

GROUNDWATER BROUCHER OF SONBHADRA DISTRICT, U.P.
(A.A.P:2012-13)

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SONBHADRA DISTRICT AT A GLANCE

GENERAL INFORMATION

District	: Sonbhadra
Geographical Area (Sq Km)	: 6788
Sub Division	
a) Number of Tehsil	:04
b) Number of Block	:08

CLIMATOLOGICAL DATA

Normal Rainfall (mm)	: 997.40
Mean Maximum temperature	44.0 ^C
Mean Minimum temperature	5.20 ^C
Average R. Humidity	56%
No of Rainy Days	58
Wind Speed Maximum	4.5Km/hr

LNAD USE (Ha)

Total area	: 361595
Total Forest area	: 569
Barren Land	: 7661
Present Fallow Land	: 55023
Pasture	: 682
Garden	: 15900

IRRIGATION

Net Cultivated Area	: 313865
Net Irrigated Area	:112477
By Canal	: 67434
Groundwater	:39250
Others	: 238

HYDRAULIC STRUCTUES

Dugwells	: 4867
Shallow tubewells	: 2488
Deep Tubewells	: 434
Exploratory Tubewells of CGWB	: 14

GROUNWATER RESOURCE POTENTIAL (as on 31.03.09)

Net Groundwater Availability	: 101946
Gross Groundwater Draft	: 23184.88
Balance Groundwater Available (Ham)	: 78761.12
Stage of Groundwater Development	:
No of Critical Blocks	: None
No of Semi critical Blocks	: 02

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1.0 INTRODUCTION

Sonbhadra district covers an area of 6788 sq.km and the Southern most district of U.P is characterized by Hard rocks particularly Bijawar Group and ChhotaNagpur Gniessic Complex of rocks. The district is administratively divided in 03 tehsils namely Robertsganj,Dudhi andGhorawal which are further divided into 08 development blocks

2.0 PHYSIOGRAPHY

The district is characterized with hard rock undulating and hilly topographic features. table land topographic features. Along the courses of river and stream, very limited valley fill deposits are observed. River Son divides the district into two distinct topographic division. The thickness of alluvium or weathered zone is more in North of river Son while it is negligible in south of river Son. Geomorphologically, the district can be divided into three distinct units; 1. Residual hills / Table lands 2.River and hills and 3. Valleys and ravines. Dendritic drainage pattern is common and trellis drainage pattern is observed in hard rock area. The elevation of the area varies from 150-400mamsl. The general slope of the tract is from North to South. The topography is influenced or modified by the existing rivers and streams.

3.0 GEOLOGY

Geologically the district is characterized by Bijawar phyllites and Chhotanagpur granite/gneiss, Vindhyan formation and younger alluvium. The age of these formations ranges from Archean to Sub recent. The Granitoids and gneisses forms the main land and traversed by pegmatitic veins, quartz reefs and basic dykes.

Table-I

STRATIGRAPHIC SEQUENCE IN SONBHADRA DISTRICT, U.P.

Period	Groups & Formation	Lithology
Recent	Quaternary Alluvium	Clay, Sand and Kankar
Lower Cretaceous- Jurassic	Gondwana	Shale, Sandstone and Clay
----- Unconformity -----"		
Cambrian	Vindhyan	Shale, Sandstone, Limestone and pyroclastic rocks.
-----Unconformity-----		
Proterozoic	Bijawars	Phyllites, Quartzites, Basic and Ultrabasic rocks
Archean	Granitoid Complex	Granite Gneiss, Schist and Pegmatites

3.1 Sub-Surface Geology:

Subsurface geology of the district has been inferred on the basis of 37 borehole data. Thickness of overburden varies from 0.50 to 30.00mbgl. Lithological logs indicate that the common fractures are encountered at 22,35, 45 and 75mbgl. Potential fracture is also encountered at 190mbgl with 180lpm discharge in Nagawa Block. The thickness of overburden diminishes towards south of the district.

4.0 HYDROMETROLOGY

The average annual rainfall is 1115.00 mm. Climate is sub humid and is characterized by hot summer and pleasant monsoon and cold season. About 90% of rainfall takes place from June to September. During monsoon surplus water flows into rivers and streams un-arrested due to hilly topographic features in Northern part of the district.

In February there is increase in temperature, May is the hottest month with the mean daily maximum temperature is 45.5°C and mean daily minimum temperature is 2.5°C. The Average temperature ranges from 16.15 to 39.80 C. The average temperature from March to June do not fluctuate much.

The average relative humidity ranges from 25 to 81%. The average monthly relative humidity of the district is 70 %. Winds are generally high with some increase in force during summer and southwest monsoon season. The mean wind velocity is 5.4Km/hr and potential evapo-transpiration rate is 1556.7 mm.

5.0 HYDROGEOLOGY

Hydrogeological Set-up:

Exploratory drilling data of CGWB and state tubewell department show that there are fractures which create secondary porosity in hard rock area and porous formation in alluvial formations. The depth of these fractures differ from place to place. The ground water condition in the area are greatly influenced by the occurrence of two distinct litho-units.

- a) Unconsolidated sediments in the valley filled area (Alluvium)
- b) Hard Rock Formation: Comprising Vindhyan and Precambrian formations

5.1 Ground Water Condition:

Ground water is mainly controlled by drainage, topography and lithological behavior, it occurs under phreatic condition at shallow depths and fractures & granular zones under at deeper depths. Depth to water in pre-monsoon ranges between 4.00 to 22.00 mbgl. Postmonsoon water level varies between 2.10 to 20.50 mbgl. Water level fluctuation is minimum in Ghorawal and maximum in Chatrah block. After the study of long term water

level trend, it is inferred that the well show the decline trend during pre-monsoon period. The average magnitude of falling trend over last 05 years is 50-65 em/year. The yield of the wells vary from 30 to 500 lpm. The shallow fractures and phreatic ground water has poor sustainability.

5.2

5.2 Ground Water Resources:

To facilitate the ground water development the ground water resources of the district have been worked out and are as follows. (Table-II):

Table-II

BLOCK WISE GROUND WATER RESOURCES OF SONBHADRA DISTRICT , U.P. (as on 01-04-2009)

Sl. No.	Assessment unit (Blocks)	Ground availability (Ham)	Ground water draft (Ham)	Level of development (%)	Category as on 31.03.09	Balance ground water
1	Babhani	558.66	192.35	34.43	Safe	176.70
2	Chopan	3535.06	736.42	20.83	Safe	2319.11
3	Dudhi	1504.65	592.47	39.76	Safe	719.25
4	Ghorawal	3996.50	2924.59	73.18	Safe	509.99
5	Myorpur	2048.04	367.70	17.95	Semi Critical	1711.63
6	Nagawa	1249.76	572.02	45.77	Safe	481.95
7	Chatra	2872.06	2402.51	83.65	Safe	319.24
8	Robertsganj	4909.64	4027.33	82.03	Safe	00.00
Total		20674.37	11815.39	57.15		6237.88

6.0 GROUND WATER QUALITY

6.1 Quality of Shallow Ground Water:

The chemical analysis of shallow ground water consists of pH, E.C., Na, K, Ca, Mg, HCO₃, CL, SO₄, NO₃, F and TH as CaCO₃. The result reflects that the ground water is safe and potable except approximately 35 villages falling in Chopan and Myorpur blocks where fluoride is above permissible limit. The concentration of fluoride in groundwater varies from 2.00 to 8.00ppm (Padwa Kodwari). High Iron in groundwater has been reported from Nagawa block even at deeper depth (190mbgl)

6.2 Quality of Deeper Aquifers:

Data of water samples collected from deeper aquifers reveals that the water is safe and potable from deeper fractures/aquifers and better than shallow aquifer except in Nagawa block where Iron in groundwater is more than permissible limit..

7.0 GROUND WATER PROBLEMS ENCOUNTERED

After study, it is inferred that the following groundwater problems have been encountered in the district.

7.1 Water Table Depleted Area:

In Sonbhadra district, there is scarcity of ground water during summer season. It is well known fact that being rocky and hilly area, the groundwater level has declined significantly over the years except Anpara and Bairpan area due to recharge through Rihand Dam. Long term water level trend reveals that it is declining in entire area

7.2 High Fluoride Affected Area:

It is now well established fact that the fluoride in groundwater is above permissible limit (upto8ppm) in parts of Chopan and Myorpur block (35 villages). The occurrence of pegmatites, Quartz veins and Biotite rich granites are common source of high fluoride in groundwater. Fluorosis involving dental carries, bending of bones and even blindness are common phenomena seen in the fluoride affected villages of the district. The defluoridisation plant attached with handpump, construction of deeper tubewells(100mbgl) are some solution.

7.3 Artificial Recharge Area:

From the analysis of long term data of water level and rainfall of the district, it is inferred that water conservation and Artificial Recharge structures are needed. The check dams and bundhi have been constructed in very large number apart from water conservation ponds/tanks in the district. There is need of percolation tanks and boridams at suitable locations in parts of Chopan and Myorpur blocks. One case history of most successful Checkdam at Bhetpari village in Bhabhani block has been enclosed.

8.0 CONCLUSIONS

Sonbhadra district covers an area of 6788 Sq. km. and falls in the Chhotanagpur gneissic complex. The district is characterized with hillocks, plateau and rocky terrains. Rainfall run-off is quite high in the district. River Son, Kanhar and Rihand are main drainage apart from smaller streams in the district. The data of Exploratory drilling conducted by CGWB in the district reveals that ground water occurs in fractures and weathered zones. Overburden varies from 0.50-30.00mbgl. Yield of well varies from 30 to 500 lpm with 30m drawdown in the District. Depth to water level in pre-monsoon ranges between 5.00 to 23.00 mbgl. Post-monsoon water level varies between 4.50 to 15.75 mbgl. Water level data of all NHS falling in the district were analyzed from 2001 to 2011 which clearly show that the long term fluctuation ranges between 0.79 to 4.00 m corroborating insignificant base flow of ground water in the area. Long term water level trend has shown the decline in ground water level in entire district. The chemical analysis of ground water samples of the district show that the water quality is fresh and potable except 35 villages in Myuorpur and Babhani blocks where high fluoride content in ground water has been observed.

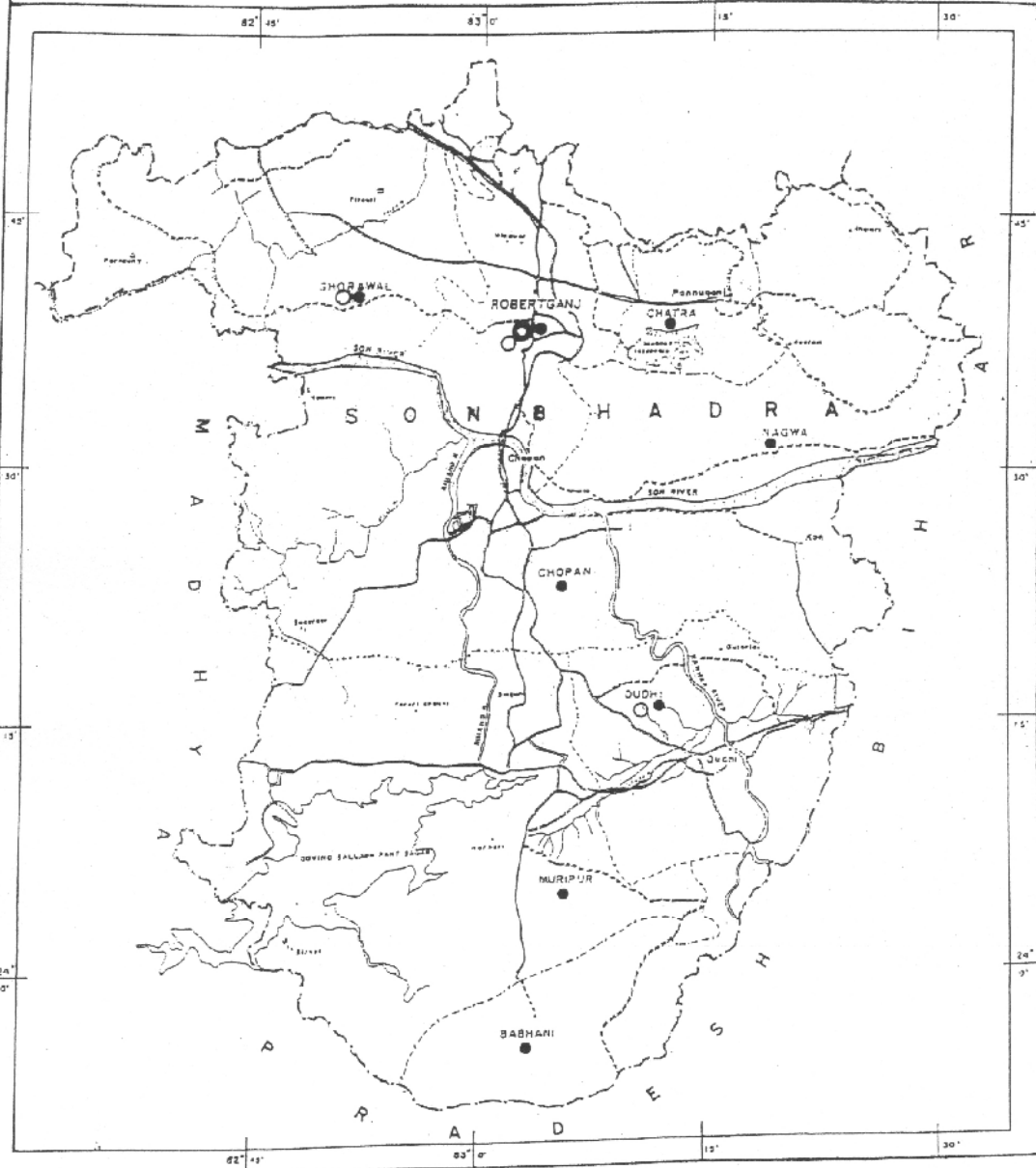
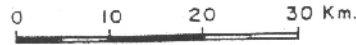
9.0 RECOMMENDATIONS

- i) Delineation of buried and paleo-channels for potable ground water may be searched out.
- ii) To counter the declining water level trend in the district the artificial recharge practices and water-shed management (from hill to valley approach) should be adopted at large scale.
- iii) There is urgent need of Quality assessment of shallow and deeper groundwater and its relationship with the litho logical behavior.

- iv) Exploration of potential sites for ground water withdrawal should be carried out through the help of Remote Sensing, Study of Satellite Imageries and Resistivity surveys.
- v) There is an urgent need of fluoride free drinking water supply either through construction of deeper boreholes or application of sustainable water purification method.

ADMINISTRATIVE MAP OF SONBHADRA DISTRICT, (U.P.)

SCALE

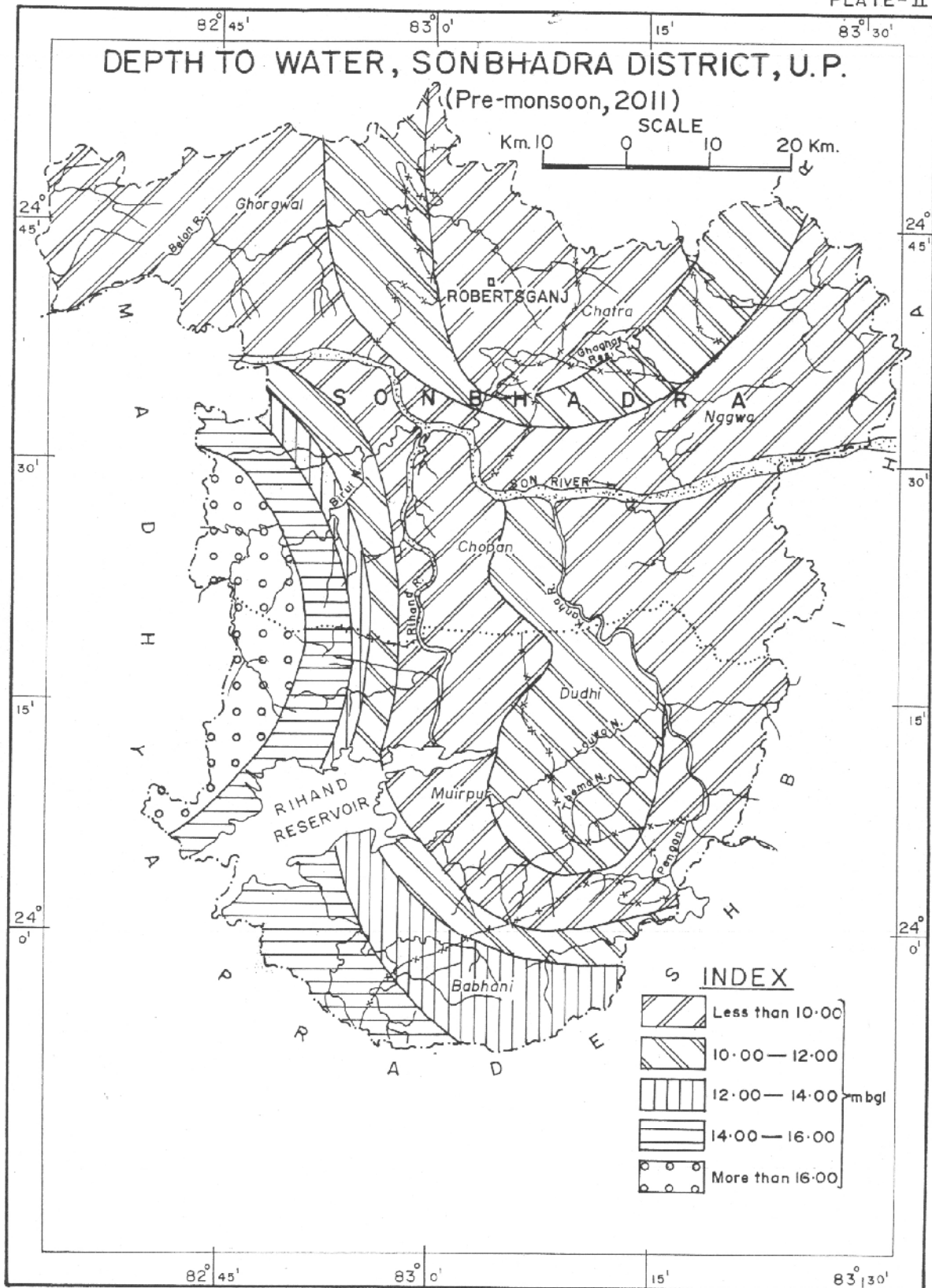


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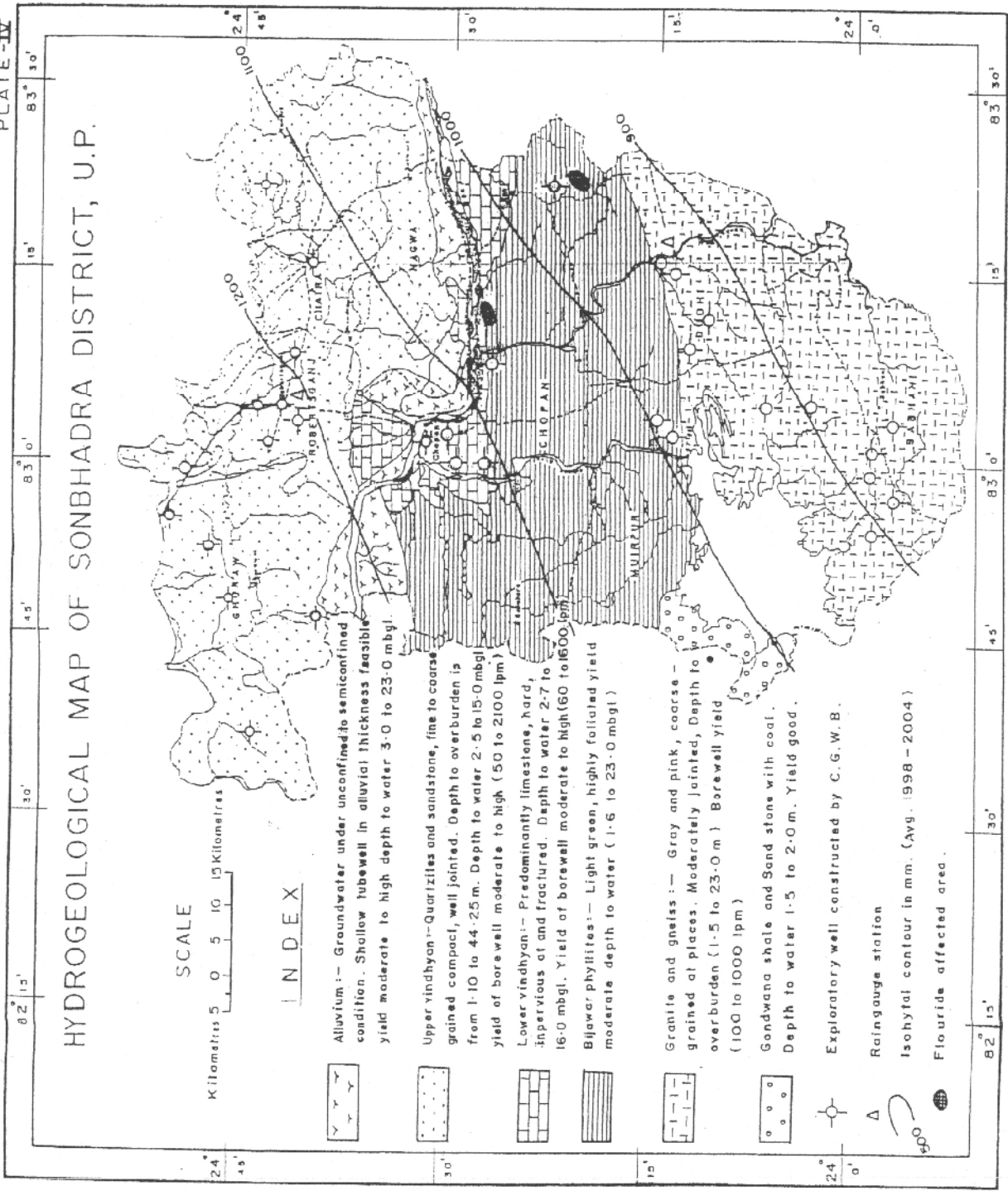
STATE BOUNDARY - - - -
 BLOCK BOUNDARY - x - x
 BLOCK HEADQUARTER ●

DISTRICT BOUNDARY - - - -
 DISTRICT HEADQUARTER ⊙
 MAIN ROAD
 RIVER

TEHSIL BOUNDARY ····
 TEHSIL HEADQUARTER ○
 RAILWAY LINE













HYDROGEOLOGICAL MAP OF SONBHADRA DISTRICT, U.P.



SCALE
Kilometres 5 0 5 10 15 Kilometres

INDEX

-  Alluvium :- Groundwater under unconfined to semiconfined condition. Shallow tubewell in alluvial thickness feasible yield moderate to high depth to water 3.0 to 23.0 mbgl.
-  Upper vindhyan :- Quartzites and sandstone, fine to coarse grained compact, well jointed. Depth to overburden is from 1-10 to 44-25 m. Depth to water 2.5 to 15.0 mbgl yield of borewell moderate to high (50 to 2100 lpm)
-  Lower vindhyan :- Predominantly limestone, hard, impervious at and fractured. Depth to water 2.7 to 16.0 mbgl. Yield of borewell moderate to high (60 to 1600 lpm)
-  Bijawar phyllites :- Light green, highly foliated yield moderate depth to water (1.6 to 23.0 mbgl)
-  Granite and gneiss :- Gray and pink, coarse grained at places. Moderately jointed, Depth to water overburden (1.5 to 23.0 m) Borewell yield (100 to 1000 lpm)
-  Gondwana shale and Sand stone with coal. Depth to water 1.5 to 2.0 m. Yield good.
-  Exploratory well constructed by C.G.W.B.
-  Rain gauge station
-  Isohyet contour in mm. (Avg. 1998 - 2004)
-  Flouride affected area.

