVER)

1 Preliminary and General

ITEM	DESCRIPTION	UNIT	QUANT.	RATE ®	PRICE ®	PRICE (€)
1.1	Site establishment	sum	1		8,730.00	€ 549.99
1.2	Guarantees	sum	1		2,182.50	€ 137.50
1.3	Insurances	sum	1		2,182.50	€ 137.50
1.4	Safe guarding of works	sum	1		2,182.50	€ 137.50
1.5	Rubble Removal	m^3	5	500.00	2,500.00	€ 157.50
	Sub total				**17,777.50**	**€ 1,119.98**

2 Hard Landscaping

ITEM	DESCRIPTION	UNIT	QUANT.	RATE ®	PRICE ®	PRICE
2.1	**Compaction and base preparation for paved areas**	m^2	100	30.00	3,000.00	€ 189.00
2.2	**Compaction and base preparation for natural pathway**	m^2	400	15.00	6,000.00	€ 378.00
2.3	**In situ concrete paving**	m^2	100	200.00	20,000.00	€ 1,260.00
2.4	**Stabilized in-situ natural pathway surface**	m^2	400	50.00	20,000.00	€ 1,260.00
2.5	**Refuse bins**	no	5.0	3,500.00	17,500.00	€ 1,102.50
2.6	**Signage**	LS	1.0	20,000.00	20,000.00	€ 1,260.00
2.7	**Enviro solution ablution facilities**	no	2.0	40,000.00	80,000.00	€ 5,040.00
2.8	**Bridge Crossing (Concrete columns and I-Beam structure with wooden Boardwalk) - 1m above ground**	m	15.0	18,000.00	270,000.00	€ 17,010.00
	Sub total				**436,500.00**	**€ 27,499.50**

3 Contingencies

ITEM	DESCRIPTION	UNIT	QUANT.	RATE ®	PRICE ®	PRICE
3.1	Allowance for additional items per instruction (5%)	Sum	1	21,825.00	21,825.00	€ 1,374.98
	Sub total				**21,825.00**	**€ 1,374.98**

4	Summary						
ITEM	DESCRIPTION				PRICE ® Euro = R15.94	PRICE (€) ROE = 0.063	
1	Preliminary and General				17,777.50	€	1,119.98
2	Hard Landscaping				436,500.00	€	27,499.50
3	Contingencies				21,825.00	€	1,374.98
TOTAL					**476,102.50**	**€**	**29,994.46**
VAT @ 14%					**66,654.35**	**€**	**4,199.22**
TOTAL INC. VAT					**542,756.85**	**€**	**34,193.68**

Assumptions

- Costing is an estimate based on current going rates. Tender prices may vary.
- Ground conditions are suitable for compaction and at appropriate levels for pedestrian
- Permits for water extraction from the river is in place
- Potable water will be supplied where required
- 10% escalation per annum to the rates will apply if phased, assuming phases commen

Exclusions

- Bulk earthworks
- Access road grading and compaction - 4135m
- Stepping stone bridge for high water crossing - spanning +/- 30m
- Park parameter fencing on Western side - 7010m
- The more than 2100m pathways required around the falls area
- The more than 6000m hiking trails pathways required around the park area

CALCULATIONS

1	*Preliminary and General*						
	Site establishment (2% of cost, excl P&G's, maintenance & contingencies)	R	436,500.00	2.00	**8,730.00**	**€**	**174.60**
	Guarantees (0.5% of cost, excl P&G's, maintenance & contingencies)	R	436,500.00	0.50	**2,182.50**	**€**	**10.91**
	Insurances (0.5% of cost, excl P&G's, maintenance & contingencies)	R	436,500.00	0.50	**2,182.50**	**€**	**10.91**
	Safeguarding (0.5% of cost, excl P&G's, maintenance & contingencies)	R	436,500.00	0.50	**2,182.50**	**€**	**10.91**
9	*Contingencies*						
	Allowance (% of cost, excl P&G's, maintenance & contingencies)	R	436,500.00	5.00	**21,825.00**	**€**	**1,091.25**

Appendix 2

Examples of Hydro-Power Plants with Tourism Facilities

1) Manapōuri Power Station, New Zealand

Manapōuri Power Station is located below ground in the middle of New Zealand's Fiordland National Park. Housed in a 364-foot-long, 128-foot-high cavern excavated from a solid granite mountain, the station sits nearly 700 feet below the surface of Lake Manapōuri.

The initial capacity of Manapōuri Power Station was to be 700,000 kilowatts. But due to a design problem, the operators of the station risked flooding the powerhouse if they ran the station at so great an output. This went on for 30 years, until the construction of a new tunnel in 2002 pushed the station's maximum generating capacity to 850,000 kilowatts. Today, Manapōuri Power Station generates enough electricity each year to power 591,000 homes.

Looking out at the lake, no one would know there was a massive generator churning away in the depths of the water. The only visible hints include a nearby control centre building, a switchyard and a pair of transmission lines looping across the lake to link up with the country's power grid. To reach the cavern for a four-hour-long tour, visitors are ferried 22 miles across the lake to its eastern end. There, they have two options to reach the heart of the plant: They can board a car that zooms down a 1.2-mile spiralling tunnel or take a two-and-a-half minute elevator ride that descends a distance equivalent to a 70-story building.

Website: https://www.meridianenergy.co.nz/who-we-are/our-power-stations/hydro/manapouri

2) Drakensberg Pumped Storage Scheme, South Africa

The Drakensberg Pumped Storage Scheme is an energy storage facility built in the Northern Drakensberg near to Oliviershoek Pass. The Drakensberg Pumped Storage Scheme provides for up to 27.6 GWh of electricity storage in the form of 27,000,000 cubic metres (950,000,000 cu ft) of water. The water is pumped to Driekloof during times of low national power consumption (generally over weekends) and released back into Kilburn Dam through four 250 MW turbine generators in times of high electricity demand. The Drakensberg Pumped Storage Scheme was designed to generate electricity for 10 hours with all 4 units per day, pump water back to the top dam for 9 hours with all 4 units per day. A special feature of the station is that it is constructed entirely underground with only a dam wall, lift shaft buildings and transmission lines visible at the surface. The four reversible pump turbines are situated 52 stories below ground level.

Guided tours of the Drakensberg Pumped Storage Scheme are offered – These guided tours are particularly popular with school groups.

Guided tours begin at the Drakensberg Visitors Centre with a presentation providing an introduction to Eskom, the utility company that owns the facility, followed by a detailed overview of the operational function of the power station. An interactive exhibition and brochures provide further information. The visit continues with a site tour to the station, which includes viewing the Valve Hall and the Machine Hall. The visit showcases the diversity of engineering disciplines involved in the construction and operation of the power station, making the attraction of interest to a wide spectrum of audiences.

The Visitors Centre opening hours for viewing the displays are from Monday to Friday as follows:
Monday – Thursday 7:00-16:00 Friday 7:00-12:00
Guided tours are conducted Monday to Thursday 9:00 or 13:00 and Friday 9:00 only.

Websites:
http://www.eskom.co.za/AboutElectricity/VisitorCentres/Pages/Drakensberg_Pumped_Storage_Scheme.aspx

http://www.eskom.co.za/Whatweredoing/ElectricityGeneration/PowerStations/Pages/Drakensberg_Pumped_Storage_Scheme.aspx

3) Hoover Dam Hydro-Power Plant, United States

When Congress authorized the construction of a massive dam on the Colorado River in 1928, the United States had never before seen such a massive undertaking of resources and labour. The Nevada town of Boulder City was developed for the sole purpose of housing the thousands of workers who were to build what would become the Hoover Dam. When complete, the nearly 730-foot-tall structure had used 5.9 million barrels of cement over the 27 years of construction.

The dam was built to divert the Colorado and control flooding by burrowing four massive, 30-foot-diameter tunnels into the walls of Black Canyon, two in Nevada and two in Arizona. Today, nearly 80 years after it began operating, the dam generates about 4 billion kilowatt-hours of hydroelectric power each year, enough to power the lives of 1.3 million people.

This National Historic Landmark has offered guided tours since 1937, drawing one million visitors each year. For $30, individuals can take an elevator 530 feet down through the rock wall of the Black Canyon for a tour through one of the dam's four tunnels. The metal behemoths are capable of moving 90,000 gallons of water each second from Lake Mead to the dam's hydroelectric generators.

Back above ground, the power plant balcony offers a panoramic view of the 650-foot-long Nevada wing of the plant, as well as eight of the dam's 17 generators. An exhibit gallery houses memorabilia from the dam's 82-year history along with a walk-through model of a generator and a detailed diorama of the entire dam.

Website: https://www.hooverdamtourcompany.com/center.html

4) Cruachan Power Station, Scotland

The location of Cruachan Power Station has a more mystical past than most power plants. According to Scottish lore, an old hag named Cailleach Bheur roamed the 3,694-foot Ben Cruachan mountain, guarding a natural spring that welled up at its peak. Every day, she covered the spring with a slab of stone at sundown, removing it at the crack of dawn the following day. One fateful evening, the story goes, Cailleach Bheur fell asleep and forgot to cover the spring, which overflowed and created the present-day freshwater lake of Loch Awe.

The station, opened in 1965, lies just over a half a mile deep inside the mountain and has a capacity of 440 thousand kilowatts. The roughly 1,000-foot-long dam pumps water from Loch Awe into an overheard reservoir, which powers the turbines that produce its electricity. Tunnels snaking through the interior of the mountain collect rainwater, which generates 10 percent of the station's electricity. The entire station can power up in an impressive two minutes, going from standby mode to peak production based on human demand on the power grid.

The station's visitor centre is open from February to December and features interactive displays that explain its operation. Guided tours can take visitors into the heart of the mountain, where tropical plants surround the walkways that lead to Cruachan's four massive generators.

Cruachan Visitor Centre, Dalmally PA33 1AN, United Kingdom
Monday to Friday 9:15am–3:45pm
Saturday and Sunday Closed

Website: https://www.visitcruachan.co.uk/the-experience/

END OF TOURISM IMPACT ASSESSMENT REPORT (3rd DRAFT – 18th November 2019)