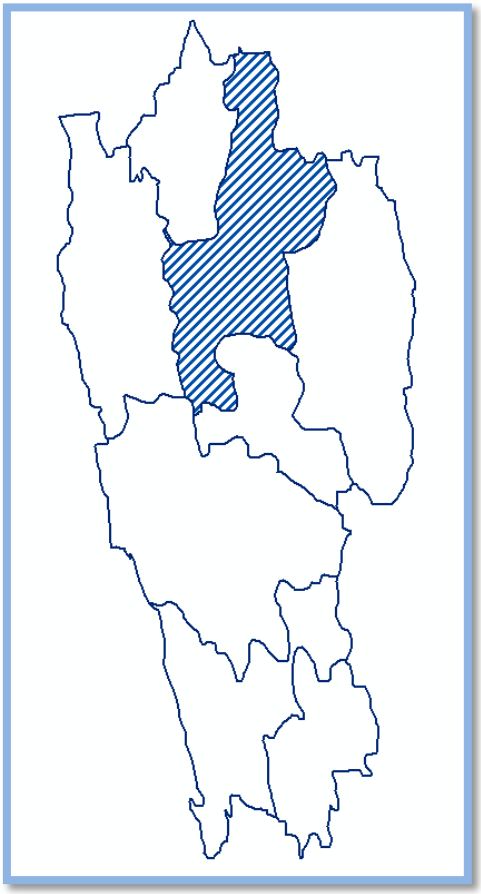
Technical Report Series: D

No:

Ground Water Information Booklet
Aizwal District, Mizoram



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

GROUND WATER INFORMATION BOOKLET
AIZWAL DISTRICT, MIZORAM

DISTRICT AT A GLANCE

Sl. No.	ITEMS	STATISTICS
1.	GENERAL INFORMATION i) Geographical Area (sq.km.) ii) Administrative Divisions (as on 2006) iii) Population (as per 2001 Census) iv) Average Annual Rainfall (mm)	 3,576.3 sq km There are five blocks, namely; Aibawk, Darlawn, Phullen, Tingsulthliah and Tiangnuam RD block. 6,80,872 2,794 mm
2.	GEOMORPHOLOGY i) Major Physiographic Units ii) Major Drainages	 Denudo Structural Hills with low and moderate ridges. Tuirial River
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
7.	PREDOMINANT GEOLOGICAL FORMATIONS	Lower Tertiary Formations of Oligocene and Miocene Age
8.	HYDROGEOLOGY i) Major water Bearing Formations	 Semi consolidated formations of Tertialr 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 31.03.09)	 Nil
10.	GROUND WATER QUALITY	Chemical constituents are within the permissible limit. Ground water is fresh and potable and is suitable for domestic 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	 3.86 0.14 0.27 3.94
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)	 09
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
AIZWAL DISTRICT, MIZORAM

1.0 Introduction

Aizwal district of Mizoram occupies the northeastern part of the state. It is bounded on North and North-east by Kolasib district of Mizoram and parts of Manipur, South by Serchip district, East by Champhai district and west by Mamit district of Mizoram. It covers an area of 3,576.3 sq km. the district has been sub-divided into five numbers of blocks.

As per 2001 census, the density of population is 95 persons per sq km. about two 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 Surma 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 mcm while net groundwater availability for future irrigation development is mcm. The stage of development is %.

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 exerted 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.

3.2 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.

4.0 Ground Water Scenario

4.1 Hydrogeology

Hydrogeologically, the entire area of Aizwal district is occupied by semi-consolidated formations of denudostructural hills belonging to Surma Formation of Miocene age. 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 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 structures may be feasible in suitable locations of the valley portions.

In general, the terrain is tectonically young and immature. The occurrence of ground water in such a terrain is mainly restricted to weak zones such as fractures, lineaments and weathered residuum. These tectonic elements create seepage conduits, which are sources of springs. These springs are utilized as the main source of water supply to the populace. The existing water supply for drinking purposes is mainly from those springs tapped through gravity drainage. A number of springs were inventoried during earlier field investigations. All the springs are fractures and joints oriented. A large number of springs are perennial. In general, discharges of the springs are meager in high altitudes which progressively increase down slope. Discharges of the spring vary between 3000 and 20,000 litres per day durind the period from January to March, which is generally dry period.

4.2 Ground Water Resources

The entire district is occupied by hill ranges with very steep slopes that are more than 20%. Moreover, no details about the recharge potential in these hills are available. As per GEC, 97, these hilly areas are not taken into account for resources computation. Due to lack of data especially on watershed basis, the smallest administrative unit, i.e. the R. D. Block has been taken as the unit of computation. Water level trend is also not available due to lack

of ground water abstraction structures, hence the annual ground water recharges of all the assessment unit have been computed by Rainfall Infiltration Factor Method.

The estimated gross annual dynamic groundwater resource is 3.86mcm while net annual ground water draft is 0.14mcm. The stage of groundwater development is3.94 %. Natural discharge during non-monsoon season is negligible. Future provision for domestic and industrial use is .27mcm and for irrigation use, it is3.21 mcm.

Aizwal district is under the **'SAFE'** category.

4.3 Ground Water Quality

As per earlier field investigation reports, it is found that the water sample collected from springs indicates thar p^H values range between 6.9 and 8.3. Electrical conductivity of the water is found to vary from 31-249 micromhos/cm at 25ºC excepting a 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 1-10 ppm respectively. Concentration of iron ranges from 0.02 to 0.3 ppm which is within permissible limit. In general, the chemical quality of ground water in the district is fresh and potable and is suitable for domestic and industrial purposes.

4.4 Status of Ground Water Development

As discussed earlier, the entire district is covered by hills of semi-consolidated rocks of tertiary age. The rock types are comprised of mostly siltstone, claystone and compact sandstone. In spite of good rainfall of more than 2,000 mm in the district, there is acute shortage of water during summer, because most of the rain water flows out as surface ron off. The scope for ground water storage is limited mostly to secondary porosities controlled by structures. These aquifers are the main source of springs. Ground water emanating in the form of springs 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.

5.0 Ground Water Management Strategy

Hydrogeological investigations carried out by the Central Ground Water Board during 1984-85 & 1985-86 in the entire state revealed the occurrence of a good number of perennial springs in different altitudes. The discharges of the springs progressively increase in the lower altitudes. These springs can be developed scientifically for providing safe drinking water to the rural people. Rain water harvesting which is well known to the people of the district can also be developed for solving scarcity of potable water.

5.1 Rainwater harvesting structures constructed under Centrally Sponsored Schemes

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

Sl. No.	Name of district/block	Name of Village	Volume of water used (litres)	No. of persons benefited
1	Aizwal/Tlangnuam RD block	Melthum	15,800	875
			15,800	2112
		Luangmual Venglai	15,800	2209
		Leitan	15,800	2341
		Bethlehem Vengthlang	15,800	2770
		Tuithiang	15,800	2510
2	Darlawn RD Block	Vaitin	15,800	1020
3	Thingsulthliah RD Block	Thingsulthliah Hospital area	15,800	2300
4	Phullen RD Block	Luangpawn	15,800	1045

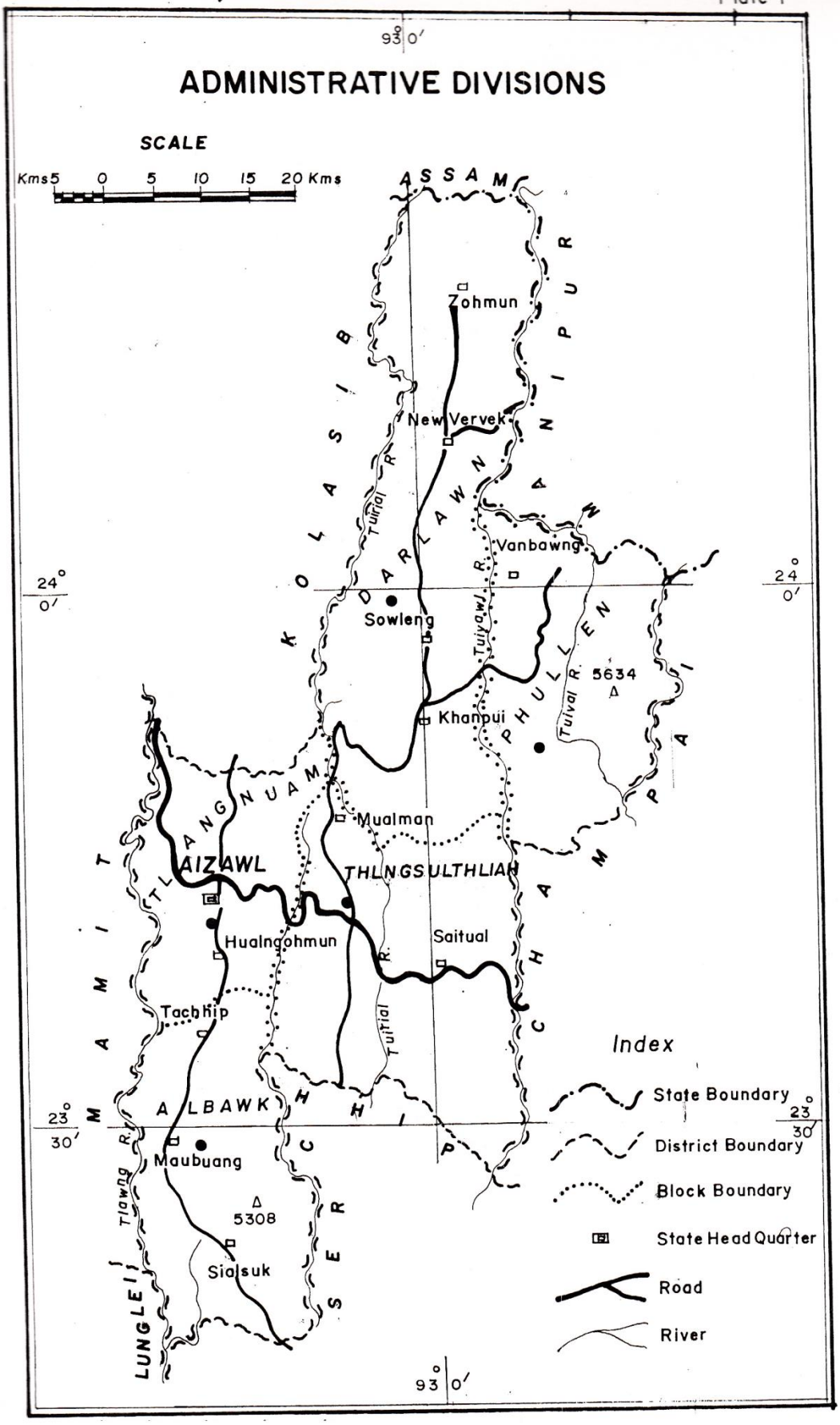
6.0 Recommendations

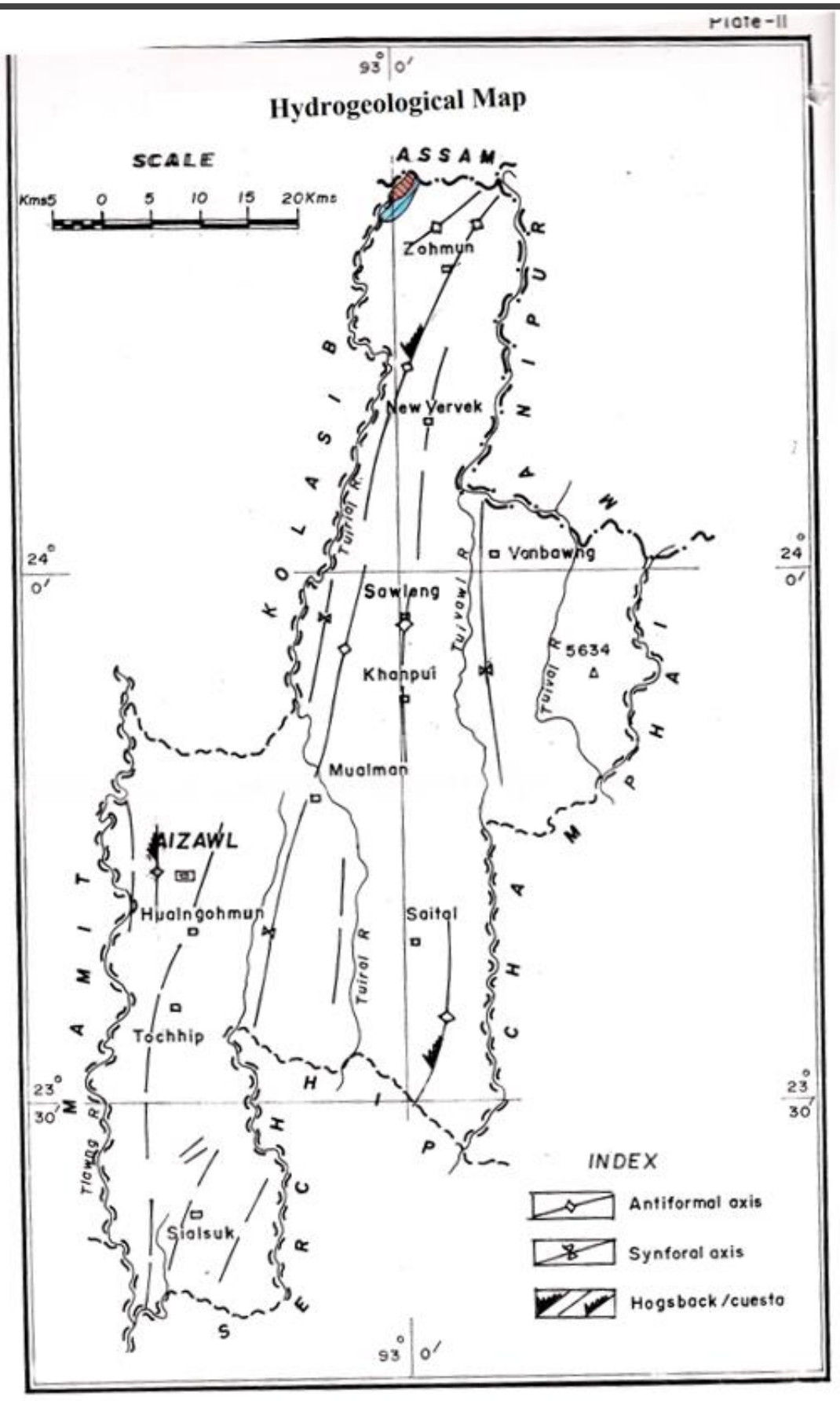
Existing hydrogeological set up indicates the limited ground water development prospects in the linear rolling valleys. Though the valleys are underlain by shale, siltstone and sandstone, the intercalated sandstone layers may be productive for construction of shallow ground water structures. Thus, ring well with 2-3 mm diameter and 10-15 m depth below ground level may be constructed in the suitable locations. These wells may be constructed with half baked bricks keeping weep holes in the sandstone layers.

In the major part of the district, tapping perennial springs and rainwater harvesting would remain the main source for water supply to the local populace. The springs should be properly developed, conserved and protected wherever they are used for domestic purposes. Some of the spring waters in lower altitudes may be impounded in some structures and pumped again for water supply.

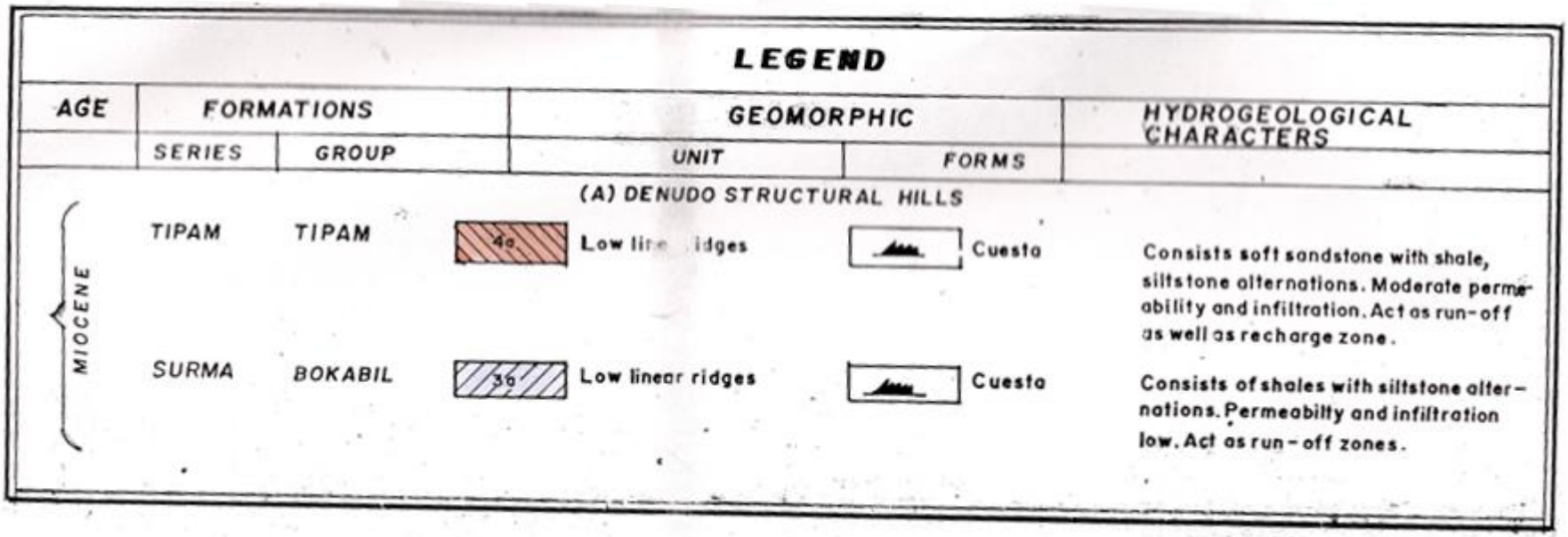
AIZAWL DISTRICT, MIZORAM

Plate-I




Hydrogeological Map
SCALE
Kms5 0 5 10 15 20Kms
93° 0′
ASSAM
Zohmun
New Vervek
Vanbawng
Sawleng
Khanpui
Mualman
AIZAWL
Hualngohmun
Saital
Tochhip
Sialsuk
Tuirial R
Tuivawl R
Tuirel R
Tiawng R
24° 0′
23° 30′
KOLASIB
NIPUR
MANIPUR
PHAI
CHAMPHAI
AMIT
HI
P
CHERC
S
5634
INDEX
Antiformal axis
Synforal axis
Hogsback /cuesta

AIZWAL 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	Cuesta	Consists of shales with siltstone alternations. Permeability and infiltration low. Act as run-off zones.