

# MABILUNG ENERGY LIMITED

## UPPER PILUWA KHOLA -3 HYDROELECTRIC PROJECT (4.95 MW)

Sankhuwasabha, Nepal

### Progress Report For The Month Of Kartik- 2081

Date: 10<sup>th</sup> Mangsir, 2081



**Submitted by:**



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## Table of Contents

<b>SALIENT FEATURES</b> .....	<b>3</b>
<b>1 GENERAL</b> .....	<b>7</b>
<b>2 PROJECT OVERVIEW</b> .....	<b>7</b>
<b>3 CONSTRUCTION WORKS</b> .....	<b>9</b>
<b>3.1 CIVIL WORKS</b> .....	<b>9</b>
3.1.1 ACCESS ROAD.....	9
3.1.2 FOREST CUTTING .....	9
3.1.3 HEADWORKS .....	9
3.1.4 GRAVEL TRAP, DESANDER AND FORE BAY.....	9
3.1.5 WATERWAY ALIGNMENT .....	9
3.1.6 SURGE TANK .....	9
3.1.7 POWER HOUSE (PH, SWITCHYARD AND TAIL RACE) .....	9
<b>3.2 HYDRO MECHANICAL WORKS</b> .....	<b>10</b>
3.2.1 GATE AND ACCESSORIES .....	10
3.2.2 HEADRACE ALIGNMENT.....	10
3.2.3 PENSTOCK ALIGNMENT.....	10
<b>3.3 ELECTROMECHANICAL WORKS</b> .....	<b>10</b>
<b>3.4 TRANSMISSION LINE</b> .....	<b>10</b>
<b>3.5 RECEIVING END SUBSTATION</b> .....	<b>11</b>
<b>4 PHOTOGRAPHS</b> .....	<b>12</b>
<b>PROJECT SCHEDULE</b> .....	<b>24</b>

## List of Figures

Figure 1: Headworks upstream side. ....	12
Figure 2: Weir and undersluice downstream side. ....	12
Figure 3: Weir after completion. ....	13
Figure 4: Settling basin after completion. ....	13
Figure 5: Forebay structure after completion. ....	14
Figure 6: Forebay structure after completion. ....	14
Figure 7: Syphon after final protection. ....	15
Figure 8: Anchor Block Construction at bend. ....	15
Figure 9: Surge tank Foundation and shear wall. ....	16
Figure 10: Installation of earthmat below powerhouse machine foundation. ....	16
Figure 11: Rebar laying and concreting work at powerhouse draft tube and foundation. ....	17
Figure 12: Powerhouse machine foundation. ....	17
Figure 13: Powerhouse Shear wall and column above service bay level. ....	18
Figure 14: Overall Powerhouse Area. ....	18
Figure 15: Pipe Installation and protection work. ....	19
Figure 16: Installation First bend after desander. ....	20
Figure 17: Installation bend and penstock pipe upstream of powerhosue. ....	20
Figure 18: NDT test in pipe welding. ....	20
Figure 19: Pipe installation downstream of sikhuwa crossing. ....	21
Figure 20: Bifurcation ready for pressure testing. ....	21
Figure 21: Penstock Pipe installation. ....	22
Figure 22: Intake gate leaf. ....	22
Figure 21: Pole and conductor installation in transmission line. ....	23
Figure 24: Permanent camp. ....	23

## SALIENT FEATURES

### 1. Project Details

Project Name	:	Upper Piluwa Khola 3 Hydroelectric Project
Location	:	Madi & Chainpur Municipalities, Sankhuwasabha
Geographical Coordinates	:	Latitude: 27° 17' 42"N and 27° 18' 04"N Longitude: 87° 24' 22"E and 87° 25' 30"E
Type of Scheme	:	Run off River
Installed Capacity	:	4.95 MW
Gross Head	:	128 m
Rated Design Head	:	116.7 m

### 2. Hydrology

Catchment Area	:	83.70 km <sup>2</sup>
Mean Annual Precipitation	:	1500 mm
100 years Design Flood (HW)	:	259 m <sup>3</sup> /s
Design Discharge - Piluwa Khola	:	4.11 m <sup>3</sup> /s
- Sikhuwa Khola	:	0.91 m <sup>3</sup> /s
Mean Annual Discharge- Piluwa Khola	:	6.0 m <sup>3</sup> /s
- Sikhuwa Khola	:	1.34 m <sup>3</sup> /s
Riparian Release - Piluwa Khola	:	96 lps
- Sikhuwa Khola	:	21 lps

### 3. Headworks

Diversion Structure	:	Concrete overflow weir with undersluice
Length of Weir	:	25.0 m
Weir crest Elevation	:	EL 1162 masl
Height of Weir	:	7.0 m from bed level at weir
Undersluice	:	3 m x 1.75 m – 2 nos
Sill Level	:	1157 masl
Intake Type	:	Side Intake

Size of Opening (B x H)	:	3.0 m x 1.2 m - 2 nos
Sill Level	:	1160.40 masl
<b>4. Gravel Trap</b>		
Type	:	Rectangular RCC
Particle Size to be settled	:	5 mm
Size of Gravel Trap	:	8.0 m x 3.3 m (L x B)
<b>5. Approach Canal</b>		
Type	:	RCC Rectangular
Size	:	2.2 m x 2.2 m (B x H)
<b>6. Desander</b>		
Type	:	Dufour, double bay
Particle Size to be settled	:	0.20 mm
Size of Desander	:	Each bay of 45 m x 6.4 m (L x B)
<b>7. Sikhuwa Diversion Scheme</b>		
Type	:	Concrete overflow weir
Intake	:	Side intake of 1.5 m x 0.7 m, 2 nos
Gravel Trap	:	2 m deep, 5.0 m long and 1.5 m wide
Transfer Pipe	:	0.9 m diameter MS Pipe, 170 m long
<b>8. Headrace Pipe</b>		
Total Length	:	1398 m
Type	:	MS-Pipe Buried and exposed section
Diameter of Pipe	:	1.366-1.566 m dia with thickness 8 mm
<b>9. Surge tank</b>		
Type	:	Restricted orifice
Size	:	4 m diameter 25 m height
<b>10. Penstock Pipe</b>		
Total Length	:	395 m
Type	:	MS-Pipe Buried and exposed section

Diameter of Pipe : 1.120 to 1.378 m dia with varied thickness 8 mm to 14 mm

#### 11. Powerhouse

Type : Surface  
 Dimension (l x b x h) : 23 m x 8.5 m X 11.40 m  
 PH Floor Level : EL. 1033.10 m  
 Turbine centerline Level : EL. 1033.50 m

#### 12. Tailrace

Type : 2.0 m wide, 1.6 m high and 25.0 m long, RCC Box canal  
 Tailrace Water Level : EL 1034.0 m  
 Minimum Tail water level : EL 1033.57 m

#### 13. Turbine

Type : 2 Nos. Horizontal Francis  
 Rated Discharge for each Turbine : 2.51 m<sup>3</sup>/s  
 Rated Output for each Unit : 2.578 MW  
 Rated Efficiency : 90%

#### 14. Generators

Type : 2 Nos. Synchronous brushless, 3Ø AC  
 Rated Voltage : 6.6 kV  
 Power Factor : 0.85  
 Layout : Horizontal  
 Synchronous speed : 1000 rpm  
 Rated Efficiency : 96.0 %  
 Rated Output : 2910 kVA  
 Rated Frequency : 50 Hz

#### 15. Power Transformer

Type : 1 No. 3 phase, 50 Hz Step up Transformer  
 Rated Efficiency : 99%

Rate Capacity	:	6500 kVA
Voltage Ratio	:	33kV/6.6kV

**16. Transmission & Interconnection**

Transmission line	:	Powerhouse Baneshwor substation, 14.0 km
Type of Circuit	:	Single Circuit 33 kV
Line Conductor	:	ACSR "dog"
Pole Type	:	Steel Tubular (11 and 13 m height)

**17. Power and Energy**

Installed Capacity	:	4.95 MW
Contract Energy after Outage & Loss	:	28.41 GWh
Wet Saleable Energy	:	23.51 GWh
Dry Saleable Energy	:	4.90 GWh

**18. Construction Period** : **2.0 Years****19. Financial Indicators**

Total Project Cost	:	893.37 MNRs. (With IDC)
B/C	:	1.27
IRR	:	15.23 %
RoE	:	18.16 %

## 1 GENERAL

The progress report has been prepared for updating about the construction and administrative progress of the Upper Piluwa Khola 3 Hydroelectric Project (UPK3HEP). This report includes the tasks completed up to the month of Kartik, 2081. This report mainly focuses on the head office status, site office, site visit, design & construction of Project components.

## 2 PROJECT OVERVIEW

Upper Piluwa Khola-3 Hydroelectric Project is located along the Piluwa Khola between confluence area with Sikhuwa Khola and confluence area with Lakhuwa Khola. The project area lies in Madi and Chainpur Municipalities of Sankhuwasabha District, Province 1 in eastern Nepal, while waterway and powerhouse lies only on Madi Municipality. Chainpur is nearest market place from the project area. Project area is accessible by about 13 km road from Chainpur with a fair-weather road. Present updated geographical boundary of project lies between latitude of 27° 17' 42"N and 27° 18' 04"N and longitude of 87° 24' 22"E and 87° 25' 30"E. The elevation at the proposed intake site is 1162 masl. The Project, optimized at an installed capacity of 4.95 MW, is a run-of-the-river type project with gross head of 128 m and design discharge of 5.02 m<sup>3</sup>/s. Net annual marketable energy to be generated from the Project is 28.41 GWh, out of which 4.90 GWh is dry season energy (Poush to Baisakah).

The Piluwa Khola is a tributary of Arun River. The basin lies in the eastern part of the Sankhuwasabha district. Elevation of the catchment ranges from 1160 m to 3525 m. The main stream flows from East to West direction. Catchment area at the intake site covers 83.70 km<sup>2</sup> out of which 15.18 km<sup>2</sup> is covered by Sikhuwa catchment and catchment at powerhouse is 98.50 km<sup>2</sup>. Design flood at the proposed headworks is taken 259 m<sup>3</sup>/s (Q100-year). The riparian release for environmental requirement is considered as 0.096 m<sup>3</sup>/s for Piluwa Khola and 0.021 m<sup>3</sup>/s for Sikhuwa Khola, which corresponds to 10% of the driest month's flow of the river.

Geologically, the project area lies in Himal Group of Higher Himalayan Crystalline. Present study only covers the rock type and structures found within project area. Bedrocks are partially exposed at steep slopes and cut bank and road cut sections. Most of the surface within project area is covered with soils.

A diversion weir on Sikhuwa diverts discharge of 0.91 m<sup>3</sup>/s from Sikhuwa Khola to approach canal from Piluwa Khola diversion works. A spilling weir at Piluwa Khola with two under sluices and two side intake openings will divert the design discharge of 5.02 m<sup>3</sup>/s to intake structure located at left bank of the river. The diversion structure is design for flood discharge of 259 m<sup>3</sup>/s. Headworks structure including side intake, gravel trap, approach canal and desander with fore bay are located on left bank of Piluwa Khola. The Headrace pipe from forebay to surge tank is aligned along left bank of Piluwa Khola. After 1360 m length of headrace pipe surge tank is located at left bank hillslope. After surge tank penstock pipe is proposed to be aligned on left bank of Piluwa Khola and the penstock line is designed to cross Lakhuwa Khola to reach Powerhouse. Powerhouse is located at left bank of Piluwa Khola near the confluence Piluwa Khola with Lakhuwa Khola. Powerhouse is dimensioned to accommodate two Francis turbine of horizontal configuration. The switchyard is located just upstream of powerhouse on left bank of Piluwa Khola. About 14 km long 33 kV transmission line connected to Baneshwar substation evacuated the Power generated from UP3HP.

The construction period of the Project has been taken to be 36 months. The total financial cost of the Project on the basis of rates as of January 2020 is estimated to be 937.37 MNRs. with IDC. The Project shall be financed from debt and equity ratio of 70:30 from financing institutions. Financial analysis has been undertaken with 11.75% interest rate on the long-term loan yielding 15.23% IRR, 18.16% RoE, and B/C ratio of 1.27.

## **3 CONSTRUCTION WORKS**

### **3.1 Civil Works**

#### **3.1.1 Access Road**

- i. Access road is re-constructed to Headworks, alignment, surge tank and powerhouse.
- ii. An alternative road is constructed to powerhouse for construction purpose.
- iii. Headrace alignment is maintained up to surge tank.

#### **3.1.2 Forest cutting**

- i. All procedure to cut trees of community forest for penstock alignment.
- ii. Tree cutting work has started.

#### **3.1.3 Headworks**

- i. Construction of Headworks (Intake, Undersluice, Weir) Completed.
- ii. Finishing and final protection work at headworks is on progress.
- iii. Excavation for sikhuwa headworks is on progress.

#### **3.1.4 Gravel trap, Desander and fore bay**

- i. Concreting of base slab of gravel trap is completed.
- ii. Rebar and formworks for shear walls of gravel trap is on progress.
- iii. Construction of head pond is completed.
- iv. Concreting around bell-mouth is completed.
- v. Concreting of Settling basin and protection work is completed.

#### **3.1.5 Waterway Alignment**

- i. Trench excavation, pipe installation, backfilling and protection of 1200m out of 1400m headrace alignment is completed.
- ii. Construction of Sikhuwa crossing (Syphon) and protection work completed.

#### **3.1.6 Surge Tank**

- i. Excavation for surge tank foundation is completed.
- ii. Concreting on base slab is completed.
- iii. Construction of surge-tank civil structure is in final stage of completion.

#### **3.1.7 Power House (PH, Switchyard and Tail race)**

- i. Excavation for powerhouse, switchyard and tailrace is completed.

- ii. Concreting of powerhouse foundation is completed.
- iii. Concreting of shear wall up to bay level is completed.
- iv. Earthwork in filling below service bay is completed.
- v. Concreting of beam column above service bay is completed
- vi. Concreting on Crane beam is completed.
- vii. Construction of machine bay and service bay is construction.

## **3.2 Hydro mechanical works**

### **3.2.1 Gate and accessories**

- i. Installation of all gate frame is completed.
- ii. Delivery of all gate leaves are accomplished.
- iii. Delivery of bifurcation is completed.
- iv. Hoisting system is delivered to site.
- v. Installation of intake gate is completed.

### **3.2.2 Headrace alignment**

- i. Installation of 1200m of total 1400m is completed.
- ii. Installation of 22 bends out of 28 is completed.
- iii. Installation of bell-mouth is completed.

### **3.2.3 Penstock alignment**

- i. Installation of 100m out of 400m is completed.
- ii. Installation of 1 bends out of 4 and casing for road crossing is completed.

## **3.3 Electromechanical Works**

- i. All EM equipment rather than substation/switchyard is delivered site.
- ii. Installation of earth-mat, drainage pipes below machine foundation is completed.
- iii. Erection of EoT crane is completed.

## **3.4 Transmission Line**

- i. All transmission pole, conductor and accessories are delivered to site.
- ii. Contractor is mobilized to install transmission pole and accessories.
- iii. Total 400 transmission poles out of 470 are installed at site.
- iv. Delivery of ACSR conductor is accomplished.
- v. Stringing of 6Km out of 14 Km conductor is completed.

### **3.5 Receiving end substation**

- i. Casting of footing at receiving end substation bay is completed.
- ii. Column casting is completed up to anchor bolt level.
- iii. Filling up to concreting level is completed.

## 4 PHOTOGRAPHS



*Figure 1: Headworks upstream side.*



*Figure 2: Weir and undersluice downstream side.*



*Figure 3: Weir after completion.*



*Figure 4: Settling basin after completion.*



Figure 5: Forebay structure after completion.



Figure 6: Forebay structure after completion.



Figure 7: Syphon after final protection.



Figure 8: Anchor Block Construction at bend.



Figure 9: Surge tank Foundation and shear wall.



Figure 10: Installation of earthmat below powerhouse machine foundation.



Figure 11: Rebar laying and concreting work at powerhouse draft tube and foundation.



Figure 12: Powerhouse machine foundation.



Figure 13: Powerhouse Shear wall and column above service bay level.



Figure 14: Overall Powerhouse Area.



Figure 15: Pipe Installation and protection work.



Figure 16: Installation First bend after desander.



Figure 17: Installation bend and penstock pipe upstream of powerhouse.



Figure 18: NDT test in pipe welding.



Figure 19: Pipe installation downstream of sikhuwa crossing.



Figure 20: Bifurcation ready for pressure testing.



Figure 21: Penstock Pipe installation.



Figure 22: Intake gate leaf.



Figure 23: Pole and conductor installation in transmission line.



Figure 24: Permanent camp.

# PROJECT SCHEDULE

UPPER PILUWA KHOLA 3 HYDROELECTRIC PROJECT (4.95MW)												
SANKHUWASABHA, NEPAL												
UPDATED PROJECT SCHEDULE												
ID	Task Name	% Complete	Duration	Start	Finish	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter
0	<b>UPK3HEP Project</b>	82%	1258.9 days	Mon 2/22/21	Mon 3/24/25							
1	<b>Infrastructures</b>	100%	718 days	Tue 8/31/21	Mon 12/11/23							
6	<b>Civil Works</b>	89%	1248.9 days	Mon 2/22/21	Mon 3/10/25							
7	<b>Headworks Construction</b>	99%	927.5 days	Fri 1/28/22	Wed 11/27/24							
142	<b>Settling Basin (Desander)</b>	100%	738.8 days	Fri 2/18/22	Mon 5/13/24							
187	<b>Headrace alignment</b>	93%	943.75 days	Sun 1/23/22	Thu 12/12/24							
194	<b>Penstock Alignment</b>	33%	360 days	Tue 1/16/24	Mon 3/10/25							
200	<b>Powerhouse</b>	78%	1219.9 days	Mon 2/22/21	Tue 1/28/25							
235	<b>Surge Tank</b>	84%	309 days	Fri 12/22/23	Fri 11/22/24							
239	<b>Hydromechanical Works</b>	69%	833.2 days	Fri 6/24/22	Mon 2/10/25							
270	<b>Transmission line construction</b>	74%	988 days	Sun 1/23/22	Wed 2/12/25							
274	<b>Interconnection work at NEA Substation</b>	53%	607 days	Wed 3/15/23	Mon 12/16/24							
277	<b>Electro-Mechanical Works</b>	67%	1032 days	Tue 1/4/22	Fri 3/21/25							
278	Fabrication, testing, Inspection and delivery of EM Equipments	90%	240 days	Tue 1/4/22	Thu 12/19/24							
279	<b>Installation work</b>	14%	99 days	Tue 11/5/24	Fri 3/21/25							
280	EOT Crane	100%	15 days	Tue 11/5/24	Mon 11/25/24							
281	EM Mechanical	0%	30 days	Mon 12/9/24	Fri 1/17/25							
282	EM Electrical	0%	30 days	Mon 12/30/24	Fri 2/7/25							
283	Testing	0%	15 days	Mon 2/10/25	Fri 2/28/25							
284	Trial Generation	0%	15 days	Mon 3/3/25	Fri 3/21/25							
285	<b>COD</b>	0%	1 day	Mon 3/24/25	Mon 3/24/25							