GROUND WATER BROCHURE OF MAU DISTRICT, U.P.

(A.A.P.:2012-13)

By

U.B. Singh
Asstt. Hydrogeologist

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PLATES:

DISTRICT AT GLANCE

1.	**GENERAL INFORMATION**		
i.	Geographical Area (Sq. Km.)	:	1713
ii.	Administrative Divisions (as on 31.03.2012)		
	Number of Tehsil	:	4
	Number of Block	:	9
	Number of Panchayat	:	92
	Number of Villages	:	1612
iii.	Population (as on 2001 census)	:	1493628
iv.	Average Annual Rainfall (mm)	:	1070
2.	**GEOMORPHOLOGY**		
	Major Physiographic Units	:	Two Physiographic unit namely (i) Ghaghara and a Ganga Alluvium Older alluvium abandoned channel, meaner scroll & surface water divide. (ii) The newer Alluvium Of Ghagara, Tones and its known as khadar.
	Major Drainages	:	Ghagara Tones, Chhoti Sarju are the main river.
3.	LAND USE (Hectare)		
a)	Forest area	:	560
b)	Net area sown	:	125033
c)	Net irrigated area	:	116833
4.	**MAJOR SOIL TYPES**	:	Older alluvial soil consisting broadly of Bhur and sandy, Matiar & clay rich and Dumat or loam.
5.	**AREA UNDER PRINCIPAL CROPS (As on 2010) Ha.**	:	Rabi – 101779 Kharif – 102360 Zaid -1117

6. IRRIGATION BY DIFFERENT SOURCES

(Area in ha. and number of structures)

Dug wells	:	0
Tubewells / Borewells nos. 287	:	3518 Ham
Tanks / Ponds	:	
Canals (Length = km) 397 km.	:	12834 Ham
Other sources	:	101731
Net Irrigated Area	:	116833
Gross Irrigated Area	:	190107

7. NUMBER OF GROUND WATER MONITORING WELLS OF CGWB (2009)

No. of Dugwells	:	9
No. of Piezometers	:	Nil

8. PREDOMINANT GEOLOGICAL FORMATIONS		Quaternary alluvial comprises of older and newer alluvial over Vindhyan Plateau.
9. HYDROGEOLOGY	:	Quaternary alluvial sediment revealed that the aquifer system can be divided in two group. (i) Shallow aquifer zone- 50 mbgl. (ii) Deeper aquifer zone 50 to 400 m or more, below ground level.
Major water bearing formation	:	Quaternary sediments Deposited over concealed basement making to major fresh water aquifer group.
Pre-monsoon Depth to water level during May' 2012	:	5.02 to 8.60 mbgl.
Post-monsoon Depth to water level during Nov.' 2012	:	2.14 to 7.75 mbgl.
Long term water level trend in 10 years (2003-2012) In m/year.	:	Rise-Nil Fall–0.113 to 0.3298

10. GROUND WATER EXPLORATION BY CGWB (As on 2012)

	No of wells drilled (EW, OW, PZ, SH, Total)	:	EW – 12
	Discharge (litres per minute)	:	1000 to 2003 lpm.
	Transmissivity (m^2/day)	:	999 to 4104
11.	**GROUND WATER QUALITY**		
	Presence of Chemical constituents more than permissible limit (e.g. EC, F, As, Fe)	:	As is main problem
	Type of water	:	At Ghaghara edge at Fatehpur & Doharighat block at place Kawalpura, Tal Ratoy, Khiri Kotha, Molanapur, Khaira Dewara, Madhuban, Surajpur, Suggichaura.
12.	**DYNAMIC GROUND WATER RESOURCES (2009)-in HAM**		
	Annual Replenishable Ground Water Resources	:	43090.76
	Gross Annual Ground water Draft	:	31832.89
	Projected Demand for domestic Industrial uses up to	:	6960.11
	Stage of Ground water Development	:	73.8710
13.	**AWARENESS AND TRAINING ACTIVITY**		
	Mass Awareness Programmes organized	:	
	Date	:	28/2/2014
	Place	:	Kusmaur, May.
	No. of participants	:	130
	Water Management Training Programme (Artificial Recharge) organized	:	Nil
	Date		
	Place		
	No. of participants		
14.	**EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING**		
	Projects completed by CGWB (No & Amount spent)	:	Nil

	Projects under technical guidance of CGWB (Numbers)	:	
15.	**GROUND WATER CONTROL AND REGULATION**	:	Nil
	Number of OE Blocks	:	Nil
	No of Critical Blocks	:	Nil
	No of blocks notified	:	
16.	**MAJOR GROUND WATER PROBLEMS AND ISSUES**	:	Arsenics problem in two block Fatehpur & Doharighat. Nature Hazards like flood common in low lying Ghaghara terrace and tones.

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1.0 INTRODUCTION

Mau district was carved out of Azamgarh and lies between $25^0$48'35" and $26^0$17'45" north latitude and $83^0$10'50" and $83^0$49'55" east longitude in surrey of India Toposheet No. 63 O & 63 N. Total geographical area of the district 1713Sq.km. District head quarter is at Mau of having (4/four) number of Tehsil and 9 (Nine) number of block. As per the 2011 census the district has population 1493928 of which 747576 males and 746052 females. The decadal growth is 24.28%. Scheduled caste population is 421680 and scheduled tribe population is 430.

Geographically the area comprise quarter nary alluvium sediments heterogeneous in nature are deposited over the Vindhayan sand stone and shale in varying thickness' the main and major drainage of district is the river Tons and Chhoti Sarju. The Ghaghara river flowing at the northern flank of district. Its tributaries are small and of an insignificant character. There are number of Tals / tanks in the district.

Agriculture is the main source of economy of the district. Both surface and ground water are used for irrigation. The net irrigated area 116833 Ha. and the net area sown 125033 Ha. length of canal in the district 397 km. and the number of government tube well is 298.

Mau district is drained by Ganga river system of which Ghaghara, Tons, Chhoti Sarju are tributaries, Ghaghara enters the district through Dohri Ghat block where as the tones touches at the district in extreme west at Mohamadabad block and flow over a length of 60 km. in district.

The district was covered under ground water resources and potential of Mau district by DR. K.S. Pandey A.A.P.: 2000-2001.

2.0 RAINFALL & CLIMATE

The average annual rain fall in district is 1070 mm. nearly 90% of rain fall received during the month of June to September. The maximum rain fall recorded during month of July and August from south west monsoon. The temperature begins to rise in March and its reaches the peak in the month of May & June when the Mercury touches nearly 45.4^0C. January is the coldest month when the minimum temperature comes down to approximately 5^0C.

The relative humidity is highest during south west monsoon ranging between 83% to 87% with lowest around 32% during peak summer of April.

3.0 GEOMORPHOLOGY & SOIL

3.1 GEOMORPHOLOGY:

The district characterized by various geomorphic units Viz.

(i) Newer Alluvial Plain

(ii) Older Alluvial Plain

(iii) Flood Plain

The master slope of the area is mainly towards north to northeastern side.

Flood Plain – The Ghaghara and tones river channel and its adjacent area forming terrace which are subjected to periodic flooding consisting of sand silt clay mainly on old and new flood plain of river.

Younger Alluvial plain the area occupied by younger alluvium can be delineated all along Ghaghara river and other tributaries streams draining the district. Newer Alluvium known as ‘Khadar’.

Older Alluival Plain - Older Alluvial remnants largely consisting clay, sand with kankar at depth locally known as 'Bangar'.

Other geomorphic unit is the old mender which occur very gently sloping landform formed by the drying up of abandoned channel, meander loops, these cur-linear channels of the old river preserved as a meander scrolls have good prospect of ground water occurrences.

3.2 SOIL:

In Mau district there are three notified type of Soil e.g.

(i) Inccpti Sals

(ii) Arid Sals and

(iii) Enti Sals

(i) Inccpti Sals:

Gray reddish brown soil is the most predominant in the district, there soils are poor in nitrogen, phosphate, potassium and organic matter. This type of soil know as 'Matiyar'.

(ii) Arid Sals:

These soil include black soil and rich in Ca, Mg and also consist of half decomposed organic matter. This type of soil locally known as 'Karail'.

(iii) Enti Sals :

These consist of Alluvial soil occupying the flood plains of major rivers and streams in the district. The older Alluvial soil occurs in the southern parts of river Ghaghara.

3.3 GEOLOGICAL SETUP:

The geological setup of the district comprises quaternary sediment classified into older and newer Alluvial.

The quarternary group of sediments represented by unconsolidated older and younger alluvial. The older alluvium occupies the central part of district on higher ground (upland) and is known as Bhangar.

The older Alluvial comprises of coarse gravel with calcareous nodular. (Kankar), Reh on the ground. Recent alluvium occupies the lower ground consist of thick sequence of clay, silt & sand.

Group		**Member**	**Lithology**
Quaternary	Upper Pleistocene	Newer Alluvium	Clay silt & sand
	Upper middle Pleistocene	Older Alluvium	Brown clay, loamy sand with Kankar

4.0 GROUND WATER SCENARIO

Table-1

WATER LEVEL FLUCTUATION (PRE & POST - MONSOON) FOR THE YEAR 2012

District	MAU			
Sl. No.	Well Name	Pre-Monsoon (mbgl)	Post- Monsoon (mbgl)	Fluctuation (m)
1	Amila	8.57	4.50	4.07
2	Dhorighat	7.10	5.65	1.45
3	Ghinahapur	8.60	4.65	3.95
4	Ghosi	5.02	2.14	2.88
5	Jejawali	5.89	5.55	0.34
6	Kamal Sagar	7.38	5.05	2.33
7	Kapaganj	-	7.75	-
8	Kora-uli	6.60	-	-
9	Paharipur	6.60	-	-

A perusal of the table and depth to water level contour map for the period May 2012 reveals that the water level varies. from 5.02 mbgl (Ghosi) in block Ghosi, 8.57 mbgl in Amila in block Baduraon. Almost all the block covering 100% area in district showing DWL between 5 to 10 mbgl. A perusal of table and depth to water level contour map for the period November 2012 reveals water level become shallower and varies from 2.14 mbgl to 7.75mbgl at Ghosi and Kopaganj block. About 100% of Area the water level is <10 mbgl.

SEASONAL FLUCTUATION:

Water level/table fluctuation in response to recharge to the aquifer and withdrawal from the aquifer. The quantum of fluctuation is a direct function of the above. Recharge takes place mainly during rainy season. The minimum depth to water level in an area is expected sometime at the close of monsoon or in the middle of monsoon period depending upon the intensity and duration of rainfall as well as soil characteristics and maximum depth to water level is expected to be just before the rainfall. The part of the rainfall in the initial period goes

towards meeting the soil moisture deficiency as well as to saturate the Evapotranspiration losses.

ANNUAL SEASONAL FLUCTUATION OF WATER LEVEL:

Annual Seasonal Fluctuation of Water Level has been determined from the Pre-monsoon (May' 2012) and Post-monsoon (Nov' 2012) water level data of Ground water monitoring wells. The fluctuation varies from min 0.34 mbgl to max 4.07 mbgl at Jalawali Fatehpur block and Badraon block.

Long Term Trend of Water Level

Table–2

LONG TERM TREND OF WATER LEVEL OF GROUND WATER MONITORING WELLS FOR TEN YEAR PERIOD 2003-2012.

Sl. No.	Location	Pre Monsoon			Post Monsoon			Annual		
		Date Points	*Rise (m/year)*	*Fall (m/year)*	*Date Points*	*Rise (m/year)*	*Fall (m/year)*	*Date Points*	*Rise (m/year)*	*Fall (m/year)*
1	Dhorighat	10		0.0166	10		0.011	40	0.0182	
2	Jejawali	9		0.0459	10		0.1077	39		0.0363
3	Amila	8		0.3298	10		0.3156	37		0.2871
4	Kamal Sagar	8		0.1961	10		0.1061	36		0.0781
5	Kora-uili	7		0.3208	9		0.1856	31		0.2302
6	Paharipur	7		0.1224	8		0.0137	32		0.0712
7	Ghosi	9		0.1731	10		0.0622	39		0.0724
8	Chiryiakot	2			2			8		
9	Saraiganga Pabi	0			0			0		
10	Kopaganj	2			6		0.5021	13		
11	Indara rly. st.	0			0			0		
12	Ghinahapur	8		0.1113	10		0.1045	37		0.0957
13	Ratanpura	2			2			9		
14	Kopaganj 1	4			5			20		

A perusal of Table show that there is falling trend in all the wells during pre monsoon period. The range of decline is 0.166 mbgl to 0.32 mts/year. Dohari Ghat in block Dohari Ghat and Korauli in Fatehpur block. Almost 80% of wells showing the decline in the range of 10 to 40 cm/year.

POST MONSOON TREND OF WATER LEVEL:

A perusal of Table show the there is falling trend during post monsoon period in all the wells. the range of decline. 0.011 at Dohri Ghat in block Dohari Ghat 0.31 mts at Amila block Badraon.

4.2 GROUND WATER RESOURCES:

The dynamic ground water presented in Table-3. The net annual ground water availability ranges from 3687.33 ham. to 5951.03 ham, minimum in Pardaha block and maximum in Ranipur block. Net ground water availability for future irrigation development is minimum is 537.69 ham, in Doharighat block and maximum in Fatehpur Madon block 1951.27 ham, stage of ground water development in district 57.43% in block Fatehpur Madon and maximum 83.40 in Badraon block stage of ground water development in the district as a whole is 73.87% of all the block in the district mostly are in 'safe' categories (Table-3).

4.3 GROUND WATER QUALITY:

Ground water in shallow aquifer, in general is colourless, and slightly alkaline in nature. The specific conductance (EC) ranges from 600 micro mhos/cm at 25^0C to 1830 micromhos/cm at 25^0C where as EC value of ground water from deeper aquifer range from 810 to 830 micromhos/cm at 25^0C Fluoride concentration more than 2 mg/lit occurring in the ground water at Bangali Pinjara, Daracra the concentration of Arsenic limit for drinking water purpose is 0.05 mg/liter. But the concentration of Arsenic in the Mau district at different place in block Doharighat at Fatehpur have traced. The concentration given in following table.

Table-3

DYNAMIC GROUND WATER RESOURCES OF MAU DISTRICT UTTAR PRADESH AS ON 31.3.2009

SI. No.	Assessment Units - Blocks/ District	Command/ Non Command/ Total	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross Ground Water Draft for Domestic & Industria1 Water Supply	Existing Gross Ground Water Draft for AH uses (11+12)	Provision for Domestic and Industrial Requirement Supply for 2025	Net Ground Water Availability for future Irrigation Development (10-11-14)	Stage of Ground Water Development (13/10)* 100 (%)	Category Safe, Semi, Critical, Critical over exploited
1	*2*	*3*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
	DISTRICT - MAUNATH BHANJAN									
1	BADRAON	Command	-		-	-	-	-	-	Safe
		Non-Command	-		-	-	-	-	-	
		Total	4925.32	3680.81	426.94	4107.75	756.02	488.49	83.40	
2	DOHARI GHAT	Command	-		-	-	-	-	-	Safe
		Non-Command	-		-	-	-	-	-	
		Total	4255.02	3080.68	398.51	3479.19	636.65	537.69	81.77	
3	FATEHPUR MADOON	Command	-		-	-	-	-	-	Safe
		Non-Command	-		-	-	-	-	-	
		Total	5513.13	2658.85	507.12	3165.97	903.01	1951.27	57.43	
4	GHOSI	Command	-		-	-	-	-	-	Safe
		Non-Command	-		-	-	-	-	-	
		Total	4383.42	2820.52	367.15	3187.67	693.00	869.90	72.72	
5	KOPAGANJ	Command	-		-	-	-	-	-	Safe
		Non-Command	-		-	-	-	-	-	
		Total	5477.41	3108.68	494.56	3603.24	940.01	1128.72	69.60	
6	MOHAMMADABAD	Command	-		-	-	-	-	-	Safe
		Non-Command	-		-	-	-	-	-	
		Total	3939.80	2296.46	487.53	2783.99	869.51	773.83	70.66	
7	PARDAHA	Command	-		-	-	-	-	-	Safe
		Non-Command	-		-	-	-	-	-	
		Total	3687.33	2025.56	292.44	2318.00	308.49	1353.28	62.86	

SI. No.	Assessment Units - Blocks/ District	Command/ Non Command/ Total	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross Ground Water Draft for Domestic & Industria1 Water Supply	Existing Gross Ground Water Draft for AH uses (11+12)	Provision for Domestic and Industrial Requirement Supply for 2025	Net Ground Water Availability for future Irrigation Development (10-11-14)	Stage of Ground Water Development (13/10)* 100 (%)	Category Safe, Semi, Critical, Critical over exploited
1	*2*	*3*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*
8	RANI PUR	Command	-		-	-	-	-	-	Safe
		Non-Command	-		-	-	-	-	-	
		Total	5951.03	4095.80	527.55	4623.35	965.53	889.70	77.69	
9	RATANPURA	Command	-		-	-	-	-	-	Safe
		Non-Command	-		-	-	-	-	-	
		Total	5258.30	4121.20	442.53	4563.73	887.89	249.21	86.79	
			43090.76	**27888.56**	**3944.33**	**31832.89**	**6960.11**	**8242.09**	**73.87**	

Location	Block	Ar (ppb)
Kawalpura	Fatehpur	20.93
Tal Ratoy	Fatehpur	16.25
Khinkota	Fatehpur	11.57
Molaanapur	Fatehpur	25.61
Khaira Dewara	Fatehpur	45.66
Dharampur	Fatehpur	49.67
Madhuban	Fatehpur	47.00
Surajpur	Doharighat	11.57

4.4 STATUS OF GROUND WATER DEVELOPMENT:

Development of ground water in district is mainly through dugwells, handpumps, India Mark II and tubewells. The gross ground water draft for irrigation in the district as on 31.3.2009 is 27888.56 where as the ground water draft for domestic and industrial is 3944.33 ham. Hence the existing gross ground water draft for all uses in the district 31832.89, net ground water availability for future irrigation development in the district 8242.09. A quantum of 6960.11 has been allocated for domestic and industrial requirement for next 25 year (2033), net available ground water availability in the district is 42090.70 ha. The stage of ground water development for the district is 73.878 of all block in district fall in safe category.

Water Supply Based on Ground Water Sources:

U.P. Jal Nigam is the government agency responsible for providing drinking water supplies to the urban and rural population in the district. The water requirements of the habitants are not with through surface water source through various mini water supply schemes or integrate water supply schemes utilizing the available water resources.

There are many shallow and deep tubewells through which water is supplied through pipe lines/taps in the urban areas of district.

In the rural areas are the districts there are 1612 number of villages is which water is supplied by Tap / Handpumps India Mark-II benefitting 1493627 population as per data of 2009-10.

5.0 GROUND WATER MANAGEMENT STRATEGY

5.1 Ground Water Development:

In these blocks there is scope of ground water development with proper movement and control where developments 70% more.

In the blocks of high level of ground water development (70%) covering major parts of the district it is necessary to exercise caution while planning further development of available ground water resources in the district.

In the area of low ground water development the well suitable for extraction of ground water suitability of rigs depth ranges and discharge in the district can be summarized as follows:

Sl. No.	Well Feasible	Rig Suitable	Depth of Well	Discharge
1.	Dug well/ Handpump	Manual Hand/ Boring set	20-50	50-100
2.	Shallow Tubewell	Rotary Rigs	50-150	1500-2500
3.	Deep Tubewell	Combination Rigs	150-500	2000-4500

5.2 Water Conservation Artificial Recharge:

In the area where the post-monsoon depth to water level is more than 8 mbgl and rate of decline during postmonsoon 72 cm/year there is immediate need to adopt techniques of water conservation and Artificial Recharge.

In such urban area rooftop rain water harvesting should be made mandatory for government building, school etc. Recharge pit / shafts / trenches of suitable design are ideal scheme for rain water harvesting in such area. Central Ground Water Board provides free technical guidance for implementation of rooftop rain water harvesting schemes. In rural area check dams, gully plug should be constructed as per local hydrogeological condition to recharge the area. Revival, Renovation and Restoration of ponds should be encouraged to arrest the rain water & minimize the decline of water level.

6.0 GROUND WATER RELATED ISSUES AND PROBLEMS

The trend analysis of ground water level data indicate fall both in pre and postmonsoon period in the major part of district. This will impact in.

1. Further decline of ground water level
2. Drying up of dug wells / shallow wells.
3. Decrease in yield of tubewells and
4. Increased expenditure and power consumption for withdrawing water from progressively deeper depth.

7.0 AWARENESS & TRAINING ACTIVITY

Central Ground Water Board has conducted mass awareness programme and water management tier-III training programme at DSR, Kusmaur of Paradaha block in Mau district.

8.0 AREAS NOTIFIED BY CENTRAL GROUND WATER AUTHORITY

Central Ground Water Authority has not notified any area / block in the district.

9.0 RECOMMENDATIONS

1. As level of development in many blocks of the district is high, further development of ground water should be restricted in these areas, especially Doharighat, Badrao and Ratanpura block which falls in over exploited category.
2. Artificial recharge technique should be adopted in the district due to occurrence of deep water condition to restrict / minimize the decline of water level, in urban areas, rooftop rain water harvesting structures such as

recharges pits / shafts / trenches of suitable design, should be made mandatory for all government buildings, schools etc. having large roof top area.

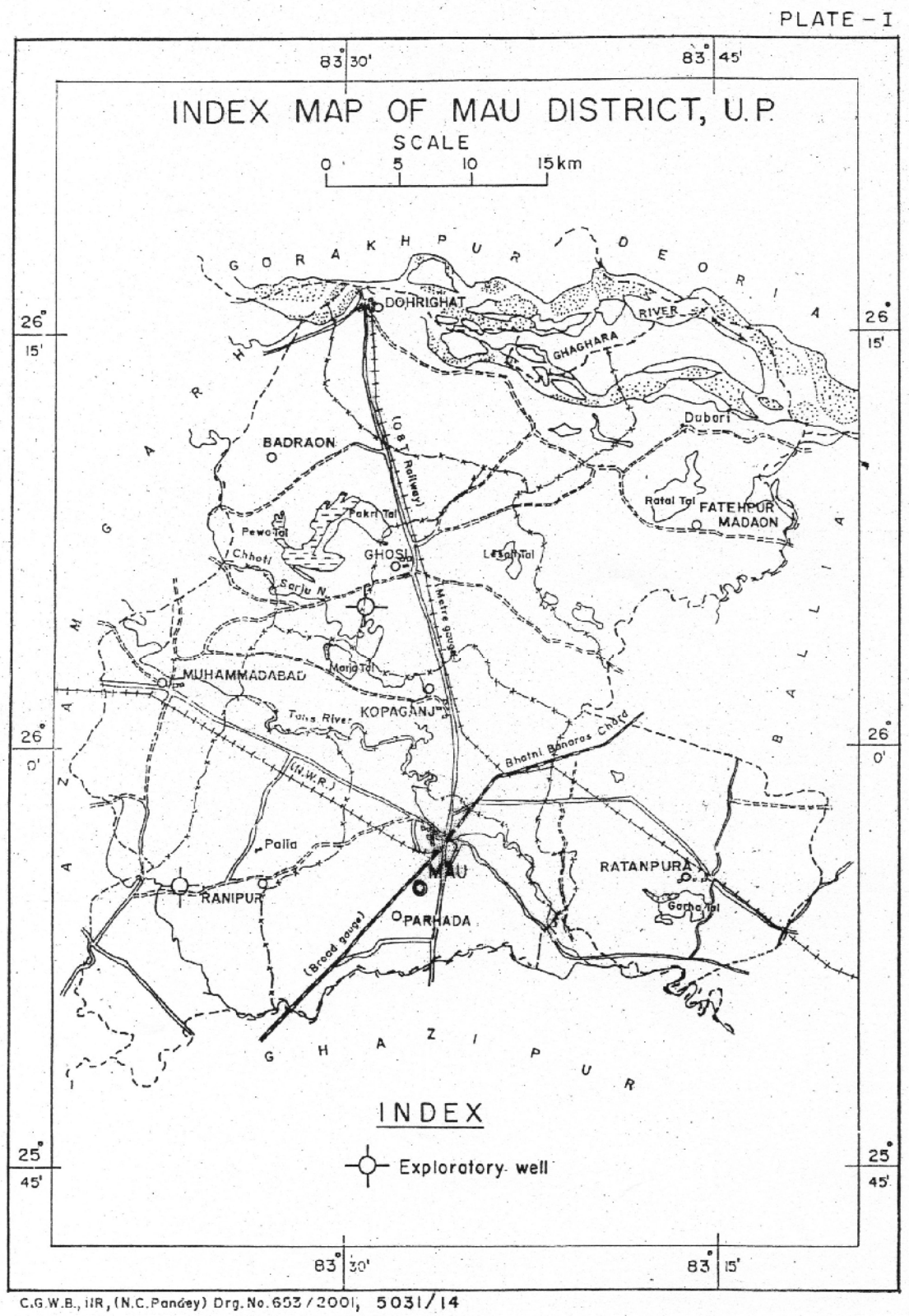
3. All the blocks are exhibiting declining trends in their ground water level hence proper vigilance and regular monitoring of water levels at close intervals through suitably located structure is essential.
4. To minimize the over stress on Aquifer Group-I, it is advisable to plan heavy duty water supply tubewell for further all uses by exploiting the ground water from the deeper aquifer.
5. Efforts should be made reclaim the barren land resulted due to saline efflorescence for agriculture purpose. The area of shallow ravines is reclaimable for cropping.
6. Excessive use of fertilizers by the farmers should be discouraged particularly in blocks showing high nitrate concentration.

REFERENCE

1. Statistical Data available in the web site : www.upgov.nic.in

2. Dr. K.S. Pandey 2000-01 : Ground Water Resource and Potential Study of Mau District, U.P.

PLATE – I



C.G.W.B., UR, (N.C.Pandey) Drg. No. 653/2001, 5031/14

PLATE-II

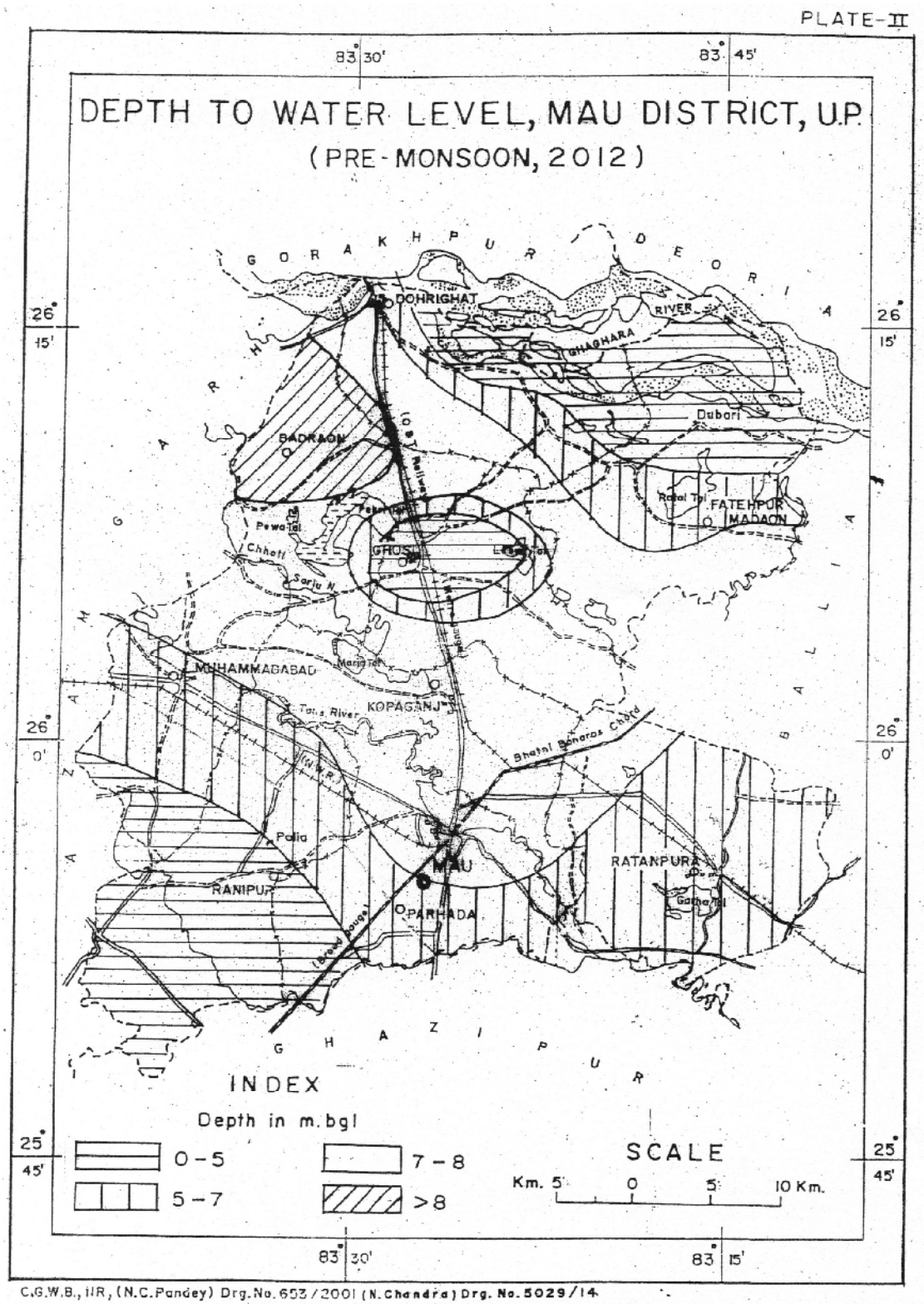


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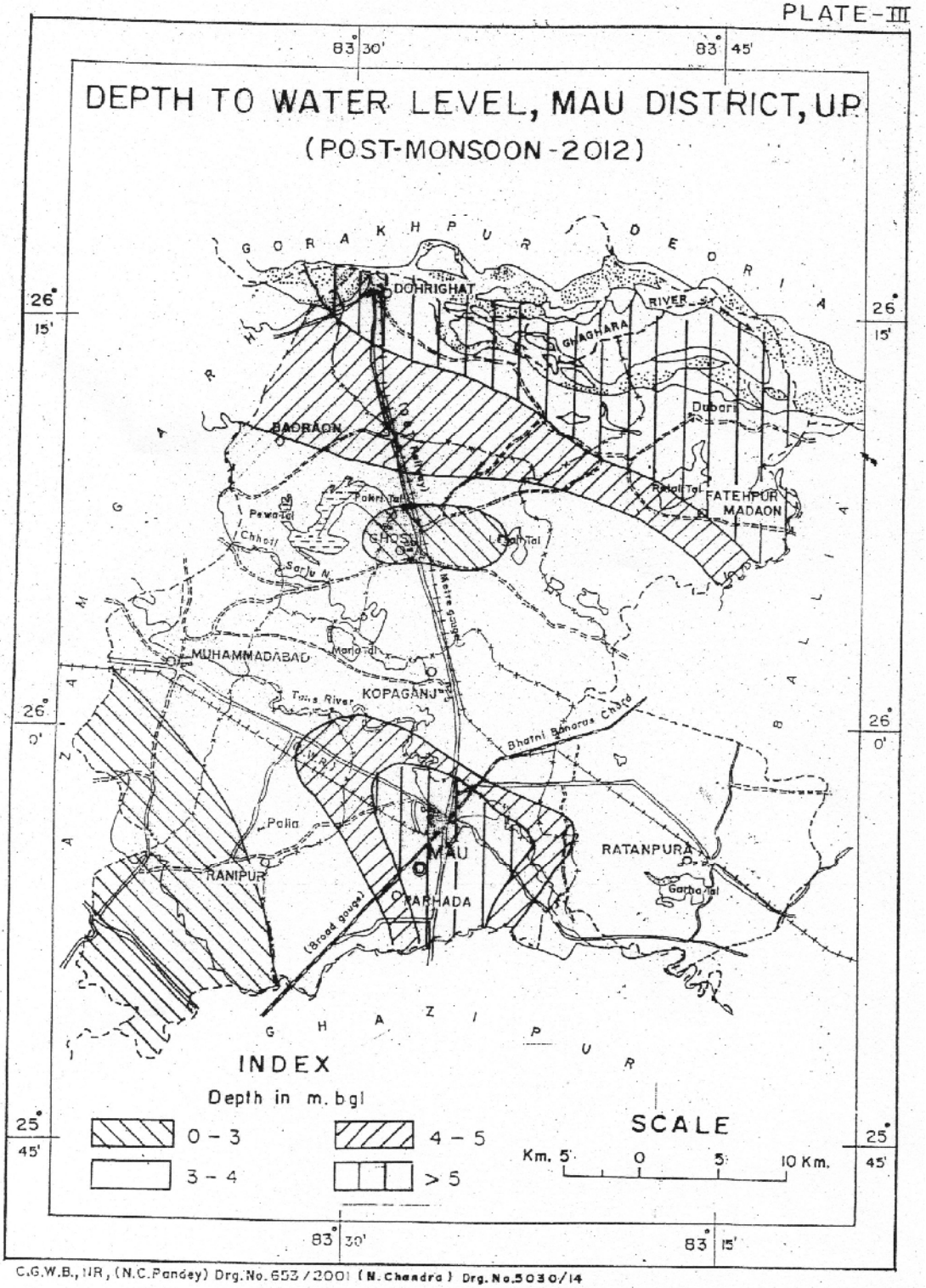
PLATE-III



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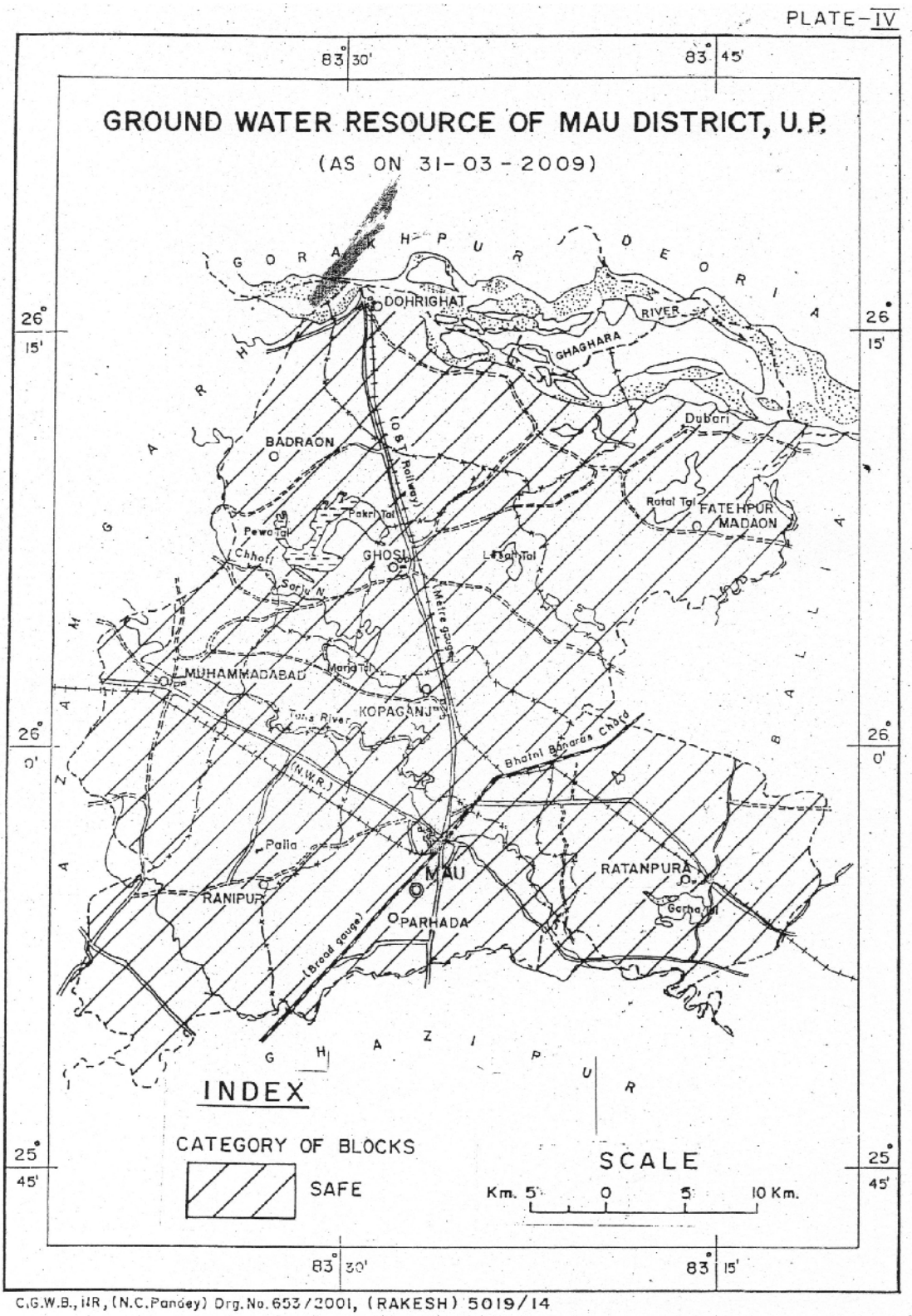
PLATE–IV



C.G.W.B., NR, (N.C.Pandey) Drg.No.653/2001, (RAKESH) 5019/14