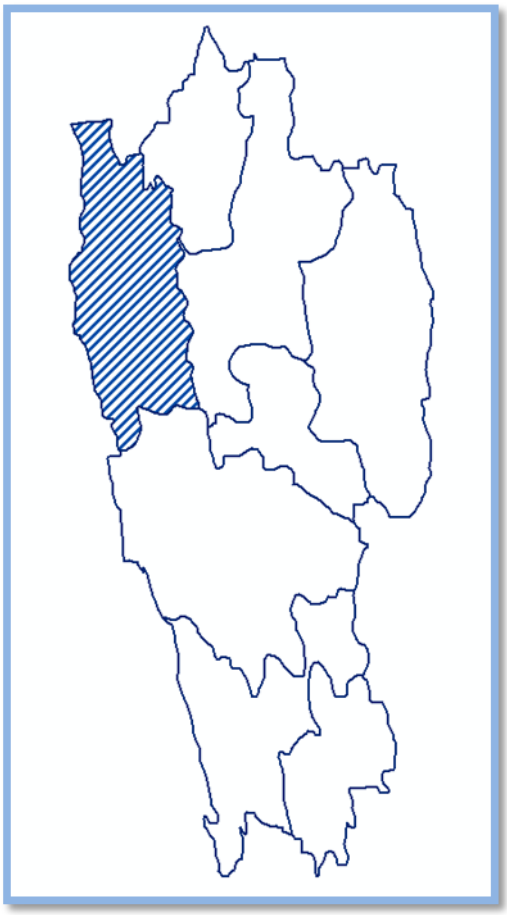
Technical Report Series: D

No:

Ground Water Information Booklet
Mamit District, Mizoram



Central Ground Water Board
North Eastern Region
Ministry of Water Resources
Guwahati
October 2013

GROUND WATER INFORMATION BOOKLET

MAMIT DISTRICT, MIZORAM

DISTRICT AT A GLANCE

Sl. No.	ITEMS	STATISTICS
1.	GENERAL INFORMATION i) Geographical Area (sq.km.) ii) Administrative Divisions (as on 2011) iii) Population (as per 2011 Census) iv) Average Annual Rainfall (mm)	 3,025.80 sq km There are two blocks, namely; Zawlnuam & Reik RD Block.. 8,6364 2,794mm
2.	GEOMORPHOLOGY i) Major Physiographic Units ii) Major Drainages	 Denudo Structural Hills with low and moderate ridges. Thhipui and Thira Rivers
3.	LAND USE (sq. km.)	More than 50% area is covered by dense forest and the rest by open forest. Both terraced cultivation and Jhum (shifting) tillage (in which tracts are cleared by burning and sown with mixed crops) are practiced.
4.	MAJOR SOIL TYPES	Colluvial soil
5.	AREA UNDER PRINCIPAL CROPS (sq.km.)	Fibreless ginger, paddy, maize, mustard, sugarcane, sesame and potato are the other crops grown in this area.
6.	IRRIGATION BY DIFFERENT SOURCES (sq.km.)	N.A
	Other sources	Small scale irrigation projects are being developed through spring development with negligible command area.
7.	PREDOMINANT GEOLOGICAL FORMATIONS	Lower Tertiary Formations of Oligocene and Miocene Age
8.	HYDROGEOLOGY i) Major water Bearing Formations	 Semi consolidated formations of Tertiary rocks. Ground water occurs in the form of spring emanating through cracks/fissures/joints etc. available in the country rock.
9.	GROUND WATER EXPLORATION BY CGWB (as on 31.03.13)	 03
10.	GROUND WATER QUALITY	Chemical constituents are within the

		permissible limit. Ground water is fresh and potable and is suitable for domestic and Industrial purposes.
11.	DYANMIC GROUND WATER RESOURCES (2009) in mcm. i) Net annual Ground Water Resources ii) Net Annual Ground Water Draft iii) Projected demand for Domestic and Industrial Use upto 2025 iv) Stage of Ground Water Development	 4.92 mcm 0.0069 mcm 0.01 mcm 0.82%
12.	AWARENESS AND TRAINING ACTIVITY	Nil
13.	EFFORTS OF ARTIFICIAL RECHARGE AND RAINWATER HARVESTING	
	i) Projects Completed by CGWB (No & amount spent)	
	ii) Projects Under technical Guidance of CGWB (Numbers)	03
14.	GROUND WATER CONTROL AND REGULATION i) Number of OE Blocks ii) Number of Critical Blocks iii) Number of Blocks Notified	 Nil
15.	MAJOR GROUND WATER PROBLEMS AND ISSUES	In spite of good rainfall, there is acute storage of water especially during the summer.

GROUND WATER INFORMATION BOOKLET
MAMIT DISTRICT
MIZORAM

1.0 Introduction

Mamit district of Mizoram occupies the western part of the state. It is bounded on North and East by Cacher District of Assam and Aizwal District, and North-east by Kolasib District of Mizoram It covers an area of 3,025.80 sq km. the district has been sub-divided into two numbers of blocks.

As per 2011 census, the density of population is 29 persons per sq km. about three quarters of the population earn their living from agriculture. Both terraced cultivation and jhum (shifting) & tillage (in which tracts are cleared by burning and sown with mixed crops) are practiced. Mizoram is famous for fibreless gingers. Paddy, maize, mustard, sugarcane, sesame and potato are the other prominent crops grown in the district. Small-scale irrigation projects are being developed to increase the crop yield. There are no major industries in the district. Small-scale industries include sericulture, handloom and handicrafts industries, sawmills and furniture workshops, oil refining, grain milling, and ginger processing.

The district receives heavy rainfall during May to late September with an average annual rainfall of 2,794 mm under the influence of southwest monsoon.

Physiographically, the district is represented by parallel to sub parallel hill ranges trending North-South direction. The hills are steep and separated by rivers which flow either to the north or to the south creating deep gorges. The major drainages include Tuirial River flowing to the South. Numbers of perennial streams flow through the district from north to south.

Geologically, the district is occupied by shale, siltstone, and sandstone of Bairal Formation of Oligocene age and Surma and Tipam formation of Miocene age.

Groundwater stored in the hill slopes emanates in the form of springs, which are being used as a source of water supply. From quality point of view, most of the chemical constituents are within permissible limits in groundwater.

The estimated gross annual dynamic groundwater resource is 4.92 mcm while net groundwater availability for future irrigation development is 4.41mcm. The stage of development is 0.82 %.

2.0 Rainfall and Climate

The climate of the district is characterized by tropical humid climate with cool summers and cold winters. Winter temperatures vary between 11º and 13º C in general. The winter season is however, without snow. The normal annual rainfall is 2,216 mm and average annual rainfall is 2,794 mm. the rainfall is due to the monsoons from early May to late September.

3.0 Geomorphology and soil type

3.1 Geomorphology

Physiographically, the terrain is mountainous with prominent relief. Hill ranges are trending in the north-south direction. Parallel to sub parallel anticlinal hill ranges, synclinal narrow valleys form deep gorges. Basically these are structural hills. The process of denudation and weathering is still continuing in response to various natural forces. One of the dominant forces of formation of such landforms is exertion by running water. Based upon lithology, relief, drainage, and structural pattern, the district has been divided into two major units viz denudostructural hills and valleys.

3.1.1 Denudostructural Hills

Major portion of the district is occupied by denudostructural hills which are predominantly argillaceous comprising shale, siltstone and mudstone, fine grained and compact sandstone with occasional limestone. The processes of denudation have not yet obliterated the structural features such as dip facets and strike trend; anticline and syncline. This major form has been further divided as follows:

Low linear ridges

These are low elevated hills and occupy outer flank of structural folds. They have gentle to moderate slopes and possess gully erosion. The main drainage system is controlled by strike of the formations and shows slight meandering pattern. The main rock types represent a mixture of arenaceous as well as argillaceous assemblages, comprising shale and fine to medium grained, friable sandstone.

Moderate linear ridge

Moderate linear ridges occupy about 90% of the district. The main constituents are hard and compact sandstone, shale and siltstone, alterations of Bhuban Formation. The ridges show serrated top and hogback pattern, which are highly dissected and separated by intervening ‘V’ shaped narrow valleys.

3.1.2 Valleys

The valleys have limited aerial extend trending North-South direction.

Linear rolling valley

These valleys are found in the structural depressions in between low linear ridges of fine to medium grained, friable sandstone with subordinate shale of Bhuban group of rocks.

4.0 Soil types

The soils of the district, in general, have been derived from parent rock such as ferruginous sandstone, shale, alluvial and colluvial materials. In general, the soil formations have been categorized into following groups:

Hills

It includes colluvial soil, formed along the steep sided slopes because of accumulation of soil forming materials on slope surface.

Valleys

Soils occur as a mixture of colluvial and alluvial materials. It is restricted to the rolling valleys along the river cources.

Terraces

These are the remnants of deposits of cobbles and pebbles.

5.0 Ground Water Scenario

5.1 Hydrogeology

Hydrogeologically, the entire area of Mammit district is occupied by semi-consolidated formations of denudostructural hills belonging to Bairal Formation of Oligocene age and the Surma formation of Miocene age with limited extent of linear rolling valleys. The low linear ridges are characterized by low permeability and infiltration capacity. It acts as run off zone. The moderate linear ridges, which occupy the major portion of the district, comprise hard and compact sandstone, shale, siltstones and alternations of Bairal and Surma Group of rocks. This unit is also characterized by very low permeability and infiltration capacity that acts as run off zone. Ground water potential is low.

The linear rolling valleys with limited aerial extend are underlain by shale, sandstone and siltstone alternations. No ground water abstraction structures are noticed in the valley. However, during earlier field investigation by CGWB, occurrences of small pond like structures with very shallow water level (2.0 m bgl) had been reported. As such ,shallow ground water structure may be feasible in suitable location of the valley portions.

In general , the terrain is tectonically young and immature. The occurrence of ground water in such terrain is mainly restricted to weak zone such as fracture , lineament

and weathered residuum . thease tectonic element create seepage conduits , which are sources of spring. Thease spring utilized as a main source of water supply to the populace. The exiting water supply for drinking purpose is mainly from those spring tapped through gravity drainage . a number of spring were inventoried during earlier field investigation . all general , discharge of the spring are meager in high altitudes which progressively increase down slope.

Discharge of the spring vary between 3000 and 20,000 liters per day during the period from January to March , which generally dry period.

5.2. Ground water resources

The entire district is occupied by hill ranges with very steep slops that are more than 20%. Moreover, no details about the recharge potential in this hilly area are available . as per GEC,97 these hilly areas are not taken into account for resource computations. Due to lack of data especially on population, number of ground water structure ,draft and other important parameters on watershed basis . the smallest administrative unit, i.e. the RD block has been taken as the unit of computation . water level trend is also not available due to ground water abstraction structure , hence the annual ground water recharge of al the assessment unit have been computed by the rainfall infiltration factor method.

The estimated gross annual dynamic ground water resource is 4.92mcm while net annual ground water draft is 0.0069 mcm the stage of ground water development if 0.82%. Natural discharge during non-monsoon season is negligible. Future provision for domestic and industrial use is 0.01 mcm and for irrigation use, it is 4.41 mcm.

Mamit district is under the “Safe” Category.

5.3 Ground Water Quality

As per earlier field investigation reports, it I is found that water sample collected from spring indicates that ph values range between 6.9 and 8.3. electrical conductivity of the water is found to vary from 31-249 micromhos/cm at 25^0C excepting few places. the concentration of bicarbonate ranges from 12 to 158 ppm. The range of concentration of calcium and magnesium is in between 4-22 and 1-10ppm respectively. Concentration of Iron ranges from 0.02-0.3ppm, which is within permissible limit. In general, the chemical quality of ground water in the district fresh and potable and is suitable for domestic and Industrial purpose.

5.4 Status of Ground water Development

As discussed earlier , the entire district covered by hill of semi consolidated rock of tertiary age. The rock type s are comprised of mostly siltstone , claystone and compact sandstone. Inspite of good rainfall of more than 2000mm in the district , there is acute shortage of water during summer, because most of the rain water flow out as surface run-off.thje scope of ground water storage is limited mostly to secondary porosities controlled by structures. These

Aquifer aer the main source of springs. Ground water emanating in the form of spring are being developed for use as a source for water supply.

Ground water is used mainly for drinking purpose as there is no major industry in the district. Ground water utilization for irrigation may be considered as negligible. Due to hilly terrain, spatial variation of rainfall, nature of soil, non –availability of irrigation facilities, people practice Jhum cultivation.

5.4 Ground Water Exploration by CGWB

Central Ground Water Board has drilled 3 bore well in the Mamit valley covering an area of 10 sq.km and hydrogeological data of these EW are shown in table: 6.5.1. Investigations carried out by CGWB shows that ground water development potentiality in valley fill and alluvial deposits are restricted to construction of open wells having depth of 15 to 20 m and deep tube well down to 200 m depth tapping Tertiary sandstone which can give yield ranging from 120 to 333 liters per minute for drawdown of 13 to 20 m. The transmissivity ranges from 11 to 46 m^2/day. Specific Capacity and Storativity of the Exploratory Well constructed at Bungthum and Zawlnuam in Lakichera valley is 25.61 lpm/mdd and $4.28x10^{-4}$ respectively

Table: Hydrogeological data of exploratory bore wells drilled in Mizoram State

Sl. No	District /Location	Depth Drilled (m)	Depth of Construction (m)	Aquifer Tapped (m)	SWL (mbgl)	Discharge (lpm)	Drawdown (m)	T (m2/day)	S	Remarks	Age
	MAMIT DISTRICT										
1	Bungthuam	200.20	175.00	60.00	3.35	333.00	13.00	45.73	$4.2X\ 10^{-4}$	Sand med to coarse	Tertiary
2	Lakkicherra	201.30	146.20	15.00	5.12	140.00	13.85	32.00		Sand fine to med	-do-
3	Kanhmun	200.10	170.00	54.00	2.37	120.00	21.35	10.54		Sand fine to coarse	-do-
TOTAL	3										

6.0 Ground Water Management Strategy-

Hydrogeological investigation carried out by The CGWB during 1984-85 &1985-86 in the entire state revealed the occurrence of agood number of perennial springs in different altitudes . the discharge of the spring progressively increase in the lower altitudes. These spring can be developed scientifically for providing safe drinking water to th rural people . rain water harvesting which is well known to the people of thr district can also developed for solving the scarcity of the potable water.

6.1 Rainwater harvesting structure constructed under centrally sponsored scheme

Village wise volume of water used and number of benefited are detailed below-

SI. No	Name of District /Block	Name of Village	Volume of water Used (litre)	No of person benefited

1	Mamit /Zawlnuam R.D.Block	Lushaicherra	15,800	1594
	-----do-------	Sermun	15,800	1,800
2	Mamit/Reiek R.D.block	Khawrihnim	15,800	1086

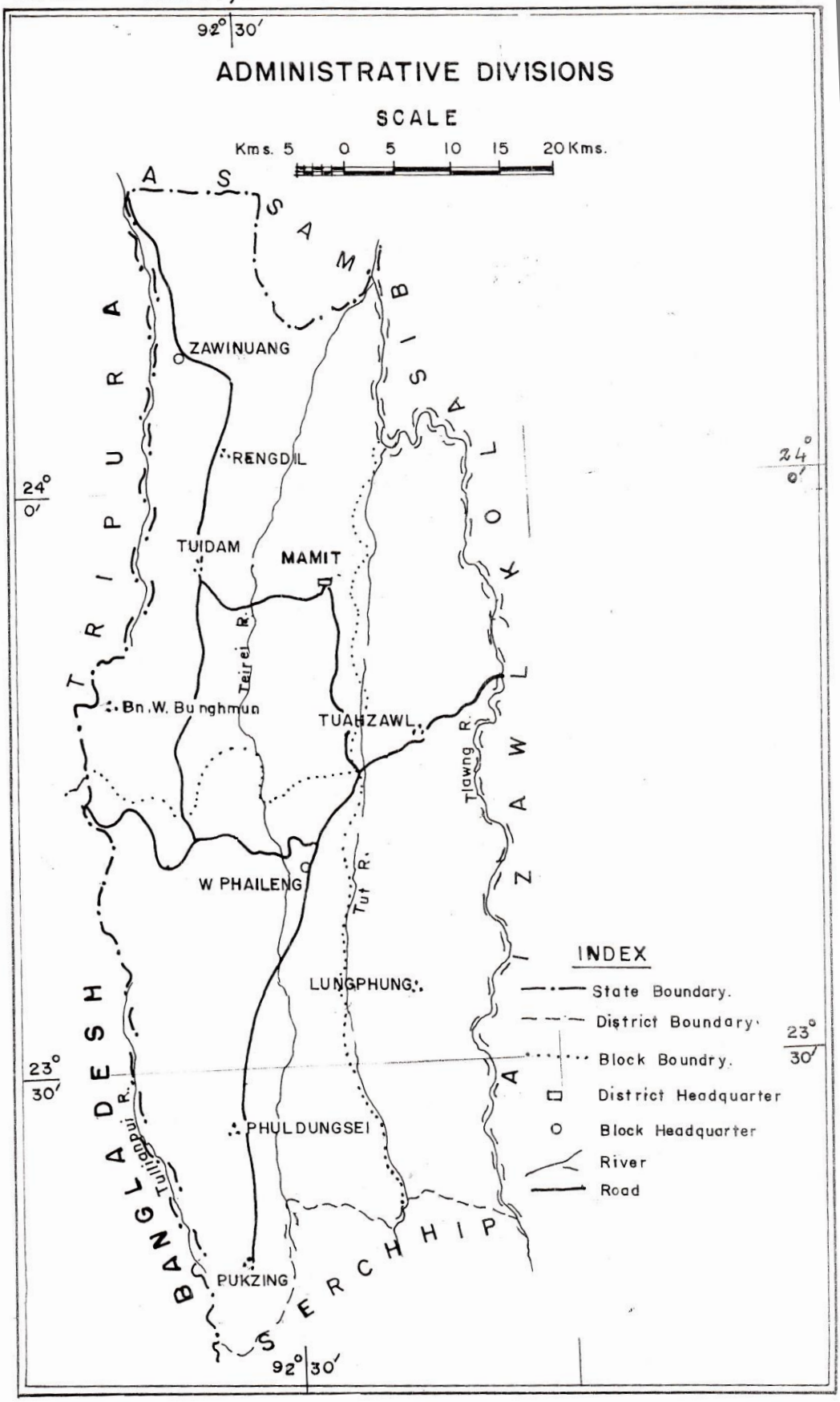
7.0 Recommendations-

Exiting hydrogeological setup indicates the limited water development prospect in the linear rolling valleys. Through the valleys are underlain by shale ,siltstone and sandstone , the intercalated sandstone layer may be productive for construction of shallow ground water structure. Thus , ring well with 2-3mm dia
metre and 10-15 m depth below ground level may be constructed in the suitable location with half backed bricks keeping weep holes in the sandstone layers.

In the major part of the district, perennial springs and rain water harvesting may be the main source for water supply to the local populace. The spring should be properly developed ,conserved and protected wherever they are used for domestic purpose. Some of the spring water in lower latitudes can be impounded in some structures and pumped again for water supply.

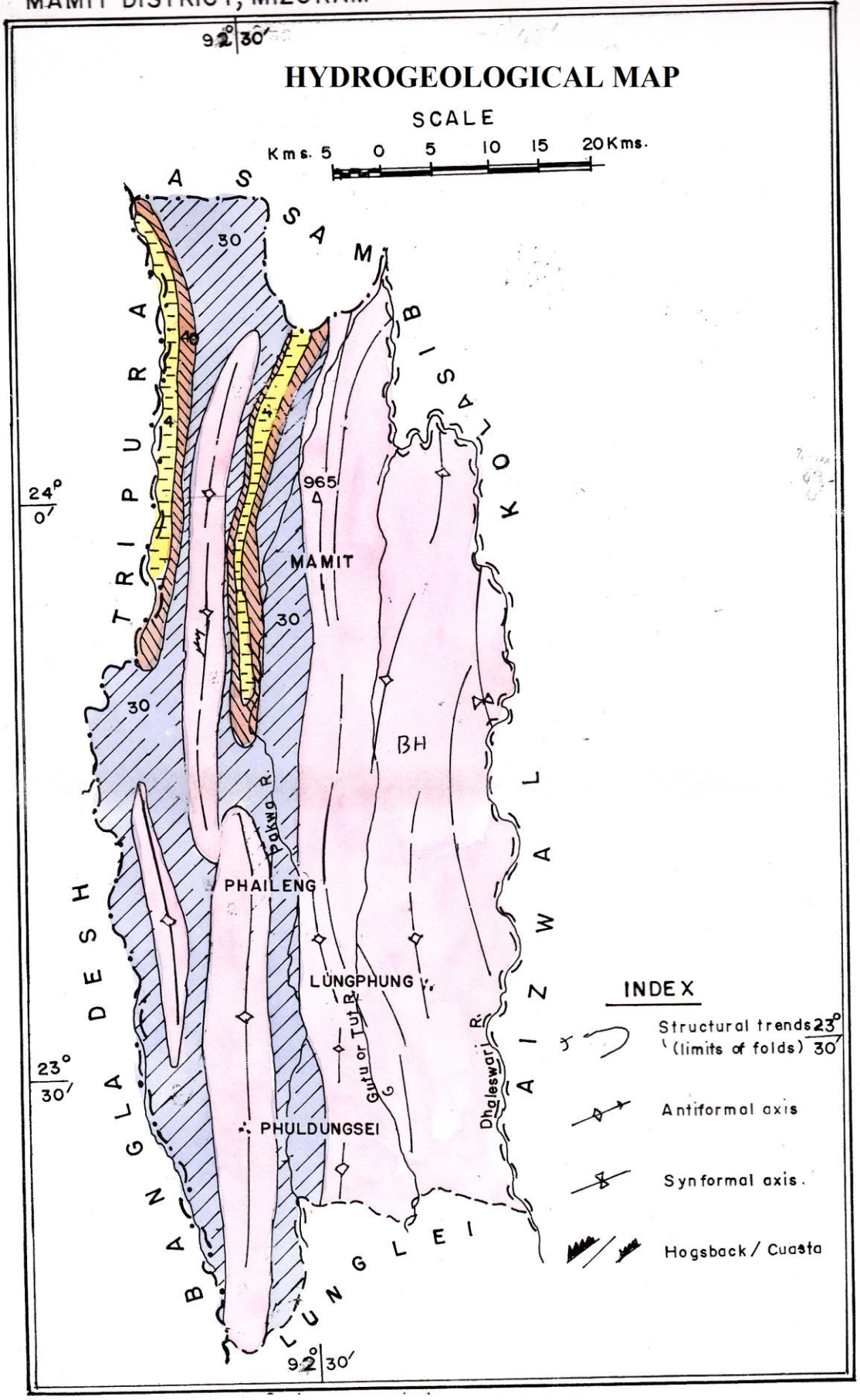
MAMIT DISTRICT, MIZORAM

Plate-I



MAMIT DISTRICT, MIZORAM

HYDROGEOLOGICAL MAP



MOMIT DISTRICT, MIZORAM.

LEGEND

AGE	FORMATIONS		GEOMORPHIC		HYDROGEOLOGICAL CHARACTERS
	SERIES	GROUP	UNIT	FORMS	
			(A) DENUDO STRUCTURAL HILLS		
MIOCENE	TIPAM	TIPAM	4a Low linear ridges	Cuesta	Consists soft sandstone with shale, siltstone alternations. Moderate permeability and infiltration. Act as run-off as well as recharge zone.
	SURMA	BOKABIL	3a Low linear ridges	Cuest	Consists of shales with siltstone alternations. Permeability and infiltration low. Act as run-off zones.
		BHUBAN	BH Moderate linear ridges	Hogs back.	Consists of hard and compact sandstone, shale, siltstone alternation. Permeability is very low and infiltration is negligible. Act as run-off zone. Ground water potential low, localised potential in limi- way can be atributed thouh development at secondary porosity through cracks.
			UNCONFORMITY		
OLIGOCENE			(B) VALLEYS		
			4 Linear rolling valley.		Consists of soft sandstone with shale, siltstone alternations. Moderate permeability and infiltration Act as recharge zone. Moderate ground water potential zone can be expected through deep aquifers.