Table of Contents

1. INTRODUCTION

1.1 Background:

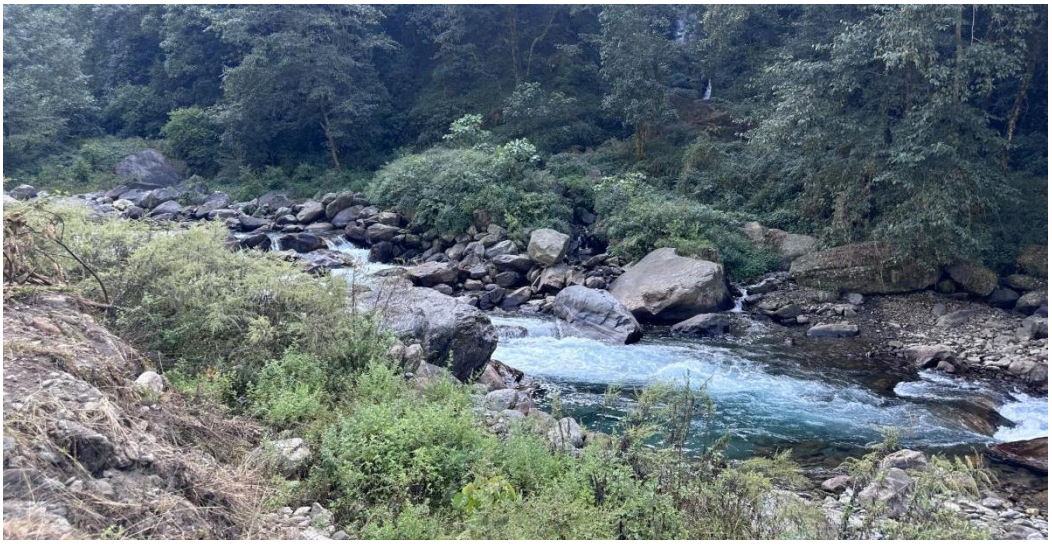
Upper Tadi Hydropower Project, situated in the Nuwakot District within the Central Development Region of Nepal, is a run-of-river (ROR) project. It is designed to generate 11 MW of installed capacity. It is being developed by Suryakunda Hydroelectric Private Limited.

Upper Tadi Hydropower Project was first identified in December 2006 with an installed capacity of 3 MW utilizing 400m head and 0.93m^3/s discharge by desk study. After obtaining the survey license from Department of Electricity Development, the Developer visited the site with experts who recommended that the project could be designed for 5 MW installed capacity utilizing only about 210 m gross head and a design discharge of 3.0 m3/s keeping in view of NEA's then policy of Q_{65}. An updated of the feasibility study September 2007 was carried out by increasing the design discharge to Q_{40}, i.e., 6.3 m^3/s. and the installed capacity was increased to 11 MW.

1.2 Location:

The Project is Located in Ghyangphedi VDC along the upper reaches of Tadi Khola in Nuwakot District, Nepal, spanning a geographical range from Latitudes 27° 59’ 03” N to 27° 57’ 32” N and Longitudes 85° 25’ 01” E to 85° 26’ 00” E. Nestled within the middle mountains, the project area varies in elevation from 1280 m to 1500 m above mean sea level. The crucial components, including the headworks and powerhouse sites, are strategically positioned at elevations of about 1500 m and 1280 m, respectively. The powerhouse is situated approximately 2.5 km downstream of the headworks on the right bank of Tadi Khola.

Image 1: Tadi River



Tadi Khola is a key tributary of the Trishuli River in the Narayani River Basin which drains the Central Development Region of Nepal with a total area of 630 km². Originating from Surya Kunda, it spans an elevation range of 5145 m to 1280 m. Temperatures range

from 4°C to 30°C and the region sees a mean annual precipitation of over 2000 mm, peaking in August and hitting lows in March.

1.3 Project Salient Feature

A. General

Name of the project	: Upper Tadi Hydropower Project
Name of River	: Tadi Khola
Type of Scheme	: Run-Off-River
Location	: Ghyangphedi VDC.
Latitude	: $27^0\,57'\,32''$ to $27^0\,59'\,03''$
Longitude	: $85^0\,25'\,01''$ to $85^0\,27'\,20''$

B. Basin Characteristic & Hydrology

Catchment area at the intake site	:	96 km^2
Catchment area at the powerhouse site	:	105km^2
Design Flow($Q_{40\%}$)	:	6.3 m^3/s
Maximum monthly flow	:	28.2 m^3/s
Minimum monthly flow	:	2.08 m^3/s
100Years Flow at the intake site	:	247 m^3/s

C. Hydraulic Structure

a) Weir

Type	:	Ungated Diversion
Material	:	Boulder Armoring
Length	:	28 m
Height	:	6 m
Design Flood	:	247 m^3/s
Weir crest elevation	:	1497 masl

b) Intake

Type	:	Orifice Side Intake
No of orifices	:	Two
Size of each orifice	:	2.5m x 2.0m
Orifice invert level	:	1495.0 masl
Intake flow	:	6.93 m^3/s

c) Gravel Trap

Size	:	~10.0m x 5.6m
Normal water level	:	1496.90 m

Flushing system	:	Continuous during monsoon
Bed slope	:	1:30

d) Approach Culvert

Type	:	Cut and cover culvert
Design Flow	:	6.93m^3/s
Shape	:	Rectangular
Size	:	112m x 2.2m x 1.6m (LxWxH)
Bed slope	:	1:500

e) Settling Basin

Size	:	60m x 6m x 4.5m(LxBxH)
No of Chambers	:	Double
Design particle size	:	0.2 mm
Settling basin trap efficiency	:	90%
Flow velocity in the basin	:	0.2 m/s
Flushing system	:	Hydraulic flushing
Hopper bed slope	:	1:50

f) Forebay

Type	:	Rectangular RCC
Size	:	25m x 12.3m x 9.15 m
Volume	:	1230 m3
Normal water level	:	1496.55 m amsl

g) Penstock Pipe

Shape	:	Circular
Material	:	Steel
Length	:	2420 m
Internal Diameter	:	1.7 m
Thickness	:	6 mm – 25 mm
Number of Anchor Blocks	:	24 nos.
Saddle Support	:	106 nos.
Pipe support Foundation	:	301 nos.

D. Powerhouse

Type	:	surface
Size	:	23.1m x 16.3m x 9.1m
Turbine Center line Elevation	:	1282 masl
Type of Switchyard	:	Outdoor

E. Tailrace Channel

Shape	:	Rectangular
Size of Tailrace tunnel	:	3.0 m x 2.5 m
Length of tailrace tunnel	:	80 m
Bed Slope	:	1 in 500

F. Electrical and Mechanical equipment

Turbine type	:	Pelton (6 jet Vertical)
No of units	:	2 no
Turbine speed	:	500 rpm
Turbine efficiency	:	91%
Generator type	:	A.C Synchronous
Generator efficiency	:	97%
Rated voltage of generators	:	11 kV
Rated frequency	:	50 Hz
Type of Transformer	:	3-phase, ONAN, outdoor
Rated capacity of transformer	:	3*4300 kVA
Transformer efficiency	:	99%

G. Transmission Line

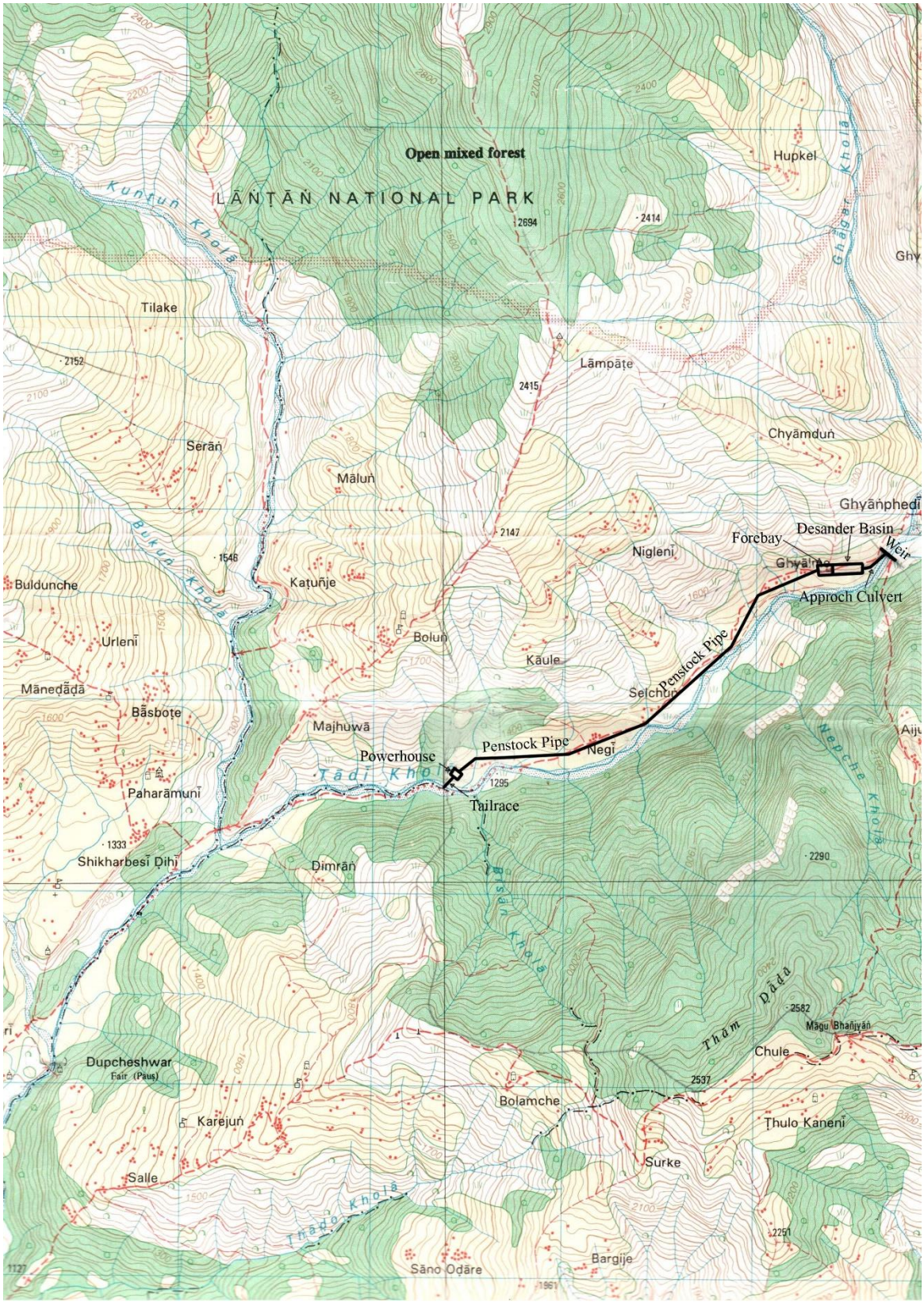
Length	:	6 km
Type	:	33kV

H. Power and Energy

Gross Head	:	215 m
Net Head	:	207.16 m
Design Discharge	:	6.3 m^3/s
Installed Capacity	:	11 MW
Annual Energy Generation	:	61.319 GWh
Dry season Energy	:	10.425 GWh
Wet season Energy	:	50.893 GWh

I. Financial Indicators

Total Project Financial cost	:	1,890,988,554 NRs.
Return on Equity (equity 25%)	:	25.29%
IRR	:	15.51%
Benefit / Cost Ratio	:	1.50
Net present value (NPV)	:	1,030,158,000 NRs.



Imgae 2: Project Layout Plan (1:50,000)

2. CONSULTANTS AND CONTRACTORS

Following list of consultants and contractors have been appointed to complete the Project:

A) Main Consultant (CIVIL): **Adyanta Engineering Private Limited**

New Baneshwor, Kathmandu, Nepal

B) Hydromechanical Consultant: **TAC Hydro Consultancy Private Limited**

Kupandole, Lalitpur, Nepal

C) EM Design and Suppliers: **FLOVEL Energy Private Limited**

Hariyana, India

D) Civil Contractors:

i. Latinath Construction Company Private Limited:

Contract Package: **UTHP-23/24-002** (All civil Works on Headrace alignment, Powerhouse, tailrace, switchyard, subation)

ii. Makalu Developers Limited:

Contract Package: **UTHP-23/24-001** (All civil works on Headworks including Weir, Intake, Gravel trap, Approcah Canal, Desander, forebay and flood walls)

E) Hydromechanical Works:

Api Hydromechanical Limited. Thapathali, Kathmandu

Pipes and bends Fabrication and erection, Gates and special parts procurement, Fabrication and erection.

F) Transmission Line works:

Latinath Construction Company Private Limited. Thapathali, Kathmandu

Poles erection and wires stringing works.

3. INSTITUTIONAL ARRANGEMENT

3.1 Board of Directors:

Chairman: Satish Neupane

CEO: Madhusudan Koirala

Director: Sanjeev Neupane

Director: Sreejana Khadka

3.2 Head office staff:

Finance Officer: Siddharth Sharma

Technical Officer: Neeraj Bhattarai

3.3 Site Staff:

Table 1: List of staff at site

SN	Name	Designation
1	Binay Uprety	Project Manager
2	Raju Pandit	Public relation officer
3	Trilok Singh Mahara	Engineer
4	Manmohan Joshi	Civil Engineer
5	Nabin Khadayat	Overseer
6	Anil Thapa Magar	Surveyor
7	Chandra Bahadur Tamang	Supervisor
8	Thaguram Chaudhary	Supervisor
9	Furpa Tamang	Supervisor
10	Kumar Adhikari	Driver
11	Baburam Gurung	Driver
12	Gokul Gurung	Secuirty guard
13	Shirfulo Tamang	Cook
14	Shanti Tamang	Cook

4. CONTRACTOR STATUS OF SITE MOBILIZATION

Civil works commenced prior to the introduction of the new civil contractor. Makalu Developers have been entrusted with all civil and Transmission line-related tasks, while Api Hydromechanical Limited assumes the role of the mechanical contractor. The electromechanical (EM) contract is currently under tender. Makalu Developers initiated mobilization in Kartik 2080, bringing in temporary building materials and excavators. All essential facilities, including temporary camps, offices, workshops, stores, labor camps, water supply and sewerage, and canteen, have been fully completed and are operational.

The site currently accommodates approximately 200 workers, including technical personnel from both contractors and clients.

4.1 Equipment:

The contractor has mobilized the majority of the essential equipment, with most being new and in excellent working condition. Some equipment has also been obtained from previous contractors.

Table 2: Equipment list at project Site

S. No	*Name of the Equipment*	*No.*
1	Excavator	5
2	Generator	5
3	Tractor	1
4	Dumper/tipper	6
5	Breaker	2
6	Concrete Mixture	8
7	Concrete Pump	2
8	Water Pump	10
9	Grinding machine	10
10	Back Hoe Loader	2
11	Crane	2
12	Rebar Cutting Machine	3
13	Rebar Bending Machine	3
14	Self Loading Mixture	1

4.2 Materials:

The quantity of materials available on site is adequate for the current activities but the contractor has been urged to continue ensuring availability of the materials for efficient operations. Aggregates and sand for current works are being acquired from local quarry until crusher plant is functional

Image 3: Cement Storage

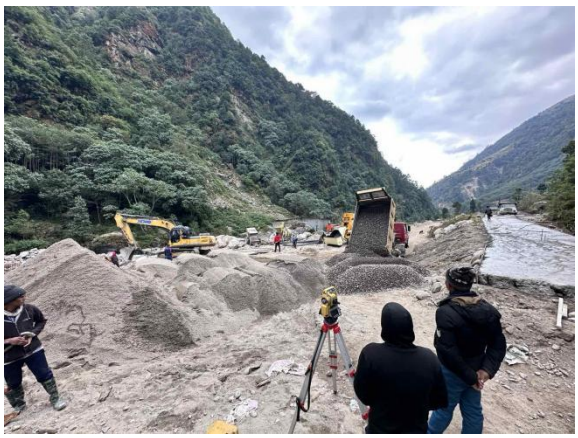


Image 4: Aggregates at Headworks Batching Area

Table 3: Material Stock at Project Site

S.N.	Name	Quantity	S.N.	Name	Quantity
1	Cement	700bags	8	Grinding wheel	50 Pcs.
2	TMT Steel rod	10 ton	9	Buffing wheel	20 Pcs
3	Diesel	15,000ltrs	10	Safety Belts	6 Nos.
4	Wire Cutter	3 No.	11	Cutting wheels	50 Pcs
5	MS Pipe 1.5” (6m long)	100 Pcs	12	CGI Sheets	100 Nos.
6	Ply woods 8/4	20 Pcs	13	Oxygen Cylinder	20 Nos.
7	Fine Aggregates	100m3	14	Coarse Aggregates	500 m3

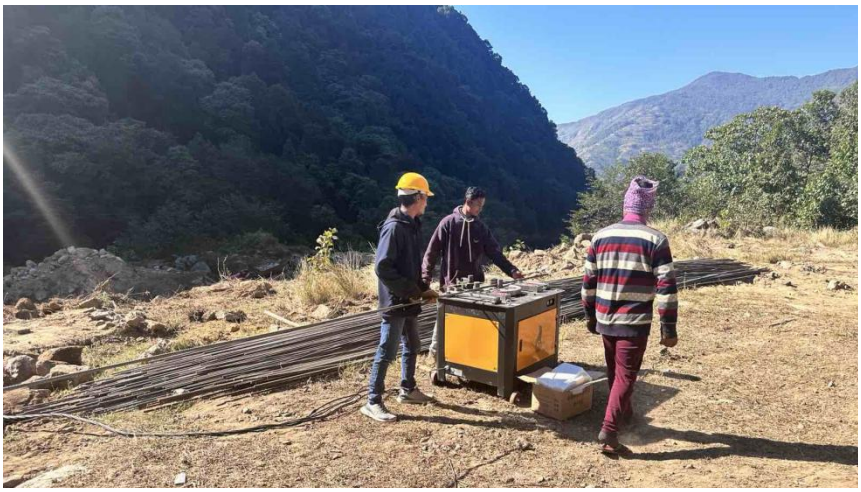


Image 5: - Rebar Straightening and Cutting Yard

4.3 Mobilized Personnel

Table 4: Mobilized Personnel at site

S. No	Designations	Numbers
1	Project Managers	1
2	Engineers	2
3	Admin/Finance	2
4	Overseer/ Surveyor (Civil)	4
5	Quality Control and safety	4
6	Supervisors	10
5	Excavator and back hoe loader Operators and helpers	12
7	Crane Operators	2
8	Crusher Operators	4
9	Drivers	9
10	Store Keeper	3
11	Cook office helper	5
12	Security	1
13	Skilled labor	30
14	Helper and unskilled labor	60
15	Welder fitter	20
	Total Personnel	**169**

4.4 Quality Assessment:

Rigorous quality control measures are maintained by two mechanical QC technicians and one civil QC technician. Essential tests such as Dye Penetrant Testing (DPT) and Ultrasonic Testing (UT) are conducted for welding and fitting by the mechanical team, while concrete strength testing and material quality checks are carried out by the civil team to ensure compliance with specified standards

4.5 Health and Safety Plan:

Generally, Health and Safety Site requirements are satisfactory. The Health Plan has been submitted and the Contractor has First Aid Kit on site. Safety management, in terms of ensuring all workers on site have requisite safety clothing, safety shoes and helmets has been satisfied.

4.6 Communication

Efficient communication has been successfully coordinated among the client, the contractor, and the design team, facilitated by the Project Manager, whether utilizing the internet or not. To streamline on-site communication, we intend to implement radio sets during the construction phase.

5. PROJECT PROGRESS DESCRIPTION

5.1 Mobilization and pre-construction activity

Table 5: Pre- construction Progress

No.	Activity	Progress	Remarks
1	Contract Award	100%	
2	Detail drawings	100%	
3	Camp and facilities	100%	Completed
4	Access roads and construction Power	100%	Completed

5.2 Physical Progress Summary

Table 6: Progress percentile Heading wise

S.N.	Particulars	Progress %	Remarks
	Civil Works	**93%**	
1	Camp and store establishment	100%	
2	Land Acquisition	100%	
3	Intake	100%	Civil works completed
4	Gravel trap	100%	"
5	Undersluice	100%	"
6	Approach Canal	100%	"
7	Desander	100%	"
8	Forebay	100%	"
9	Toe walls and Weir	95%	Boulder riprap was damaged in recent flood
10	Flood walls on Headworks	100%	
11	Saddle Support	98%	305 out of 315 completed
12	Flood walls on Pipe alignment	90%	
14	Anchor blocks	80%	19 out of 24
16	Powerhouse, Tailrace, switchyard (Civil)	80%	1st Stage Concreting completed for machine hall; Foundation works of control room and switchyard going on.
17	33kv Transmission Line	60%	147 out of 157 pole erections completed
18	Substation	5%	Designing Phase
	Hydromechanical works	**65%**	
1	Pipe Fabrication	100%	All pipe has reached to site
2	Gates and frames	50%	All frame erected; Gate fabrication completed
3	Hoisting systems	35%	Fabrication completed.
4	Pipe Erection	94%	2300m out of 2460m.
5	Expansion joints	50%	5 erected out of 19 (other are being transported
6	Bellmouth and Bifurcation	100%	Completed
	EM WORKS	**20%**	Second lot of equipment are being transferred
	OVERALL PHYSICAL PROGRESS	**87%**	

6. HEADWORKS

6.1 River Diversion:

The first stage river diversion was completed on 3rd Mangshir, 2080, allowing the commencement of the first stage works. Subsequently, the second stage river diversion was completed on 11th Baisakh, 2081, followed by the completion of all second stage weir works on 7th Jestha, 2081.

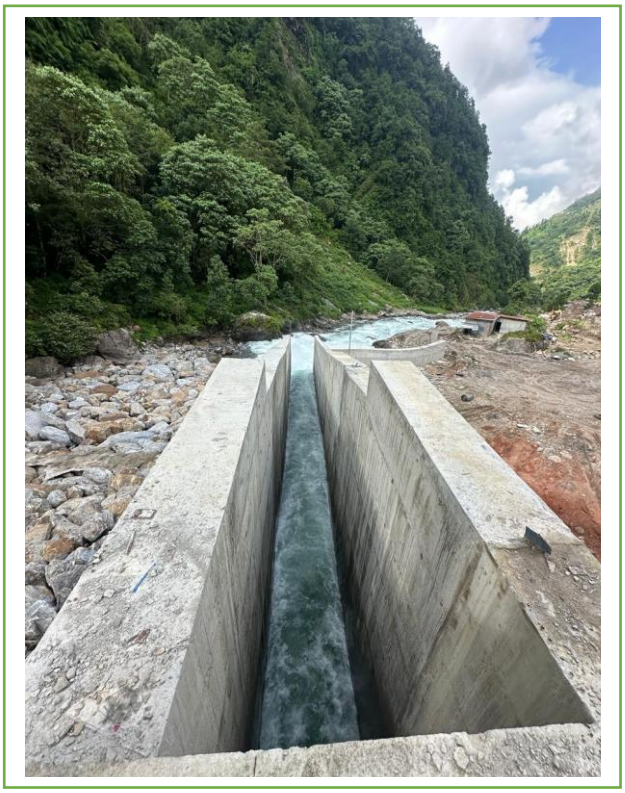
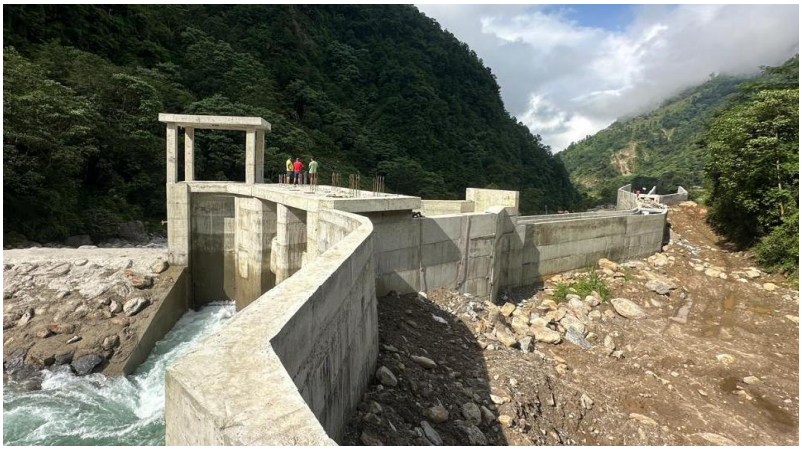


Image 6: - River Diversion through Undersluice

6.2 Intake and Gravel trap: -

The civil works for the intake and gravel trap have been fully completed. The gate frames for all four gates have been installed, while the coarse trash rack, gate leaf, and hoisting works remain. The civil works for the intake were finished on 15th Jestha, 2081.

Image 7: Intake Side view



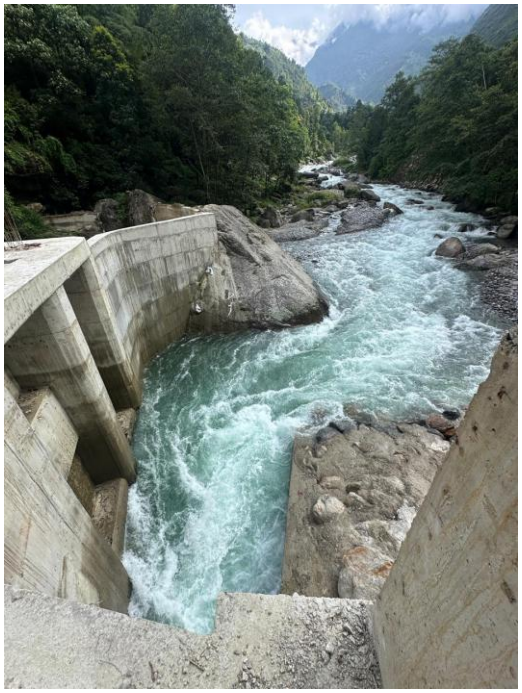


Image 8: Intake Front view

6.3 Weir and Under sluice:

A 26-meter-long boulder-armored weir and a 1-meter-wide undersluice passage have been constructed. The hoisting slab for two undersluice gates has also been completed. All civil works related to the weir and undersluice were finished on 7th Jestha 2081. However, a landslide-induced flood on 26th Bhadra 2081 caused damage to part of the boulder riprap, which is currently under repair.

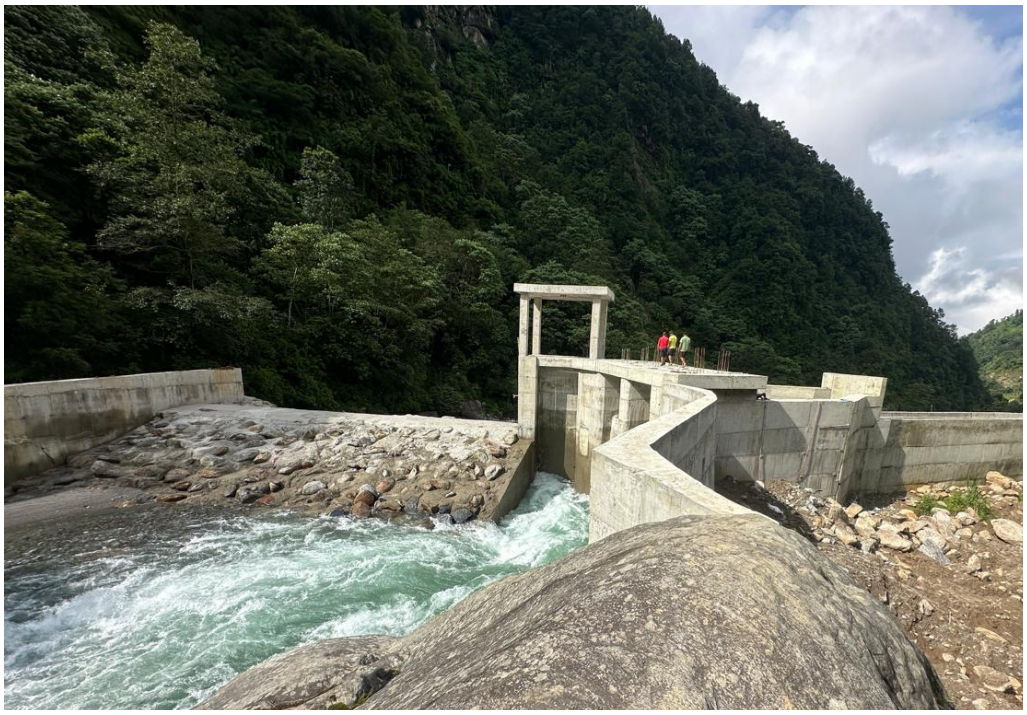


Image 9: Weir and undersluice

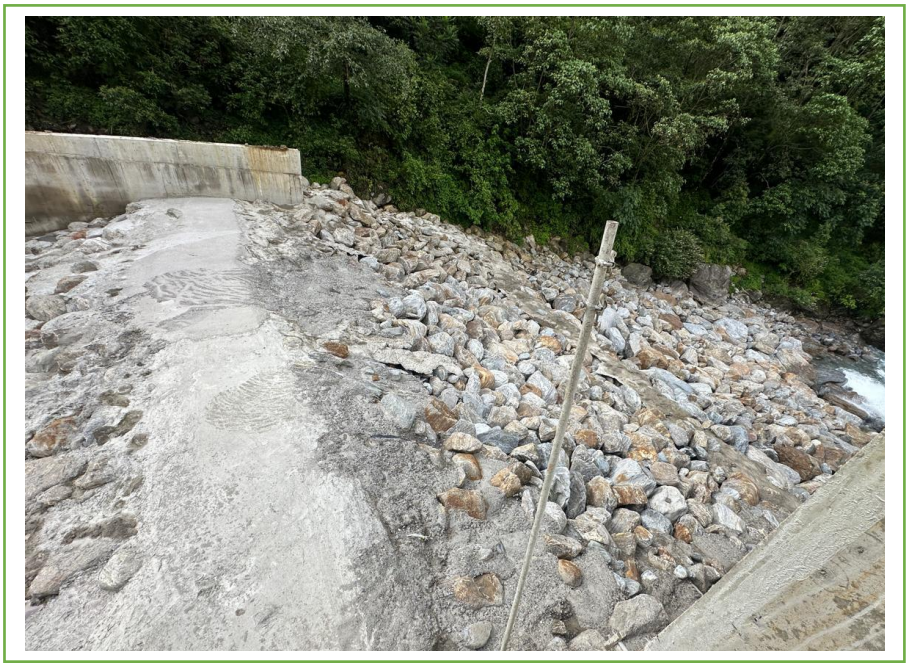


Image 10: Boulder Riprap and concrete infill in weir

6.4 Approach Canal:

A 63m long 4m high and 3m wide approach canal was constructed to provide passage for water from gravel trap to Desander. All the works in approach canal is completed.

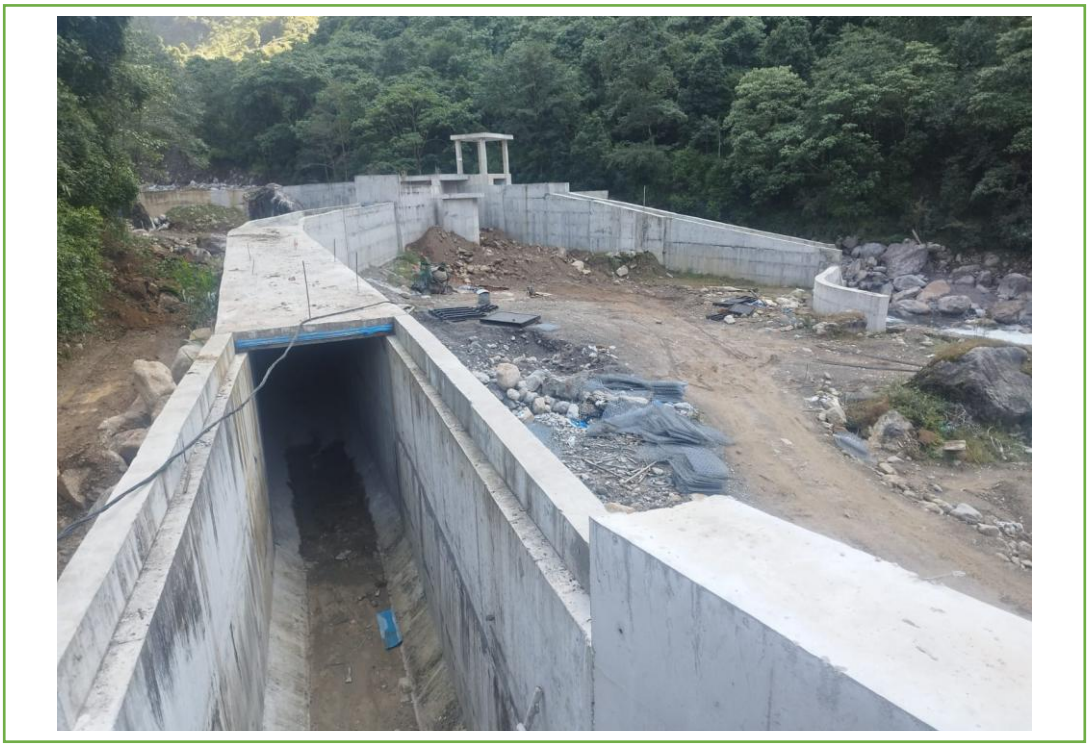


Image 11: Approach Canal and undersluice wall

6.5 Desander and forebay:

The civil works for the inlet gate panel, transition panel, 50-meter straight panel, and outlet gate panels have been completed. Additionally, the forebay, bellmouth, and spillway are finished. The construction of the retention wall and backfilling is currently in progress, while the installation of the fine trash rack and gate erection is yet to be completed.

Image 13: Forebay and spillway

7. PIPE ALIGNMENT

Excavation for the pipe alignment has been completed, and all saddle pads and saddle supports have been constructed. Of the 2480 meters of piping, 2350 meters have been erected. Additionally, 17 out of 24 anchor blocks have been constructed. Four of the five flood wall sections, covering 150 meters, have been completed. Of the 450-meter buried pipe section, 200 meters have been buried. Two of the three river crossing structures have also been completed.

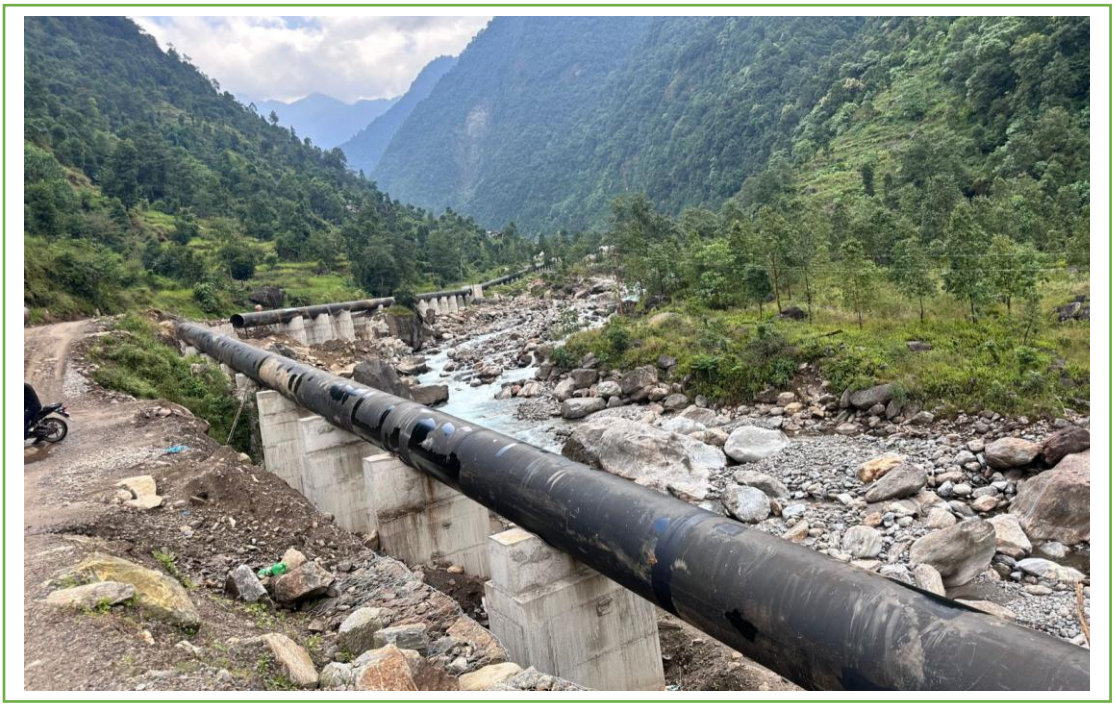


Image 14: Pipe Alignment near AB 24

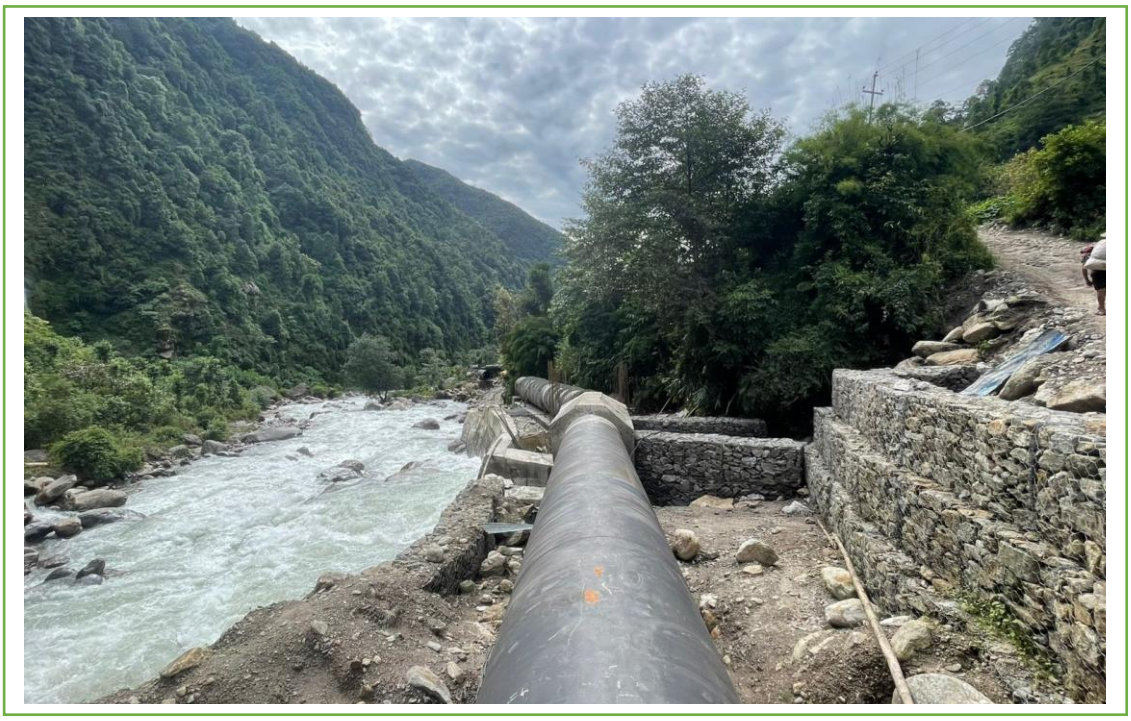


Image 15: Kholsi crossing and flood walls near AB 16

8. POWER HOUSE AND TAIL RACE

8.1 Power House:

First stage machine foundation has been completed. Beam and column have been concreted for machine hall. Brick work is going on. Foundation work for control room is going on. 100m out of 150m boundary wall is completed.

Image 16: - Machine Hall building and pipe casing

8.2 Tailrace and flood walls

The 60-meter tailrace has been concreted, and the outlet gate frames have been erected and concreted. Meanwhile, the superstructure for gate hoisting is currently under construction.

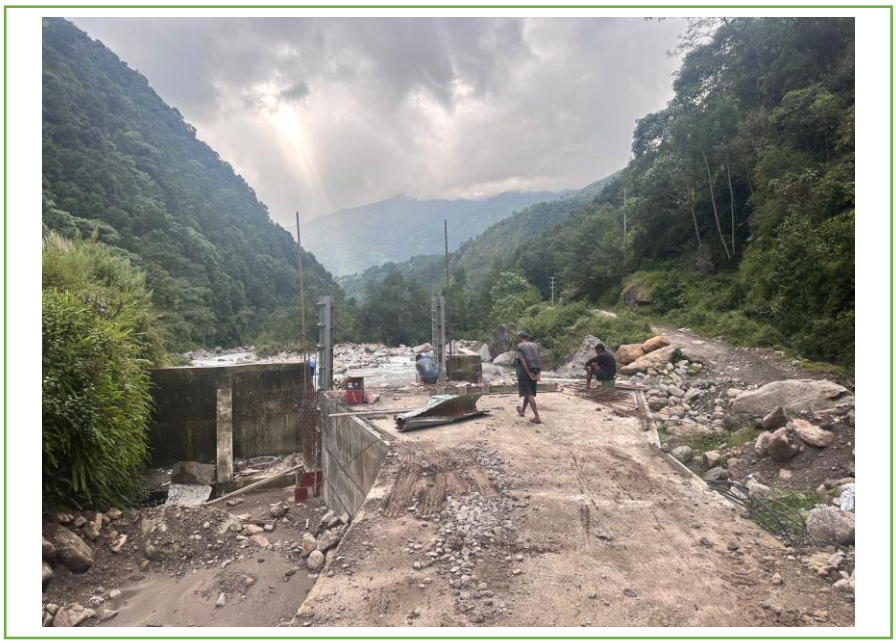


Image 17: - Tailrace outlet gate and cascade branch area

9. 33 kV TRANSMISSION LINE AND SWITCHYARD

The transmission line survey has been successfully completed, and the various route options have been thoroughly evaluated and finalized. Currently, the process of land acquisition for the transmission line is underway, with necessary steps being taken to secure the required properties.

10.INTERCONNECTION SUBSTATION

The 33kV bay at the Samundratar substation is designated for grid connection. An area under the 33kV busbar has been allocated, and earth mat installation has been completed. Foundation works will commence once the design plans are received.

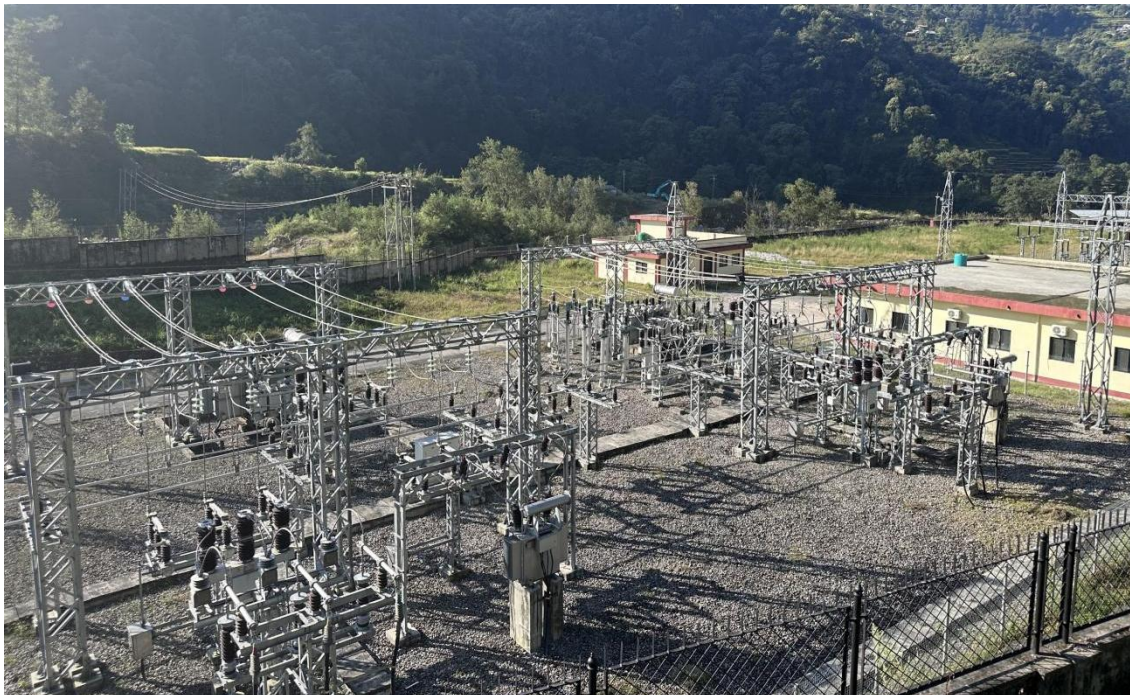


Image 20: 33kv Interconnection Bay at Samundratar substation

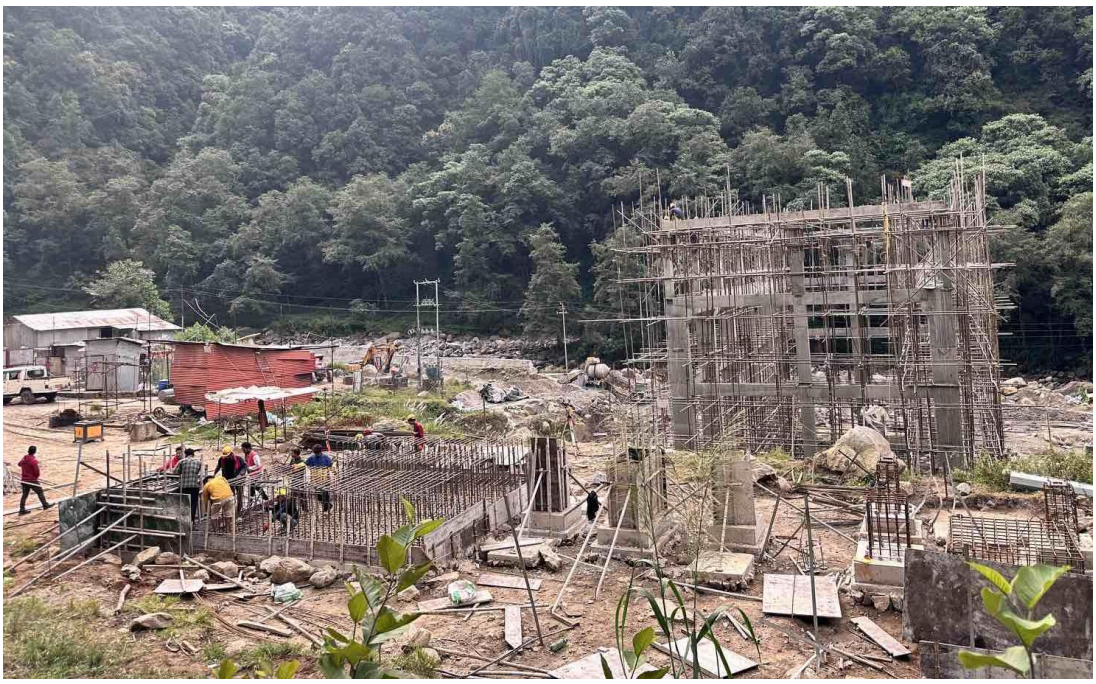


Image 21: 33kv Switchyard at poerhouse.

11. HYDROMECHANICAL WORKS:

Steel lining works in the headworks area have been completed. 30m long 800mm dia sand purging pipe have been installed in desander. Pipe fabrication, carried out at the Hetauda workshop, is now finished, with 95% of the pipes transported to the site and 93% already erected.

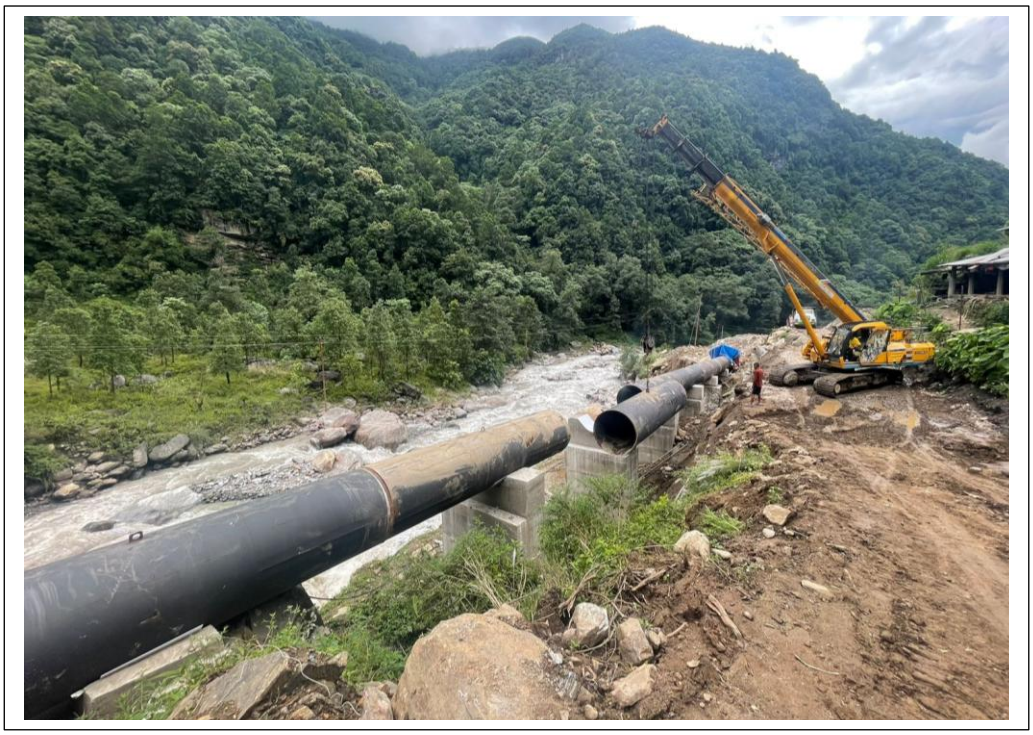


Image22: Pipe erection in saddle support along AB 24-25

Out of 19 expansion joints, 5 have been completed. Four manholes have been fabricated at the workshop and are being transported.

Image23: Expansion Joint installation

All gate frames, including the sill beam, lintel, side plates, and insert plates, have been installed. Gate fabrication is ongoing in the Hetauda workshop, with two intake gates already delivered to the site, while the remaining gate leaves are yet to be dispatched. Hoisting devices, currently being manufactured in Ludhiana, India, are expected to arrive at the site by the end of October (15th Kartik, 2081).

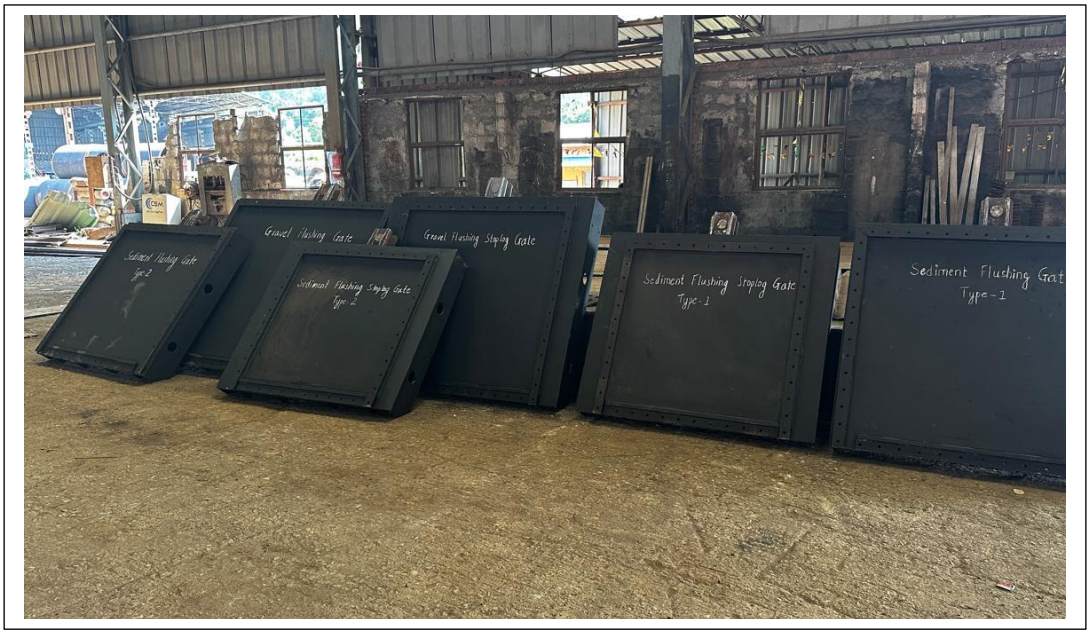


Image 24: Gate fabrication at Workshop

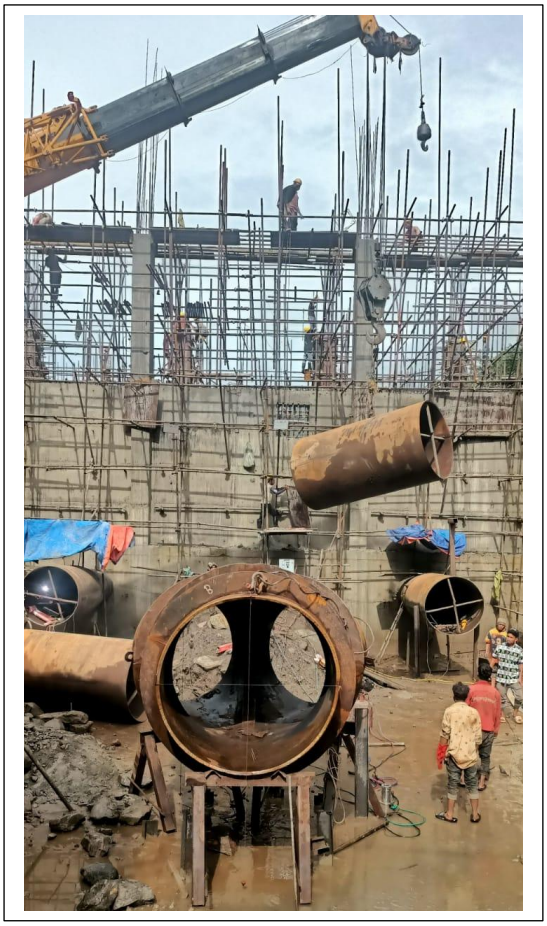


Image 25: Bifurcation erection

12.ELECTROMECHANICAL WORKS

The Electromechanical (EM) contract has been awarded to Flovel Energy Private Limited. Design drawings for the first stage of concreting have been received, while those for the second and third stages are still pending. All necessary mechanical drawings have been provided.

Mechanical equipment manufacturing is in progress and is scheduled for dispatch from the factory by December 2024 (Mangsir 2081). Additionally, inspections of key electrical components, including transformers, CTs, PTs, and isolators, have been completed, and these items are currently being transported to the site.

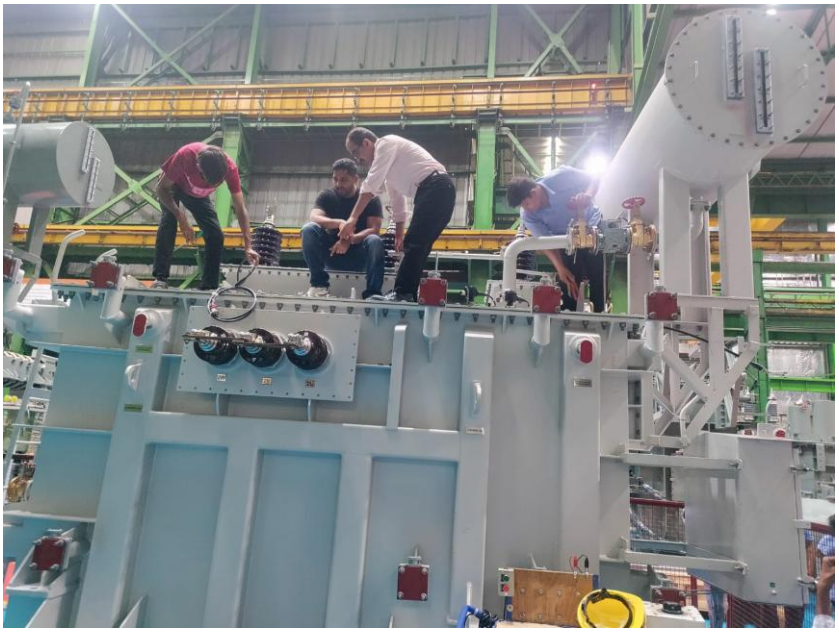


Image 26: Transformer inspection at factory

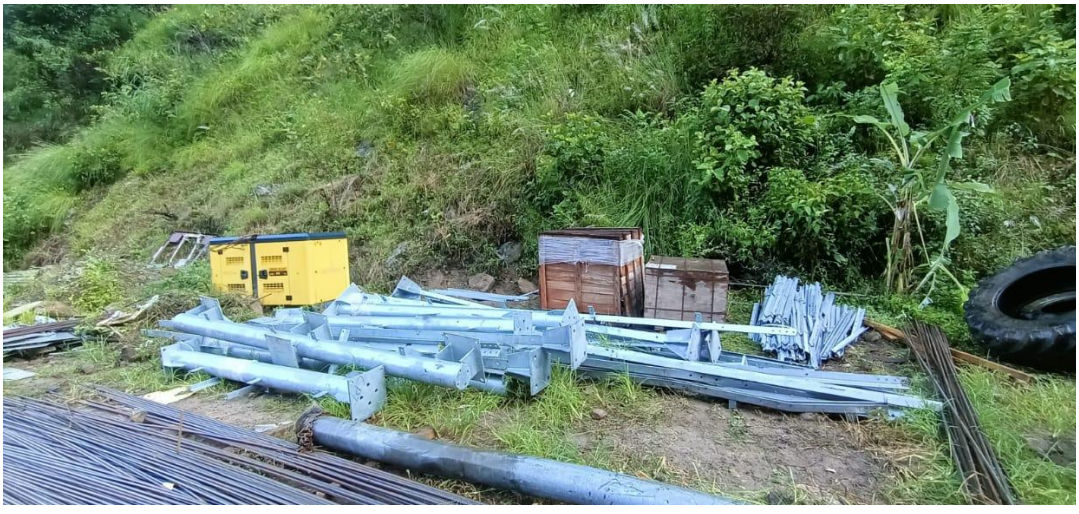


Image 27: Switchyard structure at site

13. ACCESS ROAD INFRASTRUCTURE AND CAMP FACILITIES:

The contractor has efficiently upgraded and maintained the access road throughout the project area, conducting clearance and back-cutting work from Samundratar to the headworks. Various retaining structures and protection works have been strategically implemented. The access road's enhancement involved the use of granular materials and periodic gravelling.

In the powerhouse area, three residential blocks and one kitchen block have been constructed for staff, while three temporary camps have been set up for laborers. Additionally, three local houses near the headworks have been leased to accommodate both staff and laborers.

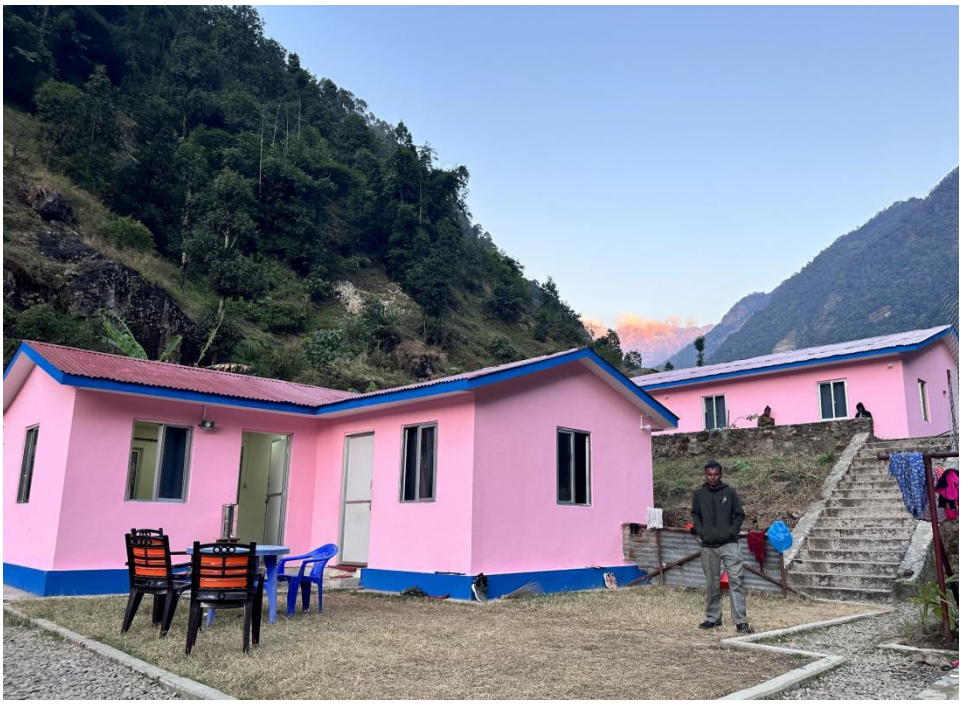


Image 28:- Staff Camp at Power House Area

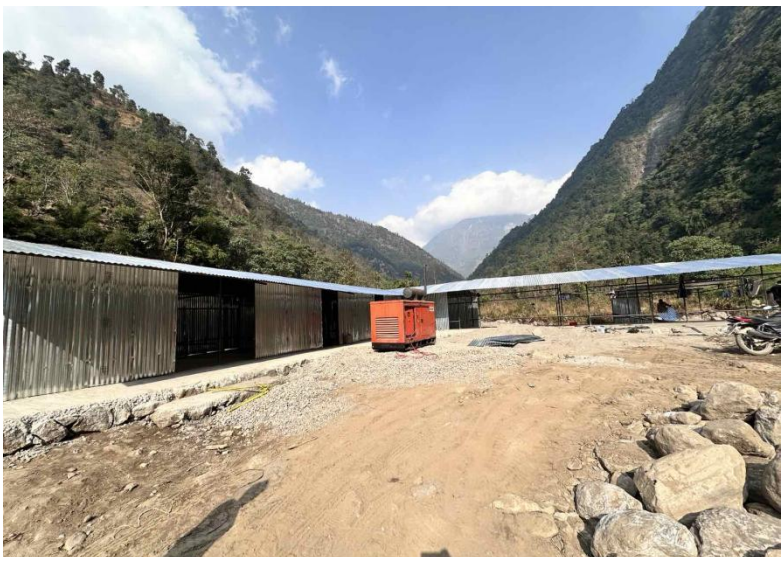


Image 29: - Hydromechanical Camp

14. NEXT MONTH PLAN

The following activities are scheduled for completion within month of Kartik.

Headworks:

- Back filling on required area
- Cleaning in all gate frame areas for gate installation and joint sealant works.
- Gate installation in Intake and undersluice.

Penstock Alignment:

- Pipe erection completion
- Expansion joint erection completion
- Manhole installation completion
- Flood wall repairs and construction in new areas.
- Painting and cleaning of all pipe alignment,
- Concreting of all anchor blocks.

Powerhouse and Tailrace:

- Control room foundation works completion
- Block masonry 60% completion
- Installtion of Switchyard foundation towers.
- Boundry wall and back filling completion.

Transmission Line:

- Completion of pole erection works
- 40% cable stringing.

15. Photographs

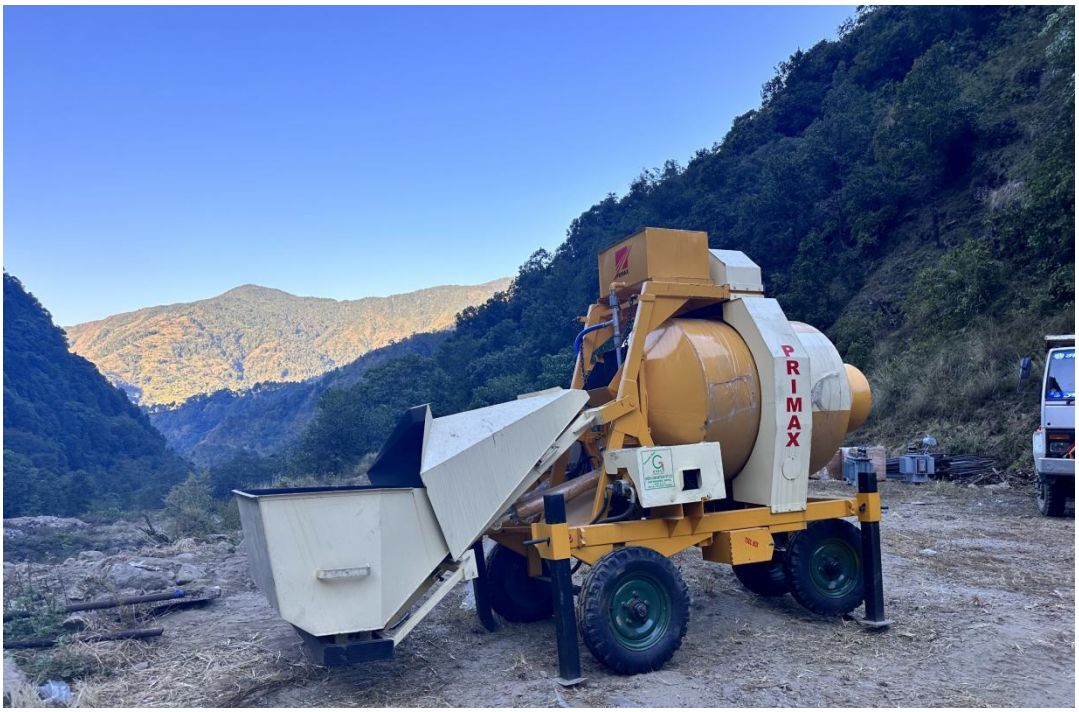


Image 30:- Concrete Mixture

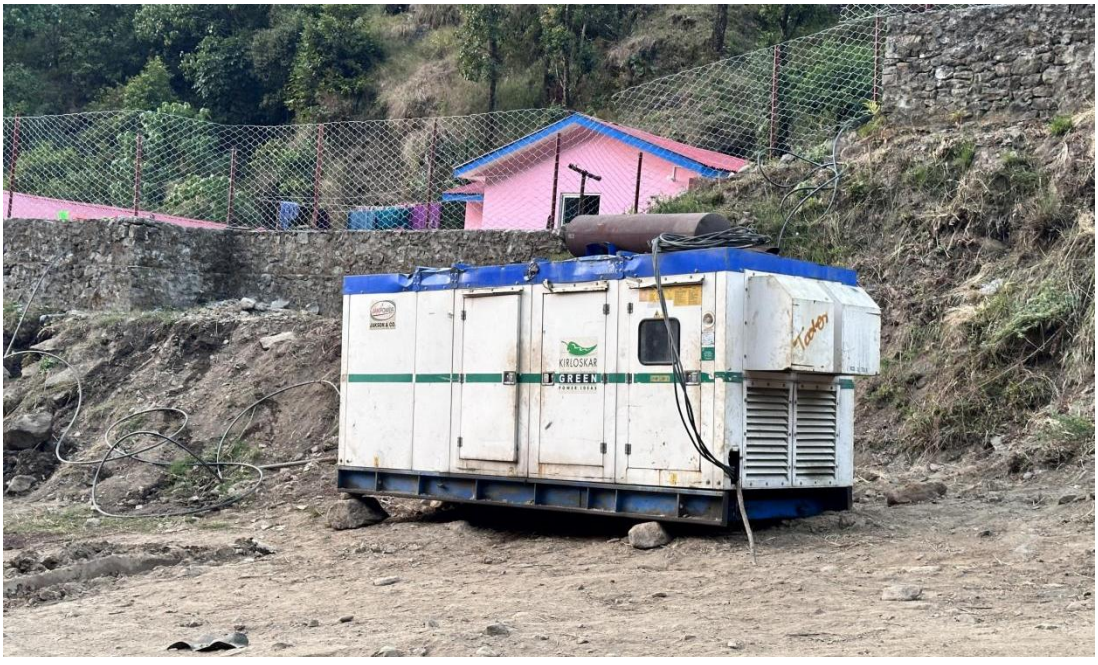


Image 31: - 125kvA Diesel Generator

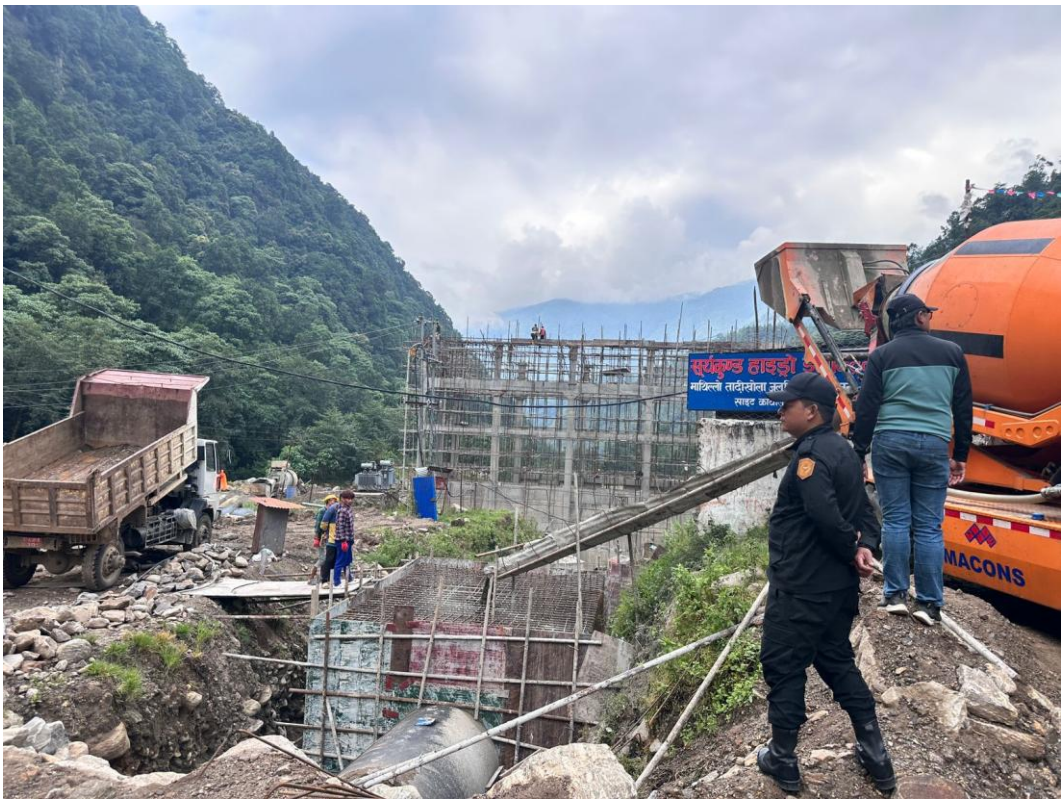


Image 32: - AnchorBlock 26 Concreting

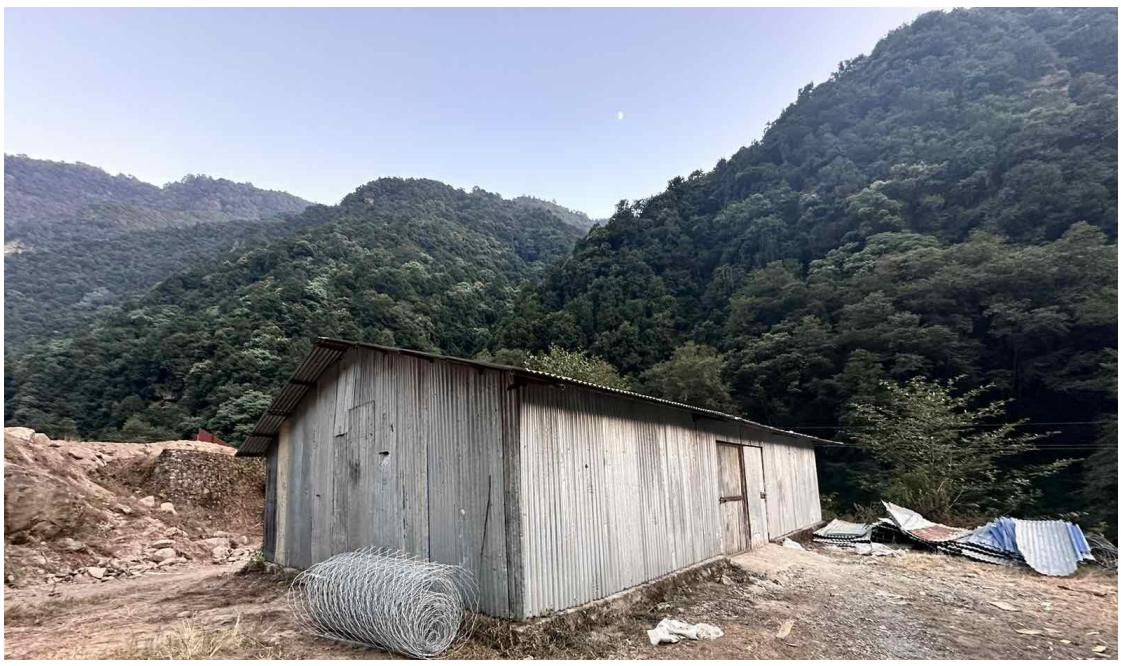


Image 33: - Store at Powerhouse sit

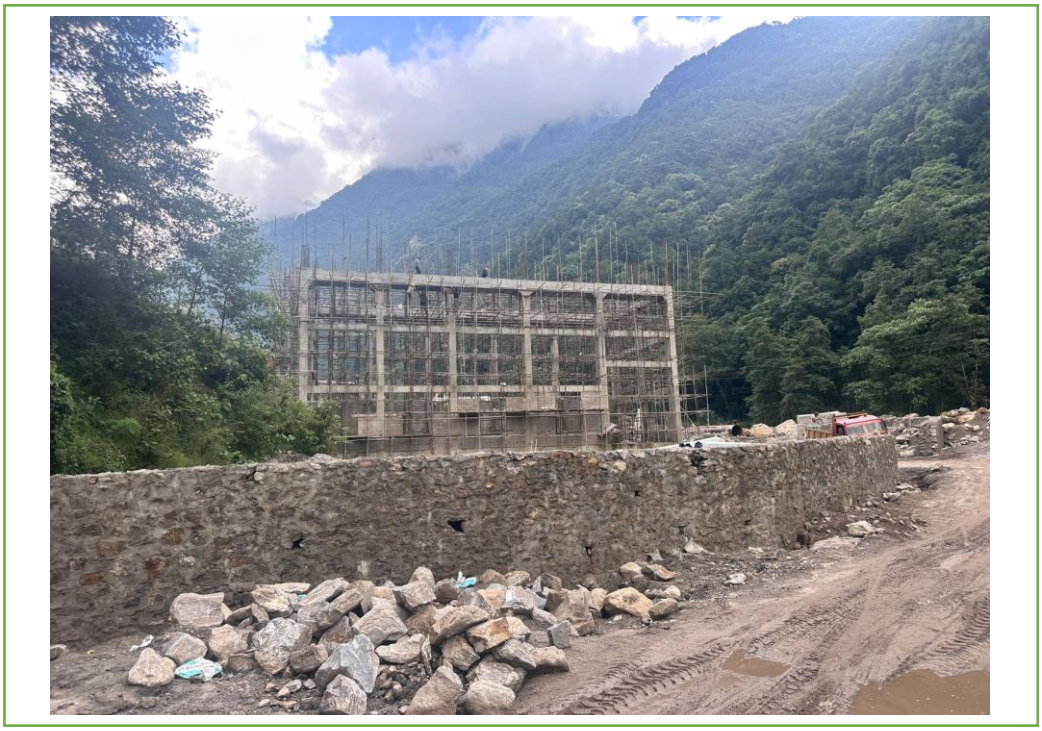


Image 34: - Boundry wall in powerhouse

Image 35: - Retention wall for backfilling at desander

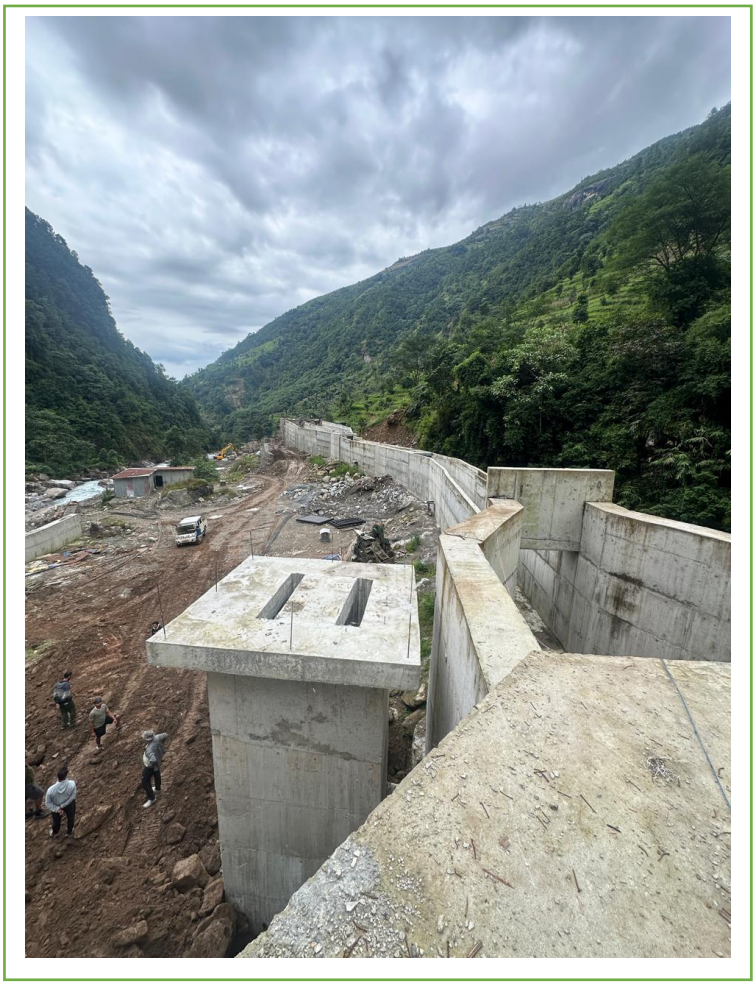


Image 36: - GT, Approach canal and desander

Image 37: - Crusher Plant in operation

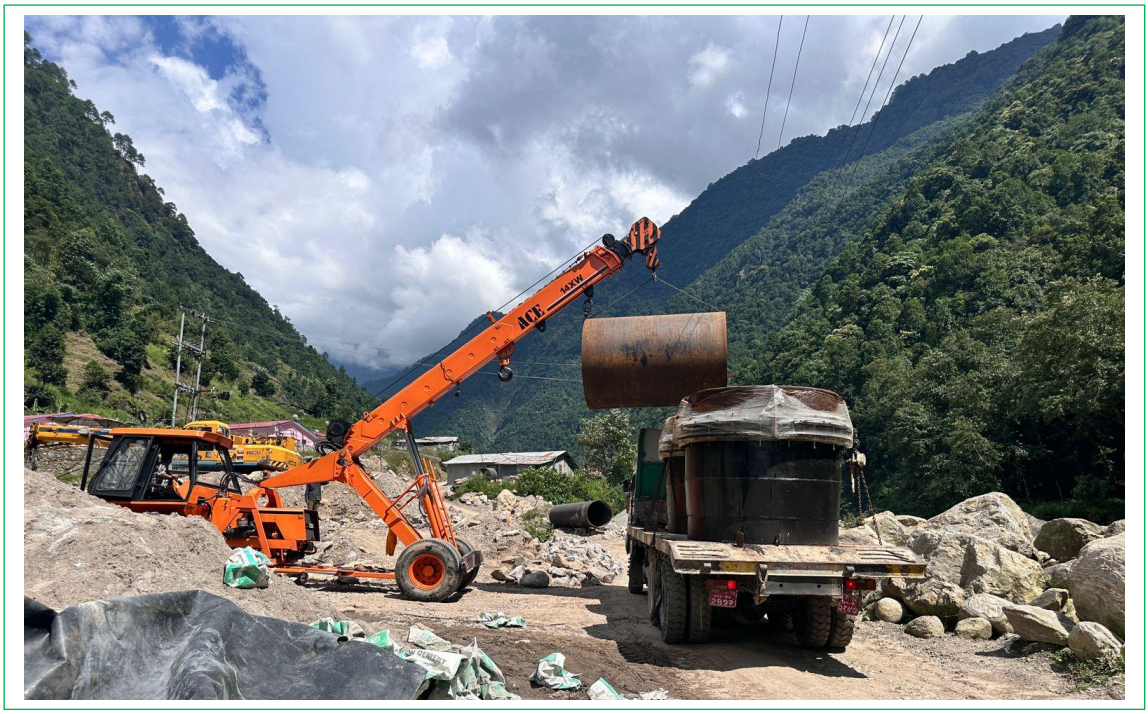


Image 38: - Pipe unloading at site

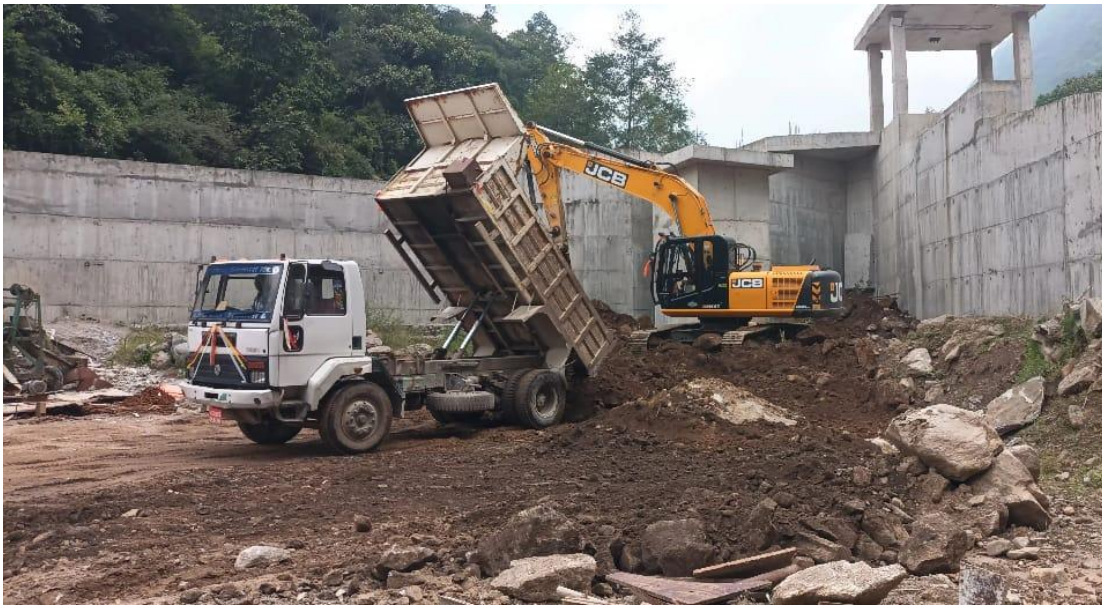


Image 39: - Backfilling at intake