केन्द्रीय 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

BAHRAICH DISTRICT
UTTAR PRADESH

उत्तरी क्षेत्र, लखनऊ

Northern Region, Lucknow

जल शक्ति मंत्रालय

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REPORT ON

AQUIFER MAPPING AND MANAGEMENT PLANS OF

BAHRAICH DISTRICT,

UTTAR PRADESH

AQUIFER MAPPING AND MANAGEMENT PLANS OF

BAHRAICH DISTRICT, UTTAR PRADESH STATE

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DISTRICT AT A GLANCE

1	GENERAL INFORMATION		
	Geographical Area (Sq km)		5020
	Administrative Divisions (As of 2019-20) Number of Tehsils/Blocks Number of Panchayat/Villages	 **:** **:**	 06/14 1054/1392
	Population (As on 2011 Census)	**:**	3478257
	Average Annual Rainfall (mm)	**:**	1152
2	GEOMORPHOLOGY		
	Major physiographic units	**:**	Upland plains, a Gently undulating slope towards the south. Older & Younger alluvium
	Major Drainages	**:**	Ghaghra and Sarju
3	LAND USE (hact.) (As of 2019-20)		
	Forest area	**:**	63097
	Net area sown	**:**	561209
	Area sown more than once	**:**	227813
4	MAJOR SOIL TYPES	**:**	Clay, sand, and loam
5	The area under principal crops (Rice, Wheat, Maize, Sugarcane, Pulse) (Sq Km)(2019-20)	**:**	215919
6	IRRIGATION BY DIFFERENT SOURCES (Number of structures/Area (hact.) 2019-20)		
	Dug-wells	**:**	69 /74867

	Tube-wells & Pump sets (Electric/ Diesel)	:	70638 /133797
	Tanks/ponds	:	---/1505
	Canals	:	1273 Km/4720
	Other sources	:	NA/0.0
	Net Irrigated area	:	220782
	Gross irrigated area	:	290603
7	NUMBERS OF GROUNDWATER MONITORING WELLS OF CGWB (As of 31-3-2020) No of Dug Wells No of Piezometers	 : :	 17 03
8	PREDOMINANT GEOLOGICAL FORMATIONS	:	Alluvium
9	HYDROGEOLOGY		
	Major Water bearing formation (Pre-monsoon Depth to water level (m. bgl) during 2021)	: :	Sand and Gravel 0.8 (Huzurpur) – 9.55 (Nanpara)
	(Post-monsoon Depth to water level (m. bgl) during 2021)	:	0.2 (Paholi) - 8.85 (Nanpara)
10	GROUNDWATER EXPLORATION BY CGWB (As of 31-3-2020)		
	No wells were drilled (EW, PZ, SH)	:	EW-18/OW-18
	Depth Range of EW's (mbgl)	:	172 (Sirajpur, Tejwapur Block) – 303 (Nanpara, Balha Block)

	Discharge (lpm)	:	1874 (Bhabhni Saida) – 2528 (Santhalia)
11	GROUNDWATER QUALITY		
	The presence of Chemical constituents more than permissible limit (e.g., EC, Cl, F, No3)	:	As (nd –0.102 ppm)
12	DYNAMIC GROUNDWATER RESOURCES (As of 31/3/2020) (In ham)		
	Net Ground Water Ground Resources	:	132290.95
	Gross Annual Ground Water Draft	:	71553.68
	Projected Demand for Domestic industrial Uses up to 2033	:	59445.07
	Stage of Ground Water Development	:	54.16 %
13	AWARENESS AND TRAINING ACTIVITY		
	Mass Awareness Programs organized	:	01
	Water Management Training Program organized	:	00
14	EFFORTS OF ARTIFICIAL RECHARGE & RAINWATER HARVESTING	:	NA
	Projects completed by CGWB (No & Amount spent)	:	NA
	Projects under the technical guidance of CGWB (Numbers)	:	NA
15	GROUNDWATER CONTROL AND REGULATION		

	Number Of OE Blocks	:	Nil
	No Critical Blocks	:	Nil
	No blocks notified	:	Nil
16	MAJOR GROUND WATER PROBLEMS AND ISSUES	:	Arsenic reported at some places. Some part is prone to water logging

INDEX

Aquifer Mapping And Management of Ground Water Resources Bahraich District, Uttar Pradesh

1. INTRODUCTION

1.1 Objectives

Aquifer Mapping and Management Program is a project launched by Central Ground Water Board under MoWR, RD & GR in response to the overuse, pollution, and other associated problems with groundwater. The initiative was started as part of the XII plan's Ground Water Management and Regulation Plan Scheme. The following are the project's main goals:

- Delineation and characterization of aquifers in three dimensions,
- Evaluation of aquifers, groundwater regime behavior, hydraulic characteristics, and hydrogeochemistry of aquifer groups on a 1:50,000 scale,
- Identification and quantification of issues,
- Development of management plans to ensure the sustainability of groundwater resources.

As part of the program, management plans are being created for every aquifer system, proposing several actions to optimize groundwater extraction, and recognizing aquifers with potable groundwater for consumption in areas with poorer quality. In addition to demand-side management options such as crop diversification, improving water use efficiency, etc., the management choices also involve recognition of possible areas for artificial recharge to groundwater and water conservation which aid in stopping dropping water levels.

1.2 Scope of the Study

Gathering and compendium of accessible data on aquifer structures, the boundary of their stretches and portrayal, assessment of data gaps, creation of extensive information to complete the recognized data gaps, and eventually preparation of aquifer maps at the preferred magnitude are all part of the systematic mapping of an aquifer. The findings of this research will help strategists, decision-makers, and other stakeholders employ resource management techniques, including long-term aquifer monitoring networks and theoretical and statistical regional ground-water-flow models. Aquifer mapping at the adequate level can aid in the planning, implementation, and monitoring of numerous managerial treatments focusing on ensuring the

long-term viability of our valuable groundwater resources, which will, in turn, aid in the achievement of drinking water security, better irrigation amenities, and overall “water resource development sustainability” in the nation.

1.3 Approach and Methodology

For the creation of aquifer maps and management plans, a multidisciplinary technique utilizing cutting-edge technologies and techniques is being used, involving remote sensing, GIS, geophysical techniques, groundwater modeling, etc.

To guarantee the quality of the deliverables, a multi-tier evaluation procedure has been implemented. The Regional Directors of the different regions of CGWB assess the aquifer maps and management plans created by the team of officers. Subsequently, at the central headquarters level, the updated maps and management plans are provided to the respective CGWB members. “The National Level Expert Committee” (NLEC), which was established for this objective, is then provided with the maps and management plans. The experts' group includes domain experts in the fields of groundwater from JNU, Delhi; IIT, Roorkee; former Chairman of CGWB; agriculture scientists, etc. The ICAR's agricultural experts have also contributed to the formulation of the management plans for every state. “The State Ground Water Coordination Committee” (SGWCC), which is chaired by the principal secretary of the relevant department, has been established in every state and UT in order to facilitate cooperation on different aquifer mapping-related matters between the State and Union Governments. In order for the suggested aquifer-specific groundwater management plans to be adopted by the State Government, the results are exchanged and discussed in the State Ground Water Coordination Committee.

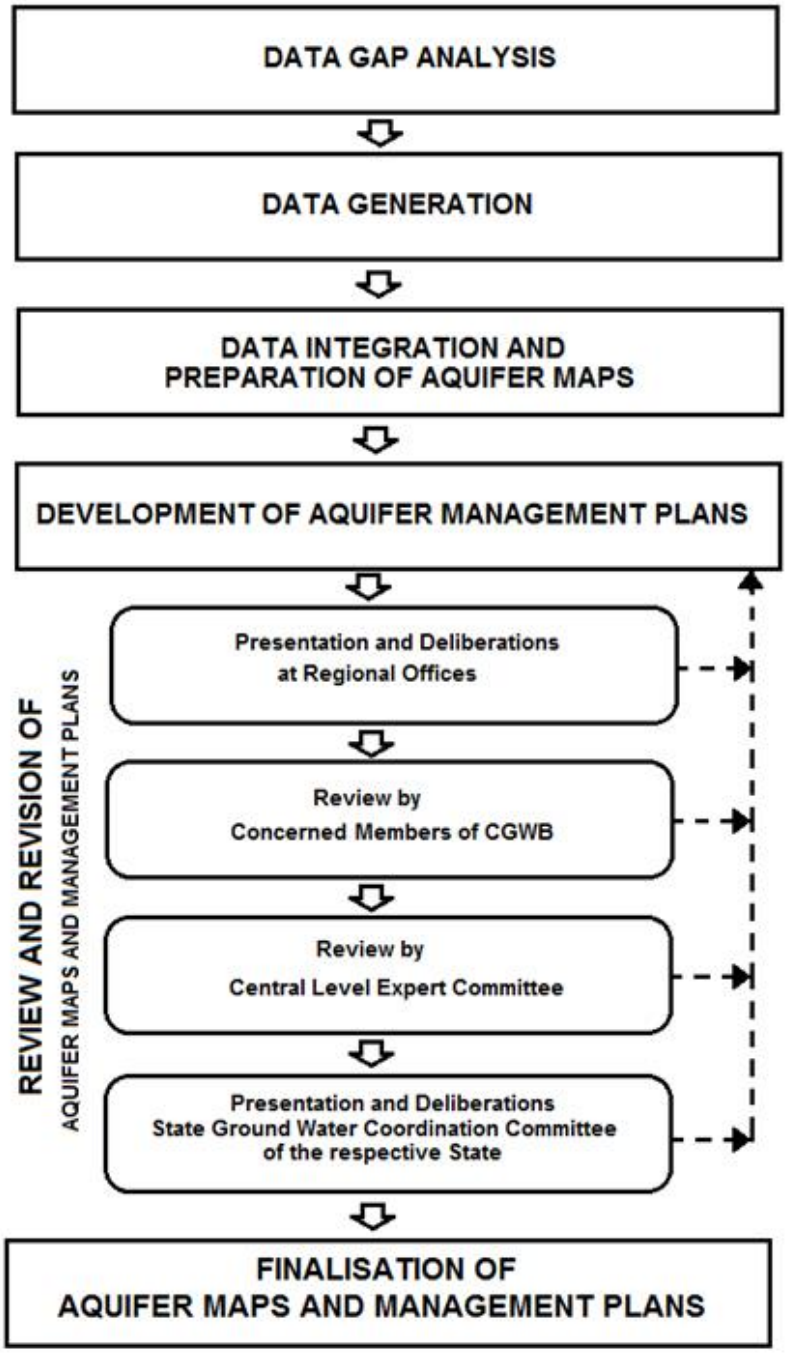


Figure-1: Methedolgy

1.4 Location of the study area

Bahraich district is one of the districts of Uttar Pradesh state of India, and Bahraich town is the district headquarters. Bahraich District is a part of the Devipatan Division. According to some other historians, in the middle age, this place was the capital of the “Bhar” dynasty. Therefore, it was called “Bharaich.” Which later came to be known as “Bahraich.” Bahraich borders Nepal districts Bardiya to the northwest and Banke to the northeast. The rest of Bahraich is surrounded by the following districts in Uttar Pradesh: Lakhimpur and Sitapur on the west, Barabanki to the southwest, Gonda to the southeast, and Shravasti to the east.

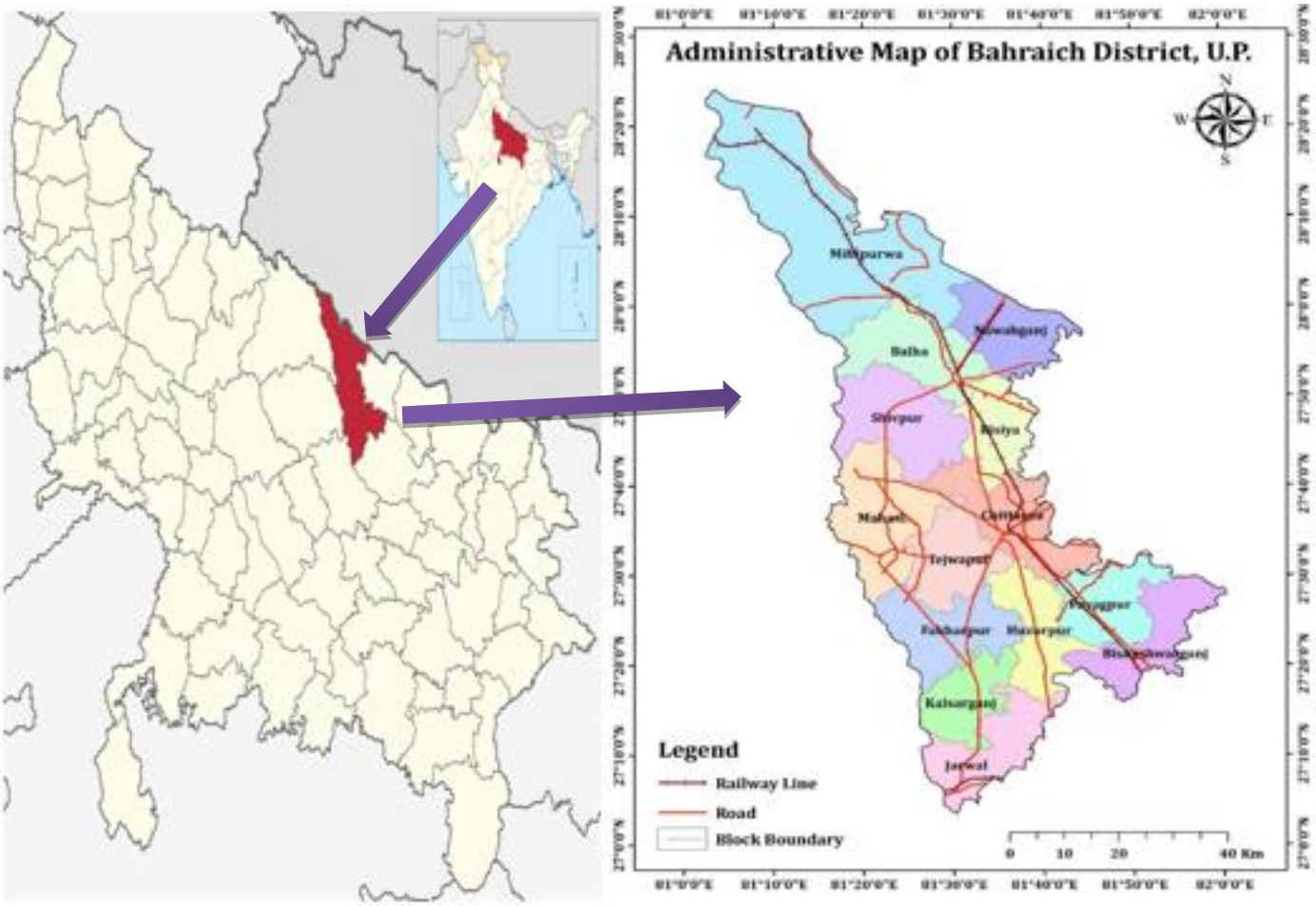


Figure 1: Location Map of Bahraich District, U.P.

1.5 Data Availability

Data on the numerous characteristics of groundwater were gathered from publications of the Central Ground Water Board, state departments, and other organizations. The collected data were displayed on a map on a scale of 1:50,000, and a data gap analysis was done to determine the need for future hydrological, hydrogeological, hydrochemical, and geophysical research. The following table lists the key facts:

Table 1: Status of Data availability, data gap, and data generation

Sl. No.	Parameter (s)	Data Required	Data Available	Data Gap	Data Generation
1.	Rainfall Data	IMD Meteorological station in the study area	No. Data obtained from European Space Agency.	No.	No.
2.	Soil	Soil Map and Soil infiltration test data.	Soil shape file available from U.P.R.S.A.C	Soil infiltration test data.	Soil infiltration across the study area.
3.	Land Use/ Land cover	Land Use/Land cover pattern	Land Use/ Land cover shape file available from U.P.R.S.A.C	No.	No.
4.	Geomorphology	Digitized Geomorphological map	District Resource Map shape file available from U.P.R.S.A.C	No.	Map generated on GIS platform.
5.	Geology	Digitized Geological map	District Resource Map available from U.P.R.S.A.C	No.	Map generated on GIS platform.
6.	Exploration Data	EW in each quadrant	Available from old CGWB & UPGWD records	Yes	Carried out in 3 blocks.
7.	Aquifer Parameters	Aquifer parameters in all the quadrants	From exploratory wells under NAQUIM	Yes	Data to be generated.

1.6 Climate

The district has a sub-humid climate with 3 seasons: summer, rainy season, and winter season. May is the warmest month, with a daily average temperature of 39.8° C. January is the coolest month, with a daily average temperature of 22.6° C. The month of August has the maximum proportion of humidity, with an average of 80 percent, preceded by 77 percent in July. The air is the lowest humid from March through May. The district's average yearly breeze speed is 5.6 kilometers per hour. In June and May, the greatest regular breeze speed is 8.4 kilometers per hour. In the winter, the breeze speed is at its lowest. The district's yearly typical prospective Evapotranspiration is 1422.7mm. The months of May and June have the highest P.E.T., with 212.6 mm and 183.2 mm, correspondingly.

The district's estimated yearly average rainfall from 1901 to 1970 was 1123.95 mm. The monsoon season, which runs from June through September, sees the most rainfall, with an average of 969.65 mm, or 86.3 percent of yearly rainfall. The rainiest month is July, with an average rainfall of 316.45 minutes, preceded by August, with an average rainfall of 298.95 mm.

1.7 Geomorphology and Geology

Geologically, the area comprises Quaternary sediments represented by Older alluvium and Younger alluvium. Older alluvium consists of oxidized sediments (brown, yellow and khakhi colour). Younger alluvium consists of non-oxidized sediments (grey and khakhi colour).

Plain comprises Older alluvium and is of Middle to Late Pleistocene age and has been extensively studied. The sediments comprise polycyclic sequence of silt, clay with calcareous concretions (Kankar) and subordinate micaceous sand beds, upto a depth of 300 mbgl (metres below ground level).

Younger alluvium of Holocene age occupies the low-lands and is divisible into Channel alluvium and Terrace alluvium.

Loose sands of point and channel bars and mud of floodplain constitute Channel alluvium along the Ghaghara river. These sediments are non-oxidized compared to oxidized sediments of Older alluvium.The Terrace alluvium comprises sequence of sand, silt and clay well developed on the depositional terrace.

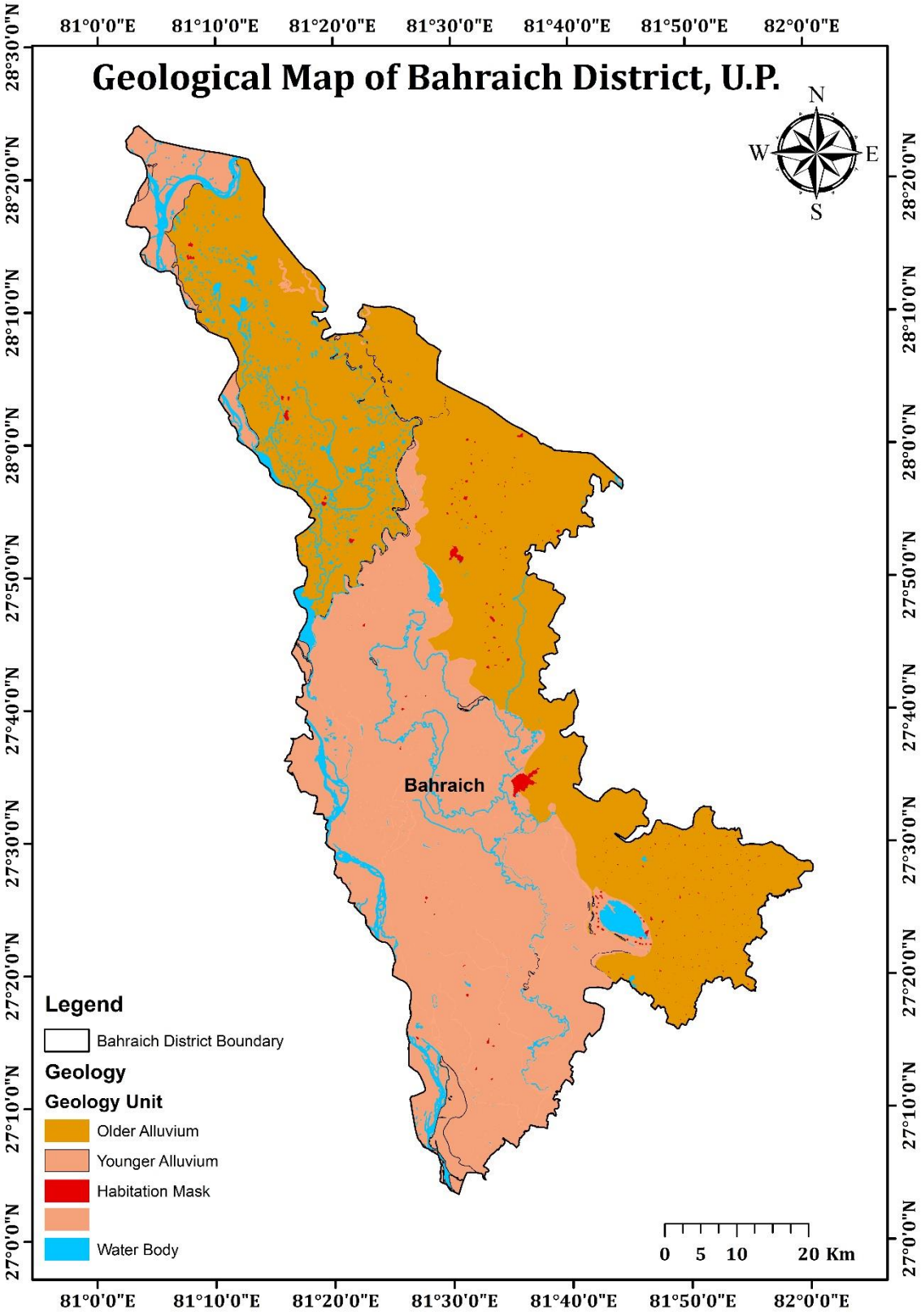


Figure 2: Geological Map of Bahraich District

- **Physiography, Geomorphologic Features, and Landforms**

In general, the territory may be described as a flat terrain with a mild southward trend. The current structure of streams and rivers has a significant impact on the landscape. In the south of the area, the highest point is 104 meters above sea level, with a typical gradient of 0.40 meters per kilometer. The highland plains land is covered by Older Alluvium, and the lowland plains land is covered by Younger Alluvium are virtually identically split in the district.

The town's physical attributes are quite well delineated, with the Ghaghara valley in the northwest, the middle highland, the Rapti valley, and the Tarai valley in the north. The Ghaghara valley extends across the district's northern and southern regions. The Rapti valley, which includes sections of the tehsils of Bahraich and Nanpara, is a gently sloping flat interspersed with areas of scrub and woods on the northeast edge of the central highland. The Tarai, lowland in the north and northeast, is mostly submerged throughout the rainy seasons.

- **Younger Alluvial Plain:**

Along the Ghaghara River, a Younger alluvial plain with plain to slope moderately undulated topography may be observed. Back swamp, oxbow lake, ancient meander, meander scar, paleochannel, and point bar are examples of fluvial landforms generated by massive alluvium reserves that frequently appear next to flood plains. It is mostly made up of Younger, unconsolidated alluvial sediments with diverse lithologies. The ground water table is quite shallow in the Younger alluvial plain region, and groundwater production possibilities are outstanding.

- **Older Alluvial Plain:**

Younger alluvial plains are identical to older alluvial plains, but older alluvial plains emerge at a sooner phase of depositional systems with unconsolidated sediments. The possibilities for groundwater are fair to excellent.

1.8 Drainage

The district's major rivers are the Ghaghara and Sarju. The river Ghagra marks the district's western edge and flows through the Indo-Nepal Global Border.

"Risiya, Bhabhni, Soti Nadi, Jhigri Nadi, and Bhakla" rivers are some of the additional major drainage waterways. All of the streams are functionally permanent, as they keep flowing for the majority of the year. Flooding is a threat in low-lying locations along the Ghaghara River.

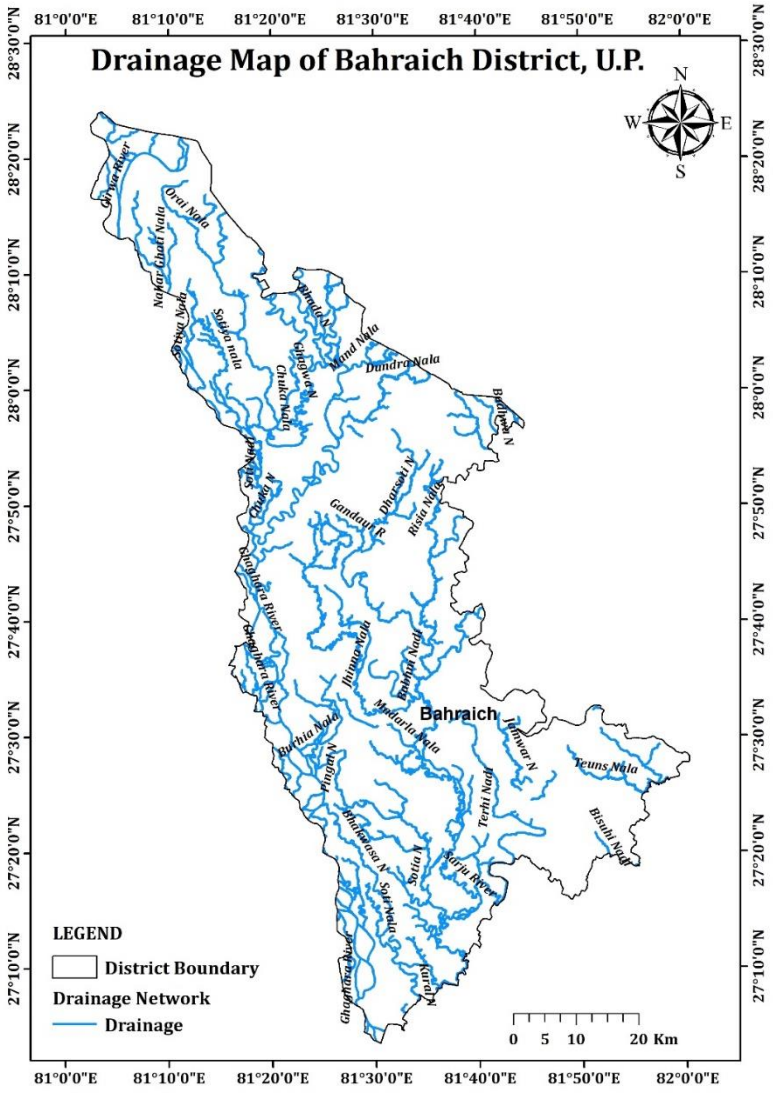


Figure 3: Drainage Map of Bahraich district

1.9 Soil

The district's soils are mostly "Matiyar," or clay, and "Domat," or loam. The Matiyar (hard clay soil) is suited for rice production and is quite fruitful. The Domat, also known as loam, is fertile soil that is good for growing a variety of crops. This is the explanation for the district's excellent agricultural production. The principal soil types present in the district are "bhur (sand and loam)," "domat (a combination of sand and clay in different amounts)," and "matiyar (clay)."

“Bhur” grows along the “Ghaghara and other streams' high banks,” whereas “matiyar” grows in “tarai with a scattering of tiny areas of loam.” “Domat” can be found in the “Rapti valley and the Central Upland.”

Apart from a handful of spots along the Tarai belt near Nepal's boundary, the soil of Bahraich is young and typically deep. There are 3 kinds of soil in total. Sandy in the Ghagra river's region. Sandy-loam in the center, with patches of loam. Soil management is inadequate, and minerals such as Zinc, Sulphur, and Boron are lacking. It is low in organic matter and has a somewhat increased PH value.

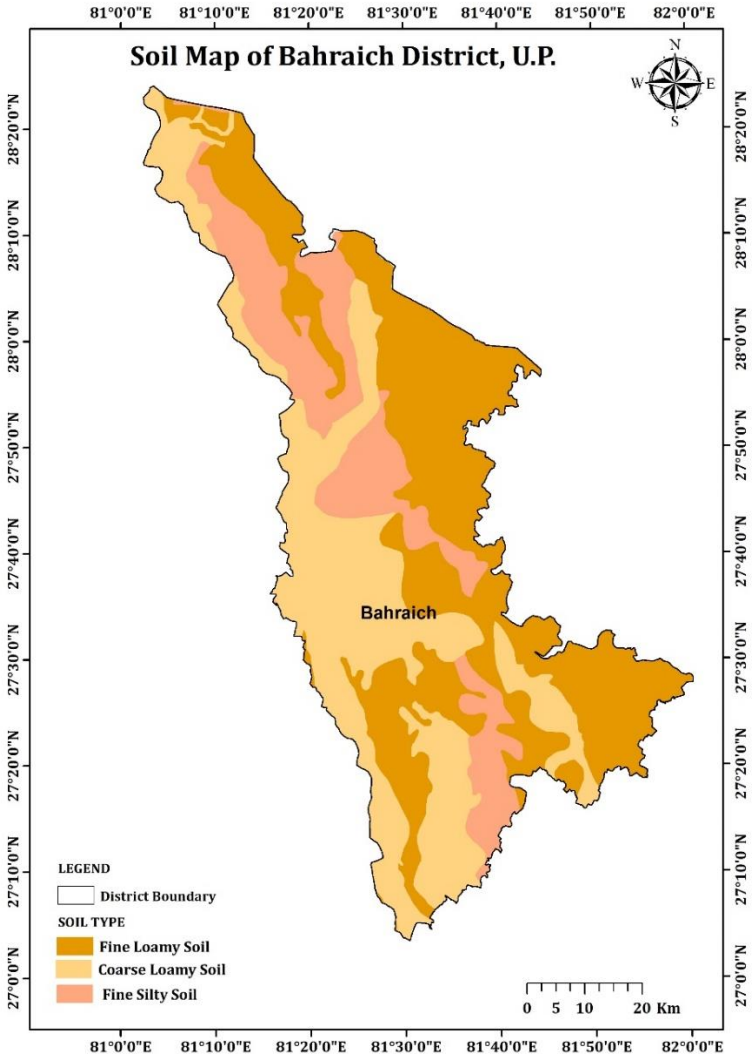


Figure 4: Soils Map Bahraich District (U.P.)

Table 2: Soils of Bahraich District (U.P.)

Legend	Plains	Description
1	**Piedmont Plains (1-3% slope)**	Deep, loamy soils and slightly eroded.
2		Deep, silty soils and slightly eroded.
3	**Alluvial plain (0-1% slope)**	Deep, loamy soils and slightly eroded.
4		Deep, loamy soils and slightly eroded are associated with silty soils.
5		Deep, fine soils and slightly eroded are associated with loamy soils.
6		Deep, silty soils associated with loamy soils are slightly eroded.
7		Deep, loamy soils and slightly eroded associated with silty soils, slightly saline/sodic, and moderately sodic.
8		Deep, silty soils and slightly eroded.
9		Deep, silty soils and slightly eroded are associated with fine soils.
10	**Old Alluvial plain with river left out channels/Oxbows/point bars (1-3%slope)**	Deep, loamy soils and slightly eroded are associated with stratified loamy soils slightly eroded.
11	**Recent Alluvial Plain (1-3% slope)**	Deep, loamy soils with slight flooding.
12	**Active Flood Plain (1-3% slope)**	Deep, sandy soils with moderate flooding are associated with stratified loamy soils and slight flooding.
13		Deep, stratified loamy soils with severe flooding are associated with loamy soils with moderate flooding.

1.10 Land use/ Landcover

Table 3 depicts the district's land use pattern. Farming land accounts for 3018.18 square kilometers of the total reported land, barren land accounts for 133.55 square kilometers (present fallows must be improved to increase crop production), and planting accounts for 65.77 square kilometers. The district's wood area is 649.72 square kilometers, accounting for 306.54 square kilometers of deciduous forest, 22.354 square kilometers of evergreen/semi-evergreen forest, 0.39 square kilometers of scrub forest, and 1.28 square kilometers of swamp/mangroves. The district's overall Barren/Unculturable/Wastelands area is 48.81 square kilometers, containing 1.40 square kilometers of sandy land and 47.41 square kilometers of scrubland. The district's built-up area accounts for 95.92 square kilometers of the overall reporting area, with mining accounting for 2.79, rural accounting for 89.74, and urban accounting for 3.39. Grass/grazing 0.40 square kilometers of the overall reporting area. Wetlands / Water bodies account for 383.63 square kilometers of the overall reported area, with inland wetland at 86.88, river/stream/canals at 284.33, and water bodies at 12.42. As a result, there is an urgent necessity for afforestation in the region. There is no livestock usage of land in the region. It would be important to improve land grazing in the district.

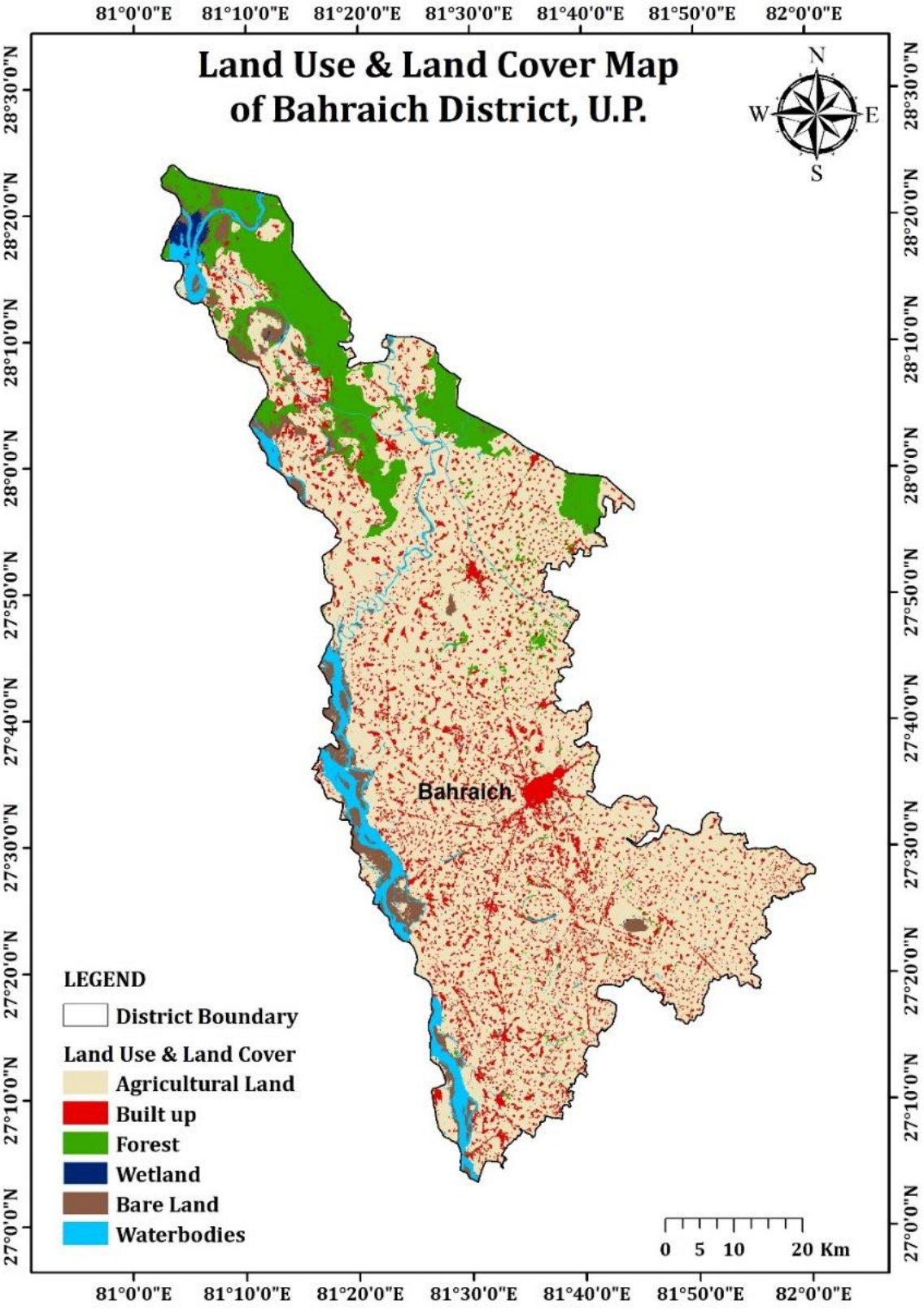


Figure 5:Land use/ Landcover (new) map of Bahraich district

Table 3: Land Use Pattern of the Bahraich District (2011 -12)

Categories	Uses	Area in Sq. Km.
Agriculture	Cropland	3018.18
	Fallow	133.55
	Plantation	65.77
Barren/unculturable/ Wastelands	Sandy Area	1.40
	Scrub Land	47.41
Built-up	Mining	2.79
	Rural	89.74
	Urban	3.39
Forest	Deciduous	306.54
	Evergreen/Semi evergreen	223.54
	Forest Plantation	0.39
	Scrub Forest	117.97
	Swamp / Mangroves	1.28
Grass / Grazing	Grass / Grazing	0.40
Wetlands / Water bodies	Inland Wetland	86.88
	River/Stream/Canals	284.33
	Water bodies	12.42

Source: https://bhuvan-app1.nrsc.gov.in/2dresources/thematic/LULC502/MAP/UP.pdf

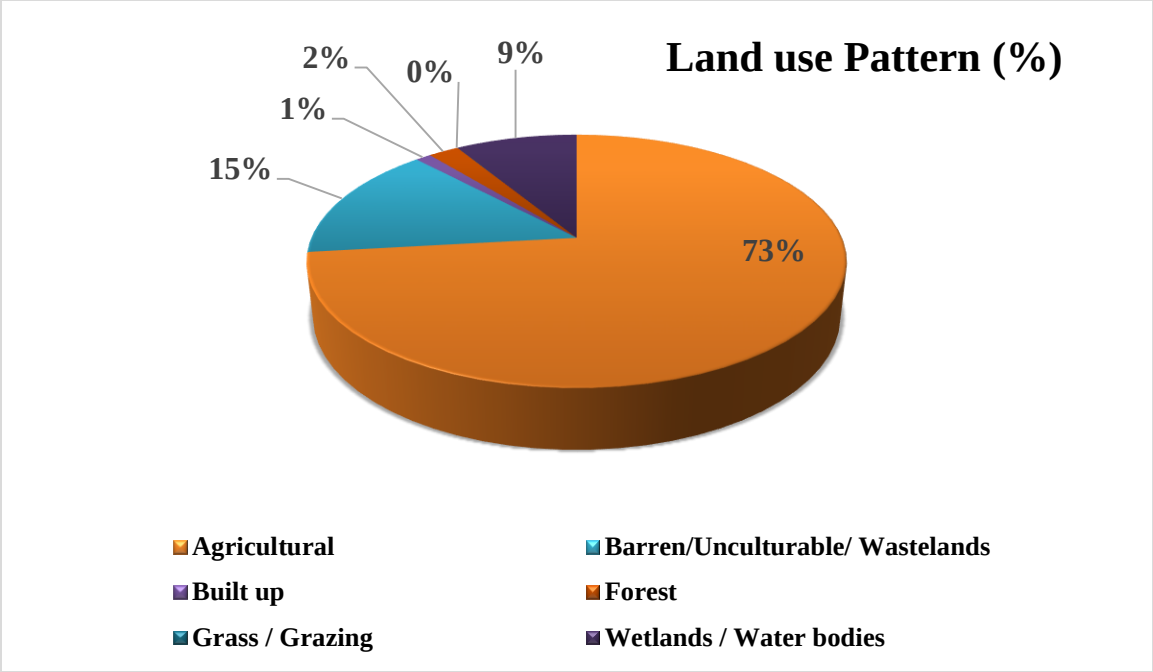


Figure 6: Land Use Pattern of the Bahraich District

1.11 Agriculture and Cropping Pattern

Bahraich is a historically significant city. Another feature of this territory is its ever-flowing rivers and lush woods, which are home to a variety of plants and wildlife. The land is extremely rich, and farming is the primary source of income for the majority of the population. The climate is also ideal for agriculture. Throughout the British time, Bahraich was a major marketplace for grains and pulses. The area is also notable for rice, corn, wheat, mustard, sugar, and legumes. Herbs and lumber are also found in the deep woods of Nanpara and Bhinga. Sericulture may also be found in Bahraich. Over 80% of the population of Bahraich depends on agriculture for a living, and over two-thirds of the entire land is ploughed. The principal commercial crops are rice, wheat, cereals and pulses, sugarcane, tomato, and potato. Pulses and tomatoes are being shipped throughout Uttar Pradesh and the nation.

Table 4: Area under major field crops & horticulture (as per latest figures of 2008-09)

S. No.	Major field crops cultivated	Area ('000 ha)							
		Kharif			Rabi				
		Irrigated	Rainfed	Total	Irrigated	Rainfed	Total	Summer	Total
1	Rice	162.6	0.2	162.8	-	-	-	-	162.8

2	**Sorghum**	0.4	-	0.4	-	-	-	-	0.4
3	**Maize**	8.8	0.3	9.2	-	-	-	-	9.2
4	**Pigeon pea**	4.4	-	4.4	-	-	-	-	4.4
5	**Wheat**	-	-	-	155.3	0.06	155.36	-	155.36
6	**Chickpea**	-	-	-	260	-	260	-	260
7	**Lentil**	-	-	-	478.3	0.003	478.3	-	478.3

	Horticulture crops - Vegetables	**Area ('000 ha)**		
		Total	**Irrigated**	**Rainfed**
1	Potato	2.2	2.2	-
2	Onion	0.1	0.1	-
3	Others	5.5	5.3	0.2
	Fodder crops	**Total**	**Irrigated**	**Rainfed**
1	Sorghum	0.11	-	-
2	Bajra	1.06	-	-
3	Maize	87.9	-	-
	Total fodder crop area	3.6	1.2	2.4

Source: https://agricoop.nic.in/sites/default/files/UP28_Bahraich%20-28.12.13_0.pdf

1.12 Irrigation

Farming is the most common employment in the entire area. Massive surface and underground water improvements are being carried out to ensure irrigation. The irrigation region in the Bahraich region is presented by many sources in (Table-5). The entire area irrigated by various sources is 1720.72 square kilometers.

Table 5: Block-wise actual irrigated area (in sq km) by various means in the district (2010-11)

BLOCKS	**Canals**	**Tube-well**		**Wells**	**Ponds**	**Others**	**Total**
		Public	**Private**				
Mihipurwa	4.57	3.14	150.11	0	0	0.30	158.12
Nawabganj	38.84	0.42	63.81	0	0	0.30	103.37
Balha	5.67	3.03	111.98	0	0	0.31	120.99
Shivpur	0	1.41	150.75	0	0	0.28	152.44
Risia	3.36	8.85	127.78	0	0	0.32	140.31
Chittaura	16.82	5.56	124.89	4.10	0	0.34	151.71

Payagpur	0.14	1.44	158.66	0	0	0.26	160.50
Bisheshwarganj	0	0.84	158.95	0	0	0.30	160.09
Mahsi	0	1.43	141.92	0	0	0.26	143.61
Tajwapur	0	2.34	120.77	4.67	0	0.32	128.10
Fakharpur	0	2.57	91.15	0	0	0.31	94.03
Huzurpur	0	1.65	85.96	0	0	0.31	87.92
Kaiserganj	0	2.90	85.96	0	0	0.30	89.16
Jarwal	0	3.74	26.29	0	0	0.34	30.37
Total District	69.40	39.32	1598.98	8.77	0	4.25	1720.72

Source: http://cgwb.gov.in/District_Profile/UP/Bahraich.pdf

Sarju Nahar Pariyojna encompasses the district's canal network. As of 31.3.2011, the extent of the principal canal in the area was 166 kilometers. State irrigation works include state tube-wells and canals, whereas private irrigation works include private tube-wells, pump sets, Rahat and masonry wells, and so on. The district's net area seeded is 3348.38 square kilometers; however, only roughly half of that land is irrigated. Approximately 95.72 percent of the net irrigated land was done by underground water in 2010-11, whereas canals and others contributed just 4.28 percent of the overall irrigated area.

2. DATA COLLECTION, INTEGRATION, AND AQUIFER MAPPING

2.1 Aquifer Geometry

The major lithology is Quaternary alluvium, underlain by the Vindhyan basement. Quaternary alluvium is divided into Older and Younger alluvium. Older alluvium consists of oxidized sediments of the polycyclic sequence of silt, clay with calcareous concretions (kankar), and micaceous beds. Younger alluvium was deposited by the annual flooding of the Ghaghara River and has non-oxidized sediments made of alternate clay and sand layers.

To understand the lithological framework and sub-surface disposition of aquifers in the study area, the lithological data of wells drilled by CGWB and UPGWD was first compiled and redefined as per ROCKWORKS software format and then plotted for visualization of aquifer disposition.

Three aquifer groups were identified visually upon generation of 2-D and 3-D models and fence diagrams. The quality of formation water is good, barring the occurrence of Iron at a few places in the unconfined aquifer.

2.2 Groundwater scenario

Groundwater in the district occurs in an aquifer system mainly made of alluvial sediments deposited by the Ghaghara River and its tributaries. Granular zones comprise fine-grained sand to silty sand with the occurrence of calcareous concretions (kankar) and possess moderate transmissivity and permeability. Clay layers act as barriers separating the three aquifer groups in the district and possess insignificant transmissivity and permeability, resulting in clay acting as confining layers.

A hydrogeological map of the study area has been attached in Figure 8 below. Perusal reveals that the groundwater flow is mainly towards the Ghaghara River and its tributaries, Tons and Choti Sarju.

2.3 Depth To Water Level

Pre-monsoon and post-monsoon water level data were collected from the key wells and piezometers in the district for 2021. The depth to water level data and fluctuation data is given at Table 6. Depth to water level maps prepared for the pre-monsoon and post-monsoon periods have been below, as shown in Figures 9 and 10.

On perusal of ground water level maps, of the study area it is observed that Pre-monsoon ground water level ranges widely between 0.8 mbgl to 9.55 mbgl, and post-monsoon ground water level ranges between 0.20 mbgl to 8.55 mbgl. Being a *Tarai* area, shallow ground water levels are characteristics of tarai. Sufficient monsoon recharge is received from the recharge zone of Bhabar formation and flood plan recharge from Ghaghra River in the study area, resulting into shallow ground water level in the range of less than 2 m during post monsoon period.

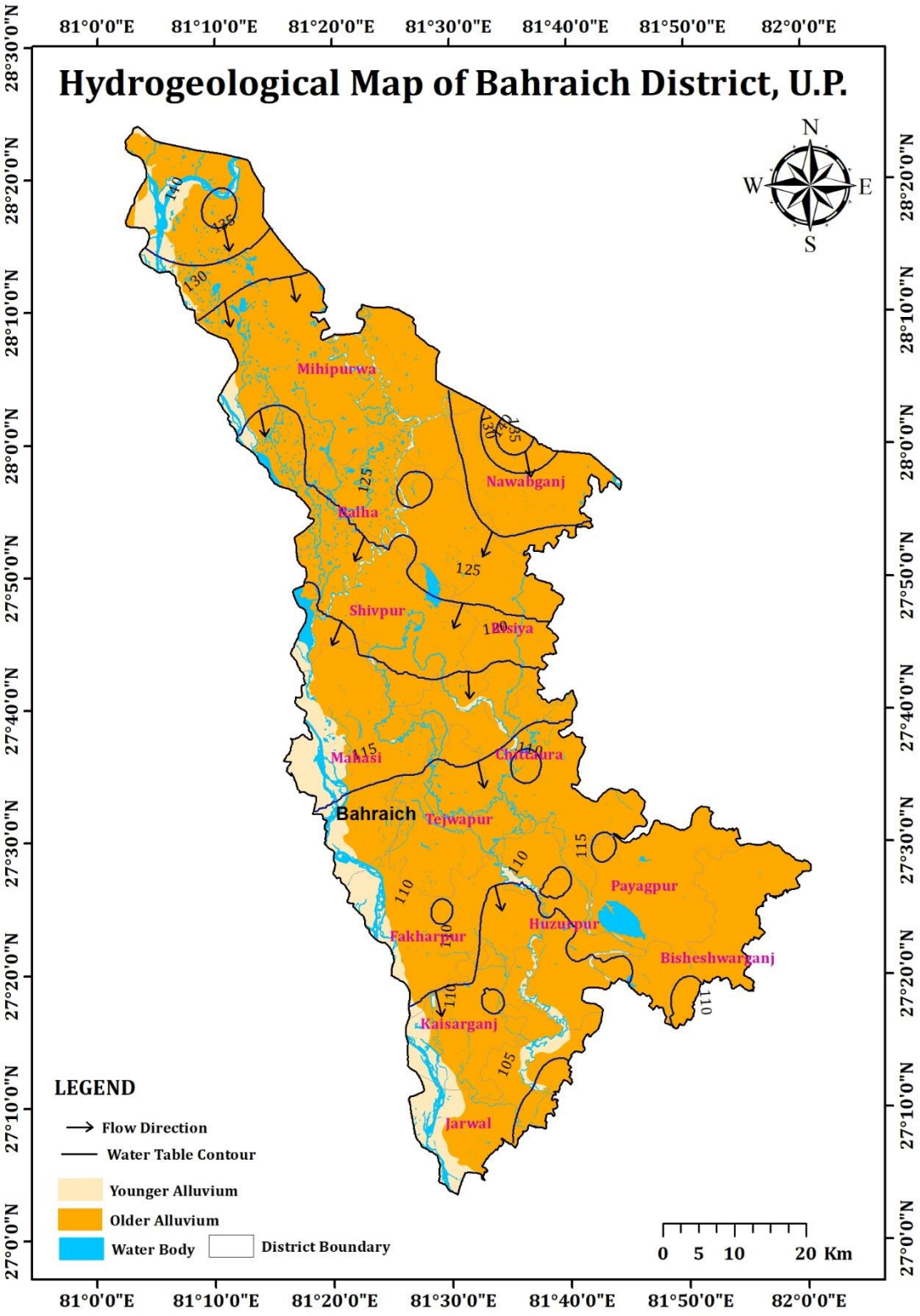


Figure 7: Hydrogeological map of the study area

Table 6: Water Level and Fluctuation Data of Water Level Monitoring Stations

S.NO.	Block Name	Loc Names	Long	Lat	Type Of well	PRM_21	PTM_21	FLU_21
1	BALAHA	LAXMANPUR MATEHI PZ	81.450000	27.950000	P	9.00	6.50	2.50
2	BALAHA	PRM.PATH.GANGAPUR PZ	81.511111	27.883333	P	5.42	2.80	2.62
3	BALAHA	PRM.PATH.KANKARI PZ	81.438889	27.869444	P	4.28	2.05	2.23
4	BALAHA	PRM.PATH.SENDURI PZ	81.508333	27.872222	P	4.82	2.42	2.40
5	CHITTAURA	BEGAMPUR	81.563889	27.644444	W	3.55	2.15	1.40
6	CHITTAURA	KALPIPARA PZ	81.602778	27.600000	P	7.80	5.80	2.00
7	CHITTAURA	LAUKANA TIPRAHA PZ	81.513889	27.663889	P	4.00	2.30	1.70
8	CHITTAURA	PAHOLI AMOLI PZ	81.694722	27.536230	P	5.10	0.20	4.90
9	FAKHERPUR	KANYA PURVA MADH.VIDH. FA	81.487778	27.410126	W	3.78	1.65	2.13
10	FAKHERPUR	PR. VIDH. AKHTIYARPUR P	81.464722	27.366667	P	2.20	0.25	1.95
11	FAKHERPUR	PR. VIDH. ATAULIA PZ	81.513889	27.387500	P	3.26	1.00	2.26
12	FAKHERPUR	PR. VIDH. BHILAURA BASU	81.571667	27.368871	P	2.67	0.98	1.69
13	FAKHERPUR	PR. VIDH. BIDORA PZ	81.583333	27.400000	P	2.65	0.81	1.84
14	FAKHERPUR	PR. VIDH. JAITAPUR PZ	81.516667	27.366667	P	3.06	0.33	2.73
15	FAKHERPUR	PR. VIDH. NANDBAL PZ	81.500000	27.383333	P	2.97	0.30	2.67
16	FAKHERPUR	PR. VIDH. SHARAD PARA PZ	81.558333	27.387322	P	2.97	1.35	1.62
17	FAKHERPUR	PR. VIDH. SISWARA PZ	81.483333	27.350000	P	2.91	0.75	2.16
18	HUZOORPUR	BHAMBHARPUR PZ	81.653056	27.455277	P	2.80	1.25	1.55
19	HUZOORPUR	HAMIRPUR PZ	81.633611	27.482778	P	2.85	1.10	1.75
20	HUZOORPUR	HUZOORPUR	81.633333	27.416667	P	1.80	0.30	1.50
21	HUZOORPUR	NAKAURA PZ	81.656667	27.320354	P	2.85	1.45	1.40
22	JARWAL	PRM.VIDH.ATTHAISA PZ	81.650000	27.200000	P	4.48	1.76	2.72
23	JARWAL	PRM.VIDH.GHAGHRA GHAT (TA	81.616667	27.150000	P	3.06	1.40	1.66
24	JARWAL	PRM.VIDH.JARWAL ROAD PZ	81.566667	27.233333	P	3.95	1.50	2.45
25	JARWAL	PRM.VIDH.KATKA PZ	81.566667	27.166667	P	2.88	0.40	2.48
26	JARWAL	PRM.VIDH.MANEHARA PZ	81.483333	27.166667	P	3.33	0.90	2.43
27	JARWAL	PURV MADH,VIDH.NANDOLIYA	81.555000	27.216201	P	2.95	0.75	2.20
28	KAISERGANJ	PR. VIDH. KUNARI PZ	81.500000	27.283333	P	3.52	0.75	2.77
29	KAISERGANJ	PR. VIDH. NAKAURHA PZ	81.500000	27.283333	P	3.85	1.95	1.90
30	KAISERGANJ	PR. VIDH. RAIGARH BEHRHA	81.597500	27.338614	P	4.05	2.35	1.70
31	MAHASI	PRI. PATH. GOVINDPUR PZ	81.444444	27.602739	P	3.30	1.82	1.48
32	MAHASI	PRI. PATH. KOTIA PZ	81.315556	27.595629	P	2.85	1.62	1.23
33	MAHASI	PRI. PATH. AERIA PZ	81.395278	27.514167	P	2.65	1.60	1.05
34	MAHASI	PRI. PATH. GASIAN PURWA	81.410000	27.621426	P	2.50	1.75	0.75
35	MAHASI	PRI. PATH. BANS PURWA PZ	81.448889	27.623071	P	3.15	2.05	1.10

36	MAHASI	PRI. PATH. BAKAINA PURWA	81.325278	27.717500	P	3.05	1.82	1.23
37	MIHIPURWA	PRI. PATH. PARVANI GARHI	81.376667	28.021389	P	4.30	2.05	2.25
38	MIHIPURWA	PRI. PATH. NAINIHA PZ	81.322500	28.014444	P	1.70	0.50	1.20
39	MIHIPURWA	PRI. PATH. SEMARHWAN PZ	81.234444	28.151702	P	2.92	1.82	1.10
40	MIHIPURWA	PRI. PATH. BHAGGA PURWA	81.453333	27.986111	P	3.16	1.70	1.46
41	NAWABGANJ	NARAINAPUR PZ	81.572778	27.931069	P	4.80	2.55	2.25
42	NAWABGANJ	ROOPAIDEEHA PZ	81.588889	28.010994	P	3.70	1.85	1.85
43	RISIA	ADHARI PURWA PZ	81.563611	27.684514	P	6.40	4.12	2.28
44	RISIA	PRM.PATH BHOPATPUR PZ	81.533611	27.730031	P	9.35	7.15	2.20
45	SHEOPUR	BLOCK CAMPUS	81.390278	27.816667	P	3.58	1.82	1.76
46	SHEOPUR	PRI. PATH. ASHWA MOHD.PUR	81.505556	27.758333	P	9.12	6.25	2.87
47	SHEOPUR	PRI. PATH. DHANAVA PZ	81.433333	27.761111	P	4.36	2.45	1.91
48	SHEOPUR	PRI. PATH. LALAIJO PZ	81.430556	27.783333	P	4.22	2.05	2.17
49	SHEOPUR	PRI. PATH. GANGA BELI SIN	81.300833	27.813379	P	3.38	2.15	1.23
50	SHEOPUR	PRI. PATH. BEHRA PZ	81.338611	27.758990	P	3.15	1.70	1.45
51	SHEOPUR	PRI. PATH. BHAGWANPUR P	81.478889	27.740833	P	3.92	2.35	1.57
52	TEJWAPUR	PRI. PATH. HUSAINPUR PZ	81.565556	27.517930	P	2.89	1.30	1.59
53	TEJWAPUR	PRI. PATH. RAMWAPUR PZ	81.438611	27.548481	P	3.09	1.20	1.89
54	BISHESHWA	BARA GAON PZ	81.833611	27.311745	P	6.65	3.40	3.25
55	BISHESHWA	PRI. VIDH. BALAPUR PZ	81.930556	27.478088	P	3.95	0.50	3.45
56	BISHESHWA	PRI. VIDH. DHANUHI PZ	81.876667	27.456078	P	3.75	1.65	2.10
57	BISHESHWA	PRM.VIDH.GANGWAL PZ	81.780833	27.341104	P	5.95	3.20	2.75
58	BISHESHWA	PRM.VIDH.LAKHANGONDA PZ	81.740000	27.339655	P	2.45	0.90	1.55
59	BISHESHWA	PRM.VIDH.BELBHARIA PZ	81.919444	27.431875	P	2.70	0.55	2.15
60	BISHESHWA	PRM.VIDH.BHAWANIYA PUR P	81.968056	27.464107	P	3.15	0.80	2.35
61	BISHESHWA	UDHARNA SARDAHI	81.869722	27.336824	W	3.15	0.55	2.60
62	PAYAGPUR	PAREDA PZ	81.735278	27.447631	P	5.95	1.05	4.90
63	PAYAGPUR	PRM.PATH.JHALA TARHAR PZ	81.733333	27.466667	P	7.45	2.95	4.50
64	PAYAGPUR	PRM.PATH.MUNDERWA THAKURA	81.823056	27.368343	P	6.25	3.60	2.65
65	PAYAGPUR	PRM.PATH.NOORPUR PZ	81.767500	27.391630	P	8.05	3.60	4.45
66	PAYAGPUR	SARSA PZ	81.720833	27.462500	P	4.65	1.85	2.80
67	PAYAGPUR	SHIRDAHA PZ	81.751944	27.447631	P	4.45	1.60	2.85
68	PAYAGPUR	TILKHAWAN PZ	81.835833	27.499047	P	5.75	0.80	4.95
69	PAYAGPUR	PRM.PATH.SAMBHU TIKRI PZ	81.773056	27.457500	P	6.65	2.60	4.05
70	PAYAGPUR	PRM.PATH.KOLUHA P	81.715556	27.490000	P	4.65	1.75	2.90
71	HUZURPUR	HUZURPUR	81.67	27.36	P	0.8	1	-0.20
72	JAMUNAHA	PARPATGANJ	81.68	27.79	W	5.27	2.77	2.50
73	KAISARGANJ	BHAKRAULI KA PURWA	81.56	27.30	W	2.25	1.42	0.83
74	MAHSI	SABLAPUR	81.38	27.72	W	3.08	2.16	0.92

75	BELHA	GAIGHAT	81.42	27.98	W	3.03	1.62	1.41
76	MIHIRPURWA	KATARNIAGHAT	81.13	28.33	W	1.8	2.35	-0.55
77	MIHIRPURWA	TAPRI GODH	81.26	28.01	W	3.58	2.67	0.91
78	MIHIRPURWA	MIHIRPURWA(KUDWA)	81.40	28.02	W	4.94	2.82	2.12
79	NANPARA	BABA KUTIR	81.50	27.87	W	1.9	1.05	0.85
80	MAHSI	RAZICHAURAHA	81.38	27.41	W	1.82	0.97	0.85
81	BELHA	BHOPATPUR	81.51	27.88	W	8.3	7.77	0.53
82	RISIA	LACHMANPUR	81.61	27.84	W	8.52	4.62	3.90
83	BELHA	NANPARA	81.51	27.86	W	9.55	8.85	0.70
84	TEJWAPUR	BAISANPURWA	81.44	27.54	W	2.42	1.65	0.77
85	MAHSI	KAPURPUR	81.44	27.56	W	3.73	2.22	1.51
86	PYAGPUR	KOLHUWA	81.66	27.35	P	5.02	2.6	2.42
87	MIHIRPURWA	MOTE BABA	81.17	28.30	W	1.5	1.35	0.15
88	BELHA	NANPARA – II	81.51	27.86	P	8.6	7.43	1.17
89	PYAGPUR	PYAGPUR – I	81.78	27.41	P	4.98	4.52	0.46

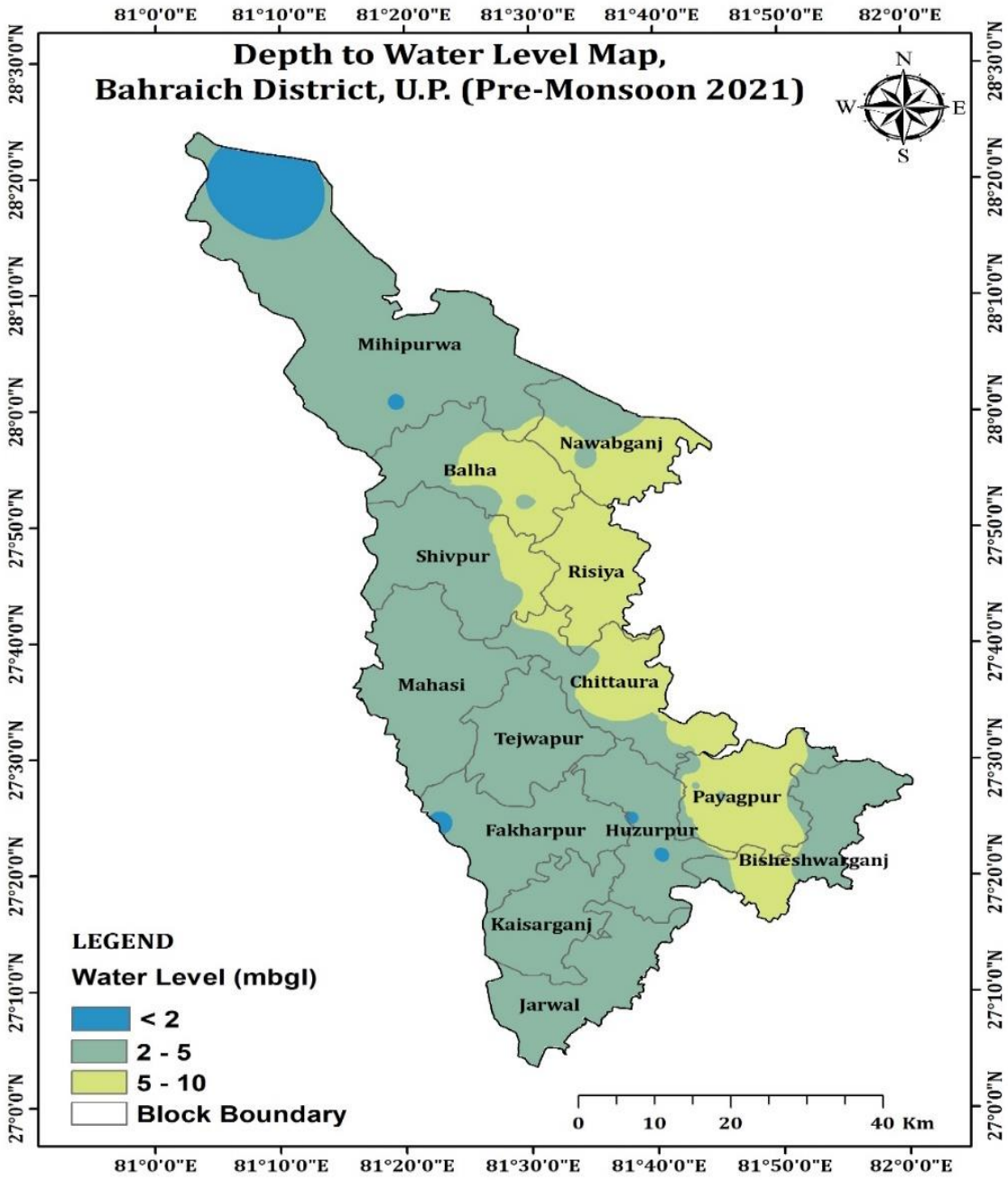


Figure 8: Depth of Water Level Map of Bahraich District (Pre-Monsoon)

On perusal of the depth to water level contour map for the period of May 2021 given at Fig. 9, reveals that ground water level are mostly in the range of 2 to 5 m bgl. Whereas on the eastern part of the district relatively deeper ground water levels in the range of 5 to 10 m bgl are present.

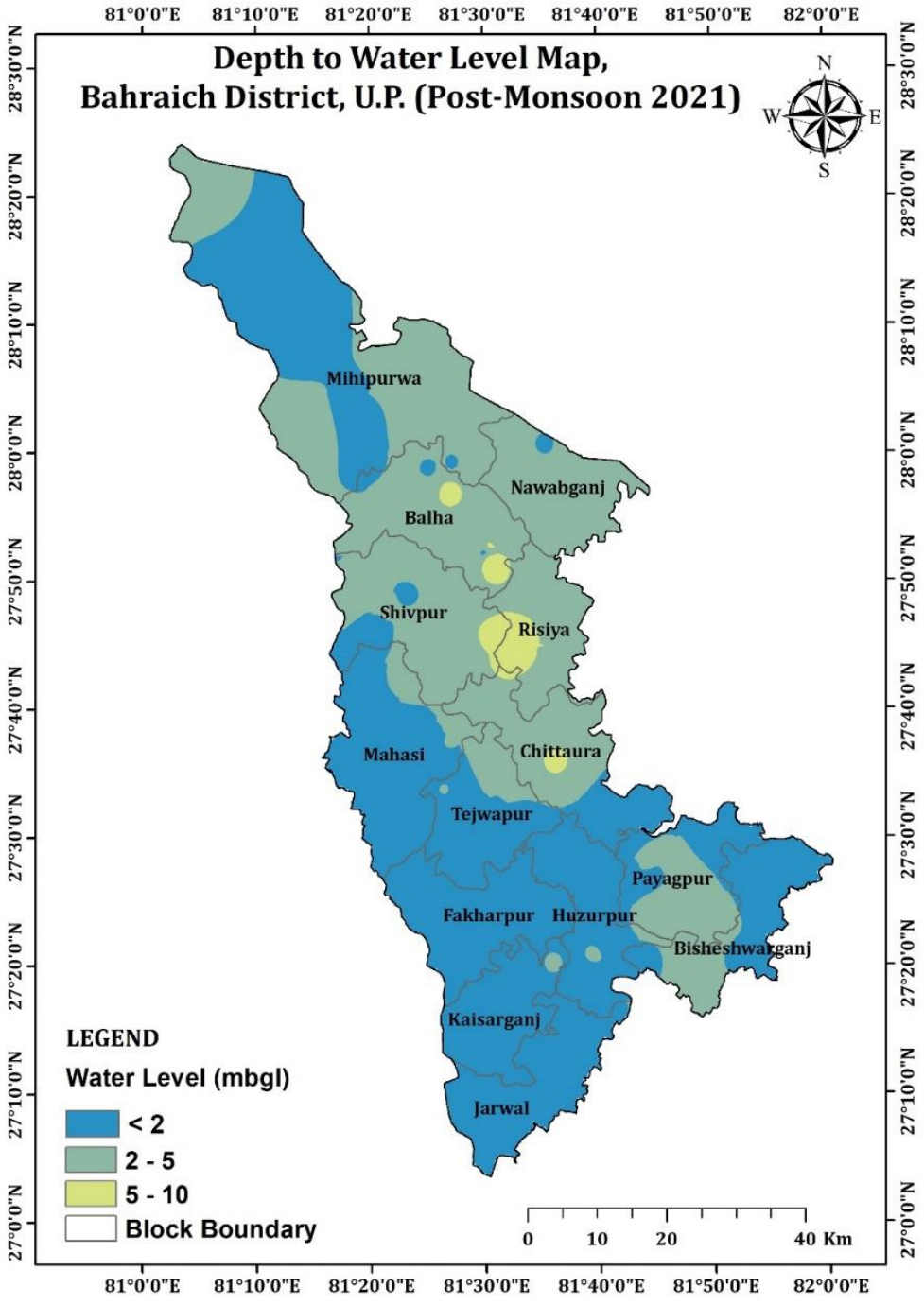


Figure 9: Depth of Water Level Map of Bahraich District (Post-Monsoon)

Depth to ground water level for post monsoon has also been ploted for the year 2021 and given at Fig. 10. perusal of the depth to water level contour map for the period November 2021 reveals water level becomes shallower owing to recharge of the aquifer from rainfall, and the majority of the area has water levels of 2 - 10 mbgl.

2.3.1 Water Level Fluctuation

According to water level statistics from Bahraich district wells for the year 2021, the district's water level is increasing. The majority of the district's water level variation is between 0.0 and 2.0 mbgl, with an increasing tendency. Figure 11 depicts the fluctuation in water level.

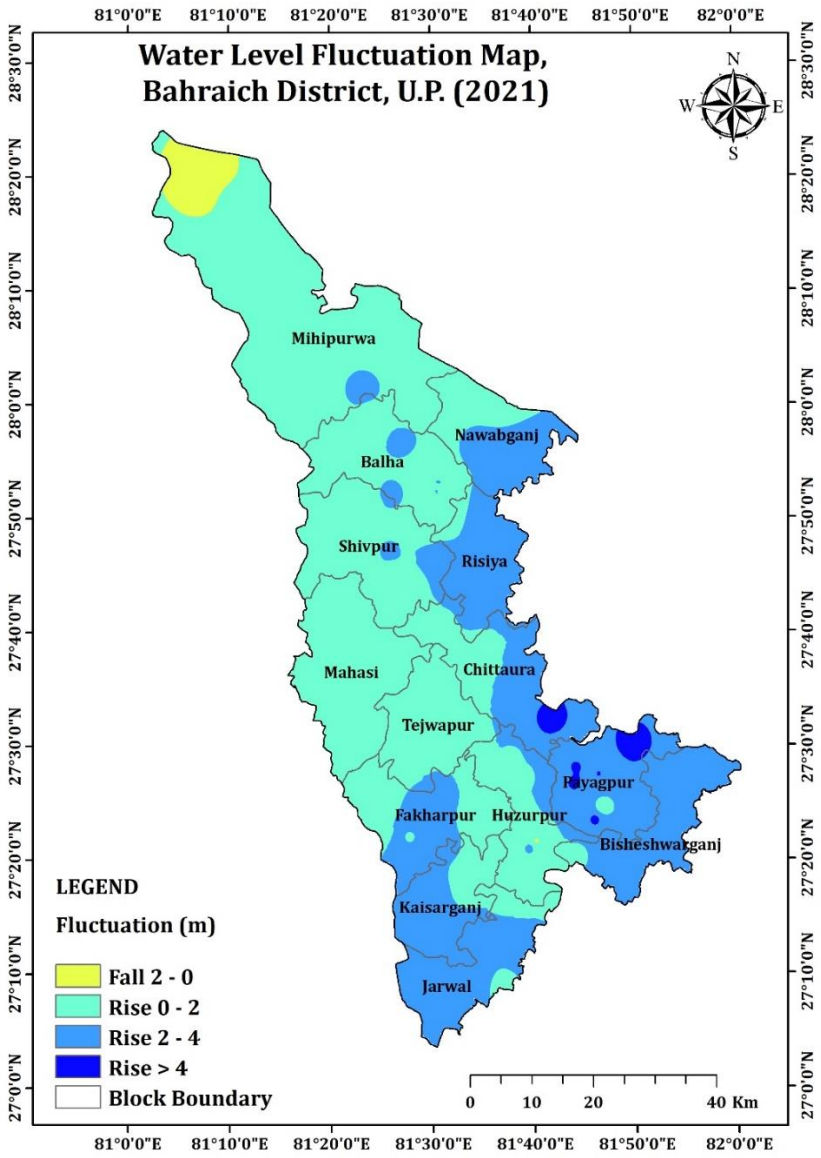


Figure 10: Water Level Fluctuation Map of Bahraich District

A perusal of the map reveals that the water level is mainly rising between 0 mbgl to > 4 mbgl across the district. A small part of the Mihipurwa block display falls at a water level between 2-0 mbgl. Parts of Mihipurwa, Balha, Nawabganj, Shivpur, Mahasi, Chittaura, Tejwapur, Fakharpur, Huzurpur, Kaisarganj, Jarwal, and little part of Payagpur blocks display rise in water level between 0-2 mbgl. Parts of Mihipurwa, Balha, Shivpur, Nawabganj, Risiya, Chittaura, Payagpur, Bisheshwarganj, Fakharpur, Kaisarganj, and Jarwal blocks show water level rise between 2-4 mbgl. Other blocks display water level rise > 4 mbgl.

2.3.2 Water Level Trend

Long-term water level trends are depicted in water level hydrographs, which show how groundwater storage in the phreatic zone has changed over time. Variations in storage are caused by variations in atmospheric pressure, as well as variances in refill and outflow rates throughout time. A long-term water level trend for the pre-and post-monsoon phase has been calculated and reported using 9-year water level data (Table-7):

Table 7: Water Level Trend of Bahraich District (from 2012 to 2021)

S. No.	Location	Pre-Monsoon			Post-Monsoon			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	Nanpara	8		0.0857	10		0.0417	39		0.0615
2	Murthia(jalia)	3			2			11		
3	Tapri godh	9	0.0378		10		0.0091	37	0.0058	
4	Katarniaghat	9		0.0105	10	0.0458		37	0.0298	
5	Fakharpur	2			2			9		
6	Baisanpurwa	9	0.1084		10	0.0899		38	0.0908	
7	Razi chauraha	9	0.0431		10	0.0132		38	0.0337	
8	Phulwari	3			2			10		
9	Motipur	4			3			14		
10	Gaighat	9	0.1030		10	0.0514		39	0.0757	
11	Dhanauli	2			1			5		
12	Bhopatpur	9		0.2470	10		0.0263	39		0.1050
13	Sablapur	9		0.0579	10		0.0255	39		0.0084
14	Kapurpur	9		0.0372	10		0.0501	39		0.0041
15	Maraucha	4			4			22		
16	Bhakraulikapurwa	9	0.0275		10		0.0623	38		0.0117
17	Jarwal1	2			8	0.0840		26	0.1360	
18	Mihipurwa	3			6	0.1977		20		
19	Huzurpur PZ (GWD)	5			6	0.0947		23		

According to the “hydrograph trend (2012-2021)” for the past 9 years, there has been a modest drop in water level in the majority of the district both in the “pre-monsoon and post-monsoon periods,” which might be attributed to over-exploitation of groundwater and reduced recharge (figures 12-27). Throughout the “pre-monsoon season,” water levels rise at “Tapri godh, Baisanpurwa, Razi chauraha, Gaighat, Bhakraulikapurwa, Mihipurwa, Jarwal1, Huzurpur PZ (GWD),” whereas throughout the “post-monsoon period,” water levels increase at “Katarniaghat, Baisanpurwa, Razi chauraha, Gaighat, Mihipurwa, Jarwal1 (GWD).” The increase in water level might be attributed to more rainfall and recharging in the region.

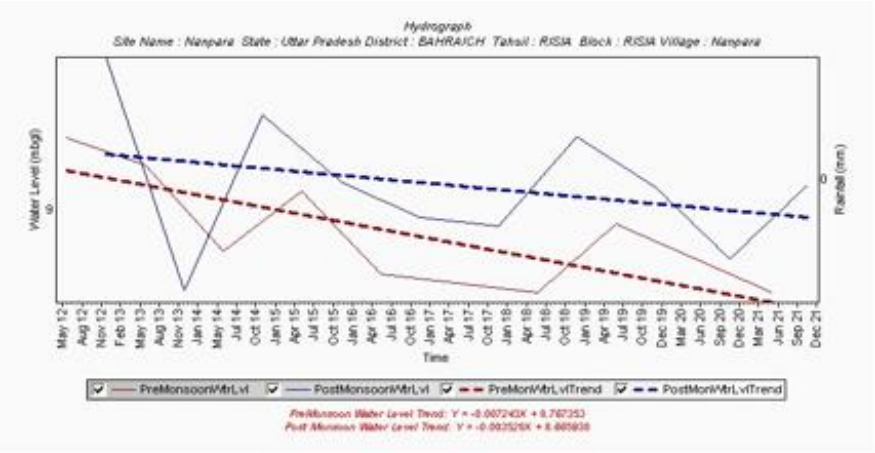


Figure 12: Long Term Water Level Trend of Nanpara (2012 – 2021), Bahraich District

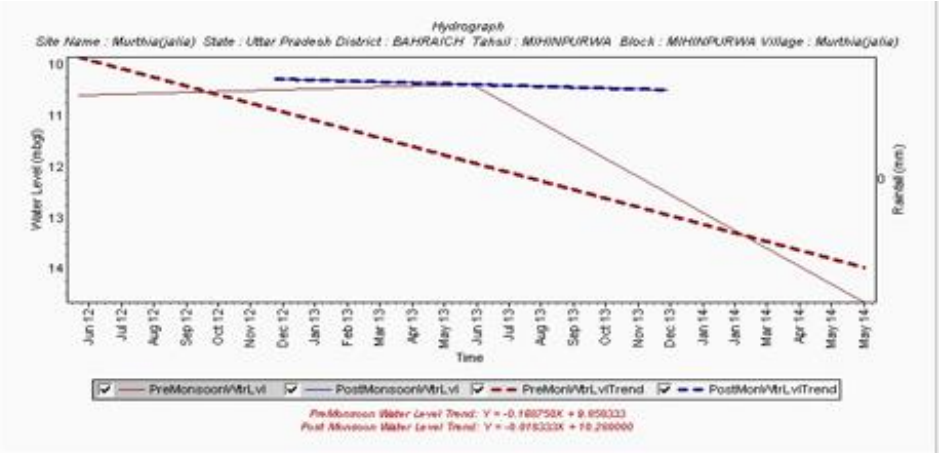


Figure 13: Long Term Water Level Trend of Murthia(jalia) (2012 – 2021), Bahraich District

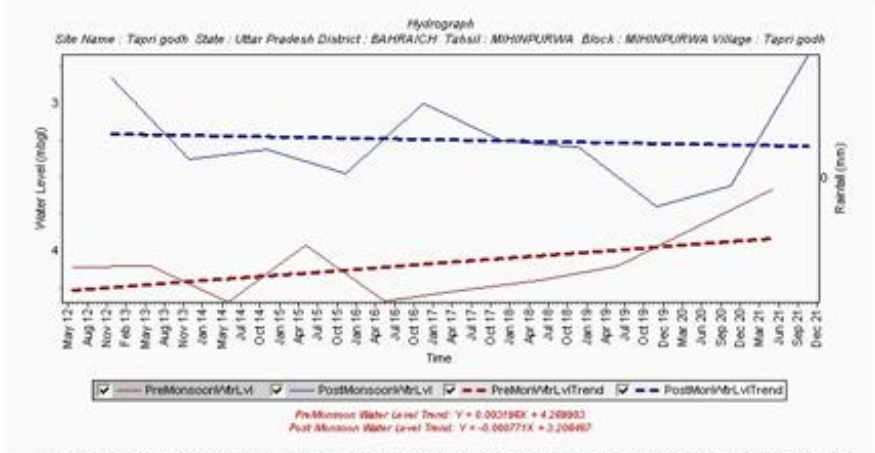


Figure 14: Long Term Water Level Trend of Tapri godh (2012 – 2021), Bahraich District

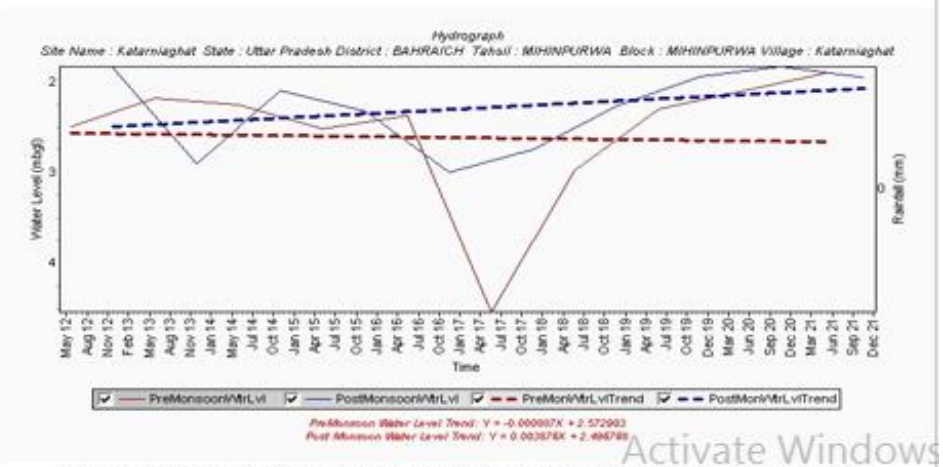


Figure 15: Long Term Water Level Trend of Katarniaghat (2012 – 2021), Bahraich District

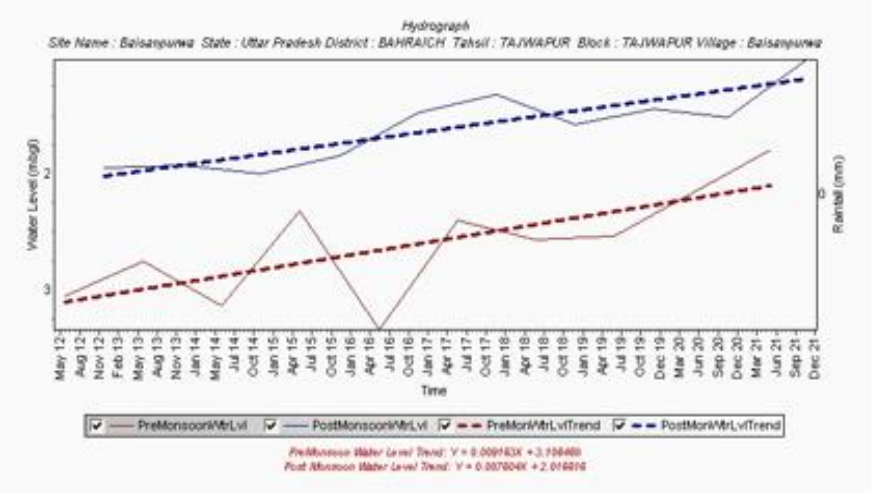


Figure 16: Long Term Water Level Trend of Baisanpurwa (2012 – 2021), Bahraich District

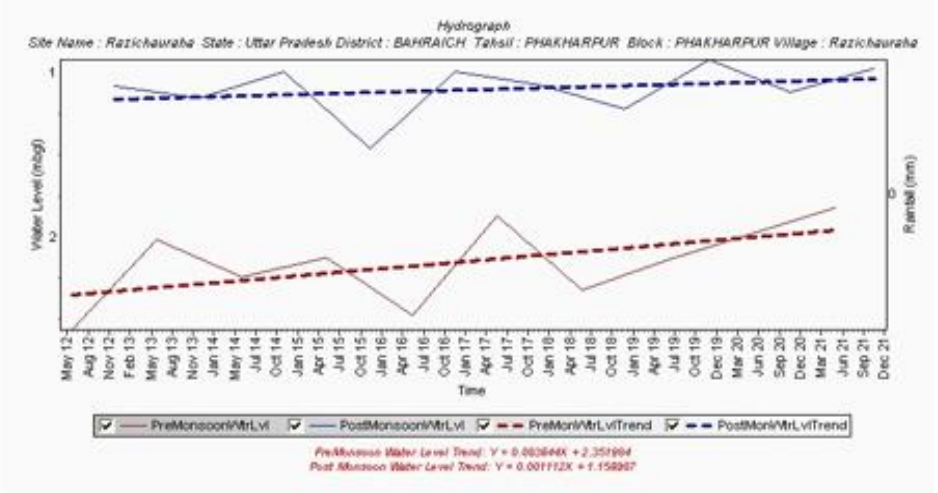


Figure 17: Long Term Water Level Trend of Razi chauraha (2012 – 2021), Bahraich District

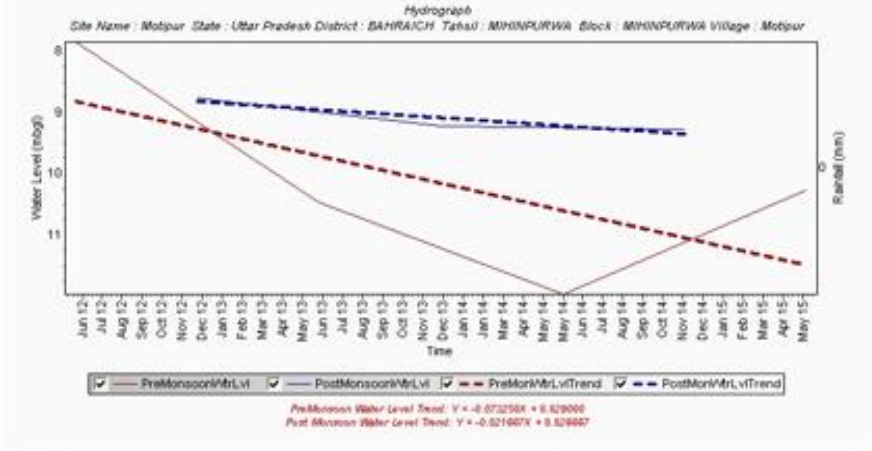


Figure 18: Long Term Water Level Trend of Motipur (2012 – 2021), Bahraich District

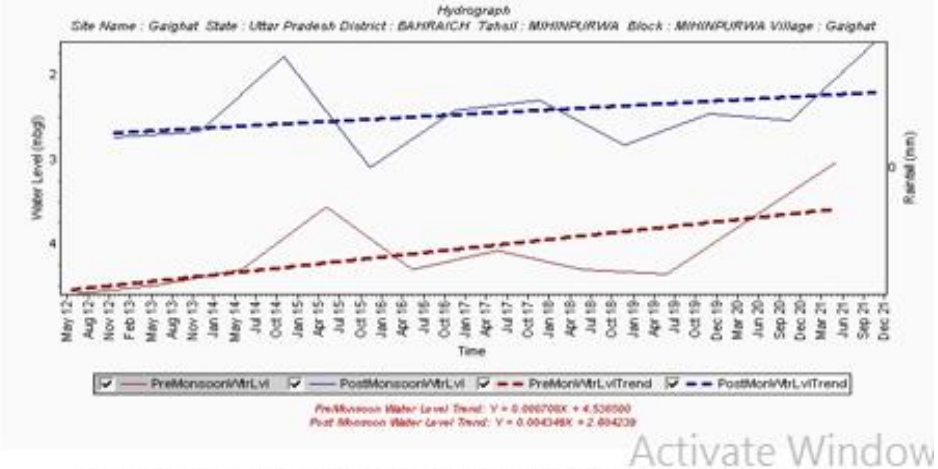


Figure 19: Long Term Water Level Trend of Gaighat (2012 – 2021), Bahraich District

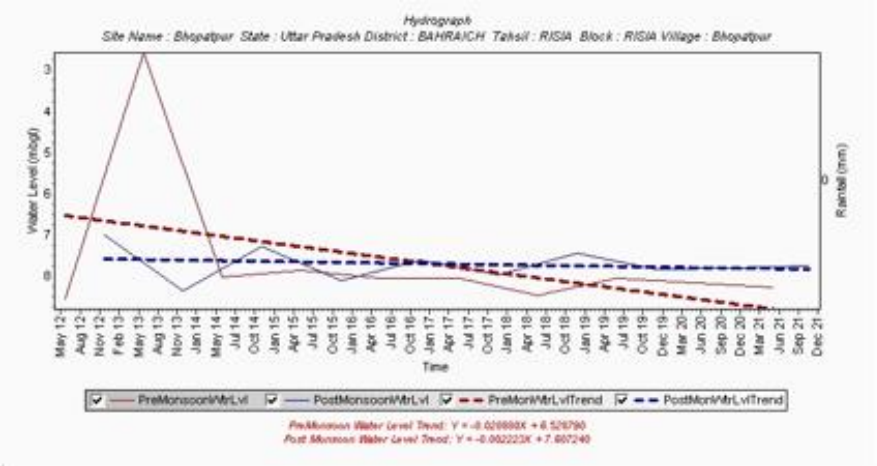


Figure 20: Long Term Water Level Trend of Bhopatpur (2012 – 2021), Bahraich District

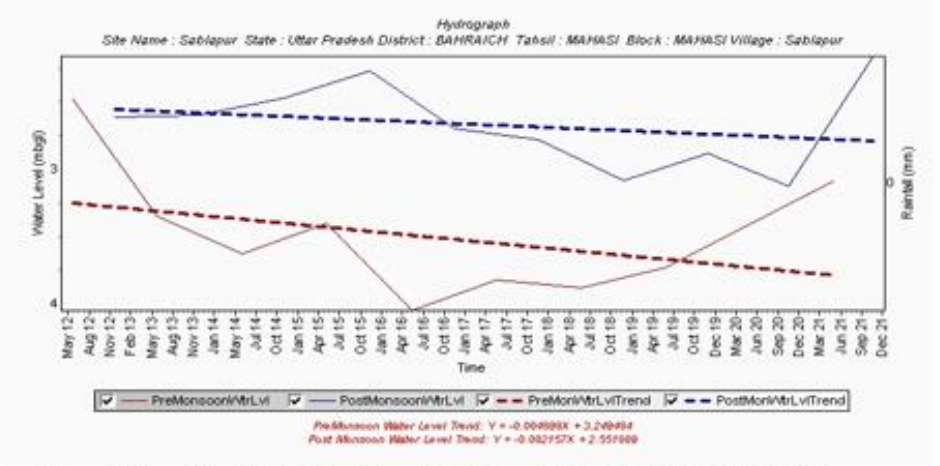


Figure 21: Long Term Water Level Trend of Sablapur (2012 – 2021), Bahraich District

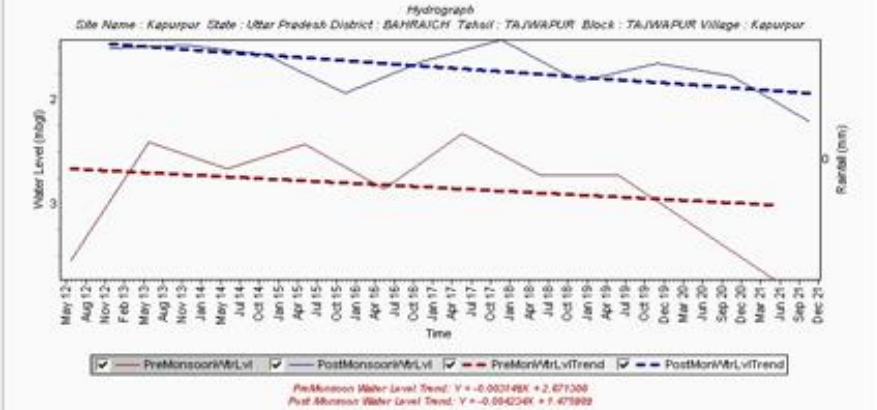


Figure 22: Long Term Water Level Trend of Kapurpur (2012 – 2021), Bahraich District

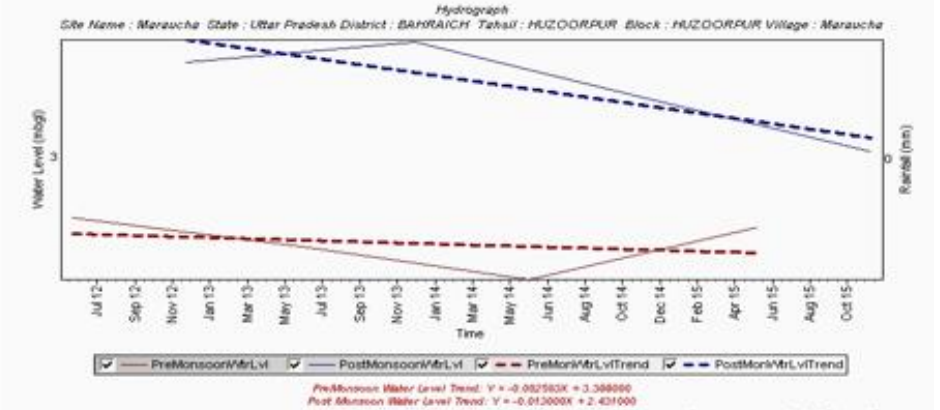


Figure 23: Long Term Water Level Trend of Maraucha (2012 – 2021), Bahraich District

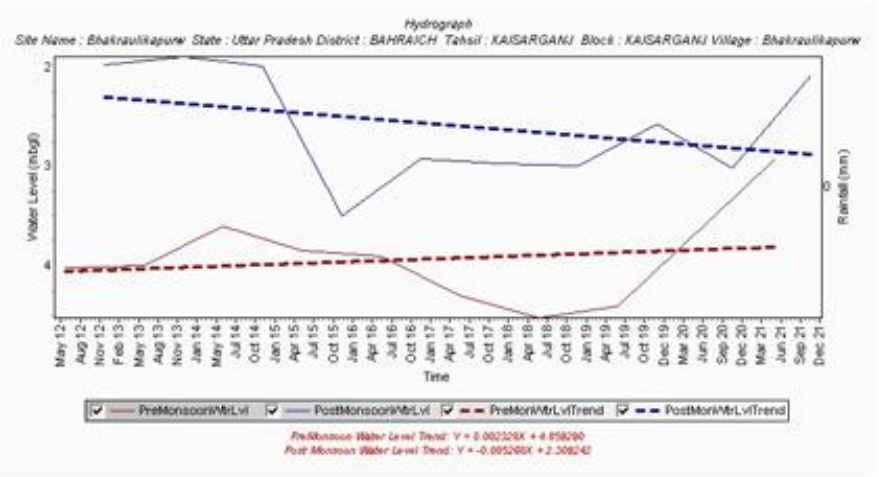


Figure 24: Long Term Water Level Trend of Bhakraulikapurwa (2012 – 2021), Bahraich District

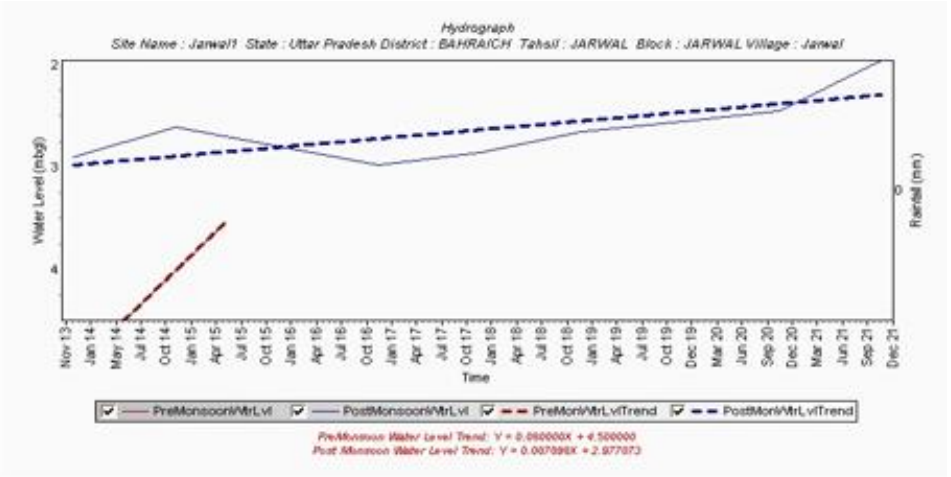


Figure 25: Long Term Water Level Trend of Jarwall (2012 – 2021), Bahraich District

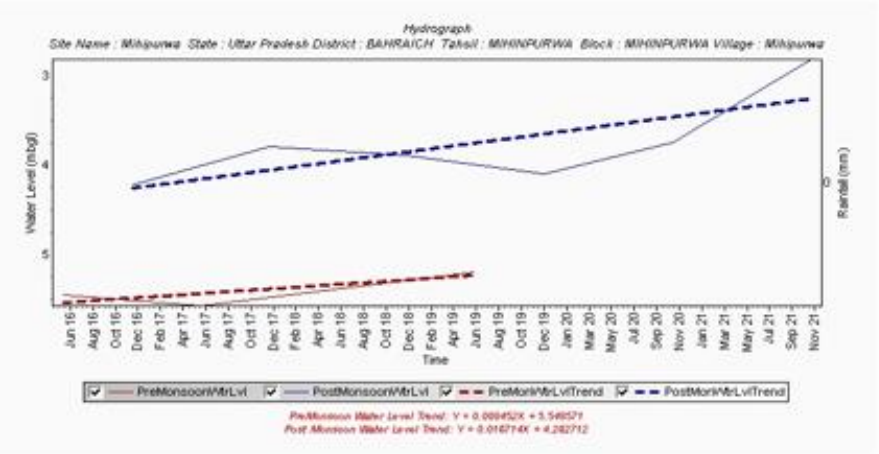


Figure 26: Long Term Water Level Trend of Mihipurwa (2012 – 2021), Bahraich District

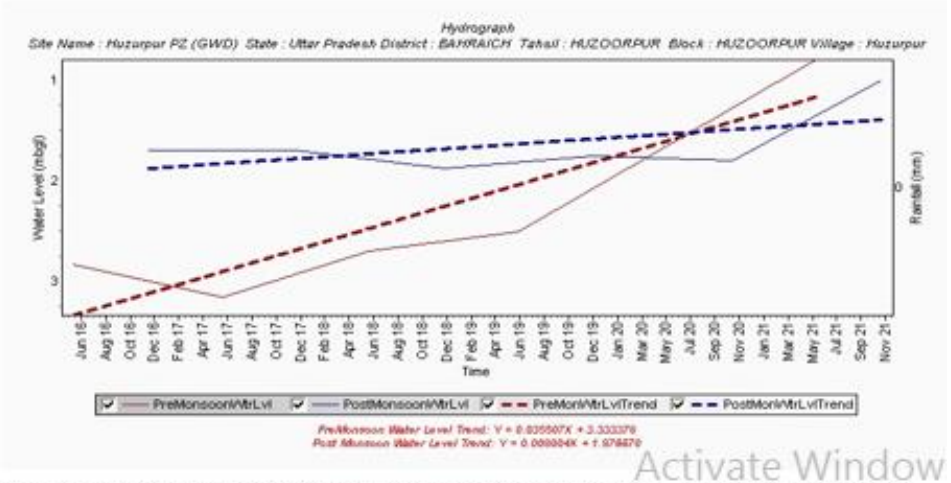


Figure 27: Long Term Water Level Trend of Huzurpur PZ (GWD) (2012 – 2021), Bahraich District

2.4 Ground Water Exploration:

There are 18 exploratory wells and 18 observatory wells in the study area which discharge varies from 1874 (Bhabhni Saida) – 2528 (Santhalia).

S. N.	Block/ Taluka	Location	Longitude	Latitude	Type of Well	Depth of well-constructed (mbgl)	Most promising water bearing Zones (limit to max 3)						Discharge (lpm)
1	Visheshwarganj	Diwanpurwa	81.830322	27.318417	EW	298	212	221	225	234	280	292	2092
2	Visheshwarganj	Diwanpurwa	81.830322	27.318417	OW	295	214	220	226	232	283	289	2092
3	Mihinpurwa	Chahalwa	81.128985	28.025097	EW	286	222	234	244	256	270	282	2233
4	Mihinpurwa	Chahalwa	81.128985	28.025097	OW	286	223	232	246	255	271	280	2233
5	Nawabganj	SSB Camp Pachpokhri	81.581836	28.025097	EW	194	70	76	96	105	120	128	2256
6	Nawabganj	SSB Camp Pachpokhri	81.581836	28.025097	OW	192	70	76	96	104	121	127	2256
7	Tajvapur	Sirajpur (Surjana)	81.456808	27.549503	EW	172	126	138	144	150	160	166	2210
8	Tajvapur	Sirajpur (Surjana)	81.456808	27.549503	OW	172	129	135	144	150	160	166	2210
9	Payagpur	Babhaniyawan	81.871639	27.493575	EW	200	146	158	162	174	188	194	2301
10	Payagpur	Babhaniyawan	81.871639	27.493575	OW	198	148	157	163	172	188	194	2301
11	Fakharpur	Gujauli Kalan	81.4255	27.446515	EW	181	88	100	127	139	169	175	2301
12	Fakharpur	Gujauli Kalan	81.4255	27.446515	OW	181	89	98	129	138	169	175	2301
13	Mihipurwa	Sarra Kalan	81.429184	28.105015	EW	294	226	235	243	249	255	264	2392
14	Mihipurwa	Sarra Kalan	81.429184	28.105015	OW	294	228	234	243	249	255	261	2392
15	Huzoorpur	Katghari	81.6425669	27.4554077	EW	300	212	215	222	234	286	297	2210
16	Huzoorpur	Katghari	81.6425669	27.4554077	OW	298	212	215	224	233	289	295	2210
17	Balha	Nanpara	81.516851	27.839211	EW	300	222	228	234	246	278	287	2256
18	Balha	Nanpara	81.516851	27.839211	OW	300	222	228	235	244	280	286	2256
19	Mahasi	Chandpara	81.404935	27.601395	EW	236	155	167	180	186	218	230	2528

20	Mahasi	Chandpara	81.404935	27.601395	OW	233	157	166	180	186	220	229	2528
21	Nawabganj	Santhalia	81.712946	27.97137	EW	188	110	116	125	131	134	140	2528
22	Nawabganj	Santhalia	81.712946	27.97137	OW	188	110	116	125	131	134	140	2528
23	Shivpur	Gujratipurwa	81.37252	27.80492	EW	235	140	152	185	194	220	229	2210
24	Shivpur	Gujratipurwa	81.37252	27.80492	OW	234	142	151	186	192	222	228	2210
25	Huzoorpur	Karmullahpur	81.6425669	27.4554077	EW	179	130	136	143	155	161	173	2210
26	Huzoorpur	Karmullahpur	81.6425669	27.4554077	OW	175	130	136	147	156	162	171	2210
27	Jarwal	Para Parasrampur	81.559569	27.129127	EW	236	174	186	192	198	218	230	2301
28	Jarwal	Para Parasrampur	81.559569	27.129127	OW	234	175	184	192	198	221	230	2301
29	Kaisarganj	Bairisalpur	81.545917	27.341832	EW	300	232	244	248	260	293	297	2301
30	Kaisarganj	Bairisalpur	81.545917	27.341832	OW	300	234	243	249	258	293	297	2301
31	Risia	Bhabani Saida	81.557677	27.636003	EW	189	148	160	171	183			1874
32	Risia	Bhabani Saida	81.557677	27.636003	OW	188	149	158	173	182			1874
33	Balha	Chandanpur	81.3932	27.923771	EW	188	126	135	149	155	163	169	2438
34	Balha	Chandanpur	81.3932	27.923771	OW	184	127	133	149	155	163	169	2438
35	Risia	Dihwa	81.648804	27.748377	EW	200	125	134	140	149	168	174	1904
36	Risia	Dihwa	81.648804	27.748377	OW	200	126	132	142	148	168	174	1904

2.5 Groundwater Quality

The concentration of elements in groundwater is governed by many factors. i.e.

- Nature of formation,
- Minerals present in the rock,
- Characteristics of soil,
- Anthropogenic activities like Irrigation run-off, Discharge of effluents, Industrial and domestic activities, etc.

In order to have a clear picture and to study the hydrochemistry of groundwater, the analytical data of monitored wells and hand pumps were analyzed by the NABL accredited Regional Chemical Laboratory at Lucknow.

2.5.1 Groundwater sampling

Pre-monsoon sampling was carried out in June 2021 for the determination of basic parameters and trace metals for the demarcation of areas with spurious water quality.

2.5.2 General Aspects of the unconfined aquifer

16 groundwater samples were collected during the pre-monsoon season in 2021 for analysis of basic parameters and trace metals. The analyzed data has been attached as Annexures 1 and 2.

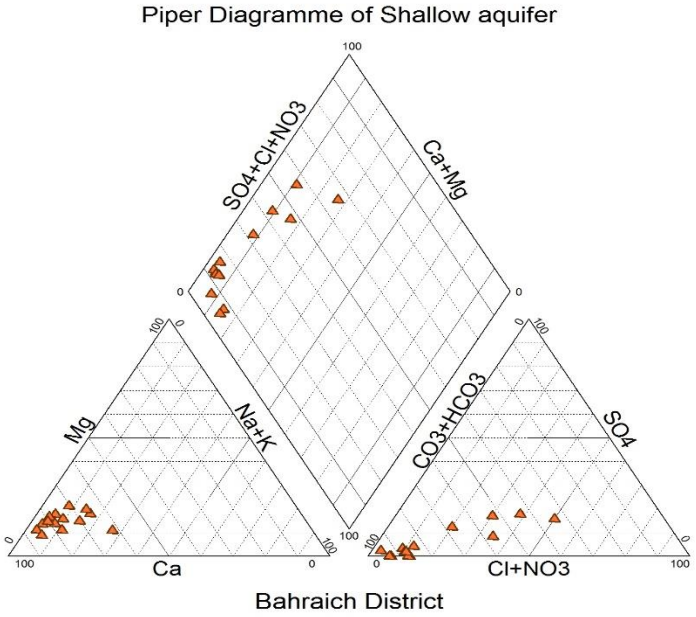


Figure 28: Trilinear Hill-Piper plot of the unconfined aquifer

2.5.3 Classification with respect to agricultural use

The unconfined aquifer's water quality has been categorized according to agricultural criteria as required by IS 11624-1986.

- **Total salt concentration –** It is represented as Electrical Conductivity (EC), and Table 8 below lists the categorization in regard to the danger it poses to soils.

Table 8: Summarized table of GW samples w.r.t EC

Sl. No.	Class	Range of EC (µS/cm)	No. of samples
1.	Low	0 – 1,500	14
2.	Medium	1,500 – 3,000	-
3.	High	3,000 – 6,000	-
4.	Very High	>6,000	-

All the samples lie within the ambit of the 'Low' class with reference to EC and pose no problem for irrigation.

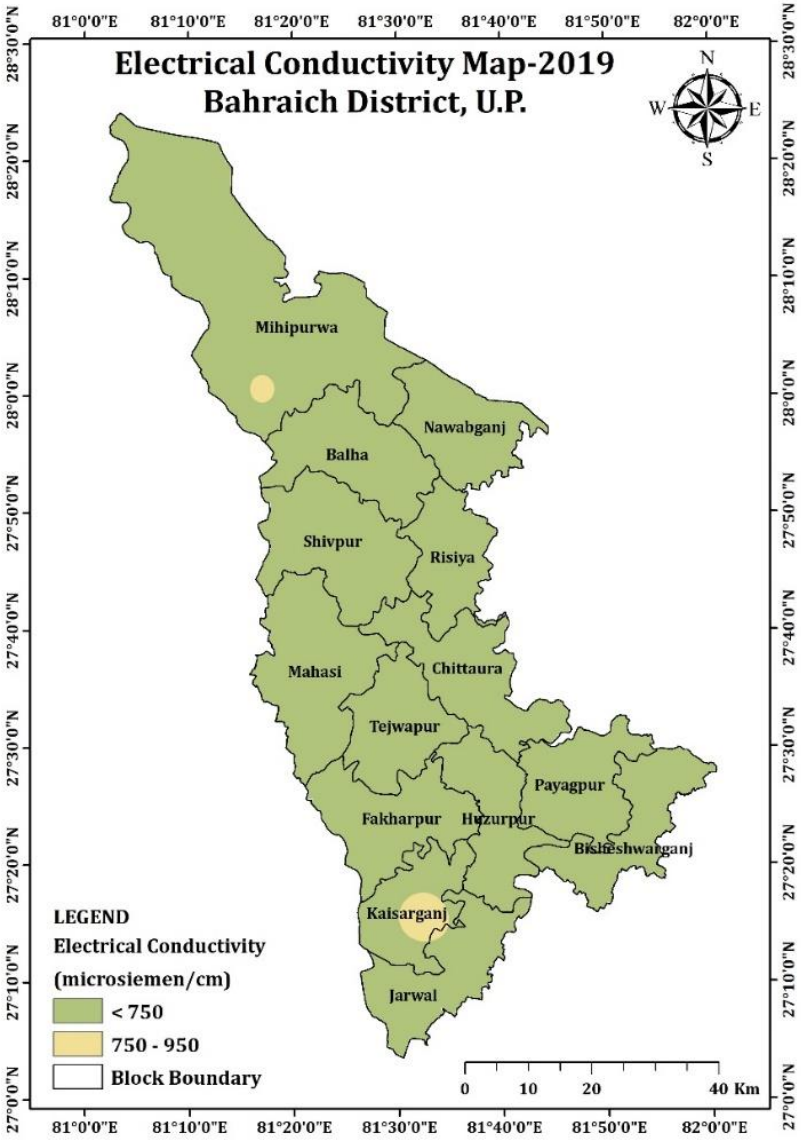


Figure 119: Electrical Conductivity Map-2019 Bahraich District, U.P.

- **Residual Sodium Carbonate –** It is computed using the below formula, where all constituents are expressed in meq/l, and is characterized in terms of the potentially harmful consequences of bicarbonate ion concentration on soil:

$$RSC = (CO_3^{2-} + HCO_3^{-}) - (Ca^{2+} + Mg^{2+})$$

Table 9: Summarized table of GW samples w.r.t RSC

Sl. No.	Class	Range of RSC (meq/l)	No. of samples
1.	Low	< 1.5	11
2.	Medium	1.5 – 3.0	2

3.	High	3.0 – 6.0	2
4.	Very High	> 6.0	-

Eleven samples (73.33% of total samples) lie within the ambit of the 'Low' class with reference to RSC and pose no problem for irrigation. Two samples (13.33% of total samples) lie within the ambit of the 'Medium' class, and the soil requires some treatment prior to the application of groundwater for irrigation. Two samples (13.33% of total samples) lie within the ambit of the 'High' class and can be used under exceptional circumstances.

- **Sodium Adsorption Ratio –** It is a measure of the quality of irrigation water that is utilized to manage soils that have been impacted by salt. The amount of the principal alkaline and alkaline earth cations found in groundwater serves as a sign of the water's appropriateness for irrigation of agricultural land. It may also be used as a diagnostic measure for a soil's sodicity risk based on an investigation of soil pore water.

It is computed from the formula given below:

$$SAR = \frac{Na}{\sqrt{(Ca + Mg)/2}}$$

Table 10: Summarized table of GW samples w.r.t SAR

Sl. No.	Class	Range of SAR (meq/l)	No. of samples
1	Low	<10	12
2	Medium	10 - 18	1
3	High	18 - 26	1
4	Very High	> 26	

Twelve samples (85.71% of total samples) lie within the ambit of the 'Low' class with reference to SAR and pose no problem for irrigation. One sample (7.14% of total samples) lies within the ambit of the 'Medium' class, and the soil requires some treatment prior to the application of groundwater for irrigation. One sample (7.14% of total samples) lies within the ambit of the 'High' class and can be used under exceptional circumstances.

2.5.4 Note on Trace elements

- **Chromium as Cr:** No Chromium was found in any sample.
- **Copper:** No Copper was found in any sample.

- **Iron:** Only five samples (approx. 35.71% of total samples), namely Balha, Shivpur, Risiya, Payagpur, and Bisheshwarganj, display values of Iron greater than 0.3 mg/l, which is an acceptable limit as per BIS 10500:2012-2nd Revision.
- **Manganese: No Manganese was found in any sample.**
- **Zinc:** No Zinc was found in any sample.
- **Arsenic as As** Only one sample, Tejwapur block displays Arsenic below the limit as per BIS 10500:2012-2nd Revision.
- **Lead:** All samples have Lead content within the acceptable limit as per BIS 10500:2012-2nd Revision.
- **Nitrate:** Only one sample, the Mihipurwa block, displays Nitrate higher than the limit as per BIS 10500:2012-2nd Revision.

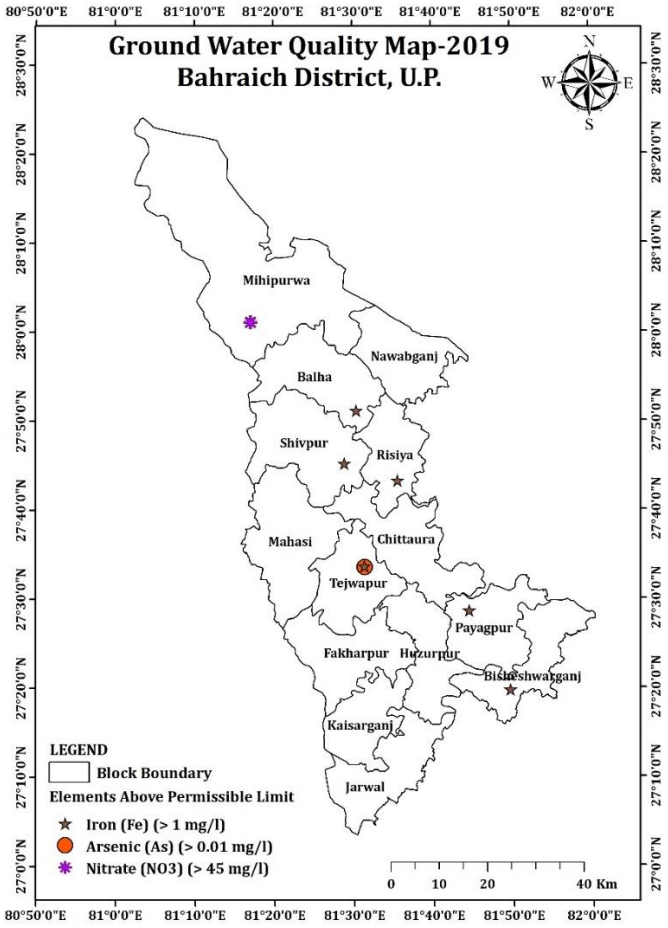


Figure 120:Water Quality Map of Bahraich district

2.5.5 General hydrochemistry of deeper aquifers

14 groundwater samples were collected in May 2019 when pumping tests were carried out to determine aquifer parameters. 3 samples were earmarked for the determination of basic parameters, namely pH, EC, Ca^{2+}, Mg^{2+}, Na^{+}, K^{+}, HCO_3^{-}, CO_3^{2-}, SO_4^{2-}, Cl^{-}, F^{-} and PO_4^{3-}. 3 samples were earmarked for analysis of trace metals, namely Fe, Mn, Cu, Cr, Zn, Pb, As, and U by ICP-MS. After obtaining the results of chemical analyses, the samples were plotted on a trilinear Hill-Piper plot, and the samples were classified into different hydrochemical facies based on dominant cations and anions.

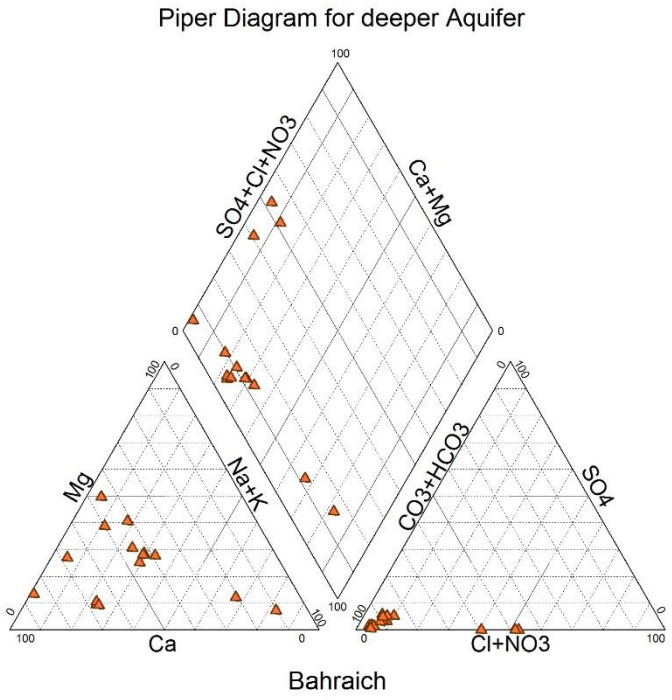


Figure 31: Trilinear Hill-Piper plot of deeper aquifer

Table 11: Deep Aquifer Quality of Bahraich

	Aquifer -1	**Aquifer-2**	**Aquifer-3**
EC range	380-882	308-740	308-740
Fluoride	0-0.28 mg/l	0-0.83 mg/l	0-0.83 mg/l
Other Problem	Arsenic and Iron Contamination as sporoidic source.	No Quality Problem	No Quality Problem

2.6 Aquifer Characteristics

The research area's main aquifers were identified by grouping sand, clay, loam, bhur, sandy-loam, and domat as aquifers separated by restricting clay layers called aquicludes. The electrical resistivity (64 inches Normal) and gamma radioactivity records of the boreholes drilled in the region were merged to identify granular zones (the aquifers) with varying resistivity. The lithological character, hydraulic parameters, and quality, as determined by exploratory drilling and geophysical logging, have been used to demarcate various aquifer groupings. Aquifer group I, Aquifer group II, and Aquifer group III are the three aquifer systems that exist in the research region.

- **Aquifer Group- I**

The Aquifer group-I lies beneath the topsoil and is found between the depths of 150.00 mbgl. Ground water occurs under water table conditions in this aquifer category, which is unconfined/phreatic. Shallow tube wells, drilled wells, and hand pumps are the most common methods of tapping this aquifer. The district's water level is generally shallow, with depths to water level ranging from 3 to 6 meters below ground level in the first aquifer. Sand, clay, and loam make up this aquifer category. The granular zone thickness ranges from 11 to 180 meters, with an average of 90 meters. This aquifer was accessed by the majority of state tube wells and public wells. The main difficulty with the 1st Aquifer's groundwater quality is occasional occurrences of arsenic (>0.01 mg/l) and Iron (>0.3 mg/l). The EC range in the 1st Aquifer is 380-882, fluoride is 0-0.28 mg/l, and there are no additional issues.

- **Aquifer Group- II**

This aquifer group is separated from the first Aquifer unit by the restricting clay layer. It usually occurs between the depths of 160.00 and 240.00 mbgl. Except for one Borehole in Kodia, where gravel and pebbles are also detected, the aquifer material is mostly sand and bhur. The granular zone thickness ranges from 36 to 168 meters, with an average of 83 meters. The transmissivity varies from 837 to 3083 m2/day, while the storativity ranges from 1.3710-04 to 6.7810-05. The majority of departmental exploratory wells are drilled in this aquifer, with cement capping at the bottom of the first aquifer. This aquifer group's quality is fresh and good; moreover, the EC range in the 2nd Aquifer is 308-740, fluoride is 0-0.83 mg/l, and there are no additional quality issues.

- **Aquifer Group- III**

This aquifer group exists between the depths of 250 mbgl and below, separated from the overlying aquifer group by thick clay. The granular zone thickness ranges from 19 to 105 meters, with an average of 40 meters. The transmissivity varies from 318 to 1766 m2/day, while the storativity ranges from 1.9810-04 to 6.1810-04. This aquifer group's quality is fresh and good; moreover, the EC range in the 3rd Aquifer is 308-740, fluoride is 0-0.83 mg/l, and there are no additional quality issues.

The data are available from exploratory drilling summarizing the depth of aquifer groups, feasible extraction structure, discharge, and other details that have been summarized below.

Table 12: Summarized details of Aquifer groups in the district

Aquifer	Group – 1 [AL03]	Group – 2 [AL03]	Group – 3 [AL03]
Formation	Sand, clay, and loam.	Gravel and pebbles, mostly sand and bhur.	Sand, silt & thick clay.
Abstraction Structure	Tube wells and public wells.	Exploratory wells	Tube-well
Depth Range (mbgl)	150	160-240	250 and below
Discharge (lpm)	50 – 100	1,517	1,1119 – 1,173
Transmissivity	-	837 to 3083 m2/day	318 to 1766 m2/day
SY / S	0.10	$1.37x10^{-04}$ to $6.78x10^{-05}$	$1.98x10^{-04}$ to $6.18x10^{-04}$

Groundwater suitability	occasional occurrences of arsenic and Iron.	Suitable for irrigation and domestic purposes.	Suitable for irrigation and domestic purposes.

2.7 Lithological Disposition and Aquifer Disposition

A 3-D model, sections, and stratigraphy diagrams based on lithological information obtained through exploratory drilling and geophysical investigations conducted by CGWB and private drillers in the district have been prepared to better understand the lithological and aquifer disposition in the study area. Borehole data is used to create the lithological strata. Aquifer/Lithological sections, Stratigraphy diagrams, and 3D Aquifer/ Lithological dispositions diagrams are all prepared using the same color codes. The existence of a substantial pile of various grades of sand with an alternating sequence of clay is shown in the research region by lithology and geophysical logging. The models were used to evaluate the lithological and aquifer dispositions; stratigraphic sections were created using Rockworks software. The vertical and horizontal scales in meters are used on the sections created for subsurface formations and aquifers.

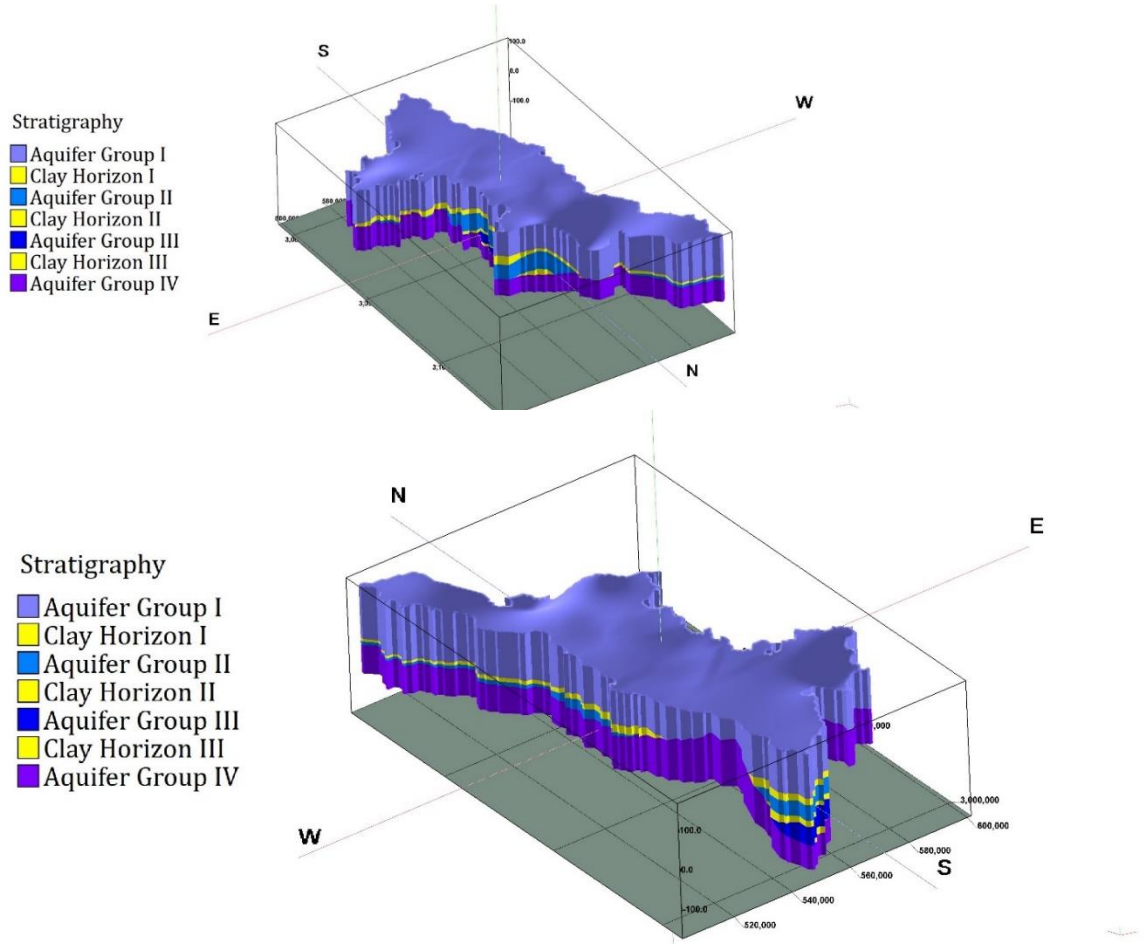
- **Principal Aquifer System in the study area**

The research area's main aquifers were identified by grouping sand, clay, loam, bhur, sandy-loam, and domat as aquifers separated by restricting clay layers called aquicludes. The electrical resistivity (64 inches Normal) and gamma radioactivity records of the boreholes drilled in the region were merged to identify granular zones (the aquifers) with varying resistivity. The lithological character, hydraulic parameters, and quality, as determined by exploratory drilling and geophysical logging, have been used to demarcate various aquifer groupings. Aquifer group I, Aquifer group II, and Aquifer group III are the three aquifer systems that exist in the research region.

Table 13: Deep Aquifer Quality of Bahraich

	Aquifer -1	Aquifer-2	Aquifer-3
EC range	380-882	308-740	308-740
Fluoride	0-0.28 mg/l	0-0.83 mg/l	0-0.83 mg/l
Other Problem	occasional occurrences of arsenic and Iron.	No Quality Problem	No Quality Problem

- **3-D lithological and Aquifer Model**



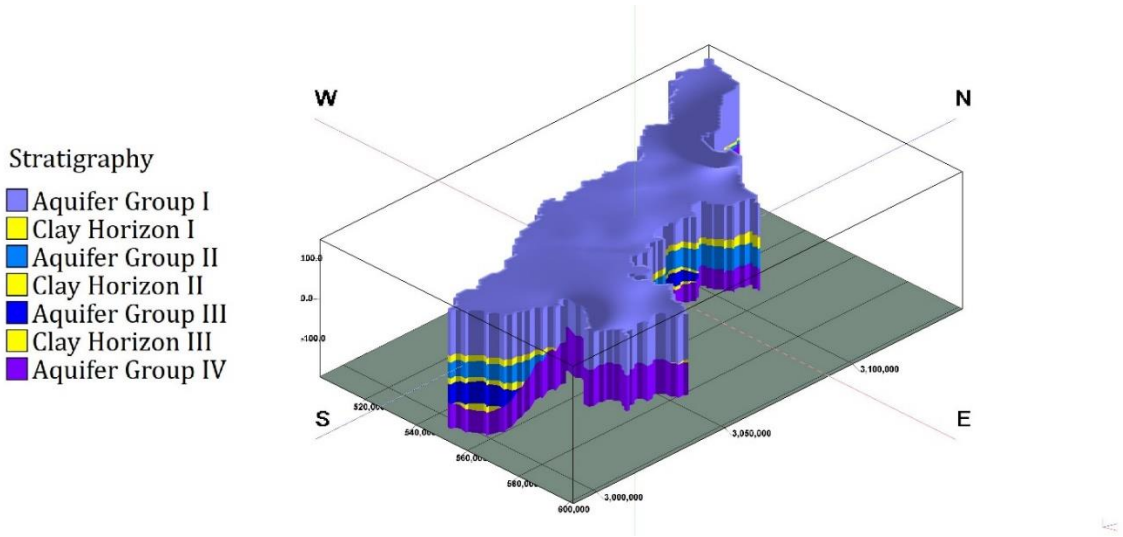
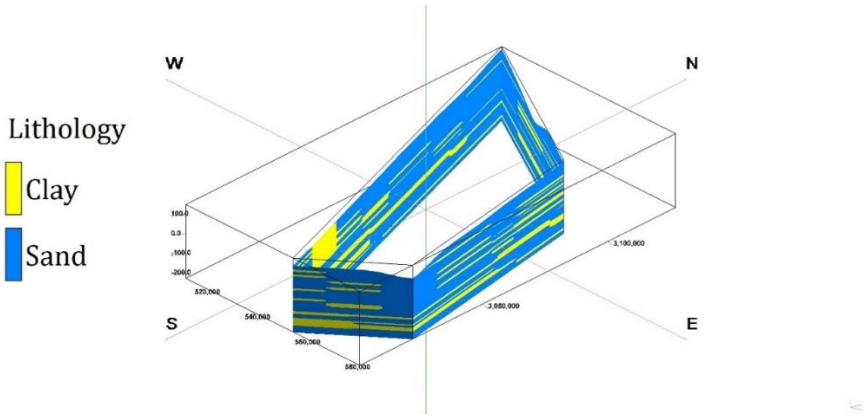


Figure 32: 3D model of Bahraich district

The thickness of Aquifer Group – 1 extends down to 150 mbgl (meters below ground level) from the ground surface. It is separated from the Aquifer Group – 2 by a clay layer. Aquifer Group – 2 is observed between 160 to 240 mbgl (meters below ground level). It is further separated from Aquifer Group - 3 by thick clay with thickness greater than the one separating Aquifers 1 and 2. Aquifer group – 3 is observed between the depths of 250 mbgl (meters below ground level) and below.

- **Fence diagram**

Figure 33 displays fence diagrams built in the research area that delineate the lithology on a regional scale.



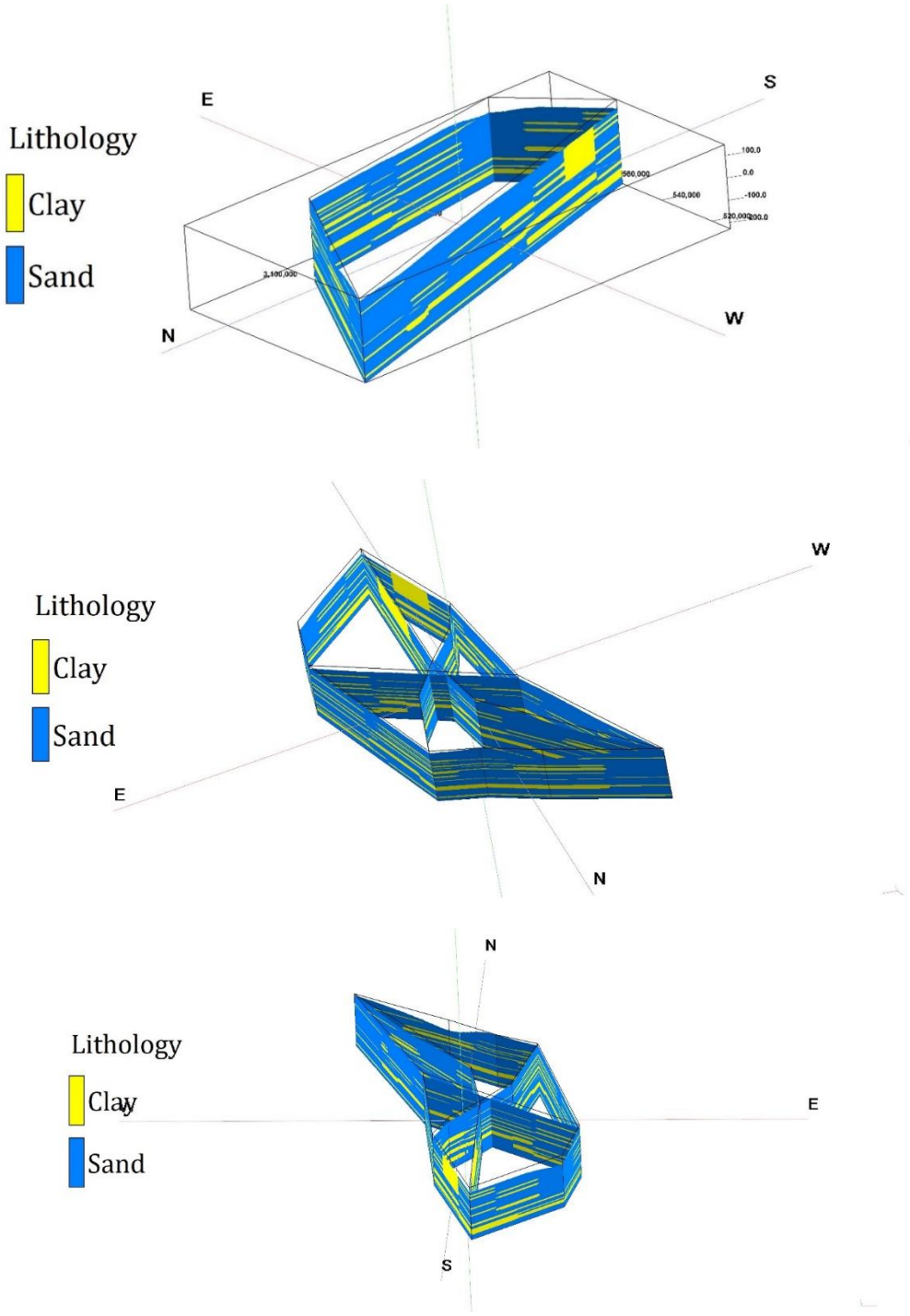


Figure 33: 3D diagram showing lithological variation in Bahraich district

3. GROUNDWATER RESOURCE POTENTIAL

- **Stage of Groundwater Development:**

The current stage of Groundwater Development in the Bahraich district has been pegged at 54.09% as per GWRE 2021, which is categorized as Safe. All the 14 blocks of the district have been categorized as "Safe" as their Stage of GW Development lies in the narrow range of 35.59% - 66.94%. Kaisarganj block lies at the lower end of the scale displaying 35.59% Stage of GW Development, whereas the Mihipurwa block lies at the extreme end of the scale with 66.94% of GW Development. Mihipurwa block has the lowest groundwater availability, whereas the Mahasi block has the highest groundwater availability.

The groundwater resource potential of the district (block-wise) has been calculated on the methodology given in Groundwater Estimation Committee (GEC) Report 2020.

Table 14: Dynamic Groundwater Resources of Bahraich district

S. No	Assessment Unit Name	Net Annual Ground-Water Availability (in ham)	Existing Gross Ground Water Draft for all Uses (in ham)	Net Ground Water Availability for future use	Stage of Ground Water Development	Categorization (OE/Critical/Semi critical/Safe)
1	**Balha**	8609.85	5466.53	3053.56	63.49%	Safe
2	**Bisheshwarganj**	9717.81	6392.56	3230.78	65.78%	Safe
3	**Chittaura**	13351.98	8028.50	5198.24	60.13%	Safe
4	**Fakharpur**	7657.56	4286.36	3303.57	55.98%	Safe
5	**Huzurpur**	8768.67	3865.10	4814.23	44.08%	Safe
6	**Jarwal**	6284.36	3157.65	3073.17	50.25%	Safe
7	**Kaisarganj**	8255.36	2938.25	5226.63	35.59%	Safe
8	**Mahasi**	12356.08	4558.19	7630.64	36.89%	Safe
9	**Mihipurwa**	7613.64	5096.58	2449.1	66.94%	Safe
10	**Nawabganj**	8467.17	3830.21	4567.36	45.24%	Safe
11	**Payagpur**	12330.05	6413.45	5811.93	52.01%	Safe

12	**Risiya**	10158.65	6714.11	3342.2	66.09%	Safe
13	**Shivpur**	10856.35	6173.79	4590.37	56.87%	Safe
14	**Tejwapur**	7863.42	4632.40	3153.29	58.91%	Safe
Total		132290.95	71553.68	59445.07	54.09%	

Map displaying the block-wise categorization as well as Stage of Groundwater Development has been attached below as Figure 34.

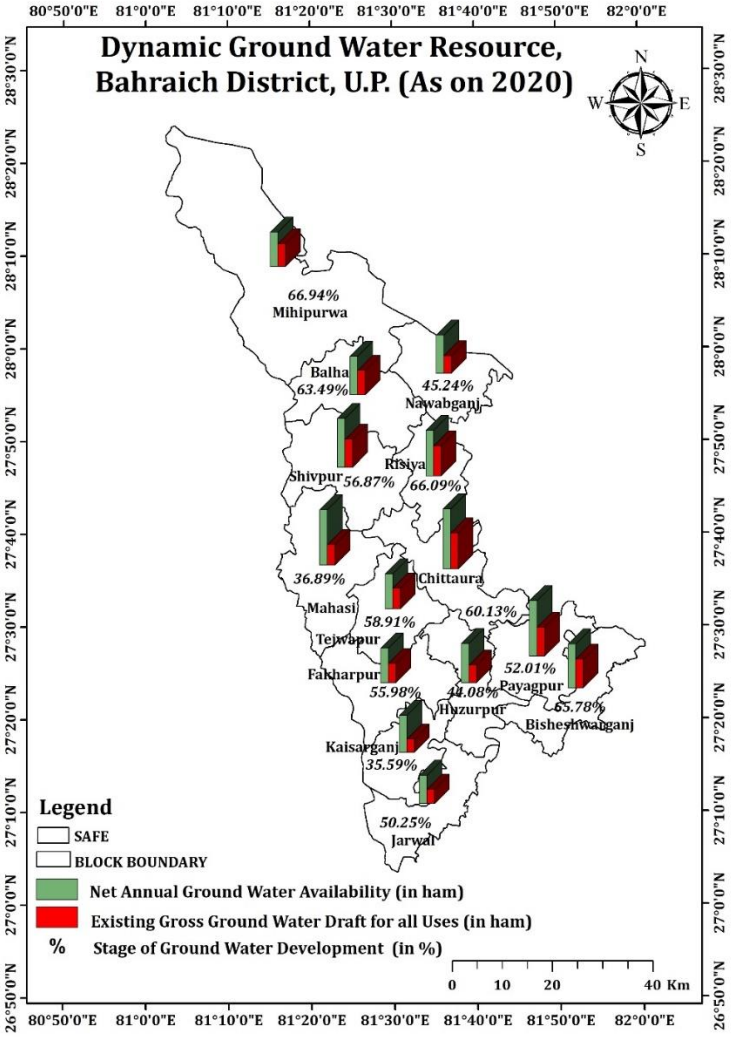


Figure 34: Dynamic Ground Water Resources Map of Bahraich district

4. GROUND WATER-RELATED ISSUES

4.1 Identification of issues

- The high contribution of groundwater towards irrigation: The contribution of surface water from the existing canal network towards irrigation ranges from 60.24% in the Nawabganj block to a paltry 1.2% in the Bisheshwarganj block. The balance is made up by harnessing groundwater. The blocks of Payagpur, Mahsi, Tajwapur, Fakharpur, Huzurpur, Kaiserganj, and Jarwal are entirely reliant on groundwater for irrigation.

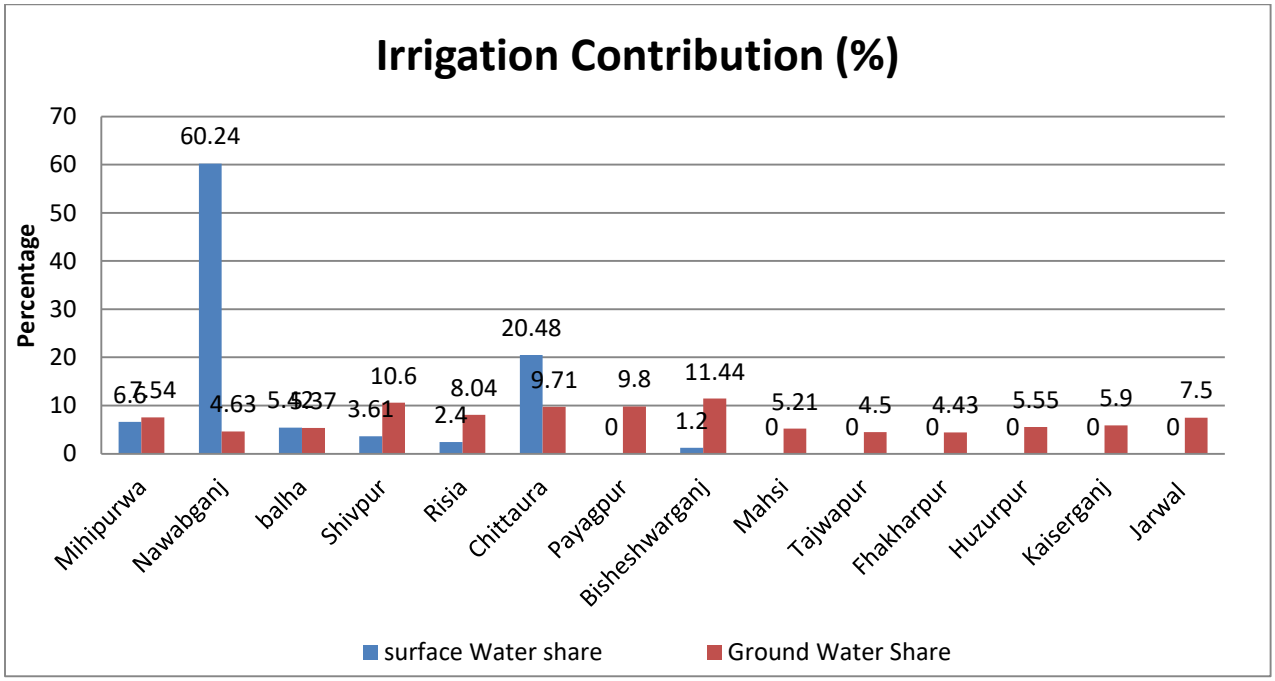


Figure 35: Graph displaying contribution of surface and groundwater for irrigation for each block (Statistical Diary-2020)

4.2 Groundwater quality issues and contamination

- Sporadic occurrence of Iron and Arsenic in the unconfined aquifer.

4.3 Miscellaneous issues

- Farmers in the district possess intermediate to low knowledge of vegetable cultivation practices.

5. MANAGEMENT STRATEGIES

In order to reduce the demand for groundwater resources and enhance their accessibility, management measures must be quickly established and put into action by the responsible agencies. The following table summarizes management techniques by demand- and supply-side actions for implementation:

Table 15: Proposed Supply-side and Demand-side interventions

SUPPLY-SIDE INTERVENTIONS	DEMAND-SIDE INTERVENTIONS
1. Carrying out de-siltation of streams, ponds, tanks, and surface water catchments to increase storage.	1. Promoting Cultivation of Sugarcane with high per hectare yield along with incentives.
2. Construction of Rainwater harvesting structures at suitable locations Where W.L is below 8mbgl.	2. Introduction rice crops that withstand water logging and flooded areas in addition to intense rainfall.
3. Construction and maintenance of Arsenic removal units at places where the Unconfined aquifer is Arsenic affected.	3. Promoting cultivation of pulses with high per hectare yield along with incentives.
4. Construction of deeper tube-wells tapping 2nd Aquifer group at locations where quality issues plague the unconfined aquifer	4. Promoting oilseed cultivation with subsidies and incentives.
5. Construction of check dams at suitable locations to increase the quantum of groundwater recharge	5. Providing impetus to horticulture and orchards by Rashtriya Krishi Vikas Yojana by State Government agencies.

5.1 Supply Side Interventions

In order to raise the amount of available water by expanding storage, encouraging community involvement in the reemergence and recovery of conventional water bodies like tanks, ponds, etc., and adequate rainwater harvesting frameworks at urban locations, it has been suggested to embrace that kind initiatives only in groundwater stressed blocks. The following is a description of the various interventions:

5.1.1 Carrying out de-siltation of streams, ponds, tanks, and surface water catchments to increase storage.

- Conventional water features like tanks, ponds, and can be desalted to expand storage space by catching extra rainwater, which can then be used for home and irrigation needs.

5.1.2 Construction of Rainwater harvesting structures at suitable locations

Rooftop rainwater harvesting is a process where rainwater from roofs of homes, buildings, schools, and other businesses is redirected to a storage tank or used to rehydrate an underground aquifer via a network of pipes and filter media (by Manager Aquifer Recharge techniques). Additionally, it takes far less upkeep to operate.

If not held in a tank, it reduces excess rainfall pouring into sewers that cause urban floods, stops soil erosion, and raises groundwater levels. It can assist get through the summer's peak water demand if kept in a tank or sump.

The amount of rainfall harvested depends on 3 factors:

- Quantum of annual Rainfall (mm)
- Rooftop area (m2)
- Runoff factor (0.2 to 0.8 depending on roofing material)

Formula to calculate harvested rainfall = Quantum of annual Rainfall (mm)* Rooftop area (m2)* Runoff factor

5.1.3 Construction and maintenance of Arsenic removal units

Construction and maintenance of Arsenic removal units at places where the Unconfined aquifer is Arsenic affected.

5.1.4 Construction of deeper tub-wells tapping 2nd Aquifer group at locations where quality issues plague the unconfined aquifer.

Deeper tube-wells tapping the 2nd Aquifer group between 70 – 152 mbgl can be constructed at suitable locations where the unconfined aquifer is affected by quality issues like high Iron, Manganese, Arsenic, etc.

5.1.5 Construction of check dams at suitable locations to increase the quantum of groundwater recharge.

5.2 Demand-side interventions

Groundwater use is primarily driven by agriculture, then by home and industrial requirements. As the conventional form of irrigation via canals produces reduced efficiency, there is growing attention on encouraging the adoption of micro-irrigation practices like spray and drip irrigation. The various treatments are explained below:

5.2.1 Promoting Cultivation of Sugarcane:

- Sugar industry is an important agro-based industry that impacts rural livelihood of about thousands of sugarcane farmers and around thousands of workers directly employed in sugar mills. Employment is also generated in various ancillary activities relating to transport, trade servicing of machinery and supply of agriculture inputs. The agro-climatic condition and availability of Groundwater resources in Bahraich district is suitable for cultivation of Sugarcane.
- Cultivation practices like Land Preparation, Inter Cultural operation, Method of Planting, Weed Management, Ratoon Management can save Groundwater upto 30-40% of GW resources.

5.2.2 Introduction of water-tolerant rice crops

- Popularization of rice varieties like Madhukar for flooded areas and Jal Priya & Jal Lahari varieties for waterlogged conditions by Krishi Vigyan Kendra among the farmers.
- These problematic areas have been identified by KVK under Thrust Area-1.

5.2.3 Promoting the cultivation of pulses

- Pulses not only give you the protein you need, but the nitrogen-fixing bacteria in their roots also add about 40 kg/Ha of nitrogen to the soil. It also helps the succeeding crop grow by making the soil's microenvironment, quality, and yield better.
- By combining the farming of pulses with other government programs already in place, such as the “Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize” (ISOPOM) program, Accelerated Pules Production program, and Pulses Development Program under “Rashtriya Krishi Vikas Yojana,” the cultivation of pulses can be given a boost.
- Via seminars and other events, the state agricultural department may educate farmers on the advantages of growing pulses as intercrops and including short-duration pulse types as cash crops.
- Promoting cultivation of pulses has been identified by KVK under Thrust Area-2.

5.2.4 Promoting oilseed cultivation with subsidies and incentives

- Since the output of oil seeds is inadequate to meet the demands of the population and involves a 40 percent import charge, India is the second biggest importer of oil seeds and the third-largest consumer of oil seeds, spending a total of 74,996 crores on imports in 2017–18.
- In the long-term, it will be advantageous for the nation to double the import duty in addition to providing bonuses for domestic oilseed cultivation by integrating the "Minimum Support Price" (MSP) with the "Minimum Remunerative Price" (MRP) and assent the oil seed sector special prestige under the "National Food Security Mission" (NFSM).
- The "Integrated Scheme of Oilseeds, Pulses, Oil Palm and Maize" (ISOPOM) is a federal program whereby every State develops a five-year seed plan outlining the needs of every farmer and designates ICAR as the nodal organization. In moreover to securing infrastructure support, technical training for farmers, and demonstrations of the most recent agricultural inputs to increase yield, ICAR is responsible for the purchasing and dispersion of seeds, weedicides/bio-pesticides, distribution of Gypsum/Pyrite/Liming/Dolomite for lining soils, and sprinkler sets.
- These oilseeds may be grown on appropriate soils, as determined by State Agricultural Universities: Linseed, Mustard, Rap seed, Sunflower, Castor Soybean, Safflower, Niger, Sesamum, and Groundnuts.
- Promoting cultivation of oilseeds has been identified by KVK under Thrust Area-2.

5.2.5 Providing impetus to horticulture and orchards under Rashtriya Krishi Vikas Yojana

National Agriculture Development Scheme is being operated by the Department of Horticulture & Food Processing, Government of Uttar Pradesh, that covers districts left out of the ambit of the National Horticulture Mission (N.H.M). 60% of the budgetary allocation is covered by the Central government, whereas 40% of budgetary allocation is covered by the State government's budget.

5.3 Miscellaneous interventions

5.3.1 Formulation of village water security and safety plan under the ambit of the National Rural Drinking Water Program (NRDWP).

With the primary goal of institutionalizing community participation and involvement in "Panchayat Raj Institution (PRI)" for water quality monitoring & surveillance of all drinking water sources, the "National Rural Drinking Water Quality Monitoring & Surveillance Program (NDWQM&S)" was introduced in February 2006. The following are the main components of NDWQM&S:

- To establish district- and sub-district-level drinking water quality testing labs (or enhance the current ones) for routine and ongoing evaluation of the water quality of rural drinking water sources.
- To provide "Field Test Kits (FTKs)" and bacteriological vials to GPs for on-the-field testing of essential general parameters (including Arsenic).
- Raising public awareness of problems with water quality and health.
- Developing the capacity of five local staff members in every GP to test water sources under their control utilizing straightforward FTKs and receiving verification from the closest water testing laboratory for samples that test positively.
- Perform a sanitary survey with certified Panchayat staff to check for potential bacterial contamination.

Underneath the program, all states receive full funding for Information, Education, and Communication (IEC) initiatives, human resource development initiatives, bolstering district-level drinking water quality testing laboratories, purchasing FTK for drinking water testing, travel and transportation costs, data reporting costs, stationery costs, honoraria for district-level surveillance coordinators, water testing, documentation, and data entry costs. Since 2009, the WQMS Program has been included into the NRDWP.

The NRDWP offers grants to all the states for the development of rural water supply schemes, with a concentrate on areas that are water-stressed and have poor water quality, as well as for initiatives to collect rainwater and recharge the groundwater, as well as for operation, and maintenance, including minor repairs. Every year, the states get their assigned cash in three installments (40 percent, 40 percent, and 30 percent, correspondingly). The NRDWP gives the states the authority to develop, authorize, and carry out water supply plans, including, among other things, the choice of acceptable treatment technology.

BLOCK-WISE, GROUNDWATER MANAGEMENT PLANS

5.4 Groundwater Management Plan of Fakharpur block

Block: Fakharpur **District:** Bahraich

General Information

State	Uttar Pradesh
District name	Bahraich
Block Name	Fakharpur
Location	
Geographical area	315.241 Sq.Km.
Basin/Sub-basin	Upper Ganga Plain
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium(AL03)
Normal Annual Rainfall	1152 mm

Aquifer Disposition

Three figures are required Showing aquifer disposition

Aquifer Disposition	Aquifer Disposition: One aquifer group with 3 Aquifer layers exist. Aquifer 1 (mbgl): From Surface to 150 Aquifer 2 (mbgl): 160.00 to 240.00 Aquifer 3 (mbgl): 250 to 300 Fresh Aquifer Depth: Upto 300 mbgl. Transmissivity (m2/day): 2339.00

	Sp. Yield: 0.0002942
Groundwater Monitoring Status	Ground Water Monitoring Wells: 9
Ground Water Quality	For Aquifer Group I: Iron and Arsenic are present in an unconfined aquifer
Aquifer Potential	Aquifer Group I: 2301 lpm
Groundwater Resource	Annual Extractable GW Recharge: 76.57 MCM GW Draft: 42.86 MCM Stage of GW Development: 55.98 % Total in-storage resource of the block (fresh) is 33.03 MCM
Existing and Future Water Demand	Present demand for All Usage: 76.57 MCM Future Demand for Domestic and Industrial Use: 33.03 MCM

Aquifer Management Plan

Groundwater issues	• Decline in water levels in some parts. GW quality Iron and Arsenic are present in an unconfined aquifer
AR & Conservation Possibilities	Construction of Recharge Structures mainly ponds and adoption of water use efficiency practices.
Groundwater Management Plan	There is a Scope of Groundwater development in the block. Hence, There Should be provide relaxation to Industries for Groundwater abstraction. DEMAND SIDE MANAGEMENT: Promoting Cultivation of Sugarcane ,rice crops ,pulses,oilseed and horticulture.

	Arsenic treatment plant need to be Constructed wherever Arsenic is reported in the block.
Status of GW Exploration	Exploratory Wells: 1 Observation Wells: 1 Piezometers: 8
Aquifer Characteristics	Aquifer Group I: Transmissivity: 2339.00 m2/day Storativity: 0.0002942

- **Water Level Behavior**

  Pre-monsoon water level ranges from 2.91 mbgl to 3.78 mbgl and post-monsoon water level ranges from 0.25 mbgl to 1.65 mbgl.

- **Issues**

Iron and Arsenic are present in an unconfined aquifer.

Groundwater contribution to agriculture is above 90%.

- **Groundwater Management Plan**

The proposed groundwater management plan for the block has been tabulated below. Upon implementation, 1.10 MCM of groundwater is expected to be available for additional utilization, and Stage of Groundwater Development is expected to decrease by 0.80%. The tentative locations for interventions has been attached as Figure 36 below.

Table 16(a): Summarized details of interventions proposed

Block	Check Dams (Nos.)	Stream Development (kms)	Nala Bunds (kms)	Ponds (Nos.)	On-farm area (Ha)	WUE area (Ha)
Fakharpur	-	-	-	05	-	-

Table 16(b): Projected GW Recharge & savings by supply and demand-side management

Net Annual GW Availability (MCM)	Existing GW Draft for all uses (MCM)	Stage of GW Development (%)	Total recharge through interventions (MCM)	Total GW savings through interventions (MCM)	Projected Net GW Availability (MCM)	Projected Stage of GW Development after interventions (%)
76.57	42.86	55.98	1.10	1.10	77.67	55.18

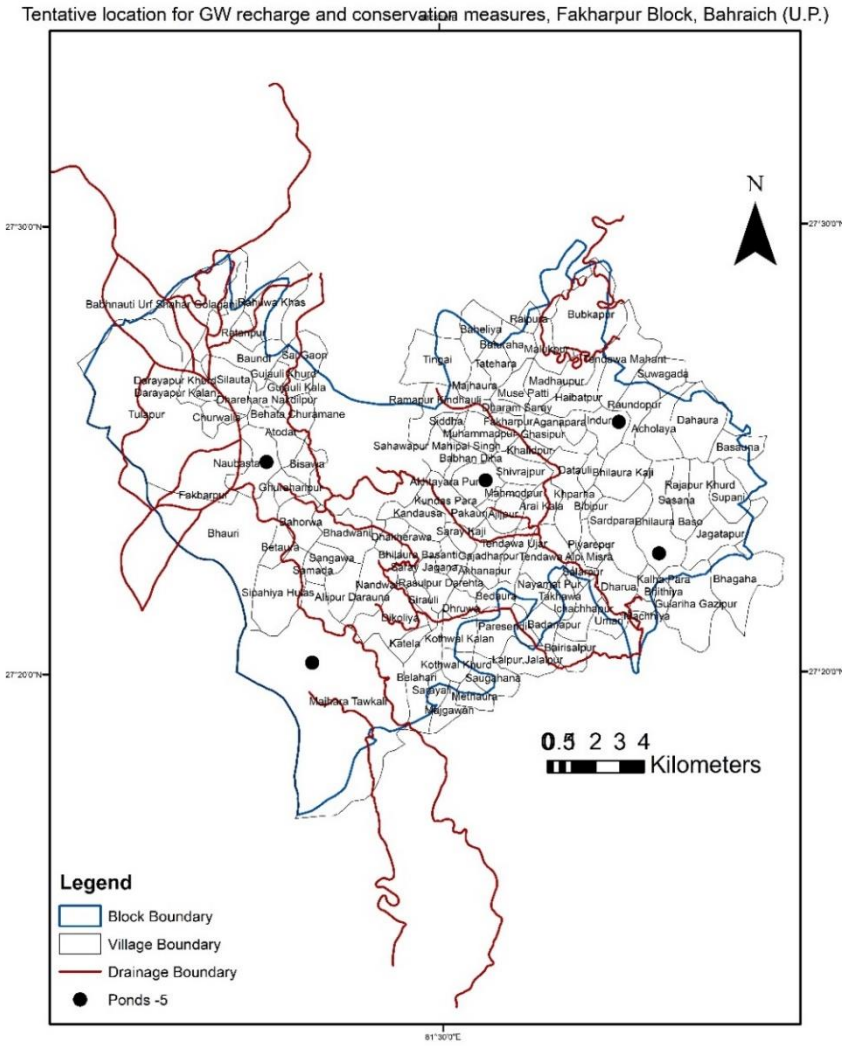


Figure 36: Tentative Sites for GW recharge and Conservation Measures, Fakharpur Block, Bahraich (U.P.)

5.5 Groundwater Management Plan of Huzurpur block

Block: Huzurpur District: Bahraich

1. General Information

State	Uttar Pradesh
District name	Bahraich
Block Name	Huzurpur
Location	
Geographical area	255.287 Sq.Km.
Basin/Sub-basin	Upper Ganga Plain
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium(AL03)
Normal Annual Rainfall	1152 mm

2. Aquifer Disposition

Aquifer Disposition	• Aquifer Disposition: One aquifer group with 3 Aquifer layers exist.
	  o Aquifer 1 (mbgl): From Surface to 150
	  o Aquifer 2 (mbgl): 160.00 to 240.00
	  o Aquifer 3 (mbgl): 250 to 300
	• Fresh Aquifer Depth: Upto 300 mbgl.
	• Transmissivity (m2/day): 3514.33
	• Sp. Yield: 0.000131 , 0.000208

Groundwater Monitoring Status	• Ground Water Monitoring Wells: 5
Ground Water Quality	• For Aquifer Group I: Iron and Arsenic are present in an unconfined aquifer
Aquifer Potential	• Aquifer Group I: 2210 lpm
Groundwater Resource	• Annual Extractable GW Recharge: 87.68 MCM • GW Draft: 38.65 MCM • Stage of GW Development: 44.08 % • Total in-storage resource of the block (fresh) is 48.14 MCM
Existing and Future Water Demand	• Present demand for All Usage: 87.68 MCM • Future Demand for Domestic and Industrial Use: 48.14 MCM

3. Aquifer Management Plan

Groundwater Management issues	• Location of feasible sites for successful wells. • • Decline in water levels in some parts. • • Decline in water levels in some parts. • GW quality Iron and Arsenic are present in an unconfined aquifer
AR & Conservation Possibilities	Construction of Recharge Structures mainly ponds and adoption of water use efficiency practices.
Groundwater Management Plan	There is a Scope of Groundwater development in the block. Hence, There Should be provide relaxation to Industries for Groundwater abstraction. DEMAND SIDE MANAGEMENT: Promoting Cultivation of Sugarcane ,rice crops ,pulses,oilseed and horticulture. Arsenic treatment plant need to be Constructed wherever Arsenic is reported in the block.
Status of GW Exploration	Exploratory Wells: 1 Observation Wells: 1 Piezometers: 5
Aquifer Characteristics	Aquifer Group I: o Transmissivity: 3514.33 m2/day o Storativity: 0.000131 , 0.000208

- **Water Level Behavior**

Pre-monsoon water level ranges from 1.80 mbgl to 2.85 mbgl and post-monsoon water level ranges from 0.30 mbgl to 1.45 mbgl. post-monsoon water level rises 0.0947 m/yr.

- **Issues**

Iron and Arsenic are present in an unconfined aquifer.

Groundwater contribution to agriculture is above 90.00%.

- **Groundwater Management Plan**

The proposed groundwater management plan for the block has been tabulated below. Upon implementation, 1.10 MCM of groundwater is expected to be available for additional utilization, and Stage of Groundwater Development is expected to decrease by 0.52%. The tentative locations for interventions has been attached as Figure 37 below.

Table 17(a): Summarized details of interventions proposed

Block	Check Dams (Nos.)	Stream Development (kms)	Nala Bunds (kms)	Ponds (Nos.)	On-farm area (Ha)	WUE area (Ha)
Huzurpur	-	-	-	05	-	-

Table 17(b): Projected GW Recharge & savings by supply and demand-side management

Net Annual GW Availability (MCM)	Existing GW Draft for all uses (MCM)	Stage of GW Development (%)	Total recharge through interventions (MCM)	Total GW savings through interventions (MCM)	Projected Net GW Availability (MCM)	Projected Stage of GW Development after interventions (%)
87.68	38.65	44.08	1.10	1.10	88.78	43.53

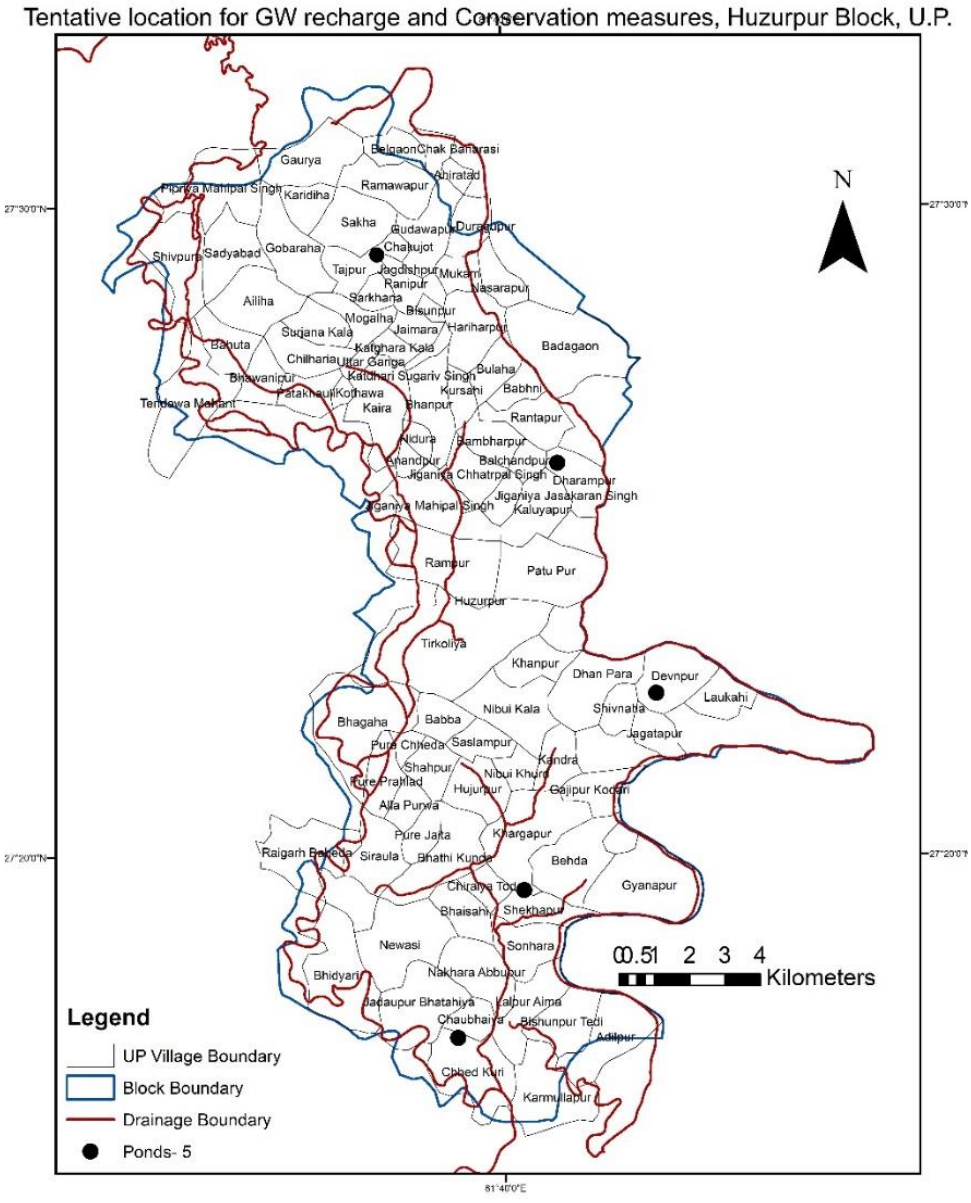


Figure 37: Tentative Sites for GW recharge and Conservation Measures, Huzurpur Block, Bahraich (U.P.)

5.6 Groundwater Management Plan of Jarwal block

Block: Jarwal **District:** Bahraich

1. General Information

State	Uttar Pradesh
District name	Bahraich
Block Name	Jarwal
Location	
Geographical area	285.048 Sq.Km.
Basin/Sub-basin	Upper Ganga Plain
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium(AL03)
Normal Annual Rainfall	1152

2. Aquifer Disposition

Aquifer Disposition	• Aquifer Disposition: One aquifer group with 3 Aquifer layers exist.
	  o Aquifer 1 (mbgl): From Surface to 150
	  o Aquifer 2 (mbgl): 160.00 to 240.00
	  o Aquifer 3 (mbgl): 250 to 300
	• Fresh Aquifer Depth: Upto 300 mbgl.
	• Transmissivity (m2/day): 1435.40
	• Sp. Yield: 0.000165

Groundwater Monitoring Status	• Ground Water Monitoring Wells: 5
Ground Water Quality	• For Aquifer Group I: Iron and Arsenic are present in an unconfined aquifer
Aquifer Potential	• Aquifer Group I: 2301 lpm
Groundwater Resource	• Annual Extractable GW Recharge: 62.84 MCM • GW Draft: 31.57 MCM • Stage of GW Development: 50.25 % • Total in-storage resource of the block (fresh) is 30.73 MCM
Existing and Future Water Demand	• Present demand for All Usage: 62.84 MCM • Future Demand for Domestic and Industrial Use: 30.73 MCM

3. Aquifer Management Plan

Groundwater Management issues	• Location of feasible sites for successful wells. • • Decline in water levels in some parts. • • Decline in water levels in some parts. • GW quality Iron and Arsenic are present in an unconfined aquifer
AR & Conservation Possibilities	Construction of Recharge Structures mainly ponds and adoption of water use efficiency practices.
Groundwater Management Plan	There is a Scope of Groundwater development in the block. Hence, There Should be provide relaxation to Industries for Groundwater abstraction. DEMAND SIDE MANAGEMENT: Promoting Cultivation of Sugarcane ,rice crops ,pulses,oilseed and horticulture. Arsenic treatment plant need to be Constructed wherever Arsenic is reported in the block.
Status of GW Exploration	Exploratory Wells: 1 Observation Wells: 1 Piezometers: 5
Aquifer Characteristics	Aquifer Group I: o Transmissivity: 1435.40 m2/day o Storativity: 0.000165

- **Water Level Behavior**

  Pre-monsoon water level ranges from 2.88 mbgl to 4.48 mbgl and post-monsoon water level ranges from 0.40 mbgl to 1.76 mbgl. post-monsoon water level rises 0.0840 m/yr.

- **Issues**

Iron and Arsenic are present in an unconfined aquifer.

Groundwater contribution to agriculture is above 90%.

- **Groundwater Management Plan**

The proposed groundwater management plan for the block has been tabulated below. Upon implementation, 1.10 MCM of groundwater is expected to be available for additional utilization, and Stage of Groundwater Development is expected to decrease by 0.88%. The tentative locations for interventions has been attached as Figure 38 below.

Table 18(a): Summarized details of interventions proposed

Block	Check Dams (Nos.)	Stream Development (kms)	Nala Bunds (kms)	Ponds (Nos.)	On-farm area (Ha)	WUE area (Ha)
Jarwal	-	-	-	05	-	-

Table 18(b): Projected GW Recharge & savings by supply and demand-side management

Net Annual GW Availability (MCM)	Existing GW Draft for all uses (MCM)	Stage of GW Development (%)	Total recharge through interventions (MCM)	Total GW savings through interventions (MCM)	Projected Net GW Availability (MCM)	Projected Stage of GW Development after interventions (%)
62.84	31.57	50.25	1.10	1.10	63.94	49.37

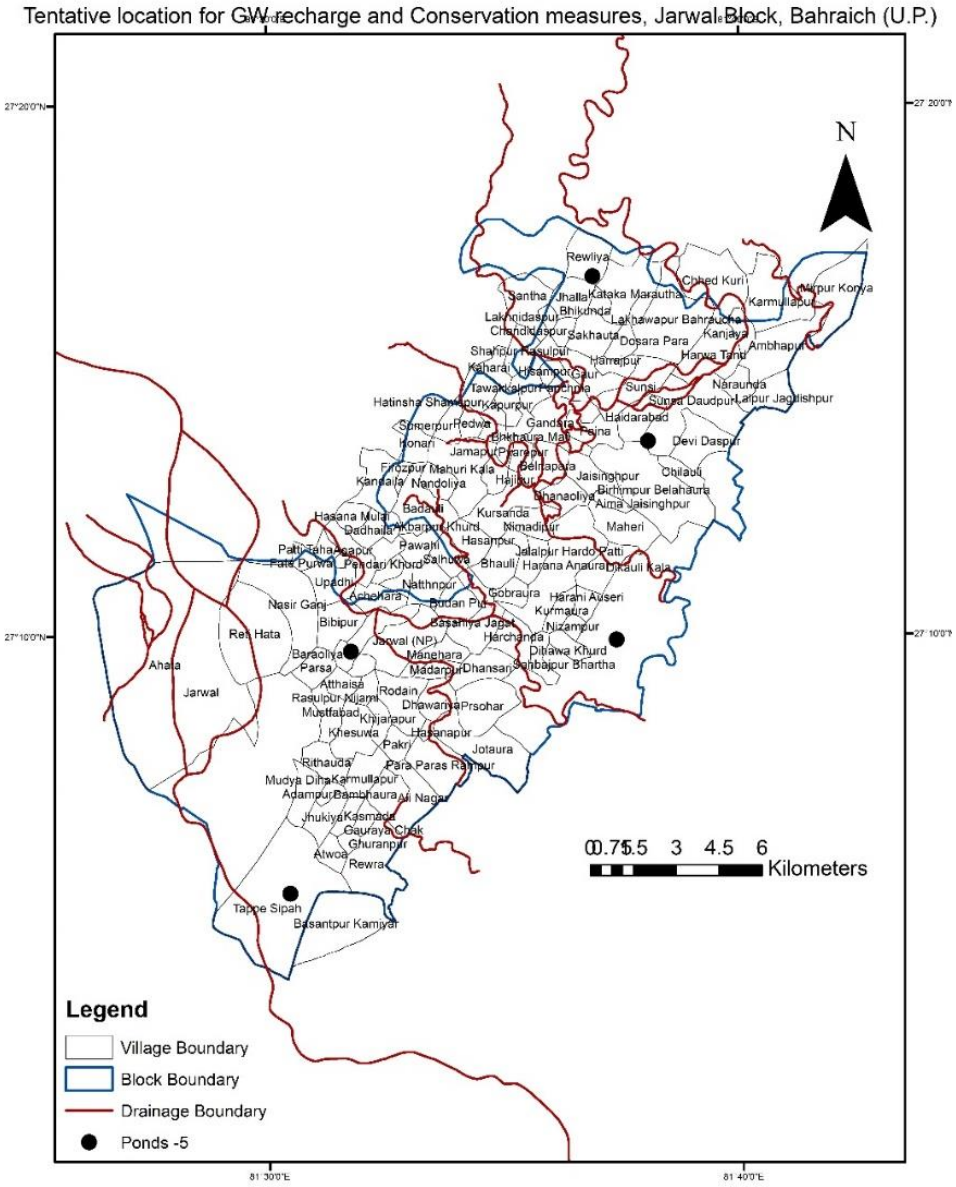


Figure 38: Tentative Sites for GW recharge and Conservation Measures, Jarwal Block, Bahraich (U.P.)

5.7 Groundwater Management Plan of Mihirpurwa block

Block: Mihipurwa **District:** Bahraich

1. General Information

State	Uttar Pradesh
District name	Bahraich
Block Name	Mihipurwa
Location	
Geographical area	1049.5 Sq.Km.
Basin/Sub-basin	Upper Ganga Plain
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium(AL03)
Normal Annual Rainfall	1152 mm

2. Aquifer Disposition

Aquifer Disposition	• Aquifer Disposition: One aquifer group with 3 Aquifer layers exist.
	  o Aquifer 1 (mbgl): From Surface to 150
	  o Aquifer 2 (mbgl): 160.00 to 240.00
	  o Aquifer 3 (mbgl): 250 to 300
	• Fresh Aquifer Depth: Upto 300 mbgl.
	• Transmissivity (m2/day): 6046.76
	• Sp. Yield: 0.0001366, 0.000289

Groundwater Monitoring Status	• Ground Water Monitoring Wells: 8
Ground Water Quality	• For Aquifer Group I: Iron and Arsenic are present in an unconfined aquifer
Aquifer Potential	• Aquifer Group I: 2233, 2392 lpm
Groundwater Resource	• Annual Extractable GW Recharge: 76.13 MCM • GW Draft: 50.96 MCM • Stage of GW Development: 66.94 % • Total in-storage resource of the block (fresh) is 24.49 MCM
Existing and Future Water Demand	• Present demand for All Usage: 76.13 MCM • Future Demand for Domestic and Industrial Use: 24.49 MCM

3. Aquifer Management Plan

Groundwater Management issues	• Location of feasible sites for successful wells. • • Decline in water levels in some parts. • • Decline in water levels in some parts. • GW quality Iron and Arsenic are present in an unconfined aquifer
AR & Conservation Possibilities	Construction of Recharge Structures mainly ponds and adoption of water use efficiency practices.
Groundwater Management Plan	There is a Scope of Groundwater development in the block. Hence, There Should be provide relaxation to Industries for Groundwater abstraction. DEMAND SIDE MANAGEMENT: Promoting Cultivation of Sugarcane ,rice crops ,pulses,oilseed and horticulture. Arsenic treatment plant need to be Constructed wherever Arsenic is reported in the block.
Status of GW Exploration	Exploratory Wells: 2 Observation Wells: 2 Piezometers: 6
Aquifer Characteristics	Aquifer Group I: o Transmissivity: 6046.76 m2/day o Storativity: 0.0001366, 0.000289

- **Water Level Behavior**

  Pre-monsoon water level ranges from 1.70 mbgl to 4.30 mbgl and post-monsoon water level ranges from 0.50 mbgl to 2.05 mbgl. post-monsoon water level rises 0.1977 m/yr.

- **Issues**

Iron and Arsenic are present in an unconfined aquifer.

Groundwater contribution to agriculture is above 90%.

- **Groundwater Management Plan**

The proposed groundwater management plan for the block has been tabulated below. Upon implementation, 1.10 MCM of groundwater is expected to be available for additional utilization, and Stage of Groundwater Development is expected to decrease by 0.96 %. The tentative locations for interventions has been attached as Figure 39 below.

Table 19(a): Summarized details of interventions proposed

Block	Check Dams (Nos.)	Stream Development (kms)	Nala Bunds (kms)	Ponds (Nos.)	On-farm area (Ha)	WUE area (Ha)
Mihipurwa	-	-	-	05	-	-

Table 19(b): Projected GW Recharge & savings by supply and demand-side management

Net Annual GW Availability (MCM)	Existing GW Draft for all uses (MCM)	Stage of GW Development (%)	Total recharge through interventions (MCM)	Total GW savings through interventions (MCM)	Projected Net GW Availability (MCM)	Projected Stage of GW Development after interventions (%)
76.13	50.96	66.94	1.10	1.10	77.23	65.98

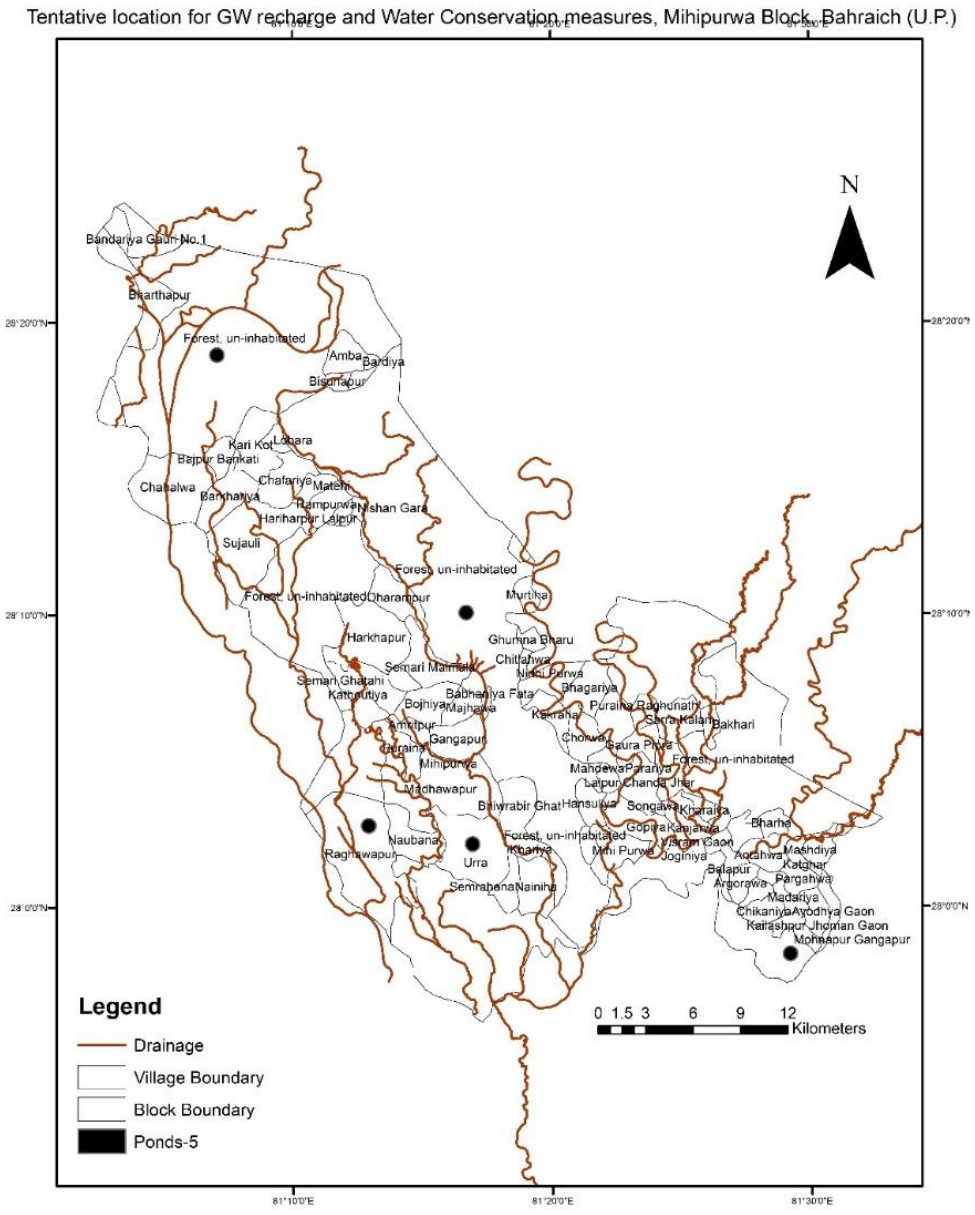


Figure 39: Tentative Sites for GW recharge and Conservation Measures, Mihipurwa Block, Bahraich (U.P.)

5.8 Groundwater Management Plan of Balha block

Block: Balha **District:** Bahraich

1. General Information

State	Uttar Pradesh
District name	Bahraich
Block Name	Balha
Location	
Geographical area	324.774 Sq.Km.
Basin/Sub-basin	Upper Ganga Plain
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium(AL03)
Normal Annual Rainfall	1152 mm

2. Aquifer Disposition

Aquifer Disposition	• Aquifer Disposition: One aquifer group with 3 Aquifer layers exist.
	  o Aquifer 1 (mbgl): From Surface to 150
	  o Aquifer 2 (mbgl): 160.00 to 240.00
	  o Aquifer 3 (mbgl): 250 to 300
	• Fresh Aquifer Depth: Upto 300 mbgl.
	• Transmissivity (m2/day): 5693.21
	• Sp. Yield: 0.000416 ,0.00122

Groundwater Monitoring Status	• Ground Water Monitoring Wells: 7
Ground Water Quality	• For Aquifer Group I: Iron and Arsenic are present in an unconfined aquifer
Aquifer Potential	• Aquifer Group I: 2256 ,2438 lpm
Groundwater Resource	• Annual Extractable GW Recharge: 86.09 MCM • GW Draft: 54.66 MCM • Stage of GW Development: 63.49 % • Total in-storage resource of the block (fresh) is 30.53 MCM
Existing and Future Water Demand	• Present demand for All Usage: 86.09 MCM • Future Demand for Domestic and Industrial Use: 30.53 MCM

3. Aquifer Management Plan

Groundwater Management issues	• Location of feasible sites for successful wells. • Decline in water levels in some parts. • Decline in water levels in some parts. • GW quality Iron and Arsenic are present in an unconfined aquifer
AR & Conservation Possibilities	Construction of Recharge Structures mainly ponds and adoption of water use efficiency practices.
Groundwater Management Plan	There is a Scope of Groundwater development in the block. Hence, There Should be provide relaxation to Industries for Groundwater abstraction. DEMAND SIDE MANAGEMENT: Promoting Cultivation of Sugarcane ,rice crops ,pulses,oilseed and horticulture. Arsenic treatment plant need to be Constructed wherever Arsenic is reported in the block.
Status of GW Exploration	Exploratory Wells: 2 Observation Wells: 2 Piezometers: 6
Aquifer Characteristics	Aquifer Group I: o Transmissivity: 5693.21 m2/day o Storativity: 0.000416 ,0.00122

- **Water Level Behavior**

  Pre-monsoon water level ranges from 4.28 mbgl to 9.00 mbgl and post-monsoon water level ranges from 2.05 mbgl to 6.50 mbgl. pre-monsoon water level rise is 0.1030 m/yr and Post-monsoon water level rise is 0.0514 m/yr.

- **Issues**

Iron and Arsenic are present in an unconfined aquifer.

Groundwater contribution to agriculture is above 90%.

- **Groundwater Management Plan**

The proposed groundwater management plan for the block has been tabulated below. Upon implementation, 1.10 MCM of groundwater is expected to be available for additional utilization, and Stage of Groundwater Development is expected to decrease by 0.80%. The tentative locations for interventions has been attached as Figure 40 below.

Table 20(a): Summarized details of interventions proposed

Block	Check Dams (Nos.)	Stream Development (kms)	Nala Bunds (kms)	Ponds (Nos.)	On-farm area (Ha)	WUE area (Ha)
Balha	-	-	-	05	-	-

Table 20(b): Projected GW Recharge & savings by supply and demand-side management

Net Annual GW Availability (MCM)	Existing GW Draft for all uses (MCM)	Stage of GW Development (%)	Total recharge through interventions (MCM)	Total GW savings through interventions (MCM)	Projected Net GW Availability (MCM)	Projected Stage of GW Development after interventions (%)
86.09	54.66	63.49	1.10	1.10	87.19	62.69

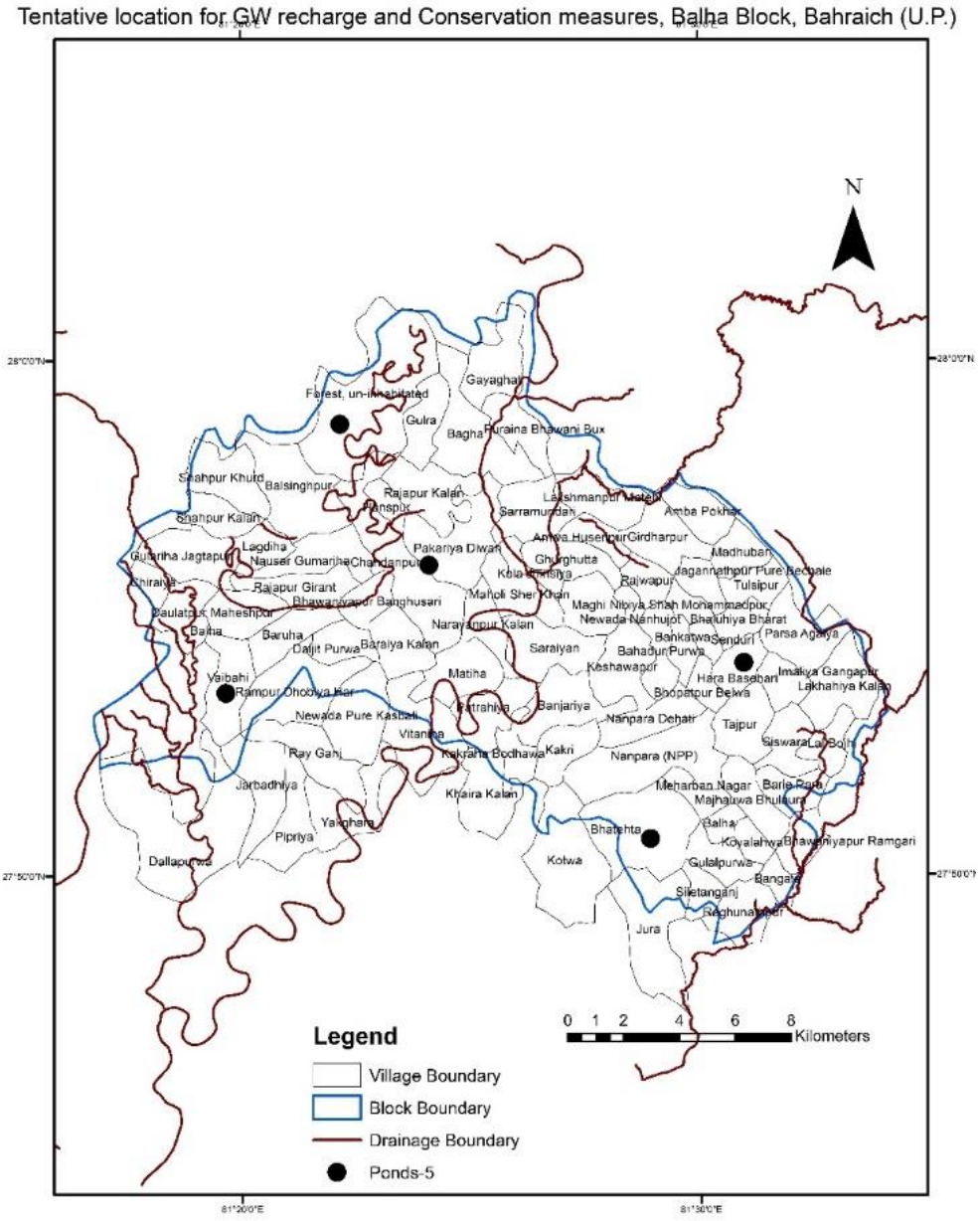


Figure 40: Tentative Sites for GW recharge and Conservation Measures, Balha Block, Bahraich (U.P.)

5.9 Groundwater Management Plan of Chittaura block

Block: Chittaura **District:** Bahraich

1. General Information

State	Uttar Pradesh
District name	Bahraich
Block Name	Chittaura
Location	
Geographical area	331.3 Sq.Km.
Basin/Sub-basin	Upper Ganga Plain
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium(AL03)
Normal Annual Rainfall	1152 mm

2. Aquifer Disposition

Aquifer Disposition	• Aquifer Disposition: One aquifer group with 3 Aquifer layers exist.
	  o Aquifer 1 (mbgl): From Surface to 150
	  o Aquifer 2 (mbgl): 160.00 to 240.00
	  o Aquifer 3 (mbgl): 250 to 300
	• Fresh Aquifer Depth: Upto 300 mbgl.
	• Transmissivity (m2/day): -
	• Sp. Yield: -

Groundwater Monitoring Status	• Ground Water Monitoring Wells: 4
Ground Water Quality	• For Aquifer Group I: Iron and Arsenic are present in an unconfined aquifer
Aquifer Potential	• Aquifer Group I: - lpm
Groundwater Resource	• Annual Extractable GW Recharge: 133.51 MCM • GW Draft: 80.28 MCM • Stage of GW Development: 60.13 % • Total in-storage resource of the block (fresh) is 51.98 MCM
Existing and Future Water Demand	• Present demand for All Usage: 133.51 MCM • Future Demand for Domestic and Industrial Use: 51.98 MCM

3. Aquifer Management Plan

Groundwater Management issues	• Location of feasible sites for successful wells. • • Decline in water levels in some parts. • • Decline in water levels in some parts. • GW quality Iron and Arsenic are present in an unconfined aquifer
AR & Conservation Possibilities	Construction of Recharge Structures mainly ponds and adoption of water use efficiency practices.
Groundwater Management Plan	• SUPPLY SIDE MANAGEMENT: Water conservation and Artificial Recharge to ground water and on Farm Activities. • DEMAND SIDE MANAGEMENT: Promoting Cultivation of Sugarcane ,rice crops ,pulses,oilseed and horticulture. • Arsenic treatment plant need to be Constructed wherever Arsenic is reported in the block.
Status of GW Exploration	Exploratory Wells: 0 Observation Wells: 0 Piezometers: 3
Aquifer Characteristics	Aquifer Group I: o Transmissivity: - m2/day o Storativity: -

- **Water Level Behavior**

  Pre-monsoon water level ranges from 4.28 mbgl to 9.00 mbgl and post-monsoon water level ranges from 2.05 mbgl to 6.50 mbgl. pre-monsoon water level rise is 0.1030 m/yr and Post-monsoon water level rise is 0.0514 m/yr.

- **Issues**

Iron and Arsenic are present in an unconfined aquifer.

Groundwater contribution to agriculture is above 90%.

- **Groundwater Management Plan**

The proposed groundwater management plan for the block has been tabulated below. Upon implementation, 1.10 MCM of groundwater is expected to be available for additional utilization, and Stage of Groundwater Development is expected to decrease by 0.50%. The tentative locations for interventions has been attached as Figure 41 below.

Table 21(a): Summarized details of interventions proposed

Block	Check Dams (Nos.)	Stream Development (kms)	Nala Bunds (kms)	Ponds (Nos.)	On-farm area (Ha)	WUE area (Ha)
Chittaura	-	-	-	05	-	-

Table 21(b): Projected GW Recharge & savings by supply and demand-side management

Net Annual GW Availability (MCM)	Existing GW Draft for all uses (MCM)	Stage of GW Development (%)	Total recharge through interventions (MCM)	Total GW savings through interventions (MCM)	Projected Net GW Availability (MCM)	Projected Stage of GW Development after interventions (%)
133.51	80.28	60.13	1.10	1.10	134.61	59.63

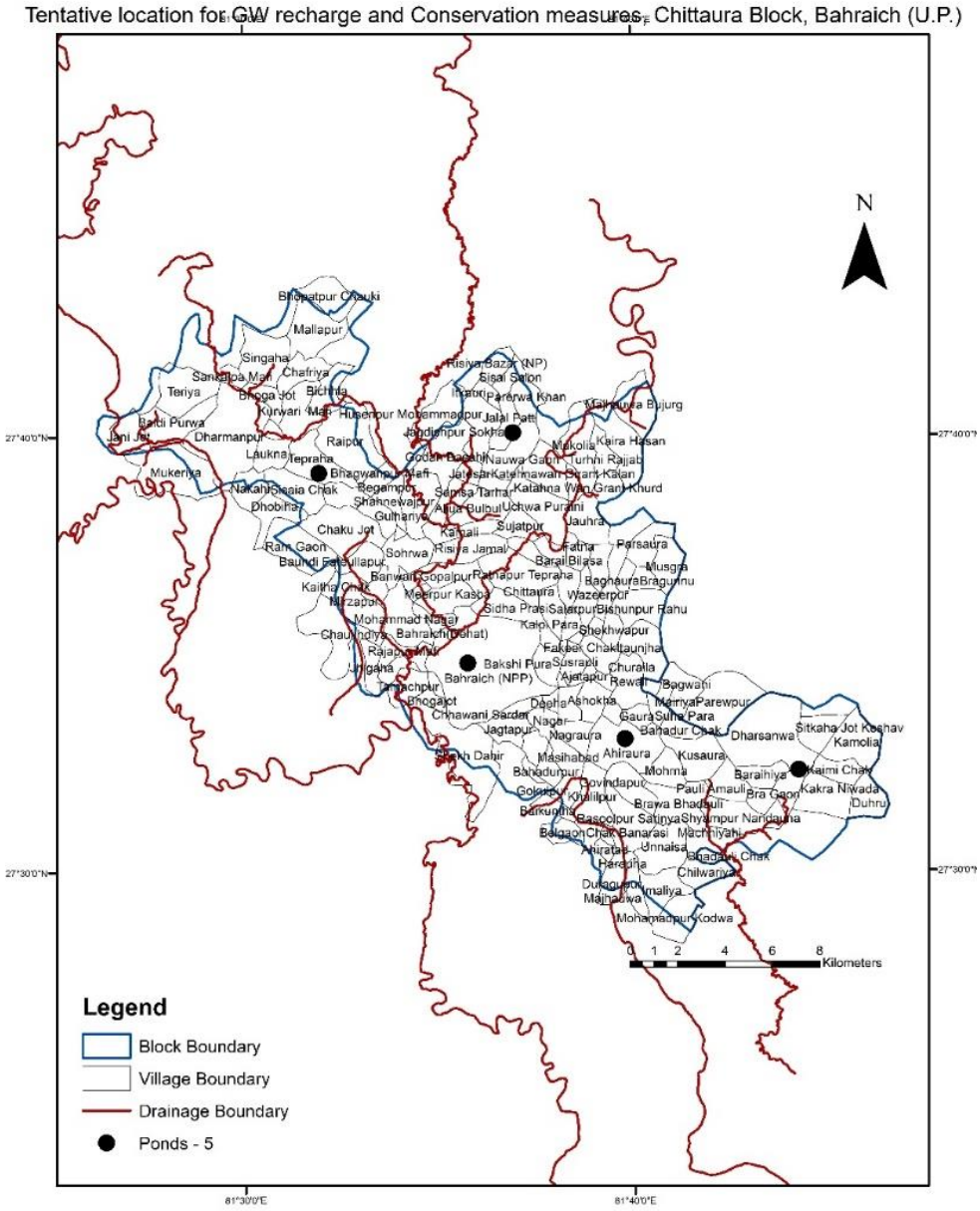


Figure 41: Tentative Sites for GW recharge and Conservation Measures, Chittaura Block, Bahraich (U.P.)

5.10 Groundwater Management Plan of Kaisarganj block

Block: Kaisarganj **District:** Bahraich

1. General Information

State	Uttar Pradesh
District name	Bahraich
Block Name	Kaisarganj
Location	
Geographical area	226.903 Sq.Km.
Basin/Sub-basin	Upper Ganga Plain
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium(AL03)
Normal Annual Rainfall	1152 mm

2. Aquifer Disposition

Aquifer Disposition	• Aquifer Disposition: One aquifer group with 3 Aquifer layers exist.
	  o Aquifer 1 (mbgl): From Surface to 150
	  o Aquifer 2 (mbgl): 160.00 to 240.00
	  o Aquifer 3 (mbgl): 250 to 300
	• Fresh Aquifer Depth: Upto 300 mbgl.
	• Transmissivity (m2/day): 2288.60
	• Sp. Yield: 0.0002942

Groundwater Monitoring Status	• Ground Water Monitoring Wells: 4
Ground Water Quality	• For Aquifer Group I: Iron and Arsenic are present in an unconfined aquifer
Aquifer Potential	• Aquifer Group I: 2301 lpm
Groundwater Resource	• Annual Extractable GW Recharge: 82.55 MCM • GW Draft: 29.38 MCM • Stage of GW Development: 35.59 % • Total in-storage resource of the block (fresh) is 52.26 MCM
Existing and Future Water Demand	• Present demand for All Usage: 82.55 MCM • Future Demand for Domestic and Industrial Use: 52.26 MCM

3. Aquifer Management Plan

Groundwater Management issues	• Location of feasible sites for successful wells. • • Decline in water levels in some parts. • • Decline in water levels in some parts. • GW quality Iron and Arsenic are present in an unconfined aquifer
AR & Conservation Possibilities	Construction of Recharge Structures mainly ponds and adoption of water use efficiency practices.
Groundwater Management Plan	There is a Scope of Groundwater development in the block. Hence, There Should be provide relaxation to Industries for Groundwater abstraction. DEMAND SIDE MANAGEMENT: Promoting Cultivation of Sugarcane ,rice crops ,pulses,oilseed and horticulture. Arsenic treatment plant need to be Constructed wherever Arsenic is reported in the block.
Status of GW Exploration	Exploratory Wells: 1 Observation Wells: 1 Piezometers: 3
Aquifer Characteristics	Aquifer Group I: o Transmissivity: 2288.60 m2/day o Storativity: 0.0002942

- **Water Level Behavior**

  Pre-monsoon water level ranges from 3.52 mbgl to 4.05 mbgl and post-monsoon water level ranges from 0.75 mbgl to 2.35 mbgl. pre-monsoon water level fall is 0.0372 m/yr and Post-monsoon water level fall is 0.0501 m/yr.

- **Issues**

Iron and Arsenic are present in an unconfined aquifer.

Groundwater contribution to agriculture is above 90%.

- **Groundwater Management Plan**

The proposed groundwater management plan for the block has been tabulated below. Upon implementation, 1.10 MCM of groundwater is expected to be available for additional utilization, and Stage of Groundwater Development is expected to decrease by 0.47%. The tentative locations for interventions has been attached as Figure 42 below.

Table 22(a): Summarized details of interventions proposed

Block	Check Dams (Nos.)	Stream Development (kms)	Nala Bunds (kms)	Ponds (Nos.)	On-farm area (Ha)	WUE area (Ha)
Kaisarganj	-	-	-	05	-	-

Table 22(b): Projected GW Recharge & savings by supply and demand-side management

Net Annual GW Availability (MCM)	Existing GW Draft for all uses (MCM)	Stage of GW Development (%)	Total recharge through interventions (MCM)	Total GW savings through interventions (MCM)	Projected Net GW Availability (MCM)	Projected Stage of GW Development after interventions (%)
82.55	29.38	35.59	1.10	1.10	83.65	35.12

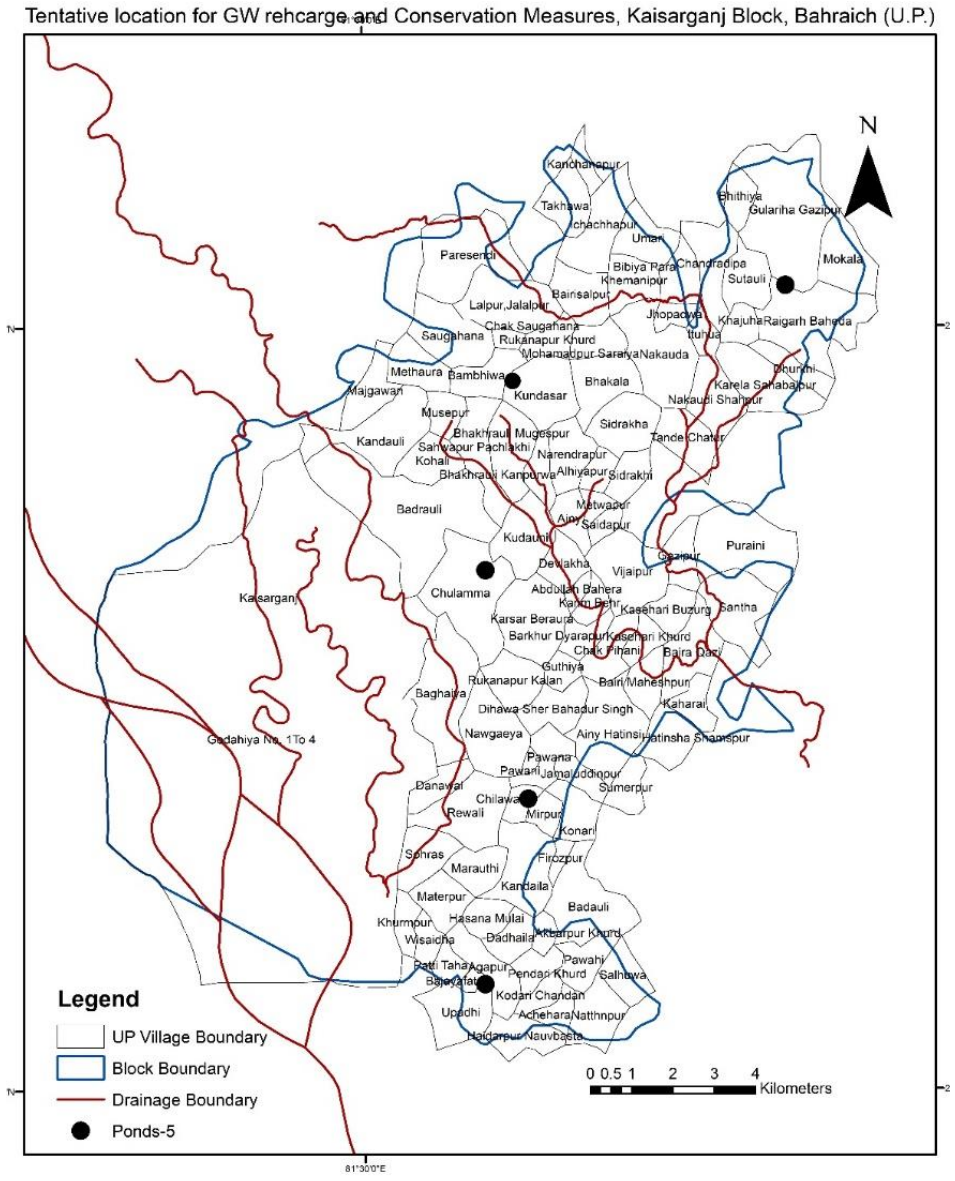


Figure 42: Tentative Sites for GW recharge and Conservation Measures, Kaisarganj Block, Bahraich (U.P.)

5.11 Groundwater Management Plan of Mahasi block

Block: Mahasi **District**: Bahraich

1. General Information

State	Uttar Pradesh
District name	Bahraich
Block Name	Mahasi
Location	
Geographical area	402.88 Sq.Km.
Basin/Sub-basin	Upper Ganga Plain
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium(AL03)
Normal Annual Rainfall	1152 mm

2. Aquifer Disposition

Aquifer Disposition	• Aquifer Disposition: One aquifer group with 3 Aquifer layers exist.
	  o Aquifer 1 (mbgl): From Surface to 150
	  o Aquifer 2 (mbgl): 160.00 to 240.00
	  o Aquifer 3 (mbgl): 250 to 300
	• Fresh Aquifer Depth: Upto 300 mbgl.
	• Transmissivity (m2/day): 4558.90
	• Sp. Yield: 0.000253

Groundwater Monitoring Status	• Ground Water Monitoring Wells: 8
Ground Water Quality	• For Aquifer Group I: Iron and Arsenic are present in an unconfined aquifer
Aquifer Potential	• Aquifer Group I: 2528 lpm
Groundwater Resource	• Annual Extractable GW Recharge: 123.56 MCM • GW Draft: 45.58 MCM • Stage of GW Development: 36.89 % • Total in-storage resource of the block (fresh) is 76.03 MCM
Existing and Future Water Demand	• Present demand for All Usage: 123.56 MCM • Future Demand for Domestic and Industrial Use: 76.03 MCM

3. Aquifer Management Plan

Groundwater Management issues	• Location of feasible sites for successful wells. • • Decline in water levels in some parts. • • Decline in water levels in some parts. • GW quality Iron and Arsenic are present in an unconfined aquifer
AR & Conservation Possibilities	Construction of Recharge Structures mainly ponds and adoption of water use efficiency practices.
Groundwater Management Plan	There is a Scope of Groundwater development in the block. Hence, There Should be provide relaxation to Industries for Groundwater abstraction. DEMAND SIDE MANAGEMENT: Promoting Cultivation of Sugarcane ,rice crops ,pulses,oilseed and horticulture. Arsenic treatment plant need to be Constructed wherever Arsenic is reported in the block.
Status of GW Exploration	Exploratory Wells: 1 Observation Wells: 1 Piezometers: 6
Aquifer Characteristics	Aquifer Group I: o Transmissivity: 4558.90 m2/day o Storativity: 0.000253

- **Water Level Behavior**

  Pre-monsoon water level ranges from 2.50 mbgl to 3.30 mbgl and post-monsoon water level ranges from 1.60 mbgl to 2.05 mbgl.

- **Issues**

Iron and Arsenic are present in an unconfined aquifer.

Groundwater contribution to agriculture is above 90%.

- **Groundwater Management Plan**

The proposed groundwater management plan for the block has been tabulated below. Upon implementation, 1.10 MCM of groundwater is expected to be available for additional utilization, and Stage of Groundwater Development is expected to decrease by 0.33%. The tentative locations for interventions has been attached as Figure 43 below.

Table 23(a): Summarized details of interventions proposed

Block	Check Dams (Nos.)	Stream Development (kms)	Nala Bunds (kms)	Ponds (Nos.)	On-farm area (Ha)	WUE area (Ha)
Mahasi	-	-	-	05	-	-

Table 23(b): Projected GW Recharge & savings by supply and demand-side management

Net Annual GW Availability (MCM)	Existing GW Draft for all uses (MCM)	Stage of GW Development (%)	Total recharge through interventions (MCM)	Total GW savings through interventions (MCM)	Projected Net GW Availability (MCM)	Projected Stage of GW Development after interventions (%)
123.56	45.58	36.89	1.10	1.10	124.66	36.56

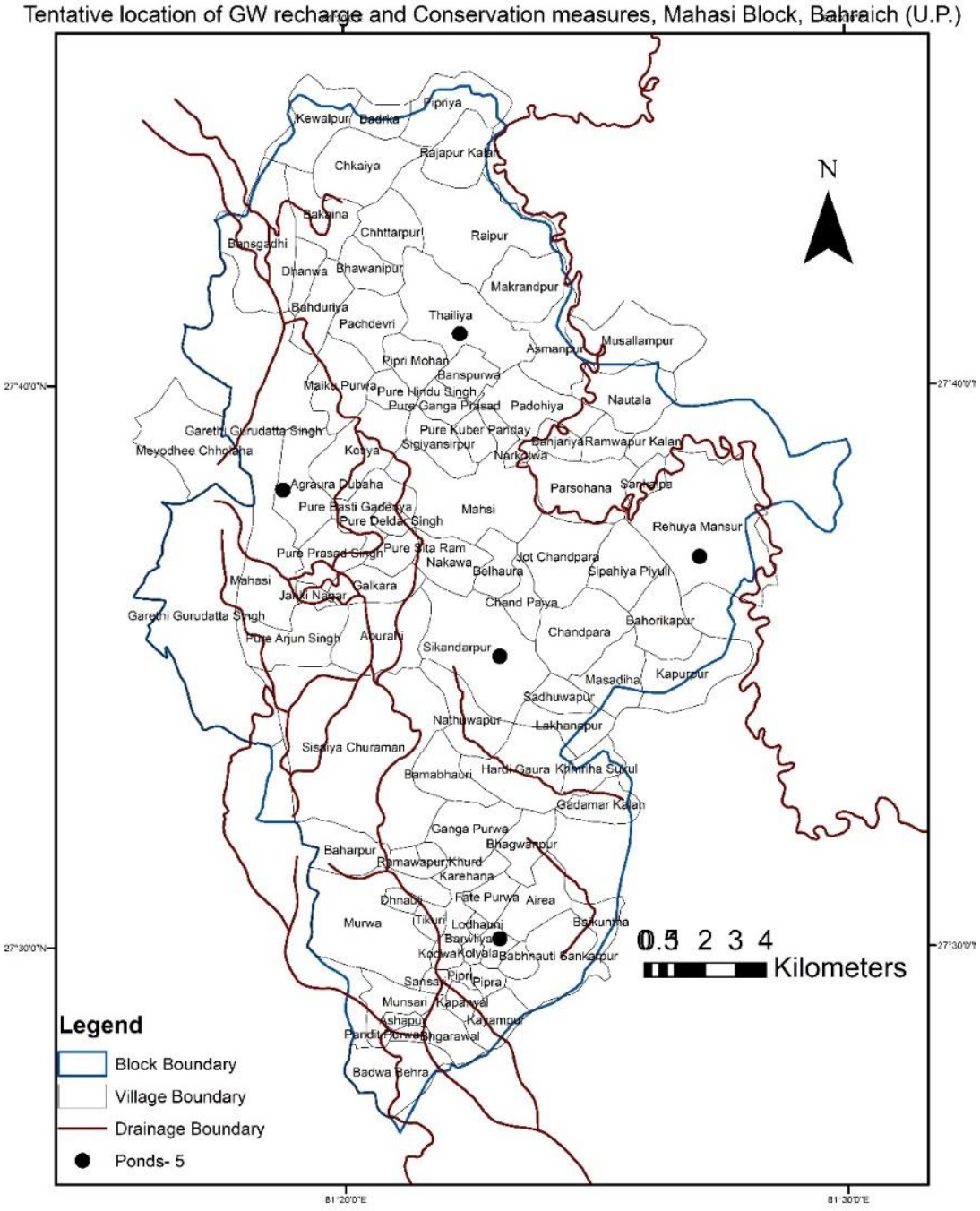


Figure 43: Tentative Sites for GW recharge and Conservation Measures, Mahasi Block, Bahraich (U.P.)

5.12 Groundwater Management Plan of Nawabganj block

Block: Nawabganj **District:** Bahraich

1. General Information

State	Uttar Pradesh
District name	Bahraich
Block Name	Nawabganj
Location	
Geographical area	265.273 Sq.Km.
Basin/Sub-basin	Upper Ganga Plain
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium(AL03)
Normal Annual Rainfall	1152 mm

2. **Aquifer Disposition:**

Aquifer Disposition	• Aquifer Disposition: One aquifer group with 3 Aquifer layers exist.
	  o Aquifer 1 (mbgl): From Surface to 150
	  o Aquifer 2 (mbgl): 160.00 to 240.00
	  o Aquifer 3 (mbgl): 250 to 300
	• Fresh Aquifer Depth: Upto 300 mbgl.
	• Transmissivity (m2/day): 5621.31
	• Sp. Yield: 0.0001446 ,0.000166

Groundwater Monitoring Status	• Ground Water Monitoring Wells: 2
Ground Water Quality	• For Aquifer Group I: Iron and Arsenic are present in an unconfined aquifer
Aquifer Potential	• Aquifer Group I: 2256 lpm
Groundwater Resource	• Annual Extractable GW Recharge: 84.67 MCM • GW Draft: 38.30 MCM • Stage of GW Development: 45.24 % • Total in-storage resource of the block (fresh) is 45.67 MCM
Existing and Future Water Demand	• Present demand for All Usage: 84.67 MCM • Future Demand for Domestic and Industrial Use: 45.67 MCM

3. Aquifer Management Plan

Groundwater Management issues	• Location of feasible sites for successful wells. • • Decline in water levels in some parts. • • Decline in water levels in some parts. • GW quality Iron and Arsenic are present in an unconfined aquifer
AR & Conservation Possibilities	Construction of Recharge Structures mainly ponds and adoption of water use efficiency practices.
Groundwater Management Plan	• SUPPLY SIDE MANAGEMENT: Water conservation and Artificial Recharge to ground water and on Farm Activities. • DEMAND SIDE MANAGEMENT: Promoting Cultivation of Sugarcane ,rice crops ,pulses,oilseed and horticulture.
Status of GW Exploration	Exploratory Wells: 2 Observation Wells: 2 Piezometers: 2
Aquifer Characteristics	Aquifer Group I: o Transmissivity: 5621.31 m2/day o Storativity: 0.0001446 ,0.000166

- **Water Level Behavior**

  Pre-monsoon water level ranges from 3.70 mbgl to 4.80 mbgl and post-monsoon water level ranges from 0.50 mbgl to 2.55 mbgl.

- **Issues**

Iron and Arsenic are present in an unconfined aquifer.

Groundwater contribution to agriculture is above 90%.

- **Groundwater Management Plan**

The proposed groundwater management plan for the block has been tabulated below. Upon implementation, 1.10 MCM of groundwater is expected to be available for additional utilization, and Stage of Groundwater Development is expected to decrease by 0.59%. The tentative locations for interventions has been attached as Figure 44 below.

Table 23(a): Summarized details of interventions proposed

Block	Check Dams (Nos.)	Stream Development (kms)	Nala Bunds (kms)	Ponds (Nos.)	On-farm area (Ha)	WUE area (Ha)
Mahasi	-	-	-	05	-	-

Table 23(b): Projected GW Recharge & savings by supply and demand-side management

Net Annual GW Availability (MCM)	Existing GW Draft for all uses (MCM)	Stage of GW Development (%)	Total recharge through interventions (MCM)	Total GW savings through interventions (MCM)	Projected Net GW Availability (MCM)	Projected Stage of GW Development after interventions (%)
84.67	38.30	45.24	1.10	1.10	85.77	44.65

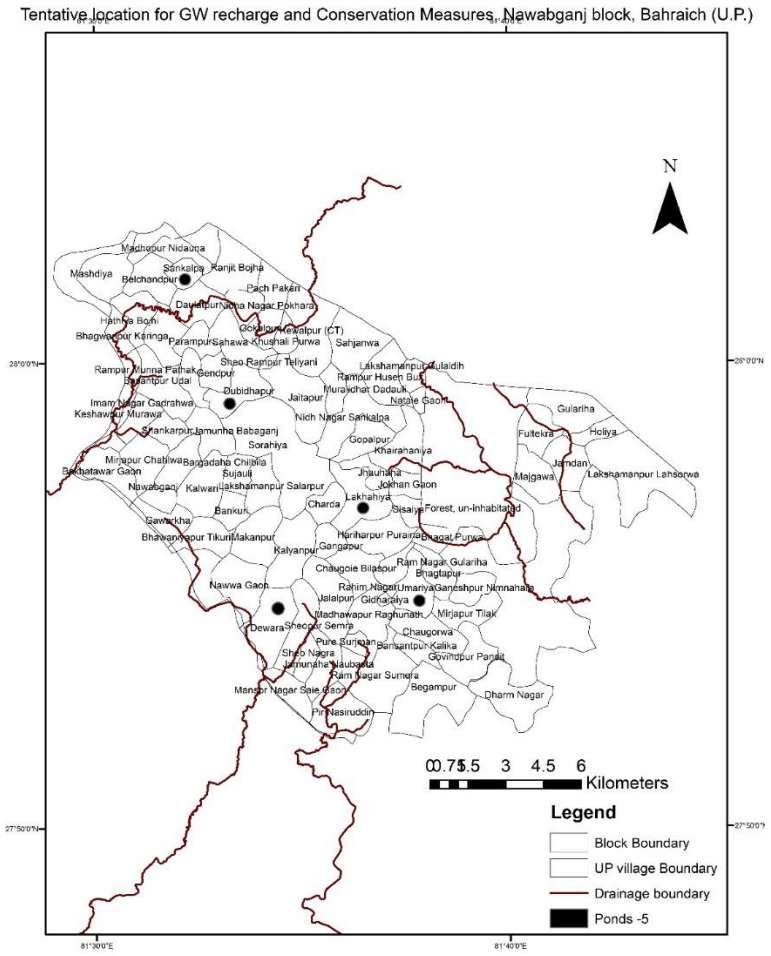


Figure 44: Tentative Sites for GW recharge and Conservation Measures, Nawabganj Block, Bahraich (U.P.)

5.13 Groundwater Management Plan of Bisheswaraganj block

Block: Bisheswarganj **District:** Bahraich

1. General Information

State	Uttar Pradesh
District name	Bahraich
Block Name	Bisheswarganj
Location	
Geographical area	264.91 Sq.Km.
Basin/Sub-basin	Upper Ganga Plain
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium(AL03)
Normal Annual Rainfall	1152

2. Aquifer Disposition

Aquifer Disposition	• Aquifer Disposition: One aquifer group with 3 Aquifer layers exist.
	  o Aquifer 1 (mbgl): From Surface to 150
	  o Aquifer 2 (mbgl): 160.00 to 240.00
	  o Aquifer 3 (mbgl): 250 to 300
	• Fresh Aquifer Depth: Upto 300 mbgl.
	• Transmissivity (m2/day): 594.56
	• Sp. Yield: 0.0004428

Groundwater Monitoring Status	• Ground Water Monitoring Wells: 8
Ground Water Quality	• For Aquifer Group I: Iron and Arsenic are present in an unconfined aquifer
Aquifer Potential	• Aquifer Group I: 2029 lpm
Groundwater Resource	• Annual Extractable GW Recharge: 97.17 MCM • GW Draft: 63.92 MCM • Stage of GW Development: 65.78 % • Total in-storage resource of the block (fresh) is 32.30 MCM
Existing and Future Water Demand	• Present demand for All Usage: 97.17 MCM • Future Demand for Domestic and Industrial Use: 32.30 MCM

3. Aquifer Management Plan

Groundwater Management issues	• Location of feasible sites for successful wells. • • Decline in water levels in some parts. • • Decline in water levels in some parts. • GW quality Iron and Arsenic are present in an unconfined aquifer
AR & Conservation Possibilities	Construction of Recharge Structures mainly ponds and adoption of water use efficiency practices.
Groundwater Management Plan	There is a Scope of Groundwater development in the block. Hence, There Should be provide relaxation to Industries for Groundwater abstraction. DEMAND SIDE MANAGEMENT: Promoting Cultivation of Sugarcane ,rice crops ,pulses,oilseed and horticulture. Arsenic treatment plant need to be Constructed wherever Arsenic is reported in the block.
Status of GW Exploration	Exploratory Wells: 1 Observation Wells: 1 Piezometers: 7
Aquifer Characteristics	Aquifer Group I: o Transmissivity: 594.56 m2/day o Storativity: 0.0004428

- **Water Level Behavior**

  Pre-monsoon water level ranges from 2.90 mbgl to 6.65 mbgl and post-monsoon water level ranges from 0.50 mbgl to 3.40 mbgl.

- **Issues**

Iron and Arsenic are present in an unconfined aquifer.

Groundwater contribution to agriculture is above 90%.

- **Groundwater Management Plan**

The proposed groundwater management plan for the block has been tabulated below. Upon implementation, 1.10 MCM of groundwater is expected to be available for additional utilization, and Stage of Groundwater Development is expected to decrease by 0.74%. The tentative locations for interventions has been attached as Figure 45 below.

Table 21(a): Summarized details of interventions proposed

Block	Check Dams (Nos.)	Stream Development (kms)	Nala Bunds (kms)	Ponds (Nos.)	On-farm area (Ha)	WUE area (Ha)
Chittaura	-	-	-	05	-	-

Table 21(b): Projected GW Recharge & savings by supply and demand-side management

Net Annual GW Availability (MCM)	Existing GW Draft for all uses (MCM)	Stage of GW Development (%)	Total recharge through interventions (MCM)	Total GW savings through interventions (MCM)	Projected Net GW Availability (MCM)	Projected Stage of GW Development after interventions (%)
97.17	63.92	65.78	1.10	1.10	98.27	65.04

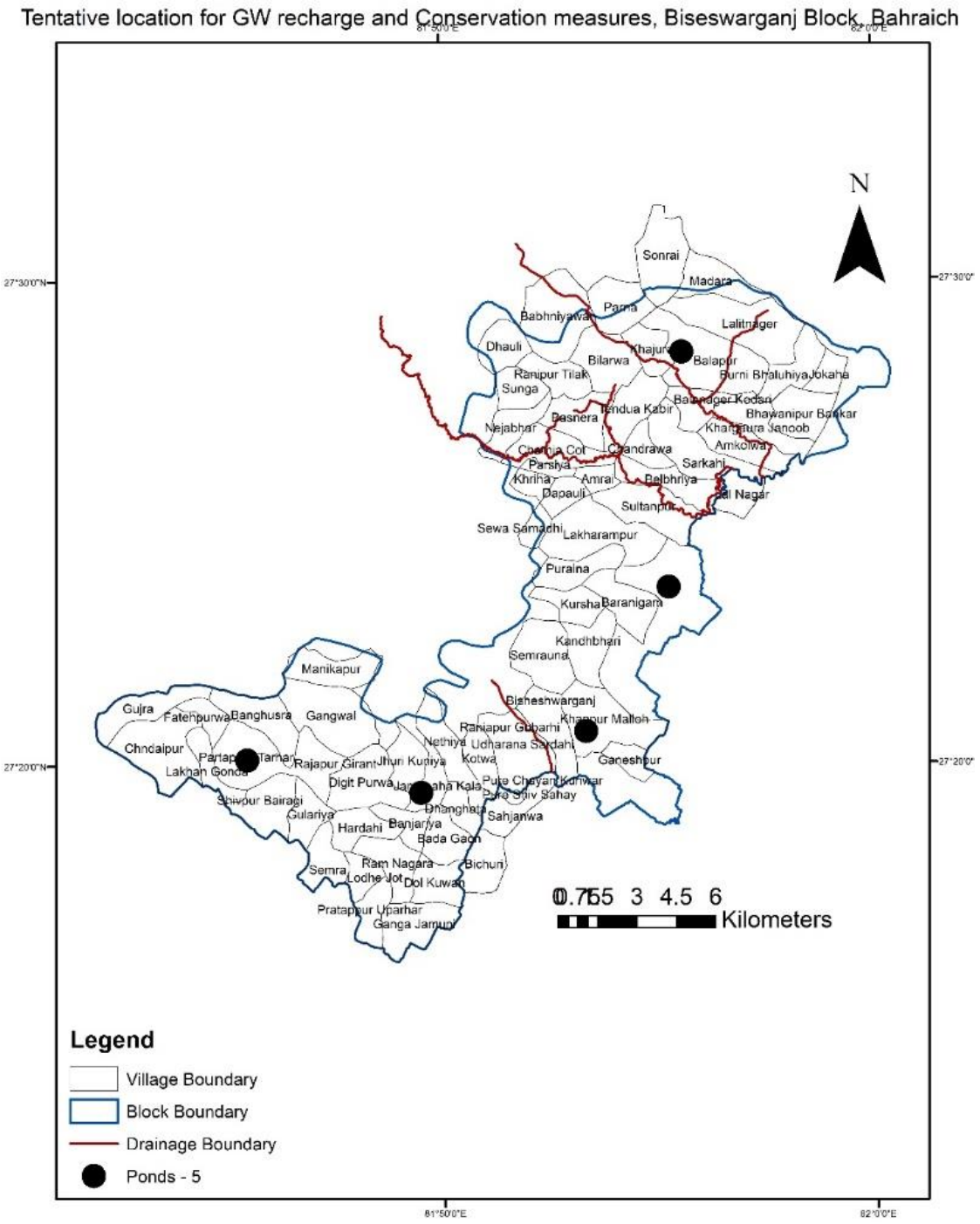


Figure 45: Tentative Sites for GW recharge and Conservation Measures, Biseswaraganj Block, Bahraich (U.P.)

5.14 Groundwater Management Plan of Tejwapur block

Block: Tejwapur District: Bahraich

1. General Information

State	Uttar Pradesh
District name	Bahraich
Block Name	Tejwapur
Location	
Geographical area	251.224 Sq.Km.
Basin/Sub-basin	Upper Ganga Plain
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium(AL03)
Normal Annual Rainfall	1152

2. Aquifer Disposition

Aquifer Disposition	• Aquifer Disposition: One aquifer group with 3 Aquifer layers exist.
	  o Aquifer 1 (mbgl): From Surface to 150
	  o Aquifer 2 (mbgl): 160.00 to 240.00
	  o Aquifer 3 (mbgl): 250 to 300
	• Fresh Aquifer Depth: Upto 300 mbgl.
	• Transmissivity (m2/day): 3898.96
	• Sp. Yield: 0.000232

Groundwater Monitoring Status	• Ground Water Monitoring Wells: 3
Ground Water Quality	• For Aquifer Group I: Iron and Arsenic are present in an unconfined aquifer
Aquifer Potential	• Aquifer Group I: 2210 lpm
Groundwater Resource	• Annual Extractable GW Recharge: 78.63 MCM • GW Draft: 46.32 MCM • Stage of GW Development: 58.91 % • Total in-storage resource of the block (fresh) is 31.53 MCM
Existing and Future Water Demand	• Present demand for All Usage: 78.63 MCM • Future Demand for Domestic and Industrial Use: 31.53 MCM

3. Aquifer Management Plan

Groundwater Management issues	• Location of feasible sites for successful wells. • • Decline in water levels in some parts. • • Decline in water levels in some parts. • GW quality Iron and Arsenic are present in an unconfined aquifer
AR & Conservation Possibilities	Construction of Recharge Structures mainly ponds and adoption of water use efficiency practices.
Groundwater Management Plan	There is a Scope of Groundwater development in the block. Hence, There Should be provide relaxation to Industries for Groundwater abstraction. DEMAND SIDE MANAGEMENT: Promoting Cultivation of Sugarcane ,rice crops ,pulses,oilseed and horticulture. Arsenic treatment plant need to be Constructed wherever Arsenic is reported in the block.
Status of GW Exploration	Exploratory Wells: 1 Observation Wells: 1 Piezometers: 2
Aquifer Characteristics	Aquifer Group I: o Transmissivity: 3898.96 m2/day o Storativity: 0.000232

- **Water Level Behavior**

  Pre-monsoon water level ranges from 2.89 mbgl to 3.09 mbgl and post-monsoon water level ranges from 1.20 mbgl to 1.30 mbgl. pre-monsoon water level fall is 0.0579 m/yr and Post-monsoon water level fall is 0.0255 m/yr.

- **Issues**

Iron and Arsenic are present in an unconfined aquifer.

Groundwater contribution to agriculture is above 90%.

- **Groundwater Management Plan**

The proposed groundwater management plan for the block has been tabulated below. Upon implementation, 1.10 MCM of groundwater is expected to be available for additional utilization, and Stage of Groundwater Development is expected to decrease by 0.82%. The tentative locations for interventions has been attached as Figure 46 below.

Table 22(a): Summarized details of interventions proposed

Block	Check Dams (Nos.)	Stream Development (kms)	Nala Bunds (kms)	Ponds (Nos.)	On-farm area (Ha)	WUE area (Ha)
Kaisarganj	-	-	-	05	-	-

Table 22(b): Projected GW Recharge & savings by supply and demand-side management

Net Annual GW Availability (MCM)	Existing GW Draft for all uses (MCM)	Stage of GW Development (%)	Total recharge through interventions (MCM)	Total GW savings through interventions (MCM)	Projected Net GW Availability (MCM)	Projected Stage of GW Development after interventions (%)
78.63	46.32	58.91	1.10	1.10	79.73	58.09

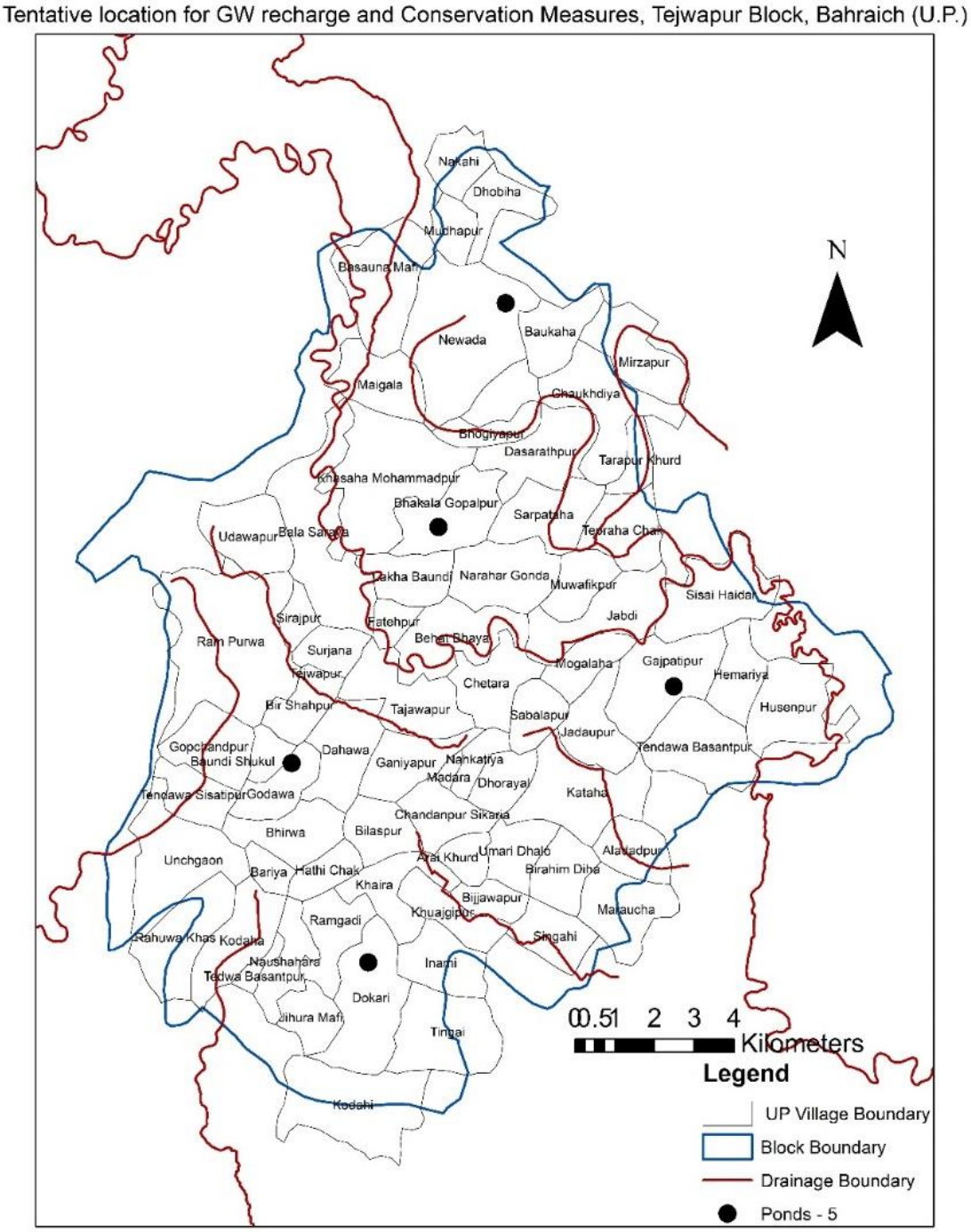


Figure 46: Tentative Sites for GW recharge and Conservation Measures, Tejwapur Block, Bahraich (U.P.)

5.15 Groundwater Management Plan of Payagpur block

Block: Payagpur **District:** Bahraich

1. General Information

State	Uttar Pradesh
District name	Bahraich
Block Name	Payagpur
Location	
Geographical area	273.309 Sq.Km.
Basin/Sub-basin	Upper Ganga Plain
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium(AL03)
Normal Annual Rainfall	1152

2. Aquifer Disposition

Aquifer Disposition	• Aquifer Disposition: One aquifer group with 3 Aquifer layers exist.
	  o Aquifer 1 (mbgl): From Surface to 150
	  o Aquifer 2 (mbgl): 160.00 to 240.00
	  o Aquifer 3 (mbgl): 250 to 300
	• Fresh Aquifer Depth: Upto 300 mbgl.
	• Transmissivity (m2/day): 1513.44
	• Sp. Yield: 0.00016

Groundwater Monitoring Status	• Ground Water Monitoring Wells: 11
Ground Water Quality	• For Aquifer Group I: Iron and Arsenic are present in an unconfined aquifer
Aquifer Potential	• Aquifer Group I: 2301 lpm
Groundwater Resource	• Annual Extractable GW Recharge: 123.30 MCM • GW Draft: 64.13 MCM • Stage of GW Development: 52.01 % • Total in-storage resource of the block (fresh) is 58.11 MCM
Existing and Future Water Demand	• Present demand for All Usage: 123.30 MCM • Future Demand for Domestic and Industrial Use: 58.11 MCM

3. Aquifer Management Plan

Groundwater Management issues	• Location of feasible sites for successful wells. • • Decline in water levels in some parts. • • Decline in water levels in some parts. • GW quality Iron and Arsenic are present in an unconfined aquifer
AR & Conservation Possibilities	Construction of Recharge Structures mainly ponds and adoption of water use efficiency practices.
Groundwater Management Plan	There is a Scope of Groundwater development in the block. Hence, There Should be provide relaxation to Industries for Groundwater abstraction. DEMAND SIDE MANAGEMENT: Promoting Cultivation of Sugarcane ,rice crops ,pulses,oilseed and horticulture. Arsenic treatment plant need to be Constructed wherever Arsenic is reported in the block.
Status of GW Exploration	Exploratory Wells: 2 Observation Wells: 2 Piezometers: 11
Aquifer Characteristics	Aquifer Group I: o Transmissivity: 1513.44 m2/day o Storativity: 0.00016

- **Water Level Behavior**

  Pre-monsoon water level ranges from 2.89 mbgl to 3.09 mbgl and post-monsoon water level ranges from 1.20 mbgl to 1.30 mbgl. pre-monsoon water level fall is 0.0579 m/yr and Post-monsoon water level fall is 0.0255 m/yr.

- **Issues**

Iron and Arsenic are present in an unconfined aquifer.

Groundwater contribution to agriculture is above 90%.

- **Groundwater Management Plan**

The proposed groundwater management plan for the block has been tabulated below. Upon implementation, 1.10 MCM of groundwater is expected to be available for additional utilization, and Stage of Groundwater Development is expected to decrease by 0.46%. The tentative locations for interventions has been attached as Figure 47 below.

Table 22(a): Summarized details of interventions proposed

Block	Check Dams (Nos.)	Stream Development (kms)	Nala Bunds (kms)	Ponds (Nos.)	On-farm area (Ha)	WUE area (Ha)
Kaisarganj	-	-	-	05	-	-

Table 22(b): Projected GW Recharge & savings by supply and demand-side management

Net Annual GW Availability (MCM)	Existing GW Draft for all uses (MCM)	Stage of GW Development (%)	Total recharge through interventions (MCM)	Total GW savings through interventions (MCM)	Projected Net GW Availability (MCM)	Projected Stage of GW Development after interventions (%)
123.30	64.13	52.01	1.10	1.10	124.40	51.55

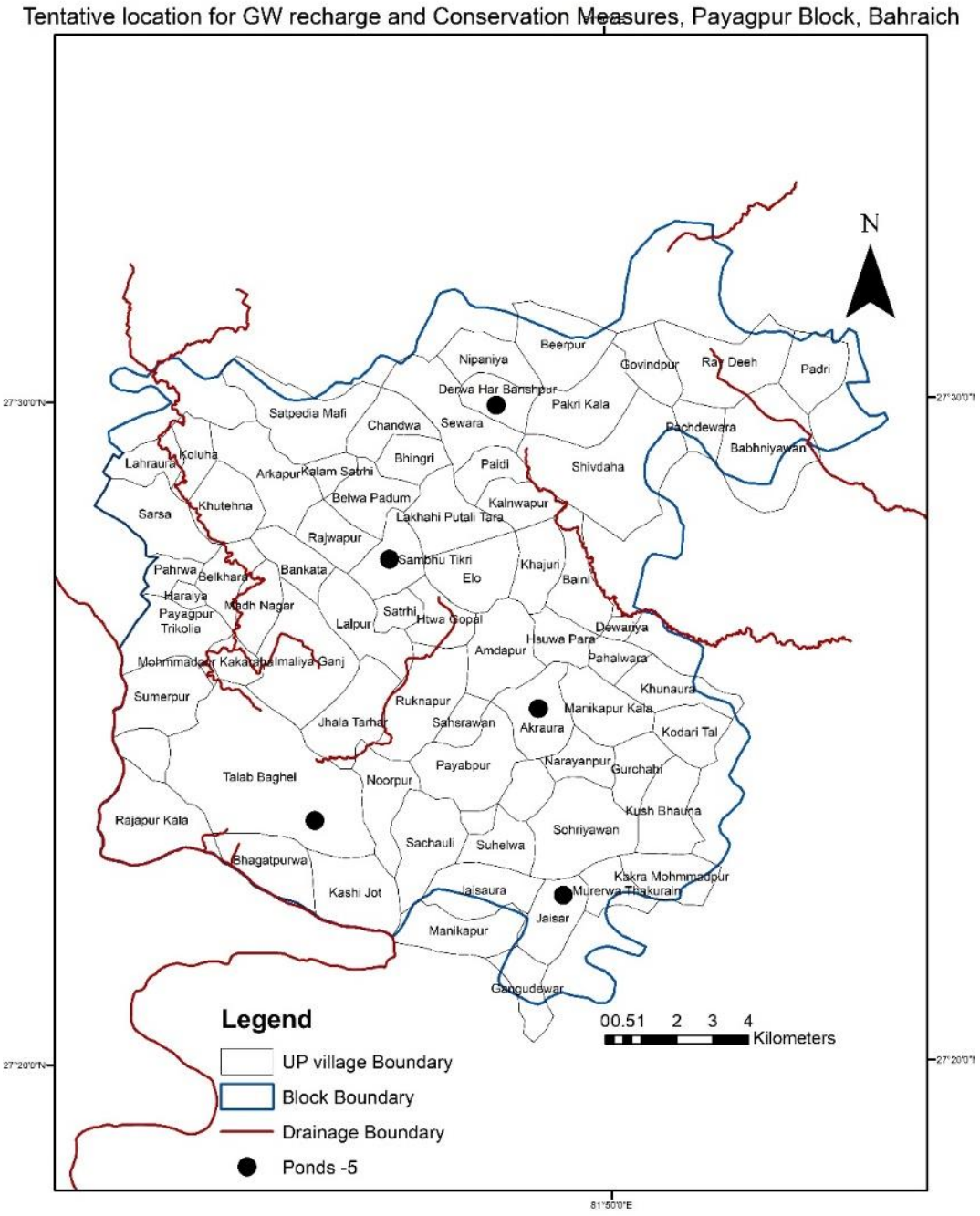


Figure 47: Tentative Sites for GW recharge and Conservation Measures, Payagpur Block, Bahraich (U.P.)

5.16 Groundwater Management Plan of Shivpur block

Block: Shivpur **District:** Bahraich

1. General Information

State	Uttar Pradesh
District name	Bahraich
Block Name	Shivpur
Location	
Geographical area	381.524 Sq.Km.
Basin/Sub-basin	Upper Ganga Plain
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium(AL03)
Normal Annual Rainfall	1152

2. Aquifer Disposition

Aquifer Disposition	• Aquifer Disposition: One aquifer group with 3 Aquifer layers exist.
	  o Aquifer 1 (mbgl): From Surface to 150
	  o Aquifer 2 (mbgl): 160.00 to 240.00
	  o Aquifer 3 (mbgl): 250 to 300
	• Fresh Aquifer Depth: Upto 300 mbgl.
	• Transmissivity (m2/day): 4574.06
	• Sp. Yield: 0.000334

Groundwater Monitoring Status	• Ground Water Monitoring Wells: 6
Ground Water Quality	• For Aquifer Group I: Iron and Arsenic are present in an unconfined aquifer
Aquifer Potential	• Aquifer Group I: 2210 lpm
Groundwater Resource	• Annual Extractable GW Recharge: 108.56 MCM • GW Draft: 61.73 MCM • Stage of GW Development: 56.87 % • Total in-storage resource of the block (fresh) is 45.90 MCM
Existing and Future Water Demand	• Present demand for All Usage: 108.56 MCM • Future Demand for Domestic and Industrial Use: 45.90 MCM

3. Aquifer Management Plan

Groundwater Management issues	• Location of feasible sites for successful wells. • • Decline in water levels in some parts. • • Decline in water levels in some parts. • GW quality Iron and Arsenic are present in an unconfined aquifer
AR & Conservation Possibilities	Construction of Recharge Structures mainly ponds and adoption of water use efficiency practices.
Groundwater Management Plan	There is a Scope of Groundwater development in the block. Hence, There Should be provide relaxation to Industries for Groundwater abstraction. DEMAND SIDE MANAGEMENT: Promoting Cultivation of Sugarcane ,rice crops ,pulses,oilseed and horticulture. Arsenic treatment plant need to be Constructed wherever Arsenic is reported in the block.
Status of GW Exploration	Exploratory Wells: 1 Observation Wells: 1 Piezometers: 6
Aquifer Characteristics	Aquifer Group I: o Transmissivity: 4574.06 m2/day o Storativity: 0.000334

- **Water Level Behavior**

  Pre-monsoon water level ranges from 3.15 mbgl to 9.12 mbgl and post-monsoon water level ranges from 1.70 mbgl to 6.25 mbgl. pre-monsoon water level rise is 0.0275m/yr and Post-monsoon water level fall is 0.0623m/yr.

- **Issues**

Iron and Arsenic are present in an unconfined aquifer.

Groundwater contribution to agriculture is above 90%.

- **Groundwater Management Plan**

The proposed groundwater management plan for the block has been tabulated below. Upon implementation, 1.10 MCM of groundwater is expected to be available for additional utilization, and Stage of Groundwater Development is expected to decrease by 0.58%. The tentative locations for interventions has been attached as Figure 48 below.

Table 22(a): Summarized details of interventions proposed

Block	Check Dams (Nos.)	Stream Development (kms)	Nala Bunds (kms)	Ponds (Nos.)	On-farm area (Ha)	WUE area (Ha)
Kaisarganj	-	-	-	05	-	-

Table 22(b): Projected GW Recharge & savings by supply and demand-side management

Net Annual GW Availability (MCM)	Existing GW Draft for all uses (MCM)	Stage of GW Development (%)	Total recharge through interventions (MCM)	Total GW savings through interventions (MCM)	Projected Net GW Availability (MCM)	Projected Stage of GW Development after interventions (%)
108.56	61.73	56.87	1.10	1.10	109.66	56.29

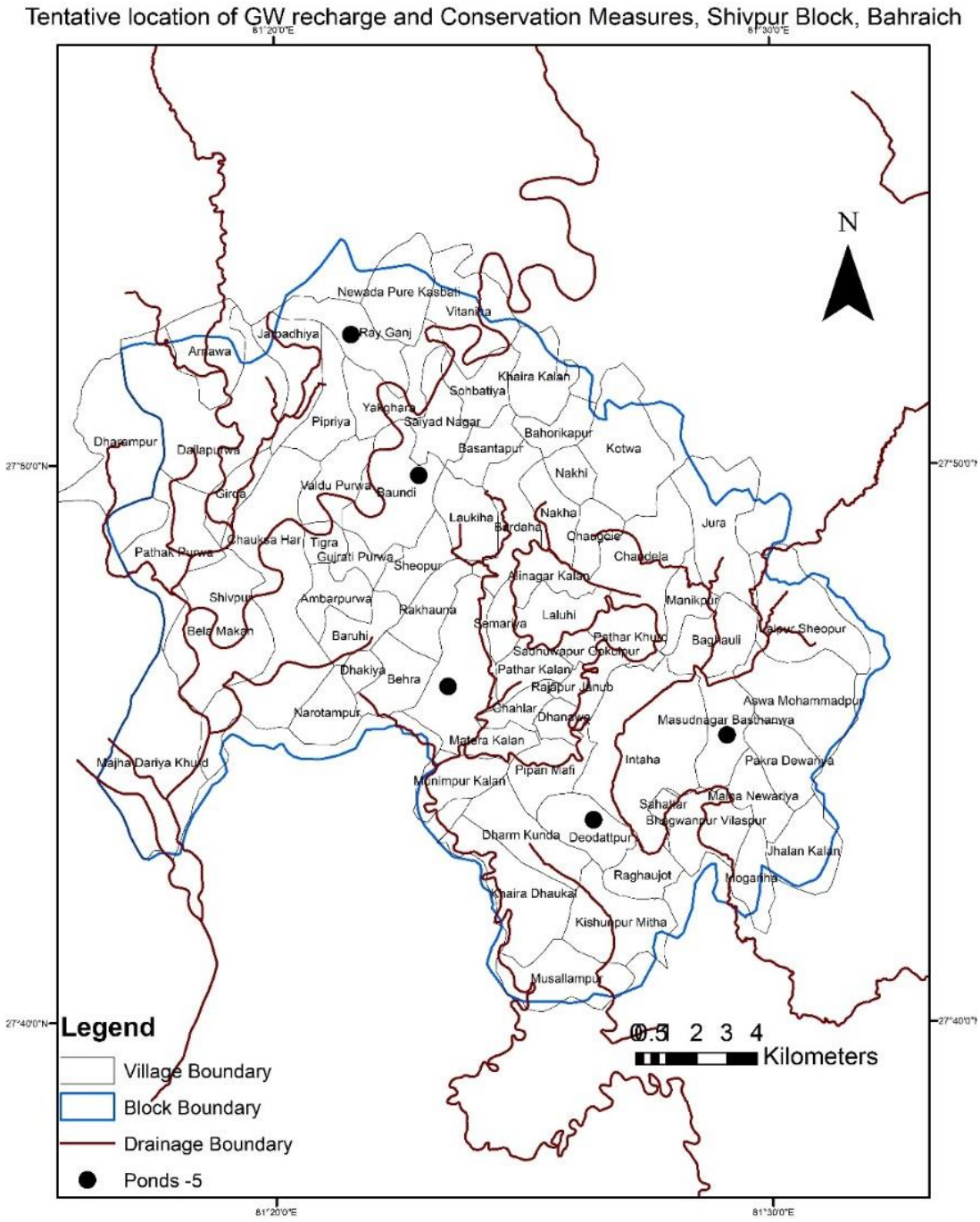


Figure 48: Tentative Sites for GW recharge and Conservation Measures, Shivpur Block, Bahraich (U.P.)

5.17 Groundwater Management Plan of Risia block

Block: Risia **District:** Bahraich

1. General Information

State	Uttar Pradesh
District name	Bahraich
Block Name	Risia
Location	
Geographical area	222.075 Sq.Km.
Basin/Sub-basin	Upper Ganga Plain
Principal Aquifer System	Alluvium
Major Aquifer System	Older Alluvium(AL03)
Normal Annual Rainfall	1152

2. Aquifer Disposition

Aquifer Disposition	• Aquifer Disposition: One aquifer group with 3 Aquifer layers exist.
	  o Aquifer 1 (mbgl): From Surface to 150
	  o Aquifer 2 (mbgl): 160.00 to 240.00
	  o Aquifer 3 (mbgl): 250 to 300
	• Fresh Aquifer Depth: Upto 300 mbgl.
	• Transmissivity (m2/day): 3774.88
	• Sp. Yield: 0.0001192 , 0.000222

Groundwater Monitoring Status	• Ground Water Monitoring Wells: 3
Ground Water Quality	• For Aquifer Group I: Iron and Arsenic are present in an unconfined aquifer
Aquifer Potential	• Aquifer Group I: 1902 lpm
Groundwater Resource	• Annual Extractable GW Recharge: 101.58 MCM • GW Draft: 67.14 MCM • Stage of GW Development: 66.09 % • Total in-storage resource of the block (fresh) is 33.42 MCM
Existing and Future Water Demand	• Present demand for All Usage: 101.58 MCM • Future Demand for Domestic and Industrial Use: 33.42 MCM

3. Aquifer Management Plan

Groundwater Management issues	• Location of feasible sites for successful wells. • • Decline in water levels in some parts. • • Decline in water levels in some parts. • GW quality Iron and Arsenic are present in an unconfined aquifer
AR & Conservation Possibilities	Construction of Recharge Structures mainly ponds and adoption of water use efficiency practices.
Groundwater Management Plan	• SUPPLY SIDE MANAGEMENT: Water conservation and Artificial Recharge to ground water and on Farm Activities. • DEMAND SIDE MANAGEMENT: Promoting Cultivation of Sugarcane ,rice crops ,pulses,oilseed and horticulture. • Arsenic treatment plant need to be Constructed wherever Arsenic is reported in the block.
Status of GW Exploration	Exploratory Wells: 1 Observation Wells: 1 Piezometers: 2
Aquifer Characteristics	Aquifer Group I: o Transmissivity: 3774.88 m2/day o Storativity: 0.0001192 , 0.000222

- **Water Level Behavior**

  Pre-monsoon water level ranges from 6.40 mbgl to 9.53 mbgl and post-monsoon water level ranges from 4.12 mbgl to 7.15 mbgl.

- **Issues**

Iron and Arsenic are present in an unconfined aquifer.

Groundwater contribution to agriculture is above 90%.

- **Groundwater Management Plan**

The proposed groundwater management plan for the block has been tabulated below. Upon implementation, 1.10 MCM of groundwater is expected to be available for additional utilization, and Stage of Groundwater Development is expected to decrease by 0.79%. The tentative locations for interventions has been attached as Figure 49 below.

Table 22(a): Summarized details of interventions proposed

Block	Check Dams (Nos.)	Stream Development (kms)	Nala Bunds (kms)	Ponds (Nos.)	On-farm area (Ha)	WUE area (Ha)
Kaisarganj	-	-	-	05	-	-

Table 22(b): Projected GW Recharge & savings by supply and demand-side management

Net Annual GW Availability (MCM)	Existing GW Draft for all uses (MCM)	Stage of GW Development (%)	Total recharge through interventions (MCM)	Total GW savings through interventions (MCM)	Projected Net GW Availability (MCM)	Projected Stage of GW Development after interventions (%)
101.58	67.14	66.09	1.10	1.10	102.68	65.38

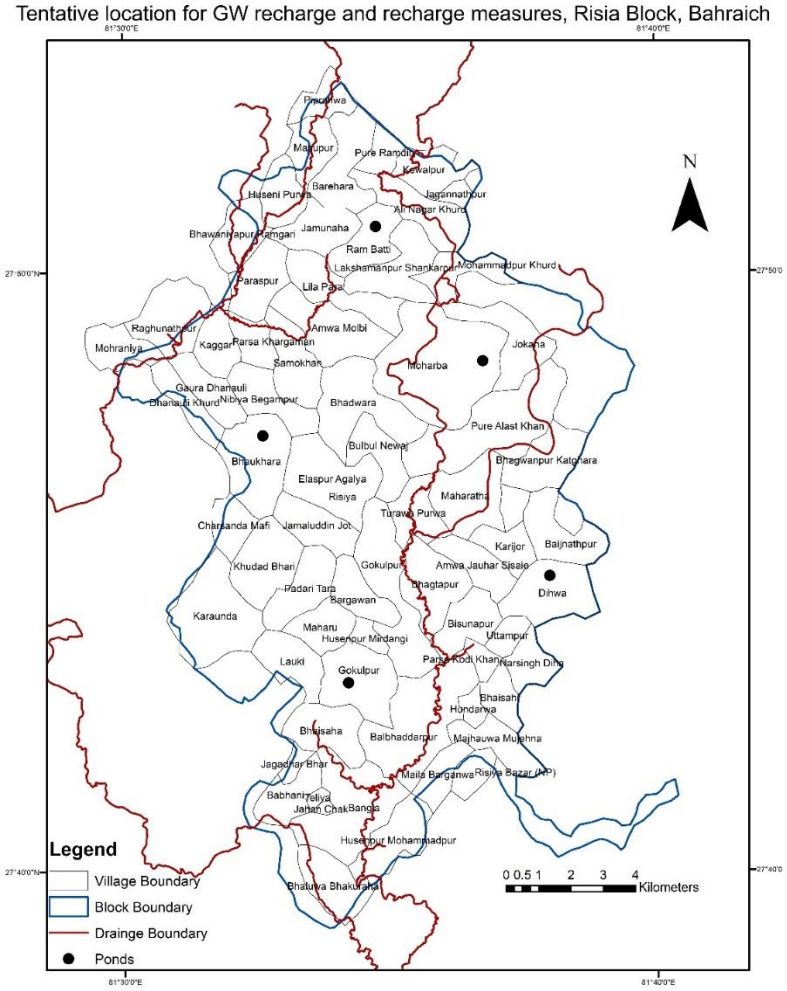


Figure 49: Tentative Sites for GW recharge and Conservation Measures, Risia Block, Bahraich (U.P.)

ANNEXURE – 1

(BASIC GW QUALITY DATA OF UNCONFINED AQUIFER)

Sl. No.	Block	Lat	Long	pH	Conductivity	Hardness as $CaCO_3$
					µmho/cm at 25°C	mg/L
1	Balha	27.8389	81.5222	8.15	505	190
2	Bisheshwarganj	27.3419	81.8325	8.42	440	220
3	Chittaura	27.5639	81.6247	8.24	475	200
4	Fakharpur	27.4233	81.5261	8.53	400	190
5	Huzurpur	27.2400	81.5460	8.12	570	250
6	Jarwal	27.1708	81.5406	8.21	380	190
7	Kaisarganj	27.2528	81.5422	8.14	882	230
8	Mahasi	27.6417	81.3889	8.05	440	220
9	Mihirpurwa	27.5460	81.2990	7.84	755	310
10	Nawabganj	28.5265	79.6276	7.98	532	250
11	Payagpur	27.5833	81.6000	8.42	715	250
12	Risiya	27.6892	81.6075	8.38	630	240
13	Shivpur	27.6840	81.5401	8.11	510	240
14	Tejwapur	27.5984	81.6245	8.09	495	230

Sl. No.	Block	CO_3	HCO_3	Ca Hardness	Mg Hardness	Na	K	F
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
1	Balha	nil	317	36	24	44	3.1	BDL
2	Bisheshwarganj	36	183	52	22	10	2.6	BDL
3	Chittaura	nil	207	20	36	26	1.5	BDL
4	Fakharpur	24	195	32	27	15	3.3	BDL
5	Huzurpur	nil	220	48	32	34	2.7	0.24
6	Jarwal	nil	232	36	24	11	2.4	BDL
7	Kaisarganj	nil	195	52	24	112	6.2	BDL
8	Mahasi	nil	256	60	17	8	3.0	BDL

9	**Mihirpurwa**	nil	220	80	27	50	3.5	BDL
10	**Nawabganj**	nil	342	56	27	26	4.0	0.28
11	**Payagpur**	24	207	32	41	70	4.5	BDL
12	**Risiya**	60	293	24	44	58	3.4	0.21
13	**Shivpur**	nil	305	52	27	16	2.5	BDL
14	**Tejwapur**	nil	293	68	15	17	3.2	BDL

Sl. No.	**Block**	**NO_3**	**SO_4**	**Cl**	**SiO_2**	**PO_4**	**SAR**	**RSC**
		mg/L	**mg/L**	**mg/L**	**mg/L**	**mg/L**		
1	**Balha**	BDL	BDL	14	37	n.d	1.4	1.4
2	**Bisheshwarganj**	BDL	10	21	34	n.d	0.3	-0.2
3	**Chittaura**	BDL	30	36	45	n.d	0.8	-0.6
4	**Fakharpur**	BDL	BDL	21	40	n.d	0.5	0.2
5	**Huzurpur**	BDL	25	78	36	n.d	0.9	-1.4
6	**Jarwal**	BDL	7	14	40	n.d	0.3	0.0
7	**Kaisarganj**	31	71	149	29	n.d	3.2	-1.4
8	**Mahasi**	BDL	BDL	21	38	n.d	0.2	-0.2
9	**Mihirpurwa**	48	70	85	31	n.d	1.2	-2.6
10	**Nawabganj**	BDL	BDL	14	38	n.d	0.7	0.6
11	**Payagpur**	BDL	65	85	38	n.d	1.9	
12	**Risiya**	BDL	8	7	39	n.d	1.6	
13	**Shivpur**	BDL	5	21	40	n.d	0.4	
14	**Tejwapur**	BDL	5	21	30	n.d	0.5	

ANNEXURE – 2

(TRACE METAL DATA OF UNCONFINED AQUIFER)

Sl. No.	Block	Fe	Mn	Cu	Zn	As	Pb	U	Cr
		(ppm)	(ppm)	(ppm)	(ppm)	(ppb)	(ppb)	(ppb)	(ppb)
1	BALHA	1.81	0.00	0.00	0.86	0.00	0.00	0.00	0.00
2	BISHESHWARGANJ	1.15	0.00	0.00	0.00	5.00	0.00	0.00	25.00
3	CHITTAURA	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.00
4	FAKHARPUR	0.86	0.00	0.00	1.08	0.00	0.00	4.00	0.00
5	HUZURPUR	0.00	0.00	0.00	1.54	0.00	0.00	0.00	0.00
6	JARWAL	0.51	0.00	0.00	0.00	0.00	0.00	2.00	0.00
7	KAISARGANJ	0.27	0.26	0.00	0.00	0.00	0.00	24.00	0.00
8	MAHASI	0.58	0.28	0.00	0.00	0.00	0.00	0.00	0.00
9	MIHIRPURWA	0.40	0.00	0.00	0.00	0.00	0.00	2.00	0.00
10	NAWABGANJ	0.34	0.00	0.00	1.68	0.00	0.00	2.00	0.00
11	PAYAGPUR	2.26	0.00	0.00	0.00	4.00	0.00	2.00	0.00
12	RISIYA	4.36	0.00	0.00	2.09	0.00	0.00	2.00	0.00
13	SHIVPUR	1.97	0.00	0.00	0.68	2.00	0.00	0.00	0.00
14	TEJWAPUR	1.47	0.00	0.00	0.00	18.00	0.00	0.00	0.00