

DISTRICT GROUND WATER BROCHURE ETAH DISTRICT, U.P.

(A.A.P.: 2012-2013)

By

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Scientist 'B'

CONTENTS

Chapter	Title	Page No.
	DISTRICT AT A GLANCE, ETAH DISTRICT3
1.0	INTRODUCTION7
2.0	RAINFALL & CLIMATE8
3.0	GEOMORPHOLOGY & SOIL TYPES8
	3.1 Geomorphology	
	3.2 Major Drainage	
	3.3 Soil Types	
4.0	GROUND WATER SCENARIO9
	4.1 Hydrogeology	
	4.2 Ground Water Resources	
	4.3 Ground Water Quality	
5.0	GROUND WATER MANAGEMENT STRATEGY16
	5.1 Ground Water Development	
	5.2 Water Conservation & Artificial Recharge	
6.0	GROUND WATER RELATED ISSUES AND PROBLEMS17
7.0	AWARENESS & TRAINING ACTIVITY17

8.0	AREAS NOTIFIED BY CGWA/SGWA18
9.0	RECOMMENDATIONS18

PLATES:

1. INDEX MAP OF ETAH DISTRICT, U.P.
2. DEPTH TO WATER LEVEL, ETAH DISTRICT, U.P. (PRE-MONSOON, MAY, 2012)
3. DEPTH TO WATER LEVEL, ETAH DISTRICT, U.P. (POST-MONSOON, NOV., 2012)
4. CATEGORIZATION OF BLOCKS IN ETAH DISTRICT, U.P.
5. HYDROGEOLOGICAL MAP, ETAH DISTRICT, U.P.

DISTRICT AT GLANCE, ETAH DISTRICT, U.P.

1. GENERAL INFORMATION

i. Geographical Area (Sq. Km.)	: 2452.92
ii. Administrative Divisions	
Number of Tehsil	: 3 (Etah, Jalesar, Aliganj) 8 (Mahehra, Nidhauri Kalan,
Number of Block	: Sheetalpur, Sakit, Aliganj, Jaithra, Jalesar & Awagarh)
Nyay Panchyat (2010-11)	: 518
Nagar Palika	: 4
Gram Panchyat	: 509
Number of Villages	: 855
Total Assembly Areas	: 4
iii. Population (as on 2001 census)	
Total	: 1761152
Male	: 945157
Female	: 815995
Density	: 724 person/sq.km.
iv. Climatological Data	
Average Annual Rainfall (mm)	: 722.40
Mean Maximum Temperature (⁰ C)	: 32
Mean Minimum Temperature (⁰ C)	: 26
Relative Humidity (Morning) (%)	: 60
Relative Humidity (Evening) (%)	: 41
Average Number of Rainy Days	: 40
Wind Velocity (Km/Hr)	: 4.5
Potential Evapotranspiration (mm)	: 1467.2

2. GEOMORPHOLOGY

	: Ganga Yamuna Doab in Central Indo-Gangetic Alluvial Plains
Major Physiographic Units	: a) Flood Plain b) Younger Alluvial Plain c) Older Alluvial Plain
Major Drainages	: Kali Nadi, Isan, Arind & Bargash Nadi

3. LAND USE (Sq. Km.)

a) Total reported area	: 2440.35
b) Total forest area	: 10.00
c) Cultivable waste land	: 125.71
d) Land under miscellaneous use other than agriculture	: 211.77
e) Barren Land	: 2519
f) Pasture	: 10.27
g) Present fallow land	: 196.46
h) Gross area sown	: 2920.00

i)	Net area sown	:	1860.00
4.	MAJOR SOIL TYPES	:	a) Dumat or loam b) Matiyar or clay c) Bhur or sand
5.	AREA UNDER PRINCIPAL CROPS	:	Rabi – 54.48% Kharif – 38.94% Zayed – 6.56%
6.	IRRIGATION BY DIFFERENT SOURCES (Areas 2009-10) <u>Area Irrigated (sq.km.)</u>		
a)	Canal	:	218.73
b)	Govt. Tubewells	:	73.28
c)	Other sources	:	7.18
e)	Private tubewells	:	1556.97
f)	Gross Irrigated Area	:	2820.00
g)	Net Irrigated Area	:	1860.00
7.	NUMBER OF GROUND WATER MONITORING WELLS OF CGWB		
a)	No. of Dugwells	:	5
b)	No. of Piezometers	:	8
	Total	:	13
8.	PREDOMINANT GEOLOGICAL FORMATIONS	:	Alluvium (Alluvial sediments of quaternary age)
9.	HYDROGEOLOGY	:	
a)	Major water bearing formation	:	Sand of various grades, clay, silt & kankar
b)	Premonsoon depth to water level	:	4.25 to 11.88 mbgl
c)	Postmonsoon depth to water level	:	3.32 to 11.02 mbgl
d)	Long term of water level in 10 years (m/year)		Pre Rise (+)0.0000 to 0.1883 Fall (-)0.0180 to 0.1353 Post : Rise (+)0.0000 to 0.5184 Fall (-)0.0318 to 0.4372 Annual : Rise 0.0180 Fall 0.0089-0.0317
10.	GROUND WATER EXPLORATION BY CGWB		
	Number of wells drilled (EW, OW, PZ, SH, Total)	:	EW = 3, OW = 3, SH = 1 Total = 7
	Depth Range (mbgl)	:	237 – 428
	Discharge (litres per second)	:	21 – 63
	Storativity (S)	:	1.57×10^{-3} to 3.00×10^{-4}
	Transmissivity (m^2/day)	:	688 to 5472

11. GROUND WATER QUALITY

Quality of formation water is good in shallow aquifers except in Awagarh, Jalesar, Sahawar & Sheetalpur blocks (at places) where EC, Cl, F, Total Hardness etc. are more than permissible limits. Quality of deeper aquifers also is not suitable for drinking purposes at places.

	EC (microsiemens/cm at 25 ⁰ C)	Cl (mg/l)	F (mg/l)	Ca (mg/l)	Total Hardness as CaCO ₃ (mg/l)	TDS (mg/l)
1. Jaitpur (Jaithra block)	2750	320	-	52	700	1650
2. Block premises Nidhauri Kalan	1180	-	-	-	250	708
3. Block premises Jalesar	2480	213	-	-	220	1488

12. DYNAMIC GROUND WATER RESOURCES (2009)-in HAM

i) Net Ground Water Availability	: 72207.99
Existing Gross Ground Water Draft for All Uses	: 60529.00
Projected Demand for Domestic and Industrial Uses upto 2025	: 4620.03

13. AWARENESS AND TRAINING ACTIVITY

Mass Awareness Programmes Organized : Nil

Date

Place

Number of Participants

Water Management Training Programmes Organized

Date

Place

Number of Participants

14. EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING : Nil

Projects Completed by CGWB (No & Amount Spent) : -

Projects Under Technical Guidance of CGWB (Numbers) : -

15. GROUND WATER CONTROL AND REGULATION :

Number of OE Blocks : 1 (Marehra)

Number of Semi Critical Blocks : 3 (Aliganj, Nidholi Kalan & Sakit)

Number of Safe Blocks : 3 (Awagarh, Jaithra, Jalesar)

Number of Blocks Notified : Nil

**16. MAJOR GROUND WATER PROBLEMS AND : -
ISSUES**

Over exploitation of ground water & quality

DISTRICT GROUND WATER BROCHURE ETAH DISTRICT, U.P.

(A.A.P.: 2012-2013)

By

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1.0 INTRODUCTION

The district is situated in the western part of the state. It lies in the central portion of the Ganga and Yamuna doab and is bounded on the north-east side by the river Ganga, which separates it from the Budaun district. For administrative convenience & proper extension of development activities the district has been further divided into three tehsils and these tehsils have been further divided into eight blocks. The district headquarters Etah is very well connected by G.T. road and also connected by rail broad gauge line of Northern Railway with Tundla junction (on Delhi – Howrah main line). The drainage system of the district is controlled by the river Ganga's tributaries, namely Kali Nadi, Isan, Arind & Bargash. The Kali Nadi which is bordering district from northern end, is perennial and the remaining tributaries are ephemeral.

The district fall under the category of agricultural dominated district, occupying mainly the areas south of Kali river. The surface water irrigation is mainly through the network of the Lower Ganga Canal & Upper Ganga Canal.

Systematic Hydrogeological surveys in one part of the district was carried out in 1966-67 (GSI) and remaining part was covered by CGWB in 1978-79. The Reappraisal Hydrogeological Surveys were carried out by CGWB in 1988-89, 1989-90 and in 1998-99. In total five exploratory tubewells have been drilled during 1991-92 to study aquifer characteristics and quality of formation water in the entire district at different levels.

2.0 RAINFALL & CLIMATE

The average annual rainfall is 722.4 mm. The climate is sub-humid and it is characterized by a pleasant cold season and a hot day summer. About 88% of rainfall takes place from June to September. During monsoon surplus water is available for deep percolation to ground water.

There is a meteorological observatory at Mainpuri, the records of which may be taken as representative meteorological conditions. After February there is continuous increase in the temperature. May is generally the hottest month of the year. The mean daily maximum temperature in May is about 41⁰C, mean daily minimum temperature is about 27⁰C and maximum temperature reaches up to over 46⁰C with the onset of the monsoon there is a rapid decrease in the day temperature. January is the coldest month with the mean daily maximum temperature is about 22⁰C and mean daily minimum temperature is 8⁰C. The mean monthly maximum temperature is 32.8⁰C and mean monthly minimum temperature is 16.5⁰C

Except during the monsoon season humidity is high and air is dry. The mean monthly morning relative humidity is 67% and mean monthly evening relative humidity is 50%.

Winds are generally light with slight increase in force during summer and early monsoon months. The mean wind velocity is 3.5 Km./hr.

The potential evapotranspiration is 1431.7 mm

3.0 GEOMORPHOLOGY & SOIL TYPES

3.1 GEOMORPHOLOGY:

In general the district exhibits a flat topography with a few gentle undulations. Geomorphologically the area is not fully matured. The district may be divided into following geomorphic units.

- (i) Flood Plain
- (ii) Younger Alluvial Plain
- (iii) Older Alluvial Plain

3.2 MAJOR DRAINAGES:

Kali, Isan, Arind & Bargash Nadi and their tributaries.

3.3 SOIL TYPES:

The soils in the district can be grouped into the following three main conventional classes depending upon their textural and compositional character:

a. Dumat or Loam :

Fertile soil which is soft to touch when powdered.

b. Matiyar Clay :

Stiff clay and becomes as hard as baked brick on drying.

c. Bhur or Sand :

Sandy soil and less fertile.

4.0 GROUND WATER SCENARIO

4.1 HYDROGEOLOGY:

4.1.1 Water Bearing Formation:

Major water bearing formation are sand of various grades, silt & kankar. A Hydrogeological map is presented at Plate-V.

4.1.2 Occurrence of Ground Water:

The ground water occurs in the pore spaces of unconsolidated alluvial sediments in the zone of sedimentation. The top silty / sandy clay beds mixed with kankar support the dugwells where ground water occurs under water table conditions. The ground water in the deeper aquifers occur in semi confined to confined conditions.

4.1.3 Nature and Depth of Aquifer Systems Encountered:

The Ist aquifer group, occurring just below the top clay layer is regionally extensive with variable thickness attaining the maximum thickness of 80 metres. The

granular material of this group comprise fine to medium sand occasionally admixed with kankar and sandy clay.

The IInd aquifer group occurring generally between the depth range of 110-160 mbgl consist of fine to coarse sand admixed with kankar and gravels.

Occurrence of clay lenses within this aquifer group is a common features in the major part of the area.

The IIIrd aquifer group, lying generally in the depth range of 240 (± 20) m, to 290 (± 20) comprises fine to coarse sand admixed occasionally with kankar and gravels.

The lithological logs of the four deep boreholes indicate that occurrence of clay lenses at depths in this aquifer too is making it regionally less extensive.

The IVth aquifer group, occurring generally below 340 m, (± 20 m), consist of fine to coarse sand with occasional gravels. The thickness of this aquifers group, though not fully ascertained due to limited drilling depth, appears to vary between 20 and 50 m, with intervening clay lenses of 10 to 20 m thickness. The thickness of aquifer group decreases towards west.

4.1.4 Depth to Water Level (Pre-Monsoon) :

During the pre-monsoon period i.e. in May & June (2012), the water levels were monitored in the Ground Water Monitoring Stations (GWMS) established in the entire district. On the basis of these data (Table-1) a depth to water level map was prepared (Plate-II). The depth to water level ranges from 4.25 mbgl (at Baghwala I) to 11.88 mbgl (at Jalesar).

Table-1

WATER LEVEL FLUCTUATION (PRE AND POST) FOR THE SELECTED YEAR 2012 FOR ETAH DISTRICT, U.P.

Sl. No.	Location	Premonsoon (mbgl)	Postmonsoon (mbgl)	Fluctuation (m)
1.	Awagarh (Pz)	10.16	10.07	0.09
2.	Bhagwala I	4.25	3.32	0.93
3.	Daryaganj	5.97	6.31	0.34
4.	Jalesar (Pz)	11.88	11.02	0.86
5.	Nidhauri (Pz)	9.68	9.40	0.28
6.	Jaisukhpur	5.85	4.23	1.62

Sl. No.	Location	Premonsoon (mbgl)	Postmonsoon (mbgl)	Fluctuation (m)
7.	Dhumri	-	1.93	-
8.	Locha	10.25	8.81	1.44
9.	Sheetalpur (Pz)	10.60	10.18	0.42
10.	Etah (Pz)	10.16	9.75	0.41
11.	Jaithra (Pz)	5.90	5.96	0.06
12.	Sakit	6.35	5.80	0.55
13.	Mirachi (Marhara Block)	7.23	6.43	0.80

4.1.5 Depth to Water Level (Postmonsoon):

During postmonsoon water levels were monitored on the same GWM Station (Table-1) on the basis of data, a depth to water level. (Postmonsoon) map was prepared (Plate-III). The depth to water level ranges from 3.32 mbgl (at Bhagwala) to 11.02 mbgl (at Jalesar).

4.1.6 Seasonal Fluctuation:

The fluctuation in water level varies from 0.06 m to 1.62 m. The maximum fluctuation is observed at Jaisukhpur (1.62 m). The data is presented in Table-1

4.1.7 Long Term Water Level Trend:

The long term water level trend from year 2003-2012 is give in Table-2 which shows that out of 6 ground water monitoring stations except at one station i.e. Daryaganj where it shows rising trend, in rest of the area falling trend of water level is observed in the district.

Table-2

LONGTERM WATER LEVEL TREND IN ETAH DISTRICT, U.P. (From 2003 – 2012)

Sl. No.	Location	Premonsoon			Postmonsoon			Annual		
		Data Points	Rise (m/year)	Fall (m/year)	Data Points	Rise (m/year)	Fall (m/year)	Data Points	Rise (m/year)	Fall (m/year)
1.	Bhagwala 1	8	-	0.0180	10	-	0.0604	37	-	0.0317
2.	Daryaganj	7	0.1883	-	9	-	0.0443	31	0.0180	-
3.	Awagarh I	4	-	-	6	0.5184	-	17	-	-
4.	Jaisukhpur	9	-	0.0888	9	-	0.1329	51	-	0.0089

Sl. No.	Location	Premonsoon			Postmonsoon			Annual		
		Data Points	Rise (m/year)	Fall (m/year)	Data Points	Rise (m/year)	Fall (m/year)	Data Points	Rise (m/year)	Fall (m/year)
5.	Sakit	10	-	0.0799	10	-	0.0318	38	-	0.0445
6.	Locha	8	-	0.1353	10	-	0.4372	70	-	0.3624

4.1.8 Aquifer Parameters:

The drilling depth of exploratory boreholes varies from 237 to 435 mbgl, the sediments of quaternary alluvium attain its maximum thickness in the eastern parts of the district. The discharge of exploratory boreholes varies from 1200 to 3800 lpm with the drawdown 2.65 to 8.82 m. The transmissivity varies from 688 m²/day to 5472 m²/day and storativity (S) ranges from 1.57×10^{-3} to 3.0×10^{-4} in the district.

4.2 GROUND WATER RESOURCES:

Precipitation is the main source of ground water recharge in the district. The quantity of recharge depends upon the intensity and duration of rainfall, nature and texture of soil, vegetation cover and land use pattern of the area.

The other sources which replenish the ground water are as under

1. Seepage from canal system
2. Return flow from applied irrigation
3. Sub surface in flow from adjoining area
4. Influent recharge from the river system

The dynamic ground water resources are given in (Table-3). Out of 8 blocks of the district 3 blocks falls under the safe category, 3 blocks falls under semi-critical whereas 1 block come under over exploited category. Marhara is the block where stage of ground water development is more than 100%. The overall stage of ground water development in the district is 83.83%.

Table-3

**DYNAMIC GROUND WATER RESOURCES OF ETAH DISTRICT, U.P.
(As on 31.03.2009)**

Sl. No.	Assessment Units – Blocks	Net Annual Ground Water Availability (in ham)	Existing Gross Ground Water Draft for All Uses (in ham)	Net Ground Water Availability for Future Irrigation Development (in ham)	Stage of Ground Water Development (in %)	Category of Block
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>
1.	Aliganj	9506.01	8457.20	824.71	88.97	Semi-critical
2.	Awagarh	9187.77	5797.26	3253.01	63.10	Safe
3.	Jaithara	8058.07	5987.75	1890.93	74.31	Safe
4.	Jalesar	6542.32	5851.45	627.80	88.09	Safe
5.	Marehra	5607.44	6998.41	-	124.81	Over Exploited
6.	Nidholi Kalan	11065.59	8836.24	2056.32	79.85	Semi-critical
7.	Sakeet	11030.23	10919.82	-	99.00	Semi-Exploited
8.	Sheetalpur	11110.63	7681.07	3209.53	69.13	Safe
	Total	72207.99	60529.20	10471.31	83.83	-

STATUS OF GROUND WATER DEVELOPMENT (BLOCKWISE):

The status of ground water development (blockwise) is given in the district (Table-4).

The blockwise proposal of ground water development for irrigation purpose in the district is given in Table-4. The categorization of blocks is presented in Plate-IV.

Table-4

**BLOCKWISE PROPOSAL OF GROUND WATER DEVELOPMENT FOR IRRIGATION PURPOSE IN
ETAH DISTRICT, U.P.**

Sl. No.	Block	Net ground water availability for future irrigation development (ham)	Ground water available for irrigation (85% of col. 3 in ham)	Ground water proposed to be utilized for irrigational development (70% of col.4 in ham)	Proposed Structure		Additional irrigation potential may be created (ha.) (Average depth of irrigation water adopted 0.50m) (Col. 5/0.50)
					<i>No. of state tubewells (taking 50% of Col. 5 unit draft 12.8 ham)</i>	<i>Private tubewell borings with pumping sets (taking 50% of col. 5 unit draft 1.8 ham)</i>	
<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>
1.	Aliganj	824.71	701.08	490.70	19	136	981.40
2.	Awagarh	3253.01	2765.05	1935.54	75	537	3871.08
3.	Jaithra	1890.93	1607.29	1125.10	44	312	2250.20
4.	Jalesar	627.60	533.46	373.42	14	103	746.84
5.	Marehra	-	-	-	-	-	-
6.	Nidholikalan	2056.32	1747.87	1223.51	48	339	2447.02
7.	Sakeet	-	-	-	-	-	-
8.	Sheetalpur	3209.53	2728.10	1909.67	74	530	3819.34

4.3 GROUND WATER QUALITY:

The quality of ground water is good in shallow aquifers except in Jaithra, Jalesar, Nidhauri Kalan blocks (at places) where EC, Cl, F, Th & TDS are more than permissible limits. The quality of deeper aquifer is not suitable for drinking purposes at places.

The specific electrical conductance of ground water in phreatic zone ranges from 460 to 2750 $\mu\text{s/cm}$ at 25⁰C (Table-5).

It is observed that the ground water is suitable for drinking and domestic uses in respect of all the constituents except fluoride and nitrate. Fluoride is found in excess of permissible limit (1.5 mg/l) samples analysed except at Jalesar where it is 2.6 mg/l.

High value of EC & TDS has been found in the samples analysed are given below-

Sl. No.	Name of District	Block	Location	TH (mg/l)	EC ($\mu\text{s/cm}$)	TDS (mg/l)	F (mg/l)
1	2	4	5	6	7	8	9
1.	Etah	Jalesar	Left side at the entrance in Block Office	-	2480	1488	2.6
2.	Etah	Jaithra	Infront of Panchayat Office	700	2750	1650	-

Table-5

RESULTS OF CHEMICAL ANALYSIS WATER SAMPLES COLLECTED IN NHS DURING MAY, 2012

Sl. No.	District	Location	pH	EC in $\mu\text{s/cm}$	Values in mg/l											
					CO_3	HCO_3	Cl	F	NO_3	SO_4	TH	Ca	Mg	Na	K	TDS
1.	Etah	Sheetalpur block	8.63	690	30	183	71	0.3	1.5	nd	160	12	32	76	2.3	414
2.	Etah	Marahara Block	8.75	640	36	195	14	0.64	0.24	48	170	16	32	61	3.9	384
3.	Etah	Premises, Nidahauli Kalan	8.48	1180	60	415	71	0.8	10	nd	250	16	51	150	3.1	708
4.	Etah	Kahetra panchyat Jaithra block	7.88	2750	0	488	320	0.65	21	406	700	52	139	299	1.9	1650
5.	Etah	Premises Jalesar block	8.56	2480	120	336	213	2.6	21	337	220	12	46	460	7.8	1488
6.	Etah	Gate Sakit block	8.45	690	24	244	21	0.25	4	34	180	24	29	68	4.3	414
7.	Etah	Jaitpur block	8.43	460	24	122	14	0.4	17	24	160	24	24	24	2.7	276
8.	Etah	Aliganj block	8.45	670	48	183	14	1.1	10	38	160	16	29	70	4.7	402
9.	Etah	Zila panchayat Etah block	8.44	800	48	146	71	0.7	nd	58	280	24	54	42	7.0	480

5.0 GROUND WATER MANAGEMENT STRATEGY

5.1 GROUND WATER DEVELOPMENT:

Ground water development should take place in those blocks only where the stage of ground water development falls under safe category (Table-6).

Table-6

BLOCKS FALLING UNDER SAFE CATEGORY, ETAH DISTRICT, U.P.

Sl. No.	Name of Block	Category of Block
1.	Awagarh	Safe
2.	Jaithra	Safe
3.	Jalesar	Safe

However further development of ground water should be done judiciously in Aliganj, Sakeet, Jalesar and Nidholi Kalan blocks as they falls under semi critical category.

The ground water development should be completely restricted / regulated in the Marhara block as it falls under over exploited category.

5.2 WATER CONSERVATION & ARTIFICIAL RECHARGE:

Artificial recharge structures may be developed in Marhara, Sakit, Aliganj and Nidholi Kalan blocks to recharge the aquifer for improving the ground water scenario in the blocks and also for improving the category of the blocks.

6.0 GROUND WATER RELATED ISSUES AND PROBLEMS

Over Exploitation and Quality:

1. In the over exploited block which is Marhara, further ground water development should be checked judiciously.
2. At places in Jalesar, Awagarh, Jaithra blocks the EC, TDS & Total Hardness is found in more than desirable limits. The quality of deeper aquifer is not suitable for drinking purposes at places.

7.0 AWARENESS AND TRAINING ACTIVITY

7.1 MASS AWARENESS PROGRAMME (MAP) & WATER MANAGEMENT TRAINING PROGRAMME (WMTP) BY CGWB:

So for neither any MAP nor any WMTP has been conducted in the district.

7.2 PARTICIPATION IN EXHIBITION, MELA, FAIR ETC.:

Nil.

7.3 PRESENTATION & LECTURE DELIVERED IN PUBLIC FORUM / RADIO / T.V. / INSTITUTION OF REPUTE / GROSS ROOT ASSOCIATION / NGO / ACADEMIC INSTITUTION ETC.:

Nil.

8.0 AREAS NOTIFIED BY CGWA/SGWA

Nil.

9.0 RECOMMENDATIONS

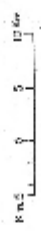
- (1) The assessment of ground water in the district indicates that the future development of ground water should be regulated in Marhara and in Sakit block as it comes under the category of over exploited category. Proper intervention of ground water management and adoption of conservation measures are urgently required.
- (2) Artificial recharge structures should be developed in Marhara, Nidhauri Kalan, Aliganj & in Sakit blocks to recharge the aquifer for increasing their ground water scenario.

- (3) The further development of ground water in Aliganj, Awagarh, Jaithra, & in Sheetalpur blocks should be done judiciously & through proper management, as these block falls under the safe category.
- (4) In other 'Safe' category blocks where the ground water levels are more or less stable or showing rising trend to a limited extent the ground water can systematically be developed to boost the agriculture economy of the district.
- (5) Possibilities for introducing light irrigation scheme for the blocks having inadequate ground water resources to meet out the total irrigational demand need to be explored.
- (6) In the area showing a declining trend regular and periodical monitoring of ground water levels is essential for which a network of shallow piezometers are to be established at suitable location.
- (7) Only two exploratory boreholes have been drilled so far in the central and western part of the district. The remaining area is to be explored in order to assess the potentiality and suitability of formation water available in deeper aquifer down to 450 m depth to the bedrock which ever to met earlier.

Part of Top. Sheet No. 86, N.W.D.

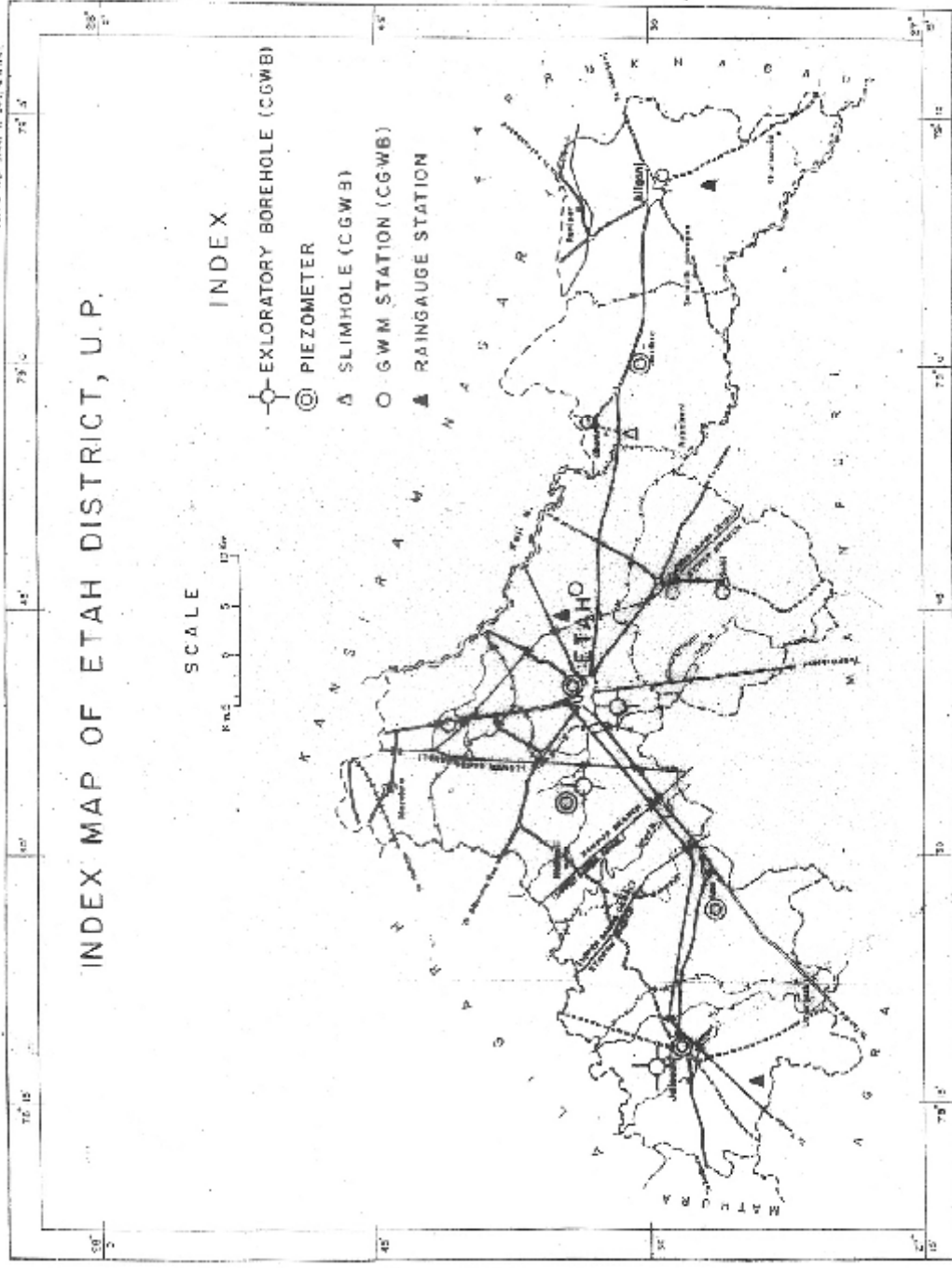
INDEX MAP OF ETAH DISTRICT, U.P.

SCALE



INDEX

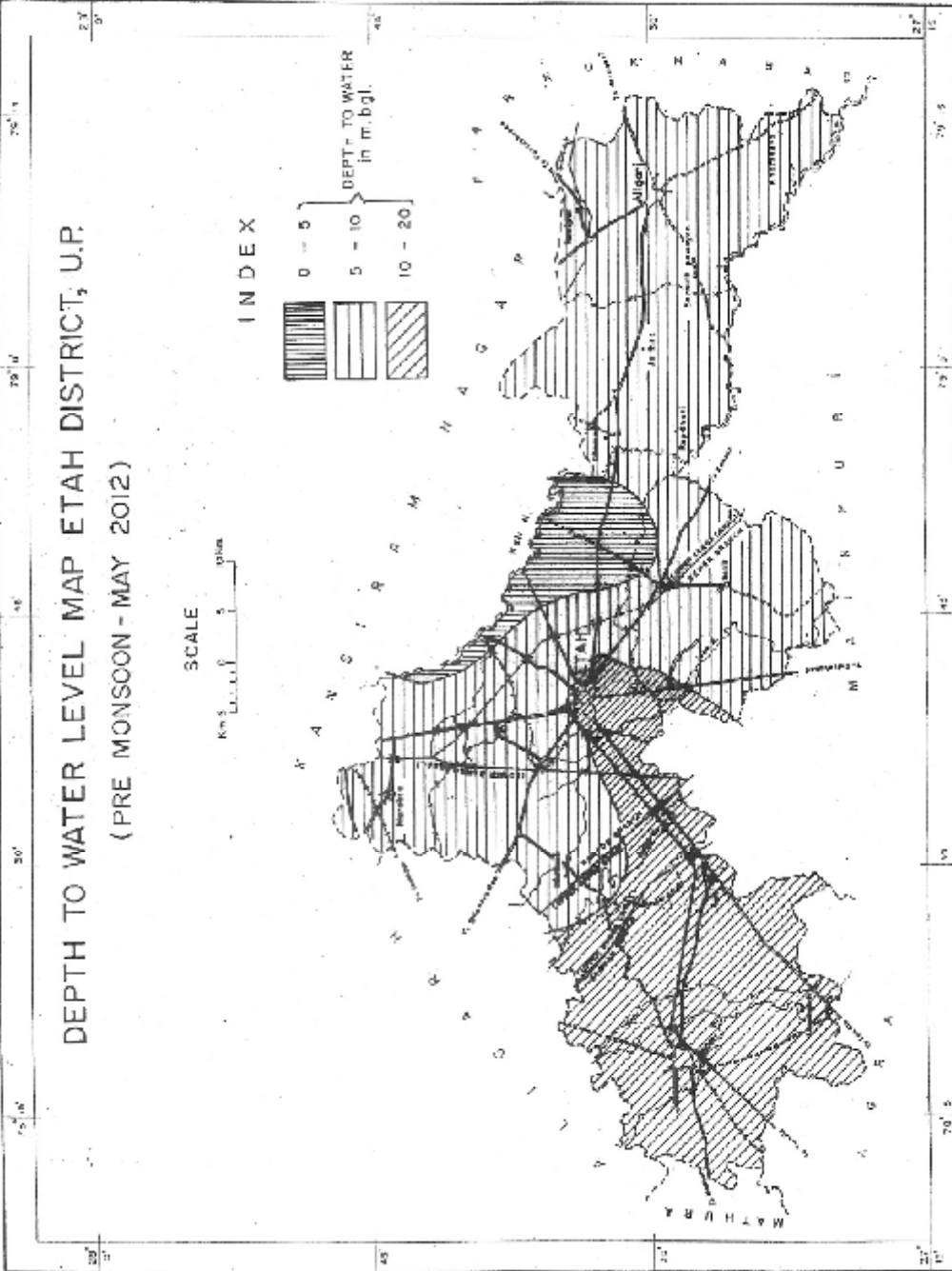
- EXPLORATORY BOREHOLE (CGWB)
- ⊙ PIEZOMETER
- △ SLIMHOLE (CGWB)
- G.W.M. STATION (CGWB)
- ▲ RAINGAUGE STATION



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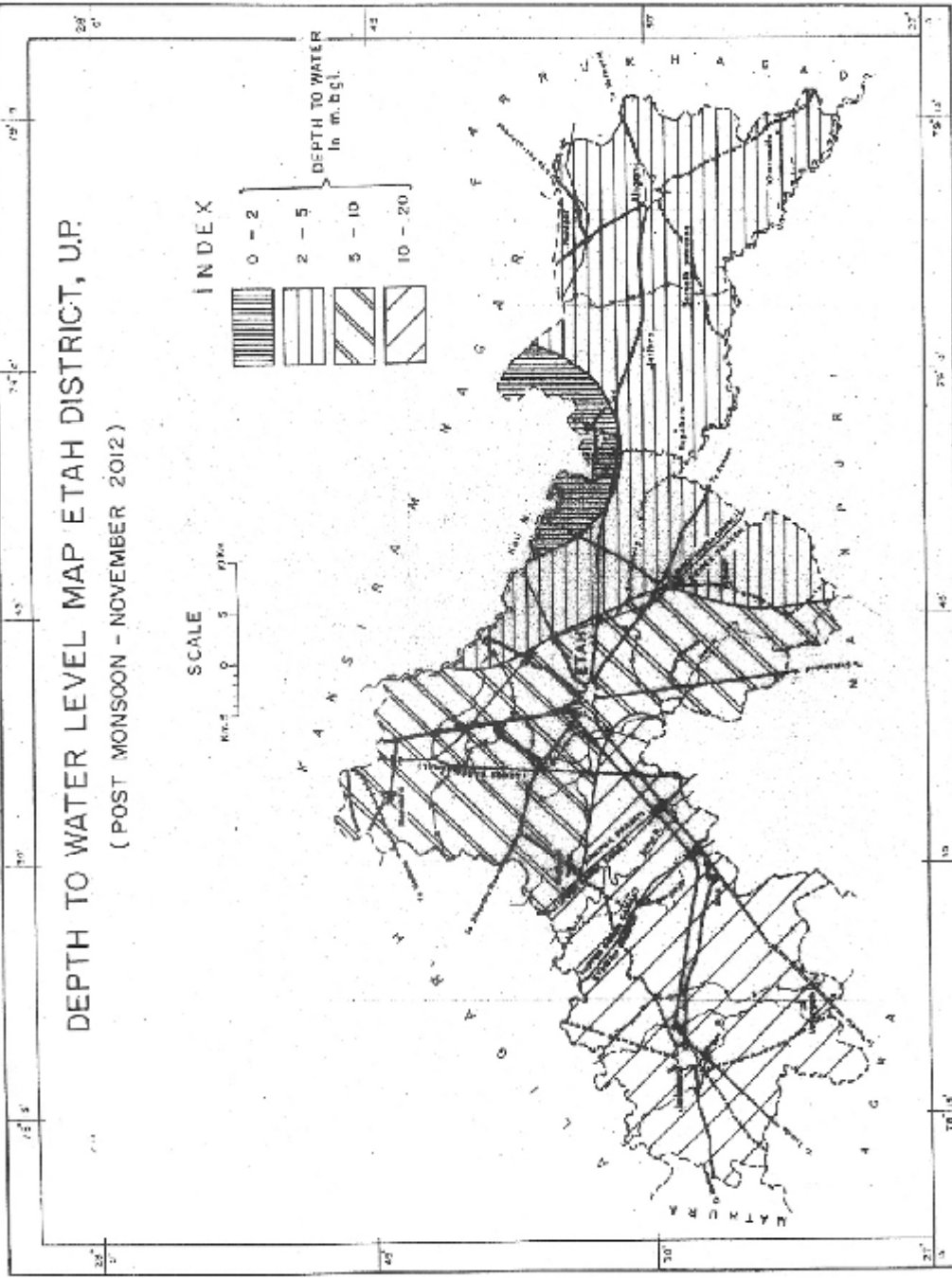
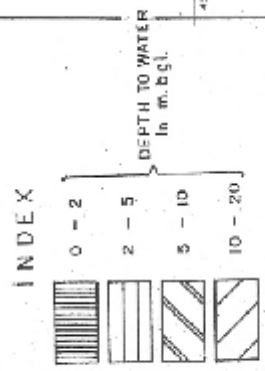
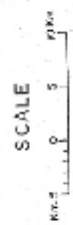
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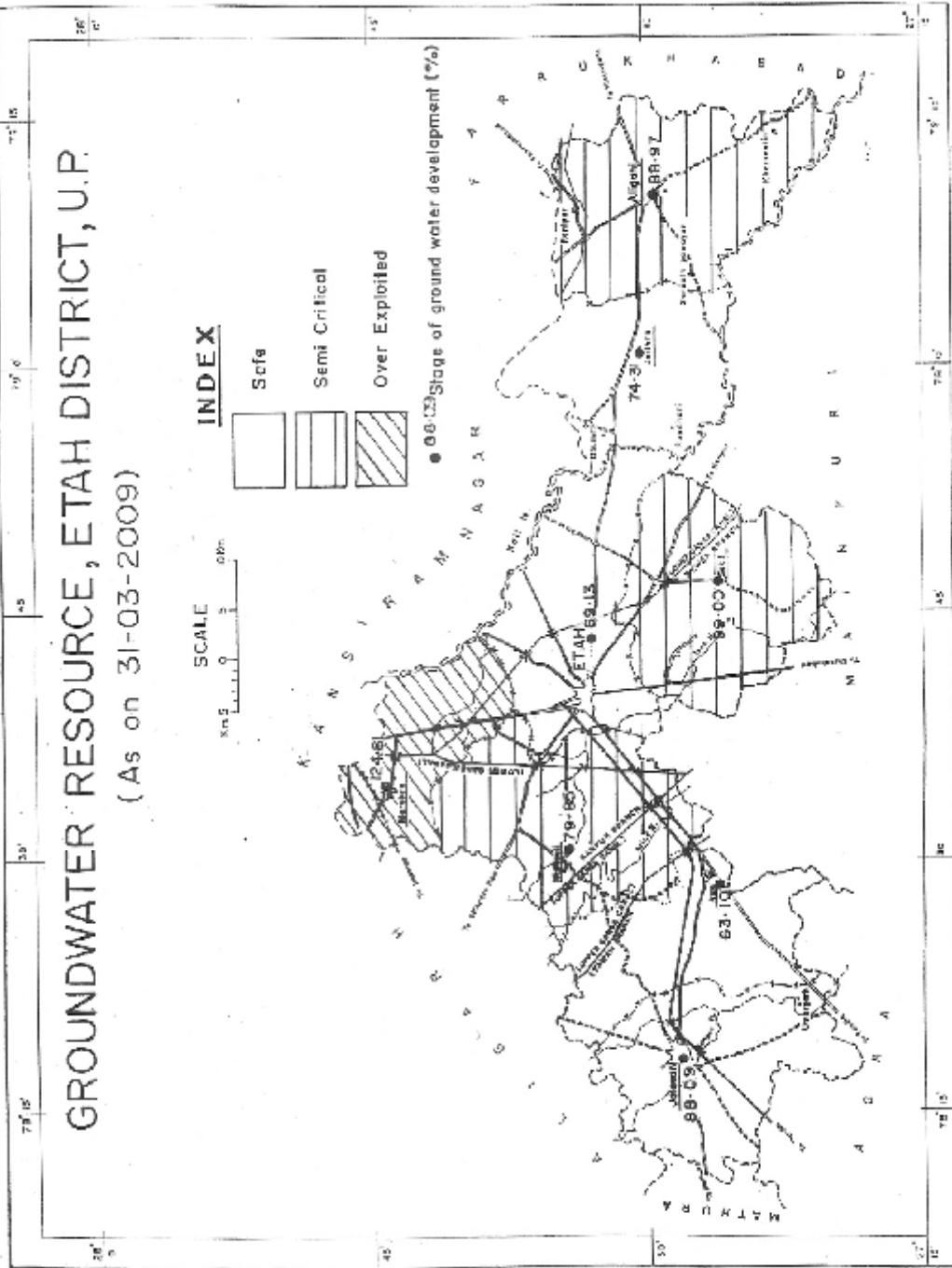
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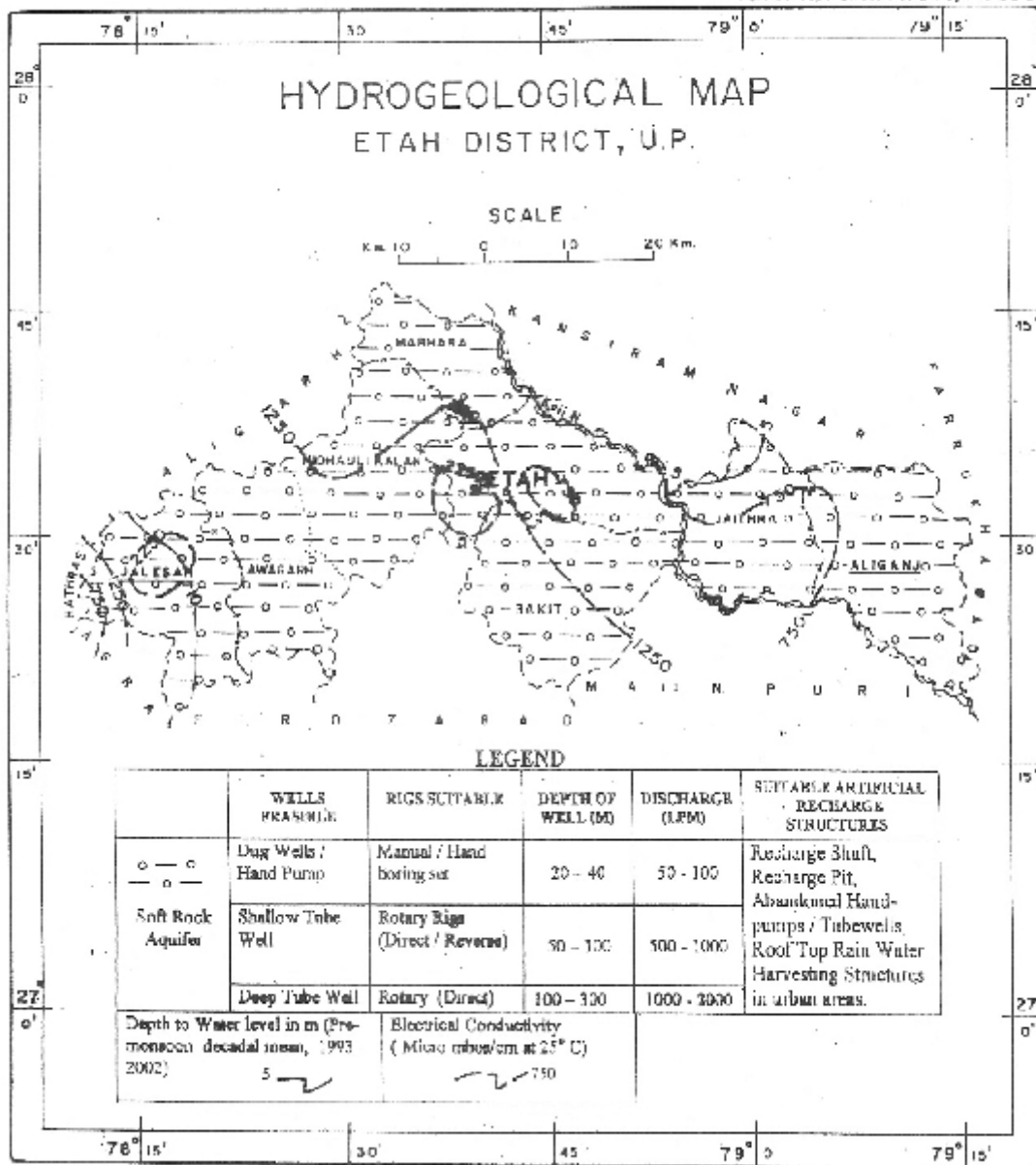
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