

**REPUBLIC OF INDIA
STATE OF MIZORAM, MINOR IRRIGATION
DEPARTMENT**

**THE STUDY
ON
DEVELOPMENT AND MANAGEMENT OF
LAND AND WATER RESOURCES
FOR SUSTAINABLE AGRICULTURE IN MIZORAM
IN
THE REPUBLIC OF INDIA**

**FINAL REPORT
ANNEX**

MAY 2015

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

NIPPON KOEI CO., LTD.

KRI INTERNATIONAL CORP.

ID
JR
15-005

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Annex 1

DPR for Laului MI scheme

Government of Mizoram
Minor Irrigation Department

Project Report
of
Laului Minor Irrigation Project

Aizawl Irrigation Division
Minor Irrigation Department
(January 2015)

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Photos



Command Area (1)



Command Area (2)



Proposed Site for Weir (1)



Proposed Site for Weir (2)

Source: Prepared by MID



OBJECTIVES

The diversion weirs and the canals are newly constructed and rehabilitated to supply stable irrigation water to the paddy field during Kharif and Rabi season. Due to these, the paddy yield is improved and the winter crops are promoted.

OUTLINE

Name of River	: Lau lui, Thingkuang lui, Vawmkuak lui
Gross Command Area	: 18.0 ha
Culturable Command Area	: 12.2 ha
Name of Villages getting water supply	: Sailam, Sialsuk in Aizawl and Thenzawl in Serchhip
Cost of Project	: 42.1 lakhs
Benefit Cost Ratio	: 5.02

CROPPING PATTERN

Aizawl: Laului Proposed Cropping Pattern Name of Crop	Month												Area (ha)		
	J	F	M	A	M	J	J	A	S	O	N	D			
Paddy (local)						■	■	■	■	■					12.2
Kharif season						■	■	■	■	■					12.2
Mixed Crop: Maize & French bean	■	■	■								■	■	■		6.2
Leafy Coriander	■	■	■	■						■	■	■	■		6.0
Rabi season										■	■	■	■		12.2
Total															24.4

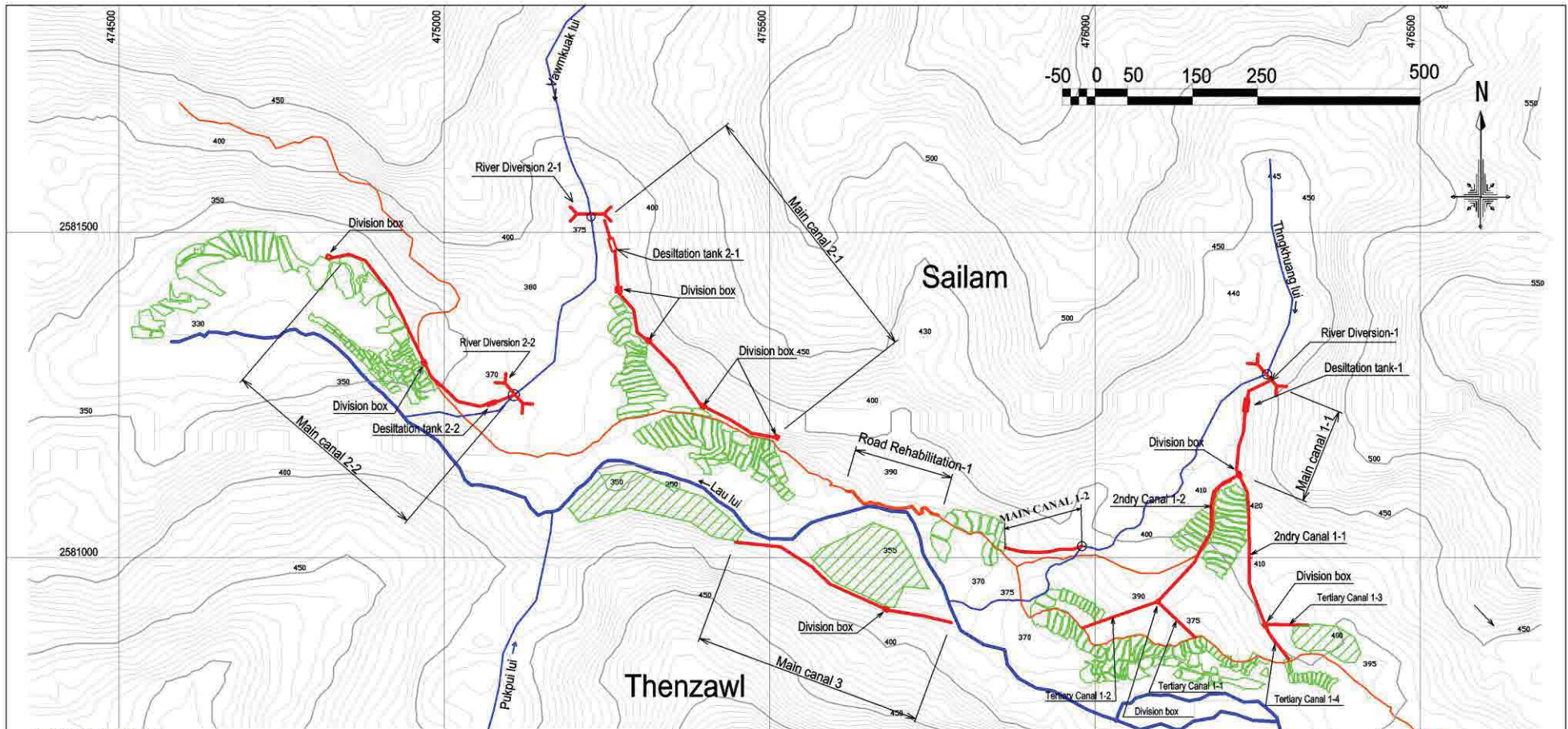
WATER USER ASSOCIATION O&M PLAN

SN.	Name of Facilities	Items	Implementer	Frequency	Schedule												
					Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
1	Diversion Weir	Patrol	Person in charge	Every week	■	■	■	■	■	■	■	■	■	■	■	■	
		Water management	Person in charge	Every day	■	■	■	■	■	■	■	■	■	■	■	■	
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■	■	■	■	■	■	■	■	■	■	■	■
			Removing weeds	All beneficiaries	4 times per year			■				■				■	
		Reporting to MID	WUA	Every month													
		Rehabilitation (minor/major)	All beneficiaries	2 times per year						■							■
2	Canal	Patrol	Person in charge	Every week	■	■	■	■	■	■	■	■	■	■	■	■	
		Water management	Person in charge	Every day	■	■	■	■	■	■	■	■	■	■	■	■	
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■	■	■	■	■	■	■	■	■	■	■	■
			Removing weeds	All beneficiaries	4 times per year			■				■				■	
		Reporting to MID	WUA	Every month													
		Rehabilitation (minor/major)	All beneficiaries	2 times per year						■							■
3	Desiltation Tank	Patrol	Person in charge	Every week	■	■	■	■	■	■	■	■	■	■	■	■	
		Water management	Person in charge	Every day	■	■	■	■	■	■	■	■	■	■	■	■	
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■	■	■	■	■	■	■	■	■	■	■	■
			Removing weeds	All beneficiaries	5 times per year			■				■				■	
		Reporting to MID	WUA	Every month													
		Rehabilitation (minor/major)	All beneficiaries	3 times per year						■							■
Crop season					Dry (Rabi)			Summer			Rainy (Kharif)			Dry (Rabi)			

PREPARATION HISTORY

Field survey	: 23 rd to 24 th September, 2014	Workshop	: 8 th to 10 th October, 2014
Finalization	: 4 th December, 2014		

This project summary was prepared by Minor Irrigation Department in association with Japan International Cooperation Agency in April 2015.



Facility List of Laului MIP

Area name	SN	Facility name	Quantity	Unit	Description (Structure, Size, etc)	Type
Thingkhung lui	1	River diversion 1	1	Ls	W=10.00 m	New
	2	Desiltation tank 1	1	Ls	Sand siceway supplementary	New
	3	Main canal 1-1	250	m	Open channel PCC: W=0.60m, H=0.30 and cap	Rehabilitation
	4	Main canal 1-2	60	m	Lining of earthen canal: W=0.30m, H=0.30m	New
	5	Secondary canal 1-1	140	m	Lining of earthen canal: W=0.30m, H=0.30m	Rehabilitation
	6	Secondary canal 1-1	20	m	Lining of earthen canal: W=0.30m, H=0.30m	New
	7	Secondary canal 1-2	200	m	Lining of earthen canal: W=0.30m, H=0.30m	New
	8	Tertiary canal 1-1	50	m	Lining of earthen canal: W=0.30m, H=0.30m	New
	9	Tertiary canal 1-2	80	m	Lining of earthen canal: W=0.30m, H=0.30m	New
	10	Tertiary canal 1-3	60	m	Lining of earthen canal: W=0.30m, H=0.30m	New
	11	Tertiary canal 1-4	60	m	Lining of earthen canal: W=0.30m, H=0.30m	Rehabilitation
	12	Division box	3	Nos		
	13	Road 1 (Landslide section)	75	m	W=3.5m, Cutting, gravel pavement, and drainage	Rehabilitation
Vavmkauk lui	14	River diversion 2-1	1	Ls	W=13m	New
	15	River diversion 2-2	1	Ls	W=10m	New
	16	Desiltation tank 2-1	1	Ls	Sand siceway supplementary	New
Lau lui	17	Desiltation tank 2/2	1	Ls	Sand siceway supplementary	New
	18	Main canal 2-1	680	m	Open channel PCC: W=0.40 m, H=0.30 m and cap	Rehabilitation
	19	Main canal 2-2	530	m	Lining of earthen canal: W=0.30m, H=0.30m	New
	20	Division box	6	Nos		
	21	Main canal 3	360	m	Open channel PCC: W=0.40 m, H=0.30 m and cap	New
	22	Division box	1	Nos	Lining of earthen canal: W=0.30m, H=0.30m	New

Legend

- River Diversion
- Main Canal
- Stream
- Farm Road
- Existing Paddy
- Land Development Area

PROJECT TITLE	DATE	DESIGNED BY	DWG NO.
LAULUI MINOR IRRIGATION PROJECT, LENGTE	Nov, 2014	○○○○○ ○○○○○	00-00-00
DWG. TITLE	SCALE	APPROVED BY	SERIAL NO.
Facility Layout Plan	1 : 6000 (A3)	○○○○○	○○○○○

Check List : Laului Minor Irrigation Project

Sl.No	Item/Activity	Remarks	Pg.No
1	Name of Project	Laului Minor Irrigation Project	-
2	Name of District/Block/Village	Aizawl District/ Aibawk RD Block/Sailam village	-
3	Longitude	92°45'17"E	-
4	Latitude	23°20'27"N	-
5	Category of Project- Storage/Diversion/Lift/percolation tank	Diversion	-
6	Type Project (Ongoing/New)	New Project	-
7	Whether scheme is in DPAP/Tribal area?	Yes	-
8	Have foundation investigations been carried out?	Yes (Trial pits)	-
9	Have soil survey in the command area been done?	Extrapolated	p.2-1
10	Have Topographical survey been carried out?	Yes	-
11	Have any alternative proposals been studied and merits and de-merits discussed?	Yes	-
12	Average rainfall in command area	3,163 mm (2011)	Annexure 8
13	Is source (river/stream/nallah) perennial?	Perennial	-
14	Availability of water in the source (In MCM)	31.28	Annexure 8
15	Minimum Discharge in cumec?	0.011	p.3-4
16	Maximum Discharge in cumec?	0.330	p.3-2
17	Effect of the present scheme on existing/contemplated/ upstream and downstream schemes on the same source, if any	Nil	-
18	Detail of drinking water supply component, if any	Nil	-
19	Area of land required to be acquired for the project	Not required	-
20	Status of Land Acquisition	N.A	-
21	Does the project falls in the command area of any existing/ ongoing/ proposed major/ medium irrigation project? If so, details thereof.	No	-
22	Whether clearance from state electricity board has been taken in case of LI schemes?	N.A	-
23	Existing Cropping pattern	Yes	p.5-1
24	Proposed cropping pattern (approved by Agricultural Deptt.)	Yes	p.5-1
25	Has the method used for determining the crop water requirement discussed?	Yes	-
26	Whether detailed design has been carried out for various component of scheme as per BIS code.	Yes	Annexure 62
27	Whether latest SOR adopted for preparation of cost estimate?	Yes	Annexure 60
28	Whether unique identification number has been given to each scheme?	Yes. MZ AZ AI SA 02 NE	-
29	Has the source of construction material has been identified?	Yes	-
30	No villaged & People benefitted?	2 villages and 11 families	p.11-1
31	No of farmers of SC/ST community benefitted?	SC - Nil, ST- 50	-
32	Whether land levelling in command area is required? If so, how state govt proposes to meet the expenditure ?	Yes, Govt. proposed to meet expenditure from CAD&WMP	-
33	How state govt proposes to meet O & M charges after completion of project?	State plan fund with beneficiary contribution	-
34	When state govt proposes to hand over scheme to WUA?	On completion	-
35	When state govt proposes to take up evaluation studies by independent agency?	After completion of CAD and WMP scheme.	-
36	Attach Index map and layout plan of Project alongwith all major, Medium and minor projects (GEO based)	Yes.	-
37	Period of completion of scheme?	2 years	-
38	Development cost Rs Lakh/ha	3.45	p.7-1
39	B.C Ratio at 10% interest	5.02	p.7-1

Sl.No	Item/Activity	Remarks	Pg.No
40	Location of scheme in reference to existing schemes	Sailam	-
41	Whether quality control mechanism exists for MI Schemes? Implementing quality control - scope and arrangement (desirable, independent quality control arrangement)	Mechanism under process of constitution	-
42	MI schemes having CCA more than 1500 ha, a certificate from State Government indicating that it is not a substitute of medium irrigation projects is required	N.A as the CCA is less than 1500 ha	-
43	Certificate from State Government indicating that the MI scheme is not a part of any other major or medium irrigation scheme	Certificate attached	-
44	Are benefits from Pisciculture / animal husbandry / plantation etc. discussed	Not significant	-

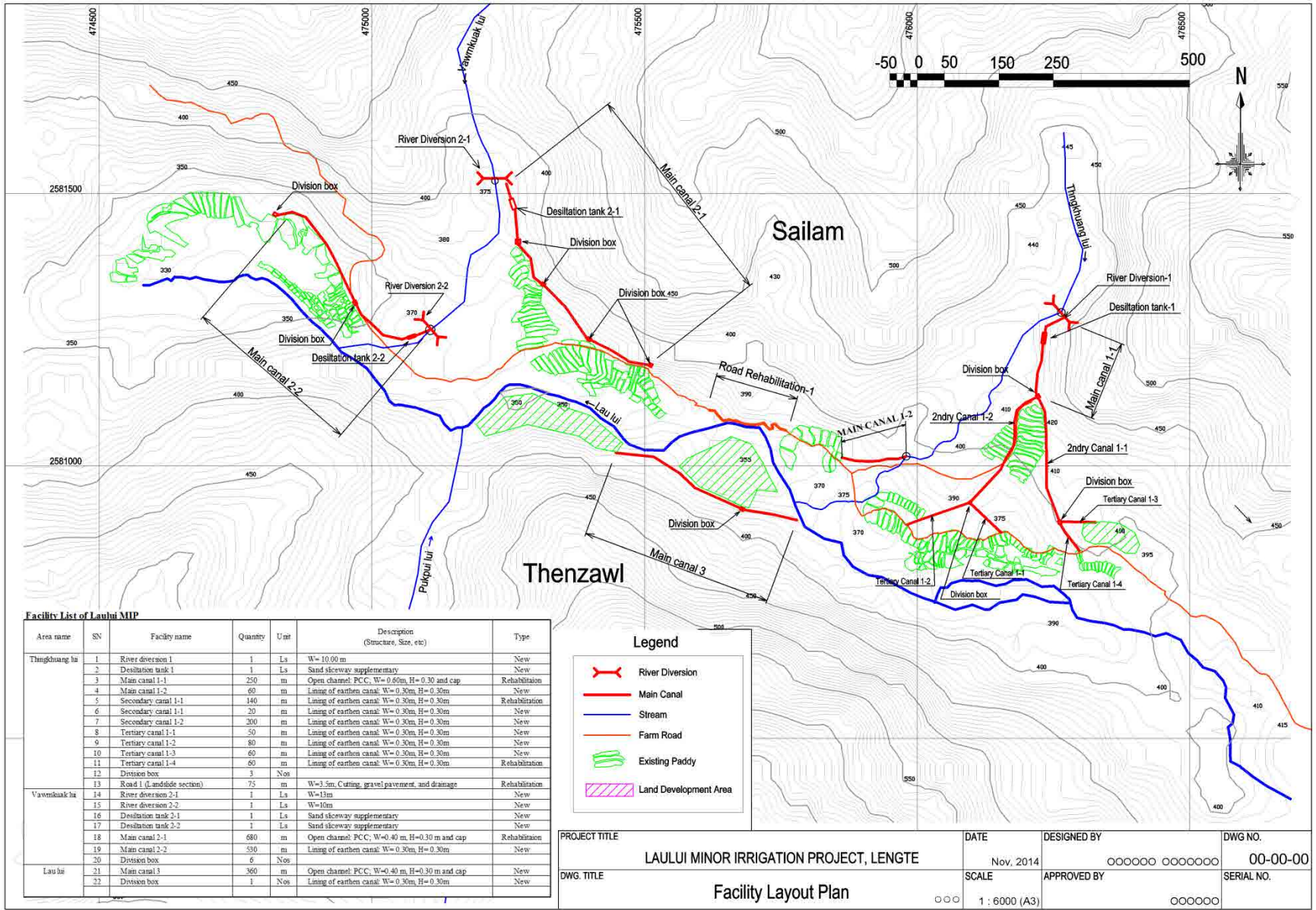
* Unique Identification Number will be given after approval by TAC but before submission to the Government.

Salient Features of the Surface Minor Irrigation Schemes

1	Name of Project	Laului Minor Irrigation Project
2	Name of River/Tributary/Nalah	Lau/Thingkhuang/Vawmkuak etc.
3	Irrigation (Hectare)	
	a) Gross Command Area (GCA)	: 18.0 ha
	b) Culturable command Area (CCA)	: 12.2 ha
	c) Area under Irrigation	: Nil
	d) Cost per Hectare of potential planned	: Rs. 3.45 lakhs
4	Name of Villages getting water supply	: Sailam, Sialsuk and Thenzawl, Aizawl District
5	Hydrology	
	a) Gross Catchment Area in Sq Km	: 21.0 sq Km
	b) Intercepted Catchment Area in Sq. Km	: Nil
	c) Un-intercepted Catchment Area in Sq.Km	: 21.0 sq Km
	d) Catchment Rain fall details in mm	: 3,163.00 mm(2011)
	e) Name of climatic station in the catchment	: Sialsuk station
	f) Annual yield at the proposed site in M.Cum	: 31.283 MCM
	g) Water Utilization of upstream projects	: Nil
	h) Water Utilization of proposed projects	: Kharif; 0.0365 cumecs, Rabi; 0.0123 cumecs
	i) Design flood at weir/barrage	: 137.34 cumecs
6	Submergences Details in ha	: Submerge area is nil.
7	Technical details of barrage/Weir	: Diversion weir W=13m, L=4.1m
8	Cropping Pattern in ha	
	a) Existing	: 12.2 ha
	b) Proposed	: 24.4 ha
9	Cost of the Project	: 42.08 lakhs
10	Benefit cost ratio	: 5.02 : 1

Source: Prepared by MID

Facility Layout Map



Facility List of Lauhni MIP

Area name	SN	Facility name	Quantity	Unit	Description (Structure, Size, etc)	Type
Thinhkuang lui	1	River diversion 1	1	Ls	W= 10.00 m	New
	2	Desiltation tank 1	1	Ls	Sand slkeway supplementary	New
	3	Main canal 1-1	250	m	Open channel: PCC, W= 0.60m, H= 0.30 and cap	Rehabilitation
	4	Main canal 1-2	60	m	Lining of earthen canal: W= 0.30m, H= 0.30m	New
	5	Secondary canal 1-1	140	m	Lining of earthen canal: W= 0.30m, H= 0.30m	Rehabilitation
	6	Secondary canal 1-1	20	m	Lining of earthen canal: W= 0.30m, H= 0.30m	New
	7	Secondary canal 1-2	200	m	Lining of earthen canal: W= 0.30m, H= 0.30m	New
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	9	Tertiary canal 1-2	80	m	Lining of earthen canal: W= 0.30m, H= 0.30m	New
	10	Tertiary canal 1-3	60	m	Lining of earthen canal: W= 0.30m, H= 0.30m	New
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	17	Desiltation tank 2-2	1	Ls	Sand slkeway supplementary	New
	18	Main canal 2-1	680	m	Open channel: PCC, W=0.40 m, H=0.30 m and cap	Rehabilitation
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Lau lui	20	Division box	6	Nos		
	21	Main canal 3	360	m	Open channel: PCC, W=0.40 m, H=0.30 m and cap	New
	22	Division box	1	Nos	Lining of earthen canal: W= 0.30m, H= 0.30m	New

Legend

- River Diversion
- Main Canal
- Stream
- Farm Road
- Existing Paddy
- Land Development Area

PROJECT TITLE	LAULUI MINOR IRRIGATION PROJECT, LENGTE		DATE	Nov, 2014	DESIGNED BY	○○○○○○ ○○○○○○	DWG NO.	00-00-00
DWG TITLE	Facility Layout Plan		SCALE	1 : 6000 (A3)	APPROVED BY	○○○○○	SERIAL NO.	

Chapter 1 Introduction

1.1 Introduction

It is often said that the economy of Mizoram is based on agriculture and about 70% of its population are engaged in or have links to agricultural activities. It is also a proven fact that the general soil condition and climate of Mizoram are suitable for raising almost any type of tropical and subtropical crops. However, the general topography of the state is hilly with deep gorges in between. The elevation ranges from 4,100 ft to a few hundred feet above mean sea level and the plain or flatland is confined to valley lands, mostly small and scattered along the river banks only. As such, irrigation schemes in the state so far are essentially small surface water diversion schemes with command area varying from about 10 ha-100 ha. In Mizoram, there are few pockets along the river banks where potential flat land of more than 200 ha are available. Most of the completed and ongoing projects under Aizawl Irrigation Division have command area ranging from ten to a few hundred hectares only. The fact that available potential flatland is very limited in the state makes it even more significant to construct minor irrigation projects wherever possible to uplift the livelihood of the people, and thereby uplifting the economy of the state as a whole, thus, this project is proposed.

1.2 Brief History

Most of the farmers in the proposed Lau lui Minor Irrigation Project hail from Sailam Village and which are 30 km and 24 km, respectively from the proposed project site. The Lau lui project lies between Sailam Village and Thenzawl Town below NH 54 (Aizawl-Lunglei Road). Potential area along the River Lau lui was being cultivated as early as 1935, making it quite old. But due to lack of systematic irrigation facilities and proper land development works, all the potential areas along the Lau River cannot be properly utilized. It is felt necessary to divert water from nearby perennial small streams to provide irrigation as some of the potential area is located at higher elevation and cannot be commanded by the Lau River.

1.3 Current Status

Though a small irrigation facility was provided by the Minor Irrigation Department way back in 2004, it was not sufficient to serve majority of the farmers. The gross command area of this area is around 50 ha and water can be tapped for irrigation from the small Thingkhuang and Vawmkuak streams. The area has a flat and gentle slope and requires land leveling works. At present, the main crops grown are paddy, onion, etc. Presently, the farmers utilize only about 7 ha of land for cultivation of paddies during rainy seasons (*Kharif*). If proper irrigation facility is provided, the farmers will be able to cultivate even in winter, thereby increasing their income. After conducting a preliminary survey, walk through survey and workshop with farmers, DPR of Lau lui Minor Irrigation Project was framed.

1.4 Meteorology

Mizoram has mild and pleasant climate with temperatures ranging from 11 °C to 21 °C in winter and 20 °C to 30 °C in summer. The entire area is under the direct influence of southwest monsoon and rain occurs heavily from May to September. The average annual rainfall of the state is 2,557 mm.

There are no evapotranspiration data collected in Mizoram. The Central Water Commission (CWC) has recently installed a pan evaporator at its office complex in Aizawl. As per the collected data of CWC, the average monthly evaporation losses vary from 40 mm during January/December to 130 mm during April/May.

1.5 Soil Characteristics of the area

The characteristics of soil under the command area are given below.

Soil colour	Brown to dark brown – Clayey Humic Hapludults / Light yellow – Clay Aquic Dystrochrepts
Soil Texture	Fine loamy & Loamy Skeletal
Drainage class	Well drained
Erosion	Slight
Soil depth	Brown to dark brown – Clayey Humic Hapludults / Light yellow – Clay Aquic Dystrochrepts

Source: Mizoram Remote Sensing Application Center

Chapter 2 Survey & Investigation

2.1 General Report

The farmers of Lau lui area approached the department to help them improve their irrigation and farming system. Accordingly, a survey was conducted to assess the socio-economic status, farming and irrigation practices, etc. It was found out that the farmers could not cultivate their entire lands due to scarcity of water and absence of proper irrigation facilities. Many of them have also been practising the *jhum* system on the side to supplement their income. Hence, it was decided to do a preliminary survey on the project.

Initially, the farmers in the command area of the proposed project were identified and interaction was held with the department. A preparatory survey and workshop were held on the 28th and 29th to 31st of October 2014, respectively. These were done to involve the farmers as much as possible right from the stage of planning the project. Numerous field visits were jointly done with the farmers and preliminary survey works like water availability, command area, cropping practices, cropping pattern and system were done.

2.2 Engineering Survey

2.2.1 Discharge

Discharge in the *Rabi* season was surveyed by MID officers on 28 October 2014. The results of the survey are as follows:

Table 2.1 Discharge

Point	Discharge	Remarks
Thingkhuang lui	11.10 (l/s)	Charte-I is considered as Thingkhuanglui
Vawmkuak lui	11.58 (l/s)	Charte-II is considered as Thingkhuanglui

Source: Prepared by MID

2.2.2 Soil Classification

Field soil classification test was done by MID officers on 28th Oct, 2014. The result of the test was as follows. The detail is shown in Attachment (Preliminary technical site survey sheet).

Table 2.2 Soil Classification

Point	Classification	Remarks
On farm	Heavy Clay Silty loam	

Source: Prepared by MID

2.2.3 Topological Survey

Nil

2.2.4 Others

Nil.

Chapter 3 Hydrology

3.1 Characteristics of Catchment

The streams are from the hills area in southern area of Aizawl district in Mizoram. The stream flow is comparatively steep and shallow. The catchment area is hilly and covered with grass land.

3.2 Assessment of Water Availability:

3.2.1 Data Availability

(1) Rainfall Data

There is no rain gauge station maintained by any agency within the catchment area, but the proposed site is not far from Siaksuk Station where daily rainfall data, maintained by the State Agriculture Department of Mizoram, is available since 1998 for the water availability studies for the project.

(2) Discharge Data

There is no discharge site being maintained by any agency within the catchment area of the proposed scheme.

3.2.2 Water Availability Studies

(1) Monsoon period

In the present data scenario, the catchment under consideration is completely ungauged and no hydrological model for computing surface runoff based on catchment characteristics has been developed for this zone. Thus, efforts have been made for computing runoff of 75% dependable average daily flow during the monsoon period by simple rational method. The results of such are tabulated in Table 3.1 and Table 3.2. As observed from the tables, the minimum 75% dependable monthly flow of streams CA 1, CA 2, and CA 3 during the monsoon period is much more than the discharge required during the monsoon period.

(2) Non-monsoon period

Flow in the streams during the non-monsoon period was calculated based on specific discharge, as shown in Table 3.1, which was prepared by the JICA Study Team in 2015. As observed from the table, the flows of Laului, Thngkhuang lui, and Vawmkuak lui during the non-monsoon period are much more than the discharge required during non-monsoon period, respectively. Water balance during the monsoon and non-monsoon periods is shown in Table 3.1.

Table 3.1 Water Balance (Rabi season, Kanghlai MIP)

Area	Monsoon (Kharif) period					Non-monsoon (Rabi) period				
	Resource Q1 (m ³ /s)	Requirement in field Q2 (m ³ /s)	Irrigation efficiency E	Requirement at inlet Q3=Q2/E (m ³ /s)	Evaluation	Resource Q1 (m ³ /s)	Requirement in field Q2 (m ³ /s)	Irrigation efficiency E	Requirement at inlet Q3=Q2/E (m ³ /s)	Evaluation
CA 1-1	-	0.0054	0.45	0.0120	-	-	0.0018	0.45	0.0040	
CA 1-2	-	0.0008	0.45	0.0018	-	-	0.0003	0.45	0.0007	
Total (CA1)	0.3301	0.0062	0.45	0.0138	Q1>Q3:OK	0.0112	0.0021	0.45	0.0047	Q1>Q3:OK
CA 2-1	-	0.0031	0.45	0.0069	-	-	0.0010	0.45	0.0022	
CA 2-2	-	0.0035	0.45	0.0078	-	-	0.0012	0.45	0.0027	
Total (CA2)	0.4751	0.0066	0.45	0.0147	Q1>Q3:OK	0.0161	0.0022	0.45	0.0049	Q1>Q3:OK
CA3	1.6910	0.0036	0.45	0.0080	Q1>Q3:OK	0.0572	0.0012	0.45	0.0027	Q1>Q3:OK

Source: Prepared by MID

(3) Annual Flow

The annual flow of Lau lui is calculated to be 31.283 MCM.

3.3 Design Flood

The peak discharge for design flood passing through the diversion headworks is estimated using Dicken's Formula in which the value of C is taken as 14, as follows:

For Lau lui

$$Q = CA^{3/4}$$

Where,

Q = Flood discharge (cumecs)

C = Runoff coefficient

= 11 -14 North-indian hilly region

= 14

A = Catchment area in sq. km

= 21.00 km²

Thus, Q = 137.34 m³/s

Table 3.2 Average monthly Discharge Series for Lau Lui ; Khariff(Mid June to Mid Oct) using rainfall data of Sialsuk station

Month	2nd half of June		July		August		September		1st half of October		Average Discharge	Ave. discharge values arrange in descending order	Average rainfall m	Probability P = m/(N+1)	Return period T= 1/P (years)	
	Rainfall	Discharge	Rainfall	Discharge	Rainfall	Discharge	Rainfall	Discharge	Rainfall	Discharge						
1998	205.50	0.293	823.00	0.567	887.00	0.611	364.00	0.259	54.000	0.077	0.3613	2,333.5	0.491440	1	0.0667	15.000
1999	466.00	0.663	734.00	0.506	518.00	0.357	411.00	0.293	113.500	0.162	0.3960	2,242.5	0.476430	2	0.1333	7.500
2000	287.50	0.409	387.00	0.267	853.00	0.588	415.00	0.295	139.000	0.198	0.3513	2,081.5	0.405325	3	0.2000	5.000
2001	371.50	0.529	579.00	0.399	462.00	0.318	352.00	0.251	144.000	0.205	0.3403	1,908.5	0.398574	4	0.2667	3.750
2002	245.50	0.349	777.00	0.535	582.00	0.401	159.00	0.113	44.500	0.063	0.2924	1,808.0	0.395994	5	0.3333	3.000
2003	591.00	0.841	534.00	0.368	515.00	0.355	379.00	0.270	135.500	0.193	0.4053	2,154.5	0.361290	6	0.4000	2.500
2004	435.00	0.619	1,532.00	1.055	419.00	0.289	378.00	0.269	158.000	0.225	0.4914	2,922.0	0.351389	7	0.4667	2.143
2005	111.00	0.158	466.00	0.321	574.00	0.395	344.00	0.245	116.500	0.166	0.2570	1,611.5	0.351347	8	0.5333	1.875
2006	552.50	0.787	701.00	0.483	423.00	0.291	371.00	0.264	118.000	0.168	0.3986	2,165.5	0.351030	9	0.6000	1.667
2007	261.00	0.372	867.00	0.597	837.00	0.577	930.60	0.662	22.500	0.174	0.4764	3,018.1	0.358442	10	0.6667	1.500
2008	234.50	0.334	727.00	0.501	859.00	0.592	381.00	0.271	66.500	0.095	0.3584	2,268.0	0.340303	11	0.7333	1.364
2009	207.60	0.296	553.00	0.381	727.00	0.501	289.00	0.206	90.000	0.128	0.3022	1,866.6	0.302220	12	0.8000	1.250
2010	285.00	0.406	513.00	0.353	501.00	0.345	578.00	0.411	169.500	0.241	0.3514	2,046.5	0.292433	13	0.8667	1.154
1998	205.50	0.293	823.00	0.567	887.00	0.611	364.00	0.259	54.000	0.077	0.3613	2,333.5	0.491440	14	0.0667	15.000

Source: Prepared by MID

CA1

$$Q = \frac{\left(\frac{R}{1000}\right) \times A \times f \times 10^6}{\text{Nos of dais in month} \times 24 \times 60 \times 60}$$

Q = Discharge in cumecs
 R = Rainfall in mm
 f = Runoff co – efficient = 0.45
 A = Catchment area, sq. km = 4.10

Now, the 75% dependable annual flow = Annual flow with probability P = 0.75,

$$\text{i.e., } T = \frac{1}{1.75} = 1.33 \text{ years}$$

By interpolation between two successive values in the above table having T= 1.250 and 1.364 respectively, the 75% dependable flow is calculated as,

$$Q_{75} = 0.3301473 \text{ m}^3/\text{s}$$

CA2

$$Q = \frac{\left(\frac{R}{1000}\right) \times A \times f \times 10^6}{\text{Nos of dais in month} \times 24 \times 60 \times 60}$$

Q = Discharge in cumecs
 R = Rainfall in mm
 f = Runoff co – efficient = 0.45
 A = Catchment area, sq. km = 5.90

Now, the 75% dependable annual flow = Annual flow with probability P = 0.75,

$$\text{i.e., } T = \frac{1}{1.75} = 1.33 \text{ years}$$

By interpolation between two successive values in the above table having $T = 1.250$ and 1.364 respectively, the 75% dependable flow is calculated as,

$$Q_{75} = 0.47509 \text{ m}^3/\text{s}$$

CA3

$$Q = \frac{\left(\frac{R}{1000}\right) \times A \times f \times 10^6}{\text{Nos of dais in month} \times 24 \times 60 \times 60}$$

Q = Discharge in cumecs

R = Rainfall in mm

f = Runoff co – efficient = 0.45

A = Catchment area, sq. km = 21.0

Now, the 75% dependable annual flow = Annual flow with probability $P = 0.75$,

$$\text{i.e., } T = \frac{1}{1.75} = 1.33 \text{ years}$$

By interpolation between two successive values in the above table having $T = 1.250$ and 1.364 respectively, the 75% dependable flow is calculated as,

$$Q_{75} = 1.6909983 \text{ m}^3/\text{s}$$

Table 3.3 Discharge for Lau lui; rabi (monsoon: Mid Oct. to Mid Feb.)

No	Name of River Basin	AREA (Sq Km)	Rainfall (75%) (mm)	Interception loss (mm)	Evaporation loss (mm)	Balance (mm)	Ground water recharge (mm)	Surface water (mm)	Surface water (MCM)	Periodic water Resource Availability											
										June -Sept (Monsoon) 80.7%			Oct-Nov (Post -Monsoon) 13.1%			Dec-March (Winter) 3.0%			April -May (Pre-Monsoon) 3.2%		
										121 days	Specific discharge		61 days	Specific discharge		119 days	Specific discharge		61 days	Specific discharge	
										MCM	(m3/s)	(m3/s/km2)	MCM	(m3/s)	(m3/s/km2)	MCM	(m3/s)	(m3/s/km2)	MCM	(m3/s)	(m3/s/km2)
1	Langkaih lui	376	1,822	91	1,109	622	62	560	211	170	16.261	0.04325	28	5.313	0.01413	6	0.584	0.00155	7	1.328	0.00353
2	Sazai Lui	940	1,828	91	1,041	696	70	626	588	475	45.435	0.04834	77	14.610	0.01554	18	1.751	0.00186	19	3.605	0.00384
3	Khawthlangtuipui (Karnaphuli)	251	2,067	103	1,041	923	92	831	209	168	16.070	0.06402	27	5.123	0.02041	6	0.584	0.00232	7	1.328	0.00529
4	Kawrpui	371	2,188	109	1,175	904	90	814	302	244	23.339	0.06291	40	7.590	0.02046	9	0.875	0.00236	10	1.897	0.00511
5	Teirei	773	1,888	94	1,093	701	70	631	488	394	37.687	0.04875	64	12.143	0.01571	15	1.459	0.00189	16	3.036	0.00393
6	Tut	829	2,171	109	1,126	936	94	842	698	563	53.853	0.06496	91	17.266	0.02083	21	2.042	0.00246	22	4.174	0.00504
7	Kau	249	2,250	113	999	1,138	114	1,024	255	206	19.705	0.07914	33	6.261	0.02515	8	0.778	0.00312	8	1.518	0.00610
8	De	419	2,309	115	1,027	1,167	117	1,050	440	355	33.957	0.08104	58	11.005	0.02626	13	1.264	0.00302	14	2.656	0.00634
9	Tuichawng	1,234	2,212	111	1,066	1,035	104	931	1,149	927	88.671	0.07186	150	28.461	0.02306	34	3.307	0.00268	37	7.020	0.00569
10	Sekulh lui	251	2,204	110	1,043	1,051	105	946	237	192	18.365	0.07317	31	5.882	0.02343	7	0.681	0.00271	8	1.518	0.00605
11	Tlawng (Dhaleshwari)	1,500	2,273	114	1,110	1,049	105	944	1,416	1,143	109.332	0.07289	185	35.102	0.02340	42	4.085	0.00272	45	8.538	0.00569
12	Mat	1,010	2,222	111	1,064	1,047	105	942	951	768	73.462	0.07273	125	23.717	0.02348	29	2.821	0.00279	30	5.692	0.00564
13	Ser lui	618	2,265	113	1,095	1,057	106	951	588	474	45.340	0.07337	77	14.610	0.02364	18	1.751	0.00283	19	3.605	0.00583
14	Tuirial	2,016	2,224	111	1,148	965	97	868	1,750	1,412	135.063	0.06700	229	43.450	0.02155	52	5.058	0.00251	56	10.625	0.00527
15	Tuivawl	856	2,199	110	1,126	963	96	867	742	599	57.296	0.06694	97	18.405	0.02150	22	2.140	0.00250	24	4.554	0.00532
16	Tuival	1,456	2,102	105	1,137	860	86	774	1,127	909	86.949	0.05972	148	28.081	0.01929	34	3.307	0.00227	36	6.831	0.00469
17	Tuipui	936	1,930	97	990	843	84	759	710	573	54.809	0.05856	93	17.646	0.01885	21	2.042	0.00218	23	4.364	0.00466
18	Tuichang	1,653	2,096	105	1,009	982	98	884	1,461	1,179	112.775	0.06822	191	36.240	0.02192	44	4.279	0.00259	47	8.918	0.00539
19	Tiau	992	1,807	90	934	783	78	705	699	564	53.949	0.05438	92	17.456	0.01760	21	2.042	0.00206	22	4.174	0.00421
20	Chhintuipui (Kolodyne)	2,159	2,166	108	1,006	1,052	105	947	2,045	1,650	157.828	0.07310	268	50.850	0.02355	61	5.933	0.00275	65	12.333	0.00571
21	Ngengpui Lui	717	2,293	115	991	1,187	119	1,068	766	618	59.114	0.08245	100	18.974	0.02646	23	2.237	0.00312	25	4.743	0.00662
22	Palak Lui	136	2,194	110	1,060	1,024	102	922	125	101	9.661	0.07104	16	3.036	0.02232	4	0.389	0.00286	4	0.759	0.00558
23	Tuisih lui	249	2,121	106	1,060	955	96	859	214	173	16.548	0.06646	28	5.313	0.02134	6	0.584	0.00234	7	1.328	0.00533
24	Tinglo lui	283	2,190	110	1,060	1,020	102	918	260	210	20.087	0.07098	34	6.451	0.02280	8	0.778	0.00275	8	1.518	0.00536
25	Mar Lui	359	2,216	111	1,174	931	93	838	301	243	23.244	0.06475	39	7.400	0.02061	9	0.875	0.00244	10	1.897	0.00529
26	Barak	118	2,021	101	1,095	825	83	742	88	71	6.791	0.05755	11	2.087	0.01769	3	0.292	0.00247	3	0.569	0.00482
27	Phairang	331	2,379	119	1,066	1,194	119	1,075	356	287	27.453	0.08294	47	8.918	0.02694	11	1.070	0.00323	11	2.087	0.00631
	GRAND TOTAL	21,082							18,175	14,668	1,403		2,379	451		545	53		583	111	

source: JICA Study Team based on MID irrigation masterplan (1995)

CA 1(Thngkhuang lui)_non-monsoon

Catchment Area 4.1 (km²)

Specific Discharge 0.00272 (m³/s/km²)

Discharge 0.01117 (m³/s)

CA 2(Vawmkuank lui)_non-monsoon

Catchment Area 5.9 (km²)

Specific Discharge 0.00272 (m³/s/km²)

Discharge 0.01607 (m³/s)

CA 3 (Laului)_non-monsoon

Catchment Area 21.0 (km²)

Specific Discharge 0.00272 (m³/s/km²)

Discharge 0.05719 (m³/s)

Chapter 4 Design Features

4.1 General

Based on the analysis of hydrology for water availability, the command area available and topography, it was decided to go for channel line irrigation by diverting the streams and then carrying the water under gravity flow to the command area and distributing it to the respective individual plots. A detailed survey of the channel alignment along the contour was conducted and the cross sections of some locations were taken for planning and design of the conveyance and distribution system.

Accordingly, the hydraulic and structural designs were made considering the following:

4.2 Design of rectangular channel section (main canal: 5 nos.) Requirement of Water in the field

Table 4.1 Summary of discharge required in the field

Name	Qf : Discharge required in the field (m ³ /s)
Main canal 1-1	0.0120
Main canal 1-2	0.0018
Main canal 2-1	0.0069
Main canal 2-2	0.0078
Main canal 3	0.0080

Source: Prepared by MID

For main canal 1-1

Q_i = Discharge required at the pipe inlet

Q_f = Discharge required in the field

For CA1-1

Discharge requires in the field

$$Q_f = 0.0054 \text{ m}^3/\text{s} \text{ (Kharif period)}$$

Irrigation efficiency

$$E = 45 \% \text{ (Pipe line)}$$

Discharge required at the pipe inlet

$$Q_i = Q_f/E/100 = 0.0120 \text{ m}^3/\text{s}$$

Maximum discharge required for the pipe line has been thus calculated. (Ref to Chapter 3 and Chapter 5)

For main canal 1-2

Q_i = Discharge required at the pipe inlet

Q_f = Discharge required in the field

For CA1-2

Discharge requires in the field

$$Q_f = 0.0008 \text{ m}^3/\text{s} \text{ (Kharif period)}$$

Irrigation efficiency

$$E = 45 \% \text{ (Pipe line)}$$

Discharge required at the pipe inlet

$$Q_i = Q_f/E/100 = 0.0018 \text{ m}^3/\text{s}$$

Maximum discharge required for the pipe line has been thus calculated. (Ref to Chapter 3 and Chapter 5)

For main canal 2-1

Q_i = Discharge required at the pipe inlet

Q_f = Discharge required in the field

For CA2-1

Discharge requires in the field

$$Q_f = 0.0031 \text{ m}^3/\text{s} \text{ (Kharif period)}$$

Irrigation efficiency

$$E = 45 \% \quad (\text{Pipe line})$$

Discharge required at the pipe inlet

$$Q_i = Q_f/E/100 = 0.0069 \text{ m}^3/\text{s}$$

Maximum discharge required for the pipe line has been thus calculated. (Ref to Chapter 3 and Chapter 5)

For main canal 2-2

Q_i = Discharge required at the pipe inlet

Q_f = Discharge required in the field

For CA2-2

Discharge requires in the field

$$Q_f = 0.0035 \text{ m}^3/\text{s} \quad (\text{Kharif period})$$

Irrigation efficiency

$$E = 45 \% \quad (\text{Pipe line})$$

Discharge required at the pipe inlet

$$Q_i = Q_f/E/100 = 0.0078 \text{ m}^3/\text{s}$$

Maximum discharge required for the pipe line has been thus calculated. (Ref to Chapter 3 and Chapter 5)

For main canal 3

Q_i = Discharge required at the pipe inlet

Q_f = Discharge required in the field

For CA3

Discharge requires in the field

$$Q_f = 0.0036 \text{ m}^3/\text{s} \quad (\text{Kharif period})$$

Irrigation efficiency

$$E = 45 \% \quad (\text{Pipe line})$$

Discharge required at the pipe inlet

$$Q_i = Q_f/E/100 = 0.0080 \text{ m}^3/\text{s}$$

Maximum discharge required for the pipe line has been thus calculated. (Ref to Chapter 3 and Chapter 5)

4.3 Design of Channel

Table 4.2 Summary of Design of Channel

Name	Depth (m)	Width (m)	Slope	v (m/s)
Main canal 1-1	0.20	0.30	1:40	1.15
Main canal 1-2	0.20	0.30	1:10	1.20
Main canal 2-1	0.20	0.30	1:50	0.92
Main canal 2-2	0.20	0.30	1:10	1.34
Main canal 3	0.20	0.30	1:80	0.80

Source: Prepared by MID

For CA 1-1 main channel 1-1

Required Conveyance Capacity = 0.012 m³/s

Design cross section of channel = Rectangular

Using equation $Q = a \times v$

Where $a = \text{Cross section area} = 2d^2$

$v = \text{Velocity of flow} = (1/n) \cdot R^{2/3} \cdot S^{1/2}$

Where $R = \text{Hydraulic Radius} = d/2$ for most economical section

$S = \text{Channel bed slope} = 1:40$

$n = \text{Roughness co-efficient} = 0.015$ (for cement concrete channel)

Therefore

$$d^{8/3} = 0.00090$$

$$d = 0.07219 \text{ m}$$

$$\text{Say } d = 0.10 \text{ m}$$

Therefore

$$\begin{aligned} \text{Width of channel } b &= 2d &= & 20 \text{ m} \\ \text{Providing free board of 10cm,} \\ \text{depth of channel } D &= & 0.1 + d \\ &= & 0.20 \text{ m} \end{aligned}$$

Therefore the following inside dimension may be adopted for construction of diversion channel

Depth of channel	=	0.20 m
Width of channel	=	0.30 m
Channel bed slope	=	1:40
Flow velocity	=	1.15 m/s

For CA 1-2 main channel 1-2

$$\begin{aligned} \text{Required Conveyance Capacity} &= & 0.018 \text{ m}^3/\text{s} \\ \text{Design cross section of channel} &= & \text{Rectangular} \\ \text{Using equation } Q &= & a \times v \\ \text{Where } a &= \text{Cross section area} &= & 2d^2 \\ v &= \text{Velocity of flow} &= & (1/n) \cdot R^{2/3} \cdot S^{1/2} \\ \text{Where } R &= \text{Hydrolic Radius} &= & d/2 \text{ for most economical section} \\ S &= \text{Channel bed slope} &= & 1:10 \\ n &= \text{Roughness co-efficient} &= & 0.015 \text{ (for cement concrete channel)} \end{aligned}$$

Therefore

$$\begin{aligned} d^{8/3} &= & 0.00007 \\ d &= & 0.02733 \text{ m} \\ \text{Say } d &= & 0.10 \text{ m} \end{aligned}$$

Therefore

$$\begin{aligned} \text{Width of channel } b &= 2d &= & 20 \text{ m} \\ \text{Providing free board of 10cm,} \\ \text{depth of channel } D &= & 0.1 + d \\ &= & 0.20 \text{ m} \end{aligned}$$

Therefore the following inside dimension may be adopted for construction of diversion channel

Depth of channel	=	0.20 m
Width of channel	=	0.30 m
Channel bed slope	=	1:10
Flow velocity	=	1.20 m/s

For CA 2-1 main channel 2-1

$$\begin{aligned} \text{Required Conveyance Capacity} &= & 0.0069 \text{ m}^3/\text{s} \\ \text{Design cross section of channel} &= & \text{Rectangular} \\ \text{Using equation } Q &= & a \times v \\ \text{Where } a &= \text{Cross section area} &= & 2d^2 \\ v &= \text{Velocity of flow} &= & (1/n) \cdot R^{2/3} \cdot S^{1/2} \\ \text{Where } R &= \text{Hydrolic Radius} &= & d/2 \text{ for most economical section} \\ S &= \text{Channel bed slope} &= & 1:50 \\ n &= \text{Roughness co-efficient} &= & 0.015 \text{ (for cement concrete channel)} \end{aligned}$$

Therefore

$$\begin{aligned} d^{8/3} &= & 0.00058 \\ d &= & 0.06117 \text{ m} \\ \text{Say } d &= & 0.10 \text{ m} \end{aligned}$$

Therefore

$$\begin{aligned} \text{Width of channel } b &= 2d &= & 20 \text{ m} \\ \text{Providing free board of 10cm,} \\ \text{depth of channel } D &= & 0.1 + d \\ &= & 0.20 \text{ m} \end{aligned}$$

Therefore the following inside dimension may be adopted for construction of diversion channel

Depth of channel	=	0.20	m
Width of channel	=	0.30	m
Channel bed slope	=	1:50	
Flow velocity	=	0.92	m/s

For CA 2-2 main channel 2-2

Required Conveyance Capacity	=	0.078	m ³ /s
Design cross section of channel	=	Rectangular	
Using equation	Q	=	a × v
Where	a = Cross section area	=	2d ²
	v = Velocity of flow	=	(1/n)*R ^{2/3} *S ^{1/2}
Where	R = Hydraulic Radius	=	d/2 for most economical section
	S = Channel bed slope	=	1:20
	n = Roughness co-efficient	=	0.015 (for cement concrete channel)

Therefore

$$d^{8/3} = 0.00042$$

$$d = 0.05394 \text{ m}$$

Say $d = 0.10 \text{ m}$

Therefore

$$\text{Width of channel } b = 2d = 20 \text{ m}$$

Providing free board of 10cm,
depth of channel $D = 0.1 + d = 0.20 \text{ m}$

Therefore the following inside dimension may be adopted for construction of diversion channel

Depth of channel	=	0.20	m
Width of channel	=	0.30	m
Channel bed slope	=	1:20	
Flow velocity	=	1.34	m/s

For CA 3 : Main channel 3

Required Conveyance Capacity	=	0.0080	m ³ /s
Design cross section of channel	=	Rectangular	
Using equation	Q	=	a × v
Where	a = Cross section area	=	2d ²
	v = Velocity of flow	=	(1/n)*R ^{2/3} *S ^{1/2}
Where	R = Hydraulic Radius	=	d/2 for most economical section
	S = Channel bed slope	=	1:80
	n = Roughness co-efficient	=	0.015 (for cement concrete channel)

Therefore

$$d^{8/3} = 0.00085$$

$$d = 0.07061 \text{ m}$$

Say $d = 0.10 \text{ m}$

Therefore

$$\text{Width of channel } b = 2d = 20 \text{ m}$$

Providing free board of 10cm,
depth of channel $D = 0.1 + d = 0.20 \text{ m}$

Therefore the following inside dimension may be adopted for construction of diversion channel

Depth of channel	=	0.20	m
Width of channel	=	0.30	m
Channel bed slope	=	1:80	
Flow velocity	=	0.80	m/s

Chapter 5 Irrigation Planning Agriculture Practices & Cropping Pattern

5.1 Cropping Pattern for Ngengrual Minor Irrigation Scheme

In Mizoram, where land is limited, self-sufficiency in food production can be achieved by utilization of the two cropping seasons, which is only possible by assured irrigation. Normally, the *Rabi* season starts in mid-October and ends in mid-February while the *Kharif* season starts in mid-June and ends in mid-October. Although the average rainfall in Mizoram for the last five years is 2,455.80 mm, rainfall distribution is not uniform during all the seasons and a cultivator may need water at regular intervals, which may not be fulfilled by rainfall alone. Hence, proper crop planning is practical only when assured irrigation is available to the farmers, provided other inputs are available for all seasons. Keeping in view the availability of assured irrigation during the *Kharif*/monsoon and *Rabi*/non-monsoon seasons, a cropping pattern, along with the area proposed to be irrigated in each season in the command area, is given in Table 5.1 and Table 5.2. Agriculture Action Plan for achieving the cropping pattern is shown in Table 5.1.

Table 5.1 Cropping Pattern of Dumlui MIP

Current Crop Proportion

Champai: Kanghai	Month												Area	
Current Cropping Pattern													(ha)	
Name of Crop	J	F	M	A	M	J	J	A	S	O	N	D		
Paddy (local)														12.2
Kharif season														12.2
Leafy Mustard														0.0
Rabi season														0.0
Total														12.2

Proposed Crop Proportion

Kolasib: Dmului	Month												Area	
Proposed Cropping Pattern													(ha)	
Name of Crop	J	F	M	A	M	J	J	A	S	O	N	D		
Paddy (Local)														12.2
Kharif season														12.2
Mixed Crop: Maize & French bean														6.2
Leafy Mustard														6.0
Rabi season														12.2
Total														24.4

Note: [Mixed Crop: Maize and French bean] Area of Maize and French bean is Maize 1.0 ha and French bean 0.6 ha into 1.0 ha (1.6ha into 1.0ha).

Source: Prepared by MID

Table 5.2 Proposed Cropping Area

SI. No.	Crops	Command Area (ha)					Total
		CA 1-1	CA 1-2	CA 2-1	CA 2-2	CA 3	
	Gross Command Area	6.1	0.9	3.3	3.8	3.9	18.0
	Culturable Command Area	4.3	0.6	2.2	2.5	2.6	12.2
A.	Karif Crops (Mid Jun. to Mid Oct.)						
1	Paddy (local)	4.3	0.6	2.2	2.5	2.6	12.2
	Total	4.3	0.6	2.2	2.5	2.6	12.2
B	Rabi Crops (Mid Oct. to Mid Feb.)						
1	Mixed Crop: Maize & French bean	2.2	0.3	1.1	1.3	1.3	6.2
2	Leafy Coriander	2.1	0.3	1.1	1.2	1.3	6.0
Total.	Total	4.3	0.6	2.2	2.5	2.6	12.2

Source: Prepared by MID

5.2 Crop Water Requirement

Crop water requirement is derived based on the proposed cropping pattern for Dumlui Minor Irrigation Project command area. Taking culturable command area as 4.2 ha, duration of crop and respective water requirement of various crops under consideration have been derived and shown in Table 5.5. The discharge required for various crops are dispersed according to their cropping season as mentioned in Table 5.4.

Table 5.3 Crop Water Requirement

Sl. No.	Crops	Req. (m)	Duration (day)	Req. (mm/d)	Discharge Required in cumecs					Total Discharge (m ³ /s)	Duty (ha/m ³ /s)
					CA 1-1 (m ³ /s)	CA 1-2 (m ³ /s)	CA 2-1 (m ³ /s)	CA 2-2 (m ³ /s)	CA 3 (m ³ /s)		
A. Karif Crops (Mid Jun. to Mid Oct.)											
1	Paddy (Local)	1.60	140	12	0.0060	0.0008	0.0031	0.0035	0.0036	0.0169	720
B. Rabi Crops (Mid Oct. to Mid Feb.)											
1	Mixed Crop: Maize & French bean	0.20	50	5	0.0013	0.0002	0.0006	0.0008	0.0008	0.0036	1,728
2	Leafy Mustard	0.40	195	3	0.0007	0.0001	0.0004	0.0004	0.0005	0.0021	2,880
Total					0.0020	0.0003	0.0010	0.0012	0.0012	0.0057	

Note: 1. Mixed crop: Maize & French bean req. 0.60m, duration 120 days, req. 5 mm/d

Area of Maize and French bean is Maize 1.0 ha and French bean 0.6 ha into 1.0 ha (1.6ha into 1.0ha).

Source: Prepared by MID

Table 5.4 Total Water Requirement

Command Area CA1-1

Sl. No.	Crops	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
A. Karif Crops (Mid Jun. to Mid Oct.)														
1	Paddy (Local)							0.0060						
B. Rabi Crops (Mid Oct. to Mid Feb.)														
1	Mixed Crop: Maize & French bean											0.0013		
2	Leafy Mustard											0.0007		
Total Karif								0.0060						
Rabi												0.0020		

Note: The total discharge required for monsoon period comes out to be $Q = 0.0060$ cumecs

The total discharge required for non-monsoon period comes out to be $Q = 0.0020$ cumecs

Command Area CA1-2

Sl. No.	Crops	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
A. Karif Crops (Mid Jun. to Mid Oct.)														
1	Paddy (Local)							0.0008						
B. Rabi Crops (Mid Oct. to Mid Feb.)														
1	Mixed Crop: Maize & French bean											0.0002		
2	Leafy Mustard											0.0001		
Total Karif								0.0060						
Rabi												0.0003		

Note: The total discharge required for monsoon period comes out to be $Q = 0.0008$ cumecs

The total discharge required for non-monsoon period comes out to be $Q = 0.0003$ cumecs

Command Area CA2-1

Sl. No.	Crops	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
A. Karif Crops (Mid Jun. to Mid Oct.)														
1	Paddy (Local)							0.0031						
B. Rabi Crops (Mid Oct. to Mid Feb.)														
1	Mixed Crop: Maize & French bean											0.0006		
2	Leafy Mustard											0.0004		
Total Karif								0.0031						
Rabi												0.0010		

Note: The total discharge required for monsoon period comes out to be $Q = 0.0031$ cumecs

The total discharge required for non-monsoon period comes out to be $Q = 0.0010$ cumecs

Command Area CA2-2

Sl. No.	Crops	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
A.	Karif Crops (Mid Jun. to Mid Oct.)													
1	Paddy (Local)							0.0035						
B.	Rabi Crops (Mid Oct. to Mid Feb.)													
1	Mixed Crop: Maize & French bean											0.0008		
2	Leafy Mustard											0.0004		
Total	Karif							0.0035						
	Rabi											0.0012		

Note: The total discharge required for monsoon period comes out to be $Q = 0.0035$ cumecs

The total discharge required for non-monsoon period comes out to be $Q = 0.0012$ cumecs

Command Area CA3

Sl. No.	Crops	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
A.	Karif Crops (Mid Jun. to Mid Oct.)													
1	Paddy (Local)							0.0036						
B.	Rabi Crops (Mid Oct. to Mid Feb.)													
1	Mixed Crop: Maize & French bean											0.0008		
2	Leafy Mustard											0.0005		
Total	Karif							0.0036						
	Rabi											0.0012		

Note: The total discharge required for monsoon period comes out to be $Q = 0.0036$ cumecs

The total discharge required for non-monsoon period comes out to be $Q = 0.0012$ cumecs

Source: Prepared by MID

Table 5.5 Water requirement for each crop

Crops	Water Requirement (m) a.	Duration (day) b.	Water Requirement (mm/d)
			c.=a./b.*1000
Group 1	Paddy	1.60	12
Group 2	Cabbage	0.45	5
	Knol-khol (Kohlrabi)	0.45	5
Group 3	Leaf Mustard	0.20	4
	Seamum	0.30	4
	Lettuce	0.30	4
	Potato	0.35	4
	Table beet	0.40	4
	Maize	0.45	4
	Group 4	Cow Pea	0.25
Lady's finger		0.30	3
Soya Bean/French Bean		0.25	3
Field pea		0.25	3
Chilly		0.40	3
Brinjal		0.35	3
Tomato		0.40	3
Broccoli		0.30	3
Cauliflower		0.30	3
Coriander	0.30	3	
Group 5	Onion	0.30	2

Source: Prepared by MID

Chapter 6 Cost Estimate

The cost estimates have been framed to show the probable cost for the execution of the Dumlui Minor Irrigation Project as per the actual requirement and measurement at the proposed site. The rates adopted for various items are based on the SOR 2013 of Mizoram PWD.

Table 6.1 Abstract of Cost

Sl.No	MINOR HEAD	UNIT	AMOUNT
1	DIRECT CHARGES		
	I - Works	INR	3,920,200.00
	II - Establishment - 2% of I-works	INR	78,404.00
	III - Ordinary Tools & Plants	INR	57,000.00
	IV - Suspense	INR	Nil
	V - Receipt & Recoveries	INR	Nil
	Sub-Total	INR	4,055,604.00
2	INDIRECT CHARGES		
	I - Capitalized value of abatement of land revenue	INR	Nil-
	II - Audit and Account@ 1%I-Works	INR	39,202.00
	Sub-Total	INR	39,202.00
	Gross estimated cost of the project	INR	4,094,806.00
	Construction of Approach Road	INR	113,200.00
	Total Cost	INR	4,208,006.00
	SAY	INR	4,208,000.00

Source: Prepared by MID

Checked by

Counter Signed by

(K. LALSANGZUALA)

(BEIZAWZI T AZYU)

Chapter 7 Benefit Cost Ratio

7.1 Direct and Indirect Benefits

The scheme envisages direct as well as indirect benefits to 23 farmers having WRC area within the command area of the project. These 23 families, who otherwise have to slash down the forest area for *jhumming*, will have a sustainable farming system as an alternative to traditional *jhum* system of cultivation after completion of the project. Thus, the project will contribute in maintaining ecological balance through conservation of forest by families involved in *jhumming* every year.

7.2 Benefit-Cost Ratio

The B/C ratio for the scheme has been worked out by considering the net annual value of agricultural production and the annual cost. Agricultural production before irrigation has been considered as per the cropping pattern presently practised and the data collected from the local farmers in the command area of the scheme.

The annual yield per hectare of various crops and its prices has been collected from the Agriculture Department and Department of Economics and Statistics, Government of Mizoram.

On the implementation of the scheme, the potential area for cultivation increases to 9.0 ha and the proposed cropping pattern envisages utilization of two seasons, namely, *Kharif* and *Rabi* season, resulting in a maximum potential utility area of 11.5 ha. The total annual benefit accrued post project has been derived in monetary terms.

Table 7.1 Calculation of Benefit Cost Ratio

**CALCULATION OF BENEFIT COST RATIO
LAULUI MINRO IRRIGATION PROJECT
AIZAWL DISTRICT**

1. Total Estimated cost of the Project 42.08 (lakhs)

2. Total cost of the headworks

a1. Diversion weir (3 nos.) 6.73 (lakhs)

a2. Intake (0 nos.) 0 (lakhs)

a3. Desiltation tank (3 nos.) 0.79 (lakhs)

Total headwaorks 7.52 (lakhs)

3. GCA 18.0 (ha)

4. CCA 12.2 (ha)

SN	Description	Pre-Project (lakhs)	Post-Project (lakhs)
1	a. Gross Receipts	9.56	46.25
	Gross annual receipts (estimated value of farm produce)		
	b. Expenses (Cost of Production)	3.03	9.02
	c. Net Value of Farm Produce (a.-b.)	6.53	37.23
2	d1. Estimated Annual Benefits after Project Completion (Post benefits - Pre benefits)	-	30.70
3	Annual Cost		
	d2. Interest on capital @ 10% of total cost of the project	-	4.21
	e. Depreciation of the project @ 4% of the project cost	-	1.68
	f. Annual operation & maintenance const @ Rs 1,175.00 per ha of CCA	-	0.14
	g. Maintenance cost of head works @ 1% of cost of head works	-	0.08
	h. Total Annual Cost (Σ d2. ~g.)	-	6.11
	i. Benefit Cost Ratio (d1./h.)	-	5.02
	j. Potential to be Created (ha)		6.7
	k. Total Project Cost per Hectare (1./4.)		3.45

Source: Prepared by MID

Table 7.2 Estimated value of crop produce before implementation

Laului Minor Irrigation Project, Aizawl, Sailam

Gross Command Area

18.0 ha

Culturable Command Area

12.2 ha

SN	Name of crop	Area (ha)	Duration (day)	Production		Produce				Net Profit (Rs)
				Cost (Rs/ha)	Total (Rs)	Yield (ton/ha)	Total Yield (ton)	Rate (Rs/ton)	Total Value (Rs)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
A. Karif Crops (Mid Jun. to Mid Oct.)										
1	Paddy	12.2	140	24,825	302,865	2.800	34.16	28,000	956,480	653,615
B. Rabi Crops (Mid Oct. to Mid Feb.)										
1	Leafy Mustard	0.0	50							
Total										
		12.2			302,865				956,480	653,615

District Agriculture Officer
Serchhip District
Department of Agriculture

Executive Engineer
Aizawl Irrigation Division
Aizawl

Table 7.3 Estimated value of crop produce after implementation

Laului Minor Irrigation Project, Aizawl, Sailam

Gross Command Area

18.0 ha

Culturable Command Area

12.2 ha

SN	Name of crop	Area (ha)	Duration (day)	Production		Produce				Net Profit (Rs)
				Cost (Rs/ha)	Total (Rs)	Yield (ton/ha)	Total Yield (ton)	Rate (Rs/ton)	Total Value (Rs)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
A. Karif Crops (Mid Jun. to Mid Oct.)										
1	Paddy	12.20	140	30,417	371,087	3.600	43.92	28,000	1,229,760	858,673
B. Rabi Crops (Mid Oct. to Mid Feb.)										
1	Mixed Crop: Maize & French Bean									
	Maize	6.20	125	20,863	129,351	2.800	17.36	18,000	312,480	183,129
	French Bean	3.72	115	37,753	140,441	8.000	29.76	31,000	922,560	782,119
2	Leafy Coriander	6.00	125	43,521	261,126	20.000	120.00	18,000	2,160,000	1,898,874
Total										
		28.12			902,005				4,624,800	3,722,795

Area of Maize and French bean is Maize 6.0 ha and French bean 3.6 ha into 6.0 ha (9.6 ha into 6.0 ha).

Remarks: Duration of French bean is same as Soya bean.

District Agriculture Officer
Serchhip District
Department of Agriculture

Executive Engineer
Aizawl Irrigation Division
Aizawl

Table 7.4 Crop Budget and Income for Paddy, OFC & Others before Implementation

Description	Year	Paddy	Maize	Green Chilli	Onion	Leaf Mustard	Leaf Coriander	Cabbage	Cauliflower	Potato	Carrot	Beat Root	Tomato	Pumpkin	Field Pea	Soyabean	Pigeon Pea	French bean
1. Unit Cost of Materials / Others	Units	Paddy	Maize	Green Chilli	Onion	Leaf Mustard	Leaf Coriander	Cabbage	Cauliflower	Potato	Carrot	Beat Root	Tomato	Pumpkin	Field Pea	Soyabean	Pigeon Pea	French bean
1 Seed	Rs./Kg	100	120	416	4,500	110	510	520	1,300	50	565	260	861	358	98	110	120	202
2 Fertilizer: Urea	Rs./Kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3 Fertilizer: SSP	Rs./Kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 Fertilizer: MOP	Rs./Kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 Organic Manure	Rs./Kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6 herbicide	Rs./Ltr.	300	300	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
7 Pesticides	Rs./Ltr.	100	60	60	60	100	60	100	100	60	60	60	100	60	100	60	60	100
8 Cattle-draft	Rs./ha	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625
9 Others cost / transport	Rs./ha	1,500	900	900	1,200	900	900	900	900	1,500	1,000	1,200	1,200	1,500	900	900	900	900
10 Machinery cost-harvest/threshing	Rs./ha	1,800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11 Supports (pole)	Rs./pole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
2. Requirements of Materials																		
1 Materials-Seed	Kg/ha	45	20.0	0.6	3.0	20	20	0.5	0.6	1,200	4	7	0.2	1.0	45	70	20	25
2 Fertilizer: Urea	Kg/ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3 Fertilizer: SSP	Kg/ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4 Fertilizer: MOP	Kg/ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5 Manure	ton/ha	20	25	25	20	20	20	25	25	25	10	25	10	5	5	5	5	5
6 herbicide	Unit/ha	1	2	2	2	-	2	2	1	1	1	1	1	1	1	1	1	1
7 Pesticides	Unit/ha	2	5	5	1	-	2	2	2	1	1	1	2	1	1	1	1	2
8 Animal-Drafting: Plough etc.	Times/ha	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9 Others, Transport	Times/ha	5	3	20	5	10	10	5	5	3	3	3	10	5	2	2	2	10
10 Machinery cost-harvest/threshing	Times/ha	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11 Supports (pole)	Bundle/ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	300
Total of Material Cost (A)	Rs./ha	16,925	8,625	21,375	22,385	13,825	21,825	7,785	8,205	64,660	8,045	8,205	15,097	10,583	9,035	12,285	6,985	19,975
3. Unit cost of Labour																		
1 Labour	Rs./day	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
4. Labour Requirement																		
a) Land preparation																		
1 Drains	Md/ha	5	10	10	10	5	5	5	5	10	5	5	12	-	5	5	5	5
2 Cleaning	Md/ha	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3 Ploughing & Harrowing	Md/ha	8	12	12	12	15	10	15	15	10	15	10	15	12	12	12	12	12
5 Plastering bunds	Md/ha	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7 Nursery preparation	Md/ha	2	-	6	15	-	-	10	10	-	-	-	50	-	-	-	-	-
b) Planting																		
1 Digging holes	Md/ha	-	10	30	15	5	5	10	10	10	10	5	30	5	5	5	5	5
2 Filling holes or/ Transplanting	Md/ha	24	9	40	15	5	5	15	15	5	5	5	30	5	5	5	5	5
3 Irrigation	Md/ha	7	10	15	15	10	10	10	10	10	10	5	10	5	5	5	5	5
c) Maintenance																		
1 Weeding	Md/ha	24	30	40	20	40	30	40	40	30	30	30	60	25	25	25	25	25
2 Irrigation	Md/ha	8	10	30	10	25	20	20	20	-	20	20	30	12	12	10	10	15
3 Fertilize application	Md/ha	8	10	25	10	12	12	12	12	10	12	12	20	6	12	10	12	12
4 Pest and disease control	Md/ha	6	6	20	10	6	6	6	6	6	6	6	10	6	6	6	6	6
d) Harvesting																		
1 Harvesting	Md/ha	34	20	70	34	80	80	25	25	50	50	34	60	30	30	20	20	80
2 Processing / Threshing / Bagging	Md/ha	24	10	40	24	40	40	15	15	10	40	24	30	10	20	15	15	40
Total Labour (including family labour)	Md/ha	158	142	343	195	248	228	188	188	176	208	161	362	121	142	123	125	215
Total Labour cost (B)	Rs./ha	39,500	35,500	85,750	48,750	62,000	57,000	47,000	47,000	44,000	52,000	40,250	90,500	30,250	35,500	30,750	31,250	53,750
5. Total Cultivation Cost (A) + (B)	Rs./ha	56,425	44,125	107,125	71,135	75,825	78,825	54,785	55,205	108,660	60,045	48,455	105,597	40,833	44,535	43,035	38,235	73,725
Excluding Family Labour Cost: 80% (C)	Rs./ha	7,900	7,100	17,150	9,750	12,400	11,400	9,400	9,400	8,800	10,400	8,050	18,100	6,050	7,100	6,150	6,250	10,750
6. Total Cultivation Cost (A) + (C)	Rs./ha	24,825	15,725	38,525	32,135	26,225	33,225	17,185	17,605	73,460	18,445	16,255	33,197	16,633	16,135	18,435	13,235	30,725
1 Yield Current (40% - 50%) to Expect. Yield	Kg/ha	2,800	1,400	4,800	9,200	12,000	12,000	13,300	12,000	12,000	8,000	10,000	9,200	10,000	3,200	600	600	4,000
2 Estimated Producer Price *1	Rs./kg	28	18	39	28	18	18	15	22	21	46	16	25	16	22	37	25	31
7. Sales Income (Gross Income)	Rs./ha	78,400	25,200	187,200	257,600	216,000	216,000	199,500	264,000	264,000	368,000	160,000	230,000	160,000	70,400	22,200	15,000	124,000
8. Net Income	Rs./ha	53,575	9,475	148,675	225,465	189,775	182,775	182,315	246,395	191,140	349,555	143,745	196,803	143,367	54,265	3,765	1,765	93,275
9. Benefit/Cost Ratio		2.16	0.60	3.86	7.02	7.24	5.50	10.61	14.00	2.60	18.95	8.84	5.93	8.62	3.36	0.20	0.13	3.04

Source: Prepared by MID

Table 7.5 Crop Budget and Income for Paddy, OFC & Others after Implementation

Description	Year	Paddy	Maize	Green Chilli	Onion	Leaf Mustard	Leaf Coriander	Cabbage	Cauliflower	Potato	Carrot	Beet Root	Tomato	Pumpkin	Field Pea	Soyabean	Pigeon Pea	French bean
1. Unit Cost of Materials / Others	Units																	
1 Seed	Rs./Kg	100	120	416	4,500	110	510	520	1,300	50	565	260	861	358	98	110	120	202
2 Fertilizer: Urea	Rs./Kg	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
3 Fertilizer: SSP	Rs./Kg	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
4 Fertilizer: MOP	Rs./Kg	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
5 Organic Manure	Rs./Kg	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
6 herbicide	Rs./Ltr.	300	300	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
7 Pesticides	Rs./Ltr.	100	60	60	60	100	60	100	60	60	60	60	60	60	60	60	60	60
8 Cattle-draft	Rs./ha	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625
9 Others cost / transport	Rs./ha	1,500	900	900	1,200	900	900	900	1,500	1,000	1,000	1,200	1,200	1,500	900	900	900	900
10 Machinery cost-harvest/threshing	Rs./ha	1,800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11 Supports (pole)	Rs./pole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
2. Requirements of Materials																		
1 Materials-Seed	Kg/ha	40	200	0.6	3.0	20	20	0.5	0.6	1,200	4	7	0.2	1.0	45	70	20	25
2 Fertilizer: Urea	Kg/ha	44	44	82	87	55	22	87	109	65	87	109	109	109	22	22	17	109
3 Fertilizer: SSP	Kg/ha	94	94	235	188	94	94	188	188	157	188	157	157	250	157	188	125	175
4 Fertilizer: MOP	Kg/ha	34	17	42	50	25	17	50	50	50	59	42	50	25	34	-	-	17
5 Manure	kg/ha	600	500	500	500	1,000	1,500	1,500	1,500	500	500	500	1,000	500	500	500	500	500
6 herbicide	Unit/ha	1	2	2	2	-	-	2	1	1	1	1	1	1	1	1	1	1
7 Pesticides	Unit/ha	2	5	5	1	-	-	2	2	1	1	1	2	-	1	1	1	2
8 Animal-Drafting: Plough etc.	Times/ha	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9 Others, Transport	Times/ha	5	3	20	5	10	10	5	5	3	3	3	10	5	2	2	2	10
10 Machinery cost-harvest/threshing	Times/ha	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11 Supports (pole)	Bundle/ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	300
Total Material Cost (A)	Rs./ha	22,667	14,163	31,156	31,142	22,080	32,121	21,542	22,204	72,400	16,802	16,537	25,725	21,132	16,002	20,135	12,797	27,003
3. Unit cost of Labour																		
1 Labour cost per day	Rs./day	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
4. Labour Requirement																		
a) Land preparation																		
1 Drains	Md/ha	4	4	10	10	5	5	5	5	10	5	5	12	-	5	5	5	5
2 Cleaning	Md/ha	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3 Ploughing & Harrowing	Md/ha	7	10	12	12	12	10	15	15	10	15	10	15	12	12	12	12	12
5 Plastering bunds	Md/ha	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7 Nursery preparation	Md/ha	2	-	4	15	-	-	10	10	-	-	-	50	-	-	-	-	-
b) Planting																		
1 Digging holes	Md/ha	-	10	30	15	5	5	10	10	10	10	5	30	5	5	5	5	5
2 Filling holes or/ Transplanting	Md/ha	24	9	40	15	5	5	15	15	25	5	5	30	5	5	5	5	5
3 Irrigation	Md/ha	7	10	15	15	10	10	10	10	10	10	5	10	5	5	5	5	5
c) Maintenance																		
1 Weeding	Md/ha	24	30	40	20	40	30	40	40	30	30	30	60	25	25	25	25	25
2 Irrigation	Md/ha	8	10	30	10	25	20	20	20	-	20	20	30	12	12	10	10	15
3 Fertilize application	Md/ha	8	10	25	10	12	12	12	12	10	12	12	20	6	12	10	12	12
4 Pest and disease control	Md/ha	6	6	20	10	6	6	6	6	6	6	6	10	6	6	6	6	6
d) Harvesting																		
1 Harvesting	Md/ha	34	20	70	34	80	80	25	25	50	50	34	60	30	30	20	20	80
2 Processing / Threshing / Bagging	Md/ha	24	10	40	24	40	40	15	15	10	40	24	30	10	20	15	15	40
Total Labour (including family labour)	Md/ha	155	134	341	195	245	228	188	188	176	208	161	362	121	142	123	125	215
Total Labour cost (B)	Rs./ha	38,750	33,500	85,250	48,750	61,250	57,000	47,000	47,000	44,000	52,000	40,250	90,500	30,250	35,500	30,750	31,250	53,750
5. Total Cultivation Cost (A) + (B)	Rs./ha	61,417	47,663	116,406	79,892	83,330	89,121	68,542	69,204	116,400	68,802	56,787	116,225	51,382	51,502	50,885	44,047	80,753
Excluding Family Labour Cost: 80% (C)	Rs./ha	7,750	6,700	17,050	9,750	12,250	11,400	9,400	9,400	8,800	10,400	8,050	18,100	6,050	7,100	6,150	6,250	10,750
6. Total Cultivation Cost (A) + (C)	Rs./ha	30,417	20,863	48,206	40,892	34,330	43,521	30,942	31,604	81,200	27,202	24,587	43,825	27,182	23,102	26,285	19,047	37,753
1 Yield (Improved): 80% to Expec. Yield	Kg/ha	3,600	2,800	9,600	12,800	24,000	20,000	24,000	24,000	16,000	16,000	20,000	20,000	20,000	6,400	1,200	1,200	8,000
2 Estimated Producer Price *1	Rs./kg	28	18	39	28	18	18	15	22	21	46	16	25	16	22	37	25	31
7. Sales Income (Gross Income)	Rs./ha	100,800	50,400	374,400	358,400	432,000	360,000	360,000	528,000	336,000	736,000	320,000	500,000	320,000	140,800	44,400	30,000	248,000
8. Net Income	Rs./ha	70,383	29,537	326,194	317,508	397,670	316,479	329,058	496,396	254,800	708,798	295,413	456,175	292,818	117,698	18,115	10,953	210,247
9. Benefit/Cost Ratio		2.31	1.42	6.77	7.76	11.58	7.27	10.63	15.71	3.14	26.06	12.02	10.41	10.77	5.09	0.69	0.58	5.57
Remark *2: (main selling methods at present)		Selling locally (100%)	Selling locally (100%)	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Selling locally (80%)	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Self consumption	Almost for Local market

Source: Prepared by MID

Chapter 8 Construction Programme & Planning

8.1 General

Construction materials required for the construction of various components of the scheme (rehabilitation of intake, irrigation channel, farm pond, etc.) mainly bricks, stones, coarse aggregate, sand, and G. I. pipes, will be procured from approved firms and supplied and delivered at the site. Since the quantity of materials required for construction is very small, most of the materials are proposed to be collected from Kolasib Town, which is in the vicinity of the project. The project, as mentioned earlier, is connected to a fair weather road and there will be no difficulty in transportation of the materials to be used for the construction project.

8.2 Construction Planning

The total quantity of work involved in the construction of the scheme is small since the scheme envisages rehabilitation of intake and construction of irrigation channel, farm pond, etc. Materials required for construction of the project is available in the vicinity of the project.

Detailed construction plan is shown in the attachment.

Chapter 9 Command Area Development

9.1 General

Command area development component is not included under this project. However, rehabilitation of the existing road which connect to the beneficiaries' farmland is included.

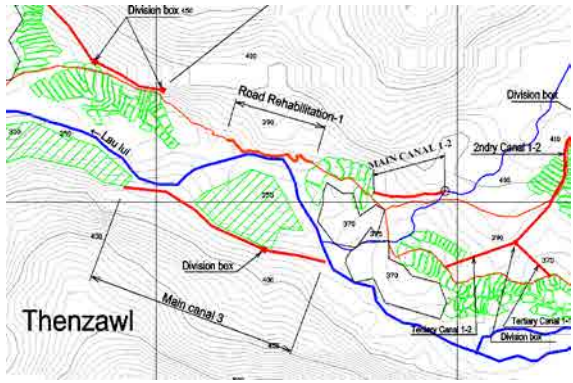

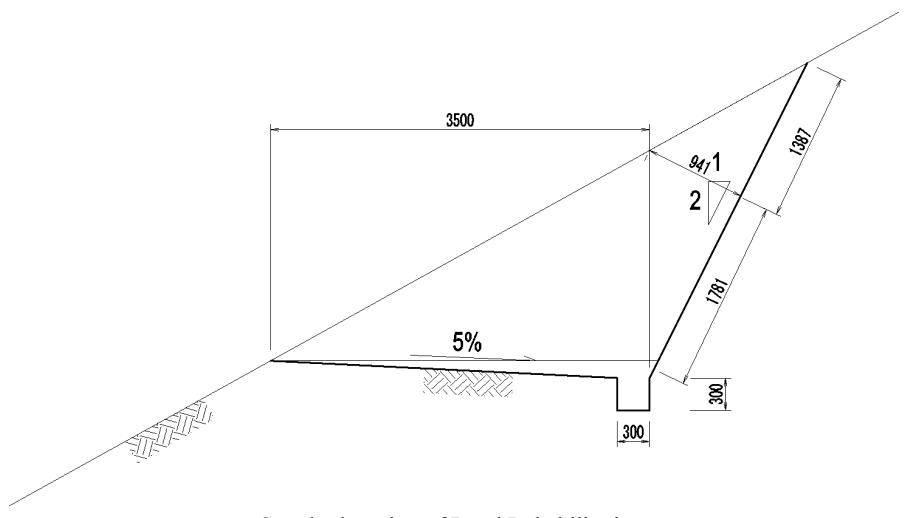
9.2 Land Development

Nil

9.3 Farm Road Rehabilitation

The targeted section of the farm road was damaged by a landslide during the monsoon season of 2014, as shown in the picture below. Currently, it is impossible to access one-half of beneficiaries' farm land. Under this project, farm road rehabilitation component is included and abstract of the work is shown below.

Table 9.1 Abstract Of The Work Of Farm Road Rehabilitation Component

 <p style="text-align: center;">Location</p>	 <p style="text-align: center;">Picture of Landslide</p>
 <p style="text-align: center;">Standard section of Road Rehabilitation Length of Rehabilitation=75m</p>	

Source: Prepared by MID

Chapter 10 Quality Control Aspect

10.1 Quality Control Aspect

Quality control plays a very important part in the construction of irrigation components. So many steps have been taken up to make sure the quality of farm structure as well as off farm structure are constructed according to the standard in the DPR. Some of the beneficial steps taken up in order to improve the quality of the irrigation structure are as follows:

- The engineer in charge visits the construction site periodically and checks the component whether it is constructed and designed according to the technical specifications or not.
- The water users/farmers are required to visit the construction site during the construction phase of components like reservoir, intake, and channel in their respective land.

Detailed quality control plan is shown in the attachment.

Chapter 11 Water Users' Association and O&M Activities

Participation of project beneficiaries has assumed a vital role in the successful implementation of minor irrigation schemes in Mizoram. To enhance sense of ownership and responsibilities, prospective beneficiaries are involved right from the start of project formulation stage to post-project management after the completion of the project. Besides, participation of project beneficiaries promotes transparency of minor irrigation schemes.

Prospective project beneficiaries are involved in the process of project formulation through their active participation in survey and investigation and the assessment of their development needs which may be covered by minor irrigation scheme within the prevailing norms and guidelines. For taking up new projects, due care and consideration to identify the development needs and aspirations of farmers are taken by having joint field visits and a series of discussions and/or interactions with the prospective project beneficiaries before preparation and finalization of DPR.

WUAs are formed once the project beneficiaries are identified and the WUAs extend active participation in supervision of works during the project implementation stage.

Upon completion of the project, WUAs share the responsibilities of O&M of irrigation structures. While WUAs assume the responsibilities of operation of irrigation structures and allotment of irrigation water, the MID executes repairs and reconstruction of damaged irrigation structures with active participation and contribution in the form of labour from the project beneficiaries.

WUA basic rule and O&M plan were prepared through the workshop with beneficiaries. The rule and plan are shown in Table 11.1.

Table 11.1 Details of Beneficiaries

Sl.No	Name	Address
1	Lalnunzira	Sailam
2	Liansailova	Sialsuk
3	Malsawma	Sailam
4	Ramsangliana	Sailam
5	Duailova	Sialsuk
6	Lalchhanliana	Sailam
7	Lalhmuliiana	Sailam
8	R Vanlalhriata	Sailam
9	M S Dawngliana	Sailam
10	Zoliana	Sailam
11	Chhuntuanga	Sailam

Source: Prepared by MID

WUA Basic Rule

Objectives:

- (1) Maximum production of rice,
- (2) Production of more horticultural crops,
- (3) Lifting of socioeconomic conditions,
- (4) Plans for improving self-sufficiency in agricultural products,
- (5) Maintenance of water harvesting structures,
- (6) Good waterways,
- (7) Good land field,
- (8) Good link road,
- (9) Marketing of agricultural products,
- (10) Selecting the right crop, and
- (11) Uniformity in development.

Membership:

- (1) Fees from persons having land in the area.
- (2) Members should follow the objectives.

Leadership:

New President/Secretary/Treasurer should be elected from the members every year.

Contribution (by member):

Rs.200/meeting or Rs.50/month from each member.

Meeting:

Once a month. In case of emergency, a meeting may be called any time.

Loan (Internal):

- (1) Loans can be lent only to members,
- (2) One member cannot borrow more than Rs.50,000,
- (3) Loan interest maybe 5%, and
- (4) The loans must be cleared in one year.

Disciplinary action:

- (1) Those absent for three consecutive meetings will be given a warning and will be removed from committee membership for the fourth absence,
- (2) Action will be taken for those who do not pay the membership fee,
- (3) Action may be taken for those who do not repay loans regularly, and
- (4) Members should follow the rules and regulations of the association.

Source: Prepared by WUA

Operation and Maintenance Plan

1. Outline of WUA

1.1 Name of MIP : Laului MI Scheme

1.2 Name of WUA : Laului WUA

1.3 Location of WUA : Sailam Division : Aizawl Village/Town : Sailam & Sialsuk

1.4 Command Area : 11.8

Command Area (ha)				Beneficiary (household)
Paddy	Upland	Orchard	Total	
11.8	0.0	0.0	11.8	12

2. List of facilities managed by WUA

SN.	Name of Facilities	Completion	Outline of Facilities	
		Year (Plan)	Structure	Dimension
1	Diversion weir 1 and 2	-	Reinforced Concrete	
2	Canal 1-1, 1-2, 2-1, 2-2, 3	-	Concrete channel	W=0.3-0.2m, B=0.3-0.2m
3	Desiltation tank 1, 2-1, 2-2	-	Concrete tank	
4				
5				

3. Operation and Maintenance Plan

SN.	Name of Facilities	Items	Implementer	Frequency	Schedule												
					Jan.	Feb.	Mar.	Apr.	May	Jun	Jnl.	Aug.	Sep.	Oct.	Nov.	Dec.	
1	Diversion Weir	Patrol	Person in charge	Every week	-----												
		Water management	Person in charge	Every day	=====												
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■	■	■	■	■	■	■	■	■	■	■	■
			Removing weeds	All beneficiaries	4 times per year			■			■		■			■	
		Reporting to MID	WUA	Every month													
Rehabilitation (minor/major)	All beneficiaries	2 times per year						■						■			
2	Cannal	Patrol	Person in charge	Every week	-----												
		Water management	Person in charge	Every day	=====												
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■	■	■	■	■	■	■	■	■	■	■	■
			Removing weeds	All beneficiaries	4 times per year			■			■		■			■	
		Reporting to MID	WUA	Every month													
Rehabilitation (minor/major)	All beneficiaries	2 times per year						■						■			
3	Desiltation Tank	Patrol	Person in charge	Every week	-----												
		Water management	Person in charge	Every day	=====												
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■	■	■	■	■	■	■	■	■	■	■	■
			Removing weeds	All beneficiaries	5 times per year			■			■		■			■	
		Reporting to MID	WUA	Every month													
Rehabilitation (minor/major)	All beneficiaries	3 times per year						■						■			
Crop season					Dry (Rabi)			Summer			Rainy (Kharif)			Dry (Rabi)			

Date: _____ Place: _____

Checked by: _____ (Sub-Divisional Engineer) Prepared by: _____ (Junior Engineer and WUA) Countersigned by: _____ (Executive Engineer)

Annexure

1. Survey & Investigation

1.1 Soil Classification

Soil classification test(in site)		Surveyed Date	24/Oct. /2014
Scheme Name	Laului MIP	Name of Surveyor	SDO and JE (Aizawl)

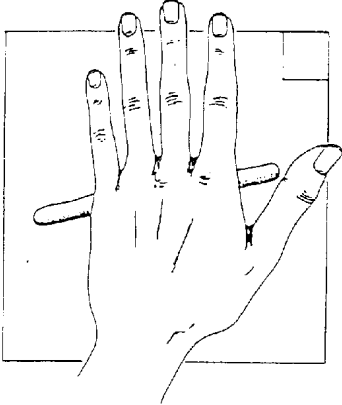
Instruction

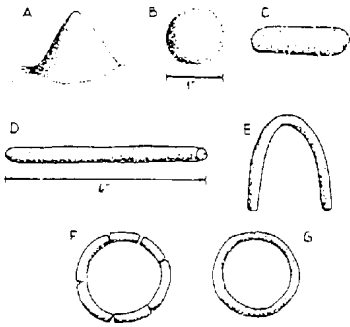
1) Visit the survey together with village chairperson and villagers.
 Visit the proposed area and choose typical soil in the area with the consultation of the village chairperson and villagers.

2) Sampling of the soil
 Gather a soil sample from the soil surface (sample should be about 10 x 10 x 10 cm).

3) Knead the soil with water.
 Add some water to the soil sample so it is moist but not wet. Knead it well. Pebbles should be removed.

4) Try to create ring shapes with the soil sample and choose the most advanced shape that can be made.





A: Soil can only be shaped into a cone. No other shapes hold together.

B: Soil can be formed into a circle, but not a rod shape.

C: Soil can be formed into a stout rod shape.

D: A thin rod (about 6 mm diameter) can be formed but not bent.

E: Thin rod can be bent without breaking

F: Circle can be formed with some breaks.

G: Complete circle with no breaks can be formed.

5) Evaluate the soil texture
 According to the result of 4), circle one of the detailed soil texture types and choose a General soil texture type by conversion of the detailed soil texture type.

Detail soil texture type	conversion	General soil texture type
Shape A Sand <input type="checkbox"/>	if you choose Shape A →	Sand <input type="checkbox"/>
Shape B Loamy sand <input type="checkbox"/>	if you choose Shape B or C →	Sandy Loam <input checked="" type="checkbox"/>
Shape C Silty Loam <input type="checkbox"/>		
Shape D Loam <input type="checkbox"/>	if you choose Shape D or E →	Clay Loam <input type="checkbox"/>
Shape E Clay Loam <input type="checkbox"/>		
Shape F Light Clay <input type="checkbox"/>	if you choose Shape F or G →	Clay <input type="checkbox"/>
Shape G Heavy Clay <input type="checkbox"/>		

6) Notable Soil Characteristics
 If there are any notable soil characteristics such as high rock outcrop, shallow soil depth and symptom of salt accumulation, please note.
 Note:

1- Note: Picture of the test is to be attached in following.



Test



Result

1.2 Measurement of stream discharge

Date of Measurement	24.9.2014
Surveyor	Aizawl division SDO
Measured discharge	Thingkhuanglui -11.10 (L/S) Vawmkuaklui – 11.58 (L/S)

Picture



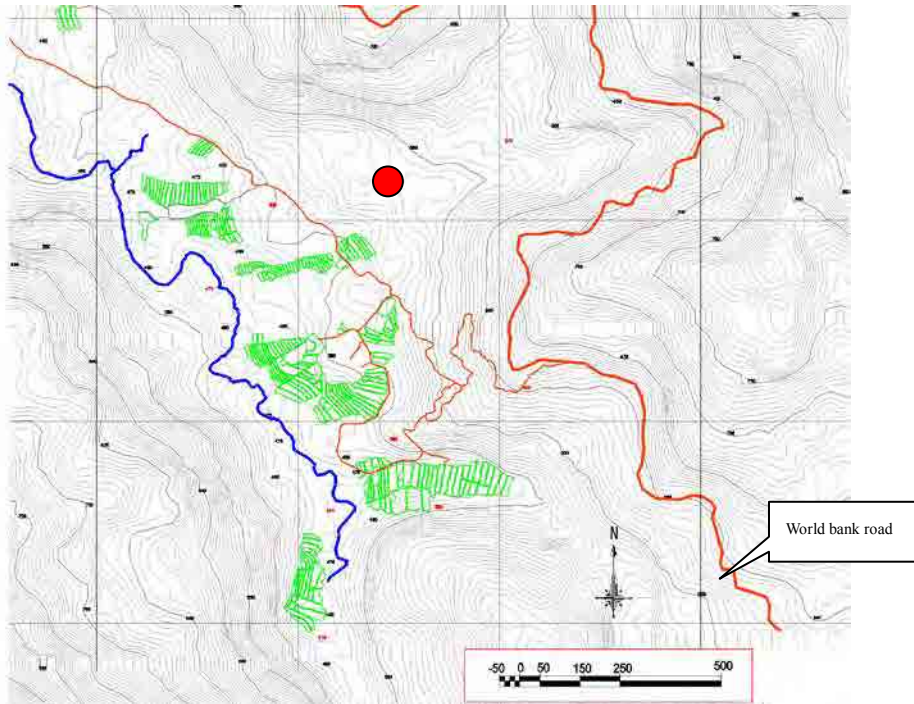
Pipe and bucket method



V-notch method

Location

Coordinate (X=477686.9918 Y=2579861.6455)



1.3 Household Survey

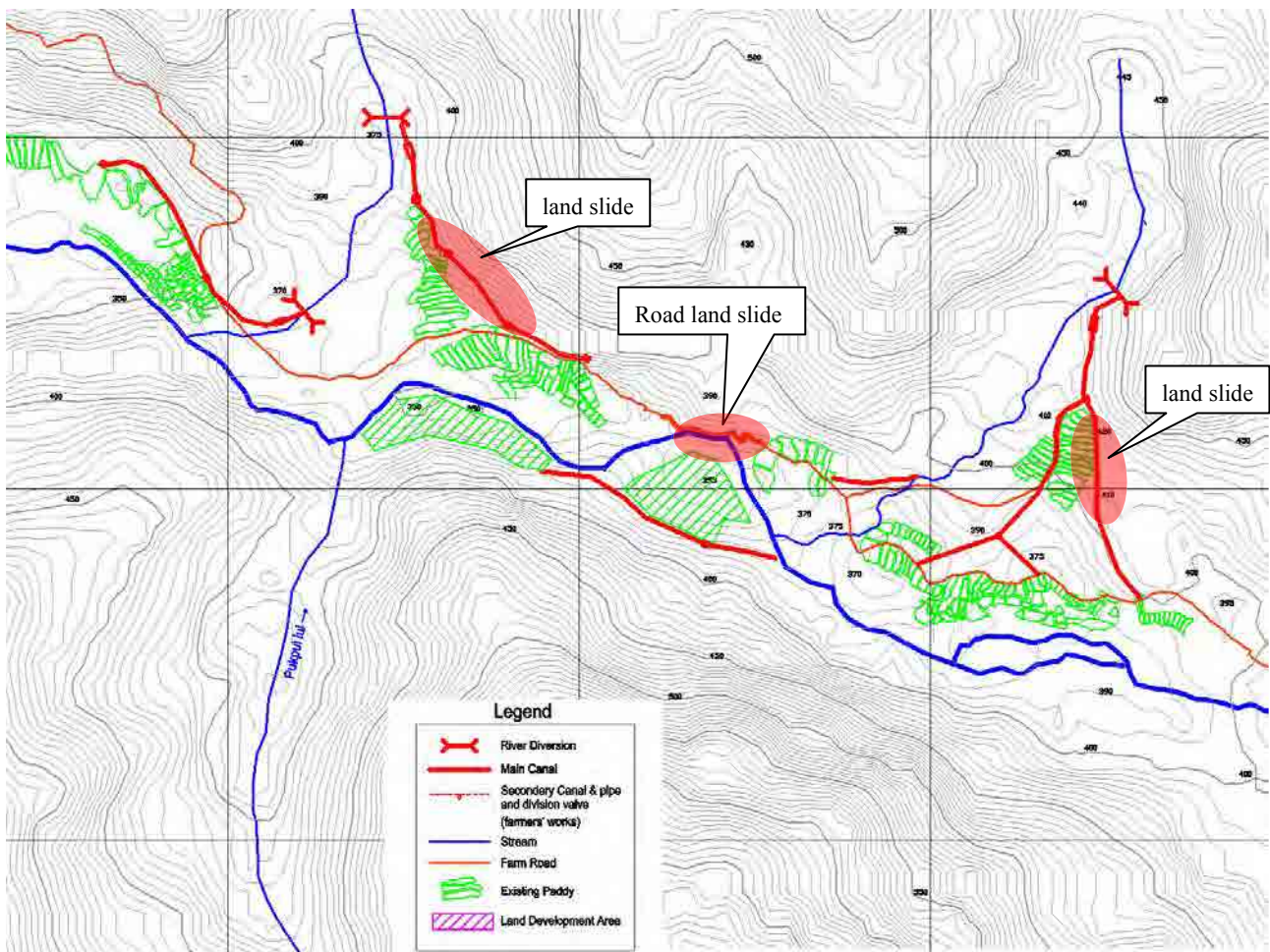
No	Residence		Land (acre)							
	Town / Village	District	Jhum	Irrigated / Wetland	Permanent rainfed	Fallow	Fish pond	Residential	Others	Total
A-1	Thenzawl	Serchhip		2.500			0.500		0.500	3.500
A-2	Thenzawl	Serchhip		1.500	1.000					2.500
A-3	Thenzawl	Serchhip		2.000	1.000					3.000
A-4	Sailam	Aizawl	0.500	5.000	1.000		0.500	0.500		7.500
A-5	Thenzawl	Serchhip		2.000	1.500					3.500
A-6	Thenzawl	Serchhip		3.500						3.500
A-7	Sailam	Aizawl		3.000	2.000			0.500		5.500
A-8	Sailam	Aizawl		1.000	3.000		1.000	0.500		5.500
A-9	Sailam	Aizawl	1.000	2.000		2.000		0.500		5.500
A-10	Sailam	Aizawl								
A-11	Sailam	Aizawl		0.500				0.500		1.000
A-12	Sailam	Aizawl		1.500				0.500		2.000
A-13	Sailam	Aizawl		2.200				0.500		2.700
A-14	Sailam	Aizawl		2.000	0.500		0.500			3.000
A-15	Sailam	Aizawl		2.000						2.000
A-16	Sailam	Aizawl		3.000	3.000		1.000	0.500		7.500
A-17	Sailam	Aizawl			2.000					2.000
A-18	Sailam	Aizawl		2.000				0.500		2.500
A-19	Sailam	Aizawl		3.000	2.000			0.500		5.500
A-20	Sailam	Aizawl		3.000	3.000			0.500		6.500
	2	Total	1.500	41.700	20.000	2.000	3.500	5.500	0.500	74.700
		(%)	2	56	27	3	5	7	1	100
		Average	0.750	2.320	1.820	2.000	0.700	0.500	0.500	3.930
		Median	0.750	2.000	2.000	2.000	0.500	0.500	0.500	3.500
		Max	1.000	5.000	3.000	2.000	1.000	0.500	0.500	7.500
		Min	0.500	0.500	0.500	2.000	0.500	0.500	0.500	1.000

1.4 DPR Preparatory Survey check sheet (For MID Engineer)

Scheme Name		LAULUI		S/N	1
Survey Date		23&24/09/2014	Name of surveyor/ Position	Aizawl Minor Irrigation Division	
S/N	Items	Content		Check	Remarks
1	Preparation of Base Map	<ul style="list-style-type: none"> • Creation of Contour Map with GIS. • Trace existing facilities like paddy, road, river. in Google earth. And save the data. • Save Google earth picture data. It is recommendable to use Google earth Pro for better resolution data. • Merge above three map data and prepare base map with CAD. • Conduct walking survey and confirm existing facilities to modify the base map. 		√	
2	Clarification of land owners	<ul style="list-style-type: none"> • Clarification of land owners and boundaries through meeting and joint walkthrough survey. • Collected information are to be mapped on the base map 		√	
3	Soil Clarification	<ul style="list-style-type: none"> • Take several soil samples from farm. • Site soil testing is to be conducted. And take pictures. 		√	
4	Bearing Capacity	<ul style="list-style-type: none"> • Take several measurement of bearing capacity at several sites, like Diversion, tank and canal, using simple portable tool. 		-	No big structure
5	Slope Soil Conditions along canal	<ul style="list-style-type: none"> • Walk through field soil survey at intake point and along main canal to identify of possible land-sliding areas and estimate risk of sliding. • Result of the survey is to shown in above Base Map and will be reflected to facility planning and designing. 		√	Refer to following page map.
6	Topological Survey	<ul style="list-style-type: none"> • River centreline level survey to identify suitable point for intake and expect future change of river bed. • Cross-leveling Survey at several typical points along canal. • Longitudinal levelling along gentle slope canal. • Total station survey around farm pond and gentle slope farm development area. 		nil	

7	Available surface water	<ul style="list-style-type: none"> • Measurement of discharge water at candidate intake points. • Take measurement of catchment area of each stream with GIS or CAD. • Make rough estimation of season wise discharge water and confirm with farmers. 	√	
8	Preparation of Layout map	<ul style="list-style-type: none"> • Preparation of first draft facility layout map on base map. • Confirm the draft plan with beneficiaries. 	√	

Land sliding, Flooding and Erosion Survey result



Annexure

2. Hydrology

2.1 Rainfall Record

MONTHLY RAINFALL RECORDED AT SIAKSUK STATION MAINTAINED BY THE AGRICULTURE DEPARTMENT

Year/Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1998	56.00	44.00	75.00	134.00	454.00	411.00	823.00	887.00	364.00	108.00	40.00	-	3,396.00
1999	-	-	40.00	41.00	526.00	932.00	734.00	518.00	411.00	227.00	-	-	3,429.00
2000	17.00	16.00	185.00	281.00	577.00	575.00	387.00	853.00	415.00	278.00	78.00	-	3,662.00
2001	-	28.00	52.00	73.00	347.00	743.00	579.00	462.00	352.00	288.00	108.00	-	3,032.00
2002	22.00	-	89.00	92.00	619.00	491.00	777.00	582.00	159.00	89.00	80.00	-	3,000.00
2003	3.00	5.00	92.00	130.00	349.00	1,182.00	534.00	515.00	379.00	271.00	-	40.00	3,500.00
2004	-	-	17.00	252.00	260.00	870.00	1,532.00	419.00	378.00	316.00	-	-	4,044.00
2005	5.00	-	230.00	147.00	100.00	222.00	466.00	574.00	344.00	233.00	2.20	11.00	2,334.20
2006	-	-	-	47.00	808.00	1,105.00	701.00	423.00	371.00	236.00	2.00	-	3,693.00
2007	-	89.00	21.00	349.00	467.00	522.00	867.00	930.60	245.00	323.00	-	-	4,650.60
2008	58.70	7.30	51.60	29.00	231.00	469.00	727.00	859.00	381.00	133.00	40.00	-	2,986.60
2009	-	-	27.00	14.00	192.00	415.20	553.00	727.00	289.00	180.00	61.00	-	2,458.20
2010	-	2.00	132.00	116.00	430.00	570.00	513.00	501.00	578.00	339.00	20.00	75.00	3,276.00
2011	24.00	-	85.00	165.00	388.00	730.00	398.00	694.00	468.00	211.00	-	-	3,163.00

2.2 Annual Average Yield

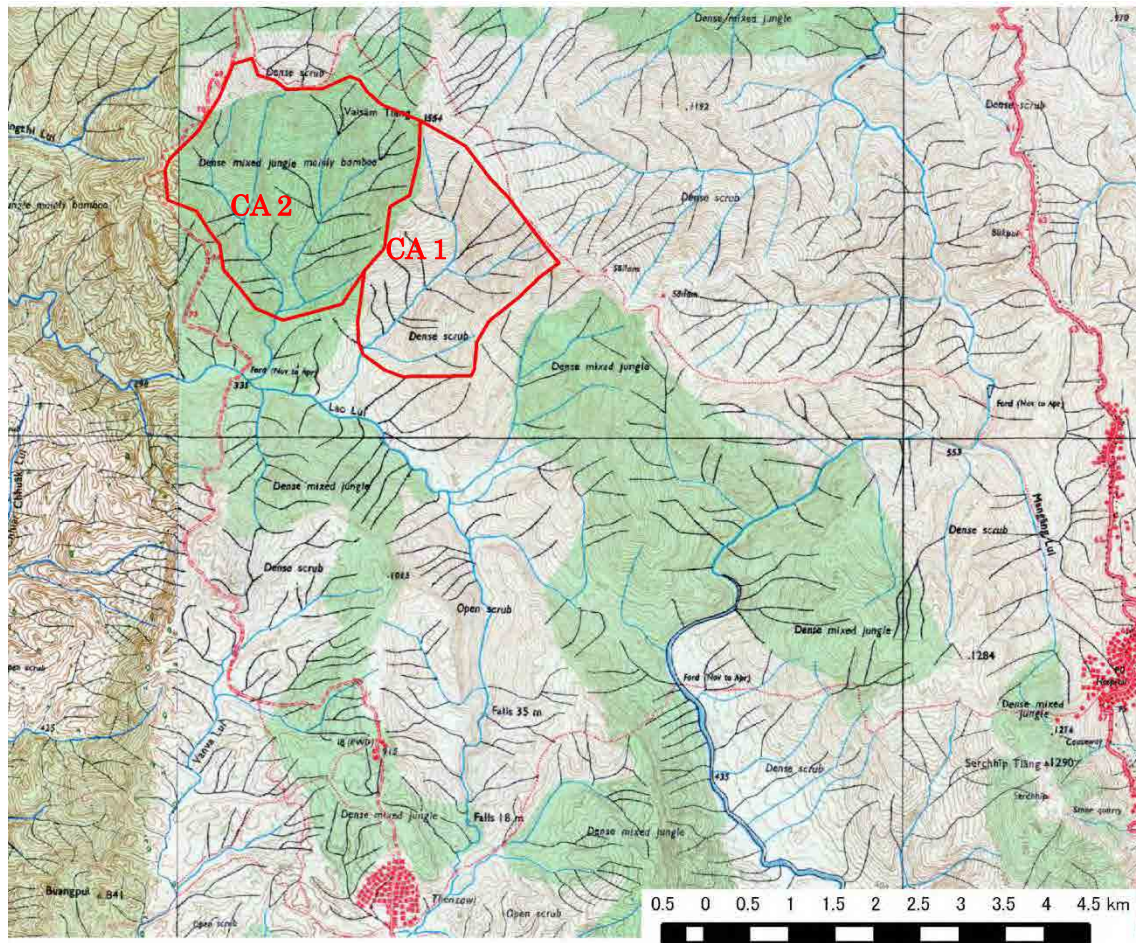
Annual Discharge of Laului Minor Irrigation Project

(Unit: m³/s)

Year/Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1998	0.198	0.172	0.265	0.489	1.602	1.498	2.904	3.130	1.327	0.381	0.146	0.000	1.009
1999	0.000	0.000	0.141	0.149	1.856	3.398	2.590	1.828	1.498	0.801	0.000	0.000	1.022
2000	0.060	0.063	0.653	1.024	2.036	2.096	1.365	3.010	1.513	0.981	0.284	0.000	1.090
2001	0.000	0.109	0.183	0.266	1.224	2.709	2.043	1.630	1.283	1.016	0.394	0.000	0.905
2002	0.078	0.000	0.314	0.335	2.184	1.790	2.741	2.053	0.580	0.314	0.292	0.000	0.890
2003	0.011	0.020	0.325	0.474	1.231	4.309	1.884	1.817	1.382	0.956	0.000	0.141	1.046
2004	0.000	0.000	0.060	0.919	0.917	3.172	5.405	1.478	1.378	1.115	0.000	0.000	1.204
2005	0.018	0.000	0.811	0.536	0.353	0.809	1.644	2.025	1.254	0.822	0.008	0.039	0.693
2006	0.000	0.000	0.000	0.171	2.851	4.029	2.473	1.492	1.353	0.833	0.007	0.000	1.101
2007	0.000	0.348	0.074	1.272	1.648	1.903	3.059	2.953	3.393	0.864	1.178	0.000	1.391
2008	0.207	0.029	0.182	0.106	0.815	1.710	2.565	3.031	1.389	0.469	0.146	0.000	0.887
2009	0.000	0.000	0.095	0.051	0.677	1.514	1.951	2.565	1.054	0.635	0.222	0.000	0.730
2010	0.000	0.008	0.466	0.423	1.517	2.078	1.810	1.768	2.107	1.196	0.073	0.265	0.976
2011	0.085	0.000	0.300	0.602	1.369	2.661	1.404	2.449	1.706	0.744	0.000	0.000	0.943
Average	0.047	0.053	0.276	0.487	1.449	2.406	2.417	2.231	1.516	0.795	0.196	0.032	0.992

Average Annual Discharge = 0.992 m³/s Catchment area = 21.00 km²
 = 31.283 MCM Runoff coefficient = 0.45

2.3 DRAINAGE MAP



Catchment area

Area Name	Area (km ²)
CA-1	4.1
CA-2	5.9

Annexure

3. Agriculture Action Plan

Annexure

4. Environmental Conformity Check List

No.	Criteria	Check items	YES	NO
1	WATER AND PHYSICAL ENVIRONMENT	<ul style="list-style-type: none"> ■ Is it sure that the project is not likely to affect or conflict with the existing water uses and water rights downstream? 	✓	
		<ul style="list-style-type: none"> ■ Are awareness heightening campaigns undertaken, or going to be undertaken, for the proper handling and use of permitted fertilizers and pesticides by the farmers, of for promoting and facilitating organic farming? 	✓	
		<ul style="list-style-type: none"> ■ Are the engine equipments for construction (trucks, others) and operation (water pumps if any) properly selected as to be in conformity with the national environmental emission standards for air quality and noise levels? 	✓	
2	FOREST	<ul style="list-style-type: none"> ◇ Will the project encroach on a forest land? 		✓
		<ul style="list-style-type: none"> ■ If it is planned that the project will encroach on forest land, a forestry clearance permit must be obtained from the Department of Environment and Forestry, and a compensatory afforestation plan must be prepared. Has a forestry clearance been submitted, or is it going to be done during the planning stage? <p><i>NOTE</i> The principle of forestry clearance is that a non forest land equivalent in area to the forest land diverted for non-forestry use must be provided for compensatory afforestation and transferred to the Environment and Forest Department for notification as forest land. The forestry clearance procedure differs according to conditions like the size of the forest land for diversion.</p>		
3	PROTECTED AREAS	<ul style="list-style-type: none"> ■ Is it sure that the project site is located outside any protected area? <p><i>NOTE</i> A protected area is a National Park, a Wildlife Sanctuary, a Conservation Reserve, or a Community Reserve (Wildlife Protection Act 1972). Should also be considered as a protected area the following: Planned extension area of an existing protected area, planned or existing Eco-sensitive Zone (buffer zone around a protected area)</p>	✓	
4	HUMAN SETTLEMENTS	<ul style="list-style-type: none"> ◇ Will the project encroach on human settlements others than housing settlements, and possibly induce damages on or loss of such settlements,? <p><i>NOTE</i> Given the conditions of permanent housing hilltop or hillside, it is assumed that small scale irrigation projects are not likely to affect housing. It is however possible in specific cases.</p>		✓
		<ul style="list-style-type: none"> ■ If it is confirmed that the project will encroach on human settlements, including housing settlements or not, and possibly induce damages on or loss of such settlements, are compensatory measures undertaken according to the legal requirements? <p><i>NOTE</i> Compensation of land and assets must be performed at least according to the Mizoram Land Acquisition Rules 2010.</p>		
5	CULTURAL AND HISTORICAL SITES	<ul style="list-style-type: none"> ■ Is it sure that the project site is not contiguous to, and is not likely to affect directly (physical damages) or indirectly (landscape), any protected monument or site notified by the Arts and Culture Department? <p><i>NOTE</i> The Arts and Culture Department has notified a list of 82 protected monuments or sites</p>	✓	
		<ul style="list-style-type: none"> ■ Is it confirmed in discussion and coordination with the Village Council, that the project site does not encroach on any valuable existing cultural or historical asset or place of importance for the local community? <p><i>NOTE</i> Valuable existing cultural or historical asset or place may include graves, sacred grooves, and any others.</p>	✓	
6	LIVING ENVIRONMENT	<ul style="list-style-type: none"> ■ Are opportunities of improvement of the living environment in relationship with irrigation works and in consultation with the local community fully taken into consideration for planning the project? <p><i>NOTE</i> For example, if a water body or river site is used for washing or bathing, the construction of irrigation works can be an opportunity to improve the conditions of use and the conditions of access, particularly for users like vulnerable people, women, and children.</p>	✓	
		<ul style="list-style-type: none"> ■ Does planning of the project take into consideration the standpoint of the women of the community of concern, and more particularly the women in vulnerable condition, as for both criteria 4 and 7? 	✓	

Annexure

5. Design Check List

Check List 1

Canal

| First Stage | : Basic Conditions

1. Outline

1.1 Land Use Paddy Upland Both1.2 Type Open Channel Pipeline Both

1.3 Canal Type and Dimension

Name	Type	Length (m)	Flow (m ³ /s)	Slope	Remarks
Main Cannal 1-1	Open Channel	250	0.0120	1:40	Rehabilitation
Main Cannal 1-2	Open Channel	60	0.0018	1:10	New
Main Cannal 2-1	Open Channel	680	0.0069	1:50	Rehabilitation
Main Cannal 2-2	Open Channel	530	0.0078	1:10	New
Main Cannal 3	Open Channel	360	0.0080	1:80	New

1.4 Supplementary facilities of Canals

Facilities	Number	Remarks
Division works	9	New
Desiltation Tank	3	New
Management Road	1	Rehabilitation
Other ()	Nil	

1.5 Consultation 1.5.1 River Need No need1.5.2 Drinking Water Need No need1.5.3 Other () Need No need

2. Basic Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
	[Example]				
3	Field survey	3.1 Whether the pictures are taken.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Annexure II
1	Design purpose	1.1 Whether the purpose is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the scope, quantity, items of design are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	Basic design conditions	2.1 Whether the irrigation system is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.2 Whether the intake points are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.3 Whether the water users are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.4 Whether the consultation items are understood.	<input type="checkbox"/>	<input type="checkbox"/>	Nil
3	Field survey	3.1 Whether the pictures are taken.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.2 Whether the field conditions (topography, soil, landuse etc.) are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.3 Whether the river and road conditions are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.4 Whether the points of the planned main faciities are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.5 Whether the difficulty or issues are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.6 Whether the important points of the construction are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	Design plan	4.1 Whether the selected canal types are suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.2 Whether the facility layout is suiiable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.3 Whether the canal standard structure is suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.4 Whether the maintenance is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer)

Place : _____ Prepared by : _____ (Junior Engineer)

Countersigned by : _____ (Executive Engineer)

Check List 2

Canal

| Middle Stage | : Drawings

1. Detailed Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
	[Example]				
3	Drawings	3.1 Whether the cross drawings are prepared,	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
1	Design Plan (supplementary facility)	1.1 Whether the following supplementary facility layout and scale are suitable.			
		- Division works (Division Box)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		- Desiltation Tank	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		- Management road	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Landslide
		- Bridge/Culvert	<input type="checkbox"/>	<input type="checkbox"/>	Nil
		- Regulator (gate)	<input type="checkbox"/>	<input type="checkbox"/>	Nil
		- Other ()	<input type="checkbox"/>	<input type="checkbox"/>	Nil
2	Hydraulics Calculation	2.1 Whether the formulas and coefficients used in hydraulic calculation are suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	Drawings	3.1 Whether the cross drawings are prepared,	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.2 Whether the drawings are consistent in hydraulics calculation.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.3 Whether the indication of drawings is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.4 Whether the special mention is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	Construction Plan	4.1 Whether the access road for construction is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer) Countersigned by : _____ (Executive Engineer)
 Place : _____ Prepared by : _____ (Junior Engineer)

Check List 3

Canal

| Final Stage | : Quantity and DPR

1. Quantity

SN.	Items	Contents	Object	Confirmation	Reasons
	[Example]				
1	Quantity	1.2 Whether the quantity is prepared for each material.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
1	Quantity	1.1 Whether the sizes used in the quantity calculation are consistent in the drawings.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the quantity is prepared for each material and each facility.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

2. DPR

SN.	Items	Contents	Object	Confirmation	Reasons
	[Example]				
1	DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Contents
1	DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the reasons of the formulas and coefficients are wrote clearly.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.3 Whether the calculation process are arranged clearly.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer) Countersigned by : _____ (Executive Engineer)
 Place : _____ Prepared by : _____ (Junior Engineer)

Check List 1

Diversion Weir

| First Stage | : Basic Conditions

1. Outline

1.1 Name of Diversion	River diversion 1	
1.2 Rive conditions	1.2.1 Gross Catchment Area of the Weir	4.1 sq.km
	1.2.2 Droughty Water Discharge	0.011 cumec
	1.2.3 River Width	10 m
1.3 Weir	1.3.1 Crest Length	10 m
	1.3.2 Intake Flow	0.0138 cumec

1.4 Gates

SN.	Function	Type	Number	Size (m)	
				Height	Width
	[Exampe]				
1	Intake	Slide	2	0.80	0.40
1	Intake	Wheel drive	1	0.60	0.60
2					
3					

1.4 Consultation	1.4.1 River	<input type="checkbox"/> Need <input checked="" type="checkbox"/> No need	1.4.2 Drinking Water	<input type="checkbox"/> Need <input checked="" type="checkbox"/> No need
	1.4.3 Fisheries	<input type="checkbox"/> Need <input checked="" type="checkbox"/> No need	1.4.4 Other ()	<input type="checkbox"/> Need <input checked="" type="checkbox"/> No need

2. Basic Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
	[Example]				
1	Design Purpose	1.1 Whether the purpose is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 4
1	Design purpose	1.1 Whether the purpose is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the scope, quantity, items of design are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	Basic design conditions	2.1 Whether the water users are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.2 Whether the maximum intake quantity is grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.3 Whether the intake point is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.4 Whether the consultation items are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	Field survey	3.1 Whether the pictures are taken.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.2 Whether the flood and scour conditions are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.3 Whether the both bank conditions of the planned point are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.4 Whether the road conditions are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.5 Whether the difficulty or issues are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.6 Whether the important points of the construction are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	Design plan	4.1 Whether the river flow is steady.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.2 Whether the irrigation water can be certainly taken during the dry season.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.3 Whether the soil inflow does not happen.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.4 Whether the weir structure is staedy and reasonable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.5 Whether the maintenance is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.6 Whether the scouring measures are considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer)
 Place : _____ Prepared by : _____ (Junior Engineer) Countersigned by : _____ (Executive Engineer)

Check List 2

Diversion Weir

[Middle Stage] : Drawings

1. Detailed Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
1	[Example] Drawings	1.2 Whether the water and ground level are shown.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6 Estimates & Drawings
1	Drawings	1.1 Whether the layout and cross and profile drawings are prepared.	<input type="checkbox"/>	<input type="checkbox"/>	
		1.2 Whether the water and ground level are shown.	<input type="checkbox"/>	<input type="checkbox"/>	
		1.3 Whether the indication of the drawings is appropriate.	<input type="checkbox"/>	<input type="checkbox"/>	
		1.4 Whether the special mention is considered.	<input type="checkbox"/>	<input type="checkbox"/>	
2	Construction Plan	2.1 Whether the access road for the construction is appropriate.	<input type="checkbox"/>	<input type="checkbox"/>	
		2.2 Whether the temporary drainage of the river is considered.	<input type="checkbox"/>	<input type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer)
 Place : _____ Prepared by : _____ (Junior Engineer) Countersigned by : _____ (Executive Engineer)

Check List 3

Diversion Weir

[Final Stage] : Quantity and DPR

1. Quantity

SN.	Items	Contents	Object	Confirmation	Reasons
1	[Example] Quantity	1.2 Whether the quantity is prepared for each material.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
1	Quantity	1.1 Whether the sizes used in the quantity calculation are consistent in the drawings.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the quantity is prepared for each material and each facility.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

2. DPR

SN.	Items	Contents	Object	Confirmation	Reasons
1	[Example] DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Contents
1	DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the reasons of the formulas and coefficients are wrote clearly.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.3 Whether the calculation process are arranged clearly.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer)
 Place : _____ Prepared by : _____ (Junior Engineer) Countersigned by : _____ (Executive Engineer)

Check List 1

Diversion Weir

[First Stage] : Basic Conditions

1. Outline

1.1 Name of Diversion	River diversion 2	
1.2 Rive conditions	1.2.1 Gross Catchment Area of the Weir	5.9 sq.km
	1.2.2 Droughty Water Discharge	0.016 cumec
	1.2.3 River Width	10 m
1.3 Weir	1.3.1 Crest Length	10 m
	1.3.2 Intake Flow	0.0147 cumec

1.4 Gates

SN.	Function	Type	Number	Size (m)	
				Height	Width
	[Exampe]				
1	Intake	Slide	2	0.80	0.40
1	Intake	Wheel drive	1	0.60	0.60
2					
3					

1.4 Consultation	1.4.1 River	<input type="checkbox"/> Need <input checked="" type="checkbox"/> No need	1.4.2 Drinking Water	<input type="checkbox"/> Need <input checked="" type="checkbox"/> No need
	1.4.3 Fisheries	<input type="checkbox"/> Need <input checked="" type="checkbox"/> No need	1.4.4 Other ()	<input type="checkbox"/> Need <input checked="" type="checkbox"/> No need

2. Basic Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
	[Example]				
1	Design Purpose	1.1 Whether the purpose is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 4
1	Design purpose	1.1 Whether the purpose is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the scope, quantity, items of design are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	Basic design conditions	2.1 Whether the water users are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.2 Whether the maximum intake quantity is grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.3 Whether the intake point is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.4 Whether the consultation items are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	Field survey	3.1 Whether the pictures are taken.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.2 Whether the flood and scour conditions are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.3 Whether the both bank conditions of the planned point are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.4 Whether the road conditions are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.5 Whether the difficulty or issues are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.6 Whether the important points of the construction are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	Design plan	4.1 Whether the river flow is steady.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.2 Whether the irrigation water can be certainly taken during the dry season.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.3 Whether the soil inflow does not happen.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.4 Whether the weir structure is staedy and reasonable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.5 Whether the maintenance is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.6 Whether the scouring measures are considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer)
 Place : _____ Prepared by : _____ (Junior Engineer) Countersigned by : _____ (Executive Engineer)

Check List 2

Diversion Weir

[Middle Stage] : Drawings

1. Detailed Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
1	[Example] Drawings	1.2 Whether the water and ground level are shown.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6 Estimates & Drawings
1	Drawings	1.1 Whether the layout and cross and profile drawings are prepared.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the water and ground level are shown.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.3 Whether the indication of the drawings is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.4 Whether the special mention is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	Construction Plan	2.1 Whether the access road for the construction is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.2 Whether the temporary drainage of the river is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer) Countersigned by : _____ (Executive Engineer)
Place : _____ Prepared by : _____ (Junior Engineer)

Check List 3

Diversion Weir

[Final Stage] : Quantity and DPR

1. Quantity

SN.	Items	Contents	Object	Confirmation	Reasons
1	[Example] Quantity	1.2 Whether the quantity is prepared for each material.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
1	Quantity	1.1 Whether the sizes used in the quantity calculation are consistent in the drawings.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the quantity is prepared for each material and each facility.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

2. DPR

SN.	Items	Contents	Object	Confirmation	Reasons
1	[Example] DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Contents
1	DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the reasons of the formulas and coefficients are wrote clearly.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.3 Whether the calculation process are arranged clearly.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer) Countersigned by : _____ (Executive Engineer)
Place : _____ Prepared by : _____ (Junior Engineer)

Annexure

6. Cost Estimate

ABSTRACT OF COST

Sl.No.	MINOR HEAD	AMOUNT
	DIRECT CHARGES	
1	I -Works	` 3,920,200.00
	II -Establishment (@2%C-works)	` 78,404.00
	III -Ordinary T & P	` 57,000.00
	IV -Suspense	` Nil
	V -Receipt & Recoveries (-)	` Nil
	Sub-Total	` 4,055,604.00
	INDIRECT CHARGES	
2	I Capitalized value of abatement of land Revenue	` Nil
	II Audit and Account@1%I-works	` 39,202.00
	Sub-Total	` 39,202.00
	Gross estimated cost of the project	` 4,094,806.00
	Construction of Approach Road	` 113,200.00
	Total cost	` 4,208,006.00
	SAY	` 4,208,000.00

Checked by

Countersigned by

(K.LALSANGZUALA)

(BEIZAWZI T AZYU)

I - WORKS
ABSTRACT OF COST

DETAIL HEAD		COST
A	- Preliminary	284,000.00
B	- Land	Nil
C	- Works	3,413,000.00
K	- Building	53,000.00
M	- Plantation	Nil
O	- Miscellaneous	125,000.00
P	- Maintenance Construction of Division Box (10 Nos)	36,100.00
Q	- Special T & P	-
R	- Communication	Nil
Y	- Losses on Stock & Unforeseen	9,100.00
TOTAL		3,920,200.00

I-WORKS
DETAILED ESTIMATE OF COST
A - PRELIMINARY

Abstract of cost of Preliminary

Sl.No.	Particulars	Amount
1	Estimate of construction surveying & expenditure on Preliminary survey	209,000.00
2	Preparation & printing of Project report	15,000.00
3	Conveyance cost during survey & supervision	50,000.00
4	Camp utensils and accesories	10,000.00
	TOTAL	284,000.00

Checked by

Countersigned by

(K.LALSANGZUALA)

(BEIZAWZI T AZYU)

I-WORKS
DETAILED ESTIMATE OF COST
C - WORKS

Abstract of cost of C-Works

A	IRRIGATION WORK		
1	Construction of River Diversion - 10m width(2nos)	Rs	420,000.00
2	Construction of River Diversion - 13m width(1no)	Rs	253,000.00
4	Rehabilitation of Existing Main Cannal 1-1	Rs	119,200.00
5	Rehabilitation of Existing Secondary1-1,Tertiary canal1-4	Rs	78,300.00
6	Rehabilitation of Existing Main Cannal 2-1	Rs	285,600.00
7	Construction of Main cannal 1-2	Rs	88,600.00
8	Construction of Secondary cannal 1-1,1-2 etc	Rs	1,405,900.00
9	Construction of Main cannal 3	Rs	610,500.00
10	Construction of Desiltation tank 1	Rs	34,700.00
11	Construction of Desiltation tank 2-1&2-2	Rs	44,200.00
12	Construction of Division Box (10 Nos)	Rs	73,000.00
	TOTAL	Rs	3,413,000.00
	SAY	Rs	3,413,000.00

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(K.LALSANGZUALA)

Countersigned by

(BEIZAWZI T AZYU)

DIRECT CHARGES
DETAILED ESTIMATE OF COST
III - ORDINARY TOOLS & PLANTS

S.No	Items	Qty	Unit	Rate per unit	Amount
1	2	3	4	5	6
1	Sledge hammer (5Kg)	10	no	360.00	3,600.00
2	Measuring tape	6	no	500.00	3,000.00
3	Silpaulin	11	no	1,200.00	13,200.00
4	Tarpaulin	5	no	3,500.00	17,500.00
5	Cement plate	23	no	250.00	5,750.00
6	Sledge hammer (2Kg)	15	nos	250.00	3,750.00
7	Cross cut saw	13	nos	300.00	3,900.00
8	Mizo Dao	30	nos	150.00	4,500.00
9	Chisel	18	no	100.00	1,800.00
Construction of Division Box (10 Nos) TOTAL					57,000.00
SAY					57,000.00

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Countersigned by

(K.LALSANGZUALA)

(BEIZAWZI T AZYU)

I - WORK
DETAIL ESTIMATE OF COST .
A : PRELIMINARY

1) Detail measurement of Canal alignment works .

Item No./ Sl.No	Particulars of items	No	Length	Breadth / Thickness	Ht. or Depth	Quantity	Unit	Rate	Amount
1	2	3	4	5	6	7	8		9

Jungle clearance for alignment survey of channel :

1/1.02 Clearing and grubbing road land including uprooting rank vegetation, grass, brush shrubs, saplings and trees of girth upto 300mm, removal of stumps, disposal of unserviceable material and stacking of serviceable material upto 100 metres from road boundary.

(b) In area of thorny jungle

		2430.00	2.00			4860.00			
TOTAL						4860.00 sqm			
						4860.00 sqm	17.80		86,508.00

3/LS Alignment survey, marking of level and fixing of the required gradient line of channel.

Unskilled labour for holding of levelling staffs = 2 nos

Unskilled labour for measuring tape = 4 nos

Unskilled labour for carrying instruments, etc = 2 no

Unskilled labour for marking of level points, etc = 4 no

12 nos

Nos of day = 25 days

No of mandays = 300 mandays 250.00 75,000.00

4/LS Check level survey during construction

Unskilled labor 4 nos for 20 = 80 mandays 250.00 20,000.00

5/LS Final recording of levels

Unskilled labor 2 nos for 10 = 20 mandays 250.00 5,000.00

6/LS Wages for supervisor

1 nos for 90 = 90 mandays 250.00 22,500.00

TOTAL 209,008.00

SAY 209,000.00

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Prepared by

(K.LALSANGZUALA)

(BEIZAWZI T AZYU)

(J LALZARMAWIA)

I - WORKS
NAME OF WORK : CONSTRUCTION OF RIVER DIVERSION-I
C - WORKS

SL.No	PARTICULARS	No	L	B	H	Qty	Unit	Amount
1	Site Clearance and Preparation						Rs	1,500.00
2/2.07	Earthwork in excavation in foundation trenches or drains etc. (not exceeding 1.5m in width or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m including getting out excavated soil and disposal of surplus excavated soil as directed within a lead of 50 metres.							
	Floor	1	2.10	10.00	0.35	7.35	Cum	
	Side Wall	2	2.10	0.30	0.50	0.63	Cum	
	Wing Wall	2	2.00	0.30	0.50	0.60	Cum	
	Cut off Wall	2	10.00	0.80	1.25	20.00	Cum	
						Total	28.58	Cum
	c)Very Hard Soil(<i>junper work</i>)		@	Rs	580.50	/Cum	Rs	16,590.69
3/5.03	Reinforced cement concrete work in walls including attached pillasters, columns, pillars, posts, piers, abutments, return walls, retaining walls, struts, buttresses, string or lacing courses, fillets etc. upto floor five level excluding cost of centering shuttering etc complete. (b) 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size)							
	Floor	1	2.10	10.00	0.15	3.15	Cum	
	Side Wall	2	2.10	1.50	0.15	0.95	Cum	
	Wing Wall	2	2.00	1.50	0.15	0.90	Cum	
	Cut off Wall	2	10.00	0.15	1.25	3.75	Cum	
	Crest	7	1.00	0.70	0.45	2.21	Cum	
						Total	10.95	Cum
			@	Rs	7116.40	/Cum	Rs	77,924.58
4/5.21	Steel reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete. (a)Mild steel and Medium Tensile steel bars.							
	Providing 100 kg/cu.m item no 3/5.03					10.95	cum	
		@	100.00	kgs/cum	=	1095.00	kg	
		@ Rs.	61.80	/Kg			Rs.	67,671.00
5/5.11	Centering and shuttering including strutting, propping, etc. and removal of form works in - (b) Walls etc.							
	Side Wall	4	2.10	1.50	12.60	Sqm		
	Wing Wall	4	2.00	1.50	12.00	Sqm		
	Crest	12	0.70	0.45	3.78	Sqm		
						Total	28.38	Sqm
			@	Rs	422.10	/Sqm	Rs	11,979.20
6/21.14	20mm cement plaster 1 : 3 (1 cement : 3 fine sand) .							
	Floor	1	10.00	1.00	10.00	Sqm		
		6	0.50	1.10	3.30	Sqm		
	Side Wall	2	2.10	1.00	4.20	Sqm		
	Side Wall (top)	2	2.10	0.15	0.63	Sqm		
	Wing Wall	2	2.00	1.00	4.00	Sqm		
	Wing Wall(top)	2	2.00	0.15	0.60	Sqm		
	Crest	7	1.00	0.70	4.90	Sqm		
						Total	27.63	Sqm
			@	Rs	293.00	/Sqm	Rs	8,095.59
7	Providing local wood planks for ponding				L.S		Rs	1,300.00
8	Providing and fitting outlet Gate				L.S			25,000.00
					Total			210,061.06
						SAY	Rs	210,000.00
		For	2	nos			Rs	420,000.00

Prepared by

Countersigned by

Checked by

(LALREMRUATA NGURTE)

(BEIZAWZI T. AZYU)

(K.LALSANGZUALA)

I - WORKS
NAME OF WORK : CONSTRUCTION OF RIVER DIVERSION 2-1
C - WORKS

SL.No	PARTICULARS	No	L	B	H	Qty	Unit	Amount
1	Site Clearance and Preparation						Rs	1,700.00
2/2.07	Earthwork in excavation in foundation trenches or drains etc. (not exceeding 1.5m in width or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m including getting out excavated soil and disposal of surplus excavated soil as directed within a lead of 50 metres.							
	Floor	1	2.10	13.00	0.35	9.56	Cum	
	Side Wall	2	2.10	0.30	0.50	0.63	Cum	
	Wing Wall	2	2.00	0.30	0.50	0.60	Cum	
	Cut off Wall	2	13.00	0.80	1.25	26.00	Cum	
					Total	36.79	Cum	
	c)Very Hard Soil(<i>junper work</i>)		@	Rs	580.50	/Cum	Rs	21,353.69
3/5.03	Reinforced cement concrete work in walls including attached pillasters, columns, pillars, posts, piers, abutments, return walls, retaining walls, struts, buttresses, string or lacing courses, fillets etc. upto floor five level excluding cost of centering shuttering etc complete. (b) 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size)							
	Floor	1	2.10	13.00	0.15	4.10	Cum	
	Side Wall	2	2.10	1.50	0.15	0.95	Cum	
	Wing Wall	2	2.00	1.50	0.15	0.90	Cum	
	Cut off Wall	2	13.00	0.15	1.25	4.88	Cum	
	Crest	9	1.00	0.70	0.45	2.84	Cum	
					Total	13.65	Cum	
			@	Rs	7116.40	/Cum	Rs	97,138.86

4/5.21	Steel reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete. (a)Mild steel and Medium Tensile steel bars. Providing 100 kg/cu.m item no 3/5.03							
						13.65	cum	
		@	100.00	kgs/cum	=	1365.00	kg	
		@ Rs.	61.80	/Kg			Rs.	84,357.00
5/5.11	Centering and shuttering including strutting, propping, etc. and removal of form works in - (b) Walls etc. Side Wall Wing Wall Crest							
		4	2.10	1.50	12.60	Sqm		
		4	2.00	1.50	12.00	Sqm		
		16	0.70	0.45	5.04	Sqm		
				Total	29.64	Sqm		
@	Rs		422.10	/Sqm	Rs	12,511.04		
6/21.14	20mm cement plaster 1 : 3 (1 cement : 3 fine sand) . Floor Side Wall Side Wall (top) Wing Wall Wing Wall(top) Crest							
		1	13.00	1.00	13.00	Sqm		
		1	3.40	1.10	3.74	Sqm		
		2	2.10	1.00	4.20	Sqm		
		2	2.10	0.15	0.63	Sqm		
		2	2.00	1.00	4.00	Sqm		
		2	2.00	0.15	0.60	Sqm		
		9	1.00	0.70	6.30	Sqm		
				Total	32.47	Sqm		
		@	Rs		293.00	/Sqm	Rs	9,513.71
7	Providing local wood planks for ponding			L.S	Rs	1,500.00		
8	Providing and fitting outlet Gate			L.S		25,000.00		
			Total			253,074.31		
				SAY	Rs	253,000.00		

Prepared by

Countersigned by

Checked by

(LALREMRUATA NGURTE)

(BEIZAWZI T. AZYU)

(K.LALSANGZUALA)

I-WORKS
DETAILED ESTIMATE OF COST
C - WORKS

3. Rehabilitation of Existing Channel 1-1

Detail Measurement and calculation of quantities of Plastering existing channel

Item No./ Sl.No	Particulars of items	No	Length	Breadth / Thickness	Ht. or Depth	Quantity	Unit	Amount
1	2	3	4	5	6	7	8	9

Jungle clearance

- 1/ Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and
 1.03 saplings of girth upto 30cm measured at a height of 1 m above ground level and removal of

Chainage

0.00 to 250.00	1	250.00	1.40		350.00	sqm
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@

9.40 /sqm

3,290.00

- 2/ Dismantling old plaster or skirting raking out joints and cleaning the surface for
 25.56 plaster including disposal of rubbish to the dumping ground within 50 metres lead.

Floor	1	250.00	0.60		150.00	cum
Walls	2	250.00		0.30	150.00	cum
Top walls	2	250.00	0.12		60.00	cum
					360.00	cum

@

16.50 /cum

5,940.00

Plaster

- 3/ 12mm cement plaster 1 :3 (1cement : 3 coarse sand) finished with a floating coat of neat
 21.18 cement.

Inside Channel walls	2	250.00		0.30	150.00	sqm
Outside Channel walls	2	250.00		0.10	50.00	sqm
Channel top	2	250.00		0.12	60.00	sqm
Channel floor	1	250.00		0.60	150.00	sqm

Total : 410.00 sqm

@

268.30 /sqm

110,003.00

TOTAL A 119,233.00
SAY 119,200.00

Checked by

Countersigned by

Prepared by

(K.LALSANGZUALA)

(BEIZAWZI T AZYU)

(J.LALZARMAWIA)

I-WORKS
DETAILED ESTIMATE OF COST
C - WORKS

Rehabilitation of Secondary Existing Cannal 1-1, Tertiary Existing Cannal 1-4

Detail Measurement and calculation of quantities of Plastering existing Secondary cannal

Item No./ Sl.No	Particulars of items	No	Length	Breadth/ Thickness	Ht. or Depth	Quantity	Unit	Amount
1	2	3	4	5	6	7	8	9

Jungle clearance

- 1/ Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and
 1.03 saplings of girth upto 30cm measured at a height of 1 m above ground level and removal of

Chainage

0.00 to 200.00	1	200.00	1.40		280.00	sqm		
							@ 9.40 /sqm	2,632.00

- 2/ Dismantling old plaster or skirting raking out joints and cleaning the surface for
 25.56 plaster including disposal of rubbish to the dumping ground within 50 metres lead.

Floor	1	200.00	0.30		60.00	cum		
Walls	2	200.00		0.30	120.00	cum		
Top walls	2	200.00	0.12		48.00	cum		
							228.00 cum	
							@ 16.50 /cum	3,762.00

Plaster

- 3/ 12mm cement plaster 1 :3 (1cement : 3 coarse sand) finished with a floating coat of neat
 21.18 cement.

Inside Channel walls	2	200.00		0.30	120.00	sqm		
Outside Channel walls	2	200.00		0.10	40.00	sqm		
Channel top	2	200.00		0.12	48.00	sqm		
Channel floor	1	200.00		0.30	60.00	sqm		
							Total : 268.00 sqm	

@ 268.30 /sqm 71,904.40

TOTAL A 78,298.40
SAY 78,300.00

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Prepared by

(K.LALSANGZUALA)

(BEIZAWZI T AZYU)

(J.LALZARMAWIA)

I-WORKS
DETAILED ESTIMATE OF COST
C - WORKS

Rehabilitation of Secondary Existing Cannal 2-1

Detail Measurement and calculation of quantities of Plastering existing Secondary cannal

Item No./ Sl.No	Particulars of items	No	Length	Breadth/ Thickness	Ht. or Depth	Quantity	Unit	Amount
1	2	3	4	5	6	7	8	9

Jungle clearance

- 1/ Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and
 1.03 saplings of girth upto 30cm measured at a height of 1 m above ground level and removal of
Chainage

0.00 to 680.00	1	680.00	1.40		952.00	sqm	
@ 9.40 /sqm							8,948.80

- 2/ Dismantling old plaster or skirting raking out joints and cleaning the surface for
 25.56 plaster including disposal of rubbish to the dumping ground within 50 metres lead.

Floor	1	680.00	0.40		272.00	cum	
Walls	2	680.00		0.30	408.00	cum	
Top walls	2	680.00	0.12		163.20	cum	
@ 16.50 /cum							13,912.80

Plaster

- 3/ 12mm cement plaster 1 :3 (1cement : 3 coarse sand) finished with a floating coat of neat
 21.18 cement.

Inside Channel walls	2	680.00		0.30	408.00	sqm	
Outside Channel walls	2	680.00		0.10	136.00	sqm	
Channel top	2	680.00		0.12	163.20	sqm	
Channel floor	1	680.00		0.40	272.00	sqm	
Total :						979.20	sqm

@ 268.30 /sqm 262,719.36

TOTAL A 285,580.96
SAY 285,600.00

#####

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Countersigned by

(J.LALZARMAWIA)

(BEIZAWZI T AZYU)

I-WORKS
DETAILED ESTIMATE OF COST
C - WORKS

Construction of Cannal -

(A) Rectangular section of PCC floor with Brick walling Secondary cannal 1-1, 1-2(220rm)
 & Tertiary cannal 1-1 & 1-2 (130rm), Tertiary New Cannal 1-4(60m), Main cannal 2-2 (530 rm)

Detail Measurement and calculation of quantities of Brick wall & cement concrete floor cannal

Item No./ Sl.No	Particulars of items	No	Length	Breadth / Thickness	Ht. or Depth	Quantity	Unit	Amount
1	2	3	4	5	6	7	8	9

A Bricklined Channel

Jungle clearance

1/ Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and
 1.03 saplings of girth upto 30cm measured at a height of 1 m above ground level and removal of
Chainage

0.00	to	940.00	1	940.00	1.40	1316.00	sqm
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@ 9.40 /sqm

12,370.40

Earthwork

2/ Earth work in excavation over areas (exceeding 30cm in depth, 1.5m in width as well as
 2.06 10sqm on plan) including disposal of excavated earth, lead upto 50m and lift upto 1.5m,

Formation width level cutting

Chainage

0.00	to	20.00	1/2	20.00	1.20	18.00	cum
------	----	-------	-----	-------	------	-------	-----

@ 284.30 /cum

5,117.40

Earthwork Trench cutting

3/ Earthwork in excavation in foundation trenches or drains etc. (not exceeding 1.5m in width
 2.07 or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m
 including getting out excavated soil and disposal of surplus excavated soil as directed within
 a lead of 50 metres.

b) Hard Soil (pick work)

0.00	to	940.00	1	940.00	0.56	131.60	cum
------	----	--------	---	--------	------	--------	-----

@ 435.40 /cum

57,298.64

PCC work

4/ Providing and laying in position cement concrete of specified grade excluding cost of
 4.02 centering and shuttering - All work upto plinth level: a) 1:2:4 (1 cement :2
 course sand :4 stone aggregate 20mm nominal size)

Floor	1	940.00	0.56	0.12	63.17	cum
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@ 6,889.60 /cum

435,202.25

5/ Half brick masonry with first class bricks in foundations and plinth in: a) in

2	940.00	0.30	564.00	sqm
---	--------	------	--------	-----

@ 1,007.10 /sqm

568,004.40

Plaster

6/ 21.18 12mm cement plaster 1 :3 (1cement : 3 coarse sand) finished with a floating coat of neat cement.

Inside Channel walls
 Outside Channel walls
 Channel top
 Channel floor

2	940.00		0.30	564.00	sqm
2	940.00		0.10	188.00	sqm
2	940.00		0.10	188.00	sqm
1	940.00		0.30	<u>282.00</u>	sqm

Total : 1222.00 sqm

@ 268.30 /sqm 327,862.60

TOTAL A 1,405,855.69
SAY 1,405,900.00

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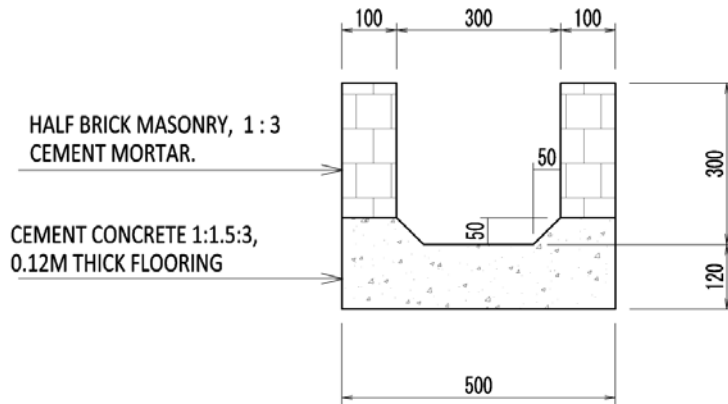
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Prepared by

(K.LALSANGZUALA)

(BEIZAWZI T AZYU)

(J.LALZARMAWIA)



X-SECTION

I-WORKS
DETAILED ESTIMATE OF COST
C - WORKS

Construction of Cannal -

(A) Rectangular section of PCC floor with Brick walling Main cannal 3(360m)

Detail Measurement and calculation of quantities of Brick wall & cement concrete floor cannal

Item No./ Sl.No	Particulars of items	No	Length	Breadth / Thickness	Ht. or Depth	Quantity	Unit	Amount
1	2	3	4	5	6	7	8	9

A Bricklined Channel

Jungle clearance

1/ Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and
 1.03 saplings of girth upto 30cm measured at a height of 1 m above ground level and removal of

Chainage

0.00	to	360.00	1	360.00	1.40	504.00	sqm
------	----	--------	---	--------	------	--------	-----

@ 9.40 /sqm

4,737.60

Earthwork

2/ Earth work in excavation over areas (exceeding 30cm in depth, 1.5m in width as well as
 2.06 10sqm on plan) including disposal of excavated earth, lead upto 50m and lift upto 1.5m,

Formation width level cutting

Chainage

0.00	to	360.00	1/2	360.00	1.00	108.00	cum
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@ 284.30 /cum

30,704.40

Earthwork Trench cutting

3/ Earthwork in excavation in foundation trenches or drains etc. (not exceeding 1.5m in width
 2.07 or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m

0.00	to	360.00	1	360.00	0.66	59.40	cum
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@ 435.40 /cum

25,862.76

PCC work

4/ Providing and laying in position cement concrete of specified grade excluding cost of
 Floor

1	360.00	0.66	0.12	28.51	cum
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@ 6,889.60 /cum

196,436.28

5/ Half brick masonry with first class bricks in foundations and plinth in: a) in

2	360.00	0.30	216.00	sqm
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@ 1,007.10 /sqm

217,533.60

Plaster

6/ 12mm cement plaster 1 :3 (1cement : 3 coarse sand) finished with a floating coat of neat
21.18 cement.

Inside Channel walls	2	360.00		0.30	216.00	sqm
Outside Channel walls	2	360.00		0.10	72.00	sqm
Channel top	2	360.00		0.10	72.00	sqm
Channel floor	1	360.00		0.40	144.00	sqm

Total : 504.00 sqm

@ 268.30 /sqm 135,223.20

TOTAL A 610,497.84
SAY 610,500.00

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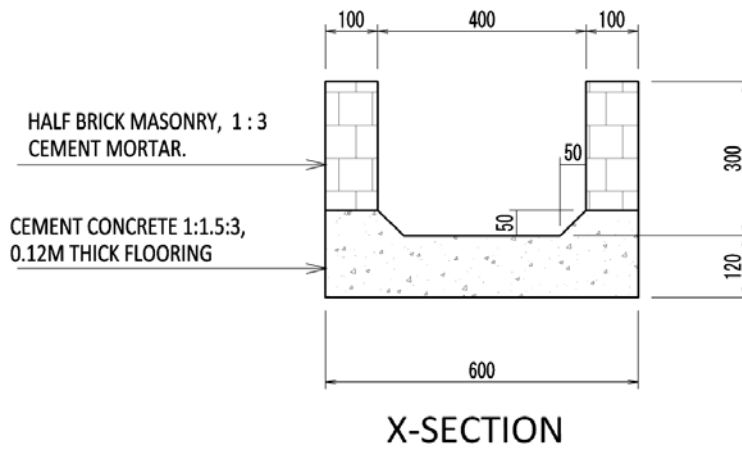
Countersigned by

Prepared by

(K.LALSANGZUALA)

(BEIZAWZI T AZYU)

(J.LALZARMAWIA)



I-WORKS
DETAILED ESTIMATE OF COST
C - WORKS

Construction of Desiltation tank

Detail Measurement and calculation of Desiltation tank-1

Item No./ Sl.No	Particulars of items	No	Length	Breadth / Thickness	Ht. or Depth	Quantity	Unit	Amount
1	2	3	4	5	6	7	8	9

1/ Earth work in excavation over areas (exceeding 30cm in depth, 1.5m in width as well as
 2.06 10sqm on plan) including disposal of excavated earth, lead upto 50m and lift upto 1.5m,

	1/2	5.00	3.00	1.00	7.50	cum	
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@ 284.30 /cum

2,132.25

Earthwork Trench cutting

2/ Earthwork in excavation in foundation trenches or drains etc. (not exceeding 1.5m in width
 2.07 or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m

	1	3.84	2.04	0.45	3.53	cum	
--	---	------	------	------	------	-----	--

435.40 /cum

@

1,534.84

PCC work

3/ Providing and laying in position cement concrete of specified grade excluding cost of
 Floor

	1	3.84	2.04	0.15	1.18	cum	
--	---	------	------	------	------	-----	--

6,889.60 /cum

@

8,095.56

5/ Half brick masonry with first class bricks in foundations and plinth in: a) in

	2	3.84		0.60	4.61	sqm	
	2	1.44		0.60	1.73	sqm	
					6.34	sqm	

1,007.10 /sqm

@

4,640.72

Plaster

6/ 12mm cement plaster 1 :3 (1cement : 3 coarse sand) finished with a floating coat of neat cement.

Inside walls	2	3.60		0.60	4.32	sqm
	2	1.80		0.60	2.16	sqm
Top	1	10.08	0.12		1.21	sqm
Channel floor	1	3.60	1.80		6.48	sqm

Total : 14.17 sqm

@ 268.30 /sqm 3,801.70

7 Providing 100mm dia GI pipe for scouring siltation

	1	6.00			6.00	rm
--	---	------	--	--	------	----

@ 913.00 /rm 5,478.00

Providing 100mm dia Gate valve

	1	1.00			1.00	no
--	---	------	--	--	------	----

@ 8,973.00 /rm 8,973.00

TOTAL 34,656.06
SAY 34,700.00

Checked by

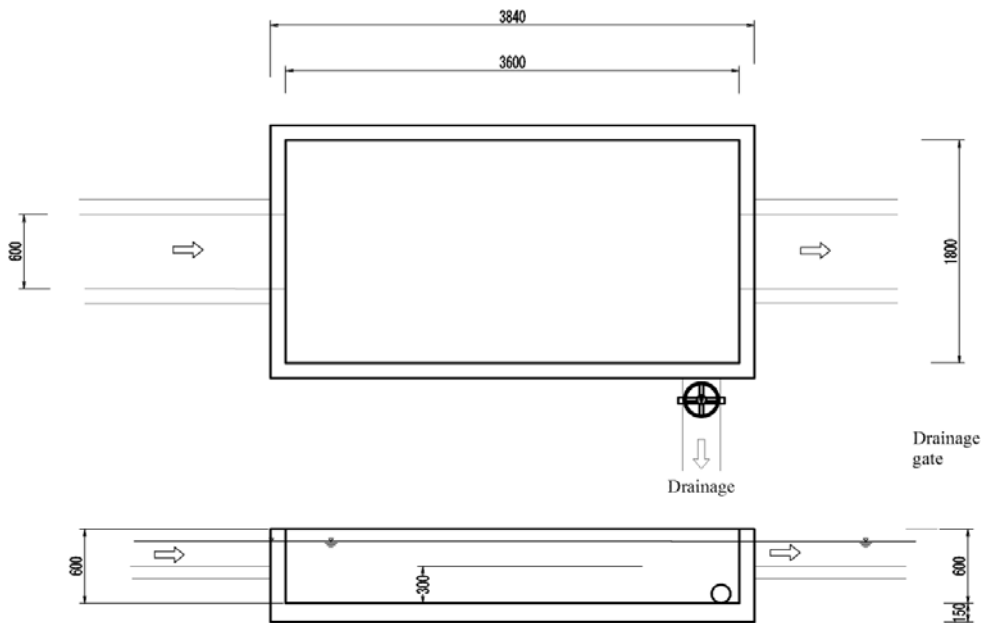
Countersigned by

Prepared by

(K.LALSANGZUALA)

(BEIZAWZI T AZYU)

(J.LALZARMAWIA)



I-WORKS
DETAILED ESTIMATE OF COST
C - WORKS

Construction of Desiltation tank

Detail Measurement and calculation of Desiltation tank 2-1 & 2-2

Item No./ Sl.No	Particulars of items	No	Length	Breadth/ Thickness	Ht. or Depth	Quantity	Unit	Amount
1	2	3	4	5	6	7	8	9

1/ Earth work in excavation over areas (exceeding 30cm in depth, 1.5m in width as well as

	1/2	3.00	2.00	1.00	3.00	cum	
--	-----	------	------	------	------	-----	--

@ 284.30 /cum

852.90

Earthwork Trench cutting

2/ Earthwork in excavation in foundation trenches or drains etc. (not exceeding 1.5m in width
 2.07 or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m

	1	2.04	1.14	0.45	1.05	cum	
--	---	------	------	------	------	-----	--

@ 435.40 /cum

455.65

PCC work

3/ Providing and laying in position cement concrete of specified grade excluding cost of
 Floor

	1	2.04	1.14	0.15	0.35	cum	
--	---	------	------	------	------	-----	--

@ 6,889.60 /cum

2,403.37

5/ Half brick masonry with first class bricks in foundations and plinth in: a) in

	2	2.04		0.60	2.45	sqm	
	2	1.44		0.60	1.73	sqm	
					4.18	sqm	

@ 1,007.10 /sqm

2,465.38

Plaster

6/ 12mm cement plaster 1 :3 (1cement : 3 coarse sand) finished with a floating coat of neat cement.

Inside walls
Top
Channel floor

2	0.90		0.60	1.08	sqm
2	1.80		0.60	2.16	sqm
1	5.28	0.12		0.63	sqm
1	0.90	1.80		1.62	sqm

Total : 5.49 sqm

@ 268.30 /sqm 1,473.93

7 Providing 100mm dia GI pipe for scouring siltation

1	6.00			6.00	rm
---	------	--	--	------	----

@ 913.00 /rm 5,478.00

Providing 100mm dia Gate valve

1	1.00			1.00	no
---	------	--	--	------	----

@ 8,973.00 /rm 8,973.00

TOTAL 22,102.24

SAY 22,100.00

For 2 nos **44,200.00**

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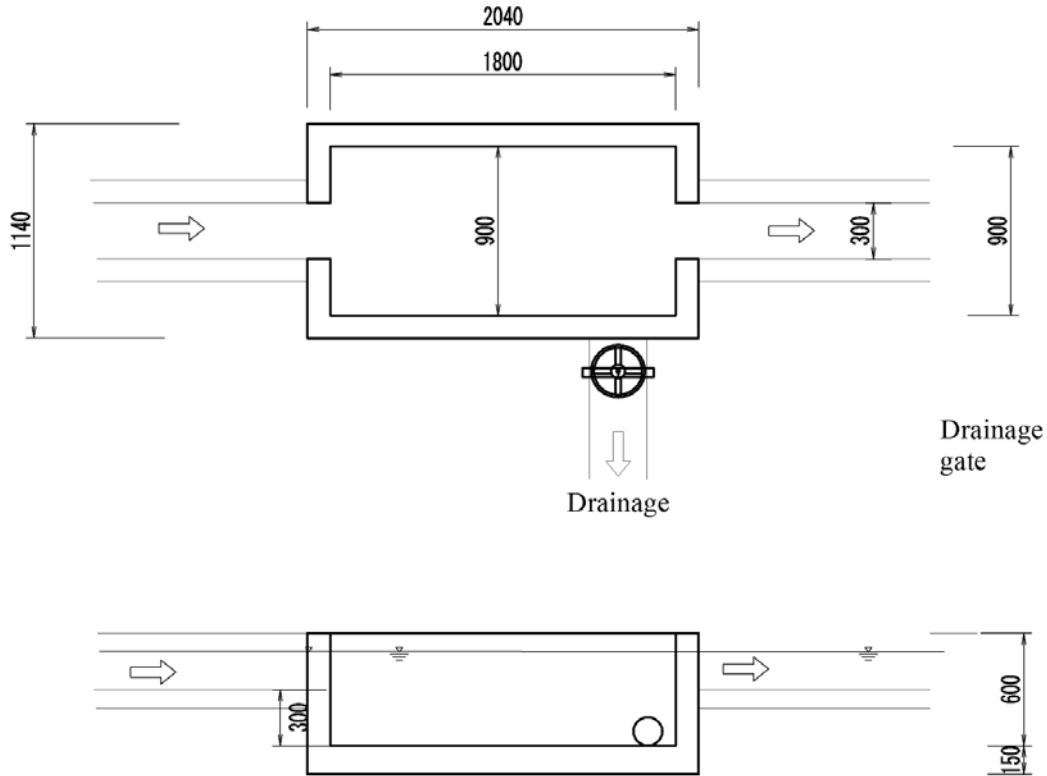
Countersigned by

Prepared by

(K.LALSANGZUALA)

(BEIZAWZI T AZYU)

(J.LALZARMAWIA)



I-WORKS
DETAILED ESTIMATE OF COST
C - WORKS

Construction of Division box

Detail Measurement and calculation of Division Box

Item No./ Sl.No	Particulars of items	No	Length	Breadth / Thickness	Ht. or Depth	Quantity	Unit	Amount
1	2	3	4	5	6	7	8	9

1/ Earth work in excavation over areas (exceeding 30cm in depth, 1.5m in width as well as
 2.06 10sqm on plan) including disposal of excavated earth, lead upto 50m and lift upto 1.5m,

	1/2	3.00	1.50	0.60	1.35	cum
--	-----	------	------	------	------	-----

@ 284.30 /cum

383.81

Earthwork Trench cutting

2/ Earthwork in excavation in foundation trenches or drains etc. (not exceeding 1.5m in width
 2.07 or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m

	1	1.34	1.34	0.35	0.63	cum
--	---	------	------	------	------	-----

@ 435.40 /cum

273.63

PCC work

3/ Providing and laying in position cement concrete of specified grade excluding cost of
 Floor

	1	1.24	1.24	0.15	0.23	cum
	1	1.34	1.34	0.05	0.09	cum

Total 0.32

@ 6,889.60 /cum

2,207.57

5/ Half brick masonry with first class bricks in foundations and plinth in: a) in

Long Walls	2	1.24		0.70	1.74	sqm
Short Walls	2	1.00		0.70	1.40	sqm
Deduction	3	0.30		0.40	0.36	sqm

Total 2.78 sqm

@ 1,007.10 /sqm

1,748.33

Plaster

6/ 12mm cement plaster 1 :3 (1cement : 3 coarse sand) finished with a floating coat of neat cement.

Inside walls	4	1.00		0.70	2.80	sqm
Deduction	3	0.30		0.40	0.36	
Top	1	7.12	0.12		0.85	sqm
Floor	1	1.00	1.00		1.00	sqm

Total : 4.29 sqm

@ 268.30 /sqm 1,152.19

7 Providing 40mm dia GI pipe for scouring siltation

1	6.00			6.00	rm
---	------	--	--	------	----

@ 261.43 /rm

1,568.58

TOTAL 7,334.10

SAY 7,300.00

For 10 nos 73,000.00

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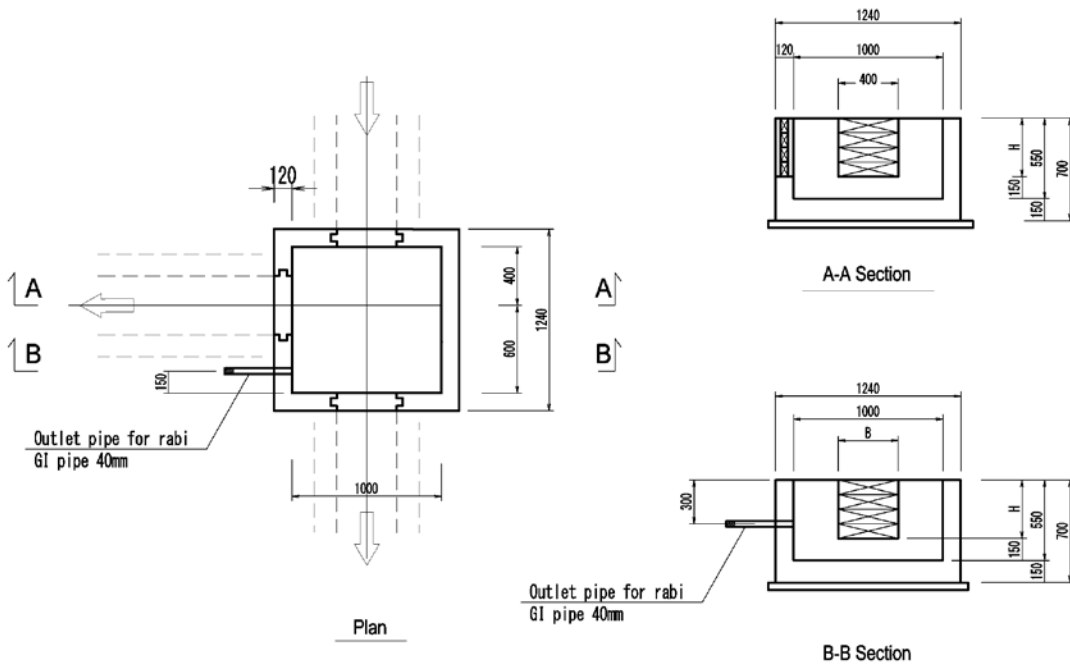
Countersigned by

Prepared by

(K.LALSANGZUALA)

(BEIZAWZI T AZYU)

(J.LALZARMAWIA)



I-WORKS
DETAILED ESTIMATE OF COST
C - WORKS

Construction of Road 1 -

Detail Measurement and calculation of quantities of Road 1

Item No./ Sl.No	Particulars of items	No	Length	Breadth / Thickness	Ht. or Depth	Quantity	Unit	Amount
1	2	3	4	5	6	7	8	9

Jungle clearance

- 1/ Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings
1.03 of girth upto 30cm measured at a height of 1 m above ground level and removal of rubbish

	1	80.00	5.00			400.00	sqm
--	---	-------	------	--	--	--------	-----

@ 9.40 /sqm

3,760.00

Earthwork

- 2/ Earth work in excavation over areas (exceeding 30cm in depth, 1.5m in width as well as
2.06 10sqm on plan) including disposal of excavated earth, lead upto 50m and lift upto 1.5m,
disposed earth to be levelled and neatly dressed. a) Ordinary and Hard soil

Formation width level cutting

	1/2	75.00	3.50	2.00	262.50	cum
	1/2	75.00	1.78	0.94	62.75	cum
	1/2	75.00	1.38	0.94	48.65	cum

Total 373.89

@ 284.30 /cum

106,296.93

Earthwork Trench cutting

- 3/ Earthwork in excavation in foundation trenches or drains etc. (not exceeding 1.5m in width
2.07 or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m

	1	80.00	0.30	0.30	7.20	cum
--	---	-------	------	------	------	-----

@ 435.40 /cum

3,134.88

TOTAL
SAY

113,191.81
113,200.00

Checked by

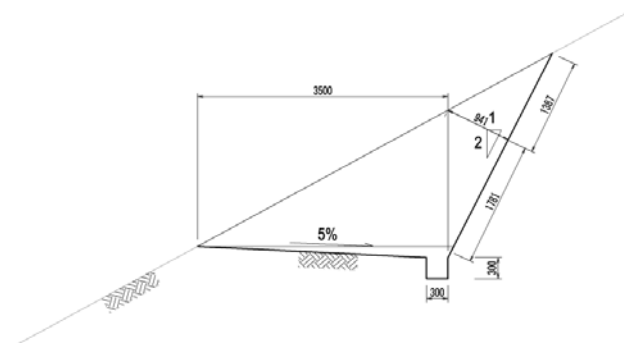
Countersigned by

Prepared by

(K.LALSANGZUALA)

(BEIZAWZI T AZYU)

(J.LALZARMAWIA)

Farm road rehabilitation Standard section

I-WORKS
DETAILED ESTIMATE OF COST
K - BUILDING

Sl. No.	Particulars	Qty	Unit	Rate	Amount
a)	Temporary staff camp Size - 10.0 x 5.0	50	sqm	Rs. 1,058	Rs. 52,900.00
		Sub-total			Rs. 52,900.00
		SAY			Rs. 53,000.00

Checked by

Countersigned by

(K.LALSANGZUALA)

I-WORKS
 DETAILED ESTIMATE OF COST
 O - MISCELLANEOUS

Sl. No.	Particulars	Qty	Unit	Amount
1	Medicine as first aid and anti-malarial measures for two working season	L.S		Rs. 5,000.00
2	Sign board, BM point, Painting etc	L.S		Rs. 20,000.00
3	Visit of Dignitaries	L.S		Rs. 30,000.00
4	Hiring charge of vehicle for supervising staff	L.S		Rs. 50,000.00
5	Other requirement for project supervision	L.S		Rs. 10,000.00
6	Photography, Documenting during pre-construction and construction period	L.S		Rs. 10,000.00

Sub-total

Rs. 125,000.00

(Rupees one lakh ten thousand) only

Checked by

Countersigned by

(K.LALSANGZUALA)

(BEIZAWZI T.AZYU)

I-WORKS
DETAILED ESTIMATE OF COST
Q - SPECIAL TOOLS & PLANTS

S.No	Items	Qty	Unit	Rate per unit	Amount
1	Automatic level	0	no	50,000.00	Rs. -
2	GPS	0	no	65,000.00	Rs. -
			Total		Rs. -

#NAME?

Checked by

Countersigned by

(K.LALSANGZUALA)

(BEIZAWZI T.AZYU)

Annexure

7. Construction Plan

Standard Construction Plan form (Draft) (Laului MID scheme)

1. Project outline

MID office in charge	Executive Engineer, Aizawl Minor Irrigation Division
Site location	Sailam, 23°20'10.74"N, 92°45'60.00"E
Construction budget	About 3.3 Lakh
Construction facilities	Intake facility; 3Nos Thingkhuang lui block channel; 1050m Vawmkuak lui block channel; 840m Lau lui block; 360m Road rehabilitation; 170m
Project description	Objective of the project is to rehabilitate and upgrade existing irrigation facilities, and promote winter crops cultivation to increase income of the beneficiary farmers.

2. Management organization

(1) MID supervision team ;

Position	Responsibility
Executive Engineer	He will <i>frequently</i> visit the project site to inspect, supervise and monitor overall progress of the project works.
Sub-Divisional Officer	He will <i>regularly</i> visit, inspect, supervise and monitor the project at every stage of the project works.
Junior Engineer	He will <i>stay</i> at the project site and oversee the project works at all the stage to ensure quality and timely completion.
Sectional Assistant	He will stay at the project site and assist Junior Engineer at all the stages of project works

(2) Safety management organization;

1). Contact list

Organization/status	Name	Contact number
Nearest Hospital	Aizawl Civil Hospital	0389-2322318
Nearest Police outpost	Sialsuk Police Outpost	0389-2571343
	O/C Kaste Romalsawma	9436960125
Water users organization	President- R.Vanlalhriata Sailam	9862872171
Village council	VCP- Lalrithanga Sailam	9862671793
Relevant Department	DOA ; P Laltluangkima AEO	9436152267
	DOH ; C Lalronghaka DHO	9436352244

2). Safety measures

Details should be referred to Contractors agreement Form 8.

3. Temporary work plan
- No special temporary work.

4. Construction plan

(1) Construction machinery utilization plan:

List to describe the name, type, specification, expected quantity, and use of construction machinery.

Machine Name	Specification	Nos	Work to use	Remarks
Excavator	JBC	2	Excavation	
Concrete mixer		2	Concrete mixing	
Compactor		2	Soil compaction	

(2) Local materials:

List to describe the name, Specification and expected source of major local materials.

Name of materials	Specification	Source of Procurement	Remarks
Aggregate	20mm dia	Thenzawl	
Stones for masonry	Nil	Thenzawl	
Sand	Coarse/Fine	Aizawl	
Brick	1 st Class	Aizawl	
Cement	Portland	Aizawl	

(3) Meeting and Documentation plan

List to describe the Meeting and Documentation plan

Meeting	Frequency	Document to prepare	Attendant	Remarks
Kick off meeting	Before site works	Construction Plan, QC plan Contract document	Executive Engineer Sub-Divisional Officer Junior Engineer Contractor	
Regular meeting	Monthly	Minutes, Daily site report	Sub-Divisional Officer Junior Engineer Contractor	
Inspection	Quarterly	Minutes, Daily site report Updated progress chart	Sub-Divisional Officer Junior Engineer Contractor	

(4) Construction Time Schedule :

Construction Time Schedule plan is attached in following page.

Laului MI Project Progress Chart

Works	Unit	Quantity	Plan Actual	1st Year			2nd year					Remarks	
				October	November	December	January	February	March	April	May		
1. General													
Preliminary/ Mobilization	L.S	1	Plan	[Planned Progress]									
2. Rehabilitation of road													
Earth works	L.S	1	Plan		[Planned Progress]								
2. Diversion Weirs													
Earth works	L.S	3	Plan					[Planned Progress]					
			Actual					[Actual Progress]					
Foundation	L.S	3	Plan					[Planned Progress]					
			Actual					[Actual Progress]					
wing walls	L.S	3	Plan						[Planned Progress]				
			Actual					[Actual Progress]					
Cut off wall	L.S	3	Plan					[Planned Progress]					
			Actual					[Actual Progress]					
Floor part	L.S	3	Plan					[Planned Progress]					
			Actual					[Actual Progress]					
Structure backfilling	L.S	3	Plan							[Planned Progress]			
			Actual							[Actual Progress]			
3. Cannal													
	Rm	2,250	Plan				[Planned Progress]						
	Rm		Actual				[Actual Progress]						
4. Desiltation tank													
	Nos	3	Plan						[Planned Progress]				
	Nos		Actual						[Actual Progress]				
5. Division box													
	Nos	9	Plan						[Planned Progress]				
	Nos		Actual						[Actual Progress]				
6. Cleaning & demoblization													
	L.S	1	Plan								[Planned Progress]		
	L.S		Actual								[Actual Progress]		

[Solid Blue Line] : Planed Progress [Dashed Red Line] : Actual Progress

Annexure

8. Quality Control Plan

1. Target of Quality control works

	Items	Quantity	Unit	Remarks
Construction Facilities	Intake facility	3	Nos	
	Thingkhuang lui block channel	1050m	Rm	
	Vawmkuak lui block channel	840m	Rm	
	Lau lui block channel	360	Rm	
	Road rehabilitation	75	Rm	
Documents	<ul style="list-style-type: none"> - Contact document , BOQ, Drawing, specification - Quality control checklist - Daily site report, site test result - Quality control related pictures - Meeting and inspection materials 			

2. Quality control action plan

Name of work	Control items	Control Methodology
1. Preliminary		
	Site condition before works	Photo
	Setting of alignment, centerline of facilitates	Modification of Drawing and BOQ, confirmation with WUA
2. Intake facility		
	Intake works general	Canal works Quality control checklist
2-1 Earth work	Foundation soil condition (bearing capacity, infiltration condition)	Test pitting, Photo, Adjustment of cutoff depth
Excavation	Working condition	Photo
	Elevation of excavation line	Level survey
Backfilling	Working condition	Photo, check of compaction
2-2 Foundation/ Wall	Concrete /form works	Concrete Quality control checklist, Photo, Slump test
	Dimension of structure	Level survey, tape measurement, photo
3. Channel/ turnout	Condition before /after the work	Photo
	Canal works general	Canal works Quality control checklist
3-1 Earth work	Foundation condition	Photo, visual observation
	Elevation of foundation level	Level survey
3-2 Foundation/ Wall	Concrete /form works	Concrete Quality control checklist, Photo, Slump test

	Material check before work (size, quantity, defects of products, damage of transportation)	Photo, catalog, etc.
	Plastering work (material,mortar mixing,thickness, cracks)	Photo, visual observation
	Dimension of structure	Level survey, tape measurement, photo
4 Road rehabilitation	Condition before/during /after the work	Photo
	Soil and drainage condition	Photo, visual observation If problem found, design should be reviewed.
	Dimensions of rehabilitated road (size, slope, elevation)	Level survey, tape measurement, photo

Notes;

- ✓ Detailed requirements of Quality control should be refer to contact document and PWD technical specification.
- ✓ When MID conducts inspection works for payment, WUA is also recommend to participate in inspection works for witnesses.
- ✓ After construction work, MID have to prepare as built drawings based on alteration of construction works.
- ✓ Above Quality control related documents are to be filed and kept in division office as evidence of the works after construction.

Annexure

9. Certificate

9.1 Certificates of hydro meteorological data and field data

Certificated that Hydro meteorological data and field data in respect of Laului Minor Irrigation Project, Sailam, Sialsuk and Thenzawl group of AIBP, such as river and rainfall data are available with the Statistical Abstract, Department of Agriculture, Government of Mizoram for incorporation in the Project report.

Date _____

Place _____

**9.2 Certificates of rate used of civil works based on the Mizoram PWD SOR 2013 and PHED
issue and laying rate**

Certificated that rates for Civil Works of Laului Minor Irrigation Project, Sailam, Sialsuk and Thenzawl group of AIBP, under Aizawl District are based on the Mizoram PWD SOR 2013 (plus 8.08% cost index for Aizawl Division as approved by Government of Mizoram, and issued rate of different GI Pipe as memo no.19020/1/2009 PHE dt.27th July 2012 and laying rates of different size of GI Pipe (medium) Memo no. N-11011/160/2011/CE/PHE/9 dt.4th July 2012.

Date _____

Place _____

9.3 Certificates of quantities calculated as per designs and approved drawings

Certificated that the quantities calculated for all components/activities proposed under Laului Minor Irrigation Project, Sailam, Sialsuk and Thenzawl group of AIBP, under Aizawl District have been calculated as per designs and approved drawings.

Date _____

Place _____

9.4 Certificates of irrigation structures designed as per B.I.S code IS456-2000 and other relevant codes

Certificated that all the Irrigation Structure i.e Weirs etc under Laului Irrigation Project, Sailam, Sialsuk and Thenzawl group of AIBP, under Aizawl District have been designed as per B.I.S code IS 456-2000 and relevant vodes.

Date _____

Place _____

9.5 Certificates of non-overlap command areas of any existing or proposed major, medium or minor irrigation project proposed/taken up by other department

Certificated that the proposed command areas of all irrigation structure under Laului Minor Irrigation Project of Sailam, Sialsuk and Thenzawl group of AIBP, under Aizawl District to be taken up by the Department of Minor Irrigation do not overlap with command areas of any existing or proposed major, medium or minor irrigation project proposed/taken up by other Department.

Also certified that this proposed minor irrigation scheme is not a part of any other major or medium scheme.

Date _____

Place _____

Annexure

10. Farmer's Application

To

The Executive Engineer,
Aizawl Irrigation Division,
Aizawl.

Subject: Laului Minor Irrigation Project siamsak tura ngenna leh intiamkamna.

Ka Pu,

I hnena Laului Minor Irrigation Project, min siamsak tura kan dilna bawhzuia Preliminary Survey te min neih sak avangin lawmthu kan sawi e.

Department aiawha lo kal te leh loneituten kan sawiho tawhna atanga Department-in ruahmanna fel tak min siamsak hi chipchiar taka sawiho a ni a. Ruahmanna tlangpui te chu –

1. Intake Facility – 3 Nos
2. Thingkhuang lui block channel – 1050m
3. Vawmkuak lui block channel – 840m
4. Lau lui block – 360m
5. Road rehabilitation – 170m

Department-in ruahmanna a siam te khi tha kan ti in min thawhsak ngei turin kan ngen a ni.

INTIAMKAMNA:

Keini a hnuai hming ziak te hian Department-in Laului Minor Irrigation Project, min siamsak theih chuan hmalaknaah theih tawp kan chhuah ang tih kan tiam a, chungte chu

- Intake facility siam emaw, block channel in a paltlang ram neituten engmah sawi buai lovin harsatna kan siam lovang.
- Kan zau tana ruahmanna hrang hrang – tuikawng, block channel leh thildangte siam chungchangah thlai a chhia anih pawhin ram neituten eng zangnadawmna (compensation) mah kan phut lovang.
- Laului Minor Irrigation Project siam chung hian, Department kut ti chak turin theihtawp kan chhuah ang.
- Project siam avanga harsatna a awmin farmers in mawh la in department kan pui zel ang.
- Tuikawng hman chungchangah zauin (Water User Association) in a rel anga in sem tlan kan in tiam e.
- Project zawh tawh hnuah mimal tinin kan ta anga ena, enkawl zui kan intiam e.

Annexure

11. Affidavit (No-Objection)

OFFICE OF THE VILLAGE COUNCIL COURT

NO OBJECTION CERTIFICATE

Minor Irrigation Department in Laului Minor Irrigation Project, Aizawl a hma lak an tum hi tha kan ti a, he Project in a kaihnawih Approach Road emaw Tuikawng (Irrigation Channel) in kan Village Council huamchhunga leilet/ram a paltlang kan remti a a, Village Council thuneihna chinah chuan engmah sawi buai (complain/compensation) kan nei/dil lovang.

Village Council President Signature

Submitted to
The Executive Engineer,
Aizawl Irrigation Division,
Department of Minor Irrigation,
Mizoram

Minute of Ratification Meeting Laului Minor Irrigation Scheme
(Draft)

The ratification meeting on **Laului Minor Irrigation Scheme** was held on 4th December, 2014 discussing the contents of DPR prepared by MID and other stakeholders based on the result of the workshop held from 8th to 10th October, 2014.

Each party have clearly understand the contents of the DPR and mutually agreed the followings if the DPR is sanctioned.

MID

- ◆ Making necessary effort for sanctioning the respective Laului Minor Irrigation Scheme implementation.
- ◆ Construct and/or rehabilitate the facilities based on the prepared DPR with sanctioning budget.
- ◆ Giving the necessary support to WUA for proper operation and maintenance of the facilities based on prepared O&M plan.

WUA

- ◆ Cooperate with MID and provide necessary support during and after construction works
- ◆ Utilizing the facilities effectively based on the prepared crop calendar and agriculture action plan
- ◆ Taking over the facilities from MID and operates and maintains the facilities in accordance with O&M plan for 25 years after construction and/or rehabilitation of the facilities

Other Government Departments and Stakeholders

- ◆ Giving follow-up activities which are stipulated in the agriculture action plan, like extension services.
- ◆ Strengthening mutual cooperation with MID and WUA for further necessary actions for effective utilization of the respective Laului Minor Irrigation Scheme, if required.

The President of WUA
Laului Minor Irrigation Project
ms Dawngliana
(**MS. DAWNGLIANA**)
Chairman
Lauphai User Association
Sailam, Mizoram

Executive Engineer
Aizawl Irrigation Division
U. B. ZAWZU
(**U. B. ZAWZU**)
Executive Engineer
Aizawl Irrigation Division
Aizawl, Mizoram

District Agriculture Officer
Aizawl District
H. S. SAITHANTLUANGA
(**Dr. H. SAITHANTLUANGA**)
District Agriculture Officer
Aizawl District, Aizawl

District Horticulture Officer
Aizawl District
L. L. HANSANGA
(**LALTHAMUANA**)
Divisional Horticulture Officer
Aizawl Division Aizawl.

Witness:
VCP, Sailam Village
L. L. HANSANGA
(**LALTHANSANGA**)
Secretary
Village Council/Court
Sailam, Aizawl District

Annex 2

DPR for Dumlui MI scheme

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Photos



COMMAND AREA (1)



COMMAND AREA (2)



Proposed Site For Wier (3)



Proposed Site For Wier (4)

Source: Prepared by MID



OBJECTIVES

The ponds are newly constructed for the water resources of paddy during Kharif season and the winter crops during Rabi season. In addition, the irrigation canals are rehabilitated to supply stable irrigation water to the paddy field. Due to these, the paddy yield is improved, the winter crops and the fisheries are promoted.

OUTLINE

Name of River	: Dumlui
Gross Command Area	: 11.2 ha
Culturable Command Area	: 9.0 ha
Name of Villages getting water supply	: Kolasib in Kolasib District
Cost of Project	: 41.0 lakhs
Benefit Cost Ratio	: 2.05

CROPPING PATTERN

Kolasib: Dumlui Proposed Cropping Pattern	Month												Area (ha)	
	J	F	M	A	M	J	J	A	S	O	N	D		
Name of Crop														
Paddy (local)														
Fish (pond) (excluded number of CCA)														
Kharif season														
Mixed Crop: Maize & French bean														
Green Chilli														
Mixed Crop: Culfiflower & Leaf Mustard														
Rabi season														
Total														

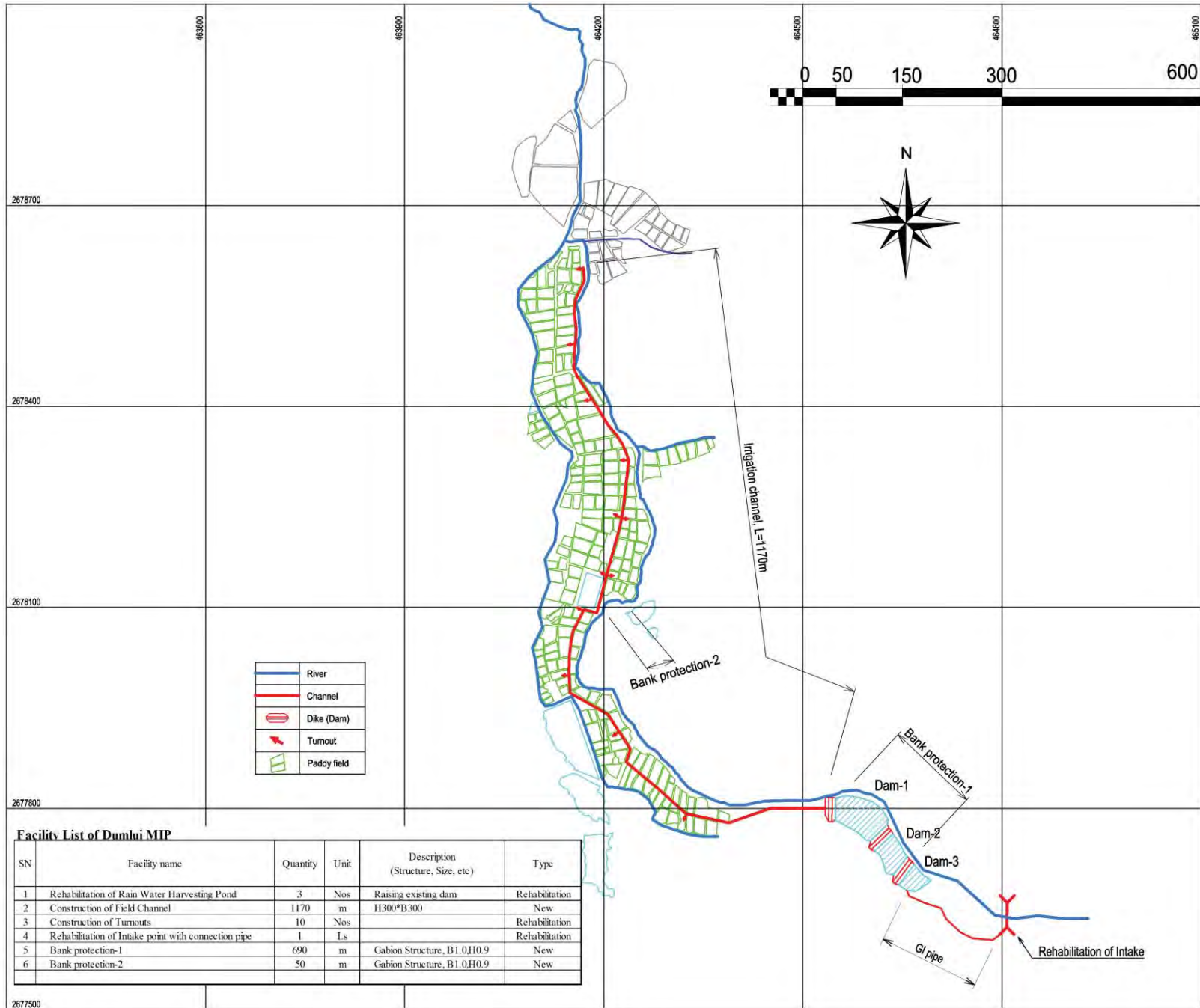
WATER USER ASSOCIATION O&M PLAN

SN.	Name of Facilities	Items	Implementer	Frequency	Schedule												
					Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
1	Intake point	Patrol	Person in charge	Every quarter													
		Water management	WUA	Every day													
		Maintenance	Removing sedimentation soil	All beneficiaries	4 times per year												
		Maintenance	Removing weeds	All beneficiaries	4 times per year												
		Report to MID	WUA	as & when necessary													
		Rehabilitation	WUA	2 times per year													
2	Field Channel	Patrol	Person in charge	Every quarter													
		Water management	WUA	Every day													
		Maintenance	Removing sedimentation soil	All beneficiaries	4 times per year												
		Maintenance	Removing weeds	All beneficiaries	4 times per year												
		Report to MID	WUA	as & when necessary													
		Rehabilitation	WUA	2 times per year													
3	Water Harvesting Pond I, II & III	Patrol	Person in charge	Every quarter													
		Water management	WUA	Every day													
		Maintenance	Removing sedimentation soil	All beneficiaries	4 times per year												
		Maintenance	Removing weeds	All beneficiaries	4 times per year												
		Report to MID	WUA	as & when necessary													
		Rehabilitation	WUA	2 times per year													
6	Turnsout	Patrol	Person in charge	as & when necessary													
		Water management	WUA	as & when necessary													
		Maintenance	Removing sedimentation soil	Beneficiary	as & when necessary												
		Maintenance	Removing weeds	Beneficiary	as & when necessary												
		Rehabilitation	Beneficiary	as & when necessary													
		Crop season					Dry (Rabi)	Summer									

PREPARATION HISTORY

Field survey : 14th to 16th October, 2014 Workshop : 20th to 22nd October, 2014
Finalization : 5th December, 2014

This project summary was prepared by Minor Irrigation Department in association with Japan International Cooperation Agency in April 2015.



Check List : Dumlui Minor Irrigation Project, Kolasib

Sl.No	Item/Activity	Remarks	Pg.No
1	Name of Project	Dumlui Minor Irrigation Project	-
2	Name of District/Block/Village	Kolasib District/ Kolasib Town	-
3	Longitude	92° 38 ' 85"E	-
4	Latitude	24° 12 ' 78"N	-
5	Category of Project- Storage/Diversion/Lift/percolation tank	Diversion	-
6	Type Project (Ongoing/New)	New Project	-
7	Whether scheme is in DPAP/Tribal area?	Yes	-
8	Have foundation investigations been carried out?	Yes (Trial pits)	-
9	Have soil survey in the command area been done?	Extrapolated	p.1-3
10	Have Topographical survey been carried out?	Yes	p.2-1
11	Have any alternative proposals been studied and merits and de-merits discussed?	Yes	-
12	Average rainfall in command area	3,010.9 mm (2011)	p. 3-1
13	Is source (river/stream/nallah) perennial?	Perennial	-
14	Availability of water in the source (In MCM)	0.839 MCM	p.3-1
15	Minimum Discharge in cumec?	0.0018	p.3-1
16	Maximum Discharge in cumec?	0.0390	p.3-1
17	Effect of the present scheme on existing/contemplated/ upstream and downstream schemes on the same source, if any	Nil	-
18	Detail of drinking water supply component, if any	Nil	-
19	Area of land required to be acquired for the project	Not required	-
20	Status of Land Acquisition	N.A	-
21	Does the project falls in the command area of any existing/ ongoing/ proposed major/ medium irrigation project? If so, details thereof.	No	-
22	Whether clearance from state electricity board has been taken in case of LI schemes?	N.A	-
23	Existing Cropping pattern	Yes	p. 5-1
24	Proposed cropping pattern (approved by Agricultural Deptt.)	Yes	p. 5-1
25	Has the method used for determining the crop water requirement discussed?	Yes	-
26	Whether detailed design has been carried out for various component of scheme as per BIS code.	Yes	Annexure 54
27	Whether latest SOR adopted for preparation of cost estimate?	Yes	Annexure 52
28	Whether unique identification number has been given to each scheme?	Yes, MZ KO BI KO DU 12 NE.	-
29	Has the source of construction material has been identified?	Yes	-
30	No villaged & People benefitted?	1 village and 23 families	p.11-1
31	No of farmers of SC/ST community benefitted?	SC-Nil, ST-23	-
32	Whether land levelling in command area is required? If so, how state govt proposes to meet the expenditure ?	Yes, Govt. proposed to meet expenditure from CAD&WMP	-
33	How state govt proposes to meet O & M charges after completion of project?	State plan fund with beneficiary contribution	-
34	When state govt proposes to hand over scheme to WUA?	On completion	-
35	When state govt proposes to take up evaluation studies by independent agency?	After completion of CAD and WMP scheme.	-
36	Attach Index map and layout plan of Project alongwith all major, Medium and minor projects (GEO based)	No.	-
37	Period of completion of scheme?	3 years	-
38	Development cost Rs Lakh/ha	4.56	p.7-1
39	B.C Ratio at 10% interest	1.49	p.7-1
40	Location of scheme in reference to existing schemes	Kolasib, Kolasib District	-

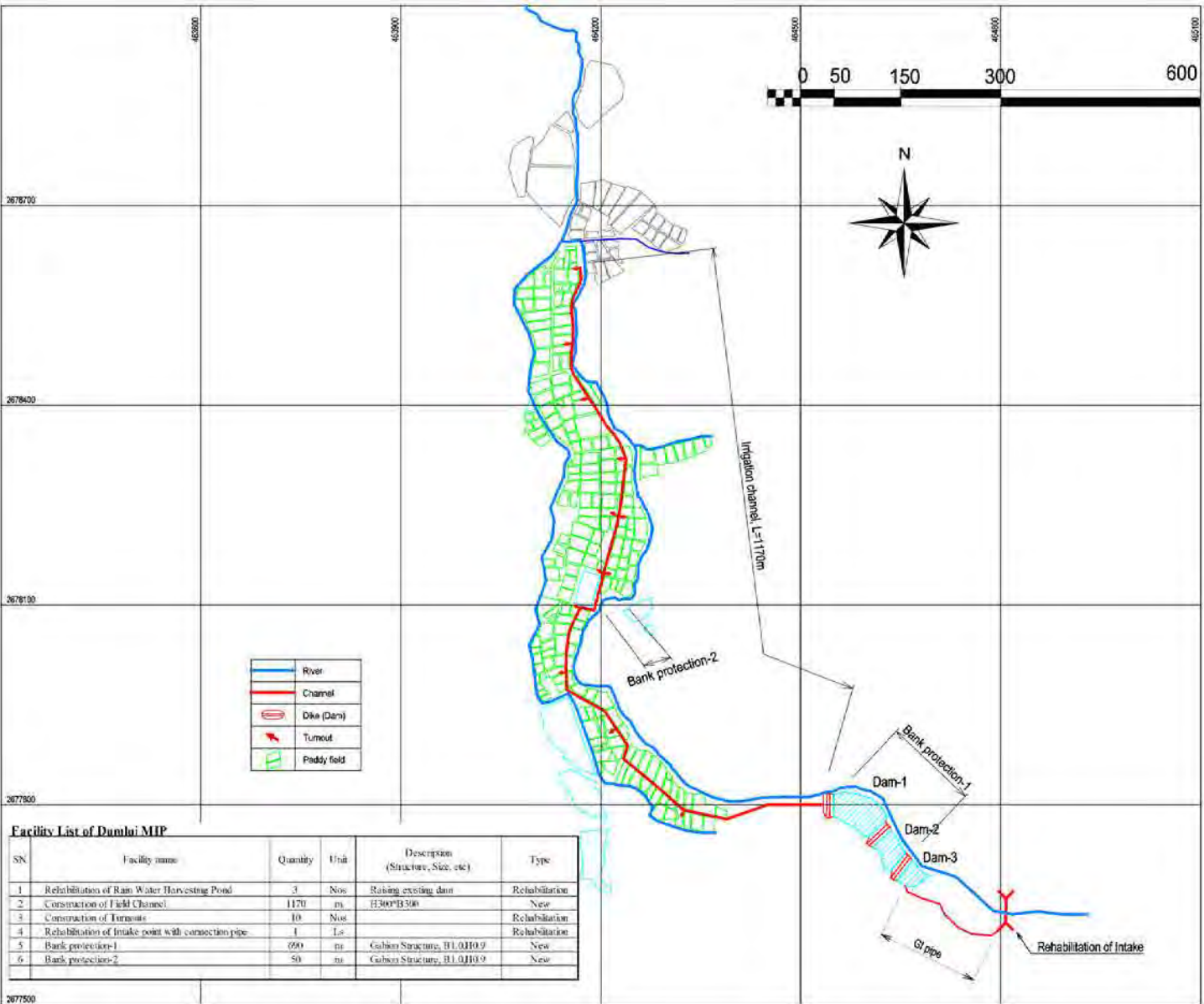
Sl.No	Item/Activity	Remarks	Pg.No
41	Whether quality control mechanism exists for MI Schemes? Implementing quality control - scope and arrangement (desirable, independent quality control arrangement)	Mechanism under process of constitution	-
42	MI schemes having CCA more than 1500 ha, a certificate from State Government indicating that it is not a substitute of medium irrigation projects is required	N.A as the CCA is less than 1500 ha	-
43	Certificate from State Government indicating that the MI scheme is not a part of any other major or medium irrigation scheme	Certificate attached	Annexure 55
44	Are benefits from Pisciculture / animal husbandry / plantation etc. discussed	Not significant	-

** Unique Identification Number will be given after approval by TAC but before submission to the Government.*

Salient Features of the Surface Minor Irrigation Schemes

1 Name of Project	Dumlui Minor Irrigation Project
2 Name of River/Tributary/Nalah	Dumlui
3 Irrigation (Hectare)	
a) Gross Command Area (GCA)	: 11.2 ha
b) Culturable command Area (CCA)	: 9.0 ha
c) Area under Irrigation	: Nil
d) Cost per Hectare of potential planned	: Rs. 4.56 lakhs
4 Name of Villages getting water supply	: Kolasib District
5 Hydrology	
a) Gross Catchment Area in Sq Km	: 0.65 sq Km
b) Intercepted Catchment Area in Sq. Km	: Nil
c) Un-intercepted Catchment Area in Sq.Km	: 0.65 sq Km
d) Catchment Rain fall details in mm	: 3,010.9 mm (2011)
e) Name of climatic station in the catchment	: Kolasib station
f) Annual yield at the proposed site in M.Cum	: 0.839 MCM
g) Water Utilization of upstream projects	: Nil
h) Water Utilization of proposed projects	: Kharif; - cumecs, Rabi; 0.0029 cumecs
i) Design flood at weir/barrage	: 10.13 cumecs
6 Submergences Details in ha	: Submerge area is nil.
7 Technical details of barrage/Weir	: Intake W=7.30m, L=4.60m
8 Cropping Pattern in ha	
a) Existing	: 9.0 ha
b) Proposed	: 11.5 ha
9 Cost of the Project	: 41.0 lakhs
10 Benefit cost ratio	: 1.49 : 1

Source: Prepared by MID



Source: Prepared by MID

Facility Layout Map, Dumlui Minor Irrigation Project, Kolasaib

Chapter 1 Introduction

1.1 General Introduction

Mizoram lies between 92° 15' to 93° 29' E longitude and 21° 58' and 24° 35' N latitude. Mizoram is 320 km long and 160 km wide. The surface is undulating and broken hills mainly run from north to south. Similarly, the major rivers also run from north to south. The altitude ranges from 21 m at Tlabung to 2,175 m at Phawngpui (Blue Mountain). Temperature ranges from 10 °C to 36 °C and the annual rainfall ranges from 2,000 mm to 2,500 mm. The climate is characterised by monsoon rains from May to October, winter from first part of December up to the end of February and summer without rainfall except a few showers from first part of March to the end of April. As a whole, Mizoram climate is pleasant during winter and moderately warm during summer. Soil in Mizoram is mostly acidic, low in organic carbon, low in phosphate and medium in potash content. The soil is young without very hard rocks and no limestone deposits. Quality of sand is also poor while almost all the crops thrive well in Mizoram conditions.

The mainstay of the economy of Mizoram is agriculture, which is currently exhibiting trends of increasing unsustainability. Crop production in the region is characterised by low input–low yield concept. Slash and burn agriculture is still predominantly practised in almost all the districts of Mizoram on steep slopes with a reduced fallow cycle of 2-3 years against 10-15 years in the past. The basic issues facing agriculture in the region are low productivity, inadequate access to appropriate technologies and other external inputs, increased natural calamities, etc. In the absence of major industries, the society is agrarian and depends on agriculture, forestry, and allied sectors for livelihood and other support. Hence, it is felt that by implementing minor irrigation scheme in the proposed project site, it is certain that the beneficiaries will have a higher economic return from their landholdings.

Kolasib District is situated in the northernmost region of the state surrounded by Aizawl District in the south and east, and Mamit District in the west, and Assam State in the north. The geographical area of the district is 1,382.51 km², which is 6.56% of the total state geographical area. It is situated between 23° 5' to 24° 35' N latitude and 92° 3' to 93° E longitude. The district is covered by humid subtropical hill zone and humid mild tropical zone.

The district consists of two Rural Development Blocks (RD Block), namely, Thingdawl and Bilkhawthlir, and 31 villages. The present total population of the district is 83,054, which is 7.6% of the state population. The total number of households is 1,255. Total number of workers in the district is 32,388. Total number of families involved in cultivation is 9,578, out of which, 7,930 are *Jhum* cultivators and 1,648 are wet rice cultivation (WRC) farmers. According to the 2001 census, there are 9,578 operational holders in the district having 12,747 ha of land under their possession. Small and marginal farmers constitute 81.67% of the landholders with only 61.4% of land under their possession.

The proposed command area of Dumlui Minor Irrigation Project lies at 24° 12' 78" N latitude and 92°38'85" E longitude. It is located in the western outskirts of Kolasib Town. It is under Thingdawl RD Block.

1.2 Brief History

Cultivation of WRC and upland areas of Dumlui started around 1955. Aside from paddy, other crops were grown. Then, with the outset of “disturbances across the state”, a fight fought by the indigenous people against the Government of India, cultivation of the area was not properly carried out. From 1972, cultivation was started again in a much proper manner than before.

The first action taken by the Government of Mizoram, Department of Agriculture in the command area, was the construction of a link road in 1975, and in 1997, the road was further improved into a jeepable road. The Agriculture Department further took up works like land levelling, land reclamation, and irrigation. Some farmers went on to construct fish ponds.

1.3 Current Status

The culturable command area is about 10.5 ha. The perennial source of water is Dumlui. During the *Kharif* season, the whole command area is used for paddy cultivation apart from some fish ponds. The farmers convey water to the field through *kutch*a channels/earthen channels to irrigate the WRC area constructed by them. Not much cropping is done during the *Rabi* and summer seasons. This is chiefly because water cannot reach a larger part of the area due to the absence of an irrigation system (water conveyance facilities). Because of the low production of crops and low return from crops, some of the farmers left much of their land fallow. Some of the farmers are engaging in fishery. Farmers used their landholdings all year round only for fishery.

1.4 Meteorology

Mizoram has mild and very pleasant climate with temperatures raging from 11 °C to 21 °C in winter and 20 °C to 30 °C in summer. The maximum and minimum temperatures observed in Aizawl are 30 °C to 40 °C in April and 8 °C in January, respectively. The entire area is under the direct influence of the southwest monsoon, and rain occurs heavily from May to September. The normal rainfall of the state is 2,540 mm per annum. The average rainfall during 1998-99 in Mizoram State was 2,180 mm to 2,371 mm. The average annual rainfall of the state capital is 2,132.2 mm, whereas, Kolasib District of Mizoram has recorded a maximum of 9,469 mm at a station in Thingdawl farm. Likewise, the average rainfall during 1998-99 in Aizawl District was 2,026 mm to 2,306 mm. The winter is almost rain free and very pleasant.

Table 1.1 Meteorological Report of Dumlui Valley

Sl.No.	Month	Temperature		Humidity (%)		Soil Temp °C	Soil Moisture(%)	PH
		Min	Max	Min	Max			
1	June	29.92	31.45	56.59	77.20	26.68	1 to 4.43	4.85
2	July	31.70	33.30	62.00	70.50	27.00	1 to 4.5	
3	August	30.00	34.32	62.00	79.66	28.00	1 to 4.10	
4	Sept	29.66	30.00	62.00	81.00	25.66	1 to 3.00	
5	Oct	26.50	29.00	62.00	80.00	21.00	1 to 2.00	
6	Nov	26.50	29.00	62.00	80.00	21.00	1 to 2.00	
7	Dec	23.80	27.00	43.00	79.00	18.20	1 to 1.80	
8	Jan	18.50	20.18	43.00	70.00	16.00	1 to 1.40	
9	Feb	22.88	30.00	43.00	81.00	25.50	1 to 2.05	

Source: Prepared by MID

From the Table 1.1, it is inferred that the soil temperature and pH, though slightly acidic, is conducive to good production.

**Table 1.2 Monthly rainfall of Hrishi Vigyan Kendra (K.V.K)
Rain gauge at Kolasib, Mizoram**

Year	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual Total
1998	Nil	Nil	Nil	138.00	251.00	748.00	245.00	493.00	247.00	120.00	54.00	Nil	2296.0
1999	Nil	Nil	39.30	23.00	579.00	308.00	486.00	339.00	333.00	171.00	11.20	Nil	2286.5
2000	12.00	20.00	354.00	151.00	382.00	211.00	201.00	502.00	479.00	304.00	6.00	Nil	2622.0
2001	Nil	72.00	95.00	170.00	357.00	915.00	736.00	610.00	743.00	295.00	158.00	Nil	4151.0

Source: Prepared by MID

1.5 Evapotranspiration

No pan-evaporation or evapotranspiration (ET) data is available for any station. Using the climatological data for Aizawl (1941-60), the potential ET has been worked out and amounted to 1,424 mm. For ET, monthly values have been used. Since ET is large compared with soil moisture retention, it was not considered. The values for the 12 stations have been worked out and shown in Table 1.3.

1.6 Soil Characteristics of the area

Soil in Mizoram is mostly acidic, low in organic carbon, low in phosphate and medium in potash content. The soil is young without very hard rocks and no limestone deposits. Quality of sand is also poor while almost all the crops thrive well in Mizoram conditions. However, no soil survey has been carried out by the Minor Irrigation Department (MID). The soil classification is based on the altitude of the location prepared by the Directorate of Research and Education, Department of Agriculture. The command area of Dumlui zau Minor Irrigation Project lies within **Kolasib-Vairengte-Pangbalkawn** belt. It lies at an altitude between 300-700 m above sea level. The soil type on this belt is sandy loam to sandy clay loam.

According to the '*Natural Resources ATLAS of Mizoram*' prepared by the Mizoram Remote Sensing Application Centre (MIRSAC), the soil composition of Dumlui area are Loamy-skeletal Typic Dystrochrepts, Fine-loamy Umbric Dystrochrepts, and Loamy-skeletal Typic Hapludults.

The general characteristics of the soil are given below.

Soil colour	Yellowish brown to light olive brown (surface to sub-surface)
Soil Texture	Fine texture, alluvial and colluvial soils
Drainage class	Moderately well drained
Erosion	Moderate
Soil depth	Very deep

Table 1.3 Evapotranspiration Details

Sl. No.	Name of Station	Actual ET in mm
1	Bilkhawthlir	1169
2	Champhai	952
3	Chawngtlai	1175
4	Chite	1052
5	Hnahthial	934
6	Kolasib	1020
7	Lawngtlai	998
8	Neihbawi farm	1121
9	Lunglei	956
10	Saiha	966
11	Serchhip	1084
12	Sialsuk	1076
13	Thingdawl	1057
14	Tlabung	916

Source: Prepared by MID

Chapter 2 Survey & Investigation

2.1 Engineering Survey

2.1.1 Discharge

Discharge in the *Rabi* season was surveyed by MID officers on 14 October 2014. The results of the survey are shown as follows:

Table 2.1 Discharge

Point	Discharge	Remarks
Dumlui (upper stream)	6 (l/s)	V-notch and bucket
Sertawklui (down stream)	5 (l/s)	bucket

Source: Prepared by MID

The details can be seen in the Attachment (Preliminary technical site survey sheet).

2.1.2 Soil Classification

Field soil classification test was done by MID officers on 14 October 2014. The results of the test are shown as follows:

Table 2.2 Soil Classification

Point	Classification	Remarks
On farm	Loam	

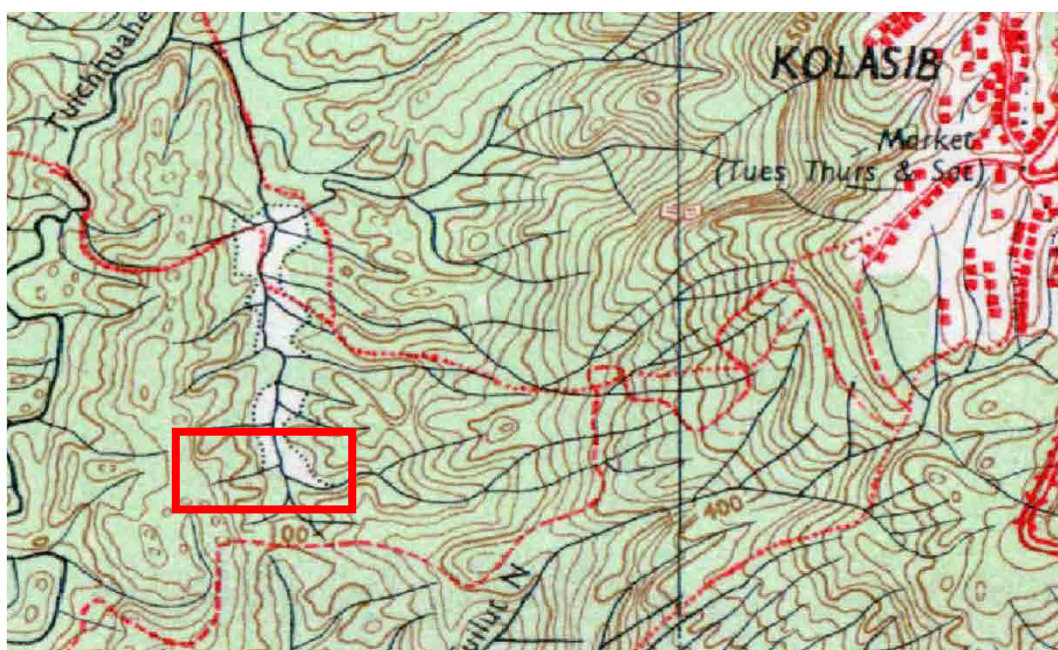
Source: Prepared by MID

2.1.3 Topological Survey

The following topological surveys have been conducted to clarify the existing topological conditions.

Table 2.3 Highlight of the Survey

Survey Name	Plane location survey
Use of survey result	Designing of irrigation pond
Period	From 29/5/ 2014 to 20/ 6/ 2014
Surveyor	MID Surveyor, Mr.Sangtea
Survey Area	10.5 ha
Coordinates	Upper Left; X=464038 Y=2678131 Down right; X=464726.166 Y=2677635.057
Benchmark Coordinates	1; X=464713.250 Y=2677671.540 2; X=464648.721 Y=2677717.424 3; X=464600.503 Y=2677808.158 4; X=464466.576 Y=2677802.496 5; X=464386.259 Y=2677786.594 6; X=464188.652 Y=2677835.726 7; X=464169.217 Y=2678034.996 8; X=464069.323 Y=2677942.318
Methodology	Survey with Total Station Machine

Survey Area map

Source: Prepared by MID

2.1.4 Others

Nil.

Chapter 3 Hydrology

3.1 Characteristics of Catchment

Kolasib District is located in the northern part of Mizoram State, which enjoys moderate climate owing to its tropical location. It is neither very hot nor too cold throughout the year. It falls under the direct influence of the southwest monsoon and receives an adequate amount of rainfall during the monsoon season. The average rainfall in Kolasib District is 2,703 mm per annum and the highest rainfall during a particular month was 852 mm, recorded during August and July. The salient thermo-characteristic of the district is that temperature does not fluctuate much throughout the year. The highest temperature observed during the past decade was 35 °C in the month of July. The warmest months with mean daily maximum of about 26 °C and mean daily minimum of about 23 °C were observed during June and July. The temperature started to get low from the month of November and it is lowest in December and January. The average temperature of **Kolasib–Vairengte–Pangbalkawn belt** is between 10 °C to 30 °C.

3.2 Assessment of Water Availability:

3.2.1 Data Availability

(1) Rainfall Data

The catchment does not have any rain gauge station. However, the available daily Kolasib rainfall data recorded by the State Agriculture Department of Mizoram is from 1998–2011 and is being used for the calculation of drainage discharge (Table 3.3).

(2) Discharge Data

There is no discharge site being maintained by any agency within the catchment area of the proposed scheme.

3.2.2 Water Availability Studies

(1) Monsoon period

This project mainly targets upland crops during Rabi season. Water resource of Kharif season is not short for existing paddy crop cultivated from middle of Jun. However proposed paddy crop cultivates from early of Jun. Water resource is possibly short during 1st half of Jun. Therefore irrigation is developed for distributing supplemental irrigation water. For reference, discharge during Kharif season is shown Table 3.2.

In the present data scenario, in which the catchment under consideration is completely ungauged and no hydrological model for computing surface run off based on catchment characteristics have yet been developed for this zone. Thus, efforts have been made for computing runoff of 75% dependable average daily flow during monsoon period by the simple rational method and result is tabulated in Table 3.2.

(2) Non-monsoon period

Flow in the stream during the non-monsoon period was calculated based on specific discharge, as shown in Table 3.3, which was prepared by the JICA Study Team in 2015. As observed from the table, the flow during non-monsoon period is much more than the discharge required. Water balance during the non-monsoon period is shown in Table 3.1

Table 3.1 Water Balance of Dumlui MIP

Area	Non-monsoon (Rabi) period				
	Resource Q1 (m3/s)	Requirement in field Q2 (m3/s)	Irrigation efficiency E	Requirement at inlet Q3=Q2/E (m3/s)	Evaluation
CA 1	0.0029	0.0013	0.45	0.0029	Q1=Q3: OK

Source: Prepared by MID

(3) Annual Flow

The annual flow of Dumlui is calculated at 0.839 MCM as shown in Annexure 9.

3.3 Design Flood

The peak discharge for design flood passing through the diversion head-works is estimated using Dicken's Formula in which the value of C is taken as 14, as follows:

For CA 1

$$Q = CA^{3/4}$$

Where,	Q	=	Flood discharge (cumecs)
	C	=	Runoff coefficient
		=	11 -14 North-indian hilly region
		=	14
	A	=	Catchment area in sq. km
		=	0.65 km ²
Thus,	Q	=	10.13 m ³ /s

Table 3.2 Average monthly Discharge Series for BIVAMF Zau ; Khariff(Mid June to Mid Oct) using rainfall data of Kolasib station

Month	2nd half of June		July		August		September		1st half of October		Average Discharge	Ave. discharge values arrange in descending order	m	Probability P = m/(N+1)	Return period T= 1/P (years)
Year	Rainfall	Discharge	Rainfall	Discharge	Rainfall	Discharge	Rainfall	Discharge	Rainfall	Discharge					
2000	105.50	0.024	184.00	0.020	502.00	0.055	488.00	0.055	152.00	0.034	0.0376	0.06771	1	0.0769	13.000
2001	457.50	0.103	736.00	0.080	610.00	0.067	743.00	0.084	19.67	0.004	0.0677	0.05084	2	0.1538	6.500
2002	185.00	0.042	392.00	0.043	662.00	0.072	200.00	0.023	117.50	0.027	0.0412	0.04937	3	0.2308	4.333
2003	293.50	0.066	401.00	0.044	410.00	0.045	468.00	0.053	127.50	0.029	0.0473	0.04728	4	0.3077	3.250
2004	167.00	0.038	714.00	0.078	564.00	0.062	308.00	0.035	31.50	0.007	0.0438	0.0465	5	0.3846	2.600
2005	60.50	0.014	704.00	0.077	332.70	0.036	383.80	0.043	94.71	0.021	0.0383	0.04416	6	0.4615	2.167
2006	336.55	0.076	457.10	0.050	415.40	0.045	214.40	0.024	112.40	0.025	0.0442	0.04382	7	0.5385	1.857
2007	210.35	0.047	376.00	0.041	539.50	0.059	611.40	0.069	134.65	0.030	0.0494	0.04326	8	0.6154	1.625
2008	218.30	0.049	404.40	0.044	643.50	0.070	313.40	0.035	148.50	0.034	0.0465	0.04119	9	0.6923	1.444
2009	151.50	0.034	319.70	0.035	260.80	0.028	297.20	0.034	60.90	0.014	0.0290	0.03831	10	0.7692	1.300
2010	170.45	0.038	358.30	0.039	649.40	0.071	441.40	0.050	79.60	0.018	0.0433	0.03762	11	0.8462	1.182
2011	258.65	0.058	639.00	0.070	630.40	0.069	305.10	0.034	100.85	0.023	0.0508	0.02897	12	0.9231	1.083

$$Q = \frac{(R/1000) \times (A \times 10^6) \times f}{\text{Nos of days in month} \times 24 \times 60 \times 60}$$

Q = Discharge in cumecs f = Runoff co-efficient = 0.45
R = Rainfall in mm A = Catchment area = 0.650 sq. km

Now, the 75% dependable annual flow = Annual flow with probability P = 0.75,
ie T = 1/0.75 = 1.33 years

By interpolation between two successive values in the above table having T= 1.250 and 1.364 respectively, the 75% dependable flow is found to be,
Q₇₅ = 0.0390 m³/s

Source: Prepared by MID

Table 3.3 Discharge for Rabi (Mid)

No	Name of River Basin	AREA (Sq Km)	Rainfall (75%) (mm)	Interception loss (mm)	Evaporation loss (mm)	Balance (mm)	Ground water recharge (mm)	Surface water (mm)	Surface water (MCM)	Periodic water Resource Availability											
										June -Sept (Monsoon) 80.7%			Oct-Nov (Post -Monsoon) 13.1%			Dec-March (Winter) 3.0%			April -May (Pre-Monsoon) 3.2%		
										121	days	Specific discharge	61	days	Specific discharge	119	days	Specific discharge	61	days	Specific discharge
										(MCM)	(m3/s)	(m3/s/km2)	(MCM)	(m3/s)	(m3/s/km2)	(MCM)	(m3/s)	(m3/s/km2)	(MCM)	(m3/s)	(m3/s/km2)
1	Langkaih lui	376	1,822	91	1,109	622	62	560	211	170	16.261	0.04325	28	5.313	0.01413	6	0.584	0.00155	7	1.328	0.00353
2	Sazai Lui	940	1,828	91	1,041	696	70	626	588	475	45.435	0.04834	77	14.610	0.01554	18	1.751	0.00186	19	3.605	0.00384
3	Khawthlangtupui (Karnaphuli)	251	2,067	103	1,041	923	92	831	209	168	16.070	0.06402	27	5.123	0.02041	6	0.584	0.00232	7	1.328	0.00529
4	Kawrpui	371	2,188	109	1,175	904	90	814	302	244	23.339	0.06291	40	7.590	0.02046	9	0.875	0.00236	10	1.897	0.00511
5	Teirei	773	1,888	94	1,093	701	70	631	488	394	37.687	0.04875	64	12.143	0.01571	15	1.459	0.00189	16	3.036	0.00393
6	Tut	829	2,171	109	1,126	936	94	842	698	563	53.853	0.06496	91	17.266	0.02083	21	2.042	0.00246	22	4.174	0.00504
7	Kau	249	2,250	113	999	1,138	114	1,024	255	206	19.705	0.07914	33	6.261	0.02515	8	0.778	0.00312	8	1.518	0.00610
8	De	419	2,309	115	1,027	1,167	117	1,050	440	355	33.957	0.08104	58	11.005	0.02626	13	1.264	0.00302	14	2.656	0.00634
9	Tuichawng	1,234	2,212	111	1,066	1,035	104	931	1,149	927	88.671	0.07186	150	28.461	0.02306	34	3.307	0.00268	37	7.020	0.00569
10	Sekulh lui	251	2,204	110	1,043	1,051	105	946	237	192	18.365	0.07317	31	5.882	0.02343	7	0.681	0.00271	8	1.518	0.00605
11	Tlawng (Dhaleshwari)	1,500	2,273	114	1,110	1,049	105	944	1,416	1,143	109.332	0.07289	185	35.102	0.02340	42	4.085	0.00272	45	8.538	0.00569
12	Mat	1,010	2,222	111	1,064	1,047	105	942	951	768	73.462	0.07273	125	23.717	0.02348	29	2.821	0.00279	30	5.692	0.00564
13	Ser lui	618	2,265	113	1,095	1,057	106	951	588	474	45.340	0.07337	77	14.610	0.02364	18	1.751	0.00283	19	3.605	0.00583
14	Tuirial	2,016	2,224	111	1,148	965	97	868	1,750	1,412	135.063	0.06700	229	43.450	0.02155	52	5.058	0.00251	56	10.625	0.00527
15	Tuivawl	856	2,199	110	1,126	963	96	867	742	599	57.296	0.06694	97	18.405	0.02150	22	2.140	0.00250	24	4.554	0.00532
16	Tuival	1,456	2,102	105	1,137	860	86	774	1,127	909	86.949	0.05972	148	28.081	0.01929	34	3.307	0.00227	36	6.831	0.00469
17	Tuipui	936	1,930	97	990	843	84	759	710	573	54.809	0.05856	93	17.646	0.01885	21	2.042	0.00218	23	4.364	0.00466
18	Tuichang	1,653	2,096	105	1,009	982	98	884	1,461	1,179	112.775	0.06822	191	36.240	0.02192	44	4.279	0.00259	47	8.918	0.00539
19	Tiau	992	1,807	90	934	783	78	705	699	564	53.949	0.05438	92	17.456	0.01760	21	2.042	0.00206	22	4.174	0.00421
20	Chhimtupui (Kolodyne)	2,159	2,166	108	1,006	1,052	105	947	2,045	1,650	157.828	0.07310	268	50.850	0.02355	61	5.933	0.00275	65	12.333	0.00571
21	Ngengpui Lui	717	2,293	115	991	1,187	119	1,068	766	618	59.114	0.08245	100	18.974	0.02646	23	2.237	0.00312	25	4.743	0.00662
22	Palak Lui	136	2,194	110	1,060	1,024	102	922	125	101	9.661	0.07104	16	3.036	0.02232	4	0.389	0.00286	4	0.759	0.00558
23	Tuisih lui	249	2,121	106	1,060	955	96	859	214	173	16.548	0.06646	28	5.313	0.02134	6	0.584	0.00234	7	1.328	0.00533
24	Tinglo lui	283	2,190	110	1,060	1,020	102	918	260	210	20.087	0.07098	34	6.451	0.02280	8	0.778	0.00275	8	1.518	0.00536
25	Mar Lui	359	2,216	111	1,174	931	93	838	301	243	23.244	0.06475	39	7.400	0.02061	9	0.875	0.00244	10	1.897	0.00529
26	Barak	118	2,021	101	1,095	825	83	742	88	71	6.791	0.05755	11	2.087	0.01769	3	0.292	0.00247	3	0.569	0.00482
27	Phairang	331	2,379	119	1,066	1,194	119	1,075	356	287	27.453	0.08294	47	8.918	0.02694	11	1.070	0.00323	11	2.087	0.00631
	GRAND TOTAL	21,082							18,175	14,668	1,403		2,379	451		545	53		583	111	

source: JICA Study Team based on MID irrigation masterplan (1995)

CA 1_non-monsoon

Catchment Area	0.65	(km ²)
Specific Discharge	0.00272	(m ³ /s/km ²)
Discharge	0.00177	(m³/s)

CA 1_reservoir for non-monsoon

Volume	12,000	(m ³)
Rabi duration	120	(days)
Discharge	0.00116	(m³/s)

CA 1 : Total_non-monsoon

Surface	0.00177	(m ³ /s)
Specific Discharge	0.00116	(m ³ /s)
Discharge	0.00293	(m³/s)

Chapter 4 Design Features

4.1 General

Based on the analysis of hydrology for water availability, the command area available and topography, it was decided to go for channel and pipeline irrigation by diverting the stream and then carrying the water under gravity flow to the command area and distributing it to the respective individual plots. A detailed survey of the channel as well as pipeline alignment along the contour was conducted and the cross sections of some locations were taken for planning and design of the conveyance and distribution system.

Accordingly, the hydraulic and structural designs were made considering the following:

- Design of open channel section (2 nos.)

4.2 Requirement of Water in the field

Table 4.1 Summary of Water Requirement

Name	Qi : Discharge required in the pipe inlet (m ³ /s)
Main canal 1	0.0029

Source: Prepared by MID

For main canal 1

Qi = Discharge required at the canal inlet

Qf = Discharge required in the field

For CA 1

Discharge requires in the field

Qf = 0.0013 m³/s (Kharif period)

Irrigation efficiency

E = 45 % (open channel)

Discharge required at the pipe inlet

Qi = Qf/E/100 = 0.0029 m³/s

Maximum discharge required for the open channel has been thus calculated. (Ref to Chapter 3 and 5)

4.3 Design of Channel

Table 4.2 Summary of Design of Channel

Name	Depth (m)	Width (m)	Slope	v (m/s)
Main canal 1	0.20	0.30	1:100	0.57
Canal (Rehabilitation)	0.20	0.30	1:100	0.46

Source: Prepared by MID

For CA 1 : Main canal 1

Required Conveyance Capacity = 0.0029 m³/s

Design cross section of channel = Rectangular

Using equation $Q = a \times v$

Where $a = \text{Cross section area} = 2d^2$
 $v = \text{Velocity of flow} = (1/n) \cdot R^{2/3} \cdot S^{1/2}$

Where $R = \text{Hydrolic Radius} = d/2$ for most economical section
 $S = \text{Channel bed slope} = 1:100$
 $n = \text{Roughness co-efficient} = 0.015$ (for cement concrete channel)

Therefore $d^{8/3} = 0.00035$
 $d = 0.05033$ m
 Say $d = 0.10$ m

Therefore
 Width of channel $b = 2d = 0.20$ m
 Providing free board of 10cm,
 depth od channel $D = 0.1 + d = 0.20$ m

Therefore the following inside dimension may be adopted for construction of diversion channel

Depth of channel	=	0.20 m
Width of channel	=	0.30 m
Channel bed slope	=	1:100
Flow velocity	=	0.57 m/s

* Minimum width of main canal (chennel) is 0.3 m.

For	Pond from stream :	Canal (Rehabilitation)
Pond 1 Capacity		= 12,000 m ³
Kharif Duration		= 120 day
Required Conveyance Capacity		= 0.0012 m ³ /s
Design cross section of channel		= Rectangular
Using equation	$Q = a \times v$	
Where $a = \text{Cross section area}$	= $2d^2$	
$v = \text{Velocity of flow}$	= $(1/n) \cdot R^{2/3} \cdot S^{1/2}$	
Where $R = \text{Hydrolic Radius}$	= $d/2$ for most economical section	
$S = \text{Channel bed slope}$	= 1:100	
$n = \text{Roughness co-efficient}$	= 0.015	(for cement concrete channel)

Therefore $d^{8/3} = 0.00014$
 $d = 0.03566$ m
 Say $d = 0.10$ m

Therefore
 Width of channel $b = 2d = 0.20$ m
 Providing free board of 10cm,
 depth od channel $D = 0.1 + d = 0.20$ m

Therefore the following inside dimension may be adopted for construction of diversion channel

Depth of channel	=	0.20 m
Width of channel	=	0.30 m
Channel bed slope	=	1:100
Flow velocity	=	0.46 m/s

* Minimum width of main canal (chennel) is 0.3 m.

4.4 Design of Farm Pond

4.4.1 General

(1) Objective

Dumlui is one of the areas with the highest agriculture potential, where the location is close to a big town, a perennial water source is available, and beneficiaries are motivated to try winter crops.

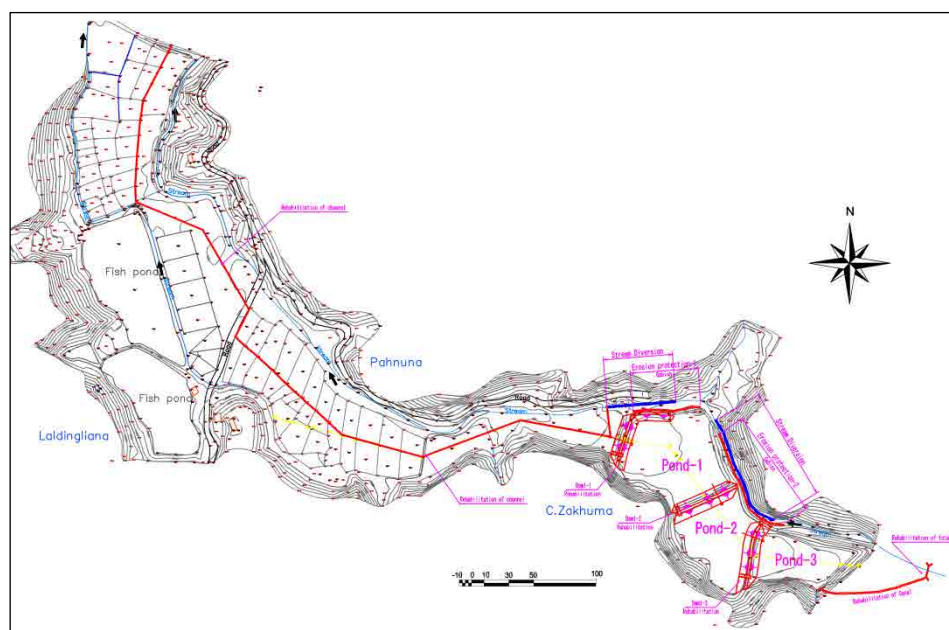
However, shortage of irrigation water is the largest factor hindering the development of winter crop cultivation for greater income generation and better utilization of potential land.

Therefore, a farm pond is to be planned and designed to store irrigation water for winter crop cultivation.

Besides, farm pond water is to be used not only for irrigation but also for fishery activities of landowners.

(2) General plan

- Targeted farm ponds are composed of three existing ponds and located upstream of Dumlui, as shown below in the map.
- The land is owned by one landowner.
- Pond water is to be irrigated to downstream farmlands through rehabilitated channels by gravity flow.
- Each of the three ponds are connected to irrigation pipes and the water level can be controlled separately.
- Source of water is the upstream intake facility which is rehabilitated under this project. GI pipe is to be installed from the rehabilitated intake to Pond 3, as shown below in the map.
- Flood water flows down the existing stream and only irrigation water is to be taken from the intake.
- To increase the available irrigation water volume of the pond, the existing dike height is to be raised and the bottom of the ponds are to be excavated, as shown in the pond profile plan.
- To prevent further embankment erosion along the stream, gabion is to be installed, as shown below in the map.



Source: Prepared by MID

(3) Components of the work

Facility	Description
Pond-1	Raise of Dike height: 0.3m Excavation: about 1100cum Drainage pipe: GI pipe80 dia Irrigation pipe: GI pipe100 dia Spillway: PCC channel B1.0m H0.5m
Pond-2	Raise of Dike height: 1.0m Excavation: about 400cum Drainage pipe: GI pipe80 dia Irrigation pipe: GI pipe100 dia Spillway: PCC channel B1.0m H0.5m
Pond-3	Raise of Dike height: 0.6m Excavation: about 300cum Drainage pipe: GI pipe80 dia Irrigation pipe: GI pipe100 dia Spillway: PCC channel B1.0m H0.5m
Intake	Rehabilitation of the main structure and intaking point Connection pipe; HDPE, Dia160mm L=90m
Erosion protection	Gabion:3 layers H:0.9m, L=140m

Source: Prepared by MID

4.4.2 Volume of the pond

Total volume capacity of the three ponds is 12,000 m³ based on the following calculation:

Volume = Average pond irrigation water level area * water depth for irrigation storage.

Note:

- Each pond average water level area: shown below in the map
- Water depth for irrigation storage: 1.5 m
- 5% extra should be considered as pond loss.

	Area (sqm)	Depth (m)	Volume (cum)	Remark
Pond-1	3,700	1.5	5,550	
Pond-2	2,700	1.5	4,050	
Pond-3	2,100	1.5	3,150	
Total			12,750	
			12,113	5% deduction
			12,000	SAY

Source: Prepared by MID

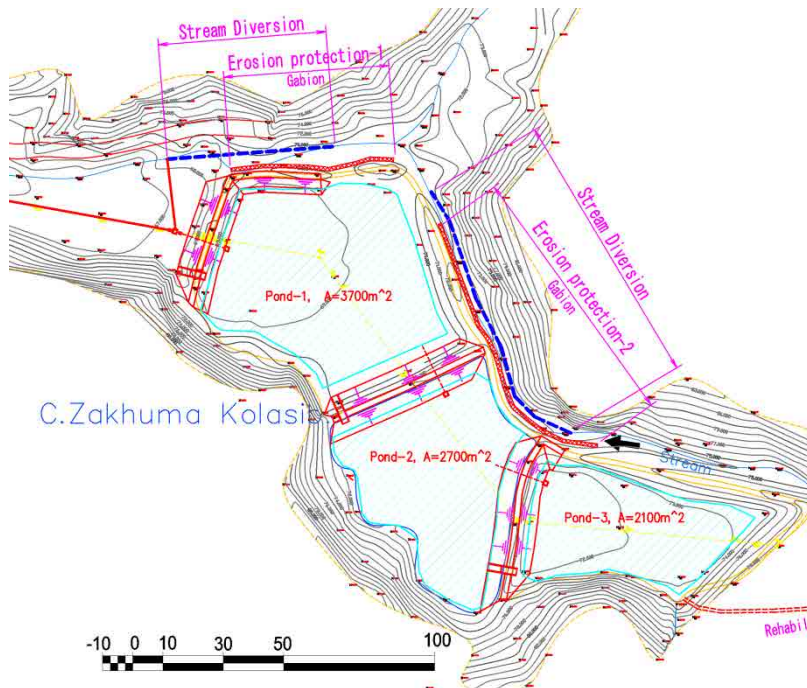
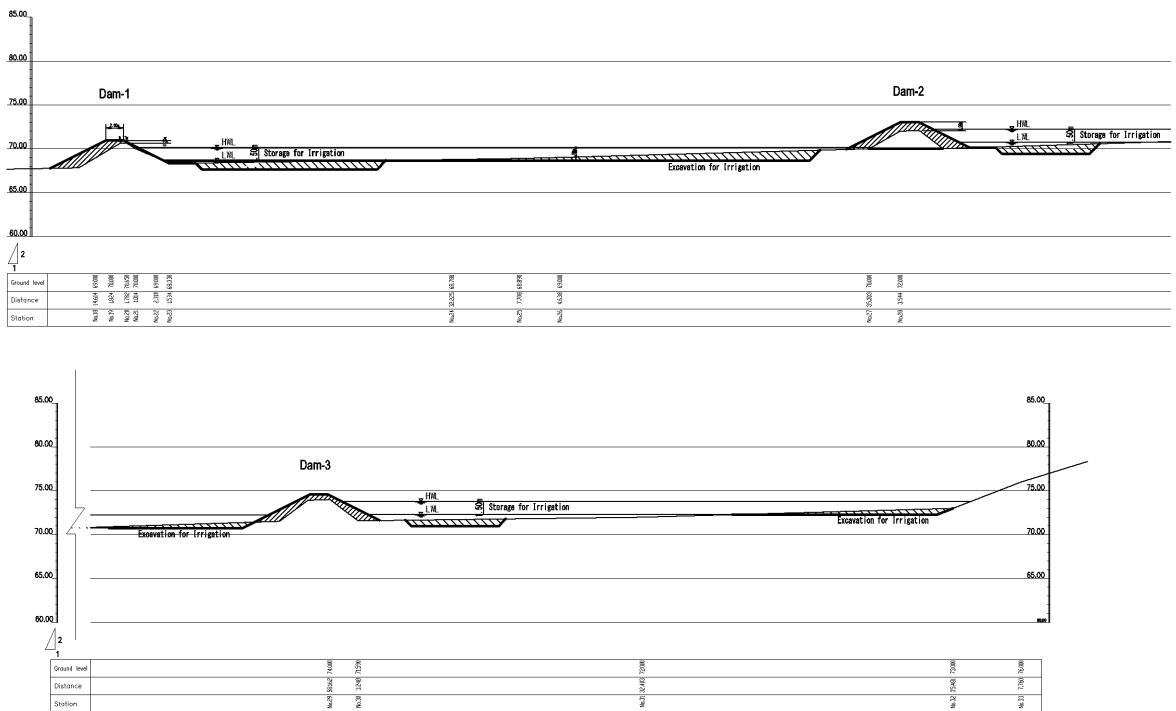


Figure 4.1 Pond average water level area Map



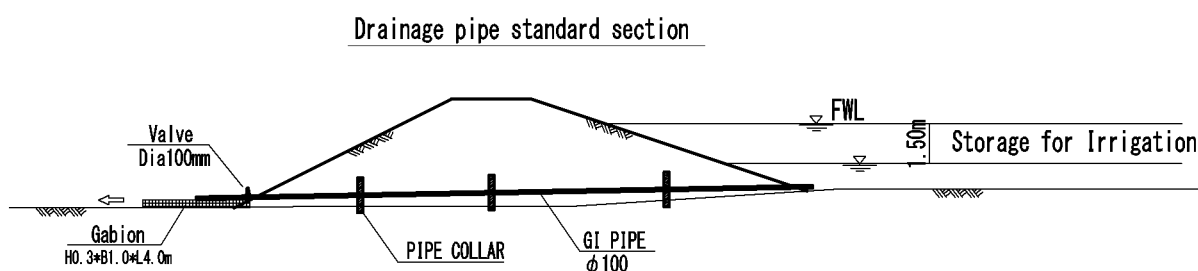
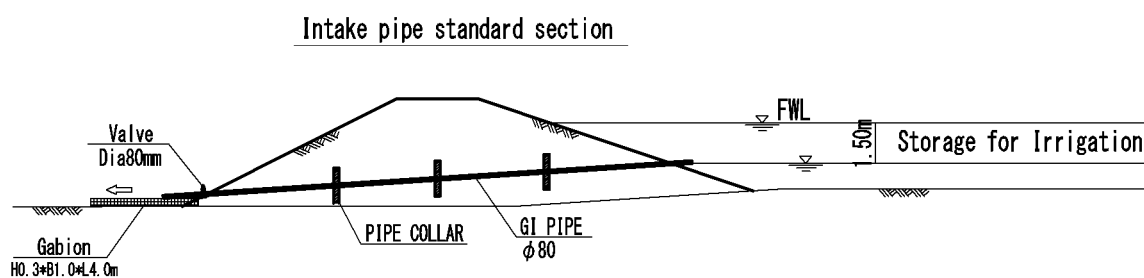
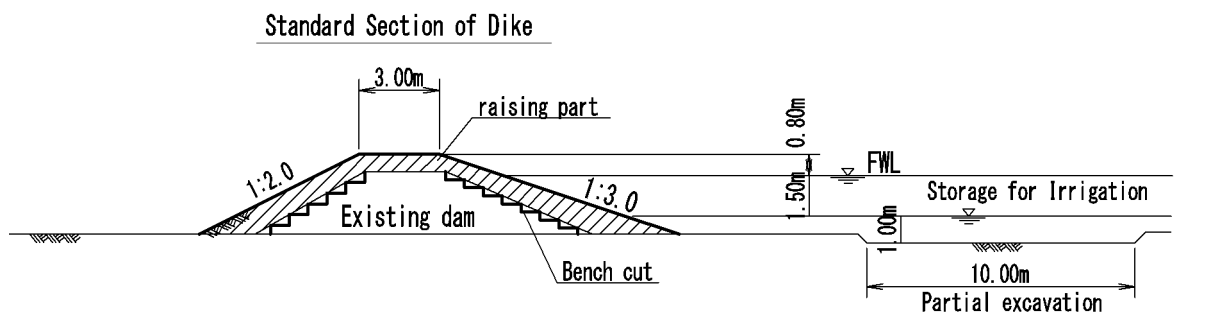
Source: Prepared by MID

Figure 4.2 Three Ponds profile plan

4.4.3 Dike structure general

The upper 1.5 m depth of water is used for irrigation and the irrigation pipe valve is to be controlled by the water user association (WUA).

Lower part of the water is saved for fishery activities of landowners and the drainage pipe valve is to be controlled by the landowners. Special note for construction work is shown below.



Special Note for construction work is shown below.

- * Top width of 3.0m shows minimum.
In case of surplus excavation soil, it can be increased.
- * Surface of existing dam slope should be bench cut, before raising dam.
- * Location of partial excavation for fishy is to decided with landowners.
- * Spreading embankment material, spreading thickness shall be 7-10cm.
- * Compacting embankment material,
passage of compactor shall be more than 10 times.
- * Before handing over the facilities,
trial ponding should be conducted and defects should be checked.

Source: Prepared by MID

4.4.4 Other

Three parties, namely, MID, WUA, and landowners, are exchanging agreement documents about the pond plan and land use officially before construction work starts, although the landowner have already agreed to the plan and idea.

Chapter 5 Irrigation Planning Agriculture Practices & Cropping Pattern

5.1 Cropping Pattern for Dumlui Minor Irrigation Scheme

In Mizoram, where land is limited, self-sufficiency in food production can be achieved by utilization of the two cropping seasons, which is only possible by assured irrigation. Normally, the *Rabi* season starts in mid-October and ends in mid-February while the *Kharif* season starts in mid-June and ends in mid-October. Although the average rainfall in Mizoram for the last five years is 2,455.80 mm, rainfall distribution is not uniform during all the seasons and a cultivator may need water at regular intervals, which may not be fulfilled by rainfall alone. Hence, proper crop planning is practical only when assured irrigation is available to the farmers, provided other inputs are available for all seasons. Keeping in view the availability of assured irrigation during the *Kharif*/monsoon and *Rabi*/non-monsoon seasons, a cropping pattern, along with the area proposed to be irrigated in each season in the command area, is given in Table 5.1 and Table 5.2. Agriculture Action Plan for achieving the cropping pattern is shown in Table 5.2.

Table 5.1 Cropping Pattern of Dumlui MIP

Current Crop Proportion

Kolasib: Dmului Current Cropping Pattern	Month												Area (ha)		
	J	F	M	A	M	J	J	A	S	O	N	D			
Paddy (local)															9.0
Fish (pond) (excluded number of CCA)															0.5
Kharif season															9.0
Cabbage															0.0
Culiflower															0.0
Tomato															0.0
Soyabean															0.0
Rabi season															0.0
Total															9.0

Proposed Crop Proportion

Kolasib: Dmului Proposed Cropping Pattern	Month												Area (ha)		
	J	F	M	A	M	J	J	A	S	O	N	D			
Paddy (local)															9.0
Fish (pond) (excluded number of CCA)															0.5
Kharif season															9.0
Mixed Crop: Maize & French bean															0.9
Green Chilli															0.8
Mixed Crop: Culiflower & Leaf Mustard															0.8
Rabi season															2.5
Total															11.5

Note: [Mixed Crop: Maize and French bean] Area of Maize and French bean is Maize 1.0 ha and French bea 0.6 ha into 1.0 ha (1.6ha into 1.0ha).

[Mixed Crop: Culiflower & Leaf mustard] Area of Culiflower and Leaf mustard is Culiflower 1.0 ha and Leaf mustard 0.6 ha into 1.0 ha (1.6ha into 1.0ha)

Source: Prepared by MID

Table 5.2 Proposed Cropping Area

SI. No.	Crops	Command Area (ha)	
		CA 1	Total
	Gross Command Area	11.2	11.2
	Culturable Command Area	9.0	9.0
A.	Karif Crops (Mid Jun. to Mid Oct.)		
1	1) Paddy	9.0	9.0
B.	Rabi Crops (Mid Oct. to Mid Feb.)		
1	1) Mixed crop: Maize & French bean	0.9	0.9
2	2) Green Chilli	0.8	0.8
3	3) Mixed crop: Culiflower & Leaf mustard	0.8	0.8
	Total	2.5	2.5

Source: Prepared by MID

5.2 Crop Water Requirement

Crop water requirement is derived based on the proposed cropping pattern for Dumlui Minor Irrigation Project command area. Taking culturable command area as 4.2 ha, duration of crop and respective water requirement of various crops under consideration have been derived and shown in Table 5.3. The discharge required for various crops are dispersed according to their cropping season as mentioned in Source: Prepared by MID

Table 5.5.

Table 5.3 Crop Water Requirement of Dumlui MIP, Kolasib

SI. No.	Crops	Req. (m)	Duration (day)	Req. (mm/d)	Discharge Required in cumecs CA 1 (m ³ /s)	Total Discharge (m ³ /s)	Duty (ha/m ³ /s)
A.	Karif Crops (Mid Jun. to Mid Oct.)						
	1) Paddy	1.60	140	12			
B.	Rabi Crops (Mid Oct. to Mid Feb.)	[Target]					
	1) Mixed crop: Maize & French bean	0.60	120	5	0.0005	0.0005	1,728
	2) Green Chilli	0.40	195	3	0.0003	0.0003	2,880
	3) Mixed crop: Culiflower & Leaf mustard	0.42	90	5	0.0005	0.0005	1,728
	Total				0.0013	0.0013	

Note: 1) Mixed crop: Maize & French bean req. 0.60m, duration 120days, and req. 5 mm/d

Area of Maize and French bean is Maize 1.0 ha and French bean 0.6 ha into 1.0 ha (1.6ha into 1.0ha).

3) Mixed crop: Culiflower & Leaf mustard 0.42m, duration 90days, and req. 5 mm/d

Area of Culiflower and Leaf mustard is Culiflower 1.0 ha and Leaf mustard 0.6 ha into 1.0 ha (1.6ha into 1.0ha)

Water requirement: Green chilli = Chilli = 3 mm/day

Source: Prepared by MID

Table 5.4 Total Water Requirement (Command Area CA 1) of Dumlui MIP, Kolasib

SI. No.	Crops	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
A.	Karif Crops (Mid Jun. to Mid Oct.)													
	1) Paddy													
B.	Rabi Crops (Mid Oct. to Mid Feb.)													
	1) Mixed crop: Maize & French bean											0.0005		
	2) Green Chilli											0.0003		
	3) Mixed crop: Culiflower & Leaf mustard											0.0005		
Total	Karif							0.0000						
	Rabi											0.0013		

Note: The total discharge required for monsoon period comes out to be $Q = -$ cumecs

The total discharge required for non-monsoon period comes out to be $Q = 0.0013$ cumecs

Source: Prepared by MID

Table 5.5 Water requirement for each crop

Crops		Water Requirement (m) a.	Duration (day) b.	Water Requirement (mm/d) c.=a./b.*1000
Group 1	Paddy	1.60	140	12
Group 2	Cabbage	0.45	110	5
	Knol-khol (Kohlrabi)	0.45	100	5
Group 3	Leaf Mustard	0.20	50	4
	Seamum	0.30	90	4
	Lettuce	0.30	75	4
	Potato	0.35	105	4
	Table beet	0.40	125	4
	Maize	0.45	125	4
Group 4	Cow Pea	0.25	95	3
	Lady's finger	0.30	125	3
	Soya Bean/French Bean	0.25	115	3
	Field pea	0.25	85	3
	Chilly	0.40	195	3
	Brinjal	0.35	145	3
	Tomato	0.40	140	3
	Broccoli	0.30	130	3
	Cauliflower	0.30	130	3
	Coriander	0.30	125	3
Group 5	Onion	0.30	160	2

Source: Prepared by MID

Chapter 6 Cost Estimate

The cost estimates have been framed to show the probable cost for the execution of the Dumlui Minor Irrigation Project as per the actual requirement and measurement at the proposed site. The rates adopted for various items are based on the SOR 2013 of Mizoram PWD.

Table 6.1 Abstract of Cost

Sl.No	MINOR HEAD	UNIT	AMOUNT
1	DIRECT CHARGES		
	I - Works	INR	3,957,200.00
	II - Establishment - 2% of I-works	INR	79,144.00
	III - Ordinary Tools & Plants	INR	21,660.00
	IV - Suspense	INR	Nil
	Sub-Total	INR	4,058,004.00
2	INDIRECT CHARGES		
	I - Capitalized value of abatement of land revenue	INR	Nil
	II - Audit and Account@ 1%I-Works	INR	39,572.00
	Sub-Total	INR	39,572.00
	Gross estimated cost of the project	INR	4,097,576.00
3	OFF-FARM DEVELOPMENT WORKS		
	Cost of Approach Road	INR	
	GRAND TOTAL		4,097,576.00
	SAY	INR	4,097,000.00

Source: Prepared by MID

Chapter 7 Benefit Cost Ratio

7.1 Direct and Indirect Benefits

The scheme envisages direct as well as indirect benefits to 23 farmers having WRC area within the command area of the project. These 23 families, who otherwise have to slash down the forest area for *jhumming*, will have a sustainable farming system as an alternative to traditional *jhum* system of cultivation after completion of the project. Thus, the project will contribute in maintaining ecological balance through conservation of forest by families involved in *jhumming* every year.

7.2 Benefit-Cost Ratio

The B/C ratio for the scheme has been worked out by considering the net annual value of agricultural production and the annual cost. Agricultural production before irrigation has been considered as per the cropping pattern presently practised and the data collected from the local farmers in the command area of the scheme.

The annual yield per hectare of various crops and its prices has been collected from the Agriculture Department and Department of Economics and Statistics, Government of Mizoram.

On the implementation of the scheme, the potential area for cultivation increases to 9.0 ha and the proposed cropping pattern envisages utilization of two seasons, namely, *Kharif* and *Rabi* season, resulting in a maximum potential utility area of 11.5 ha. The total annual benefit accrued post project has been derived in monetary terms.

Table 7.1 Calculation of Benefit Cost Ratio Source: Prepared by MID

**CALCULATION OF BENEFIT COST RATIO
DUMLUI MINRO IRRIGATION PROJECT
KOLASIB DISTRICT**

1. Total Estimated cost of the Project	41.0	(lakhs)
2. Total cost of the headworks		
a1. Diversion weir (1 nos.)	0.0	(lakhs)
a2. Intake (1 nos.)	3.8	(lakhs)
a3. Desiltation tank (1 nos.)	0.0	(lakhs)
Total headwaorks	3.8	(lakhs)
3. GCA	11.2	(ha)
4. CCA	9.0	(ha)

SN	Description	Pre-Project (lakhs)	Post-Project (lakhs)
1	a. Gross Receipts	7.19	21.66
	Gross annual receipts (estimated value of farm produce)		
	b. Expenses (Cost of Production)	2.26	4.66
	c. Net Value of Farm Produce (a.-b.)	4.93	17.00
2	d1. Estimated Annual Benefits after Project Completion (Post benefits - Pre benefits)	-	12.07
3	Annual Cost		
	d2. Interest on capital @ 10% of total cost of the project	-	4.10
	e. Depreciation of the project @ 4% of the project cost	-	1.64
	f. Annual operation & maintenance const @ Rs 1,175.00 per ha of CCA	-	0.11
	g. Maintenance cost of head works @ 1% of cost of head works	-	0.04
	h. Total Annual Cost (Σ d2.~g.)	-	5.88
	i. Benefit Cost Ratio (d1./h.)	-	2.05
	j. Potential to be Created (ha)		6.7
	k. Total Project Cost per Hectare (1./4.)		4.56

Table 7.2 Estimated value of crop produce before implementation

Dumlui Minor Irrigation Project, Kolasib

Gross Command Area 11.2 ha

Culturable Command Area 9.0 ha

SN	Name of crop	Area (ha)	Duration (day)	Production		Produce				Net Profit (Rs)
				Cost (Rs/ha)	Total (Rs)	Yield (ton/ha)	Total Yield (ton)	Rate (Rs/ton)	Total Value (Rs)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
A. Karif Crops (Mid Jun. to Mid Oct.)										
1	Paddy	9.0	140	24,825	223,425	2.800	25.200	28,000	705,600	482,175
B. Rabi Crops (Mid Oct. to Mid Feb.)										
1	Cabbage	0.0	110							
2	Culiflower	0.0	130							
3	Tomato	0.0	140							
4	Soyabean	0.0	115							
	Fish (pond)	0.5	150	4,725	2,363	0.130	0.065	200,000	13,000	10,638
	Total	9.0			225,788				718,600	492,813

District Agriculture Officer
Kolasibi District
Department of Agriculture

Executive Engineer
Kolasib Irrigation Division
Kolasib

Table 7.3 Estimated value of crop produce after implementation

Dumlui Minor Irrigation Project, Kolasib

Gross Command Area 11.2 ha

Culturable Command Area 9.0 ha

SN	Name of crop	Area (ha)	Duration (day)	Production		Produce				Net Profit (Rs)
				Cost (Rs/ha)	Total (Rs)	Yield (ton/ha)	Total Yield (ton)	Rate (Rs/ton)	Total Value (Rs)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
A. Karif Crops (Mid Jun. to Mid Oct.)										
1	Paddy	9.00	140	30,417	273,753	3.600	32.40	28,000	907,200	633,447
B. Rabi Crops (Mid Oct. to Mid Feb.)										
1	Mixed crop: Maize & French bean									
	Maize	0.90	125	20,863	18,777	2.800	2.52	18,000	45,360	26,583
	French bean	0.54	115	37,753	20,387	8.000	4.32	31,000	133,920	113,533
2	Green Chilli	0.80	195	48,206	38,565	9.600	7.68	39,000	299,520	260,955
3	Mixed crop: Culiflower & Leaf mustard									
	Culiflower	0.80	130	31,604	25,283	24.000	19.20	22,000	422,400	397,117
	Leaf mustard	0.48	50	34,330	16,478	24.000	11.52	18,000	207,360	190,882
	Fish (pond)	0.50	360	146,230	73,115	1.500	0.75	200,000	150,000	76,885
	Total	11.2			466,358				2,165,760	1,699,402

Area of Maize and French bean is Maize 0.90 ha and French bean 0.54 ha into 0.90 ha (1.44 ha into 0.90 ha).

Area of Culiflower and Leaf mustard is Culiflower 0.80 ha and Leaf mustard 0.48 ha into 0.80 ha (1.28 ha into 0.80 ha).

District Agriculture Officer
Kolasib District
Department of Agriculture

Executive Engineer
Kolasib Irrigation Division
Kolasib

Table 7.4 Crop Budget and Income for Paddy, OFC & Others before Implementation

Description	Year	Paddy	Maize	Green Chilli	Onion	Leaf Mustard	Leaf Coriander	Cabbage	Cauliflower	Potato	Carrot	Beat Root	Tomato	Pumpkin	Field Pea	Soyabean	Pigeon Pea	French bean
1. Unit Cost of Materials / Others	Units	Paddy	Maize	Green Chilli	Onion	Leaf Mustard	Leaf Coriander	Cabbage	Cauliflower	Potato	Carrot	Beat Root	Tomato	Pumpkin	Field Pea	Soyabean	Pigeon Pea	French bean
1 Seed	Rs./Kg	100	120	416	4,500	110	510	520	1,300	50	565	260	861	358	98	110	120	202
2 Fertilizer: Urea	Rs./Kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3 Fertilizer: SSP	Rs./Kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 Fertilizer: MOP	Rs./Kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 Organic Manure	Rs./Kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6 herbicide	Rs./Ltr.	300	300	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
7 Pesticides	Rs./Ltr.	100	60	60	60	100	60	100	100	60	60	60	100	60	100	60	60	100
8 Cattle-draft	Rs./ha	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625
9 Others cost / transport	Rs./ha	1,500	900	900	1,200	900	900	900	900	1,500	1,000	1,200	1,200	1,500	900	900	900	900
10 Machinery cost-harvest/threshing	Rs./ha	1,800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11 Supports (pole)	Rs./pole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
2. Requirements of Materials																		
1 Materials-Seed	Kg/ha	45	20.0	0.6	3.0	20	20	0.5	0.6	1,200	4	7	0.2	1.0	45	70	20	25
2 Fertilizer: Urea	Kg/ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3 Fertilizer: SSP	Kg/ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4 Fertilizer: MOP	Kg/ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5 Manure	ton/ha	20	25	25	20	20	20	25	25	25	25	10	25	10	5	5	5	5
6 herbicide	Unit/ha	1	2	2	2	-	2	2	1	1	1	1	1	1	1	1	1	1
7 Pesticides	Unit/ha	2	5	5	1	-	2	2	1	1	1	1	2	-	1	1	1	2
8 Animal-Drafting: Plough etc.	Times/ha	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9 Others, Transport	Times/ha	5	3	20	5	10	10	5	5	3	3	3	10	5	2	2	2	10
10 Machinery cost-harvest/threshing	Times/ha	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11 Supports (pole)	Bundle/ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	300
Total of Material Cost (A)	Rs./ha	16,925	8,625	21,375	22,385	13,825	21,825	7,785	8,205	64,660	8,045	8,205	15,097	10,583	9,035	12,285	6,985	19,975
3. Unit cost of Labour																		
1 Labour	Rs./day	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
4. Labour Requirement																		
a) Land preparation																		
1 Drains	Md/ha	5	10	10	10	5	5	5	5	10	5	5	12	-	5	5	5	5
2 Cleaning	Md/ha	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3 Ploughing & Harrowing	Md/ha	8	12	12	12	15	10	15	15	10	15	10	15	12	12	12	12	12
5 Plastering bunds	Md/ha	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7 Nursery preparation	Md/ha	2	-	6	15	-	-	10	10	-	-	-	50	-	-	-	-	-
b) Planting																		
1 Digging holes	Md/ha	-	10	30	15	5	5	10	10	10	10	5	30	5	5	5	5	5
2 Filling holes or/ Transplanting	Md/ha	24	9	40	15	5	5	15	15	25	5	5	30	5	5	5	5	5
3 Irrigation	Md/ha	7	10	15	15	10	10	10	10	10	10	5	10	5	5	5	5	5
c) Maintenance																		
1 Weeding	Md/ha	24	30	40	20	40	30	40	40	30	30	30	60	25	25	25	25	25
2 Irrigation	Md/ha	8	10	30	10	25	20	20	20	-	20	20	30	12	12	10	10	15
3 Fertilize application	Md/ha	8	10	25	10	12	12	12	12	10	12	12	20	6	12	10	12	12
4 Pest and disease control	Md/ha	6	6	20	10	6	6	6	6	6	6	6	10	6	6	6	6	6
d) Harvesting																		
1 Harvesting	Md/ha	34	20	70	34	80	80	25	25	50	50	34	60	30	30	20	20	80
2 Processing / Threshing / Bagging	Md/ha	24	10	40	24	40	40	15	15	10	40	24	30	10	20	15	15	40
Total Labour (including family labour)	Md/ha	158	142	343	195	248	228	188	188	176	208	161	362	121	142	123	125	215
Total Labour cost (B)	Rs./ha	39,500	35,500	85,750	48,750	62,000	57,000	47,000	47,000	44,000	52,000	40,250	90,500	30,250	35,500	30,750	31,250	53,750
5. Total Cultivation Cost (A) + (B)																		
Excluding Family Labour Cost: 80% (C)	Rs./ha	7,900	7,100	17,150	9,750	12,400	11,400	9,400	9,400	8,800	10,400	8,050	18,100	6,050	7,100	6,150	6,250	10,750
6. Total Cultivation Cost (A) + (C)																		
1 Yield Current (40% - 50%) to Expect. Yield	Kg/ha	2,800	1,400	4,800	9,200	12,000	12,000	13,300	12,000	12,600	8,000	10,000	9,200	10,000	3,200	600	600	4,000
2 Estimated Producer Price *1	Rs./kg	28	18	39	28	18	18	15	22	21	46	16	25	16	22	37	25	31
7. Sales Income (Gross Income)																		
Rs./ha	78,400	25,200	187,200	257,600	216,000	216,000	216,000	199,500	264,000	264,600	368,000	160,000	230,000	160,000	70,400	22,200	15,000	124,000
8. Net Income																		
Rs./ha	53,575	9,475	148,675	225,465	189,775	182,775	182,775	182,315	246,395	191,140	349,555	143,745	196,803	143,367	54,265	3,765	1,765	93,975
9. Benefit/Cost Ratio																		
Rs./ha	2.16	0.60	3.86	7.02	7.24	5.50	10.61	14.00	2.60	18.95	8.84	5.93	8.62	3.36	0.20	0.13	3.04	

Source: Prepared by MID

Table 7.5 Crop Budget and Income for Paddy, OFC & Others after Implementation

Description	Year																		
	Units	Paddy	Maize	Green Chilli	Onion	Leaf Mustard	Leaf Coriander	Cabbage	Cauliflower	Potato	Carrot	Beet Root	Tomato	Pumpkin	Field Pea	Soyabean	Pigeon Pea	French bean	
1. Unit Cost of Materials / Others																			
1 Seed	Rs./Kg	100	120	416	4,500	110	510	520	1,300	50	565	260	861	358	98	110	120	202	
2 Fertilizer: Urea	Rs./Kg	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	
3 Fertilizer: SSP	Rs./Kg	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	
4 Fertilizer: MOP	Rs./Kg	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	
5 Organic Manure	Rs./Kg	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
6 herbicide	Rs./Ltr.	300	300	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100	
7 Pesticides	Rs./Ltr.	100	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	60	
8 Cattle-draft	Rs./ha	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	
9 Others cost / transport	Rs./ha	1,500	900	1,200	900	900	900	900	1,500	1,000	1,000	1,200	1,200	1,500	900	900	900	900	
10 Machinery cost-harvest/threshing	Rs./ha	1,800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
11 Supports (pole)	Rs./pole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
2. Requirements of Materials																			
1 Materials-Seed	Kg/ha	40	20.0	0.6	3.0	20	20	0.5	0.6	1,200	4	7	0.2	1.0	45	70	20	25	
2 Fertilizer: Urea	Kg/ha	44	44	82	87	55	22	87	109	65	87	109	109	109	22	22	17	109	
3 Fertilizer: SSP	Kg/ha	94	94	235	188	94	94	188	188	157	188	157	250	157	188	125	17	109	
4 Fertilizer: MOP	Kg/ha	34	17	42	50	25	17	50	50	50	50	50	42	50	25	34	-	17	
5 Manure	kg/ha	600	500	500	500	1,000	1,500	1,500	1,500	500	500	500	1,000	500	500	500	500	500	
6 herbicide	Unit/ha	1	2	2	2	-	-	2	1	1	1	1	1	1	1	1	1	1	
7 Pesticides	Unit/ha	2	5	5	1	-	-	2	2	1	1	1	2	-	1	1	1	2	
8 Animal-Drafting: Plough etc.	Times/ha	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
9 Others, Transport	Times/ha	5	3	20	5	10	10	5	5	3	3	3	10	5	2	2	2	10	
10 Machinery cost-harvest/threshing	Times/ha	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
11 Supports (pole)	Bundle/ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	300	
Total Material Cost (A)	Rs./ha	22,667	14,163	31,156	31,142	22,080	32,121	21,542	22,204	72,400	16,802	16,537	25,725	21,132	16,002	20,135	12,797	27,003	
3. Unit cost of Labour																			
1 Labour cost per day	Rs./day	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	
4. Labour Requirement																			
a) Land preparation																			
1 Drains	Md/ha	4	4	10	10	5	5	5	5	10	5	5	12	-	5	5	5	5	
2 Cleaning	Md/ha	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	
3 Ploughing & Harrowing	Md/ha	7	10	12	12	12	10	15	15	10	15	10	15	12	12	12	12	12	
5 Plastering bunds	Md/ha	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
7 Nursery preparation	Md/ha	2	-	4	15	-	-	10	10	-	-	-	50	-	-	-	-	-	
b) Planting																			
1 Digging holes	Md/ha	-	10	30	15	5	5	10	10	10	5	5	30	5	5	5	5	5	
2 Filling holes or/ Transplanting	Md/ha	24	9	40	15	5	5	15	15	25	5	5	30	5	5	5	5	5	
3 Irrigation	Md/ha	7	10	15	15	10	10	10	10	10	10	5	10	5	5	5	5	5	
c) Maintenance																			
1 Weeding	Md/ha	24	30	40	20	40	30	40	40	30	30	30	60	25	25	25	25	25	
2 Irrigation	Md/ha	8	10	30	10	25	20	20	20	-	20	20	30	12	12	10	10	15	
3 Fertilize application	Md/ha	8	10	25	10	12	12	12	12	10	12	12	20	6	12	10	12	12	
4 Pest and disease control	Md/ha	6	6	20	10	6	6	6	6	6	6	6	10	6	6	6	6	6	
d) Harvesting																			
1 Harvesting	Md/ha	34	20	70	34	80	80	25	25	50	50	34	60	30	30	20	20	80	
2 Processing / Threshing / Bagging	Md/ha	24	10	40	24	40	40	15	15	10	40	24	30	10	20	15	15	40	
Total Labour (including family labour)	Md/ha	155	134	341	195	245	228	188	188	176	208	161	362	121	142	123	125	215	
Total Labour cost (B)	Rs./ha	38,750	33,500	85,250	48,750	61,250	57,000	47,000	47,000	44,000	52,000	40,250	90,500	30,250	35,500	30,750	31,250	53,750	
5. Total Cultivation Cost (A) + (B)	Rs./ha	61,417	47,663	116,406	79,892	83,330	89,121	68,542	69,204	116,400	68,802	56,787	116,225	51,382	51,502	50,885	44,047	80,753	
Excluding Family Labour Cost: 80% (C)	Rs./ha	7,750	6,700	17,050	9,750	12,250	11,400	9,400	9,400	8,800	10,400	8,050	18,100	6,050	7,100	6,150	6,250	10,750	
6. Total Cultivation Cost (A) + (C)	Rs./ha	30,417	20,863	48,206	40,892	34,330	43,521	30,942	31,604	81,200	27,202	24,587	43,825	27,182	23,102	26,285	19,047	37,753	
1 Yield (Improved): 80% to Expec. Yield	Kg/ha	3,600	2,800	9,600	12,800	24,000	20,000	24,000	24,000	16,000	16,000	20,000	20,000	6,400	1,200	1,200	8,000	8,000	
2 Estimated Producer Price *1	Rs./kg	28	18	39	28	18	18	15	22	21	46	16	25	16	22	37	25	31	
7. Sales Income (Gross Income)	Rs./ha	100,800	50,400	374,400	358,400	432,000	360,000	360,000	528,000	336,000	736,000	320,000	500,000	320,000	140,800	44,400	30,000	248,000	
8. Net Income	Rs./ha	70,383	29,537	326,194	317,508	397,670	316,479	329,058	496,396	254,800	708,798	295,413	456,175	292,818	117,698	18,115	10,953	210,247	
9. Benefit Cost Ratio		2.31	1.42	6.77	7.76	11.58	7.27	10.63	15.71	3.14	26.06	12.02	10.41	10.77	5.09	0.69	0.58	5.57	
Remark *2: (main selling methods at present)		Selling locally (100%)	Selling locally (100%)	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Selling locally (80%)	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Self consumption	Almost for Local market	

Source: Prepared by MID

Table 7.6 Estimated values of fish culture production BEFORE the implementation of the Dumlui Scheme (2014/2015)

SN	Description	Area (Ha)	Duration (months)	Production Cost		Produce				Net Profit (INR)
				Cost/Ha (INR/Ha)	Total cost (INR)	Yield (ton/ha)	Total Yield (Ton)	Rate/Ton (INR/Ton)	Total value	
1	2	3	4	5	6	7	8	9	10	11
	Fish pond culture (Traditional practice)	0.50	5	4,725	2,363	0.130	0.07	200,000	13,000	10,638

Note: 1) Mix culture of at least 3 fish varieties (from common carp, catla, rohu, mirgal, silver carp, etc.)

2) One cycle operation of 5 months.

Source: Prepared by MID

Table 7.7 Estimated values of fish culture production AFTER the implementation of the Dumli Scheme (2015-2017)

SN	Description	Area (Ha)	Duration (months)	Production Cost		Produce				Net Profit (INR)
				Cost/Ha (INR/Ha)	Total cost (INR)	Yield (ton/ha)	Total Yield (Ton)	Rate/Ton (INR/Ton)	Total value	
1	2	3	4	5	6	7	8	9	10	11
	Fish pond culture* (Improved extensive practice)	0.50	12	146,230	73,115	1.500	0.75	200,000	150,000	76,885

Note: 1) Mix culture of at least 3 fish varieties (from common carp, catla, rohu, mirgal, silver carp, etc.) for effective use of diverse food webs in the pond.

2) Assumption that there will be no expansion pond area in future.

3) Grow out shall be continuous with partial harvesting to meet market demand and re-stocking of fingerlings.

4) Feeding of commercial fish feed should be restricted to 3 to 5 % of the body weight of fish to reduce wastage and production cost.

5) Major fixed cost of pond renovation shall be only in the first year, and thereafter the ponds should be maintained properly for effective use.

6) Fish price is farmgate price at INR200/kg.

Source: Prepared by MID

Chapter 8 Construction Programme & Planning

8.1 General

Construction materials required for the construction of various components of the scheme (rehabilitation of intake, irrigation channel, farm pond, etc.) mainly bricks, stones, coarse aggregate, sand, and G. I. pipes, will be procured from approved firms and supplied and delivered at the site. Since the quantity of materials required for construction is very small, most of the materials are proposed to be collected from Kolasib Town, which is in the vicinity of the project. The project, as mentioned earlier, is connected to a fair weather road and there will be no difficulty in transportation of the materials to be used for the construction project.

8.2 Construction Planning

The total quantity of work involved in the construction of the scheme is small since the scheme envisages rehabilitation of intake and construction of irrigation channel, farm pond, etc. Materials required for construction of the project is available in the vicinity of the project.

Detailed construction plan is shown in the attachment.

Chapter 9 Command Area Development

9.1 Land Consolidation

Nil

9.2 Link Road

Nil

9.3 Rive Improvement

Nil

9.4 Others

Nil

Chapter 10 Quality Control Aspect

10.1 Quality Control Aspect

Quality control plays a very important part in the construction of irrigation components. So many steps have been taken up to make sure the quality of farm structure as well as off farm structure are constructed according to the standard in the DPR. Some of the beneficial steps taken up in order to improve the quality of the irrigation structure are as follows:

- The engineer in charge visits the construction site periodically and checks the component whether it is constructed and designed according to the technical specifications or not.
- The water users/farmers are required to visit the construction site during the construction phase of components like reservoir, intake, and channel in their respective land.

Detailed quality control plan is shown in the attachment.

Chapter 11 Water Users' Association and O&M Activities

Participation of project beneficiaries has assumed a vital role in the successful implementation of minor irrigation schemes in Mizoram. To enhance sense of ownership and responsibilities, prospective beneficiaries are involved right from the start of project formulation stage to post-project management after the completion of the project. Besides, participation of project beneficiaries promotes transparency of minor irrigation schemes.

Prospective project beneficiaries are involved in the process of project formulation through their active participation in survey and investigation and the assessment of their development needs which may be covered by minor irrigation scheme within the prevailing norms and guidelines. For taking up new projects, due care and consideration to identify the development needs and aspirations of farmers are taken by having joint field visits and a series of discussions and/or interactions with the prospective project beneficiaries before preparation and finalization of DPR.

WUAs are formed once the project beneficiaries are identified and the WUAs extend active participation in supervision of works during the project implementation stage.

Upon completion of the project, WUAs share the responsibilities of O&M of irrigation structures. While WUAs assume the responsibilities of operation of irrigation structures and allotment of irrigation water, the MID executes repairs and reconstruction of damaged irrigation structures with active participation and contribution in the form of labour from the project beneficiaries.

WUA basic rule and O&M plan were prepared through the workshop with beneficiaries. The rule and plan are shown in Table 11.1.

Table 11.1 Details of Beneficiaries

Sl.No	Name	Address
1	CT Mawia	Diakkawn, Kolasib
2	Pahnuna	Venglai, Kolasib
3	Laldinglana	Vengthar Kolasib
4	Zoramchhana	Vengthar, Kolasib
5	Tlangchuana	College Veng, Kolasib
6	Chuaiлови	College Veng, Kolasib
7	Lalnunpari	Diakkawn, Kolasib
8	Joseph Lalhminglana	Project Veng, Kolasib
9	R.Malsawmzuala	Venglai, Kolasib
10	Zohminglana	Venglai, Kolasib

Source: Prepared by MID

WUA Basic Rule

Name: Dumlui Water User Association

Objectives:

- (1) Self-sufficiency,
- (2) Timely irrigation of facilities,
- (3) Good cooperation,
- (4) Higher productivity,
- (5) Better approach road, and
- (6) Marketing and electricity.

Membership:

Members can be owners of the land in Dumlui area

Appointment of leaders:

Chairman, vice chairman, secretary, assistant secretary, treasurer, and financial secretary.
Committee members will be composed of all the members.

Rules and regulations:

- (1) Membership fee: Rs.200; Annual fee: Rs.100
- (2) New leaders should be elected after every two years,
- (3) A person cannot hold the same post for more than two terms,
- (4) Meetings should be held after every two months, and any time in case of emergency,
- (5) Picnic should be held every year during Christmas time,
- (6) There should be a receipt for every expense,
- (7) There should be a book for rules and regulations,
- (8) Financial report should be submitted by every committee,
- (9) Membership fee/annual fee should be paid every year before March, and
- (10) If modifications are made in the rules and regulations, then it should be accepted by two-thirds of the members.

Disciplinary action:

- (1) Fine of Rs.200 will be made if a person is absent for three times,
- (2) A person not paying the annual fee will not be included as a member, and
- (3) Actions will be taken for those not involving themselves in the community works.

Operation and Maintenance Plan

1. Outline of WUA

1.1 Name of MIP : Dumlui M.I.P

1.2 Name of WUA : Dumlui WUA

1.3 Location of WUA : Division : Kolasib Village/Town : Kolasib

1.4 Command Area :

Command Area (ha)				Beneficiary (household)
Paddy	Upland	Orchard	Total	
9.0	0.0	0.0	9.0	21

2. List of facilities managed by WUA

SN.	Name of Facilities	Completion Year (Plan)	Outline of Facilities	
			Structure	Dimension
1	Rehabilitation of Intake		Reinforced Concrete	
2	Construction of Field Channel		P.C.C., Brick, Cement lining.	1170
3	Rehabilitation of Pond 1		Earthen dam	L = 44m
4	Rehabilitation of Pond 2		Earthen dam	L = 52m
5	Rehabilitation of Pond 3		Earthen dam	L = 48m
6	Turnout facility		P.C.C., Brick, Cement lining.	L = 1.4 B = 1.4 H = 0.55

3. Operation and Maintenance Plan

SN.	Name of Facilities	Items	Implementer	Frequency	Schedule															
					Jan.	Feb.	Mar.	Apr.	May	Jun	Jnl.	Aug.	Sep.	Oct.	Nov.	Dec.				
1	Intake point	Patrol	Person in charge	Every quarter			■						■					■		
		Water management	WUA	Every day	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
		Maintenance	Removing sedimentation soil	All beneficiaries	4 times per year			■							■					■
			Removing weeds	All beneficiaries	4 times per year			■							■					■
		Report to MID	WUA	as & when necessary																
Rehabilitation	WUA	2 times per year						■										■		
2	Field Channel	Patrol	Person in charge	Every quarter			■						■					■		
		Water management	WUA	Every day	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
		Maintenance	Removing sedimentation soil	All beneficiaries	4 times per year			■							■					■
			Removing weeds	All beneficiaries	4 times per year			■							■					■
		Report to MID	WUA	as & when necessary																
Rehabilitation	WUA	2 times per year							■									■		
3	Water Harvesting Pond 1, II & III	Patrol	Person in charge	Every quarter			■						■					■		
		Water management	WUA	Every day	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	
		Maintenance	Removing sedimentation soil	All beneficiaries	4 times per year			■							■					■
			Removing weeds	All beneficiaries	4 times per year			■							■					■
		Report to MID	WUA	as & when necessary																
Rehabilitation	WUA	2 times per year							■									■		
6	Turnsout	Patrol	Person in charge	as & when necessary																
		Water management	WUA	as & when necessary																
		Maintenance	Removing sedimentation soil	Beneficiary	as & when necessary															
			Removing weeds	Beneficiary	as & when necessary															
		Rehabilitation	Beneficiary	as & when necessary																
Crop season					Dry (Rabi)			Summer			Rainy (Kharif)			Dry (Rabi)						

Date: _____ Place: _____

Checked by: _____ (Sub-Divisional Engineer) Prepared by: _____ (Junior Engineer and WUA) Countersigned by: _____ (Executive Engineer)

Annexure

1. Survey & Investigation

1.1 Soil Classification

Soil classification test(in site)		Surveyed Date	14/Oct. /2014
Scheme Name	Dumlui MIP	Name of Surveyor	SDO and JE (Lunglei)

Instruction

1) Visit the survey together with village chairperson and villagers.

Visit the proposed area and choose typical soil in the area with the consultation of the village chairperson and villagers.

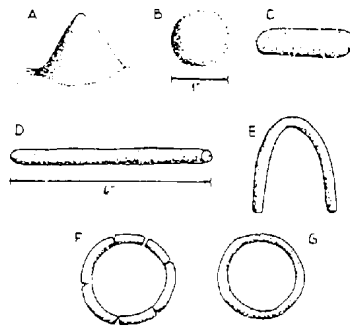
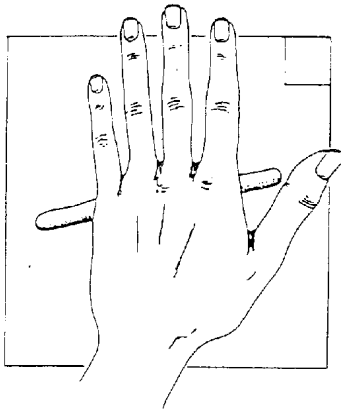
2) Sampling of the soil

Gather a soil sample from the soil surface (sample should be about 10 x 10 x 10 cm).

3) Knead the soil with water.

Add some water to the soil sample so it is moist but not wet. Knead it well. Pebbles should be removed.

4) Try to create ring shapes with the soil sample and choose the most advanced shape that can be made.



A: Soil can only be shaped into a cone. No other shapes hold together.
 B: Soil can be formed into a circle, but not a rod shape.
 C: Soil can be formed into a stout rod shape.
 D: A thin rod (about 6 mm diameter) can be formed but not bent.
 E: Thin rod can be bent without breaking
 F: Circle can be formed with some breaks.
 G: Complete circle with no breaks can be formed.

5) Evaluate the soil texture

According to the result of 4), circle one of the detailed soil texture types and choose a General soil texture type by conversion of the detailed soil texture type.

Detail soil texture type	conversion	General soil texture type
Shape A Sand <input type="checkbox"/>	if you choose Shape A →	Sand <input type="checkbox"/>
Shape B Loamy sand <input type="checkbox"/>	if you choose Shape B or C →	Sandy Loam <input type="checkbox"/>
Shape C Silty Loam <input type="checkbox"/>		
Shape D Loam <input checked="" type="checkbox"/>	if you choose Shape D or E →	Clay Loam <input checked="" type="checkbox"/>
Shape E Clay Loam <input type="checkbox"/>		
Shape F Light Clay <input type="checkbox"/>	if you choose Shape F or G →	Clay <input type="checkbox"/>
Shape G Heavy Clay <input type="checkbox"/>		

6) Notable Soil Characteristics

If there are any notable soil characteristics such as high rock outcrop, shallow soil depth and symptom of salt accumulation, please note.

Note:

Note: Picture of the test is to be attached in following.



Test



Result

1.2 Measurement of stream discharge

Date of Measurement	15 th Oct. 2014
Surveyor	SOD and JE (Kolasib)
Measured discharge	6 (L/S) (River 1; upper river)

Picture



Date of Measurement	14 th Oct. 2014
Surveyor	SOD and JE (Kolasib)
Measured discharge	5 (L/S) (River 2; lower river)

Picture



Bucket method :

This is a simple method of measuring a small flow of less than 5 l/s with a very high accuracy.

Begin to build a small dam of earth across the stream to stop the flow. You can use wood poles, bamboo or tree branches to hold the earth in place while you build the dam. When the dam is about half built, put in a pipe about 5-7 cm in diameter and about 1-1.5m long. This pipe can be made of bamboo.

Finish building the dam across the across so that all the water flow passes through the pipe.

Find at least two buckets or other, similar containers which you can use to catch the water flowing through the pipe. You will also need a bottle or other, smaller 1-litre container.

Using the 1- litre container, count the number of litres needed to fill the buckets with water, in order to find how much each bucket will hold.

Using one bucket after the other, catch all the water flowing through the pipe for 1 minute. Count how many buckets you can fill during that time. Calculate the total water flow (in l/s).



1.3 Household Survey

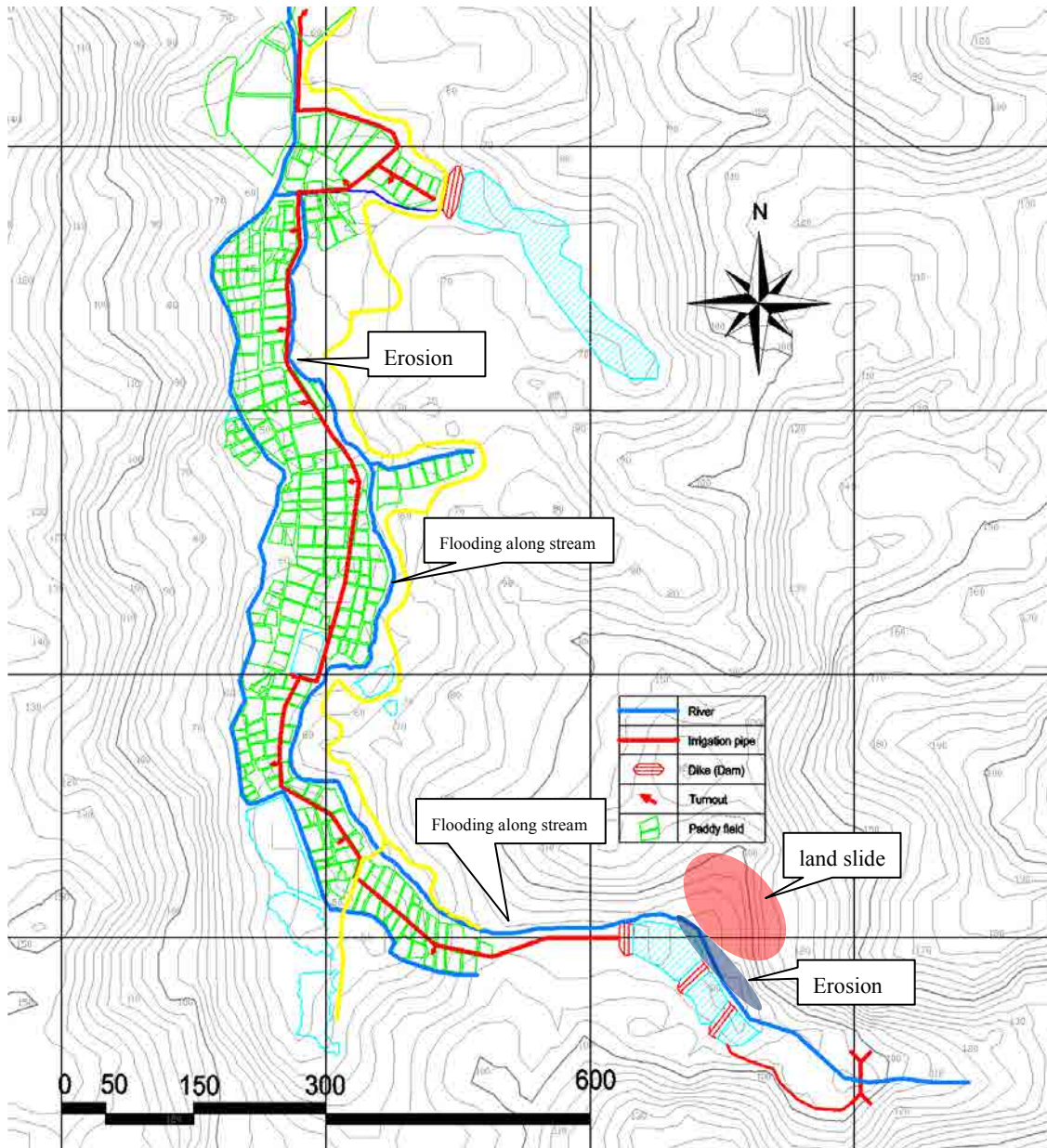
No	Residence		Land (acre)							
	Town / Village	District	Jhum	Irrigated / Wetland	Permanent rainfed	Fallow	Fish pond	Residential	Others	Total
K-1	Kolasib	Kolasib	1.500	2.000			1.000	0.020		4.520
K-2	Kolasib	Kolasib					1.000			1.000
K-3	Kolasib	Kolasib					1.300			1.300
K-4	Dawrpui Vengthar	Aizawl	1.300	1.300	2.000					4.600
K-5	Kolasib	Kolasib		2.000	3.000		1.500			6.500
K-6	Kolasib	Kolasib		1.200						1.200
K-7	Kolasib	Kolasib								0.000
K-8	Tumpui	Kolasib	1.000	1.000			0.040			2.040
K-9	Kolasib	Kolasib		2.000			0.250	0.080		2.330
K-10	Kolasib	Kolasib		0.040	0.800		1.600		0.084	2.524
K-11	Kolasib	Kolasib		1.200			1.200			2.400
K-12	Kolasib	Kolasib		1.000			1.500			2.500
K-13	Kolasib	Kolasib		1.600						1.600
K-14	Kolasib	Kolasib					2.000			2.000
K-15	Kolasib	Kolasib		1.600						1.600
K-16	Kolasib	Kolasib		1.500			1.000			2.500
	2	Total	3.800	16.440	5.800	-	12.390	0.100	0.084	38.614
		(%)	10	43	15	-	32	0	0	100
		Average	1.267	1.370	1.933	-	1.126	0.050	0.084	2.413
		Median	1.300	1.400	2.000	-	1.200	0.050	0.084	2.185
		Max	1.500	2.000	3.000	-	2.000	0.080	0.084	6.500
		Min	1.000	0.040	0.800	-	0.040	0.020	0.084	0.000

1.4 DPR Preparatory Survey check sheet (For MID Engineer)

Scheme Name		Dumlui		S/N	1
Survey Date		14&15/09/2014	Name of surveyor/ Position	Kolasib Minor Irrigation Division	
S/N	Items	Content	Check	Remarks	
1	Preparation of Base Map	<ul style="list-style-type: none"> • Creation of Contour Map with GIS. • Trace existing facilities like paddy, road, river. in Google earth. And save the data. • Save Google earth picture data. It is recommendable to use Google earth Pro for better resolution data. • Merge above three map data and prepare base map with CAD. • Conduct walking survey and confirm existing facilities to modify the base map. 	√		
2	Clarification of land owners	<ul style="list-style-type: none"> • Clarification of land owners and boundaries through meeting and joint walkthrough survey. • Collected information are to be mapped on the base map 	√		
3	Soil Clarification	<ul style="list-style-type: none"> • Take several soil samples from farm. • Site soil testing is to be conducted. And take pictures. 	√		
4	Bearing Capacity	<ul style="list-style-type: none"> • Take several measurement of bearing capacity at several sites, like Diversion, tank and canal, using simple portable tool. 	-	No big structure	
5	Slope Soil Conditions along canal	<ul style="list-style-type: none"> • Walk through field soil survey at intake point and along main canal to identify of possible land-sliding areas and estimate risk of sliding. • Result of the survey is to shown in above Base Map and will be reflected to facility planning and designing. 	√	Refer to following page map.	
6	Topological Survey	<ul style="list-style-type: none"> • River centreline level survey to identify suitable point for intake and expect future change of river bed. • Cross-leveling Survey at several typical points along canal. • Longitudinal levelling along gentle slope canal. • Total station survey around farm pond and gentle slope farm development area. 	√	Two farm pond candidate sites	

7	Available surface water	<ul style="list-style-type: none"> • Measurement of discharge water at candidate intake points. • Take measurement of catchment area of each stream with GIS or CAD. • Make rough estimation of season wise discharge water and confirm with farmers. 	√	
8	Preparation of Layout map	<ul style="list-style-type: none"> • Preparation of first draft facility layout map on base map. • Confirm the draft plan with beneficiaries. 	√	

Land sliding, Flooding and Erosion Survey result



Annexure

2. Hydrology

2.1 Rainfall Record

MONTHLY RAINFALL RECORDED AT KOLASIB STATION UNDER AGRICULTURE DEPARTMENT

Year/ Month	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec	Total
2000	12.0	20.0	354.0	425.0	210.0	211.0	184.0	502.0	488.0	304.0	6.0	0.0	2,716.0
2001	0.0	122.0	95.0	170.0	357.0	915.0	736.0	610.0	743.0	295.0	161.0	0.0	4,204.0
2002	5.0	0.0	10.0	324.0	829.0	370.0	392.0	662.0	200.0	235.0	88.0	2.0	3,117.0
2003	0.0	17.0	112.0	299.0	257.0	587.0	401.0	410.0	468.0	255.0	0.0	60.0	2,866.0
2004	5.0	0.0	7.0	595.0	240.0	334.0	714.0	564.0	308.0	63.0	0.0	0.0	2,830.0
2005	0.0	14.0	228.4	129.3	435.2	121.0	704.0	332.7	383.8	189.4	0.0	0.0	2,537.8
2006	0.0	0.0	1.2	264.7	462.1	673.1	457.1	415.4	214.4	224.8	8.3	0.0	2,721.1
2007	0.0	57.1	30.4	360.8	342.2	420.7	376.0	539.5	611.4	269.3	96.8	0.0	3,104.2
2008	33.8	23.2	123.6	25.8	166.2	436.6	404.4	643.5	313.4	297.2	0.0	0.0	2,467.7
2009	0.0	24.0	50.2	201.6	196.7	303.0	319.7	260.8	297.2	121.8	6.0	0.0	1,781.0
2010	1.2	1.2	170.8	522.4	340.9	340.9	358.3	649.4	441.4	159.2	5.2	58.0	3,048.9
2011	3.0	0.0	39.1	114.1	561.2	517.3	639.0	630.4	305.1	201.7	0.0	0.0	3,010.9
Total	60.0	278.5	1,221.7	3,431.7	4,397.5	5,229.6	5,685.5	6,219.7	4,773.7	2,615.4	371.3	120.0	34,404.6

2.2 Annual Average Yield

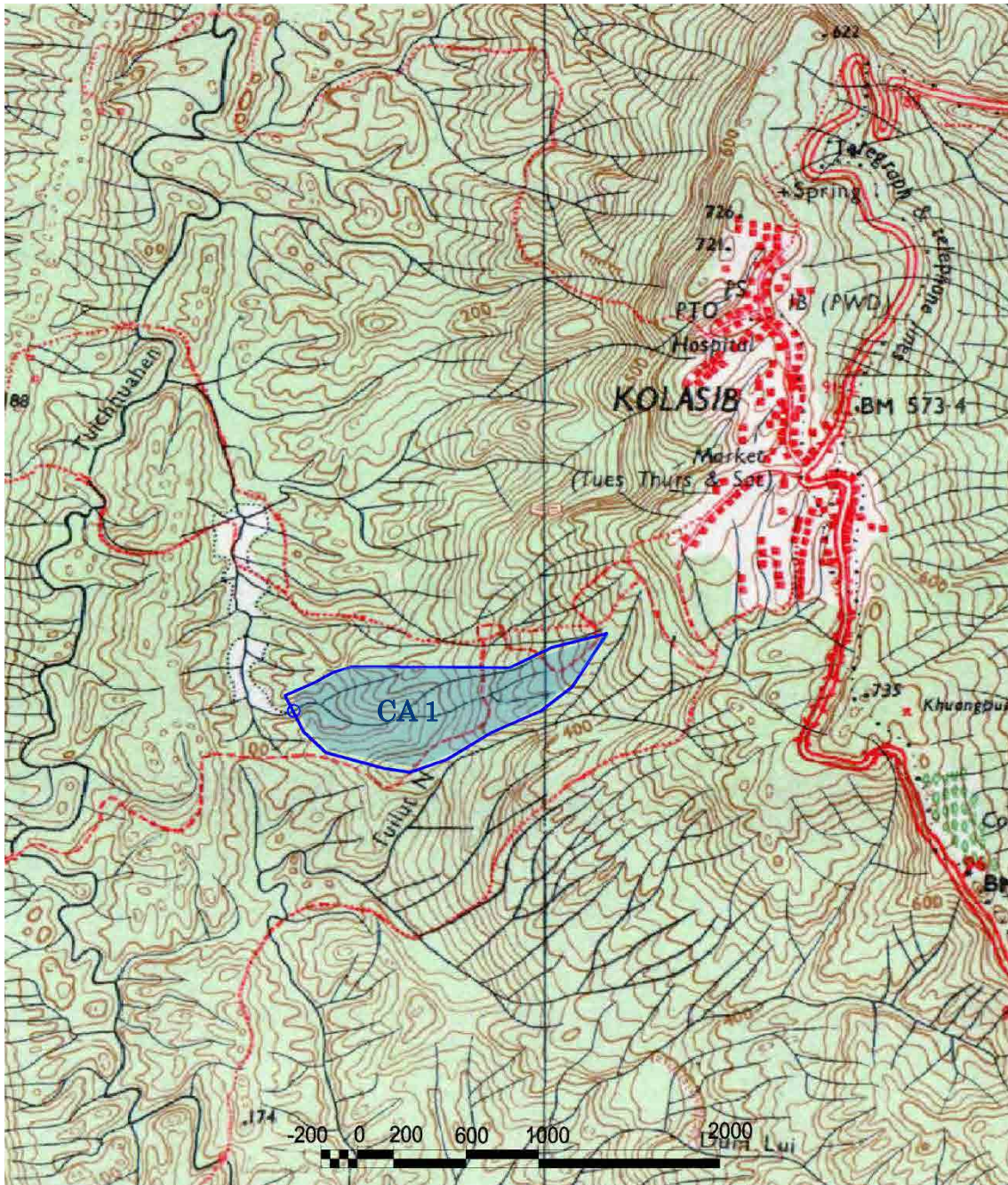
ANNUAL YIELD SERIES OF DURLUI MINOR IRRIGATION PROJECT, KOLASIB AREA OF CATCHMENT 0.65 Sq.Km

YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1	2	3	4	5	6	7	8	9	10	11	12	13	14
2000	0.004	0.006	0.104	0.124	0.061	0.062	0.054	0.147	0.143	0.089	0.002	0.000	0.794
2001	0.000	0.036	0.028	0.050	0.104	0.268	0.215	0.178	0.217	0.086	0.047	0.000	1.230
2002	0.001	0.000	0.003	0.095	0.242	0.108	0.115	0.194	0.059	0.069	0.026	0.001	0.912
2003	0.000	0.005	0.033	0.087	0.075	0.172	0.117	0.120	0.137	0.075	0.000	0.018	0.838
2004	0.001	0.000	0.002	0.174	0.070	0.098	0.209	0.165	0.090	0.018	0.000	0.000	0.828
2005	0.000	0.004	0.067	0.038	0.127	0.035	0.206	0.097	0.112	0.055	0.000	0.000	0.742
2006	0.000	0.000	0.000	0.077	0.135	0.197	0.134	0.122	0.063	0.066	0.002	0.000	0.796
2007	0.000	0.017	0.009	0.106	0.100	0.123	0.110	0.158	0.179	0.079	0.028	0.000	0.908
2008	0.010	0.007	0.036	0.008	0.049	0.128	0.118	0.188	0.092	0.087	0.000	0.000	0.722
2009	0.000	0.007	0.015	0.059	0.058	0.089	0.094	0.076	0.087	0.036	0.002	0.000	0.521
2010	0.000	0.000	0.050	0.153	0.100	0.100	0.105	0.190	0.129	0.047	0.002	0.017	0.892
2011	0.001	0.000	0.011	0.033	0.164	0.151	0.187	0.184	0.089	0.059	0.000	0.000	0.881
Total	0.018	0.081	0.357	1.004	1.286	1.530	1.663	1.819	1.396	0.765	0.109	0.035	10.063

Average Annual Yield = 0.839 MCM

2.3 DRAINAGE MAP

Drainage Map



Catchment area

Area Name	Area (km ²)
CA-1	0.65

Annexure

3. Agriculture Action Plan

Annexure

4. Environmental Conformity Check List

No.	Criteria	Check items	YES	NO
1	WATER AND PHYSICAL ENVIRONMENT	<ul style="list-style-type: none"> ■ Is it sure that the project is not likely to affect or conflict with the existing water uses and water rights downstream? 	✓	
		<ul style="list-style-type: none"> ■ Are awareness heightening campaigns undertaken, or going to be undertaken, for the proper handling and use of permitted fertilizers and pesticides by the farmers, of for promoting and facilitating organic farming? 	✓	
		<ul style="list-style-type: none"> ■ Are the engine equipments for construction (trucks, others) and operation (water pumps if any) properly selected as to be in conformity with the national environmental emission standards for air quality and noise levels? 	✓	
2	FOREST	<ul style="list-style-type: none"> ◇ Will the project encroach on a forest land? 		✓
		<ul style="list-style-type: none"> ■ If it is planned that the project will encroach on forest land, a forestry clearance permit must be obtained from the Department of Environment and Forestry, and a compensatory afforestation plan must be prepared. Has a forestry clearance been submitted, or is it going to be done during the planning stage? <p><i>NOTE</i> The principle of forestry clearance is that a non forest land equivalent in area to the forest land diverted for non-forestry use must be provided for compensatory afforestation and transferred to the Environment and Forest Department for notification as forest land. The forestry clearance procedure differs according to conditions like the size of the forest land for diversion.</p>		
3	PROTECTED AREAS	<ul style="list-style-type: none"> ■ Is it sure that the project site is located outside any protected area? <p><i>NOTE</i> A protected area is a National Park, a Wildlife Sanctuary, a Conservation Reserve, or a Community Reserve (Wildlife Protection Act 1972). Should also be considered as a protected area the following: Planned extension area of an existing protected area, planned or existing Eco-sensitive Zone (buffer zone around a protected area)</p>	✓	
4	HUMAN SETTLEMENTS	<ul style="list-style-type: none"> ◇ Will the project encroach on human settlements others than housing settlements, and possibly induce damages on or loss of such settlements,? <p><i>NOTE</i> Given the conditions of permanent housing hilltop or hillside, it is assumed that small scale irrigation projects are not likely to affect housing. It is however possible in specific cases.</p>		✓
		<ul style="list-style-type: none"> ■ If it is confirmed that the project will encroach on human settlements, including housing settlements or not, and possibly induce damages on or loss of such settlements, are compensatory measures undertaken according to the legal requirements? <p><i>NOTE</i> Compensation of land and assets must be performed at least according to the Mizoram Land Acquisition Rules 2010.</p>		
5	CULTURAL AND HISTORICAL SITES	<ul style="list-style-type: none"> ■ Is it sure that the project site is not contiguous to, and is not likely to affect directly (physical damages) or indirectly (landscape), any protected monument or site notified by the Arts and Culture Department? <p><i>NOTE</i> The Arts and Culture Department has notified a list of 82 protected monuments or sites</p>	✓	
		<ul style="list-style-type: none"> ■ Is it confirmed in discussion and coordination with the Village Council, that the project site does not encroach on any valuable existing cultural or historical asset or place of importance for the local community? <p><i>NOTE</i> Valuable existing cultural or historical asset or place may include graves, sacred grooves, and any others.</p>	✓	
6	LIVING ENVIRONMENT	<ul style="list-style-type: none"> ■ Are opportunities of improvement of the living environment in relationship with irrigation works and in consultation with the local community fully taken into consideration for planning the project? <p><i>NOTE</i> For example, if a water body or river site is used for washing or bathing, the construction of irrigation works can be an opportunity to improve the conditions of use and the conditions of access, particularly for users like vulnerable people, women, and children.</p>	✓	
		<ul style="list-style-type: none"> ■ Does planning of the project take into consideration the standpoint of the women of the community of concern, and more particularly the women in vulnerable condition, as for both criteria 4 and 7? 	✓	

Annexure

5. Design Check List

Check List 1

Canal

| First Stage | : Basic Conditions

1. Outline

1.1 Land Use

 Paddy Upland Both

1.2 Type

 Open Channel Pipeline Both

1.3 Canal Type and Dimension

Name	Type	Length (m)	Flow (m ³ /s)	Slope	Remarks
Rec. Channel	Open Channel	1,170	0.140	1/1,000	

1.4 Supplementary facilities of Canals

Facilities	Number	Remarks
Division works	12	
Regulating reservoir		Nil
Management Road		Nil
Culvert/Bridge		Nil
Regulator (gate)	36	
Other ()		Nil

1.5 Consultation

1.5.1 River

 Need No need

1.5.2 Drinking Water

 Need No need

1.5.3 Other ()

 Need No need

2. Basic Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
	<i>[Example]</i>				
3	Field survey	3.1 Whether the pictures are taken.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Annexure II
1	Design purpose	1.1 Whether the purpose is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the scope, quantity, items of design are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	Basic design conditions	2.1 Whether the irrigation system is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.2 Whether the intake points are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.3 Whether the water users are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.4 Whether the consultation items are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	Field survey	3.1 Whether the pictures are taken.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.2 Whether the field conditions (topography, soil, landuse etc.) are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.3 Whether the river and road conditions are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.4 Whether the points of the planned main faciities are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.5 Whether the difficulty or issues are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.6 Whether the important points of the construction are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	Design plan	4.1 Whether the selected canal types are suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.2 Whether the facility layout is suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.3 Whether the canal standard structure is suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.4 Whether the maintenance is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer)

Place : _____ Prepared by _____ (Junior Engineer)

Countersigned by : _____ (Executive Engineer)

Check List 2

Canal

[Middle Stage] : Drawings

1. Detailed Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
	<i>[Example]</i>				
3	Drawings	3.1 Whether the cross drawings are prepared,	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
1	Design Plan (supplementary facility)	1.1 Whether the following supplementary facility layout and scale are suitable.			
		- Division works	<input type="checkbox"/>	<input type="checkbox"/>	Nil
		- Regulator reservoir	<input type="checkbox"/>	<input type="checkbox"/>	Nil
		- Management road	<input type="checkbox"/>	<input type="checkbox"/>	Nil
		- Bridge/Culvert	<input type="checkbox"/>	<input type="checkbox"/>	Nil
		- Regulator (gate)	<input type="checkbox"/>	<input type="checkbox"/>	Nil
		- Other ()	<input type="checkbox"/>	<input type="checkbox"/>	Nil
2	Hydraulics Calculation	2.1 Whether the formulas and coefficients used in hydraulic calculation are suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	Drawings	3.1 Whether the cross drawings are prepared,	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.2 Whether the drawings are consistent in hydraulics calculation.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.3 Whether the indication of drawings is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.4 Whether the special mention is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	Construction Plan	4.1 Whether the access road for construction is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer) Countersigned by : _____ (Executive Engineer)
 Place : _____ Prepared by : _____ (Junior Engineer)

Check List 3

Canal

[Final Stage] : Quantity and DPR

1. Quantity

SN.	Items	Contents	Object	Confirmation	Reasons
	<i>[Example]</i>				
1	Quantity	1.2 Whether the quantity is prepared for each material.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
1	Quantity	1.1 Whether the sizes used in the quantity calculation are consistent in the drawings.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the quantity is prepared for each material and each facility.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

2. DPR

SN.	Items	Contents	Object	Confirmation	Reasons
	<i>[Example]</i>				
1	DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Contents
1	DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the reasons of the formulas and coefficients are wrote clearly.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.3 Whether the calculation process are arranged clearly.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer) Countersigned by : _____ (Executive Engineer)
 Place : _____ Prepared by : _____ (Junior Engineer)

Check List 1

Pond 1

| First Stage | : Basic Conditions

1. Outline

1.1 Purpose Irrigation Fisheries Other

1.2 Pond Dimension

1.2.1 Embankment Length m Height m

1.2.2 Gross Catchment Area ha

1.2.3 Reservoir Volume cum

1.2.4 Command Area ha

1.3 Supplementary Facilities

1.3.1 Spillway Need No need

1.3.2 Intake Facility Need No need

1.4 Consultation

1.4.1 Rive Need No need

1.4.2 Drinking Water Need No need

1.4.3 Fisheries Need No need

1.4.4 Other () Need No need

2. Basic Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
	[Example]				
3	Field survey	3.1 Whether the pictures are taken.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Annexure II
1	Design purpose	1.1 Whether the purpose is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the scope, quantity, items of design are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	Basic design conditions	2.1 Whether the water users are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.2 Whether the gross catchment and command area are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.3 Whether the layout of the embankment and supplementary facilities are appropriate as topography and irrigation.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.4 Whether the necessity of the emergency discharge is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.5 Whether the consultation items are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	Field survey	3.1 Whether the pictures are taken.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.2 Whether the land use of the plan site is grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.3 Whether the road conditions are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.4 Whether the difficulty or issues (downstream fisheries etc.) are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.5 Whether the borrow pit conditions are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.6 Whether the important points of the construction are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	Design plan	4.1 Whether the embankment layout is suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.2 Whether the embankment structure is suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.3 Whether the location and structure of the spillway are appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.4 Whether the location and structure of the intake facility are appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.5 Whether the land acquisition and compensation are confirmed.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.6 Whether the maintenance is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer)
 Place : _____ Prepared by _____ (Junior Engineer) Countersigned by : _____ (Executive Engineer)

Check List 2

Pond 1

[Middle Stage] : Drawings

1. Detailed Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
2	[Example] Construction Plan	2.1 Whether the access road for the construction is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 8
1	Drawings	1.1 Whether the layout and cross and profile drawings are prepared.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the water and ground level are shown.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.3 Whether the indication of the drawings is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.4 Whether the special mention is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	Construction Plan	2.1 Whether the access road for the construction is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.2 Whether the temporary drainage of the river is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer) Countersigned by : _____ (Executive Engineer)
Place : _____ Prepared by _____ (Junior Engineer)

Check List 3

Pond 1

[Final Stage] : Quantity and DPR

1. Quantity

SN.	Items	Contents	Object	Confirmation	Reasons
1	[Example] Quantity	1.2 Whether the quantity is prepared for each material.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
1	Quantity	1.1 Whether the sizes used in the quantity calculation are consistent in the drawings.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the quantity is prepared for each material and each facility.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

2. DPR

SN.	Items	Contents	Object	Confirmation	Reasons
1	[Example] DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Contents
1	DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the reasons of the formulas and coefficients are wrote clearly.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.3 Whether the calculation process are arranged clearly.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Engineer) Countersigned by : _____ (Executive Engineer)
Place : _____ Prepared by _____ (Junior Engineer)

Annexure

6. Cost Estimate

ABSTRACT OF COST

Sl.No	MINOR HEAD	UNIT	AMOUNT
1	DIRECT CHARGES		
	I - Works	INR	3,957,200.00
	II - Establishment - 2% of I-works	INR	79,144.00
	III - Ordinary Tools & Plants	INR	21,660.00
	IV - Suspense	INR	Nil
	Sub-Total	INR	4,058,004.00
2	INDIRECT CHARGES		
	I - Capitalized value of abatement of land revenue	INR	Nil
	II - Audit and Account@ 1%I-Works	INR	39,572.00
	Sub-Total	INR	39,572.00
	Gross estimated cost of the project	INR	4,097,576.00
3	OFF-FARM DEVELOPMENT WORKS		
	Cost of Approach Road	INR	
	GRAND TOTAL		4,097,576.00
	SAY	INR	4,097,000.00

(LALCHHANDAMA)

I - WORKS
ABSTRACT OF COST
CHHIMLUANGTE MINOR IRRIGATION PROJECT , MEIDUM.

Sl.No	DETAILED HEAD	UNIT	COST
1	A - Preliminary	INR	70,300.00
2	C - Works	INR	3,714,600.00
4	O - Miscellaneous	INR	123,000.00
5	P - Maintenance	INR	39,500.00
8	Y - Losses on stock & unforeseen	INR	9,800.00
GRAND TOTAL		INR	3,957,200.00

(LALCHHANDAMA)

I - WORKS
ABSTRACT OF COST OF C - WORKS

Sl.No	Item of works	Qty	Unit		Amount
1	Rehabilitation of Pond - I, II & III	3	nos	INR	1,051,900.00
2	Construction of Field Channel	1170	m	INR	1,561,300.00
3	Construction of Turnouts	12	nos	INR	99,600.00
4	Rehabilitation of Intake point	1	ls	INR	378,900.00
6	Construction of Gabion Structure	190	m	INR	622,900.00
GRAND TOTAL				INR	3,714,600.00

(LALCHHANDAMA)

I - WORKS
DETAILED ESTIMATE OF COST
A - PRELIMINARY

Sl. No.	Particulars	Unit	Amount
1	Estimate of survey & investigation expenditure on preliminary survey	INR	52,300.00
2	Preparation & printing of Project report	INR	5,000.00
3	Conveyance cost during survey & supervision	INR	5000.00
4	Camp utensil and accessories, equipment	INR	8000.00
TOTAL		INR	70,300.00

(LALCHHANDAMA)

**A - PRELIMINARY
DETAIL ESTIMATE FOR SURVEY AND INVESTIGATION**

1	Rabi Discharge Measurement	Unskilled :	5	nos for	1	day	
	@ INR .	220.00	/day			INR	1,100.00
		Skilled	3	nos for	1	day	
	@ INR .	380.00	/day			INR	1,140.00
	Bucket @IN	200	2	nos		INR	400
2	Reconnaissance Survey	Unskilled :	3	nos for	4	days	
	@ INR .	220.00	/day			INR	2,640.00
2	Preliminary survey of Command Area	Unskilled :	4	nos for	8	days	
	@ INR .	220.00	/day			INR	7,040.00
3	Contour survey of command Area at 0.25m interval GCA	@ INR .	850.00	/Ha	9	INR	7,650.00
4	Preliminary survey of stream	Unskilled :	5	nos for	5	days	
	@ INR .	220.00	/day			INR	5,500.00
5	Detail survey of streams including taking L-Section & Cross-section at RWHD	Unskilled :	4	nos for	6	days	
	@ INR .	220.00	/day			INR	5,280.00
6	Water distribution alignment survey	Unskilled :	5	nos for	4	days	
	@ INR .	220.00	/day			INR	4,400.00
9	Final survey of alignment during construction	Unskilled :	6	nos for	10	days	
	a) At the time of formation cutting @ INR .	220.00	/day			INR	13,200.00
	b) At the time of channel flooring @ INR .	220.00	/day		5	days	6,600.00
					TOTAL	INR	52,310.00
					SAY	INR	52,300.00

CHECKED BY :

PREPARED BY:-

(JACINTA LALTANPUII)

(M.K. BHATTACHARJEE)

COUNTERSIGNED BY:-

(LALCHHANDAMA)

I - WORKS
DETAILED ESTIMATE OF COST
C - WORKS

CONSTRUCTION OF HARVESTING POND-I

Detail Measurement, Calculation of Quantities and Cost Estimate

Sl.No.	Description of Work	Measurement				Qty	Unit	Amount	
		No	L	B	H				
1/1.02	Clearing and grubbing road land including uprooting rank vegetation, grass, brush shrubs, saplings and trees of girth upto 300 mm, removal of stumps, disposal of unserviceable material and stacking of serviceable material upto 100 metres from road boundary.							1904.00	
	a)By manual means								
	i)in area of light jungle		1	80.00	2.00		160.00		Sqm
		@ INR 11.90 / sqm					INR		
2/2.07	Earthwork in excavation in foundation trenches or drains etc. (not exceeding 1.5m in width or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m including getting out excavated soil and disposal of surplus excavated soil as directed within a lead of 50 metres.							542273.82	
	a) Ordinary soil		No	Length (L)	Area				
	POND1		1	45.00	24.00		1080.00		
	POND2		1	45.00	6.80		306.00		
	POND3		1	27.00	8.20		221.40		
	FISHRY						300		
			INR				1907.40		
		@ INR 284.30 / cum					INR		
3/2.18	Filling available excavated earth(excluding rocks) in trenches,plinth,etc. in layers not exceeding 20cms in depth,consolidating each layer by ramming and watering and dressing lead upto 50m and lift upto 1.5m							148308.72	
	a) Ordinary soil		No	Length (L)	Area				
	POND1		1	44.00	9.00		396.00		
	POND2		1	52.00	14.00		728.00		
	POND3		1	48.00	10.80		518.40		
							1642.40		
			Add Compaction allowance @10%				164.24		
			Total Vol. of Dam earthwork				1806.64		
			G.Total E/W				1806.64		cum
	No.2/2.06		@ INR 90.30 / cum						INR
4/4.02	Providing and laying cement concrete of specific grade excluding cost of centering - All work upto plint level							109183.97	
	a) 1:2:4 (1 cement :2 course sand :4 stone aggregate 20mm nominal size)								
			No	Length (L)	Area				
	Spilways		3	14.43	0.36		15.58		
	Collar for Irrigation pipe		3	3	0.45		0.18		
Collar for Drain pipe		3	3	0.30		0.08			
		T.T				15.85	cum		
		@ INR 6889.60 / cum					INR		

7/5.11	Centering & shuttering including strutting,propping etc and removal of form works in							
	Spillway	3	2	14.43	0.65		56.28	
		3	2	14.43	0.50		43.29	
						T.T	99.57	sqm
	@ INR		422.10			/ sqm		INR
								42027.23
12	Gabian Structure for Erosion Control, River Training Works and Protection works (Providing and constructing gabain structures for erosion control, river training works and protection works with wire crates of size 2 m x 1 m x 0.3 m each divided into 1m compartments by cross netting, made from 4 mm galvanised steel wire @ 32 Kg per 10 sqm having minimum tensile strength of 300 Mpa conforming to IS:4826, woven into mesh with double twist, mesh size not exceeding 100 mm x 100 mm, filled with boulders with least dimension of 200 mm, all loose ends to be securely tied with 4 mm galvanised steel wire.							
	erosion protection	No	L	B	H		7.2	cum
		6	4	1	0.3			
						Total	7.2	
	@ INR		5044.00			/ cum		INR
								36316.80
						TOTAL		INR
						Subtract 4.13% Cost index on SOR 2013 for Kolasib District		INR
						TOTAL (A)		INR
								880014.54
								36344.60
								843669.94
12	Irrigation pipe 100 mm dia.- 1 rows & As per PHE Rate Dt 4.7.2012							
			3	20.00			60	rm
	@ INR		806.11			/ rm		INR
								48366.60
13	Laying of Irrigation pipe 100 mm dia.- 1 row As per PHE Rate Dt 27.7.2012							
			3	20.00			60	rm
	@ INR		324.00			/ rm		INR
								19440.00
14	Drainage pipe 80mm dia. - 1 rows As per PHE Rate Dt 4.7.2012							
			3	22.00			66	rm
	@ INR		543.97			/ rm		INR
								35902.02
15	Laying of Drainage pipe 80 mm dia.- 1 rows As per PHE Rate Dt 27.7.2012							
			3	22.00			66	rm
	@ INR		222.00			/ rm		INR
								14652.00
16	GME Wheel valve(80 mm Dia.)	3		1			3	nos
	@ INR		11498.00			/ nos		INR
								34494.00
	GME Wheel valve(100 mm Dia.)	3		1			3	nos
	@ INR		18490.00			/ nos		INR
								55470.00

TOTAL INR 208,324.62
G. TOTAL (A+B) INR 1,051,994.56
SAY INR 1,051,900.00

CHECKED BY :

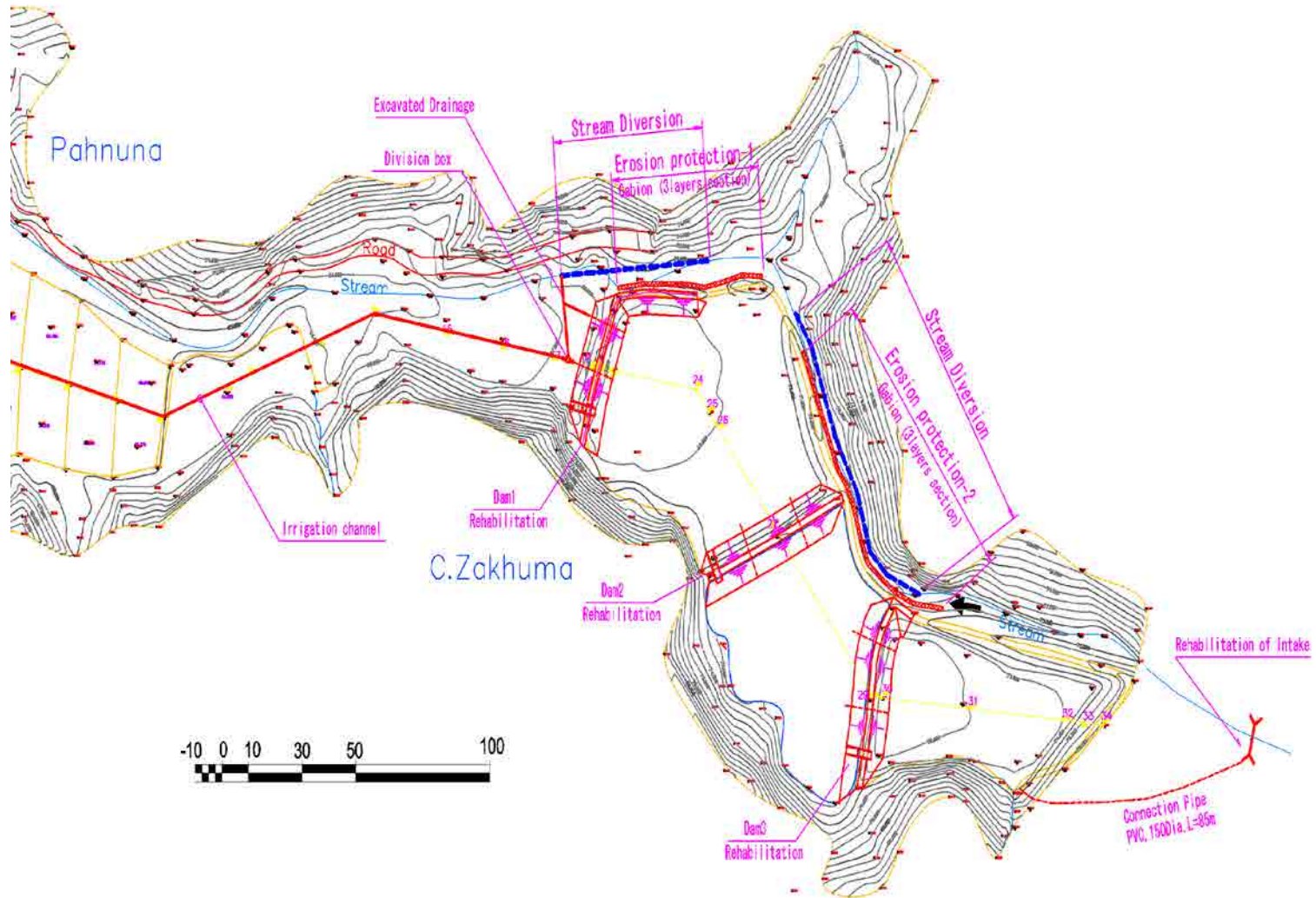
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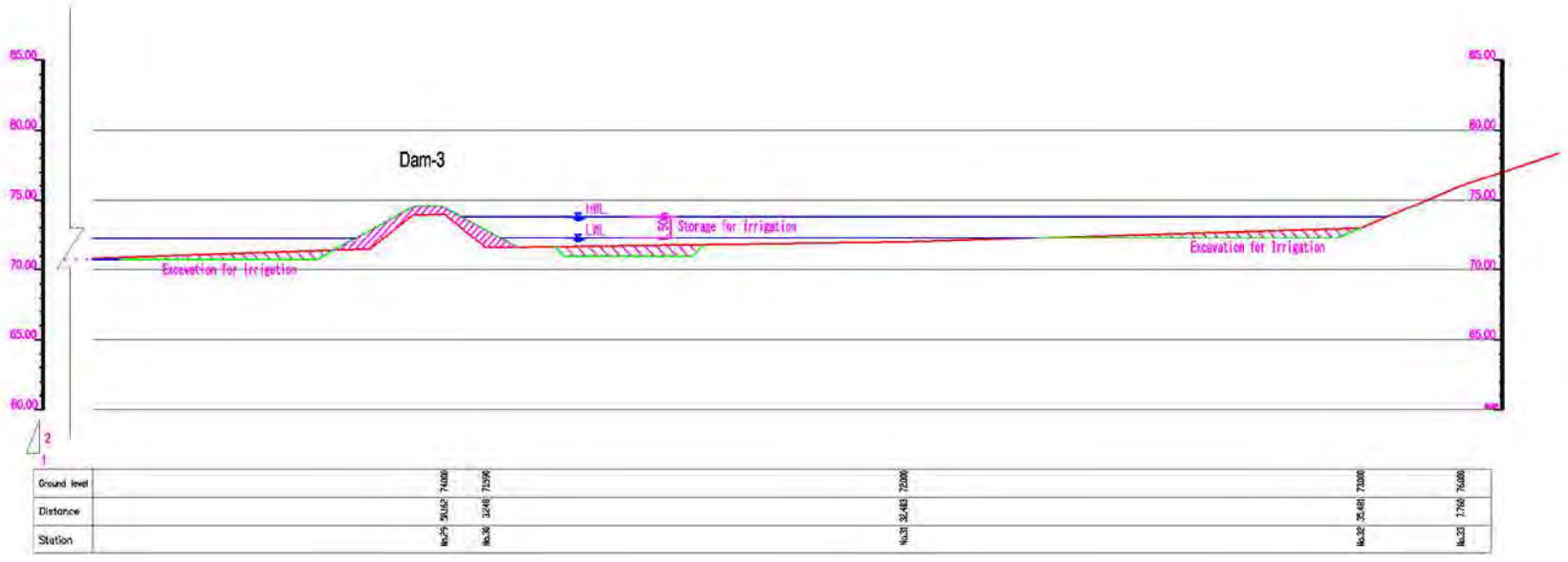
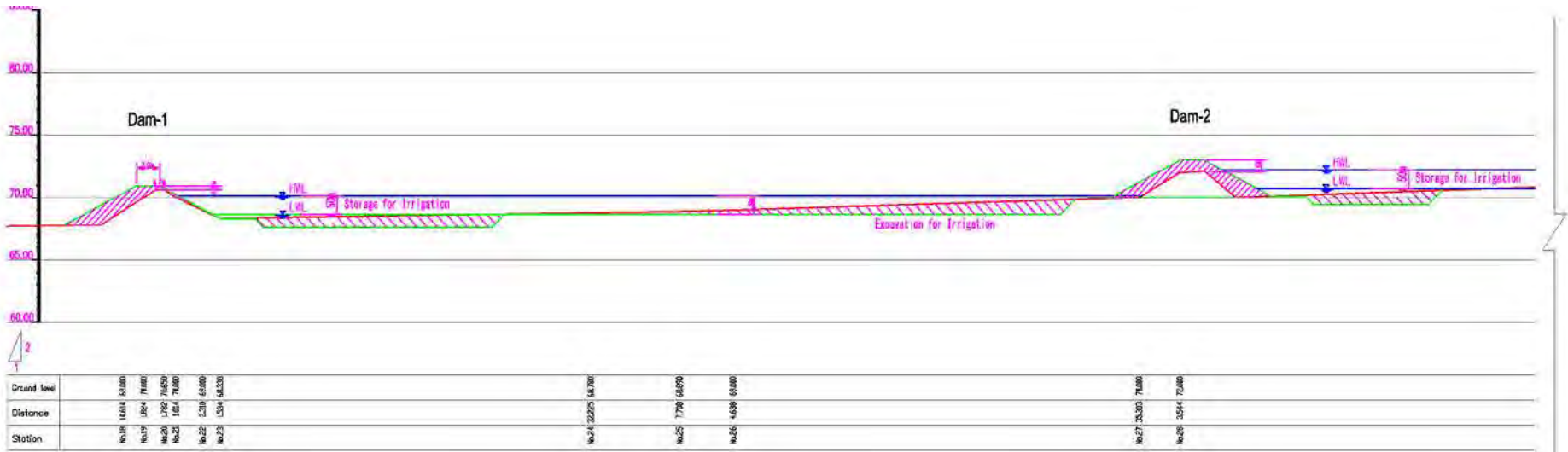
(JACINTA LALTANPUII)

(M.K. BHATTACHARJEE)

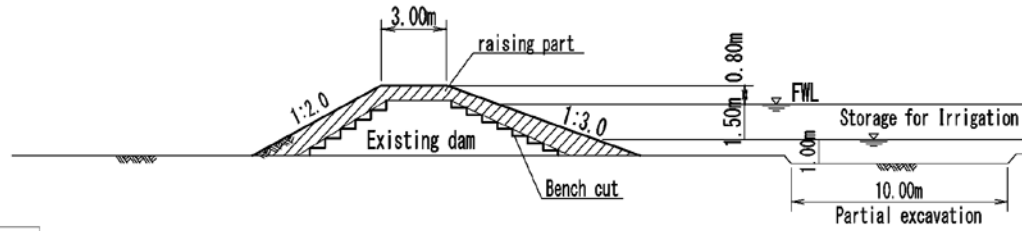
COUNTERSIGNED BY:-

(LALCHHANDAMA)

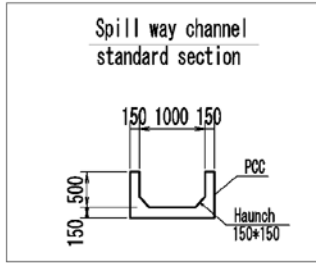




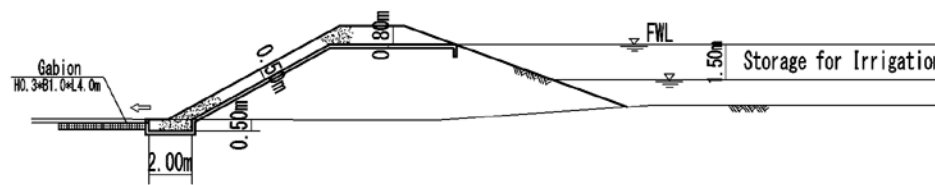
Standard Section of Dike



Spill way channel standard section



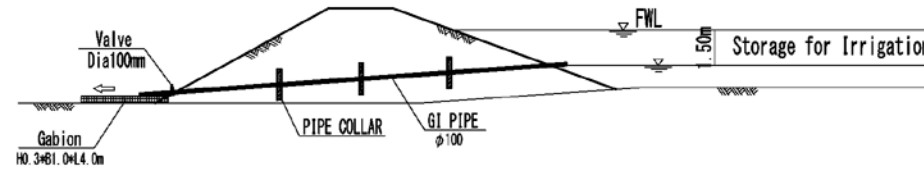
Spill way standard section



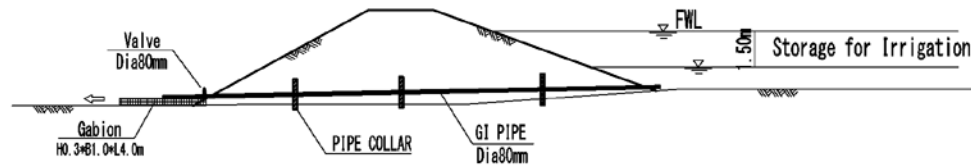
Note:

- Top width of 3.0m shows minimum. In case of surplus excavation soil, it can be increased.
- Surface of existing dam slope should be bench cut, before raising dam.
- Location of partial excavation for fishy is to decided with landowners.
- Spreading embankment material, spreading thickness shall be 7-10cm.
- Compacting embankment material, passage of compactor shall be more than 10 times.
- Before handing over the facilities, trial ponding should be conducted and defects should be checked.

Intake pipe standard section



Drainage pipe standard section



I - WORKS
DETAIL ESTIMATE OF COST
C - WORKS

CONSTRUCTION OF IRRIGATION CHANNEL
Detail Measurement, Calculation of Quantities and Cost Estimate

Sl.No	Description of Work	Measurement				Qty.	Unit	Amount
		No	L	B	H			
1/2.01	Surface dressing of ground including removing vegetation and inequalities not exceeding 15cm deep and disposal of rubbish, lead upto 50 m and lift upto 1.5m .							
	a)All kinds of soil	1	1158.00	1.00		1158.00	Sqm	
		@ INR	94.70	/ sqm			INR	109662.60
2/2.07	Earthwork in excavation in foundation trenches or drains etc. (not exceeding							
	a) Ordinary soil	1	1	1158	0.70	0.20	162.12	cum
		@ INR	290.20	/ cum			INR	47047.22
3/4.02	Providing and laying in position cement concrete of specified grade excluding							
	a) 1:2:4 (1 cement :2 course sand :4 stone aggregate 20mm nominal size)	1	1	1158	0.50	0.1	57.90	cum
		0.5	2	1158	0.03	0.05	1.74	
							59.64	
		@ INR	6889.60	/ cum			INR	410875.08
4/6.05	Half brick masonry with first class brick in foundation and plinth in:							
	(a) in cement moratar 1:3 (1 cement : 3 fine sand)	1	2	1158		0.30	694.80	sqm
		@ INR	1007.10	/ sqm			INR	699733.08
5/21.1 9	12mm cement plaster 1 : 4 (1 cement : 4 fine sand) finished with a floating coat of neat cement.							
	Inside wall	1	2	1158		0.30	694.80	
	Outside wall	1	2	1158		0.10	231.60	
	Top wall	1	2	1158		0.10	231.60	
	Floor	1	1	1158		0.24	277.92	
						T.T	1435.92	sqm
		@ INR	248.70	/ sqm			INR	357113.30

6/2.18	Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50 m and lift upto 1.5 m.						
	1	2	1158.00	0.10	0.20	46.32	cum
	@ INR	90.30	/cum				INR 4182.70

TOTAL INR 1,628,613.98

Subtract 4.13% Cost index on SOR 2013 for Kolasib District INR 67,261.76

G. TOTAL INR 1,561,352.22

SAY INR 1,561,300.00

CHECKED BY:-

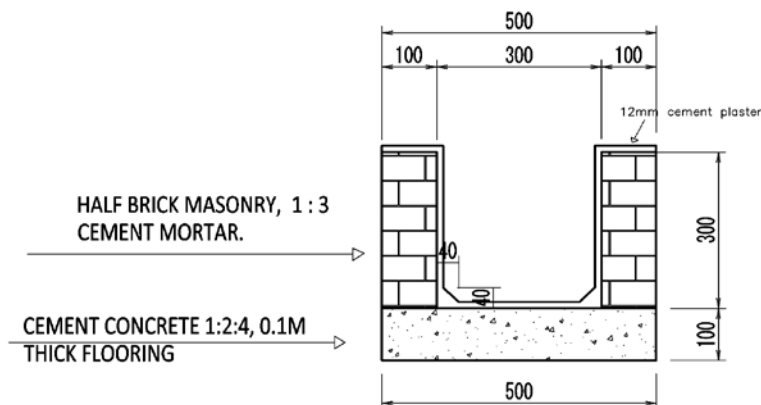
PREPARED BY:-

(JACINTA LALTANPUII)

(M.K BHATTACHARJEE)

COUNTERSIGNED BY:-

(LALCHHANDAMA)



I - WORKS
DETAIL ESTIMATE OF COST
C - WORKS

CONSTRUCTION OF TURN OUTS**Detail Measurement, Calculation of Quantities and Cost Estimate**

Sl.No	Description of Work	Measurement				Qty.	Unit	Amount	
		No	L	B	H				
1/2.07	Earthwork in excavation in foundation trenches or drains etc. (not exceeding 1.5m in width or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto a) Ordinary soil	1	1	1.5	1.5	0.7	1.575	cum	
	@ INR	290.20		/ cum				INR	457.065
2/4.05	Providing and laying in position cement concrete of specified grade excluding cost of centering and shuttering - All work upto plinth level: (a) 1 : 5 : 10 (1 cement : 5 course sand : 10 stone aggregate 40mm nominal size)	1	1	1.5	1.5	0.05	0.1125	cum	
	@ INR	4806.10		/ cum				INR	540.68625
3/4.02	Providing and laying in position cement concrete of specified grade excluding cost of a) 1:2:4 (1 cement :2 course sand :4 stone aggregate 20mm nominal size)	1	1	1.40	1.40	0.2	0.39	cum	
	@ INR	6889.60		/ cum		0.39		INR	2700.72
4/6.05	Half brick masonry with first class brick in foundation and plinth in: (a) in cement mortar 1:3 (1 cement : 3 fine sand)	1	2	1.30		0.55	1.43	sqm.	
		1	2	0.90		0.55	0.99		
						TT	2.42		
	Channel opening	1	3	0.45	0.2	0.40	0.11	cum	
	Deducting Channel opening						2.31		
	@ INR	1007.10		/ sqm				INR	2328.42
5/21.1 9	12mm cement plaster 1 : 4 (1 cement : 4 fine sand) finished with a floating coat of neat cement.	1	4	0.90		0.55	1.98	sqm	
	Inside wall	1	1	5.20		0.20	1.04		
	Top wall	1	6	0.40		0.20	0.48		
	Side wall	1	1	1.00		1.00	1.00		
	Floor	1	1	2.00		0.10	0.20		
	Outside wall	1	2	0.60		0.10	0.12		
						TT	4.82		
	Channel opening	1	3	0.45		0.40	0.54		
	Deducting Channel opening						4.28		
	@ INR	248.70		/ sqm				INR	1064.44

6/2.18	Filling available excavated earth (excluding rock) in trenches, plinth, sides of						cum	
	1	1	2.00	0.05	0.65	0.07		
	1	2	0.60	0.05	0.65	0.78		
	@ INR	90.30	/cum	TT	0.85	INR	76.30	
7	Providing & fixing GI Pipe of 40mm outlet with valve for rabi crops and						INR	2500.00

TOTAL	INR	8,669.88
Subtract 4.13% Cost index on SOR 2013 for Kolasib District	INR	358.07
G. TOTAL	INR	8,311.81
SAY	INR	8,300.00
For 12 nos.	INR	99,600.00

CHECKED BY:-

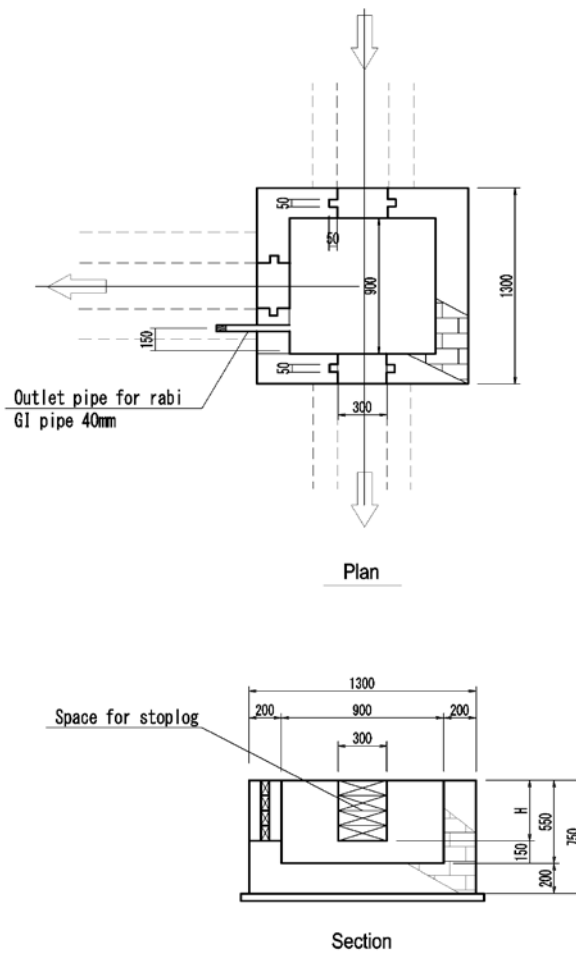
PREPARED BY:-

(JACINTA LALTANPUII)

(M.K BHATTACHARJEE)

COUNTERSIGNED BY:-

(LALCHHANDAMA)



I - WORKS
DETAIL ESTIMATE OF COST
C - WORKS

CONSTRUCTION OF TURN OUTS**Detail Measurement, Calculation of Quantities and Cost Estimate**

Sl.No	Description of Work	Measurement				Qty.	Unit	Amount
		No	L	B	H			

A : OVERFLOW STRUCTURE

1/25.03 Demolishing R.C.C work including stacking of steel bars and disposal of unserviceable material within 50m lead.

	2	0.5	4	1.5	0.75	4.5	cum	
	@	INR	1043.80	/ cum			INR	4,697.10

2/25.04 Demolishing R.B work including stacking of steel bars and disposal of unserviceable material within 50m lead.

	2	0.5	4	1.5	0.75	4.5	cum	
	@	INR	820.40	/ cum			INR	3,691.80

3/5.04 Reinforcement cement concrete work in beams, suspended floors, roofs having slope upto 150 landings, balconies, shelves, chajjas, lintels, bands, window sills, stair cases, spiral stair cases, cantilevers upto floor five level excluding cost of centering, shuttering etc complete with 1:2:4.

1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size)

		2	4.0	1.5	0.15	1.8	cum	
	@ INR	INR	7387.20	/ cum			INR	13,296.96

4/5.21 Steel reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete.

a) Mild steel and medium tensile steel bars.

		2	4.0	1.5	0.15	1.8	cum	
			slab	100	kg/cum	180	kg	
	@ INR	INR	61.80	/ kg			INR	11,124.00

B : PROTECTION WALL

5/2.07 Earthwork in excavation in foundation trenches or drains etc (not exceeding 1.5m in width or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m including getting out excavated soil and disposal of surplus excavated soil as directed within the lead of 50m.

b) Hard soil

			5.30	0.90	2.00	9.54		
	@ INR	INR	435.40	/ cum			INR	4,153.72

- 6/5.04 Reinforcement cement concrete work in beams, suspended floors, roofs having slope upto 150 landings, balconies, shelves, chajjas, lintels, bands, window sills, stair cases, spiral stair cases, cantilevers upto floor five level excluding cost of centering, shuttering etc complete with 1:2:4.

1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size)

Foundation			5.3	0.9	0.15	0.72	cum	
Walls			5.3	0.3	3.5	5.57	cum	
Outlet			1.3	0.3	1.2	0.47	cum	
Siltation Wall		1	1	0.3	1.2	0.36	cum	
Pipe outlet			1	0.2	0.3	0.06		
					Total	7.17	cum	
	@ INR	INR	7387.20	/ cum			INR	52,955.14

- 7/5.21 Steel reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete.

a) Mild steel and medium tensile steel bars.

Foundation			5.3	0.9	0.15	0.72	cum	
Walls			5.3	0.3	3.5	5.57	cum	
Outlet			1.3	0.3	1.2	0.47	cum	
Siltation Wall		1	1	0.3	1.2	0.36	cum	
Pipe outlet			1	0.2	0.3	0.06		
					Total	7.17	cum	
Column/Wall		310 kg/cum			2222.24 kg			
	@ INR	INR	61.80	/ kg			INR	137,334.12

C : GABION STRUCTURE

- 8/2.07 Earthwork in excavation in foundation trenches or drains etc (not exceeding 1.5m in width or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m including getting out excavated soil and disposal of surplus excavated soil as directed within the lead of 50m.

b) Hard soil

		1	6.20	1.50	1.00	9.30	cum	
	@ INR	INR	227.80	/ cum			INR	2,118.54

- 9/15.13 Gabian Structure for Erosion Control, River Training Works and Protection works (Providing and constructing gabain structures for erosion control, river training works and protection works with wire crates of size 2 m x 1 m x 0.3 m each divided into 1m compartments by cross netting, made from 4 mm galvanised steel wire @ 32 Kg per 10 sqm having minimum tensile strength of 300 Mpa conforming to IS:4826, woven into mesh with double twist, mesh size not exceeding 100 mm x 100 mm, filled with boulders with least dimension of 200 mm, all loose ends to be securely tied with 4 mm galvanised steel wire.

		1	6.20	1.50	0.90	8.37	cum	
	@ INR	INR	5044.00	/ cum			INR	42,218.28

10/2.03 Earthwork in excavation exclusive of compensation of earth in:

a) Ordinary

Soil

(i) Kassi work undressed involving an average horizontal throw upto 2 metres and

	0.5	138.00	1.00	1.00	69.00	cum	
@ INR	INR	83.40	/ cum			INR	5,754.60

TOTAL INR **277,344.26**

Subtract 4.13% Cost index on SOR 2013 for Kolasib District INR **11,454.32**

G. TOTAL A + B + C INR **265,889.94**

D : INLET PIPE

11	Irrigation pipe (HDPE) 160 mm dia. - 1 rows As per prevailing market Rate R	1.00	90		90	rm	
	@ INR	620.00	/ rm			INR	55800.00

12	Irrigation pipe (HDPE) 160 mm dia. - 1 rows As per prevailing market Rate Rate Nov 2014	1.00	180		180	rm	
	@ INR	200.00	/ rm			INR	36000.00

Pipe Accessories

13				LS	2	nos	9300.00
----	--	--	--	----	---	-----	----------------

14	GME Wheel valve (160 mm)	1	1		1	nos	
	@ INR	12000.00	/ rm			INR	12000.00

TOTAL INR **113,100.00**

G. TOTAL (A + B + C + D) INR **378,989.94**

SAY INR **378,900.00**

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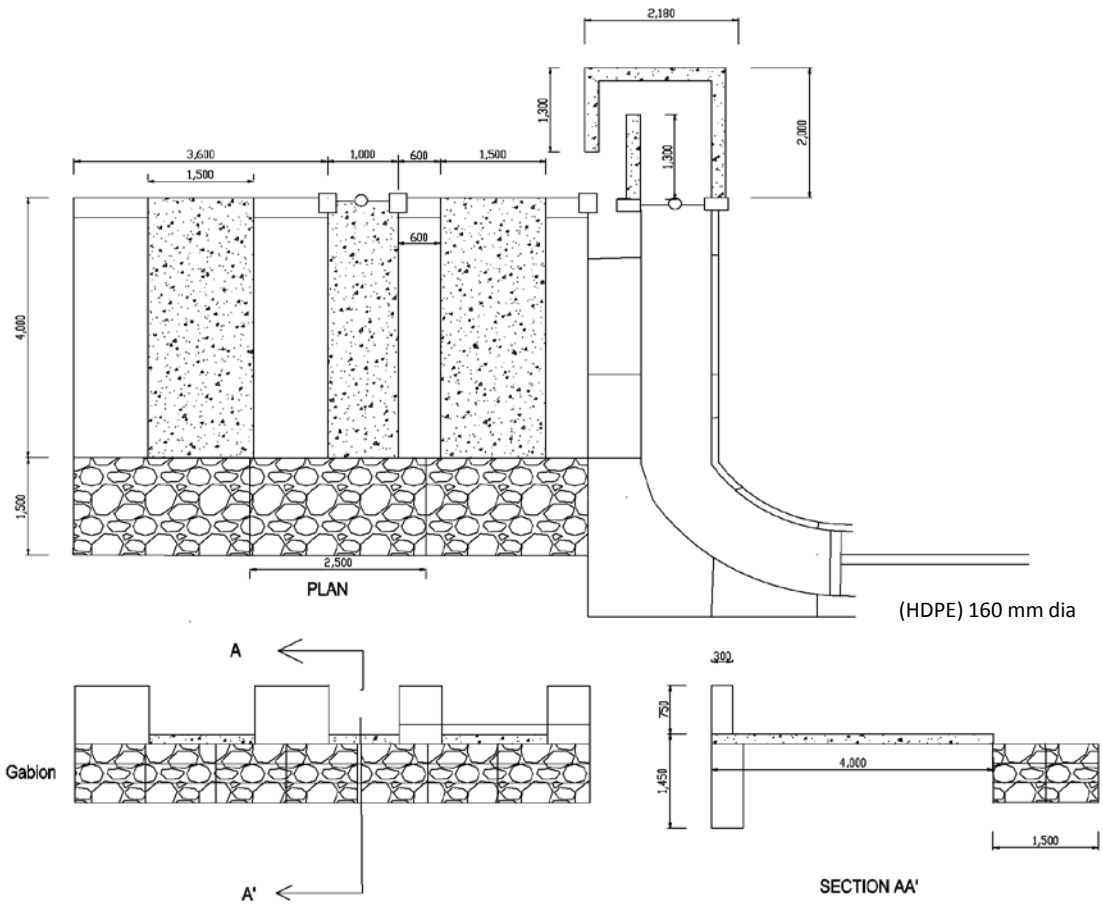
PREPARED BY:-

(JACINTA LALTANPUII)

(M.K BHATTACHARJEE)

COUNTERSIGNED BY:-

(LALCHHANDAMA)



Renovation of Intake at Dumlui MIP

I - WORKS
DETAIL ESTIMATE OF COST
C - WORKS

CONSTRUCTION OF GABION STRUCTURE

Detail Measurement, Calculation of Quantities and Cost Estimate

Sl.No	Description of	Measurement				Qty.	Unit	Amount
		No	L	B	H			
1/2.07	Earthwork in excavation in foundation trenches or drains etc. (not a) Ordinary soil							
	Protection-1	1	0.5	140	1	0.7	49	cum
	Protection-2	1	0.5	50	1	0.7	17.5	
						Total	66.5	
	@ INR	290.20				/ cum		INR
								19298.3
2/15.13	Gabian Structure for Erosion Control, River Training Works and Protection works (Providing and constructing gabain structures for erosion control, river training works and protection works with wire crates of size 2 m x 1 m x 0.3 m each divided into 1m compartments by cross netting, made from 4 mm galvanised steel wire @ 32 Kg per 10 sqm having minimum tensile strength of 300 Mpa conforming to IS:4826, woven into mesh with double twist, mesh size not exceeding 100 mm x 100 mm, filled with boulders with least dimension of 200 mm, all loose ends to be securely tied with 4 mm galvanised steel wire.							
	Protection-1	1	140	1	1	0.9	126	cum
	Protection-2	1	50	1	1	0.9	45	
						Total	171	
	@ INR	5044.00				/ cum		INR
								862524

TOTAL INR 881,822.30

Subtract 4.13% Cost index on SOR 2013 for Kolasib District INR 36,419.26

G. TOTAL INR 845,403.04

SAY INR 622,900.00

10

CHECKED BY:-

PREPARED BY:-

(JACINTA LALTANPUII)

(M.K BHATTACHARJEE)

COUNTERSIGNED BY:-

(LALCHHANDAMA)

**DETAILED ESTIMATE OF COST
CALCULATION FOR P - MAINTENANCE AND Y - LOSSES**

Data :	C - work	3,714,600.00		
	A - Prelim. Work	70300.00		
	K - Building	-		
	O - Miscellaneous	123,000.00		
I - Works(Iw)				
	Iw = C+A+K+O+Y			
	P = 1%(I-Works - A+K+O)			
	Y = 0.25%(I-Works - A+K+O+P)			
A+K+O =	193,300.00			
	P = 1%(I-Works - A+K+O)			
	= 0.01 Iw -	1,933.00		
	Y = 0.25%(I-Works - A+K+O+P)			
	= 0.25% Iw - 0.25% (A+K+O) - 0.25% P			
	= 0.0025 Iw -	483.25	- 0.0025 P	
P + Y =	0.0125 Iw -	2,416.25	- 0.0025 P	
	= 0.0125 Iw -	2,416.25	- 0.000025 Iw +	4.83
	= 0.012475 Iw -	2,411.42		
Iw =	C + (A+K+O) + (P+Y)			
	= 3,714,600.00	193,300.00	+ 0.012475 Iw -	2,411.42
	= 3,905,488.6	+ 0.012475 Iw		
Iw =	3954825.025			
hence, P =	39,548.25			
Say =	39,500.00			

CHECKED BY :

PREPARED BY:-

(JACINTA LALTANPUII)

(M.K. BHATTACHARJEE)

COUNTERSIGNED BY:-

(LALCHHANDAMA)

I - WORKS
DETAILED ESTIMATE OF COST
O - MISCELLANEOUS

Sl no.	Items	Qty. (in Nos)	Unit	Amount
1	Medicine as first aid and anti-malaria for two working season	LS	INR	8,000.00
2	Visit of Dignitaries	LS	INR	5,000.00
3	Engagement of Technical staff	LS	INR	40,000.00
4	Running of transit camp/site camp	LS	INR	10,000.00
5	Inspection vehicles	LS	INR	40,000.00
6	Transport for labour and staff	LS	INR	20,000.00
TOTAL			INR	123,000.00

(Rupees three lakh thirteen thousand)only

CHECKED BY :

PREPARED BY:-

(JACINTA LALTANPUII)

(M.K. BHATTACHARJEE)

COUNTERSIGNED BY:-

(LALCHHANDAMA)

DIRECT CHARGES
I - WORKS
III - TOOLS & PLANT

Sl no.	Items	Qty. (in Nos)	Rate (in INR)	Unit	Amount
1	Wheel barrow	2	1800.00	INR	3,600.00
2	Shovel	5	150.00	INR	750.00
3	Spade	3	120.00	INR	360.00
4	Jumper	4	250.00	INR	1,000.00
5	Hammer (2 Kg)	6	150.00	INR	900.00
6	Earth rammer (durmuj)	5	300.00	INR	1,500.00
7	Pick Axe	2	200.00	INR	400.00
8	Cross cut saw	3	500.00	INR	1,500.00
9	Chisel	5	150.00	INR	750.00
10	Cement plate	20	80.00	INR	1,600.00
12	Hand saw	4	200.00	INR	800.00
13	Cement mixing plate	8	1000.00	INR	8,000.00
14	Hack saw with blade	4	50.00	INR	200.00
15	Steel brush	6	50.00	INR	300.00
TOTAL				INR	21,660.00

CHECKED BY :

(JACINTA LALTANPUII)

PREPARED BY:-

(M.K. BHATTACHARJEE)

COUNTERSIGNED BY:-

(LALCHHANDAMA)

Annexure

7. Construction Plan

Standard Construction Plan form (Draft) (DUMLUI MID scheme)

1. Project outline

Name of Project	Dumlui MID.				
MID office in charge	Irrigation Division Kolasib.				
Site location	N: 24°12'78", E: 92°38'85"				
Construction budget	39.9 lakh.				
Construction facilities	Rehabilitation of Rain Water Harvesting Pond	3	Nos		
	Construction of Field Channel	1170	m		
	Construction of Turnouts	12	Nos		
	Rehabilitation of Intake point	1	Ls		
	G.I. Pipe line	85	m		
	Construction of Gabion Structure	690	m		
Project description	Objective of the project is to rehabilitate and upgrade existing irrigation facilities, and promote winter crops cultivation to increase income of the beneficiaries and promote better utilization of the farm land near town.				

2. Management organization

(1) MID supervision team ;

Position	Responsibility
EE	To check whether works are executed as per Agreement (Form 8)
SDO	To check whether works are executed as per design within the time frame
JE	To check whether works are executed as per design and estimate.
EE	To check whether works are executed as per Agreement (Form 8)

(2) Safety management organization;

1). Contact list

Organization/status	Name	Contact number
Hospital	Civil Hospital Kolasib	
Water users organization	Dumlui Water User Association.	
Village council	Project Veng Village Council.	
Relevant Department	DOA, DOH, DOF	

2). Safety measures

- Details should be referred to Contractors agreement Form 8.

3. Temporary work plan

- No special temporary work.

4. Construction plan

(1) Construction machinery utilization plan:

List to describe the name, type, specification, quantity, and use of construction machinery.

Example is shown below.

Machine Name	Specification	Nos	Work to use	Remarks
Excavator	JBC, 0.4m ³	2	Excavation	
Compactor		2	Soil compaction	

(2) Major local materials:

List to describe the name, Specification and expected source of major local materials.

Name of materials	Description	Quantity	Unit	Source of Procurement	Remarks
Cement		43.13	ton	Local dealer	
Aggregate	20mm nominal size 40mm nominal size	51.25 0.027	cum	Local stone quarry	
Sand	Coarse fine	55.96 23.14	cum	Local sand quarry	
Reinforcement bar	Mild steel and medium tensile steel bar	2402.24	kg	Local dealer	
Brick	First class	41229	nos	Local dealer	
Wood plank	First class	40.95	sqm	Local dealer	

(3) Meeting and Documentation plan

List to describe the Meeting and Documentation plan

Meeting	Date	Document to prepare	Attendant	Remarks
Kick off meeting	Before site works	Construction Plan, QC plan Contract document	Executive Engineer Sub-Divisional Officer Junior Engineer Contractor	
Regular meeting	Monthly	Minutes, Daily site report	Sub-Divisional Officer Junior Engineer Contractor	
Inspection	Quarterly	Minutes, Daily site report Updated progress chart	Sub-Divisional Officer Junior Engineer Contractor	

(4) Construction Time Schedule :

Construction Time Schedule plan is attached in following page.

Dumlui Project Progress Chart

Works	Unit	Quantity	Plan Actual	2nd year					Remarks	
				November	December	January	February	March		April
Grand total										
1. General										
Preliminary/ Mobilization	L.S	1	Plan		██████████					
2. Dam works										
Dam-1	L.S	1	Plan			██████████	██████████	██████████		
Dam-2	L.S	1	Plan			██████████	██████████	██████████		
Dam-3	L.S	1	Plan				██████████	██████████		
3. Rehabilitation of channel										
	Rm	1,170	Plan				██████████	██████████		
3. Rehabilitation of Intake										
	L.S	1	Plan				██████████			
4. Pipe work (from intake to dam)										
	Rm	85	Plan					██████████		
5. Gabion works										
	Rm	690	Plan				██████████	██████████		
6. Cleaning & demoblization										
	L.S	1	Plan						██████████	

██████████ : Planed Progress

Annexure

8. Quality Control Plan

Quality control plan (Dumlui MI scheme)

1. Target of Quality control works

	Items	Quantity	Unit	Remarks
Construction Facilities	Rehabilitation of Pond	3	Nos	Raise of Dike, Spillway, Drainage/Intake pipe
	Construction of Channel	1170	m	W=0.3, H=0.30m
	Construction of Turnouts	12	Nos	
	Rehabilitation of Intake point	1	Ls	Rehabilitation of existing Intake
	Pipe line	85	m	Dia150, PVC
	Bank protection	720	m	Gabion structure
	Documents	<ul style="list-style-type: none"> - Contact document , BOQ, Drawing, specification - Quality control checklist - Daily site report, site test result - Quality control related pictures - Meeting and inspection materials 		

2. Quality control action plan

Name of work	Control items	Control Methodology
1. Preliminary		
	Site condition before works	Photo
	Setting of alignment, centerline of facilitates	Modification of Drawing and BOQ, confirmation with WUA
2. Rehabilitation of Pond		
	Condition before /after the work	Photo
2-1 Earth work		
Excavation	Elevation of excavation line	Level survey
Embankment	Embankment materials (Remove of unsuitable materials)	Photo, visual observation
	Compaction	Embankment Quality control checklist, Photo
	Embankment dimensions	Level survey, tape measurement, photo
2-2 Spillway		
Concrete work	Condition before /after the work	Photo
	Concrete /form works	Concrete Quality control checklist, Photo, slump test
	Spillway dimensions	Level survey, tape measurement, photo
2-3 Drainage/intake pipe	Material check before work (specification, quantity, defects of products, damage of transportation)	Photo, catalog, etc.

	Elevation of installment	Level survey, tape measurement, photo
3. Channel/ turnout/ intake rehabilitation	Condition before /after the work	Photo
	Canal works general	Canal works Quality control checklist
3-1 Earth work	Foundation condition	Photo, visual observation
	Elevation of foundation level	Level survey
3-2 Foundation/ Wall	Concrete /form works	Concrete Quality control checklist, Photo, Slump test
	Material check before work (size, quantity, defects of products, damage of transportation)	Photo, catalog, etc.
	Plastering work (material,mortar mixing,thickness, cracks)	Photo, visual observation
	Dimension of structure	Level survey, tape measurement, photo
4 bank protection (gabion works)	Material check before work (size, quantity, defects of products, damage of transportation)	Photo, catalog, etc.
	Dimension of structure	Level survey, tape measurement, photo

Notes;

- ✓ Detailed requirements of Quality control should be refer to contract document and PWD technical specification.
- ✓ With regards to pond construction, trial ponding test should be conducted, and defects and leakage should be checked, before handing over the facility.
- ✓ When MID conducts inspection works for payment, WUA is also recommend to participate in inspection works for witnesses.
- ✓ After construction work, MID is to prepare as built drawings based on alteration of construction works.
- ✓ Above Quality control related documents are to be filed and kept in division office as evidence of the works after construction.

1.

Annexure

9. Certificate

9.1 Certificates of hydro meteorological data and field data

Certificated that Hydro meteorological data and field data in respect of Dumlui Minor Irrigation Project, Kolasib group of AIBP, such as river and rainfall data are available with the Statistical Abstract, Department of Agriculture, Government of Mizoram for incorporation in the Project report.

Date _____

Place _____

**9.2 Certificates of rate used of civil works based on the Mizoram PWD SOR 2013 and PHED
issue and laying rate**

Certified that rates for Civil Works of Dumlui M.I Project, Kolasib are based on the SOR 2012 of Mizoram PWD and cost index. -4.13% is deduct for Kolasib District.

The rate adopted for laying of pipes is based on Rates for New G.I. Pipe w.e.f 04.7.2012 vide Memo.No.M-11011/160/2011-CE/PHE/9 Dt. 4th July, 2012 and Issue rates of different G.I. Pipes(Medium) vide Memo.No.D.19020/1/2009 Dt.27th July, 2012.

Date _____

Place _____

Countersigned By :

(LALCHHANDAMA)

(LALTHANLIANA)

9.3 Certificates of quantities calculated as per designs and approved drawings

Certified that the quantities calculated for all components/ activities proposed under Dumlui M.I Project, Kolasib have been calculated as per designs and approved drawings.

Date _____

Place _____

Countersigned By :

(LALCHHANDAMA)

(LALTHANLIANA)

9.4 Certificates of irrigation structures designed as per B.I.S code IS456-2000 and other relevant codes

Certified that all the Irrigation Structures i.e RCC Slab Culvert, Field Channel, Water Harvesting Pond and G.I Pipe line etc. under Dumlui M.I Project, Kolasib have been designed as per B.I.S. code IS 456-2000 and other relevant codes.

Date _____

Place _____

Countersigned By :

(LALCHHANDAMA)

(LALTHANLIANA)

9.5 Certificates of non-overlap command areas of any existing or proposed major, medium or minor irrigation project proposed/taken up by other department

Certified that the proposed commands areas of all irrigation structure under Dumlui M.I Project, Kolasib to be taken up by the Department of Minor Irrigation do not overlap with command areas of any existing or proposed minor irrigation project proposed/taken up by the Department.

Also certified that this proposed minor irrigation scheme is not a part of any other major or medium irrigation scheme.

Dated : _____

Place : _____

(LALTHANLIANA)

Annexure

10. Farmer's Application

To

The Executive Engineer,
Kolasib Irrigation Division,
Kolasib.

Subject: Dumlui Minor Irrigation Project, Kolasib siamsak tura ngenna leh intiamkamna.

Ka Pu,

I hnena Dumlui Minor Irrigation Project, Kolasib min siamsak tura kan dilna bawhzuia Preliminary Survey te min neih sak avangin lawmthu kan sawi e.

Department aiawha lo kal te leh loneituten kan sawiho tawhna atanga Department-in ruahmanna fel tak min siamsak hi chipchiar taka sawiho a ni a. Ruahmanna tlangpui te chu –

1. Rehabilitation of intake – 1 Nos
2. Rehabilitation of Channel – 1170m
3. Rehabilitation of pond – 3 Nos

Department-in ruahmanna a siam te khi tha kan ti in min thawhsak ngei turin kan ngen a ni.

INTIAMKAMNA:

- Keini a hnuuia hming ziak te hian Department-in Dumlui Minor Irrigation Project, Kolasib min siamsak theih chuan hmalaknaah theih tawp kan chhuah ang tih kan tiam a, chungte chu
- Facility siam thatin a paltlang ram neituten engmah sawi buai lovin harsatna kan siam lovang.
- Kan zau tana ruahmanna hrang hrang – intake, channel leh dil thuamthat chungchangah thlai a chhia anih pawhin ram neituten eng zangnadawmna (compensation) mah kan phut lovang.
- Dumlui Minor Irrigation Project Kolasib siam chung hian, Department kut ti chak turin theihtawp kan chhuah ang.
- Project siam avanga harsatna a awmin farmers in mawh la in department kan pui zel ang
- Tuikawng hman chungchangah zauin (Water User Association) in a rel anga in sem tlan kan in tiam e.
- Project zawh tawh hnuah mimal tinin kan ta anga ena, enkawl zui kan intiam e.

Annexure

11. Affidavit (No-Objection)

OFFICE OF THE VILLAGE COUNCIL COURT

NO OBJECTION CERTIFICATE

Minor Irrigation Department in Dumlui Minor Irrigation Project, Kolasib a hma lak an tum hi tha kan ti a, he Project in a kaihnawih facility thumthat in kan Village Council huamchhunga leilet/ram a paltlang kan remti a a, Village Council thuneihna chinah chuan engmah sawi buai (complain/compensation) kan nei/dil lovang.

Village Council President Signature

Submitted to
The Executive Engineer,
Kolasib Irrigation Division,
Department of Minor Irrigation,
Mizoram

Minute of Ratification Meeting Dumlui Minor Irrigation Scheme

(Draft)

The ratification meeting on **Dumlui Minor Irrigation Scheme** was held on 5th December, 2014 discussing the contents of DPR prepared by MID and other stakeholders based on the result of the workshop held from 20th to 22nd October, 2014.

Each party have clearly understand the contents of the DPR and mutually agreed the followings if the DPR is sanctioned.

MID


- ◆ Making necessary effort for sanctioning the respective Dumlui Minor Irrigation Scheme implementation.
- ◆ Construct and/or rehabilitate the facilities based on the prepared DPR with sanctioning budget.
- ◆ Giving the necessary support to WUA for proper operation and maintenance of the facilities based on prepared O&M plan.

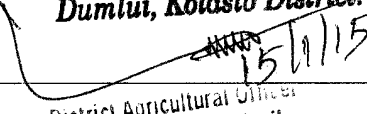
WUA

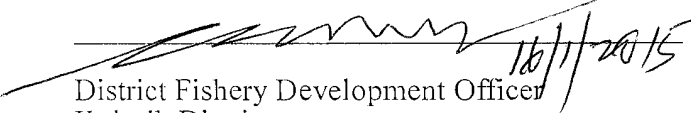
- ◆ Cooperate with MID and provide necessary support during and after construction works
- ◆ Utilizing the facilities effectively based on the prepared crop calendar and agriculture action plan
- ◆ Taking over the facilities from MID and operates and maintains the facilities in accordance with O&M plan for 25 years after construction and/or rehabilitation of the facilities

Other Government Departments and Stakeholders

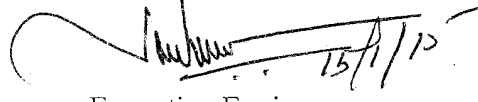
- ◆ Giving follow-up activities which are stipulated in the agriculture action plan, like extension services.
- ◆ Strengthening mutual cooperation with MID and WUA for further necessary actions for effective utilization of the respective Dumlui Minor Irrigation Scheme, if required.


 The President of WUA
 Dumlui Water User Association
 Dumlui, Kolasib District.

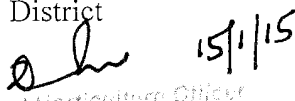

 District Agricultural Officer
 Kolasib District, Kolasib
 Kolasib District


 District Fishery Development Officer
 Kolasib District

District Fisheries Development Officer,
 Kolasib District, Kolasib


 Executive Engineer
 Kolasib Irrigation Division
 Executive Engineer
 Kolasib Minor Irrigation Division
 Kolasib, Mizoram.

District Horticulture Officer
 Kolasib District


 Divisional Horticulture Officer
 Kolasib Division, Kolasib

Witness: 
 Chairman, Joint Village Council,
 Kolasib District


 Chairman
 Kolasib District Joint Village
 Council Committee

Annex 3

DPR for Kanghai MI scheme

Government of Mizoram
Minor Irrigation Department

Project Report
of
Kanghlai Minor Irrigation Project

Champhai Irrigation Division
Minor Irrigation Department
(January 2015)

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Photos



Command Area (1)



Command Area (2)



Proposed Site for Pond (1)



Proposed Site for Pond (2)

Source: Prepared by MID



OBJECTIVES

The ponds are newly constructed for the water resources of paddy during Kharif season and the winter crops during Rabi season. The canals are newly constructed to supply stable irrigation water to the paddy field. Due to these, the paddy yield is improved, the winter crops and the fisheries are promoted.

OUTLINE

Name of River	: Thlepuri Lui
Gross Command Area	: 65.0 ha
Culturable Command Area	: 65.0 ha
Name of Villages getting water supply	: Tlangsam in Champhai Dsistrict
Cost of Project	: 132.1 lakhs
Benefit Cost Ratio	: 2.86

CROPPING PATTERN

Champhai: Kanghai		Month												Area	
Proposed Cropping Pattern		J	F	M	A	M	J	J	A	S	O	N	D	(ha)	
Name of Crop															
Paddy (Local/MANIPUR)															16.5
Paddy (Local/YAMIN)															16.3
Paddy (Local/tawi sang)															16.2
Paddy (Local/vui tawi)															16.0
Fish (at paddy field)															
Kharif season															65.0
Onion															2.4
Mixed Crop: Potato and Field Pea															2.2
Mixed Crop: Mustard Leaf and French bean															2.1
Rabi season															6.7
Total															71.7

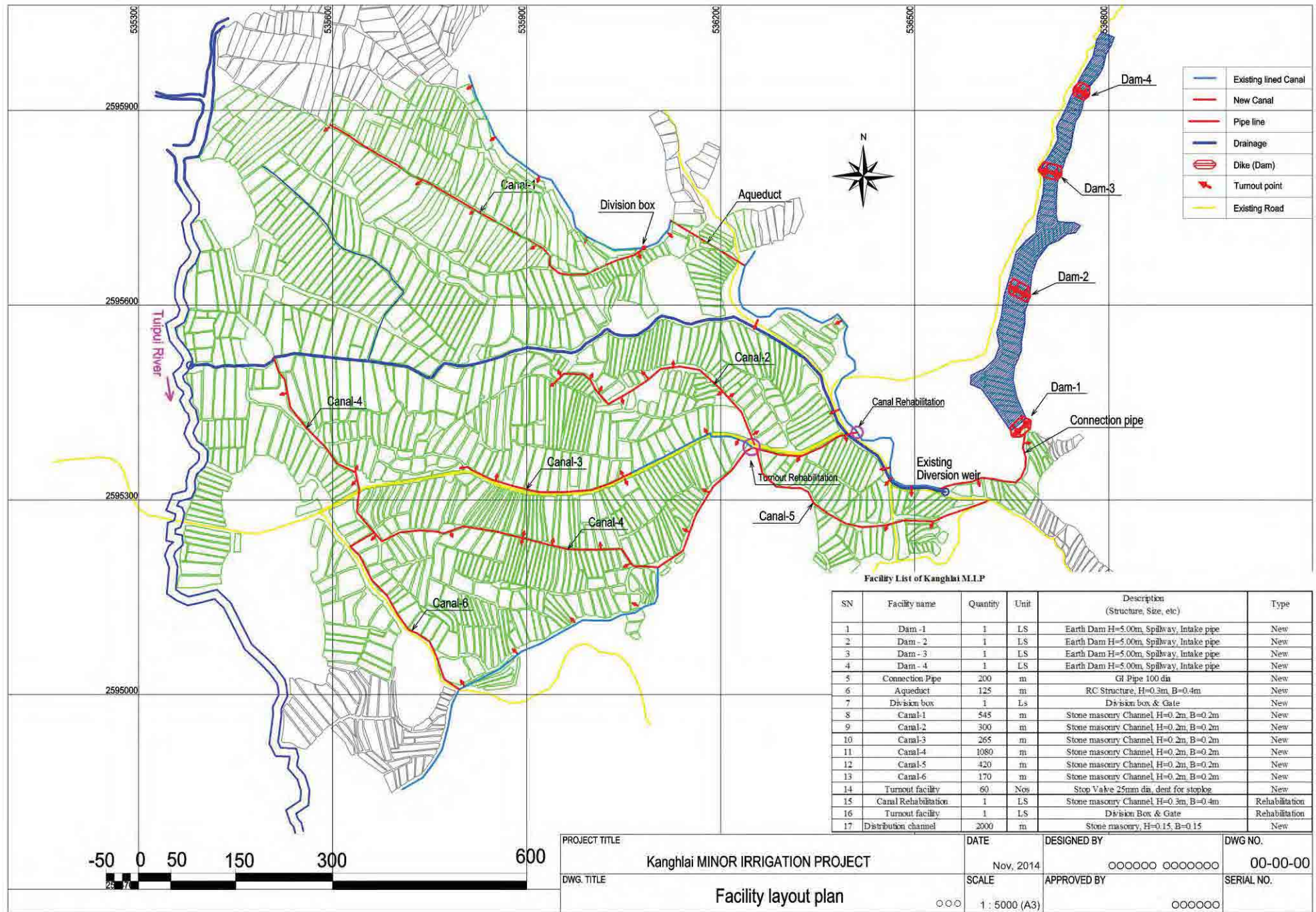
WATER USER ASSOCIATION O&M PLAN

SN.	Name of Facilities	Items	Implementer	Frequency	Schedule												
					Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
1	Main Channel 1-6	Patrol	Member of WUA	Every month	●	●	●	●	●	●	●	●	●	●	●	●	
		Water management	Member of WUA	Every day	—————												
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	●	●	●	●	●	●	●	●	●	●	●	●
			Removing weeds	All beneficiaries	4 times per year		●					●					●
	Rehabilitation	All beneficiaries	as per needed														
2	Distribution Channel	Patrol	Member of WUA	Every month	●	●	●	●	●	●	●	●	●	●	●	●	
		Water management	Member of WUA	Every day	—————												
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	●	●	●	●	●	●	●	●	●	●	●	●
			Removing weeds	All beneficiaries	4 times per year		●					●					●
	Rehabilitation	All beneficiaries	as per needed														
3	Turnout facility	Patrol	Member of WUA	Every month	●	●	●	●	●	●	●	●	●	●	●	●	
		Water management	Member of WUA	Every day	—————												
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	●	●	●	●	●	●	●	●	●	●	●	●
			Removing weeds	All beneficiaries	4 times per year		●					●					●
	Rehabilitation	All beneficiaries	as per needed														
Crop season					Dry (Rabi)			Summer			Rainy (Kharif)			Dry (Rabi)			

PREPARATION HISTORY

Field survey	: 28 th October, 2014	Workshop	: 29 th to 31 st October, 2014
Finalization	: 4 th December, 2014		

This project summary was prepared by Minor Irrigation Department in association with Japan International Cooperation Agency in April 2015.



Facility List of Kanchlai M.I.P

SN	Facility name	Quantity	Unit	Description (Structure, Size, etc)	Type
1	Dam -1	1	LS	Earth Dam H=5.00m, Spillway, Intake pipe	New
2	Dam - 2	1	LS	Earth Dam H=5.00m, Spillway, Intake pipe	New
3	Dam - 3	1	LS	Earth Dam H=5.00m, Spillway, Intake pipe	New
4	Dam - 4	1	LS	Earth Dam H=5.00m, Spillway, Intake pipe	New
5	Connection Pipe	200	m	GI Pipe 100 dia	New
6	Aqueduct	125	m	RC Structure, H=0.3m, B=0.4m	New
7	Division box	1	Ls	Division box & Gate	New
8	Canal-1	545	m	Stone masonry Channel, H=0.2m, B=0.2m	New
9	Canal-2	300	m	Stone masonry Channel, H=0.2m, B=0.2m	New
10	Canal-3	265	m	Stone masonry Channel, H=0.2m, B=0.2m	New
11	Canal-4	1080	m	Stone masonry Channel, H=0.2m, B=0.2m	New
12	Canal-5	420	m	Stone masonry Channel, H=0.2m, B=0.2m	New
13	Canal-6	170	m	Stone masonry Channel, H=0.2m, B=0.2m	New
14	Turnout facility	60	Nos	Stop Valve 25mm dia, dent for stoplog	New
15	Canal Rehabilitation	1	LS	Stone masonry Channel, H=0.3m, B=0.4m	Rehabilitation
16	Turnout facility	1	LS	Division Box & Gate	Rehabilitation
17	Distribution channel	2000	m	Stone masonry, H=0.15, B=0.15	New

PROJECT TITLE	Kanchlai MINOR IRRIGATION PROJECT		DATE	Nov, 2014	DESIGNED BY	○○○○○ ○○○○○○	DWG NO.	00-00-00
DWG. TITLE	Facility layout plan		SCALE	1 : 5000 (A3)	APPROVED BY	○○○○○	SERIAL NO.	

Check List : Kanghlai Minor Irrigation Project, Kolasib

Sl.No	Item/Activity	Remarks	Pg.No
1	Name of Project	Kanghlai Minor Irrigation Project	-
2	Name of District/Block/Village	Champhai District/ Tlangsam village	-
3	Longitude	93° 21 ' 07"E	-
4	Latitude	23° 28 ' 07"N	-
5	Category of Project- Storage/Diversion/Lift/percolation tank	Diversion	-
6	Type Project (Ongoing/New)	New Project	-
7	Whether scheme is in DPAP/Tribal area?	Yes	-
8	Have foundation investigations been carried out?	Yes (Trial pits)	-
9	Have soil survey in the command area been done?	Yes	p.2-1
10	Have Topographical survey been carried out?	Yes	-
11	Have any alternative proposals been studied and merits and de-merits discussed?	Yes	-
12	Average rainfall in command area	2005.29 mm (annual)	Annexure 8
13	Is source (river/stream/nallah) perennial?	Perennial	-
14	Availability of water in the source (In MCM)	1.617 MCM	Annexure 8
15	Minimum Discharge in cumec?	0.0039	p. 3-3
16	Maximum Discharge in cumec?	0.0735	p. 3-2
17	Effect of the present scheme on existing/contemplated/ upstream and downstream schemes on the same source, if any	Nil	-
18	Detail of drinking water supply component, if any	Nil	-
19	Area of land required to be acquired for the project	Not required	-
20	Status of Land Acquisition	N.A	-
21	Does the project falls in the command area of any existing/ ongoing/ proposed major/ medium irrigation project? If so, details thereof.	No	-
22	Whether clearance from state electricity board has been taken in case of LI schemes?	N.A	-
23	Existing Cropping pattern	Yes	p.5-1
24	Proposed cropping pattern (approved by Agricultural Deptt.)	Yes	p.5-1
25	Has the method used for determining the crop water requirement discussed?	Yes	-
26	Whether detailed design has been carried out for various component of scheme as per BIS code.	Yes	Annexure 51
27	Whether latest SOR adopted for preparation of cost estimate?	Yes	Annexure 49
28	Whether unique identification number has been given to each scheme?		-
29	Has the source of construction material has been identified?	Yes	-
30	No villaged & People benefitted?	1 village and 41 families	p. 11-1
31	No of farmers of SC/ST community benefitted?	SC-Nil, ST-41	-
32	Whether land levelling in command area is required? If so, how state govt proposes to meet the expenditure ?	No	-
33	How state govt proposes to meet O & M charges after completion of project?	State plan fund with beneficiary contribution	-
34	When state govt proposes to hand over scheme to WUA?	On completion	-
35	When state govt proposes to take up evaluation studies by independent agency?		-
36	Attach Index map and layout plan of Project alongwith all major, Medium and minor projects (GEO based)	Yes.	-
37	Period of completion of scheme?	3 years	-
38	Development cost Rs Lakh/ha	2.03	p. 7-1
39	B.C Ratio at 10% interest	2.86	p. 7-1

Sl.No	Item/Activity	Remarks	Pg.No
40	Location of scheme in reference to existing schemes	Tlamsam, Champhai District	-
41	Whether quality control mechanism exists for MI Schemes? Implementing quality control - scope and arrangement (desirable, independent quality control arrangement)	"Mechanism under process of constitution"	-
42	MI schemes having CCA more than 1500 ha, a certificate from State Government indicating that it is not a substitute of medium irrigation projects is required	N.A as the CCA is less than 1500 ha	-
43	Certificate from State Government indicating that the MI scheme is not a part of any other major or medium irrigation scheme	Certificate attached	-
44	Are benefits from Pisciculture / animal husbandry / plantation etc. discussed		

* Unique Identification Number will be given after approval by TAC but before submission to the Government.

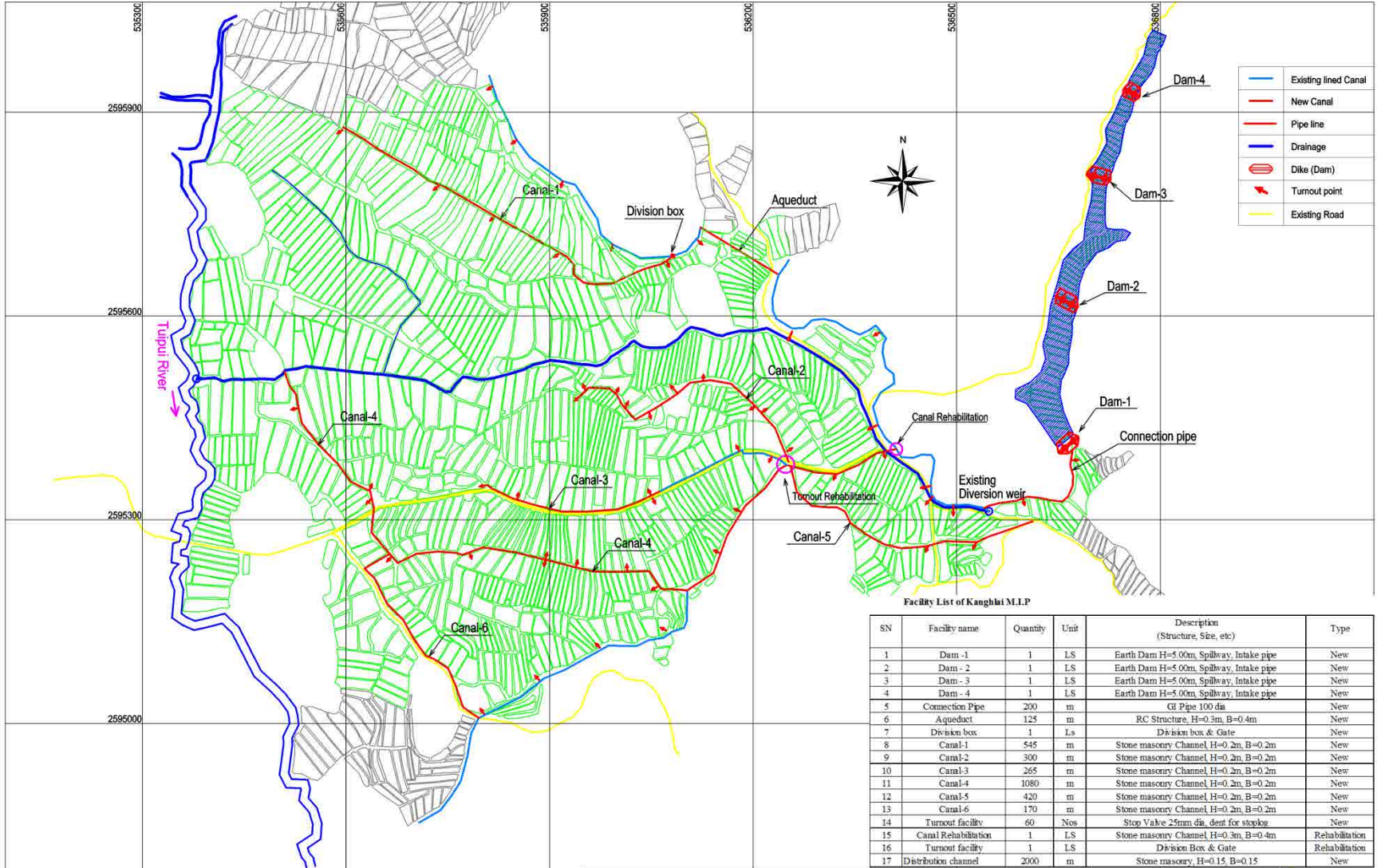
Salient Features of the Surface Minor Irrigation Schemes

1 Name of Project	Kanghlai Minor Irrigation Project
2 Name of River/Tributary/Nalah	: Thlepuri Lui
3 Irrigation (Hectare)	
a) Gross Command Area (GCA)	: 65.0 ha
b) Culturable command Area (CCA)	: 65.0 ha
c) Area under Irrigation	: Nil
d) Cost per Hectare of potential planned	: Rs. 2.03 lakhs
4 Name of Villages getting water supply	: Tlangsam, Champahi District
5 Hydrology	
a) Gross Catchment Area in Sq Km	: 1.8 sq Km
b) Intercepted Catchment Area in Sq. Km	: Nil
c) Un-intercepted Catchment Area in Sq.Km	: 1.8 sq Km
d) Catchment Rain fall details in mm	: 2,072.50 mm (2011)
e) Name of climatic station in the catchment	: Champaii station
f) Annual yield at the proposed site in M.Cum	: 1.617 MCM
g) Water Utilization of upstream projects	: Nil
h) Water Utilization of proposed projects	: Kharif; - cumecs, Rabi; 0.0076 cumecs
i) Design flood at weir/barrage	: 21.76 cumecs
6 Submergences Details in ha	: Submerge area is nil.
7 Technical details of barrage/Weir	: Nil
8 Cropping Pattern in ha	: 65.0 ha
a) Existing	: 65.0 ha
b) Proposed	: 132.14 lakhs
9 Cost of the Project	: 2.86 : 1
10 Benefit cost ratio	Kanghlai Minor Irrigation Project

Source: Prepared by MID

Source: Prepared by MID

Facility Layout Map



	Existing lined Canal
	New Canal
	Pipe line
	Drainage
	Dike (Dam)
	Turnout point
	Existing Road

Facility List of Kanghlai MLP

SN	Facility name	Quantity	Unit	Description (Structure, Size, etc.)	Type
1	Dam - 1	1	LS	Earth Dam H=5.00m, Spillway, Intake pipe	New
2	Dam - 2	1	LS	Earth Dam H=5.00m, Spillway, Intake pipe	New
3	Dam - 3	1	LS	Earth Dam H=5.00m, Spillway, Intake pipe	New
4	Dam - 4	1	LS	Earth Dam H=5.00m, Spillway, Intake pipe	New
5	Connection Pipe	200	m	G/I Pipe 100 dia	New
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12	Canal-5	420	m	Stone masonry Channel, H=0.2m, B=0.2m	New
13	Canal-6	170	m	Stone masonry Channel, H=0.2m, B=0.2m	New
14	Turnout facility	60	Nos	Stop Valve 25mm dia, dent for stoplog	New
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17	Distribution channel	2000	m	Stone masonry, H=0.15, B=0.15	New



PROJECT TITLE	DATE	DESIGNED BY	DWG NO.
Kanghlai MINOR IRRIGATION PROJECT	Nov, 2014	○○○○○○ ○○○○○○	00-00-00
DWG. TITLE	SCALE	APPROVED BY	SERIAL NO.
Facility layout plan	○○○ 1: 5000 (A3)	○○○○○○	

Chapter 1 Introduction

1.1 Introduction

It is often said that the economy of Mizoram is based on agriculture and about 70% of its population are engaged in or have links to agricultural activities. It is also a proven fact that the general soil condition and climate of Mizoram are suitable for raising almost any type of tropical and subtropical crops. However, the general topography of the state is hilly with deep gorges in between. The elevation ranges from 4,100 ft to a few hundred feet above mean sea level, which makes the flatland suitable for cultivation limited to patches along rivers and streams. In fact, it is not possible or near impossible to find flatland of more than 2,000 ha for a single project, therefore, all the irrigation projects and this proposal are no exception.

Champhai District is one of the eight districts of Mizoram. The district is bounded on the north by Churachanpur District of Manipur State, on the west by Aizawl and Serchhip districts and on the south and east by Myanmar. The district occupies an area of 3,185.83 km². Champhai Town is the administrative headquarters of the district and it is 194 km from the state capital, Aizawl. According to 2011 Census, Champhai District has a population of 125,370 with a population density of 39 inhabitants per square kilometre. Champhai has a gender ratio of 981 females to 1,000 males and a literacy rate of 93.51%. There are 88 inhabited villages in the district. The district comprises four Rural Development Blocks: Champhai, Khawbung, Khawzawl, and Ngopa. The district has five Legislative Constituencies. These are: Champhai, Khawbung, Khawhai, Khawzawl, and Ngopa. There are three administrative sub-divisions, namely: Champhai, Khawzawl, and Ngopa.

The district has a pleasant climate. It is generally cool in summer and not very cold in winter. In winter, the temperature varies from 8 °C to 24 °C and in summer, it is between 18 °C and 32 °C. Relative humidity is highest during the southwest monsoon and heavy precipitation is usually received during the months from May up to September every year. The average annual rainfall is about 2,558 mm. During the rainy season, it is usually heavily cloudy. There is an increase of cloudiness from March onwards. A clear and cool weather starts appearing from the month of September up to January the next year.

Status of Agriculture: The method of cultivation has remained the primitive practice of *jhumming* or shifting cultivation. For various reasons this method of cultivation has not undergone significant changes until today. The main reasons are: lack of suitable land for wet rice cultivation (WRC) and lack of adequate resources. More than 90% of farmers have no proper irrigation system. Therefore, even though shifting cultivation is destructive for the environment, backbreaking and unremunerative for the cultivators, the vast majority of rural and semi-urban householders have to resort to this primitive method of cultivation for want of any alternative farming system or occupation. Rice is the staple food of the people and the paddy harvested from *jhum* is still much more than that harvested from WRC. Therefore, development of all the potential areas for WRC and protection of the available potential flatland is very important to achieve self-sufficiency in food production and other commercial crops.

1.2 Brief History

The proposed project is located on the outskirts of Champhai Town and it is located about 8 km from the town. The township of Champhai is located on the bank of the Tuipui River, about 6 km west of the Indo-Myanmar border. With an altitude of 1,678 m, the town overlooks a patch of flatland which happens to be the largest plain area in the state. The largest plain in Mizoram is located at Champhai, which is known as the '*Rice Bowl of Mizoram*'. The economy of Champhai is mainly agriculture. It has a flatland measuring 113 km long and 43 km wide for WRC. The average annual rainfall is 1,814 mm.

1.3 Current Status

The total cultivable area of this project is about 23.7 ha. Being located at the outskirts of Champhai Town, the area has a good prospect for supplying vegetables and other cash crops to Champhai market. As such, the progressive farmers in this area put their best efforts to cultivate the area using their own resources. So far, they have accomplished to provide irrigation for some potential area by diverting water from a nearby perennial stream and conveying the water to the WRC area through earthen channels for production of *Kharif* paddy. Though the farmers tried their level best, even the areas which

were already irrigated could not be properly utilized for production of crops especially during the *Rabi* and summer seasons due to lack of irrigation. The DPR targeted a part of the cultivated command area (CCA) that was discussed with farmers and officers of MID, Department of Agriculture (DOA), and Department of Horticulture (DOH). Hence, the project was prepared.

1.4 Meteorology

Mizoram has mild and pleasant climate with temperatures ranging from 11 °C to 21 °C in winter and 20 °C to 30 °C in summer. The entire area is under the direct influence of the southwest monsoon and rain occurs heavily from May to September. The average annual rainfall of the state is 2,557 mm.

There are no evapotranspiration data collected in Mizoram. The Central Water Commission (CWC) has recently installed a pan evaporator at its office complex in Aizawl. As per the collected data of CWC, the average monthly evaporation losses vary from 40 mm during January/December to 130 mm during April/May.

1.5 Soil Characteristics of the Area

The characteristics of soil under the command area are given below.

Soil colour	Dark
Soil Texture	Clayey Humic Hapludutus, F.L Humic Hapludults, Clayey Tropic Hapludults
Drainage class	Well drained
Erosion	Moderate
Soil depth	Deep

source: Mizoram Remote Sensing Application Center

Chapter 2 Survey & Investigation

2.1 General Report

The farmers of Kanghlai area approached the department to help them improve their irrigation and farming system. Accordingly, a survey was conducted to assess the socio-economic status, farming and irrigation practices, etc. It was found out that the farmers could not cultivate their entire lands due to scarcity of water and absence of proper irrigation facilities. Many of them have also been practising the *Jhum* system on the side, to supplement their income. Hence, it was decided to do a preliminary survey on the project.

Initially, the farmers in the command area of the proposed project were identified and interaction was held with the department. The preparatory survey and workshop were held on the 28th and 29th to 31st of October 2014, respectively. These were done to involve the farmers as much as possible right from the planning stage of the project. Numerous field visits were jointly done with the farmers and preliminary survey works like water availability, command area, cropping practices, cropping patterns and systems were done.

2.2 Engineering Survey

2.2.1 Discharge

Discharge in the *Rabi* season was surveyed by MID officers on 25 October 2014. The results of the survey are as follows:

Table 2.1 Discharge

Point	Discharge	Remarks
Thlerpui lui	9.67 (l/s)	

Source: Prepared by MID

2.2.2 Soil Classification

Field soil classification test was done by MID officers on 28th Oct, 2014. The result of the test was as follow. The detail is shown in Attachment (Preliminary technical site survey sheet).

Table 2.2 Soil Classification

Point	Classification	Remarks
On farm	Clay loam	

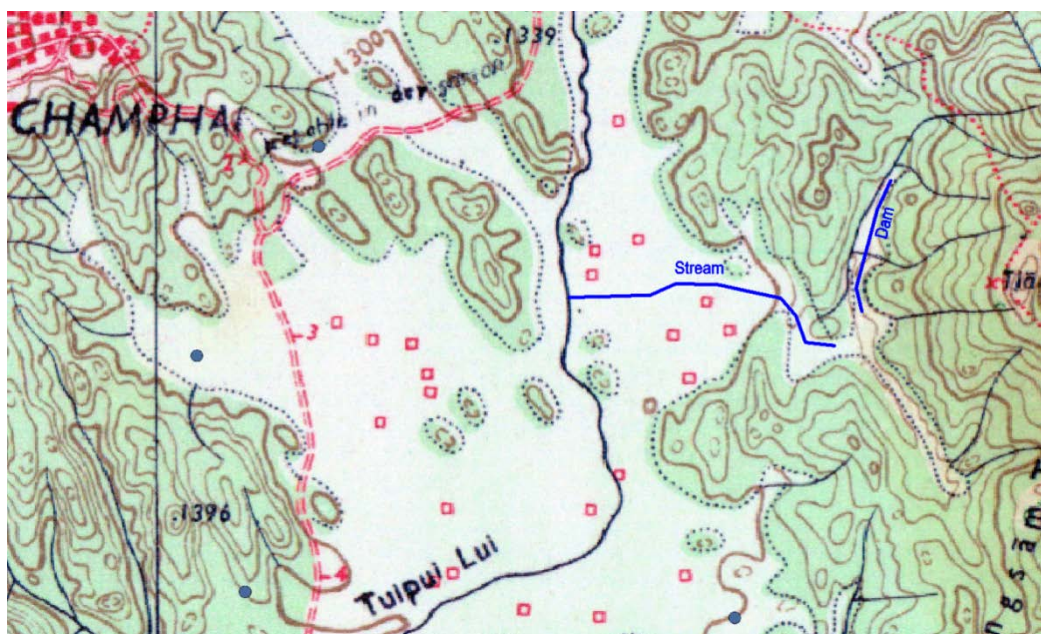
Source: Prepared by MID

2.2.3 Topological Survey

Following topological surveys were conducted to clarify the existing topological conditions.

Table 2.3 Highlight of the Survey

Survey Name	Stream profile and cross-section survey
Use of survey result	Designing of Drainage stream and Dams
Period	From 1/7/ 2014 to 10/ 7/ 2014
Surveyor	MID Surveyor, Mr.Sangtea
Survey Area	Stream; profile L=1,327m, section:33Nos Dam; profile L=660m,
Coordinates	Stream: BP, X=535421.11 Y=2595631.70 EP, X=536516.53 Y=2595312.36
	Dam: BP, X= 536639.59 Y= 2595412.55 EP, X= 536757.02 Y= 2596022.01
Benchmark Coordinates	Nil
Methodology	Survey with Total Station Machine

Survey Area map

Source: Prepared by MID

2.2.4 Others

Nil.

Chapter 3 Hydrology

3.1 Characteristics of Catchment

The Thlerpui River is a small river. It originates from the hill ranges near Tlamsam Village located in Champhai District in Mizoram. The proposed scheme is located on the Thlerpui River at 23°28'02" N latitude, and 93°21'07" E longitude. The catchment area of the streams up to the proposed scheme is worked out to be 1.8 km², as per the topography sheet of Survey of India and satellite data generated by MIRSAC Mizoram. The topography of the river basin mainly comprised hilly terrain, covered with forest, wild scrubs and dense bamboo jungle.

3.2 Assessment of Water Availability:

3.2.1 Data Availability

(1) Rainfall Data

There is no rain gauge station maintained by any agency within the catchment area. However, the daily rainfall data of Champhai Station, maintained by GREF and the State Agriculture Department of Mizoram, is available since 1998 for the water availability studies for the project.

(2) Discharge Data

There is no discharge site being maintained by any agency within the catchment area of the proposed scheme.

3.2.2 Water Availability Studies

(1) Monsoon Period

In the present data scenario, the catchment under consideration is completely ungauged and no hydrological model for computing surface runoff based on catchment characteristics has yet been developed for this zone. Thus, efforts have been made for computing runoff of 75% dependable average daily flow during the monsoon period by runoff factor approach using rainfall data of the nearby station and the results are tabulated in Table 3.1, Source: Prepared by MID

Table 3.2, and Table 3.3. The flow of a stream (where the existing diversion weir is located) during monsoon period is calculated based on the discharge shown in Table 3.3, which was prepared by the JICA Study Team in 2015. As observed from the tables, the flow during the monsoon period is much more than the discharge required during the non-monsoon period.

(2) Non-monsoon Period

Flow in the stream during the non-monsoon period was calculated based on specific discharge, as shown in Table 3.4, which was prepared by the JICA Study Team in 2015. As observed from the table, the flows during the non-monsoon period are much more than the discharge required during the non-monsoon period. Water balance during the monsoon and non-monsoon periods is shown in Table 3.1.

Table 3.1 Water Balance (Kharif season, Kanghlai MIP)

Surface Water	River	0.0735	(m ³ /s)
	Irrigation Efficiency	0.45	
	CCA	65.0	(ha)
	Water Resource	4.3	(mm/day)
Effective Rainfall	Jul to Sep (2002)	728.8	(mm)
	Day	92	(day)
	Water Resource	7.9	(mm/day)
Water Resource	Surface Water	4.3	(mm/day)
	Effective Rainfall	7.9	(mm/day)
	Total	12.2	(mm/day) > 12 --- OK

Source: Prepared by MID

Table 3.2 Water Balance (Rabi season, Kanghlai MIP)

Area	Non-monsoon (Rabi) preiod				Evaluation
	Resource Q1 (m ³ /s)	Requirement in field Q2 (m ³ /s)	Irrigation efficiency E	Requirement at inlet Q3=Q2/E (m ³ /s)	
CA 1	-	0.0002	0.45	-	
CA 2	-	0.0003	0.45	-	
CA 3	-	0.0002	0.45	-	
CA 4	-	0.0005	0.45	-	
CA 5	-	0.0002	0.45	-	
CA 6	-	0.0002	0.45	-	
Others	-	0.0018	0.45	-	
Total (CA)	0.0078	0.0034	0.45	0.0076	Q1>Q3: OK

Source: Prepared by MID

(3) Annual Flow

The annual flow of Thlerpui lui is calculated at 1.617 MCM.

3.3 Design Flood

The peak discharge for design flood passing through the diversion headworks is estimated using Dicken's Formula in which the value of C is taken as 14, as follows:

For CA 1

$$Q = CA^{3/4}$$

Where,

Q	=	Flood discharge (cumecs)
C	=	Runoff coefficient
	=	11 -14 North-indian hilly region
	=	14
A	=	Catchment area in sq. km
	=	1.80 km ²

Thus,

Q	=	21.76 m ³ /s
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Table 3.3 Average monthly discharge series for Thlerpui Lui; Kharif (monsoon: Mid Jun. to Mid Oct.)

Month	2nd half of June		July		August		September		1st half of October		Average Discharge	Ave. discharge values arrange in descending order	m	Probability P = m/(N+1)	Return period T= 1/P (years)
	Rainfall	Discharge	Rainfall	Discharge	Rainfall	Discharge	Rainfall	Discharge	Rainfall	Discharge					
1988	358.50	0.224	458.00	0.139	494.00	0.149	414.00	0.129	321.50	0.201	0.1685	0.1685	1	0.0400	25.000
1989	196.00	0.123	500.00	0.151	482.00	0.146	361.00	0.113	196.00	0.123	0.1310	0.1310	2	0.0800	12.500
1990	216.50	0.135	230.00	0.070	205.00	0.062	276.00	0.086	121.00	0.076	0.0857	0.1235	3	0.1200	8.333
1991	95.50	0.060	204.00	0.062	301.00	0.091	303.00	0.095	114.50	0.072	0.0757	0.1228	4	0.1600	6.250
1992	139.00	0.087	585.00	0.177	484.00	0.146	232.00	0.073	127.50	0.080	0.1125	0.1125	5	0.2000	5.000
1993	97.00	0.061	420.00	0.127	328.00	0.099	221.00	0.069	118.50	0.074	0.0860	0.1121	6	0.2400	4.167
1994	148.00	0.093	214.00	0.065	305.00	0.092	172.00	0.054	97.00	0.061	0.0728	0.1072	7	0.2800	3.571
1995	232.00	0.145	257.00	0.078	410.00	0.124	289.00	0.090	197.50	0.123	0.1121	0.1045	8	0.3200	3.125
1996	69.26	0.043	290.20	0.088	634.50	0.192	267.60	0.084	83.60	0.052	0.0918	0.1033	9	0.3600	2.778
1997	341.14	0.213	625.75	0.189	219.33	0.066	361.43	0.113	51.42	0.032	0.1228	0.0983	10	0.4000	2.500
1998	128.03	0.080	287.10	0.087	316.12	0.096	250.26	0.078	22.80	0.014	0.0710	0.0982	11	0.4400	2.273
1999	130.29	0.081	301.21	0.091	165.23	0.050	183.58	0.057	53.56	0.033	0.0627	0.0918	12	0.4800	2.083

$$Q = \frac{(R/1000) \times (A \times 10^6) \times f}{\text{Nos of days in month} \times 24 \times 60 \times 60} \quad Q = \text{Discharge in cumecs} \quad R = \text{Rainfall in mm} \quad 2.2362$$

$$f = \text{Runoff co-efficient} = 0.45 \quad A = \text{Catchment area} = 1.80 \text{ Sq.km}$$

Now, the 75% dependable annual flow = Annual flow with probability P = 0.75, i.e T = 1/0.75 = 1.33 years

By interpolation between two successive values in the above table having T= 1.316 and 1.389 respectively, the 75% dependable flow is found to be,

$$Q_{75} = 0.07348 \text{ m}^3/\text{s}$$

Source: Prepared by MID

Table 3.4 Discharge for Rabi (Mid)

No	Name of River Basin	AREA (Sq Km)	Rainfall (75%) (mm)	Interception loss (mm)	Evaporation loss (mm)	Balance (mm)	Ground water recharge (mm)	Surface water (mm)	Surface water (MCM)	Periodic water Resource Availability											
										June -Sept (Monsoon) 80.7%			Oct-Nov (Post -Monsoon) 13.1%			Dec-March (Winter) 3.0%			April -May (Pre-Monsoon) 3.2%		
										121 days	Specific discharge		61 days	Specific discharge		119 days	Specific discharge		61 days	Specific discharge	
										MCM	(m3/s)	(m3/s/km2)	MCM	(m3/s)	(m3/s/km2)	MCM	(m3/s)	(m3/s/km2)	MCM	(m3/s)	(m3/s/km2)
1	Langkaih lui	376	1,822	91	1,109	622	62	560	211	170	16.261	0.04325	28	5.313	0.01413	6	0.584	0.00155	7	1.328	0.00353
2	Sazai Lui	940	1,828	91	1,041	696	70	626	588	475	45.435	0.04834	77	14.610	0.01554	18	1.751	0.00186	19	3.605	0.00384
3	Khawthlangtuipui (Karnaphuli)	251	2,067	103	1,041	923	92	831	209	168	16.070	0.06402	27	5.123	0.02041	6	0.584	0.00232	7	1.328	0.00529
4	Kawrpui	371	2,188	109	1,175	904	90	814	302	244	23.339	0.06291	40	7.590	0.02046	9	0.875	0.00236	10	1.897	0.00511
5	Teirei	773	1,888	94	1,093	701	70	631	488	394	37.687	0.04875	64	12.143	0.01571	15	1.459	0.00189	16	3.036	0.00393
6	Tut	829	2,171	109	1,126	936	94	842	698	563	53.853	0.06496	91	17.266	0.02083	21	2.042	0.00246	22	4.174	0.00504
7	Kau	249	2,250	113	999	1,138	114	1,024	255	206	19.705	0.07914	33	6.261	0.02515	8	0.778	0.00312	8	1.518	0.00610
8	De	419	2,309	115	1,027	1,167	117	1,050	440	355	33.957	0.08104	58	11.005	0.02626	13	1.264	0.00302	14	2.656	0.00634
9	Tuichawng	1,234	2,212	111	1,066	1,035	104	931	1,149	927	88.671	0.07186	150	28.461	0.02306	34	3.307	0.00268	37	7.020	0.00569
10	Sekulh lui	251	2,204	110	1,043	1,051	105	946	237	192	18.365	0.07317	31	5.882	0.02343	7	0.681	0.00271	8	1.518	0.00605
11	Tlawng (Dhaleshwari)	1,500	2,273	114	1,110	1,049	105	944	1,416	1,143	109.332	0.07289	185	35.102	0.02340	42	4.085	0.00272	45	8.538	0.00569
12	Mat	1,010	2,222	111	1,064	1,047	105	942	951	768	73.462	0.07273	125	23.717	0.02348	29	2.821	0.00279	30	5.692	0.00564
13	Ser lui	618	2,265	113	1,095	1,057	106	951	588	474	45.340	0.07337	77	14.610	0.02364	18	1.751	0.00283	19	3.605	0.00583
14	Tuirial	2,016	2,224	111	1,148	965	97	868	1,750	1,412	135.063	0.06700	229	43.450	0.02155	52	5.058	0.00251	56	10.625	0.00527
15	Tuivawl	856	2,199	110	1,126	963	96	867	742	599	57.296	0.06694	97	18.405	0.02150	22	2.140	0.00250	24	4.554	0.00532
16	Tuival	1,456	2,102	105	1,137	860	86	774	1,127	909	86.949	0.05972	148	28.081	0.01929	34	3.307	0.00227	36	6.831	0.00469
17	Tuipui	936	1,930	97	990	843	84	759	710	573	54.809	0.05856	93	17.646	0.01885	21	2.042	0.00218	23	4.364	0.00466
18	Tuichang	1,653	2,096	105	1,009	982	98	884	1,461	1,179	112.775	0.06822	191	36.240	0.02192	44	4.279	0.00259	47	8.918	0.00539
19	Tiau	992	1,807	90	934	783	78	705	699	564	53.949	0.05438	92	17.456	0.01760	21	2.042	0.00206	22	4.174	0.00421
20	Chhintuipui (Kolodyne)	2,159	2,166	108	1,006	1,052	105	947	2,045	1,650	157.828	0.07310	268	50.850	0.02355	61	5.933	0.00275	65	12.333	0.00571
21	Ngengpui Lui	717	2,293	115	991	1,187	119	1,068	766	618	59.114	0.08245	100	18.974	0.02646	23	2.237	0.00312	25	4.743	0.00662
22	Palak Lui	136	2,194	110	1,060	1,024	102	922	125	101	9.661	0.07104	16	3.036	0.02232	4	0.389	0.00286	4	0.759	0.00558
23	Tuisih lui	249	2,121	106	1,060	955	96	859	214	173	16.548	0.06646	28	5.313	0.02134	6	0.584	0.00234	7	1.328	0.00533
24	Tinglo lui	283	2,190	110	1,060	1,020	102	918	260	210	20.087	0.07098	34	6.451	0.02280	8	0.778	0.00275	8	1.518	0.00536
25	Mar Lui	359	2,216	111	1,174	931	93	838	301	243	23.244	0.06475	39	7.400	0.02061	9	0.875	0.00244	10	1.897	0.00529
26	Barak	118	2,021	101	1,095	825	83	742	88	71	6.791	0.05755	11	2.087	0.01769	3	0.292	0.00247	3	0.569	0.00482
27	Phairang	331	2,379	119	1,066	1,194	119	1,075	356	287	27.453	0.08294	47	8.918	0.02694	11	1.070	0.00323	11	2.087	0.00631
	GRAND TOTAL	21,082								18,175	14,668	1,403		2,379	451		545	53		583	111

source: JICA Study Team based on MID irrigation masterplan (1995)

CA_non-monsoon

Catchment Area 1.8 (km²)
 Specific Discharge 0.00218 (m³/s/km²)

Discharge 0.00393 (m³/s)

Reservoir for non-monsoon

Volume 40,000 (m³)
 Rabi duration 120 (day)

Discharge 0.00386 (m³/s)

CA_non-monsoon (total)

River discharge 0.00393 (m³/s)
 Pond discharge 0.00386 (m³/s)

Total 0.00779 (m³/s)

Chapter 4 Design Features

4.1 General

Based on the analysis of hydrology for water availability, the command area available and topography, it was decided to go for channel and pipeline irrigation by diverting Thlerpui lui and then carrying the water under gravity flow to the command area and distributing it to the respective individual plots. A detailed survey of the channel as well as pipeline alignment along the contour was conducted and the cross sections of some locations were taken for planning and design of the conveyance and distribution system.

Accordingly, the hydraulic and structural designs were made considering the following:

- - Design of pipeline (1 no.)
- - Design of rectangular channel section (7 nos.)

4.2 Requirement of Water in the field

Table 4.1 Summary of Water Requirement

Name	Qi : Discharge required in the pipe inlet (m ³ /s)
Canal 1	0.0136
Canal 2	0.0160
Canal 3	0.0058
Canal 4	0.0213
Canal 5	0.0096
Canal 6	0.0069

Source: Prepared by MID

For canal 1

Qi = Discharge required at the canal inlet

Qf = Discharge required in the field

Discharge requires in the field

$$Q_f = 0.0061 \text{ m}^3/\text{s} \text{ (Kharif period)}$$

Irrigation efficiency

$$E = 45 \% \text{ (open channel)}$$

Discharge required at the pipe inlet

$$Q_i = Q_f/E/100 = 0.0136 \text{ m}^3/\text{s}$$

Maximum discharge required for the open channel has been thus calculated. (Ref to Chapter 3 and Chapter 5)

For canal 2

Qi = Discharge required at the canal inlet

Qf = Discharge required in the field

Discharge requires in the field

$$Q_f = 0.0072 \text{ m}^3/\text{s} \text{ (Kharif period)}$$

Irrigation efficiency

$$E = 45 \% \text{ (open channel)}$$

Discharge required at the pipe inlet

$$Q_i = Q_f/E/100 = 0.0160 \text{ m}^3/\text{s}$$

Maximum discharge required for the open channel has been thus calculated. (Ref to Chapter 3 and Chapter 5)

For canal 3

Q_i = Discharge required at the canal inlet

Q_f = Discharge required in the field

Discharge requires in the field

$$Q_f = 0.0096 \text{ m}^3/\text{s} \text{ (Kharif period)}$$

Irrigation efficiency

$$E = 45 \% \text{ (open channel)}$$

Discharge required at the pipe inlet

$$Q_i = Q_f/E/100 = 0.0213 \text{ m}^3/\text{s}$$

Maximum discharge required for the open channel has been thus calculated. (Ref to Chapter 3 and Chapter 5)

For canal 4

Q_i = Discharge required at the canal inlet

Q_f = Discharge required in the field

Discharge requires in the field

$$Q_f = 0.0096 \text{ m}^3/\text{s} \text{ (Kharif period)}$$

Irrigation efficiency

$$E = 45 \% \text{ (open channel)}$$

Discharge required at the pipe inlet

$$Q_i = Q_f/E/100 = 0.0213 \text{ m}^3/\text{s}$$

Maximum discharge required for the open channel has been thus calculated. (Ref to Chapter 3 and Chapter 5)

For canal 5

Q_i = Discharge required at the canal inlet

Q_f = Discharge required in the field

Discharge requires in the field

$$Q_f = 0.0043 \text{ m}^3/\text{s} \text{ (Kharif period)}$$

Irrigation efficiency

$$E = 45 \% \text{ (open channel)}$$

Discharge required at the pipe inlet

$$Q_i = Q_f/E/100 = 0.0096 \text{ m}^3/\text{s}$$

Maximum discharge required for the open channel has been thus calculated. (Ref to Chapter 3 and Chapter 5)

For canal 3

Q_i = Discharge required at the canal inlet

Q_f = Discharge required in the field

Discharge requires in the field

$$Q_f = 0.0031 \text{ m}^3/\text{s} \text{ (Kharif period)}$$

Irrigation efficiency

$$E = 45 \% \text{ (open channel)}$$

Discharge required at the pipe inlet

$$Q_i = Q_f/E/100 = 0.0069 \text{ m}^3/\text{s}$$

Maximum discharge required for the open channel has been thus calculated. (Ref to Chapter 3 and Chapter 5)

4.3 Design of Pipe Line

For Connection pipe line

Reservoir	V =	40,000	m ³
Rabi duration	n =	120	day
Irrigation time	t =	8	hour
Required Conveyance Capacity	=	0.0116	m ³ /s
By using formula for pipe flow	h =	2flv ² / gd	
Assuming, diameter of pipe			

Here,	h = Head difference	=	30	m
	f = Co-efficient of friction	=	0.005	
	g = Acc. Due to gravity	=	9.81	m/s/s
	l = Length of pipe	=	350	m

$$a = 3.14d^2 / 4$$

$$v^2 = hgd / 2fl$$

$$Q = av$$

$$Q = (3.14d^2/4) * (hgd/2fl)^{1/2}$$

$$d^{5/2} = 0.00161$$

$$d = 0.07630 \text{ m}$$

$$d = 76 \text{ mm}$$

Say	d =	100	mm
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Minimum size d=100mm

4.4 Design of Channel

Table 4.2 Summary of Design of Channel

Name	Depth (m)	Width (m)	Slope	v (m/s)
Canal 1	0.20	0.20	1:20	1.54
Canal 2	0.20	0.20	1:20	1.60
Canal 3	0.20	0.20	1:20	1.24
Canal 4	0.20	0.20	1:20	1.72
Canal 5	0.20	0.20	1:20	1.41
Canal 6	0.20	0.20	1:20	1.30

Source: Prepared by MID

For Canal 1

Required Conveyance Capacity	=	0.0136	m ³ /s
Design cross section of channel	=	Rectangular	
Using equation	Q =	a X v	
Where	a = Cross section area	=	2d ²
	v = Velocity of flow	=	(1/n)*R ^{2/3} *S ^{1/2}
Where	R = Hydraulic Radius	=	d/2 for most economical section
	S = Channel bed slope	=	1:20
	n = Roughness co-efficient	=	0.015 (for cement concrete channel)
Therefore	d ^{8/3}	=	0.00072

$$\begin{aligned}
 & d = 0.06644 \text{ m} \\
 \text{Say } & d = 0.10 \text{ m} \\
 \text{Therefore} & \\
 \text{Width of channel } & b = 2d = 0.20 \text{ m} \\
 \text{Providing free board of 10cm,} & \\
 \text{depth of channel } & D = 0.1 + d \\
 & = 0.20 \text{ m}
 \end{aligned}$$

Therefore the following inside dimension may be adopted for construction of diversion channel

Depth of channel	=	0.20 m
Width of channel	=	0.20 m
Channel bed slope	=	1:20
Flow velocity	=	1.54 m/s

For Canal 2

$$\begin{aligned}
 \text{Required Conveyance Capacity} & = 0.016 \text{ m}^3/\text{s} \\
 \text{Design cross section of channel} & = \text{Rectangular} \\
 \text{Using equation } & Q = a \times v \\
 \text{Where } a = \text{Cross section area} & = 2d^2 \\
 v = \text{Velocity of flow} & = (1/n) \cdot R^{2/3} \cdot S^{1/2} \\
 \text{Where } R = \text{Hydrolic Radius} & = d/2 \text{ for most economical section} \\
 S = \text{Channel bed slope} & = 1:20 \\
 n = \text{Roughness co-efficient} & = 0.015 \text{ (for cement concrete channel)}
 \end{aligned}$$

Therefore

$$\begin{aligned}
 d^{8/3} & = 0.00085 \\
 d & = 0.07061 \text{ m} \\
 \text{Say } d & = 0.10 \text{ m}
 \end{aligned}$$

Therefore

$$\begin{aligned}
 \text{Width of channel } & b = 2d = 0.20 \text{ m} \\
 \text{Providing free board of 10cm,} & \\
 \text{depth of channel } & D = 0.1 + d \\
 & = 0.20 \text{ m}
 \end{aligned}$$

Therefore the following inside dimension may be adopted for construction of diversion channel

Depth of channel	=	0.20 m
Width of channel	=	0.20 m
Channel bed slope	=	1:20
Flow velocity	=	1.60 m/s

For Canal 3

$$\begin{aligned}
 \text{Required Conveyance Capacity} & = 0.0058 \text{ m}^3/\text{s} \\
 \text{Design cross section of channel} & = \text{Rectangular} \\
 \text{Using equation } & Q = a \times v \\
 \text{Where } a = \text{Cross section area} & = 2d^2 \\
 v = \text{Velocity of flow} & = (1/n) \cdot R^{2/3} \cdot S^{1/2} \\
 \text{Where } R = \text{Hydrolic Radius} & = d/2 \text{ for most economical section} \\
 S = \text{Channel bed slope} & = 1:20 \\
 n = \text{Roughness co-efficient} & = 0.015 \text{ (for cement concrete channel)}
 \end{aligned}$$

Therefore

$$d^{8/3} = 0.00031$$

$$d = 0.04827 \text{ m}$$

Say $d = 0.10 \text{ m}$

Therefore

Width of channel $b = 2d = 0.20 \text{ m}$
 Providing free board of 10cm,
 depth of channel $D = 0.1 + d = 0.20 \text{ m}$

Therefore the following inside dimension may be adopted for construction of diversion channel

Depth of channel	=	0.20 m
Width of channel	=	0.20 m
Channel bed slope	=	1:20
Flow velocity	=	1.24 m/s

For Canal 4

Required Conveyance Capacity = 0.0213 m³/s

Design cross section of channel = Rectangular

Using equation $Q = a \times v$

Where $a = \text{Cross section area} = 2d^2$

$v = \text{Velocity of flow} = (1/n) \cdot R^{2/3} \cdot S^{1/2}$

Where $R = \text{Hydrolic Radius} = d/2$ for most economical section

$S = \text{Channel bed slope} = 1:20$

$n = \text{Roughness co-efficient} = 0.015$ (for cement concrete channel)

Therefore

$$d^{8/3} = 0.00113$$

$$d = 0.07861 \text{ m}$$

Say $d = 0.10 \text{ m}$

Therefore

Width of channel $b = 2d = 0.20 \text{ m}$
 Providing free board of 10cm,
 depth of channel $D = 0.1 + d = 0.20 \text{ m}$

Therefore the following inside dimension may be adopted for construction of diversion channel

Depth of channel	=	0.20 m
Width of channel	=	0.20 m
Channel bed slope	=	1:20
Flow velocity	=	1.72 m/s

For Canal 5

Required Conveyance Capacity = 0.0096 m³/s

Design cross section of channel = Rectangular

Using equation $Q = a \times v$

Where $a = \text{Cross section area} = 2d^2$

$v = \text{Velocity of flow} = (1/n) \cdot R^{2/3} \cdot S^{1/2}$

Where $R = \text{Hydrolic Radius} = d/2$ for most economical section

	S = Channel bed slope	=	1:20	
	n = Roughness co-efficient	=	0.015	(for cement concrete channel)
Therefore				
	$d^{8/3}$	=	0.00051	
	d	=	0.05830	m
Say	d	=	0.10	m
Therefore				
	Width of channel	b = 2d	=	0.20 m
	Providing free board of 10cm,			
	depth of channel	D	=	0.1 + d
			=	0.20 m

Therefore the following inside dimension may be adopted for construction of diversion channel

Depth of channel	=	0.20 m
Width of channel	=	0.20 m
Channel bed slope	=	1:20
Flow velocity	=	1.41 m/s

For Canal 6

Required Conveyance Capacity	=	0.0069	m ³ /s	
Design cross section of channel	=	Rectangular		
Using equation	Q	=	a X v	
Where	a = Cross section area	=	2d ²	
	v = Velocity of flow	=	(1/n)*R ^{2/3} *S ^{1/2}	
Where	R = Hydraulic Radius	=	d/2 for most economical section	
	S = Channel bed slope	=	1:20	
	n = Roughness co-efficient	=	0.015 (for cement concrete channel)	
Therefore				
	$d^{8/3}$	=	0.00037	
	d	=	0.05151 m	
Say	d	=	0.10 m	
Therefore				
	Width of channel	b = 2d	=	0.20 m
	Providing free board of 10cm,			
	depth of channel	D	=	0.1 + d
			=	0.20 m

Therefore the following inside dimension may be adopted for construction of diversion channel

Depth of channel	=	0.20 m
Width of channel	=	0.20 m
Channel bed slope	=	1:20
Flow velocity	=	1.30 m/s

4.5 Design of Farm Pond

4.5.1 General

(1) Objective

Kanghlai is one of the areas with the highest agriculture potential, where the location is close to a big town, a perennial water source is available and beneficiaries are motivated to try winter crops.

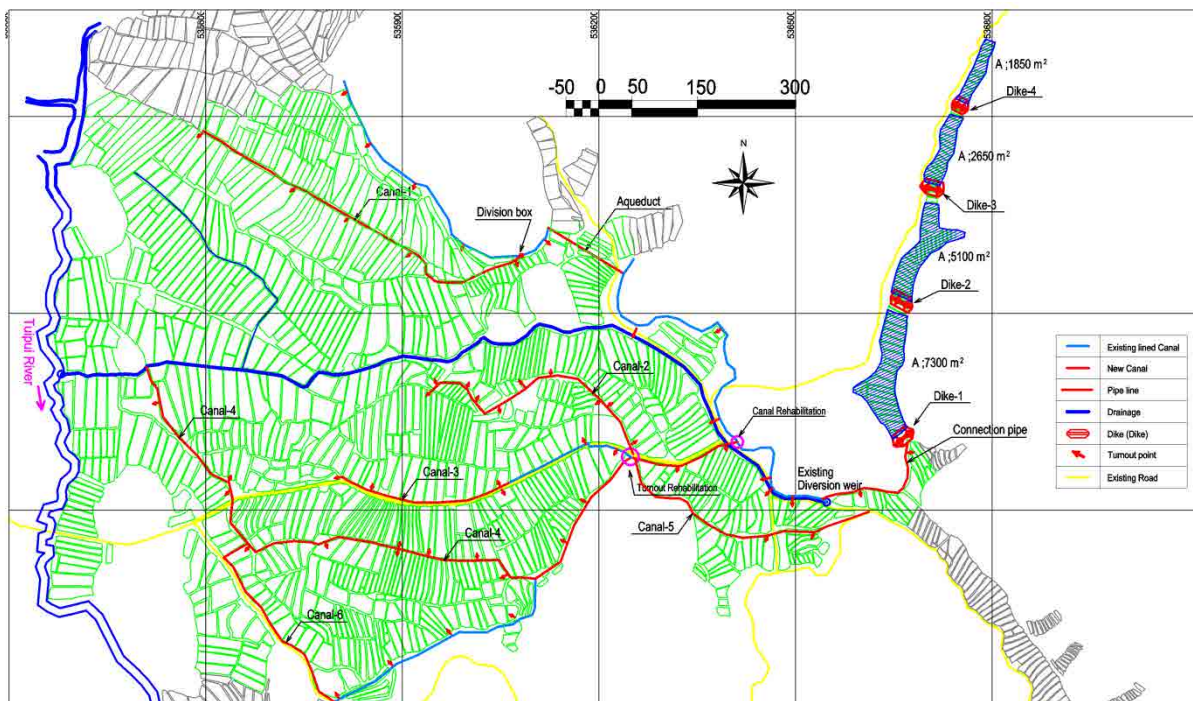
However, shortage of irrigation water is the largest factor hindering the development of winter crop cultivation for greater income generation and better utilization of potential land.

Therefore, a farm pond is to be planned and designed to store irrigation water for winter crop cultivation.

Besides, farm pond water is to be used not only for irrigation but also for fishery activities of landowners.

(2) General plan

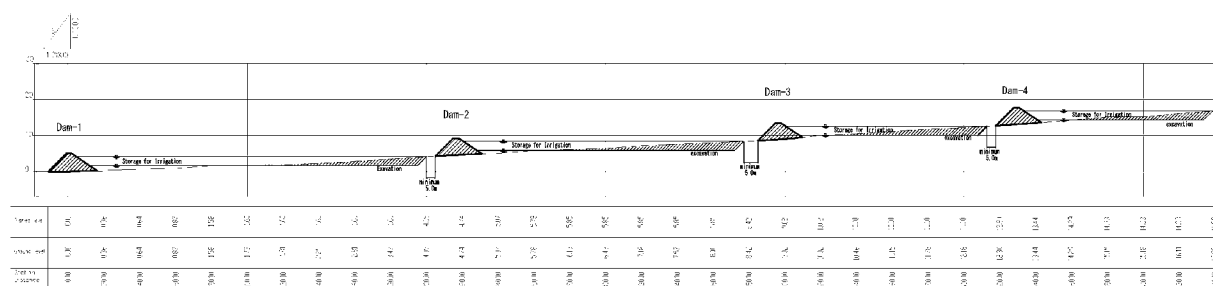
- Targeted farm ponds are composed of four proposed ponds and located upstream of Kanghlai scheme area, as shown below in the map. Current land use of the targeted area is paddy and there are four landowners.
- Pond water is to be irrigated to downstream farmlands through connection pipes and irrigation channels by gravity flow, as shown below in the map.
- Each of the four ponds are connected to irrigation pipes and the water level can be controlled separately.
- Source of water is existing perennial stream in the valley.
- Flood water flows down through spillways of the ponds step by step.
- To increase the available irrigation water volume of the pond, the bottom of the ponds are to be excavated, as shown in the pond profile plan.



Source: Prepared by MID

(3) Components of the work

Facility	Description
Pond-1	Dike height: 5.0m Excavation: about 3465cum Intake cum Drainage pipe: GI pipe125 dia Spillway: Stone masonry channel B5.0m H1.0m
Pond -2	Dike height: 5.0m Excavation: about 3200cum Intake cum Drainage pipe: GI pipe125 dia Spillway: Stone masonry channel B5.0m H1.0m
Pond -3	Dike height: 5.0m Excavation: about 2500cum Intake cum Drainage pipe: GI pipe125 dia Spillway: Stone masonry channel B5.0m H1.0m
Pond -4	Dike height: 5.0m Excavation: about 1540cum Intake cum Drainage pipe: GI pipe125 dia Spillway: Stone masonry channel B5.0m H1.0m
Connection pipe	From Dike and existing diversion weir point Connection GI pipe: Dia100mm L=200m



Note: Ground level profile was taken by leveling survey.
Ground level elevation shows relative height.

Figure 4.1 Profile plan of Four Ponds

4.5.2 Volume of the pond

Total volume capacity of the three ponds is 40,000 m³ based on the following calculation:

Volume = Average pond irrigation water level area * water depth for irrigation storage

Note;

- Each pond average water level area: shown below in the map
- Water depth for irrigation storage: 1.5 m
- 5% extra should be considered as pond loss.

	Area (sqm)	Depth (m)	Volume (cum)	Remark
Pond-1	7,300	2.5	18,250	
Pond-2	5,100	2.5	12,750	
Pond-3	2,650	2.5	6,625	
Pond-4	1,850	2.5	4,625	
Total			42,250	
			40,138	5% deduction
			40,000	SAY

Source: Prepared by MID

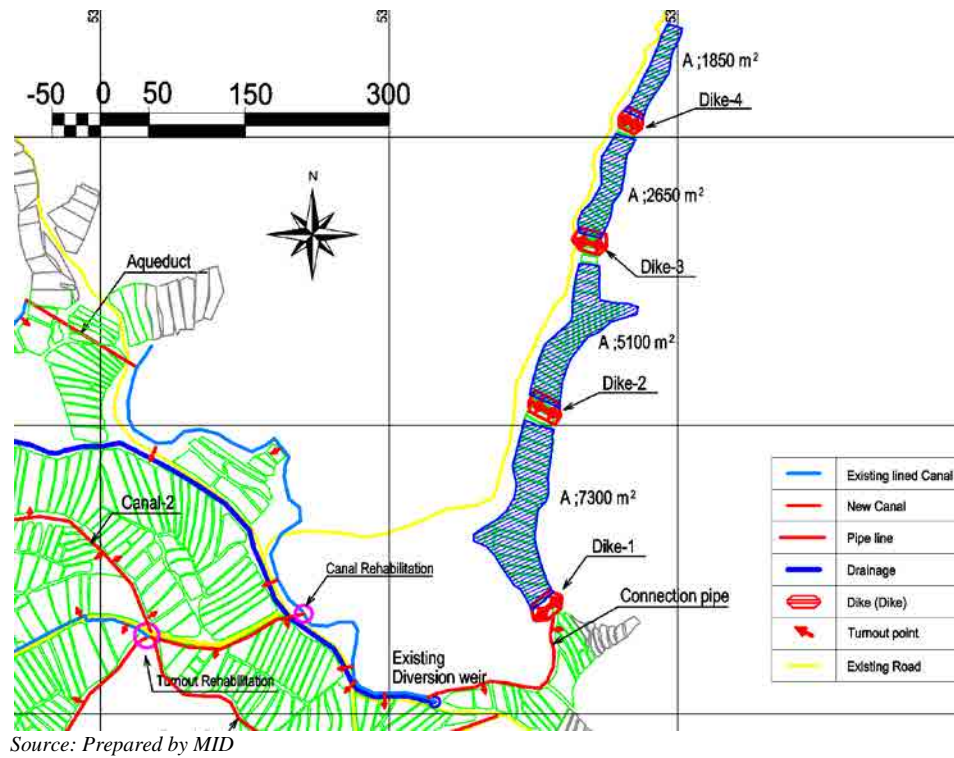


Figure 4.2 Pond average water level area Map

4.5.3 Dike structure general

The upper 2.5 m depth of water is used for irrigation and the irrigation pipe valve is to be controlled by the water users' association (WUA).

Lower part of the water is saved for fishery activities of landowners and the drainage pipe valve is to be controlled by the landowners.

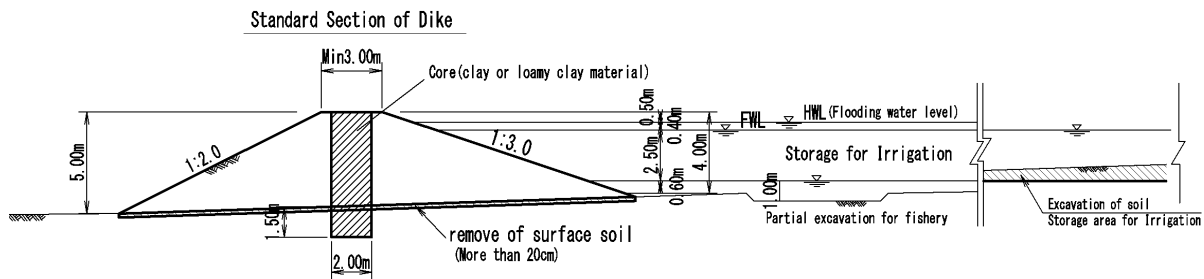
Irrigation and drainage water is to be taken from the intake/drainage pipe, which is shown below.

Flooding water depth is 0.4 m from spillway calculation (refer to Section 4.4.4 Spillway for details)

MID shall supervise dike compaction works very carefully.

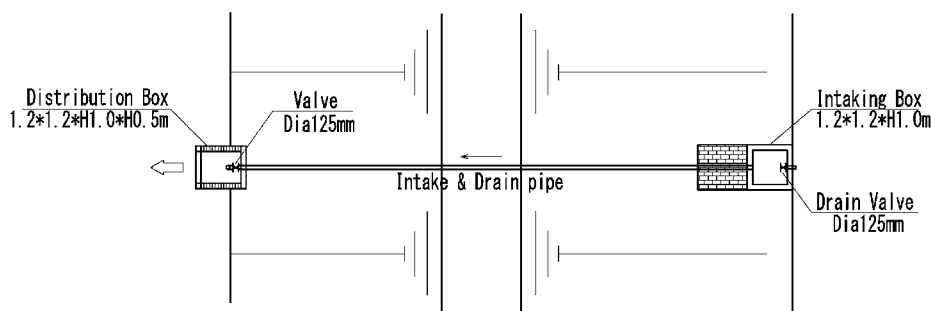
Special note for construction work is shown below.

- * Top width of 3.0m shows minimum.
In case of surplus excavation soil, it can be increased.
- * Gray core part material shall be the soil which is classified as clay or loamy clay
- * Location of partial excavation for fishy is to decided with landowners.
- * Provision of extra embankment (more than 10cm)
- * Spreading embankment material, spreading thickness shall be 7-10cm.
- * Compacting embankment material, passage of compactor shall be more than 10 times.
- * Before handing over the facilities, trial ponding should be conducted and defects should be checked.

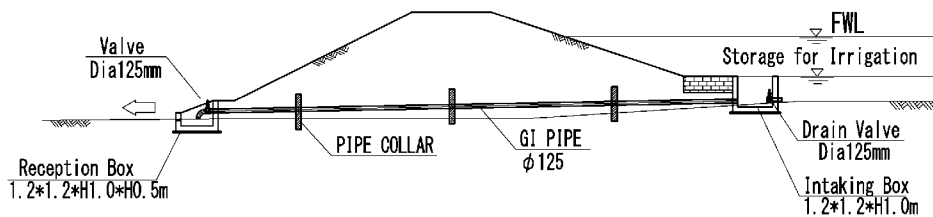


Intake cum Drain pipe for Dam-2, 3, 4

Plan



Section



Source: Prepared by MID

4.5.4 Spillway

Design calculation for Spillway

Peak Discharge formula using Rational Method:

$$Q = \frac{CIA}{3.6}$$

Where, Q = Design peak runoff in cumec
 C = Runoff coefficient
 I = to the time of concentration (t_c) of the watershed
 A = Watershed area in km^2

Using Kirpich Equation to calculate Intensity of rain

Where, $t_c = 0.01947 L^{0.77} S^{-0.385}$
 t_c = Time of concentration (minutes)
 L = Maximum length of travel of water in meters
 = 1700 m
 S = Slope of the catchment
 = $\Delta H/L$
 ΔH = Difference in elevation between between the most remote point on the catchment and the outlet in meters
 = 180 m

For easy use,

$$t_c = 0.01947 K_1^{0.77}$$

$$K_1 = \sqrt{L^3/\Delta H}$$

$$K_1 = 5224.4085$$

$$t_c = 14.20 \text{ mins.}$$

Rainfall Intensity

$$I = \frac{K T^x}{(t_c + a)^n}$$

Maximum *Intensity-Duration-Frequency* relationships, India

Typical values of coefficients K, x, a and n

Zone	K	x	a	n
North east	7.206	0.156	0.75	0.94

$$T = 25$$

(recurrence interval as 25 years for earthdams having natural spillways)

$$\text{Therefore, } I = 12.058 \text{ cm/hr} = 120.5758388 \text{ mm/hr}$$

Using Rational Formula for Peak Discharge Q

$$Q = \frac{CIA}{3.6}$$

Taking C value in Rational Formula for Watersheds with forest cover with slope 10-30%

$$C = 0.3$$

$$A = 0.750 \text{ km}^2$$

$$Q = \boxed{7.540} \text{ cumec}$$

For Spillway Design using rectangular weir formula

$$Q = CLH^{3/2}$$

C=coefficient, H=Depth of over flow, L=length of crest

$$C = 2.1 \text{ (crest)}$$

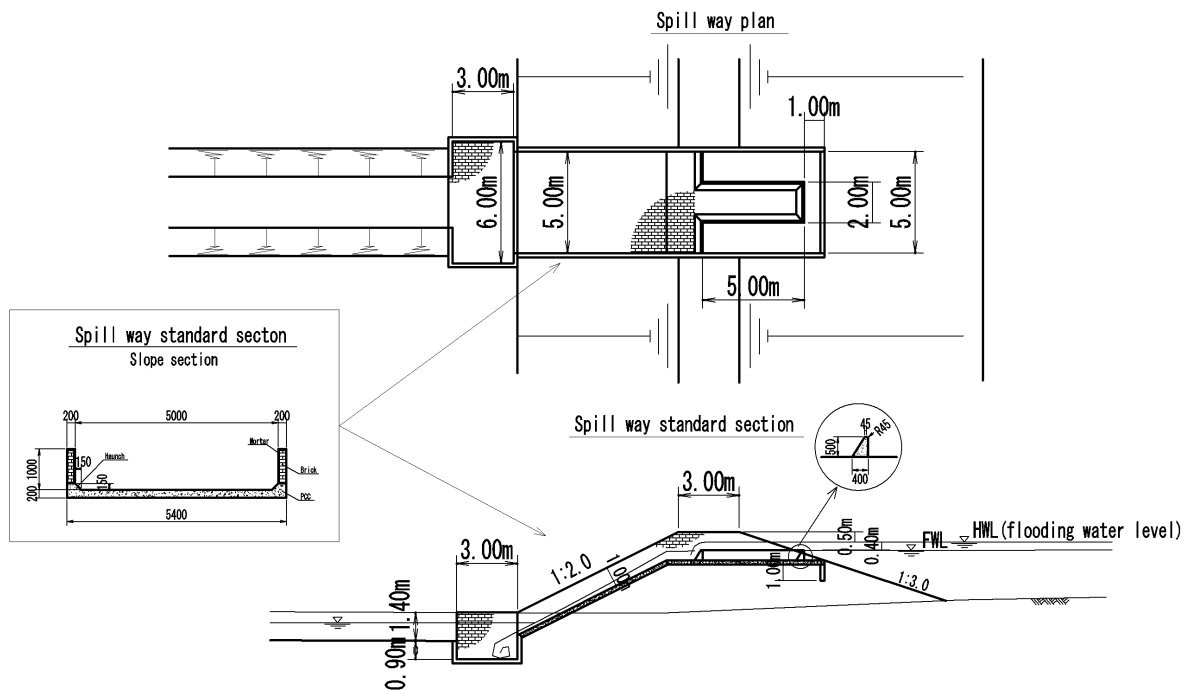
$$L = 15.00 \text{ m}$$

$$H = 0.4 \text{ m}$$

$$Q = 7.97 > 7.54 \text{ m}^3/\text{s}$$

from above result Length of crest needs more than 15m

Standard spillway structure drawing is shown in Figure 4.3.



Source: Prepared by MID

Figure 4.3 Standard spillway structure drawing

Chapter 5 Irrigation Planning Agriculture Practices & Cropping Pattern

5.1 Cropping Pattern for Kanghlai Minor Irrigation Scheme

In Mizoram, where land is limited, self-sufficiency in food production can be achieved by utilization of the two cropping seasons, which is only possible by assured irrigation. Normally, the *Rabi* season starts in mid-October and ends in mid-February while the *Kharif* season starts in mid-June and ends in mid-October. Although the average rainfall in Mizoram for the last five years is 2,455.80 mm, rainfall distribution is not uniform during all the seasons and a cultivator may need water at regular intervals, which may not be fulfilled by rainfall alone. Hence, proper crop planning is practical only when assured irrigation is available to the farmers, provided other inputs are available for all seasons. Keeping in view the availability of assured irrigation during the *Kharif*/monsoon and *Rabi*/non-monsoon seasons, a cropping pattern, along with the area proposed to be irrigated in each season in the command area, is given in Table 5.1 and Table 5.2. Agriculture Action Plan for achieving the cropping pattern is shown in Table 5.2.

Table 5.1 Cropping Pattern of Kanghlai MIP

Current Crop Proportion

Champai: Kanghai Current Cropping Pattern	Month												Area (ha)				
	J	F	M	A	M	J	J	A	S	O	N	D					
Paddy (Local/MANIPUR)																	
Paddy (Local/YAMIN)																	
Paddy (Local/tawi sang)																	
Paddy (Local/vui tawi)																	
Kharif season																	
Field Pea																	
Leafy Mustard																	
Rabi season																	
Total																	65.0

Proposed Crop Proportion

Kolasib: Dmului Proposed Cropping Pattern	Month												Area (ha)				
	J	F	M	A	M	J	J	A	S	O	N	D					
Paddy (Local/MANIPUR)																	
Paddy (Local/YAMIN)																	
Paddy (Local/tawi sang)																	
Paddy (Local/vui tawi)																	
Fish (at paddy field)																	
Kharif season																	
Onion																	
Mixed Crop: Potato and																	
Field Pea																	
Mixed Crop: Mustard Leaf and																	
French bean																	
Rabi season																	
Total																	71.7

Note: [Mixed Crop: Maize and French bean] Area of Maize and French bean is Maize 1.0 ha and French bean 0.6 ha into 1.0 ha (1.6ha into 1.0ha).

[Mixed Crop: Cauliflower & Leaf mustard] Area of Cauliflower and Leaf mustard is Cauliflower 1.0 ha and Leaf mustard 0.6 ha into 1.0 ha (1.6ha into 1.0ha)

Source: Prepared by MID

Table 5.2 Proposed Cropping Area

SI. No.	Crops	Command Area (ha)							Total
		CA 1	CA 2	CA 3	CA 4	CA 5	CA 6	Other	
	Gross Command Area	4.4	5.2	1.9	6.9	3.1	2.2	41.3	65.0
	Culturable Command Area	4.4	5.2	1.9	6.9	3.1	2.2	41.3	65.0
A.	Karif Crops (Mid Jun. to Mid Oct.)								
1	Paddy (MANIPUR)	1.1	1.3	0.5	1.8	0.8	0.6	10.4	16.5
2	Paddy (YAMIN)	1.1	1.3	0.5	1.7	0.8	0.6	10.3	16.3
3	Paddy (tawi sang)	1.1	1.3	0.5	1.7	0.8	0.5	10.3	16.2
4	Paddy (vui tawi)	1.1	1.3	0.4	1.7	0.7	0.5	10.3	16.0
5	Fish (at paddy field) (included number)	1.1	1.3	0.4	1.7	0.7	0.5	10.3	16.0
	Total	4.4	5.2	1.9	6.9	3.1	2.2	41.3	65.0
B.	Rabi Crops (Mid Oct. to Mid Feb.)								
1	Onion	0.2	0.2	0.1	0.3	0.2	0.1	1.3	2.4
2	Mixed Crop: Potato and Field Pea	0.2	0.2	0.1	0.3	0.1	0.1	1.2	2.2
3	Mixed Crop: Mustard Leaf and French bean	0.1	0.2	0.1	0.3	0.1	0.1	1.2	2.1
	Total	0.5	0.6	0.3	0.9	0.4	0.3	3.7	6.7

Source: Prepared by MID

5.2 Crop Water Requirement

Crop water requirement is derived on the basis of proposed cropping pattern for Kanghlai Minor Irrigation Project command area. Taking culturable command area as 23.7 ha, duration of crop and respective water requirement of various crops under consideration have been derived and given in Table 5.3. The discharge required for various crops are dispersed according to their cropping season as mentioned in Source: Prepared by MID Table 5.4.

Table 5.3 Crop Water Requirement

SI. No.	Crops	Req. (m)	Duration (day)	Req. (mm/d)	Discharge Required in cumecs							Total Discharge (m ³ /s)	Duty (ha/m ³ /s)
					CA 1 (m ³ /s)	CA 2 (m ³ /s)	CA 3 (m ³ /s)	CA 4 (m ³ /s)	CA 5 (m ³ /s)	CA 6 (m ³ /s)	Other (m ³ /s)		
A.	Karif Crops (Mid Jun. to Mid Oct.)												
1	Paddy (MANIPUR)	1.60	140	12	0.0015	0.0018	0.0007	0.0025	0.0011	0.0008	0.0144	0.0229	720
2	Paddy (YAMIN)	1.60	140	12	0.0015	0.0018	0.0007	0.0024	0.0011	0.0008	0.0143	0.0226	720
3	Paddy (tawi sang)	1.60	140	12	0.0015	0.0018	0.0007	0.0024	0.0011	0.0007	0.0143	0.0225	720
4	Paddy (vui tawi)	1.60	140	12	0.0015	0.0018	0.0006	0.0024	0.0010	0.0007	0.0143	0.0222	720
	Total				0.0061	0.0072	0.0026	0.0096	0.0043	0.0031	0.0574	0.0903	
B.	Rabi Crops (Mid Oct. to Mid Feb.)												
1	Onion	0.30	160	2	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0003	0.0006	4,320
2	Mixed Crop: Potato and Field Pea	0.50	95	6	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0008	0.0015	1,440
3	Mixed Crop: Mustard Leaf and French bean	0.35	83	5	0.0001	0.0001	0.0001	0.0002	0.0001	0.0001	0.0007	0.0012	1,728
	Total				0.0002	0.0003	0.0002	0.0005	0.0002	0.0002	0.0018	0.0033	

Note: 1) Mixed crop: Mixed Crop: Potato and Field Pea req. 0.50m, duration 95days, and req. 6 mm/d

Area is Potato 1.0 ha and Field Pea 0.6 ha into 1.0 ha (1.6ha into 1.0ha).

2) Mixed crop: Mustard leaf and French bean req. 0.35m, duration 83days, and req. 5 mm/d

Area is Mustard Leaf 1.0 ha and French bea 0.6 ha into 1.0 ha (1.6ha into 1.0ha).

Source: Prepared by MID

Table 5.4 Total Water Requirement (Command Area CA 1-6)**Command Area CA 1**

Sl. No.	Crops	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
A.	Karif Crops (Mid Jun. to Mid Oct.)													
1	Paddy (MANIPUR)							0.0015						
2	Paddy (YAMIN)							0.0015						
3	Paddy (tawi sang)							0.0015						
4	Paddy (vui tawi)							0.0015						
5	Fish (at paddy field)													
B.	Rabi Crops (Mid Oct. to Mid Feb.)													
1	Onion											0.0000		
2	Mixed Crop: Potato and Field Pea											0.0001		
3	Mixed Crop: Mustard Leaf and French bean											0.0001		
Total	Karif							0.0061						
	Rabi											0.0002		

Note: The total discharge required for monsoon period comes out to be $Q = 0.0061$ cumecs

The total discharge required for non-monsoon period comes out to be $Q = 0.0002$ cumecs

Command Area CA 2

Sl. No.	Crops	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
A.	Karif Crops (Mid Jun. to Mid Oct.)													
1	Paddy (MANIPUR)							0.0018						
2	Paddy (YAMIN)							0.0018						
3	Paddy (tawi sang)							0.0018						
4	Paddy (vui tawi)							0.0018						
5	Fish (at paddy field)													
B.	Rabi Crops (Mid Oct. to Mid Feb.)													
1	Onion											0.0000		
2	Mixed Crop: Potato and Field Pea											0.0001		
3	Mixed Crop: Mustard Leaf and French bean											0.0001		
Total	Karif							0.0072						
	Rabi											0.0003		

Note: The total discharge required for monsoon period comes out to be $Q = 0.0072$ cumecs

The total discharge required for non-monsoon period comes out to be $Q = 0.0003$ cumecs

Command Area CA 3

Sl. No.	Crops	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
A.	Karif Crops (Mid Jun. to Mid Oct.)													
1	Paddy (MANIPUR)							0.0007						
2	Paddy (YAMIN)							0.0007						
3	Paddy (tawi sang)							0.0007						
4	Paddy (vui tawi)							0.0006						
5	Fish (at paddy field)													
B.	Rabi Crops (Mid Oct. to Mid Feb.)													
1	Onion											0.0000		
2	Mixed Crop: Potato and Field Pea											0.0001		
3	Mixed Crop: Mustard Leaf and French bean											0.0001		
Total	Karif							0.0026						
	Rabi											0.0002		

Note: The total discharge required for monsoon period comes out to be $Q = 0.0026$ cumecs

The total discharge required for non-monsoon period comes out to be $Q = 0.0002$ cumecs

Command Area CA 4

Sl. No.	Crops	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
A.	Karif Crops (Mid Jun. to Mid Oct.)													
1	Paddy (MANIPUR)							0.0025						
2	Paddy (YAMIN)							0.0024						
3	Paddy (tawi sang)							0.0024						
4	Paddy (vui tawi)							0.0024						
5	Fish (at paddy field)													

B.	Rabi Crops (Mid Oct. to Mid Feb.)														
1	Onion														0.0001
2	Mixed Crop: Potato and Field Pea														0.0002
3	Mixed Crop: Mustard Leaf and French bean														0.0002
Total	Karif														0.0096
	Rabi														0.0005

Note: The total discharge required for monsoon period comes out to be $Q = 0.0096$ cumecs

The total discharge required for non-monsoon period comes out to be $Q = 0.0005$ cumecs

Command Area CA 5

Sl. No.	Crops	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
A.	Karif Crops (Mid Jun. to Mid Oct.)													
1	Paddy (MANIPUR)							0.0011						
2	Paddy (YAMIN)							0.0011						
3	Paddy (tawi sang)							0.0011						
4	Paddy (vui tawi)							0.0010						
5	Fish (at paddy field)													
B.	Rabi Crops (Mid Oct. to Mid Feb.)													
1	Onion													0.0000
2	Mixed Crop: Potato and Field Pea													0.0001
3	Mixed Crop: Mustard Leaf and French bean													0.0001
Total	Karif													0.0043
	Rabi													0.0002

Note: The total discharge required for monsoon period comes out to be $Q = 0.0043$ cumecs

The total discharge required for non-monsoon period comes out to be $Q = 0.0002$ cumecs

Command Area CA 6

Sl. No.	Crops	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
A.	Karif Crops (Mid Jun. to Mid Oct.)													
1	Paddy (MANIPUR)							0.0008						
2	Paddy (YAMIN)							0.0008						
3	Paddy (tawi sang)							0.0007						
4	Paddy (vui tawi)							0.0007						
5	Fish (at paddy field)													
B.	Rabi Crops (Mid Oct. to Mid Feb.)													
1	Onion													0.0000
2	Mixed Crop: Potato and Field Pea													0.0001
3	Mixed Crop: Mustard Leaf and French bean													0.0001
Total	Karif													0.0031
	Rabi													0.0002

Note: The total discharge required for monsoon period comes out to be $Q = 0.0031$ cumecs

The total discharge required for non-monsoon period comes out to be $Q = 0.0002$ cumecs

Command Area CA 1-6 Total

Sl. No.	Crops	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
A.	Karif Crops (Mid Jun. to Mid Oct.)													
1	Paddy (MANIPUR)							0.0144						
2	Paddy (YAMIN)							0.0143						
3	Paddy (tawi sang)							0.0143						
4	Paddy (vui tawi)							0.0143						
5	Fish (at paddy field)													
B.	Rabi Crops (Mid Oct. to Mid Feb.)													
1	Onion													0.0003
2	Mixed Crop: Potato and Field Pea													0.0008
3	Mixed Crop: Mustard Leaf and French bean													0.0007
Total	Karif													0.0574
	Rabi													0.0018

Note: The total discharge required for monsoon period comes out to be $Q = 0.0574$ cumecs

The total discharge required for non-monsoon period comes out to be $Q = 0.0018$ cumecs

Source: Prepared by MID

Table 5.5 Water requirement for each crop

Crops		Water Requirement (m) a.	Duration (day) b.	Water Requirement (mm/d) c.=a./b.*1000
Group 1	Paddy	1.60	140	12
Group 2	Cabbage	0.45	110	5
	Knol-khol (Kohlrabi)	0.45	100	5
Group 3	Leaf Mustard	0.20	50	4
	Seamum	0.30	90	4
	Lettuce	0.30	75	4
	Potato	0.35	105	4
	Table beet	0.40	125	4
Group 4	Cow Pea	0.25	95	3
	Lady's finger	0.30	125	3
	Soya Bean/French Bean	0.25	115	3
	Field pea	0.25	85	3
	Chilly	0.40	195	3
	Brinjal	0.35	145	3
	Tomato	0.40	140	3
	Broccoli	0.30	130	3
	Cauliflower	0.30	130	3
	Coriander	0.30	125	3
Group 5	Onion	0.30	160	2

Source: Prepared by MID

Chapter 6 Cost Estimate

The cost estimates have been framed to show the probable cost for the execution of the Dumlui Minor Irrigation Project as per the actual requirement and measurement at the proposed site. The rates adopted for various items are based on the SOR 2013 of Mizoram PWD.

Table 6.1 Abstract of Cost

Sl.No	MINOR HEAD	UNIT	AMOUNT
1	DIRECT CHARGES		
	I - Works	INR	12,820,900.00
	II - Establishment - 2% of I-works	INR	256,418.00
	III - Ordinary Tools & Plants	INR	8,480.00
	IV - Suspense	INR	-
	V - Receipt & Recoveries	INR	-
	Sub-Total	INR	13,085,798.00
2	INDIRECT CHARGES		
	I - Capitalized value of abatement of land revenue	INR	-
	II - Audit and Account@ 1%I-Works	INR	128,209.00
	Sub-Total	INR	128,209.00
	Gross estimated cost of the project	INR	13,214,007.00
	Total Cost	INR	13,214,007.00
	SAY	INR	13,214,000.00

Source: Prepared by MID

Chapter 7 Benefit Cost Ratio

7.1 Direct and Indirect Benefits

The scheme envisages direct as well as indirect benefits to 41 farmers having WRC area within the command area of the project. These 41 families, who otherwise have to slash down the forest area for *jhumming*, will have a sustainable farming system as an alternative to traditional *jhum* system of cultivation after completion of the project. Thus, the project will contribute in maintaining ecological balance through conservation of forest by families involved in *jhumming* every year.

7.2 B/C Ratio

The B/C ratio for the scheme has been worked out by considering the net annual value of agricultural production and the annual cost. Agricultural production before irrigation has been considered as per the cropping pattern presently practised and the data collected from the local farmers in the command area of the scheme.

The annual yield per hectare of various crops and its prices has been collected from the Agriculture Department and Department of Economics and Statistics, Government of Mizoram.

On the implementation of the scheme, the potential area for cultivation increases to 71.7 ha and the proposed cropping pattern envisages utilization of two seasons, namely, *Kharif* and *Rabi* season, resulting in a maximum potential utility area of 71.7 ha. The total annual benefit accrued post project has been derived in monetary terms.

Table 7.1 Calculation of Benefit Cost Ratio
CALCULATION OF BENEFIT COST RATIO
KANGHLAI MINRO IRRIGATION PROJECT
CHAMPHAI DISTRICT

1. Total Estimated cost of the Project	132.14	(lakhs)
2. Total cost of the headworks		
a1. Diversion weir (0 nos.)	0	(lakhs)
a2. Intake (0 nos.)	0	(lakhs)
a3. Desiltation tank (0 nos.)	0	(lakhs)
Total headwaorks		0 (lakhs)
3. GCA	65.0	(ha)
4. CCA	65.0	(ha)

SN	Description	Pre-Project (lakhs)	Post-Project (lakhs)
1	a. Gross Receipts Gross annual receipts (estimated value of farm produce)	50.96	115.97
	b. Expenses (Cost of Production)	16.14	26.04
	c. Net Value of Farm Produce (a.-b.)	34.82	89.93
2	d1. Estimated Annual Benefits after Project Completion (Post benefits - Pre benefits)	-	55.11
3	Annual Cost		
	d2. Interest on capital @ 10% of total cost of the project	-	13.21
	e. Depreciation of the project @ 4% of the project cost	-	5.29
	f. Annual operation & maintenance const @ Rs 1,175.00 per ha of CCA	-	0.76
	g. Maintenance cost of head works @ 1% of cost of head works	-	0.00
	h. Total Annual Cost (∑ d2. ~g.)	-	19.26
	i. <u>Benefit Cost Ratio (d1./h.)</u>	-	2.86
	j. Potential to be Created (ha)		6.7
	k. Total Project Cost per Hectare (1./4.)		2.03

Source: Prepared by MID

Table 7.2 Estimated value of crop produce before implementation

Kanghlai Minor Irrigation Project, Champai

Gross Command Area

65.0 ha

Culturable Command Area

65.0 ha

SN	Name of crop	Area (ha)	Duration (day)	Production		Produce				Net Profit (Rs)
				Cost (Rs/ha)	Total (Rs)	Yield (ton/ha)	Total Yield (ton)	Rate (Rs/ton)	Total Value (Rs)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
A. Karif Crops (Mid Jun. to Mid Oct.)										
1	Paddy (Local/MANIPUR)	16.5	140	24,825	409,613	2.800	46.200	28,000	1,293,600	883,988
2	Paddy (Local/YAMIN)	16.3	140	24,825	404,648	2.800	45.640	28,000	1,277,920	873,273
3	Paddy (Local/tawi sang)	16.2	140	24,825	402,165	2.800	45.360	28,000	1,270,080	867,915
4	Paddy (Local/vui tawi)	16.0	140	24,825	397,200	2.800	44.800	28,000	1,254,400	857,200
B. Rabi Crops (Mid Oct. to Mid Feb.)										
1	Field Pea	0.0	85							
2	Leafy masturd	0.0	50							
Total										
		65.0			1,613,625				5,096,000	3,482,375

District Agriculture Officer
Lunglei District
Department of Agriculture

Executive Engineer
Champhai Irrigation Division
Champhai

Source: Prepared by MID

Table 7.3 Estimated value of crop produce after implementation

Kanghlai Minor Irrigation Project, Champai

Gross Command Area

65.0 ha

Culturable Command Area

65.0 ha

SN	Name of crop	Area (ha)	Duration (day)	Production		Produce				Net Profit (Rs)
				Cost (Rs/ha)	Total (Rs)	Yield (ton/ha)	Total Yield (ton)	Rate (Rs/ton)	Total Value (Rs)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
A. Karif Crops (Mid Jun. to Mid Oct.)										
1	Paddy (Local/MANIPUR)	16.50	140	30,417	501,881	3.600	59.400	28,000	1,663,200	1,161,320
2	Paddy (Local/YAMIN)	16.30	140	30,417	495,797	3.600	58.680	28,000	1,643,040	1,147,243
3	Paddy (Local/tawi sang)	16.20	140	30,417	492,755	3.600	58.320	28,000	1,632,960	1,140,205
4	Paddy (Local/vui tawi)	16.00	140	30,417	486,672	3.600	57.600	28,000	1,612,800	1,126,128
5	Fish (at paddy field) (included number)	16.00		12,500	200,000	0.425	6.800	300,000	2,040,000	1,840,000
B. Rabi Crops (Mid Oct. to Mid Feb.)										
1	Onion	2.40	160	40,829	97,990	12.800	30.720	28,000	860,160	762,170
2	Mixed Crop: Potato and Field Pea									
	Potato	2.20	105	81,200	178,640	16.000	35.200	21,000	739,200	560,560
	Field Pea	1.32	85	23,102	30,495	6.400	8.448	22,000	185,856	155,361
3	Mixed Crop: Mustard Leaf and French bean									
	Mustard Leaf	2.10	50	34,330	72,093	24.000	50.400	18,000	907,200	835,107
	French bean	1.26	115	37,753	47,569	8.000	10.080	31,000	312,480	264,911
Total										
		74.28			2,603,891				11,596,896	8,993,005

Area of Potato and Field Pea is Potato 2.20 ha and Field Pea 1.32 ha into 2.20 ha (3.52 ha into 2.20 ha).

Area of Mustard leaf and French bean is Mustard Leaf 2.10 ha and French bean 1.26ha into 2.10 ha (3.36 ha into 2.10 ha)

District Agriculture Officer
Lunglei District
Department of Agriculture

Executive Engineer
Champhai Irrigation Division
Champhai

Source: Prepared by MID

Table 7.6 Estimated values of fish culture production AFTER the implementation of the Kanghlai Scheme (2015-Onwards)

SN	Description	Area ** (Ha)	Duration (months)	Production Cost		Produce				Net Profit (INR)
				Cost/Ha (INR/Ha)	Total cost (INR)	Yield (ton/ha)	Total Yield (Ton)	Rate/Ton (INR/Ton)	Total value	
1	2	3	4	5	6	7	8	9	10	11
	Rice-Fish Culture	16.00	7-8months	12,500	200,000	0.425	6.80	300,000	2,040,000	1,840,000

Note: 2) Mono-culture of common carp will be continued as it is a preferred fish species for cultivation by the farmers and also it commands high price.

3) Good quality fingerlings of common carps are produced locally by a few fish farmers, although the production is not sufficient.

4) Assumptions:

a) With the project a few more fish farmers would commence fry/fingerling production to meet the shortage.

b) Farmers would prepare or dig appropriate fish refuge ditches to keep and extend the culture period to 7 or 8 months (currently around 5 months).

c) With the fish refuge ditches, partial harvest of marketable fishes would be conducted & under-size fishes could be allowed to grow along with an addition of 250 fingerlings stocked. The preferred size of the additional fingerlings must be more than 6 inches.

d) Size of fingerlings is around 5 inch and cost is INR10 per fingerling.

e) Survival rate of stocked fingerlings is 85%.

f) Average fish size harvested would be more than 250 g, say 400 g/fish.

g) Farmgate price is INR 300/kg.

. Source: Prepared by MID

Chapter 8 Construction Programme & Planning

8.1 General

Construction materials required for the construction of various components of the scheme (rehabilitation of intake, irrigation channel, farm pond, etc.) mainly bricks, stones, coarse aggregate, sand, and G. I. pipes, will be procured from approved firms and supplied and delivered at the site. Since the quantity of materials required for construction is very small, most of the materials are proposed to be collected from Kolasib Town, which is in the vicinity of the project. The project, as mentioned earlier, is connected to a fair weather road and there will be no difficulty in transportation of the materials to be used for the construction project.

8.2 Construction Planning

The total quantity of work involved in the construction of the scheme is small since the scheme envisages rehabilitation of intake and construction of irrigation channel, farm pond, etc. Materials required for construction of the project is available in the vicinity of the project.

Detailed construction plan is shown in the attachment.

Chapter 9 Command Area Development

9.1 Land Consolidation

Nil

9.2 Link Road

Nil

9.3 Rive Improvement

Nil

9.4 Others

Nil

Chapter 10 Quality Control Aspect

10.1 Quality Control Aspect

Quality control plays a very important part in the construction of irrigation components. So many steps have been taken up to make sure the quality of farm structure as well as off farm structure are constructed according to the standard in the DPR. Some of the beneficial steps taken up in order to improve the quality of the irrigation structure are as follows:

- The engineer in charge visits the construction site periodically and checks the component whether it is constructed and designed according to the technical specifications or not.
- The water users/farmers are required to visit the construction site during the construction phase of components like reservoir, intake, and channel in their respective land.

Detailed quality control plan is shown in the attachment.

Chapter 11 Water Users' Association and O&M Activities

Participation of project beneficiaries has assumed vital role in successful implementation of Minor Irrigation Schemes in Mizoram. To enhance sense of ownership and responsibilities, prospective beneficiaries are involved right from the stage of project formulation to post-project management after completion of the project. Besides, participations of project beneficiaries promote transparency of minor irrigation schemes.

Prospective project beneficiaries are involved in the process of project formulation through their active participation in survey & investigation and assessment of their development needs which may be covered by minor irrigation scheme within the prevailing norms and guidelines. For taking up new project, due care and consideration to identify development needs and aspirations of the farmers are taken by having joint field visits and series of discussions and/or interactions with the prospective project beneficiaries before preparation and finalization of DPR.

Water Users Associations are formed once the project beneficiaries are identified and they extend active participation in supervision of works during the stage of project implementation.

On completion of the projects, Water Users Associations share the responsibilities of operation & maintenance of irrigation structures - while Water Users Association assume the responsibilities of operation of irrigation structures and allotment of irrigation water, Minor Irrigation Department execute works on repairs and reconstruction of damaged irrigation structures with active participation and contribution in the form of labour from the project beneficiaries.

WUA Basic rule and O&M Plan were prepared through workshop with beneficiaries and the rule and the plan are shown Table 11.1.

Table 11.1 Details of Beneficiaries

Sl.No	Name	Address
1	C.Chawngthansanga	Champhai
2	Rolura Sailo	Champhai
3	F.Aizika	Champhai
4	Chawngthuama	Champhai
5	F.Roliana	Champhai
6	F.Rothangpuii	Champhai
7	R.C Thavunga	Champhai
8	Kapbuaia	Champhai
9	F.Sawiluiaia	Champhai
10	Lalthansanga	Champhai
11	F.Rothanga	Champhai
12	Chhuanawma	Champhai
13	R.Lalrintluanga	Champhai
14	Dengrikhuma	Champhai
15	Rorehlova Sailo	Champhai
16	Vanlalhruaia	Champhai
17	Rohnaa Sailo	Champhai
18	K.Zoramkhuma	Champhai
19	C.Lalhmingthanga	Champhai
20	F.Vanlalchhuana	Champhai
21	Hrangchungnunga	Champhai
22	C.Lalawmpuia	Champhai
23	Rev.Lalthanga(L)	Champhai
24	Lalnunmawia	Champhai
25	C.Sualneka	Champhai
26	Chalchungnunga	Champhai
27	J.Lalnunzira	Champhai
28	C.Sangtuala	Champhai
29	F.Pachhunga	Champhai
30	Chawngkhuma	Champhai
31	K.Lalvela	Champhai
32	Lianhmingthanga	Champhai
33	Lalzapi	Champhai
34	H.Biakzama	Champhai
35	Laldingliana	Champhai
36	H.Zadinga	Champhai
37	K.Lalduha	Champhai
38	Ropianga	Champhai
39	Huansanga	Champhai
40	H.Lalzova	Champhai
41	K.Pachhunga	Champhai

Source: Prepared by MID

WUA Basic Rule

Name: Kanghlai Water User Association

Objectives:

- (1) Progression of every member,
- (2) Upliftment of each member,
- (3) Self-sufficiency, and
- (4) Increase in production.

Members:

Those having lands in the area (Kanghlai)

Election of leaders:

Chairman, vice chairman, secretary, assistant secretary, treasurer, and financial secretary. Committee members will be composed of all the members.

Rules and regulations:

- (1) Chairman
- (2) Vice chairman
- (3) Secretary
- (4) Assistant secretary
- (5) Treasurer
- (6) Financial secretary

The leaders will hold their post for a two-year term. A member cannot hold their post for more than two terms. Two-thirds of members should be present for election.

Fund:

- (1) Membership fee – Rs.50
- (2) Annual fee – Rs.100
- (3) There should be an auditor to audit the money

Activities:

- (1) Voluntary social work

Meeting:

- (1) Meeting once a month.
- (2) Meeting whenever necessary.
- (3) General meeting once a year.

Loans:

- (1) Loans can be borrowed from the association.
- (2) Interest on loans should be paid at 1%/month.
- (3) Loans should be paid in full in one year.

Disciplinary action:

- (1) Members should participate in voluntary social works.
- (2) Absentees shall be fined Rs.100 each.
- (3) Those absent without an excuse will be fined Rs.250 each.
- (4) Those not attending three consecutive meetings (without excuse) will be charged Rs.500.

Note: WUA basic rules can be changed/amended/added on. General meeting to be held if required.

Operation and Maintenance Plan

1. Outline of WUA

1.1 Name of MIP : KANGHLAI MIP

1.2 Name of WUA : KANGHLAI ZAU WUA

1.3 Location of WUA : CHAMPHAI Division : CHAMPHAI IRRIGATION DIVISION

Village/Town : TLANGSAM, CHAMPHAI

1.4 Command Area : 27 Ha

Command Area (ha)				Beneficiary (household)
Paddy	Upland	Orchard	Total	
65.0	-	-	65.0	41 nos

2. List of facilities managed by WUA

SN.	Name of Facilities	Completion Year (Plan)	Outline of Facilities	
			Structure	Dimension
1	Main Channel 1-6	2017	Stone masonry, cement lining	L=2780 m
2	Distribution Channel	2017	Stone masonry, cement lining	L=3000m
3	Turnout facility	2017	Stop valve 25mm	60 nos.
4				
5				

3. Operation and Maintenance Plan

SN.	Name of Facilities	Items	Implementer	Frequency	Schedule													
					Jan.	Feb.	Mar.	Apr.	May	Jun	Jnl.	Aug.	Sep.	Oct.	Nov.	Dec.		
1	Main Channel 1 -6	Patrol	Member of WUA	Every month	■	■	■	■	■	■	■	■	■	■	■	■	■	
		Water management	Member of WUA	Every day	█													
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■	■	■	■	■	■	■	■	■	■	■	■	■
			Removing weeds	All beneficiaries	4 times per year			■			■			■			■	
2	Distribution Channel	Patrol	Member of WUA	Every month	■	■	■	■	■	■	■	■	■	■	■	■	■	
		Water management	Member of WUA	Every day	█													
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■	■	■	■	■	■	■	■	■	■	■	■	■
			Removing weeds	All beneficiaries	4 times per year			■			■			■			■	
3	Turnout facility	Patrol	Member of WUA	Every month	■	■	■	■	■	■	■	■	■	■	■	■	■	
		Water management	Member of WUA	Every day	█													
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■	■	■	■	■	■	■	■	■	■	■	■	■
			Removing weeds	All beneficiaries	4 times per year			■			■			■			■	
					Dry (Rabi)			Summer			Rainy (Kharif)			Dry (Rabi)				

Date: _____ Place: _____
 Checked by: _____ (Sub-Divisional Engineer) Prepared by: _____ (Junior Engineer and WUA) Countersigned by: _____ (Executive Engineer)

Annexure

1. Survey & Investigation

1.1 Soil Classification

Soil classification test(in site)		Surveyed Date	28/Oct. /2014
Scheme Name	Kanghlai MIP	Name of Surveyor	SDO and JE (Champhai)

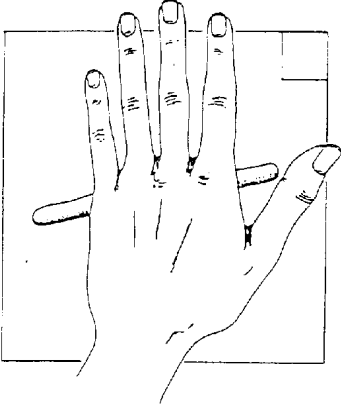
Instruction

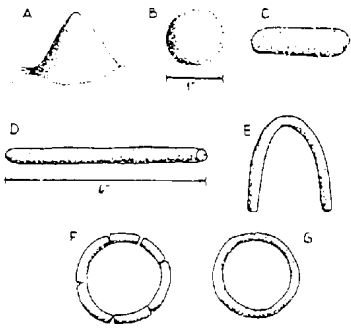
1) Visit the survey together with village chairperson and villagers.
 Visit the proposed area and choose typical soil in the area with the consultation of the village chairperson and villagers.

2) Sampling of the soil
 Gather a soil sample from the soil surface (sample should be about 10 x 10 x 10 cm).

3) Knead the soil with water.
 Add some water to the soil sample so it is moist but not wet. Knead it well. Pebbles should be removed.

4) Try to create ring shapes with the soil sample and choose the most advanced shape that can be made.





A: Soil can only be shaped into a cone. No other shapes hold together.

B: Soil can be formed into a circle, but not a rod shape.

C: Soil can be formed into a stout rod shape.

D: A thin rod (about 6 mm diameter) can be formed but not bent.

E: Thin rod can be bent without breaking

F: Circle can be formed with some breaks.

G: Complete circle with no breaks can be formed.

5) Evaluate the soil texture
 According to the result of 4), circle one of the detailed soil texture types and choose a General soil texture type by conversion of the detailed soil texture type.

Detail soil texture type	conversion	General soil texture type
Shape A Sand <input type="checkbox"/>	if you choose Shape A →	Sand <input type="checkbox"/>
Shape B Loamy sand <input type="checkbox"/>	if you choose Shape B or C →	Sandy Loam <input type="checkbox"/>
Shape C Silty Loam <input type="checkbox"/>		
Shape D Loam <input type="checkbox"/>	if you choose Shape D or E →	Clay Loam <input checked="" type="checkbox"/>
Shape E Clay Loam <input checked="" type="checkbox"/>		
Shape F Light Clay <input type="checkbox"/>	if you choose Shape F or G →	Clay <input type="checkbox"/>
Shape G Heavy Clay <input type="checkbox"/>		

6) Notable Soil Characteristics
 If there are any notable soil characteristics such as high rock outcrop, shallow soil depth and symptom of salt accumulation, please note.
 Note:

Note: Picture of the test is to be attached in following.



Test



Result

1.2 Measurement of stream discharge

Date of Measurement	25. October 2014
Surveyor	SDOs and JE
Measured discharge	9.67 (L/S)

Picture



Test



Result

1.3 Household Survey

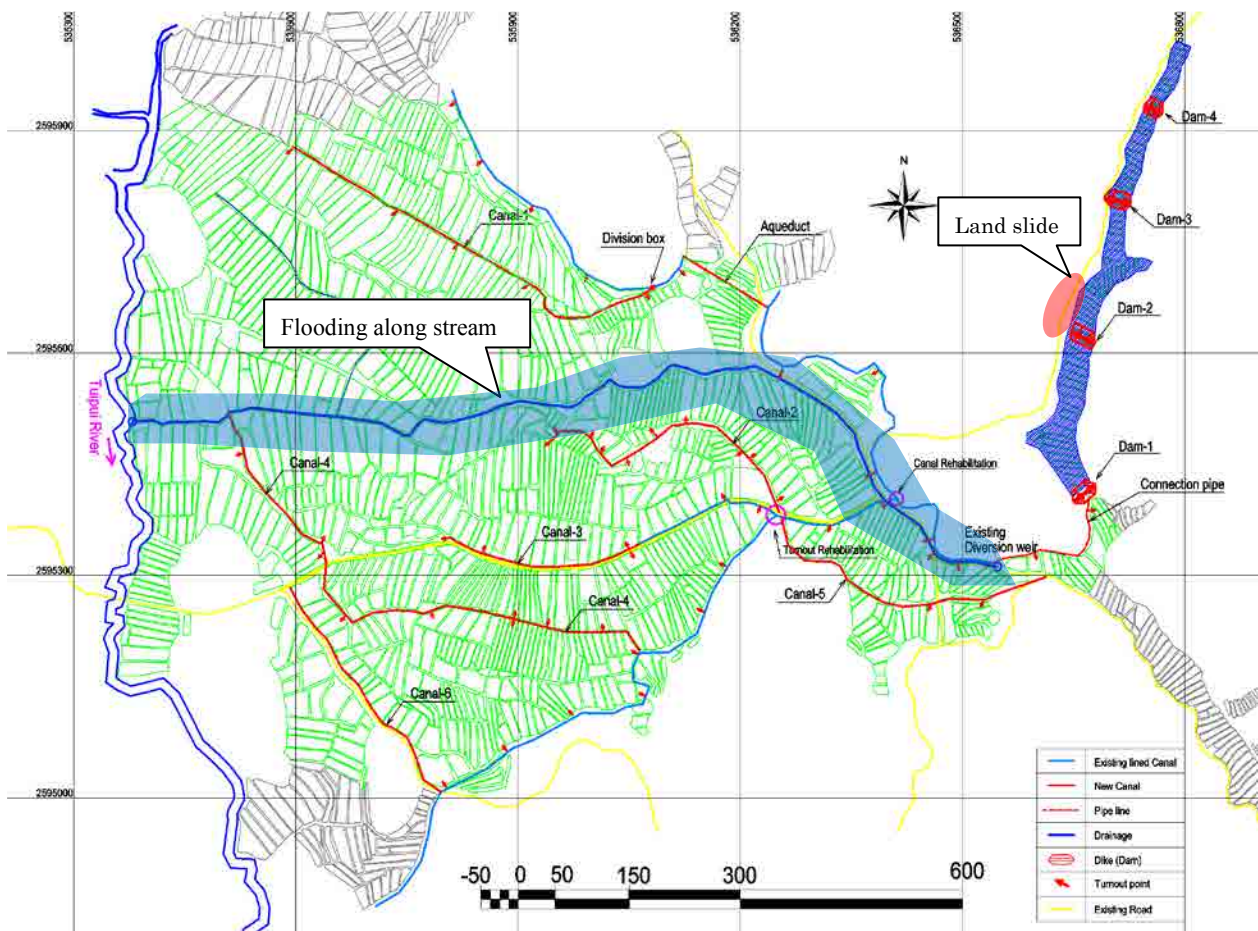
No	Residence		Land (acre)							
	Town / Village	District	Jhum	Irrigated / Wetland	Permanent rainfed	Fallow	Fish pond	Residential	Others	Total
C-1	Champhai	Champhai								
C-2	Champhai	Champhai		0.800						0.800
C-3	Champhai	Champhai								
C-4	Champhai	Champhai		6.300	4.600			0.670		11.570
C-5	Champhai	Champhai		5.000						5.000
C-6	Champhai	Champhai								
C-7	Champhai	Champhai		0.670	0.010			0.060		0.740
C-8	Champhai	Champhai		1.000						1.000
C-9	Champhai	Champhai		0.800						0.800
C-10	Champhai	Champhai								
C-11	Champhai	Champhai		0.870			0.300			1.170
C-12	Champhai	Champhai		0.930			0.040			0.970
C-13	Champhai	Champhai	0.670							0.670
C-14	Champhai	Champhai		0.670						0.670
C-15	Champhai	Champhai								
C-16	Champhai	Champhai		3.800			0.350	0.560		4.710
C-17	Champhai	Champhai		1.600						1.600
C-18	Champhai	Champhai		0.530						0.530
		1 Total	0.670	22.970	4.610	-	0.690	1.290	-	30.230
		(%)	2	76	15	-	2	4	-	100
		Average	0.670	1.914	2.305	-	0.230	0.430	-	2.325
		Median	0.670	0.900	2.305	-	0.300	0.560	-	0.970
		Max	0.670	6.300	4.600	-	0.350	0.670	-	11.570
		Min	0.670	0.530	0.010	-	0.040	0.060	-	0.530

1.4 DPR Preparatory Survey check sheet (For MID Engineer)

Scheme Name		Kanghlai MID scheme		S/N	1
Survey Date		27/09/2014	Name of surveyor/ Position	Champhai Minor Irrigation Division	
S/N	Items	Content		Check	Remarks
1	Preparation of Base Map	<ul style="list-style-type: none"> • Creation of Contour Map with GIS. • Trace existing facilities like paddy, road, river. in Google earth. And save the data. • Save Google earth picture data. It is recommendable to use Google earth Pro for better resolution data. • Merge above three map data and prepare base map with CAD. • Conduct walking survey and confirm existing facilities to modify the base map. 		√	
2	Clarification of land owners	<ul style="list-style-type: none"> • Clarification of land owners and boundaries through meeting and joint walkthrough survey. • Collected information are to be mapped on the base map 		√	
3	Soil Clarification	<ul style="list-style-type: none"> • Take several soil samples from farm. • Site soil testing is to be conducted. And take pictures. 		√	
4	Bearing Capacity	<ul style="list-style-type: none"> • Take several measurement of bearing capacity at several sites, like Diversion, tank and canal, using simple portable tool. 		√	No high bearing capacity structure
5	Slope Soil Conditions along canal	<ul style="list-style-type: none"> • Walk through field soil survey at intake point and along main canal to identify of possible land-sliding areas and estimate risk of sliding. • Result of the survey is to shown in above Base Map and will be reflected to facility planning and designing. 		√	Refer to annex for example map.
6	Topological Survey	<ul style="list-style-type: none"> • River centreline level survey to identify suitable point for intake and expect future change of river bed. • Cross-leveling Survey at several typical points along canal. • Longitudinal levelling along gentle slope canal. • Total station survey around farm pond and gentle slope farm development area. 		√	Along stream and dam site

7	Available surface water	<ul style="list-style-type: none"> • Measurement of discharge water at candidate intake points. • Take measurement of catchment area of each stream with GIS or CAD. • Make rough estimation of season wise discharge water and confirm with farmers. 	√	Refer to annex for methodology of simple water measurement and rough estimation of discharge.
10	Preparation of Layout map	<ul style="list-style-type: none"> • Preparation of first draft facility layout map on base map. • Confirm the draft plan with beneficiaries. 	√	

Land sliding, Flooding and Erosion Survey result



Annexure

2. Hydrology

2.1 Rainfall Record

Monthly rainfall record under Agriculture & Minor Irrigation Department

District: Champhai
Name of Station: Champhai

Annexure - A: Monthly rainfall data recorded at Champhai station under Dept. Of Agriculture, Govt. Of Mizoram.

Year\Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1998	48.00	22.00	103.00	128.00	322.00	293.00	326.00	490.00	299.00	78.00	7.00	-	2,116.00
1999	-	-	25.00	42.00	380.00	296.00	454.00	276.00	458.00	228.00	12.00	25.00	2,196.00
2000	20.00	11.00	90.00	162.00	363.00	191.00	242.00	398.00	369.00	102.00	37.00	-	1,985.00
2001	-	20.00	11.00	53.00	287.00	318.00	182.00	217.00	200.00	239.00	105.00	-	1,632.00
2002	13.00	-	39.00	122.00	322.00	257.00	393.00	314.00	250.00	42.00	90.00	-	1,842.00
2003	-	-	53.00	111.00	215.00	563.00	223.00	223.00	214.00	162.00	-	28.00	1,792.00
2004	-	-	12.00	333.00	128.00	414.00	494.00	190.00	376.00	78.00	7.00	-	2,032.00
2005	-	-	111.00	98.00	172.00	184.00	203.00	285.00	267.00	305.00	5.00	20.00	1,650.00
2006	-	4.00	-	20.00	407.00	656.00	308.00	39.00	221.00	77.00	-	-	1,732.00
2007	-	73.00	2.00	273.00	237.00	404.00	330.00	367.00	459.00	177.00	116.00	-	2,438.00
2008	80.00	7.00	33.00	2.00	132.00	297.00	406.00	470.00	390.00	138.00	41.00	-	1,996.00
2009	-	-	5.00	112.30	113.00	378.00	271.30	448.00	300.00	197.00	40.90	-	1,865.50
2010	-	-	142.00	200.00	292.00	318.00	439.00	313.00	653.00	278.00	15.00	75.00	2,725.00
2011	37.00	-	53.00	122.00	266.00	436.80	342.80	321.60	217.00	276.30	-	-	2,072.50

2.2 Annual Average Yield

Annual Discharge of Kanghlai Minor Irrigation Project

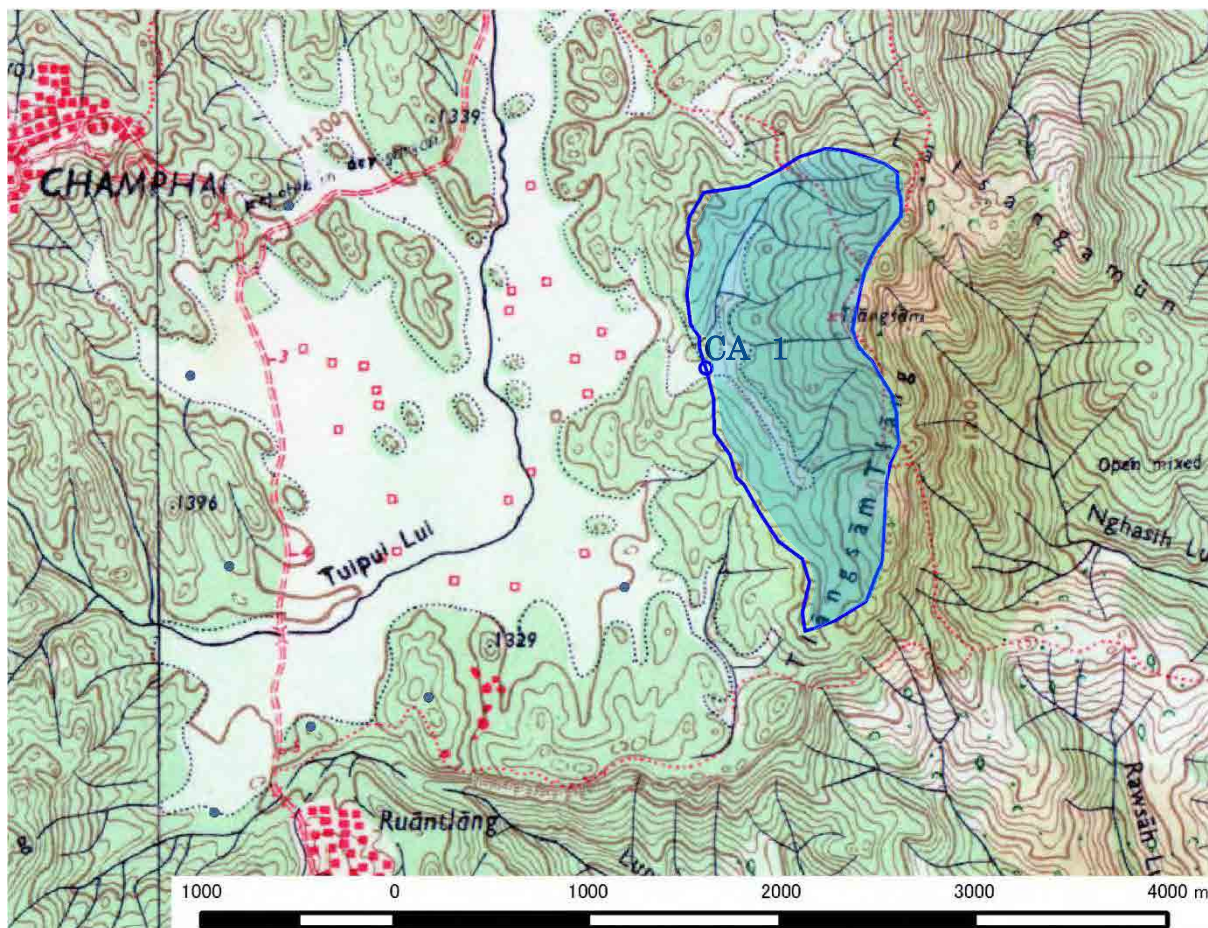
District: Champhai
Name of Station: Champhai

Year\Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1998	0.015	0.007	0.031	0.040	0.097	0.092	0.099	0.148	0.093	0.024	0.002	0.000	0.054
1999	0.000	0.000	0.008	0.013	0.115	0.093	0.137	0.083	0.143	0.069	0.004	0.008	0.056
2000	0.006	0.004	0.027	0.051	0.110	0.060	0.073	0.120	0.115	0.031	0.012	0.000	0.051
2001	0.000	0.007	0.003	0.017	0.087	0.099	0.055	0.066	0.063	0.072	0.033	0.000	0.042
2002	0.004	0.000	0.012	0.038	0.097	0.080	0.119	0.095	0.078	0.013	0.028	0.000	0.047
2003	0.000	0.000	0.016	0.035	0.065	0.176	0.067	0.067	0.067	0.049	0.000	0.008	0.046
2004	0.000	0.000	0.004	0.104	0.039	0.129	0.149	0.057	0.118	0.024	0.002	0.000	0.052
2005	0.000	0.000	0.034	0.031	0.052	0.058	0.061	0.086	0.083	0.092	0.002	0.006	0.042
2006	0.000	0.001	0.000	0.006	0.123	0.205	0.093	0.012	0.069	0.023	0.000	0.000	0.044
2007	0.000	0.024	0.001	0.085	0.072	0.126	0.100	0.111	0.143	0.054	0.036	0.000	0.063
2008	0.024	0.002	0.010	0.001	0.040	0.093	0.123	0.142	0.122	0.042	0.013	0.000	0.051
2009	0.000	0.000	0.002	0.035	0.034	0.118	0.082	0.135	0.094	0.060	0.013	0.000	0.048
2010	0.000	0.000	0.043	0.063	0.088	0.099	0.133	0.095	0.204	0.084	0.005	0.023	0.070
2011	0.011	0.000	0.016	0.038	0.080	0.137	0.104	0.097	0.068	0.084	0.000	0.000	0.053
Average	0.004	0.003	0.015	0.040	0.079	0.112	0.100	0.094	0.104	0.051	0.011	0.003	0.051

Annual Discharge = 0.051 m³/s Catchment area = 1.8 km²
= 1.617 MCM Runoff coefficient = 0.45

2.3 DRAINAGE MAP

Drainage Map



Catchment area

Area Name	Area (km ²)
CA-1	1.8

Annexure

3. Agriculture Action Plan

No	Action Item	Schedule																																				Responsibility	Assisted by													
		2015												2016												2017													Organization	Financial		Technical										
		M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F			(L. Rs.)	Source											
<i>Cultivation Season</i>																																																				
<i>Sub Target: Strengthening WUA (Group Formation)</i>																																																				
1	Mobilisation / capacity building of WUA																																				WUA															
	- Receiving training	■																																						MID / DOA												
	- Development of Rules & regulation		■																																						MID											
2	Consensus building among members																																								WUA / MID											
	- Agricultural activities																																									DOA / DOH										
	- O&M of irrigation system																																								MID											
	- Proposed plan of dam																																								MID											
3	Finalization of DPR																																								MID											
4	Trial of well irrigation system																																									WUA										
5	Improvement of irrigation facilities																																									IMD / WUA										
<i>Sub Target: Improvement of paddy cultivation</i>																																																				
1	Receiving training for improved technique																																											WUA								
2	Preparation of cultivation schedule																																												WUA / DOA							
3	Implementation of paddy cultivation along with the schedule																																												WUA							
<i>Sub Target: Horticulture</i>																																																				
1	Preparation of cultivation schedule																																													WUA / DOH						
2	- selection of strategic crops etc.																																													WUA / DOH						
3	Receiving training for selected crops																																														WUA / DOH					
4	Trail of group procurement system for farm-inputs																																															WUA				
5	Implementation of farm school at model farmers place																																															WUA / DOH				
6	Hold meeting for improvement of market system																																															WUA				
<i>Sub Target: Improvement of paddy cultivation at paddy field</i>																																																				
1	Preparation of Fish Refuge (Ditch/Trench)																																																	WUA		
2	Procurement & Stocking Fingerlings																																																	WUA		
3	Growing out																																																		WUA	
4	Receiving extension, training & technical assistance																																																			WUA
5	Harvesting																																																			WUA
6	Follow-up of recording & book-keeping																																																			WUA
9	Implement patrol system (for reduce poaching)																																																			WUA

Annexure

4. Environmental Conformity Check List

No.	Criteria	Check items	YES	NO
1	WATER AND PHYSICAL ENVIRONMENT	■ Is it sure that the project is not likely to affect or conflict with the existing water uses and water rights downstream?	√	
		■ Are awareness heightening campaigns undertaken, or going to be undertaken, for the proper handling and use of permitted fertilizers and pesticides by the farmers, of for promoting and facilitating organic farming?	√	
		■ Are the engine equipments for construction (trucks, others) and operation (water pumps if any) properly selected as to be in conformity with the national environmental emission standards for air quality and noise levels?	√	
2	FOREST	◇ Will the project encroach on a forest land?		√
		■ If it is planned that the project will encroach on forest land, a forestry clearance permit must be obtained from the Department of Environment and Forestry, and a compensatory afforestation plan must be prepared. Has a forestry clearance been submitted, or is it going to be done during the planning stage? <i>NOTE</i> <i>The principle of forestry clearance is that a non forest land equivalent in area to the forest land diverted for non-forestry use must be provided for compensatory afforestation and transferred to the Environment and Forest Department for notification as forest land. The forestry clearance procedure differs according to conditions like the size of the forest land for diversion.</i>		
3	PROTECTED AREAS	■ Is it sure that the project site is located outside any protected area? <i>NOTE</i> <i>A protected area is a National Park, a Wildlife Sanctuary, a Conservation Reserve, or a Community Reserve (Wildlife Protection Act 1972). Should also be considered as a protected area the following: Planned extension area of an existing protected area, planned or existing Eco-sensitive Zone (buffer zone around a protected area)</i>	√	
4	HUMAN SETTLEMENTS	◇ Will the project encroach on human settlements others than housing settlements, and possibly induce damages on or loss of such settlements,?		√
		◇ Will the project encroach on housing settlements, and possibly induce damages on or loss of such settlements? <i>NOTE</i> <i>Given the conditions of permanent housing hilltop or hillside, it is assumed that small scale irrigation projects are not likely to affect housing. It is however possible in specific cases.</i>		
		■ If it is confirmed that the project will encroach on human settlements, including housing settlements or not, and possibly induce damages on or loss of such settlements, are compensatory measures undertaken according to the legal requirements? <i>NOTE</i> <i>Compensation of land and assets must be performed at least according to the Mizoram Land Acquisition Rules 2010.</i>		
5	CULTURAL AND HISTORICAL SITES	■ Is it sure that the project site is not contiguous to, and is not likely to affect directly (physical damages) or indirectly (landscape), any protected monument or site notified by the Arts and Culture Department? <i>NOTE</i> <i>The Arts and Culture Department has notified a list of 82 protected monuments or sites</i>	√	
		■ Is it confirmed in discussion and coordination with the Village Council, that the project site does not encroach on any valuable existing cultural or historical asset or place of importance for the local community? <i>NOTE</i> <i>Valuable existing cultural or historical asset or place may include graves, sacred grooves, and any others.</i>	√	
6	LIVING ENVIRONMENT	■ Are opportunities of improvement of the living environment in relationship with irrigation works and in consultation with the local community fully taken into consideration for planning the project? <i>NOTE</i> <i>For example, if a water body or river site is used for washing or bathing, the construction of irrigation works can be an opportunity to improve the conditions of use and the conditions of access, particularly for users like vulnerable people, women, and children.</i>	√	
		■ Does planning of the project take into consideration the standpoint of the women of the community of concern, and more particularly the women in vulnerable condition, as for both criteria 4 and 7?		√

Annexure

5. Design Check List

Check List 1

Canal

| First Stage | : Basic Conditions

1. Outline

1.1 Land Use

 Paddy Upland Both

1.2 Type

 Open Channel Pipeline Both

1.3 Canal Type and Dimension

Name	Type	Length (m)	Flow (m ³ /s)	Slope	Remarks
Channel 1	Open Channel	545	0.015	1:20	
Channel 2	Open Channel	300	0.018	1:20	
Channel 3	Open Channel	265	0.007	1:20	
Channel 4	Open Channel	1,080	0.024	1:20	
Channel 5	Open Channel	420	0.011	1:20	
Channel 6	Open Channel	170	0.009	1:20	
Distribution Channel	Open Channel	3,000	0.012	1:20	

1.4 Supplementary facilities of Canals

Facilities	Number	Remarks
Divisin works		Nil
Regulating reservoir		Nil
Management Road		Nil
Culvert/Bridge		Nil
Regulator (gate)		Nil
Other ()		Nil

1.5 Consultation

1.5.1 River

 Need No need

1.5.2 Drinking Water

 Need No need

1.5.3 Other ()

 Need No need

2. Basic Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
1	Design purpose	1.1 Whether the purpose is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the scope, quantity, items of design are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	Basic design conditions	2.1 Whether the irrigation system is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.2 Whether the intake points are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.3 Whether the water users are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.4 Whether the consultation items are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	Field survey	3.1 Whether the pictures are taken.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.2 Whether the field conditions (topography, soil, landuse etc.) are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.3 Whether the river and road conditions are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.4 Whether the points of the planned main faciities are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.5 Whether the difficulty or issues are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.6 Whether the important points of the construction are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	Design plan	4.1 Whether the selected canal types are suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.2 Whether the facility layout is suiiable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.3 Whether the canal standard structure is suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.4 Whether the maintenance is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer)

Place : _____ Prepared by : _____ (Junior Engineer)

Countersigned by : _____ (Executive Engineer)

Check List 2

Canal

| Middle Stage | : Drawings

1. Detailed Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
	[Example]				
3	Drawings	3.1 Whether the cross drawings are prepared,	✓	✓	DPR Chapter 6
1	Design Plan (supplementary facility)	1.1 Whether the following supplementary facility layout and scale are suitable. - Division works - Regulator reservoir - Management road - Bridge/Culvert - Regulator (gate) - Other ()	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Nil Nil Nil Nil Nil Nil
2	Hydraulics Calculation	2.1 Whether the formulas and coefficients used in hydraulic calculation are suitable.	✓	✓	
3	Drawings	3.1 Whether the cross drawings are prepared, 3.2 Whether the drawings are consistent in hydraulics calculation. 3.3 Whether the indication of drawings is appropriate. 3.4 Whether the special mention is appropriate.	✓ ✓ ✓ ✓	✓ ✓ ✓ ✓	
4	Construction Plan	4.1 Whether the access road for construction is appropriate.	✓	✓	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer) Countersigned by : _____ (Executive Engineer)
Place : _____ Prepared by : _____ (Junior Engineer)

Check List 3

Canal

| Final Stage | : Quantity and DPR

1. Quantity

SN.	Items	Contents	Object	Confirmation	Reasons
	[Example]				
1	Quantity	1.2 Whether the quantity is prepared for each material.	✓	✓	DPR Chapter 6
1	Quantity	1.1 Whether the sizes used in the quantity calculation are consistent in the drawings. 1.2 Whether the quantity is prepared for each material and each facility.	✓ ✓	✓ ✓	

2. DPR

SN.	Items	Contents	Object	Confirmation	Reasons
	[Example]				
1	DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	✓	✓	DPR Contents
1	DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR". 1.2 Whether the reasons of the formulas and coefficients are wrote clearly. 1.3 Whether the calculation process are arranged clearly.	✓ ✓ ✓	✓ ✓ ✓	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer) Countersigned by : _____ (Executive Engineer)
Place : _____ Prepared by : _____ (Junior Engineer)

Check List 1

Pond 1

| First Stage | : Basic Conditions

1. Outline

1.1 Purpose	<input checked="" type="checkbox"/> Irrigation <input type="checkbox"/> Fisheries <input type="checkbox"/> Other					
1.2 Pond Dimension	1.2.1 Embankment	Length	35	Height	4	m
	1.2.2 Gross Catchment Area		75		ha	
	1.2.3 Reservoir Volume		Approx	40,000	cum	
	1.2.4 Command Area		65		ha	
1.3 Supplementary Facilities	1.3.1 Spillway	<input checked="" type="checkbox"/> Need <input type="checkbox"/> No need				
	1.3.2 Intake Facility	<input checked="" type="checkbox"/> Need <input type="checkbox"/> No need				
1.4 Consultation	1.4.1 River	<input type="checkbox"/> Need <input checked="" type="checkbox"/> No need		1.4.2 Drinking Water	<input type="checkbox"/> Need <input checked="" type="checkbox"/> No need	
	1.4.3 Fisheries	<input type="checkbox"/> Need <input checked="" type="checkbox"/> No need		1.4.4 Other ()	<input type="checkbox"/> Need <input checked="" type="checkbox"/> No need	

2. Basic Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
	[Example]				
3	Field survey	3.1 Whether the pictures are taken.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Annexure II
1	Design purpose	1.1 Whether the purpose is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the scope, quantity, items of design are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	Basic design conditions	2.1 Whether the water users are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.2 Whether the gross catchment and command area are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.3 Whether the layout of the embankment and supplementary facilities are appropriate as topography and irrigation.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.4 Whether the necessity of the emergency discharge is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.5 Whether the consultation items are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	Field survey	3.1 Whether the pictures are taken.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.2 Whether the land use of the plan site is grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.3 Whether the road conditions are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.4 Whether the difficulty or issues (downstream fisheries etc.) are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.5 Whether the borrow pit conditions are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.6 Whether the important points of the construction are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	Design plan	4.1 Whether the embankment layout is suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.2 Whether the embankment structure is suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.3 Whether the location and structure of the spillway are appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.4 Whether the location and structure of the intake facility are appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.5 Whether the land acquisition and compensation are confirmed.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.6 Whether the maintenance is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer)

Place : _____ Prepared by _____ (Junior Engineer)

Countersigned by : _____ (Executive Engineer)

Check List 2

Pond 1

[Middle Stage] : Drawings

1. Detailed Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
2	[Example] Construction Plan	2.1 Whether the access road for the construction is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 8
1	Drawings	1.1 Whether the layout and cross and profile drawings are prepared.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the water and ground level are shown.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.3 Whether the indication of the drawings is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.4 Whether the special mention is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	Construction Plan	2.1 Whether the access road for the construction is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.2 Whether the temporary drainage of the river is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer) Countersigned by : _____ (Executive Engineer)
Place : _____ Prepared by _____ (Junior Engineer)

Check List 3

Pond 1

[Final Stage] : Quantity and DPR

1. Quantity

SN.	Items	Contents	Object	Confirmation	Reasons
1	[Example] Quantity	1.2 Whether the quantity is prepared for each material.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
1	Quantity	1.1 Whether the sizes used in the quantity calculation are consistent in the drawings.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the quantity is prepared for each material and each facility.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

2. DPR

SN.	Items	Contents	Object	Confirmation	Reasons
1	[Example] DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Contents
1	DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the reasons of the formulas and coefficients are wrote clearly.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.3 Whether the calculation process are arranged clearly.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Engineer) Countersigned by : _____ (Executive Engineer)
Place : _____ Prepared by _____ (Junior Engineer)

Check List 1

Canal

[First Stage] : Basic Conditions

1. Outline

1.1 Land Use

 Paddy Upland Both

1.2 Type

 Open Channel Pipeline Both

1.3 Canal Type and Dimension

Name	Type	Length (m)	Flow (m ³ /s)	Slope	Remarks
Channel 1	Open Channel	545	0.015	1:20	
Channel 2	Open Channel	300	0.018	1:20	
Channel 3	Open Channel	265	0.007	1:20	
Channel 4	Open Channel	1,080	0.024	1:20	
Channel 5	Open Channel	420	0.011	1:20	
Channel 6	Open Channel	170	0.009	1:20	
Distribution Channel	Open Channel	3,000	0.012	1:20	

1.4 Supplementary facilities of Canals

Facilities	Number	Remarks
Divisin works		Nil
Regulating reservoir		Nil
Management Road		Nil
Culvert/Bridge		Nil
Regulator (gate)		Nil
Other ()		Nil

1.5 Consultation 1.5.1 River

 Need No need

1.5.2 Drinking Water

 Need No need

1.5.3 Other ()

 Need No need

2. Basic Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
1	Design purpose	1.1 Whether the purpose is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the scope, quantity, items of design are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	Basic design conditions	2.1 Whether the irrigation system is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.2 Whether the intake points are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.3 Whether the water users are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.4 Whether the consultation items are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	Field survey	3.1 Whether the pictures are taken.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.2 Whether the field conditions (topography, soil, landuse etc.) are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.3 Whether the river and road conditions are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.4 Whether the points of the planned main faciities are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.5 Whether the difficulty or issues are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.6 Whether the important points of the construction are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	Design plan	4.1 Whether the selected canal types are suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.2 Whether the facility layout is suiiable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.3 Whether the canal standard structure is suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.4 Whether the maintenance is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer)

Place : _____ Prepared by _____ (Junior Engineer)

Countersigned by : _____ (Executive Engineer)

Check List 2

Canal

[Middle Stage] : Drawings

1. Detailed Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
	[Example]				
3	Drawings	3.1 Whether the cross drawings are prepared,	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
1	Design Plan (supplementary facility)	1.1 Whether the following supplementary facility layout and scale are suitable. - Division works - Regulator reservoir - Management road - Bridge/Culvert - Regulator (gate) - Other ()	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	Nil Nil Nil Nil Nil Nil
2	Hydraulics Calculation	2.1 Whether the formulas and coefficients used in hydraulic calculation are suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	Drawings	3.1 Whether the cross drawings are prepared, 3.2 Whether the drawings are consistent in hydraulics calculation. 3.3 Whether the indication of drawings is appropriate. 3.4 Whether the special mention is appropriate.	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	
4	Construction Plan	4.1 Whether the access road for construction is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer) Countersigned by : _____ (Executive Engineer)
Place : _____ Prepared by : _____ (Junior Engineer)

Check List 3

Canal

[Final Stage] : Quantity and DPR

1. Quantity

SN.	Items	Contents	Object	Confirmation	Reasons
	[Example]				
1	Quantity	1.2 Whether the quantity is prepared for each	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
1	Quantity	1.1 Whether the sizes used in the quantity calculation are consistent in the drawings. 1.2 Whether the quantity is prepared for each material and each facility.	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	

2. DPR

SN.	Items	Contents	Object	Confirmation	Reasons
	[Example]				
1	DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Contents
1	DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR". 1.2 Whether the reasons of the formulas and coefficients are wrote clearly. 1.3 Whether the calculation process are arranged clearly.	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer) Countersigned by : _____ (Executive Engineer)
Place : _____ Prepared by : _____ (Junior Engineer)

Check List 1

Pond 1

[First Stage] : Basic Conditions

1. Outline

1.1 Purpose Irrigation Fisheries Other

1.2 Pond Dimension

1.2.1 Embankment Length Height m

1.2.2 Gross Catchment Area ha

1.2.3 Reservoir Volume cum

1.2.4 Command Area ha

1.3 Supplementary Facilities

1.3.1 Spillway Need No need

1.3.2 Intake Facility Need No need

1.4 Consultation

1.4.1 River Need No need

1.4.2 Drinking Water Need No need

1.4.3 Fisheries Need No need

1.4.4 Other () Need No need

2. Basic Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
	[Example]				
3	Field survey	3.1 Whether the pictures are taken.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Annexure II
1	Design purpose	1.1 Whether the purpose is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the scope, quantity, items of design are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	Basic design conditions	2.1 Whether the water users are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.2 Whether the gross catchment and command area are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.3 Whether the layout of the embankment and supplementary facilities are appropriate as topography and irrigation.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.4 Whether the necessity of the emergency discharge is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.5 Whether the consultation items are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	Field survey	3.1 Whether the pictures are taken.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.2 Whether the land use of the plan site is grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.3 Whether the road conditions are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.4 Whether the difficulty or issues (downstream fisheries etc.) are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.5 Whether the borrow pit conditions are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.6 Whether the important points of the construction are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	Design plan	4.1 Whether the embankment layout is suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.2 Whether the embankment structure is suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.3 Whether the location and structure of the spillway are appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.4 Whether the location and structure of the intake facility are appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.5 Whether the land acquisition and compensation are confirmed.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.6 Whether the maintenance is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer) Countersigned by : _____ (Executive Engineer)

Place : _____ Prepared by : _____ (Junior Engineer)

Annexure

6. Cost Estimate

ABSTRACT OF COST
KANGHLAI MINOR IRRIGATION PROJECT, CHAMPHAI

Sl. No.	MINOR HEAD	AMOUNT
1	DIRECT CHARGES	
	I - Works	` 12,820,900.00
	II - Establishment	` 256,418.00
	III - Ordinary T & P (LS)	` 8,480.00
	IV - Suspense	` -
	V - Receipt & Recoveries	` -
	Sub - Total	` 13,085,798.00
2	INDIRECT CHARGES	
	I - Capitalized value of abatement of land revenue	` -
	II - Audit & Account @ 1% of I- Works	` 128,209.00
	Sub - Total	` 128,209.00

Gross estimated cost of the project ` **13,214,007.00**

TOTAL COST ` **13,214,007.00**

Say ` **13,214,000.00**

#NAME?

**I - WORKS
ABSTRACT OF COST**

DETAIL HEAD		COST
A	- Preliminary survey	231,000.00
B	- Land	
C	- Works	12,239,900.00
K	- Building	-
M	- Plantation	-
O	- Miscellaneous	150,000.00
P	- Maintenance (during constr.)	200,000.00
Q	- Special T & P	
R	- Communication	
Y	- Losses on stock & Unforeseen	
TOTAL		12,820,900.00

**I - WORKS
ABSTRACT OF COST
C - WORKS**

Sl. No	Particulars	Qty.	Unit	Amount
1	POND 1	1	Ls	5,330,300.00
2	POND 2	1	Ls	
3	POND 3	1	Ls	
4	POND 4	1	Ls	
5	CHANNEL 1	545	Rm	826,900.00
6	CHANNEL 2	300	Rm	455,000.00
7	CHANNEL 3	265	Rm	402,000.00
8	CHANNEL 4	1,080	Rm	1,638,500.00
9	CHANNEL 5	420	Rm	637,200.00
10	CHANNEL 6	170	Rm	258,000.00
11	DISTRIBUTION FIELD CHANNEL	2,000	Rm	1,203,000.00
12	AQUEDUCT	125	Rm	1,011,000.00
13	GI PIPE 100 mm DIA	200	Rm	266,320.00
14	TURNOUT FACILITY	60	Nos	74,000.00
15	DIVISION BOX	1	Ls	17,000.00
16	TURNOUT REHABILITATION	1	Ls	19,400.00
17	CANAL REHABILITATION	1	Ls	101,300.00
TOTAL				12,239,920.00
SAY				12,239,900.00

**I - WORKS
ABSTRACT ESTIMATE OF COST
K - BUILDING**

Sl.No	Particulars	Amount	
1	Detail Estimate for construction of Site Office cum Staff Camp - 1 no.	-	-
2	Internal Water Supply	-	-
	TOTAL	-	-

I - WORK
DETAIL ESTIMATE FOR SURVEY & INVESTIGATION
A - PRELIMINARY

Sl.no / item no.	Particular of Items	No	L	B	H	Qty.	Unit	Amount (in `)	
1	1.03	Clearing jungle including uprooting of rank vegetation, grass, brush wood, trees and saplings of girth upto 30cm measured at a height of 1m above ground level and removal of rubbish upto a distance of 50 metres outside the periphery of the area cleared.							
			1	1000		1	1000	sqm	
	(a)	By manual means.				Total	1000	sqm	
				80%			800	sqm	
			@		9.40	/sqm		7,520.00	
				20%			200	sqm	
			@		14.10	/sqm		2,820.00	
<u>Tracepath Cutting of alignment</u>									
2	2.07	Earthwork in excavation in foundation trenches or drains etc. (not exceeding 1.5m in width or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m including getting out excavated soil and disposal of surplus excavated soil as directed within a lead of 50 metres.							
			0.5	1200	1.00	1.00	600	sqm	
						Total	600	sqm	
	(a)	Ordinary		90%			540	sqm	
			@		290.20	/ sqm		156,708.00	
	(b)	Soft Rock (blasting work).		10%			60	sqm	
			@		504.70	/ sqm		30,282.00	
3		Alignment survey, marking of level and fixing of the required gradient line of channel							
	a)	Unskilled labour for holding staff		2				No	
	b)	Unskilled labour for chainage		2				No	
	c)	Unskilled labour for carrying level		1				No	
	d)	Unskilled labour for marking of level point& marking of peg.		2				No	
		No of days	5	7			35	day	
			@		250.00	/ day		8,750.00	
4		Checked Survey for Unskilled Labour		4	5		20	day	
			@			250.00 / day		5,000.00	
5		Final recording of Level Unskilled-labour		4	5		20	day	
			@			250.00 / day		5,000.00	
						Total		216,080.00	
		Add Cost Index			7.23%			15,622.58	
							TOTAL		231,702.58
							Say		231,000.00

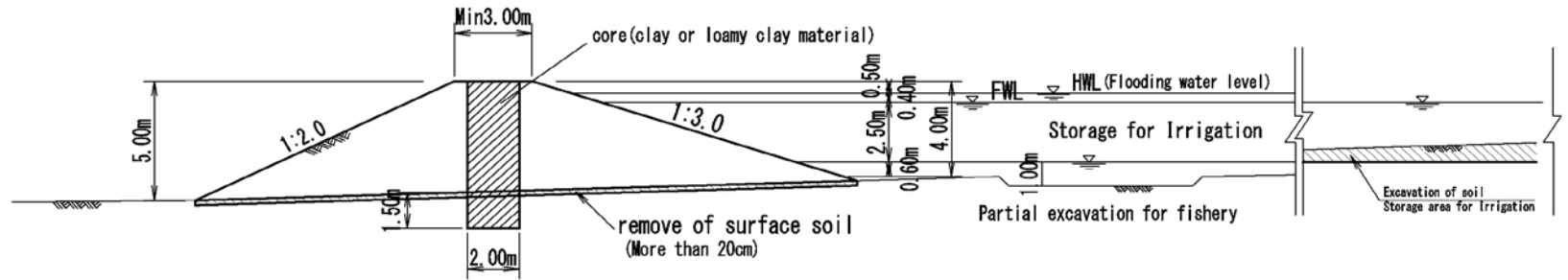
(Rupees two lakh thirty one thousand) only.

Prepared by

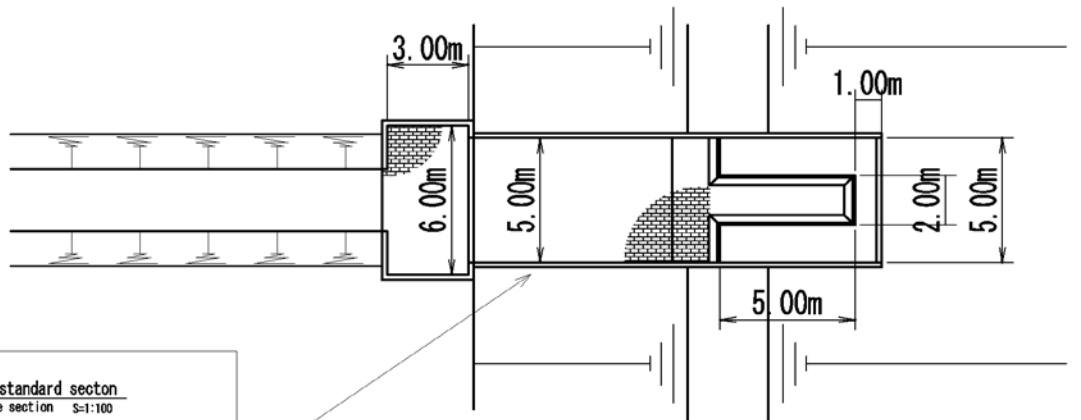
Checked by

Counter Signed by

Standard Section of Dike



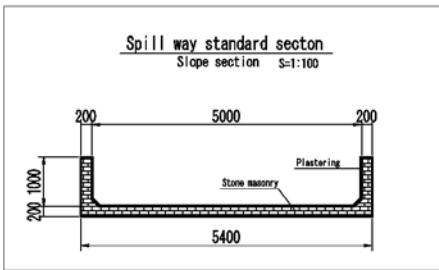
Spill way plan



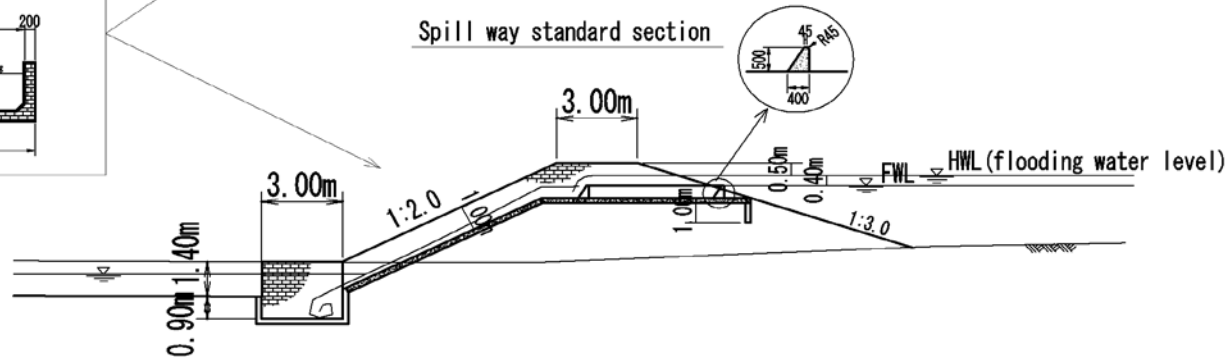
Note:

- * Top width of 3.0m shows minimum. In case of surplus excavation soil, it can be increased.
- * Cray core part material shall be the soil which is classified as cray or loamy clay
- * Location of partial excavation for fishy is to decided with landowners.
- * Provision of extra embankment (more than 10cm)
- * Spreading embankment material, spreading thickness shall be 7-10cm.
- * Compacting embankment material, passage of compactor shall be more than 10 times.
- * Before handing over the facilities, trial ponding should be conducted and defects should be checked.

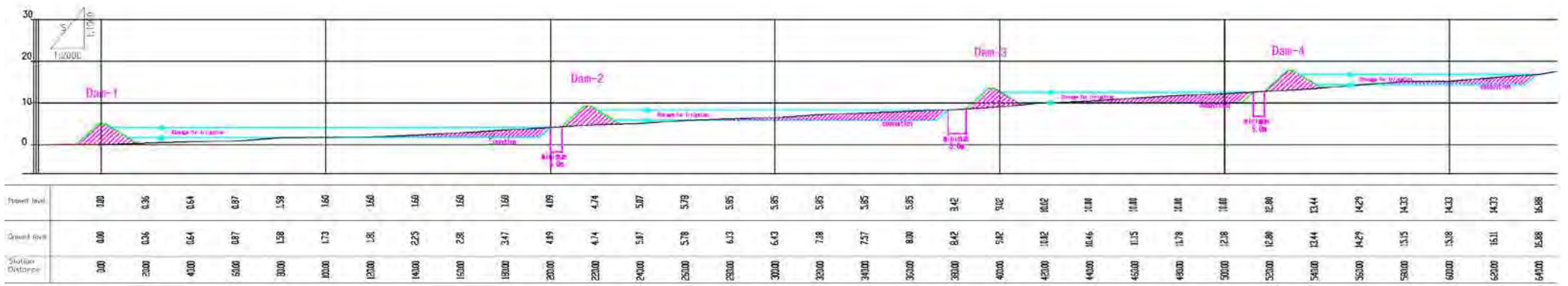
Spill way standard section



Spill way standard section

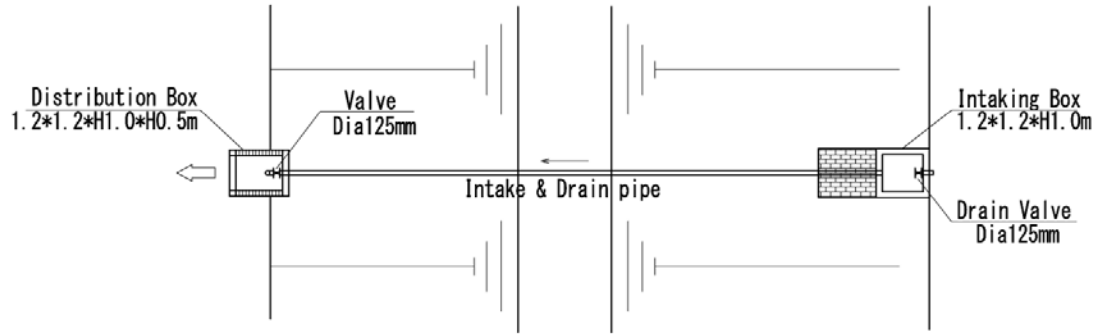


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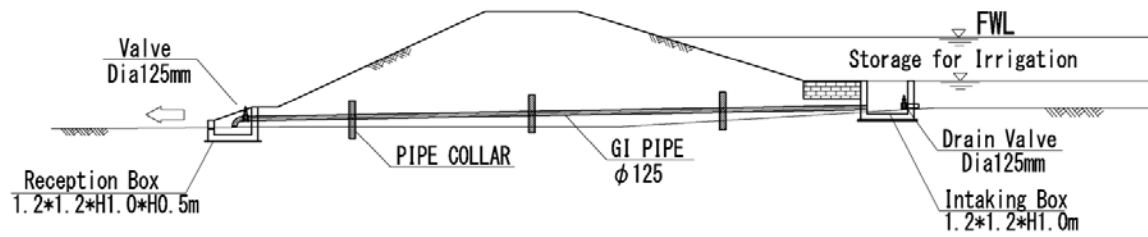


Intake cum Drain pipe for Pond-2, 3, 4

Plan



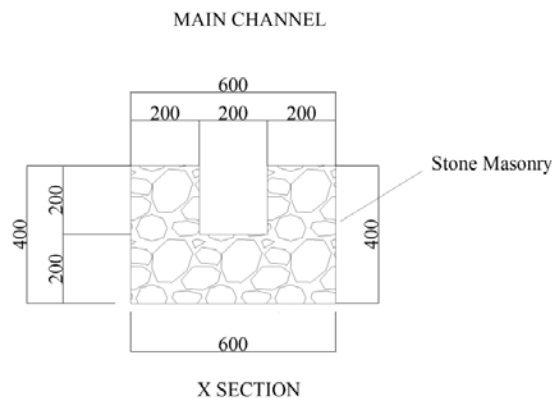
Section



ESTIMATE FOR THE CONSTRUCTION OF STONE MASONRY CHANNEL-1, KANGLAI MINOR IRRIGATION PROJECT, TLANGSAM, CHAMPHAI.

Sl. no	Item no.	Description	No.	L	B	H/T	Qty.	Unit	Amount
1	2.08	Earthwork in excavation in foundation trenches etc. not exceeding 2 meters depth including dressing of bottom and sides of trenches and subsequent filling and compaction in 15cm layers as in column foundations, fence posts, etc. and disposal of all surplus soil as directed within a lead of 30 metres.							
		(a) ordinary soil	1	545	0.60	0.50	163.50	cum	
		@	Rs	218.1	/cum			Rs	35,659.35
3	7.03	Course rubble masonry with hard (a) in cement mortar 1:3 (1cement :3fine sand)							
		floor	1	545	0.60	0.2	65.4	cum	
		wall	2	545	0.20	0.2	43.6	cum	
						Total	109	cum	
		@	Rs	5282.3	/cum			Rs	575,770.70
4	21.14	20 mm cement plaster 1:3 (1cement :3 fine sand)							
		wall	2	545	0.20		218.0	sqm	
		floor	1	545	0.20		109.0	sqm	
		top	2	545	0.2		218.0	sqm	
						total	545.0	sqm	
		@	Rs	293	/sqm			Rs	159,685.00
						Sub Total		Rs	771,115.05
		Add cost index for Champhai district @		7.23%				Rs	55,751.62
						Grand total		Rs	826,866.67
						Say			826,900.00

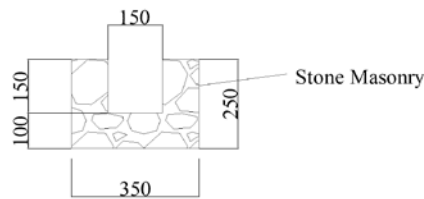
(Rupees eight lakh twenty six thousand nine hundred) only.



ESTIMATE FOR THE CONSTRUCTION OF STONE MASONRY DISTRIBUTION CHANNEL, KANGHLAI MINOR IRRIGATION PROJECT, TLANGSAM, CHAMPHAI.

Sl.no	Item no.	Description	No.	L	B	H/T	Qty.	Unit	Amount
1	2.08	Earthwork in excavation in foundation trenches etc. not exceeding 2 meters depth including dressing of bottom and sides of trenches and subsequent filling and compaction in 15cm layers as in column foundations, fence posts, etc. and disposal of all surplus soil as directed within a lead of 30 metres.							
		(a) ordinary soil	1	2000	0.35	0.35	245.00	cum	
		@	Rs	218.1	/cum			Rs	53,434.50
3	7.03	Course rubble masonry with hard stone in foundation (a) in cement mortar 1:3 (1cement :3fine sand)							
		floor	1	2000	0.35	0.1	70	cum	
		wall	2	2000	0.10	0.15	60	cum	
						Total	130	cum	
		@	Rs	5282.3	/cum			Rs	686,699.00
4	21.14	20 mm cement plaster 1:3 (1cement :3 fine sand)							
		wall	2	2000	0.15		600.0	sqm	
		floor	1	2000	0.15		300.0	sqm	
		top	2	2000	0.1		400.0	sqm	
						total	1300.0	sqm	
		@	Rs	293	/sqm			Rs	380,900.00
						Sub Total		Rs	1,121,033.50
		Add cost index for Champhai district @		7.23%				Rs	81,050.72
						Grand total		Rs	1,202,084.22
								Say	1,203,000.00

FIELD
DISTRIBUTION
CHANNEL

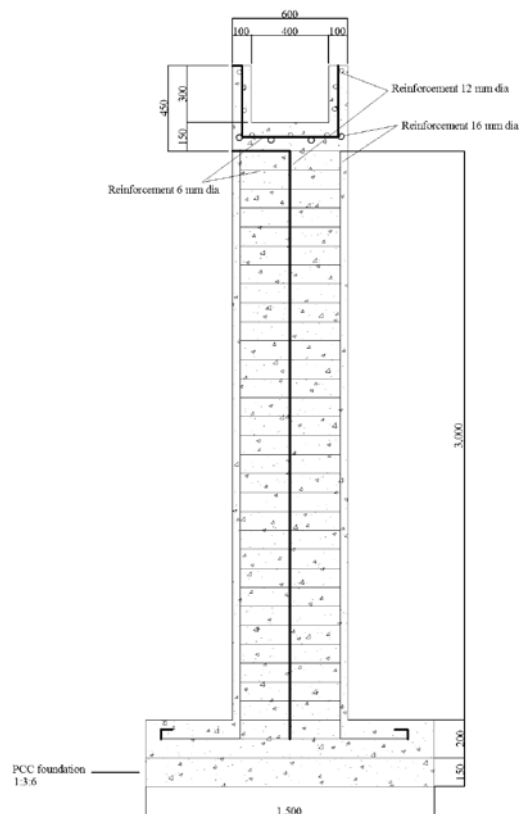


X SECTION

DETAIL ESTIMATE FOR CONSTRUCTION OF AQUADUCT

Sl. no	Item no.	Description	No.	L	B	H/T	Qty.	unit	Amount
1	2.06	Earthwork in excavation over areas (exceeding 30cm in depth, 1.5m in width as well as 10sqm on plan) including disposal of excavated earth, lead upto 50m and lift upto 1.5m, disposed earth to be levelled and neatly dressed.							
	(a)	Ordinary & hard soil	35	1.20	1.00	1.20	50.40	cum	
			@	284.30	/cum				14328.72
2	4.08	Providing and laying cement concrete in retaining wall, return walls, walls (any thickness) including pilasters, piers, columns, abutments, pillars, posts, plain window sills, sunken floors, etc. up to floor five level excluding the cost of centering, shuttering and finishing :							
		b) 1:3: 6(1 cement : 3 coarse sand : 6 stone aggregate 40mm nominal size)							
		Foundation Post	35	1.20	1.00	0.15	6.30	cum	
						Total	6.30	cum	
			@	7384.30	/cum				46521.09
3	5.01	Providing and laying in position reinforced cement concrete excluding cost of centering and shuttering , finishing and reinforcement in -							
		All works upto foundation & plint...							
	b)	1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal	35	1.00	1.00	0.20	7.00	cum	
		Foundation Post	@	7101.00	/cum				49707.00
4	5.03	Reinforced cement concrete work in walls including attached pillasters, columns, pillars, posts, piers, abutments, return walls, retaining walls, struts, buttresses, string or lacing courses, fillets etc. upto floor five level excluding cost of centering shuttering etc complete.							
	b)	1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size)							
		Post	35	0.60	0.30	3.00	18.90	cum	
						Total	18.90	cum	
			@	7116.40	/cum				134499.96
5	5.04	Reinforce cement concrete work in beams, suspended floors, roofs having slope upto 15 ° landings, balconies, shelves, chajjas, lintels, bands, window sills, stair cases, spiral stair cases, cantilevers upto floor five level excluding cost of centering shuttering etc complete. with 1:2:4(1cement : 2 coarse sand :4 stone aggregate 20mm)							
		Channel wall	2	125.00	0.10	0.30	7.50	cum	
		Channel floor	1	125.00	0.60	0.15	11.25	cum	
						Total	18.75	cum	
			@	7387.20	/cum				138510.00

6	5.11	Centering and shuttering including strutting, propping etc. And removal of form for:							
		(c) Columns, pillars, piers, abutments, posts and struts.							
		Posts	2	35	0.60	3	126	sqm	
			2	35	0.30	3	63	sqm	
							Total	189	sqm
			@		506.30	/ sqm			95690.70
		(b) Walls including attached pillasters, buttresses, string courses, etc.							
		Floor		1	125.00	0.6	75	sqm	
		outside walls		2	125.00	0.45	112.5	sqm	
		Inside walls		2	125.00	0.3	75	sqm	
							Total	262.5	sqm
			@		422.10	/ sqm			110801.25
7	21.14	20mm cement plaster 1:3 (1 cement : 3 fine							
		top wall	2	125.00	0.10	25.00	sqm		
		inside wall	2	125.00	0.30	75.00	sqm		
		outside wall	2	125.00	0.45	112.50	sqm		
		floor	1	125.00	0.40	50.00	sqm		
							Total	262.50	sqm
			@		293.00	/ sqm			76912.50
8	5.21	Steel reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete Qty. of slno. 3, 4 & 5							
		a) Mild steel and medium tensile steel bars	@		61.80	/ Kg	100	4465.00	Kg
							Total		275937.00
		Adding cost index			7.23%				942908.22
									68172.26
							G. Total		1,011,080.48
							Say		1,011,000.00



DETAIL ESTIMATE FOR GI PIPE

(As per NETL No. NETL/PHE-MIZ/11-12/210 Dt.26/6/2012)

Sl No	Items	Length		Rate (Rs.)		Unit	Amount
1	100mm dia G.I. Pipe (medium)	200	Rm.	806.11	/Rm	Rs.	161,222.00
2	Fitting, fixing G.I.Pipe complete with all G.I.fittings including cutting, threading, jointing and laying in trenches to minimum depth of 100cm below ground level in all types of soil including trimming, dressing, levelling in gradient, re-filling of trenches in 20cm layers watering and ramming, removing surplus earth and bringing back to its original position etc. all complete as per design and direction of Engineer-in-charge. Excluding cost of pipe (Latest issue rate of pipe should be added in the						
	100 mm dia G.I. Pipe (medium)	200	Rm	332.00	/Rm	Rs.	66,400.00
				Total		Rs.	227,622.00
	Add	7%	for GI Special			Rs.	15,933.54
	Add	10%	for price escalation			Rs.	22,762.20
				G.Total		Rs.	266,317.74
				Say		Rs.	266,320.00

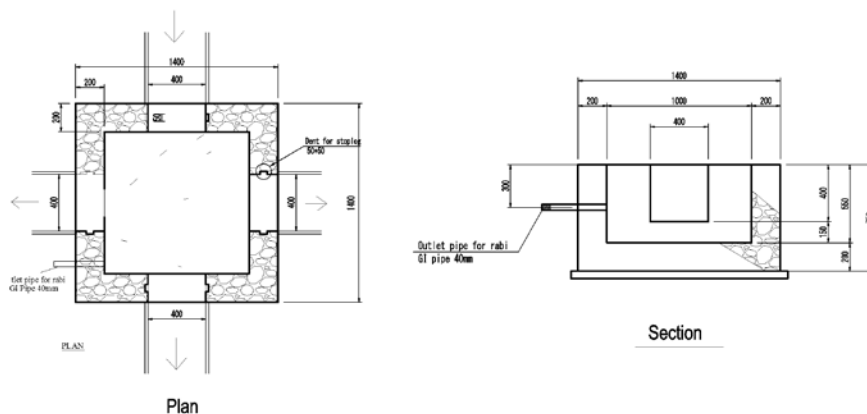
(Rupees two lakh sixty six thousand three hundred twenty) only.

ESTIMATE FOR THE CONSTRUCTION OF STONE MASONRY DIVISION BOX, KANGLAI MINOR IRRIGATION PROJECT, TLANGSAM, CHAMPHAI.

Sl.no	Item no.	Description	No.	L	B	H/T	Qty.	Unit	Amount
1	2.08	Earthwork in excavation in foundation trenches etc. not exceeding 2 meters depth including dressing of bottom and sides of trenches and subsequent filling and compaction in 15cm layers as in column foundations, fence posts, etc. and disposal of all surplus soil as directed within a lead of 30 metres.							
		(a) ordinary soil	1	1.4	1.40	0.20	0.39	cum	
			@	Rs	218.1	/cum		Rs	85.50
2	4.04	Providing and laying in position cement concrete of specified grade excluding cost of centering and shuttering - All work upto plinth level:							
		(a) 1 : 4 : 8 (1 cement : 4 course sand : 8 stone aggregate 20mm nominal size)	1	1.4	1.40	0.2	0.392	cum	
			@	Rs	5226.00	/cum		Rs	2048.59
3	7.03	Course rubble masonry with hard stone in foundation							
		(a) in cement mortar 1:3 (1cement :3fine sand)							
		floor	1	1.4	1.40	0.2	0.392	cum	
		wall	4	1.4	0.55	0.2	0.616	cum	
						i	1.008	cum	
		Subtracting the division outlet	2	0.4	0.55	0.2	0.088	cum	
			1	0.2	0.55	0.2	0.022	cum	
						ii	0.110	cum	
						Total(i - ii)	0.898	cum	
			@	Rs	5282.3	/cum		Rs	4,743.51
4	21.14	20 mm cement plaster 1:3 (1cement :3 fine sand)							
		wall	4	1.4	0.55		3.1	sqm	
		floor	1	1.0	1.00		1.0	sqm	
		top	4	1.4	0.2		1.1	sqm	
						total	5.2	sqm	
			@	Rs	293	/sqm		Rs	1,523.60
5		Check gate	LS					Rs	7500.00
						Sub Total		Rs	15,901.19
		Add cost index for Champhai district @			7.23%			Rs	1,149.66
						Grand total		Rs	17,050.85
								Say	17,000.00

(Rupees seventeen thousand) only.

DIVISION BOX
(TURNOUT REHABILITATION)



**ESTIMATE FOR THE CONSTRUCTION OF STONE MASONRY DIVISION BOX(TURNOUT REHABILITATION), KANGHLAI
MINOR IRRIGATION PROJECT,TLANGSAM,CHAMPHAI.**

Sl.no	Item no.	Description	No.	L	B	H/T	Qty.	Unit	Amount
1	2.08	Earthwork in excavation in foundation trenches etc. not exceeding 2 meters depth including dressing of bottom and sides of trenches and subsequent filling and compaction in 15cm layers as in column foundations, fence posts, etc. and disposal of all surplus soil as directed within a lead of 30 metres.							
		(a) ordinary soil	1	1.4	1.40	0.20	0.39	cum	
			@	Rs	218.1	/cum		Rs	85.50
2	4.04	Providing and laying inposition cement concrete of specified grade excluding cost of centering and shuttering - All work upto plinth level:							
	(a)	1 : 4 : 8 (1 cement : 4 course sand : 8 stone aggregate 20mm nominal size)	1	1.4	1.40	0.2	0.392	cum	
			@	Rs	5226.00	/cum		Rs	2048.59
3	7.03	Course rubble masonry with hard stone in foundation							
		(a)in cement mortar 1:3 (1cement :3fine sand)							
		floor	1	1.4	1.40	0.2	0.392	cum	
		wall	4	1.4	0.55	0.2	0.616	cum	
						i	1.008	cum	
		Subtracting the division outlet	4	0.4	0.55	0.2	0.176	cum	
						ii	0.176	cum	
						Total(i - ii)	0.832	cum	
			@	Rs	5282.3	/cum		Rs	4,394.87
4	21.14	20 mm cement plaster 1:3 (1cement :3 fine sand)							
		wall	4	1.4	0.55		3.1	sqm	
		floor	1	1.0	1.00		1.0	sqm	
		top	4	1.4	0.2		1.1	sqm	
						total	5.2	sqm	
			@	Rs	293	/sqm		Rs	1,523.60
5		Check gate	LS					Rs	10000.00
						Sub Total		Rs	18,052.56
		Add cost index for Champhai district @			7.23%			Rs	1,305.20
						Grand total		Rs	19,357.76
							Say		19,400.00

(Rupees nineteen thousand four hundred) only.

**ESTIMATE FOR THE CONSTRUCTION OF CHANNEL REHABILITATION(STONE MASONRY CHANNEL), KANGHLAI
MINOR IRRIGATION PROJECT,TLANGSAM,CHAMPHAI.**

Sl.no	Item no.	Description	No.	L	B	H/T	Qty.	Unit	Amount
1	7.03	Course rubble masonry with hard stone in foundation (a)in cement mortar 1:3 (1cement :3fine sand)							
		floor	1	50	0.80	0.2	8.00	cum	
		wall	2	50	0.30	0.2	6.00	cum	
							Total	14	cum
			@	Rs	5282.3	/cum			Rs 73,952.20
2	21.14	20 mm cement plaster 1:3 (1cement :3 fine sand)							
		wall	2	50	0.30		30.0	sqm	
		floor	1	50	0.40		20.0	sqm	
		top	2	50	0.2		20.0	sqm	
							total	70.0	sqm
			@	Rs	293	/sqm			Rs 20,510.00
							Sub Total		Rs 94,462.20
		Add cost index for Champhai district @			7.23%				Rs 6,829.62
							Grand total		Rs 101,291.82
							Say		101,300.00

(Rupees one lakh one thousand three hundred) only.

Annexure

7. Construction Plan

Standard Construction Plan form (Draft) (Kanghlai MID scheme)

1. Project outline

MID office in charge	Champhai Irrigation Division																																																																																																												
Site location	Tlamsam																																																																																																												
Construction budget	About 13,068,600.00 Rs																																																																																																												
Construction facilities	<table border="1"> <thead> <tr> <th>SN</th> <th>Facility name</th> <th>Quantity</th> <th>Unit</th> <th>Description (Structure, Size, etc)</th> <th>Type</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Dam -1</td> <td>1</td> <td>LS</td> <td>Earth Dam H=5.00m, Spillway, Intake pipe</td> <td>New</td> </tr> <tr> <td>2</td> <td>Dam - 2</td> <td>1</td> <td>LS</td> <td>Earth Dam H=5.00m, Spillway, Intake pipe</td> <td>New</td> </tr> <tr> <td>3</td> <td>Dam - 3</td> <td>1</td> <td>LS</td> <td>Earth Dam H=5.00m, Spillway, Intake pipe</td> <td>New</td> </tr> <tr> <td>4</td> <td>Dam - 4</td> <td>1</td> <td>LS</td> <td>Earth Dam H=5.00m, Spillway, Intake pipe</td> <td>New</td> </tr> <tr> <td>5</td> <td>Connection Pipe</td> <td>200</td> <td>m</td> <td>GI Pipe 100 dia</td> <td>New</td> </tr> <tr> <td>6</td> <td>Aqueduct</td> <td>125</td> <td>m</td> <td>RC Structure, H=0.3m, B=0.4m</td> <td>New</td> </tr> <tr> <td>7</td> <td>Division box</td> <td>1</td> <td>Ls</td> <td>Division box & Gate</td> <td>New</td> </tr> <tr> <td>8</td> <td>Canal-1</td> <td>545</td> <td>m</td> <td>Stone masonry Channel, H=0.2m, B=0.2m</td> <td>New</td> </tr> <tr> <td>9</td> <td>Canal-2</td> <td>300</td> <td>m</td> <td>Stone masonry Channel, H=0.2m, B=0.2m</td> <td>New</td> </tr> <tr> <td>10</td> <td>Canal-3</td> <td>265</td> <td>m</td> <td>Stone masonry Channel, H=0.2m, B=0.2m</td> <td>New</td> </tr> <tr> <td>11</td> <td>Canal-4</td> <td>1080</td> <td>m</td> <td>Stone masonry Channel, H=0.2m, B=0.2m</td> <td>New</td> </tr> <tr> <td>12</td> <td>Canal-5</td> <td>420</td> <td>m</td> <td>Stone masonry Channel, H=0.2m, B=0.2m</td> <td>New</td> </tr> <tr> <td>13</td> <td>Canal-6</td> <td>170</td> <td>m</td> <td>Stone masonry Channel, H=0.2m, B=0.2m</td> <td>New</td> </tr> <tr> <td>14</td> <td>Turnout facility</td> <td>60</td> <td>Nos</td> <td>Stop Valve 25mm dia, dent for stoplog</td> <td>New</td> </tr> <tr> <td>15</td> <td>Canal Rehabilitation</td> <td>1</td> <td>LS</td> <td>Stone masonry Channel, H=0.3m, B=0.4m</td> <td>Rehabilitation</td> </tr> <tr> <td>16</td> <td>Turnout facility</td> <td>1</td> <td>LS</td> <td>Division Box & Gate</td> <td>Rehabilitation</td> </tr> <tr> <td>17</td> <td>Distribution channel</td> <td>2000</td> <td>m</td> <td>Stone masonry, H=0.15, B=0.15</td> <td>New</td> </tr> </tbody> </table>	SN	Facility name	Quantity	Unit	Description (Structure, Size, etc)	Type	1	Dam -1	1	LS	Earth Dam H=5.00m, Spillway, Intake pipe	New	2	Dam - 2	1	LS	Earth Dam H=5.00m, Spillway, Intake pipe	New	3	Dam - 3	1	LS	Earth Dam H=5.00m, Spillway, Intake pipe	New	4	Dam - 4	1	LS	Earth Dam H=5.00m, Spillway, Intake pipe	New	5	Connection Pipe	200	m	GI Pipe 100 dia	New	6	Aqueduct	125	m	RC Structure, H=0.3m, B=0.4m	New	7	Division box	1	Ls	Division box & Gate	New	8	Canal-1	545	m	Stone masonry Channel, H=0.2m, B=0.2m	New	9	Canal-2	300	m	Stone masonry Channel, H=0.2m, B=0.2m	New	10	Canal-3	265	m	Stone masonry Channel, H=0.2m, B=0.2m	New	11	Canal-4	1080	m	Stone masonry Channel, H=0.2m, B=0.2m	New	12	Canal-5	420	m	Stone masonry Channel, H=0.2m, B=0.2m	New	13	Canal-6	170	m	Stone masonry Channel, H=0.2m, B=0.2m	New	14	Turnout facility	60	Nos	Stop Valve 25mm dia, dent for stoplog	New	15	Canal Rehabilitation	1	LS	Stone masonry Channel, H=0.3m, B=0.4m	Rehabilitation	16	Turnout facility	1	LS	Division Box & Gate	Rehabilitation	17	Distribution channel	2000	m	Stone masonry, H=0.15, B=0.15	New
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17	Distribution channel	2000	m	Stone masonry, H=0.15, B=0.15	New																																																																																																								
Project description	Location: N: 23°28'02", E: 93°21'07" EL= 1296 m CCA=23.7 ha																																																																																																												

2. Management organization

(1) MID supervision team ;

Position	Name	Responsibility
Executive Engineer	Laldinpui	As per CPWD works manual
Sub-Divisional Officer	Vanlalpekhluo Sailo	-do-
Junior Engineer	Lalrinliana	-do-
Junior Engineer	K.Lalbiakdika	-do-

(2) Safety management organization;

1). Contact list

Organization/status	Name	Contact number
Civil Hospital	Civil Hospital, Champhai	9612800124
Police Outpost	Champhai Police Station	8974924728
Water users organization Phase I	Chairman :Huansanga	9862614143
	Secretary: Laldingliana	9862668717
Phase II	Chairman:Rolura Sailo	9862290111

	Secretary:F.Aizika	9612112824
Village council	President:Lalnunzira	9615009583
	Secretary:Hmunsiamama	9862648988
Relevant Department	DOA	

2). Safety measures

Details should be referred to Contract Agreement Form (Form 8)

3. Temporary work plan

- No special temporary work.

4. Construction plan

(1) Construction machinery utilization plan:

List to describe the name, type, specification, expected quantity, and use of construction machinery.

Machine Name	Specification	Nos	Work to use	Remarks
Excavator	JBC	2	Excavation	
Concrete mixer		2	Concrete mixing	
Compactor		2	Soil compaction	

(2) Major materials:

List to describe the name, s Specification and expected source of major local materials.

Name of materials	Description	Quantity	Unit	Source of Procurement
Cement	As per CPWD works specification	4747	bag	Champhai
Aggregate	-do-	115	cum	-do-
Sand(fine)	-do-	362	cum	-do-
Sand(coarse)	-do-	164	cum	-do-
Stone for masonry	-do-	787	cum	-do-
Reinforcement bar	-do-	12055.5	kgs	-do-

(3) Meeting and Documentation plan

List to describe the Meeting and Documentation plan

Meeting	Frequency	Document to prepare	Attendant	Remarks
Kick off meeting	Before site works	Construction Plan, QC plan Contract document	Executive Engineer, Sub-Divisional Officer, Junior Engineer and Contractor.	
Regular meeting	Monthly	Minutes, Daily site report	Sub-Divisional Officer, Junior Engineer and Contractor.	
Inspection	Quarterly	Minutes, Daily site report Updated progress chart	Sub-Divisional Officer, Junior Engineer and Contractor.	

(4) Construction Time Schedule :

Construction Time Schedule plan is attached in following page.

Kanghlai MIP

Kanglai Project Progress Chart

Works	Unit	Quantity	Plan Actual	1st year		2nd year					Remarks		
				November	December	January	February	March	April	May			
1. General													
Preliminary/ Mobilization	L.S	1	Plan	████████████████████									
2. Construction works			Plan										
Dam 1		1	Plan			██							
Dam 2		1	Plan				██						
Dam 3		1	Plan				██						
Dam 4		1	Plan					██					
Channel 1	Rm	545	Plan			██							
Channel 2	Rm	300	Plan			██							
Channel 3	Rm	265	Plan			██							
Channel 4	Rm	1,080	Plan			██							
Channel 5	Rm	420	Plan			██							
Channel 6	Rm	120	Plan			██							
Distribution channel	Rm	3,000	Plan				██						
Aqueduct	Rm	125	Plan				██						
Division Box	No	2	Plan				████████████████████						
3. Cleaning & demoblization	L.S	1	Plan							████████████████████			

Annexure

8. Quality Control Plan

Quality control plan (Kanghlai MI scheme)

1. Target of Quality control works

	Items	Quantity	Unit	Remarks
Construction Facilities	Construction of Pond	4	Nos	Dike H=5.00m, Spillway, Drainage cum Intake pipe
	Connection Pipe	200	Rm	GI Pipe100dia
	Aqueduct	125	Rm	H=0.3m, B=0.4m
	Canal	4780	Rm	Stone masonry channel
	Turnout facility	60	Nos	
Documents	<ul style="list-style-type: none"> - Contact document , BOQ, Drawing, specification - Quality control checklist - Daily site report, site test result - Quality control related pictures - Meeting and inspection materials 			

2. Quality control action plan

Name of work	Control items	Control Methodology
1. Preliminary		
	Site condition before works	Photo
	Setting of alignment, centerline of facilitates	Modification of Drawing and BOQ, confirmation with WUA
2. Construction of Pond		
	Condition before/during /after the work	Photo
2-1 Earth work		
Excavation	Elevation of excavation line	Level survey
Embankment	Embankment materials (Remove of unsuitable materials)	Photo, visual observation
	Compaction	Embankment Quality control checklist, Photo
	Embankment dimensions	Level survey, tape measurement, photo
2-2 Spillway		
Concrete work	Concrete /form works	Concrete Quality control checklist, Photo, slump test
	Spillway dimensions	Level survey, tape measurement, photo
Stone masonry	Stone masonry works	Checklist of Canal works

2-3 Drainage/intake pipe/ Connection pipe	Material check before work (specification, quantity, defects of products, damage of transportation)	Photo, catalog, etc.
	Elevation and alignment of installment	Level survey, tape measurement, photo
3. Canal/Aqueduct/Turnout		
	Condition before/during /after the work	Photo
	Canal/Aqueduct works general	Canal works Quality control checklist
3-1 Earth work	Foundation soil condition Especially for Aqueduct	Photo, visual observation
	Elevation of foundation level	Level survey
3-2 Foundation/ Wall	Concrete /form works	Concrete Quality control checklist, Photo, Slump test
	Material check before work (size, quantity, defects of products, damage of transportation)	Photo, catalog, etc.
	Plastering work (material,mortar mixing,thickness, cracks)	Photo, visual observation
	Dimension of structure	Level survey, tape measurement, photo
3-3 Turnout	Material check before work (specification, quantity, defects of products, damage of transportation)	Photo, catalog, etc.

Notes;

- ✓ Detailed requirements of Quality control should be refer to contact document and PWD technical specification.
- ✓ With regards to pond construction, trial ponding test should be conducted, and defects and leakage should be checked, before handing over the facility.
- ✓ When MID conducts inspection works for payment, WUA is also recommend to participate in inspection works for witnesses.
- ✓ After construction work, MID is to prepare as built drawings based on alteration of construction works.
- ✓ Above Quality control related documents are to be filed and kept in division office as evidence of the works after construction.

Annexure

9. Certificate

9.1 Certificates of hydro meteorological data and field data

Certificated that Hydro meteorological data and field data in respect of Kanghlai Minor Irrigation Project, Tlangsam group of AIBP, such as river and rainfall data are available with the Statistical Abstract, Department of Agriculture, Government of Mizoram for incorporation in the Project report.

Date _____

Place _____

**9.2 Certificates of rate used of civil works based on the Mizoram PWD SOR 2013 and PHED
issue and laying rate**

Ce Certificated that rates for Civil Works of Kanghlai Minor Irrigation Project, Tlangsam group of AIBP, under Champhai District are based on the Mizoram PWD SOR 2013 (plus 7.23% cost index for Champhai Division as approved by Government of Mizoram, and issued rate of different GI Pipe as memo no.19020/1/2009 PHE dt.27th July 2012 and laying rates of different size of GI Pipe (medium) Memo no. N-11011/160/2011/CE/PHE/9 dt.4th July 2012.

Date _____

Place _____

9.3 Certificates of quantities calculated as per designs and approved drawings

Certificated that the quantities calculated for all components/activities proposed under Kanghlai Minor Irrigation Project, Tlangsam group of AIBP, under Champhai District have been calculated as per designs and approved drawings.

Date _____

Place _____

9.4 Certificates of irrigation structures designed as per B.I.S code IS456-2000 and other relevant codes

C Certificated that all the Irrigation Structure i.e Weirs etc under Kanghlai Irrigation Project, Tlangsam group of AIBP, under Champhai District have been designed as per B.I.S code IS 456-2000 and relevant vodes.

Date _____

Place _____

9.5 Certificates of non-overlap command areas of any existing or proposed major, medium or minor irrigation project proposed/taken up by other department

Certificated that the proposed command areas of all irrigation structure under Kanghlai Minor Irrigation Project of Tlangsam group of AIBP, under Champhai District to be taken up by the Department of Minor Irrigation do not overlap with command areas of any existing or proposed major, medium or minor irrigation project proposed/taken up by other Department.

Also certified that this proposed minor irrigation scheme is not a part of any other major or medium scheme.

Date _____

Place _____

Annexure

10. Farmer's Application

To

The Executive Engineer,
Champhai Irrigation Division,
Champhai.

Subject: Kanghlai Minor Irrigation Project, Champhai siamsak tura ngenna leh intiamkamna.

Ka Pu,

I hnena Kanghlai Minor Irrigation Project, Champhai min siamsak tura kan dilna bawhzuia Preliminary Survey te min neih sak avangin lawmthu kan sawi e.

Department aiawha lo kal te leh loneituten kan sawiho tawhna atanga Department-in ruahmanna fel tak min siamsak hi chipchiar taka sawiho a ni a. Ruahmanna tlangpui te chu –

1. Small dams – 4 Nos
2. Extension Channel – 2800Rm
3. Aqueduct – 125m
4. Turnout facility – 60 Nos

Department-in ruahmanna a siam te khi tha kan ti in min thawhsak ngei turin kan ngen a ni.

INTIAMKAMNA:

- Keini a hnuai hming ziak te hian Department-in Kanghlai Minor Irrigation Project, Champhai min siamsak theih chuan hmalaknaah theih tawp kan chhuah ang tih kan tiam a, chungte chu
- Dam siam emaw, tuikawng in a paltlang ram neituten engmah sawi buai lovin harsatna kan siam lovang.
- Kan zau tana ruahmanna hrang hrang – tuikawng, dams leh thildangte siam chungchangah thlai a chhia anih pawhin ram neituten eng zangnadawmna (compensation) mah kan phut lovang.
- Kanghlai Minor Irrigation Project Champhai siam chung hian, Department kut ti chak turin theihtawp kan chhuah ang.
- Project siam avanga harsatna a awmin farmers in mawh la in department kan pui zel ang.
- Tuikawng hman chungchangah zauin (Water User Association) in a rel anga in sem tlan kan in tiam e.
- Project zawh tawh hnuah mimal tinin kan ta anga ena, enkawl zui kan intiam e.

Annexure

11. Affidavit (No-Objection)

OFFICE OF THE VILLAGE COUNCIL COURT

NO OBJECTION CERTIFICATE

Minor Irrigation Department in Kanghlai Minor Irrigation Project, Champhai a hma lak an tum hi tha kan ti a, he Project in a kaihnhawih Tuikawng (Irrigation Channel) in kan Village Council huamchhunga leilet/ram a paltlang kan remti a a, Village Council thuneihna chinah chuan engmah sawi buai (complain/compensation) kan nei/dil lovang.

Village Council President Signature

Submitted to

The Executive Engineer,

Champhai Irrigation Division,

Department of Minor Irrigation,

Mizoram

Minute of Ratification Meeting Kanchlai Minor Irrigation Scheme

The ratification meeting on **Kanchlai Minor Irrigation Scheme** was held on 4th December, 2014 discussing the contents of DPR prepared by MID and other stakeholders based on the result of the workshop held from 28th to 31st October, 2014.

Each party have clearly understand the contents of the DPR and mutually agreed the followings if the DPR is sanctioned.

MID

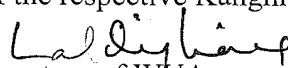
- ◆ Making necessary effort for sanctioning the respective Kanchlai Minor Irrigation Scheme implementation.
- ◆ Construct and/or rehabilitate the facilities based on the prepared DPR with sanctioning budget.
- ◆ Giving the necessary support to WUA for proper operation and maintenance of the facilities based on prepared O&M plan.

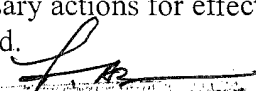
WUA

- ◆ Cooperate with MID and provide necessary support during and after construction works
- ◆ Utilizing the facilities effectively based on the prepared crop calendar and agriculture action plan
- ◆ Taking over the facilities from MID and operates and maintains the facilities in accordance with O&M plan.

Other Government Departments and Stakeholders

- ◆ Giving follow-up activities which are stipulated in the agriculture action plan, like extension services.
- ◆ Strengthening mutual cooperation with MID and WUA for further necessary actions for effective utilization of the respective Kanchlai Minor Irrigation Scheme, if required.


The President/Secretary of WUA
Kanchlai Minor Irrigation Project


The President/Secretary of Secretary
Water User Association
Kanchlai Project, Champhai

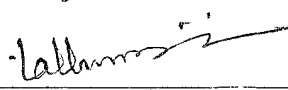
Executive Engineer
Champhai Irrigation Division

District Agriculture Officer
Champhai District

District Horticulture Officer
Champhai District

District Fishery Development Officer
Champhai District

Witness
VCP, Tlansam Village


Secretary
Village Council/Court
Tlansam, Champhai - 12

Annex 4

DPR for Ngenrual MI scheme

Government of Mizoram
Minor Irrigation Department

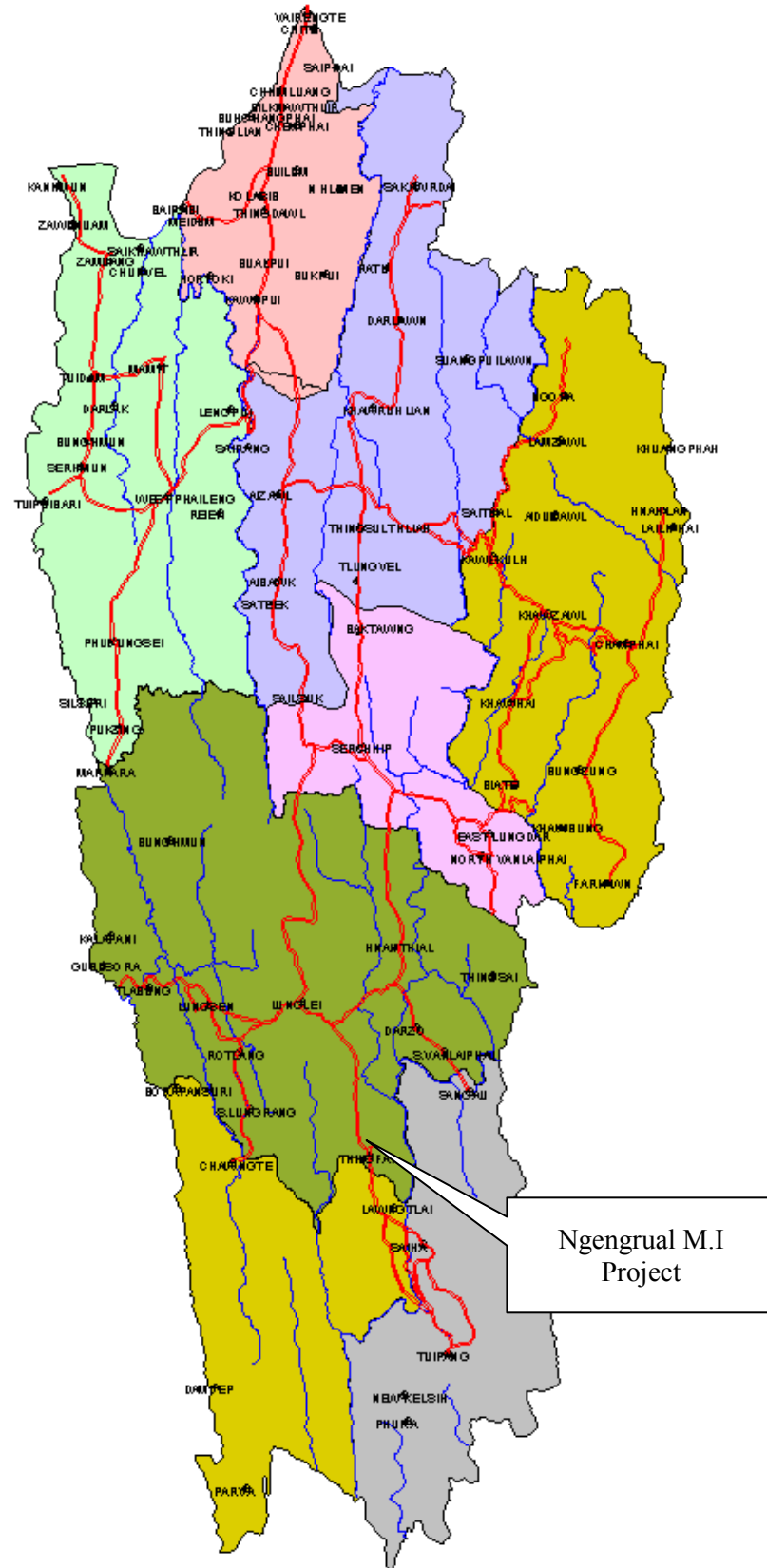
Project Report
of
Ngengrual Minor Irrigation Project

Lunglei Irrigation Division
Minor Irrigation Department
(January 2015)

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10.1 Quality Control Aspect.....	10-1
Chapter 11 Water Users' Association and O&M Activities	11-1

Location Map



Photos



Command Area (1)



Command Area (2)



Proposed Site for Weir



PROJECT SUMMARY OF NGENGRUAL MINOR IRRIGATION PROJECT

OBJECTIVES

The diversion weirs and the canals are newly constructed to supply stable irrigation water to the proposed and existing paddy field during Kharif and Rabi season. Due to these, the paddy area is expanded, the paddy yield is improved, and the winter crops are promoted.

OUTLINE

Name of River	: Ngengrual Lui and Dranaml Lui
Gross Command Area	: 18.0 ha
Culturable Command Area	: 14.7 ha
Name of Villages getting water supply	: Thingfal in Lunglei District
Cost of Project	: 75.0 lakhs
Benefit Cost Ratio	: 3.74

CROPPING PATTERN

Lunglei: Ngenrual Proposed Cropping Pattern Name of Crop	Month												Area (ha)		
	J	F	M	A	M	J	J	A	S	O	N	D			
Paddy (DRRH2)						■	■	■	■	■					10.3
Paddy (Local)						■	■	■	■	■					4.4
Kharif season						■	■	■	■	■					14.7
Mixed Crop: Maize & French bean	■	■	■								■	■	■		5.8
Field Pea (pea)		■	■	■						■	■	■			3.1
Leafy Mustard	■	■										■	■		2.9
Green Chilli	■	■										■	■		2.9
Rabi season	■	■										■	■		14.7
Total															29.4

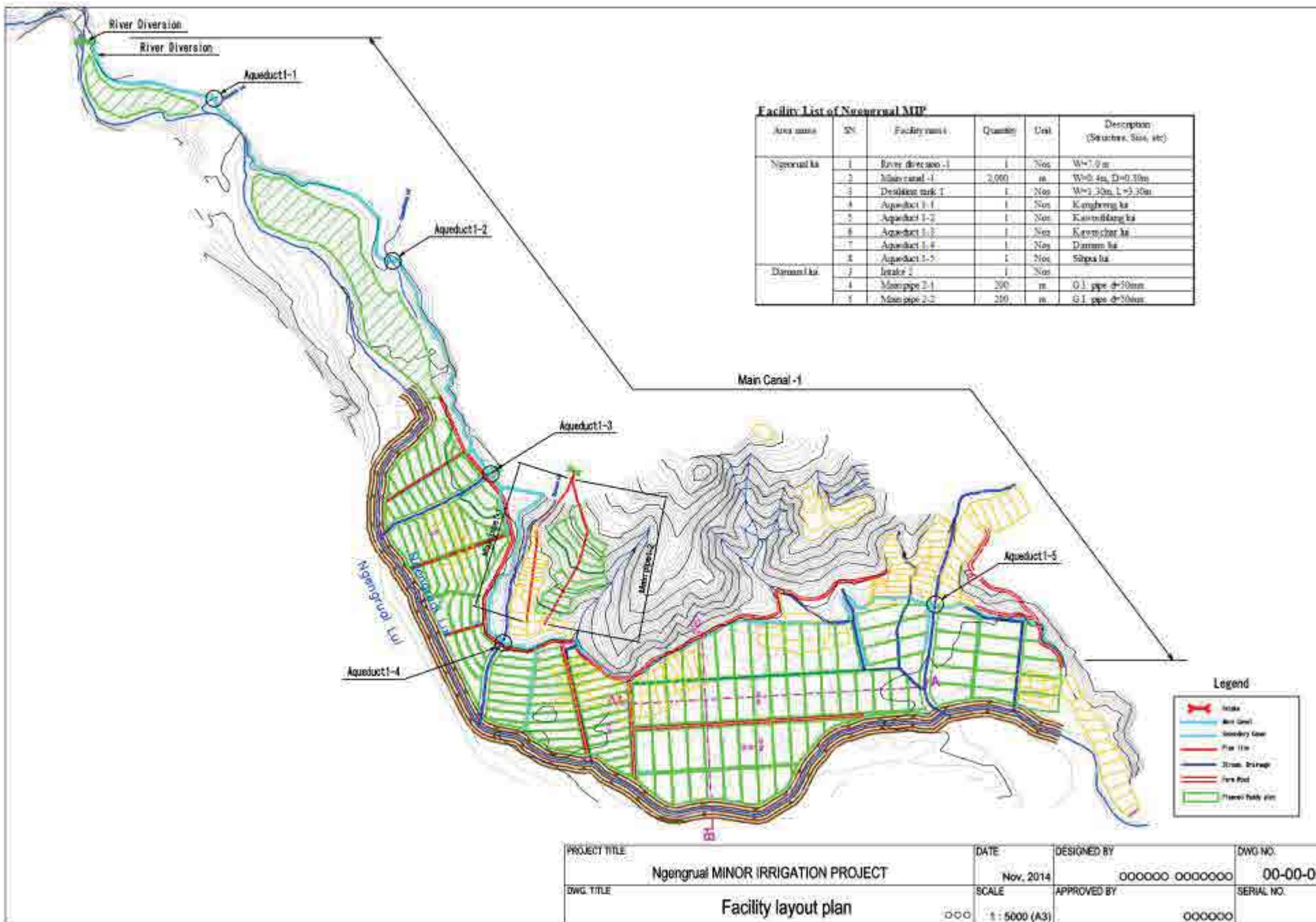
WATER USER ASSOCIATION O&M PLAN

SN.	Name of Facilities	Items	Implementer	Frequency	Schedule												
					Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	
1	River diversion -1 and Desilting tank 1	Patrol	Person in charge	Every week	■	■	■	■	■	■	■	■	■	■	■	■	
		Water management	Person in charge	Every day	■	■	■	■	■	■	■	■	■	■	■	■	
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■											
		Maintenance	Removing weeds	All beneficiaries	4 times per year			■			■			■			■
		Report to MID	Person in charge	2 times per year					■						■		
		Rehabilitation	All beneficiaries	2 times per year						■					■		
2	Main canal-1, Aqueduct 1-1, 1-2, 1-3, 1-4, and 1-5	Patrol	Person in charge	Every week	■	■	■	■	■	■	■	■	■	■	■	■	
		Water management	Person in charge	Every day	■	■	■	■	■	■	■	■	■	■	■	■	
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■											
		Maintenance	Removing weeds	All beneficiaries	4 times per year			■			■			■			■
		Report to MID	Person in charge	2 times per year					■						■		
		Rehabilitation	All beneficiaries	2 times per year						■					■		
3	Intake 2, Main pipe 2-1 and 2-1	Patrol	Person in charge	Every week	■	■	■	■	■	■	■	■	■	■	■	■	
		Water management	Person in charge	Every day	■	■	■	■	■	■	■	■	■	■	■	■	
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■											
		Maintenance	Removing weeds	All beneficiaries	4 times per year			■			■			■			■
		Report to MID	Person in charge	2 times per year					■						■		
		Rehabilitation	All beneficiaries	2 times per year						■					■		
Crop season					Dry (Rabi)			Summer			Rainy (Kharif)			Dry (Rabi)			

PREPARATION HISTORY

Field survey : 28th October, 2014 Workshop : 29th to 30th October, 2014
 Finalization : 5th December, 2014

This project summary was prepared by Minor Irrigation Department in association with Japan International Cooperation Agency in April 2015.



Facility List of Ngegrual MIP

Area name	SN	Facility name	Quantity	Unit	Description (Structure, Size, etc)
Ngegrual ka	1	River diversion -1	1	Nos	W=7.0m
	2	Main canal -1	2,050	m	W=0.4m, D=0.30m
	3	Division mark T	1	Nos	W=1.30m, L=3.30m
	4	Aqueduct 1-1	1	Nos	Kayuhang ka
	5	Aqueduct 1-2	1	Nos	Kawandang ka
	6	Aqueduct 1-3	1	Nos	Kayuhang ka
	7	Aqueduct 1-4	1	Nos	Darung ka
	8	Aqueduct 1-5	1	Nos	Sihpa ka
Daman ka	2	Intake 2	1	Nos	
	4	Main pipe 2-1	200	m	G.I. pipe ϕ =70mm
	5	Main pipe 2-2	200	m	G.I. pipe ϕ =70mm

Legend

	Main Canal
	Secondary Canal
	Tertiary Canal
	Farm Road
	Stream Drainage
	Farm Road
	Farm Road

PROJECT TITLE	Ngegrual MINOR IRRIGATION PROJECT	DATE	Nov, 2014	DESIGNED BY	000000 000000	DWG NO.	00-00-00
DWG TITLE	Facility layout plan	SCALE	1 : 5000 (A3)	APPROVED BY	000000	SERIAL NO.	

Check List : Ngengrual Minor Irrigation Project

Sl.No	Item/Activity	Remarks	Pg.No
1	Name of Project	Ngengrual Minor Irrigation Project	-
2	Name of District/Block/Village	Lunglei District/ Thingfal village	-
3	Longitude	92°52'49" - 92°53'17" E	-
4	Latitude	22°36'49" - 22°37'20" N	-
5	Category of Project- Storage/Diversion/Lift/percolation tank	Diversion	-
6	Type Project (Ongoing/New)	New Project	-
7	Whether scheme is in DPAP/Tribal area?	Yes	-
8	Have foundation investigations been carried out?	Yes (Trial pits)	-
9	Have soil survey in the command area been done?	Surveyed	p. 2-1
10	Have Topographical survey been carried out?	Yes	p. 2-1
11	Have any alternative proposals been studied and merits and de-merits discussed?	Yes	-
12	Average rainfall in command area	3,164 mm (2011)	Annexure 8
13	Is source (river/stream/nallah) perennial?	Perennial	-
14	Availability of water in the source (In MCM)	12.427	Annexure 8
15	Minimum Discharge in cumec?	0.028	p.3-3
16	Maximum Discharge in cumec?	0.798	p.3-2
17	Effect of the present scheme on existing/contemplated/ upstream and downstream schemes on the same source, if any	Nil	-
18	Detail of drinking water supply component, if any	Nil	-
19	Area of land required to be acquired for the project	Not required	-
20	Status of Land Acquisition	N.A	-
21	Does the project falls in the command area of any existing/ ongoing/ proposed major/ medium irrigation project? If so, details thereof.	No	-
22	Whether clearance from state electricity board has been taken in case of LI schemes?	N.A	-
23	Existing Cropping pattern	Yes	p.5-1
24	Proposed cropping patern (approved by Agricultural Deptt.)	Yes	p.5-1
25	Has the method used for determining the crop water requirement discussed?	Yes	-
26	Whether detailed design has been carried out for various component of scheme as per BIS code.	Yes	Annexure 59
27	Whether latest SOR adopted for preparation of cost estimate?	Yes	Annexure 57
28	Whether unique identification number has been given to each scheme?	Yes. MZ LU LU TH 02 NE	-
29	Has the source of construction material has been identified?	Yes	-
30	No villaged & People benefitted?	1 village and 17 families	p.11-1
31	No of farmers of SC/ST community benefitted?	SC-Nil, ST-17	-
32	Whether land levelling in command area is required? If so, how state govt proposes to meet the expenditure ?	Yes, Govt. proposed to meet expenditure from CAD&WMP	-
33	How state govt proposes to meet O & M charges after completion of project?	State plan fund with beneficiary contribution	-
34	When state govt proposes to hand over scheme to WUA?	On completion	-
35	When state govt proposes to take up evaluation studies by independent agency?	After completion of CAD and WMP scheme.	-
36	Attach Index map and layout plan of Project alongwith all major, Medium and minor projects (GEO based)	Yes.	-
37	Period of completion of scheme?	3 years	-
38	Development cost Rs Lakh/ha	5.10	p.7-1
39	B.C Ratio at 10% interest	3.74	p.7-1
40	Location of scheme in reference to existing schemes	Thingfal, Lunglei District	-

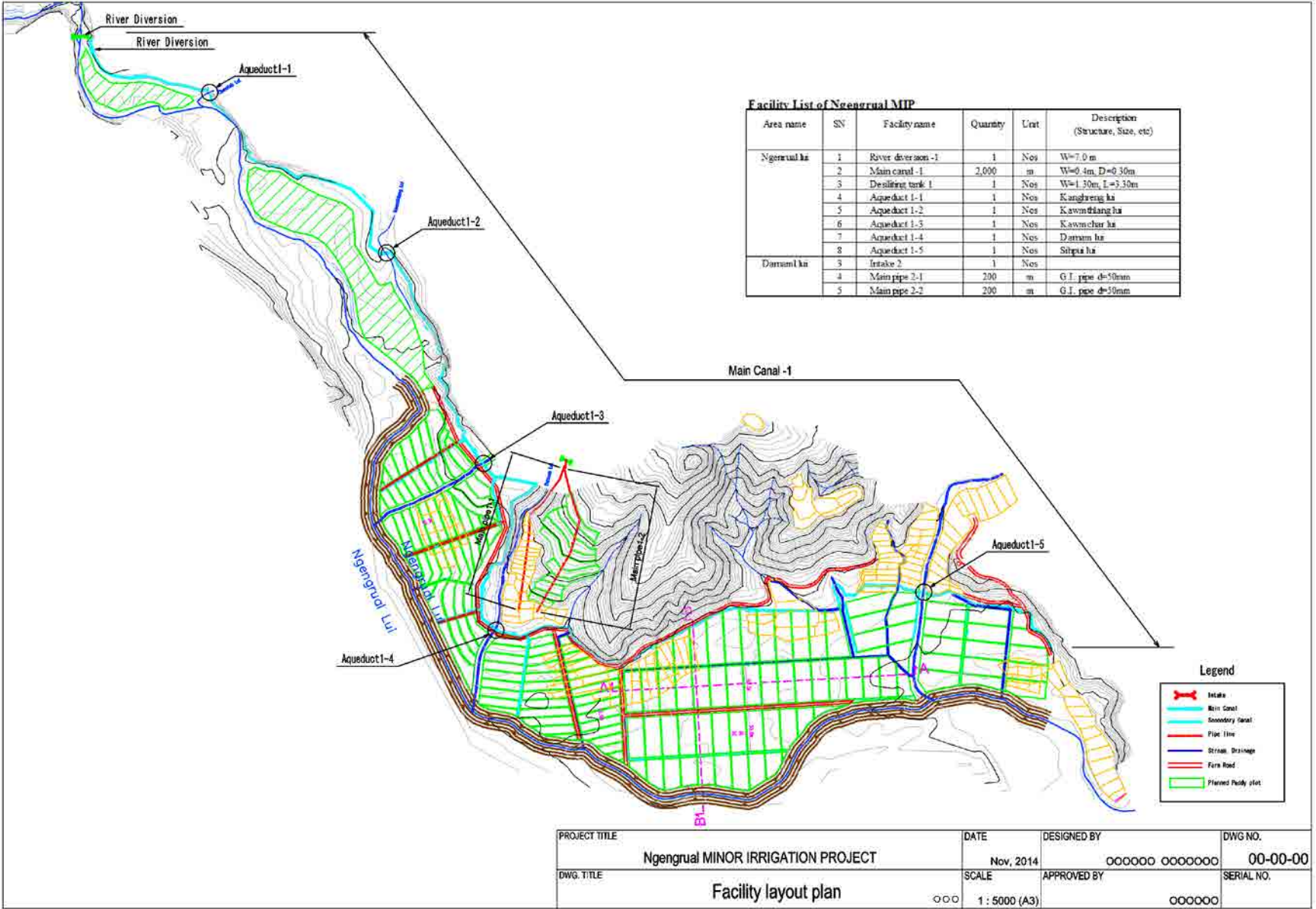
Sl.No	Item/Activity	Remarks	Pg.No
41	Whether quality control mechanism exists for MI Schemes? Implementing quality control - scope and arrangement (desirable, independent quality control arrangement)	Mechanism under process of constitution	-
42	MI schemes having CCA more than 1500 ha, a certificate from State Government indicating that it is not a substitute of medium irrigation projects is required	N.A as the CCA is less than 1500 ha	-
43	Certificate from State Government indicating that the MI scheme is not a part of any other major or medium irrigation scheme	Certificate attached	Annexure 60
44	Are benefits from Pisciculture / animal husbandry / plantation etc. discussed	Not significant	-

* Unique Identification Number will be given after approval by TAC but before submission to the Government.

Salient Features of the Surface Minor Irrigation Schemes

1 Name of Project	Ngengrual Minor Irrigation Project
2 Name of River/Tributary/Nalah	Ngengrual etc.
3 Irrigation (Hectare)	
a) Gross Command Area (GCA)	: 18.0 ha
b) Culturable command Area (CCA)	: 14.7 ha
c) Area under Irrigation	: Nil
d) Cost per Hectare of potential planned	: 5.10
4 Name of Villages getting water supply	: Thingfal, Lunglei District
5 Hydrology	
a) Gross Catchment Area in Sq Km	: 9.0 sq Km
b) Intercepted Catchment Area in Sq. Km	: Nil
c) Un-intercepted Catchement Area in Sq.Km	: 9.0 sq Km
d) Catchment Rain fall details in mm	: 3,164.00 mm(annual)
e) Name of climatic station in the catchment	:Lunglei station
f) Annual yield at the proposed site in M.Cum	: 12.427 MCM
g) Water Utilization of upstream projects	: Nil
h) Water Utilization of proposed projects	: Kharif; 0.0189 cumecs, Rabi; 0.0063 cumecs
i) Design flood at weir/barrage	: 72.75 cumecs
6 Submergences Details in ha	: Submerge area is nil.
7 Technical details of barrage/Weir	: Diversion weir W=14m, L=7m
8 Cropping Pattern in ha	
a) Existing	: 6.0 ha
b) Proposed	: 28.48 ha
9 Cost of the Project	: 75.03 lakhs
10 Benefit cost ratio	: 3.74 : 1

Facility Layout Map



Chapter 1 Introduction

1.1 Introduction

It is often said that the economy of Mizoram is based on agriculture and about 70% of its population are engaged or have links with agricultural activities. It is also a proven fact that the general soil condition and climate of Mizoram are suitable for raising almost any type of tropical and sub-tropical crops. However, the general topography of the state is hilly with deep gorges in between. The elevation ranges from 4,100 ft to a few hundred feet above mean sea level, which make the flatland suitable for cultivation limited to patches along rivers and streams. In fact, it is not possible or near impossible to find flatland of more than 2,000 ha for a single project, therefore, all the irrigation projects and this proposal are no exception. Most of the completed and ongoing projects under the Lunglei Irrigation Division have a command area ranging from ten to a few hundred hectares. The fact that potential flatland is limited in the state makes it even more significant to construct minor irrigation projects wherever possible to uplift the livelihood of the people, and thereby uplifting the economy of the state. Thus, this project is proposed.

1.2 Brief History

The proposed Ngengrual Minor Irrigation Project lies about 5 km on the eastern side of Thingfal Village. The village itself is on NH 54, about 67 km from Lunglei on the way to Saiha. Potential area along the Ngengrual River has been under cultivation as early as 1935, making it one of the earliest wet rice cultivation (WRC) areas in Mizoram. However, a heavy landslide in 1995 has completely damaged most of the cultivated flatland, covering it with mud and other debris and leaving the area uncultivable for a number of years. Even the course of the Ngengrual River itself suffered severe and drastic changes. In fact, the surrounding area of about 300 m long of the river proper course was inundated, making it marshy and unsuitable for any type of cultivation. Now, after more than 15 years, the land seems to be suitable and ready again for any type of cultivation. But in order to utilise all the potential area along the Ngengrual River, it is necessary to divert water from nearby streams since some of the potential area is located at higher elevation and cannot be commanded by this river.

1.3 Current Status

As stated above, the proposed area has undergone heavy landslide in 1995 and devastated the cultivated area for about 15 years. However, the local farmers started cultivation in the area for a couple of years then. The farmers, along with the field staff of the Minor Irrigation Department (MID), started surveying the area from March 2011, and their opinion is that it is possible to cultivate in a limited area again. Some farmers have then started paddy cultivation in a limited area with good and reasonable harvest, even without proper irrigation facilities, which greatly aroused interest of the local farmers.

After the Detailed Project Report (DPR) of Ngengrual (January 2014) was prepared, the DPR targeted a part of the cultivated command area (CCA), which was discussed with farmers and officers of MID, Department of Agriculture (DOA) and Department of Horticulture (DOH). Hence, the project was prepared.

1.4 Meteorology

Mizoram has mild and pleasant climate with temperatures ranging from 11 °C to 21 °C in winter and 20 °C to 30 °C in summer. The entire area is under the direct influence of the southwest monsoon, and rain occurs heavily from May to September. The average annual rainfall of the state is 2,557 mm.

There are no evapotranspiration data collected in Mizoram. The Central Water Commission (CWC) has recently installed a pan evaporator at its office complex in Aizawl. As per the collected data of CWC, the average monthly evaporation losses vary from 40 mm during January/December to 130 mm during April/May.

1.5 Soil Characteristics of the Area

The characteristics of soil under the command area are described below

Soil colour	Brown to dark brown
Soil Texture	Clay Loam
Drainage class	Well drained
Erosion	Slight
Soil depth	Very deep

Source: Mizoram Remote Sensing Application Center

Chapter 2 Survey & Investigation

2.1 General Report

The farmers of Ngengrual area approached the MID to help them improve their irrigation and farming system. Accordingly, a survey was conducted to assess the socio-economic status, farming and irrigation practices, etc. It was found out that the farmers could not cultivate their entire lands due to scarcity of water and absence of proper irrigation facilities, and many of them have also been practising the *Jhum* system, on the side, to supplement their income. Hence, it was decided to do a preliminary survey on the project.

Initially, the farmers in the command area of the proposed project were identified, and interaction was held with the MID. The preparatory survey and workshop were held on the 28th to 29th and 31st of October 2014, respectively. These were done to involve the farmers as much as possible right from the stage of planning the project. Numerous field visits were jointly done with the farmers, and preliminary survey works such as on water availability, command area, cropping practices, and cropping patterns and systems were done.

2.2 Engineering Survey

2.2.1 Discharge

Discharge in the *Rabi* season was surveyed by MID officers on 28 October 2014. The results of the survey are summarised below. The details can be seen in the Attachment (DPR preparatory survey check sheet).

Table 2.1 Discharge

Point	Discharge	Remarks
Ngengrual lui at the diversion	300 (l/s)	
Dranaml lui at the intake	8 (l/s)	

Source: Prepared by MID

2.2.2 Soil Classification

Field soil classification test was done by MID officers on 28 October 2014. The results of the test are summarised below. The details can be seen in the Attachment (Preliminary technical site survey sheet).

Table 2.2 Soil Classification

Point	Classification	Remarks
On farm	Clay loam	

Source: Prepared by MID

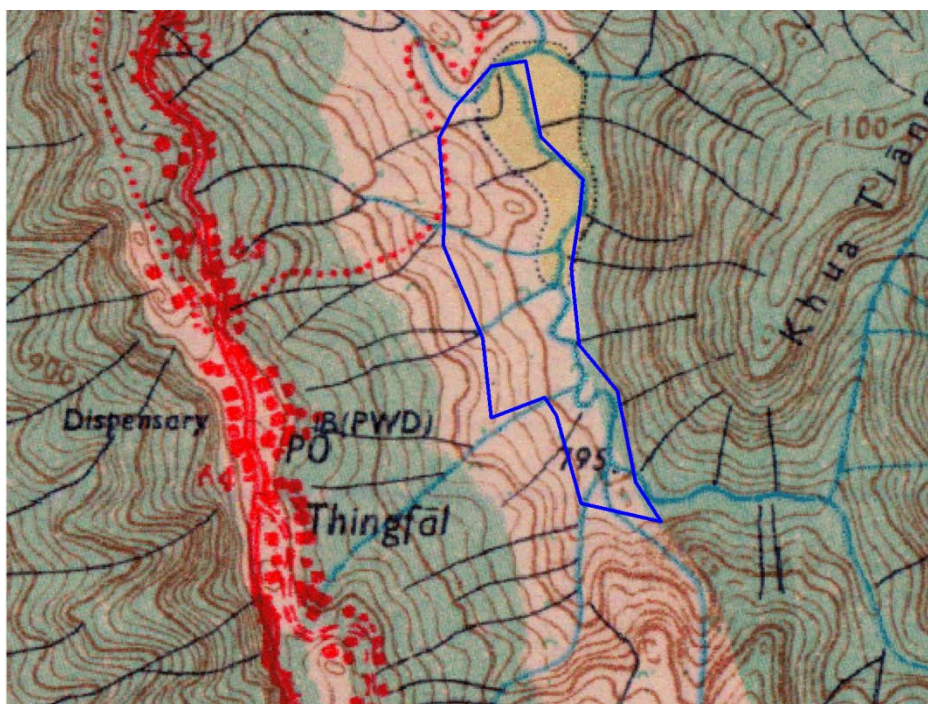
2.2.3 Topological Survey

The following topological surveys have been conducted to clarify the existing topological conditions.

Table 2.3 Highlight of the Survey

Survey Name	Plane location survey
Use of survey result	Designing of land development and facility layout plan
Period	From 15/7/ 2014 to 30/ 7/ 2014
Surveyor	MID Surveyor, Mr.Sangtea
Survey Area	40ha
Benchmark Coordinates	1: X=487094.098 Y=2500974.223 2; X=487463.360 Y=2500458.211 3; X=487765.430 Y=2500310.478 4; X=487925.156 Y=2500366.950 5; X=488113.295 Y=2500385.717 6; X=488237.910 Y=2500269.828 7; X=487640.657 Y=2500468.639 8; X=487765.136 Y=2500538.130 9; X=487904.776 Y=2500491.881
Methodology	Survey with Total Station Machine

Survey Area map



Source: Prepared by MID

2.2.4 Others

Nil.

Chapter 3 Hydrology

3.1 Characteristics of Catchment

The rivers of Ngengrual, Sihpuilui, Darnam, etc., originate from the hills near Thingfal Village in Lunglei District of Mizoram at an elevation of about 1,232 m. The rivers are tributaries of the Kolodyne River. It flows a distance of about 6 km toward the south direction, down to the proposed scheme site, and then further covering a distance of about 25 km into the Kolodyne River. The river flows generally in a deep channel, but in the proposed scheme area, the river is comparatively shallow. The entire catchment area is almost hilly and covered with grass.

3.2 Assessment of Water Availability:

3.2.1 Data Availability

(1) Rainfall Data

There is no rain gauge station maintained by any agency within the catchment area, but the proposed area is not far from Lunglei Town where daily rainfall data, which is maintained by the State Agriculture Department of Mizoram, is available since 1998 for water availability studies for the project.

(2) Discharge Data

There is no discharge site being maintained by any agency within the catchment area of the proposed scheme.

3.2.2 Water Availability Studies

(1) Monsoon period

In the present data scenario, in which the catchment under consideration is completely ungauged and no hydrological model for computing surface runoff based on catchment characteristics has yet been developed for this zone. Thus, efforts have been made for computing runoff of 75% dependable average daily flow during the monsoon period by simple rational method. The results of such are tabulated in Table 3.1 and Table 3.2. As observed from the tables, the minimum 75% dependable monthly flow of the streams of CAXI and CAXII during monsoon period is much more than the discharge required during the monsoon period.

(2) Non-monsoon period

Flow in the stream during the non-monsoon period was calculated based on specific discharge, as shown in Table 3.3, which was prepared by the JICA Study Team in 2015. As observed from the table, the flows of Ngengrual lui and Darnam lui during the non-monsoon period are much more than the discharge required during the non-monsoon period, respectively. Water balance during the monsoon and non-monsoon periods is shown in Table 3.1.

Table 3.1 Water Balance (Rabi season, Kanglei MIP)

Area	Monsoon (Kharif) period					Non-monsoon (Rabi) period				
	Resource Q1 (m ³ /s)	Requirement in field Q2 (m ³ /s)	Irrigation efficiency E	Requirement at inlet Q3=Q2/E (m ³ /s)	Evaluation	Resource Q1 (m ³ /s)	Requirement in field Q2 (m ³ /s)	Irrigation efficiency E	Requirement at inlet Q3=Q2/E (m ³ /s)	Evaluation
CAX I	0.0886	0.0015	0.55	0.0027	Q1>Q3 OK	0.0031	0.0005	0.55	0.0008	Q1>Q3 OK
CAX II	0.7978	0.0189	0.45	0.0420	Q1>Q3 OK	0.0281	0.0063	0.45	0.0139	Q1>Q3 OK

Source: Prepared by MID

(3) Annual Flow

The annual flow of Ngengrual lui is calculated at 12.427 MCM.

3.3 Design Flood

The peak discharge for design flood passing through the diversion headworks is estimated using Dicken’s Formula in which the value of C is taken as 14 as follows:

For CA 1

$$Q = CA^{3/4}$$

Where, Q = Flood discharge (cumecs)
 C = Runoff coefficient = 11 -14 North-indian hilly region = 14

A = Catchment area in sq. km = 9.00 km²

Thus, Q = 72.75 m³/s

Table 3.2 Average monthly discharge series for Thlerpui Lui; Kharif (monsoon: Mid Jun. to Mid Oct.)

Month	2nd half of June		July		August		September		1st half of October		Average Discharge	Ave. discharge values arrange in descending order	m	Probability P = m/(N+1)	Return period T= 1/P (years)
Year	Rainfall	Discharge	Rainfall	Discharge	Rainfall	Discharge	Rainfall	Discharge	Rainfall	Discharge					
1998	333.00	0.116	882.00	0.148	665.00	0.112	284.00	0.049	136.50	0.047	0.0944	0.1390	1	0.0909	11.000
1999	387.50	0.135	734.00	0.123	598.00	0.100	692.00	0.120	197.50	0.069	0.1094	0.1258	2	0.1818	5.500
2000	504.00	0.175	866.00	0.145	1,412.0	0.237	501.00	0.087	145.00	0.050	0.1390	0.1183	3	0.2727	3.667
2001	392.00	0.136	613.00	0.103	521.00	0.088	426.00	0.074	187.50	0.065	0.0931	0.1094	4	0.3636	2.750
2002	265.00	0.092	981.00	0.165	543.00	0.091	312.00	0.054	44.50	0.015	0.0835	0.1047	5	0.4545	2.200
2003	598.00	0.208	477.00	0.080	624.00	0.105	584.00	0.101	85.00	0.030	0.1047	0.0944	6	0.5455	1.833
2004	616.50	0.214	919.00	0.154	535.00	0.090	594.00	0.103	86.50	0.030	0.1183	0.0931	7	0.6364	1.571
2005	135.95	0.047	556.20	0.093	622.20	0.105	436.30	0.076	206.30	0.072	0.0785	0.0906	8	0.7273	1.375
2006	399.85	0.139	737.10	0.124	479.50	0.081	405.00	0.070	113.10	0.039	0.0906	0.0835	9	0.8182	1.222
2007	350.95	0.122	804.20	0.135	910.70	0.153	945.40	0.164	158.55	0.055	0.1258	0.0785	10	0.9091	1.100

CAXI

$$Q = \frac{(R/1000)(A \times 10^6) \times f}{\text{Nos of days in month} \times 24 \times 60 \times 60}$$

Q = Discharge in cumecs f = Runoff co-efficient = 0.45
 R = Rainfall in mm A = Catchment area in sq. km = 9.00

Now, the 75% dependable annual flow = Annual flow with probability P = 0.75,

ie T = 1/0.75 = 1.33 years

By interpolation between two successive values in the above table having T= 1.300 and 1.444 respectively, the 75% dependable flow is found to be,

Q₇₅ = 0.08865 m³/s

CAXII

$$Q = \frac{(R/1000)(A \times 10^6) \times f}{\text{Nos of days in month} \times 24 \times 60 \times 60}$$

Q = Discharge in cumecs f = Runoff co-efficient = 0.45
 R = Rainfall in mm A = Catchment area in sq. km = 9.00

Now, the 75% dependable annual flow = Annual flow with probability P = 0.75,

ie T = 1/0.75 = 1.33 years

By interpolation between two successive values in the above table having T= 1.300 and 1.444 respectively, the 75% dependable flow is found to be,

Q₇₅ = 0.79783 m³/s

Source: Prepared by MID

Table 3.3 Discharge for Ngengural Lui; rabi (monsoon: Mid Oct. to Mid Feb.)

No	Name of River Basin	AREA (Sq Km)	Rainfall (75%) (mm)	Interception loss (mm)	Evaporation loss (mm)	Balance (mm)	Ground water recharge (mm)	Surface water (mm)	Surface water (MCM)	Periodic water Resource Availability											
										June -Sept (Monsoon) 80.7%			Oct-Nov (Post -Monsoon) 13.1%			Dec-March (Winter) 3.0%			April -May (Pre-Monsoon) 3.2%		
										121 days		Specific discharge	61 days		Specific discharge	119 days		Specific discharge	61 days		Specific discharge
										MCM	(m3/s)	(m3/s/km2)	MCM	(m3/s)	(m3/s/km2)	MCM	(m3/s)	(m3/s/km2)	MCM	(m3/s)	(m3/s/km2)
1	Langkaih lui	376	1,822	91	1,109	622	62	560	211	170	16.261	0.04325	28	5.313	0.01413	6	0.584	0.00155	7	1.328	0.00353
2	Sazai Lui	940	1,828	91	1,041	696	70	626	588	475	45.435	0.04834	77	14.610	0.01554	18	1.751	0.00186	19	3.605	0.00384
3	Khawthlangtuipui (Karnaphuli)	251	2,067	103	1,041	923	92	831	209	168	16.070	0.06402	27	5.123	0.02041	6	0.584	0.00232	7	1.328	0.00529
4	Kawrpui	371	2,188	109	1,175	904	90	814	302	244	23.339	0.06291	40	7.590	0.02046	9	0.875	0.00236	10	1.897	0.00511
5	Teirei	773	1,888	94	1,093	701	70	631	488	394	37.687	0.04875	64	12.143	0.01571	15	1.459	0.00189	16	3.036	0.00393
6	Tut	829	2,171	109	1,126	936	94	842	698	563	53.853	0.06496	91	17.266	0.02083	21	2.042	0.00246	22	4.174	0.00504
7	Kau	249	2,250	113	999	1,138	114	1,024	255	206	19.705	0.07914	33	6.261	0.02515	8	0.778	0.00312	8	1.518	0.00610
8	De	419	2,309	115	1,027	1,167	117	1,050	440	355	33.957	0.08104	58	11.005	0.02626	13	1.264	0.00302	14	2.656	0.00634
9	Tuichawng	1,234	2,212	111	1,066	1,035	104	931	1,149	927	88.671	0.07186	150	28.461	0.02306	34	3.307	0.00268	37	7.020	0.00569
10	Sekulh lui	251	2,204	110	1,043	1,051	105	946	237	192	18.365	0.07317	31	5.882	0.02343	7	0.681	0.00271	8	1.518	0.00605
11	Tlawng (Dhaleshwari)	1,500	2,273	114	1,110	1,049	105	944	1,416	1,143	109.332	0.07289	185	35.102	0.02340	42	4.085	0.00272	45	8.538	0.00569
12	Mat	1,010	2,222	111	1,064	1,047	105	942	951	768	73.462	0.07273	125	23.717	0.02348	29	2.821	0.00279	30	5.692	0.00564
13	Ser lui	618	2,265	113	1,095	1,057	106	951	588	474	45.340	0.07337	77	14.610	0.02364	18	1.751	0.00283	19	3.605	0.00583
14	Tuirial	2,016	2,224	111	1,148	965	97	868	1,750	1,412	135.063	0.06700	229	43.450	0.02155	52	5.058	0.00251	56	10.625	0.00527
15	Tuivawl	856	2,199	110	1,126	963	96	867	742	599	57.296	0.06694	97	18.405	0.02150	22	2.140	0.00250	24	4.554	0.00532
16	Tuival	1,456	2,102	105	1,137	860	86	774	1,127	909	86.949	0.05972	148	28.081	0.01929	34	3.307	0.00227	36	6.831	0.00469
17	Tuipui	936	1,930	97	990	843	84	759	710	573	54.809	0.05856	93	17.646	0.01885	21	2.042	0.00218	23	4.364	0.00466
18	Tuichang	1,653	2,096	105	1,009	982	98	884	1,461	1,179	112.775	0.06822	191	36.240	0.02192	44	4.279	0.00259	47	8.918	0.00539
19	Tiau	992	1,807	90	934	783	78	705	699	564	53.949	0.05438	92	17.456	0.01760	21	2.042	0.00206	22	4.174	0.00421
20	Chhintuipui (Kolodyne)	2,159	2,166	108	1,006	1,052	105	947	2,045	1,650	157.828	0.07310	268	50.850	0.02355	61	5.933	0.00275	65	12.333	0.00571
21	Ngengpui Lui	717	2,293	115	991	1,187	119	1,068	766	618	59.114	0.08245	100	18.974	0.02646	23	2.237	0.00312	25	4.743	0.00662
22	Palak Lui	136	2,194	110	1,060	1,024	102	922	125	101	9.661	0.07104	16	3.036	0.02232	4	0.389	0.00286	4	0.759	0.00558
23	Tuisih lui	249	2,121	106	1,060	955	96	859	214	173	16.548	0.06646	28	5.313	0.02134	6	0.584	0.00234	7	1.328	0.00533
24	Tinglo lui	283	2,190	110	1,060	1,020	102	918	260	210	20.087	0.07098	34	6.451	0.02280	8	0.778	0.00275	8	1.518	0.00536
25	Mar Lui	359	2,216	111	1,174	931	93	838	301	243	23.244	0.06475	39	7.400	0.02061	9	0.875	0.00244	10	1.897	0.00529
26	Barak	118	2,021	101	1,095	825	83	742	88	71	6.791	0.05755	11	2.087	0.01769	3	0.292	0.00247	3	0.569	0.00482
27	Phairang	331	2,379	119	1,066	1,194	119	1,075	356	287	27.453	0.08294	47	8.918	0.02694	11	1.070	0.00323	11	2.087	0.00631
	GRAND TOTAL	21,082							18,175	14,668	1,403		2,379	451		545	53		583	111	

source: JICA Study Team based on MID irrigation masterplan (1995)

CAXII_non-monsoon

Catchment Area	9.0	(km ²)
Specific Discharge	0.00312	(m ³ /s/km ²)
Discharge	0.02808	(m³/s)

CAXI_non-monsoon

Catchment Area	1.0	(km ²)
Specific Discharge	0.00312	(m ³ /s/km ²)
Discharge	0.00312	(m³/s)

Chapter 4 Design Features

4.1 General

Based on the analysis of hydrology for water availability, the command area available and topography, it was decided to go for channel and pipeline irrigation by diverting Ngengrual and Darnam lui and then carrying the water under gravity flow to the command area and distributing it to respective individual plots. A detailed survey of channel as well as pipeline alignment along the contour was conducted and the cross sections of some locations were taken for planning and design of the conveyance and distribution system.

Accordingly, the hydraulic and structural designs were made considering the following:

- Design of rectangular channel section (1 no.)
- Design of pipelines (2 nos.)

4.2 Requirement of Water in the field

For Pipe line1

Q_i = Discharge required at the pipe inlet

Q_f = Discharge required in the field

For CAXI

Discharge requires in the field

$$Q_f = 0.0015 \text{ m}^3/\text{s} \text{ (Kharif period)}$$

Irrigation efficiency

$$E = 55 \% \text{ (Pipe line)}$$

Discharge required at the pipe inlet

$$Q_i = Q_f/E/100 = 0.0027 \text{ m}^3/\text{s}$$

Maximum discharge required for the pipe line has been thus calculated. (Ref to Chapter 3 and Chapter 5)

For Channel

Q_i = Discharge required at the channel inlet

Q_f = Discharge required in the field

For CAXII

Discharge requires in the field

$$Q_f = 0.0189 \text{ m}^3/\text{s} \text{ (Kharif period)}$$

Irrigation efficiency

$$E = 45 \% \text{ (Pipe channel)}$$

Discharge required at the pipe inlet

$$Q_i = Q_f/E/100 = 0.0420 \text{ m}^3/\text{s}$$

Maxmum discharge required for the channel has been thus calculated. (Ref to Chapter 3 and Chapter 5)

4.3 Design of G.I. Pipe

For CAXI : Main pipe 2-1 and main pipe 2-2

Required Conveyance Capacity = 0.0027 m^3/s

By using formula for pipe flow $h = 2flv^2 / gd$

Assuming, diameter of pipe

Here, $h =$ Head difference = 20 m

$f =$ Co-efficient of friction = 0.005

$$\begin{aligned}
 g &= \text{Acc. Due to gravity} &= & 9.81 \text{ m/s}^2 \\
 l &= \text{Length of pipe} &= & 200 \text{ m} \\
 a &= 3.14d^2 / 4 \\
 v^2 &= hgd / 2fl \\
 Q &= av \\
 Q &= (3.14d^2/4)*(hgd/2fl)^{1/2} \\
 d^{5/2} &= 0.00035 \\
 d &= 0.04133 \text{ m} \\
 d &= 41 \text{ mm} \\
 \text{Say } d &= 50 \text{ mm}
 \end{aligned}$$

4.4 Design of Channel

For CAXII: Main channel 1-1

Required Conveyance Capacity = 0.042 m³/s

Design cross section of channel = Rectangular

Using equation $Q = a \times v$

Where $a = \text{Cross section area} = 2d^2$

$v = \text{Velocity of flow} = (1/n) \times R^{2/3} \times S^{1/2}$

Where $R = \text{Hydrolic Radius} = d/2 \text{ for most economical section}$

$S = \text{Channel bed slope} = 1:100$

$n = \text{Roughness co-efficient} = 0.015 \text{ (for cement concrete channel)}$

Therefore $d^{8/3} = 0.00500$

$d = 0.13713 \text{ m}$

Say $d = 0.20 \text{ m}$

Therefore

Width of channel $b = 2d = 0.4 \text{ m}$

Providing free board of 10cm,

depth od channel $D = 0.1 + d = 0.30 \text{ m}$

Therefore the following inside dimension may be adopted for construction of diversion channel

Depth of channel	=	0.30 m
Width of channel	=	0.40 m
Channel bed slope	=	1:100
Flow velocity	=	1.12 m/s

Chapter 5 Irrigation Planning Agriculture Practices & Cropping Pattern

5.1 Cropping Pattern for Ngengrual Minor Irrigation Scheme

In Mizoram, where land is limited, self-sufficiency in food production can be achieved by utilization of the two cropping seasons, which is only possible by assured irrigation. Normally, the *Rabi* season starts in mid-October and ends in mid-February while the *Kharif* season starts in mid-June and ends in mid-October. Although the average rainfall in Mizoram for the last five years is 2,455.80 mm, rainfall distribution is not uniform during all the seasons and a cultivator may need water at regular intervals, which may not be fulfilled by rainfall alone. Hence, proper crop planning is practical only when assured irrigation is available to the farmers, provided other inputs are available for all seasons. Keeping in view the availability of assured irrigation during the *Kharif*/monsoon and *Rabi*/non-monsoon seasons, a cropping pattern, along with the area proposed to be irrigated in each season in the command area, is given in Table 5.1 and Table 5.2. Agriculture Action Plan for achieving the cropping pattern is shown in Table 5.2.

Table 5.1 Cropping Pattern of Dumlui MIP

Current Crop Proportion

Champai: Kanghai Current Cropping Pattern	Month												Area (ha)				
	J	F	M	A	M	J	J	A	S	O	N	D					
Paddy (DRRH2)																	
Paddy (IR64)																	
Paddy (Local)																	
Kharif season																	
Field Pea																	
Leafy Mustard																	
Pumpkin (leaves)																	
Rabi season																	
Total																	6.0

Proposed Crop Proportion

Kolasib: Dmului Proposed Cropping Pattern	Month												Area (ha)				
	J	F	M	A	M	J	J	A	S	O	N	D					
Paddy (DRRH2)																	
Paddy (Local)																	
Kharif season																	
Mixed Crop: Maize & French bean																	
Field Pea (pea)																	
Leafy Mustard																	
Green Chilli																	
Rabi season																	
Total																	29.4

Note: [Mixed Crop: Maize and French bean] Area of Maize and French bean is Maize 1.0 ha and French bean 0.6 ha into 1.0 ha (1.6ha into 1.0ha).

Source: Prepared by MID

Table 5.2 Proposed Cropping Area

Sl. No.	Crops	Command Area (ha)		Total
		CA 1	CA 2	
	Gross Command Area	1.7	16.3	18.0
	Culturable Command Area	1.1	13.6	14.7
A.	Karif Crops (Mid Jun. to Mid Oct.)			
1	Paddy (DRRH2)	0.8	9.5	10.3
2	Paddy (Local)	0.3	4.1	4.4
	Total	1.1	13.6	14.7
B.	Rabi Crops (Mid Oct. to Mid Feb.)			
1	Mixed Crop: Maize & French bean	0.4	5.4	5.8
2	Field Pea (pea)	0.3	2.8	3.1
3	Leafy Mustard	0.2	2.7	2.9
4	Green Chilli	0.2	2.7	2.9
	Total	1.1	13.6	14.7

Source: Prepared by MID

5.2 Crop Water Requirement

Crop water requirement is derived on the basis of proposed cropping pattern for Ngenrual Minor Irrigation Project command area. Taking culturable command area as 14.7 ha, duration of crop and respective water requirement of various crops under consideration have been derived and given in Table 5.2. The discharge required for various crops are dispersed according to their cropping season as mentioned in Table 5.3.

Table 5.3 Crop Water Requirement

Sl. No.	Crops	Req. (m)	Duration (day)	Req. (mm/d)	Discharge Required in cumecs		Total Discharge (m ³ /s)	Duty (ha/m ³ /s)
					CA 1 (m ³ /s)	CA 2 (m ³ /s)		
A.	Karif Crops (Mid Jun. to Mid Oct.)							
1	Paddy (DRRH2)	1.60	140	12	0.0011	0.0132	0.0143	720
2	Paddy (Local)	1.60	140	12	0.0004	0.0057	0.0061	720
	Total				0.0015	0.0189	0.0204	
B.	Rabi Crops (Mid Oct. to Mid Feb.)							
1	Mixed Crop: Maize & French bean	0.60	120	5	0.0002	0.0031	0.0034	1,728
2	Field Pea (pea)	0.25	85	3	0.0001	0.0010	0.0011	2,880
3	Leafy Mustard	0.20	50	4	0.0001	0.0013	0.0013	2,160
4	Green Chilli	0.40	195	3	0.0001	0.0009	0.0010	2,880
	Total				0.0005	0.0063	0.0068	

Note: 1. Mixed crop: Maize & French bean req. 0.60m, duration 120 days, req. 5 mm/d

Area of Maize and French bean is Maize 1.0 ha and French bean 0.6 ha into 1.0 ha (1.6ha into 1.0ha).

Source: Prepared by MID

Table 5.4 Total Water Requirement

Command Area CAXI

Sl. No.	Crops	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
A.	Karif Crops (Mid Jun. to Mid Oct.)													
1	Paddy (DRRH2)							0.0011						
2	Paddy (Local)							0.0004						
B.	Rabi Crops (Mid Oct. to Mid Feb.)													
1	Mixed Crop: Maize & French bean											0.0002		
2	Field Pea (pea)											0.0001		
3	Leafy Mustard											0.0001		

4	Green Chilli										0.0001			
Total	Karif	0.0015												
	Rabi											0.0005		

Note: The total discharge required for monsoon period comes out to be $Q = 0.0015$ cumecs
 The total discharge required for non-monsoon period comes out to be $Q = 0.0005$ cumecs

Command Area CAXI

Sl. No.	Crops	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb
A.	Karif Crops (Mid Jun. to Mid Oct.)													
1	Paddy (DRRH2)							0.0132						
2	Paddy (Local)							0.0057						
B.	Rabi Crops (Mid Oct. to Mid Feb.)													
1	Mixed Crop: Maize & French bean											0.0031		
2	Field Pea (pea)											0.0010		
3	Leafy Mustard											0.0013		
4	Green Chilli											0.0009		
Total	Karif	0.0189												
	Rabi											0.0063		

Note: The total discharge required for monsoon period comes out to be $Q = 0.0189$ cumecs
 The total discharge required for non-monsoon period comes out to be $Q = 0.0063$ cumecs

Table 5.5 Water requirement for each crop

Crops	Water Requirement (m)	Duration (day)	Water Requirement (mm/d)	
	a.	b.	c.=a./b.*1000	
Group 1	Paddy	1.60	140	12
Group 2	Cabbage	0.45	110	5
	Knol-khol (Kohlrabi)	0.45	100	5
Group 3	Leaf Mustard	0.20	50	4
	Seamum	0.30	90	4
	Lettuce	0.30	75	4
	Potato	0.35	105	4
	Table beet	0.40	125	4
	Maize	0.45	125	4
Group 4	Cow Pea	0.25	95	3
	Lady's finger	0.30	125	3
	Soya Bean/French Bean	0.25	115	3
	Field pea	0.25	85	3
	Chilly	0.40	195	3
	Brinjal	0.35	145	3
	Tomato	0.40	140	3
	Broccoli	0.30	130	3
	Cauliflower	0.30	130	3
	Coriander	0.30	125	3
Group 5	Onion	0.30	160	2

Source: Prepared by MID

Chapter 6 Cost Estimate

The cost estimates have been framed to show the probable cost for the execution of the Dumlui Minor Irrigation Project as per the actual requirement and measurement at the proposed site. The rates adopted for various items are based on the SOR 2013 of Mizoram PWD.

Table 6.1 Abstract of Cost

Sl.No	MINOR HEAD	UNIT	AMOUNT
1	DIRECT CHARGES		
	I - Works	INR	7,284,200.00
	II - Establishment - 2% of I-works	INR	145,684.00
	III - Ordinary Tools & Plants	INR	Nil
	IV - Suspense	INR	Nil
	V - Receipt & Recoveries	INR	Nil
	Sub-Total	INR	7,429,884.00
2	INDIRECT CHARGES		
	I - Capitalized value of abatement of land revenue	INR	-
	II - Audit and Account@ 1%I-Works	INR	72,842.00
	Sub-Total	INR	72,842.00
	Gross estimated cost of the project	INR	7,502,726.00
	SAY	INR	7,503,000.00

Source: Prepared by MID

Chapter 7 Benefit Cost Ratio

7.1 Direct and Indirect Benefits

The scheme envisages direct as well as indirect benefits to 23 farmers having WRC area within the command area of the project. These 23 families, who otherwise have to slash down the forest area for *jhumming*, will have a sustainable farming system as an alternative to traditional *jhum* system of cultivation after completion of the project. Thus, the project will contribute in maintaining ecological balance through conservation of forest by families involved in *jhumming* every year.

7.2 B/C Ratio

The B/C ratio for the scheme has been worked out by considering the net annual value of agricultural production and the annual cost. Agricultural production before irrigation has been considered as per the cropping pattern presently practised and the data collected from the local farmers in the command area of the scheme.

The annual yield per hectare of various crops and its prices has been collected from the Agriculture Department and Department of Economics and Statistics, Government of Mizoram.

On the implementation of the scheme, the potential area for cultivation increases to 9.0 ha and the proposed cropping pattern envisages utilization of two seasons, namely, *Kharif* and *Rabi* season, resulting in a maximum potential utility area of 11.5 ha. The total annual benefit accrued post project has been derived in monetary terms.

Table 7.1 Calculation of Benefit Cost Ratio
CALCULATION OF BENEFIT COST RATIO
NGENGRUAL MINRO IRRIGATION PROJECT
LUNGLEI DISTRICT

1. Total Estimated cost of the Project	75.03	(lakhs)
2. Total cost of the headworks		
a1. Diversion weir (1 nos.)	15.58	(lakhs)
a2. Intake (1 nos.)	0.35	(lakhs)
a3. Desiltation tank (1 nos.)	0.37	(lakhs)
Total headwaorks	16.3	(lakhs)
3. GCA	18.0	(ha)
4. CCA	14.7	(ha)

SN	Description	Pre-Project (lakhs)	Post-Project (lakhs)
1	a. Gross Receipts	4.90	54.12
	Gross annual receipts (estimated value of farm produce)		
	b. Expenses (Cost of Production)	1.46	10.10
	c. Net Value of Farm Produce (a.-b.)	3.44	44.02
2	d1. Estimated Annual Benefits after Project Completion (Post benefits - Pre benefits)	-	40.58
3	Annual Cost		
	d2. Interest on capital @ 10% of total cost of the project	-	7.50
	e. Depreciation of the project @ 4% of the project cost	-	3.00
	f. Annual operation & maintenance const @ Rs 1,175.00 per ha of CCA	-	0.17
	g. Maintenance cost of head works @ 1% of cost of head works	-	0.16
	h. Total Annual Cost (∑ d2.~g.)	-	10.84
	i. Benefit Cost Ratio (d1./h.)	-	3.74
	j. Potentrial to be Created (ha)		23.4
	k. Total Project Cost per Hectare (1./4.)		5.10

Source: Prepared by MID

Table 7.2 Estimated value of crop produce before implementation

Nngengrual Minor Irrigation Project, Lunglei, Thingfal

Gross Command Area 6.0 ha

Culturable Command Area 6.0 ha

SN	Name of crop	Area (ha)	Duration (day)	Production		Produce				Net Profit (Rs)
				Cost (Rs/ha)	Total (Rs)	Yield (ton/ha)	Total Yield (ton)	Rate (Rs/ton)	Total Value (Rs)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
A. Karif Crops (Mid Jun. to Mid Oct.)										
1	Paddy (DRRH2)	3.3	140	24,825	81,923	2.800	9,240	28,000	258,720	176,798
2	Paddy (IR64)	1.1	140	24,825	27,308	2.800	3,080	28,000	86,240	58,933
3	Paddy (Local)	1.1	140	24,825	27,308	2.800	3,080	28,000	86,240	58,933
B. Rabi Crops (Mid Oct. to Mid Feb.)										
1	Field Pea	0.2	85	16,135	3,227	3.200	0.640	22,000	14,080	10,853
2	Leaf Mustard	0.2	50	26,225	5,245	12.000	2.400	18,000	43,200	37,955
3	Pumpkin (leaves)	0.1	135	9,583	958	0.045	0.005	240,000	1,080	122
Total		6.0			145,968				489,560	343,592

District Agriculture Officer
Lunglei District
Department of Agriculture

Executive Engineer
Lunglei Irrigation Division
Lunglei

Source: Prepared by MID

Table 7.3 Estimated value of crop produce after implementation

Nngengrual Minor Irrigation Project, Lunglei, Thingfal

Gross Command Area 18.0 ha

Culturable Command Area 14.7 ha

SN	Name of crop	Area (ha)	Duration (day)	Production		Produce				Net Profit (Rs)
				Cost (Rs/ha)	Total (Rs)	Yield (ton/ha)	Total Yield (ton)	Rate (Rs/ton)	Total Value (Rs)	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
A. Karif Crops (Mid Jun. to Mid Oct.)										
1	Paddy (DRRH2)	10.30	140	30,417	313,295	3.600	37,080	28,000	1,038,240	724,945
2	Paddy (Local)	4.40	140	30,417	133,835	3.600	15,840	28,000	443,520	309,685
B. Rabi Crops (Mid Oct. to Mid Feb.)										
1	Mixed Crop: Maize & French bean									
	Maize	5.80	125	20,863	121,005	2.800	16,240	18,000	292,320	171,315
	French bean	3.48	115	37,753	131,380	8.000	27,840	31,000	863,040	731,660
2	Field Pea (pea)	3.10	85	23,102	71,616	6.400	19,840	22,000	436,480	364,864
3	Leafy Mustard	2.90	50	34,330	99,557	24.000	69,600	18,000	1,252,800	1,153,243
4	Green Chilli	2.90	195	48,206	139,797	9.600	27,840	39,000	1,085,760	945,963
Total		28.48			1,010,486				5,412,160	4,401,674

Area of Maize and French bean is maize 5.80 ha and French bean 3.48 ha into 5.80 ha (9.28 ha into 5.80 ha).

District Agriculture Officer
Lunglei District
Department of Agriculture

Executive Engineer
Lunglei Irrigation Division
Lunglei

Source: Prepared by MID

Table 7.4 Crop Budget and Income for Paddy, OFC & Others before Implementation

Description	Year	Paddy	Maize	Green Chilli	Onion	Leaf Mustard	Leaf Coriander	Cabbage	Cauliflower	Potato	Carrot	Beat Root	Tomato	Pumpkin	Field Pea	Soyabean	Pigeon Pea	French bean
1. Unit Cost of Materials / Others	Units	Paddy	Maize	Green Chilli	Onion	Leaf Mustard	Leaf Coriander	Cabbage	Cauliflower	Potato	Carrot	Beat Root	Tomato	Pumpkin	Field Pea	Soyabean	Pigeon Pea	French bean
1 Seed	Rs./Kg	100	120	416	4,500	110	510	520	1,300	50	565	260	861	358	98	110	120	202
2 Fertilizer: Urea	Rs./Kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3 Fertilizer: SSP	Rs./Kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4 Fertilizer: MOP	Rs./Kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5 Organic Manure	Rs./Kg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6 herbicide	Rs./Ltr.	300	300	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
7 Pesticides	Rs./Ltr.	100	60	60	60	100	60	100	100	60	60	60	100	60	100	60	60	100
8 Cattle-draft	Rs./ha	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625
9 Others cost / transport	Rs./ha	1,500	900	900	1,200	900	900	900	900	1,500	1,000	1,200	1,200	1,500	900	900	900	900
10 Machinery cost-harvest/threshing	Rs./ha	1,800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11 Supports (pole)	Rs./pole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
2. Requirements of Materials																		
1 Materials-Seed	Kg/ha	45	20.0	0.6	3.0	20	20	0.5	0.6	1,200	4	7	0.2	1.0	45	70	20	25
2 Fertilizer: Urea	Kg/ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
3 Fertilizer: SSP	Kg/ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4 Fertilizer: MOP	Kg/ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5 Manure	ton/ha	20	25	25	20	20	20	25	25	25	10	25	10	5	5	5	5	5
6 herbicide	Unit/ha	1	2	2	2	-	-	2	1	1	1	1	1	1	1	1	1	1
7 Pesticides	Unit/ha	2	5	5	1	-	-	2	2	1	1	1	2	1	1	1	1	2
8 Animal-Drafting: Plough etc.	Times/ha	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9 Others, Transport	Times/ha	5	3	20	5	10	10	5	5	3	3	3	10	5	2	2	2	10
10 Machinery cost-harvest/threshing	Times/ha	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11 Supports (pole)	Bundle/ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	300
Total of Material Cost (A)	Rs./ha	16,925	8,625	21,375	22,385	13,825	21,825	7,785	8,205	64,660	8,045	8,205	15,097	10,583	9,035	12,285	6,985	19,975
3. Unit cost of Labour																		
1 Labour	Rs./day	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
4. Labour Requirement																		
a) Land preparation																		
1 Drains	Md/ha	5	10	10	10	5	5	5	5	10	5	5	12	-	5	5	5	5
2 Cleaning	Md/ha	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3 Ploughing & Harrowing	Md/ha	8	12	12	12	15	10	15	15	10	15	10	15	12	12	12	12	12
5 Plastering bunds	Md/ha	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7 Nursery preparation	Md/ha	2	-	6	15	-	-	10	10	-	-	-	50	-	-	-	-	-
b) Planting																		
1 Digging holes	Md/ha	-	10	30	15	5	5	10	10	10	10	5	30	5	5	5	5	5
2 Filling holes or/ Transplanting	Md/ha	24	9	40	15	5	5	15	15	5	5	5	30	5	5	5	5	5
3 Irrigation	Md/ha	7	10	15	15	10	10	10	10	10	10	5	10	5	5	5	5	5
c) Maintenance																		
1 Weeding	Md/ha	24	30	40	20	40	30	40	40	30	30	30	60	25	25	25	25	25
2 Irrigation	Md/ha	8	10	30	10	25	20	20	20	-	20	20	30	12	12	10	10	15
3 Fertilize application	Md/ha	8	10	25	10	12	12	12	12	10	12	12	20	6	12	10	12	12
4 Pest and disease control	Md/ha	6	6	20	10	6	6	6	6	6	6	6	10	6	6	6	6	6
d) Harvesting																		
1 Harvesting	Md/ha	34	20	70	34	80	80	25	25	50	50	34	60	30	30	20	20	80
2 Processing / Threshing / Bagging	Md/ha	24	10	40	24	40	40	15	15	10	40	24	30	10	20	15	15	40
Total Labour (including family labour)	Md/ha	158	142	343	195	248	228	188	188	176	208	161	362	121	142	123	125	215
Total Labour cost (B)	Rs./ha	39,500	35,500	85,750	48,750	62,000	57,000	47,000	47,000	44,000	52,000	40,250	90,500	30,250	35,500	30,750	31,250	53,750
5. Total Cultivation Cost (A) + (B)	Rs./ha	56,425	44,125	107,125	71,135	75,825	78,825	54,785	55,205	108,660	60,045	48,455	105,597	40,833	44,535	43,035	38,235	73,725
Excluding Family Labour Cost: 80% (C)	Rs./ha	7,900	7,100	17,150	9,750	12,400	11,400	9,400	9,400	8,800	10,400	8,050	18,100	6,050	7,100	6,150	6,250	10,750
6. Total Cultivation Cost (A) + (C)	Rs./ha	24,825	15,725	38,525	32,135	26,225	33,225	17,185	17,605	73,460	18,445	16,255	33,197	16,633	16,135	18,435	13,235	30,725
1 Yield Current (40% - 50%) to Expect. Yield	Kg/ha	2,800	1,400	4,800	9,200	12,000	12,000	13,300	12,000	10,000	8,000	10,000	9,200	10,000	3,200	600	600	4,000
2 Estimated Producer Price *1	Rs./kg	28	18	39	28	18	18	15	22	21	46	16	25	16	22	37	25	31
7. Sales Income (Gross Income)	Rs./ha	78,400	25,200	187,200	257,600	216,000	216,000	199,500	264,000	264,600	368,000	160,000	230,000	160,000	70,400	22,200	15,000	124,000
8. Net Income	Rs./ha	53,575	9,475	148,675	225,465	189,775	182,775	182,315	246,395	191,140	349,555	143,745	196,803	143,367	54,265	3,765	1,765	93,275
9. Benefit/Cost Ratio		2.16	0.60	3.86	7.02	7.24	5.50	10.61	14.00	2.60	18.95	8.84	5.93	8.62	3.36	0.20	0.13	3.04

Source: Prepared by MID

Table 7.5 Crop Budget and Income for Paddy, OFC & Others after Implementation

Description	Year	Paddy	Maize	Green Chilli	Onion	Leaf Mustard	Leaf Coriander	Cabbage	Cauliflower	Potato	Carrot	Beat Root	Tomato	Pumpkin	Field Pea	Soyabean	Pigeon Pea	French bean
1. Unit Cost of Materials / Others	Units																	
1 Seed	Rs./Kg	100	120	416	4,500	110	510	520	1,300	50	565	260	861	358	98	110	120	202
2 Fertilizer: Urea	Rs./Kg	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11
3 Fertilizer: SSP	Rs./Kg	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
4 Fertilizer: MOP	Rs./Kg	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
5 Organic Manure	Rs./Kg	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
6 herbicide	Rs./Ltr.	300	300	100	100	100	100	100	100	100	100	100	100	100	100	100	100	100
7 Pesticides	Rs./Ltr.	100	60	60	60	100	60	100	60	60	60	60	60	60	60	60	60	60
8 Cattle-draft	Rs./ha	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625	2,625
9 Others cost/ transport	Rs./ha	1,500	900	1,200	900	900	900	900	1,500	1,000	1,200	1,200	1,500	900	900	900	900	900
10 Machinery cost-harvest/threshing	Rs./ha	1,800	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11 Supports (pole)	Rs./pole	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10
2. Requirements of Materials																		
1 Materials-Seed	Kg/ha	40	200	0.6	3.0	20	20	0.5	0.6	1,200	4	7	0.2	1.0	45	70	20	25
2 Fertilizer: Urea	Kg/ha	44	44	82	87	55	22	87	109	65	87	109	109	109	22	22	17	109
3 Fertilizer: SSP	Kg/ha	94	94	237	188	94	94	188	188	188	188	157	157	250	157	188	125	175
4 Fertilizer: MOP	Kg/ha	34	17	42	50	25	17	50	50	50	59	42	50	25	34	-	-	17
5 Manure	kg/ha	600	500	500	500	1,000	1,500	1,500	1,500	500	500	500	1,000	500	500	500	500	500
6 herbicide	Unit/ha	1	2	2	2	-	-	2	1	1	1	1	1	1	1	1	1	1
7 Pesticides	Unit/ha	2	5	5	1	-	-	2	2	1	1	2	-	1	1	1	1	2
8 Animal-Drafting: Plough etc.	Times/ha	1	1	1	1	1	1	1	1	-	1	1	1	1	1	1	1	1
9 Others, Transport	Times/ha	5	3	20	5	10	10	5	5	3	3	3	10	5	2	2	2	10
10 Machinery cost-harvest/threshing	Times/ha	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11 Supports (pole)	Bundle/ha	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	300
Total Material Cost (A)	Rs./ha	22,667	14,163	31,156	31,142	22,080	32,121	21,542	22,204	72,400	16,802	16,537	25,725	21,132	16,002	20,135	12,797	27,003
3. Unit cost of Labour																		
1 Labour cost per day	Rs./day	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250	250
4. Labour Requirement																		
a) Land preparation																		
1 Drains	Md/ha	4	4	10	10	5	5	5	5	10	5	5	12	-	5	5	5	5
2 Cleaning	Md/ha	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
3 Ploughing & Harrowing	Md/ha	7	10	12	12	12	10	15	15	10	15	10	15	12	12	12	12	12
5 Plastering bunds	Md/ha	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7 Nursery preparation	Md/ha	2	-	4	15	-	-	10	10	-	-	-	50	-	-	-	-	-
b) Planting																		
1 Digging holes	Md/ha	-	10	30	15	5	5	10	10	10	10	5	30	5	5	5	5	5
2 Filling holes or/ Transplanting	Md/ha	24	9	40	15	5	5	15	15	5	5	5	30	5	5	5	5	5
3 Irrigation	Md/ha	7	10	15	15	10	10	10	10	10	10	5	10	5	5	5	5	5
c) Maintenance																		
1 Weeding	Md/ha	24	30	40	20	40	30	40	40	30	30	30	60	25	25	25	25	25
2 Irrigation	Md/ha	8	10	30	10	25	20	20	20	-	20	20	30	12	12	10	10	15
3 Fertilize application	Md/ha	8	10	25	10	12	12	12	12	10	12	12	20	6	12	10	12	12
4 Pest and disease control	Md/ha	6	6	20	10	6	6	6	6	6	6	6	10	6	6	6	6	6
d) Harvesting																		
1 Harvesting	Md/ha	34	20	70	34	80	80	25	25	50	50	34	60	30	30	20	20	80
2 Processing / Threshing / Bagging	Md/ha	24	10	40	24	40	40	15	15	10	40	24	30	10	20	15	15	40
Total Labour (including family labour)	Md/ha	155	134	341	195	245	228	188	188	176	208	161	362	121	142	123	125	215
Total Labour cost (B)	Rs./ha	38,750	33,500	85,250	48,750	61,250	57,000	47,000	47,000	44,000	52,000	40,250	90,500	30,250	35,500	30,750	31,250	53,750
5. Total Cultivation Cost (A) + (B)	Rs./ha	61,417	47,663	116,406	79,892	83,330	89,121	68,542	69,204	116,400	68,802	56,787	116,225	51,382	51,502	50,885	44,047	80,753
Excluding Family Labour Cost: 80% (C)	Rs./ha	7,750	6,700	17,050	9,750	12,250	11,400	9,400	9,400	8,800	10,400	8,050	18,100	6,050	7,100	6,150	6,250	10,750
6. Total Cultivation Cost (A) + (C)	Rs./ha	30,417	20,863	48,206	40,892	34,330	43,521	30,942	31,604	81,200	27,202	24,587	43,825	27,182	23,102	26,285	19,047	37,753
1 Yield (Improved): 80% to Expec. Yield	Kg/ha	3,600	2,800	9,600	12,800	24,000	20,000	24,000	24,000	16,000	16,000	20,000	20,000	20,000	6,400	1,200	1,200	8,000
2 Estimated Producer Price *1	Rs./kg	28	18	39	28	18	18	15	22	21	46	16	25	16	22	37	25	31
7. Sales Income (Gross Income)	Rs./ha	100,800	50,400	374,400	358,400	432,000	360,000	360,000	528,000	336,000	736,000	320,000	500,000	320,000	140,800	44,400	30,000	248,000
8. Net Income	Rs./ha	70,383	29,537	326,194	317,508	397,670	316,479	329,058	496,396	254,800	708,798	295,413	456,175	292,818	117,698	18,115	10,953	210,247
9. Benefit/Cost Ratio		2.31	1.42	6.77	7.76	11.58	7.27	10.63	15.71	3.14	26.06	12.02	10.41	10.77	5.09	0.69	0.58	5.57
Remark *2: (main selling methods at present)		Selling locally (100%)	Selling locally (100%)	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Selling locally (80%)	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Almost for Local market	Self consumption	Almost for Local market

Source: Prepared by MID

Chapter 8 Construction Programme & Planning

8.1 General

Construction materials required for the construction of various components of the scheme (rehabilitation of intake, irrigation channel, farm pond, etc.) mainly bricks, stones, coarse aggregate, sand, and G. I. pipes, will be procured from approved firms and supplied and delivered at the site. Since the quantity of materials required for construction is very small, most of the materials are proposed to be collected from Kolasib Town, which is in the vicinity of the project. The project, as mentioned earlier, is connected to a fair weather road and there will be no difficulty in transportation of the materials to be used for the construction project.

8.2 Construction Planning

The total quantity of work involved in the construction of the scheme is small since the scheme envisages rehabilitation of intake and construction of irrigation channel, farm pond, etc. Materials required for construction of the project is available in the vicinity of the project.

Detailed construction plan is shown in the attachment.

Chapter 9 Command Area Development

9.1 Land Consolidation

Nil

9.2 Link Road

Nil

9.3 Rive Improvement

Nil

9.4 Others

Nil

Chapter 10 Quality Control Aspect

10.1 Quality Control Aspect

Quality control plays a very important part in the construction of irrigation components. So many steps have been taken up to make sure the quality of farm structure as well as off farm structure are constructed according to the standard in the DPR. Some of the beneficial steps taken up in order to improve the quality of the irrigation structure are as follows:

- The engineer in charge visits the construction site periodically and checks the component whether it is constructed and designed according to the technical specifications or not.
- The water users/farmers are required to visit the construction site during the construction phase of components like reservoir, intake, and channel in their respective land.

Detailed quality control plan is shown in the attachment.

Chapter 11 Water Users' Association and O&M Activities

Participation of project beneficiaries has assumed vital role in successful implementation of Minor Irrigation Schemes in Mizoram. To enhance sense of ownership and responsibilities, prospective beneficiaries are involved right from the stage of project formulation to post-project management after completion of the project. Besides, participations of project beneficiaries promote transparency of minor irrigation schemes.

Prospective project beneficiaries are involved in the process of project formulation through their active participation in survey & investigation and assessment of their development needs which may be covered by minor irrigation scheme within the prevailing norms and guidelines. For taking up new project, due care and consideration to identify development needs and aspirations of the farmers are taken by having joint field visits and series of discussions and/or interactions with the prospective project beneficiaries before preparation and finalization of DPR.

Water Users Associations are formed once the project beneficiaries are identified and they extend active participation in supervision of works during the stage of project implementation.

On completion of the projects, Water Users Associations share the responsibilities of operation & maintenance of irrigation structures - while Water Users Association assume the responsibilities of operation of irrigation structures and allotment of irrigation water, Minor Irrigation Department execute works on repairs and reconstruction of damaged irrigation structures with active participation and contribution in the form of labour from the project beneficiaries.

WUA Basic rule and O&M Plan were prepared through workshop with beneficiaries and the rule and the plan is shown as Table 11.1.

Table 11.1 Details of Beneficiaries

Sl.No	Name	Address
1	Dosanga	Papua
2	Zairema	Lalliana(L)
3	Hrangchunga	Lalseia (L)
4	Lalthlamuana	C.Sangkhuma(L)
5	Thangmawii	Sangduna(L)
6	Ngunchii	H.Lianmawia
7	MS Nghaka	Hrangkhuma(L)
8	Dinhang	Chhunlinga(L)
9	Lalzawta	TC Hrangtuma
10	Thantluanga	Hrangkhuma
11	Lalzarliana	Hrangkhuma
12	Ropianga	Zanzauva(L)
13	Sawiluaia	Tialmanga(L)
14	Zachunga	Zanauva (L)
15	Lalremkima	Lungmuana(L)
16	VL Dawma	Sainghingi
17	Lalluaia	Lianvenga

Source: Prepared by MID

WUA Basic Rule

Name: Ngengrual Water Users' Association

Aim:

- (1) Self-sufficiency in agriculture.
- (2) Making Thingfal financially self-sufficient.

Objectives:

- (1) Distribution of water,
- (2) Helping the needy,
- (3) Good cooperation,
- (4) Preparing every cultivable area for paddy and other crops, and
- (5) Marketing of post-harvest products.

Membership:

Owners of the land, including Office Bearers and Committee Members, can be members of the WUA.

Appointment of leaders:

- (1) Chairman
- (2) Vice Chairman
- (3) Secretary
- (4) Asst. Secretary
- (5) Treasurer
- (6) Financial Secretary
- (7) Committee Members

Rules and regulations:

- (1) Membership fee: Rs.100, Annual fee: Rs.50
- (2) Leaders should be elected after every three years.
- (3) Meeting can be held at any time.
- (4) Picnic should be held every year.
- (5) There should be a receipt for every expense.
- (6) There should be a book for rules and regulations.
- (7) Financial report from each committee.
- (8) Membership fee/annual fee should be paid every year before the month of March.
- (9) Any modification made to the rules and regulations should be approved by the Office Bearers.

Disciplinary actions:

- (1) Any member who discontinues paying the annual fee shall be automatically removed from membership of the WUA.
- (2) Fines may be imposed (at local daily rate) on any member who is not willing to participate in the community works.

Source: Prepared by WUA

Operation and Maintenance Plan

1. Outline of WUA

1.1 Name of MIP : Ngengrual minor irrigation project

1.2 Name of WUA : Ngengrual water users association

1.3 Location of WUA : Division : Lunglei Village/Town : Thingfal

1.4 Command Area :

Command Area (ha)				Beneficiary (household)
Paddy	Upland	Orchard	Total	
14.7	0.0	0.0	14.7	17

2. List of facilities managed by WUA

SN	Name of Facilities	Completion Year (Plan)	Outline of Facilities	
			Structure	Dimension
Ngengrual				
1	River diversion -1	2017	Reinforced cement concrete	l=7m, w=14m
2	Main canal -1	2017	Reinforced cement concrete	l=2000 m
3	Desilting tank 1	2017	Reinforced cement concrete	l=3.4 m
4	Aqueduct 1-1	2017	Reinforced cement concrete	l=22 m
5	Aqueduct 1-2	2017	Reinforced cement concrete	l=10 m
6	Aqueduct 1-3	2017	Reinforced cement concrete	l=6 m
7	Aqueduct 1-4	2017	Reinforced cement concrete	l=6m
8	Aqueduct 1-5	2017	Reinforced cement concrete	l=22 m
Darnam				
1	Intake 2	2017	Reinforced cement concrete	l=2 m
2	Main pipe 2-1	2017	GI Pipe	l= 200 Rm
3	Main pipe 2-2	2017	GI Pipe	l=200 Rm

SN	Name of Facilities	Items	Implementer	Frequency	Schedule																		
					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec							
1	River diversion -1	Patrol	Person in charge	Every week																			
		Water management	Person in charge	Every day																			
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■																	
			Removing weeds	All beneficiaries	4 times per year				■														
		Report to MID	Person in charge	2 times per year					■														
2	Main canal -1	Patrol	Person in charge	Every week																			
		Water management	Person in charge	Every day																			
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■																	
			Removing weeds	All beneficiaries	4 times per year				■														
		Report to MID	Person in charge	2 times per year					■														
3	Desilting tank 1	Patrol	Person in charge	Every week																			
		Water management	Person in charge	Every day																			
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■																	
			Removing weeds	All beneficiaries	4 times per year				■														
		Report to MID	Person in charge	2 times per year					■														
4	Aqueduct 1-1	Patrol	Person in charge	Every week																			
		Water management	Person in charge	Every day																			
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■																	
			Removing weeds	All beneficiaries	4 times per year				■														
		Report to MID	Person in charge	2 times per year					■														
5	Aqueduct 1-2	Patrol	Person in charge	Every week																			
		Water management	Person in charge	Every day																			
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■																	
			Removing weeds	All beneficiaries	4 times per year				■														
		Report to MID	Person in charge	2 times per year					■														
6	Aqueduct 1-3	Patrol	Person in charge	Every week																			
		Water management	Person in charge	Every day																			
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■																	
			Removing weeds	All beneficiaries	4 times per year				■														
		Report to MID	Person in charge	2 times per year					■														
7	Aqueduct 1-4	Patrol	Person in charge	Every week																			
		Water management	Person in charge	Every day																			
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■																	
			Removing weeds	All beneficiaries	4 times per year				■														
		Report to MID	Person in charge	2 times per year					■														
8	Aqueduct 1-5	Patrol	Person in charge	Every week																			
		Water management	Person in charge	Every day																			
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■																	
			Removing weeds	All beneficiaries	4 times per year				■														
		Report to MID	Person in charge	2 times per year					■														
1	Intake 2	Patrol	Person in charge	Every week																			
		Water management	Person in charge	Every day																			
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■																	
			Removing weeds	All beneficiaries	4 times per year				■														
		Report to MID	Person in charge	2 times per year					■														
2	Main pipe 2-1	Patrol	Person in charge	Every week																			
		Water management	Person in charge	Every day																			
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■																	
			Removing weeds	All beneficiaries	4 times per year				■														
		Report to MID	Person in charge	2 times per year					■														
3	Main pipe 2-2	Patrol	Person in charge	Every week																			
		Water management	Person in charge	Every day																			
		Maintenance	Removing sedimentation soil	All beneficiaries	Every month	■																	
			Removing weeds	All beneficiaries	4 times per year				■														
		Report to MID	Person in charge	2 times per year					■														

Date: _____ Place: _____

Checked by: _____ Prepared by: _____ Countersigned by: _____

(Sub-Divisional Engineer) (Junior Engineer and WUA) (Executive Engineer)

Annexure

1. Survey & Investigation

1.1 Soil Classification

Soil classification test(in site)		Surveyed Date	28/Oct. /2014
Scheme Name	Ngengrual MIP	Name of Surveyor	SDO and JE (Lunglei)

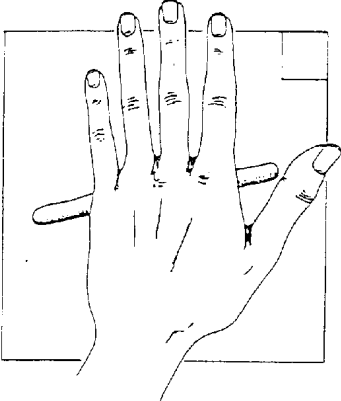
Instruction

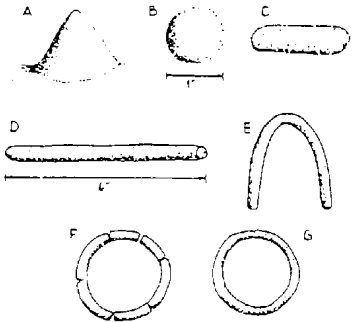
1) Visit the survey together with village chairperson and villagers.
 Visit the proposed area and choose typical soil in the area with the consultation of the village chairperson and villagers.

2) Sampling of the soil
 Gather a soil sample from the soil surface (sample should be about 10 x 10 x 10 cm).

3) Knead the soil with water.
 Add some water to the soil sample so it is moist but not wet. Knead it well. Pebbles should be removed.

4) Try to create ring shapes with the soil sample and choose the most advanced shape that can be made.





A: Soil can only be shaped into a cone. No other shapes hold together.

B: Soil can be formed into a circle, but not a rod shape.

C: Soil can be formed into a stout rod shape.

D: A thin rod (about 6 mm diameter) can be formed but not bent.

E: Thin rod can be bent without breaking

F: Circle can be formed with some breaks.

G: Complete circle with no breaks can be formed.

5) Evaluate the soil texture
 According to the result of 4), circle one of the detailed soil texture types and choose a General soil texture type by conversion of the detailed soil texture type.

Detail soil texture type		conversion		General soil texture type
Shape A Sand	<input type="checkbox"/>	if you choose Shape A	→	Sand <input type="checkbox"/>
Shape B Loamy sand	<input type="checkbox"/>	if you choose Shape B or C	→	Sandy Loam <input type="checkbox"/>
Shape C Silty Loam	<input type="checkbox"/>			
Shape D Loam	<input checked="" type="checkbox"/>	if you choose Shape D or E	→	Clay Loam <input checked="" type="checkbox"/>
Shape E Clay Loam	<input type="checkbox"/>			
Shape F Light Clay	<input type="checkbox"/>	if you choose Shape F or G	→	Clay <input type="checkbox"/>
Shape G Heavy Clay	<input type="checkbox"/>			

6) Notable Soil Characteristics
 If there are any notable soil characteristics such as high rock outcrop, shallow soil depth and symptom of salt accumulation, please note.
 Note:

Note: Picture of the test is to be attached in following.



Test

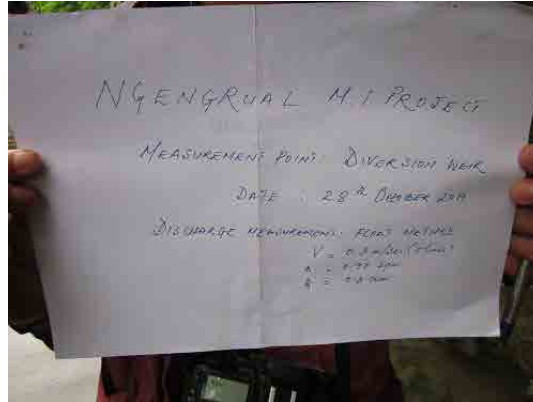


Result

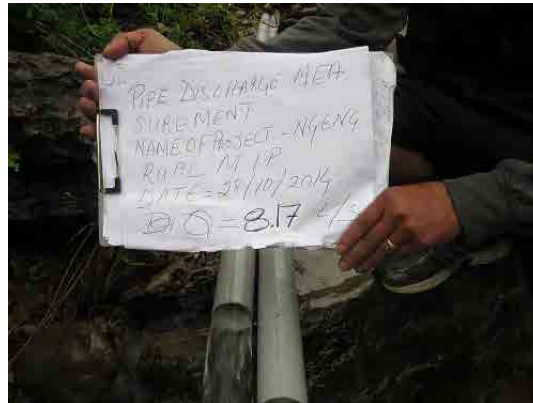
1.2 Measurement of stream discharge

Date of Measurement	28.10.14
Surveyor	P. Lalnunthara
Measured discharge	1. Ngengrual 0.325 cum 2. Darnamlui 0.008 cum

Picture



Ngengrual lui at the diversion weir



Darnamlui at the intake point

1.3 Household Survey

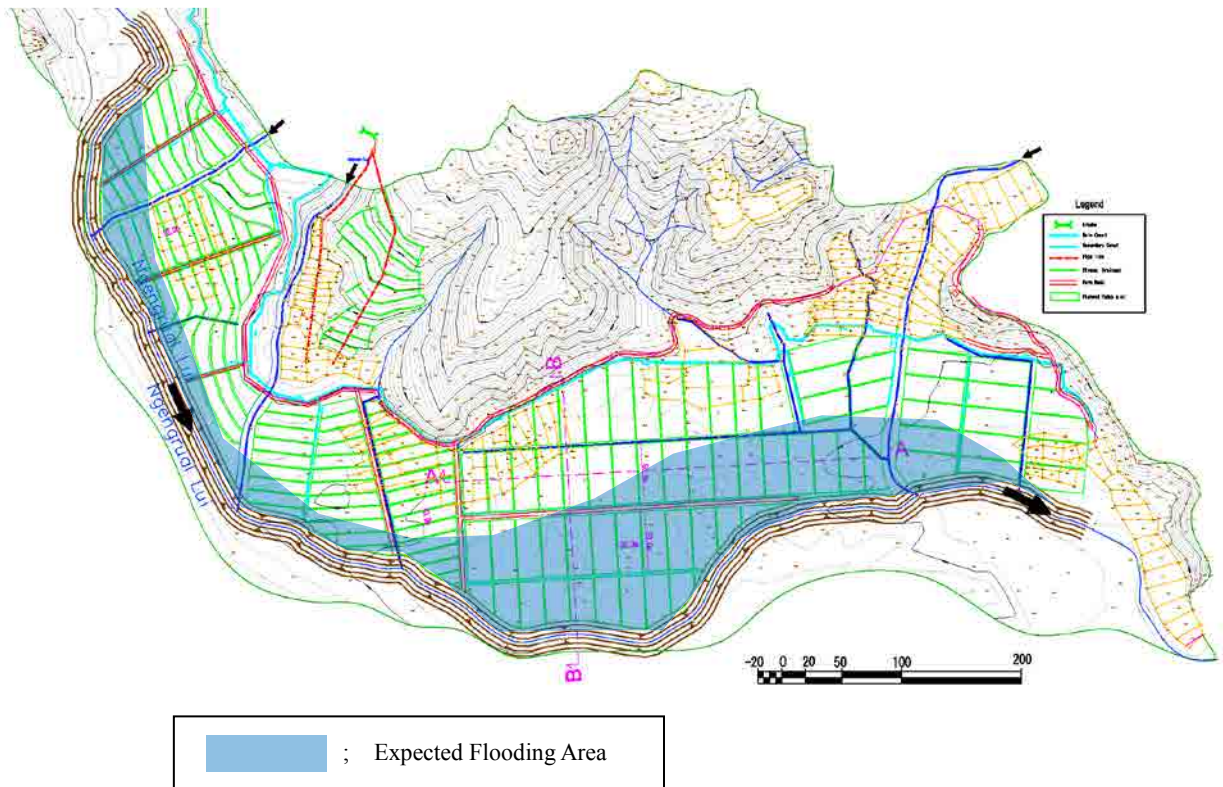
No	Residence		Land (acre)							
	Town / Village	District	Jhum	Irrigated / Wetland	Permanent rainfed	Fallow	Fish pond	Residential	Others	Total
L-1	Thingfal	Lunglei		2.000			9.290	0.002		11.292
L-2	Thingfal	Lunglei		2.000				0.002		2.002
L-3	Thingfal	Lunglei		2.000						2.000
L-4	Thingfal	Lunglei		2.000						2.000
L-5	Thingfal	Lunglei			2.000		0.500	1.000		3.500
L-6	Thingfal	Lunglei		1.500	1.500					3.000
L-7	Thingfal	Lunglei								
L-8	Thingfal	Lunglei	1.000							1.000
L-9	Thingfal	Lunglei		3.000						3.000
L-10	Thingfal	Lunglei	1.000		1.000					2.000
L-11	Thingfal	Lunglei								
L-12	Thingfal	Lunglei		2.000						2.000
L-13	Thingfal	Lunglei	1.000	3.000						4.000
L-14	Thingfal	Lunglei			3.000					3.000
L-15	Thingfal	Lunglei								
L-16	Thingfal	Lunglei		2.000						2.000
L-17	Thingfal	Lunglei		2.000	3.000		0.004			5.004
L-18	Thingfal	Lunglei			2.000					2.000
L-19	Thingfal	Lunglei		3.000						3.000
L-20	Thingfal	Lunglei		4.000	3.000			1.000		8.000
L-21	Thingfal	Lunglei								
L-22	Thingfal	Lunglei								
L-23	Thingfal	Lunglei		2.000			0.500	1.000		3.500
L-24	Thingfal	Lunglei		1.000	2.000			1.000		4.000
L-25	Thingfal	Lunglei								
L-26	Thingfal	Lunglei		1.000	3.000		0.500	0.500		5.000
L-27	Thingfal	Lunglei								
L-28	Thingfal	Lunglei		2.000	2.000			0.500		4.500
L-29	Thingfal	Lunglei		7.000				0.500		7.500
L-30	Thingfal	Lunglei								
L-31	Thingfal	Lunglei								
L-32	Thingfal	Lunglei		4.000						4.000
L-33	Thingfal	Lunglei		5.000	5.000		0.500	0.500		11.000
L-34	Thingfal	Lunglei								
L-35	Thingfal	Lunglei			1.000					1.000
L-36	Thingfal	Lunglei								
L-37	Thingfal	Lunglei		5.000						5.000
L-38	Thingfal	Lunglei		3.000						3.000
L-39	Thingfal	Lunglei		1.000						1.000
		Total	3.000	59.500	28.500	-	11.294	6.004	-	108.298
		(%)	3	55	26	-	10	6	-	100
		Average	1.000	2.705	2.375	-	1.882	0.600	-	3.868
		Median	1.000	2.000	2.000	-	0.500	0.500	-	3.000
		Max	1.000	7.000	5.000	-	9.290	1.000	-	11.292
		Min	1.000	1.000	1.000	-	0.004	0.002	-	1.000

1.4 DPR Preparatory Survey check sheet (For MID Engineer)

Scheme Name		NGENGRUAL MINOR IRRIGATION PROJECT		S/N	
Survey Date		28/10/2014	Name of surveyor/ Position	P.Lalnunthara, SDO(S)	
S/N	Items	Content		Check	Remarks
1	Preparation of Base Map	<ul style="list-style-type: none"> • Creation of Contour Map with GIS. • Trace existing facilities like paddy, road, river. in Google earth. And save the data. • Save Google earth picture data. It is recommendable to use Google earth Pro for better resolution data. • Merge above three map data and prepare base map with CAD. • Conduct walking survey and confirm existing facilities to modify the base map. 		√	
2	Clarification of land owners	<ul style="list-style-type: none"> • Clarification of land owners and boundaries through meeting and joint walkthrough survey. • Collected information are to be mapped on the base map 		√	
3	Soil Clarification	<ul style="list-style-type: none"> • Take several soil samples from farm. • Site soil testing is to be conducted. And take pictures. 		√	
4	Bearing Capacity	<ul style="list-style-type: none"> • Take several measurement of bearing capacity at several sites, like Diversion, tank and canal, using simple portable tool. 		√	No high bearing capacity structure
5	Slope Soil Conditions along canal	<ul style="list-style-type: none"> • Walk through field soil survey at intake point and along main canal to identify of possible land-sliding areas and estimate risk of sliding. • Result of the survey is to shown in above Base Map and will be reflected to facility planning and designing. 		√	Refer to annex for example map.
6	Topological Survey	<ul style="list-style-type: none"> • River centreline level survey to identify suitable point for intake and expect future change of river bed. • Cross-leveling Survey at several typical points along canal. • Longitudinal levelling along gentle slope canal. • Total station survey around farm pond and gentle slope farm development area. 		√	Gentle slope farm development area

7	Available surface water	<ul style="list-style-type: none"> • Measurement of discharge water at candidate intake points. • Take measurement of catchment area of each stream with GIS or CAD. • Make rough estimation of season wise discharge water and confirm with farmers. 	√	
8	Preparation of Layout map	<ul style="list-style-type: none"> • Preparation of first draft facility layout map on base map. • Confirm the draft plan with beneficiaries. 	√	

Land sliding, Flooding and Erosion Survey result



Annexure

2. Hydrology

2.1 Rainfall Record

Monthly rainfall record under Agriculture & Minor Irrigation Department

Name of Station : Lunglei

Year\Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1998	31.00	77.00	128.00	225.00	652.00	600.00	882.00	665.00	284.00	273.00	4.00	0.00	3,821.00
1999	0.00	0.00	17.00	17.00	436.00	775.00	734.00	598.00	692.00	395.00	0.00	98.00	3,762.00
2000	6.00	5.00	162.00	289.00	918.00	1,008.00	866.00	1,412.00	501.00	290.00	97.00	0.00	5,554.00
2001	0.00	8.00	8.00	49.00	617.00	784.00	613.00	521.00	426.00	375.00	240.00	0.00	3,641.00
2002	24.00	0.00	77.00	70.00	738.00	530.00	981.00	543.00	312.00	89.00	141.00	0.00	3,505.00
2003	0.00	1.00	25.00	58.00	220.00	1,196.00	477.00	624.00	584.00	170.00	0.00	27.00	3,382.00
2004	0.00	0.00	25.00	290.00	296.00	1,233.00	919.00	535.00	594.00	173.00	11.00	0.00	4,076.00
2005	2.00	0.00	87.10	104.80	267.60	271.90	556.20	622.20	436.30	412.60		12.80	2,773.50
2006	0.00	0.00	2.60	67.30	494.50	799.70	737.10	479.50	405.00	226.20	0.00	0.00	3,211.90
2007	0.00	55.20	1.80	173.60	454.50	701.90	804.20	910.70	945.40	317.10	73.00	0.00	4,437.40
2008	72.00	8.10	29.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.00	111.40
2009	0.00	0.00	0.00	0.00	0.00	0.00	0.00	830.20	482.40	198.20	169.10	0.00	1,679.90
2010	0.00	1.00	85.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	86.80
2011	0.00	0.00	0.00	55.40	607.90	574.00	495.00	749.30	489.50	192.90	0.00	0.00	3,164.00

2.2 Annual Average Yield

Annual Discharge of Ngengrual Minor Irrigation Project

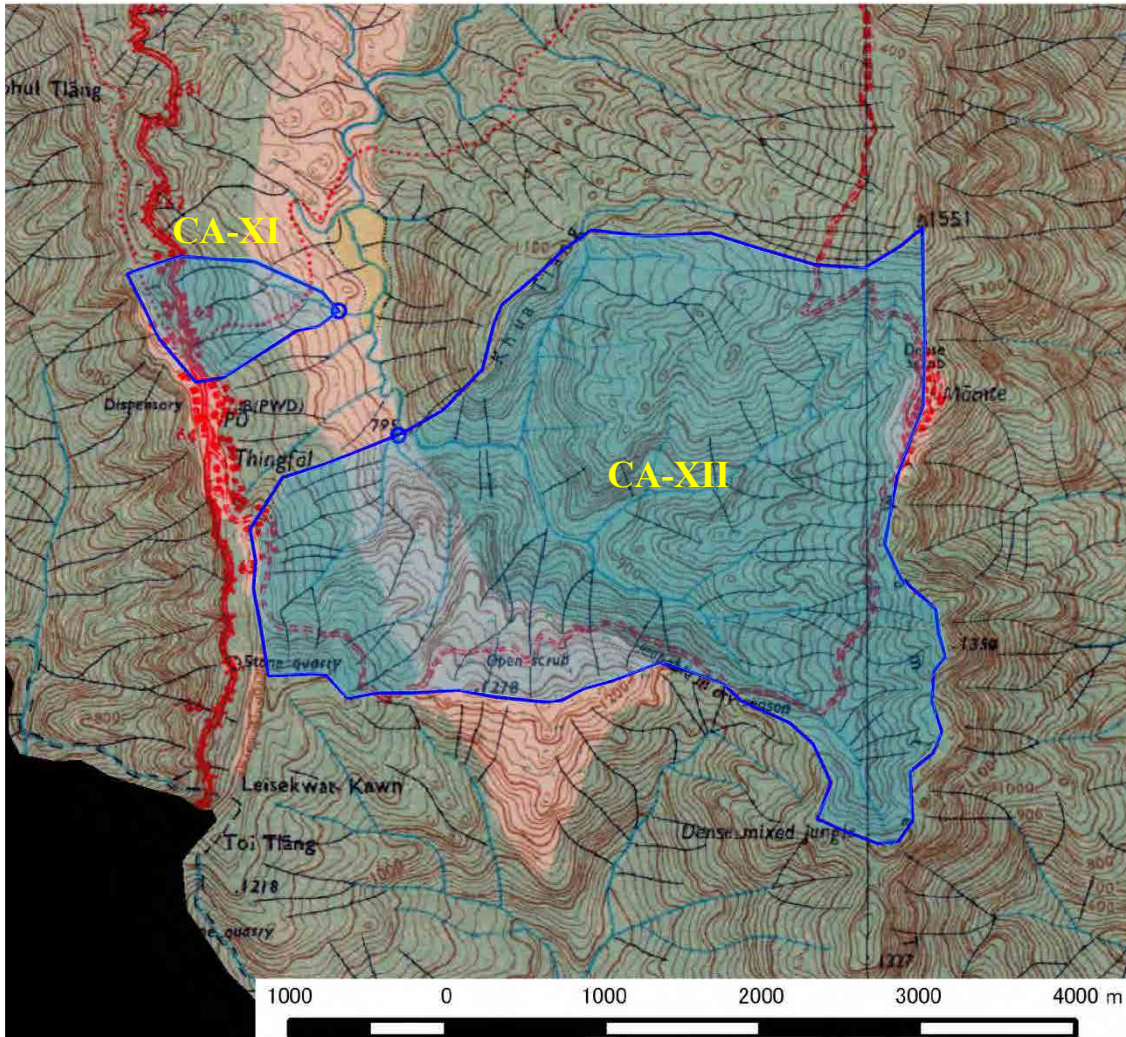
Name of Station : Lunglei

Year\Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1998	0.047	0.129	0.194	0.352	0.986	0.938	1.334	1.006	0.444	0.413	0.006	0.000	0.487
1999	0.000	0.000	0.026	0.027	0.659	1.211	1.110	0.904	1.081	0.597	0.000	0.148	0.480
2000	0.009	0.008	0.245	0.452	1.388	1.575	1.309	2.135	0.783	0.439	0.152	0.000	0.708
2001	0.000	0.013	0.012	0.077	0.933	1.225	0.927	0.788	0.666	0.567	0.375	0.000	0.465
2002	0.036	0.000	0.116	0.109	1.116	0.828	1.483	0.821	0.488	0.135	0.220	0.000	0.446
2003	0.000	0.002	0.038	0.091	0.333	1.869	0.721	0.944	0.913	0.257	0.000	0.041	0.434
2004	0.000	0.000	0.038	0.453	0.448	1.927	1.390	0.809	0.928	0.262	0.017	0.000	0.523
2005	0.003	0.000	0.132	0.164	0.405	0.425	0.841	0.941	0.682	0.624	0.000	0.019	0.353
2006	0.000	0.000	0.004	0.105	0.748	1.250	1.115	0.725	0.633	0.342	0.000	0.000	0.410
2007	0.000	0.092	0.003	0.271	0.687	1.097	1.216	1.377	1.477	0.479	0.114	0.000	0.568
2008	0.109	0.014	0.044	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.003	0.014
2009	0.000	0.000	0.000	0.000	0.000	0.000	0.000	1.255	0.754	0.300	0.264	0.000	0.214
2010	0.000	0.002	0.130	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.011
2011	0.000	0.000	0.000	0.087	0.919	0.897	0.748	1.133	0.765	0.292	0.000	0.000	0.403
Average	0.015	0.019	0.070	0.156	0.616	0.946	0.871	0.917	0.687	0.336	0.082	0.015	0.394

Average Annual Discharge = 0.394 m³/s
 Catahnebt area = 9.00 km²
 12.427 MCM Runoff coefficient = 0.45

2.3 DRAINAGE MAP

Drainage Map



Catchment area

Area Name	Area (km ²)
CA-XI	1.0
CA-XII	9.0

Annexure

3. Agriculture Action Plan

No	Action Item	Schedule																																				Responsibility	Assisted by					
		2015												2016												2017													Financial			Technical		
		M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F		Organization	(L. Rs.)	Source			
<i>Sub Target: Improvement of group farming system</i>																																												
1	Establishment of WUA - holding General Meeting - improvement of rules & regulation etc. - receiving members' assent for WUA																																						Nominated members					MID / DOA / DOH
2	Receiving training - Record keeping and other O&M training for WUA and farm management - group farming system for group purchasing of farm inputs																																						WUA WUA WUA / Farmer group		MID DOA			MID / DOA MID / DOA DOA
3	Hold special committee meeting - Finalization detail activities concern to DPR - Discussion about possibilities of community contract - Methods of O&M of irrigation system																																						WUA WUA WUA WUA					MID / DOA MID / DOA MID MID
<i>Sub Target: Improvement of paddy cultivation</i>																																												
1	Preparation of cultivation schedule																																						WUA WUA					DOA DOA
2	Receiving training for paddy cultivation and other activities																																						WUA		DOA			DOA
3	Group purchasing of farm-inputs by assistance of DOA																																						WUA		DOA			DOA
4	Trial cultivation of Hy-brid rice with chemical fertilizer and othe new techniques - receiving technical training for hy-brid paddy cultivation																																						Farmer group / WUA Farmer group / WUA			DOA		DOA DOA
5	Implementation of paddy cultivation by joint action - Selection of variety of paddy - Selection of model farmers - Preparation of joint action programmes																																						Farmer group / WUA Farmer group / WUA Farmer group / WUA Farmer group / WUA					DOA DOA DOA DOA
<i>Sub Target: Improvement of winter crop</i>																																												
1	Preparation of cultivation schedule with DOA, DOH - selection of model paddy field for winter crop - Selection of model farmer group - Preparation of rules for group farming																																						Farmer group / WUA Do. Do. Do.					DOH / DOA Do. Do. Do.
2	Receiving training for winter crop cultivation - mixed crop cultivation - Fertilizer application - Practical training at the field																																						Farmer group / WUA Do. Do. Do.			DOH / DOA DOH / DOA DOH / DOA		DOH / DOA Do. Do. Do.
<i>Sub Target: Improvement of infrastructure</i>																																												
1	Improvement of access road																																						DOA					
2	Development of farm land consolidation																																						DOA					
3	Improvement of river (Ngengruai lui)																																						SWCD					

Annexure

4. Environmental Conformity Check List

No.	Criteria	Check items	YES	NO
1	WATER AND PHYSICAL ENVIRONMENT	<ul style="list-style-type: none"> ■ Is it sure that the project is not likely to affect or conflict with the existing water uses and water rights downstream? 	✓	
		<ul style="list-style-type: none"> ■ Are awareness heightening campaigns undertaken, or going to be undertaken, for the proper handling and use of permitted fertilizers and pesticides by the farmers, of for promoting and facilitating organic farming? 	✓	
		<ul style="list-style-type: none"> ■ Are the engine equipments for construction (trucks, others) and operation (water pumps if any) properly selected as to be in conformity with the national environmental emission standards for air quality and noise levels? 	✓	
2	FOREST	<ul style="list-style-type: none"> ◇ Will the project encroach on a forest land? 		✓
		<ul style="list-style-type: none"> ■ If it is planned that the project will encroach on forest land, a forestry clearance permit must be obtained from the Department of Environment and Forestry, and a compensatory afforestation plan must be prepared. Has a forestry clearance been submitted, or is it going to be done during the planning stage? <p><i>NOTE</i> The principle of forestry clearance is that a non forest land equivalent in area to the forest land diverted for non-forestry use must be provided for compensatory afforestation and transferred to the Environment and Forest Department for notification as forest land. The forestry clearance procedure differs according to conditions like the size of the forest land for diversion.</p>		
3	PROTECTED AREAS	<ul style="list-style-type: none"> ■ Is it sure that the project site is located outside any protected area? <p><i>NOTE</i> A protected area is a National Park, a Wildlife Sanctuary, a Conservation Reserve, or a Community Reserve (Wildlife Protection Act 1972). Should also be considered as a protected area the following: Planned extension area of an existing protected area, planned or existing Eco-sensitive Zone (buffer zone around a protected area)</p>	✓	
4	HUMAN SETTLEMENTS	<ul style="list-style-type: none"> ◇ Will the project encroach on human settlements others than housing settlements, and possibly induce damages on or loss of such settlements,? <p><i>NOTE</i> Given the conditions of permanent housing hilltop or hillside, it is assumed that small scale irrigation projects are not likely to affect housing. It is however possible in specific cases.</p>		✓
		<ul style="list-style-type: none"> ■ If it is confirmed that the project will encroach on human settlements, including housing settlements or not, and possibly induce damages on or loss of such settlements, are compensatory measures undertaken according to the legal requirements? <p><i>NOTE</i> Compensation of land and assets must be performed at least according to the Mizoram Land Acquisition Rules 2010.</p>		
5	CULTURAL AND HISTORICAL SITES	<ul style="list-style-type: none"> ■ Is it sure that the project site is not contiguous to, and is not likely to affect directly (physical damages) or indirectly (landscape), any protected monument or site notified by the Arts and Culture Department? <p><i>NOTE</i> The Arts and Culture Department has notified a list of 82 protected monuments or sites</p>	✓	
		<ul style="list-style-type: none"> ■ Is it confirmed in discussion and coordination with the Village Council, that the project site does not encroach on any valuable existing cultural or historical asset or place of importance for the local community? <p><i>NOTE</i> Valuable existing cultural or historical asset or place may include graves, sacred grooves, and any others.</p>		
6	LIVING ENVIRONMENT	<ul style="list-style-type: none"> ■ Are opportunities of improvement of the living environment in relationship with irrigation works and in consultation with the local community fully taken into consideration for planning the project? <p><i>NOTE</i> For example, if a water body or river site is used for washing or bathing, the construction of irrigation works can be an opportunity to improve the conditions of use and the conditions of access, particularly for users like vulnerable people, women, and children.</p>	✓	
		<ul style="list-style-type: none"> ■ Does planning of the project take into consideration the standpoint of the women of the community of concern, and more particularly the women in vulnerable condition, as for both criteria 4 and 7? 	✓	

Annexure

5. Design Check List

Check List 1

Canal

[First Stage] : Basic Conditions

1. Outline

1.1 Land Use

Paddy Upland Both

1.2 Type

Open Channel Pipeline Both

1.3 Canal Type and Dimension

Name	Type	Length (m)	Flow (m3/s)	Slope	Remarks
Main channel	Open Channel	2,000	0.042	1/ 100	

1.4 Supplementary facilities of Canals

Facilities	Number	Remarks
Divisin works		Nil
Regulating reservoir		Nil
Management Road		Nil
Culvert/Bridge		Nil
Regulator (gate)		Nil
Other (Aqueduct)	5	

1.5 Consultation

1.5.1 River

Need No need

1.5.3 Other ()

Need No need

1.5.2 Drinking Water

Need No need

2. Basic Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
	<i>[Example]</i>				
3	Field survey	3.1 Whether the pictures are taken.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Annexure II
1	Design purpose	1.1 Whether the purpose is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the scope, quantity, items of design are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2	Basic design conditions	2.1 Whether the irrigation system is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.2 Whether the intake points are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.3 Whether the water users are grasped.	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
		2.4 Whether the consultation items are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
3	Field survey	3.1 Whether the pictures are taken.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.2 Whether the field conditions (topography, soil, landuse etc.) are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter-2
		3.3 Whether the river and road conditions are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.4 Whether the points of the planned main facilities are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.5 Whether the difficulty or issues are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.6 Whether the important points of the construction are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	Design plan	4.1 Whether the selected canal types are suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.2 Whether the facility layout is suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.3 Whether the canal standard structure is suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.4 Whether the maintenance is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer)

Place : _____ Prepared by _____ (Junior Engineer)

Countersigned by : _____ (Executive Engineer)

Check List 2

Canal

[Middle Stage] : Drawings

1. Detailed Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
	<i>[Example]</i>				
3	Drawings	3.1 Whether the cross drawings are prepared,	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
1	Design Plan (supplementary facility)	1.1 Whether the following supplementary facility layout and scale are suitable.			
		- Division works	<input type="checkbox"/>	<input type="checkbox"/>	Nil
		- Regulator reservoir	<input type="checkbox"/>	<input type="checkbox"/>	Nil
		- Management road	<input type="checkbox"/>	<input type="checkbox"/>	Nil
		- Bridge/Culvert	<input type="checkbox"/>	<input type="checkbox"/>	Nil
		- Regulator (gate)	<input type="checkbox"/>	<input type="checkbox"/>	Nil
		- Aqueduct	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
2	Hydraulics Calculation	2.1 Whether the formulas and coefficients used in hydraulic calculation are suitable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 4
3	Drawings	3.1 Whether the cross drawings are prepared,	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
		3.2 Whether the drawings are consistent in hydraulics calculation.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
		3.3 Whether the indication of drawings is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
		3.4 Whether the special mention is appropriate.	<input type="checkbox"/>	<input type="checkbox"/>	Nil
4	Construction Plan	4.1 Whether the access road for construction is appropriate.	<input type="checkbox"/>	<input type="checkbox"/>	Nil

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer) Countersigned by : _____ (Executive Engineer)
 Place : _____ Prepared by : _____ (Junior Engineer)

Check List 3

Canal

[Final Stage] : Quantity and DPR

1. Quantity

SN.	Items	Contents	Object	Confirmation	Reasons
	<i>[Example]</i>				
1	Quantity	1.2 Whether the quantity is prepared for each material.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
1	Quantity	1.1 Whether the sizes used in the quantity calculation are consistent in the drawings.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
		1.2 Whether the quantity is prepared for each material and each facility.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

2. DPR

SN.	Items	Contents	Object	Confirmation	Reasons
	<i>[Example]</i>				
1	DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Contents
1	DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the reasons of the formulas and coefficients are wrote clearly.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 4
		1.3 Whether the calculation process are arranged clearly.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 4

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer) Countersigned by : _____ (Executive Engineer)
 Place : _____ Prepared by : _____ (Junior Engineer)

Check List 1

Diversion Weir

[First Stage] : Basic Conditions

1. Outline

1.1 Name of Diversion	River diversion 1	
1.2 Rive conditions	1.2.1 Gross Catchment Area of the Weir	900 ha
	1.2.2 Droughty Water Discharge	0.3 cumec
	1.2.3 River Width	10 m
1.3 Weir	1.3.1 Crest Length	14 m
	1.3.2 Intake Flow	0.042 cumec

1.4 Gates

SN.	Function	Type	Number	Size (m)	
				Height	Width
	<i>[Exampe]</i>				
1	Intake	Slide	2	0.80	0.40
1	Nil				
2					
3					

1.4 Consultation	1.4.1 River	<input type="checkbox"/> Need <input checked="" type="checkbox"/> No need	1.4.2 Drinking Water	<input type="checkbox"/> Need <input checked="" type="checkbox"/> No need
	1.4.3 Fisheries	<input type="checkbox"/> Need <input checked="" type="checkbox"/> No need	1.4.4 Other ()	<input type="checkbox"/> Need <input checked="" type="checkbox"/> No need

2. Basic Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
	<i>[Example]</i>				
1	Design Purpose	1.1 Whether the purpose is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 4
1	Design purpose	1.1 Whether the purpose is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the scope, quantity, items of design are understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 1,4
2	Basic design conditions	2.1 Whether the water users are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Annex-11
		2.2 Whether the maximum intake quantity is grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.3 Whether the intake point is understood.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		2.4 Whether the consultation items are understood.	<input type="checkbox"/>	<input type="checkbox"/>	Nil
3	Field survey	3.1 Whether the pictures are taken.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Annex-5
		3.2 Whether the flood and scour conditions are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.3 Whether the both bank conditions of the planned point are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.4 Whether the road conditions are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Attachment 2-1
		3.5 Whether the difficulty or issues are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		3.6 Whether the important points of the construction are grasped.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
4	Design plan	4.1 Whether the river flow is steady.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.2 Whether the irrigation water can be certainly taken during the dry season.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.3 Whether the soil inflow does not happen.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		4.4 Whether the weir structure is staedy and reasonable.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Chapter-4 & 6
		4.5 Whether the maintenance is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Chapter-6
		4.6 Whether the scouring measures are considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Chapter-6

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer)
 Place : _____ Prepared by : _____ (Junior Engineer) Countersigned by : _____ (Executive Engineer)

Check List 2

Diversion Weir

[Middle Stage] : Drawings

1. Detailed Conditions

SN.	Items	Contents	Object	Confirmation	Reasons
	<i>[Example]</i>				
1	Drawings	1.2 Whether the water and ground level are shown.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6 Estimates & Drawings
1	Drawings	1.1 Whether the layout and cross and profile drawings are prepared.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Chapter-6
		1.2 Whether the water and ground level are shown.	<input type="checkbox"/>	<input type="checkbox"/>	Nil
		1.3 Whether the indication of the drawings is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Chapter-6
		1.4 Whether the special mention is considered.	<input type="checkbox"/>	<input type="checkbox"/>	Nil
2	Construction Plan	2.1 Whether the access road for the construction is appropriate.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Attachment 2-1
		2.2 Whether the temporary drainage of the river is considered.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

Certification

Date : _____ Checked by : _____ (Msub-Divisional Officer) Countersigned by : _____ (Executive Engineer)
 Place : _____ Prepared by _____ (Junior Engineer)

Check List 3

Diversion Weir

[Final Stage] : Quantity and DPR

1. Quantity

SN.	Items	Contents	Object	Confirmation	Reasons
	<i>[Example]</i>				
1	Quantity	1.2 Whether the quantity is prepared for each material.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Chapter 6
1	Quantity	1.1 Whether the sizes used in the quantity calculation are consistent in the drawings.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Chapter-6
		1.2 Whether the quantity is prepared for each material and each facility.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Chapter-6

2. DPR

SN.	Items	Contents	Object	Confirmation	Reasons
	<i>[Example]</i>				
1	DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	DPR Contents
1	DPR	1.1 Whether the table of contents of DPR is based on the "Guidelines of preparation of DPR".	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
		1.2 Whether the reasons of the formulas and coefficients are wrote clearly.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Chapter-4
		1.3 Whether the calculation process are arranged clearly.	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	Chapter-4 & 6

Certification

Date : _____ Checked by : _____ (Sub-Divisional Officer) Countersigned by : _____ (Executive Engineer)
 Place : _____ Prepared by _____ (Junior Engineer)

Annexure

6. Cost Estimate

ABSTRACT OF COST

Ngengrual Minor Irrigation Project, Thingfal
Lunglei District : Mizoram

Sl.No.	MINOR HEAD	AMOUNT
1	DIRECT CHARGES	
	I -Works	` 7,284,200.00
	II -Establishment (@2%I-works)	` 145,684.00
	III -Ordinary T & P	` Nil
	IV -Suspense	` Nil
	V -Receipt & Recoveries (-)	` Nil
	Sub-Total	` 7,429,884.00
2	INDIRECT CHARGES	
	I Capitalized value of abatement of land Revenue	` Nil
	II Audit and Account@1%I-works	` 72,842.00
	Sub-Total	` 72,842.00

Gross estimated cost of the project ` 7,502,726.00

Say ` 7,503,000.00

I - WORKS
ABSTRACT OF COST
 Ngengrual Minor Irrigation Project, Thingfal
 Lunglei District : Mizoram

DETAIL HEAD		AMOUNT
A	- Preliminary	478,000.00
B	- Land	Nil
C	- Works	6,351,000.00
K	- Building	100,000.00
M	- Plantation	Nil
O	- Miscellaneous	255,200.00
P	- Maintenance	100,000.00
R	- Communication	Nil
Total		7,284,200.00

I-WORKS
 DETAILED ESTIMATE OF COST
 A - PRELIMINARY
 Ngengrual Minor Irrigation Project, Thingfal
 Lunglei District : Mizoram

Abstract of cost of Preliminary

Sl.No.	Particulars	Amount
1	Detail estimate for Survey & Investigation	` 208,000.00
2	Preparation and printing of project report	` 30,000.00
3	Conveyance cost for supervision of Project	` 200,000.00
4	Camp utensils and accesories	` 40,000.00
	Total	` 478,000.00

DETAILED ESTIMATE OF COST

Ngengrual MIP

NGENGRUAL MINOR IRRIGATION PROJECT;THINGFAL

Abstract of cost of C-Works

Sl. No.	Particulars	Qty	Unit		Amount
I	Ngengrual Lui				
1	Construction of Diversion weir 1	1	no	`	1,557,582.19
2	Construction of Main channel	1	no	`	3,992,734.59
3	Construction of Desiltation Tank	1	no	`	37,491.35
4	Construction of aqueduct 1-1	1	no		136,240.85
5	Construction of aqueduct 1-2	1	no		57,849.47
6	Construction of aqueduct 1-3	1	no		42,399.97
7	Construction of aqueduct 1-4	1	no		89,978.50
8	Construction of aqueduct 1-5	1	no		136,240.85
II	Darnam Lui				
1	Intake 2	1	no		34,893.70
2	Main Pipeline 2-1	200	rm		132,800.20
3	Main Pipeline 2-2	200	rm		132,800.20
				TOTAL :	Rs 6,351,011.87
			Say	Rs	6,351,000.00

I-WORKS
DETAILED ESTIMATE OF COST
O - MISCELLANEOUS

Ngengrual Minor Irrigation Project, Thingfal
 Lunglei District : Mizoram

Sl. No.	Particulars	Qty	Unit	Amount
1	Project Assistant (Skilled-II for 24 months)	L.S	`	175,200.00
2	Cost of Surveying instrument	L.S	`	80,000.00
Total :-				255,200.00

I - WORK

**A : PRELIMINARY :- Ngengrual Minor Irrigation Project, Thingfal,Lunglei
 DETAILED ESTIMATE FOR SURVEY AND INVESTIGATION OF
 NGENGRUAL MINOR IRRIGATION PROJECT.THINGFAL,LUNGLEI**

1 Alignment Survey for channel

a) Semi skilled Labours	15	Manday		
@ `	190	/head	`	2,850.00
b) Unskilled Labour	25	Manday		
@ `	170	/head	`	4,250.00

2 Check survey during construction of channel

a) Semi skilled Labours	15	Manday		
@ `	190	/head	`	2,850.00
b) Unskilled Labour	15	Manday		
@ `	170	/head	`	2,550.00

3 Final Survey

a) Semi skilled Labours	10	Manday		
@ `	190	/head	`	1,900.00
b) Unskilled Labour	15	Manday		
@ `	170	/head	`	2,550.00

4 Command area survey

	38	ha		
@ `	850	/ha	`	32,300.00

5 Reconnaissance Survey (Survey before DPR finalisation)

LS			`	40,000.00
----	--	--	---	------------------

6/1.02 Clearing and grubbing road land including uprooting rank vegetation, grass, brush shrubs, saplings and trees of girth upto 300 mm, removal of stumps, disposal of unserviceable material and stacking of serviceable material upto 100 metres from road boundary.

(a) By manual means.

i) In area of light jungle.

0 to 800.00

800.00	10.00	8,000.00	`
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ii) In area of thorny jungle.

800 to 2650.00

1850.00	9.00	16,650.00	`
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Total		24,650.00	sqm
-------	--	-----------	-----

@

	4.8	/sqm		118,320.00
TOTAL			`	207,570.00
SAY			`	208,000.00

1. Construction of Diversion weir at Ngengrual River
1.1: Detail quantities and Cost estimate of Diversion weir

- 1/2.08 Earthwork in excavation in foundation trenches etc. not exceeding 2 meters depth including dressing of bottom and sides of trenches and subsequent filling and compaction in 15cm layers as in
 (b) Hard Soil (*pick work*)

Cut-off Wall,D/s & U/s	2.00	14.00	1.00	2.50	70.00	Cum
Cut-off Wall,Center	1.00	14.00	1.00	2.00	28.00	Cum
Side walls	2.00	7.00	1.00	2.00	28.00	Cum
Wing-Walls U/s	2.00	3.00	1.00	2.00	12.00	Cum
Wing-Walls D/s	2.00	4.00	1.00	2.00	16.00	Cum
					154.00	Cum
@	327.20					/cum
						Rs
						50,388.80

- 2/4.02 Providing and laying in position cement concrete of specified grade excluding cost of centering and shuttering - All work upto plinth level:

- (a) 1:2:4 (1 cement :2 course sand :4 stone aggregate 20mm nominal

Cut-off Wall,D/s & U/s	2.00	14.00	0.30	0.15	1.26	Cum
	1.00	14.00	0.30	0.15	0.63	Cum
Side walls	2.00	7.00	0.30	0.15	0.63	Cum
Wing-Walls U/s	2.00	3.00	0.30	0.15	0.27	Cum
Wing-Walls D/s	2.00	4.00	0.30	0.15	0.36	Cum
					3.15	Cum
@	6,889.60					/cum
						Rs
						21,702.24

- 3/5.35 Providing and laying in position machine batched, machine mixed and machine vibrated design mix M-20 grade

- (a) All work upto plinth level.

U/s&D/s Apron	2	14.00	3.00	0.15	12.60	cum
Crest	1	14.00	0.75	0.40	4.20	cum
					16.80	cum
@	8847.30					/cum
						Rs
						148,634.64

- (b) All work from plinth level upto floor V level.

Cut-off Wall,D/s & U/s	2.00	14.00	3.50	0.20	19.60	Cum
	1.00	14.00	3.50	0.20	9.80	Cum
Side walls	2.00	7.00	3.50	0.20	9.80	Cum
Wing-Walls U/s	2.00	3.00	3.50	0.20	4.20	Cum
Wing-Walls D/s	2.00	4.00	3.50	0.20	5.60	Cum
L Beam	3.00	14.00	0.30	0.30	3.78	Cum
S Beam	3.00	2.50	0.30	0.30	0.68	Cum
					53.46	Cum
@	9,393.30					/cum
						Rs
						502,165.82

- 4/5.21 Steel reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all

@	100 kg /cum	70.26	Cum
		7026.00	Kgs
@	61.80 /kg		
			Rs
			434,206.80

5/5.11 Centering and shuttering including strutting, propping, etc. and removal of form works in -

(b) Walls including attached pillasters, buttresses, string courses, etc.

Cut-off Wall,D/s & U/s	2.00	2.00	14.00	2.50	140.00	Cum
	2.00	1.00	14.00	2.00	56.00	Cum
Side walls	2.00	2.00	7.00	2.50	70.00	Cum
Wing-Walls U/s	2.00	2.00	3.00	2.50	30.00	Cum
Wing-Walls D/s	2.00	2.00	4.00	2.50	40.00	Cum
L Beam	2.00	3.00	14.00	0.30	25.20	Cum
S Beam	2.00	3.00	2.50	0.30	4.50	Cum
					365.70	Cum
@ 422.10 /cum						Rs 154,361.97

6/21.20 15mm cement plaster 1;3
(1cement ;3 fine sand)

U/s&D/s Apron	2	14.00	3.00		84.00	cum
Crest	1	14.00	1.44		20.16	cum
Side walls	1.00	7.00	2.50		17.50	Cum
Wing-Walls U/s	1.00	3.00	2.50		7.50	Cum
Wing-Walls D/s	1.00	4.00	2.50		10.00	Cum
					139.16	Cum
@ 300.50 /cum						Rs 41,817.58

7/7.14 Dry stone pitching 22.50 cm thick including supply of stones and preparing

		14.00	2.50	2.00	70.00	Cum
@ 434.10 /cum						Rs 30,387.00

8.7.17 Back filling behind abutment, wing wall and return wall complete as per drawing and Technical Specification.

(a) Gravelly material.

Side walls		7.00	2.50	1.50	26.25	Cum
Wing-Walls U/s		3.00	2.50	1.50	11.25	Cum
Wing-Walls D/s		4.00	2.50	1.50	15.00	Cum
					52.50	Cum
@ 848.00 /cum						Rs 44,520.00
					Total	Rs 1,428,184.85
9 Add 8.08% cost index						Rs 115,397.34
10 Providing and fixing Sluice gates				2 nos @ 7,000.00		Rs 14,000.00
					G.Total	Rs 1,557,582.19

(Rupees fifteen lakhs fifty seven thousand five hundred eighty two and nineteen paise)

DETAILED ESTIMATE OF COST**1. Laying of Cement concrete channel****1.1: Detail quantities and Cost estimate of Cement concrete channel**

1/2.06	Earthwork in excavation over areas (exceeding 30cm in depth, 1.5m in width as well as 10sqm on plan) including disposal of excavated earth, lead upto 50m and lift upto 1.5m, disposed earth to be levelled and neatly dressed.						
		No	L	B	H	Total	Unit
		1/2	2000	2.00	1.50	3000.00	cum
	(a) Ordinary and Hard Soil						
	@ 284.30 /cum						852,900.00
2/2.08	Earthwork in excavation in foundation trenches etc. not exceeding 2 meters depth including dressing of bottom and sides of trenches and subsequent filling and compaction in 15cm layers as in column foundations, fence posts, etc. and disposal of all surplus soil as directed within a lead of 30 metres.						
	(b) Hard Soil (<i>pick work</i>).	1	2000	0.50	0.25	250.00	cum
	@ 327.20 /cum					250.00	81,800.00
3/4.02	Providing and laying in position cement concrete of specified grade excluding cost of centering and shuttering - All work upto plinth level:						
	(b) 1:2:4 (1 cement : 2 coarse sand : 4 graded	1	2000	0.40	0.10	80.00	cum
	@ 6708.40 /cum					80.00	536,672.00
4/4.07	Providing and laying cement concrete in retaining wall, return walls, walls (any thickness) including pilasters, piers, columns, abutments, pillars, posts, plain window sills, sunken floors, etc. up to floor five level excluding the cost of centering, shuttering and finishing :						
	(b) 1 : 2 : 4 (1 cement : 2 course sand : 4 stone aggregate 40mm)	2	2000	0.30	0.10	120.00	cum
	@ 8292.90 /cum					120.00	995,148.00
5/5.11	Centering and shuttering including strutting, propping, etc. and removal of form works in -						
	(b) Walls including attached pillasters, buttresses, string courses, etc.	2	2000	0.30		1200.00	sqm
	@ 422.10 /sqm					1200.00	506,520.00

6/21.20 15 mm cement plaster 1 : 3 (1 cement : 3 fine sand) finished with a floating coat of neat cement.

Flooring :	1	2000		0.40	800.00	sqm
Walls :	2	2000		0.30	1200.00	sqm
Top :	2	2000		0.10	400.00	sqm
				Total	2400.00	sqm

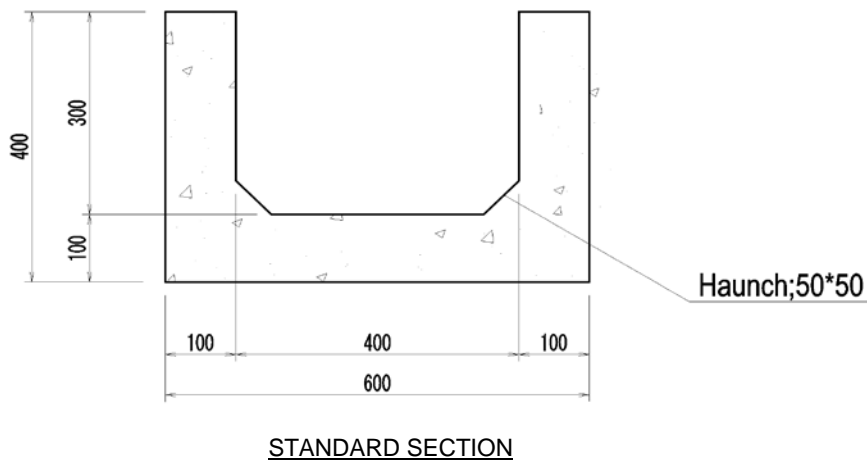
@ 300.50 /sqm

Total 'A' : 721,200.00
3,694,240.00

12 Add 8.08% Cost Index Vide MPWD SOR 2013

G.TOTAL 298,494.59
3,992,734.59

(Rupees thirty nine lakh ninety two thousand seven hundred thirty four and paise fifty nine) only.



DETAILED ESTIMATE OF COST

2. Construction of Desilting Tank -

Detail quantities and Cost estimate of Desilting tank

1/2.07 Earthwork in excavation in foundation trenches, drains, etc. not exceeding 2 meters depth including dressing of bottom and sides of trenches and disposal of all surplus soil as directed within a lead of 30 metres.

No.	L	B	H	Total	Unit	
1	3.20	1.00	0.90	2.88	cum	
				Total	2.88 cum	
(b) Hard Soil (pick work)	@	435.40 /cum			Rs	1,253.95

2/5.01 Providing and laying in position reinforced cement concrete excluding cost of centering and shuttering , finishing and reinforcement in -

All work upto plinth level.

(b) 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate

Flooring :-	1	3.40	1.30	0.10	0.44	cum	
@		7101.00 /cum				Rs	3,124.44

3/5.03 Reinforced cement concrete work in walls including attached pillasters, columns, pillars, posts, piers, abutments, return walls, retaining walls, struts, buttresses, string or lacing courses, fillets etc. upto floor five level excluding cost of centering shuttering etc complete.

(b) 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size)

(b) Walls etc.	Walls :-	2	3.40	0.80	0.10	0.54	cum
	- do -	2	1.20	0.80	0.10	0.19	cum
	Baffle walls:-	2	1.00	0.60	0.10	0.12	cum
		Total :-			0.85	cum	
@		7116.40 /cum				Rs	6,048.94

(c) Beams,Suspended floor etc.

	Slab :-	1	3.40	1.20	0.10	0.41	cum
@		7116.40 /cum					2,917.72

4/5.21 Steel reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete.

(a) Mild steel and Medium Tensile steel bars.

		100 kg/cum	1.70 cum	
	to Item No. 2& 3	1.70 cum	170 Kg	
@		61.80 /kg	Rs	10,506.00

5/5.11 Centering and shuttering including strutting, propping, etc. and removal of form works in -

(b) Walls including attached pillasters, buttresses, string

4	3.00	0.80	-	9.6	Sqm	
4	1.00	0.80	-	3.20	Sqm	
4	1.00	0.60	-	2.40	Sqm	
1	3.00	1.00		3.00	Sqm	
				Total	18.2 Sqm	
@		422.10 /sqm			Rs	7,682.22

6/21.20 15mm cement plaster 1 : 3 (1 cement : 3 fine sand) finished with a floating coat of neat cement.

Flooring :-	1	3.00	1.00	-	3.00	Sqm
Walls	2	3.00	1.00	-	6.00	Sqm
	2	1.00	0.60	-	1.20	Sqm
Top	1	3.00	0.1	-	0.30	Sqm
	Total				10.50	Sqm

@ 300.50 /Sqm

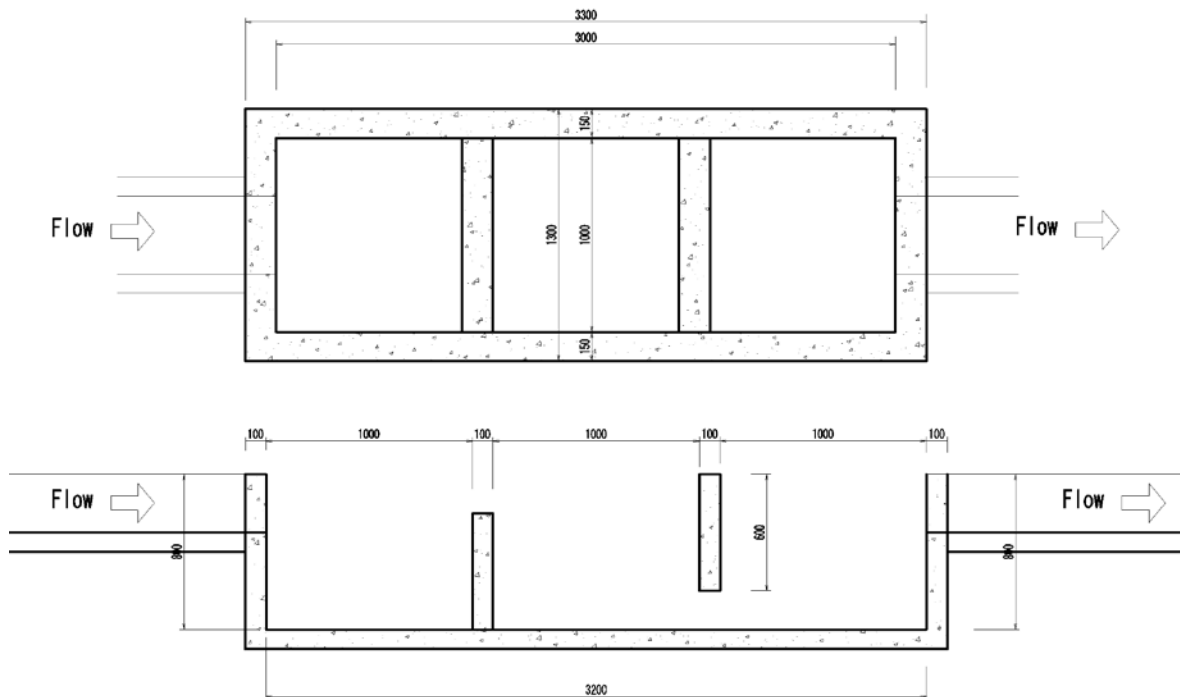
Total

Rs	3155.25
Rs	34,688.52
Rs	2,802.83
Rs	37,491.35

Add 8.08% Cost Index Vide MPWD SOR 2013

G.Total

(Rupees thirty seven thousand four hundred ninety one and paise thirty five) only.



DETAILED ESTIMATE OF COST

1. Construction of Aquaduct at at Kanghrenglui (1-1)

1.1: Detail quantities and Cost estimate of Aquaduct

1/2.07 Earthwork in excavation in foundation trenches or drains etc. (not exceeding 1.5m in width or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m including getting out excavated soil and disposal of surplus excavated soil as directed within a lead of 50 metres.

(b) Hard Soil (*pick work*)

No	L	B	H	Total	Unit
8	1.00	1.00	1.00	8.00	cum

@ 435.40 /cum

3,483.20

2/5.01 Providing and laying in position reinforced cement concrete excluding cost of centering and shuttering , finishing and reinforcement in -

(a) All work upto foundation & plinth level :

1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size)

No	L	B	H	Total	Unit
8	1.00	1.00	0.10	0.80	cum

@ 7101.00 /cum

5,680.80

3/5.03 Reinforced cement concrete work in walls including attached pillasters, columns, pillars, posts, piers, abutments, return walls, retaining walls, struts, buttresses, string or lacing courses, fillets etc. upto floor five level excluding cost of centering shuttering etc complete.

(b) Columns
Walls :
S.floor:

No	L	B	H	Total	Unit
8	0.20	0.20	3.00	0.96	cum
2	22.00	0.30	0.10	1.32	cum
1	22.00	0.60	0.10	1.32	cum
Total:				3.60	cum

@ 7116.40 /Cum

25,619.04

4/5.21 Steel reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete.

1) Footing	100 Kg/Cum	0.80 cum
		80.00 Kg
2) Column	310 Kg/Cum	3.60 cum
		1,116.00 Kg
		Total:- 1,196.00 Kg

@ 61.80 /kg

73,912.80

5/5.11 Centering and shuttering including strutting, propping, etc. and removal of form

b)Walls including attached pillasters, buttresses, string courses, etc.

No	L	B	H	Total	Unit
8	4	0.20	3.00	19.20	sqm
Total:				19.20	sqm

@ 422.10 /cum

8,104.32

6/21.20 15mm cement plaster 1 : 3 (1 cement : 3 fine sand) finished with a floating coat of neat cement.

1	22.00	0.60		13.20	sqm
2	22.00	0.30		13.20	sqm
2	22.00	0.10		4.40	sqm
Total:				30.80	sqm

@ 300.50 /cum

9,255.40

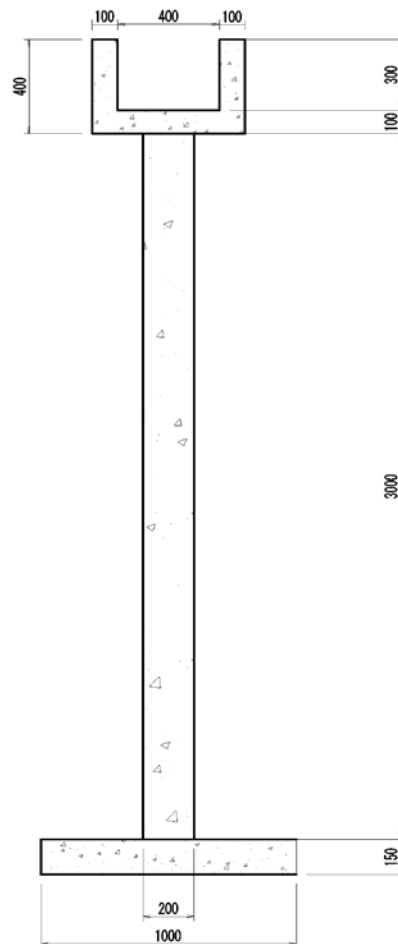
TOTAL : 126,055.56

7 Adding 8.08% for cost index

10,185.29

G Total 136,240.85

(Rupees one lakh thirty six thousand two hundred forty and paise eighty five) only.



DETAILED ESTIMATE OF COST

1. Construction of Aquaduct at at Kawmthlanglui (1-2)

1.1: Detail quantities and Cost estimate of Aquaduct

1/2.07 Earthwork in excavation in foundation trenches or drains etc. (not exceeding 1.5m in width or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m including getting out excavated soil and disposal of surplus excavated soil as directed within a lead of 50 metres.

(b) Hard Soil (*pick work*)

No	L	B	H	Total	Unit
3	1.00	1.00	1.00	3.00	cum

@ 435.40 /cum

1,306.20

2/5.01 Providing and laying in position reinforced cement concrete excluding cost of centering and shuttering , finishing and reinforcement in -

(b) 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size)

No	L	B	H	Total	Unit
3	1.00	1.00	0.10	0.30	cum

@ 7101.00 /cum

2,130.30

3/5.03 Reinforced cement concrete work in walls including attached pillasters, columns, pillars, posts, piers, abutments, return walls, retaining walls, struts, buttresses, string or lacing courses, fillets etc. upto floor five level excluding cost of centering shuttering etc complete.

(b)

Columns
Walls :
S.floor:

No	L	B	H	Total	Unit
3	0.20	0.20	3.00	0.36	cum
2	10.00	0.30	0.10	0.60	cum
1	10.00	0.60	0.10	0.60	cum
Total:-				1.56	cum

@ 7116.40 /Cum

11,101.58

4/5.21 Steel reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete.

(a) 1) Footing 100 Kg/Cum 0.30 cum
30.00 Kg
2) Column 310 Kg/Cum 1.56 cum
483.60 Kg
Total:- 513.60 Kg

@ 61.80 /kg

31,740.48

5/5.11 Centering and shuttering including strutting, propping, etc. and removal of form

b)Walls including attached pillasters, buttresses, string courses, etc.

Column

3	4	0.20	3.00	7.20	sqm
Total:				7.20	sqm

@ 422.10 /cum

3,039.12

6/21.20 15mm cement plaster 1 : 3 (1 cement : 3 fine sand) finished with a floating coat of neat cement.

1	10.00	0.60		6.00	sqm
2	10.00	0.30		6.00	sqm
2	10.00	0.10		2.00	sqm
Total:				14.00	sqm

@ 300.50 /cum

4,207.00

TOTAL : 53,524.68

7 Adding 8.08% for cost index

4,324.79

G Total 57,849.47

(Rupees fifty seven thousand eight hundred forty nine and paise forty seven) only.

DETAILED ESTIMATE OF COST

1. Construction of aqueduct kawmcharlui(1-3)
1.1: Detail quantities and Cost estimate of Aquaduct

1/2.07 Earthwork in excavation in foundation trenches or drains etc. (not exceeding 1.5m in width or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m including getting out excavated soil and disposal of surplus excavated soil as directed within a lead of 50 metres.

(b) Hard Soil (*pick work*)

No	L	B	H	Total	Unit
3	1.00	1.00	1.00	3.00	cum

@ 435.40 /cum 1,306.20

2/5.01 Providing and laying in position reinforced cement concrete excluding cost of centering and shuttering, finishing and reinforcement in -

(b)

1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size)

No	L	B	H	Total	Unit
3	1.00	1.00	0.10	0.30	cum

@ 7101.00 /cum 2,130.30

3/5.03 Reinforced cement concrete work in walls including attached pillasters, columns, pillars, posts, piers, abutments, return walls, retaining walls, struts, buttresses, string or lacing courses, fillets etc. upto floor five level excluding cost of centering shuttering etc complete.

(b)

Columns
Walls :
S.floor:

No	L	B	H	Total	Unit
3	0.20	0.20	3.00	0.36	cum
2	6.00	0.30	0.10	0.36	cum
1	6.00	0.60	0.10	0.36	cum
Total:				1.08	cum

@ 7116.40 /Cum 7,685.71

4/5.21 Steel reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete.

1) Footing	100 Kg/Cum	0.30 cum
		30.00 Kg
2) Column	310 Kg/Cum	1.08 cum
		334.80 Kg
		Total:- 364.80 Kg

@ 61.80 /kg 22,544.64

5/5.11 Centering and shuttering including strutting, propping, etc. and removal of form

b)Walls including attached pillasters, buttresses, string courses, etc.

Column

3	4	0.20	3.00	7.20	sqm
Total:				7.20	sqm

@ 422.10 /cum 3,039.12

6/21.20 15mm cement plaster 1 : 3 (1 cement : 3 fine sand) finished with a floating coat of neat cement.

1	6.00	0.60		3.60	sqm
2	6.00	0.30		3.60	sqm
2	6.00	0.10		1.20	sqm
Total:				8.40	sqm

@ 300.50 /cum

2,524.20

TOTAL : 39,230.17

7 Adding 8.08% for cost index

3,169.80

G Total 42,399.97

##

DETAILED ESTIMATE OF COST**1. Construction of Aquaduct at at Darnamlui(1-4)****1.1: Detail quantities and Cost estimate of Aquaduct**

- 1/2.07 Earthwork in excavation in foundation trenches or drains etc. (not exceeding 1.5m in width or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m including getting out excavated soil and disposal of surplus excavated soil as directed within a lead of 50 metres.

(b) Hard Soil (*pick work*)

No	L	B	H	Total	Unit
5	1.00	1.00	1.00	5.00	cum

@ 435.40 /cum

2,177.00

- 2/5.01 Providing and laying in position reinforced cement concrete excluding cost of centering and shuttering, finishing and reinforcement in -

(b)

1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size)

No	L	B	H	Total	Unit
5	1.00	1.00	0.10	0.50	cum

@ 7101.00 /cum

3,550.50

- 3/5.03 Reinforced cement concrete work in walls including attached pillasters, columns, pillars, posts, piers, abutments, return walls, retaining walls, struts, buttresses, string or lacing courses, fillets etc. upto floor five level excluding cost of centering shuttering etc complete.

(b)

Columns
Walls :
S.floor:

No	L	B	H	Total	Unit
5	0.20	0.20	3.00	0.60	cum
2	15.00	0.30	0.10	0.90	cum
1	15.00	0.60	0.10	0.90	cum
Total:				2.40	cum

@ 7116.40 /Cum

17,079.36

- 4/5.21 Steel reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete.

1) Footing	100 Kg/Cum	0.50 cum
		50.00 Kg
2) Column	310 Kg/Cum	2.40 cum
		744.00 Kg
		Total:- 794.00 Kg

@ 61.80 /kg

49,069.20

- 5/5.11 Centering and shuttering including strutting, propping, etc. and removal of form

b) Walls including attached pillasters, buttresses, string courses, etc.

Column

5	4	0.20	3.00	12.00	sqm
Total:				12.00	sqm

@ 422.10 /cum

5,065.20

6/21.20 15mm cement plaster 1 : 3 (1 cement : 3 fine sand) finished with a floating coat of neat cement.

1	15.00	0.60		9.00	sqm
2	15.00	0.30		9.00	sqm
2	15.00	0.10		3.00	sqm
Total:				21.00	sqm

@ 300.50 /cum

6,310.50

TOTAL : 83,251.76

7 Adding 8.08% for cost index

6,726.74

G Total 89,978.50

(Rupees eighty nine thousand nine hundred seventy eight and paise fifty) only.

DETAILED ESTIMATE OF COST

1. Construction of Aquaduct Sihpuilui (1-5)

1.1: Detail quantities and Cost estimate of Aquaduct

1/2.07 Earthwork in excavation in foundation trenches or drains etc. (not exceeding 1.5m in width or 10sqm on plan) including dressing of sides and ramming of bottoms, lift upto 1.5m including getting out excavated soil and disposal of surplus excavated soil as directed within a lead of 50 metres.

(b) Hard Soil (*pick work*)

No	L	B	H	Total	Unit
8	1.00	1.00	1.00	8.00	cum

@ 435.40 /cum

3,483.20

2/5.01 Providing and laying in position reinforced cement concrete excluding cost of centering and shuttering, finishing and reinforcement in -

(b)

1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20mm nominal size)

No	L	B	H	Total	Unit
8	1.00	1.00	0.10	0.80	cum

@ 7101.00 /cum

5,680.80

3/5.03 Reinforced cement concrete work in walls including attached pillasters, columns, pillars, posts, piers, abutments, return walls, retaining walls, struts, buttresses, string or lacing courses, fillets etc. upto floor five level excluding cost of centering shuttering etc complete.

(b)

Columns
Walls :
S.floor:

No	L	B	H	Total	Unit
8	0.20	0.20	3.00	0.96	cum
2	22.00	0.30	0.10	1.32	cum
1	22.00	0.60	0.10	1.32	cum
Total:				3.60	cum

@ 7116.40 /Cum

25,619.04

4/5.21 Steel reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete.

1) Footing	100 Kg/Cum	0.80 cum
		80.00 Kg
2) Column	310 Kg/Cum	3.60 cum
		1,116.00 Kg
		Total:- 1,196.00 Kg

@ 61.80 /kg

73,912.80

5/5.11 Centering and shuttering including strutting, propping, etc. and removal of form

b) Walls including attached pillasters, buttresses, string courses, etc.

Column

8	4	0.20	3.00	19.20	sqm
Total:				19.20	sqm

@ 422.10 /cum

8,104.32

6/21.20 15mm cement plaster 1 : 3 (1 cement : 3 fine sand) finished with a floating coat of neat cement.

1	22.00	0.60		13.20	sqm
2	22.00	0.30		13.20	sqm
2	22.00	0.10		4.40	sqm
Total:				30.80	sqm

@ 300.50 /cum

9,255.40

TOTAL : 126,055.56

7 Adding 8.08% for cost index

10,185.29

G Total 136,240.85

(Rupees one lakh thirty six thousand two hundred forty and paise eighty five) only.

DETAILED ESTIMATE OF COST

1. Construction of intake -(Darnamlui)

1.1: Detail quantities and Cost estimate of headwork- Intake

1/2.08 Earthwork in excavation in foundation trenches etc. not exceeding 2 meters depth including dressing of bottom and sides of trenches and subsequent filling and compaction in 15cm layers as in column foundations, fence posts, etc. and disposal of all surplus soil as directed within a lead of 30 metres.

Foundation
Wing wall Foundation
(c) Very Hard Soil (jumper work)
@ 509.00 /cum

No	L	B	H	Total	Unit
1	2.00	0.50	0.50	0.50	cum
2	1.50	0.50	0.50	0.75	cum
				1.25	cum

636.25

2/5.35 Providing and laying in position machine batched, machine mixed and machine vibrated design mix M-20 grade reinforced cement concrete excluding cost of centering and shuttering and reinforcement in -

(a) All work upto plinth level.

Foundation

1	2.00	0.50	0.10	0.10	cum
2	1.50	0.50	0.10	0.15	cum
				0.25	cum

@ 8847.30 /cum

2,211.83

(b) All work from plinth level upto floor V level.

Wingwall

Wall

Floor

2	1.50	0.20	1.00	0.60	cum
1	2.00	0.20	1.00	0.40	cum
1	2.00	1.50	0.10	0.30	cum
				Total :	1.30 cum

@ 9393.30 /cum

12,211.29

3/5.21 Steel reinforcement for RCC work including straightening, cutting, bending, placing in position and binding all complete.

@ 100 kg /cum

1.55	cum
155.00	Kgs

@ Rs 61.80 /kg

9,579.00

4/5.11 Centering and shuttering including strutting, propping, etc. and removal of form works in -

(b) Walls including attached pillasters, buttresses, string courses, etc.

Walls
Wing walls

2	2.00	1.00	4.00	Sqm
4	1.50	1.00	6.00	Sqm
Total :			10.00	Sqm

@ 422.10 /cum

4,221.00

5/21.20 15mm cement plaster 1 : 3 (1 cement : 3 fine sand).

Walling
W/Walls
Top

2	2.00	1.00	4.00	Sqm
4	1.50	1.00	6.00	Sqm
2	2.00	0.20	0.80	Sqm
2	1.50	0.20	0.60	Sqm
Total :			11.40	Sqm

@ 300.50 /cum

3,425.70

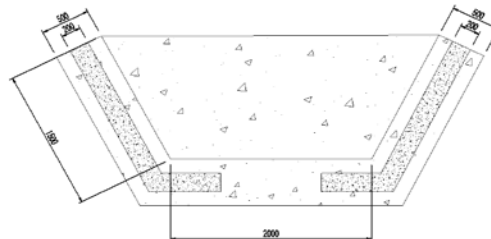
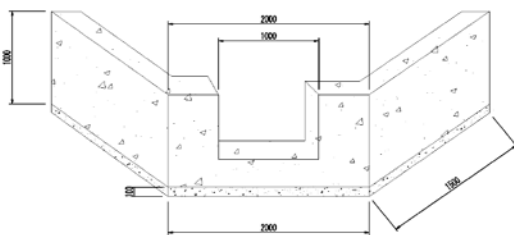
G.Total 32,285.07

6 Add 8.08% Cost Index Vide MPWD SOR 2013

2,608.63

G.Total 34,893.70

(Rupees thirty four thousand eight hundred ninety three and paise seventy) only.



DETAILED ESTIMATE OF COST

1. cost,laying and fitting of G.I.Pipe 2-1

1.1: Detail laying, fitting and Cost estimate of G.I.pipe

A Providing G.I.pipes complete with socket on one end
Vide Memo No.H-19020/1/2009-PHE/9. Dt.37th July 2012

Size	Length	Rate	Amount
50 mm	200.00	326.95	65,390.00
S. Total			65,390.00

Adding	7% for G.I Special etc		4,577.30
Adding	10.00% for cost index		6,539.00
Total of ' A'			76,506.30

B Fitting, fixing G.I.pipes complete with all G.I.fittings including cutting, threading, jointing and laying in trenches to a minimum of 100cm below ground level in all types of soil including trimmings, dressing, leveling in gradient and refilling of trenches in 20cm layers, watering and ramming, removing surplus earth and bringing back to its original position etc.
Vide Memo No.H-11011/160/2011-CE/PHE/9. Dt.4th July 2012

Size	Length	Rate	Amount
50 mm	200.00	218.00	43,600.00
Total of 'B'			43,600.00

C Carrying of G.I Pipe from Lunglei to Thingfal 65 Km
Vide Memo No.J-15011/3/97-DTE(SPY)/263 .Dt.12th Feb 2007

Dia.	Rm		Rate kg/rm	weight
50 mm	1,310.00	@	5.10	6,681.00

			6,681.00 Kg	
			66.81 qtl	
@		2.00	/km/ctl	8,685.30

D Carrying of G.I Pipe from Thingfal to Work-site(Headload) 4 Km
Vide Memo No.J-15011/3/97-DTE(SPY)/263 .Dt.12th Feb 2007

Dia.	Rm		Rate kg/rm	weight
50 mm	1,310.00	@	5.10	6,681.00

			6,681.00 Kg	
			66.81 qtl	
@		15.00	/km/ctl	4,008.60
G.Total				132,800.20

(Rupees one lakh thirty two thousand eight hundred and paise twenty) only.

DETAILED ESTIMATE OF COST

1. cost,laying and fitting of G.I.Pipe 2-2
1.1: Detail laying, fiting and Cost estimate of G.I.pipe

A Providing G.I.pipes complete with socket on one end
 Vide Memo No.H-19020/1/2009-PHE/9. Dt.37th July 2012

Size	Length	Rate	Amount
50 mm	200.00	326.95	65,390.00
S. Total			65,390.00

Adding 7% for G.I Special etc 4,577.30
 Adding 10.00% for cost index 6,539.00
Total of ' A' 76,506.30

B Fitting, fixing G.I.pipes complete with all G.I.fittings including cutting, threading, jointing and laying in trenches to a minimum of 100cm below ground level in all types of soil including trimmings, dressing, leveling in gradient and refilling of trenches in 20cm layers, watering and ramming, removing surplus earth and bringing back to its original position etc.
 Vide Memo No.H-11011/160/2011-CE/PHE/9. Dt.4th July 2012

Size	Length	Rate	Amount
50 mm	200.00	218.00	43,600.00
Total of 'B'			43,600.00

C Carrying of G.I Pipe from Lunglei to Thingfal 65 Km
 Vide Memo No.J-15011/3/97-DTE(SPY)/263 .Dt.12th Feb 2007

Dia.	Rm		Rate kg/rm	weight
50 mm	1,310.00	@	5.10	6,681.00

6,681.00 Kg
 66.81 qtl
 @ 2.00 /km/ctl **8,685.30**

D Carrying of G.I Pipe from Thingfal to Work-site(Headload) 4 Km
 Vide Memo No.J-15011/3/97-DTE(SPY)/263 .Dt.12th Feb 2007

Dia.	Rm		Rate kg/rm	weight
50 mm	1,310.00	@	5.10	6,681.00

1,310.00 6,681.00 Kg
 66.81 qtl
 @ 15.00 /km/ctl **4,008.60**
G.Total 132,800.20

(Rupees one lakh thirty two thousand eight hundred and paise twenty) only.

Annexure

7. Construction Plan

Standard Construction Plan form (NGENGRUAL MIP)

1. Project outline

MID office in charge	Lunglei Irrigation Division						
Site location	Thingfal, Lunglei District						
Construction budget	About Rs. 75 lakh						
Construction facilities	Area name	S N	Facility name	Quantity	Unit	Description (Structure, Size, etc)	
	Ngenrual lui	1	River diversion -1	1	Nos	W=7.0 m	
		2	Main canal -1	2,000	m	W=0.4m, D=0.30m	
		3	Desilting tank 1	1	Nos	W=1.30m, L=3.30m	
		4	Aqueduct 1-1	1	Nos	Kanghreng lui	
		5	Aqueduct 1-2	1	Nos	Kawmthlang lui	
		6	Aqueduct 1-3	1	Nos	Kawmchar lui	
		7	Aqueduct 1-4	1	Nos	Darnam lui	
		8	Aqueduct 1-5	1	Nos	Sihpui lui	
	Darnaml lui	3	Intake 2	1	Nos		
		4	Main pipe 2-1	200	m	G.I. pipe d=50mm	
5		Main pipe 2-2	200	m	G.I. pipe d=50mm		
Project description	a) Coordinates: 22°36 E: 92°53 N b) CCA : 14.7 Ha c) Elevation : 780 m d) Distance from main road: 5 km e) No of beneficiaries: 17 nos						

2. Management organization

(1) MID supervising team ;

Position	Responsibility
Executive Engineer	As per CPWD works manual
Sub-Divisional Officer	Ditto
Junior Engineer	Ditto
Surveyor	Ditto

(2) Safety management organization;

1). Contact listz

Organization/status	Name	Contact number
Hospital	Lawngtlai Civil Hospital	
Police outpost	Police Station, Lawngtlai	
Water users organization		
Village council		
Relevant Department	DOA	
	DOH	

2). Safety measures

Details should be referred to Contract agreement form 8.

3. Temporary work plan

- No special temporary work.

4. Construction plan

(1) Construction machinery utilization plan:

List to describe the name, type, specification, expected quantity, and use of construction machinery.

Machine Name	Specification	Nos	Work to use	Remarks
Excavator	JBC	2	Excavation	
Concrete mixer		2	Concrete mixing	
Compactor		2	Soil compaction	

(2) Major local materials:

List to describe the name, Specification and expected source of major local materials.

Name of materials	Specification	Expected Source Of Procurement	Remarks
Aggregate	*****		
Stones for masonry	*****		
Sand	*****		
Birck	*****		

(3) Meeting and Documentation plan

List to describe the Meeting and Documentation plan

Meeting	Frequency	Document to prepare	Attendant	Remarks
Kick off meeting	Before site works	Construction Plan, QC plan Contract document	Executive Engineer Sub-Divisional Officer Junior Engineer Contractor	
Regular meeting	Monthly	Minutes, Daily site report	Sub-Divisional Officer Junior Engineer Contractor	
Inspection	Quarterly	Minutes, Daily site report Updated progress chart	Sub-Divisional Officer Junior Engineer Contractor	

(4) Construction Time Schedule :

Construction Time Schedule plan is attached in following page..

NGENGRUAL Project Progress Chart

Works	Unit	Quantity	Plan Actual	2nd year												Remarks
				October	November	December	January	February	March	April	May					
Grand total																
1. General																
Preliminary/ Mobilization	L.S	1	Plan													
Channel																
	Rm	2,000	Plan													
Aqueduct																
	Nos	5	Actual													
Intake Facility																
	L.S	1	Plan													
GI Pipe -1																
	Rm	400	Plan													
Diversion Weir																
Preparation	L.S	1	Plan													
Earth works	L.S	1	Plan													
Foundation	L.S	1	Plan													
wing walls	L.S	1	Plan													
Cut off wall	L.S	1	Plan													
Floor part	L.S	1	Plan													
Structure backfilling	L.S	1	Plan													
Cleaning & demoblization																
	L.S	1	Plan													

: Planed Progress

Annexure

8. Quality Control Plan

Quality control plan (Ngengrual MI scheme)

1. Target of Quality control works

	Items	Quantity	Unit	Remarks
Construction Facilities	River diversion	1	Nos	W=14 m
	Main canal	2,000	Rm	W=0.4m, H=0.30m
	Aqueduct	5	Nos	
	Intake	1	Nos	
	Pipe line	400	Rm	G.I. pipe d=50mm
Documents	<ul style="list-style-type: none"> - Contact document , BOQ, Drawing, specification - Quality control checklist - Daily site report, site test result - Quality control related pictures - Meeting and inspection materials 			

2. Quality control action plan

Name of work	Control items	Control Methodology
1. Preliminary		
	Site condition before works	Photo
	Setting of alignment, centerline of facilitates	Modification of Drawing and BOQ, confirmation with WUA
2. River diversion/ Intake		
	Condition before/during /after the work	Photo
	Diversion /Intake works general	Canal works Quality control checklist
2-1 Earth work	Foundation soil condition (bearing capacity, infiltration condition)	Test pitting, Photo, Adjustment of cutoff depth
Excavation	Elevation of excavation line	Level survey
	Excavated slope condition (risk of erosion and collapse)	Visual observation
Backfilling	Compaction work	Photo, checklist of embankment
2-2 Foundation/ Wall	Concrete /form works	Concrete Quality control checklist, Photo, Slump test
	Dimension of structure	Level survey, tape measurement, photo
3. Canal/Aqueduct	Condition before/during /after the work	Photo
	Canal works general	Canal works Quality control checklist

3-1 Earth work	Foundation soil condition Especially for Aqueduct	Photo, visual observation
	Elevation of foundation level	Level survey
3-2 Foundation/ Wall	Concrete /form works	Concrete Quality control checklist, Photo, Slump test
	Material check before work (size, quantity, defects of products, damage of transportation)	Photo, catalog, etc.
	Plastering work (material,mortar mixing,thickness, cracks)	Photo, visual observation
	Dimension of structure	Level survey, tape measurement, photo
4. Pipe line	Material check before work (specification, quantity, defects of products, damage of transportation)	Photo, catalog, etc.
	Elevation of installment	Level survey, tape measurement, photo
	Leakage check after installment	visual observation, pressure gauge

Notes;

- ✓ Detailed requirements of Quality control should be refer to contact document and PWD technical specification.
- ✓ When MID conducts inspection works for payment, WUA is also recommend to participate in inspection works for witnesses.
- ✓ After construction work, MID have to prepare as built drawings based on alteration of construction works.
- ✓ Above Quality control related documents are to be filed and kept in division office as evidence of the works after construction.

Annexure

9. Certificate

9.1 Certificates of hydro meteorological data and field data

Certificated that Hydro meteorological data and field data in respect of Ngengrual Minor Irrigation Project, Thingfal group of AIBP, such as river and rainfall data are available with the Statistical Abstract, Department of Agriculture, Government of Mizoram for incorporation in the Project report.

Date _____

Place _____

**9.2 Certificates of rate used of civil works based on the Mizoram PWD SOR 2013 and PHED
issue and laying rate**

Certificated that rates for Civil Works of Ngengrual Minor Irrigation Project, Thingfal group of AIBP, under Lunglei District are based on the Mizoram PWD SOR 2013 (plus 8.08% cost index for Lunglei Division as approved by Government of Mizoram, and issued rate of different GI Pipe as memo no.19020/1/2009 PHE dt.27th July 2012 and laying rates of different size of GI Pipe (medium) Memo no. N-11011/160/2011/CE/PHE/9 dt.4th July 2012.

Date _____

Place _____

9.3 Certificates of quantities calculated as per designs and approved drawings

Certificated that the quantities calculated for all components/activities proposed under Ngengrual Minor Irrigation Project, Thingfal group of AIBP, under Lunglei District have been calculated as per designs and approved drawings.

Date _____

Place _____

9.4 Certificates of irrigation structures designed as per B.I.S code IS456-2000 and other relevant codes

Certificated that all the Irrigation Structure i.e Weirs etc under Ngengrual Irrigation Project, Thingfal group of AIBP, under Lunglei District have been designed as per B.I.S code IS 456-2000 and relevant vodes.

Date _____

Place _____

9.5 Certificates of non-overlap command areas of any existing or proposed major, medium or minor irrigation project proposed/taken up by other department

Certificated that the proposed command areas of all irrigation structure under Ngengrual Minor Irrigation Project of Thingfal group of AIBP, under Lunglei District to be taken up by the Department of Minor Irrigation do not overlap with command areas of any existing or proposed major, medium or minor irrigation project proposed/taken up by other Department.

Also certified that this proposed minor irrigation scheme is not a part of any other major or medium scheme.

Date _____

Place _____

Annexure

10. Farmer's Application

To

The Executive Engineer,
 Ngengrual Irrigation Division,
 Lunglei.

Subject: Ngengrual Minor Irrigation Project, Thingfal siamsak tura ngenna leh intiamkamna.

Ka Pu,

I hnaena Ngengrual Minor Irrigation Project, Thingfal min siamsak tura kan dilna bawhzuia Preliminary Survey te min neih sak avangin lawmthu kan sawi e.

Department aiawha lo kal te leh loneituten kan sawiho tawhna atanga Department-in ruahmanna fel tak min siamsak hi chipchiar taka sawiho a ni a. Ruahmanna tlangpui te chu –

1. Ngengrual lui intake facility – 1 Nos
2. Main canal – 2000Rm
3. Aqueduct – 5 Nos
4. Darnam lui intake facility – 1 Nos
5. Irrigation pipe – 400m

Department-in ruahmanna a siam te khi tha kan ti in min thawhsak ngei turin kan ngen a ni.

INTIAMKAMNA:

Keini a hnuai hming ziak te hian Department-in Ngengrual Minor Irrigation Project, Thingfal min siamsak theih chuan hmalaknaah theih tawp kan chhuah ang tih kan tiam a, chungte chu

- Tuikawng in a paltlang ram neituten engmah sawi buai lovin harsatna kan siam lovang.
- Kan zau tana ruahmanna hrang hrang – tuikawng leh thildangte siam chungchangah thlai a chhia anih pawhin ram neituten eng zangnadawmna (compensation) mah kan phut lovang.
- Ngengrual Minor Irrigation Project Thingfal siam chung hian, Department kut ti chak turin theihtawp kan chhuah ang.
- Project siam avanga harsatna a awmin farmers in mawh la in department kan pui zel ang.
- Tuikawng hman chungchangah zauin (Water User Association) in a rel anga in sem tlan kan in tiam e.
- Project zawh tawh hnuah mimal tinin kan ta anga ena, enkawl zui kan intiam e.

Annexure

11. Affidavit (No-Objection)

OFFICE OF THE VILLAGE COUNCIL COURT

NO OBJECTION CERTIFICATE

Minor Irrigation Department in Ngengrual Minor Irrigation Project, Thingfal a hma lak an tum hi tha kan ti a, he Project in a kaihhnawih Tuikawng (Irrigation Channel) in kan Village Council huamchhunga leilet/ram a paltlang kan remti a a, Village Council thuneihna chinah chuan engmah sawi buai (complain/compensation) kan nei/dil lovang.

Village Council President Signature

Submitted to
The Executive Engineer,
Lunglei Irrigation Division,
Department of Minor Irrigation,
Mizoram

Minute of Ratification Meeting Ngengrual Minor Irrigation Scheme
(Draft)

The ratification meeting on **Ngengrual Minor Irrigation Scheme** was held on 5th December, 2014 discussing the contents of DPR prepared by MID and other stakeholders based on the result of the workshop held from 28th to 31st October, 2014.

Each party have clearly understand the contents of the DPR and mutually agreed the followings if the DPR is sanctioned.

MID

- ◆ Making necessary effort for sanctioning the respective Ngengrual Minor Irrigation Scheme implementation.
- ◆ Construct and/or rehabilitate the facilities based on the prepared DPR with sanctioning budget.
- ◆ Giving the necessary support to WUA for proper operation and maintenance of the facilities based on prepared O&M plan.

WUA

- ◆ Cooperate with MID and provide necessary support during and after construction works
- ◆ Utilizing the facilities effectively based on the prepared crop calendar and agriculture action plan
- ◆ Taking over the facilities from MID and operates and maintains the facilities in accordance with O&M plan for 25 years after construction and/or rehabilitation of the facilities

Other Government Departments and Stakeholders

- ◆ Giving follow-up activities which are stipulated in the agriculture action plan, like extension services.
- ◆ Strengthening mutual cooperation with MID and WUA for further necessary actions for effective utilization of the respective Ngengrual Minor Irrigation Scheme, if required.

The President of WUA
Ngengrual Minor Irrigation Project (A. LALSAWILVAIA)

Executive Engineer
Lunglei Irrigation Division

(L. MALSAWMA HAV)

District Agriculture Officer
Lunglei District (NGURRINSANGA SAILO)

District Horticulture Officer
Lunglei District

(VANLALREMRUATI HNAMI)

District Soil Conservation Officer
Lunglei District (F. LALRAMNGHINGLOVA)

Witness
VCP, Thingfal Village

(T. C. HOLOINMA)
President
Village Council/Court
Thingfal