

**DISTRICT GROUND WATER BROCHURE OF  
FARRUKHABAD DISTRICT, U.P.**

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

By

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**DISTRICT GROUND WATER BROCHURE OF  
FARRUKHABAD DISTRICT, UTTAR PRADESH.**

1.	<b>GENERAL INFORMATION</b>	
	Geographical Area (Sq km)	: 2199
	Administrative Divisions (As on 31.3.2011)	
	Number of Tehsils/Blocks	: Tehsil 3/Block 7
	Number of Panchayat/Villages	: Panchayat 512/ Villages 1007
	Population (As on 2011 Census)	: 18.87 Lakhs
	Average Annual Rainfall (mm)	: 810
2.	<b>GEOMORPHOLOGY</b>	
	Major Physiographic units	: Ganga Alluvial Plain which is sub-divided in Older and Newer Alluvial Plains.
	Major Drainages	: Ganga and Ramganga rivers
3.	<b>LAND USE (Sq Km)</b>	
	Forest area	: 5.18
	Net area sown	: 1486.30
	Gross area sown	: 2083.75
4.	<b>MAJOR SOIL TYPES</b>	: Sandy loam and clayey
5.	Area under principal crops (As on 2010-11)	: 2083.75
6.	<b>IRRIGATION BY DIFFERENT SOURCES (Number of structures/Area (Sq Km)) 2010-11</b>	
	Dugwells	29/Nil
	Tubewells / Borewells	: 32823 / 1345.65 Sq Km
	Canal	: 144 km. length/28.62 sq.km.

	Other sources	: Nil
	Net Irrigated area (year 2010-11)	: 1378.00 sq. km.
	Gross Irrigated area (year2010-11)	: 1774.76 sq. km.
7.	NUMBERS OF GROUND WATER MONITORING WELLS OF CGWB (As on 31-3-2012)	
	No of Dug Wells	: 4
	No of Piezometers	: 4
8.	PREDOMINANT GEOLOGICAL FORMATIONS	: Quaternary Alluvium consisting of mainly sands of various grades, silt, clay and kankar.
9.	HYDROGEOLOGY AND AQUIFER GROUP	: Multiple aquifer groups (three) upto 450 m. depth.
	Major Water bearing formation	: Gravel and Sand
	Pre-monsoon Depth to water level (m. bgl) during 2012	: 4.81 to 18.59
	Post-monsoon Depth to water level (m. bgl) during 2012	: 4.85 to 17.40
	Long term water level trend in 10 yrs (2003- 2012)	: Pre-Monsoon: Fall 0.0033 to 0.0695 m/year Post- Monsoon: Fall 0.0202 to 0.3030 m/year
10	GROUND WATER EXPLORATION BY CGWB	
	No of wells drilled (EW, OW, PZ, SH, Total)	: 5 (EW)
	Depth Range (mbgl)	: 120 – 452
	Discharge (lpm)	: 2000 – 3300
	Storativity (S)	: $1.4 \times 10^{-4}$
	Transmissivity ( $m^2/day$ )	: 1583
11.	GROUND WATER QUALITY	

	Presence of Chemical constituents more than permissible limit (e.g. EC, Cl, F, As, Fe)	:	All the constituents are within normal range, except in Rajepur where the Fluoride is beyond the maximum permissible limit viz. F- 3.1 mg/l
	Type of Water	:	Good
12.	<b>DYNAMIC GROUND WATER RESOURCES (2009) (MCM)</b>		
	Annual Replenishable Ground Water Resources	:	561.98
	Gross Annual Ground Water Draft	:	395.03
	Projected Demand for Domestic / Industrial Uses upto 2025	:	42.25
	Stage of Ground Water Development	:	(70.29%) All blocks are under "Safe" category
13.	<b>AWARENESS AND TRAINING ACTIVITY</b>		
	Mass Awareness Programmes organized	:	None
	Water Management Training Programme organized	:	None
14.	<b>EFFORTS OF ARTIFICIAL RECHARGE AND RAINWATER HARVESTING</b>		
	Projects completed by CGWB (No & Amount spent)	:	Nil
	Projects under technical guidance of CGWB (Numbers)	:	Nil
15.	<b>GROUND WATER CONTROL AND REGULATION</b>		
	Number Of OE Blocks	:	Nil
	No of Critical Blocks	:	Nil
	No of blocks notified	:	Nil
16.	<b>MAJOR GROUND WATER PROBLEMS AND ISSUES</b>		
		:	The construction cost of tube wells may increase in the areas where the ground water levels have been gradually depleted to a great extent due to over exploitation

# **DISTRICT GROUND WATER BROCHURE OF FARRUKHABAD DISTRICT, U.P.**

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

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## **1.0 INTRODUCTION**

Farrukhabad district is located in the Western part of Uttar Pradesh and lies between latitudes 26°46’00” and 27°43’00” N and longitudes 79°07’30” and 80°02’00” East. It falls in survey of India Toposheet No. 54M and 54N. Total geographical areas of the district is 2199.11 sq.km.

The district headquarter is at Farrukhabad and there are three number of tehsils namely Farrukhabad, Kaimganj and Amritpur. There are seven number of blocks in the district. As per census 2011 district has population of 18.87 Lacs of which 53.36% is males and 46.63% females. Density of population is 858 person/Sq.km.

Physiographically district constitutes the central part of Indo Gangetic alluvial plain. The Rajepur block is located between Ganga and Ramganga rivers. Main source of irrigation in the district is through Ground water and canal. Total length of canal is 144 kms. by which 2862 hectare area is irrigated. There are 285 no. of government tubewells by which 4874 hectare area is irrigated. Irrigation by private tubewells is 129691 hectare. Hence 97.92 % area is irrigated by ground water. Net sown area is 148630 hectare and net irrigated area is 137800 hectares. Net irrigated area to net sown area is 92.71 %. There are 883 India Mark II handpumps for providing safe drinking water to 1228860 persons.

Under the ground water exploration programme of CGWB, five deep tubewells and two shallow tubewells were constructed to delineate aquifer system and their hydrogeological characteristics in the area.

## **2.0 CLIMATE AND RAINFALL**

The average annual rainfall in the district is 810 mm. The climate is sub-tropical humid and it is characterised by a hot dry summer and a pleasant cold season. About 88% of rainfall takes place from June to September. During the monsoon surplus water is available for deep percolation to ground water.

There is a meteorological observatory at Kaimganj, the record of which may be taken as representative meteorological condition. January is the coldest month. The mean daily minimum temperature is about 8<sup>0</sup>C and mean maximum temperature is about 23<sup>0</sup>C. May is the hottest month with mean daily maximum temperature 41<sup>0</sup>C and mean daily minimum temperature of 26<sup>0</sup>C. With the onset of the monsoon, day temperature dropdown appreciably. The mean monthly maximum temperature is 32.2<sup>0</sup>C and mean monthly minimum temperature is 19.5<sup>0</sup>C.

In the South-West monsoon season the humidity is high and after withdrawal of monsoon humidity decreases steadily. The mean monthly morning relative humidity is 65% and mean monthly evening relative humidity is 47%.

Winds are generally light. The wind velocity is 9.6 k.m.p.h. The potential evapotranspiration is 1464.5 mm.

## **3.0 GEOMORPHOLOGY**

Based on Geomorphological map prepared by Remote Sensing Application Centre, the following geomorphic units have been identified.

1. Meander Flood Plain
2. Newer Alluvial Plain or Lowland
3. Older Alluvial Plain or Upland

### **3.1 MEANDER FLOOD PLAIN:**

It is a flat low lying, poorly drained area of little or no relief feature. Confined mainly along the river channels, spreading few meters to a kilometers in width. The sediments of this area are comprised of coarse to fine sand, silt, clay and at places gravels are also found. The area is characterised by the typical geomorphic features

viz. point bars, channel bars resulted from the meandering and braiding of rivers. Channel bars are mainly composed of coarse sand. Point bars are composed of fine to medium sand deposited in parabolic shape in concave turning of meandering rivers.

### **3.2 NEWER ALLUVIAL PLAINS:**

These are flat to gently sloping & slightly undulating terrain formed by the extensive deposition of sediments by the river Ganga. It comprises of unconsolidated alluvial sediments of varying lithology.

### **3.3 OLDER ALLUVIAL PLAIN OR UPLAND:**

The older alluvial plain covers about 80% of the total area of the district and it is sub divided into the following four sections by the river Bagar, Kali and Isan that traversing from west to east.

1. Doab, between Ganga cliff and Bagar rivers occupying the northern most part of the district.
2. Area between Bagar and Kali rivers bounded eastward by Ganga.
3. Area between Kali and Isan rivers.
4. Area lying south of Isan river.

The sediments of the older alluvial plain are mainly comprised of coarse to fine sand, silt and clay. Abandoned channels, meander lakes, marshy and swampy lands are common and frequent in this unit.

### **3.4 DRAINAGE:**

The drainage system of the area is controlled by river Ganga and its tributaries like Ramganga, Son, Kali, Isan, Burhiganga, Bagar, Pandu and Arind. The first four tributaries are perennial and others are ephemeral.



## **4.0 SOILS**

The soils of the district area typical of those found in Ganga alluvial plain and can be classified into the following three main traditional classes on the basis of their colour, texture, pH and drainage.

- (a) Dumat or loam
- (b) Matiyar or clayey
- (c) Bhur or sandy

Although the above nomenclature is employed throughout the district but they differ greatly in their characters in upland and lowland systems. In uplands each class has the same character as elsewhere in Ganga-Yamuna doab i.e. Dumat is a fertile loam which is safe to touch when powdered, Bhur is sandy and rough to touch and Matiyar is a shift clay which splits into fissures and becomes as hard as baked brick on drying.

## **5.0 GROUND WATER SCENARIO**

### **5.1 HYDROGEOLOGY**

The Farrukhabad district occupies a small part of Indo-Gangetic alluvial plain in Ganga-Yamuna Doab. The area is underlain by quaternary sediments comprising mainly a sequence of clay, silty clay, fine to coarse sand occasionally mixed with kankars and gravels in varying proportions and grades.

The Central Ground Water Board, under its exploratory drilling programme, has drilled 5 numbers of boreholes in the district at Khalwara, Sahapur, Aseh (Nagla Talpur), Rasoolpur and Tahpur. The perusal of sub-surface lithological logs, it reveals that four distinct groups of granular zones occur down to the depth of 450 mbgl. ,separated by poorly permeable / impermeable horizons. Each group of granular zone represent a separate sedimentological environment or cycle. Based on borehole data four type of aquifer systems exists in Farrukhabad district. The depth ranges area as follows:

S. No.	Aquifer	Depth Range in mbgl	Granular Materials
1.	I <sup>st</sup>	27.00 – 100.00	Fine to medium sand, kankar and sometimes coarse sand & gravels.
2.	II <sup>nd</sup>	140.00 – 200.00	Composed of fine to medium sand.
3.	III <sup>rd</sup>	240.00 - 310.00	Fine grained sand and clay.
4.	IV <sup>th</sup>	405.00 – 440.00	Fine grained sand.

Ground water occurs under unconfined to semi-confined conditions.

## 5.2 DEPTH TO WATER LEVEL:

As per depth to water level data of ground water monitoring stations of the year 2012, Pre monsoon water level varies from 4.81 to 18.59 mbgl. Table-I In postmonsoon period depth to water varies from 4.85 to 17.40 mbgl. Seasonal water level fluctuation varies from 0.86 to 1.02 m.

### WATER LEVEL FLUCTUATION (PRE AND POST) FOR THE YEAR 2012.

Table-I

Sl. No.	Well Name	Premonsoon Water Level (mbgl)	Postmonsoon Water Level (mbgl)	Fluctuation (m)
1.	Barhpur Pz	18.59	-	-
2.	Kaimganj2	6.53	5.67	0.86
3.	Kampil	9.40	9.63	-0.23
4.	Dabhau Pz	9.76	8.86	0.9
5.	Fatehgarh Pz	13.72	12.70	1.02
6.	Shukrullahpur Pz	10.78	10.44	0.34
7.	Mohanpur pz	17.84	17.40	0.44
8.	Rajepur	4.81	4.85	-0.04

### **5.3 LONG TERM WATER LEVEL TREND:**

The long term water level trend for ten years (2003-2012) of 3 ground water monitoring wells have shown an average falling trend from 0.0033 to 0.0695 m/year during Pre-Monsoon and 0.0202 to 0.3030 m/year during Post Monsoon season. wells have declining trend i.e. Kampil (0.0695 m/year), Kaimganj 2 (0.0362 m/year) and Rajepur (0.0033 m/year) during Pre-monsoon season and these 3 monitoring wells i.e. Kampil (0.1194 m/year), Kaimganj2 (0.3030 m/year) and Rajepur (0.0202 m/year) have also decline trend during Post Monsoon. These wells showing annual fall of ground water i.e. Kampil (0.1034 m/year) , Kaimganj2 (0.02026) and Rajepur (0.0060 m/year) . (Annexure-I)

### **5.4 GROUND WATER RESOURCES:**

As per the report on Dynamic Ground Water Resources of Uttar Pradesh as on 31.3.2009, the Net annual ground water availability of the district is 56197.55 ham. The gross ground water draft for all uses is 39502.65 ham. The stage of ground water development is 70.29%. As per the estimates all blocks of the district fall under 'Safe' category of ground water development. (Annexure-II).

**TREND OF WATER LEVEL – ALL**

From Year 2003 to Year 2012

State : Uttar Pradesh

District: Farrukhabad

Sl. No.	Location	Premonsoon			Post			Annual		
		<i>Data points</i>	<i>Rise (m/year)</i>	<i>Fall (m/year)</i>	<i>Data points</i>	<i>Rise (m/year)</i>	<i>Fall (m/year)</i>	<i>Data points</i>	<i>Rise (m/year)</i>	<i>Fall (m/year)</i>
1.	Rajepur	10		0.0033	10		0.0202	39		0.0060
2.	Kampil	9		0.0695	10		0.1194	37		0.1034
3.	Kaimganj2	6		0.0362	8		0.3030	58		0.2026

**ASSESSMENT OF DYNAMIC GROUND WATER RESOURCES OF THE FARRUKHABAD DISTRICT,  
UTTAR PRADESH . (As on 31.3.2009)**

Annexure -II

Sl. No.	Assessment Units Blocks/District	Net Annual Ground Water Availability	Existing Gross Ground Water Draft for Irrigation	Existing Gross Ground Water Draft for Domestic & Industrial Water Supply	Existing Gross Ground Water Draft for All 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
<i>1</i>	<i>2</i>	<i>10</i>	<i>11</i>	<i>12</i>	<i>13</i>	<i>14</i>	<i>15</i>	<i>16</i>	<i>17</i>
1.	Barhpur	3293.10	2505.45	377.47	2882.92	617.67	169.98	87.54	Safe
2.	Kamalganj	7843.05	4857.88	593.88	5451.76	805.62	2179.55	69.51	Safe
3.	Kayamganj	9645.33	7104.68	473.13	7577.81	639.25	1901.40	78.56	Safe
4.	Mohammadabad	10275.44	6675.86	495.41	7171.27	564.18	3035.40	69.79	Safe
5.	Nawabganj	7490.30	4943.00	359.60	5302.60	499.64	2047.67	70.79	Safe
6.	Rajepur	8053.01	3121.06	390.37	3511.43	544.71	4387.24	43.60	Safe
7.	Samsabad	9597.32	7190.30	414.56	7604.86	553.89	1853.13	79.24	Safe
	<b>Total</b>	<b>56197.55</b>	<b>36398.23</b>	<b>3104.42</b>	<b>39502.65</b>	<b>4224.96</b>	<b>15574.35</b>	<b>70.29</b>	

## 5.5 GROUND WATER QUALITY:

The mineralization of ground water depends upon lithology, texture and nature of soil and hydrogeological property of zone through which water moves. The water samples collected from ground water monitoring wells during May 2012 from NHS were analysed in chemical laboratory, Central Ground Water Board, Northern Region, Lucknow. The major constituents are within permissible limits as per drinking water norms except for nitrate at Kamalganj (160 mg/l) and Fluoride at Rajepur(3.1mg/l). The electrical conductivity varies from 460 to 1480 micro mhos/cm.

Qualitatively, the ground water in I<sup>st</sup> aquifer group (2 and 20 m), III<sup>rd</sup> aquifer group (240 and 310 m) and IV<sup>th</sup> aquifer group (405 and 440 meters) is generally fresh and suitable for domestic and irrigation uses. The high sodium content at Kamalganj 161 mg/l and Rajepur 299 mg/l requires proper leaching for irrigation use and suitable for general domestic use.

Chemical analysis results of ground water monitoring wells for the year 2012 of Farrukhabad district, U.P. are as follows :

Location	E.C. in micromhos/cm at 25°C	pH	Chemical Constituents											
			CO <sub>3</sub>	HCO <sub>3</sub>	Cl	NO <sub>3</sub>	SO <sub>4</sub>	F	Ca	Mg	TH	Na	K	PO <sub>4</sub>
Bharhpur	810	7.8	nd	378	43	18	nd	0.58	48	41	290	46	3.5	0
Kamalganj	1460	7.8	nd	329	192	160	19	0.16	108	19	350	161	1.5	0
Kaimganj	600	7.8	nd	293	21	2.5	nd	0.64	40	24	200	38	3.5	0
Muhammadabad	1060	7.8	nd	403	99	33	nd	0.61	76	51	400	51	3.1	0
Nawabganj	460	7.8	nd	226	7.1	5.6	nd	0.31	16	27	150	30	4.3	0
Rajepur	1480	7.8	Nd	549	43	0.6	110	3.1	16	7.3	70	299	1.7	0
Shamsabad	610	7.8	nd	244	43	15	nd	0.32	40	27	210	35	4.3	0

## **5.6 STATUS OF GROUND WATER DEVELOPMENT:**

In all blocks of the district ground water development takes place through dugwells, borewells and State tubewells. The wells generally meet out the domestic requirements. There are 27870 diesel pumpsets used in borewells for irrigation. Maximum numbers of diesel pumpsets are in Shamsabad block i.e. 6173 and minimum are in Barhpur block i.e. 1987. Maximum number of electric pumpsets are in Kamalganj block i.e. 1418 and minimum are in Rajepur block i.e. 59. Maximum number of state tubewells are in Mohammadabad block i.e. 99 and minimum numbers are in Rajepur block i.e. 2. A state tube well can irrigate 1 to 1.5 hectare land. In the four blocks namely Rajepur, Barhpur, Mohammadabad and Kamalganj ground water is the only source of irrigation since the area is devoid of canal network system. Maximum area irrigated by state tubewells is in Muhammadabad block viz 3093 hectare and minimum is in Rajepur i.e. 20 hectare. Maximum area is irrigated through canal is in Nawabganj block i.e. 1423 hectare and minimum in Shamsabad block i.e. 412 hectare. Under water supply by taps/ handpump India Mark II, 883 numbers have been constructed for drinking water.

## **6.0 GROUND WATER MANAGEMENT STRATEGY**

### **6.1 GROUND WATER DEVELOPMENT:**

The stage of ground water development in the district is 70.29%. The maximum stage of ground water development is in Barhpur block i.e. 87.54% and minimum in Rajepur block i.e. 43.60%. Other Five blocks have the stage of ground water development i.e. Samsabad 79.24%, Kaimganj 78.56%, Nawabganj 70.79%, Mohamdabad 69.79% and Kamalganj 69.51%. Therefore all the 7 blocks are in safe category. So that all blocks having good scope to further ground water development through shallow and moderately deep tubewells. (Annexure – II).

## **6.2 WATER CONSERVATION STRUCTURE AND ARTIFICIAL RECHARGE:**

As the district lies in interfluvium of Ganga and Ramganga rivers with thick sand cover on top, recharge takes place naturally from return flow from irrigation of Kanpur branch of lower Ganga canal and also by flood. Artificial recharge structure may be constructed in the area where water levels are more than 10.0 mbgl e.g. Nawabganj, Muhammadabad and Kamalganj blocks area. The annual long term water level trend is also declining i.e. Kaimganj (0.2026 m/year), Kampil (0.1034 m/year) and Rajepur (0.006 m/year). Hence the artificial recharge scheme may be taken up in Kaimganj, Kampil and Rajepur blocks to check the declining water level trend. Conjunctive use of ground water with surface water may be helpful in dealing with this problems.

## **7.0 GROUND WATER RELATED ISSUES AND PROBLEMS**

### **7.1 WATER LOGGED AREAS:**

During the monsoon season, same areas in the blocks e.g. Kaimganj, Shamsabad, Barhpur and Kamalganj have affected with flood water of Ganga river. The Rajepur block area where the water level is less than 5.0 mbgl is highly affected with flood water of Ganga and Ramganga rivers.

### **7.2 WATER QUALITY PROBLEMS:**

As per the chemical analysis result of ground water monitoring wells for the year 2012. There is no problem in ground water quality. All the constituents are in normal range. Only the E.C. of ground water in Rajepur and Kamalganj exceeds the permissible limit. Average range of E.C. is 460 to 1480 (Rajepur) micromhos/cm at 25°C. Fluoride is also more than permissible limit in Rajepur (3.1 mg/l).

### **7.3 DRILLING PROBLEMS:**

In the district 4 numbers of exploratory tubewells have been constructed by CGWB, NR, Lucknow down to depth of 450.00 mbgl. But there was no caving problems due to the sand mixed with clay and a few kankar and gravels, and no occurrence of finer silt.



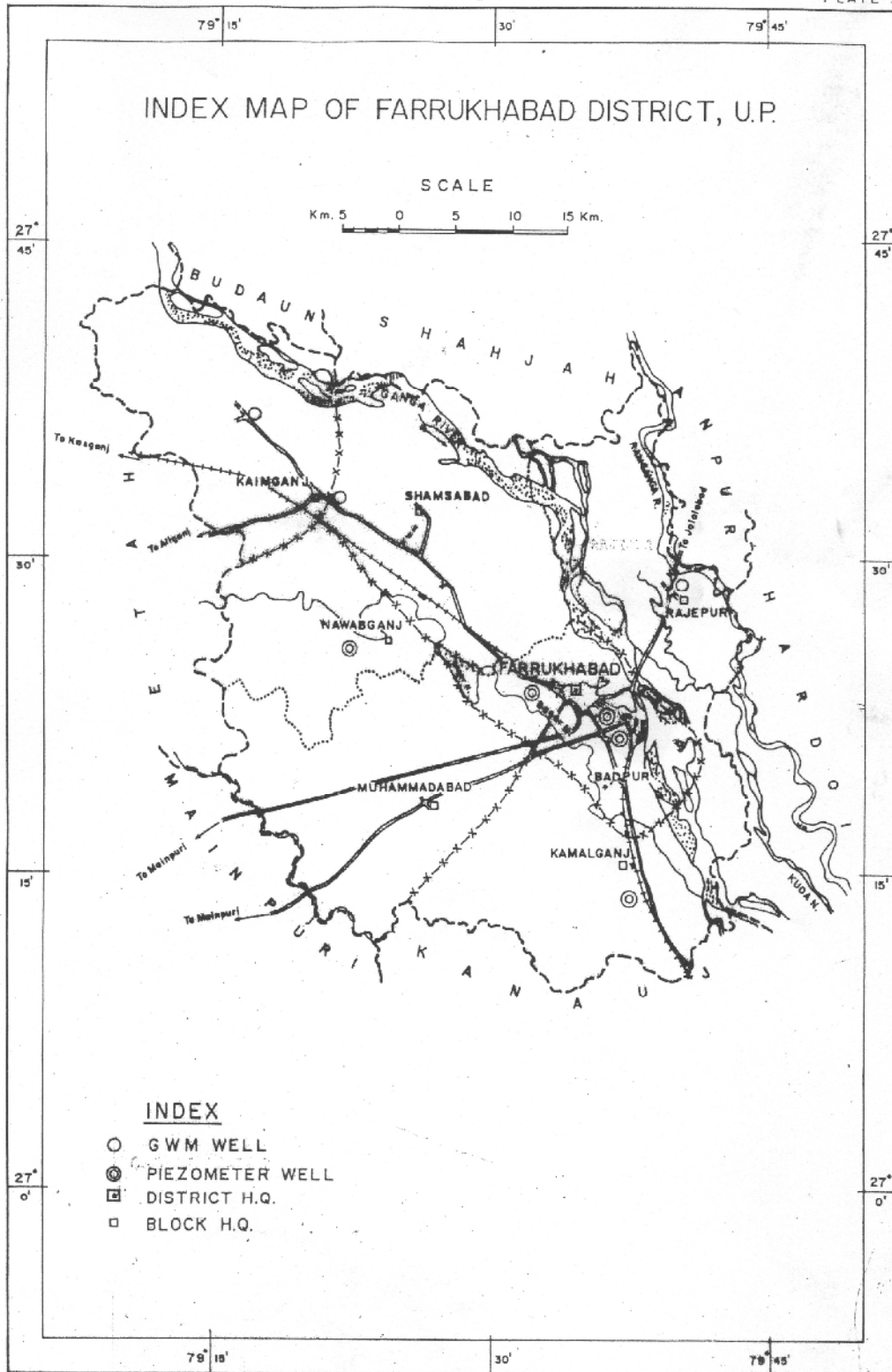
#### **7.4 GROUND WATER CONTROL AND REGULATION:**

Since the stage of ground water development in all seven blocks is less than 90%, and there is no significant fall in long term water level during pre and post monsoon season, and all blocks are falling under safe category, hence none of these blocks comes under notified area.

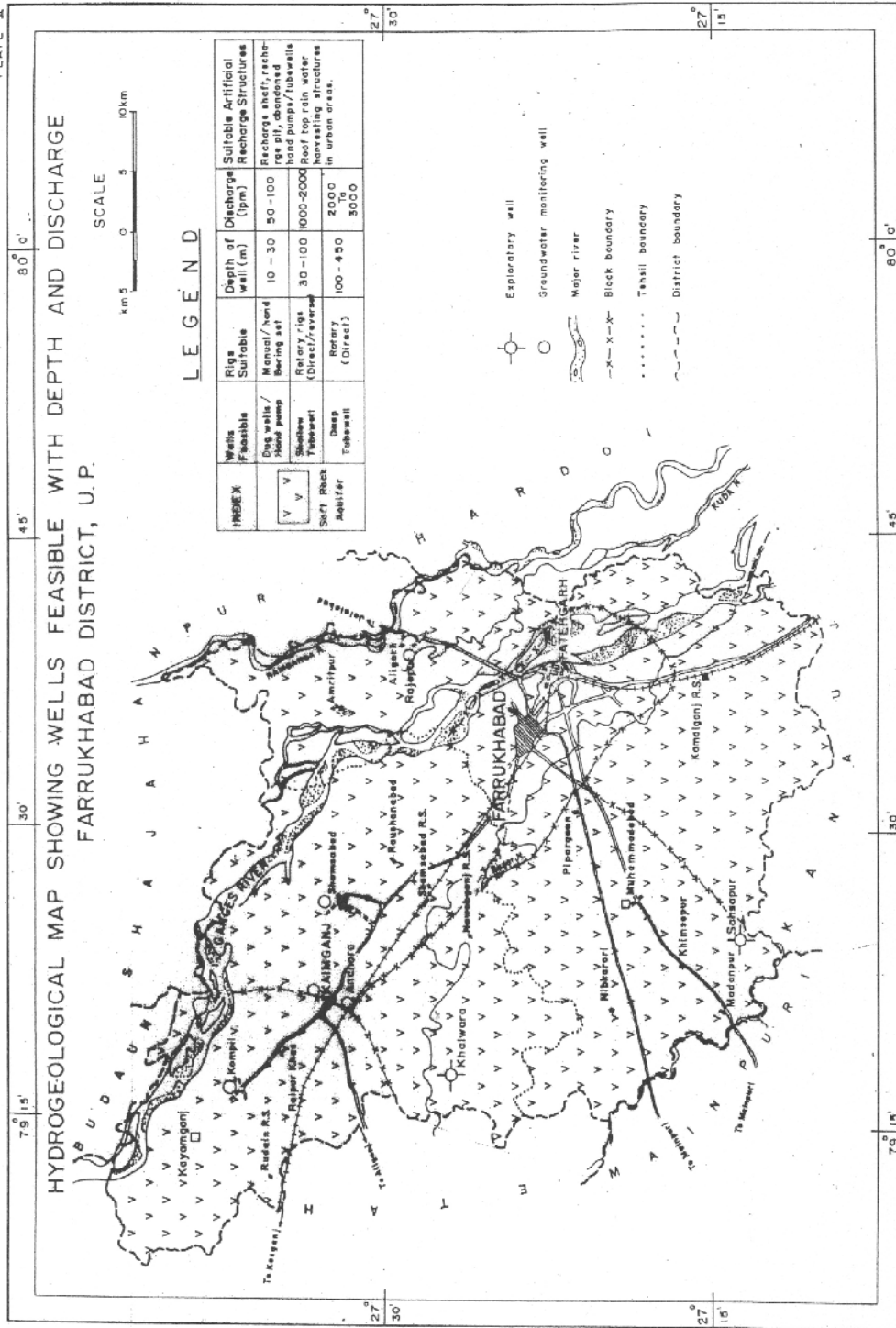
#### **8.0 RECOMMENDATIONS**

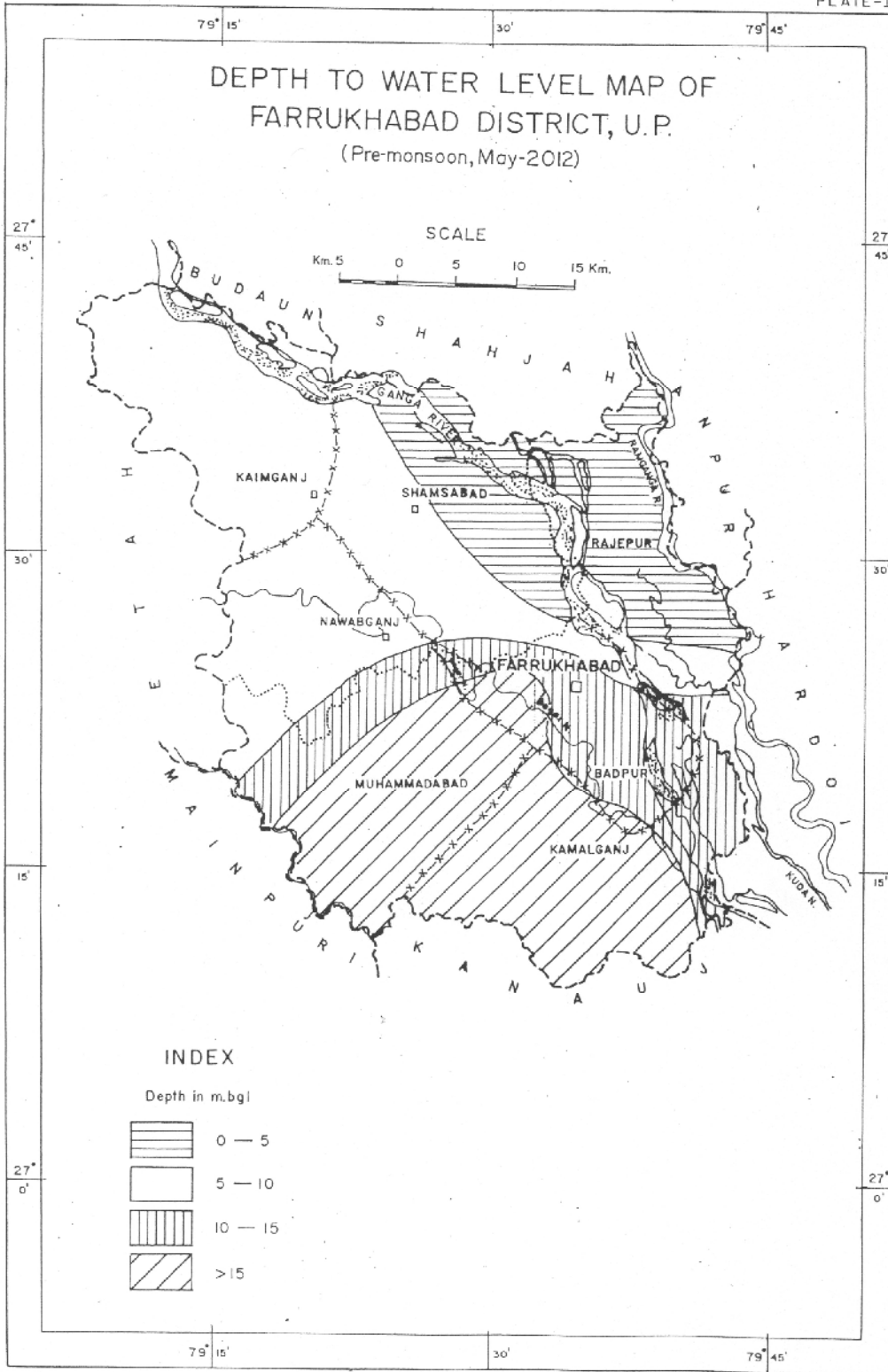
The harnessing of ground water for irrigation has seriously affected the overall hydrogeological regime of the district. In order to improve the present scenario the following recommendations are suggested.

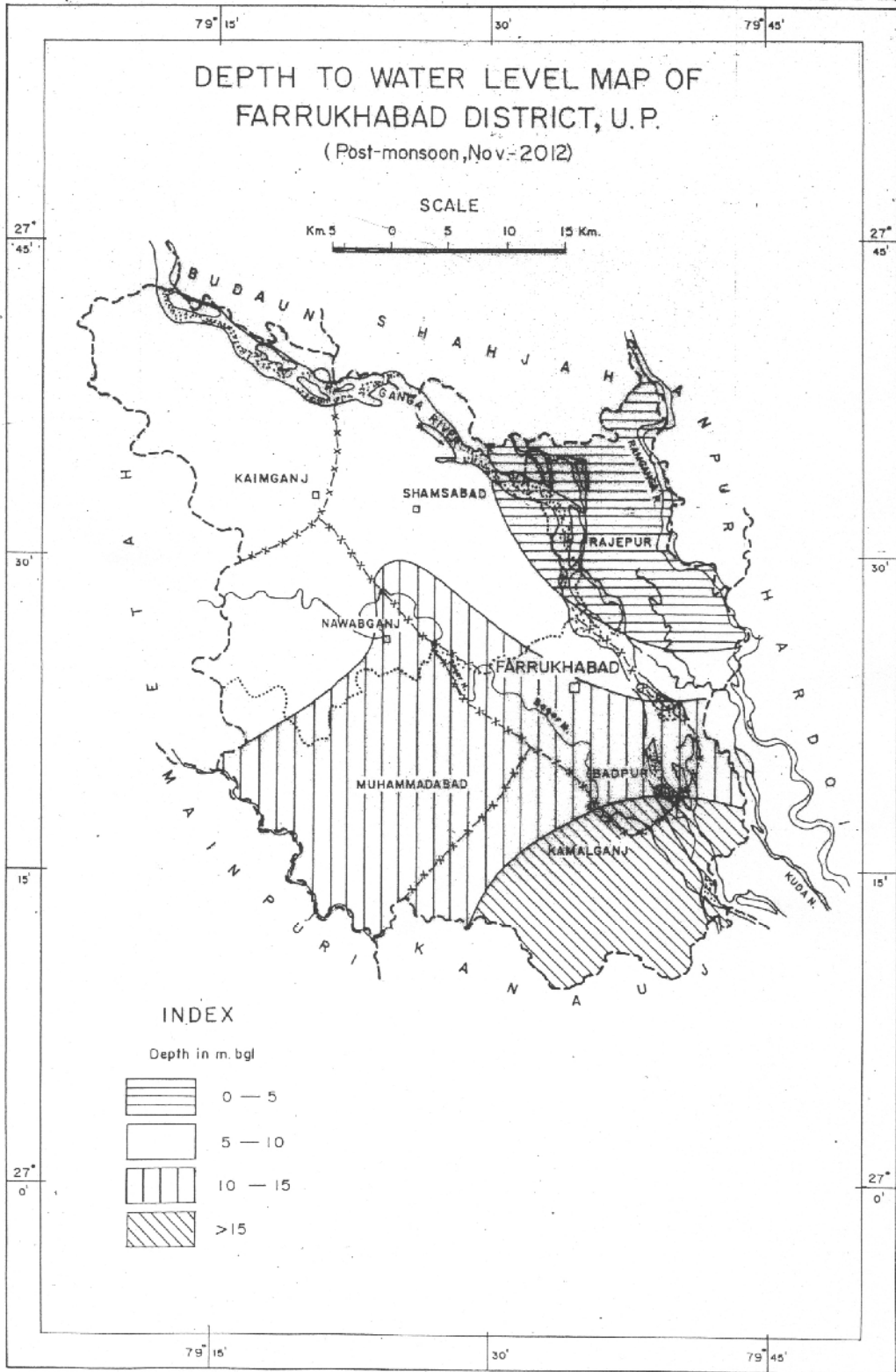
1. Management of water resources and conservation of ground water should be under taken after detail study.
2. Artificial recharge to ground water required to be under taken in the areas where water levels are more than 10.0 m. deep. To recharge the aquifer for ensuring their sustainability, roof top rain water harvesting is the best method for recharging ground water for urban areas and check dams across rivers, recharge trenches along channels, recharge shaft, revival of ponds etc. are recommended for artificial recharge techniques for rural areas.
3. In a few blocks i.e. Barhpur, Kamalganj, Muhamdabad and south of Nawabganj areas have the deep water level more than 15.0 m.bgl in the district. Hence a regular monitoring of water level at close interval is essential by constructing Piezometers in the district.

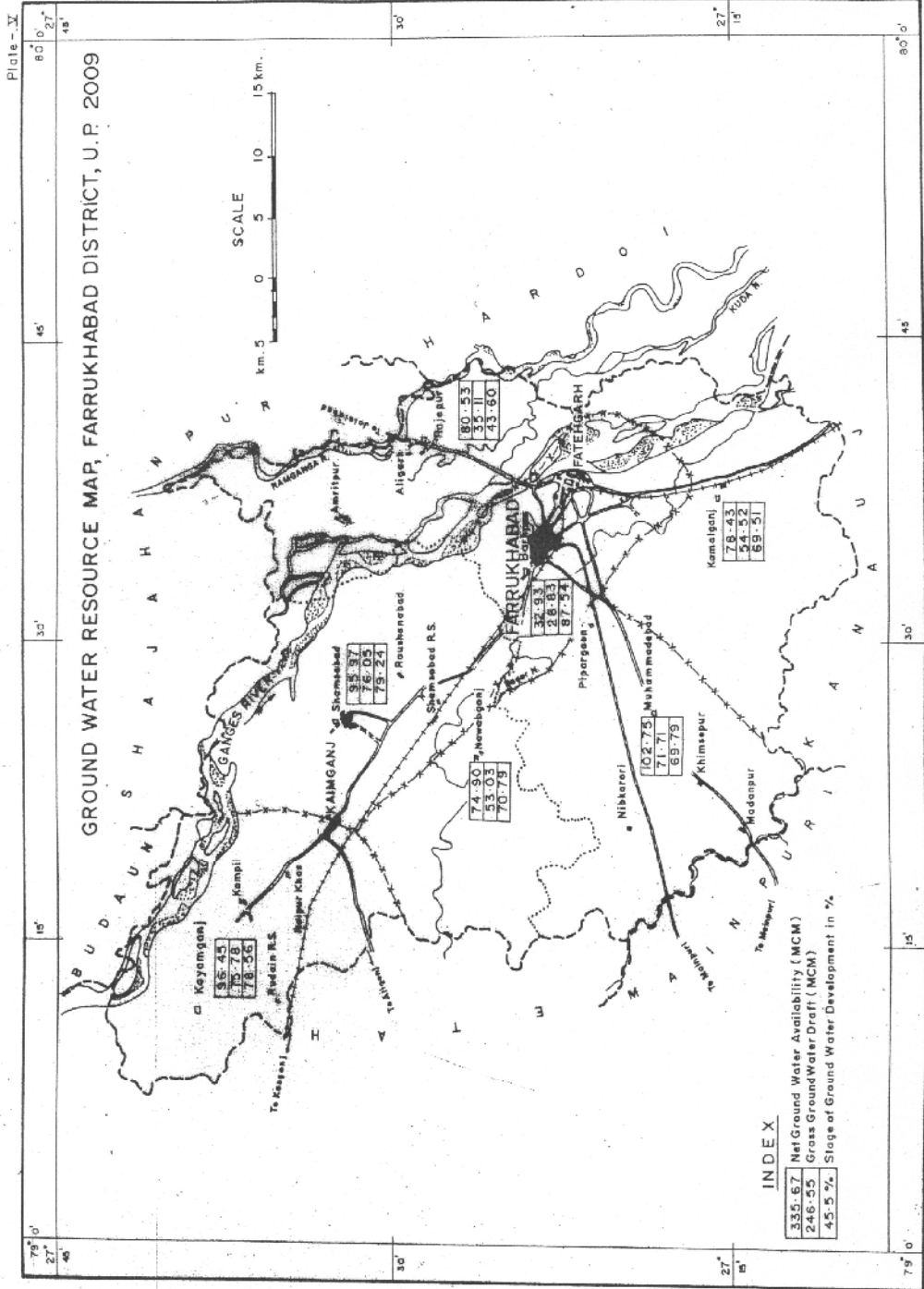


C. G. W. B., N. R., (AKS), Drg. no. 3968/10., 3970/10 [N. Chandra] Drg. No. 1902/13









C. G. W. B. N-R. (Roza) Drg. No. 4.361/II, 1906/13