केंद्रीय भूमि जल बोर्ड

जल संसाधन, नदी विकास और गंगा संरक्षण

विभाग, जल शक्ति मंत्रालय

भारत सरकार

Central Ground Water Board

Department of Water Resources, River Development and Ganga Rejuvenation,

Ministry of Jal Shakti

Government of India

AQUIFER MAPPING AND MANAGEMENT OF GROUND WATER RESOURCES

NORTH TRIPURA DISTRICT, TRIPURA

उत्तर पूर्वी क्षेत्र, गुवाहाटी

North Eastern Region, Guwahati

GOVERNMENT OF INDIA
MINISTRY OF WATER RESOURCES, RIVER DEVELOPMENT & GANGA REJUVENATION
CENTRAL GROUND WATER BOARD

REPORT
ON
"AQUIFER MAPPING AND MANAGEMENT PLAN OF NORTH TRIPURA DISTRICT, TRIPURA"
(AAP 2016-17)

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CONTENTS

1. INTRODUCTION

Central Ground Water Board, North Eastern Region has carried out Aquifer mapping and management plan in North Tripura district, Tripura during AAP 2016-17 covering 994 sq.km out of total geographical area of 2106 sq.km. Under National Aquifer Mapping and Management (NAQUIM) program, combination of geologic, geophysical, hydrologic and hydro chemical information is applied to characterize the quantity, quality and sustainability of ground water aquifers. Systematic aquifer mapping will improve our understanding of the geologic framework of aquifers, their hydrogeologic characteristics, quality and also quantifying the available ground water resources potential and proposing plans appropriate to the scale of demand and the institutional arrangements for management. Aquifer mapping at the appropriate scale can help prepare, implement and monitor the efficacy of various management interventions aimed at long-term sustainability of our precious ground water resources, which, in turn, will help achieve drinking water security, improved irrigation facilities and sustainability in water resources development**.**

1.1 Objectives :

The objectives of this project are to understand the aquifer systems up to 200 m depth, to define the aquifer geometry, type of aquifers, ground water regime behaviors, hydraulic characteristics and to establish groundwater quantity, quality, and sustainability, and to estimate the dynamic and static resources accurately through a multidisciplinary scientific approach on 1:50,000 scale and finally formulate a complete, sustainable and effective management plan for ground water development.

1.2 Scope of the Study:

The activities of the Aquifer Mapping and Management Program can be envisaged as follows:

1.2.1 Data Compilation & Data Gap Analysis: One of the important aspect of the aquifer mapping programme was the synthesis of the large volume of data already collected during specific studies carried out by Central Ground Water Board and various Government organizations with a new data set generated that broadly describe an aquifer system. The data were assembled, analysed, examined, synthesized and interpreted from available sources. These sources were predominantly non computerized data, which was converted into computer based GIS data sets. On the basis of available data, Data Gaps were identified.

1.2.3 Data Generation: There was also a strong need for generating additional data to fill the data gaps to achieve the task of aquifer mapping. This was achieved by multiple activities such as exploratory drilling, geophysical techniques, hydro-geochemical analysis, remote

sensing, besides detailed hydrogeological surveys to delineate multi aquifer system; to bring out the efficacy of various geophysical techniques and a protocol for use of geophysical techniques for aquifer mapping in different hydrogeological environs.

1.2.4 Aquifer Map Preparation: On the basis of integration of data generated from various studies of hydrogeology & geophysics, aquifers have been delineated and characterized in terms of quality and potential. Various maps have been prepared bringing out Characterization of Aquifers, which can be termed as Aquifer maps providing spatial variation (lateral & vertical) in reference aquifer extremities, quality, water level, potential and vulnerability (quality & quantity).

1.2.5 Aquifer Management Plan Formulation: Aquifer Maps and ground water regime scenario will be utilized to identify a suitable strategy for sustainable development of the aquifer in the area.

1.3 Approach and Methodology:

Aquifer mapping has been carried out by adopting a multi-disciplinary approach:

(i) Geophysical Surveys through Vertical Electrical Sounding (VES)

(ii) Exploratory drilling and construction of tube wells tapping various groups of aquifers

(iii) Ground Water Regime monitoring by establishing monitoring wells tapping different aquifers at different depths for long term monitoring of water level and quality,

(iv) Pumping test, soil infiltration test, specific yield determination, slug tests for determination of ground water recharge scope, intensity and potentials and also to determine the characteristics and performances of existing aquifers at various depths

(v) Collection of various relevant technical data from the field in North Tripura district and also from the concerned State Govt. Agencies and other Institutes dealing with ground water and incorporating these data along with CGWB data for final output.

(vi) Preparations of a micro level mapping of existing aquifers, their potentials depth wise and sideways in 2D and 3D forms viewed from different angles by various GIS Layers.

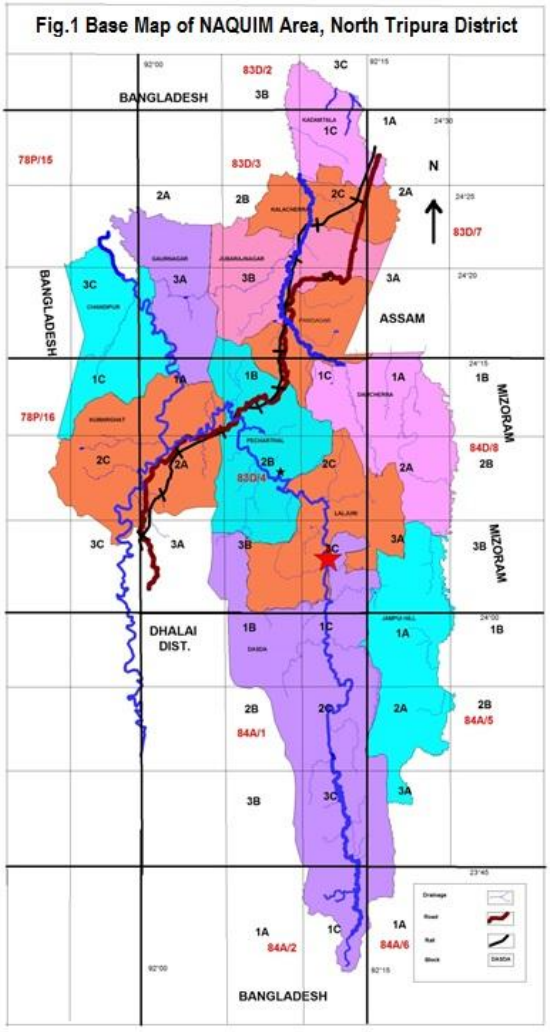
1.4 Area Details:

Aquifer mapping and management programme has been taken up during Annual Action Plan 2016–17 in North Tripura district (recently divided into North Tripura and

Unakoti districts) covering Kadamtala, Kalachara, Jubarajnagar, Dasda, Laljuri, Jampui, Panisagar, Damcharra, Kumarghat, Gournagar, Chandipur and Pecharthal blocks in order to delineate the available aquifers.The district headquarter of Unakoti district is Kailashahar and Dharmanagar is for North Tripura district. As per Census 2011, the North Tripura district is having a total population of 693947dominated by SC, ST and OBCs.

The district lies in the Northern most part of Tripura State and is confined within North Latitudes $24^0 33'$ and $23^0 39'$ and East Longitudes of $91^0 53'$ and $92^0 21'$.The area is falling mainly and partly in 50 Quadrants in the Survey of India Toposheets bearing nos. 78 P/15,78 P/16, 83D/2, 83D/3, 83D/4,k 83D/7, 83D/8, 84A/1, 84A/2, 84 A/5, 84 A/6 and is bounded in the North West and South by the international boundary with Bangladesh, in the west by Dhalai District and in the East by Mizoram and in the North east by Assam. Fig.1 depicts the base map of the NAQUIM area.

Fig.1 Base Map of NAQUIM Area, North Tripura District



1.5 Data Availability, Data Adequacy and Data Gap Analysis:

Hydrogeological, geophysical and ground water exploration data available in the district are as follows:

- **Exploration Data**: CGWB has constructed 22 (Twenty two) tub wells in North Tripura district and are shown in Fig 2. Details of these drilling operations, aquifer parameters are furnished in the Annexure – 3. State govt. has also drilled about hundreds of tube wells in the district.
- **Geophysical Survey (VES) Data**: Neither CGWB nor the State Govt. Departments have conducted any VES survey in this district till 2015. However, CGWB had carried out 36 (Thirty Six)VES survey during 2015-16.
- **Ground Water Level Monitoring Data:** CGWB has established 22 (Twenty Two) nos. of GWM wells which are monitored 4 times in a year. State ground water user departments, viz., PWD (WR), PWD (DWS) do not have any ground water monitoring station.
- **Ground Water Quality Monitoring Data**: CGWB collects water samples from 22 GWM wells and carried out chemical analysis in its regional laboratory at Guwahati.

1.6 Data Gap Analysis & Data Generation:

1.6.1 Data Gap Analysis:

- **Exploration Data Gap:**

CGWB, NER has constructed 22 (Twenty two) exploratory well in the district. Based on this drilling work, hydrogeological data have been gathered. Prior to this study, CGWB has not carried out ground water exploration in Kanchanpur Valley.

- **VES and Profiling Data Gap:**

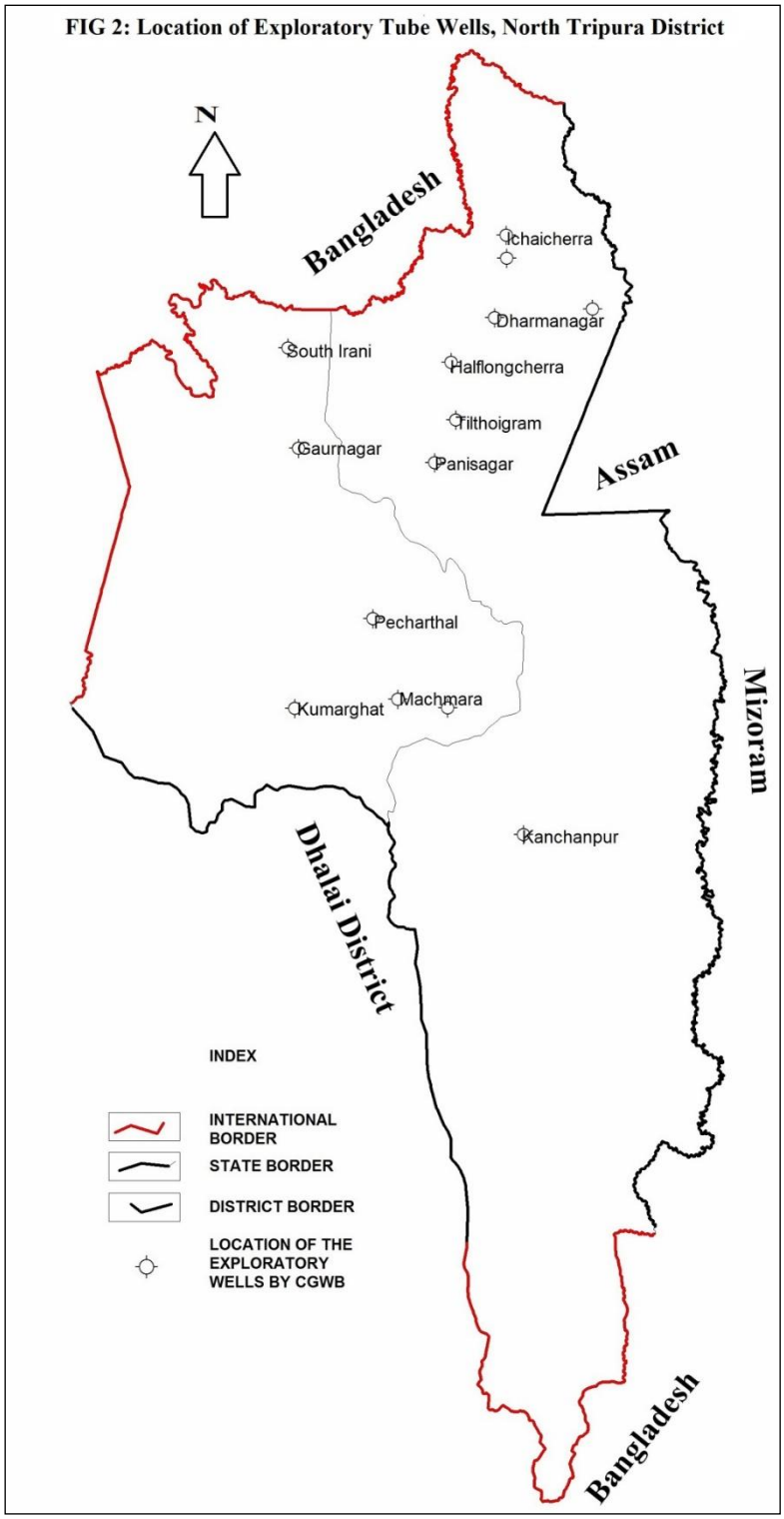
Data gap related to Resistivity Surveys i.e., VES and Profiling was extended over the whole North Tripura district containing parts of the Toposheets Nos. 78 P/16, 79 M/13, 83D/2, 83D/3, 83D/4,k 83D/7, 83D/8, 84A/1, 84A/2, 84 A/5, 84 A/6 as no such Geophysical survey had ever been carried out by CGWB or by any State Govt. Departments in any of the 50 relevant quadrants.

- **Ground Water Level Monitoring Data Gap:**

CGWB has established 22 (Twenty Two) GWM wells in the district and there is no data gap.

➢ **Ground Water Quality Monitoring Data Gap:**

Generally, water samples were collected and analyzed from all the 22 (Twenty Two) GWM wells falling in the district. There is no gap in data in terms of ground water quality monitoring.



1.6.2 Recommendation on Data Generation:

The following quantity of various kinds of data had been suggested to be generated:

- **Recommendation for Exploration:**

According to the data gap analysis, 4 nos. of DTW in quadrant 2B, 3C of toposheet no. 83D/4 piercing both Aquifer Group – I & Aquifer Group – II) have to be constructed. So the construction of a total 4 nos. of exploratory wells was recommended for further data generation in North Tripura district as per the existing norm.

- **Recommendation for VES and Profiling:**

From the data gap analysis it appears that 36 nos. of VES are required mainly to ascertain the depth and thickness of the individual aquifers as per the recommended norms of additional data generation. Thus a total 36 numbers of VES with a maximum electrode separation (AB) preferably ranging from 500 to 900 meter were recommendedfor geophysical data generation.

1.7 Physiography:

Physiographically, the district can be divided into two parts, viz., (1) Anticlinal Hill Ranges and (2) Synclinal flat bottomed valleys.

The major hill ranges in the study area are Jampui ,Sakhantlang and Longtarai. The hill ranges are tightly folded. The trend of the hill ranges is almost N – S. The height of the hill ranges increases from west to east. The highest elevation being 975 m above MSL at Betlingshib in Jampui hill ranges. The highest peak in the Sakhantlang ranges is at Sakhan, which is at 316 m above MSL.

The broad synclinal valleys occurring in the study area are -

(1) Dharmanagar – Kanchanpur valley, situated between Jampui and Sakhantlang hill ranges.
(2) Kailashahar – Kumarghat valley situated between Sakhantlang and Longtarai hill ranges.

All the valleys become narrow and constricted towards south and widens towards north. The master slope of the valleys are towards north. The valleys are gently undulating with intermittent flood plains of rivers and streams. The undulation formed by 10 – 30 m high mounds with gullies in between them, locally called “loonga.”

1.8 Geomorphology:

Geomorphologically, the area can be defined as a second order morpho-structural land system similar to that of "**Ridge and Valley Province**" of USA. The erosional and depositional units of land system are confined mainly to the structural valleys. Genetic geomorphological map by GSI enables recognition of 3 genetic types of landform units : (i) units of structural origin, (ii) units of denudational origin and (iii) units of fluvial origin, which can be shown in relation to their bedrock geology and structural pattern.

Units of structural origin characterize the structural pattern of folded rock bodies and include features occurring only in anticlinal hill ranges. Units of denudational origin are confined to structural valleys, where erosional processes predominate, developing an eroded topography, represented by residual hillocks/mounds and an incised net of stream beds. Incised stream beds form the conspicuous geomorphic feature of valley landscape partly filled by alluvial materials derived from adjacent hill slopes. Units of fluvial origin include only the flood plains of major rivers confined to the flat part of structural valleys.

There are two fundamentally different landform domains : **(i) Neogene Fold Ridges**, which constitute the roughly N-S aligned anticlinal ridges with rounded to nearly flat top; (ii) **Terraced alluvial terrain**, on the basis of characteristic relief, slope, degree of dissection, soil character, landform assemblage and nature of alluvial fill, is again divisible into three groups in chronological order : **(1)** table lands (tilla lands) and rolling mounds formed by the Upper Pleistocene terraces characterized by maximum dissection, drainage density and weathering; **(2)** low lands ('loonga') of Holocene terrace comprising stabilized, undissected, higher flood plains; **(3)** recent flood plains constituting the present-day flood-prone belts fringing the rivers. 3 distinct physiographic zones i.e. terrains are **(i)** N-S Hill Ranges, **(ii)** Undulating Plateau Land andHigh Lands **(iii)** Low lying Alluvial Plains on valleys.

1.9 LandUse:

Land use data for 2014-15 of the district shows that net sown area is only about 19% and forest area is 58% of the total geographical area. Land use data for 2014-15 has been shown in Table – 1.1. Block-wise land use data of the district for 2013 is shown in Annexure – 1.

Table 1.1 Land Classification during 2014-15

Sl. No.	Items			LAND CLASSIFICATION (Area In Ha)	
1	District			North	Unakoti
2	Geographical Area			141837	68779
3	Reporting area for land utilisation Statistics **(col 4+7+11+14+15)**			141837	68779
4	Forest			89292	33039
5 (a)	Not available for cultivation	Area under non-Agri cultural uses	Water logged land	NA	NA
5 (b)			Social Forestry	NA	NA
5 (c)			Land under still water	NA	NA
5 (d)			Other land	NA	NA
5 (e)			Total (col. 5a to 5d)	NA	NA
6		Barren & unculturable land		NA	NA
7		**Total**		**23212**	**13378**
8	Other uncultivated land excluding Fallow Land	Permanent pastures & other grazing land		468	308
9		Land under mosc.tree crops & groves (not incl.in net area sown)		4985	2918
10		Culturable waste land		1238	894
11		**Total (Colum 8 + 9 + 10)**		**6691**	**4121**
12	Fallow Land	Fallow lands other than current fallows		316	277
13		Current fallows		338	242
14		**Total (Colum 12 + 13)**		**654**	**519**
15	**Neat Area Sown**			**21988**	**17722**
16	**Total cropped Area**			**42340**	**28806**
17	Area sown more thanonce **(Colum 16-15)**			20352	11084

1.10 Soil:

In general, soils of the district are acidic in nature. The pH of soil ranges from 5.50 to 5.68. Nitrogen and phosphate is low, available potash is medium to high, calcium, magnesium and sulfur are deficient in these soils.

In the district, lateritic soil is found in tilla (hilly / small mounds) area, younger soils or river valley soils are found along all major river courses and clayey soils are found in paddy fields. Apart from these, sandy loam, clayey loam and loamy soils are also available. In Saraspur – Mahespur area, black soil rich in humus are available.

1.11 Irrigation Projects: Major, Medium and Minor

Agriculture is dependent on minor irrigation schemes only. There is no major irrigation project in the district. A part of a medium irrigation project on Manu River (near Nalkata) is under progress. Various types of minor irrigation projects present in the district are lift irrigation, diversion, sluice gates, pick up weirs, deep tube wells, shallow tube wells etc. amongst them the most important is (river) lift irrigation projects. Farmers also construct

permanent or seasonal bund across cherras / nalas/ streamlets to collect the water and cater for irrigation through pump sets. Structure wise irrigation potential created by PWD (WR) and potential utilisation (as on March 2013) is shown in Table 1.2. Block-wise no. of irrigation structure constructed in the district is shown in Table 1.3.

Table 1.2: Structure wise Irrigation Potential Created by PWD (WR) and Potential Utilisation (as on March 2013)

Potential Created (ha)					Total Potential Created (ha)	Net Potential Utilised (ha)
Lift Irrigation (LI + HPLI)	DTW	Diversion	Medium Irrigation	Low/High Pickup Weir		
11465	550	140	1027	26	13208	10228

Table 1.3: Block wise Nos. of different Irrigation Structures and Irrigation Coverage Area (as on March 2013) for North Tripura district

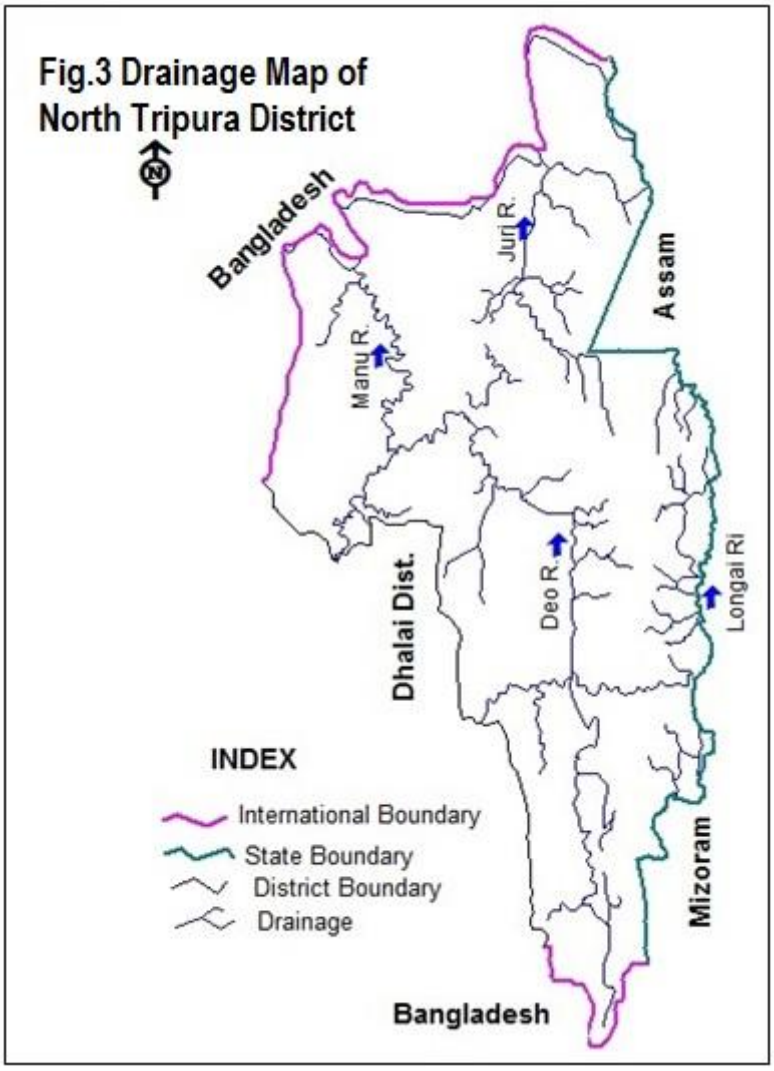
Block	Lift Irrigation (LI) *No. of Structure (Area covered)*	High Power Lift Irrigation (HPLI) *No. of Structure (Area covered)*	Diversion *No. of Structure (Area covered)*	Low & Medium Pick-up Weir *No. of Structure (Area covered)*	Deep Tube Well *No. of Structure (Area covered)*	Small Bore TW/ Mini Deep TW *No. of Structure (Area covered)*	Shallow Tube Well *No. of Structure (Area covered)*
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Panisagar	49 (1700)	---	---	---	2 (50)	39 (107)	6 (53)
Kadamtala	40 (1560)	---	1 (120)	---	6 (158)	17 (47)	36 (350)
Pecharthal	31 (939)	1 (60)	---	---	---	3 (8)	0 (0)
Dasda	34 (762)	1 (190)	1 (20)	3 (26)	0	2 (6)	3 (24)
Damcherra	7 (173)	1 (40)	---	---	---	0 (0)	5 (41)
Jampui hill	0	0	0	0	0	0 (0)	0 (0)
Jubarajnagar (Sub-block)	38 (1305)	---	---	---	8 (195)	19 (52)	0 (0)
Kumarghat	82 (2540)	---	---	Medium (1027)	3 (67)	31 (85)	0 (0)
Gaurnagar	61 (2196)	---	---	---	4 (80)	39 (107)	8 (71)
Total of North Tripura dist.	**342 (11175)**	**3 (290)**	**2 (140)**	**3 (1053)**	**23 (550)**	**150 (412)**	**58 (539)**

1.12 Ponds, Tanks and other Water Conservation Structures

There are thousands of small ponds available in the district. These ponds are used mainly for fish cultivation and also used for domestic purpose like washing, bathing, water for cattle's etc. But rarely these ponds are used for irrigation purpose as these ponds do not have much water during summer periods. Farmers rarely use these ponds for irrigation during summer periods.

1.13Drainage:

The anticlinal hill ranges forms the watersheds from which various drainage channels emerged. The common drainage patterns are sub-parallel to parallel and dendritic. Up to 4th order streams are found in the area. The major rivers in the area are Manu, Deo, Juri and Longai. These perennial rivers are a part of Barak sub-basin which in turn forms a part of Meghna basin. Drainage in the district is shown in Fig 3.



1.14Agriculture:

Agriculture in North Tripura district depends mainly on the timely monsoon. Fertile soils of the valleys and the abundant rainfall are very conducive to growing of better-quality agricultural and horticultural crops.Net area under agriculture (net area sown) is**40316** ha(in 2013-14), whichis19.14 % of total geographical area(**210616** ha).

Economy of the area is basically agrarian and about 55 % of the population is dependent on agriculture and allied activities for their livelihood as agricultural work is the single largest provider of employment to the rural people of North Tripura district. Favorable agro-climatic conditions, fertile soils, sub-tropical climate with pockets of temperate zones, large 'tilla' lands and high rainfall also promotes growing of horticultural plants like fruits, vegetables, spices, floriculture, medicinal and aromatic plants etc.

People cultivate on high hill slopes by practicing traditional '**JHUM'** process (shifting cultivation) to grow mainly rice in the monsoon.

The main crop is paddy; all three i.e. summer paddy (Aus), monsoon paddy (Aman) and winter paddy (Boro) are being raised, which are followed by maize, wheat, mesta, jute, cotton, pulses and oilseeds. Over a limited area cashew nut and pineapple are also grown. Rubber and tea plantations are also seen in a large scale on small mounds and foothills. Principal crops and area cultivated under them is shown in Table 1.4.

Table 1.4: Principal Crop Area (Ha) & Yield (Kg/Ha or Bales/Ha),2013-14

Agricultural Sub- Division	Aush Paddy		Aman Paddy		Boro Paddy		'Jhum' Paddy		Maize		Wheat		Khariff Pulses		Rabi Pulses	
	A	**Y**	**A**	**Y**	**A**	**Y**	**A**	**Y**	**A**	**Y**	**A**	**Y**	**A**	**Y**	**A**	**Y**
Panisagar	4876	2554	5801	2821	150	2720	346	1029	272	1265	22	1955	476	674	139	741
Kadamtala	3806	2656	5264	2780	110	3018	70	1043	84	1250	10	1700	168	631	150	767
Kanchanpur	1429	2276	4490	2511	100	2260	3951	1086	284	1229	10	2500	130	692	48	729
Kumarghat	5876	2592	11652	2745	417	2815	570	1070	178	1208	50	1980	613	644	559	716
Total	**15987**	**2567**	**27207**	**2730**	**777**	**2754**	**4937**	**1079**	**818**	**1238**	**92**	**2000**	**1387**	**658**	**896**	**2953**

Agricultural Sub- Division	Sesamum		Khariff Ground Nut		Rabi Ground Nut		Rape & Mustard		Jute (P : Bales) (Y : Bales/Ha)		Mesta(P: Bales) (Y : Bales/Ha)		Cotton (P : Bales) (Y : Bales/Ha)	
	A	**Y**	**A**	**Y**	**A**	**Y**	**A**	**Y**	**A**	**Y**	**A**	**Y**	**A**	**Y**
Panisagar	88	489	7	1000	11	1364	619	798	57	8.61	40	7.35	86	1.31
Kadamtala	48	500	5	1000	5	1400	265	758	58	8.53	29	8.45	30	1.42
Kanchanpur	131	466	3	1000	0	0	642	773	4	9.00	8	8.88	211	1.31
Kumarghat	212	552	13	1308	42	1429	605	813	49	8.47	42	8.45	77	1.52
Total	**479**	**511**	**28**	**1143**	**58**	**1414**	**2131**	**790**	**168**	**8.55**	**119**	**8.11**	**404**	**5.56**

A – Area (Ha); P – Production (MT); Y – Yield (Kg/Bales per Ha)

1.15 Cropping Pattern:

The cropping pattern of the district is mainly paddy oriented and production amount of paddy is more than any other crop. Depending on the period of its growth the paddy is divided into three varieties – (i) monsoon paddy (Aman), (ii) winter paddy (Boro) and (iii) summer paddy (Aush). Aush is cultivated in a very limited area. After the cultivation of Aman paddy and before the cultivation of Boro paddy, different vegetables viz. potato, cabbage, gourds etc., oil seeds and pulses are cultivated.After Boro paddy, jute is also grown in a small scale. In most of the cultivable land only one paddy (Aman) is grown. In double-cropped areas, twopaddies are grown (Aman & Boro) but in some places one paddy (Aman) and vegetables are grown. Triple cropped area is very limited and here the cropping pattern is two paddies and one vegetable or one paddy with two times vegetables. Cropping pattern not only depends on fertility of land and availability of water but also depends on individual cultivator. Over a limited area, orchards of pineapples, jackfruits, mangoes and cashew are raised. Rubber plantations are also in vogue on small mounds and foothills over a considerable area, which is ever increasing.

The cropping pattern of the district shows that among paddy varieties Aman paddy is cultivated in maximum area followed by Boro, 'Jhum' paddy (cultivated on the hill slopes by the village tribals) and Aush. After paddy, vegetables which includes potato followed by pulses are the major cultivated crops in the area.

1.16 Prevailing Water Conservation/Recharge Practices:

In North Tripura district, small/medium check dams are highly feasible to be constructed in foothill areas to store water which can be used during lean periods. Forest, Agricultural, Rural Development Department, Block Development Offices have constructed many rain water harvesting structures like ponds, check dams, nala bundhs.

1.17 General Geology:

Geologically, the study area is occupied by Quaternary & Upper Tertiary groups of rocks. The geological succession of the area is given in Table 1.6.

Table 1.6: Geological Succession in North Tripura District

Age	Group	Formation	Lithology
Quarternary	Recent	Recent	Alluvium, represented by unconsolidated pale to dirty gray, silt, sand, clay, silty clay, sandy clay etc and yellowish brown coarse river sand, gravels & concretions.
	---------- UNCONFORMITY----------		
Upper Tertiary	Dupitila	Dupitila	Brown to buff sandy clay with grayish sandy loam, clayey sandstone with ferruginous materials & laterites.
	---------- UNCONFORMITY----------		
	Tipam	Champaknagar	Massive medium to coarse sandstone with sandy shale.
		Manubazar	Fairly bedded fine to medium sub-arkosic sandstone with sandy shale and siltstone.
	---------- UNCONFORMITY----------		
	Surma	Bokabil	Thinly laminated, bedded sandstone and silt (repetition) with ferruginous material, medium to coarse micaceous sandstone with mudstone.
		Bhuban	Intruded, hard compact, both massive & well-bedded sandstone, dark to olive shale repeated.
Base not known			

The distribution of the geological formations is described as under:

a) Surma Group: The Surma Group is represented by Upper Bhuban and Bokabil Formations. The rocks of Bhuban Formation, constituting compact sandstones and shales, which are exposed in the core of the anticlines of the district, viz SakhanTlang, Jampui hills and Longtarai etc. These formations usually form high hills with steep slopes and are conformably overlain by Bokabil Formation. The rocks of Bokabil Formation are predominantly of argillaceous composition and are exposed on both limbs of the anticlines.

b) Tipam Group: The Tipam Formations are conformable and transitional to the underlying Bokabil Formation. These Formations are arenaceous in nature and comprised of fine to medium grained, yellow to light buff and brownish yellow colour, friable sandstones, and occur along the outer flanks of the anticlinal hill ranges with moderate dip to near horizontal disposition. The sequence of these formations shows variations due to facies changes within the group. The maximum thickness of these formations is estimated to be around 1400 m, the minimum being 400 m.

c) Dupitila Group: The Dupitila sediments consisting of earthy brown to buff sandy clay, mottled clay, clayey sandstone and coarse to gritty ferruginous sandstone unconformably overlie the Tipam Formation, and are well developed in central portion of the synclinal valleys. These formations occur in the form of disconnected mounds. The thickness of this formation varies from 10 – 30 m.

d) Recent Group: Recent alluvium occurs along the streams and the flood plains of major rivers. It consists of coarse sand, sandy clay, silt, silty clay and clay etc.

1.18Sub-Surface Geology

It has been interpreted on the basis of the lithological logs of boreholes drilled by Central Ground Water Board and various state government Agencies. The sub-surface configurations of different granular zones have been shown in two panel diagrams. The granular zones encountered down to 300 m depths belong to semi-consolidated Tipam and Dupitila groups and constitute medium to coarse grained, sub-rounded quartz, feldspathic material. The occurrence and thickness of these zones very laterally as well as vertically.

In Dharmanagar valley, three major granular zones are present. Below top soil (7 to 14 m thickness) a 10 – 40 m thick clay bed occurs all along the valley and its thickness increases towards north (Ichailalcherra). The first major granular zone occurs below this clay bed and is comprising of sandstone, fine to medium grained, yellowish brown in color. The thickness of this zone varies from 46 – 74 m. The second granular zone occurs in the depth range of 100 – 140 m bgl and its thickness varies from 10 – 50 m. It's thickness tends to be thinned towards north. The third granular zone occurs in the depth range of 165 – 175 m bgl. This zone tends to get thickened towards north which is opposite to the above zones.

In the central part of the Kailashahar valley, Kumarghat – Karamcherra area, a continuous granular zone of thickness varies from 100 – 135 m occur below 5 m. The thickness of this zone gets reduced towards north and south due to the presence of clay / shale horizons. Another granular zone of some significance occur below 200m with thickness varies from 25 – 40 m. Other granular zones present at depth are comparatively much thinner and intercalated with clay / shale horizons.

2. DATA COLLECTION & GENERATION

- **Actual achievement in generating exploratory drilling data :**

Total 3 nos. of Deep Tube Wells (DTW) including 2nos. of Exploratory Tube Wells and 1 no of Observation Well were constructed in the district under Toposheet 83 D/4.

One exploratory well was drilled at Karaichera school premises under Pecharthal block of North Tripura district. Drilled depth of the well was 116.60 m and it was abandoned due to lack of granular zone. One exploratory and one observation well were drilled at Kanchanpur court premises under Laljuri block of North Tripura district. Drilled depth of the well was 92.30 m and assembly lowered upto 90.50 m. Three zones between 51- 57, 63-72, 75- 87 were tapped during exploration. Thickness of the aquifer tapped is 24m. Discharge and drawdown were recorded at 48 m^3/hr and 4.84 meters respectively. Static water level was 4.64 m below ground level. Specific capacity of the well is 2.9. Transmissivity and Storativity were 234 m^2 /day and 1 $x10^{-2}$ respectively.

- **Actual achievement in generating geophysical survey data :**

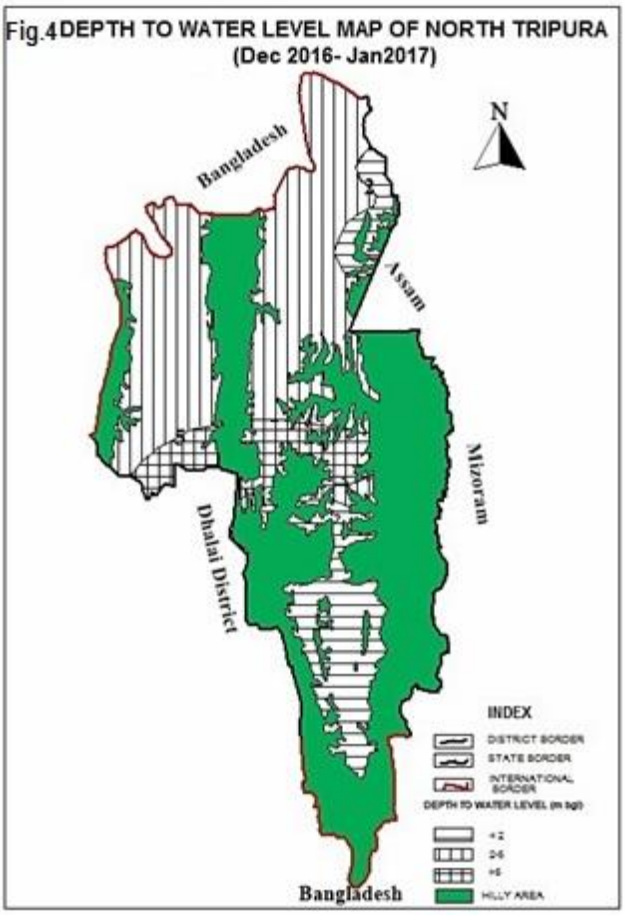
36 nos. of Vertical Electrical Soundings (VES) at 36 nos. of different site spread all over the North Tripura district conducted and locations of VES sites were depicted in Fig 14.

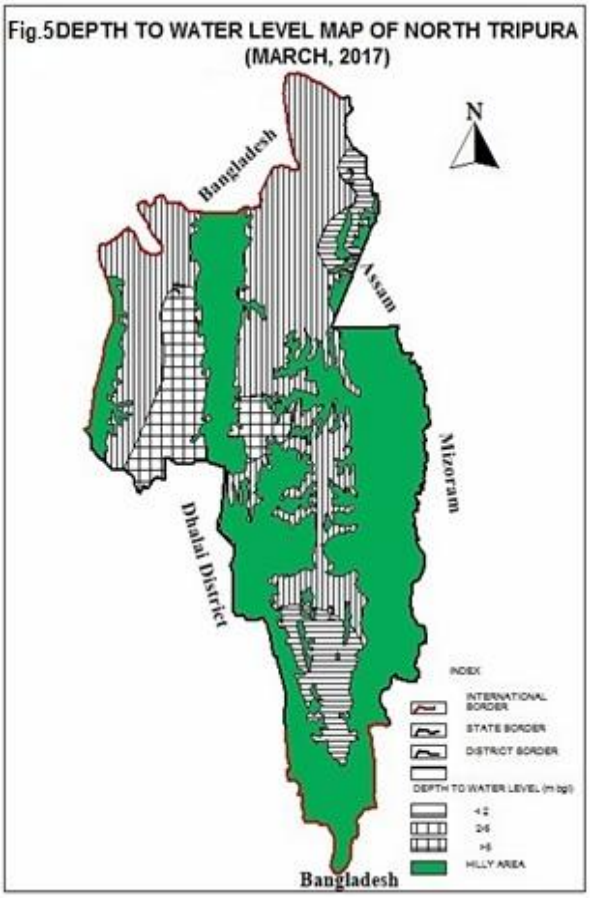
- **Actual achievement in generating Water Quality data :**

In addition to previously existing GMS wells, 29 other dug wells have been established as Key Wells and since pre-monsoon of 2017, water samples from these 29 wells are being collected.

3.DATA INTERPRETATION, INTEGRATION AND AQUIFER MAPPING

3.1 Depth to water level: Depth to water level during December, 2016-January 2017 monitored from dug wells (first Aquifer) ranges from 1.02 to 8.90 m bgl while in March,2017 depth to water level ranges from 1.34 to 7.18 m bgl. Depth to water level during December 2016 – January 2017 is shown in Fig 4 and DTWL for March 2017 is shown in Fig 5.





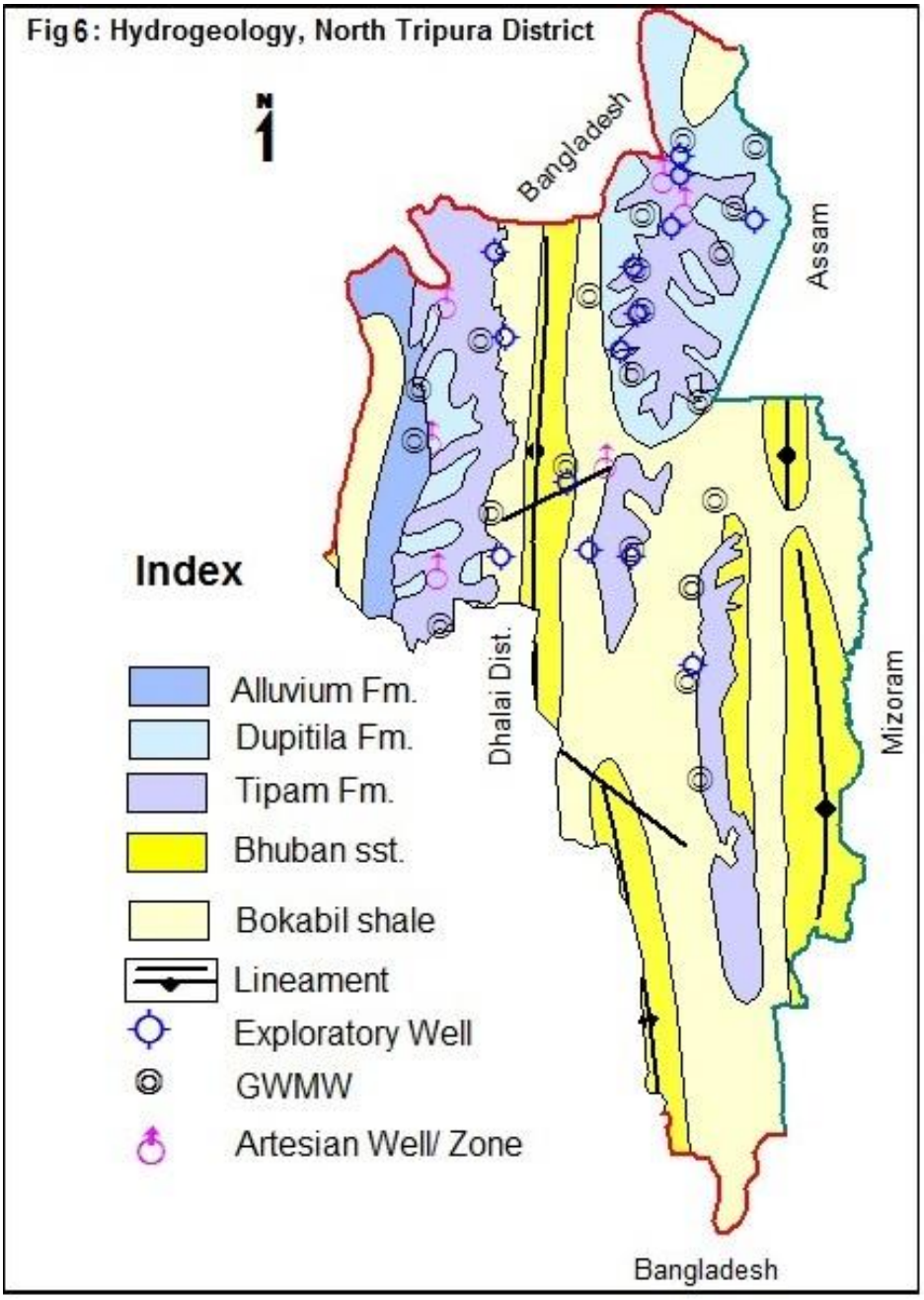
3.2 General Hydrogeology and Occurrences of Ground Water

The main hydrogeological formation of the aquifer mapping area is Quaternary to Tertiary semi-consolidated formations, more specifically Recent Alluvium of Quaternary age and Dupitila & Tipam formation of Tertiary age. The fine to medium grained semi-compact buff colored thick Tipam Sandstone forms the principal aquifer in the area. The ground water in this aquifer mapping area occurs under unconfined, semi-confined and confined conditions. Study of dug wells, shallow tube wells and deep exploration data of CGWB

reveals the presence of phreatic, shallow and deeper aquifers in North Tripura district. Hydrogeological map of the district is shown in Fig 6.

Occurrences of Ground Water in Shallow Aquifer: Shallow aquifer generally extend within the depth range of 5 to 30 m bgl. In shallow aquifer, ground water generally occurs under unconfined condition. In major part of the area, ground water in shallow depths occurs under unconfined condition but it occurs under confined condition within shallow depths in small isolated zones in the northern part (Samrurpar – Jarultali area) of Gournagar block; (Ichailalcherra area) of Kadamtala block and Krishnanagar – Fatikray area of Kumarghat block.

Occurrences of Ground Water in Deeper Aquifer: In deeper aquifer ground water occurs under semi-confined to confined conditions. Most of the heavy duty ground water abstraction structures for different purposes are tapping these deeper aquifers. Deep tubewells located at Dharmanagar (jail road), Chandrapur, Batarshi, Krishnapur, Charupasa, Tongibari and North Dewanpasa in Panisagar block; Kadamtala, Bhagyapur & Pratekray in Kadamtala block; Nabincherra in Pecharthal block, Tuichama in Dasda block; Betcherra in Kumarghat block and Kailashar in Gournagar block constructed by PHED, Govt. of Tripura are found to be in artesian (flowing) condition. The piezometric head of these artesian wells vary from 0.50 to 1.03 m agl and their discharge was up to 36 m^3/hr (during 2005 – 06).



LEGEND

Age		Group	Formation	Lithology	Aquifer Disposition	Ground Water Potential
Quaternary	Unconsolidated	Recent	Recent Alluvium	Clay, Silt and Sand	Limited thickness along river valleys	Yield Prospects very limited due to superficial thickness
Upper Tertiary	Semi Consolidated	Dupitila	Dupitila	Coarse to gritty Sandstone with dominated Clay layers	Forms Unconfined aquifer in dug well zones near surface. Maximum thickness : 30 m	Limited yield prospect due to poor permeability
		Tipam	Champaknagar/ Manu Bazar	Fine to coarse Sandstone with intercalations of Shale layers	Forms major aquifer system for shallow and deep tube wells up to 300 m depth at favourable locations.	Moderate yield prospect, yields varies from 20 to 150 m^3/hr for drawdown up to 30 m
		Surma	Bokabil/ Bhuban	Thinly bedded Sandstone, Siltstone and Shale	Occurs on anticlinal hill ranges	Not potential for ground water development, due to argillaceous nature of formations

3.3 Number of Aquifers:

The areas under mapping possess two aquifer systems. The first aquifer is phreatic/ unconfined aquifer. Based on existing exploration data, it is ascertained that the depth of the first aquifer is within 30 m bgl. The soft Tipam sandstone occurring below 30 m and having a reasonably higher permeability forming the second aquifer. The maximum depth of the second aquifer is encountered down to the explored depth of 300 m bgl. Thus the aquifer system of the mapping area is divided into two groups, viz., shallow aquifer group within 30 m bgl and deep aquifer group between 30 to 300 m bgl.

3.4 Aquifer Systems:

The aquifers mostly consist of sedimentary formations of Tertiary age. Three hydrogeological units/ water bearing formations identified in the area are Alluvial formation, Dupitila formation, Tipam formation.

(A) Alluvial Formation : It occurs along the banks of main rivers and thickness varies from 5 to 10 m. Ground water occurs under unconfined condition and its development is not very significant because of high clay and sandy clay content of this formation. Ground water is developed through dug wells and shallow tube wells fitted with hand pumps.

(B) Dupitila Formation: Dupitila formation is nearly horizontal in disposition and its thickness varies from 10 to 30 m. The formation consists of mainly clay and silt with some intercalations of gritty & ferruginous sandstones. It is exposed in the western middle part of Udaipur - Subroom valley. Due to high clay content, it has low permeability, low storage capacity and the ground water extraction occurs through dug wells and shallow tube wells fitted with hand pumps.

(C) Tipam Formation: Sandstones of Tipam formation forms the principal aquifer system in mapping area. Permeability of this sandstone is much higher than that of Dupitila sandstone or Bokabil (Surma Group) sandstones. This formation consists of sub-rounded, fine to medium grained, friable sandstone with intercalated clay. The recharge area of these sandstones is in the neighboring anticlinal hills. Ground water occurs under unconfined, semi-confined to confined conditions. Sandstones are mostly developed by deep tube wells, mini deep tube wells, shallow tube wells and dug wells.

3.5 Aquifer Geometry

The main objective of the study is to delineate the horizontal and vertical disposition of aquifer as well as to study the aquifer character. To know the aquifer disposition in the

district, exploratory wells data, VES data available with CGWB and lithologs of state departments, Govt. of Tripura were utilized.

CGWB has drilled 24 tube wells within a depth range of 260 m. It can be deciphered from the lithologs of different exploratory wells drilled by CGWB and tube wells by State Govt. that mono aquifer system occurs in the area in regional scale. The district is underlain by potential water-bearing formation of Tipam Group comprising of medium to fine grained, semi-consolidated, friable, soft, sandstones. This sandstone aquifer is having shale/ clay intercalations in places. In some places due to the presence of clay intercalations 2 to 4 granular zones occur in the district. Separations of two or more granular zones by clay beds often misguide to classify the aquifers into a multiple aquifer system. However, these clay beds are mostly in lensoid shape and they pinches out within a short distance. Thickness of the saturated zone varies from 50 to 150 m within a depth range of 200 m. Sub-surface geology of the district is depicted through a few sections and panel diagrams and are shown in Fig8, 9, 10 and 11.

In the central part of the **Kailashahar**valley (Kumarghat – Karamcherra area) a continuous aquifer of thickness varies from 100 – 135 m occur below 5 m. The thickness of this aquifer gets reduced towards north and south due to the presence of clay / shale horizons. Other granular zones present at depth are comparatively much thinner and intercalated with clay / shale horizons. Another granular zone of some significance occur below 200 m with thickness varies from 25 – 40 m.

Dharmanagar – Kanchanpur valley is dominated by alternating sandstone horizons with thin intervening shale / clay horizons. In the central part of the valley good productive aquifer but comparatively thin granular zones intercalated with shale occur within 90 m bgl. However, towards the north (Ichailalcherra) and south (Kanchanpur) the thickness of clay / shale is more. Granular zones of significant thickness are encountered between 110 – 240 m bgl. The deeper aquifers are more consistent and their thickness varies from 15 to 80 m.

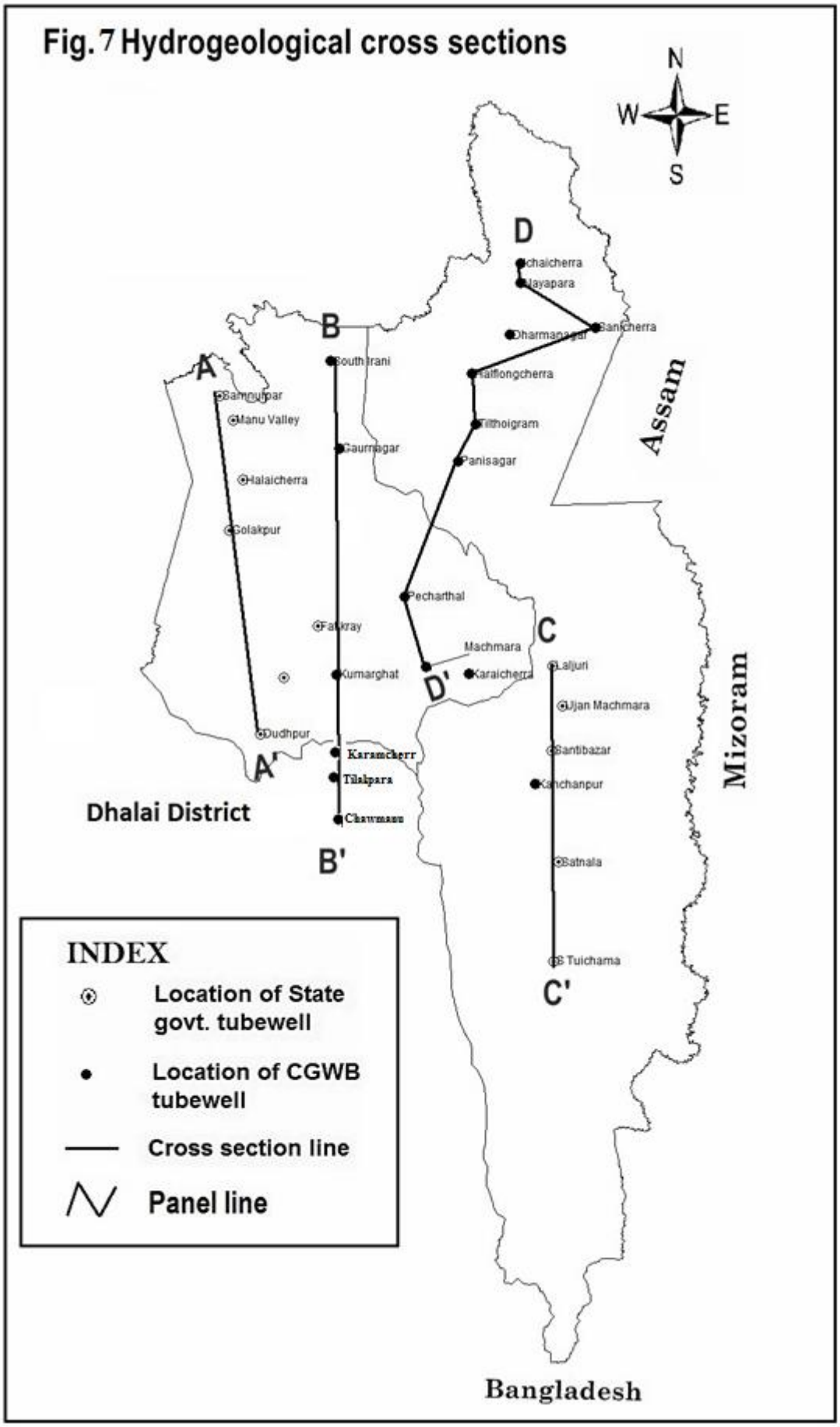


Fig. 7 Hydrogeological cross sections
N
W
E
S
D
Kalaicherra
Jayapara
Dharmanagar
Bankcherra
B
South Irani
Salflongcherra
A
Baimuipar
Manu Valley
Tilthoigram
Gaurnagar
Panisagar
Assam
Halaicherra
Golakpur
Pecharthal
C
Machmara
Kumarghat
D'
Karaicherra
Laljuri
Ujan Machmara
Dudhpur
Santibazar
A'
Karamcherr
Tilakpara
Kanchanpur
Dhalai District
Chawmanu
B'
Batnala
B Tuichama
C'
Mizoram
INDEX
Location of State govt. tubewell
Location of CGWB tubewell
Cross section line
Panel line
Bangladesh

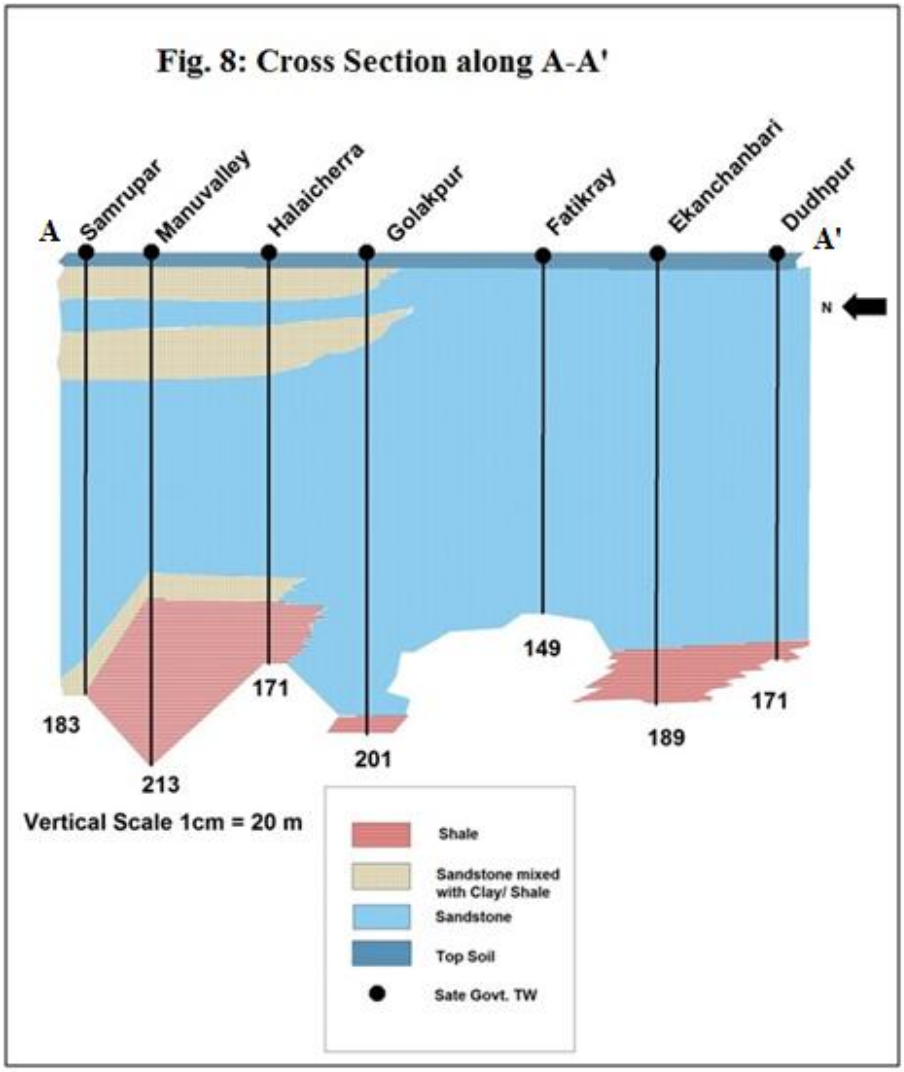


Fig. 8: Cross Section along A-A'
A
Samrupar
Manuvalley
Halaicherra
Golakpur
Fatikray
Ekanchanbari
Dudhpur
A'
N
183
213
171
201
149
189
171
Vertical Scale 1cm = 20 m
Shale
Sandstone mixed with Clay/ Shale
Sandstone
Top Soil
Sate Govt. TW

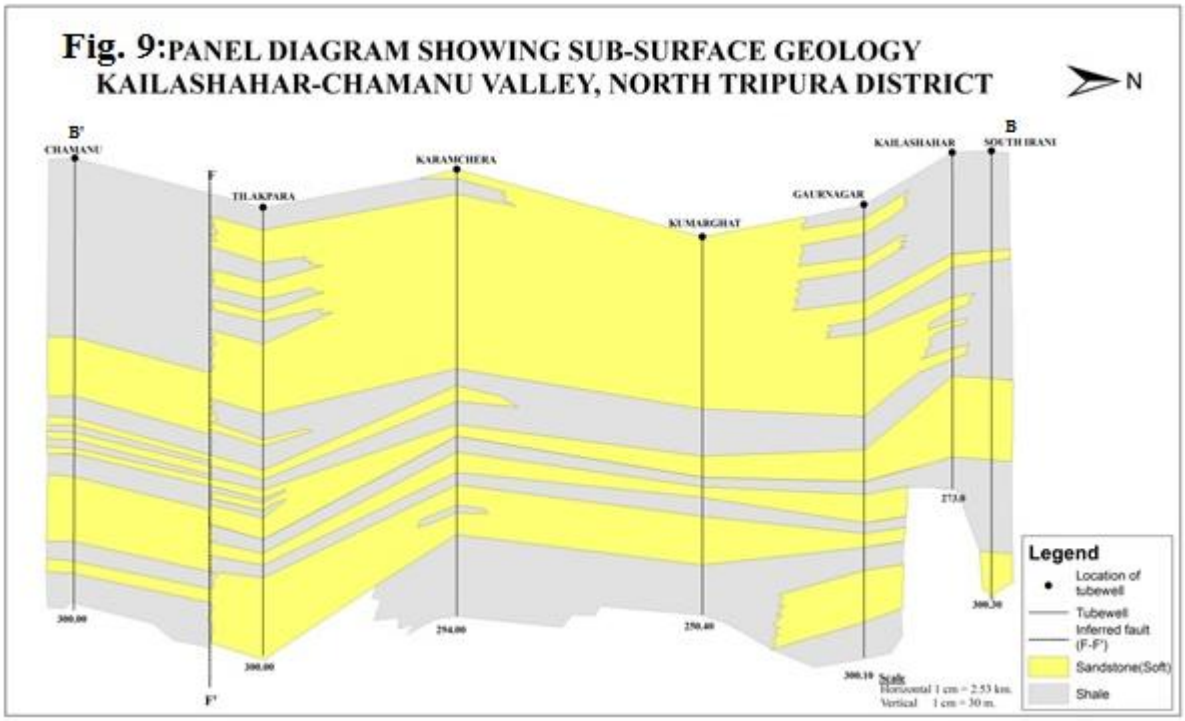


Fig. 9: PANEL DIAGRAM SHOWING SUB-SURFACE GEOLOGY
KAILASHAHAR-CHAMANU VALLEY, NORTH TRIPURA DISTRICT
N
B'
CHAMANU
F
TILAKPARA
KARAMCHERA
KUMARGHAT
GAURNAGAR
KAILASHAHAR
B
SOUTH IRANI
F'
Legend
Location of tubewell
Tubewell
Inferred fault (F-F')
Sandstone(Soft)
Shale

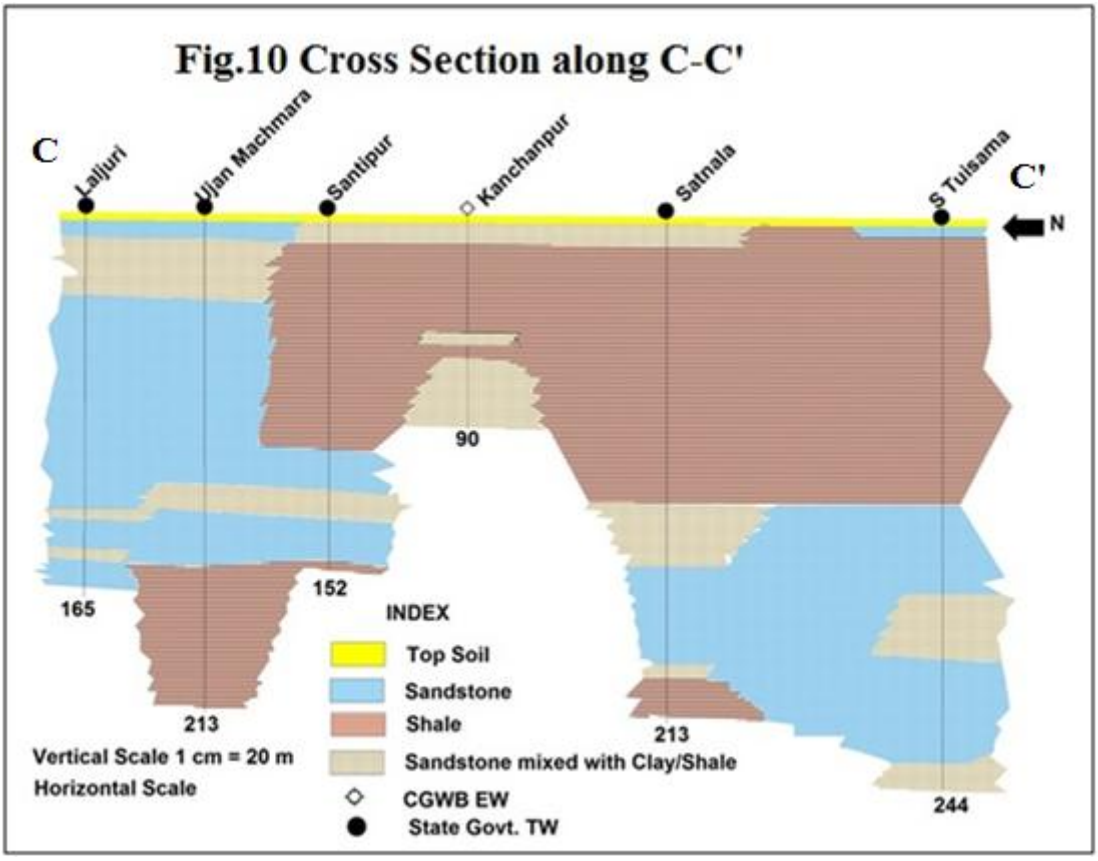


Fig.10 Cross Section along C-C'
C
C'
N
Laljuri
Ujan Machmara
Santipur
Kanchanpur
Satnala
S Tuisama
90
165
152
213
213
244
INDEX
Top Soil
Sandstone
Shale
Sandstone mixed with Clay/Shale
CGWB EW
State Govt. TW
Vertical Scale 1 cm = 20 m
Horizontal Scale

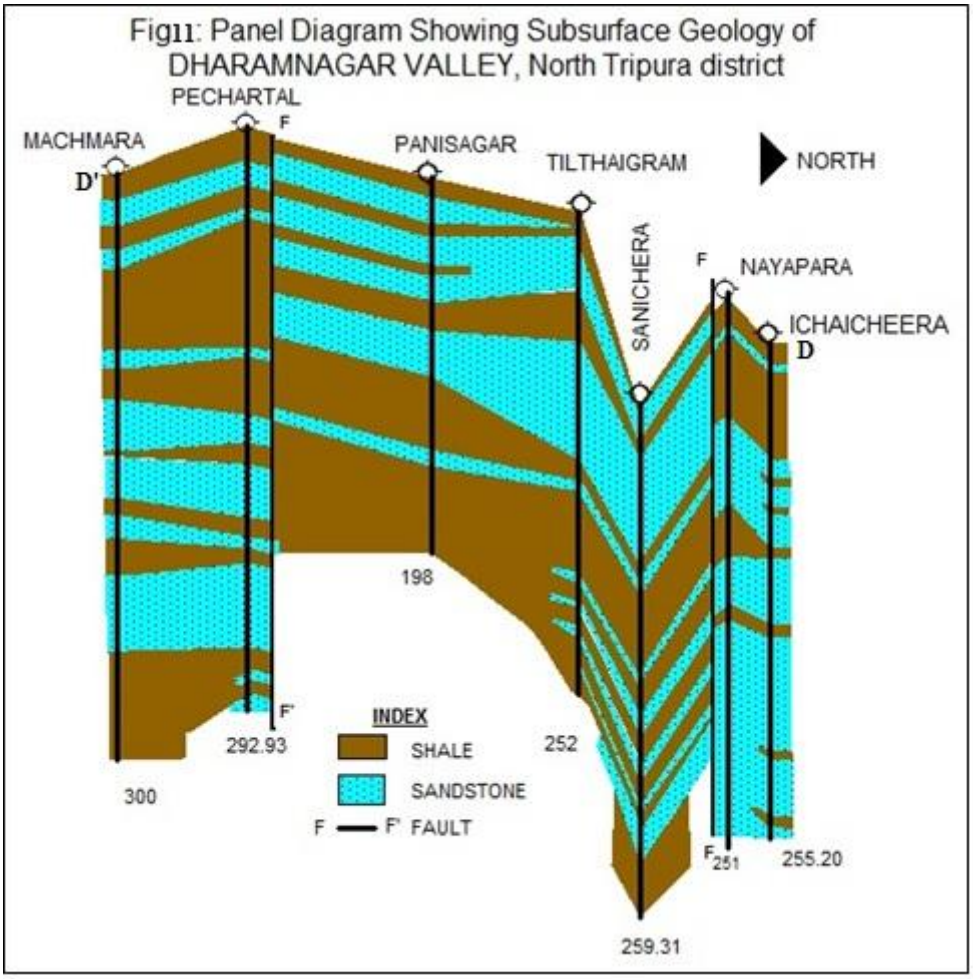


Fig11: Panel Diagram Showing Subsurface Geology of
DHARAMNAGAR VALLEY, North Tripura district
PECHARTAL
MACHMARA
PANISAGAR
TILTHAIGRAM
NORTH
SANICHERA
NAYAPARA
ICHAICHEERA
D'
D
F
F'
198
292.93
300
252
259.31
255.20
INDEX
SHALE
SANDSTONE
F F' FAULT

3.5 Aquifer Properties (Yield, Parameters etc.)

Aquifer I: During the 2005-06, 8 nos. of pumping tests in dug wells were carried out to determine aquifer characteristics of the unconfined aquifer. It is found that specific capacity varies from 1.66 to 20.10 lpm/m of drawdown. Dug wells and shallow tube wells are constructed in shallow aquifer. In some parts of the district shallow tube wells are found to be overflowing i.e., in artesian condition. The piezometric head and discharge of the artesian wells varies from 0.05 – 0.80 m agl and 0.04 - 1.00 lps respectively.

Aquifer II: CGWB has drilled 24 nos. of DTWs down to the depth of 260 m bgl. It is observed that tubewells constructed down to a depth from 145 to 237 m and tapping 44 – 55 m cumulative thickness of aquifer are capable to yield 3.9 to 95 m^3/hr for a maximum drawdown upto 31 m. The transmissivity of the aquifer is calculated as 5.7 to 627 m^2/day andpermeability as 0.1 to 12.6 m/day.Storativity calculated at Nayapara exploratory well was $2.7X10^{-4}$. Exploratory well constructed by CGWB at Pecharthal was found to be in artesian condition.

4.GROUNDWATER ISSUES

Major ground water related issues can be summarized as under:

- Low stage of groundwater development (5.26%).
- Higher concentration of iron both in shallow and deeper aquifer**.**

4.1 Ground Water Resources

Estimation of Ground Water Resources in the North Tripura district has been carried out based on the methodology recommended by Ground water Estimation Committee (GEC'97), where two approaches are recommended: (i) water level fluctuation method and (ii) rainfall infiltration method. The latest dynamic resource computation based on the basis of various available technical data, the results of exploratory drilling and other hydrogeological testing by CGWB and State Govt. departments such as PWD (Water Resources), PWD (DWS) & Agriculture Dept., Govt. of Tripura, is done for the year 2012 – 2013 (1st April, 2012 to 31st March, 2013), where the smallest and undisputed administrative unit, the rural development block is taken as the unit of computation in absence of actually GEC-97 recommended assessment unit watershed wise number of ground water structures, amount of ground water draft, population and other vital geographical and economical figures or statistics. Hydrogeological formations comprising Sandstones and Shale named as Dupitila, Tipam and Surma Formations of Upper Tertiary age are spread all over the north Tripura distract and all are considered as a single hydrogeological unit. Area with more than 20% slope has been excluded for the recharge computation. The dynamic reserve which is seasonally renewable in response to monsoon recharge has been assessed based on the seasonal fluctuation of water table and specific yield of shallow aquifer materials and also based on rainfall recharge by infiltration. The main potential aquifer in the North Tripura distract is Tipam sandstone and the specific yield value for Tipam sandstone is taken here as 0.08 (GEC'97) and the rainfall infiltration factor is here taken as 0.16. These values are approved by the R&D advisory committee on Dynamic Ground Water Resource Estimation.

Dynamic resources of ground water, extent of current utilization, balance available for further development have been estimated and presented in Table 4.1 and 4.2. There is no saline/brackish water aquifer or any other poor ground water quality area. There is no major or medium canal irrigation scheme and thus the whole North Tripura district has been considered as a non-command area.

Table: 4.1 Dynamic Groundwater Resources, North Tripura District, 2012-13

District (p)	Stage of Ground Water development (%)	Net GW Availability (ham)	Existing Ground Water Draft for Irrigation	Existing Gross Ground Water Draft for All Uses	Provision for Domestic & Industrial requirement for upto 2025	GW Availability for Future Irrigation
Kadamtala	6.88	6434.20	108.00	334.40	961.23	5364.98
Panisagar	4.17	5894.66	18.00	227.63	657.26	5219.40
Pecharthal	2.80	3146.89	0.00	88.03	256.29	2890.60
Damcherra	15.53	459.51	15.00	56.39	160.58	283.93
Dasda	1.96	11101.83	9.00	208.19	594.82	10498.01
Jampui hill	2.86	877.64	0.00	25.12	70.02	807.62
Gournagar	4.47	6526.67	24.00	267.52	771.47	5731.20
Kumarghat	3.44	6059.62	0.00	208.61	601.74	5457.88
North Tripura district	**5.26**	**40501.03**	**174.00**	**1415.89**	**4073.40**	**36253.62**

Table: 4.2Dynamic Groundwater Resources, North Tripura District, 2012-13

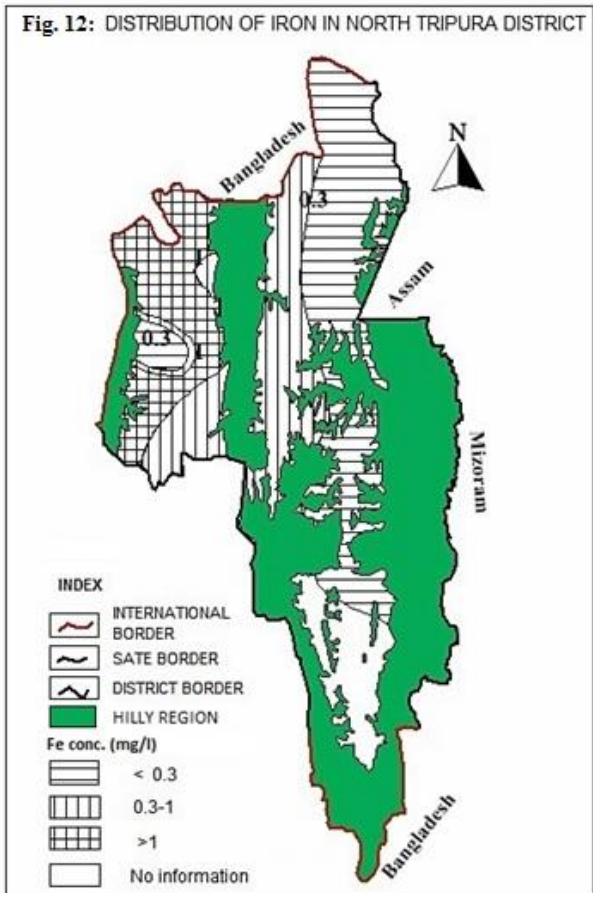
Sl. No.	Assessment Unit	Stage of Ground Water Development (%)	Pre-monsoon		Post-monsoon		Category (Safe/ Semi-critical/ Critical/ Over-exploited)
1	2	16	Water level Trend	Is there a significant decline (Yes/ No)	Water level Trend	Is there a significant decline (Yes/ No)	
27	Kadamtala	6.88	Falling	No	Rising	No	Safe
28	Panisagar	4.17	Rising	No	Rising	No	Safe
29	Pecharthal	2.80	Falling	No	Rising	No	Safe
30	Damcherra	15.53	-	No	-	No	Safe
31	Dasda	1.96	-	No	-	No	Safe
32	Jampui hill	2.86	-	No	-	No	Safe
33	Gournagar	4.47	Falling	No	Rising	No	Safe
34	Kumarghat	3.44	Rising	No	Rising	No	Safe
North Tripura district		**5.26**	-	No	Rising	No	Safe

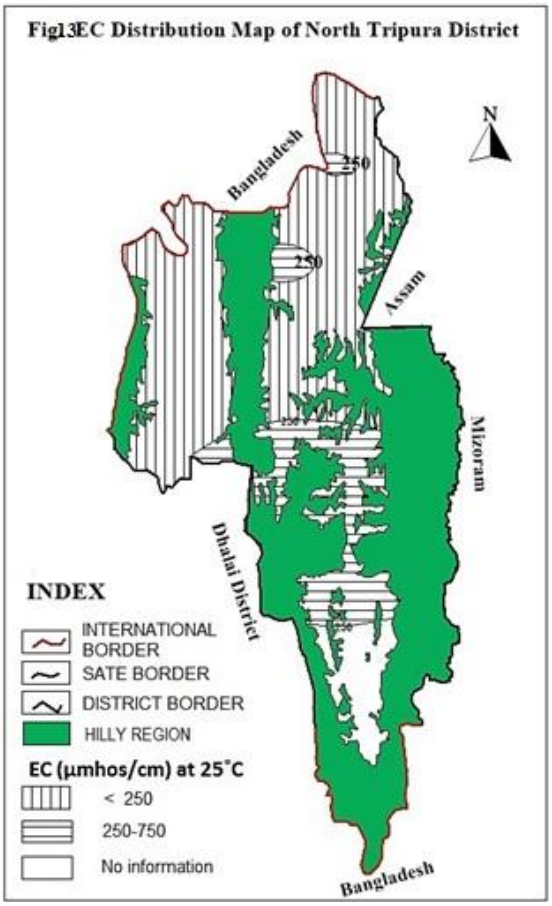
4.2 Water Quality Problems

The pH values of the ground water ranges from 6.49 to 8.30 for shallow aquifer and from 6.36 to 8.19 for deeper aquifer. The BIS has recommended acceptable range of pH from 6.5 to 8.5 for domestic use. The water of the tube well at Panisagar in North Tripura has pH value of 6.36 and at Satnala Dug Well has pH value of 8.30 otherwise all water of the area is acceptable for domestic use in view of pH ranges. Ground water quality in the area is potable and range of all the chemical constituents are within the permissible limit set by BIS, except

iron. In shallow aquifer EC values ranges from 82.30 to 692 and in deeper aquifer it ranges from 105 to 365. Fluoride content in ground water from shallow aquifer ranges from 0.15 to 0.74 ppm and in deeper aquifer it ranges from 0.12 to 0.29 ppm. Distribution of iron and EC in groundwater in the district is depicted in the Fig No.12&13.

Ground water of the area is characterized by a generally high iron content which ranges from 0 to 12 ppm. The concentration of iron in ground water is generally much above the prescribed desirable limit of 0.3 ppm and maximum permissible limit of 1 ppm. The iron concentration in water from open well is comparatively less than that of tube wells. This is due to the fact that the scope of aeration is more in open wells allowing the precipitation of ferrous iron as ferric iron. The enrichment of iron in water of the area is due to the ferruginous nature of Tipam sandstones, which forms the major aquifers. The high content of iron renders ground water unsuitable for drinking purpose, hence the level of concentration should be brought down to the desirable limit before use for drinking purpose, to avoid any health hazards. The iron concentration in ground water from shallow aquifer ranges from 0 to 6.62 ppm and in deeper aquifer it ranges from 0.06 to 12.00 ppm. During ground water exploration at Panisagar the concentration of iron is found to be 12 ppm.





5. MANAGEMENT STRATEGIES

As per dynamic ground water resource estimation of North Tripura district for 2012-13, net ground water availability is 40,501ham and stage of development is only 5.26%. The district is having balance net ground water availability for future irrigation use in the tune of 36,253ham. If an irrigation plan is made to develop 60% of the balance dynamic ground water resources available, then 21,752 ham of groundwater resources is available in the district for the future irrigation uses. From this available resource (planned for future development) 11,448 nos. of shallow tube wells (considering a unit draft of 1.9 ham/year) can be constructed. Therefore, there is enough scope for future development of ground water in the district to bring more area under irrigation practice.

During Kharif season, land under cultivation (field crops only) in the district is 33,246 ha (N Tripura dist. 18,197 ha and Unakuti dist. 15,049 ha). Land use data for 2015-16 shows that cropping intensity in North Tripura district is 192% while in Unakuti district it is 162%. During Rabi season, land under cultivation (field crops only) in the district is 26,417 ha (North Tripura dist. 16,019 ha and Unakuti dist. 10,398 ha). Irrigation potential created in the district is 18,043 ha (N Tripura dist 9573 ha and Unakuti district 8470 ha). It can be seen that land cultivated during rabi season is more than the irrigation potential created. This may due to the fact that apart from the assured minor irrigation projects farmers use pump sets to collect water directly from rivers and some artesian wells; in some narrow valleys during dry season also water seeps from hills, some temporary bunds are constructed on small rivers / streamlets for irrigation in the district, which were not accounted.

After Kharif crops are over a part of this cultivable area remains fallow during Rabi season. Gap between area cultivated during Kharif season and Rabi season is 6829 ha (N Tripura dist. 2178 ha and Unakuti dist. 4651 ha). The intention of this plan is to utilize this fallow land of about 6829 ha under assured irrigation during Rabi season which will help to increase gross cropped area to 13,658 ha. This will help to increase gross cropped area to 66,492 ha and thereby increase cropping intensity up to 200%. Since stage of dynamic ground water is only about 5%, this area of 6829 ha can easily be covered by constructing ground water based irrigation projects. To use the groundwater for irrigation purpose a cropping plan has been designed for the district by using CROPWAT model developed by FAO. A suitable cropping plan for the district was prepared and is presented in Table 5.1.

In rice fallow, potato, mustard, pulses and rabi vegetables can be grown with the support of irrigation. Present cropping pattern, proposed cropping pattern, targeted increase in cropping intensity were shown in Table 5.2a and 5.2b.

Crop-wise and month-wise irrigation water requirement (Precipitation deficit) has been estimated from CROPWAT after giving necessary meteorological, soil, crop plan inputs and the same has been shown in Table 5.3. Crop-wise and month-wise Irrigation water requirement in ham has been further calculated in Table 5.4.

Fig 5.1: CROPPING PATTERN DATA

(File: C:\Users\hp\Desktop\NOrth Tripura cropwat\N Tripura.PAT)

Cropping pattern name: N Tripura

No.	Crop file	Crop name	Planting date	Harvest date	Area %
1	...Data\CROPWAT\data	Rice	25/06	22/10	25
2	...Data\CROPWAT\data	Rice	07/07	03/11	25
3	...CROPWAT\data\crop	Small Vegetables	07/11	09/02	12
4	rape___mustard.CRO	Mustard	15/11	29/03	13
5	...a\CROPWAT\data\cr	Pulses	07/12	26/03	12
6	...\CROPWAT\data\cro	Potato	15/12	23/04	13

Fig 5.1: CROPPING PATTERN DATA

(File: C:\Users\hp\Desktop\Unakuti Cropwat\Unakuti.PAT)

Cropping pattern name: Unakuti

No.	Crop file	Crop name	Planting date	Harvest date	Area %
1	...Data\CROPWAT\data	Rice	15/06	12/10	12
2	...Data\CROPWAT\data	Rice	21/06	18/10	13
3	...Data\CROPWAT\data	Rice	27/06	24/10	12
4	...Data\CROPWAT\data	Rice	07/07	03/11	13
5	...CROPWAT\data\crop	Small Vegetables	07/11	09/02	13
6	rape___mustard.CRO	Mustard	15/11	29/03	13
7	...a\CROPWAT\data\cr	Pulses	07/12	26/03	12
8	...\CROPWAT\data\cro	Potato	15/12	23/04	12

Source: CROPWAT

Table 5.2a. Proposed cropping pattern with water deficit months and IWR, North Tripura district

Crop	Growing period (Months)	Periods/months of water deficit	Irrigation requirement (ha m)
Rice	4	1 – 2	726
Potato	5	5	215
Mustard	6	6	227
Vegetables	3	3	197
Pulses	4	1	220

Table 5.2b. Cropping pattern, proposed cropping pattern, intended cropping intensity, for mono-cropped un-irrigated area in North Tripura district.

Mono-cropped Un-irrigated area in North Tripura district (new)				
Rice based cropping pattern				
1. Rice-Potato 2. Rice-Mustard 3. Rice-Vegetables 4. Rice-Pulses	Present Cultivated area (**ha**)	Area to be cultivated (**ha**)	Area to be cultivated (**%**)	Irrigation requirement (**ha m**)
	1	**2**	**3(= % of 1)**	**4**
Rice (main crop)	2178	2178		139
Vegetables	0	545	25	39
Mustard	0	545	25	40
Pulses	0	544	25	35
Potato		544	25	39
Net cultivated area	2178	**2178**		
Gross cultivated area (1+potato/+mustard/+Veg/+Pulses)	2178	**4356**		
Total irrigation requirement				**292**
Cropping intensity	**100% (Present)**	**200% (Intended)**		
Mono-cropped Un-irrigated area in Unakuti district (new)				
Rice based cropping pattern				
1. Rice-Potato 2. Rice-Mustard 3. Rice-Vegetables 4. Rice-Pulses	Present Cultivated area (**ha**)	Area to be cultivated (**%**)	Area to be cultivated (**ha**)	Irrigation requirement (**ha m**)
	1	**2**	**3(= % of 1)**	**4**
Rice (main crop)	4651	4651		588
Vegetables	0	1116	24	176
Mustard	0	1209	26	187
Pulses	0	1117	24	163
Potato		1209	26	
Net cultivated area	4651	**4651**		
Gross cultivated area (1+potato/+mustard/+Veg/+Pulses)	4651	**9302**		
Total irrigation requirement				**1294**
Cropping intensity	**100% (Present)**	**200% (Intended)**		
North Tripura Dist. (old)				
Net cultivated area	**Gross cultivated area**		**Irrigation requirement (Ham)**	
6829	**13658**		**1586**	

The total area of rice cultivation is comprised of (6829 ha). During Kharif season, rice is cultivated from June to mid-July. Since this huge area cannot be cultivated in a single day (one planting date), so it is considered/ planned to cultivate rice in two to four stages during this period.

It is planned to utilize rice fallow of 6829 ha for the cultivation of pulses, potato, mustard and vegetables. It is considered to cultivate Vegetables and pulses in 1661 ha each and potato and mustard in 1753 ha each.

The peak water requirement for irrigation for rice is in the month of June, for potato and pulses it is in the month of February, for mustard it is in the month of December & January and for vegetables it is during December.

Table 5.3: Crop-wise and month-wise precipitation deficit (mm) using CROPWAT 8 for North Tripura District.

Crops	Precipitation deficit (mm)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
North Tripura district												
1. Rice	0	0	0	0	0	147.1	0	0	0	6.5	0	0
2. Rice	0	0	0	0	0	2.8	98	0	0	0.4	0	0
3. Small Vegetables	55.4	13.6	0	0	0	0	0	0	0	0	18.7	60.8
4. Mustard	48.1	35.9	2.9	0	0	0	0	0	0	0	4.4	50.2
5. Pulses	46.7	52.6	14.1	0	0	0	0	0	0	0	0	21.2
6. Potato	32.2	51.2	38.2	0	0	0	0	0	0	0	0	18
Unakuti district												
1. Rice	0	0	0	0	49.1	98	0	0	0	6.9	0	0
2. Rice	0	0	0	0	0	147.7	0	0	0	0	0	0
3. Rice	0	0	0	0	1.9	102.8	0	0	0	0	0	0
4. Rice	0	0	0	0	0	0	98	0	0	1.5	0	0
5. Small Vegetables	59	16.2	0	0	0	0	0	0	0	0	21.3	61.4
6. Mustard	51.7	43.5	2.7	0	0	0	0	0	0	0	6.2	50.8
7. Pulses	50.3	60.2	13.7	0	0	0	0	0	0	0	0	21.6
8. Potato	35.9	58.8	36.3	0	0	0	0	0	0	0	0	18.2

Table 5.4: Irrigation water requirement (ham) of Ri Bhoi district

Crops	% of total area of 4356 ha	Precipitation deficit												
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
North Tripura District														
1. Rice	25	0.00	0.00	0.00	0.00	0.00	80.10	0.00	0.00	0.00	3.54	0.00	0.00	83.64
2. Rice	25	0.00	0.00	0.00	0.00	0.00	1.52	53.36	0.00	0.00	0.22	0.00	0.00	55.10
3. Vegetables	12	14.48	3.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.89	15.89	38.81
4. Mustard	13	13.62	10.16	0.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.25	14.21	40.06
5. Pulses	12	12.21	13.75	3.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.54	35.18
6. Potato	13	9.12	14.50	10.82	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.10	39.53
	100	49.42	41.96	15.32	0.00	0.00	81.62	53.36	0.00	0.00	3.76	6.13	40.74	292.32
	% of total area of 9302 ha	**Unakuti District**												
1. Rice	12	0.00	0.00	0.00	0.00	54.81	109.39	0.00	0.00	0.00	7.70	0.00	0.00	171.90
2. Rice	13	0.00	0.00	0.00	0.00	0.00	178.61	0.00	0.00	0.00	0.00	0.00	0.00	178.61
3. Rice	12	0.00	0.00	0.00	0.00	2.12	114.75	0.00	0.00	0.00	0.00	0.00	0.00	116.87
4. Rice	13	0.00	0.00	0.00	0.00	0.00	0.00	118.51	0.00	0.00	1.81	0.00	0.00	120.32
5. Small Vegetables	12	65.86	18.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.78	68.54	176.25
6. Mustard	13	62.52	52.60	3.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.50	61.43	187.31
7. Pulses	12	56.15	67.20	15.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.11	162.75
8. Potato	13	43.41	71.10	43.90	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.01	180.42
	100	227.94	208.99	62.45	0.00	56.93	402.75	118.51	0.00	0.00	9.52	31.27	176.09	1294.44
Total North Tripura District (OLD)		277.36	250.95	77.78	0.00	56.93	484.37	171.87	0.00	0.00	13.27	37.41	216.83	1586.76

Under ground water exploration programme, CGWB has drilled 24 nos. of exploratory (including observation wells) tube wells in the district down to the depth of 260 m bgl. It is established that the aquifer in most part of the valleys in the district is having moderate to high potentiality, having an average discharge of about 48 m^3/hr and can be sustainably developed and use for irrigation purpose. Shallow tube wells of small yield up to 50 m depth can be constructed through 150/100mm diameter well assembly tapping 20 – 30 m granular zones having 25 m housing and 10 m slotted portion. The annular space between the borehole and the well assembly should be shrouded preferably with 100 mm thick zone of pea gravels. The yield of such tube wells in central part of the valleys is expected to be 15 – 20 m^3/hr at 5 to 10 m drawdown and in foothills yield of such tube wells is expected to be 10 –15 m3/hr at draw down 5 – 10m. Shallow tube wells in valley portions where draw down is less than 5m and where non-pumping water level is less than 2 m bgl, enable the use of centrifugal pumps.

A shallow tube well in the district is expected to yield 20 m^3/hr. If such a tube well runs for 8 hrs/day for 120 days, then it will create a draft of 1.9 ham.

In the considered area of 6829 ha, 1700 nos. of shallow bore wells can be constructed (considering 200 m distance between any two shallow tube wells). 1700 nos. of bore wells can extract 3230 ham of water annually.

Annual irrigation water requirement is 1586 ham while irrigation water requirement during dry season spanning from October to March it is 874 ham. However, proportionate dynamic groundwater resources available for future irrigation use (proposed to use 60% of availability) in 6829 ha in the district is 1495 ham. Therefore, this rice fallow area can be irrigated by constructing ground water abstraction structures and can bring under double cropped area. This amount of groundwater resources can be harnessed by constructing 460 tube wells. It is also proposed to construct water harvesting structures at suitable places. As per available ground water resources (60% availability) 11448 nos. of tube wells can be constructed and State Govt. has already constructed 23 deep tube wells, 150 mini deep tube wells and 58 shallow tube wells. For drinking purposes also there is thousands of shallow tube wells drilled by State Govt. and by public/private. Still there is scope for drilling this 460 tube wells.

Groundwater in the area is infested with iron, therefore before consumption aeration/ filtering/ installation of Iron Removal Plant is necessary.

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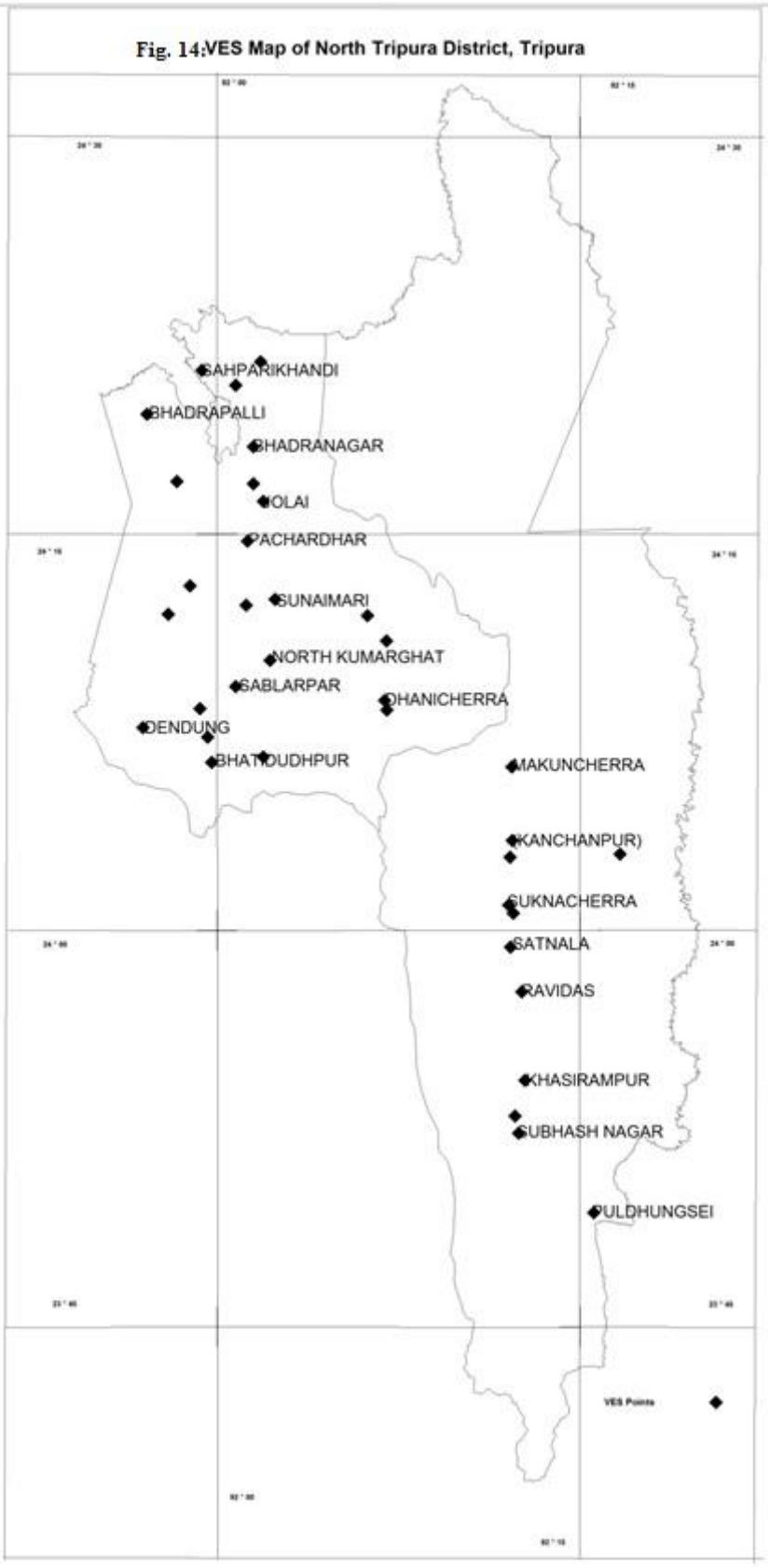
Fig. 14: VES Map of North Tripura District, Tripura



Annexure 1: Block wise land utilization of the North Tripura District (as on 2013)

Name of Block	Geographical Area	Area under Forest	Land not Available for Agricultural Use		Permanent Pasture & other Grazing Land	Land under Misc. Tree crops & Groves (Not included in Net Sown Area)	Cultivable Waste Land	Fallow Land other than Current Fallow	Current Fallow	Net Area Sown	Single Crops Area	Double Crops Area	Tripple Cropped Area	Total Cropped Area	Area Sown more than once	Total Cultivable Area	Cropping Intencity
			Land put to non-agricultural use	Barren uncultivable Land													
NORTH TRIURA																	
Panisagar	20031	6992	2786	797	418	1592	713	94	212	7472	1767	4795	910	14087	5705	10501	189
Kadamtala	15063	580	4298	618	268	1883	358	88	133	7971	3299	4404	268	12911	4672	10701	162
Pecharthal	19415	13828	2023	374	21	998	153	92	27	2063	481	1384	198	3843	1582	3354	186
Dasda	71721	53042	10864	532	63	2817	253	86	56	3854	1768	1894	192	6132	2086	7129	159
Damcherra	15786	12269	956	549	31	637	85	53	12	1139	764	318	57	1571	375	1957	138
Jampuihill	19236	16409	468	96	25	151	49	0	28	2020	2020	0	0	2020	0	2273	100
Kumarghat	27466	14473	3582	217	103	1085	255	77	127	7201	2075	4631	495	12822	5126	8848	178
Gaurnagar	21898	4738	5584	232	407	1480	645	112	162	8596	3122	4924	550	14620	5474	11402	170
TOTAL	**210616**	**122331**	**30561**	**3415**	**1336**	**10643**	**2511**	**602**	**757**	**40316**	**15296**	**22350**	**2670**	**68006**	**25020**	**56165**	**160**

Annexure 2:WATER QUALITY DATA OF NORTH TRIPURA DISTRCTFOR THE YEAR 2016

Sl. No.	Village/ Location	Taluka/ Block	Lat	Long Year	Depth (mbgl)	Aquifer Type	p^H	EC (µS/cm)	TRBD (NTU)	TDS	CO_3	HCO_3	TA	Cl^-	SO_4^{-2}	NO_3^-	F^-	Ca^{+2}	Mg^{+2}	TH	Na^+	K^+	Fe
											(mg/lt)												
1.	Chandra- mor Kami	Kumarghat	24° 06' 43"	92° 11' 54"	6.3	(Uncon-fined)	7.70	258.10	BDL	138.40	0.00	90.00	90.00	15.00	42.84	0.70	0.46	26.00	12.14	115.00	14.00	6.76	0.32
2.	Pancham-nagar	Chandipur	24° 13' 05.7"	91° 58' 52.8"	7.47	(Uncon-fined)	7.97	164.10	BDL	87.96	0.00	75.00	75.00	10.00	16.41	0.30	0.28	22.00	7.28	85.00	5.57	4.40	0.00
3.	Jarul Tali	Gaurnagar	24° 15' 15"	91° 59' 09"	3.59	(Uncon-fined)	8.05	139.30	BDL	81.21	0.00	55.00	55.00	17.49	8.78	0.00	0.17	12.00	3.64	45.00	15.59	2.93	0.00
4.	Gaurnagar	Gaurnagar	24° 17' 21.4"	92° 02' 0.5"	-	(Uncon-fined)	6.49	186.90	BDL	97.76	0.00	50.00	50.00	19.99	30.45	0.50	0.19	10.00	7.28	55.00	17.49	12.35	1.94
5.	Rajnagar	Yubraj-nagar	24° 19' 14.3"	92° 07' 05"	8.77	(Uncon-fined)	7.50	395.10	BDL	211.20	0.00	90.00	90.00	52.48	63.39	0.60	0.29	10.00	6.07	50.00	76.70	4.94	6.62
6.	Krishnapur	Yubraj-nagar	24° 20' 22"	92° 09' 28"	6.95	(Uncon-fined)	7.40	151.30	BDL	83.22	0.00	50.00	50.00	17.49	18.25	0.00	0.18	12.00	4.85	50.00	16.17	6.55	0.00
7.	Dharmanagar	Kadam-tala	24° 22' 44.2"	92° 09' 35.6"	-	(Uncon-fined)	7.56	187.40	BDL	101.00	0.00	65.00	65.00	17.49	20.97	0.60	0.27	12.00	8.50	65.00	20.06	2.09	0.00
8.	Lalchhara	Kadam-tala	24° 25' 57"	92° 11' 32.5"	7.62	(Uncon-fined)	7.78	380.80	BDL	214.50	0.00	95.00	95.00	54.98	39.90	0.30	0.27	26.00	10.92	110.00	45.59	3.93	0.00
9..	Churaibari	Kadam-tala	24° 26' 29"	92° 14' 16"	6.16	(Uncon-fined)	7.67	171.20	BDL	92.03	0.00	50.00	50.00	24.99	27.37	0.40	0.22	8.00	6.07	45.00	24.01	12.06	0.00
10.	Shanichhara	Kadam-tala	24° 23' 01"	92° 13' 57"	7.09	(Uncon-fined)	7.67	226.60	BDL	121.10	0.00	70.00	70.00	32.49	12.10	0.70	0.15	16.00	3.64	55.00	30.86	3.47	0.00
11.	Baghbassa	Kadam-tala	24° 21' 06.6"	92° 13' 19.9"	-	(Uncon-fined)	7.48	100.80	BDL	51.83	0.00	35.00	35.00	15.00	8.57	0.90	0.15	8.00	6.07	45.00	7.99	1.74	0.00
12.	Deocherra	Panisagar	24° 18' 37"	92° 09' 35.5"	6.88	(Uncon-fined)	7.40	130.20	BDL	66.48	0.00	45.00	45.00	17.49	7.40	1.30	0.18	10.00	4.85	45.00	12.23	3.57	0.22
13.	Panisagar	Panisagar	24° 18' 37"	92° 09' 35.5"	6.88	(Uncon-fined)	7.33	359.20	BDL	189.00	0.00	40.00	40.00	47.49	59.73	5.60	0.74	16.00	7.28	70.00	40.02	21.85	0.65
14.	Kunjanagar	Panisagar	24° 14' 44"	92° 12' 20.7"	7.37	(Uncon-fined	7.26	82.30	BDL	41.93	0.00	45.00	45.00	15.00	12.07	0.10	0.19	8.00	3.64	35.00	9.10	12.97	0.07

Sl. No.	Village/ Location	Taluka/ Block	Lat	Long Year	Depth (mbgl)	Aquifer Type	p^H	EC (µS/cm)	TRBD (NTU)	TDS	CO_3	HCO_3	TA	Cl^-	SO_4^{-2}	NO_3^-	F^-	Ca^{+2}	Mg^{+2}	TH	Na^+	K^+	Fe
											(mg/lt)												
15	Naba Joypara	Laljuri	24˚ 10' 30"	92˚ 12' 59.7"	7.97	(Uncon-fined)	7.7	135.9	BDL	69.93	0	40	40	17.5	25.55	0.4	0.4	8	3.64	35	20.21	6.66	0.07
16	Laljuri	Laljuri	24˚ 06' 43"	92˚ 11' 54"	8.89	(Uncon-fined)	7.34	407.2	BDL	212.6	0	60	60	72.5	45.71	5.7	0.26	20	21.84	140	37.29	3.53	0.06
17	Kanchanpur	Dasda	24˚ 02' 44"	92˚ 11' 42"	-	(Uncon-fined)	7.56	692.2	0.7	358.2	0	60	60	125	50.92	1.4	0.15	14	23.06	130	70.4	19.21	0.21
18	Satnala	Dasda	23˚ 58' 32"	92˚ 12' 21"	7.02	(Uncon-fined)	8.3	402.1	BDL	205.2	10	120	130	32.5	43.07	0	0.25	18	29.13	165	23.7	6.48	0.09
19	Karaicherra	Pecharthal	24˚ 08' 24"	92˚ 09' 05"	9.55	(Uncon-fined)	7.86	182.7	BDL	92.39	0	80	80	15	30.89	0.7	0.21	20	12.14	100	11.05	2.24	0.94
20	Pecharthal	Pecharthal	24˚ 11' 55.8"	92˚ 05' 59.8"	-	(Uncon-fined)	7.1	122.1	BDL	63.11	0	45	45	12.5	29.59	0	0.36	10	10.92	70	9.59	1.11	0.34
21	Kanchancherra	Kumarghat	24˚ 05' 07.9"	92˚ 00' 09.1"	6.16	(Uncon-fined)	6.99	103.6	BDL	53.15	0	20	20	20	23.53	0.7	0.19	2	4.85	25	20.07	4.25	0.67
22	Kumarghat	Kumarghat	24˚ 09' 55"	92˚ 02' 31"	6.46	(Uncon-fined)	7.67	171.2	BDL	92.03	0	50	50	25	27.37	0.4	0.22	8	6.07	45	24.01	12.06	0

ANNEXURE 3:DETAILS OF EXPLORATORY WELLS DRILLED BY CGWB

1. DHARMANAGAR VALLEY, NORTH TRIPURA DISTRICT

Sl. No.	Well Location / Year of Construction	Depth Drilled/ Assembly lowered (m)	Position of slot (m)	Thickness of aquifer tapped (m)	Discharge (m^3/h) / Drawdown (m)	SWL (m bgl)	Specific Capacity (lpm/m)	Transmissivity (m^2/day)	Permeability (m/day)	Storativity	Remark
1	Ichailalcherra	255.2/209	72 – 85 110 – 140 182 – 192˚ 201 – 206	56	24.4 / 23.4	0.42 magl	16.6	7.8	0.1	-	Auto Flow
2	Nayapara	251.8/160	66 – 73 77 – 103 128 – 145 148 – 157	59	82.4 / 25.43	2.34 magl	54.3	74.3	12.6	$2.7x10^{-4}$	-do-
3	Haflongcherra	232.7/180	80 – 98 134 – 154 158 – 176	44	3.9 / 23.35	17.20	2.7	20.0	0.4	-	Deposit well
4	Dharmanagar	251/210	59 – 80 135 – 156 183 – 204	63	22.5 / 4.30	7.15	87.2	340	5.4	-	-do-
5	Sanicherra	250.3/237	73 – 76 90 – 95 151 – 172 184 – 198 204 – 213 221 – 234	59	11.4 / 31	6.47	6.1	5.7	-	-	ETW
6	Tilthaigram	250.9/145	45 – 51 61 – 76 78 – 97 113 – 119 136 – 142	55	95.4 / 23.2	1.12	64.6	627	11.4	-	-do-
7	Panisagar / 1977	198/178	83 – 89 100 – 137 143 – 149 162 – 168	55	66.0 / 42.33	23.0	26.0	50.0	0.9	-	Deposit well
8	Pecharthal / 1980-81	292.9/199.8	112 – 115 144 – 159 174 – 198	42	14.9 / 29.50	2.85 magl	8.5	4.5	0.1	-	Auto flow
9	Machmara / 1983	300/184	116 – 125 128 – 137 140 – 149 154 – 166 175 – 181	45	91˚/ 18.44	0.70	82.3	222.0	4.9	$4.20x\ 0^{-4}$	ETW
10	Panisagar BSF / 2005	197.45 / 154	84 – 99 105 – 135 142 – 148	41	27.71 / 6.73	16.93	68.65	507.43	9.95	-	ETW

2. KAILASAHAR VALLEY, NORTH TRIPURA DISTRICT

Sl No	Well Location	Depth Drilled/ Assembly lowered (m)	Position of slot (m)	Thickness of aquifer tapped (m)	Discharge (m^3/h) / Drawdown (m)	SWL (m bgl)	Specific Capacity (lpm/m)	Transmissivity (m^2/day)	Permeability (m/day)	Storativity	Remark
1	South Irani	300/ -	Abandoned due to lack of granular zones								ETW
2	Gaurnagar	300/265	88 – 94 118 – 124 136 – 142 172 – 184 205 – 208 223˚– 229 250 – 262	51	90.4 / 6.7	1.82	225.9	1212.9	23.7	-	-do-
3	Kumarghat / 1983	250/159	54 – 72 75 – 87 92˚– 101 104 – 111 144 – 150 150 – 156	55	85.0 / 25.75	1.16	55.1	189.0	3.4	2.2×10^{-3}	-do-
4	Karamcherra	294/175	52 – 65 71 – 83 89 – 104 125 – 130 149 – 155 167 – 173	57	210.5 / 20.88	0.42	168	614	10.7	-	-do-
5	Tilakpara / 1980	300/221	54 – 60 72 – 75 96 – 111 120 – 138 176 – 179 200 – 203 212 – 218	54	90 / 18.22	2.37	82.3	228.1	4.2	5.89×10^{-4}	-do-
6	Chawmanu / 1981	300/259.5	126 – 131 134 – 146 148 – 152 156 – 158	60	37.9 / 38.36	1.74 m agl	16.4	26.4	0.4	-	-do-

DETAILS OF EXPLORATORY WELLS DRILLED BY CGWB

3. KANCHANPUR VALLEY, NORTH TRIPURA DISTRICT DURING 2016

Sl. No.	Well Location / Year of Construction	Depth Drilled/ Assembly lowered (m)	Position of slot (m)	Thickness of aquifer tapped (m)	Discharge (m^3/h) / Drawdown (m)	SWL (m bgl)	Specific Capacity (lpm/m)	Transmissivity (m^2/day)	Permeability (m/day)	Storativity	Remark
1	Karaicherra	116.60	Abandoned due to lack of granular zone								Abandoned
2	Kanchanpur	92.30/90.50	51 -57 63 -72 75 -87	24	48 /4.84	4.64m bgl	2.9	234.27		1×10^{-2}	

ANNEXURE 4: WATER LEVEL DATA OF GROUND WATER MONITORING STATIONS OF NORTH THRIPURA (March, 2017)

S.N	District*	Block*	Village	Lat*	Long*	Well* Type	MP*	RL*	Depth*	Dia*	Water Level (m bgl) Jan-2017	Water Level (mbgl) Mar-17*
STATE : TRIPURA												
1	North Tripura	Kadam-tala	Baghbassa	24˚ 21' 07"	92˚ 13' 20"	DUG	0.95	39.75			1.24	1.10
2	North Tripura	Kadam-tala	Dharmanagar	24˚ 22' 44"	92˚ 09' 36"	DUG	1.47	28.575			4.53	4.43
3	North Tripura	Panisagar	Panisagar	24˚ 15' 51"	92˚ 09' 08"	DUG	0.78	41.595			3.48	4.12
4	North Tripura	Yubraj-naga	Rajnagar	24˚ 19' 14."	92˚ 07' 05"	DUG	0.84		8.77	1.05	3.76	2.26
5	North Tripura	Yubaraj-nagar	Krishnapur	24˚ 20' 22"	92˚ 09' 28"	DUG	1.35		6.95	1.05	2.38	2.35
6	North Tripura	Laljuri	Naba Joypara (Natun Basti)	24˚ 10' 30"	92˚ 12' 59"	DUG	0.78		7.97	2.55	4.07	4.76
7	North Tripura	Pani-sagar	Kunjanagar	24˚ 14' 44"	92˚ 12' 21"	DUG	1.07		7.37	1.12	3.42	3.53
8	North Tripura	Kadam-tala	Lalchhara	24˚ 25' 57"	92˚ 11' 33"	DUG	0.92		7.62	1.15	2.75	2.08
9	North Tripura	Kadam-tala	Churaibari	24˚ 26' 29"	92˚ 14' 16"	DUG	0.96		6.19	1.2	1.51	1.88
10	North Tripura	Kadam-tala	Sanicherra	24˚ 23' 01"	92˚ 13' 57"	DUG	0.92		8.82	1.3	2.54	2.01
11	North Tripura	Panisagar	Deocherra	24˚ 18' 37"	92˚ 09' 36"	DUG	0.88		6.88	1	4.76	6.17
12	North Tripura	Laljuri	Laljuri	24˚ 06' 43"	92˚ 11' 54"	DUG	0.87		8.89	1.1	6.47	7.05
13	North Tripura	Dasda	Kanchanpur	24˚ 02' 44"	92˚ 11' 42"	DUG	0.5	87.86	6.89		1.68	4.60
14	North Tripura	Dasda	Satnala	23˚ 58' 32"	92˚ 12' 21"	DUG	1.05		7.02	1.1	1.1	-0.05
15	Unakoti	Gaurnagar	Gaurnagar	24˚ 17' 21"	92˚ 02' 01"	DUG	0.79	34.1	0.79		4.41	5.05
16	Unakoti	Gaurnagar	Jarultali	24˚ 15' 15"	91˚ 59' 09"	DUG	0.75		3.59	1.2	4.95	2.21
17	Unakoti	Kumarghat	Chandra- moni Kami	24˚ 06' 43"	92˚ 11' 54"	DUG	0.9		6.3	1.1	3.8	4.22
18	Unakoti	Kumarghat	Kumarghat	24˚ 09' 55"	92˚ 02' 31"	DUG	0.32		6.46	1.5	4.8	5.36
19	Unakoti	Kumarghat	Kanchan-cherra	24˚ 05' 08"	92˚ 00' 09"	DUG	1.35		6.16	1.17	5.32	5.50
20	Unakoti	Pecharthal	Pecharthal	24˚ 11' 56"	92˚ 06' 00"	DUG	0.68				6.62	6.17
21	Unakoti	Pecharthal	Karaicherra	24˚ 08' 24"	92˚ 09' 05"	DUG	0.75		9.55	1.1	-	4.78

ANNEXURE 5: WATER LEVEL DATA OF KEY WELLS OF NORTH THRIPURA (March, 2017)

S.N	District*	Block*	Village	Lat*	Long*	Well* Type	MP*	RL*	Depth*	Dia*	Water Level (mbmp) Dec-2016	Water Level (mbgl) Mar-17*
STATE : TRIPURA												
1	N.TRIPURA	DASDA	SHANTIPUR	24˚04' 29"	92˚11' 59"	DUG	0.86		7.95		1.39	2.09
2	N.TRIPURA	DASDA	DASDA LAXMIPUR	23˚55' 59"	92˚12' 38"	DUG	0.59		8.97		1.02	1.38
3	N.TRIPURA	KADAMTALA	ICHAILACHHARA	24˚25' 57"	92˚11' 32"	DUG	0.87		8.50		2.95	2.53
4	N.TRIPURA	KADAMTALA	MAESHPUR	24˚27' 22"	92˚11' 39"	DUG	0.90		6.70		2.54	2.61
5	N.TRIPURA	KADAMTALA	KADAMTALA	24˚27' 15"	92˚12' 34"	DUG	0.92		12.00		8.90	8.48
6	N.TRIPURA	KADAMTALA	RAMIBARI	24˚31' 18"	92˚10' 09"	DUG	0.90		7.80		2.40	2.67
7	N.TRIPURA	KADAMTALA	KHERENGJINI	24˚24' 39."	92˚13' 53"	DUG	0.85		8.92		6.00	6.24
8	N.TRIPURA	PANISAGAR	RAMNAGAR	24˚18' 37"	92˚09' 35"	DUG	0.86		7.65		5.50	5.09
9	N.TRIPURA	PANISAGAR	JALABASE	24˚16' 08"	92˚10' 02"	DUG	0.80		7.96		4.46	4.78
10	N.TRIPURA	PANISAGAR	KUCHINAGAR	24˚14' 43"	92˚12' 20"	DUG	0.94		8.40		4.33	3.9
11	N.TRIPURA	DAMCHHARA	NARENDRA NAGAR	24˚14' 29"	92˚17' 06"	DUG	0.86		10.70		3.46	3.32
12	N.TRIPURA	PANISAGAR	DAKSHIN PODAMABI	24˚17' 55"	92˚10' 55"	DUG	0.79		6.90		2.08	1.72
13	N.TRIPURA	PANISAGAR	TILTHAI	24˚17' 50"	92˚09' 00"	DUG	0.86		6.30		4.34	4.99
14	N.TRIPURA	PANISAGAR	RADHANAGAR	24˚21' 12"	92˚08' 50"	DUG	0.78		6.34		4.66	6.39
15	N.TRIPURA	PANISAGAR	RAJNAGAR	24˚19' 15"	92˚07' 13"	DUG	0.71		4.34		2.29	2
16	N.TRIPURA	GURNAGAR	LAXMIPUR	24˚18' 10"	92˚02' 31"	DUG	0.80		3.44		2.19	5.38
17	N.TRIPURA	GURNAGAR	RANGANTI	24˚22' 40"	91˚59' 41"	DUG	0.86		4.20		2.70	2.59
18	N.TRIPURA	GURNAGAR	HIRACHHARA	24˚21' 08"	92˚00' 49"	DUG	0.90		7.10		6.30	5.89
19	N.TRIPURA	GURNAGAR	CHANDIPUR	24˚19' 09"	91˚59' 05"	DUG	0.90		6.80		4.75	4.55
20	N.TRIPURA	GURNAGAR	MURITHICHARA	24˚19' 34"	91˚56' 56"	DUG	0.93		5.24		3.12	2.49
21	N.TRIPURA	GURNAGAR	HALAICHHARA	24˚15' 49"	91˚58' 09"	DUG	0.95		6.55		4.00	3.53
22	N.TRIPURA	PENCHARTHAL	KAMALAPUR LAMSHMICHHARA	24˚11' 59"	92˚06' 29"	DUG	0.89		6.32		4.77	4.32
23	N.TRIPURA	PENCHARTHAL	UTTAR MACHMARA	24˚07' 11"	92˚06' 48"	DUG	0.98		9.17		6.60	5.84

S.N	District*	Block*	Village	Lat*	Long*	Well* Type	MP*	RL*	Depth*	Dia*	Water Level (mbmp) Dec-2016	Water Level (mbgl) Mar-17*
ROUTE NO.11 NHNS DATA ENTRY FORM												
STATE : TRIPURA												
26	N.TRIPURA	PENCHARTHAL	KANPANCHHARA DAKSHMI	24˚08' 13"	92˚07' 41"	DUG	0.95		10.39		2.77	2.44
27	N.TRIPURA	PENCHARTHAL	RANU	24˚06' 11"	92˚07' 05"	DUG	0.90		10.15		6.54	6.36
28	N.TRIPURA	KUMARGHAT	PPASCHIN KANCHANBASSI	24˚06' 48"	91˚58' 36"	DUG	0.86		5.56		3.47	3.26
29	N.TRIPURA	KUMARGHAT	PENGDUNG	24˚07' 45"	91˚56' 44"	DUG	0.97		7.74		3.80	-
30	N.TRIPURA	KUMARGHAT	LAXMIPUR NILKETA	24˚04' 57"	91˚59'.11"	DUG	0.90		7.25		3.88	5.28
31	N.TRIPURA	KUMARGHAT	NEW DARLONG	24˚01' 11"	91˚58' 31"	DUG	0.95		6.93		5.44	5.01
32	N.TRIPURA	KUMARGHAT	DHUMACHHARA	24˚01' 11"	91˚58' 31"	DUG	0.85		6.23		4.00	3.91
33	N.TRIPURA	PENCHARTHAL	MACHMARA BAZAR	24˚07' 14"	92˚06' 47"	DUG	0.85		6.83	1.25	6.52	6.70
34	N.TRIPURA	PENCHARTHAL	KANRAPARA	24˚08' 12"	92˚10' 37"	DUG	1.05	48	4.39	1.20	3.19	2.56
35	N.TRIPURA	LALJURI	SHANTIPUR	24˚04' 29"	92˚11' 58"	DUG	0.83	64	7.08	1.20	1.61	1.65
36	N.TRIPURA	DASDA	SUKNACHHARA			DUG	0.66		8.69	1.25	-	1.24
37	N.TRIPURA	GURNAGAR	BHAGABAN NAGAR	24˚18' 06"	92˚01' 17"	DUG	0.68		8.59		1.34	2.30
38	N.TRIPURA	GURNAGAR	JALAI	24˚15' 08"	92˚02' 22"	DUG	0.75	20	5.98	1.05	2.12	1.55
39	N.TRIPURA	KUMARGHAT	SONAIMURI	24˚12' 30"	92˚02' 05"	DUG	0.77	26	4.31	1.20	2.56	1.18
40	N.TRIPURA	GURNAGAR	BHAGWANNAGAR	24˚18' 18"	92˚02' 35"	DUG	0.60	30	2.87	0.95	1.93	1.19
41	N.TRIPURA	KUMARGHAT	RATACHEARA	24˚09' 03"	92˚01' 10"	DUG	0.63		6.37	1.20	3.84	3.84

ANNEXURE6 : LITHOLOGS

Location: Karaicherra School Premise (CGWB EW)
Block : Pecharthal
District: North Tripura

Lat:- 24° 8′ 25.05″
Long:- 92° 9′ 4.58″
Rl- 34 M

Depth	Formation	Remarks
0-3	Topsoil	Yellowish in Colour
3-18	Shale mixed with Sand	Yellowish in Colour
18-60	Shale	Grey in Colour
60-90	Hard Shale	Grey in Colour
90-116.60	Very Hard Shale	Grey in Colour

Location : Kanchanpur Court Premises(CGWB EW)
Block : Laljuri
District: North Tripura

Lat- 24° 03′ 23.17″
Long-92°12′ 3.5″

Depth	Formation	Remarks
0-3	Topsoil	Yellowish in Colour
3-12	Shale mixed with Sand	Yellowish in Colour
12-27	Shale	Grey in Colour
27-30	Hard Shale	Grey in Colour
30-39	Shale	Grey in Colour
39-51	Plastic Shale	Sticky in Nature and Blakish Grey in Colour
51-57	Sand mixed With Shale	Greyish Yellow in Colour
57-63	Shale	Grey in Colour
63-66	Sand mixed With Shale	Greyish Yellow in Colour
66-72	Coarse sand Mixed With Shale	Greyish Yellow in Colour
72-75	Fine Sand Mixed With Shale	Greyish Yellow in Colour
75-87	Coarse sand With Shale	Greyish Yellow in Colour
87-90	Sand with Shale	Greyish Yellow in Colour

Location : Panisagar BSF Camp (Year 2005)(CGWB EW)
Block : Panisagar
District: North Tripura

Depth range (m bgl)	Thickness (m)	Lithology
00.00-6.80	6.80	**Surface Soil**: Brownish, sandy.
6.80-22.25	15.45	**Shale**: Brownish, mixed with fine grained sandstone.
22.25-25.25	3.00	**Shale**: Brownish.
25.25-31.40	6.15	**Sandstone**: Fine grained, brownish, with little shale.
31.40-65.30	33.90	**Sandstone**: Fine to medium grained, brownish.
65.30-68.30	3.00	**Sandstone**: Brownish, fine to medium grained mixed with little shale.
68.30-80.60	12.30	**Sandstone**: Brownish, fine to medium grained mixed with grey shale.
80.60-99.05	18.45	**Sandstone**: Whitish, fine to medium grained.
99.05-105.20	6.15	**Sandstone**: Light brownish, fine grained.
105.20-139.10	33.90	**Sandstone**: Whitish, fine to medium grained.
139.10-142.10	3.00	**Sandstone**: Whitish, fine to medium grained, mixed with grey shale.
142.10-148.25	6.15	**Sandstone**: Whitish, fine to medium grained.
148.25-151.40	3.15	**Sandstone**: Light brownish, fine grained.
151.40-191.30	39.90	**Sandstone**: Whitish, fine grained.
191.30-197.45	6.15	**Shale:** Grey

Location : Kumarghat (CGWB EW)
Block : Kumarghat
District: Unokuti (North Tripura)

Depth range (m bgl)	Thickness (m)	Lithology
00.00-12.50	12.50	**Sandstone**: Fine grained, greyish.
12.50-15.60	3.10	**Sandstone**: Medium grained, brownish.
15.60-110.00	94.40	**Sandstone**: Grey, fine to medium grained with mafic minerals
110.00-125.40	15.40	**Sandstone**: Fine grained, grayish mixed with shale.
125.40-143.70	18.30	**Shale**: Grayish.
143.70-165.00	21.30	**Sandstone**: Fine to medium grained, grayish with shale.
165.00-168.10	3.10	**Sandstone**: Fine to medium grained, grayish.
168.10-174.20	6.10	**Sandstone**: Fine grained, grayish, mixed with shale.
174.20-183.30	9.10	**Shale**: Grayish.
183.30-189.40	6.10	**Sandstone**: Fine grained, grayish.
189.40-213.80	24.40	**Sandstone**: Fine grained, grayish, mixed with shale.
213.80-235.00	21.20	**Shale**: Grayish sticky.
235.00-250.40	15.40	**Sandstone**: Fine to medium grained, grayish with shale.

Location : Pecharthal (CGWB EW) Block : Pecharthal District: North Tripura		
Depth range (m bgl)	**Thickness (m)**	**Lithology**
0.00-3.80	3.80	**Shale:** Yellowish brown.
3.80-6.80	3.00	**Shale:** Yellowish with silty sandstone.
6.80-10.5	3.25	**Sandstone:** Dirty white, friable fine grained consists of sub rounded grains of quartz, dirty minerals and iron rubbles.
10.5-13.5	3.00	**Sandstone:** Gray, fine to medium grey with little shale.
13.5-16.30	3.25	**Shale:** Grey to ash grey with silty sandstone.
16.30-25.55	9.25	**Sandstone:** Gray fine grained with subrounded to sub angular grains of quartz micas etc.
25.55-28.80	3.25	**Sandstone:** Grey fine grained with grey shale.
28.80-41.30	12.50	**Shale:** Grey with silt and fine grained sandstone.
41.30-44.30	3.00	**Sandstone:** Grey fine grained.
44.30-47.55	3.25	**Silty sandstone:** Grey moderately compact.
47.55-85.05	37.50	**Shale:** Grey, brittle.
85.05-110.05	25.00	**Shale:** Grey, with fine grained sandstone.
110.05-113.05	3.00	**Sandstone:** Grey fine grained with little shale.
113.05-116.30	3.25	**Sandstone:** Grey fine grained.
116.30-144.30	28.00	**Shale:** Grey, with silty sandstone.
144.30-160.05	15.75	**Sandstone:** Grey fine to medium grained with fragments of wood and coal.
160.05-172.55	12.50	**Shale:** Grey, with silty sandstone.
172.55-175.55	3.00	**Sandstone:** Grey with shale.
175.55-200.68	25.13	**Sandstone:** Grey fine to medium grained.
200.68-209.88	9.20	**Shale:** Grey, with fine to medium grained sandstone.
209.88-212.88	3.00	**Sandstone:** Grey with shale.
212.88-215.98	3.10	**Shale:** Grey, with fine to medium grained sandstone.
215.98-246.48	30.50	**Sandstone:** Grey fine to medium grained.
246.48-249.48	3.00	**Sandstone:** Grey fine to medium grained with shale.
249.48-255.58	6.10	**Sandstone:** Grey fine to medium grained.
255.58-264.78	9.20	**Sandstone:** Grey fine to medium grained with shale.
264.78-276.98	12.20	**Shale:** Grey, with fine to medium grained sandstone.
276.98-279.98	3.00	**Sandstone:** Grey fine to medium grained with shale.
279.98-286.08	6.10	**Shale:** With fine to medium grained sandstone.
286.08-292.93	6.85	**Sandstone:** Grey fine to medium grained.

Location : Kailashahar(CGWB EW) Block : Gournagar District: (Unokuti) North Tripura		
Depth range (m bgl)	**Thickness (m)**	**Lithology**
00-18.30	18.30	**Shale:** Grey, mixed with fine grained sand stone.
18.30-36.60	18.30	**Shale:** Brownish.
36.60-42.70	6.10	**Sandstone:** Brownish mixed with shale.
42.70-57.90	15.20	**Shale:** Brownish.
57.90-67.10	9.20	**Sandstone:** Light gray, mixed with shale.
67.10-79.20	12.10	**Sandstone:** Fine to medium grained, grayish.
79.20-88.40	9.20	**Sandstone:** Light gray mixed with shale.
88.40-97.50	9.10	**Sandstone:** Fine grained, grayish.
97.50-109.70	12.20	**Sandstone:** Light gray mixed with shale.
109.70-115.80	6.10	**Sandstone:** Fine to medium grained, grayish.
115.80-176.80	61.00	**Shale:** Grayish.
176.80-207.30	30.80	**Sandstone:** Fine grained, grayish.
207.30-225.60	18.30	**Sandstone:** Light gray mixed with shale.
225.60-231.60	6.00	**Shale:** Grayish.
231.60-253.00	21.40	**Sandstone:** Light gray mixed with shale.
253.00-262.10	9.10	**Shale:** Brownish.

Location : Machmara (CGWB EW) Block : Pecharthal District: North Tripura		
Depth range (m bgl)	**Thickness (m)**	**Lithology**
00.00-10.30	10.30	**Shale**: Brownish.
10.30-25.70	15.40	**Sandstone**: Medium grained, brownish.
25.70-59.30	33.60	**Shale**: Grayish mixed with sandstone.
59.30-68.40	18.10	**Sandstone**: Fine to medium grained, grayish.
68.40-86.70	18.30	**Shale**: Grayish.
86.70-89.80	3.10	**Sandstone**: Fine grained, grayish mixed with shale.
89.80-95.90	6.10	**Sandstone**: Fine grained, grayish.
95.90-102.00	6.10	**Shale**: Grayish.
102.00-105.00	3.00	**Sandstone**: Fine grained, grayish mixed with shale.
105.00-111.10	6.10	**Shale**: Grayish.
111.10-114.20	3.10	**Sandstone**: Grayish, mixed with shale.
114.20-138.60	24.40	**Sandstone**: Fine to medium grained grayish.
138.60-141.60	3.00	**Sandstone**: Grayish mixed with shale.
141.60-166.00	24.40	**Sandstone**: Fine to medium grained, grayish.

166.00-172.10	6.10	**Sandstone**: Grayish mixed with shale.
172.10-181.30	9.20	**Sandstone**: Fine to medium grained, grayish.
181.30-196.50	15.20	**Sandstone**: Grayish, mixed with shale.
196.50-205.70	9.20	**Shale**: Grayish.
205.70-245.30	39.60	**Sandstone**: Fine to medium grained, grayish.
245.30-300.30	55.00	**Shale**: Fine grained sandstone, grayish.

Location : South Irani(CGWB EW)
Block : Gournagar
District: (Unokuti) North Tripura

Depth range (m bgl)	Thickness (m)	Lithology
00-3.00	3.00	**Sandstone:** Weathered, yellow fine grained, rounded to sub rounded quartz with little shale.
3.00-6.80	3.80	**Shale:** Yellow, with thin intercalations of sandstone.
6.80-12.90	6.10	**Sandstone:** Yellow, fine to medium with intercalation of shale
12.90-15.90	3.00	**Shale:** Yellow, with thin intercalations of sandstone.
15.90-22.00	6.10	**Sandstone:** Yellow, fine with thin intercalated shale.
22.00-34.20	12.20	**Sandstone:** Yellow to reddish grey with thin sandstone, intercalations.
34.20-40.30	6.10	**Sandstone:** Yellow to reddish yellow fine grained.
40.30-43.40	3.10	**Shale:** Grey to greenish grey.
43.40-49.50	6.10	**Sandstone:** Yellow to reddish yellow fine grained.
49.50-73.90	24.40	**Shale:** Grey, to yellowish and reddish grey with thin intercalations of sandstone.
73.90-77.00	3.10	**Sandstone:** Grey, fine grained.
77.00-141.00	64.00	**Shale:** Grey, to greenish grey with thin sandstone intercalations.
141.00-44.00	3.00	**Sandstone:** Yellow, fine grained.
144.00-195.00	51.90	**Shale:** Grey, to yellowish grey with thin intercalations of sandstone.
195.00-217.20	21.30	**Sandstone:** With shale.
217.20-235.50	18.30	**Shale:** With sandstone.
235.50-247.70	12.20	**Sandstone:** With thin shale intercalations. .
247.70-253.80	6.10	**Shale**
253.80-256.90	3.10	**Sandstone:** With shale.
256.90-259.90	3.00	**Shale:** Grey.
259.90-263.00	3.10	**Sandstone:** Grey, fine grained.
263.00-278.20	15.20	**Shale**
278.20-287.40	9.20	**Sandstone:** Grey, fine with thin intercalations of shale.
287.40-290.40	3.00	**Shale:** With thin intercalations of sandstone.
290.40-296.50	3.80	**Sandstone:** Grey, fine with shale.
296.50-300.30	3.80	**Shale:** Grey, with thin intercalation of sandstone.

Litholog of Deep Tube Well at South Tuisama (Near Tuisamapara J.B. School) under Dasda Block, North Tripura Dist. (State Govt.)

Lithology	Depth Range (mbgl)	Thickness (m)
Top soil Grey in Colour	0-3.048	3.048
Fine sand light yellow in Colour	3.048-6.096	3.048
Clay deep grey in Colour	6.096-121.92	109.728
Fine to medium Sand grey in Colour	121.92-161.544	143.256
Fine Sand Mixed with clay grey in Colour	161.544-188.976	152.400
Fine to medium Sand grey in Colour	188.976-201.168	158.496
Fine Sand Grey in Colour	201.168-213.36	146.264
Fine to medium Sand grey in Colour	213.36-234.696	161.544
Clay Mixed with Fine Sand grey in Colour	234.696-243.84	167.640

Litholog of Deep Tube Well at N.C. Para Halaichara Tea Bagan,Unokoti District (State Govt.)

Lithology	Depth Range (mbgl)	Thickness (m)
Surface Sand white in Colour	0-6.096	6.096
Sandy Clay red in Colour	6.096-21.336	15.240
Fine Sand red in Colour	21.336-30.480	9.144
Sandy Clay Yellow in Colour	30.480-51.816	21.336
Medium Sand Light Yellow in Colour	51.816-112.776	60.960
Fine to Medium Sand Grey in Colour	112.776-137.160	24.384
Sandy Clay Grey in Colour	137.160-146.304	9.144
Clay Grey in Colour	146.304-170.688	24.384

Litholog of Deep Tube Well at Tilabazar under Gaurnagar, Unokoti,Tripura (State Govt.)

Lithology	Depth Range (mbgl)		Thickness (m)
Top Soil Redish in Colour	0	6.096	6.096
Fine to Medium light in colour	6.096	54.86	48.768
Medium Sand Grey in Colour	54.864	60.96	6.096
Sandy Clay red in Colour	60.96	91.44	30.48
Medium Sand grey in Colour	91.44	115.8	24.384

Fine to Medium Sand Redish in Colour	115.824	131.1	15.24
Sandy Clay Dark Grey in Colour	131.064	134.1	3.048
Fine to Medium Sand Light in Colour	134.112	140.2	6.096
Fine to Medium Sand Grey in Colour	140.208	164.6	24.384
Sandy Clay Grey in Colour	164.592	365.8	201.168

Litholog of Deep Tube Well at Durgapur
(Ujan Machmara G/P) under Laljuri Block, Unokoti,Tripura (State Govt.)

Lithology	Depth Range (mbgl)		Thickness (m)
Yellow Top Soil	0	3.048	3.048
Yellow fine Sand	3.048	12.19	9.144
Sandy Clay Light Grey in Colour	12.192	36.58	24.384
Fine to Medium Sand Grey in Colour	36.576	73.15	36.576
Fine Sand Greyish in Colour	73.152	97.54	24.384
Fine to Medium Sand Light Grey in Colour	97.536	115.8	18.288
Sandy Clay Grey in Colour	115.824	128	12.192
Fine to Medium Sand Grey in Colour	128.016	152.4	24.384
Clay Grey in Colour	152.4	213.4	60.96

Litholog of Deep Tube Well at Nayapara-2nd Point (Jagannath Pur)
under Kumarghat Block, Unokoti,Tripura (State Govt.)

Lithology	Depth Range (mbgl)		Thickness (m)
Surface Soil redish in Colour	0	3.048	3.048
Sandy Clay Yellowish in Colour	3.048	36.58	33.528
Sandy Clay Redish in Colour	36.576	42.67	6.096
Sandy Clay Grey in Colour	42.672	48.77	6.096
Fine to Medium Sand Whitish in Colour	48.768	67.06	18.288
Sandy Clay Grey in Colour	67.056	199.9	132.8928

ANNEXURE7:Vertical Electric Survey Details Prepared By Geo-physicist

Unique ID	VES 1UNKT	**Date/Year**	13/01/2016
Village	NORTH KUMARGHAT	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	KUMARGHAT	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/4	**Depth Drilled**	
Lat	N 24°10'13.2"	**Discharge (lps)**	
Long	E92°02'11.4"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 1UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	0.6	0.6	47	Top soil with clay, sand etc
0.6	10.5	9.91	22	Clays with fine sand etc
10.5	58.6	48.1	81	Sands etc
Below 58.6		-	121	Consolidated Sand/ shale etc.

Unique ID	VES 2UNKT	**Date/Year**	13/01/2016
Village	SUNAIMARI	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	KUMARGHAT	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/4	**Depth Drilled**	
Lat	N 24°12'31.4"	**Discharge (lps)**	
Long	E92°02'23.8"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 2UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	0.784	0.784	137	Top soil with sands etc
0.784	1.25	0.463	15	Clays with intercalation of sands etc.
1.25	12.5	11.3	35	Sands with intercalation of clay etc
12.5	20.6	8.05	159	Consolidated Shale etc
Below 20.6		-	50	Medium to coarse sands etc.

Unique ID	VES 3UNKT	**Date/Year**	13/01/2016
Village	JOLAI	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	GOURNAGAR	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/3	**Depth Drilled**	
Lat	N 24°16'14.0"	**Discharge (lps)**	
Long	E92°01'54.4"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 3UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	0.995	0.995	94	Top soil with sands, clays etc
0.995	9.76	8.77	16	Clays with intercalation of sands etc.
9.76	37.5	27.8	189	Consolidated shale/ sandstone etc
37.5	68	30.5	8	Clays etc
Below 68		-	180	Consolidated shale/sandstone etc

Unique ID	VES 4UNKT	**Date/Year**	13/01/2016
Village	KAILIKURA	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	GOURNAGAR	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/3	**Depth Drilled**	
Lat	N 24°16'53.9"	**Discharge (lps)**	
Long	E92°01'29.3"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 4UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	2.44	2.44	23	Top soil with sands, clays etc
2.44	14.3	11.9	33	Sands etc
Below 14.3		-	97	Consolidated shale/sandstone etc

Unique ID	VES 5UNKT	**Date/Year**	14/01/2016
Village	BHADRANAGAR	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	GOURNAGAR	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/3	**Depth Drilled**	
Lat	N 24°18'17.8"	**Discharge (lps)**	
Long	E92°01'29.6"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 5UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	2.15	2.15	44	Top soil with sands etc
2.15	15.9	13.8	19	Clays with intercalation of sands etc.
15.9	71.2	55.3	37	Sands etc
Below 71.2		-	78	Coarse sands/gravel/consolidate shale etc

Unique ID	VES 6UNKT	**Date/Year**	14/01/2016
Village	SAHPARIKHANDI	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	GOURNAGAR	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	78 P/15	**Depth Drilled**	
Lat	N 24°21'10.7"	**Discharge (lps)**	
Long	E91°59'21.8"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 6UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	1.11	1.11	50	Top soil with sands, clays etc
1.11	18.6	17.5	22	Clays with intercalation of sands etc.
18.6	75.5	56.9	43	Sands etc

Below 75.5	-	17	Clays with intercalation of sand etc

Unique ID	VES 7UNKT	**Date/Year**	13/01/2016
Village	YUVRAJNAGAR	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	GOURNAGAR	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/3	**Depth Drilled**	
Lat	N 24°20'37.7"	**Discharge (lps)**	
Long	E92°00'46.3"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 7UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	0.485	0.485	149	Top soil with sands, clays etc
0.485	1.09	0.609	15	Clays with intercalation of sands etc.
1.09	17.6	16.5	60	Sands etc
17.6	300	282	22	Clays with intercalation of sand etc
Below 300		-	5	Clays etc

Unique ID	VES 8UNKT	**Date/Year**	14/01/2016
Village	EAST YAZEKHOWRA	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	GOURNAGAR	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/3	**Depth Drilled**	
Lat	N 24°21'30.2"	**Discharge (lps)**	
Long	E92°01'47.7"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 8UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	1.471	1.471	217	Top soil with sands, clays etc
1.471	10.46	8.994	96	Sands /consolidated shale etc
10.46	36.87	26.4	44	Sands etc

Below 36.87	-	31	Sands with intercalation of clay etc

Unique ID	VES 9UNKT	**Date/Year**	15/01/2016
Village	SHANTIPUR	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	PECHARTHAL	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/4	**Depth Drilled**	
Lat	N 24°10'10.5"	**Discharge (lps)**	
Long	E93°05'53.9"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 9UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	1.2	1.2	203	Top soil with sands, clays etc
1.2	2.508	1.308	75	Sands etc
2.508	5.241	2.734	20	Clays with intercalation of sand etc
5.241	23.09	17.85	99	Coarse Sands/gravel etc
23.09	101.2	78.14	20	Clays with intercalation of sand etc
Below 101.2		-	46	Sands etc

Unique ID	VES 10UNKT	**Date/Year**	13/01/2016
Village	SOLANALA	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	PECHARTHAL	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/4	**Depth Drilled**	
Lat	N 24°10'57"	**Discharge (lps)**	
Long	E92°06'59.9"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 10UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	1.04	1.04	53	Top soil with sands,

				clays etc
1.04	22.7	21.7	19	Clays with intercalation of sands etc.
22.7	39.9	17.2	124	Consolidated shale etc
Below 39.9		-	34	Sands with intercalation of clay etc

Unique ID	VES 11UNKT	**Date/Year**	15/01/2016
Village	KAMLAPUR	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	PECHARTHAL	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/4	**Depth Drilled**	
Lat	N 24°11'54.8"	**Discharge (lps)**	
Long	E92°06'13.0"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 11UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	2.69	2.69	237	Top soil with sands, clays etc
2.69	7.85	5.13	43	Sands etc
7.85	16.3	8.5	5	Clays etc
Below 16.3		-	50	Sands etc

Unique ID	VES 12UNKT	**Date/Year**	16/01/2016
Village	DHANICHERRA	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	PECHARTHAL	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/4	**Depth Drilled**	
Lat	N 24°08'42.2"	**Discharge (lps)**	
Long	E92°06'55.3"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 12UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	1.49	1.49	63	Top soil with sands, clays etc

1.49	8.53	7.03	34	Sands with intercalation of clay etc
8.53	31.3	22.8	56	Sands etc
31.3	67.1	35.8	12	Clays etc
Below 67.1		-	48	Sands etc

Unique ID	VES 13NTRP	**Date/Year**	16/01/2016
Village	MAKUNCHERRA	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	LALJURY	**Yield / discharge**	
District	NORTH TRIPURA	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/4	**Depth Drilled**	
Lat	N 24°06'18.2"	**Discharge (lps)**	
Long	E92°12'10.9"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 13NTRP

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	1.2	1.2	438	Top dry soil with sands, clays etc
1.2	6.94	5.74	102	Consolidated Sands with intercalation of clay/shale etc.
6.94	40	33.1	28	Sands with clay etc
Below 40		-	57	Sands etc

Unique ID	VES 14NTRP	**Date/Year**	16/01/2016
Village	(KANCHANPUR)	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	LALJURY	**Yield / discharge**	
District	NORTH TRIPURA	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/4	**Depth Drilled**	
Lat	N 24°03'24.1"	**Discharge (lps)**	
Long	E92°12'12.3"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 14TRP

Depth range (m bgl)		Thickness (m)	Resistivity (ohm-m)	Inferred Lithology
From	To			
0	0.560	0.560	162	Top soil with sands, clays etc
0.560	4.355	3.795	42	Sands etc
4.355	13.59	9.232	23	Clay with intercalation of sand etc
13.59	178.4	164.8	8	Clays etc
Below 178.4		-	116	Consolidated shale/sandstone etc

Unique ID	VES 15NTRP	**Date/Year**	16/01/2016
Village	KANCHANPUR	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	LALJURY	**Yield / discharge**	
District	NORTH TRIPURA	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/4	**Depth Drilled**	
Lat	N 24°02'46.1"	**Discharge (lps)**	
Long	E92°12'05.9"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 15NTRP

Depth range (m bgl)		Thickness (m)	Resistivity (ohm-m)	Inferred Lithology
From	To			
0	0.592	0.592	55	Top soil with sands, clays etc
0.592	4.28	3.69	21	Clays with intercalation of sands etc.
4.28	16.2	11.9	50	Sands etc
16.2	151	135	5	Clays etc
Below 151		-	27	Sands with intercalation of clay etc

Unique ID	VES 16NTRP	**Date/Year**	17/01/2016
Village	HMUNPUI	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	VANGHMUN	**Yield / discharge**	
District	NORTH TRIPURA	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/8	**Depth Drilled**	

Lat	N 24°02’53.9”	**Discharge (lps)**	
Long	E92°16’38.5”	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 16NTRP

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	1.17	1.17	825	Top dry soil with sands, pebbles etc
1.17	7.76	6.59	414	Consolidated shale weathered rock etc
7.76	15.8	8.01	18	Clay with intercalation of sand etc
15.8	27.2	11.4	344	Consolidated shale/sandstone etc
Below 27.2		-	2	Clays etc

Unique ID	VES 17NTRP	**Date/Year**	17/01/2016
Village	PULDHUNGSEI	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	VANGHMUN	**Yield / discharge**	
District	NORTH TRIPURA	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	84 A/5	**Depth Drilled**	
Lat	N 23°49’19.4”	**Discharge (lps)**	
Long	E92°15’34.1”	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 17NTRP

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	1.07	1.07	1618	Top soil with boulders, pebbles, sands etc
1.07	1.99	0.919	403	Consolidated shale/weathered formation etc
1.99	4.16	2.17	2597	Consolidated dry shale/ dry sandstone etc
4.16	11.4	7.24	7	Clays etc
Below 11.4		-	1363	Consolidated shale/sandstone/weathered formation etc

Unique ID	VES 18NTRP	**Date/Year**	19/01/2016

Village	SUKNACHERRA	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	DASDA	**Yield / discharge**	
District	NORTH TRIPURA	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/4	**Depth Drilled**	
Lat	N 24°00'57.1"	**Discharge (lps)**	
Long	E92°12'02.8"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 18NTRP

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	0.923	0.923	104	Top soil with sands, clays etc
0.923	16.5	15.6	39	Sands with intercalation of clays etc
16.5	88.7	72.2	6.6	Clays etc
Below 88.7		-	21	Clay with intercalation of sand etc

Unique ID	VES 19NTRP	**Date/Year**	19/01/2016
Village	RAVIDAS	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	DASDA	**Yield / discharge**	
District	NORTH TRIPURA	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	84 A/4	**Depth Drilled**	
Lat	N 23°57'41.0"	**Discharge (lps)**	
Long	E92°12'35.7"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 19NTRP

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	1.31	1.31	53	Top soil with sands, clays etc
1.31	9.12	7.81	24	Clays with intercalation of sands etc.
9.12	18.97	9.85	7	Clays etc
18.97	44.13	25.16	13	Clays with fine sand etc
44.13	97.5	53.36	2	Clays etc
Below 97.5		-	293	Consolidated shale/sandstone etc

Unique ID	VES 20UNKT	**Date/Year**	13/01/2016

Village	MACHMARA	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	PECHARTHAL	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/4	**Depth Drilled**	
Lat	N 24°08'20.4"	**Discharge (lps)**	
Long	E92°07'00.6"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 20UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	0.75	0.75	64	Top soil with sands, clays etc
0.75	1.7	0.945	26	Clays with intercalation of sands etc.
1.7	19.6	17.9	38	Sands with clay etc
Below 19.6		-	26	Clay with intercalation of sand etc

Unique ID	VES 21NTRP	**Date/Year**	20/01/2016
Village	KHASIRAMPUR	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	DASDA	**Yield / discharge**	
District	NORTH TRIPURA	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	84 A/1	**Depth Drilled**	
Lat	N 23°54'20.4"	**Discharge (lps)**	
Long	E92°12'42.8"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 21NTRP

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	0.879	0.879	166	Top soil with sands, clays etc
0.879	2.029	1.15	73	Sands etc
2.029	7.791	5.761	37	Sands with intercalation of clay etc
7.791	32.99	25.2	10	Clays etc
32.99	63.33	30.34	4	Clay
Below 63.33		-	17	Clay with intercalation of sand

Unique ID	VES 22NTRP	**Date/Year**	20/01/2016
Village	SUBHASH NAGAR	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	DASDA	**Yield / discharge**	
District	NORTH TRIPURA	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	84 A/1	**Depth Drilled**	
Lat	N 23°52'20.0"	**Discharge (lps)**	
Long	E92°12'27.8"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 22NTRP

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	0.899	0.899	166	Top soil with sands, clays etc
0.899	4.19	3.29	61	Sands etc
4.19	25.3	21.1	11	Clays etc
25.3	55.4	30.1	3	Clay
Below 55.4		-	831	Consolidated shale/ dry sandstone etc

Unique ID	VES 27UNKT	**Date/Year**	25/01/2016
Village	BHATIDUDHPUR	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	KUMARGHAT	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	78 P/16	**Depth Drilled**	
Lat	N 24°06'21.4"	**Discharge (lps)**	
Long	E91°59'46.7"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 27UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	0.515	0.515	37	Top soil with sands, clays etc
0.515	4.75	4.23	21	Clays with intercalation of sand etc

4.75	15.7	11	139	Consolidated shale/sand etc
Below 15.7		-	58	Sands with intercalation of clay

Unique ID	VES 30UNKT	**Date/Year**	16/02/2016
Village	SABLARPAR	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	KUMARGHAT	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/4	**Depth Drilled**	
Lat	N 24°09'13.8"	**Discharge (lps)**	
Long	E92°00'45.2"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 30UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	5.74	5.74	30	Top soil with sands, clays etc
5.74	27.2	21.5	79	Sands etc
Below 27.2		-	74	Sands with intercalation of clay etc

Unique ID	VES 31UNKT	**Date/Year**	16/02/2016
Village	PASCHIM RATACHERRA	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	KUMARGHAT	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	78 P/16	**Depth Drilled**	
Lat	N 24°08'23.5"	**Discharge (lps)**	
Long	E91°59'16.9"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 31UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	0.375	0.375	10	Top soil with clays etc
0.375	7	6.63	37	Sands with clay etc
7	10.6	3.62	483	Consolidated shale etc
Below 10.6		-	57	Sands with intercalation of clay

Unique ID	VES 32UNKT	**Date/Year**	16/02/2016
Village	DENDUNG	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	KUMARGHAT	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	78 P/16	**Depth Drilled**	
Lat	N 24°07'40.3"	**Discharge (lps)**	
Long	E91°56'56.1"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 32UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	0.904	0.904	127	Top soil with sands, clays etc
0.904	2.714	1.809	39	Sands with intercalation of clay etc
2.714	32.18	29.46	60	Sands etc
32.18	55.15	22.97	29	Sands with intercalation of clay
Below 55.15		-	65	Sands etc

Unique ID	VES 51UNKT	**Date/Year**	25/01/2016
Village	PANCHAMNAGAR	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	CHANDIPUR	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	78 P/16	**Depth Drilled**	
Lat	N 24°13'02.2"	**Discharge (lps)**	
Long	E91°58'52.0"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 51UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	1.483	1.483	470	Top hard soil with sands, clays etc
1.483	7.441	5.958	211	Consolidated shale/ dry sands etc

Below 7.441	-	68	Sands etc

Unique ID	VES 52UNKT	**Date/Year**	25/02/2016
Village	FATIKCHERRA	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	KUMARGHAT	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	78 P/16	**Depth Drilled**	
Lat	N 24°11'57.8"	**Discharge (lps)**	
Long	E91°57'58.0"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 52UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	0.59	0.59	222	Top soil with sands, clays etc
0.59	1.75	1.16	639	Hard soil/dry formation
1.75	3.48	1.73	38	Sands with intercalation of clay etc
3.48	7.7	4.23	347	Consolidated shale etc
7.7	18.2	10.5	53	Sands etc
18.2	35.3	17.1	300	Consolidated shale etc
Below 35.3		-	71	Consolidated Sands with intercalation of clay etc

Unique ID	VES 54UNKT	**Date/Year**	26/02/2016
Village	TARININAGAR	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	KUMARGHAT	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	78 P/16	**Depth Drilled**	
Lat	N 24°07'19.0"	**Discharge (lps)**	
Long	E91°59'35.7"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 54UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			

0	1.06	1.06	80	Top soil with sands, clays etc
1.06	6.16	5.1	24	Sands with intercalation of clay
Below 6.16		-	63	Sands etc

Unique ID	VES 58NTRP	**Date/Year**	28/02/2016
Village	BALCHERRA	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	DASDA	**Yield / discharge**	
District	NORTH TRIPURA	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	84 A/1	**Depth Drilled**	
Lat	N 23°52'59.4"	**Discharge (lps)**	
Long	E92°12'18.7"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 58NTRP

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	1.01	1.01	79	Top soil with sands, clays etc
1.01	7.7	6.69	25	Sands with intercalation of clay etc
7.7	22.3	14.6	7	Clay etc
22.3	45.7	23.5	17	Sands with intercalation of clay
45.7	84.9	39.2	3	Clay
Below 84.9		-	2786!!	Consolidated dry shale/sand etc

Unique ID	VES 59NTRP	**Date/Year**	28/02/2016
Village	SATNALA	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	DASDA	**Yield / discharge**	
District	NORTH TRIPURA	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	84 A/4	**Depth Drilled**	
Lat	N 23°59'21.9"	**Discharge (lps)**	
Long	E92°12'07.8"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 59NTRP

Depth range (m bgl)		Thickness (m)	Resistivity (ohm-m)	Inferred Lithology
From	To			
0	0.705	0.705	66	Top soil with sands, clays etc
0.705	14.2	13.5	47	Sands with intercalation of clay etc
14.2	150	136	8	Clays etc
Below 150		-	23	Clay with intercalation of sand

Unique ID	VES 60NTRP	**Date/Year**	28/02/2016
Village	KASTORAIPARA	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	DASDA	**Yield / discharge**	
District	NORTH TRIPURA	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/4	**Depth Drilled**	
Lat	N 24°00'38.9"	**Discharge (lps)**	
Long	E92°12'13.8"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 60NTRP

Depth range (m bgl)		Thickness (m)	Resistivity (ohm-m)	Inferred Lithology
From	To			
0	0.990	0.990	84	Top soil with sands, clays etc
0.990	4.269	3.278	51	Sands etc
4.269	19.17	15	31	Sands with intercalation of clay
Below 19.17		-	8	Clay etc

Unique ID	VES 61UNKT	**Date/Year**	29/02/2016
Village	JUGARAI	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	KUMARGHAT	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/4	**Depth Drilled**	
Lat	N 24°06'33.4"	**Discharge (lps)**	
Long	E92°01'53.9"	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 61UNKT

Depth range (m bgl)		Thickness (m)	Resistivity (ohm-m)	Inferred Lithology
From	To			
0	0.711	0.711	108	Top soil with sands, clays etc
0.711	1.712	1	52	Sands etc
1.712	6.405	4.693	127	Consolidated shale/Sands etc
6.405	7.515	1.11	31	Sands with intercalation of clay
7.515	237.1	229.6	102	Consolidated shale/sand etc
Below 237.1		-	19	Sands with clay etc

Unique ID	VES 64UNKT	**Date/Year**	01/03/2016
Village	KRISHNANAGAR	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	KUMARGHAT	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/4	**Depth Drilled**	
Lat	N 24°12’18.0”	**Discharge (lps)**	
Long	E92°01’11.6”	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 64UNKT

Depth range (m bgl)		Thickness (m)	Resistivity (ohm-m)	Inferred Lithology
From	To			
0	0.75	0.75	39	Top soil with sands, clays etc
0.75	1.558	0.807	18	Clay with sand etc
1.558	6.722	5.164	27	Sands with clay etc
6.722	13.96	7.235	42	Sands with intercalation of clay
13.96	28.98	15.03	99	Shale /consolidated sand etc
Below 28.98		-	70	Sands etc

Unique ID	VES 65UNKT	**Date/Year**	01/03/2016
Village	PACHARDHAR	**Nearby DW/DCBW/BW Depth**	
Taluka/Block	KUMARGHAT	**Yield / discharge**	
District	UNAKOTI	**Whether borehole was drilled at this point? If yes,**	
Toposheet No.	83 D/4	**Depth Drilled**	
Lat	N 24°14’43.6”	**Discharge (lps)**	
Long	E92°01’14.7”	**Transmissivity (m^2 /day)**	

RL (m amsl)		Storativity	
Unique ID: VES 65UNKT			

Depth range (m bgl)		Thickness (m)	Resistivity (ohm-m)	Inferred Lithology
From	To			
0	0.982	0.982	130	Top soil with sands, clays etc
0.982	14.4	13.41	37	Sands with intercalation of clay etc
14.4	59.13	44.73	69	Sands etc
59.13	174	114.9	36	Sands with intercalation of clay
Below 174		-	472	Consolidated shale/sanstone etc

Unique ID	VES 66UNKT	Date/Year	01/03/2016
Village	BHADRAPALLI	Nearby DW/DCBW/BW Depth	
Taluka/Block	CHANDIPUR	Yield / discharge	
District	UNAKOTI	Whether borehole was drilled at this point? If yes,	
Toposheet No.	78 P/15	Depth Drilled	
Lat	N 24°19’31.7”	Discharge (lps)	
Long	E91°57’05.6”	Transmissivity (m^2 /day)	
RL (m amsl)		Storativity	
Unique ID: VES 66UNKT			

Depth range (m bgl)		Thickness (m)	Resistivity (ohm-m)	Inferred Lithology
From	To			
0	2.37	2.37	139	Top soil with sands, clays etc
2.37	4.96	2.59	52	Sands etc
4.96	150	145	30	Sands with intercalation of clay
Below 150		-	56	Sands etc

Unique ID	VES 67UNKT	Date/Year	01/03/2016
Village	5 NO KALISHASHANT	Nearby DW/DCBW/BW Depth	
Taluka/Block	CHANDIPUR	Yield / discharge	
District	UNAKOTI	Whether borehole was drilled at this point? If yes,	
Toposheet No.	78 P/15	Depth Drilled	

Lat	N 24°16’59.4”	**Discharge (lps)**	
Long	E91°58’19.7”	**Transmissivity (m^2 /day)**	
RL (m amsl)		**Storativity**	

Unique ID: VES 67UNKT

Depth range (m bgl)		**Thickness (m)**	**Resistivity (ohm-m)**	**Inferred Lithology**
From	**To**			
0	1.916	1.916	1085	Top soil with sands, shale etc
1.916	4.731	2.815	108	Consolidated sands etc
4.731	8.497	3.767	493	Consolidated shale etc
Below 8.497		-	78	Sands etc