

DETAILED PROJECT REPORT

LOWER LIKIMRO HEP

3 x 2.70 MW



VOLUME - II Financial Analysis

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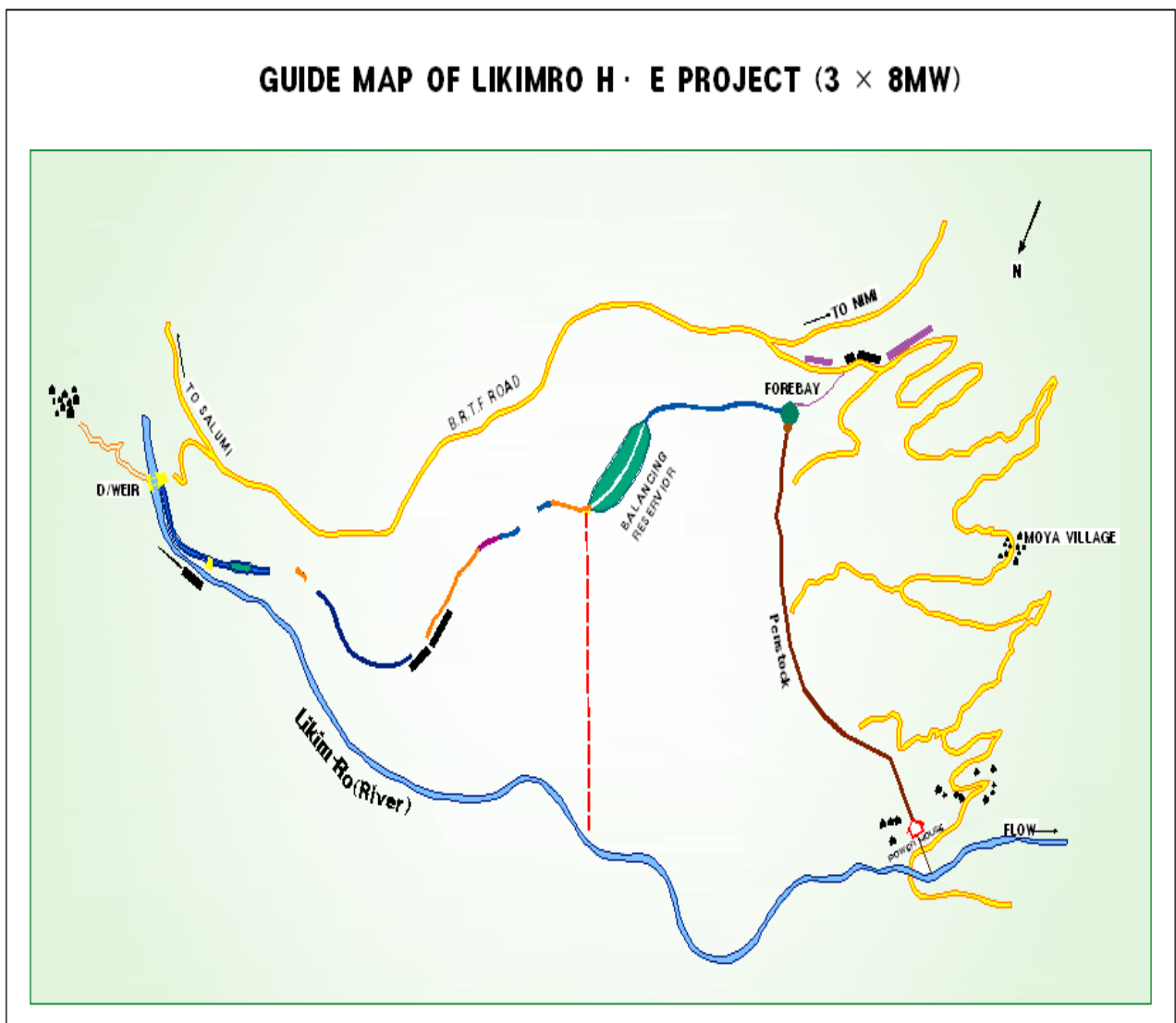
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Hydrological Investigation

1. Purpose

The main purposes of this investigation are set forth as follows:

- To review the reliability of the available data, analyses and references
- To evaluate the water resources availability in the catchment area
- To propose the appropriate hydrological observation networks



General Layout of the Likimro Hydro Electric Power Project

2. General Description of the Project Area

Topography and Physiography

The State of Nagaland is a narrow strip of mountainous territory. It lies between latitude 25°6'N & 27°4'N and longitude 93°20'E & 95°13'E.

Nagaland, state in extreme northeastern India, bordered on the west and north by Assam state, on the east by Myanmar (formerly known as Burma), on the north by Arunachal Pradesh state, and on the south by Manipur state. Nagaland is one of India's smallest states, with a total area of 16,579 km². The Naga Hills run through this small state, which has Saramati as its highest peak at a height of 3,841 m.

From the plains in the south the land changes through tea plantations into heavily forested mountain regions. There are green valleys, high mountains and deep gorges, which sustain a huge variety of fauna and flora. Kohima, the capital, is 1,444 m above mean sea level. The topography is very severe, full of hill ranges which break into a wide chaos of spurs and ridges.

History

The history of Nagaland is cloudy before the British rule of India, but certainly in this time the British did have a few run-ins with the Nagas. By the end of the 19th Century the British had made peace with the Nagas and found them powerful allies in the war against the Japanese, who reached Kohima before finally retreating.

The Naga territory remained split between Assam and the North East Frontier Agency after Indian independence in 1947, despite a vocal movement advocating the political union of all the Naga tribes. In 1957, following violent incidents, the Indian government established a single Naga administrative unit under Indian rule. The Naga people responded by refusing to pay their taxes and by conducting a campaign of sabotage. In 1960 the Indian government agreed to make Nagaland a self-governing state within India; the state was officially inaugurated on the 1st of December, 1963.

Economy

Nagaland's gross state domestic product for 2004 is estimated at \$1.4 billion in current prices. Agriculture is the most important economic activity in Nagaland, with more than 90% of the population employed within it. Principal crops include rice, corn, millets, pulses, tobacco, oilseeds, sugarcane, potatoes and fibres. However, Nagaland still depends on the import of food supplies from other states. Shifting cultivation (also known as slash-and-burn agriculture) is widely practiced. Food needs have caused the fallow, or idle, period to be cut to a couple of years. However, this has been affected by the exploitation of valuable trees for their wood, causing erosion and a loss of soil fertility and crop yields. Only the Angami and Chakesang tribes in the Kohima district use terracing and irrigation techniques. Forestry is also an important source of income.

The forests, which cover about 17 percent of Nagaland, are its most important source of income. There are varied mineral reserves, including oil deposits, but little exploitation. The state has adopted an industrialization program since the 1970s.

The forests, which cover about 17 percent of Nagaland, are its most important source of income. Cottage industries such as weaving, woodwork and pottery are also an important source of revenue. Tourism is important, but largely limited owing to the state's geographic isolation and

political instability in the past. Recently Nagaland has been given permission to control its own tourism plan so this industry is obviously seen as an important way to increase the economic prosperity of the region.

Industry

The establishment of industries in the state has been hampered by poor transportation and infrastructure. Lack of finance, raw materials, electricity supply and reliable communications are problems that persist even today. In Dimapur, there is a television factor, brick factory, sugar mill and distillery, and more industries have arisen in recent years in other urban centres as well. In Kohima, government machinery is coupled with armed forces installations. The Government is sponsoring an outreach to modern service and manufacturing industries through information technology and modern infrastructure.

Transportation

Nagaland depends mostly on roads for transportation. Nagaland is largely dependent on a few all-weather roads to connect it with other states. An important road connects Dimapur with Kohima and leads to Imphal in Manipur. Another highway links Mokokchung with Amguri in Assam. Passing from Dimapur through Assam is a short stretch of the Northeast Frontier Railway - the only rail transport link in the state. An airport connects Dimapur with Guwahati and Kolkata, and another civil airport has been constructed in Kohima, largely for government purposes.

Location of the Project

The Likimro Hydroelectric Power Plant is located in Tuensang district. The approach to the site takes off from Kiphire, which is a major town, 122 km away from Tuensang on State highway. Kiphire is connected with Pungro town with a fair weather road and is at a distance of approx. 35

km. The power house is approx. 17.5 km from the bridge over Likimro river on Pungro-Moya village Road.

The diversion weir is located approx. 2 km from Salumi village near the bridge over Likimro river on Salumi-Nimi village road. The Pungro-Moya and Pungro-Salumi-Nimi roads are being improved.

Climate

Nagaland has a largely monsoon climate with generally high humidity levels. Rains are heavy in the State. The average annual precipitation varies from 1,750 mm and 2,500 mm. Most of the heavy rainfall is during the 4 months from June to September. The rain during April to May is low. Strong winds blow from the northwest in February and March.

River System and Catchment

The main rivers that flow through Nagaland are Dhansiri, Doyang, Dikhu, Jhanji and Tizu. The terrain is mountainous, thickly wooded, and cut by deep river valleys. The river system draining the hills of Nagaland consists of Doyang, Dikhu & Jhanji of Brahmaputra catchment and river Tizu of the Irrawady catchment. The river Doyang is a tributary of the river Dhansiri. The river Likimro is a major tributary of the river Tizu.

Likimro river rises at an elevation of about 3,100 m above M.S.L in the western slopes of Saramati Range. It flows due northwest for about 5 km and then turns westward. After traversing for about 11 km, the river moves in southwest direction.

Ramwongto and Wurki are its main tributaries. A number of springs, on right bank as well as on left bank, attributes to the river flow. Total length of the river up to its confluence with river Tizu is 37 km. The distance of weir site from source along the river is 23.5 km. The river has an average gradient of the order of 1 in 14.

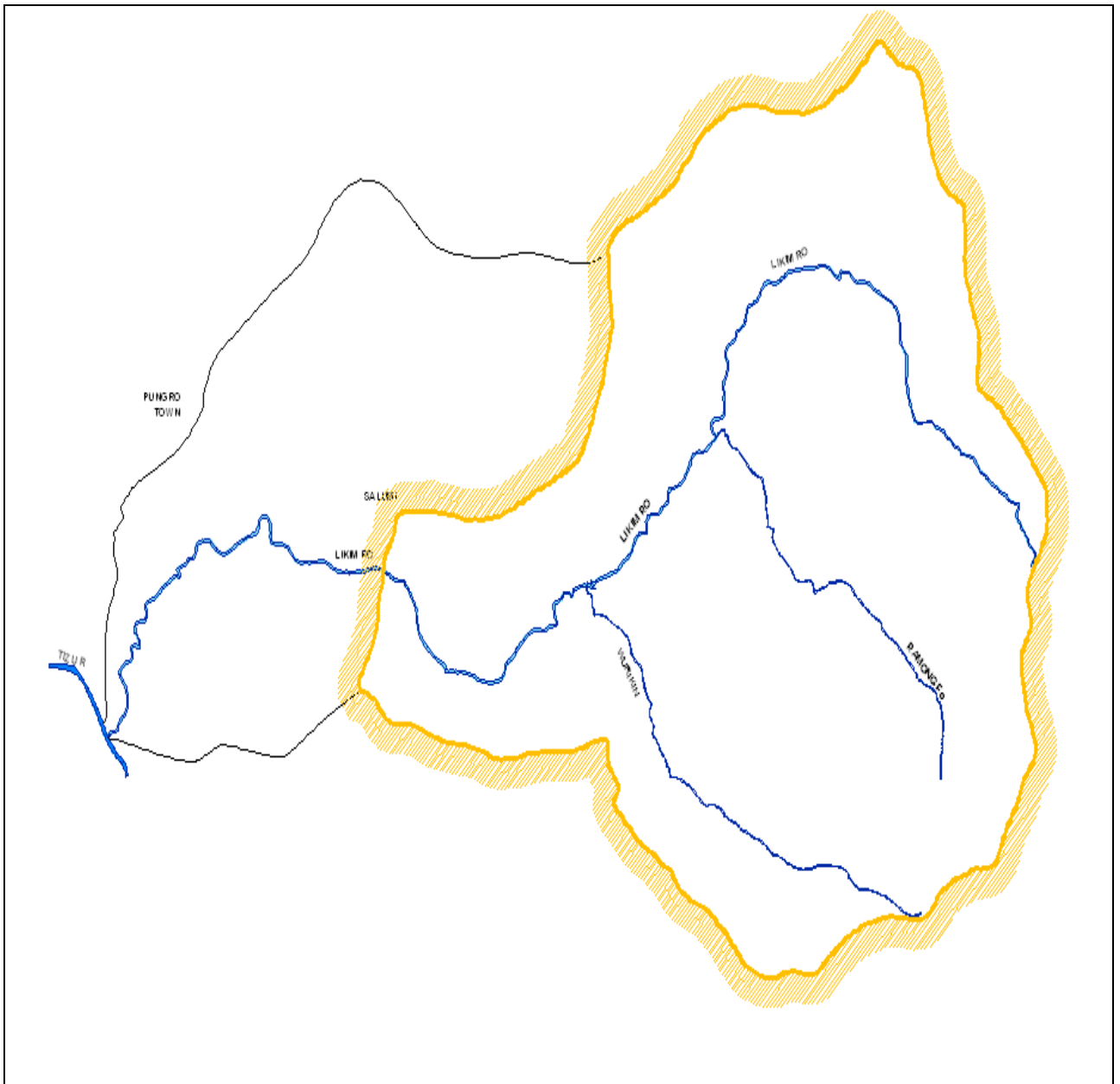
The catchment within the State of Nagaland can be broadly divided into Brahmaputra catchment and Irrawady catchment. State's contribution to the Irrawady catchment is of the order of approx. 7,000 km².

The Irrawady catchment consists of dense forest with negligible inhabitant between the western slope of Saramati range and eastern slope of Barail range.

Likimro catchment lies between longitudes 94°51' and 95°04' east and latitudes 25°43'24" and 25°52' north. East of catchment is bound by western slope of Saramati range. The catchment is fan shaped. The pattern of catchment is dendritic.

Stream density and stream frequency of the basin is of very high order. Relief is great due to the combination of steep slope and low permeability resulting in rapid run-off. The total catchment area of Likimro upto the diversion weir site is 148.25 km². The catchment area is mostly covered with thick forests and dense bushwood. There is hardly any use of surface water within the catchment. The villages within the catchment hardly have any population. Hence, river water goes untapped. Surface water is used for cultivation only in the down stream of diversion weir.

However, recently, logging or timber cutting has been prevalent in the catchment area and it may accelerate deforestation. As a result, it may cause adverse effect on run-off by lowering the stream discharges during the dry seasons.



Likimro Hydro Electric Power Plant Catchment Area

Electricity and Resources

Power generation depends mainly on diesel plants, though hydroelectric output has increased. More than 50 percent of Nagaland's electricity comes from Assam's hydroelectric power stations.

Water resources is confined mainly to surface water only in Nagaland. No serious effort has been made for exploration of groundwater. The surface run-off and sub-surface run-flow is the result of direct run-off over the steep slopes of surrounding mountains. The main existing use of water resources is mainly for drinking purpose and to some extent irrigation of terraced field. The exploitation of water resources for hydro power generation is yet to take a definite shape.

There are varied mineral reserves, including oil deposits, but little exploitation. The state has adopted an industrialization program since the 1970s.

Chromium, nickel, cobalt, iron ore, and limestone are found in Nagaland, but only low-grade coal deposits are mined at present. Boreholes drilled in the western district of Wokha have yielded oil, and seepages in the Dikhu valley, near Assam, suggest the presence of exploitable oil reserves.

3. Basic Hydrology

General

Hydrological data, especially stream flow, is basic and essential data in order to operate the power plant properly and efficiently. Thus, it is necessary to know not only the average stream flow, but also the variation of the stream flow with time. For run of river plants, the preparation of daily flow duration curve shows not only the time variation, but also the calculation of available energy. Flood flows are required in order to design the hydraulic structures including diversion weir, spillway, etc properly. Therefore, the calculation of flood flows can be used to verify the reliability and confidence of the design flood. It indicates potential possibilities of risk to the power plant. In addition, it is also necessary to measure the sedimentation data in order to prevent possible damages to the turbines. These data should be measured and/or estimated consistently and periodically over a long time.

Precipitation

Precipitation is the principle source of water resources. Thus, it is basic and essential to know the areal and temporal distribution of precipitation in water resources management.

According Detailed Project Report (1988), there were seven reporting rain gauge stations at Mokokchung, Tuensang, Kohima, Dimapur, Wokha, Wakchong, Henima and one self-recording rain gauge station at Kohima in Nagaland. For the purpose of hydrological investigation related to power projects, the state power department established rain gauge stations at Salumi, Doyang dam site, Longmatra, Lauri, Phek and Tamlu.

However, now there are no rain gauge stations in Likimro catchment area. Rainfall data at Salumi where rain gauge station had been located in project site is available for the period June 1983 to February 1988. A rain gauge station was established at Salumi village in June 1983. Daily, 10-daily and monthly rainfall data for the period June 1983 to April 1988 were recorded.

Rainfall data at Kiphire and Pfutsero adjacent to Likimro site are given in < Table 3.2 > and < Table 3.3 >.

< Table 3.1 > List of Rain Gauge Stations

STATE	STATION	LONGITUDE	LATITUDE	HIGHT (EL.m)	BEGINNING	AVAILABLE DATA
NAGALAND	SALUMI	94°53'48"	25°47'07"	N.A	1983.06	1983.06-1988.02
NAGALAND	PFUTSERO	N.A	N.A	N.A	N.A	1978.02-1987.11
NAGALAND	KIPIHIRI	94°47'00"	25°58'00"	1195	N.A	1998.01-2005.12
NAGALAND	MELURI	94°38'00"	25°41'30"	1350	N.A	1995.01-2005.12

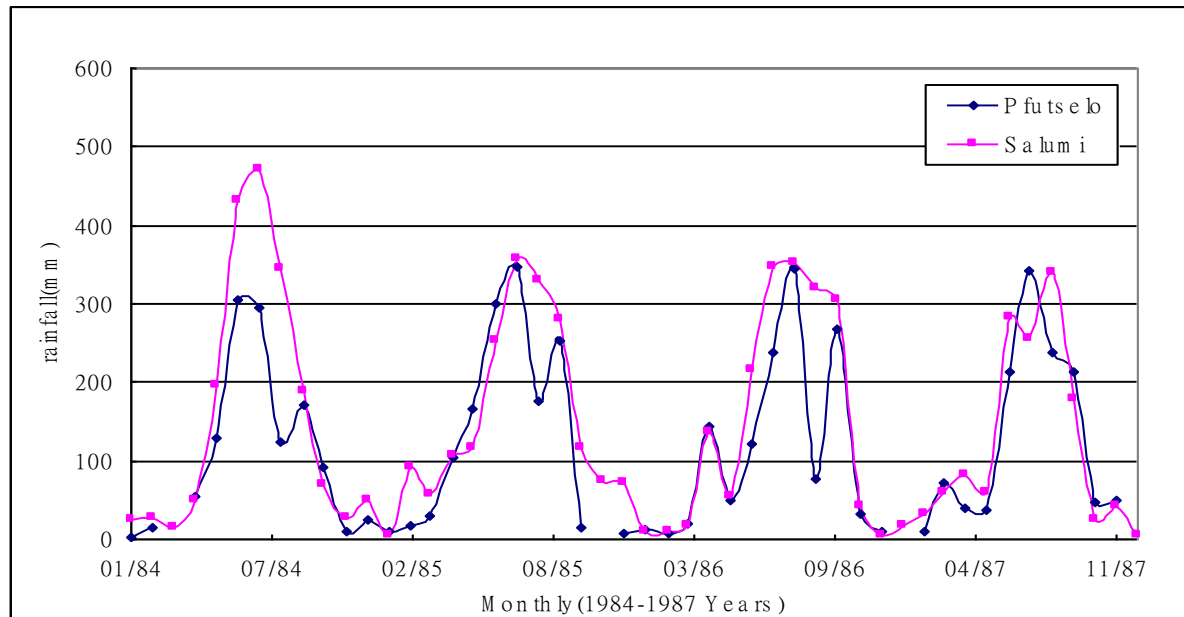
< Table 3.2 > Monthly Rainfall Data at SALUMI

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1983	N.A	N.A	N.A	N.A	N.A	179.8	379.5	280.2	120.5	145.9	48.3	30.0	1184.1
1984	24.5	26.3	14.0	50.0	195.3	431.1	470.1	344.4	188.2	70.6	27.3	50.4	1892.1
1985	6.1	90.6	56.4	107.0	116.9	253.2	358.1	328.9	280.6	116.1	75.4	71.2	1860.6
1986	9.4	10.4	17.5	136.9	54.9	214.9	347.5	353.1	319.5	304.0	42.2	3.8	1814.1
1987	18.3	31.8	59.9	81.0	59.2	281.7	254.8	339.6	178.3	24.6	42.7	4.3	1376.2
Average	14.6	39.8	37.0	93.7	106.6	272.1	362.0	329.2	217.4	132.3	47.1	31.9	1625.4

The major precipitation is generally spread over a period of five months i.e. from May to September. The basin gets southeast monsoon and cyclonic rain and about 79% of the total precipitation occurs in these months. From October to April only 21% of total precipitation occurs.

< Table 3.3 > Monthly Rainfall Data at PFUTSERO

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1978	N.A	3.2	33.7	48.3	110.4	255.0	221.7	166.4	152.8	25.3	15.6	N.A	1032.4
1979	N.A	6.2	54.4	43.8	39.0	102.1	226.5	178.0	184.9	66.3	12.2	19.4	932.8
1980	5.9	11.3	75.1	35.6	203.2	322.8	221.7	267.3	166.9	174.4	N.A	1.3	1485.5
1981	22.5	23.7	34.3	115.9	210.8	181.1	309.0	152.7	132.8	29.9	6.0	7.0	1225.7
1982	N.A	37.3	6.8	92.6	61.8	168.0	388.0	66.0	127.0	26.0	43.0	10.0	1026.5
1983	22.4	35.9	120.2	75.5	132.3	189.2	312.7	179.8	211.6	107.8	42.3	33.7	1463.4
1984	3.2	16.0	N.A	53.6	128.7	305.6	295.4	124.4	170.8	91.0	10.8	25.0	1224.5
1985	10.0	18.3	30.0	104.1	165.7	301.0	346.2	175.9	252.9	15.4	N.A	6.7	1426.2
1986	11.4	6.5	19.4	143.1	48.7	122.7	237.2	344.1	76.8	268.7	31.0	10.3	1319.9
1987	N.A	10.2	71.0	38.5	36.4	214.3	342.5	237.3	212.2	46.7	50.6	N.A	1259.7
Average	12.6	16.9	49.4	75.1	113.7	216.2	290.1	189.2	168.9	85.2	26.4	14.2	1239.7



Streamflow Data

Run-off data simply can be defined as continuous flow data series in the streams (or rivers). It is normally produced by streamflow measurements. Flow data series are basic and essential data for hydrological analysis related to water resources planning and management including hydro power.

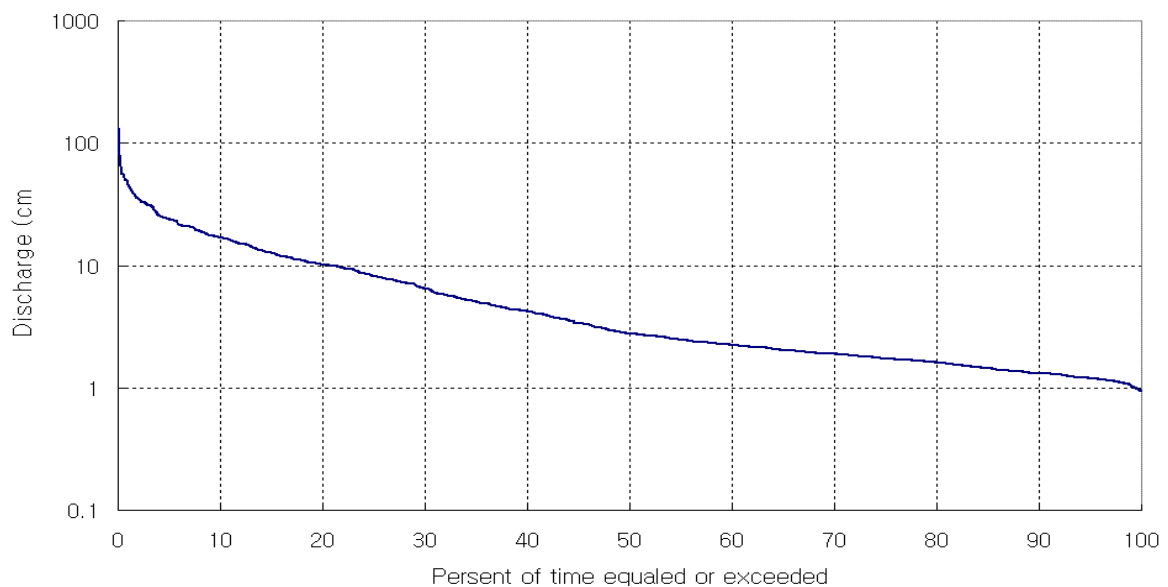
It is necessary to know not only the average river flow, but also the variation of the streamflow with time. For run of river plants, preparation of a daily flow duration curve shows not only the time variation, but also allows the calculation of available energy.

No discharge observation was made at any section of the Likimro river prior to June 1983 due to remoteness and difficult approach. Gauge and discharge observation was started at diversion weir site since June 1983. Discharge observations were carried out by float run method. As the velocities were observed by float run, 20% deduction from observed discharge has been affected. A minimum discharge of 0.94 cumsec has been recorded on the 20th of March, 1985.

3.3.1 Flow Duration Curve

Flow duration curves are the relationship between any given discharge and the percentage of time that the discharge is exceeded. The preparation of a flow duration curve using data covering a period of twenty years would give a reliable indication of the long term energy potential.

Flow duration curve is prepared using pre described daily streamflow data at Likimro weir site. This curve is useful for evaluating the power output of run-of-river projects. The flow duration curve at Likimro weir site is shown in < Fig. 3.1 >.

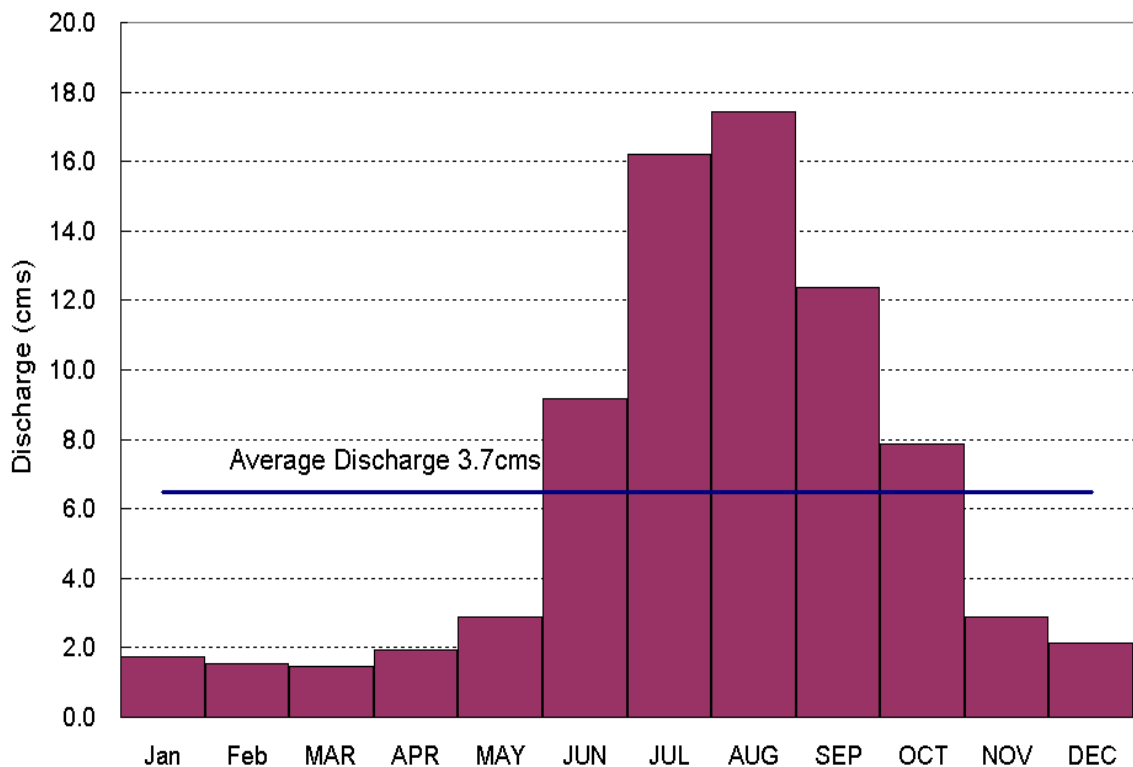


< Figure 3.1 > Flow duration curve at Likim Ro weir site

3.3.2 Seasonal Flow Distribution

Seasonal flow distribution should be presented showing seasonal distribution of runoff. This information, which could be presented in graphical form, is useful for evaluating the usability of the Likim Ro power project. Figure 2.5 shows the monthly variation of streamflow at Likim Ro weir site.

The average annual flow at this site is about 3.7 cms for construction period.



< Figure 3.2 > Monthly variation of streamflow at Likim Ro weir site

4. Power and Energy

Use points on the flow-duration curve and compute the power for each discharge using the water power equation as followings.

$$kW = 9.81QH_e$$

Where KW is the theoretical kilowatts of electrical, Q is in cms and e is the overall efficiency defined as

$$e = e_g e_t$$

where e_g is the generator efficiency. For technical trip a generator efficiency of 95% and a generator efficiency(e_t) is 60-80%. The overall efficiency (e) is 60-80%.

The annual energy with the design flow equal to $3.77 \text{ m}^3/\text{s}$ would be 130Gwh. The dependable capacity is 14.8Mw.

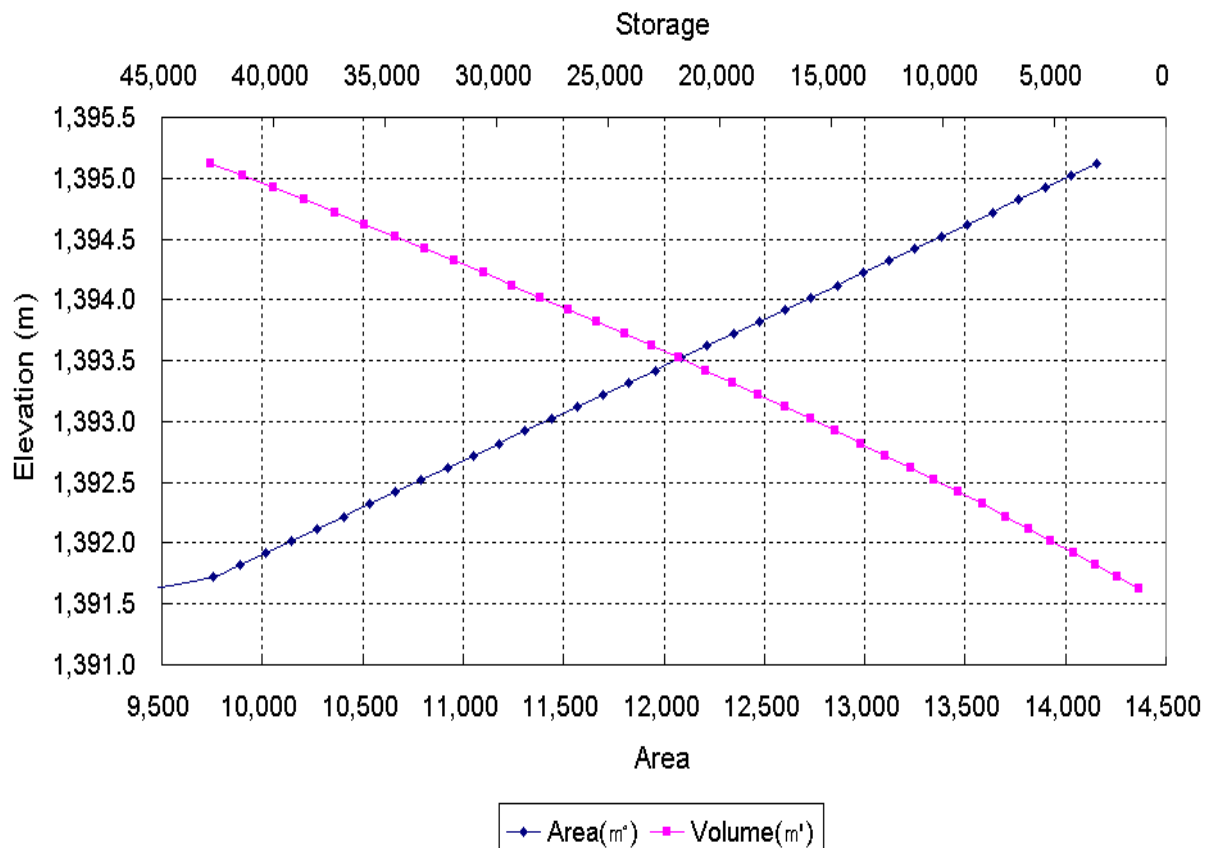
< Table 4.1 > Average Annual Energy

Percent	Flow	Hnet0	Eff.	Power	Flow	Hnet	Power	En.
%	cms	m	%	kW	cms	m	KW	KWh
0	136.08	0.0	78.0%	0	3.77	720.5	20784	1039
5	23.74	0.0	78.0%	0	3.77	720.5	20784	1039
10	16.88	0.0	78.0%	0	3.77	720.5	20784	1039
15	12.63	179.7	78.0%	17362	3.77	720.5	20784	1039
20	10.14	400.0	78.0%	20783	3.77	720.5	20784	1039
25	8.15	541.2	78.0%	20783	3.77	720.5	20784	1039
30	6.48	636.2	78.0%	20783	3.77	720.5	20784	1039
35	5.04	700.3	78.0%	20783	3.77	720.5	20784	1046
40	4.18	731.7	77.9%	20783	3.77	731.7	21073	1010
45	3.36	757.4	77.4%	19323	3.36	757.4	19323	885
50	2.78	772.1	76.3%	16069	2.78	772.1	16069	754
55	2.47	776.2	74.9%	14089	2.47	776.2	14089	665
60	2.23	781.4	73.2%	12507	2.23	781.4	12507	589
65	2.02	785.4	71.0%	11053	2.02	785.4	11053	529
70	1.89	787.8	69.3%	10125	1.89	787.8	10125	477
75	1.73	790.4	66.8%	8960	1.73	790.4	8960	424
80	1.60	792.4	64.3%	8002	1.60	792.4	8002	372
85	1.45	790.9	61.0%	6861	1.45	790.9	6861	318
90	1.31	793.3	57.3%	5843	1.31	793.3	5843	271
95	1.19	794.3	53.8%	4992	1.19	794.3	4992	207
100	0.94	798.0	44.6%	3281	0.94	798.0	3281	
Annual Energy (GWh)				129.83				

5. Hydraulic Structures

Balancing Reservoir

In Linkimro project, it is necessary to determine the elevation-storage and elevation-area characteristics of the balance reservoir. This information is used in reservoir regulation and evaporation studies. Elevation-storage and elevation-area curves are generally developed from topographic maps or design drawing book by planimetrying elevation contours upstage from bottom elevation. To increase accuracy of these curves we had measured the key elevations with total Station for 2days and finally developed them with Auto Cad process. These data can also be developed in tabular form for direct input to sequential streamflow routing program. Figure 5.1 and Table 5.1 shows the elevation-storage and elevation-area curve and tables.



< Figure 5.1 > Elevation-Storage and Elevation-Area Curve of Balance Reservoir

Using this elevation-storage curve and sequential streamflow routing program, we can estimate the daily inflow with mass balance equation in balance reservoir. Table A-1 is the water level records and Figure 7 shows the daily recession process since Feb. 6. 2006.

< Table 5.1 > Elevation-Storage and Elevation-Area Table of Balance Reservoir

Balancing Reservoir Water Level - Capacity Curve			
Stage	El.m	Zero EL. M	EL. 1391.620m
		Area(m ²)	Volume(m ³)
0.0	1,391.6	9,463.1	1,197.2
0.1	1,391.7	9,757.9	2,158.2
0.2	1,391.8	9,887.2	3,140.5
0.3	1,391.9	10,016.6	4,135.7
0.4	1,392.0	10,145.9	5,143.8
0.5	1,392.1	10,275.3	6,164.8
0.6	1,392.2	10,404.6	7,198.8
0.7	1,392.3	10,534.0	8,245.8
0.8	1,392.4	10,663.3	9,305.6
0.9	1,392.5	10,792.7	10,378.4
1.0	1,392.6	10,922.0	11,464.1
1.1	1,392.7	11,051.4	12,562.8
1.2	1,392.8	11,180.7	13,674.4
1.3	1,392.9	11,310.1	14,799.0
1.4	1,393.0	11,439.4	15,936.4
1.5	1,393.1	11,568.8	17,086.8
1.6	1,393.2	11,698.1	18,250.2
1.7	1,393.3	11,827.5	19,426.5
1.8	1,393.4	11,956.8	20,615.7
1.9	1,393.5	12,086.2	21,817.8
2.0	1,393.6	12,215.5	23,032.9
2.1	1,393.7	12,344.9	24,260.9
2.2	1,393.8	12,474.2	25,501.9

2.3	1,393.9	12,603.6	26,755.8
2.4	1,394.0	12,732.9	28,022.6
2.5	1,394.1	12,862.3	29,302.3
2.6	1,394.2	12,991.6	30,595.0
2.7	1,394.3	13,121.0	31,900.7
2.8	1,394.4	13,250.3	33,219.2
2.9	1,394.5	13,379.7	34,550.7
3.0	1,394.6	13,509.0	35,895.1
3.1	1,394.7	13,638.4	37,252.5
3.2	1,394.8	13,767.7	38,622.8
3.3	1,394.9	13,897.1	40,006.1
3.4	1,395.0	14,026.4	41,402.2
3.5	1,395.1	14,155.8	42,811.3

Table A-1 DAILY RAINFALL DATA AT KIPHIRE (1998)

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.0	N.A	0.0	2.0	2.3	0.0	27.6	2.0	3.4	0.0	0.0	0.0
2	0.0	N.A	0.0	3.0	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.0
3	0.0	N.A	0.0	0.0	0.0	0.0	0.0	3.3	8.4	0.0	0.0	0.0
4	0.0	N.A	0.0	0.0	0.0	0.0	30.1	3.0	5.3	0.0	0.0	0.0
5	0.0	N.A	0.0	0.0	0.0	5.3	10.0	4.0	4.5	0.0	0.0	0.0
6	0.0	N.A	0.0	5.0	38.0	0.0	0.0	0.0	5.2	0.0	0.0	0.0
7	0.0	N.A	10.0	2.0	0.0	1.4	5.2	0.0	0.0	0.0	0.0	0.0
8	0.0	N.A	4.0	0.0	5.2	0.0	0.0	26.3	0.0	0.0	0.0	0.0
9	0.0	N.A	0.0	1.3	4.2	0.0	0.0	3.4	0.0	0.0	0.0	0.0
10	0.0	N.A	0.0	7.3	0.0	0.0	14.0	15.4	0.0	0.0	0.0	0.0
11	0.0	N.A	0.0	5.3	0.0	0.0	46.0	18.2	0.0	1.2	0.0	0.0
12	0.0	N.A	0.0	0.0	7.2	0.0	15.0	3.2	0.0	24.5	0.0	0.0
13	0.0	N.A	0.0	0.0	0.0	11.4	0.0	3.3	0.0	3.4	0.0	0.0
14	0.0	N.A	0.0	0.0	0.0	4.3	14.2	15.0	0.0	0.0	0.0	0.0
15	0.0	N.A	0.0	0.0	0.0	8.2	14.0	6.2	0.0	7.0	0.0	0.0
16	0.0	N.A	0.0	0.0	0.0	2.3	6.2	30.2	0.0	8.2	0.0	0.0
17	0.0	N.A	0.0	5.3	0.0	0.0	8.3	16.2	0.0	5.2	0.0	0.0
18	0.0	N.A	0.0	20.0	0.0	0.0	18.0	2.3	0.0	3.2	0.0	0.0
19	0.0	N.A	0.0	1.2	0.0	0.0	16.0	1.2	42.3	16.0	0.0	0.0
20	3.0	N.A	0.0	6.0	2.0	1.3	13.4	2.2	0.0	0.0	0.0	0.0
21	0.0	N.A	0.0	7.0	25.0	0.0	8.2	2.0	0.0	2.3	0.0	0.0
22	0.0	N.A	0.0	27.0	15.0	16.3	2.3	7.2	0.0	0.0	0.0	0.0
23	12.0	N.A	3.3	4.3	9.0	25.3	0.0	4.3	0.0	0.0	11.2	0.0
24	N.A	N.A	7.2	3.3	1.2	4.3	0.0	32.0	1.3	0.0	16.0	0.0
25	N.A	N.A	16.0	5.0	0.0	0.0	9.0	12.6	0.0	0.0	12.0	0.0
26	N.A	N.A	5.0	1.3	0.0	16.2	7.0	17.4	5.0	0.0	0.0	0.0
27	N.A	N.A	0.0	0.0	10.2	0.0	0.0	12.3	0.0	0.0	0.0	0.0
28	N.A	N.A	0.0	1.3	16.0	0.0	17.3	3.2	11.5	0.0	0.0	0.0
29	N.A		0.0	3.2	9.0	5.2	2.2	0.0	0.0	0.0	0.0	0.0
30	N.A		0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0
31	N.A		0.0		0.0		0.0	0.4		0.0		0.0
TOTAL	15.0	-	45.5	110.8	144.3	103.8	284.0	256.8	91.2	71.0	39.2	0.0

STATION: KIPHIRE

Unit : mm

Table A-2 DAILY RAINFALL DATA AT KIPHIRE (1999)

STATION: KIPHIRE											Unit : mm	
DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.0	0.0	0.0	0.0	0.0	0.0	2.5	0.0	2.3	0.0	0.3	0.0
2	0.0	0.0	0.7	0.0	0.0	0.0	1.2	3.2	3.2	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	5.0	0.0	1.3	0.0	12.2	0.0	22.4	0.0
4	0.0	0.0	0.0	0.0	16.2	0.0	1.2	20.2	0.2	8.4	0.4	0.0
5	0.0	0.0	0.0	0.0	32.3	0.0	4.5	0.0	0.0	4.2	0.0	1.3
6	0.0	0.0	0.0	1.2	6.2	0.0	14.2	0.0	2.3	0.3	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	13.5	0.0	6.4	0.2	0.0	0.0
8	0.0	0.0	0.0	0.5	3.4	2.3	1.3	0.0	13.4	3.4	0.0	0.0
9	0.0	0.0	0.0	0.0	4.2	0.0	0.5	2.2	0.0	0.3	0.0	0.0
10	0.0	0.0	0.0	0.3	3.2	0.0	4.2	1.2	4.4	0.0	0.0	0.0
11	5.0	0.0	0.0	0.2	2.5	0.0	5.2	3.4	0.4	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.5	65.4	1.3	0.2	0.4	2.3	0.0	8.2
13	0.0	0.0	0.0	0.0	2.3	2.5	5.4	3.0	2.4	14.2	0.0	0.0
14	0.0	0.0	0.0	0.0	6.5	0.0	8.4	20.3	8.2	0.2	0.0	0.0
15	0.0	0.0	0.0	2.4	0.0	1.5	0.0	19.2	0.0	1.2	0.0	0.0
16	0.0	0.0	0.0	0.0	0.3	4.2	4.2	0.2	0.0	2.1	0.0	1.2
17	0.0	0.0	0.0	0.0	0.0	0.0	6.2	0.0	70.2	3.4	0.0	0.0
18	0.0	0.0	0.0	0.0	0.2	2.3	5.4	16.3	12.3	17.2	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	21.5	0.0	0.2	2.2	17.4	0.0	0.0
20	0.0	0.0	0.0	0.0	14.2	12.2	4.2	0.3	0.2	3.2	0.0	0.0
21	0.0	0.0	0.0	0.0	0.2	0.0	3.2	9.4	0.0	42.4	0.0	0.0
22	0.0		0.0	0.0	5.2	0.0	20.4	18.4	0.0	2.1	0.0	0.0
23	0.0	0.0	0.0	0.0	9.3	8.2	0.0	12.0	1.0	0.3	0.0	0.4
24	0.0	0.0	0.0	0.0	81.5	25.4	0.0	0.0	0.0	0.2	0.0	0.0
25	0.0	0.0	10.0	0.0	2.2	1.2	14.3	12.3	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	17.5	0.0	0.0	16.2	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	1.5	3.2	0.0	0.3	2.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	9.4	34.2	5.3	29.4	27.3	0.0	0.0	0.0
29	0.0		0.0	0.0	10.3	30.2	8.2	58.4	4.2	0.0	0.0	0.0
30	0.0		0.0	0.0	7.3	3.4	11.3	1.4	0.2	3.4	0.0	0.0
31	0.0		0.0		9.2		0.0	6.4		1.4		0.0
TOTAL	5.0	0.0	10.7	4.6	250.6	217.7	147.4	254.1	175.4	127.8	23.1	11.1

Table A-3 DAILY RAINFALL DATA AT KIPHIRE (2000)

STATION: KIPHIRE

Unit :

mm

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.0	0.0	0.0	0.0	2.4	7.2	0.0	0.4	19.3	8.2	0.0	0.0
2	0.0	0.0	14.2	0.0	4.2	0.0	10.4	2.2	4.3	9.2	0.0	0.0
3	0.0	0.0	23.4	0.0	2.0	0.0	0.0	19.2	0.0	17.3	0.0	0.0
4	0.0	0.2	0.4	0.0	0.0	0.0	3.2	0.3	0.0	4.5	0.0	0.0
5	0.0	0.0	1.2	0.0	1.0	0.0	0.4	0.4	2.4	0.0	0.0	0.0
6	0.0	0.0	2.4	0.0	6.2	0.0	2.3	15.2	0.0	0.0	0.0	0.0
7	0.0	1.3	0.0	0.0	16.2,	27.2	34.2	4.3	0.0	0.0	0.0	0.0
8	0.0	4.2	0.0	0.0	0.0	7.3	11.2	17.4	0.0	14.5	0.0	0.0
9	0.0	0.0	6.4	0.0	0.0	3.2	7.2	4.3	5.3	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	19.2	6.4	3.2	6.4	23.4	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	39.5	15.1	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	8.4	0.0	0.0	12.3	0.0	0.0	0.0	0.0
13	0.4	0.0	1.2	0.0	0.0	18.3	2.4	4.2	0.0	0.0	1.2	0.0
14	0.0	0.0	4.3	0.0	0.0	4.2	37.6	0.0	0.0	1.2	0.0	0.0
15	0.0	0.0	5.2	0.0	0.0	5.2	12.4	0.0	19.3	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	8.3	0.0	2.3	36.2	0.0	0.0	0.0
17	0.0	0.0	0.0	0.2	0.0	0.4	10.2	0.0	7.2	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	20.4	0.0	0.0	0.0	8.4	0.4	0.0	0.0
19	0.0	0.0	0.0	2.2	52.3	0.0	0.5	2.6	8.2	0.0	0.0	0.0
20	0.0	0.0	0.0	0.3	9.4	2.3	10.6 ,	0.4	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	1.4	3.2 -	0.0	0.0	0.3	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	1.2	0.0 ,	0.0	0.0	0.4	0.0	0.0
23	0.3	0.0	0.0	0.0	0.0	0.0	12.4	0.0	1.2	0.0	0.0	0.0
24	1.2	0.0	0.0	1.2	0.0	0.0	18.2	0.0	6.2	0.0	0.0	0.0
25	0.2	0.0	0.0	2.1	6.2	1.2	0.0	0.0	3.1	0.0	0.0	0.0
26	0.0	0.0	0.0	6.2	8.4	1.0	16.3	0.0	0.3	0.0	0.0	0.0
27	0.0	0.0	0.0	2.2	9.6	0.0	1.4	0.4	3.1	0.5	0.0	0.0
28	0.0	0.0	0.0	0.0	1.3	0.0	16.2	30.4	0.0	36.4	0.0	0.0
29	0.0		0.0	4.1	0.0	3.2	0.5	4.2	0.0	32.3	0.0	0.0
30	8.2		0.0	1.4	5.3	5.4	14.6	0.0	0.0	0.3	0.0	0.0
31	11.3		0.0		0.4		0.0	3.4		0.0		0.0
TOT AI	21.6	5.7	58.7	19.9	153.7	116.2	231.8	166.6	146.0	148.9	1.2	0.0

Table A-4 DAILY RAINFALL DATA AT KIPHIRE (2001)

STATION: KIPHIRE

Unit :

mm

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.0	0.0	0.0	0.0	2.3	9.3	24.3	4.2	0.0	0.3	22.3	0.0
2	0.0	0.0	0.0	0.0	0.3	5.4	1.4	0.0	0.0	18.2	0.0	0.0
3	0.0	0.0	0.0	0.0	3.4	12.3	0.0	0.0	0.0	16.3	0.0	0.0
4	0.0	0.0	0.0	0.0	1.3	10.3	0.3	0.0	0.0	11.4	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	32.3	0.0	0.0	0.0	8.4	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	15.2	1.2	0.0	2.3	15.3	0.0	0.0
7	0.0	0.0	0.0	4.2	1.4	1.4	0.0	12.4	6.4	3.4	0.0	0.0
8	0.0	0.0	0.0	0.0	12.4	15.2	0.0	0.0	10.0	2.3	16.2	0.0
9	0.0	0.0	0.0	0.0	0.0	12.4	0.0	0.0	10.6	0.0	1.2	0.0
10	0.0	0.0	0.0	1.2	13.2	12.2	12.2	0.0	1.3	16.3	0.0	0.0
11	0.0	0.0	0.0		6.3	0.0	0.0	0.0	0.3	0.0	0.0	0.0
12	0.0	0.0	0.0	2.3	16.2	0.0	0.0	0.0	19.3	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.3	0.0	6.3	0.0	4.4	0.0	0.0	0.0
14	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	11.2	0.0	0.0
15	0.0	0.0	0.0	3.4	0.0	0.0	18.3	1.4	0.0	1.2	0.0	0.0
16	0.0	0.0	0.0	3.5	0.0	2.3	2.3	11.3	0.0	20.4	0.0	0.0
17	0.0	0.0	0.0	0.0	3.3	0.0	0.3	3.2	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.3	2.3	11.2	0.0	0.0	0.0	3.4	0.0	0.0
19	0.0	0.0	0.0	0.0	1.2	11.4	0.0	0.0	0.0	4.3	0.0	0.0
20	0.0	1.5	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.7	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	5.2	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	2.3	2.4	20.4	0.0	0.0	0.0
23	1.2	0.0	1.4	0.0	1.3	0.0	0.0	25.3	0.0	0.0	0.0	0.0
24	2.3	0.0	0.3	0.0	1.2	0.0	0.0	0.3	4.0	0.0	0.0	0.0
25	0.4	3.2	1.4	0.0	3.4	0.0	23.4	1.2	0.0	0.0	0.0	0.0
26	0.0	15.4	0.3	0.0	0.3	15.2	27.2	7.4	0.4	0.0	0.0	0.0
27	0.0	21.3	0.2	0.0	0.2	0.3	14.3	19.4	0.2	0.0	0.0	0.0
28	0.0	0.0	0.0	4.3	0.4	10.3	0.4	22.3	0.0	0.0	0.0	0.0
29	0.0		0.0	3.2	1.2	6.2	0.0	0.0	0.4	0.0	0.0	0.0
30	0.0		0.0	2.3	0.0	32.3				6.4	0.0	0.0
31	0.0		0.0		0.0		4.3	0.0		2.3		0.0
TOTAL	3.9	41.4	3.6	25.9	71.9	215.4	147.4	110.8	80.0	141.8	39.7	0.0

Table A-5 DAILY RAINFALL DATA AT KIPHIRE (2002)

STATION: KIPHIRE

Unit :

mm

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.0	0.0	0.0	6.2	0.0	0.0	3.2	6.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	2.2	9.3	0.0	6.0	33.4	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	11.4	0.0	8.1	0.0	19.2	0.0	0.0	0.0
4	0.0	0.0	0.4	7.2	3.2	1.4	5.0	0.0	0.0	0.0	0.3	0.0
5	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	42.3	0.0	0.0	0.4	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	2.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	5.2	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	1.3	0.0	24.4	0.0	0.0	0.0	0.0	0.0
10	6.5	0.0	0.0	0.0	2.3	0.0	0.0	40.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.3	0.0	10.4	25.2	0.0	25.3	0.0	1.2	0.0	0.0
12	0.0	0.0	0.4	0.0	17.4	8.4	6.3	26.4	10.1	0.0	8.4	0.0
13	0.0	0.0	0.0	15.2	4.2	5.2	1.2	6.2	0.0	0.0	16.9	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	7.4	7.0	0.0	3.1	6.1	0.0
15	0.0	0.0	0.0	0.0	3.4	0.0	4.8	7.4	0.4	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	11.4	0.0	0.0	2.4	0.0	0.0
17	0.0	0.0	0.0	12.3	0.0	22.3	0.0	0.0	0.0	0.4	0.0	0.0
18	1.4	0.0	0.0	3.4	2.3	3.4	14.3	22.2	0.0	0.0	0.0	3.1
19	0.3	0.0	0.0	0.0	0.0	0.4	4.2	16.3	0.0	0.2	0.0	0.2
20	0.0	6.5	0.0	0.4	5.3	12.2	3.4	9.1	0.0	8.2	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	4.3	9.2	0.0	0.3	2.1	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	14.4	14.1	0.0	0.0	0.0	0.0	0.0
23	1.2	0.0	0.0	7.4	5.2	3.2	7.4	0.0	0.3	0.0	0.4	0.0
24	16.3	0.0	6.4	3.2	1.2	0.0	13.2	10.2	24.4	0.0	0.0	0.0
25	0.0	0.0	1.3	9.3	11.3	0.0	0.0	1.2	14.3	0.0	0.0	0.0
26	0.0	0.0	6.2	1.2	17.4	0.0	1.2	0.4	5.2	0.0	0.0	0.0
27	0.0	0.0	0.0	9.4	0.0	33.4	17.1	0.0	1.2	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	2.3	24.3	0.0	8.3	0.0	0.0	0.0
29	0.0		0.0	0.0	0.0	0.3	0.0	0.0	3.4	0.0	0.0	0.0
30	0.3		10.4	0.0	10.2	7.2	8.4	0.0	0.0	0.0	0.0	0.0
31	0.0		6.3		0.0		5.2	0.0		0.0		0.0
TOT AI	26.0	6.5	31.7	82.9	160.8	143.6	199.8	211.5	87.1	17.6	32.1	3.3

Table A-6 DAILY RAINFALL DATA AT KIPHIRE (2003)

STATION: KIPHIRE

Unit :

mm

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.0	0.0	0.0	4.4	15.2	8.3	1.2	1.2	0.0	0.0	5.2	0.0
2	2.1	0.0	0.3	2.3	7.2	21.4	10.3	42.3	0.0	1.2	0.0	0.0
3	0.0	0.0	0.0	0.0	2.4	9.2	1.2	2.1	24.2	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	16.2	1.4	5.1			5.2	0.0	0.0
5	13.1	0.0	0.0	0.0	7.3	10.2	13.2	0.0	0.0	5.1	0.0	0.0
6	0.0	4.1	0.0	0.0	0.0	6.3	3.2	0.0	0.0	1.2	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	2.4	4.1	2.1	1.2	3.3	0.0	0.0
8	0.0	0.0	0.0	0.0	9.2	0.4	1.2	2.2	23.4	1.0	0.0	0.0
9	0.0	0.0	0.0	0.0	0.0	3.4	0.0	8.1	1.2	4.3	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	22.1	0.0	0.3	0.0	6.2	0.0	0.0
11	0.0	4.3	0.0	0.0	16.3	8.2	11.2	1.4	0.0	14.2	0.0	0.0
12	0.0	0.0	1.4	0.0	0.0	6.1	4.0	0.2	0.0	4.2	0.0	1.2
13	0.0	1.2	0.0	0.0	0.0	0.0	5.4	11.4	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	6.2	0.0	0.0	48.4	0.0	2.1	0.0	0.0	0.0
15	0.0	1.2	1.2	0.0	4.0	2.3	0.0	10.3	5.2	5.2	0.0	0.0
16	0.0	0.0	0.0	1.2	0.0	2.1	3.2	50.1	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	4.2	0.0	0.3	4.3	16.2	0.0	0.0	0.0
18	0.0	0.0	0.0	33.4	3.1	0.0	0.0	45.2	1.2	0.0	0.0	3.2
19	0.0	0.0	1.0	9.2	0.0	4.3	3.1	10.3	1.4	0.0	0.0	4.2
20	0.0	0.0	1.4	0.0	0.0	0.2	6.3	0.0	5.2	0.0	0.0	6.3
21	0.0	0.0	0.0	1.2	5.4	0.0	3.4	0.0	1.2	8.4	0.0	0.0
22	0.0	0.0	0.0	0.0	3.2	5.3	1.2	9.2	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	20.1	0.4	2.4	0.0	0.3	0.0	2.1	0.0	0.0
24	0.0	0.0	6.2	0.0	3.1	16.1	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.3	0.0	0.0	7.2	2.2	0.0	0.0	0.4	0.0	0.0
26	0.0	0.0	5.1	0.0	0.0	0.0	2.2	2.2	0.0	10.5	0.0	0.0
27	0.0	0.0	0.0	0.0	2.2	2.4	0.0	0.0	0.0	4.4	0.0	0.0
28	0.0	0.4	0.0	4.2	0.0	0.0	1.3	0.0	3.2	1.2	0.0	0.0
29	0.0		0.0	10.3	0.0	1.2	3.2	24.2	0.0	0.0	0.0	0.0
30	0.0		0.0	12.2	0.0	0.0	3.1	14.2	3.1	0.0	0.0	2.1
31	1.5		0.0		0.0		5.2	0.0		0.0		0.0
TOTAL	16.7	14.2	16.9	104.7	99.4	142.9	143.2	241.6	92.0	78.1	5.2	17.0

Table A-7 DAILY RAINFALL DATA AT KIPHIRE (2004)

STATION: KIPHIRE

Unit :

mm

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.0	0.0	0.0	1.0	1.4	0.0	0.0	11.4	6.4	2.4	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.4	6.4	8.3	0.0	0.0	0.0
3	0.0	0.0	0.0	2.4	0.0	8.4	4.4	1.3	9.1	0.0	0.0	0.0
4	0.0	0.0	0.0	5.3	0.0	4.3	3.1	3.3	2.3	3.4	0.0	0.0
5	0.0	0.0	0.0	8.4	0.0	3.4	9.3	12.3	4.4	2.3	0.0	0.0
6	0.0	0.0	0.0	13.3	0.0	1.4	12.3	8.2	5.3	11.2	2.3	0.0
7	0.0	0.0	0.0	0.0	0.0	8.1	8.2	11.4	3.2	11.2	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	10.3	11.4	0.0	4.1	11.1	0.0	0.0
9	0.0	0.0	0.0	8.3	0.0	11.4	0.0	0.0	8.3	12.3	0.0	0.0
10	0.0	0.0	0.0	7.2	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.0
11	0.0	0.0	0.0	7.4	0.0	0.0	0.0	0.0	4.1	0.0	0.0	0.0
12	0.0	0.0	0.0	13.2	0.0	4.4	0.0	0.0	3.2	0.0	0.0	0.0
13	0.0	0.0	0.0	11.3	0.4	6.0	0.0	0.0	11.2	0.0	0.0	0.0
14	0.0	0.0	0.0	10.2	0.3	4.2	5.2	5.2	5.3	0.0	0.0	0.0
15	0.0	0.0	0.0	8.2	0.0	6.1	12.1	12.1	0.0	10.3	0.0	0.3
16	0.0	0.0	0.0	9.1	2.3	3.2	0.0	0.0	1.2	9.4	0.0	0.0
17	0.0	0.0	0.0	7.4	0.0	0.0	0.0	0.0	0.0	7.2	0.0	0.0
18	0.0	0.0	0.0	11.2	0.0	7.2	0.0	0.0	3.4	0.0	0.0	0.0
19	0.0	0.0	0.0	7.3	5.2	6.1	0.0	0.0	9.3	0.0	0.0	0.0
20	0.0	0.0	0.0	5.2	12.4	11.2	0.0	0.0	6.1	0.0	0.5	0.0
21	0.0	0.0	1.2	0.0	9.1	8.1	0.0	0.0	0.0	0.0	0.0	1.3
22	0.0	0.0	0.0	3.2	4.3	3.2	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	3.2	9.4	3.2	6.3	6.3	6.1	0.0	1.3	0.0
25	0.4	0.0	0.0	0.0	5.4	1.3	4.1	4.1	0.0	0.0	3.2	0.0
26	0.3	0.0	0.0	0.0	4.3	0.0	0.4	0.4	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	2.1	0.0	5.2	5.2	0.0	4.2	0.0	0.0
28	0.0	0.0	0.0	6.1	0.0	0.0	0.0	0.0	4.3	0.0	0.0	0.0
29	0.0	0.0	0.0	4.3	7.3	0.0	3.1	3.1	7.3	0.0	0.3	0.0
30	0.0	0.0	0.0	0.0	0.0	4.4	11.1	7.2	5.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0	6.2	4.1	0.0	0.0	0.0	0.0
TOTAL	0.7	0.0	1.2	153.2	63.9	116.2	102.8	102.0	122.2	85.0	7.6	1.6

Table A-8 DAILY RAINFALL DATA AT KIPHIRE (2005)

STATION: KIPHIRE

Unit :

mm

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.0	0.0	0.0	0.0	0.0	0.0	8.1	0.4	0.0	10.4	0.1	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.3	0.0	10.6	0.4	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	8.4	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.2	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	3.2	0.0	0.2	3.8	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.6	0.0	0.0
7	0.0	0.0	0.0	0.0	5.2	0.0	0.0	2.3	5.2	1.8	0.0	0.0
8	0.0	0.0	0.0	0.0	3.2	0.0	11.2	12.4	3.4	0.8	0.0	0.0
9	3.4	0.0	0.0	0.0	0.0	0.0	11.4	5.3	0.0	0.2	0.0	0.0
10	0.5	0.0	0.0	0.0	2.3	0.0	10.4	0.0	0.0	0.8	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	7.1	4.2	2.2	0.0	0.1	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	2.1	1.2	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	7.2	2.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	2.1	3.1	8.1	0.4	0.0	14.2	0.0	0.0
15	0.0	0.0	0.4	0.0	0.0	4.3	4.4	1.4	0.0	7.2	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	4.4	10.1	5.4	6.3	4.2	0.0	0.0
17	0.0	0.3	0.0	0.0	2.2	1.2	4.1	6.2	3.0	3.1	0.0	0.0
18	0.0	0.4	0.0	0.0	1.2	5.4	2.4	8.4	3.2	1.8	0.0	0.0
19	0.0	0.2	1.4	0.0	9.2	0.0	1.2	4.2	0.0	0.6	0.0	0.0
20	0.0	0.0	5.4	0.0	2.4	0.0	0.3	1.3	3.3	1.4	0.0	0.0
21	0.0	0.0	7.2	0.0	4.4	0.0	2.0	2.4	4.3	0.8	0.0	0.0
22	0.0	0.0	6.3	0.0	7.2	6.3	14.1	0.3	3.4	3.4	0.0	0.0
23	0.0	0.0	5.2	0.0	3.2	7.3	0.0	2.4	0.2	12.0	0.0	0.4
24	0.0	1.2	3.2	0.0	7.4	2.4	7.0	7.2	2.4	8.6	0.0	0.2
25	0.0	0.0	4.5	0.4	13.1	12.3	0.0	8.3	1.2	3.8	0.0	0.0
26	0.0	0.0	3.2	2.1	7.2	9.2	4.2	6.2	2.4	2.8	0.0	3.2
27	0.0	0.0	1.4	5.2	0.0	7.3	0.0	4.0	6.1	1.8	0.0	0.0
28	0.0	0.0	3.2	9.1	5.4	6.1	0.0	2.3	2.3	0.4	0.0	0.0
29	0.0		5.3	8.3	1.3	0.0	0.0	0.0	7.4	0.0	0.0	0.0
30	0.0		3.1	0.0	1.0	0.0	0.0	0.0	12.1	0.0	0.0	0.0
31	0.0		0.0		0.0		0.0	0.0		0.2		0.0
Total	3.9	2.1	49.8	25.1	78.0	76.4	118.8	88.8	66.4	108.0	0.5	3.8

Table A-10 DAILY RAINFALL DATA AT KIPHIRE (1996)

STATION: MELURI

Unit :

mm

<i>DATE</i>	<i>JAN</i>	<i>FEB</i>	<i>MAR</i>	<i>APR</i>	<i>MAY</i>	<i>JUN</i>	<i>JUL</i>	<i>AUG</i>	<i>SEP</i>	<i>OCT</i>	<i>NOV</i>	<i>DEC</i>
1	0.0	0.0	0.0	0.0	27.0	15.2	11.0	0.0	0.0	3.0	3.0	0.0
2	0.0	0.0	1.0	0.0	5.6	7.9	8.0	0.0	1.6	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	N.A	0.0	12.0	0.0	0.0	19.0	0.0	0.0
4	0.0	0.0			N.A	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	N.A	0.0	0.8	0.0	0.0	4.0	0.0	0.0
6	0.0	0.0	0.0	0.0	N.A	8.9	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	N.A	0.0	0.0	10.5	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	N.A	1.0	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	14.6	0.0	16.8	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	6.4	1.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	9.8	0.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0
13	0.0	0.0	18.8	0.0	12.8	2.8	0.0	41.0	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	6.0	0.0	0.0	29.8	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	1.0	8.0	7.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	4.5	11.1	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	0.0	4.3	3.0	2.3	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	2.4	0.0	6.9	0.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	4.8	0.0	2.4	0.0	7.4	0.0	0.0	0.0	0.0
21	0.0	q.o	0.0	0.0	0.0	0.0	0.0	18.0	7.2	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	2.8	0.0	0.0	0.0	7.2	1.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	10.0	0.0	14.0	4.2	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0
26	0.0	0.0	0.0	7.2	0.0	0.0	0.0	0.0	0.0	2.3	0.0	0.0
27	0.0	0.0	0.0	7.8	2.9	3.0	0.0	0.0	0.0	1.3	0.0	0.0
28	0.0	0.0	30.5	0.0	3.8	0.0	0.0	0.0	0.0	2.4	0.0	0.0
29	0.0		12.2	0.0	0.0	0.0	9.0	0.0	0.0	1.4	0.0	0.0
30	0.0		5.5	0.0	2.9	22.5	3.0	6.5	0.0	3.0	0.0	0.0
31	0.0		0.0		0.0		25.5	0.0		1.6		0.0
TOTAL	0.0	0.0	74.0	22.6	72.0	94.5	136.0	116.7	26.1	44.2	3.0	0.0

Table A-11 DAILY RAINFALL DATA AT KIPHIRE (1997)

STATION: MELURI

Unit :

mm

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.0	0.0	0.0	0.0	3.8	0.0	0.0	0.0	2.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	4.0	5.0	0.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	2.0	0.0	9.1	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	7.5	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	11.0	0.0	7.0	0.0	0.0	0.0	0.0	1.0	0.0
10	0.0	0.0	0.0	0.0	5.0	7.2	6.4	24.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	1.0	0.0	8.0	15.4	0.0	0.0	4.0	18.0
12	0.0	0.0	0.0	8.0	0.0	3.0	2.2	14.8	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	3.0	3.2	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	12.5	0.0	0.0	23.2	3.0	0.0	0.0	0.0	8.5
16	0.0	0.0	0.0	0.0	0.0	7.6	27.6	28.4	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	5.0	0.0	5.0	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	11.0	20.6	8.0	2.5	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	4.2	23.0	17.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	8.6	0.0	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	5.0	0.0	18.8	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.5	0.0	12.4	0.0	0.0	0.0	0.0	4.0	0.0	0.0
26	0.0	0.0	10.8	0.0	0.0	0.0	0.0	2.0	12.0	0.0	0.0	0.0
27	0.0	6.0	0.0	0.0	0.0	9.0	0.0	0.0	14.0	0.0	0.0	0.0
28	0.0	6.4	0.0	3.0	0.0	1.0	0.0	0.0	21.0	0.0	0.0	0.0
29	0.0		0.0	0.0	0.0	0.0	0.0	6.2	6.0	0.0	0.0	0.0
30	0.0		0.0	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
31	0.0		10.0		0.0		0.0	3.2		0.0		0.0
TOTAL	0.0	12.4	213	413	42.4	85.4	127.5	139.0	63.0	4.0	5.0	26.5

Table A-12 DAILY RAINFALL DATA AT KIPHIRE (1998)

STATION: MELURI

Unit :

mm

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.0	2.6	0.0	0.0	3.8	0.0	26.0	0.0	10.0	0.0	19.6	0.0
2	0.0	0.0	0.0	0.3	0.2	0.0	0.0	5.0	5.0	0.0	3.0	0.0
3	0.0	0.0	0.0	0.0	5.2	0.0	0.0	5.3	9.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.3	0.0	0.0	22.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	1.0	0.0	2.4	0.0	5.2	7.0	0.0	0.0	0.0
6	0.0	0.0	0.0	4.0	3.0	0.0	1.0	6.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	3.0	2.4	0.3	15.8	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	2.0	0.0	3.0	12.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.2	11.8	0.0	10.0	4.0	0.0	0.0	0.0	0.0
10	0.0	0.0	13.0	10.0	0.0	0.0	7.0	7.4	0.0	0.0	0.0	0.0
11	0.0	0.0	8.0	19.2	0.0	0.2	28.5	13.6	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	8.9	0.0	7.0	3.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	7.2	5.0	6.0	0.0	0.0	4.4
14	0.0	0.0	0.0	0.0	0.0	4.8	9.5	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	0.0	14.0	0.0	0.0
17	0.0	0.0	0.0	8.6	0.0	0.0	2.5	20.0	0.0	4.2	0.0	0.0
18	0.0	0.0	0.0	16.0	0.0	0.0	15.0	0.0	0.0	3.0	0.0	0.0
19	0.0	6.0	0.0	0.0	0.4	0.0	0.0	8.0	0.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	0.0	0.0	15.6	0.0	0.0	3.0	0.0	0.0
21	0.0	0.0	0.0	19.2	36.0	7.0	3.2	0.0	0.0	6.4	0.0	0.0
22	0.0	0.0	0.0	20.6	15.0	30.0	0.0	12.4	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.4	2.0	1.2	2.6	0.0	0.0	10.2	0.0
24	0.0	0.0	0.0	9.0	0.0	3.0	2.0	12.0	10.0	0.0	16.0	0.0
25	0.0	0.0	16.4	0.2	0.0	0.0	8.0	8.0	3.0	0.0	12.0	0.0
26	0.0	0.0	30.6	0.0	10.0	12.0	3.0	5.3	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	42.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	15.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0
29	0.0		-0.0	0.0	0.0	26.0	0.0	0.0	0.0	0.0	0.0	0.0
30	0.0		0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0
31	0.0		3.0		0.0		0.0	2.2		0.0		0.0
TOTAL	0.0	8.6	71.0	111.6	156.1	87.7	192.5	140.4	50.0	30.6	60.8	4.4

Table A-13 DAILY RAINFALL DATA AT KIPHIRE (1999)

STATION: MELURI

Unit :

mm

<i>DATE</i>	<i>JAN</i>	<i>FEB</i>	<i>MAR</i>	<i>APR</i>	<i>MAY</i>	<i>JUN</i>	<i>JUL</i>	<i>AUG</i>	<i>SEP</i>	<i>OCT</i>	<i>NOV</i>	<i>DEC</i>
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	9.8	0.0	0.0	0.0	0.0	0.0	16.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	42.0	0.0	1.0	0.0
5	0.0	0.0	0.0	0.0	41.0	0.0	3.4	0.0	14.0	17.0	0.0	0.0
6	0.0	0.0	0.0	0.0	11.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	2.8	2.8	0.0	0.6	0.0	14.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	11.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	0.0	10.4	0.0	0.0	13.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	2.5	12.0	0.0	1.0	23.0	0.0	0.0	0.0	0.0
11	0.6	0.0	0.0	0.0	11.2	0.0	12.8	16.8	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	10.8	0.0	0.0	14.5	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	4.2	0.0	0.0	14.8	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	4.0	9.0	0.0	13.4	0.0	0.0
15	0.0	0.0	0.0	3.8	0.0	0.0	0.0	3.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	3.4	0.0	0.0	27.6	3.2	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	7.0	2.2	6.4	0.0	6.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	2.6	15.0	12.0	0.0	4.2	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	0.0	23.7	2.5	0.0	5.3	0.0	0.0
20	0.0	0.0	0.0	0.0	16.1	0.0	32.0	0.0	0.0	3.2	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	10.0	22.0	0.0	0.0	2.2	0.0	0.0
22	0.0	0.0	0.0	0.0	7.0	0.0	1.0	7.2	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0	5.0	0.4	0.0	0.0
24	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.2	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	32.0	5.6	0.0	11.2	0.0	0.0	0.0	0.0
27	0.0	0.0	5.5	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	0.0	10.1	3.0	8.0	20.4	0.0	0.0	0.0	0.0
29	0.0	0.0	0.0	0.0	2.0	0.0	14.0	27.0	0.0	0.0	0.0	0.0
30	0.0	0.0	0.0	0.0	20.0	0.0	5.0	0.4	0.0	3.0	0.0	0.0
31	0.0	0.0	0.0	0.0	10.1	0.0	0.6	0.0	0.0	0.0	0.0	0.0
TOTAL	0.6	0.0	5.5	9.1	226.3	31.6	150.7	200.2	105.8	57.9	17.0	0.0

Table A-14 DAILY RAINFALL DATA AT KIPHIRE (2000)

STATION: MELURI

Unit :

mm

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.0	0.0	0.0	0.0	20.8	3.6	13.0	0.0	41.0	14.0	0.0	0.0
2	0.0	0.0	10.2	0.0	28.0	0.0	1.8	5.4	0.0	20.0	0.0	0.0
3	0.0	0.0	17.9	0.0	0.0	0.0	0.0	13.4	0.0	20.4	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.0	0.0	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0	9.8	0.0	0.0	0.0	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	32.0	44.0	0.0	0.0	0.0	0.0
8	0.0	4.0	0.0	0.0	0.0	15.0	36.8	1.4	1.0	0.0	0.0	0.0
9	0.0	0.6	19.8	0.0	0.0	2.6	8.7	0.0	4.2	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	15.2	16.6	3.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	0.0	0.0	0.0	11.8	22.0	0.0	0.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	3.2	3.4	7.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	25.0	25.6	4.0	0.0	0.0	0.0	0.0
14	0.0	0.0	14.5	0.0	0.0	2.2	10.2	8.4	0.0	0.0	0.0	0.0
15	0.0	0.0	13.0	0.0	27.0	0.0	0.0	0.0	10.0	0.0	0.0	0.0
16	0.0	0.0	0.0	19.8	0.0	3.6	20.2	1.2	12.0	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	9.8	0.0	10.0	0.0	22.6	0.0	0.0	0.0
18	0.0	0.0	0.0	2.8	57.0	0.0	0.0	0.0	24.8	0.0	0.0	0.0
19	0.0	0.0	0.0	0.0	44.0	0.0	17.0	0.0	9.2	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	8.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	0.0	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
23	6.0	0.0	0.0	0.0	2.6	0.0	9.6	1.6	2.6	0.0	0.0	0.0
24	0.0	0.0	0.0	0.0	7.6	0.0	0.8	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	5.2	13.6	13.6	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	0.0	3.6	0.0	12.0	0.0	0.0	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	7.2	17.0	12.6	0.0	0.0	10.0	0.0	0.0
28	0.0	0.0	0.0	9.2	2.6	10.0	11.8	5.4	2.4	11.4	0.0	0.0
29	4.0		0.0	8.0	0.0	50.0	7.8	5.6	0.0	12.5	0.0	0.0
30	17.0		0.0	5.6	5.0	15.8	11.6	0.0	0.0	8.0	0.0	0.0
31	0.0		0.0		0.0		0.0	11.8		0.0		0.0
TOTAL	27.0	4.6	75.4	45.4	229.0	176.8	296.7	140.0	137.8	101.5	0.0	0.0

Table A-15 DAILY RAINFALL DATA AT KIPHIRE (2001)

STATION: MELURI

Unit :

mm

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.0	0.0	0.0	0.0	0.0	8.2	0.0	2.0	0.0	0.0	12.6	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	2.0	7.0	6.0	44.8	1.4	0.0
3	0.0	0.0	0.0	0.0	5.2	0.0	0.0	0.0	0.0	22.0	0.0	0.0
4	0.0	0.0	0.0	0.0	11.2	0.0	6.0	3.0	0.0	6.8	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	31.1	0.0	0.0	0.0	4.5	0.0	0.0
6	0.0	0.0	0.0	0.0	0.0	7.2	0.0	0.0	0.0	4.4	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	6.9				6.7	0.0	0.0
8	0.0	0.0	0.0	0.0	20.4	8.3	0.0	0.0	5.3	0.0	13.0	0.0
9	0.0	0.0	0.0	0.0	0.0	38.3	2.4	0.0	1.9	0.0	8.8	0.0
10	0.0	0.0	0.0	0.0	16.4	14.5	8.8	0.0	0.0	11.6	0.0	0.0
11	0.0	0.0	0.0	0.0	5.3	9.2	8.0	0.0	11.0	1.4	0.0	0.0
12	0.0	0.0	0.0	0.7	0.0	3.6	9.4	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.4	0.0	4.4	1.0	0.0	4.0	0.0	0.0	0.0
14	0.0	0.0	0.0	0.0	0.0	0.0	5.4	0.0	2.5	3.4	0.0	0.0
15	0.0	0.0	0.0	0.0	0.0	0.0	10.2	3.0	0.0	1.0	0.0	0.0
16	0.0	0.0	0.0	0.0	16.2	4.1	27.0	5.6	0.0	15.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	0.4	17.5	7.8	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.0	0.0	3.3	10.0	0.0	0.0	3.0	0.0	0.0
19	0.0	0.0	0.0	0.0	0.0	12.8	7.0	5.8	0.0	5.2	0.0	0.0
20	0.0	9.0	0.0	0.0	0.0	8.2	0.0	0.0	23.4	8.0	2.0	0.0
21	0.0	1.0	0.0	0.0	0.3	0.8	5.2	0.0	0.0	10.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.0	23.0	5.0	1.3	6.0	0.0	0.0
23	0.0	0.2	0.0	0.0	0.0	1.6	0.0	9.2	7.9	0.0	0.0	0.0
24	0.0	0.2	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0
25	0.0	0.0	0.0	0.0	0.0	0.0	18.0	0.0	2.2	0.0	0.0	0.0
26	0.0	14.6	0.0	0.0	8.3	0.0	10.2	2.0	1.0	0.0	0.0	0.0
27	0.0	30.0	7.5	2.0	0.0	0.0	21.0	35.2	2.4	0.0	0.0	0.0
28	0.0	0.0	0.0	2.5	0.0	13.8	0.0	4.7	28.4	0.0	0.0	0.0
29	0.0		0.0	3.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0
30	0.0		0.0	0.0	32.5	31.2	0.0	0.0	1.2	6.6	0.0	0.0
31	0.0		2.0		0.2		0.0	6.0		13.2		0.0
TOTAL	0.0	55.0	153	8.6	116.0	207.9	192.1	963	112.9	173.6	38.0	0.0

Table A-16 DAILY RAINFALL DATA AT KIPHIRE (2002)

STATION: MELURI											Unit : mm	
DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.0	0.0	0.0	0.9	8.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	14.1	2.4	0.0	30.0	26.2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	6.2	0.0	10.2	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	4.2	0.0	13.6	0.0	0.0	6.8	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	13.2	0.0	0.0	0.0	0.0	0.0	5.1	0.0
6	0.0	0.0	0.0	0.0	16.5	0.0	0.0	0.0	0.0	0.0	1.1	0.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0
8	0.0	0.0	0.0	8.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
9	0.0	0.0	0.0	2.2	0.8	0.0	15.2	0.0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0	1.6	16.1	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	6.4	10.3	3.6	0.0	30.2	0.0	0.0	0.0	0.0
12	0.0	0.0	4.2	6.0	12.4	12.4	14.6	27.0	14.6	0.0	12.6	0.0
13	0.0	0.0	0.0	0.0	0.0	11.2	3.2	14.2	1.8	0.0	22.0	0.0
14	0.0	0.0	0.0	0.0	5.6	0.8	3.2	9.0	0.0	0.0	4.2	0.0
15	0.0	0.0	0.0	0.0	6.4	0.0	2.2	15.0	0.0	0.0	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	0.0	5.0	0.0	2.6	4.6	0.0	0.0
17	0.0	0.0	0.0	9.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
18	0.0	0.0	0.0	10.2	3.5	8.6	30.0	10.2	0.0	0.0	0.0	2.6
19	2.0	0.0	0.0	0.0	0.0	10.0	9.0	31.0	0.0	0.0	0.0	2.0
20	0.0	6.5	0.0	0.0	6.3	17.4	0.0	17.4	0.5	12.4	0.0	2.1
21	0.0	0.0	0.0	0.6	6.0	0.9	0.0	0.0	0.0	21.0	0.0	0.0
22	0.0	0.0	0.0	8.0	0.0	0.0	20.0	0.0	1.4	0.0	0.0	0.0
23	0.0	0.0	0.6	10.0	8.2	0.0	7.6	0.0	0.0	0.0	0.0	0.0
24	12.8	0.0	9.2	6.0	0.0	0.0	10.8	18.0	21.0	0.0	0.0	0.0
25	0.8	0.0	0.0	10.2	10.4	0.0	1.0	0.0	0.0	0.0	2.6	0.0
26	0.0	0.0	0.0	0.0	6.2	0.0	0.0	0.0	18.5	0.0	0.0	0.0
27	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
28	0.0	0.0	0.0	10.0	3.6	0.0	0.0	0.0	6.0	0.0	0.0	0.0
29	0.0		0.8	12.8	2.4	0.6	5.6	0.0	12.2	0.0	0.0	0.0
30	0.0		12.4	9.2	0.6	19.5	12.0	0.0	0.0	0.0	0.0	0.0
31	0.0		4.2		0.5		4.8	0.0		0.0		0.0
TOTAL	15.6	6.5	35.6	124.1	144.0	85.0	186.0	221.1	78.6	41.2	47.6	6.7

Table A-17 DAILY RAINFALL DATA AT KIPHIRE (2003)

STATION: MELURI

Unit :

mm

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.0	0.0	0.0	0.0	0.0	6.5	0.0	3.4	3.3	0.0	21.1	0.0
2	2.3	0.0	0.0	2.8	12.0	0.0	52.0	97.0	0.2	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	10.4	0.0	4.2	0.0	0.4	0.0	0.0	0.0
4	0.0	0.0	0.6	0.6	7.2	0.0	9.5	0.0	6.0	29.0	0.0	0.0
5	12.4	2.3	0.0	1.2	14.2	6.8	12.9	0.0	0.0	5.5	0.0	0.0
6	0.0	6.4	0.0	0.8	0.0	5.8	8.9	0.0	0.0	13.4	0.0	0.0
7	0.0	0.0	0.0	0.0	0.0	6.2	0.0	9.0	0.0	6.0	0.0	0.0
8	0.0	0.0	0.0	0.0	4.2	8.0	0.0	2.8	40.2	4.0	0.0	2.0
9	0.0	0.0	0.0	0.0	10.8	4.6	0.0	0.0	1.0	9.0	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	13.0	0.0	12.1	0.1	5.2	0.0	2.4
11	0.0	4.4	0.0	0.0	0.0	1.6	0.0	0.0	0.0	34.8	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	7.2	0.0	0.0	0.0	0.0	0.0	2.6
13	0.0	0.0	2.6	7.1	0.0	7.1	0.0	11.8	0.0	0.0	0.0	0.0
14	0.0	0.0	0.0	8.0	0.0	0.0	30.0	3.6	0.0	0.0	0.0	0.0
15	0.0	0.0	0.2	0.0	0.0	0.0	1.2	16.8	20.6	15.0	0.0	0.0
16	0.0	2.4	0.8	0.3	25.4	0.0	0.0	37.0	0.0	0.0	0.0	0.0
17	0.0	0.0	0.0	2.5	4.2	0.0	0.0	26.0	36.2	0.0	0.0	0.0
18	0.0	0.0	0.0	2.0	3.6	0.0	0.0	37.5	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	3.6	0.0	7.2	16.0	0.0	1.0	0.0	0.0	8.4
20	0.0	0.0	0.0	4.6	0.0	1.4	0.0	23.0	29.0	0.0	0.0	9.2
21	0.0	0.0	0.8	4.0	15.3	2.4	6.4	1.2	5.4	2.0	0.0	4.0
22	0.0	0.0	0.0	3.5	0.6	6.4	2.1	0.0	0.0	0.0	0.0	0.0
23	0.0	0.0	0.0	11.6	0.0	8.2	26.4	0.5	2.1	6.8	0.0	0.0
24	0.0	0.0	0.0	10.4	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0
25	0.0	0.0	0.0	0.0	9.5	5.4	4.6	0.0	0.0	2.0	0.0	0.0
26	0.0	0.0	0.0	0.0	0.0	0.0	2.6	0.0	29.1	15.2	0.0	0.0
27	0.0	0.0	0.0	0.0	8.6	0.0	0.0	0.0	0.0	9.2	0.0	0.0
28	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0	3.4	0.0	0.0
29	0.0		0.0	0.0	0.0	6.3	0.0	15.0	0.0	0.0	0.0	6.3
30	0.0		0.0	0.0	0.0	4.1	0.0	1.0	1.6	0.0	0.0	0.0
31	3.2		0.0		0.0		24.2	0.4		0.0		0.0
TOTAL	17.9	15.5	5.0	33.0	126.0	111.2	201.0	298.1	181.2	160.5	21.1	34.9

Table A-18 DAILY RAINFALL DATA AT KIPHIRE (2004)

STATION: MELURI

Unit :

mm

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.0	0.0	0.0	0.4	0.0	24.8	0.0	0.0	2.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	13.2	0.0	0.0
3	0.0	0.0	0.0	2.8	0.0	0.0	10.0	6.0	17.8	0.0	0.0	0.0
4	0.0	0.0	0.0	6.0	0.0	20.0	12.2	8.6	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	6.8	0.0	0.0	8.2	0.0	28.3	15.0	0.0	0.0
6	0.0	0.0	0.0	3.5	0.0	0.0	12.0	34.8	1.2	13.2	0.0	0.0
7	0.0	0.0	0.0	2.3	0.0	0.0	19.8	28.2	4.0	16.4	7.2	0.0
8	0.5	0.0	0.0	2.5	0.0	0.0	14.6	2.0	7.0	2514	0.0	0.0
9	2.0	0.0	0.0	15.2	0.0	0.0	20.2	0.0	9.8	7.0	0.0	0.0
10	0.0	0.0	0.0	12.6	0.0	0.0	15.1	0.0	8.0	10.0	0.0	0.0
11	0.0	0.0	0.8	23.6	0.0	0.0	10.8	0.0	9.8	0.0	0.0	0.0
12	0.0	0.0	0.0	15.0	0.0	0.0	6.2	0.0	13.2	0.0	0.0	0.0
13	0.0	0.0	0.0	14.6	0.0	0.0	16.0	0.0	25.0	0.0	11.0	0.0
14	0.0	0.0	0.0	14.4	0.8	0.0	5.4	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.0	10.3	0.0	21.4	1.8	38.6	3.4	16.4	0.0	0.0
16	0.0	0.0	0.0	12.6	0.0	0.0	10.0	1.8	0.0	23.6	0.0	0.0
17	0.0	0.0	0.0	8.2	0.0	0.0	14.0	0.0	0.0	0.0	0.0	0.0
18	0.0	0.0	0.0	0.3	11.3	11.6	6.0	0.0	0.0	0.0	0.0	0.0
19	0.0	0.0	0.0	0.6	0.4	15.0	12.5	0.0	10.0	0.0	0.0	0.0
20	0.0	0.0	0.0	0.0	20.6	10.2	8.8	3.6	28.2	0.0	0.0	0.0
21	0.0	0.0	0.0	0.0	0.0	21.4	1.6	0.2	0.2	0.0	0.0	0.0
22	0.0	0.0	0.0	0.0	0.0	0.8	5.8	0.0	5.0	0.0	0.0	0.0
23	0.0	0.0	0.0	0.0	0.0	16.5	0.0	0.0	0.0	0.0	0.0	0.0
24	0.0	0.0	0.0	9.6	0.0	0.8	0.0	5.1	8.2	0.0	0.0	0.0
25	0.0	0.0	0.0	10.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
26	0.0	0.0	0.0	9.0	0.0	5.3	33.8	5.8	0.0	1.0	5.0	0.0
27	0.0	0.0	0.0	0.0	0.0	11.2	0.0	8.6	0.0	9.4	0.0	0.0
28	0.0	0.0	0.0	15.6	0.0	0.0	5.4	0.0	18.0	0.0	0.0	0.0
29	0.0	0.0	0.0	13.2	0.0	0.0	39.0	11.8	49.2	0.0	1.0	0.0
30	0.0	0.0	0.0	0.8	0.0	8.5	25.6	4.6	29.0	0.0	0.0	0.0
31	0.0	0.0	0.0	0.0	0.0	0.0	10.6	0.0	0.0	0.0	0.0	0.0
TOTAL	2.5	0.0	0.8	210.1	33.1	168.1	325.4	159.7	277.3	150.6	24.2	0.0

Table A-19 DAILY RAINFALL DATA AT KIPHIRE (2005)

STATION: MELURI

Unit :

mm

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.0	0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	48.0	16.6	0.0
2	0.0	0.7	0.0	0.0	0.6	0.0	10.0	0.0	0.0	24.2	0.0	0.0
3	0.0	0.0	0.0	0.0	3.4	0.0	0.0	2.2	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
5	0.0	0.0	0.0	0.0	0.0	0.0	9.6	0.0	14.2	0.0	0.0	0.0
6	0.0	0.0	0.4	0.0	0.0	0.0	0.0	2.0	0.0	0.4	0.0	0.0
7	0.0	0.0	0.0	0.0	3.8	0.0	0.0	1.2	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	38.4	7.2	0.0	0.0	0.0	0.0
9	3.6	0.0	0.0	0.0	0.0	0.0	8.5	1.0	0.0	0.2	0.0	0.0
10	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	0.0	0.0	0.0	13.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0
12	0.0	0.0	0.0	0.0	0.0	0.0	15.8	0.0	0.0	0.0	0.0	0.0
13	0.0	0.0	0.0	0.0	0.0	0.0	10.8	0.0	0.0	0.0	0.0	0.0
14	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0
16	0.0	0.0	0.0	0.0	0.0	8.6	20.2	33.4	10.2	0.0	0.0	0.0
17	0.0	0.0	0.0	0.0	0.0	7.2	7.3	5.0	2.4	0.0	0.0	0.0
18	0.0	3.2	0.0	0.0	0.0	6.5	3.2	17.2	4.6	2.6	0.0	0.0
19	0.0	0.4	0.8	0.2	0.0	0.6	5.2	0.0	0.0	4.6	0.0	0.0
20	3.0	0.0	0.0	0.0	26.8	3.0	0.6	1.8	6.2	6.0	0.0	0.0
21	0.0	0.0	3.4	0.0	15.5	0.0	2.2	0.0	14.0	0.0	0.0	0.0
22	0.0	0.0	6.2	0.0	16.2	0.6	10.8	0.0	5.0	8.4	0.0	0.0
23	0.0	4.6	2.6	0.0	10.5	0.8	2.6	1.2	0.0	25.2	0.0	5.4
24	0.0	0.0	3.4	0.0	12.7	2.4	1.4	0.4	0.0	9.2	0.0	2.2
25	0.0	0.0	5.2	0.8	16.5	0.6	0.0	2.8	2.4	0.0	0.0	2.0
26	0.0	0.0	0.8	6.7	15.2	2.4	0.0	4.2	13.6	0.0	0.0	0.8
27	0.0	0.0	0.6	8.5	0.8	3.6	0.0	0.0	11.0	3.2	0.0	0.0
28	0.0	0.0	0.0	10.8	0.0	0.8	4.0	0.0	4.8	0.0	0.0	0.0
29	0.0		0.0	0.0	0.0	4.2	0.0	0.0	3.2	0.0	0.0	0.0
30	0.0		0.0	0.0	0.0	3.4	0.0	0.0	9.2	0.0	0.0	0.0
31	0.0		0.0		0.0		0.0	0.0		0.0		0.0
TOTAL	7.4	9.5	24.0	40.0	122.0	44.7	153.6	79.6	100.8	166.2	16.6	10.4

Table A-20 DAILY RAINFALL DATA AT KIPHIRE (1983)

STATION: SALUMI

Unit :

mm

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	N.A	N.A	N.A	N.A	N.A	0.00	3.05	0.00	0.00	4.57	0.00	0.00
2	NA	N.A	N.A	N.A	N.A	0.00	17.02	3.05	4.57	0.00	0.00	0.00
3	N.A	NA	N.A	N.A	N.A	0.00	25.92	0.00	0.00	0.00	0.00	0.00
4	N.A	N.A	N.A	N.A	N.A	5.08	1.38	4.32	0.00	0.00	0.00	0.00
5	N.A	NA	N.A	N.A	N.A	0.00	2.83	3.56	0.00	8.64	0.00	0.00
6	N.A	N.A	N.A	N.A	N.A	0.00	7.11	25.40	0.00	23.11	0.00	0.00
7	N.A	N.A	N.A	N.A	N.A	0.51	0.00	0.00	4.32	2.79	0.00	0.00
8	N.A	N.A	N.A	N.A	N.A	0.00	0.00	0.00	7.62	1.78	0.00	0.00
9	N.A	N.A	N.A	N.A	N.A	0.00	0.00	0.00	0.00	0.00	5.59	0.00
10	N.A	N.A	N.A	N.A	N.A	0.00	61.98	0.00	17.78	0.00	31.75	0.00
11	N.A	N.A	N.A	N.A	N.A	0.00	4.57	13.97	2.54	1.78	2.03	0.00
12	N.A	N.A	N.A	N.A	N.A	0.00	0.00	0.00	0.00	3.56	0.00	0.00
13	N.A	N.A	N.A	N.A	N.A	3.30	0.00	2.29	2.79	0.00	0.00	0.00
14	N.A	N.A	N.A	N.A	N.A	6.60	0.00	0.00	0.00	2.03	0.00	0.00
15	N.A	N.A	N.A	N.A	N.A	11.19	4.32	0.00	17.02	7.87	0.00	0.00
16	N.A	N.A	N.A	NA.	N.A	4.32	0.00	4.08	10.98	12.45	0.00	0.00
17	N.A	N.A	N.A	N-A	N.A	8.63	0.00	0.00	4.83	26.16	0.00	0.00
18	N.A	N.A	N.A	NA	N.A	4.57	45.72	0.00	10.67	13.50	6.86	0.00
19	N.A	N.A	N.A	NA	N.A	0.00	5.88	0.00	3.05	0.00	2.03	0.00
20	N.A	N.A	N.A	N.A	N.A	3.05	42.67	71.88	3.81	10.69	0.00	0.00
21	N.A	N.A	N.A	N.A	N.A	2.29	6.60	5.59	6.60	2.03	0.00	0.00
22	N.A	N.A	N.A	NA	N.A	0.00	14.99	9.65	7.37	1.78	0.00	0.00
23	NA	N.A	N.A	NA	N.A	33.78	30.99	9.64	14.73	0.00	0.00	0.00
24	N.A	N.A	N.A	N.A	N.A	0.00	1.52	21.34	0.00	3.05	0.00	0.00
25	N.A	N.A	N.A	NA	N.A	7.62	41.15	7.11	0.00	18.29	0.00	0.00
26	NA	N.A	N.A	N.A	N.A	0.00	5.95	17.27	0.00	0.00	0.00	0.00
27	N.A	N.A	N.A	N.A	N.A	36.32	6.35	6.35	0.00	0.00	0.00	23.41
28	N.A	N.A	N.A	N.A	N.A	4.06	3.30	0.00	1.78	0.00	0.00	6.60
29	NA		N.A	N.A	N.A	1.52	5.08	0.00	0.00	1.78	0.00	0.00
30	N.A		N.A	N.A	N.A	46.99	1.02	43.43	0.00	0.00	0.00	0.00
31	N.A		N.A		N.A	0.00	40.13	31.24		0.00		0.00
TOTAL	0.00	0.00	0.00	0.00	0.00	179.83	379.53	280.17	120.46	145.86	48.26	30.01

Table A-21 DAILY RAINFALL DATA AT KIPHIRE (1984)

STATION: SALUMI Unit : mm

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.00	0.00	0.00	0.00	7.11	0.00	16.26	0.00	21.34	0.00	0.00	0.00
2	0.00	0.00	0.00	4.06	12.06	0.00	10.92	10.67	4.86	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00	1.52	7.87	7.87	1.78	0.00	0.00	0.00
4	0.00	0.00	0.00	0.00	2.79	0.00	12.70	6.86	5.59	14.73	0.00	0.00
5	0.00	0.00	0.00	0.00	2.03	6.86	7.87	6.60	2.79	5.84	0.00	0.00
6	0.00	0.00	0.00	0.00	0.00	1.27	23.37	1.52	5.84	1.78	0.00	0.00
7	0.00	0.00	0.00	0.00	15.75	38.10	2.79	7.62	2.29	0.00	0.00	0.00
8	0.00	14.99	0.00	0.00	4.32	20.32	3.05	1.52	0.00	0.00	0.00	0.00
9	0.00	1.88	0.00	0.00	6.86	5.59	3.56	2.03	7.11	0.00	0.00	0.00
10	0.00	0.00	0.00	0.00	7.87	32.51	4.32	3.81	1.78	0.00	0.00	5.59
11	0.00	0.00	0.00	0.00	3.81	2.29	11.94	3.81	9.14	0.00	0.00	3.81
12	0.00	0.00	0.00	0.00	11.45	3.05	20.32	0.00	0.00	0.00	0.00	0.00
13	0.00	0.00	0.00	0.00	7.11	0.00	7.87	1.78	2.89	0.00	0.00	0.00
14	0.00	0.00	0.00	0.00	0.00	0.00	12.70	16.51	4.86	5.83	0.00	8.64
15	0.00	0.00	0.00	5.08	18.80	10.18	13.56	11.94	11.94	0.00	0.00	8.38
16	0.00	0.00	0.00	2.03	10.16	11.68	1.52	10.67	17.53	0.00	0.00	0.00
17	11.18	0.00	0.00	2.29	6.10	25.91	8.38	3.30	8.13	0.00	0.00	0.00
18	0.00	0.00	0.00	17.58	0.00	32.24	1.52	1.88	6.35	2.03	0.00	0.00
19	0.00	0.00	0.00	0.00	0.00	18.03	1.52	4.83	2.03	0.00	0.00	0.00
20	0.00	0.00	0.00	0.00	0.00	37.08	5.33	13.46	0.00	8.89	0.00	0.00
21	1.22	1.09	1.28	1.91	1.20	9.43	35.77	39.13	3.05	3.14	2.84	2.25
22	1.22	1.07	1.01	1.73	1.21	8.01	22.94	31.11	7.83	3.14	2.75	2.17
23	1.22	1.07	0.97	1.38	1.71	9.92	21.19	23.35	10.56	3.04	2.75	2.17
24	1.22	1.07	0.97	3.31	4.32	8.42	35.17	20.33	10.40	2.94	2.66	2.15
25	1.20	1.07	1.02	1.75	16.14	32.34	30.30	32.77	8.38	2.94	3.13	2.15
26	1.19	1.07	1.60	1.39	30.95	27.14	32.19	20.67	8.38	2.85	2.66	2.13
27	1.19	1.68	1.29	1.91	9.27	20.94	27.14	17.97	7.63	2.76	2.65	2.13
28	1.18	1.28	1.21	1.78	4.96	15.25	28.27	15.02	7.63	2.76	2.65	2.10
29	1.18		1.36	2.03	3.58	13.41	21.03	12.81	7.10	2.68	2.58	2.42
30	1.17		1.94	1.75	3.10	20.92	20.67	11.86	0.99	2.68	2.58	2.17
31	1.36		1.37		2.65	18.65	18.11	11.11		2.59		2.13
TOTA	24.53	26.27	14.02	49.98	19531	431.06	470.05	344.43	188.20	70.62	27.25	5039

Table A-22 DAILY RAINFALL DATA AT KIPHIRE (1985)

STATION: SALUMI

Unit :

mm

DATE	IAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.00	0.00	3.05	0.00	3.56	4.06	0.00	8.04	10.01	5.91	2.59	2.49
2	0.51	1.52	1.27	3.56	0.00	13.72	0.00	1.28	10.08	5.66	2.51	2.49
3	0.00	0.76	8.89	2.79	3.30	8.38	0.00	4.01	8.67	5.40	2.51	2.49
4	0.00	2.03	3.85	0.00	1.52	5.84	2.03	3.50	7.71	5.19	2.44	2.48
5	0.00	0.00	0.00	1.54	0.00	0.00	5.39	25.45	7.73	5.01	233	2.48
6	0.00	0.00	0.00	0.00	0.00	7.62	19.82	1.50	7.72	4.80	2.28	2.48
7	3.30	44.32	0.00	6.35	5.84	21.34	14.22	3.30	734	4.59	2.20	2.41
8	0.00	1.27	0.00	17.78	4.06	2.54	838	0.00	8.15	4.28	2.17	2.40
9	0.00	0.00	0.00	1.54	0.00	2.03	26.92	2.54	7.38	4.15	2.17	234
10	0.00	7.62	0.00	7.62	0.00	0.00	6.35	0.00	14.07	4.06	2.17	234
11	0.00	0.00	0.00	1.78	0.00	7.11	0.00	13.90	1437	3.88	2.12	234
12	0.00	0.00	0.00	0.00	0.00	0.00	11.18.	1.54	11.91	3.69	2.12	234
13	0.00	0.00	0.00	0.00	2.54	0.00	18.83	3.56	10.68	3.66	2.06	2.33
14	0.00	0.00	0.00	0.00	0.00	0.00	27.18	0.00	11.22	3.51	2.05	2.26
15	0.00	3.30	0.00	6.60	2.29	8.38	5.59	18.82	10.04	337	2.09	2.26
16	0.00	10.41	0.00	5.08	1.52	10.16	6.86	2.54	11.14	335	2.93	2.26
17	0.00	10.16	0.00	4.86	0.00	54.36	49.02	70.52	10.53	335	2.92	2.26
18	0.00	0.00	0.00	0.00	0.00	23.62	35.81	10.45	11.04	3.22	2.85	2.26
19	0.00	0.00	0.25	0.00	2.03	1.27	6.10	0.00	9.42	4.28	2.84	2.26
20	0.00	0.00	7.11	5.33	11.43	0.00	4.06	8.38	8.47	3.22	2.75	2.26
21	0.00	0.00	0.00	0.00	0.00	18.54	19.81	10.97	8.05	3.14	2.89	2.25
22	0.00	0.00	2.29	2.29	4.06	7.87	4.83	4.08	7.83	3.14	2.75	2.17
23	0.00	0.00	2.29	14.78	1.27	2.03	11.43	15.40	10.56	3.04	2.75	2.17
24	0.00	0.00	2.03	2.03	15.24	0.00	20.96	21.34	10.40	2.94	2.66	2.15
25	0.00	0.00	7.37	0.00	12.70	33.27	5.33	2.29	838	2.94	3.13	2.15
26	0.00	2.54	3.05	0.00	40.64	14.99	23.62	15.45	8.33	2.85	2.66	2.13
27	0.00	6.68	0.00	9.14	4.86	3.30	2.54	7.11	7.63	2.76	2.65	2.13
28	0.00	0.00	0.00	0.00	0.00	0.00	2.29	55.15	7.63	2.76	2.65	2.10
29	0.00		10.92	1.27	0.00	0.00		6.35	7.10	2.68	2.58	2.42
30	0.00		4.06	12.70	0.00	2.79	19.56	11.45	6.99	2.68	2.58	2.17
31	2.29		0.00		0.00		0.00	0.00		2.59		2.13
TOTAL	,6.10	90.61	56.43	107.04	116.86	253.22	358.	328.92	280.58	116.10	75.40	71.20

Table A-23 DAILY RAINFALL DATA AT KIPHIRE (1986)

STATION: SALUMI

Unit :

mm

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	0.00	0.00	0.00	13.21	0.00	0.00	28.70	0.00	0.00	7.87	0.00	0.00
2	0.00	0.00	0.00	0.00	0.00	1.78	3.56	47.50	55.12	2.29	0.00	0.00
3	0.00	0.00	0.00	5.59	0.00	0.00	2.79	7.87	3.81	0.00	0.00	0.00
4	0.00	0.00	0.00	0.51	1.78	0.00	3.56	2.79	13.72	2.54	0.00	0.00
5	0.00	0.00	0.00	6.60	8.13	0.00	41.40	3.05	3.81	4.57	0.00	0.00
6	0.00	0.00	0.00	7.87	6.60	0.00	2.03	4.83	9.14	26.67	2.03	0.00
7	0.00	0.00	0.00	0.00	6.10	7.87	0.00	0.00	0.00	39.12	0.00	0.00
8	0.00	0.00	5.08	13.46	0.00	0.00	20.83	6.35	11.18	39.88	0.00	0.00
9	0.00	0.00	2.54	1.78	0.00	30.48	17.27	14.48	10.16	19.05	21.34	0.00
10	0.00	0.00	1.27	1.52	0.00	17.78	0.00	9.40	14.73	12.70	7.37	0.00
11	0.00	0.00	0.00	2.54	0.00	0.00	0.51	30.48	11.18	0.00	0.00	0.00
12	0.00	0.00	0.00	2.29	2.79	5.84	0.00	4.32	11.43	11.94	3.05	1.50
13	0.00	5.33	4.57	7.37	2.79	3.81	0.00	32.00	12.19	0.00	0.00	1.20
14	0.00	1.52	2.54	8.64	0.00	9.14	8.38	5.08	9.14	10.67	0.00	0.80
15	0.00	1.78	0.00	0.00	10.16	1.27	6.35	6.35	10.16	6.86	0.00	0.30
16	5.33	1.78	0.00	0.00	5.84	32.26	2.54	11.68	0.00	0.00	0.00	0.00
17	4.06	0.00	0.00	0.00	5.08	5.33	11.18	13.72	3.30	6.10	1.52	0.00
18	0.00	0.00	0.00	0.00	1.52	8.89	13.21	0.00	3.30	0.00	6.86	0.00
19	0.00	0.00	0.00	0.00	0.00	10.16	5.59	0.00	10.16	4.57	0.00	0.00
20	0.00	0.00	1.52	11.18	0.00	21.84	13.97	6.60	10.92	33.02	0.00	0.00
21	0.00	0.00	0.00	17.53	1.52	4.83	2.03	2.03	11.18	30.48	0.00	0.00
22	0.00	0.00	0.00	0.00	0.00	8.13	14.48	14.48	27.94	20.32	0.00	0.00
23	0.00	0.00	0.00	0.00	0.00	2.03	10.67	10.67	0.00	0.00	0.00	0.00
24	0.00	0.00	0.00	4.57	0.00	0.00	16.76	16.76	0.00	19.05	0.00	0.00
25	0.00	0.00	0.00	0.00	0.00	7.37	2.54	11.18	0.00	6.35	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	22.61	45.47	30.48	27.94	0.00	0.00	0.00
27	0.00	0.00	0.00	11.43	2.54	4.83	4.32	32.00	4.57	0.00	0.00	0.00
28	0.00	0.00	0.00	5.84	0.00	0.00	0.00	24.13	27.43	0.00	0.00	0.00
29	0.00		0.00	11.94	0.00	4.06	22.61	3.05	6.35	0.00	0.00	0.00
30	0.00		0.00	3.05	0.00	4.57	31.50	1.78	10.67	0.00	0.00	0.00
31	0.00		0.00		0.00		15.24	0.00		0.00		0.00
TOTAL	9.40	10.41	17.53	136.91	54.86	214.88	347.47	353.06	319.53	304.04	42.16	3.80

Table A-24 DAILY RAINFALL DATA AT KIPHIRE (1987)

STATION: SALUMI

Unit :

mm

DATE	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1	4.83	0.00	0.00	0.00	2.54	3.30	1.78	3.30	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00	4.57	3.56	1.78	2.03	6.35	0.00	0.00	0.00
3	0.00	6.60	0.00	0.00	0.00	2.54	2.29	9.40	0.00	0.00	0.00	0.00
4	0.00	3.81	0.00	0.00	21.84	2.29	5.33	6.10	1.78	0.00	5.59	0.00
5	0.00	12.95	2.54	0.00	11.43	41.15	8.64	14.99	3.56	0.00	2.29	0.00
6	0.00	0.00	0.00	0.00	1.52	69.09	12.45	25.40	1.52	0.00	0.00	0.00
7	0.00	0.00	0.00	0.00	0.00	3.81	6.10	23.11	25.40	2.03	0.00	0.00
8	0.00	0.00	3.56	2.03	8.89	5.33	7.87	0.00	3.05	0.00	0.00	0.00
9	0.00	0.00	3.56	5.08	1.27	23.62	1.52	3.30	12.19	0.00	0.00	0.00
10	0.00	0.00	0.00	9.91	0.00	23.62	14.22	2.29	0.00	7.37	0.00	0.00
11	0.00	4.57	9.40	0.00	0.00	13.97	12.45	5.08	0.00	2.54	0.00	0.00
12	6.60	0.00	5.08	5.08	0.00	14.48	3.56	4.06	6.35	0.00	0.00	0.00
13	0.00	0.00	2.03	0.00	0.00	2.03	1.52	1.52	8.13	0.00	2.03	2.79
14	0.00	0.00	0.00	0.00	0.00	2.29	7.11	4.06	26.67	0.00	11.68	1.52
15	0.00	0.00	0.00	0.00	0.00	2.29	2.03	14.73	4.32	0.00	1.52	0.00
16	0.00	0.00	1.52	0.00	0.00	5.33	3.05	5.33	2.81	0.00	19.56	0.00
17	0.00	0.00	6.60	0.00	0.00	0.00	4.06	0.00	3.05	0.00	0.00	0.00
18	0.00	0.00	5.08	0.00	0.00	3.56	3.56	5.84	3.30	0.00	0.00	0.00
19	0.00	1.78	2.03	3.05	0.00	4.32	0.00	16.26	2.03	0.00	0.00	0.00
20	0.00	0.00	1.78	3.30	0.00	2.03	54.86	27.43	1.52	12.70	0.00	0.00
21	0.00	0.00	11.68	0.00	0.00	3.05	0.00	8.13	12.19	0.00	0.00	0.00
22	0.00	0.00	0.00	2.54	0.00	18.54	0.00	8.89	8.13	0.00	0.00	0.00
23	0.00	0.00	0.00	1.78	0.00	8.89	6.86	6.10	3.81	0.00	0.00	0.00
24	0.00	0.00	1.78	1.78	2.03	2.29	33.53	5.08	5.84	0.00	0.00	0.00
25	0.00	0.00	0.00	14.73	0.00	4.83	9.91	49.28	6.10	0.00	0.00	0.00
26	0.00	0.00	0.00	0.00	0.00	3.05	9.65	27.43	13.72	0.00	0.00	0.00
27	0.00	0.00	1.78	0.00	0.00	1.27	4.83	7.62	6.86	0.00	0.00	0.00
28	0.00	2.03	1.52	10.67	3.30	0.00	5.84	7.62	4.57	0.00	0.00	0.00
29	2.54		0.00	9.14	0.00	1.52	3.81	45.21	5.08	0.00	0.00	0.00
30	4.32		0.00	11.94	0.00	9.65	19.30	0.00	0.00	0.00		0.00
31	0.00		0.00		1.78		6.86	0.00		0.00		0.00
TOTAL	18.29	31.75	59.94	81.03	59.18	281.69	254.76	339.60	178.32	24.64	42.67	432

Table A-27 Discharge Measurement Sheet (2)

Location

Balancing Reservoir upper-stream 10m (Power Channel)

:

25-Mar-

Measurer

Date

Korea Water Resources Corporation (K-Water)

06

Width: 2.350 Area: 1.870 Mean Velocity: 0.176 Discharge: 0.388

Method: Velocity-Area Method (mid-section)

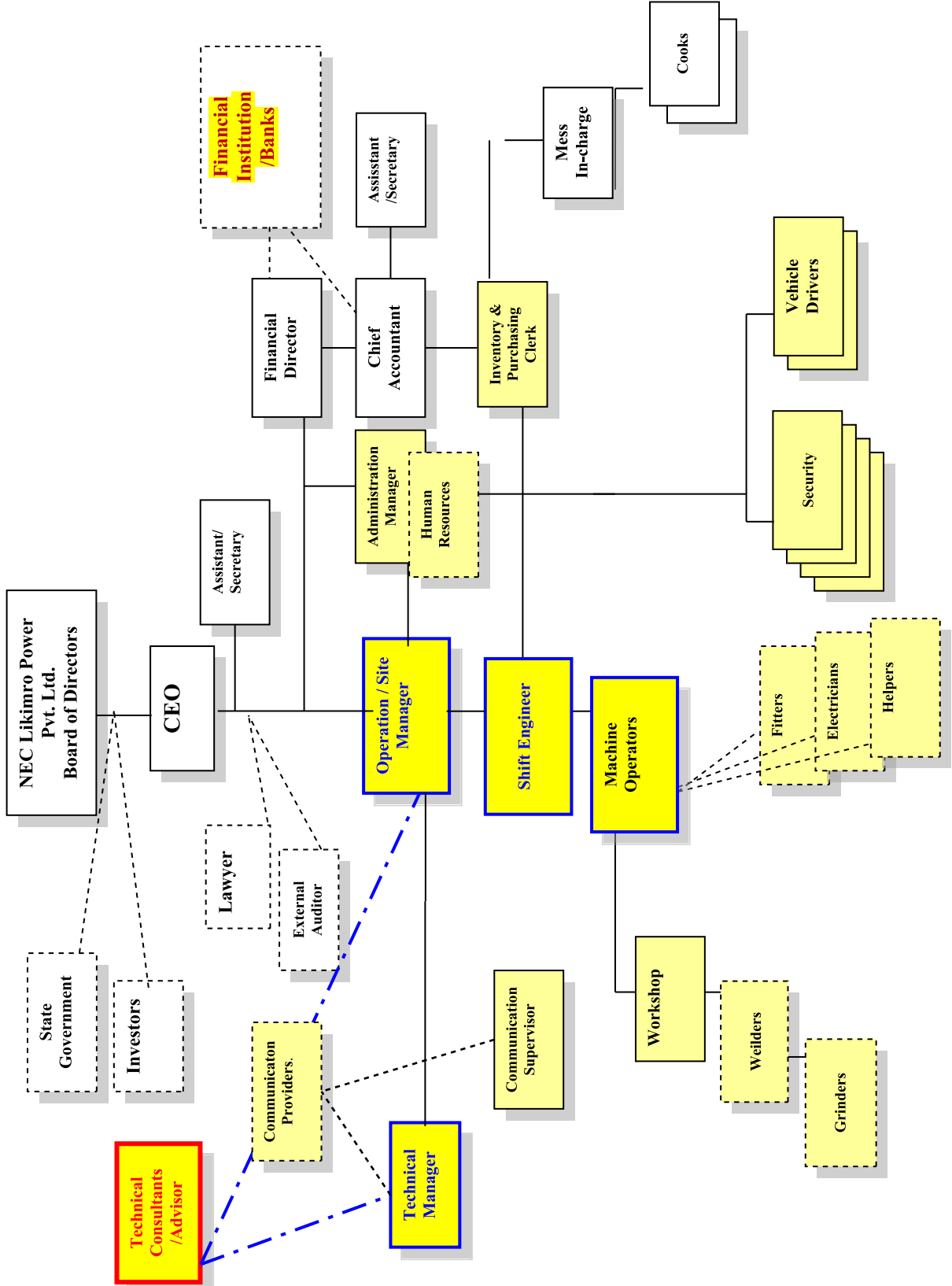
Distance from Origin	Width	Total Depth	Velocity				Area	Discharge
			0.2H	0.6H	0.8H	Mean Velocity		
0.000	0.000	0.750	0.000	0.000	0.000	0.000	0.075	0.000
0.200	0.200	0.800	0.206	0.190	0.196	0.196	0.200	0.039
0.500	0.300	0.800	0.239	0.285	0.252	0.265	0.240	0.064
0.800	0.300	0.800	0.242	0.286	0.288	0.276	0.240	0.066
1.100	0.300	0.800	0.237	0.265	0.260	0.257	0.240	0.062
1.400	0.300	0.800	0.220	0.246	0.246	0.240	0.240	0.057
1.700	0.300	0.800	0.198	0.230	0.211	0.217	0.300	0.065
2.150	0.450	0.800	0.140	0.131	0.137	0.135	0.260	0.035
2.350	0.200	0.750	0.000	0.000	0.000	0.000	0.075	0.000

Table A-28 Discharge Measurement Sheet (3)

Location: Diversion
 Weir Upper-stream
 1000m (Likimro river)
 Date: 29-Mar-06
 3.613 Mean
 Width: 12.100
 Area: Velocity: 0.067 Discharge:
 Method: Velocity-Area Method (mid-section)

Distance from Origin	Width	Total Depth	Velocity				Area	Discharge
			0.2H	0.6H	0.8H	Mean Velocity		
0.000	0.000	0.00	0.000	0.000	0.000	0.000	0.000	
1.000	1.000	0.20	0.000	0.000	0.000	0.000	0.200	
2.000	1.000	0.30	0.027	0.052	0.139	0.068	0.300	
3.000	1.000	0.45	0.165	0.166	0.207	0.176	0.450	
4.000	1.000	0.51	0.002	0.007	0.279	0.074	0.505	
5.000	1.000	0.58	0.090	0.178	0.222	0.167	0.580	
6.000	1.000	0.45	0.106	0.146	0.164	0.141	0.450	
7.000	1.000	0.36	0.094	0.104	0.118	0.105	0.360	
8.000	1.000	0.23	0.084	0.122	0.111	0.110	0.230	
9.000	1.000	0.18	0.007	0.033	0.050	0.031	0.180	
10.000	1.000	0.20	0.000	0.000	0.000	0.000	0.200	
11.000	1.000	0.15	0.000	0.000	0.000	0.000	0.158	
12.100	1.100	0.00	0.000	0.000	0.000	0.000	0.000	

Appendix – B



Appendix – C

TABLE D.1 - ABSTRACT OF ESTIMATED COST FOR CIVIL & HYDRO-MECHANICAL WORKS				
SL.No	ITEM OF WORK	UNIT	QTY	AMOUNT
TRENCH WEIR				
1	Excavation in SMB	cum	408	31,44,663
2	Excavation in hard rock	cum	2038	65,28,125
3	Excavation in foundation	cum	407	23,05,570
4	H.P. stone filling	cum	1630	30,56,250
5	P.C.C. M-10	cum	408	25,47,501
6	R.C.C. M-20 in foundation	cum	540	44,54,484
7	R.C.C. M-20 in walls	cum	1020	84,14,938
8	MS work in reinforcement	MT	102	48,69,063
9	R.R. stone masonry in 1:6	cum	1020	38,44,063
10	Dewatering	Job	2	10,27,344
11	Providing & Fixing Trash rack	MT	16	16,30,000
12	Flushing Gate	MT	4	4,39,900
13	Intake Gate	MT	12	12,23,500
	TOTAL			4,34,85,401
POWER INTAKE				
	POWER INTAKE			
1	Excavation in SMB	cum	661	12,34,701
2	Excavation in hard rock .	cum	823	16,17,438
3	Excavation in Foundation	cum	330	12,47,725
4	P.C.C. , M-10	cum	659	41,17,500
5	R.C.C. , M-20 in Raft	cum	165	13,58,360
6	RC.C. , M-20 in Walls	cum	165	13,58,363
7	R.R. stone masonry in 1:6	cum	165	11,17,438
8	R.R. stone masonry in dry	cum	165	8,33,228
9	MS work in reinforcement	MT	26	12,51,340
10	Wire Boulder crates	cum	165	15,08,719
11	HP Stone filling	cum	1647	30,87,188
	TOTAL			1,87,32,000
DESILTING TANK				
1	Excavation in SMB	cum	279	6,61,400
2	Excavation in hard rock	cum	1605	12,03,350
3	Excavation in foundation	cum	669	5,01,494
4	H.P. stone filling	cum	0	-
5	P.C.C. M-10	cum	673	85,06,250
6	R.C.C. M-20 in foundation	cum	1070	98,27,500
7	R.C.C. M-20 in walls	cum	803	96,00,600
8	MS work in reinforcement	MT	114	84,00,156
9	R.R. stone masonry in 1:6	cum	1070	40,00,500
10	MS pipe, 600 mm dia & 6 mm thick	MT	20	20,06,250
11	S/F 600 mm dia sluice valve	Nos.	8	8,02,500
12	Desilting Gate	MT	13	13,20,000
	TOTAL			4,68,30,000

WATER CONDUCTOR SYSTEM				
1	Excavation in SMB	cum	313	91,11,171
2	Excavation in Compact rock	cum	15581	87,90,625
3	Excavation in foundation	cum	310	91,54,813
4	P.C.C. M-10 grade	cum	774	88,37,891
5	P.C.C. M-15 grade	Cum	4644	2,49,30,078
6	R.C.C. M-20 grade	Cum	774	2,45,86,016
7	MS Reinforcement	MT	294	2,39,81,828
8	Fabrication & erection of Pipe	MT	1161	12,48,27,578
9	TOTAL			23,42,20,000
SURGE SHAFT				
1	Earth work in SMB	cum	1025	13,63,698
2	Earth work in hard rock	cum	3038	45,18,750
3	Earth work in foundation	cum	405	12,02,500
4	PCC M 10 1:3:6	cum	1013	83,28,125
5	R.C.C. M-20 (In foundation)	cum	608	56,11,874
6	R.C.C. M-20 (In Walls)	cum	405	33,46,250
7	MS Work in reinforcement	MT	61	28,85,625
8	H.P. Stone filling	cum	1519	28,48,178
9	TOTAL			3,01,05,000
PENSTOCK AND ITS SUPPORTS				
A- PART : ANCHOR, SADDLES & THRUST BLOCK				
1	Excavation in SMB	cum	399	16,41,592
2	Excavation in hard rock	cum	997	24,98,563
3	Excavation in foundation	cum	598	12,99,138
4	P.C.C. M-10	cum	100	16,63,203
5	P.C.C. M-15	cum	199	33,81,047
6	R.C.C. , M-20 in Raft	cum	100	16,62,628
7	R.C.C. , M-20 in Walls	cum	120	11,87,154
8	MS Work in reinforcement	MT	13	6,45,197
9	R.R. 1:6	cum	399	12,95,975
10	RR Dry	cum	399	14,95,688
11	TOTAL			1,67,70,185
B - PART: PENSTOCK WORK				
1	P/laying of Penstock 1800 mm dia, 10 mm thick	MT	89.74125	1,23,39,422
2	P/Laying of Penstock 1400 mm dia & 10 mm thick	MT	15.954	21,33,675
3	P/Fixing of Expansion Joint 1800 m dia 12 mm thick	Nos.	5.986395	7,48,299
4	P/Fixing of Y-Piece	Nos.	1.99525	2,49,406
5	P/Fixing of Saddle Plates	MT	3.9885	2,74,209
6	Painting	Sqm	1495.688	9,34,805
7	TOTAL			1,66,79,816

POWER HOUSE, TAIL RACE & SWITCHYARD				
1	Earth work in SMB	cum	2127	7,55,085
2	Earth work in hard rock	cum	2133	40,66,500
3	Earth work in Foundation	cum	1062.5	5,31,250
4	HP stone filling	cum	956.25	17,92,969
5	P.C.C. M-10	cum	637.5	39,84,375
6	C.C. M-15	cum	212.5	34,60,938
7	P.C.C. M-20	cum	425	65,06,250
8	R.C.C. M-20 in foundation	cum	1700	2,40,25,000
9	R.C.C. M-20 in S/S	cum	425	55,06,250
10	MS work in reinforcement	MT	127.5	60,56,250
11	Heavy Structural Work.	MT	180.625	1,44,17,969
12	P/F Pressed steel door frames a Single rebate	RM	318.75	1,99,219
13	b double rebate	RM	127.5	1,27,500
14	P/F Pressed steel door /windows	Sqm	244.375	15,27,344
15	Brick work (in foundation)	cum	53.125	2,98,828
16	Brick work (in S/S) one brick thick	cum	212.5	12,48,438
17	R.C.R. stone masonry 1:4	cum	110.5	3,86,750
18	R.R. stone masonry 1:6	cum	701.25	17,53,125
19	R.R. dry stone masonry	cum	265.625	2,98,828
20	CP 12mm thick 1:6	sqm	2125	5,31,250
21	CP 12mm thick 1:6 (rough face)	sqm	2125	5,31,250
22	CP on stone work 1:4	sqm	159.375	59,766
23	Raised/struck pointing 1:2	sqm	743.75	92,969
24	P/F Glass strip 25x4mm	RM	191.25	23,906
25	P/F Aluminum strip 50x6mm	RM	680	1,70,000
26	CC floor 25mm thick over 80 mm thick CC 1:4:8	sqm	605.625	1,89,258
27	CC floor 50mm thick	sqm	265.625	1,66,016
28	Kota stone flooring 25mm thick	sqm	425	4,25,000
29	Kota stone 25mm thick in skirting	sqm	212.5	2,65,625
30	P/F ceramic tiles	sqm	138.125	4,31,641
31	P/F Acid proof tiles	sqm	121.125	3,78,516
32	P/F 32 mm th Flush door shutters	sqm	106.25	2,65,625
33	P/F Aluminium partitions	sqm	42.5	2,65,620
34	P/F C.G.I Sheet Roofing	sqm	425	5,33,250
35	P/F G.I. plain sheet	RM	191.25	1,79,297
36	P/F 6mm thick false ceiling	sqm	212.5	2,65,625
37	White washing	sqm	2125	66,406
38	Oil bound distemper	sqm	2125	4,65,625
39	Exterior texture painting	sqm	2125	7,96,875
40	Synthetic Enamel Painting	sqm	1700	15,93,750
41	MS chequered plates	MT	4.25	2,92,188
42	S/ F of rolling shutter	sqm	89.25	5,57,813
43	S/f of steel glazed windows	sqm	212.5	2,35,813
44	P/F Chain link fencing	sqm	318.75	4,88,086
45	Electrification work of the area	LS	1	10,45,000
46	Sanitary & Water Supply	LS	1	10,48,962
	TOTAL			8,83,08,000
	TOTAL CIVIL & HYDRO-MECHANICAL COST			51,01,20,402

Appendix – D

Appendix - D

S.NO.	DESCRIPTION	QTY	Total Cost
1	750 RPM, 2700 kW _e , Q= 4.27 Cumecs, H _{net} = 75.0m, Francis type Horizontal Turbine complete with spiral casing, Draft tube elbow and cone, shaft seal, distributor assembly with stainless steel (13Cr/4Ni) guide vanes and stainless steel (13Cr/4Ni) runner, guide vane servomotor, etc.	3	7,29,43,780
2	Cooling water system	3	66,08,606
3	Plant Drainage and dewatering System	1	42,02,869
4	1200 mm, PN 12, Single seal, Inlet Butterfly Valve equipped with dismantling joint, upstream and downstream pipes, counter weight, electrical / hydraulic Bypass arrangement, hydraulic servomotor,	3	1,90,42,153
5	Digital Governor. Hydraulic OPU, Piping , Oil etc.	3	85,12,880
6	Generator relay control, instrumentation and annunciation	3	56,29,976
7	11 / 66 kV Power Transformer / Line CRM panel	1	46,12,951
8	Common Generator Synchronizing panel with Auto synchronizer	1	64,63,700
9	Main 415V LTAC Panel for aux. power distribution	1	32,11,470
10	11kV Switchgear (2I/C +1O/G+ 1PT) + 1 O/G Line VCB + 1 LBS Line breaker	1	41,45,901
11	11kV, Generator Neutral Grounding Panel	3	15,12,880
12	11kV, LAVT, surge capacitor, CT & PT panel	3	18,12,880
13	110V DC battery and charger, DCDB	1	16,95,550
14	Surge Shaft Water Level sensing and transmission medium with controller	1	6,37,548
15	Remote Stage-1 operator Control panel	1	16,20,951
16	Cable trays & Accessories	1	14,01,738
17	4000 kW _e , 600 RPM, 11kV, 0.9pf, Horizontal Synchronous Generator with digital excitation system and Lubrication system if any, with suitable Bearings for Turbine Axial and Radial Loads.	3	5,50,79,617
18	10000 KVA, 11KV/66KV Isolating Power Transformer	1	1,48,20,354
19	11kV/433V, 300 KVA Station Auxiliary Transformer	1	9,89,813
20	100 KVA DG Set	1	16,40,325
21	30T EOT Crane	1	34,77,751
22	Power, control & Instrumentation Cables	1	54,77,750
23	Earthing system for Power House , s/yard & Transformer yard plus Lightning Protection	1	11,59,250
24	Station Lighting, Road lighting, along road between PH and Switchyard	1	4,05,738
25	Power Plant Ventilation	1	6,02,869
26	Fire Fighting system	1	7,15,925
27	Spares - Commissioning	1	1,24,79,625
28	Tools & Tackles	1	16,37,050
29	Erection and commissioning	1	47,11,100
30	Supervision of Erection & Commissioning	1	27,47,000
31	66kV switchyard Equipments & 66 kV line with interconnection to Kiphire-Likimro Line		4,43,60,000
32	TOTAL PRICE		29,43,60,000

Appendix – E

Table-1. Basic Parameters

Sl.no.	Parameters	Method	Units	Value	Remarks
1	Capacity		MW	8.1	Evaluated as per Head & Hydrological Data
2	CUF (Capacity Utilisation Factor) / PLF (Plant Load Factor)			45.00%	As Per CERC-Renewable Energy Tariff Regulation, 2024 : Chapter-4, clause 28
3	Units Generated (Kwh)		MU	31.93	Energy available for sale(ii), AHEC-IITR/MNRE/SHP Standards/ 1.6 General - Economic & Financial Analysis and Tariff Determination: Plant availability – During the operation there may be some forced outage due to emergency shut downs and unplanned maintenance etc. On account of forced outage 5% of gross energy generated at generator terminal may be considered for deduction.
4	Less: Auxiliary consumption			1.0%	Energy available for sale(i), AHEC-IITR/MNRE/SHP Standards/ 1.6 General - Economic & Financial Analysis and Tariff Determination: Auxiliary consumption – The energy consumed by auxiliary equipment of the power generating station and transformer losses within the generating station are considered as auxiliary consumption. This may be taken as 1% of gross energy generated at generator terminal. As Per CERC-Renewable Energy Tariff Regulation, 2024 : Chapter-4, clause 29
5	Units available for sale		MU	31.61	As per PPA
6	Sale price Non-preferential Tariff	PPA (Upto 20 years) PPA (21-40 years)	levelised tariff for 20 years		
7	Useful life		In years	40	As Per CERC-Renewable Energy Tariff Regulation, 2024 : Useful Life Point (HH)
8	Tariff period		in years	40	As per PPA.
9	Debt Equity Ratio (70 : 30)	Total Capital (Project)			As Per CERC-Renewable Energy Tariff Regulation, 2024 : Chapter 4, clause 27 & Chapter- 2, clause 13
a.	Debt		70%	67.42	
b.	Equity		30%	28.90	96.3212
10	Construction period		in months	36	
11	Repayment quarterly		No. of installment	60	
12	Repayment quarterly		Rs. In lacs	116.27	
13	Subsidy received		Rs. In lacs	NIL	As per UNNATI 2024 : Subsidy to be received in the second year after COD)
14	Interest rate on loan (Working capital)		in percentage	10.50%	
15	IDC		in percentage	9.25%	
16	Loan Tenure and Interest on Term Loan	(15 years)	in percentage	10.50%	For the purpose of computation of tariff, normative interest rate of two hundred (200) basis points above the average State Bank of India MCLR (Marginal Cost Lending Rate –one year tenor) prevalent during the last available six months is considered, as per CERC-Renewable Energy Tariff Regulation, 2024, Chapter 2, clause 14.
17	Return on equity			15.00%	Sub-Regulation (2) of Regulation 16 of the CERC RE Tariff Order 2019-20 stipulates the normative Return on Equity (ROE) as 17.60% (after grossing up by prevailing MAT rate of 20.46%) (Avg. MAT rate) as on 1 April 2018) for the useful life of the project. As Per CERC-Renewable Energy Tariff Regulation, 2024 Chapter -2, clause 16.
18	Discount rate			9.4455%	(10.52% x 70% x (1-27.82%))+17.6%*30% (rate of Return on Equity (ROE) is considered at post tax rate of 17.6 %)
19	OTHER EXPENSES				
a.	Depreciation				DEPRECIATION 24. Regulation 15 of the CERC RE Tariff Order 2024-25 provides for computation of depreciation in the following manner: (1) "The value base for the purpose of depreciation shall be the Capital Cost of the asset admitted by the Commission. The Salvage value of the asset shall be considered as 10% and depreciation shall be allowed up to maximum of 90% of the Capital Cost of the asset. (2) Depreciation rate of 4.67% per annum for first 15 years and remaining depreciation to be spread during remaining useful life of the RE projects considering the salvage value of the project as 10% of project cost shall be considered. (3) Depreciation shall be chargeable from the first year of commercial operation. Provided that in case of commercial operation of the asset for part of the year, depreciation shall be charged on pro rata basis". As Per CERC-Renewable Energy Tariff Regulation, 2024 : Chapter-2, clause 15.
	Depreciation for 1st 15 years	SLM Method		4.67%	
	Depreciation for remaining period	SLM Method		4.480%	
b.	O&M Expenses			299.13	Small Hydro: CERC RE Tariff Order 2024 provides for the normative O&M expenses for small hydro projects for the first year of the Control Period which shall be escalated at the rate of 5.25% per annum over the tariff period for determination of the levelised tariff. Accordingly, from the table, the O&M cost for SHP as specified by the Commission for FY 2024-25 is 36.93 lacs/MW. As Per CERC-Renewable Energy Tariff Regulation, 2024. : Chapter-2, clause 19 & Chapter-4,
c.	Annual escalation of O&M expenses			5.89%	
d.	REC Benefit		Rupees in Lacs	NIL	The amount (after Income Tax) has not been considered in tariff calculation as it is not applicable in case of preferential tariff.
e.	Income Tax as per Normal provision (Income tax rate @ 27.82% (25% IT rate + 7% surcharge + 4% Health and Education cess)			27.82%	
20	Levelized Tariff (In Rs.)			5.45	

Table-2 Abstract of Project-costs & Means of Finace		
Sl. No.	Particulars	Ammount (in lakhs)
A	Civil works	4,766.70
	<i>Trench Weir</i>	434.85
	<i>Power Channel</i>	187.32
	<i>Desilting Basin</i>	468.30
	<i>Water Conductor System</i>	2,342.20
	<i>Surge Shaft</i>	301.05
	<i>Power House and Tail Race</i>	883.08
	<i>Land Acquisition</i>	149.90
B.	Cost of EM works	2,943.60
	<i>Power Plant + Erection (E&M)</i>	2,500.00
	<i>Transmission line / Distribution</i>	443.60
C.	Cost of HM works	334.50
	<i>Penstock</i>	334.50
D.	Contigencies	156.90
	<i>Preliminary & Enviornmental Exp</i>	156.90
E.	Project Managements & Other Services	420.08
I	Total (A + B + C + D + E)	8,621.78
II	Financing Charges	69.59
III	Interest During Construction (IDC)	940.75
	Project Cost (I + II + III)	9,632.12
	MEANS OF FINANCE	
1	Equity (30% of Project Cost, including Finance charges)	2,656.12
2	Debt without IDC (70% of Project Cost)	6,035.25
3	IDC	940.75
	Total Capitalised Cost	9,632.12

8.1 MW Lower Likimro HPP

Table-5 Computation of Interest and Schedule of Term Loan Repayment									
Year	Quarter	Subsidy	Loan at the beginning of the quarter	Principal repayment during the quarter	Interest during the quarter	Balance loan at the end of the quarter	Annual interest payment	Annual Principal payment	Total Repayment
1	1		6975.99	116.27	183.47	6859.73	715.53	465.07	1180.59
	2		6859.73	116.27	180.41	6743.46			
	3		6743.46	116.27	177.35	6627.20			
	4		6627.20	116.27	174.30	6510.93			
2	5		6510.93	116.27	171.24	6394.66	666.60	465.07	1131.67
	6		6394.66	116.27	168.18	6278.40			
	7		6278.40	116.27	165.12	6162.13			
	8		6162.13	116.27	162.06	6045.86			
3	9		6045.86	116.27	159.01	5929.60	617.68	465.07	1082.74
	10		5929.60	116.27	155.95	5813.33			
	11		5813.33	116.27	152.89	5697.06			
	12		5697.06	116.27	149.83	5580.80			
4	13		5580.80	116.27	146.77	5464.53	568.75	465.07	1033.82
	14		5464.53	116.27	143.72	5348.26			
	15		5348.26	116.27	140.66	5232.00			
	16		5232.00	116.27	137.60	5115.73			
5	17		5115.73	116.27	134.54	4999.46	519.83	465.07	984.89
	18		4999.46	116.27	131.49	4883.20			
	19		4883.20	116.27	128.43	4766.93			
	20		4766.93	116.27	125.37	4650.66			
6	21		4650.66	116.27	122.31	4534.40	470.90	465.07	935.97
	22		4534.40	116.27	119.25	4418.13			
	23		4418.13	116.27	116.20	4301.86			
	24		4301.86	116.27	113.14	4185.60			
7	25		4185.60	116.27	110.08	4069.33	421.98	465.07	887.04
	26		4069.33	116.27	107.02	3953.06			
	27		3953.06	116.27	103.97	3836.80			
	28		3836.80	116.27	100.91	3720.53			
8	29		3720.53	116.27	97.85	3604.26	373.05	465.07	838.12
	30		3604.26	116.27	94.79	3488.00			
	31		3488.00	116.27	91.73	3371.73			
	32		3371.73	116.27	88.68	3255.46			
9	33		3255.46	116.27	85.62	3139.20	324.13	465.07	789.19
	34		3139.20	116.27	82.56	3022.93			
	35		3022.93	116.27	79.50	2906.66			
	36		2906.66	116.27	76.45	2790.40			
10	37		2790.40	116.27	73.39	2674.13	275.20	465.07	740.27
	38		2674.13	116.27	70.33	2557.86			
	39		2557.86	116.27	67.27	2441.60			
	40		2441.60	116.27	64.21	2325.33			
11	41		2325.33	116.27	61.16	2209.07	226.28	465.07	691.34
	42		2209.07	116.27	58.10	2092.80			
	43		2092.80	116.27	55.04	1976.53			
	44		1976.53	116.27	51.98	1860.27			
12	45		1860.27	116.27	48.92	1744.00	177.35	465.07	642.42
	46		1744.00	116.27	45.87	1627.73			
	47		1627.73	116.27	42.81	1511.47			
	48		1511.47	116.27	39.75	1395.20			
13	49		1395.20	116.27	36.69	1278.93	128.43	465.07	593.49
	50		1278.93	116.27	33.64	1162.67			
	51		1162.67	116.27	30.58	1046.40			
	52		1046.40	116.27	27.52	930.13			

14	53		930.13	116.27	24.46	813.87	79.50	465.07	544.57
	54		813.87	116.27	21.40	697.60			
	55		697.60	116.27	18.35	581.33			
	56		581.33	116.27	15.29	465.07			
15	57		465.07	116.27	12.23	348.80	30.58	465.07	495.64
	58		348.80	116.27	9.17	232.53			
	59		232.53	116.27	6.12	116.27			
	60		116.27	116.27	3.06	0.00			

8.1 MW Lower Likimro HPP

Table-6 Working Capital Requirement

YEAR	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Sales	1906.14	1906.14	1906.14	1906.14	1906.14	1906.14	1906.14	1906.14	1906.14	1906.14	1906.14	1906.14	1906.14	1906.14	1906.14	1906.14	1906.14	1906.14	1906.14	1906.14	1906.14
O&M Charges	299.13	314.84	331.37	348.76	367.07	386.34	406.63	427.98	450.44	474.09	498.98	525.18	552.75	581.77	612.31	644.46	678.29	713.90	751.38	790.83	
Working Capital Requirement																					
Receivable equiv. to 2 months of Energy charges	317.6895249	317.68952	317.6895	317.68952	317.68952	317.69	317.6895	317.6895	317.6895	317.69	317.69	317.69	317.68952	317.689525	317.68952	317.689525	317.6895	317.69	317.68952	317.68952	317.689525
Maintenance Spares @ 15% of O&M charges	44.87	47.23	49.70	52.31	55.06	57.95	60.99	64.20	67.57	71.11	74.85	78.78	82.91	87.27	91.85	96.67	101.74	107.09	112.71	118.62	
O&M Charges (for 1 month)	24.93	26.24	27.61	29.06	30.59	32.20	33.89	35.66	37.54	39.51	41.58	43.76	46.06	48.48	51.03	53.70	56.52	59.49	62.62	65.90	
Total Working capital Requirement	387.4872249	391.15	395.01	399.07	403.34	407.84	412.57	417.55	422.79	428.31	434.12	440.23	446.66477	453.435972	460.56266	468.06	475.96	484.267	493.01257	502.22	
Margin Money@30%	116.2461675	117.35	118.50	119.72	121.00	122.35	123.77	125.27	126.84	128.49	130.24	132.07	134.00	136.03	138.17	140.42	142.79	145.28	147.90	150.67	
Bank Finance	271.2410574	273.81	276.51	279.35	282.34	285.49	288.80	292.29	295.96	299.82	303.88	308.16	312.67	317.41	322.39	327.64	333.17	338.99	345.11	351.55	
Interest on WC @11.52%	31.25	31.54	31.85	32.18	32.53	32.89	33.27	33.67	34.09	34.54	35.01	35.50	36.02	36.57	37.14	37.74	38.38	39.05	39.76	40.50	

Regulation 17 of the CERC RE Tariff Order (2023-24) provides for the working capital requirements of the RE projects as under:

- (1) The Working Capital requirement in respect of Small Hydro Power shall be computed in accordance with the following:
- Operation & Maintenance expenses for one month;
 - Receivables equivalent to 2 (two) months of energy charges for sale of electricity calculated on the normative CUF;
 - Maintenance spare @ 15% of operation and maintenance expenses

Table-7 Profitability Statement																				
Details	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
BENEFITS																				
Net Saleable energy	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61	31.61
Energy Unit Price	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78	5.78
Turnover	1,827.11	1,827.11	1,827.11	1,827.11	1,827.11	1,827.11	1,827.11	1,827.11	1,827.11	1,827.11	1,827.11	1,827.11	1,827.11	1,827.11	1,827.11	1,827.11	1,827.11	1,827.11	1,827.11	1,827.11
REC	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71	33.71
Total Revenue	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82
EXPENSES																				
Construction Cost																				
O&M Expenses	299.133	314.84	331.37	348.76	367.07	386.34	406.63	427.98	450.44	474.09	498.98	525.18	552.75	581.77	612.31	644.46	678.29	713.90	751.38	790.83
Total expenses before Tax	299.133	314.84	331.37	348.76	367.07	386.34	406.63	427.98	450.44	474.09	498.98	525.18	552.75	581.77	612.31	644.46	678.29	713.90	751.38	790.83
Profit before Int. depr. & tax	1,561.69	1,549.98	1,529.46	1,512.06	1,493.75	1,474.48	1,454.19	1,432.85	1,410.38	1,386.73	1,361.84	1,335.64	1,308.07	1,279.05	1,248.51	1,216.36	1,182.53	1,146.92	1,109.44	1,069.99
Depreciation	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72
Interest on Term Loan	715.53	666.60	617.68	568.75	519.83	470.90	421.98	373.05	324.13	275.20	226.28	177.35	128.43	79.50	30.58					
Interest on WC	31.25	31.54	31.85	32.18	32.53	32.89	33.27	33.67	34.09	34.54	35.01	35.50	36.02	36.57	37.14	37.74	38.38	39.05	39.76	40.50
Total expenses for IT calculation	1,503.63	1,470.70	1,438.62	1,407.42	1,377.14	1,347.85	1,319.59	1,292.42	1,266.38	1,241.55	1,217.99	1,195.75	1,174.92	1,154.92	1,135.80	1,117.57	1,100.04	1,141.32	1,179.51	1,219.70
Operational profit before Tax	357.20	390.12	422.21	453.41	483.68	512.97	541.23	568.40	594.44	619.27	642.84	665.07	685.91	714.62	742.42	770.25	798.25	826.30	854.44	882.67
Mat @ 20.5868% till 1st to 5th year and income tax from 6th to 20th years	73.54	80.31	86.92	93.34	99.57	142.71	150.57	158.13	165.37	172.28	178.84	185.02	190.82	215.50	220.45	219.85				
Profit after Tax	283.66	309.81	335.29	360.06	384.10	370.26	390.66	410.27	429.06	446.99	464.00	480.05	495.09	519.12	571.97	570.40	555.78	519.50	468.31	417.12
Add depr.	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72	457.72
Cash accruals before loan installment	741.38	767.53	793.01	817.78	841.82	827.98	848.38	867.99	886.78	904.71	921.72	937.77	952.80	947.48	960.34	958.77	944.15	910.77	869.68	829.49
Installment for loan repayment	465.07	465.07	465.07	465.07	465.07	465.07	465.07	465.07	465.07	465.07	465.07	465.07	465.07	465.07	465.07	465.07	465.07	465.07	465.07	465.07
Cash accruals after loan installment	276.31	302.46	327.94	352.72	376.76	362.91	383.31	402.93	421.72	439.64	456.65	472.70	487.73	482.41	495.27	498.77	484.15	455.72	424.61	394.02
Discount Rate	9.4455%	9.4455%	9.4455%	9.4455%	9.4455%	9.4455%	9.4455%	9.4455%	9.4455%	9.4455%	9.4455%	9.4455%	9.4455%	9.4455%	9.4455%	9.4455%	9.4455%	9.4455%	9.4455%	9.4455%
Turnover	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82
Discounting Factor @ 10.5953%	1.0000	0.9042	0.8176	0.7392	0.6684	0.6044	0.5465	0.4941	0.4468	0.4040	0.3653	0.3303	0.2986	0.2700	0.2442	0.2208	0.1996	0.1805	0.1632	0.1476
NPV Turnover	1,860.82	1,682.55	1,521.36	1,375.61	1,243.82	1,124.66	1,016.92	919.49	831.40	751.75	679.73	614.61	557.73	502.49	454.35	410.82	371.47	335.88	303.70	274.60
Expenses	1,503.63	1,470.70	1,438.62	1,407.42	1,377.14	1,347.85	1,319.59	1,292.42	1,266.38	1,241.55	1,217.99	1,195.75	1,174.92	1,154.92	1,135.80	1,117.57	1,100.04	1,141.32	1,179.51	1,219.70
NPV Expenses	1,503.63	1,329.80	1,176.17	1,040.43	920.52	814.63	721.14	638.63	565.81	501.57	444.91	394.95	350.89	293.32	260.87	236.36	220.59	206.01	192.50	179.99

Statement Showing computation of IRR (Internal Rate of Return)																				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
	1,470,050	47,005,000																		
CFAT BEFORE INTEREST ON TERM LOAN	1,456.91	1,434.13	1,410.68	1,386.54	1,361.65	1,298.88	1,270.35	1,241.04	1,210.91	1,179.91	1,148.00	1,115.12	1,081.23	1,026.99	990.92	958.77	1,144.15	1,107.87	1,069.68	1,029.49
RE BENEFIT (NET OF TAX/AFTER INCOME TAX)	1,490.619	1,467.840	1,444.395	1,420.248	1,395.361	1,332.593	1,304.067	1,274.757	1,244.623	1,213.621	1,181.707	1,148.832	1,114.945	1,060.700	1,024.628	992.482	1,177.858	1,141.578	1,103.393	1,063.203
TOTAL CFAT AFTER RE BENEFITS	1,000.00	0.6802	0.4627	0.3148	0.2141	0.1457	0.0991	0.0674	0.0459	0.0312	0.0212	0.0144	0.0098	0.0067	0.0045	0.0031	0.0021	0.0014	0.0010	0.0007
DISCOUNT FACTOR																				
PVCI	1,490.62	998.50	668.38	447.06	298.78	194.11	129.21	85.92	57.07	37.85	25.07	16.58	10.95	7.08	4.65	3.07	2.48	1.63	1.07	0.70
NPV																				



Likimro Power Private Limited

Financial Analysis for Lower Likimro HPP

Table 8 - Statement Showing computation of ARR (Accounting/Average Rate of Return)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
RE BENEFIT (NET OF TAX/AFTER INCOME TAX) A	33,712	33,712	33,712	33,712	33,712	33,712	33,712	33,712	33,712	33,712	33,712	33,712	33,712	33,712	33,712	33,712	33,712	33,712	33,712	33,712
Profit After Tax B	283,666	309,811	335,299	360,006	384,100	370,266	390,666	410,277	429,006	446,959	464,000	480,005	495,009	559,12	571,97	570,40	755,78	719,50	681,31	641,12
Total Post Tax Return per year C	317,37	343,52	369,00	393,78	417,82	403,97	424,37	443,99	462,78	480,70	497,71	513,76	528,80	592,83	605,68	604,11	789,49	753,21	715,03	674,84
Total Post Tax Return in 20 years D	10332,75																			
Period of Project E	20																			
Average Return F=D/E	516.64																			
Initial Investment G	9632.12																			
Terminal Value H	963.21																			
Average Investment I=(G+H)/2	5297.67																			
ARR (in %) J=I*100/J	9.75																			

ARR= Post Tax Average Rate of Return over the period of project*100/Average Investment
 Where Average Investment = (Initial Investment+Terminal Value of the project at the end of useful life of the project)/2

Statement Showing computation of NPV (NET PRESENT VALUE)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
TOTAL CFAT AFTER RE BENEFITS AND AFTER INTEREST ON TERM LOAN	775,091	801,238	826,717	851,495	875,534	861,691	882,089	901,704	920,495	938,418	955,429	971,478	986,517	981,197	994,050	992,482	1177,858	1141,578	1103,393	1063,203
Discounting Factor @ 10.5953%	1.0000	0.9042	0.8176	0.7393	0.6685	0.6045	0.5466	0.4942	0.4469	0.4041	0.3654	0.3304	0.2987	0.2701	0.2442	0.2208	0.1997	0.1806	0.1633	0.1476
PVCO	775.09	724.49	675.93	629.50	585.28	520.85	482.11	445.63	411.34	379.18	349.08	320.94	294.69	265.03	242.78	219.18	235.21	206.13	180.15	156.96
NPV																				

Statement Showing computation of BCR (Benefit Cost Ratio)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Turnover	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82	1,860.82
RE receipts	47.42	47.42	47.42	47.42	47.42	47.42	47.42	47.42	47.42	47.42	47.42	47.42	47.42	47.42	47.42	47.42	47.42	47.42	47.42	47.42
Total Turnover	1,908.24	1,908.24	1,908.24	1,908.24	1,908.24	1,908.24	1,908.24	1,908.24	1,908.24	1,908.24	1,908.24	1,908.24	1,908.24	1,908.24	1,908.24	1,908.24	1,908.24	1,908.24	1,908.24	1,908.24
Discounting Factor @ 10.5953%	1.0000	0.9042	0.8176	0.7393	0.6685	0.6044	0.5465	0.4941	0.4468	0.4040	0.3653	0.3303	0.2986	0.2700	0.2442	0.2208	0.1996	0.1805	0.1632	0.1476
NPV Turnover	1,908.24	1,725.42	1,560.12	1,410.66	1,275.52	1,153.32	1,042.83	942.59	852.59	770.91	697.05	630.27	569.89	515.29	465.93	421.29	380.93	344.44	311.44	281.60
Total Expenses	1503.63	1470.70	1438.62	1407.42	1377.14	1347.85	1319.59	1292.42	1266.38	1241.55	1217.99	1195.75	1174.92	1086.21	1068.40	1070.57	1105.04	1141.32	1179.51	1219.70
NPV Expenses	1503.63	1329.80	1176.17	1040.43	920.52	814.63	721.14	638.63	565.81	501.57	444.91	394.95	350.89	293.32	260.87	236.36	220.59	206.01	192.50	179.99
BCR (Benefit Cost Ratio) C=A/B																				1.44

Statement Showing computation of FBP (Payback Period)

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Cost of Project	9632.12																			
Annual Cash Inflows after Tax	775.09	801.24	826.72	851.49	875.53	861.69	882.09	901.70	920.49	938.42	955.43	971.48	986.52	981.20	994.05	992.48	1177.86	1141.58	1103.39	1063.20
Cumulative Annual Cash Inflows	775.09	1,576.33	2,403.05	3,254.54	4,130.07	4,991.76	5,873.85	6,775.56	7,696.05	8,634.47	9,589.90	10,561.38	11,547.89	12,529.09	13,523.14	14,515.62	15,693.48	16,835.06	17,938.45	19,001.65
FBP																				

Table -10 Statement Showing Computation of RE Benefits			
	No. of Units of Saleable Energy	31610898	
	1 REC=1000KWH		
	Total Annual RECs for 8 MW	31610.898	
	Expected Discovered Price		
	Price Per REC (in Rs.)	150	
	Number of RECs	31610.898	
			<i>(in Rs.)</i>
a	REC value		47,41,634.70
b	12% GST on REC Trade value	12% on Trade value(a)	5,68,996.16
c	Exchange Charges	(Rs. 20/REC)	6,32,217.96
d	Exchange GST	18% on Exchange Charges	1,13,799.23
e	Assume Trading margin (Rs-10/REC)		3,16,108.98
f	GST ON TRADING MARGIN		56,899.62
	Total Earning from Sale of REC		30,53,612.75
	RE Receipts Net of Expenses		37,93,307.76
			<i>(Rupees in Lakhs)</i>
	RE RECEIPT		37.93
	INCOME TAX @ 11.128%		4.22
	Net of income Tax		33.71

8.1 MW Lower Likimro HPP