



GOVERNMENT OF INDIA
Ministry of Jal Shakti
Department of Water Resources RD&GR

GROUND WATER YEAR BOOK 2021-22
JAMMU & KASHMIR



CENTRAL GROUND WATER BOARD
North Western Himalayan Region
Jammu



GOVERNMENT OF INDIA
Ministry of Jal Shakti
Department of Water Resources
River Development and Ganga Rejuvenation

GROUND WATER YEAR BOOK 2021–22
JAMMU & KASHMIR

Principal Contributor: **Rayees Ahmad Pir (AHG)**
Hydrochemistry Chapter: K S Rawat Chemist (Sc.-B)

CENTRAL GROUND WATER BOARD
NORTH WESTERN HIMALAYAN REGION
3rd Floor, Jal Ayog Bhawan, Rajinder Nagar, Phase 1,
Ban Talab Jammu – 181 123
Jammu

FOREWORD

WATER is one of the essential natural resources for sustaining life on the blue planet “**Earth**”. The demand for fresh/usable water has increased manifold globally due to rapid population growth, which in turn caused a change in agricultural patterns and an increase in industrial activities. To meet the demand for fresh water in various sectors, there is enormous stress on groundwater resources as surface water pollution is increasing day by day. This has resulted in the water level decline in many parts of the country.

Central Groundwater Board, the apex organization under the Ministry of Water Resources River Development & Ganga Rejuvenation, Government of India, monitors the behaviour of the groundwater regime through a network of groundwater monitoring wells spread across the country. The water level data collected from such observation wells in each state are compiled and processed and the salient features are brought out as a “Groundwater Year Book” every year. This report pertains to the scenario of the groundwater regime in the state of Jammu and Kashmir for the years 2021-2022.

Central Groundwater Board, North Western Himalayan Region, Jammu is monitoring the groundwater regime under various hydrogeological settings through Dug wells and Piezometers in valley areas of Jammu and Kashmir State, viz. Jammu, Kathua, Rajouri, Reasi, Samba, and Udhampur districts four times a year (January, May, August, and November) and Anantnag, Bandipora, Baramulla, Budgam, Ganderbal, Kupwara, Pulwama and Srinagar Districts three times in a year (May, August, and November). Due to the snowfall monitoring of January month is not being done. The effect of rainfall/snowfall on the groundwater regime is studied through the fluctuations between pre and post-monsoon seasons in Jammu Region and pre and post-winter seasons in Kashmir Valley. Similarly, water level fluctuations between the two consecutive seasons are studied and comparisons of water levels for the year are done with the long-term mean of at least one decade. The spatial and temporal variations in the chemical quality of the formation water are studied through chemical analysis results of water samples collected from the groundwater monitoring wells during May.

The information and data presented in this report will serve as a database for the user agencies, groundwater planners, and managers and will be of immense use to understand the regional picture of the quantitative and qualitative aspects of the groundwater regime in Jammu & Kashmir State.

The present Groundwater Year Book, 2021 – 2022 is the hard work & outcome of the efforts made by **Rayees Ahmad Pir**, Assistant Hydrogeologist. The efforts in depicting the groundwater scenario of Jammu & Kashmir State through maps and giving proper shape to this report are highly appreciable.

Place: Jammu
Date: 23.09.2022

Sd-
Anurag Khanna
Regional Director

GROUNDWATER YEAR BOOK, JAMMU & KASHMIR 2021 – 22

CONTENTS
TITLE

CHAPTER

No.

- 1 INTRODUCTION
 - Status of Hydrograph Network Stations
- 1.1 PHYSIOGRAPHY
- 1.2 GEOLOGY
- 1.3 DRAINAGE
- 1.4 HYDROMETEROLOGY
 - Climate of Jammu Division
 - Climate of Kashmir Division
- 1.5 SOILS
- 2 HYDROGEOLOGY
 - Behaviour of water Levels
 - 2.1 Depth to Water Level -May 2021
 - Depth to Water Level -August 2021
 - Depth to Water Level -November 2021
 - Depth to Water Level -January 2021
 - 2.2 Seasonal Fluctuation of Water Level
 - November 2021 with respect to May 2021 in Jammu Region
 - 2.3 Annual Fluctuation
 - May 2021 with respect to May 2020
 - August 2021 with respect to August 2020
 - November 2021 with respect to November 2020
 - January 2022 with respect to January 2021
 - 2.4 Decadal Fluctuation
 - May 2021 with respect to mean of May 2011– May 2020
 - August 2021 with respect to mean of August 2011 – August 2020
 - November 2021 with respect to mean of November 2011 – Nov. 2020
 - January 2022 with respect to mean of January 2012 – January 2021
- 3 HYDROCHEMISTRY
 - 3.1 Sampling & Analysis
 - 3.2 Groundwater Quality Characterisation in J&K
 - Electrical Conductance
 - pH
 - Chloride
 - Fluoride
 - Nitrate
 - Sulphate
 - Total Hardness
 - Calcium
 - Magnesium
 - Uranium
 - Arsenic
 - SAR
 - RSC
 - 3.3 Results & Discussions
 - 3.4 Conclusions & Recommendations
- 4 RECOMMENDATIONS

LIST OF FIGURES

FIGURE No.	TITLE
<i>Figure 1</i>	Administrative Map of Jammu and Kashmir
<i>Figure 2</i>	Location of Groundwater Monitoring wells in J&K
<i>Figure 3</i>	Valley areas in Jammu & Kashmir
<i>Figure 4</i>	Depth to Water Level May 2021 Jammu Region
<i>Figure 5</i>	Depth to Water Level May 2021 Kashmir Region
<i>Figure 6</i>	Depth to Water Level August 2021 Jammu Region
<i>Figure 7</i>	Depth to Water Level August 2021 Kashmir Region
<i>Figure 8</i>	Depth to Water Level November 2021 Jammu Region
<i>Figure 9</i>	Depth to Water Level January 2022 Jammu Region
<i>Figure 10</i>	Seasonal Fluctuation (November 2021 w.r.t May 2021 Jammu Region
<i>Figure 11</i>	Annual Fluctuation (May 2021 w.r.t May 2020) Jammu Region
<i>Figure 12</i>	Annual Fluctuation (August 2021 w.r.t August 2019) Jammu Region
<i>Figure 13</i>	Annual Fluctuation (November 2021 w.r.t November 2019) Jammu Region
<i>Figure 14</i>	Annual Fluctuation (January 2021 w.r.t January 2020) Jammu Region
<i>Figure 15</i>	Decadal Fluctuation (May 2020 w.r.t mean of 2010-19) Jammu Region
<i>Figure 16</i>	Decadal Fluctuation (August 2020 w.r.t mean of 2010-19) Jammu Region
<i>Figure 17</i>	Decadal Fluctuation (November 2020 w.r.t mean of 2010-19) Jammu Region
<i>Figure 18</i>	Decadal Fluctuation (January 2021 w.r.t mean of 2011-20) Jammu Region
<i>Figure 19</i>	Groundwater monitoring sampling locations in J&K
<i>Figure 20</i>	EC Distribution (May 2021)
<i>Figure 21</i>	pH Map (May 2021)
<i>Figure 22</i>	Chloride distribution Map (May 2021)
<i>Figure 23</i>	Fluoride distribution Map (May 2021)
<i>Figure 24</i>	Total Hardness Map (May 2021)
<i>Figure 25</i>	Nitrate distribution Map (May 2021)

LIST OF GRAPHS

Graph No.	TITLE
<i>Graph No. 1</i>	District-wise Groundwater Monitoring Wells in Alluvial Aquifers of J&K UT (As on January 2022)
<i>Graph No. 2</i>	Bar Chart showing total annual rainfall in J&K in 2020
<i>Graph No. 3</i>	Pie Chart showing total annual rainfall in J&K in 2020
<i>Graph No. 4</i>	Bar Chart showing Average rainfall in J&K in 2020
<i>Graph No. 5</i>	Pie Chart showing Average rainfall in J&K in 2020

LIST OF TABLES

TITLE

TABLE No.	TITLE
<i>Table 1</i>	District wise break up of active Groundwater Monitoring Wells in J&K (as on January 2022)
<i>Table 2</i>	Geological Setting in Jammu & Kashmir
<i>Table 3</i>	Categorization of depth to water level- May 2021
<i>Table 4</i>	Categorization of depth to water level- August 2021
<i>Table 5</i>	Categorization of depth to water level- November 2021
<i>Table 6</i>	Categorization of depth to water level- January 2022
<i>Table 7</i>	Categorization of changes in water level between May 2021 and Nov 2021
<i>Table 8</i>	Categorization of changes in water level between May 2021 and May 2020
<i>Table 9</i>	Categorization of changes in water level between August 2021 and August 2020
<i>Table 10</i>	Categorization of changes in water level between November 2021 and November 2020
<i>Table 11</i>	Categorization of changes in water level between January 2022 and January 2021
<i>Table 12</i>	Categorization of changes in water level between May 2021 to decadal mean (May 2011-May - 20)
<i>Table 13</i>	Categorization of changes in water level between August 2021 to decadal mean (Aug. 2011-Aug. - 20)
<i>Table 14</i>	Categorization of changes in water level between Nov 2021 to decadal mean (Nov. 2011- Nov. - 20)
<i>Table 15</i>	Categorization of changes in water level between January 2022 to decadal mean (Jan. 2012-Jan. - 21)
<i>Table 16</i>	Groundwater Quality during May 2021
<i>Table 17</i>	SAR & RSC ranges during May 2021

LIST OF ANNEXURES

TITLE

ANNEXURE No.	TITLE
<i>Annexure I</i>	Depth to Water Level Data for all the four Seasons (JAMMU REGION)
<i>Annexure II</i>	Depth to Water Level Data for all the four Seasons (KASHMIR REGION)
<i>Annexure III</i>	Result of Chemical Analysis of water samples of NHS collected during May 2021 Jammu & Kashmir

EXECUTIVE SUMMARY

The present report discusses the regional behaviour of water levels and chemical quality of groundwater in the phreatic aquifers of the outer plains of the Jammu region, extending between River Ravi in the east to Munawar Tawi in the west covering parts of Jammu, Samba, and Kathua districts J&K, India. Dun Belt covers alluvium areas of Kathua Samba and Udhampur including parts of the Rajouri district. In this area, the water supply is mainly dependant on groundwater either from the springs, or shallow/ or deep aquifer systems. The groundwater also forms the main source of the surface water bodies through base flow. In this study, monitoring of groundwater levels was carried out during May, August, November 2021, and January 2022. Further, to understand the spatiotemporal fluctuations of groundwater in response to groundwater recharge and/or discharge, the groundwater level contour maps were generated using Natural Neighbourhood Interpolation methods in the GIS platform. Additionally, the chemical quality evaluation of the groundwater was also carried out based on 269 water samples collected from shallow aquifers during the pre-monsoon season (May-June 2021) using GIS techniques. The groundwater level maps showed that the water levels in the Kandi formation are deeper than areas in the Sirowal formation and are significantly controlled by the monsoons. In certain places, particularly in urban and industrial areas, the groundwater levels are showing a declining trend in response to over-exploitation. The chemical analysis indicated overall a good quality of the groundwater that is suitable for drinking and other domestic purposes. The EC was generally low indicating groundwater as fresh and potable. The pH showed the neutral to alkaline nature of water. The total hardness was found to be within the acceptable limits (BIS-2012) for drinking purposes. The chloride and fluoride concentrations were also found within the maximum permissible limits of BIS standards. The calcium and magnesium, concentrations, in general, are low except for certain places where the concentration of Fluoride is relatively found to be high at few locations. The chemical quality analysis showed that although, the ion concentration is within the permissible ranges. Thus, proper protection measures are required to be taken to avoid contamination of groundwater in the area. For instance, proper monitoring for ions and other trace elements in urban & industrial areas like Bari-Brahmana, Gangyal, etc. shall be taken up and monitoring network stations shall be established all along the nalas and drains carrying industrial effluents and municipal wastes in the area.

1. INTRODUCTION

Jammu and Kashmir is the northern most UT of India after Ladakh. It lies within latitudes of 32°17' and 36°08' N and longitudes of 73°23' and 76°47' E. The UT has a total geographical area of 42,241 Sq. Km. The Union Territory has an international border with Pakistan in the west. The States of Punjab and Himachal Pradesh forms its southern border and the UT of Ladakh form the northern and north eastern border. Major parts of the J&K State represent high and rugged mountainous terrain. Jammu & Kashmir is divided into two administrative divisions viz. Kashmir Division and Jammu division. NHS monitoring is being carried out for valley parts (Alluvium area) of 6 districts in the Jammu region (Jammu, Samba, Kathua, Rajouri, Reasi, and Udhampur) and 5 districts of the Kashmir Region (Kupwara, Baramulla, Pulwama, Anantnag, and Srinagar). Therefore, the groundwater estimation is computed by the rainfall infiltration method only. There is a total of 20 districts in J&K UT. The administrative map of the state is shown in figure 1.

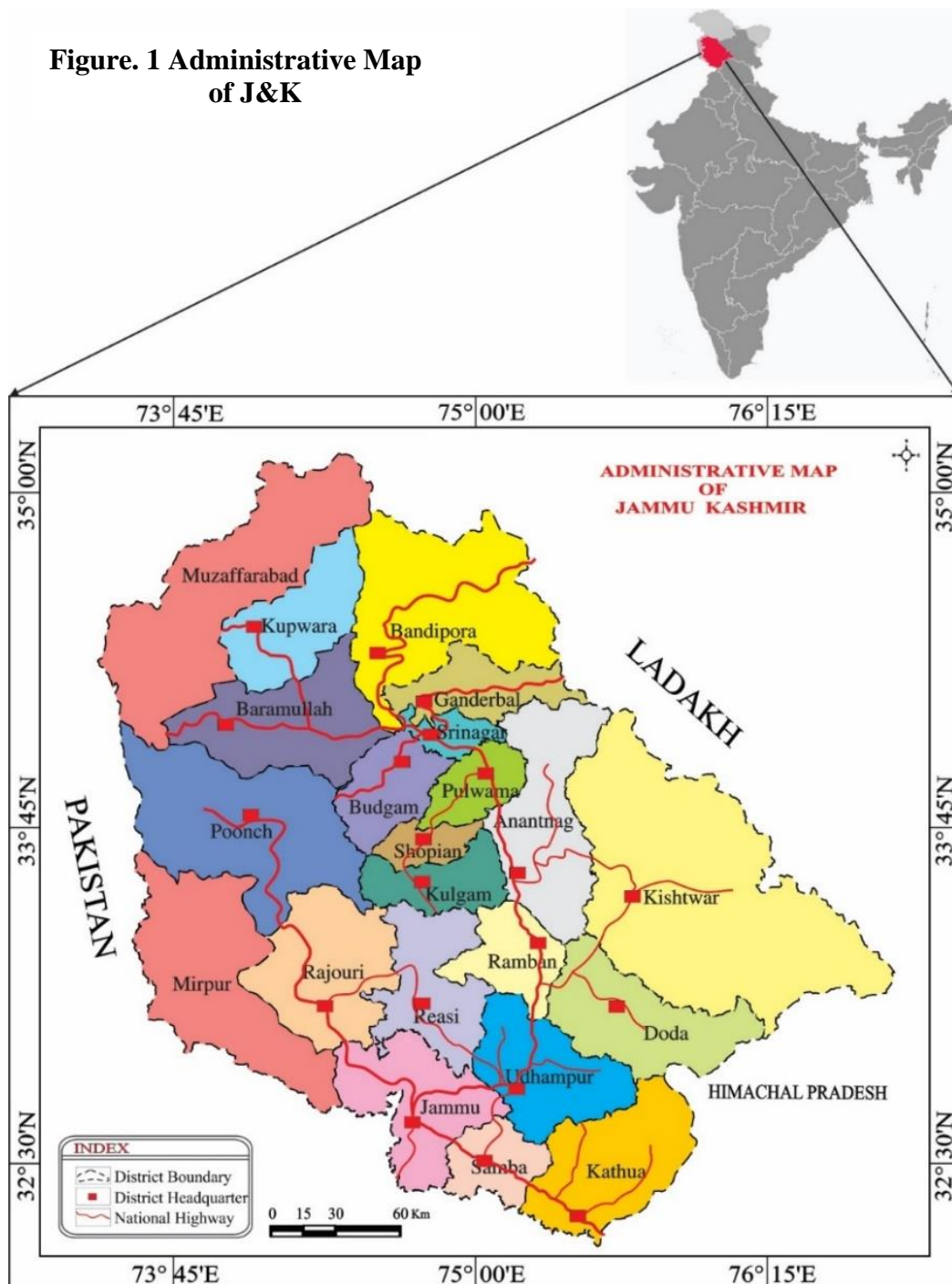
The Central Groundwater Board started monitoring of groundwater regime through the All-India network of hydrograph stations from 1969 onwards. The density of observation wells increased year after year. Earlier groundwater monitoring was carried out through a network of open wells, generally dug wells for drinking purposes tapping shallow aquifers. Keeping in view the importance of future groundwater development, the network was subsequently strengthened by the construction of purpose-built piezometers. Presently in Jammu and Kashmir, a total of 298 dug wells are being monitored for this purpose. The Central Groundwater Board, North Western Himalayan Region is monitoring water levels in observation wells in Jammu and Kashmir State four times a year viz. May (between 20th and 31st), August (between 20th and 31st), November (1st and 10th), and January (1st and 10th). Water samples from observation wells are collected once a year during May for quality testing. The water level and chemical analysis data thus collected is analysed and interpreted by GEMS and Map Info software and Groundwater Regime Monitoring Bulletin is prepared and issued seasonally with interpreted data and thematic maps depicting the groundwater scenario of J&K UT.

The total number of active groundwater monitoring wells is 298 (as on January 2022) which are located in alluvial areas of Jammu, Kathua, Samba, Rajouri, Reasi, Udhampur, Srinagar, Baramulla, Anantnag, Kupwara and Pulwama Districts. Most monitoring stations fall in valley areas of these districts.

The present report discusses the regional behaviour of water levels in phreatic aquifers for the period May, August, November 2021, and January 2022 which will enable user agencies to plan development strategies. The results of chemical analysis of water samples collected in May 2021 from observation wells established by Central Groundwater Board, North Western Himalayan Region are also discussed.

The main objectives of groundwater regime monitoring in Jammu and Kashmir may be summarised as follows:

1. To study the fluctuation of water levels both spatially and temporally in response to groundwater recharge and/or discharge.
2. To evaluate changes in groundwater level with respect to the preceding year for the same period.
3. To evaluate changes in groundwater levels with respect to a long-term average water level such as the decadal mean.
4. To study the fluctuation of water level during different seasons.
5. To study the hydro-chemical behaviour of phreatic aquifers.



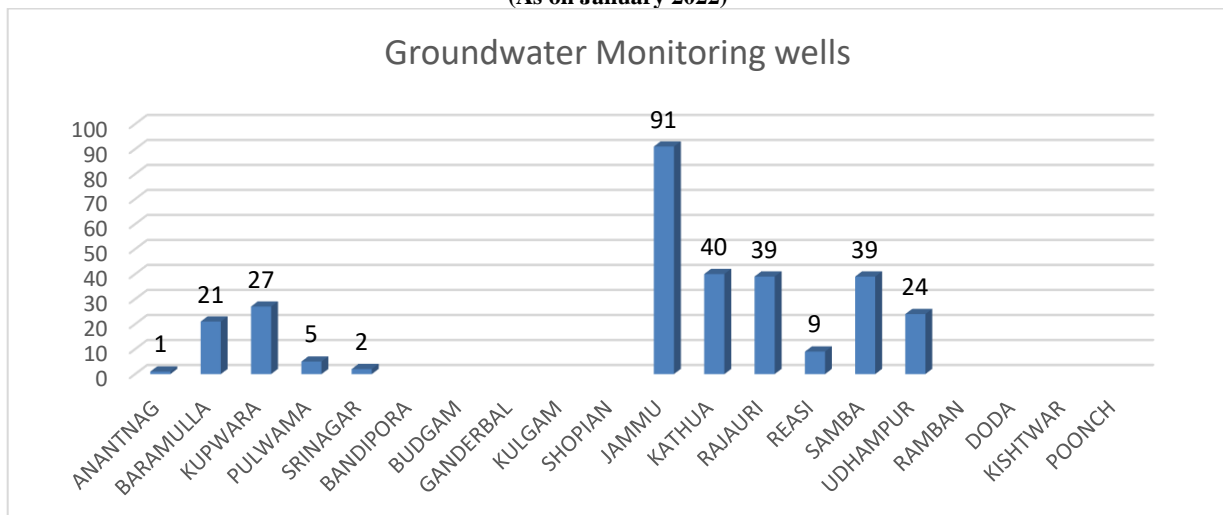
Status of Hydrograph Network Stations

In Jammu & Kashmir, at present, 304 Hydrograph Network Stations are being monitored every year during pre-monsoon and post-monsoon periods. 242 NHS exist in Jammu Region and 62 stations in Kashmir Region. To date, no monitoring stations have been established in Ladakh Region. District-wise number of hydrograph network stations as of 31.03.2022 is given in table 1 and their locations are shown in Figure 2.

Table: 1 District-wise break-up of Groundwater Monitoring Wells in Alluvial Aquifers of J&K UT (as on January 2022)

Sl. No.	REGION	DISTRICT	Total No of Monitoring wells	Number of Active Groundwater Monitoring Wells			
				May-18	Aug-18	Nov-18	Jan-19
1	KASHMIR REGION	Anantnag	1	0	0		Monitoring not carried out due to snowfall
2		Baramulla	21	11	19		
3		Kupwara	27	6	24		
4		Pulwama	5	2	3		
5		Srinagar	2	1	1		
6		Bandipora	0				
7		Budgam	0				
8		Ganderbal	0				
9		Kulgam	0				
10		Shopian	0	--	--	--	
	Total		56	20	47	0	
11	JAMMU REGION	Jammu	91	74	84	83	87
12		Kathua	40	32	38	36	41
13		Rajouri	39	36	35	33	38
14		Reasi	9	8	8	8	9
15		Samba	39	32	36	34	40
16		Udhampur	24	24	24	24	23
17		Doda	0				
18		Kishtwar	0				
19		Ramban	0				
20		Poonch	0				
	Total		242	206	225	218	238
	TOTAL J&K		298	226	272	218	238

Graph 1. District-wise Groundwater Monitoring Wells in Alluvial Aquifers of J&K UT (As on January 2022)



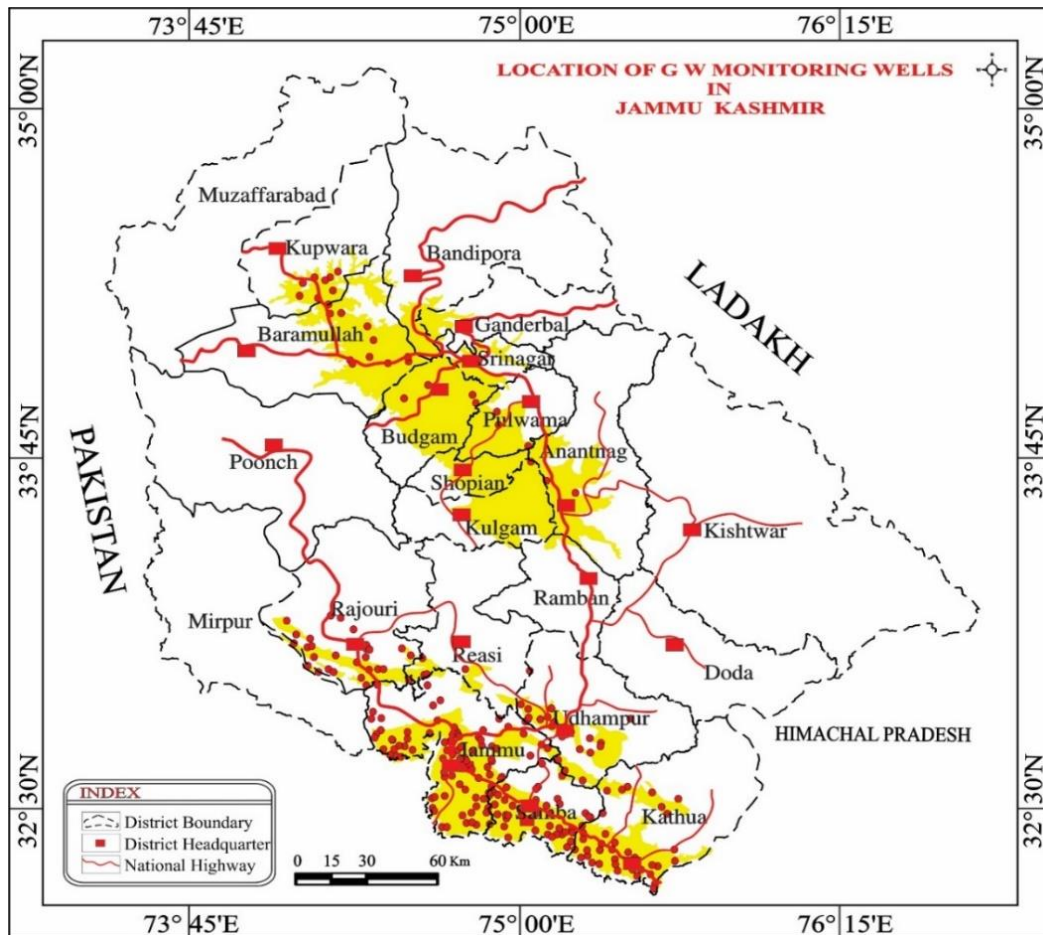


Figure 2. Location Map of Groundwater monitoring wells in Alluvial Aquifers in J&K

1.1 PHYSIOGRAPHY

Physiography of the Jammu & Kashmir State is highly varied with the highest mountain ranges in the world, extensive plateau, enormous valleys, deep gorges, and large canyons in the Middle and Trans-Himalayan Regions. The individual ranges have characteristic steep slopes towards the south and a much gentle slope towards the north. The northern slopes are covered with a thick and dense growth of vegetation. While the southern slopes are mostly bare, with thin sparse forest cover. The Zaskar range separates Ladakh Region from Kashmir Valley while the Pir Panjal range divides Jammu Region and Kashmir Valley (Figure 3). The state can be divided into six distinct physiographic units as discussed below.

Sirowal Belt: The Sirowal belt covers an area of about 1000 km² and has an average topographic gradient of 1:250 to 1:300 in the southwest direction. The land elevation of the Sirowal belt above the mean sea level is normally within 320 m. Southern parts of Jammu and Kathua Districts fall in this belt.

Kandi Belt: The elevation of the Kandi belt ranges between 320 m and 400 m above mean sea level (m AMSL). The average topographic gradient varies between 1:60 and 1:100. Kandi belt

covers an area of about 1500 km² and occupies parts of Jammu and Kathua Districts imperceptibly north of the Sirowal belt. Kandi belt in Jammu & Kashmir state runs in a northwest-southeast direction as a narrow strip between rivers Munawar Tawi in the west and Ravi in the east. The belt is occupied by reworked Siwalik debris, which has a master slope towards the southwest.

Siwalik Region: The land elevation of the Siwalik region ranges between 400 m and 750 m above mean sea level. Ridges and small independent valleys are the prominent features of the Siwalik region which covers parts of Kathua, Jammu, Udhampur, and Rajouri Districts.

Kashmir Valley: The elevation of the valley floor above the mean sea level ranges between 1500 m and 2000 m. Kashmir valley covers an area of 5600 km and comprises parts of Budgam, Pulwama, Srinagar, Anantnag, Baramulla, and Kupwara Districts.

Hilly Mountains: The high mountain ranges have an elevation between 2000 m and 5000 m above MSL and form parts of Udhampur, Anantnag, Baramulla, Srinagar, and Kupwara Districts.

Trans-Himalayan Zone: The trans-Himalayan zone constitutes the inaccessible mountainous terrain of the Kargil and Leh districts in the Ladakh Region. The elevation of this zone varies between 5000 m and 8000 m above mean sea level. However, along the lower reaches of the Indus and Shyok rivers, the elevation is less than 5000 m.

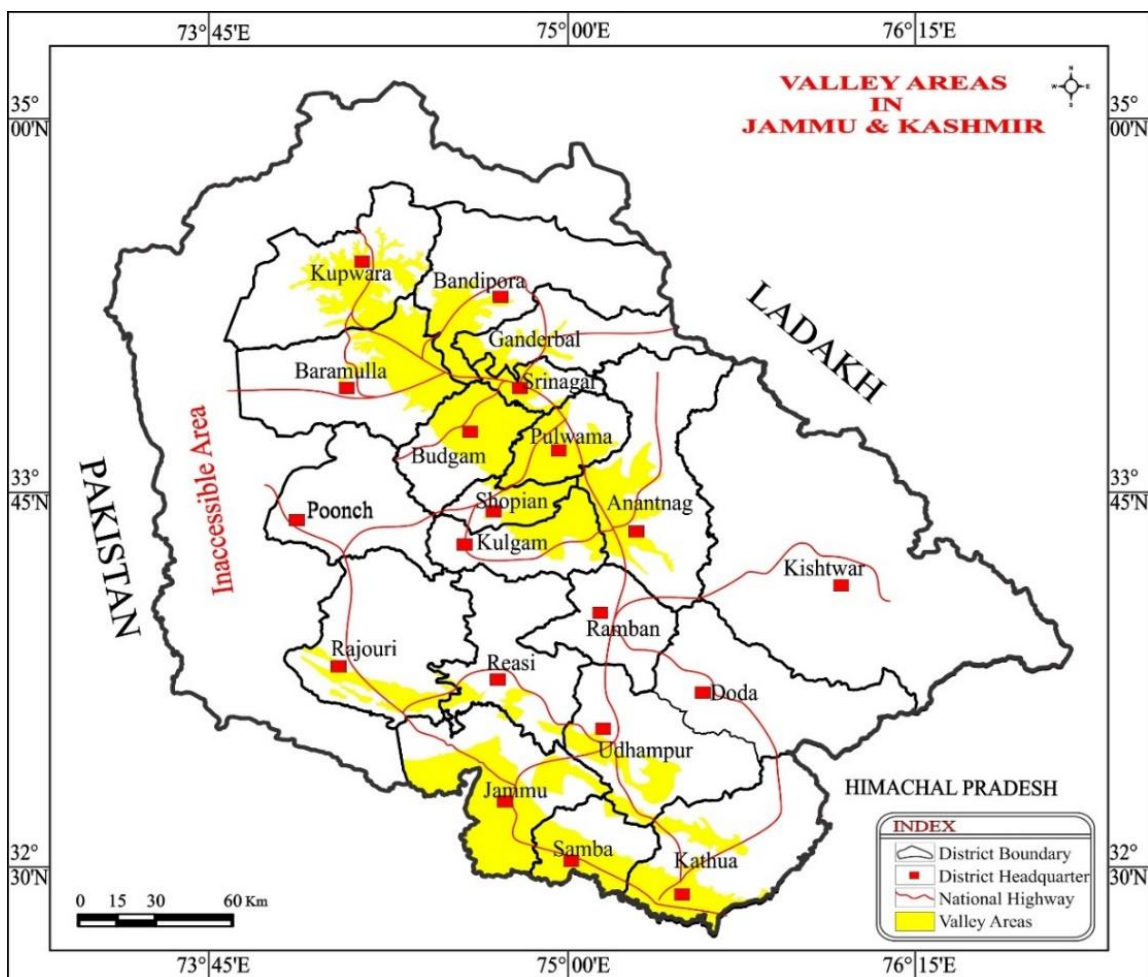


Figure 3. Map showing Valley areas in J&K

1.2. GEOLOGY

Geological formations ranging in age from Pre-Cambrian to Recent are found in the State. These formations can broadly be classified into three categories. Hard or consolidated- rocks comprising granites, slates, quartzite, Panjal traps, limestone, etc. Semi-consolidated rocks comprising claystone, siltstone, sandstone, etc. Unconsolidated formations from Quaternary to Recent age are comprised of Clay, Silt, Sand, Gravel, pebbles, boulders, etc. The brief geological setting of the state is given in Table 2.

Table 2 Geological Setting in J&K State

Age	Formation
Recent to Sub-recent	Alluvium
Pleistocene	Karewas
Middle Pliocene to Pleistocene	Siwaliks
Miocene	Murees
Unconformity	
Eocene	Subathu Formation
Cretaceous/ Eocene	Volcanics/ Basic Intrusives
Cretaceous	Flysch Beds
Jurassic	Punch-Mandi Formations
Triassic	Mandi& Infra-Triassic Formations
Paleozoic	Panjal Traps/ Tanwal
Carboniferous / Permian	Agglomeratic Slates Fenestella Shales Gondwana Formations Zewan Beds
Silurian-Devonian	MuthQuartzites
Upper Pre-Cambrian to Lower Cambrian	Dogra Slates
Lower Pre-Cambrian	Salkhala Series
Pre-Cambrian	Granite & Basic Intrusives

The Salkhala outcrops have been traced in the form of hairpin bend around the northwestern end of the Kashmir Valley. The salkhala group comprises a succession of Carbonaceous Shales, Schists, graphitic phyllites, carbonaceous limestones, dolomites, marbles, and quartzites. The Salkhala group is stratigraphically overlain by Dogra Salates, which conformably grades into the lower paleozoic succession. In the southern part of Kashmir, the Dogra Slates are conformably overlain by a succession of phyllites, sandstones, massive quartzites, grits, and conglomerates known as Tanawals and suggesting that the succession bridges the gap between Dogra Slate and upper Paleozoic rocks in the south and southwestern Kashmir.

The Paleozoic formations of Kashmir exposed along the pir-panjal range and great Himalayan ranges rest either over Dogra slates or pre-Cambrian crystalline rocks of the Salkhal group. A succession of white quartzites, Shales, siltstones, and dolomitic limestones exposed around Kashmir synclinorium has been referred to as Muth formation. In the Northern part of Kashmir, the Muth Quartzites are conformably overlain by Syringothris limestone, a succession of Grey and dark blue limestone with a few interbedded shales, quartzites, and traps. The formation is exposed along the southern slopes of Pirpanjal near Banihal.

Agglomeratic slate series is well exposed in the Pir Panjal range Baramulla district, Liddar valley, Anantnag District, and Kistwar in Doda district. The polymiocites consists of rock

fragments derived from glacial erosion as well as from volcanic outburst. It is a succession of slates, sandstone, quartzite, and a few bands of conglomerates. The Agglomeratic slate series is overlain and often intermixed with a thick succession of Andesitic and basaltic traps known as Panjal volcanic. The volcanic occupy the steep slopes and high peaks of the Pir Panjal ranges and higher reaches of Liddar valley. The volcanic activity seems to have persisted in Kashmir from the late Carboniferous to late Triassic epochs.

Permian rocks of Kashmir are conformably overlain by a thick succession of limestones and shales known as Zeewan formation.

The outcrops of Jurassic rock have restricted distribution in Kashmir. A major part of the rock is buried beneath the Quaternary sediments and reported in the northern slopes of Pir Panjal range Baltal and Joji-la areas. The Cretaceous rocks have not been reported from the Kashmir Himalayas.

The Murres extensively exposed on the Jammu-Srinagar highway around Batote consists of basal conglomerate bed overlain by intercalations of bright red-purple clay and green sandstones and is overlain by Siwalik group rock formations.

Most of the Kashmir valley is occupied by this gravel-sand and mud succession known in Indian Stratigraphy as the 'Karewa formation'. There are different opinions about the deposition of Karewa formations. But based on detailed geological mapping Bhatt (1978, 1982) proposed that sedimentation of Karewa deposits took place in a lake basin but suggested that during deposition of Lower Karewa lake occupied the whole Kashmir valley floor, but during Upper Karewa time the lake was localized only in the north-eastern flank of the basin.

Karewas cover an area of about 5600 sq.Km in Kashmir Valley. Karewa group is defined to include the more or less unconsolidated layered sedimentary succession deposited in fluvio-lacustrine environments in the Kashmir valley, overlying the Precambrian-Mesozoic basement and overlain by Holocene alluvium of modern rivers, etc. Karewa group is divided into two formations viz., Lower Karewa and Upper Karewa. The Lower Karewa formation is characterized by plastic grey to bluish grey clay, light grey sandy clay, lignite, and lignitic-clay, coarse to medium-grained sand, and conglomerates. It is about 1200-m thick formations.

The Upper Karewa formation is characterized by brown, grey sandy clay, medium to coarse-grained sand, cream-colored marl, conglomerate, and loam (loess) sediments. In this upper Karewas lignitic shale and grey bluish shale are absent. The thickness of this formation is about 50 to 200 mt. The loamy sediments are present throughout the valley making the top of the Karewa Plateau. The Upper Karewa formation sediments are exposed extensively on the Pir Panjal flank due to the uplift of the Pir Panjal range along with its Karewa sediments.

The top of Karewa terraces is capped by a fine-grained mostly silty succession without any bedding structures. These are mainly loam or loess formations. The formation is in some places extremely muddy, silty, or rather sandy. In some cases, sand layers are intercalated.

1.3. DRAINAGE

The entire state of Jammu and Kashmir falls in the Indus River Basin and the only exception is the small area in the extreme northeast which is part of the Quraqush River Basin.

1.3.1. Indus Basin

The total drainage area of the Indus Basin is 11,78,440 km² out of which an area of 453,250 km² falls in the high Himalayan mountains and the remaining 725,190 km² falls in the plains drainage area in plains. A total of 321,290 km² area of the Indus basin falls in India whereas only 131,960 km² area falls in Pakistan.

The Indus River (Sanskrit-Sindhu, Greek-Sinthos, Latin-Sindhus) originates from lofty mountains near Mansarovar Lake at an elevation of 5182 m and traverses for several hundred km through Tibet and India before reaching Suleiman mountains in Pakistan. A part of the Indus Basin is above the permanent snow line, which varies in altitude from 4268 m in the eastern part to 5792 m in the western part. In Ladakh Region, the snow line is at 5488 m above mean sea level, which recedes during summer.

The hydrographic system of the Indus Basin is very extensive. The river initially runs along the strike of the mountains and then suddenly makes an acute bend to the south and flows directly across the mountain. The Gilgit River joins the Indus at its great bend to the south. The Indus flows initially under the name of Singee Khabab until it is joined by the Ghar River at about 257 km from its source. After a short distance downstream it enters The State of Jammu & Kashmir at an elevation of 4206 m. It skirts Leh at 3200 m and is joined by the Zaskar River while still flowing north but more westerly. The Indus passes near Skardu and reaches Haramosh Mountain (7407 m). Here it takes a turn southwards at an acute angle and passing near Hattu Pir, enters Kohistan. After flowing through the wilds of Kohistan and at about 1450 km from its source, the Indus is joined by Kabul and Swat Rivers from Afghanistan. At this point, the elevation of the Indus falls to about 610 m. After leaving Attock in Pakistan the river flows southwards, parallel to the Suleiman Range. At about 805 km. from the Arabian Sea and at an elevation of 79 mamsl, the Indus receives waters from all of its five major tributaries viz. Jhelum, Chenab, Ravi, Beas, and Satluj, and here, it is known as Panjnad (five rivers). The river finally joins the Arabian Sea through its mouth, which forms a big delta covering 7770 km² and a vast coastline of about 201 km.

Major sub-basins of the Indus System in Jammu & Kashmir State are the Jhelum Sub-basin, the Chenab Sub-basin, and the Ravi Sub-basin. A brief account of these three sub-basins is given as: -

Jhelum Sub-Basin

The Jhelum is known in Kashmir as the Veth River. Most parts of Kashmir valley are drained by the Jhelum River, which flows in a northwesterly direction. The Jhelum River (Sanskrit-Vitasta, Greek-Hydaspes, Latin-Bipaspes) originates from Verinag Spring. The River has various tributaries in the valley, several of which come from the everlasting snows of the Liddar valley. Near Srinagar, it is received by the Sind River, and then forms the Wular Lake in Baramulla District which is a delta of the Jhelum River. Below Baramulla, the river leaves the fertile banks of the valley and

rushes headlong down a deep gorge at Khadnayar, and joins the Chenab River at Trimmu in Pakistan.

Chenab Sub-Basin

The Chenab River or Asikin, as it was known in Vedic times, is formed by two important tributaries, the Chandra and the Bhaga, which join near Keylong in Himachal Pradesh to form Chandra-Bhaga or the Chenab River in Himachal Pradesh.

The River then flows through the Kashmir Himalayas to emerge into the plains at Akhnoor in Jammu District, about 250 km from its source. Ranbir canal takes off from its left bank in Akhnoor tehsil.

Ravi Sub-Basin

Very small parts of the state, mainly the extreme south-eastern parts, fall in the RaviSub-basin. The Ravi River rises from the northern face of Rohtang Pass in Himachal Pradesh at an elevation of 4116 m. After passing through the Dhauladhar hill ranges, the river emerges from the foothills near Madhopur where the head works of the Upper Bari Doab Canal exist. It has the smallest catchment area among the rivers of the Indus System. An important tributary of the Ravi River, the Ujh River Which originates from the Basohli hills of Kathua District joins the mainstream to its right at Lassian.

1.4. HYDROMETEOROLOGY

The State of Jammu and Kashmir has great diversity in its temperature and precipitation. Excepting the plain, south of the Siwaliks of the Jammu Division, the climate over the greater parts of the state resembles that of the mountainous and continental parts of the temperate latitudes. The average rainfall and Annual rainfall in all districts of Jammu & Kashmir is shown in Bar and Pie Chart (Graph 2-5)

1.4.1. The climate of the Jammu Division

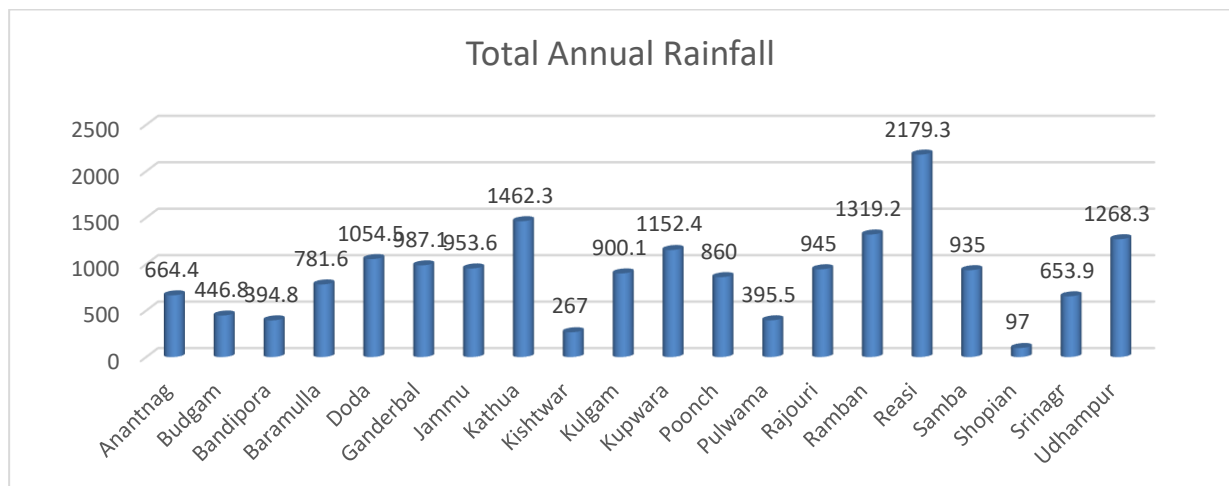
The climate of the Jammu division is sub-humid to sub-tropical. It is divisible into two parts namely (i) the plain region, lying to the south of the Siwaliks, and (ii) the mountainous region, stretching over the Middle and the Greater Himalayas in the districts of Doda, Rajouri, Poonch, and Udhampur. The climate of the plain region and Middle Himalayas including the Pir Panjal is characterized by a rhythm of seasons which is caused by the reversal of winds in the form of southwest and north-east monsoons. The reversal of pressure takes place regularly twice a year. This region has a sub-tropical climate with a hot and dry climate in summer and a cold climate in winter. It lies in the northern hemisphere above the tropic of Cancer. The Minimum and Maximum temperature of the district varies between 4°C to 47°C and the monsoon starts from the beginning of July to the first week of September. From October to June the precipitation and temperature patterns resemble closely the valley temperature zones. However, the summer rainfall and temperature resemble the precipitation pattern in the sub-tropical zone. The region receives an

average annual precipitation of 1070 mm mainly in the form of rainfall. Snowfall occurs in high mountainous parts of the Jammu region due to the southwest monsoon from July to September and contributes about 80% of the total rainfall. The temperature in plain areas of the Jammu region goes up to 45°C during summer and drops to as low as 3° C during the winter season. The average number of Annual rainy days in the Jammu region is 59.

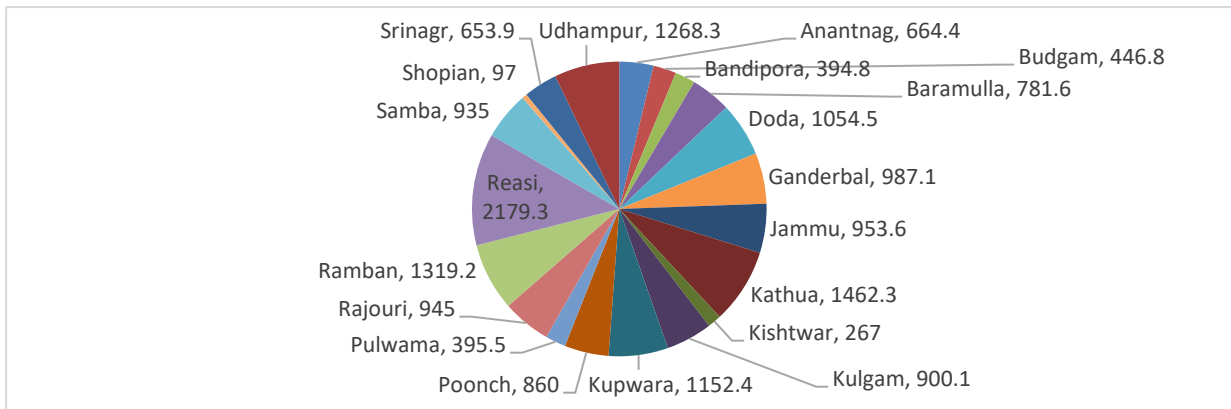
1.4.2. The climate of the Kashmir Division

The weather and climate of the Kashmir Division are intrinsically linked with the weather mechanism of the subcontinent in general. The location of the Kashmir Valley at a high altitude (about 1600m AMSL) in the north-western corner of the subcontinent, surrounded by high mountains on all sides, gives it a unique geographical character with distinctive climatic characteristics. It experiences Temperate-cum-Mediterranean type of climate. The average annual precipitation is 660 mm. In winter, rainfall occurs from the western disturbances (temperate cyclones). These disturbances have their origin in the Mediterranean Sea. The rainfall generated by these cyclones is fairly widespread locally known as *Alamgir*. About 65% of the precipitation occurs in the form of snow during the winter season, i.e. December to February. March and April are the months of rainfall. May to September is relatively dry months. The mercury drops between -8°C and 12°C during winter and attains a moderate temperature of around 35°C during summer.

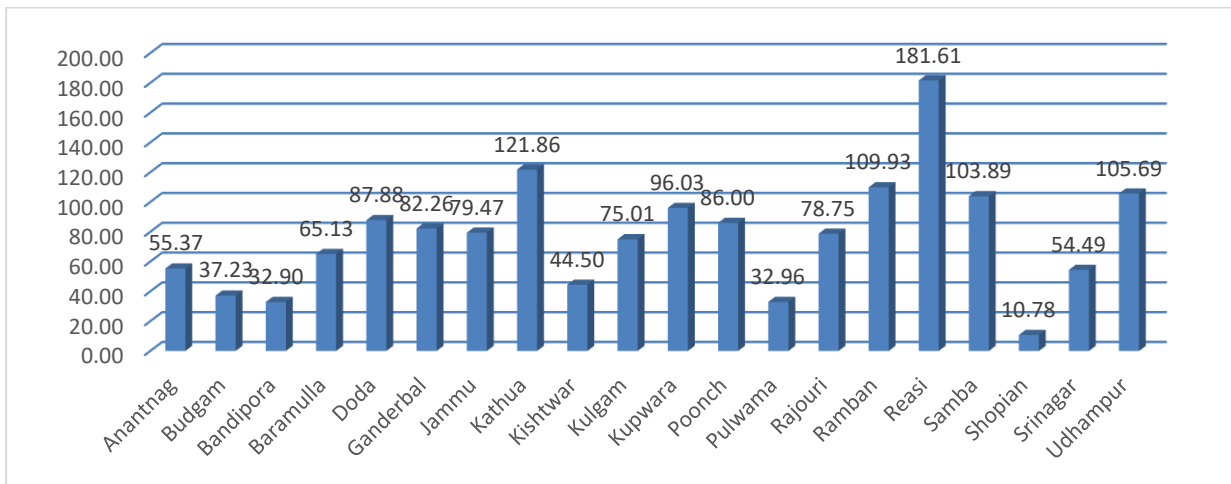
Graph 2. Bar Chart showing Total Annual Rainfall in J&K in 2020



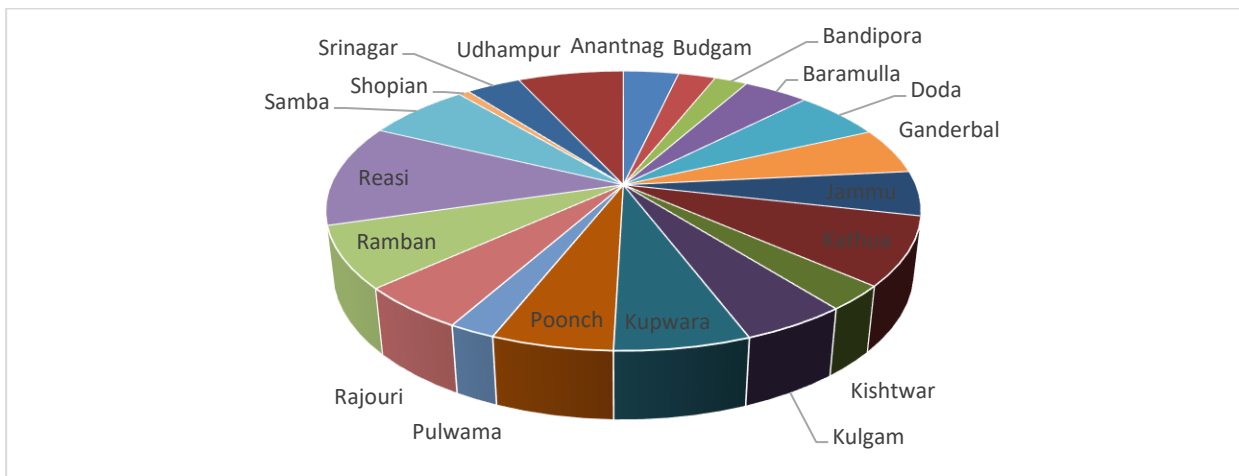
Graph 3. Pie Chart showing Total Annual Rainfall in J&K in 2020



Graph 4. Bar Chart showing Monthly Average Rainfall in J&K in 2020



Graph 5. Pie Chart showing Monthly Average Rainfall in J&K in 2020



1.5. SOILS

The soils of J&K UT have been classified into the undermentioned 8 groups:

1. Brown Earth/Brown Forest Soils: These soils have been spotted in parts of Kathua, Udhampur, Doda, Poonch, Rajouri, Anantnag, and Baramulla District. Their water holding capacity exceeds 40%. They belong to groups Haplustalfs, Ochraualfs, Eustrochrepts, Hapludolls, Udorthrents, Cryothrents, and Udifluvents.

2. Degraded or Grey Brown Podzolic Soils: These soils occur in parts of Baderwah, Ramnagar, Poonch, Gulmarg, and Pahalgam and are of loam to clay texture at their surface and clay loam to clay texture at their sub-surface and of fine granular well developed angular block structure. They belong to great groups Hapludalfs, Hapludolls, Eutrochrepts, and Haplumbrepts.

3. Red and Yellow Podzolic Soils: These soils occur in parts of Udhampur, Kathua, Rajouri, and Poonch. They are of coarse texture, Water holding capacity is 40%. They belong to a great group hapludalfs, haplustalfs.

4. Hill or Mountain Forest Soils: These are sandy loam to loamy, fine to weakly granular soils. They occur at lower elevations and have 32-41% water holding capacity. They belong to a great group cryoboralfs and hapludolls.

5. Mountain Meadow Soils: Sandy loam to clay loam fine to coarse granular mountain meadow soils occur in Gulmarg, Pahalgam, Sonamarg, Lolab, Gurez, and Changthang. Water holding capacity of (51-61%) They belong to great groups Cryoboralfs and Argiudolls.

6. Lithosols: Gravelly loam to gravelly silty loam, coarse to weak granular soils. Lithosols occur on steep slopes in the forest hills of 400 to 600 meters above sea level in Jammu, Udhampur, Kathua, Rajouri, and Poonch Districts. They contain 33 to 38% water holding capacity. They belong to a great group Ustorthrents.

7. Saline Alkali Soils: These soils occur in alluvial belt of Jammu (RS Pura/Bishna), Kathua (Ramkol/Challain). They belong to Ustifluvents, Hapluaquents, and Ustorthents great groups.

8. Alluvial Soils: These soils cover the plains of Kathua, Jammu Rajouri, Poonch, Udhampur in Jammu, and the Valleys in Kashmir. They are situated in the flood plains of Ravi, Chenab, and Jhelum and their tributaries. They are old and new alluvial soils. They belong to a great group Ustifluvents and Udifluvents

Based on the Kashmiri Nomenclature

Nambal (Peaty Soils): Near the banks of the Jhelum River and in the vicinity of the Wular, Manasbal, and Anchar lakes is found the rich peaty soil, locally known as Nambal.

Tand (Mountainous Soils): The land on the slopes of mountains, reclaimed from the forests is called Tand soil. After reclamation, the land gives good productivity, but declines by accelerated soil erosion as land loses its natural strength and after many years the land acquires the shape of a pasture and culturable waste.

Zabelzamin (Alkaline Soils): Patches of irrigated land if excessively irrigated lose their fertility and develop alkaline formations. Such adversely affected patches of saline and alkaline formations are known as zabelzamin. These soils are unproductive from the agricultural point of view unless specially treated with gypsum, water, and manures. There are numerous other types of soils recognized by the Kashmiri farmers, such soils are Kharzamin, Tresh, Limb, Ront, Shath, and Tats.

Karewa Soil (Wudur): Karewas are fresh-water (fluvial and lacustrine) deposits found as low flat mounds or elevated plateaus in the Valley of Kashmir and the Kishtwar and Bhadarwah tracts of the Jammu Division. The important Karewas are found in Kulgam, Shopian, Budgam, Qazigund, Tangmarg, Gulmarg, Baramulla, Laithpora, Chandhara, Pampore, Bijbehara, Awantipora, Islamabad (Anantnag), Mattan, Tral and Ganderbal. The Karewa soils are composed of fine, silty clays with sand boulder gravel, the coarse detritus being, as a rule, restricted to the peripheral parts of the valley, while the finer variety prevails towards the central parts.

Clayey Soil (Gurti): This soil is found in the flood plains of Jhelum in the southern parts of Srinagar city and is subjected to annual fresh silt deposition. Gurti soil contains a large proportion of clay. Its water retaining capacity is high.

Loamy Soil (Bahil): This soil is found above the level of the flood plain, on the right bank of Jhelum, and is highly fertile and suitable for paddy cultivation. The humus content is high which enriches the soil fertility.

Sandy Loam (Sekil): It has usually been found in the Sind valley in the northwest of the city. In the Sekil soil, if the field is artificially irrigated, good crops of rice are harvested in the summer season.

Sandy Silt (Dazanlad): This soil is a mixture of sand and clay. A peculiar characteristic of Dazanlad is that the field turns red when irrigation water stands in the fields. This soil is generally found in the low-lying areas in the west of the city and also occurs in the hilly areas in the north (Husain, 2000).

2. HYDROGEOLOGY

The hydrogeological setup in the state is very complicated owing to varied geological settings and groundwater conditions. All three regions of Jammu & Kashmir state represent entirely different groundwater regimes. Based on geology and aquifer characteristics, the area of the state can be divided into two broad hydrogeological units. These are Porous and Fissured formations.

Porous Formation

Porous formations are best suitable for exploration and development. Potential zones are encountered in these formations. Region-wise porous formations are described hereunder: -

Jammu Region

In the Outer Plains of the Jammu Region, extending between River Ravi in the east to Munawar Tawi in the west, the groundwater occurs in piedmont deposits belonging to the upper Pleistocene to the Recent age. The deposits comprise unconsolidated sediments in the form of terraces and coalescent alluvial fans developed by the streams debauching out of Siwalik Hills. The sediments consist of coarse clastic ranging in size from boulder to gravel in the loose clay matrix and occasionally alternating bands of clay of varying thickness. Kankar is also intercalated with these sediments at different intervals and in variable quantities.

These deposits are graded into finer sediments from north to south in that order. Down south it comprises alternate bands of sands of all grades and clay with subordinate pecks of gravel and pebbles.

➤ ***Kandi Formation***

Kandi formation comprises very coarse material with little clay but in the Outer Plain of Jammu & Kashmir State, the typical Kandi formations are not seen. Instead, they comprise boulders, gravels, pebbles, and coarse sand with a substantial amount of clay sometimes hard and sticky of varying thickness. The clay proportion increases towards the southwest. The occurrence of perched water bodies is a common phenomenon in the Kandi belt of Jammu & Kashmir state. Groundwater generally occurs under unconfined conditions in the Kandi formation.

➤ ***Sirowal Formation***

The Kandi formation coalesces into Sirowal formation in the south, finer outwash of Siwalik debris, brought by streams. Groundwater occurs under both confined as well as unconfined conditions in Sirowal formation. A spring line demarcates the contact between Kandi and Sirowal formations because the groundwater oozes out along this line causing marshy conditions. The spring line has undergone deformation due to the decline of water level resulting from the development of groundwater in the Sirowal area. However, the base flow could be seen in streams south of this line, which also in the Sirowal formation is the existence of auto-flow conditions in the deeper aquifer system.

The Dun Belt separates the Siwalik hills from the middle Himalayas and runs as a series of river terraces between Basohli (32°30', 76°49'30") in the east to Riasi (33°05', 74°50') and beyond in the west. The sediments are in the form of isolated Sub-Recent to Recent valley fill deposits ranging in thickness between a few metres to a few tens of metres. These deposits are often dissected as a result of the present-day drainage pattern. The deposits comprise coarse clastics such as boulders, cobbles, pebbles, etc. inter-bedded with lenticular clays.

➤ ***Isolated Valley Fills in Middle Himalayas***

There exist several isolated valleys in the middle Himalayas where groundwater occurs in valley fill deposits comprising lacustrine to fluvio-glacial sediments. A few meter-thick layers of loess overlie these deposits, which is windblown.

Groundwater in such valleys generally occurs under confined conditions. One of the prominent isolated valleys in the middle Himalayas is Kishtwar valley in the Kishtwar district of the Jammu Region.

Kashmir Region

Kashmir valley covers an area of 5600 km and is occupied by Karewas which consist of a huge pile of alternating bands of sand, silt, and clay interspersed by glacial boulder beds. The sands are mostly fine to very fine-grained and they are rarely medium to coarse-grained. There is considerable lateral facies variation like sediments. The aggregate thickness of these sediments is of the order of 2500-3000 m. Groundwater in the Karewas of Kashmir valley occurs under both confined as well as unconfined conditions.

Fissured Formation

About 15000 sq. km. area in Jammu Region is occupied by hilly terrain. It comprises rocks ranging in age from Precambrian (Salkhala series) to Miocene or even Pliocene (Murees and upper-middle Siwaliks). The rock types range from soft or friable sandstones, Clays, Shales, and Conglomerates to hard traps and metamorphics such as quartzite and crystalline limestone. In the Siwalik terrain, where groundwater is tapped, it comes mainly either from the weathered mantle or from the joints or cracks of these rocks. Friable Siwalik sandstones do possess primary porosity but are not very potential.

2.1. BEHAVIOUR OF WATER LEVELS

2.1.1. DEPTH TO WATER LEVEL

The water levels in Groundwater Monitoring Wells of Jammu and Kashmir State were measured four times during the period 2021–2022 (May 2021, August 2021, November 2021, and January 2022). The water levels observed are shown in Annexures – I & II. The groundwater levels in different seasons were analysed to evaluate the temporal behaviour of water levels. The behaviour of water levels during the period May 2021 to January 2022 has been compared with the previous water levels as well as with the average water level for the last decade (decadal behaviour) to

ascertain the changes in the groundwater regime. All the data has been put in the GIS format and the data has been analysed. After analysis, the contours of water levels below the ground surface have been created by joining the areas with the same water levels and the areas have been demarcated with uniform contour intervals. The contouring has been done by Natural Neighbourhood Interpolation method. District-wise categorization of water levels observed during May, August, November 2021, and January 2022 is given in Annexure-I & II

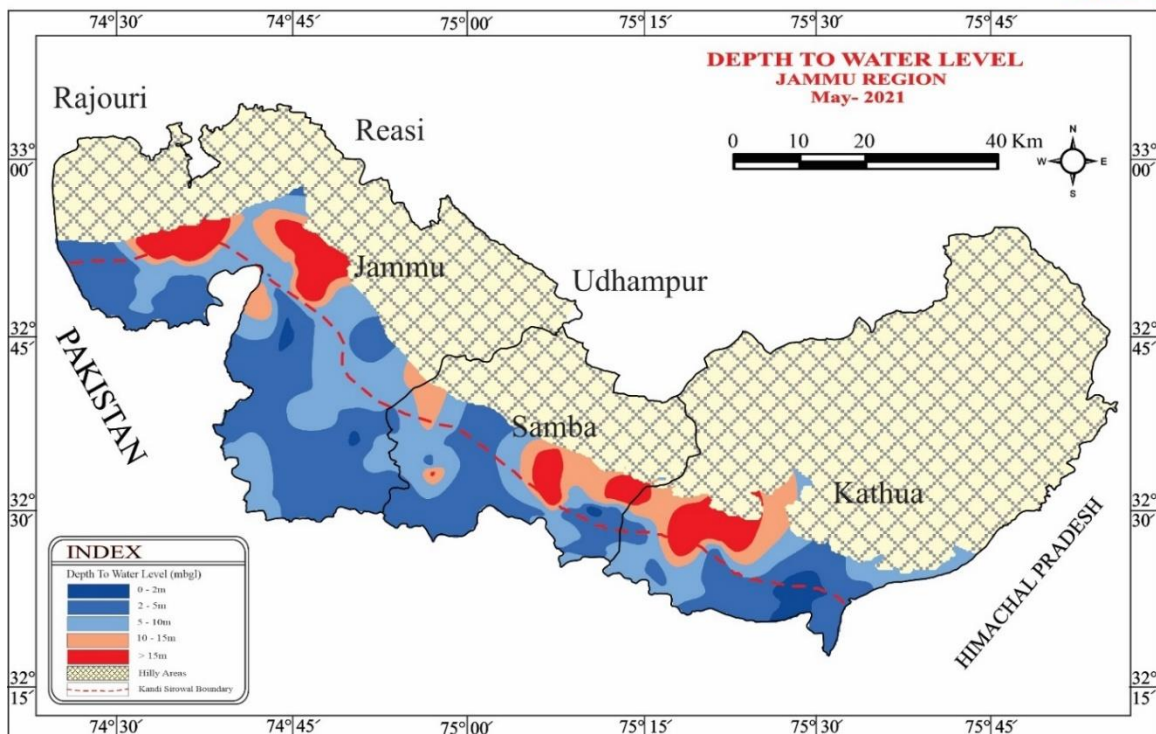
Depth to Water Level -May 2021

Jammu Region: The water level data in respect of 206 wells for May 2021 were analysed. The depth to water level varied from 0.85 m bgl (Sanoora in Samba District) to 35.60 m bgl (Taryai in Jammu district). The categorization of depth to the water level in May 2021 is given in table 3.

18 wells (8.7%) have recorded a water level of less than 2.0 m bgl. About 95 (46.1%) of the total wells analysed have shown depth to water level in the range 2-5 m bgl. Whereas 70 wells (34%) have shown water levels in the range of 5-10 m bgl. 7 (3.4%) wells have registered deeper water levels, in the range of 10-15 m bgl. Another 16 wells (7.8%) of the total wells analysed have shown water levels in the range of >15 m bgl.

Valley areas of Jammu, Samba and Kathua districts below the contact of Kandi Sirowal show water level between 2-5 m bgl except few patches that show water levels between 0-2m bgl. In Sirowal area of Outer Plains, most of the water levels have been recorded between 2 - 10 m bgl except a few small patches that show water levels from 0 to 2 m & above 10 m bgl. In Kandi Belt, the water levels are deeper ranging between 5-15 m bgl and a few patches northern and north western Jammu, central, parts of Samba & north & central parts of Kathua respectively) having water levels more than 15 m bgl (Figure 4).

Figure 4



Kashmir Region: The water level data in respect of 20 wells for the month of May 2021 were analysed. The depth to water level varied from 0.54 m bgl to 15.66 m bgl.

11 wells (55%) have recorded the water level less than 2.0 m bgl. About 25% of the total wells (5 wells) analysed have shown depth to water level in the range 2-5 m bgl. Whereas 3 wells (15%) have shown water levels in the range of 5-10 m bgl. 0 (0%) wells have registered deeper water levels, in the range of 10-15 m bgl. Another 01 well (5%) of the total wells analysed have shown water levels in the range of >15 m bgl

Valley areas of Kashmir Region have shown water levels in all ranges. Major portion has shown within 2m bgl in Kupwara and Baramulla districts. Water levels above 2 but under 5 m have been shown in the northern parts of Baramulla few patches in Kupwara and Srinagar and Pulwama districts. The water level is deeper towards northern and north-eastern parts of Pulwama district (Figure 5).

Figure 5

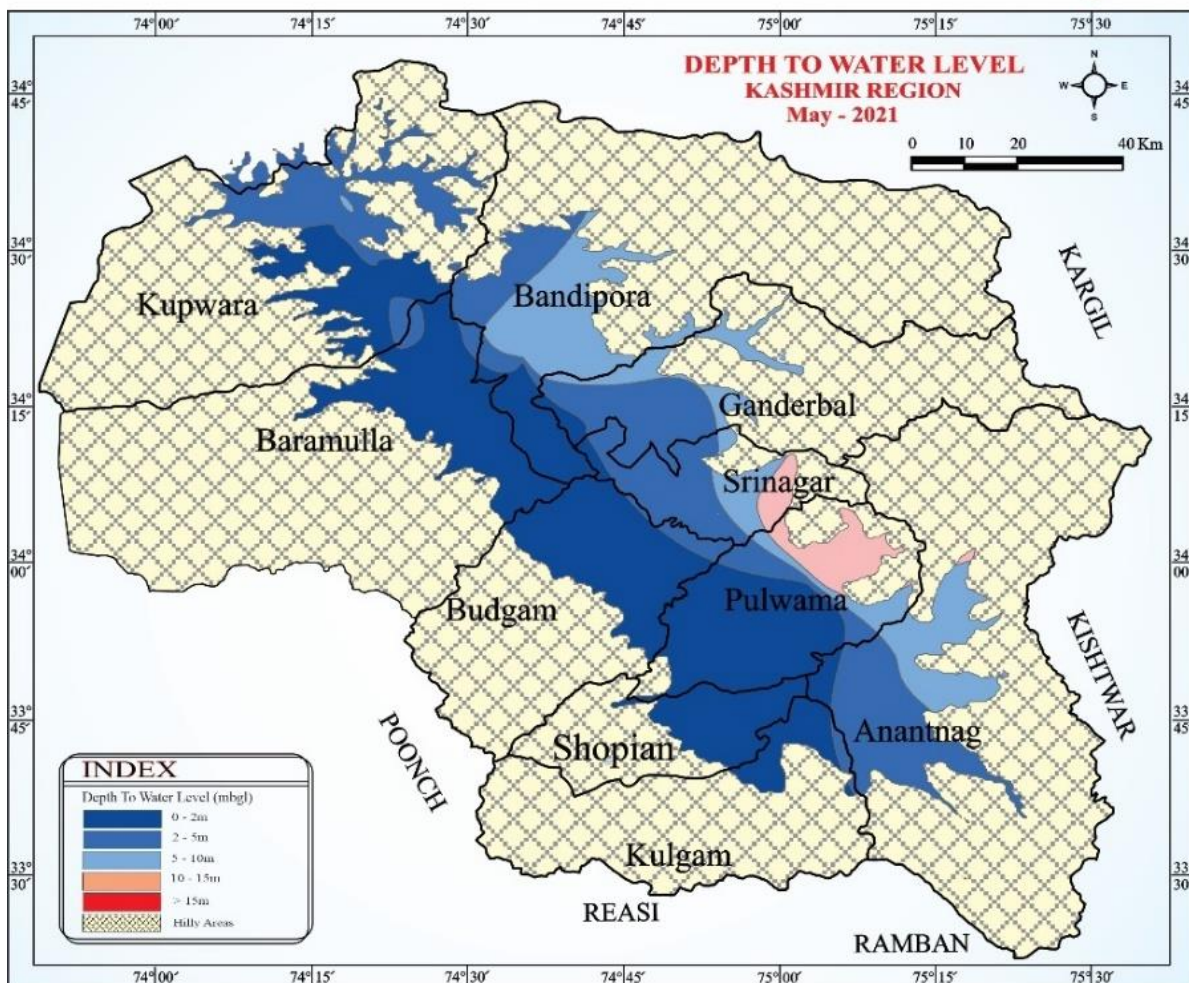


Table 3. CATEGORIZATION OF DEPTH TO WATER LEVEL- MAY 2021

REGION	District	No. Of wells analysed	Depth to Water Level (mbgl)		Number of Wells Showing Depth to Water Level (mbgl) in the Range of					Percentage of Wells Showing Depth to Water Level (mbgl) in the Range of				
			Min	Max	0-2	2-5	5-10	10-15	> 15	0-2	2-5	5-10	10-15	> 15
KASHMIR REGION	Anantnag													
	Baramulla	11	0.54	6.44	9	1	1	0	0	81.8	9.1	9.1	0.0	0.0
	Kupwara	6	1.50	5.18	2	3	1	0	0	33.3	50.0	16.7	0.0	0.0
	Pulwama	2	5.69	15.66	0	0	1	0	1	0.0	0.0	50.0	0.0	50.0
	Srinagar	1			0	1	0	0	0	0.0	100.0	0.0	0.0	0.0
	Total	20	0.54	15.66	11	5	3	0	1	55.0	25.0	15.0	0.0	5.0
JAMMU REGION	Jammu	74	1.40	35.60	2	33	29	3	7	2.7	44.6	39.2	4.1	9.5
	Kathua	32	1.49	19.48	5	11	11	2	3	15.6	34.4	34.4	6.3	9.4
	Rajouri	36	1.20	7.98	7	20	9	0	0	19.4	55.6	25.0	0.0	0.0
	Reasi	8	2.46	26.50	0	6	1	0	1	0.0	75.0	12.5	0.0	12.5
	Samba	32	0.85	26.11	1	13	11	2	5	3.1	40.6	34.4	6.3	15.6
	Udhampur	24	1.20	9.70	3	12	9	0	0	12.5	50.0	37.5	0.0	0.0
	Total	206	0.85	35.60	18	95	70	7	16	8.7	46.1	34.0	3.4	7.8
	Total J&K	226			29	100	73	7	17	12.8	44.2	32.3	3.1	7.5

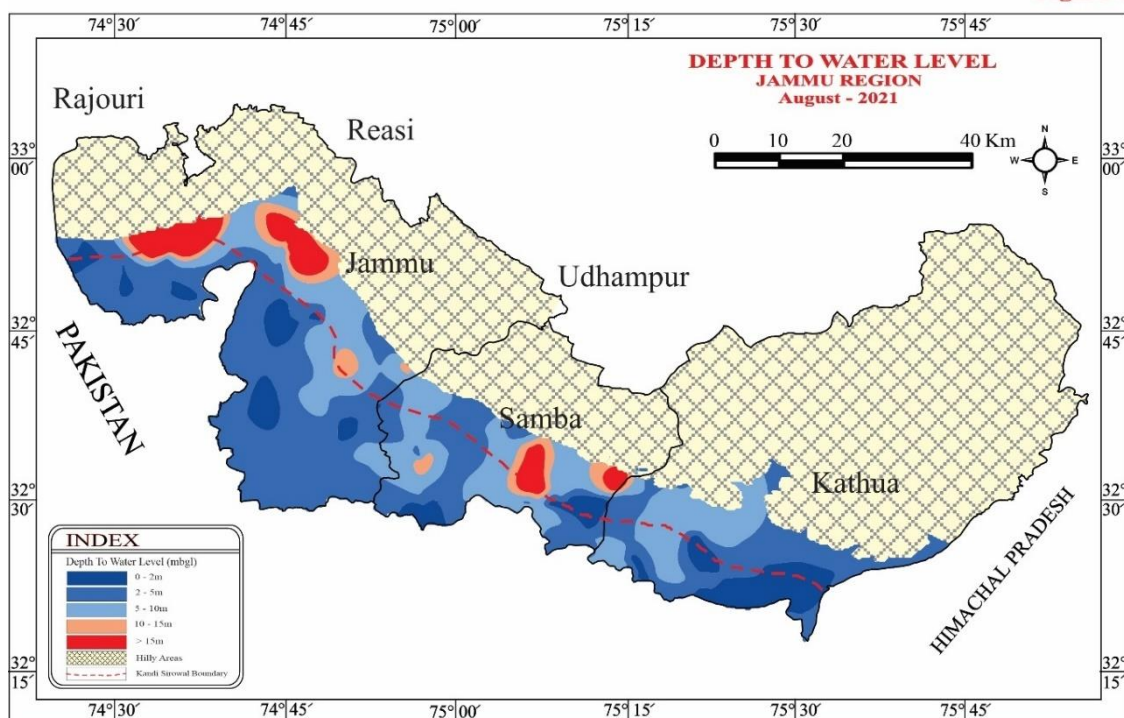
Depth to Water Level -August 2021

Jammu Region: The water level data in respect of 221 wells for the month of August 2021 were analysed. The depth to water levels varied from 0.24 m bgl (in Khanpur Kahua district) to a maximum of 35.10 m bgl (Taryai in Jammu district). Categorization of DTWL is given in table 4.

The water level less than 2 meters below ground level was recorded in 85 wells (38.5%). 88 wells (39.8%), have shown water level in the range of 2 to 5 m bgl, whereas 33 wells (14.9%) have shown water level in the range of 5 to 10 m bgl. 6 wells (2.7%) have shown deeper water levels i.e. in the range of 10 to 15 m bgl. 9 wells (4.1%) have shown very deep-water level of >15 m bgl.

In Sirowal formation, water levels varied between 0 to 5 in major portion and 5-10 m bgl at a few places. The transition part of Sirowal belt and Kandi belt of both Jammu and Kathua Districts shows varied water levels. Water levels deeper than 15m bgl were observed in the extreme north-western portion of Jammu district in Kandi belt and middle and N-Eastern areas in Samba district (Figure 6).

Figure 6



Kashmir Region: The water level data in respect of 47 wells for the month of May 2021 were analysed. The depth to water level varied from 0.64 m bgl to 15 m bgl.

13 wells (27.7%) have recorded the water level less than 2.0 m bgl. About 59.6% of the total wells (28 wells) analysed have shown depth to water level in the range 2-5 m bgl. Whereas 4 wells (8.5%) have shown water levels in the range of 5-10 m bgl. 01 well (2.1%) wells have registered deeper water levels, in the range of 10-15 m bgl. Another 1 well (2.1%) of the total wells analysed have shown water levels in the range of >15 m bgl.

Valley areas of Kashmir Region have shown water levels in all ranges. Major portion has shown within 2m bgl. In Kupwara and Baramulla districts water levels above 2 but under 5 m have been shown in the northern parts of Baramulla few patches in Kupwara and Srinagar and Pulwama districts. The water level is deeper towards northern and north-eastern parts of Pulwama district (figure 7).

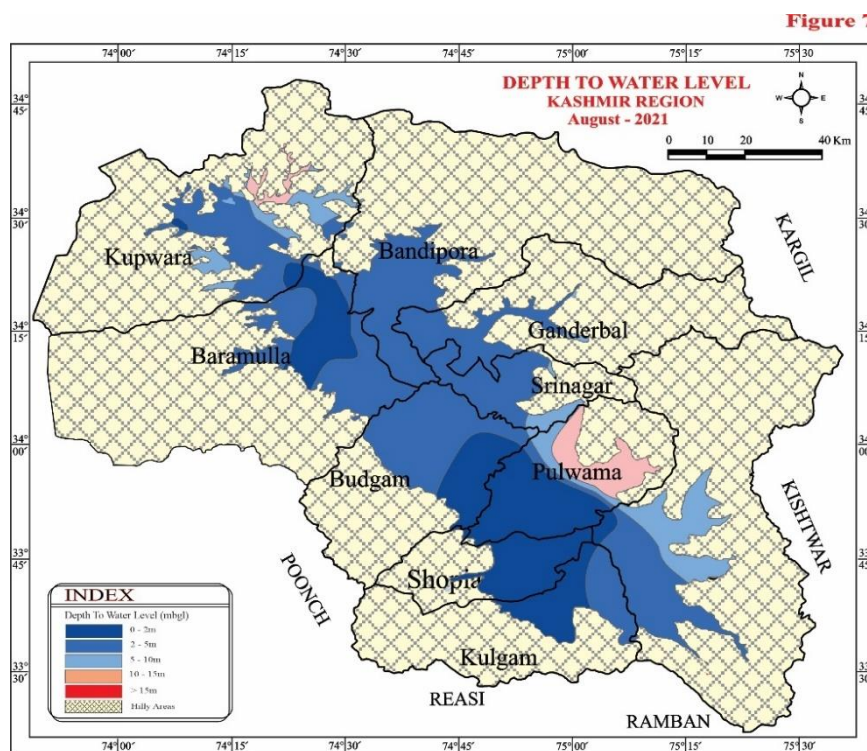


Table 4. CATEGORIZATION OF DEPTH TO WATER LEVEL- AUGUST 2021

REGION	District	No. Of wells Analysed	Depth to Water Level (mbgl)		Number of Wells Showing Depth to Water Level (mbgl) in the Range of					Percentage of Wells Showing Depth to Water Level (mbgl) in the Range of				
			Min	Max	0-2	2-5	5-10	10-15	> 15	0-2	2-5	5-10	10-15	> 15
KASHMIR REGION	Anantnag													
	Baramulla	19	0.64	4.48	10	9	0	0	0	52.6	47.4	0.0	0.0	0.0
	Kupwara	24	1.47	11.5	2	18	3	1	0	8.3	75.0	12.5	4.2	0.0
	Pulwama	3	0.95	15.00	1	0	1	0	1	33.3	0.0	33.3	0.0	33.3
	Srinagar	1			0	1	0	0	0	0.0	100.0	0.0	0.0	0.0
	Total	47	0.64	15.00	13	28	4	1	1	27.7	59.6	8.5	2.1	2.1
JAMMU REGION	Jammu	81	0.40	35.10	19	40	12	5	5	23.5	49.4	14.8	6.2	6.2
	Kathua	36	0.24	9.54	16	12	8	0	0	44.4	33.3	22.2	0.0	0.0
	Rajouri	38	0.60	4.68	20	18	0	0	0	52.6	47.4	0.0	0.0	0.0
	Reasi	8	0.77	25.30	5	1	1	0	1	62.5	12.5	12.5	0.0	12.5
	Samba	35	0.50	21.35	10	10	11	1	3	28.6	28.6	31.4	2.9	8.6
	Udhampur	23	0.25	7.10	15	7	1	0	0	65.2	30.4	4.3	0.0	0.0
	Total	221	0.24	35.10	85	88	33	6	9	38.5	39.8	14.9	2.7	4.1
	TOTAL J&K	268			98	116	37	7	10	36.6	43.3	13.8	2.6	3.7

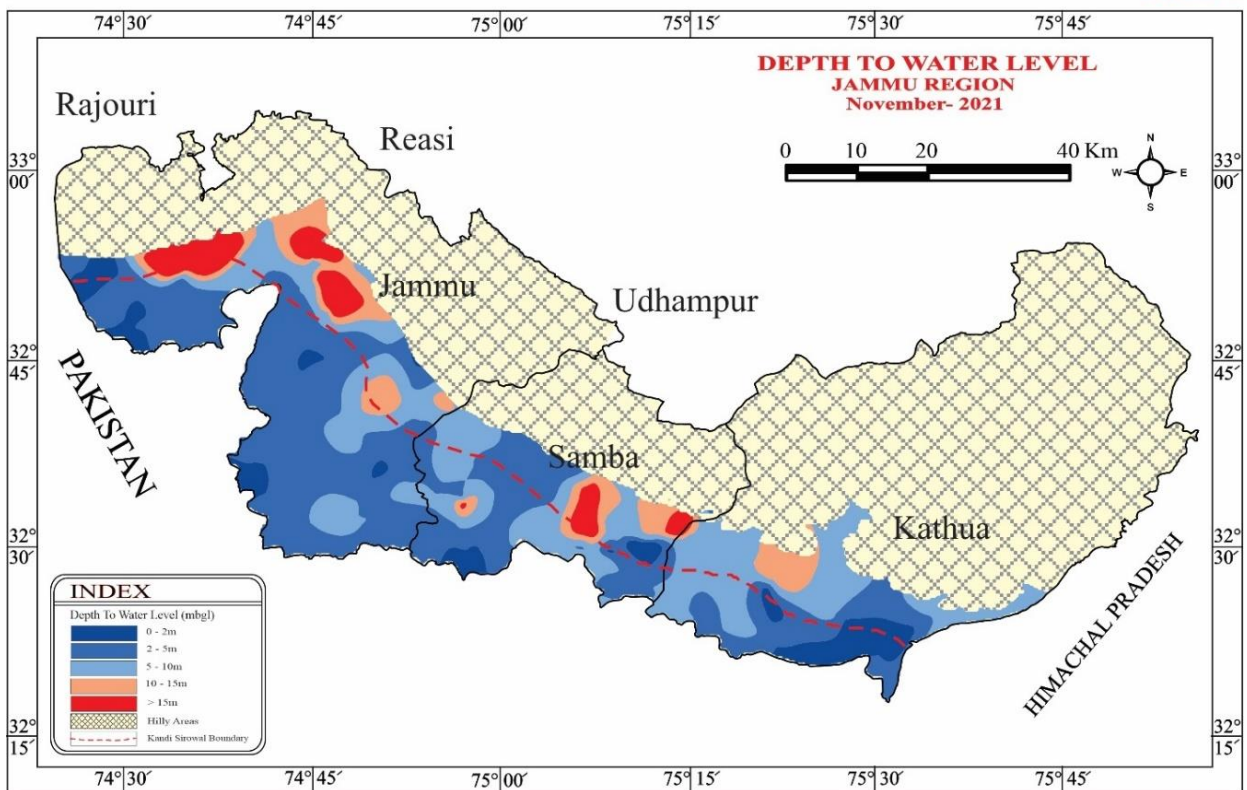
Depth to Water Level -November 2021

Jammu Region: The water level data in respect of 225 wells for the month of November 2021 were analysed. The depth to water level ranges from 0.32 m bgl (Kotka Swal Jammu district) to 31.80 m bgl (Taryai in Jammu district). Categorization of DTWL Nov. 2021 is given in table 5.

A total of 81 numbers of wells (36%) have recorded the water level less than 2.0 m bgl. Majority of the wells (85 wells, 37.8% of the total wells) analysed have shown depth to water level in the range of 2-5 m bgl. Whereas 42 wells (18.7%) have shown water levels in the range of 5-10 m bgl. 7 (3.1%) wells have registered deeper water levels, in the range of 10-15 m bgl. Another 10 wells (4.4%) of the total wells analysed have shown water levels in the range of >15 m bgl.

In Sirowal formation of Jammu, Samba and Kathua, water levels varied between 0 to 5 in major parts and 0-2 m bgl at a few parts. Major part of Sirowal belt in all the three districts shows water levels between 2 and 5 m bgl and water levels in the range of 0-2 m & 5 – 10 m bgl have been observed at a few patches. In Kandi belt, the water levels generally found are within the range of 5 - 15 mbgl. Water levels deeper than 15m bgl were observed in the extreme north & north-western portion of Jammu district in Kandi belt and central & eastern parts in Samba district (Figure 8).

Figure 8



REGION	District	No. Of wells Analysed	Depth to Water Level (mbgl)		Number of Wells Showing Depth to Water Level (mbgl) in the Range of					Percentage of Wells Showing Depth to Water Level (mbgl) in the Range of				
			Min	Max	0-2	2-5	5-10	10-15	> 15	0-2	2-5	5-10	10-15	> 15
JAMMU REGION	Jammu	82	0.32	31.80	17	41	15	4	5	20.7	50.0	18.3	4.9	6.1
	Kathua	38	0.41	14.04	12	9	16	1	0	31.6	23.7	42.1	2.6	0.0
	Rajauri	35	0.50	5.40	23	11	1	0	0	65.7	31.4	2.9	0.0	0.0
	Reasi	8	0.85	25.05	5	1	1	0	1	62.5	12.5	12.5	0.0	12.5
	Samba	38	0.91	23.40	8	17	7	2	4	21.1	44.7	18.4	5.3	10.5
	Udhampur	24	0.45	7.45	16	6	2	0	0	66.7	25.0	8.3	0.0	0.0
	Total		225	0.32	31.80	81	85	42	7	10	36.0	37.8	18.7	3.1

Depth to Water Level -January 2022

Jammu Region: The water level data in respect of 219 wells for the month of January 2022 were analysed. The depth to water levels varied from 0.11 at Dalsar Udhampur District to 35.50 m bgl in Taryai Jammu District. Categorization of depth to water level January 2022 is given in table 6.

A total of 77 wells (35.2% of the total wells analysed) have recorded the water level less than 2.0 m bgl. 83 wells (37.9%) have shown depth to water level in the range 2-5 m bgl, whereas 39 wells (17.8%) wells have shown water levels in the range of 5-10 m bgl, 8 (3.7%) wells have shown the deeper water levels i.e. 10-15 m bgl and 12 (5.5%) wells have shown water level > 15 m bgl.

In entire Sirowal area, the water levels varied between 2 to 5 m bgl with few small patches of 0-2 and 5-10 m. Besides, small portions of all the three districts recorded water level in the range of 5 to 10 mbgl. The Kandi belt shows deeper water levels between 5 to 15 m bgl. of all the three districts, the deeper water levels deeper i.e. more than 15 m bgl were also observed in north & north western part of Jammu, central & north eastern parts of samba and northern parts of Kathua districts (Figure 9).

Figure 9

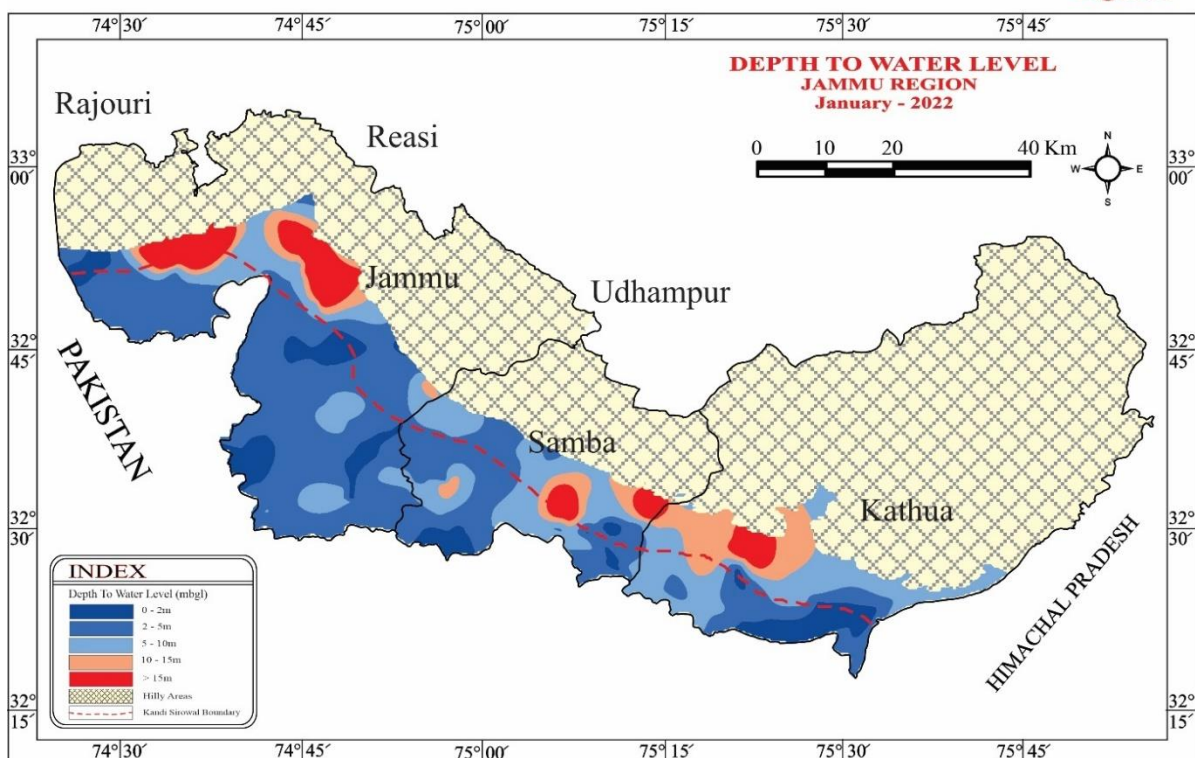


Table 6. CATEGORIZATION OF DEPTH TO WATER LEVEL- JANUARY 2022

REGION	District	No. Of wells Analysed	Depth to Water Level (mbgl)		Number of Wells Showing Depth to Water Level (mbgl) in the Range of					Percentage of Wells Showing Depth to Water Level (mbgl) in the Range of				
			Min	Max	0-2	2-5	5-10	10-15	> 15	0-2	2-5	5-10	10-15	> 15
JAMMU REGION	Jammu	81	0.19	35.50	20	35	15	3	8	24.7	43.2	18.5	3.7	9.9
	Kathua	36	0.69	18.62	10	12	10	3	1	27.8	33.3	27.8	8.3	2.8
	Rajouri	35	0.19	5.50	17	16	2	0	0	48.6	45.7	5.7	0.0	0.0
	Reasi	8	1.63	24.88	2	4	1	0	1	25.0	50.0	12.5	0.0	12.5
	Samba	36	0.18	24.33	9	14	9	2	2	25.0	38.9	25.0	5.6	5.6
	Udhampur	23	0.11	8.06	19	2	2	0	0	82.6	8.7	8.7	0.0	0.0
	Total		219	0.11	35.50	77	83	39	8	12	35.2	37.9	17.8	3.7

2.2. SEASONAL FLUCTUATION OF WATER LEVEL

November 2021 with respect to May 2021

Jammu Region: The seasonal water level fluctuation between November 2021 & May 2021 in respect of 199 National Hydrograph Stations are analysed. It is observed that 184 stations have shown rise in water level where as only 15 stations have shown fall in water levels in the range of 0-2 m, 2-4 m and >4 m. The minimum rise 0.01 m is shown at Pangdour Samba district and maximum rise of 11.90 m is shown at Chapki Kalan Kathua district. Whereas minimum decline of 0.02 m is recorded at Pansar Kathua district and maximum of 2.18 m is shown at Khairi Raipur in Jammu district. Categorization of fluctuations in water levels is given in Table 7.

Out of 184 stations showing rise in water levels, 101 wells (50.8%) have shown rise less than 2 m. 57 wells (28.6%) and 2 wells (13.1%) have shown rise in the range of 2-4 m and >4 m respectively. 14 wells (7%) have shown decline between 0-2 m and 1 well (0.5%) have shown fall between 2-4 and 0 wells (0%) have shown decline of >4 m.

Effect of rainfall is directly reflected in all parts of the area monitored during November 2021. Almost all the valley areas are showing rise in the water levels except for small patches in all districts. A few locations of each district have registered fall within 0-5 m bgl (Figure 10).

Figure 10

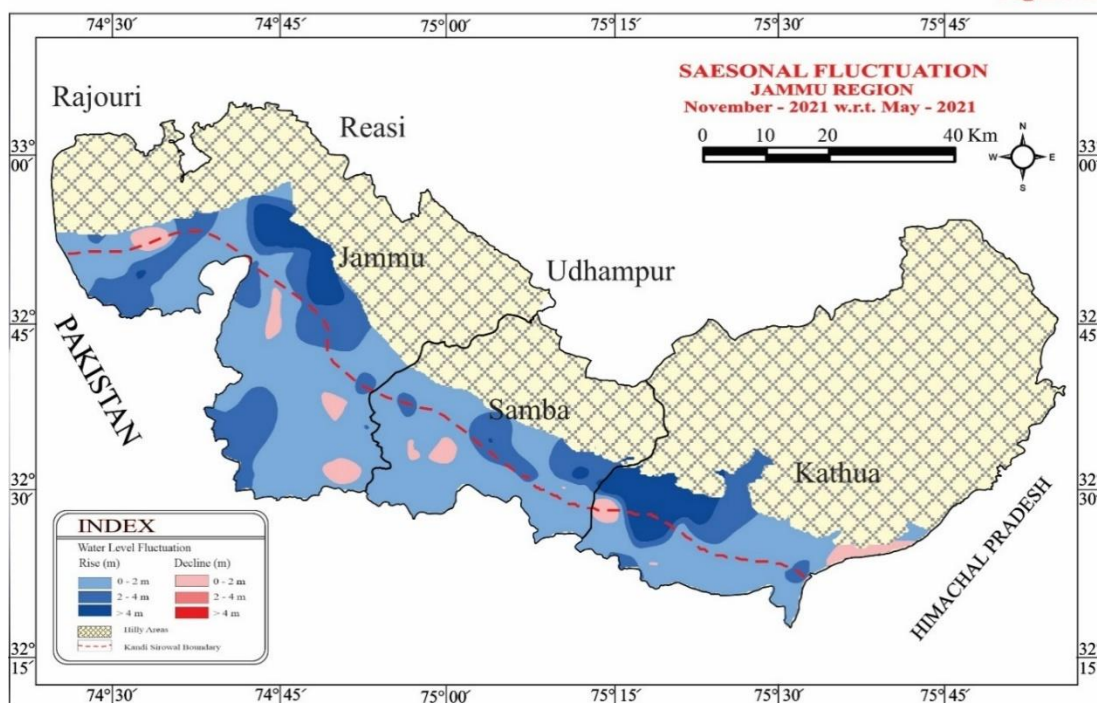


Table 7. CATEGORIZATION OF CHANGES IN WATER LEVEL BETWEEN MAY 2021-NOVEMBER 21 - JAMMU DIVISION

District	No. Of wells Analysed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation (m)						Percentage of wells Showing Fluctuation						Total No. Of Wells	
		Rise		Fall		Rise			Fall			Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4		
Jammu	69	0.04	10.80	0.11	2.18	31	22	10	5	1	0	44.9	31.9	14.5	7.2	1.4	0.0	63	6
Kathua	32	0	11.9	0.02	1.59	20	4	5	3	0	0	62.5	12.5	15.6	9.4	0.0	0.0	29	3
Rajouri	34	0.06	4.00		0.20	18	14	1	1	0	0	52.9	41.2	2.9	2.9	0.0	0.0	33	1
Reasi	8	0.91	4.10		0.20	3	3	1	1	0	0	37.5	37.5	12.5	12.5	0.0	0.0	7	1
Samba	32	0.01	5.97	0.06	0.28	19	5	4	4	0	0	59.4	15.6	12.5	12.5	0.0	0.0	28	4
Udhampur	24	0.46	6.71			10	9	5	0	0	0	41.7	37.5	20.8	0.0	0.0	0.0	24	0
TOTAL	199	0.01	11.90	0.02	2.18	101	57	26	14	1	0	50.8	28.6	13.1	7.0	0.5	0.0	184	15

2.3. ANNUAL FLUCTUATION OF WATER LEVEL

May 2021 with respect to May 2020

Jammu Region: The water level data in respect of 180 National Hydrograph Stations for the month of May 2021 was analysed. It was compared with May 2020. Majority of the wells have shown rise in water levels. A total of 32 wells have shown rise and 148 wells have shown fall in water levels in the range of 0-2 m, 2-4 m and >4 m. The minimum rise 0.01 m is shown at Khukhial Kathua district and maximum rise of 4.10 m is shown at Bhagwal Kathua district. Whereas minimum decline of 0.03 m is recorded at Mandli Kathua district and maximum of 5.31 m is shown at Badsoo in Jammu district. Categorization of fluctuations in water levels is given in table 8.

Rise is shown by 27 wells (15%) in the range of 0-2 m. 4 wells (2.2%) have registered rise from 2-4 m bgl and 1 wells (0.6%) are showing rise of >4 m. Among 104 wells showing fall, 35 wells (57.8%) have shown fall in water level in the range of 0-2 m, 9 wells (19.4%) have shown fall between 2-4 m, and 1 (5%) well have shown fall of >4 m.

All the districts have shown rise in water levels where as a significant portion have shown decline in water level. All the districts have registered rise in water levels at few locations, but decline in water levels in the range of 0-2 m is observed in sufficient portions in all the districts. Major parts of Jammu district, entire Samba and most of Kathua districts shown decline. South Jammu, north west of Kathua shows >4m decline in water levels (Figure 11).

Figure 11

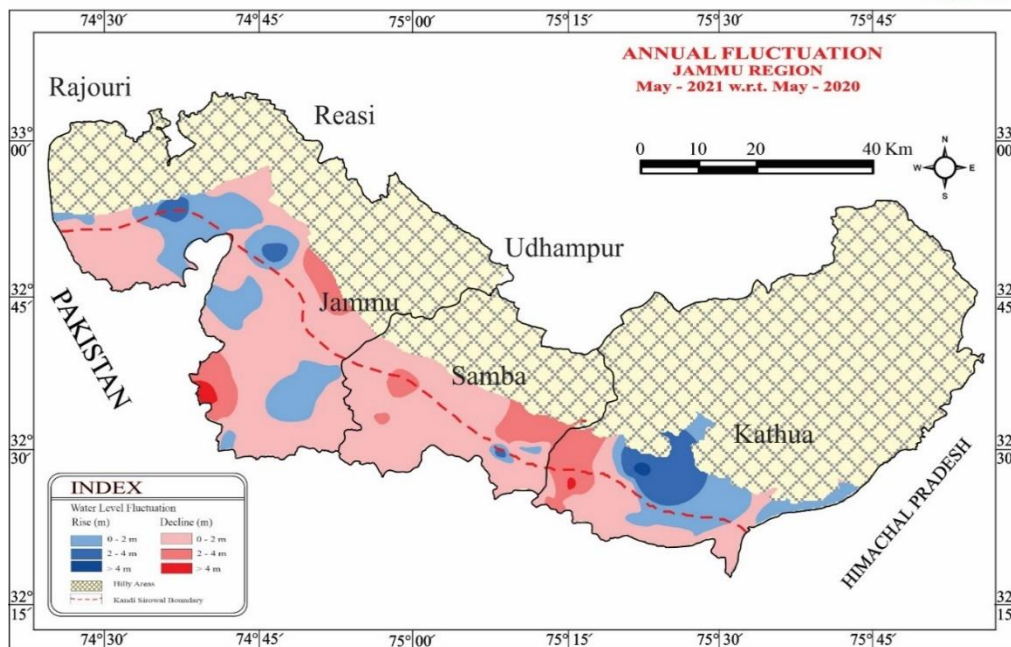


Table 8. CATEGORIZATION OF CHANGES IN WATER LEVEL BETWEEN MAY 2020 AND MAY 21

District	No. Of wells Analysed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation (m)						Percentage of wells Showing Fluctuation						Total No. Of Wells	
		Rise		Fall		Rise			Fall			Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4		
Jammu	63	0.08	2.90	0.18	5.31	16	2	0	36	5	4	25.4	3.2	0.0	57.1	7.9	6.3	18	45
Kathua	27	0.01	4.10	0.03	4.17	4	1	1	15	5	1	14.8	3.7	3.7	55.6	18.5	3.7	6	21
Rajouri	31		0.08	0.24	4.90	2	0	0	23	5	1	6.5	0.0	0.0	74.2	16.1	3.2	2	29
Reasi	7		1.24	0.08	2.94	1	0	0	4	2	0	14.3	0.0	0.0	57.1	28.6	0.0	1	6
Samba	32	0.09	3.52	0.07	4.67	2	1	0	18	9	2	6.3	3.1	0.0	56.3	28.1	6.3	3	29
Udhampur	20	0.07	0.25	0.40	4.63	2	0	0	8	9	1	10.0	0.0	0.0	40.0	45.0	5.0	2	18
Total	180	0.01	4.10	0.03	5.31	27	4	1	104	35	9	15.0	2.2	0.6	57.8	19.4	5.0	32	148

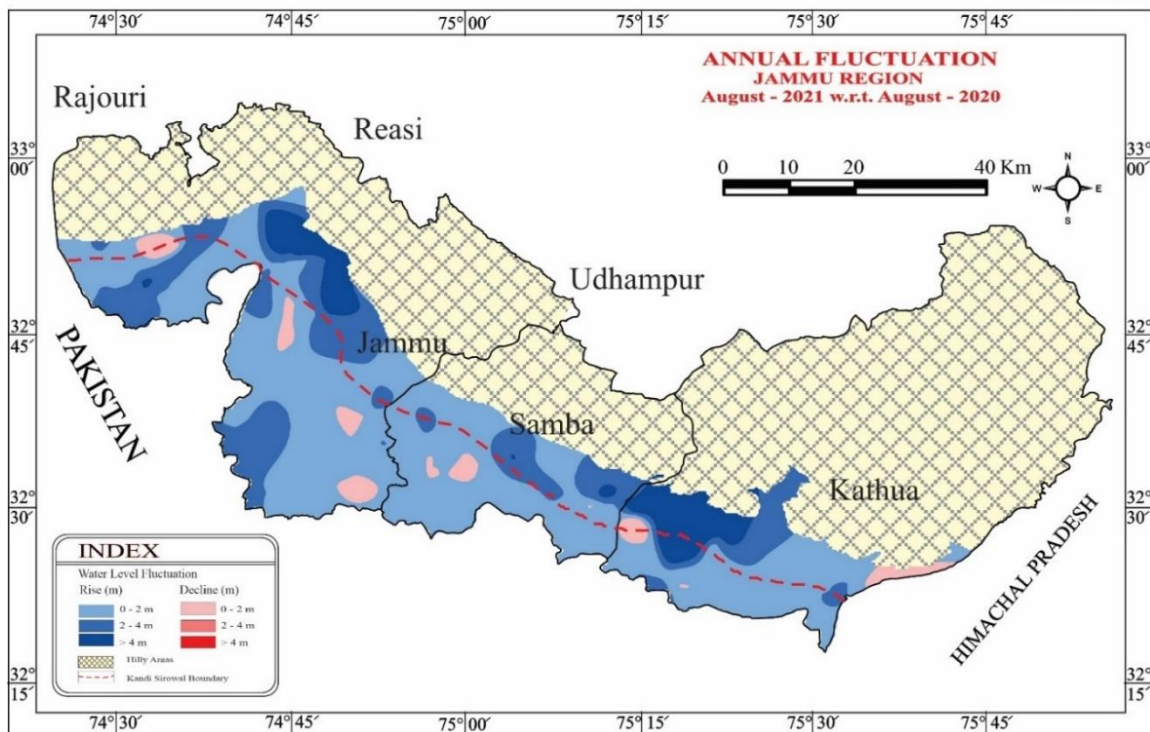
August 2021 with respect to August 2020

Jammu Region: For analysing the annual fluctuation, the water level data in respect of 204 National Hydrograph Network Stations for the month of August 2021 were analysed and compared with the water levels of August 2020. The minimum rise 0.02 m is shown at Bishnah Jammu district and maximum rise of 6.68 m is shown at Kangar Jammu district. Whereas minimum decline of 0.02 m is recorded at Kachrial and Thangrot in Jammu & Rajouri district respectively and maximum of 5.95 m is shown at Nilcha Samba district. Categorization of fluctuations in water levels is given in table 9.

A total of 51 wells have shown rise and 153 wells have shown fall in water levels. Rise is shown by 47 wells (23%) in the range of 0-2 m, 2 wells (1%) in the range of 2-4 m bgl and 2 wells (1%) have registered rise of >4 m. Among 153 wells showing decline, a total of 132 wells (64.7%) have registered fall in the range of 0-2 m, 19 well (9.3%) have shown fall between 2-4 m and 2 wells (1%) have shown fall of >4 m.

Jammu Region is showing rise in water levels in all districts. The decline in the range of 0 – 2 m has been observed in minor portions in each district. Major portions of all the districts have shown rise in water levels. The Kandi areas show rise of >4 m in major portions, (Figure 12).

Figure 12



District	No. Of wells Analysed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation (m)						Percentage of wells Showing Fluctuation						Total No. Of Wells	
		Rise		Fall		Rise			Fall			Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4		
Jammu	78	0.02	6.68	0.02	2.98	15	1	1	55	6	0	19.2	1.3	1.3	70.5	7.7	0.0	17	61
Kathua	33	0.07	1.17	0.11	4.80	12	0	0	15	5	1	36.4	0.0	0.0	45.5	15.2	3.0	12	21
Rajouri	33	0.07	1.40	0.08	2.83	8	0	0	23	2	0	24.2	0.0	0.0	69.7	6.1	0.0	8	25
Reasi	4		5.87	0.02	3.16	0	0	1	2	1	0	0.0	0.0	###	50.0	25.0	0.0	1	3
Samba	33	0.03	1.94	0.09	5.95	8	0	0	20	4	1	0.0	0.0	0.0	60.6	12.1	3.0	8	25
Udhampur	23	0.03	2.33	0.10	2.71	4	1	0	17	1	0	17.4	4.3	0.0	73.9	4.3	0.0	5	18
Total	204	0.02	6.68	0.02	5.95	47	2	2	132	19	2	23.0	1.0	1.0	64.7	9.3	1.0	51	153

November 2021 with respect to November 2020

Jammu Region: The water level data, in respect of 210 National Hydrograph Stations for the month of November 2021 was analysed. It was compared with those monitored during November 2020. Majority of the wells have shown rise in water levels. A total of 125 wells have shown rise and 84 wells have shown fall in water levels. The minimum rise 0.03 m is shown at Jhiri Jammu district and maximum rise of 8.82 m is shown at Akhnoor Batera Jammu district. Whereas minimum decline of 0.02 m is recorded at Chhani Mansar and Salabra Samba & Udhampur district respectively and maximum of 5.86 m is shown at Khairi Raipur in Jammu district. Categorization of fluctuations in water levels is given in table 10.

Rise is shown by 106 wells (50.5%) in the range of 0-2 m. 17 wells (8.1%) have recorded rise in the range of 2-4 m bgl and only 2 well (1%) has shown rise of >4 m. Among 84 wells showing fall, 79 wells (37.6%) have shown fall in the range of 0-2 m. 4 wells (1.9%) have shown fall between 2-4 m, and 1 (0.5%) well have shown fall of >4 m.

Major parts of all the districts have shown decline in water levels in the range of 0-2 m and some pockets have shown rise in water level above 2 mbgl in Jammu & Kathua district. Major parts of each district have shown decline in 0-2m with few exceptions in northern and Jammu & north-eastern Samba district (Figure 13).

Figure 13

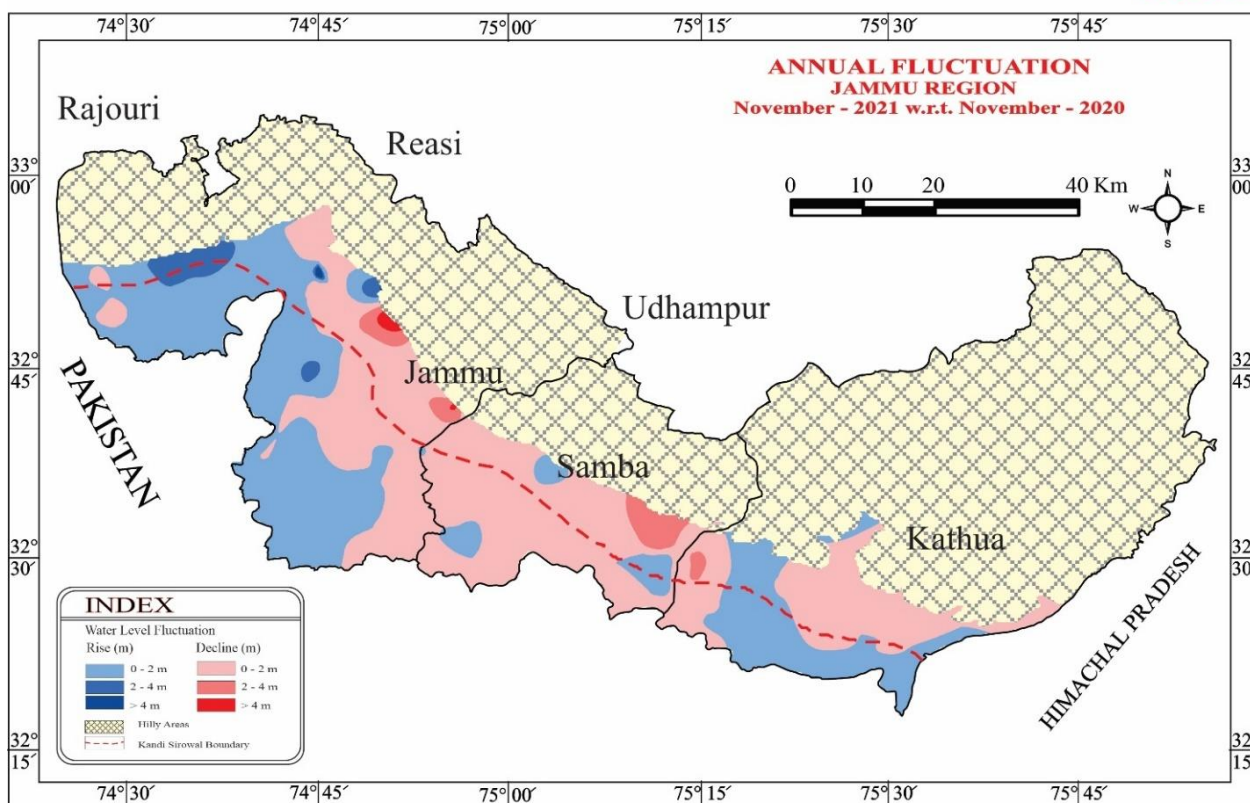


Table 10. CATEGORIZATION OF CHANGES IN WATER LEVEL BETWEEN NOVEMBER 2020 AND NOVEMBER 21

District	No. Of wells Analysed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation (m)						Percentage of wells Showing Fluctuation					Total No. Of Wells		
		Rise		Fall		Rise			Fall			Rise			Fall		Rise	Fall	
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4			>4
Jammu	76	0.03	8.82	0.04	5.86	40	5	2	27	0	1	52.6	6.6	2.6	35.5	0.0	1.3	47	28
Kathua	32	0.08	1.63	0.17	2.22	17	0	0	13	2	0	53.1	0.0	0.0	40.6	6.3	0.0	17	15
Rajouri	33	0.05	2.71	0.12	1.30	21	6	0	6	0	0	63.6	18.2	0.0	18.2	0.0	0.0	27	6
Reasi	8	0.25	2.90		0.05	6	1	0	1	0	0	75.0	12.5	0.0	12.5	0.0	0.0	7	1
Samba	37	0.04	0.84	0.02	3.51	9	0	0	26	2	0	24.3	0.0	0.0	70.3	5.4	0.0	9	28
Udhampur	24	0.07	3.86	0.02	1.02	13	5	0	6	0	0	54.2	20.8	0.0	25.0	0.0	0.0	18	6
Total	210	0.03	8.82	0.02	5.86	106	17	2	79	4	1	50.5	8.1	1.0	37.6	1.9	0.5	125	84

January 2022 with respect to January 2021

Jammu Region: The water level data, in respect of 211 National Hydrograph Stations for the month of January 2022 was analysed. It was compared with those monitored during January 2021. Majority of the wells have shown rise in water levels. A total of 113 wells have shown rise and 98 wells have shown fall in water levels. The minimum rise 0.01 m is shown at Nagri, Maheen Chakaran, Talpad in Kathua, Samba & Udhampur districts respectively and maximum rise of 6.72 m is shown at Birpur Samba district. Whereas minimum decline of 0.01 m is recorded at Kotka Swal, Lakhri, Gudwal in Jammu, Kathua & Samba district respectively and maximum of 4.34 m is shown at Lam Rajouri in Rajouri district. Categorization of fluctuations in water levels is given in table 11.

Rise is shown by 90 wells (42.7%) in the range of 0-2 m. 7 wells (3.3%) have recorded rise in the range of 2-4 m bgl and 1 well (0.5%) have shown rise of >4 m. Among 113 wells showing fall, 93

wells (44.1%) have shown fall in the range of 0-2 m, 19 wells (9%) have shown fall between 2-4m, and 1 well (0.5%) has shown fall of >4 m.

In Jammu district, decline in water levels in the range of 0-2 m has been observed equally in entire areas except few portions. Some pockets have shown rise in water level of 2 m in all districts. Small pockets have shown decline above 4m in central Samba and northern Jammu (Fig. 14)

Figure 14

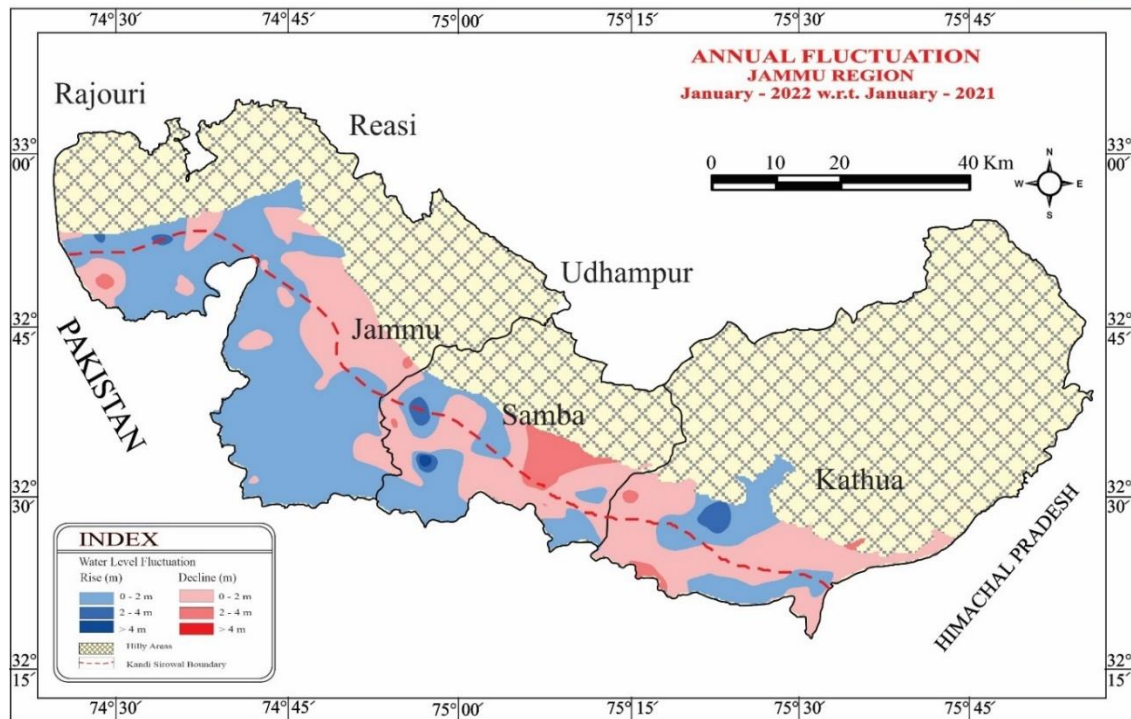


Table 11. CATEGORIZATION OF CHANGES IN WATER LEVEL BETWEEN JANUARY 2021 AND JANUARY 22

District	No. Of wells Analysed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation (m)						Percentage of wells Showing Fluctuation						Total No. Of Wells	
		Rise		Fall		Rise			Fall			Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4		
Jammu	75	0.04	2.32	0.01	2.53	47	2	0	23	3	0	62.7	2.7	0.0	30.7	4.0	0.0	49	26
Kathua	36	0.01	2.88	0.01	3.00	13	3	0	17	3	0	36.1	8.3	0.0	47.2	8.3	0.0	16	20
Rajouri	34	0.11	1.68	0.10	4.34	5	0	0	23	5	1	14.7	0.0	0.0	67.6	14.7	2.9	5	29
Reasi	8		0.12	0.35	2.36	1	0	0	6	1	0	12.5	0.0	0.0	75.0	12.5	0.0	1	7
Samba	35	0.01	6.72	0.01	4.00	8	1	1	19	6	0	22.9	2.9	2.9	54.3	17.1	0.0	10	25
Udhampur	23	0.01	5.42	5.00	2.42	16	1	0	5	1	0	69.6	4.3	0.0	21.7	4.3	0.0	17	6
Total	211	0.01	6.72	0.01	4.34	90	7	1	93	19	1	42.7	3.3	0.5	44.1	9.0	0.5	98	113

2.4. DECADAL FLUCTUATION OF WATER LEVEL

May 2021 with respect to mean of May 2011 – May 2020

The water level fluctuation for the month of May 2021 Vs. (Mean of May 2011 – May 2020) has been worked out in respect of 189 observation wells. It is observed that a total of 50 wells have shown rise and 139 wells have shown decline in water level (especially in Kandi areas of Outer plains). The minimum rise 0.03 m is shown at Dulme Chak Samba district and maximum rise of 5.97 m is shown at Bhagwanachak Jammu district. Whereas minimum decline of 0.02 m is recorded at Madun Samba district and maximum of 6.95 m is shown at Kangar Jammu district. Categorisation of fluctuations in water level is given in table 12.

Out of 50 number of wells showing rise, 46 wells (24.3%) have shown rise less than 2 m, 2 wells (1.1%) have shown rise from 2-4 m and 2 (1.1%) wells have shown rise of > 4 m. Out of 139 wells showing fall, 106 wells (56.1%) have shown fall in the range of 0-2 m, 29 wells (15.3%) have shown fall between 2-4 m and 4 wells (2.1%) have shown fall of >4 m.

All of the areas have shown rise as well as decline in water levels in all ranges in Jammu Region. In Jammu district, the decline in range of 0-5m was found in entire area except north western and some southern patches. In Samba major areas have shown decline except few portions, and in Kathua district major area is in rising trend except in the eastern and western portions rise in all ranges was recorded. (Figure 15).

Figure 15

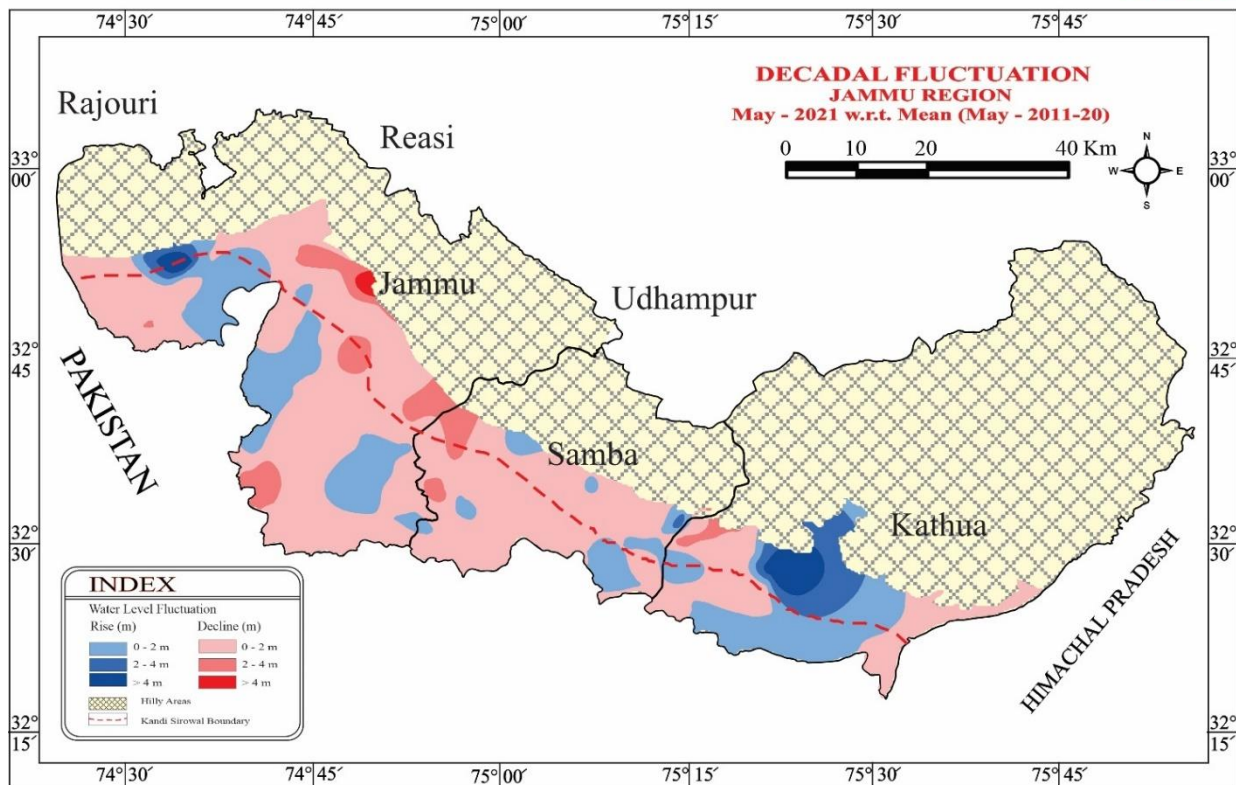


Table 12. CATEGORISATION OF CHANGES IN WATER LEVEL BETWEEN MAY 2021 TO DECADAL MEAN (MAY 2011-MAY 2020)

District	No. Of wells Analysed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation (m)						Percentage of wells Showing Fluctuation						Total No. of Wells	
		Rise		Fall		Rise			Fall			Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4		
Jammu	68	0.09	5.97	0.04	6.95	16	0	1	36	11	4	23.5	0.0	1.5	52.9	16.2	5.9	17	51
Kathua	26	0.14	4.96	0.26	2.69	13	0	1	11	1	0	50.0	0.0	3.8	42.3	3.8	0.0	14	12
Rajouri	34	0.16	2.16	0.11	3.00	9	1	0	20	4	0	26.5	2.9	0.0	58.8	11.8	0.0	10	24
Reasi	8			0.07	2.75	0	0	0	6	2	0	0.0	0.0	0.0	75.0	25.0	0.0	0	8
Samba	32	0.03	2.62	0.02	3.79	7	1	0	20	4	0	21.9	3.1	0.0	62.5	12.5	0.0	8	24
Udhamapur	21		0.03	0.11	3.41	1	0	0	13	7	0	4.8	0.0	0.0	61.9	33.3	0.0	1	20
TOTAL	189	0.03	5.97	0.02	6.95	46	2	2	106	29	4	24.3	1.1	1.1	56.1	15.3	2.1	50	139

August 2021 with respect to mean of August 2011– August 2020

The water level fluctuation for the month of August 2021 Vs. (Mean of Aug. 2011 – Aug.2020 has been worked out in respect of 207 wells. It is observed that a total of 58 wells have shown rise and 149 wells have shown decline in water level. The minimum rise 0.01 m is shown at Bagnoti Rajouri

district and maximum rise of 1.69 m is shown at Chan Khatrian Kathua district. Whereas minimum decline of 0.01 m is recorded at Marchola and Battal Baliyan in Rajouri & Udhampur districts respectively and maximum of 5.67 m is shown at Khairi Raipur Jammu district. Categorisation of fluctuations in water level is given in table 13.

Out of 58 number of wells showing rise, 58 wells (28%) have shown rise less than 2 m, 0 wells (0%) have shown rise from 2-4 m whereas 0 well (0%) shown rise of > 4 m. Out of 149 wells showing fall, 127 wells (61.4%) have shown fall in the range of 0-2 m, 20 well (9.7%) has shown fall between 2-4 m and 2 wells (1%) has shown fall of >4 m bgl.

Almost entire Jammu and Samba districts have shown decline with few exceptions, where as in Kathua rise and decline is equally observed. Decline of above 2mbgl is shown in Jammu in Kandi formation. In Samba district western areas show decline in central and western parts. In Kathua district middle portions show rise whereas eastern and western show rise in 0-2m bgl. (Figure 16).

Figure 16

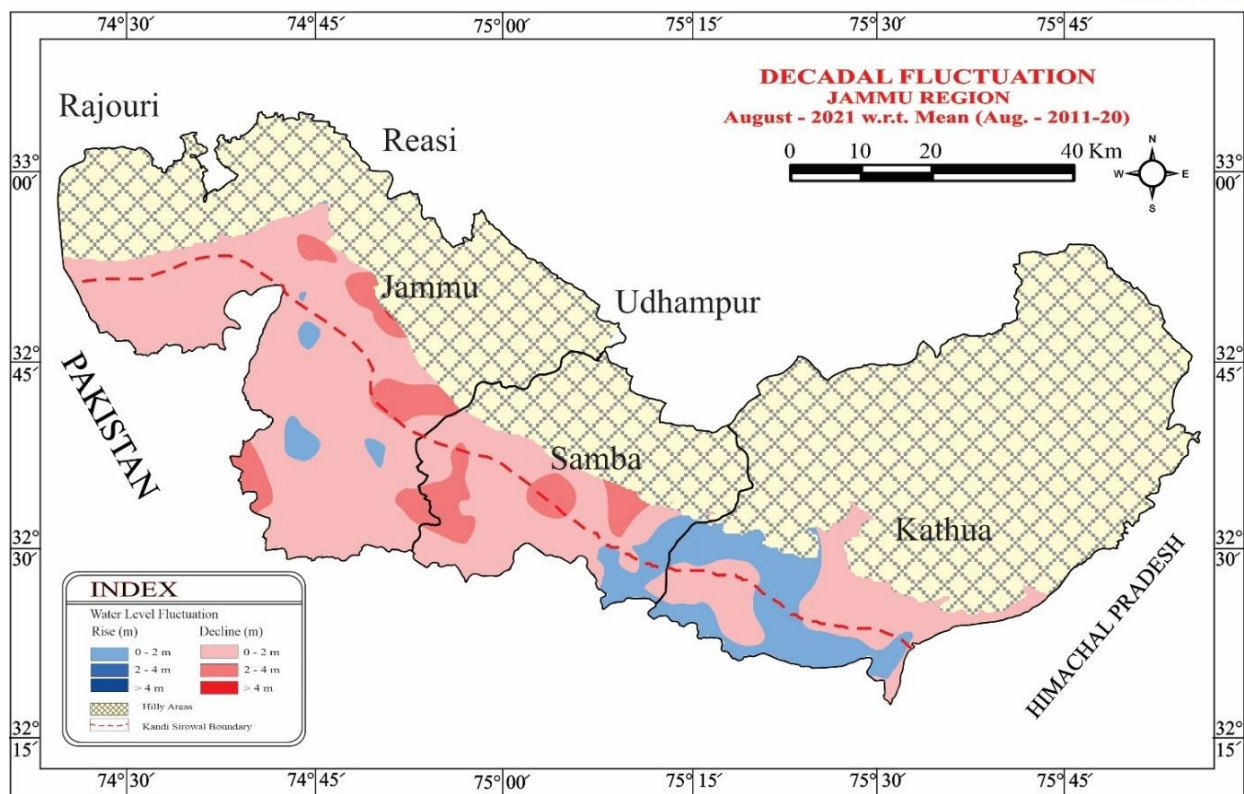


Table 13. CATEGORISATION OF CHANGES IN WATER LEVEL BETWEEN AUGUST 2021 TO DECADAL MEAN (AUGUST 2011-AUGUST 2020)

District	No. Of wells Analysed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation (m)						Percentage of wells Showing Fluctuation						Total No. of Wells	
		Rise		Fall		Rise			Fall			Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4		
Jammu	75	0.04	0.36	0.05	5.67	11	0	0	54	8	2	14.7	0.0	0.0	72.0	10.7	2.7	11	64
Kathua	31	0.28	1.69	0.11	3.41	16	0	0	13	2	0	51.6	0.0	0.0	41.9	6.5	0.0	16	15
Rajouri	35	0.01	1.51	0.01	1.54	13	0	0	22	0	0	37.1	0.0	0.0	62.9	0.0	0.0	13	22
Reasi	8	0.06	0.42	0.06	2.45	3	0	0	4	1	0	37.5	0.0	0.0	50.0	12.5	0.0	3	5
Samba	35	0.04	0.96	0.07	3.72	8	0	0	19	8	0	22.9	0.0	0.0	54.3	22.9	0.0	8	27
Udhampur	23	0.04	0.48	0.01	2.22	7	0	0	15	1	0	30.4	0.0	0.0	65.2	4.3	0.0	7	16
TOTAL	207	0.01	1.69	0.01	5.67	58	0	0	127	20	2	28.0	0.0	0.0	61.4	9.7	1.0	58	149

November 2021 with respect to mean of November 2011 – November 2020

The water level fluctuation for the month of November 2021 w.r.t. (mean of November 2011 to November 2020) has been worked out in respect of 205 observation wells. It is observed that a total of 121 wells have shown rise and 84 wells have shown decline in water levels. The minimum rise 0.01 m is shown at Hamirpur Sidhar Jammu district and maximum rise of 6.82 m is shown at Akhnoor Batera Jammu district. Whereas minimum decline of 0.03 m is recorded at Garhi Udhampur district and maximum of 7.60 m is shown at Khairi Raipur Jammu district. Categorisation of fluctuations in water level is given in table 14.

Out of 121 number of wells showing rise, 104 wells (50.7%) are showing rise less than 2 m, 17 well (8.3%) have shown rise from 2-4 m and 0 wells (0%) have shown rise of more than 4 m. Out of 84 wells, which are showing fall, 77 wells (37.6%) have shown fall in water levels in the range of 0-2 m, 5 wells (2.4%) have shown fall between 2-4 m and 2 wells (1%) have shown fall of >4 m.

Decline in water levels was observed in all the districts of Jammu Region. A few areas have shown rise in water levels above 0-2m in all districts. Western areas of Jammu district, northern and south eastern Samba and southern areas of Kathua districts have shown rise in water levels. Small portions in Jammu show decline above 4 m. (Figure 17).

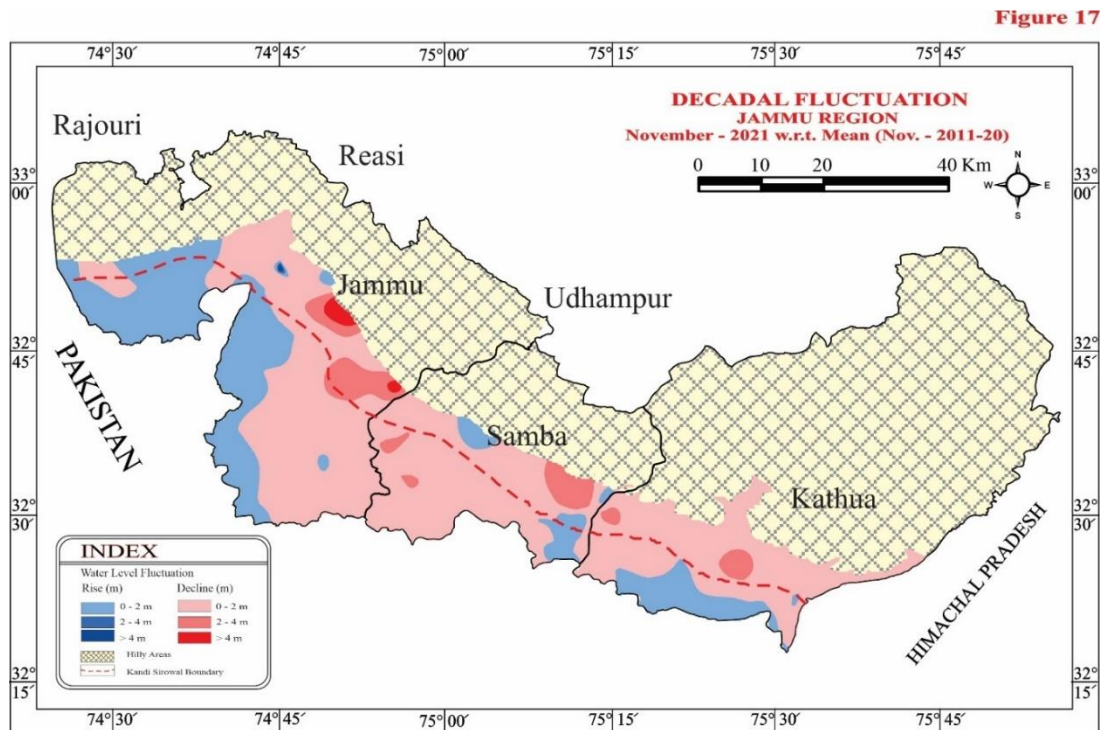


Table 14. CATEGORISATION OF CHANGES IN WATER LEVEL BETWEEN NOVEMBER 2021 TO DECADAL MEAN (NOVEMBER 2011-NOVEMBER 2020)

District	No. Of wells Analysed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation (m)						Percentage of wells Showing Fluctuation						Total No. of Wells	
		Rise		Fall		Rise			Fall			Rise			Fall			Rise	Fall
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4		
Jammu	76	0.01	6.82	0.05	7.60	37	1	0	35	1	2	48.7	1.3	0.0	46.1	1.3	2.6	38	38
Kathua	29	0.03	0.73	0.06	2.61	14	13	0	2	0	0	48.3	44.8	0.0	6.9	0.0	0.0	27	2
Rajouri	33	0.02	3.52	0.07	0.76	22	2	0	9	0	0	66.7	6.1	0.0	27.3	0.0	0.0	24	9
Reasi	8	0.10	1.61		0.67	7	0	0	1	0	0	87.5	0.0	0.0	12.5	0.0	0.0	7	1
Samba	36	0.04	0.78	0.06	3.65	9	0	0	23	4	0	25.0	0.0	0.0	63.9	11.1	0.0	9	27
Udhampur	23	0.05	3.03	0.03	1.35	15	1	0	7	0	0	65.2	4.3	0.0	30.4	0.0	0.0	16	7
TOTAL	205	0.01	6.82	0.03	7.60	104	17	0	77	5	2	50.7	8.3	0.0	37.6	2.4	1.0	121	84

January 2022 with respect to mean of January 2012 – January 2021

The water level fluctuation for the month of January 2022 w.r.t. (mean of January 2012 to January 2021) has been worked out in respect of 193 observation wells. It is observed that a total of 101 wells have shown rise and 92 wells have shown decline in water levels. The minimum rise 0.01 m is shown at Sei Khurd, Garhi in Jammu & Udhampur districts respectively and maximum rise of 3.82 m is shown at Jakhar Udhampur district. Whereas minimum decline of 0.01 m is recorded at Muthi, Bareri in Jammu & Rajouri districts respectively and maximum of 4.11 m is shown at Kangar Jammu district. Categorisation of fluctuations in water level is given in table 15.

Out of 101 number of wells showing rise, 90 wells (46.6%) have shown rise less than 2 m, 11 wells (5.7%) have shown rise from 2-4 m and 0 well (0 %) have shown rise of more than 4 m. Out of 92 wells showing fall in water levels, 82 wells (42.5%) have shown fall in the range of 0-2 m, 9 wells (4.7%) have shown fall between 2-4 m and 1 well (0.5%) has shown fall of >4 m. In Jammu Region, decline as well as rise is in water levels is observed in all the districts of Jammu Region. Decline is shown in northern and eastern Jammu areas, almost entire Samba, and central and entire northern Kathua district. (Figure 18)

Figure 18

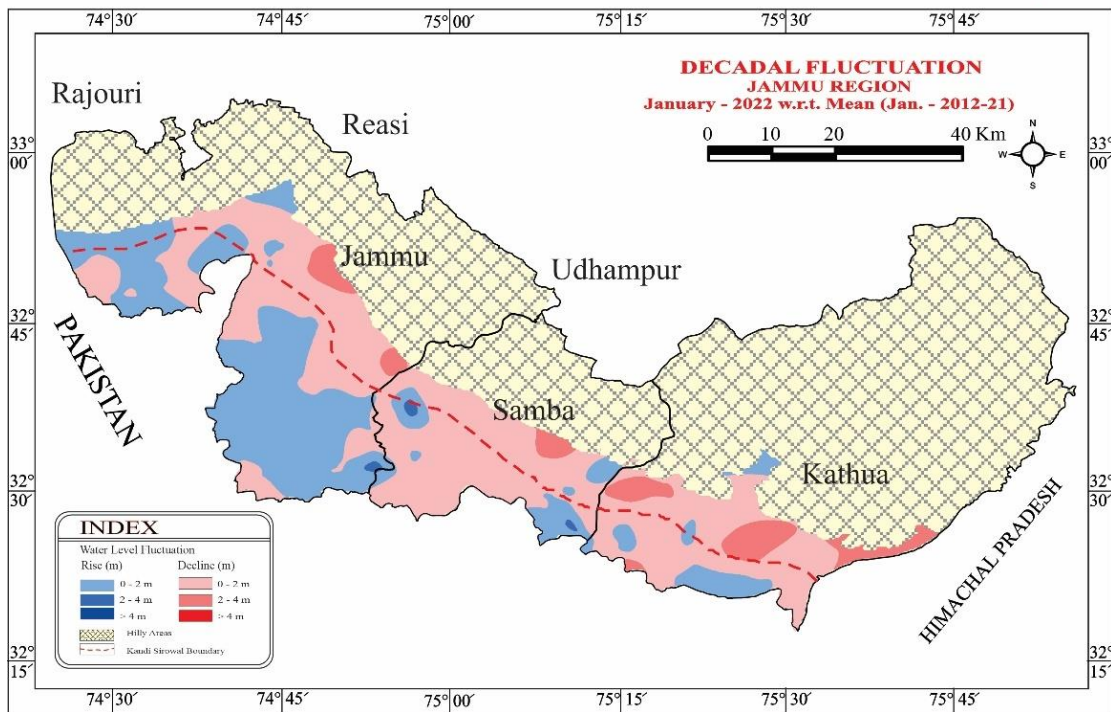


Table 15. CATEGORISATION OF CHANGES IN WATER LEVEL BETWEEN JANUARY 2022 TO DECADAL MEAN (JANUARY 2012-JANUARY 2021)

District	No. Of wells Analysed	Range of Fluctuation (m)				No. of Wells Showing Fluctuation (m)						Percentage of wells Showing Fluctuation					Total No. of Wells		
		Rise		Fall		Rise			Fall			Rise			Fall		Rise	Fall	
		Min	Max	Min	Max	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4	>4	0-2	2-4			>4
Jammu	73	0.01	2.72	0.01	4.11	38	2	0	30	2	1	52.1	2.7	0.0	41.1	2.7	1.4	40	33
Kathua	30	0.04	2.60	0.03	3.09	12	2	0	10	6	0	40.0	6.7	0.0	33.3	20.0	0.0	14	16
Rajouri	30	0.02	2.20	0.01	1.62	12	4	0	14	0	0	40.0	13.3	0.0	46.7	0.0	0.0	16	14
Reasi	8	0.06	1.85	0.09	0.79	4	0	0	4	0	0	50.0	0.0	0.0	50.0	0.0	0.0	4	4
Samba	32	0.09	2.52	0.09	2.87	7	2	0	22	1	0	21.9	6.3	0.0	68.8	3.1	0.0	9	23
Udhampur	20	0.01	3.82	0.18	1.10	17	1	0	2	0	0	85.0	5.0	0.0	10.0	0.0	0.0	18	2
TOTAL	193	0.01	3.82	0.01	4.11	90	11	0	82	9	1	46.6	5.7	0.0	42.5	4.7	0.5	101	92

3. HYDROCHEMISTRY

The availability of fresh water is 3% for domestic usages such as human consumption, irrigation, and other activities are required. With the rapid increase in population, urbanization, industrialization, and erratic behaviour of rains the demand for fresh water is increasing but the availability of water is decreasing. 71 percent of the Earth's surface is water-covered. The Oceans hold about 96.5 percent of all Earth's water. Water also exists in the air in the form of water vapor, in rivers, lakes, springs, glaciers, in the ground as soil moisture, and in aquifers. As reported 96.5 percent of the earth's water is found in the ocean, this water is very much saline and its composition contains a lot of chemical compounds which are not suitable for human use.

Thus, to meet the requirement of fresh water, the dependency on groundwater is increasing in comparison to surface water because during the summer season most of the surface water bodies become dry, while groundwater is easily accessible throughout the year. Thus, the common source of water usage in human life is groundwater. "The water present in aquifers below the surface is known as groundwater". Groundwater is considered to be the largest freshwater resource and is considered to be safe for drinking purposes among all water resources.

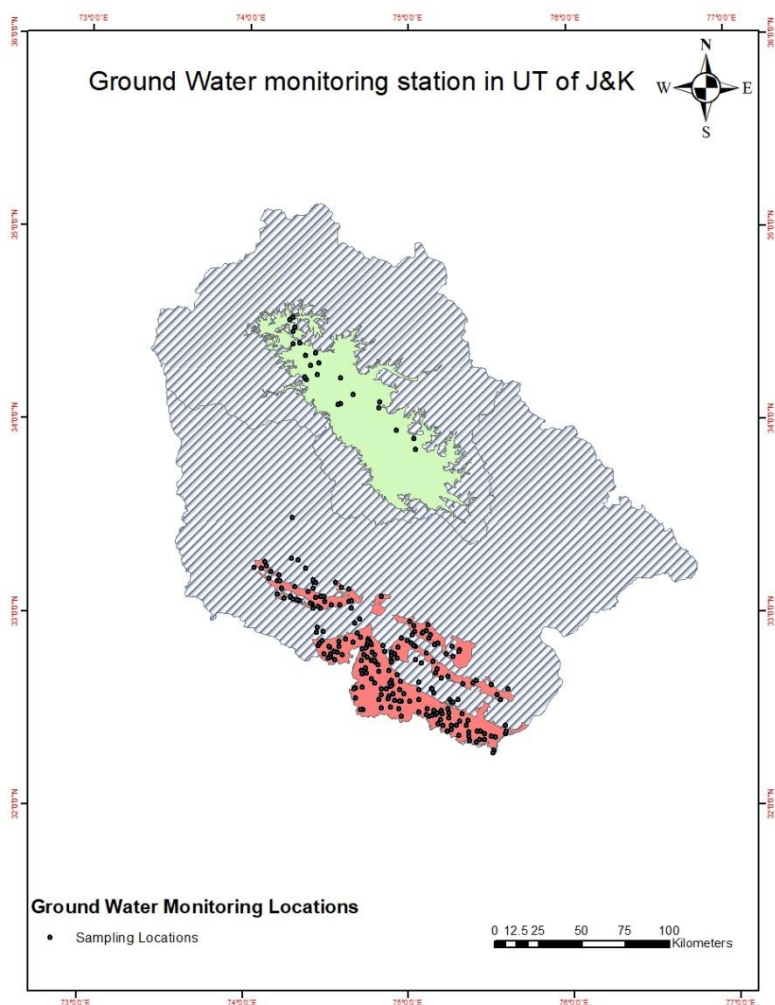
The groundwater quality is determined through physical, chemical, and biological parameters to determine its suitability for the intended use. The quality of groundwater depends on the nature of rocks, contact time, circulation, and temperature. Analysing the different parameters of groundwater helps in finding its suitability and also helps in taking effective remedial measures for its improvement.

In most UT of J&K, groundwater is a major resource for drinking, irrigation, and industrial applications, especially in areas where surface water is inadequate or unavailable. Central Groundwater Board, North Western Himalayan Region (CGWB, NWHR) Jammu annually monitors the groundwater quality through dedicated Groundwater Monitoring Stations consisting of dug wells, tube wells, or hand pumps of shallow depth to check the chemical quality of groundwater acknowledging its importance in the life of common people.

3.1. Sampling and Analysis

The chemical quality of groundwater in the Union Territory (UT) of Jammu & Kashmir has been evaluated based on 1000 water samples (250 for Basic, 250 for Uranium, 250 for Arsenic, and 250 for Heavy metals) collected from shallow aquifers during pre-monsoon season in the month of May-June, 2021. the details of sampling location is given in figure 19. All the collected samples were analysed by adopting standard methods of analysis from APHA. Chemical analysis data of groundwater samples collected during NHS May 2021 monitoring in Jammu & Kashmir UT is given in Annexure – III

Figure 19. Sampling Locations of GW monitoring stations in J&K



3.2. Groundwater Quality Characterization of J&K

Electrical Conductivity (EC)

The Electrical Conductivity (EC) of groundwater is the representation of concentration of various chemical constituents present in it. The EC values determine the suitability of groundwater for drinking, irrigation and industrial purpose. In most part of Jammu & Kashmir UT the value is generally low. Majority of samples (66.8%) are found to have specific conductance less than 750 $\mu\text{S}/\text{cm}$ at 25°C (Table 16) suggesting that the groundwater is fresh and potable. 33.2% samples have specific conductance between 750-3000 $\mu\text{S}/\text{cm}$ at 25°C. In Jammu & Kashmir, specific conductance varies between 204 and 1953 $\mu\text{S}/\text{cm}$ at 25°C. More than 3000 $\mu\text{S}/\text{cm}$ is not observed in any sample location.

pH Distribution:

In Jammu & Kashmir UT, groundwater is neutral to alkaline in nature. Most of the samples collected from shallow groundwater of Jammu & Kashmir are alkaline in nature. The pH values range between 6.15 to 9.04. 37.6% samples are dominated with carbonate type in nature.

Figure 20. EC Distribution in J&K

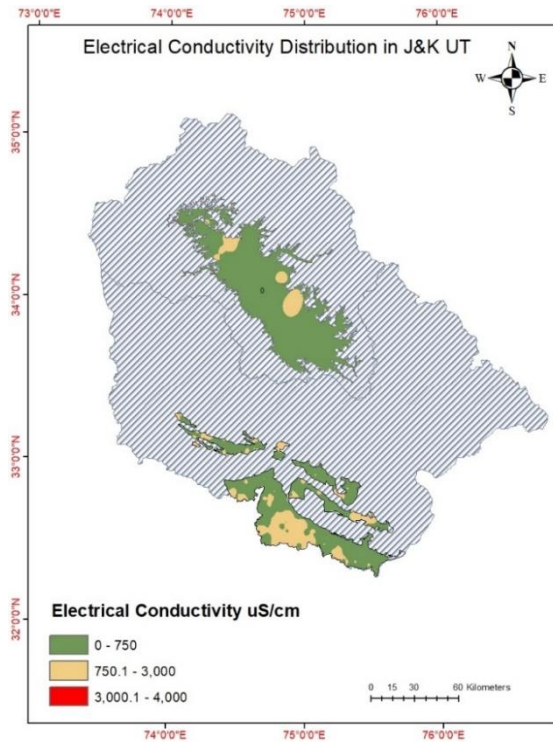
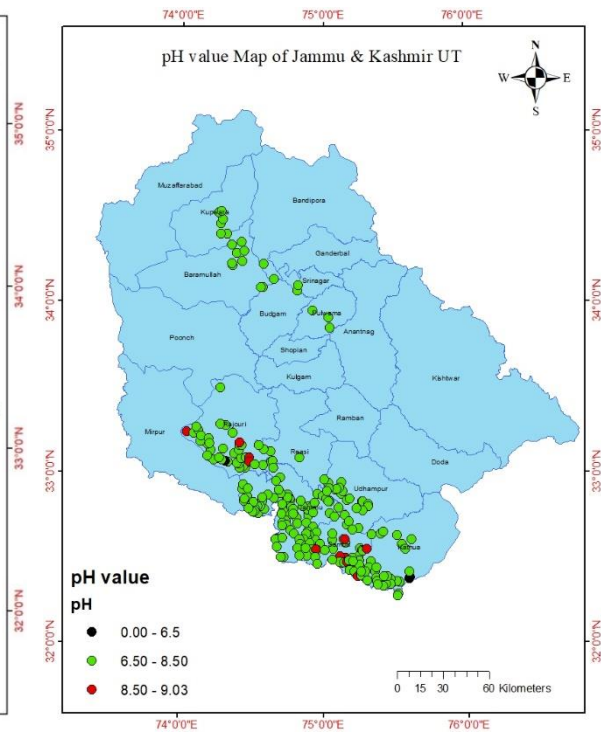


Figure 21. pH Distribution in J&K



Chloride

Chloride is present at mostly at low concentrations. It is highly soluble in water and moves freely with water through soil and rock. The chloride content of groundwater generally follows the Electrical conductivity pattern. The Chloride concentration varies from 5.4 to 216.8 mg/l. The concentrations in all the wells are within the maximum permissible limit 1000 mg/l as prescribed by Bureau of Indian Standards (BIS) for drinking water purpose. In all the samples (100%) chloride concentration are less than 250. The highest value is found in Gho Brahmna which is 216.8 mg/l. None of the samples has shown Chloride concentration >1000 mg/l (Table 16).

Fluoride

The fluoride element is required in the small amount for the human body but it is dangerous in large amount. The concentration of fluoride ion in majority of the samples (93.2%) is within acceptable limit of 1.0 mg/l. 4.8 % of the samples (12 locations), the fluoride concentrations vary from 1.01 – 1.50 mg/l and are within permissible limit as prescribed by BIS. 05 samples show greater than 1.50 mg/l fluoride concentration. Those samples, which are having high fluoride concentration, may be due to Geogenic sources (Table 16)

Figure 22. Chloride Distribution in J&K

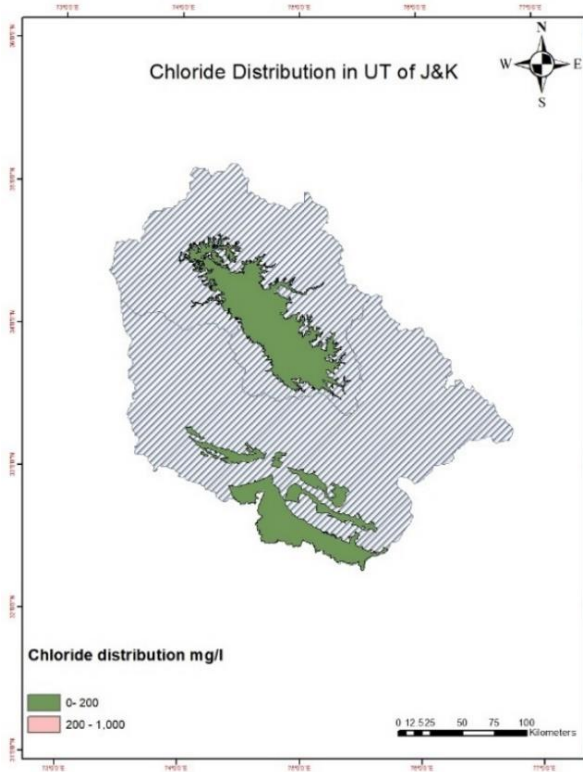
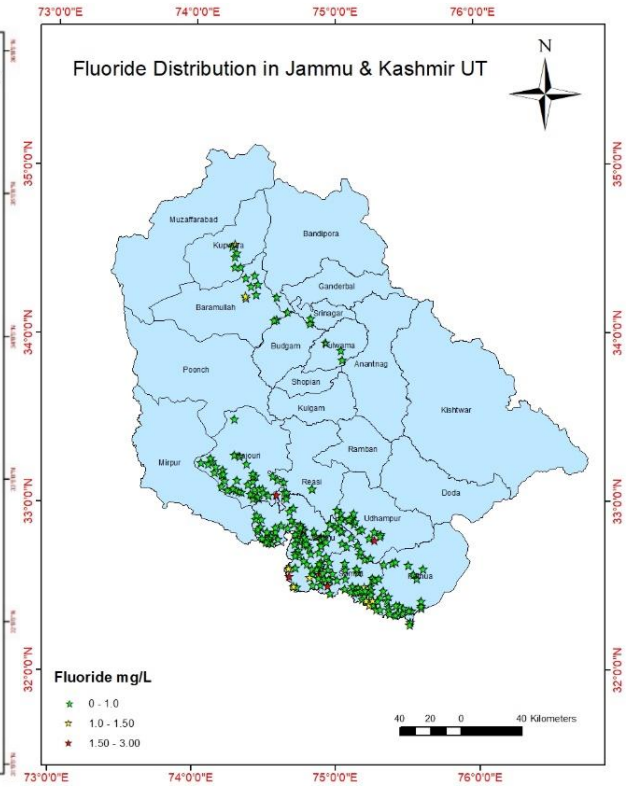


Figure 23. Fluoride Distribution in J&K



Nitrate Distribution

The presence of nitrate in higher amount is considered to be dangerous for groundwater usage. The probable sources of nitrate contamination of groundwater are through excessive application of fertilizers, bacterial nitrification of organic nitrogen, and seepage from animal and human wastes and atmospheric inputs. Nitrate concentration in 88.8% samples is low, but high values are also reported in some of the samples (11.2%). The details of samples having Nitrate concentration more than maximum permissible limit of BIS are summarized in the table 16.

Sulphate

Sulphate concentration varies in all the sample varies from 2.8 to 181.5 mg/l, and in all locations are within the permissible limit (400 mg/l) prescribed by BIS for drinking water purpose. In all samples, SO₄ concentrations are less than 200 mg/l i.e. within desirable limits.

Table 16 Groundwater Quality during May 2021

S. No.	Parameters	Samples Analysed	Permissible limit	Ranges	No. of Samples	Percentage %
1	Electrical Conductivity µs/cm at 25°C	250	3000 µs/cm	<750	167	66.8
				750-3000	83	33.2
				>3000	0	0
2	Chloride (mg/l)	250	1000 mg/l	<250	250	100
				250-1000	00	0
				>1000	00	0
3	Fluoride (mg/l)	250	1.50 mg/l	<1.00	233	93.2
				1.01-1.50	12	4.8
				>1.50	5	2.0
4	Nitrate (mg/l)	250	45 mg/l	<45	222	88.8
				>45	28	11.2

Total Hardness

The salts of Calcium and Magnesium such as carbonates, bicarbonates, sulphate etc. salts in groundwater causes hardness. High hardness values in water can cause scaling in water supply lines and prevent the foam production with the soap solution. High concentration of hardness in groundwater is social economic problem; hence it is also an important water quality parameter.

Classification of Hardness

As per the classification of hardness, 03 samples fall under very hard category i.e. greater than 600 mg/l and 175 samples fall in hard category (200-600 mg/l). 70 samples are found in soft category i.e. less than 200 mg/l of hardness.

The BIS Standards, 200 and 600 mg/l is the acceptable and permissible limit respectively for total hardness in drinking water. It is clear that majority of samples are within the maximum permissible limit (i.e. 600 mg/l), except 3 location where high value of total Hardness > 600 mg/l is observed.

Figure 24. Nitrate Distribution in J&K

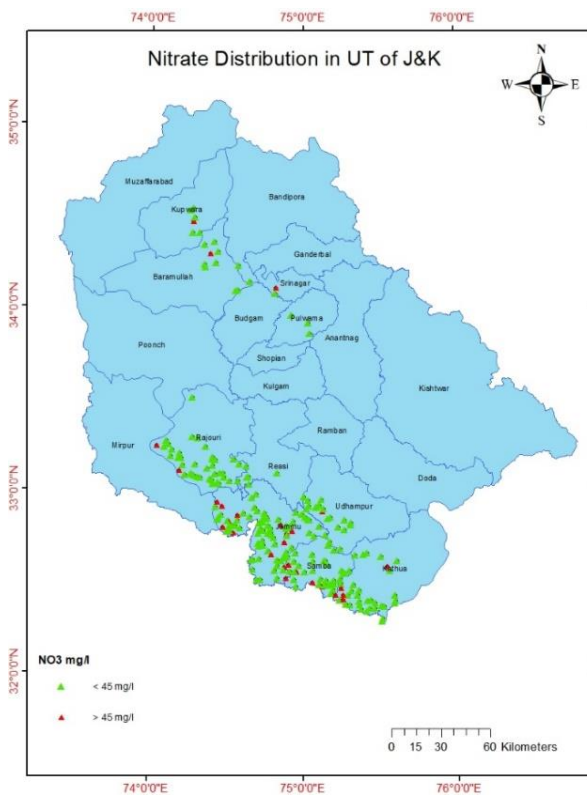
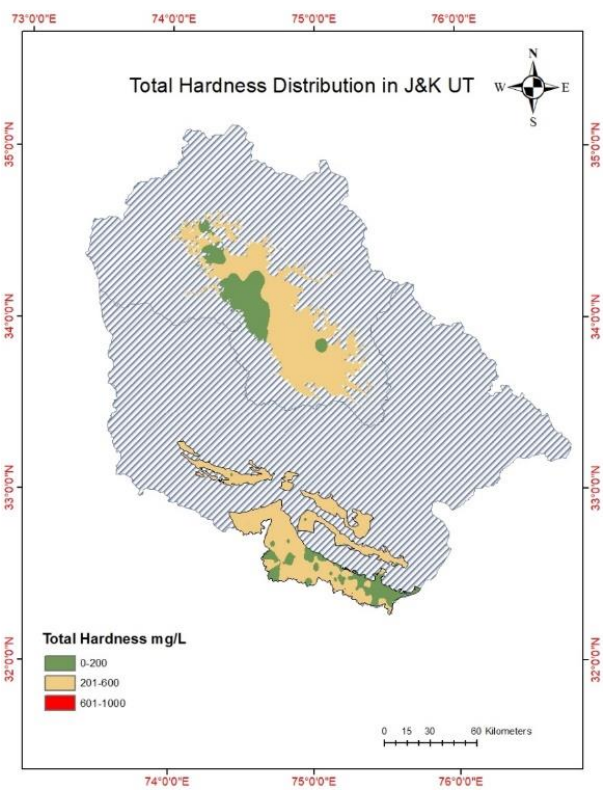


Figure 25. Total Hardness Distribution in J&K



Calcium

The calcium is a major constituent of various rocks. It is one of the most common constituents present in natural water. Calcium is essential for nervous and muscular system cardiac

functions and in coagulation of blood. Higher concentration of calcium causes encrustation in water supply systems, kidney, bladder stones and irritation in urinary passages.

In UT of J&K, the calcium concentration varies from 10.2 to 158 mg/l. The concentration in all the wells are within the maximum permissible limit up to 200 mg/l as prescribed by BIS for drinking water purpose.

Magnesium

The Magnesium concentration varies from 4.9 to 105.5 mg/l. In 205 samples Magnesium concentration are less than 30 mg/l i.e. within desirable limits whereas 43 samples are with high values then the acceptable limits but are less than the 100 mg/l permissible limits prescribed by BIS. Only 2 samples have shown magnesium concentration >100 mg/l.

Uranium

Uranium analysis is also done in all the 250 samples collected. All the samples were having uranium concentration below the permissible limit of 30 ppb prescribed by the World Health Organization thus indicating that the shallow water levels are free from uranium contamination.

Sodium Adsorption Ratio (SAR)

The Sodium Adsorption Ratio (SAR) is an indicator of the relative proportion of sodium ions in a water sample to those of calcium and magnesium. SAR is used to predict the sodium hazard and the potential for sodium to accumulate in the soil, if sodic water was in constant use.

The clay minerals in the soil adsorb divalent cations, like calcium and magnesium ions from irrigation water. Whenever the exchange sites in clay are filled by divalent cations, the soil texture is conducive for plant growth. The tendency of water to replace absorbed calcium and magnesium with sodium can be expressed by the Sodium Adsorption Ratio.

Residual Sodium Carbonate (RSC)

When water having high bicarbonates and low calcium and magnesium is used for irrigation purpose, precipitation of calcium and magnesium as carbonate takes place, changing the residual water to high sodium water with sodium bicarbonate in solution. It is termed as Residual Sodium Carbonate which is expressed as

$$\text{RSC (meq/l)} = (\text{CO}_3 + \text{HCO}_3) - (\text{Ca} + \text{Mg})$$

The recommended classification with respect to Sodium Absorption Ratio, and residual sodium carbonate, under customary irrigation conditions has been depicted in table given below:

Table 17 SAR & RSC Ranges during May 2021

Water class	Alkalinity hazards	
	SAR	RSC (meq/l)
Excellent	< 10	< 1.25
Good	10 - 18	1.25 - 2.0
Medium	18 - 26	2.0 - 2.5
Bad	> 26	2.5 - 3.0

SAR and RSC Variation in UT of J&K

The average value of SAR in UT of J&K is 0.814 and RSC average value is -0.28. From the above table it can be clearly seen that the groundwater in UT of J&K is in excellent condition for irrigation purpose.

3.3. Chemical Quality of Deeper Aquifer wells (Exploratory wells)

The chemical quality of the exploratory wells drilled during the year 2021-22 was analysed to assess the deeper aquifer water quality. Total 19 samples were received in the chemical lab. The samples were analysed for basic parameters and uranium. All the samples were found within the permissible limit prescribed by the BIS. Chemical analysis data of deeper aquifers in Jammu & Kashmir UT is given in Annexure – III.

Result and Discussion

The Groundwater quality in Jammu and Kashmir is found to be potable. The hydrochemical facie of groundwater is Ca-Mg-HCO₃ and Na-K-HCO₃ type. In terms of pH values, the measure of nature of water, the groundwater is found to be alkaline. The values of electrical conductivity (EC) in majority of the samples are well below the 750 µS/cm at 25°C suggesting that the salinity is not a concern in the UT of J&K. No Sample is found having EC value greater than 3000 µS/cm.

The major anions such as Bicarbonates, Chloride, Nitrate, Sulphate and Fluoride are analysed to assess the groundwater quality. Bicarbonate is the dominating anion present in the groundwater. The values of chloride are well within the range prescribed by BIS suggesting that salinity is not an issue in J&K UT. However, the values of Nitrate are found to be higher in 28 samples than 45 mg/L as prescribed by the BIS suggesting the anthropogenic pollution could be behind the increase. The high values of nitrate may be due to the Human and animal excreta adding nitrate to water by bacterial decomposition and usage of nitrogen pesticides/ fertilizers in agriculture and horticulture. The mixing from septic tank and sewage discharges etc in groundwater can also leads to increase in nitrate concentration in groundwater which is a matter of concern.

The fluoride ion is required by human body in some quantity. However, high concentration of the fluoride can cause fluorosis and other issues. In J&K, the majority of the water samples have fluoride concentration well within the range prescribed by the BIS. 05 samples show greater than 1.50 mg/l fluoride concentration. Those samples, which are having high fluoride concentration, may be due to Geogenic sources. Rest other anions such as Sulphate, phosphate are found well within the range.

The major cations analysed in the groundwater are Calcium, Magnesium, Sodium and Potassium. The values of calcium and magnesium ion are found well within the range prescribed by the BIS.

The salts of Calcium and Magnesium cations present in the groundwater represent the hardness. As per the classification of hardness, 03 samples fall under very hard category i.e. greater than 600

mg/l and 175 samples fall in hard category (200-600 mg/l). 70 samples are found in soft category i.e. less than 200 mg/l of hardness. The high values of hardness can cause scaling in the pipes and can cause skin, hair and gastro problems etc.

The radioactive element Uranium was also analysed in the groundwater samples. All the samples are found having uranium concentration of less than 30 ppb.

3.4. Conclusions & Remedial Measures

- As the water supply in UT of Jammu and Kashmir are groundwater based, proper well head protection measures need to be taken to avoid bacteriological contamination like coliform bacteria and E-coli. These water supply pipes should be thoroughly checked for ant mixing with sewer pipe lines.
- Nitrate contamination in groundwater is a cause of concern as pollution. The mixing from septic tank and sewage discharges etc. in groundwater can leads to increase in nitrate concentration in groundwater. Thus, proper sewage system may be developed and their disposal should be far away from water sources thus rendering less chances of the contamination.
- Most of the groundwater is hard to very hard category causing gastro-intestinal problems. This type of water may be treated properly before supplying the water for drinking RO, Ion exchange processes etc. may be used to treat the water and then supply it for drinking purpose. These same processes can be used to treat fluoride problem also.
- Deeper aquifers in both Jammu Division and Kashmir valley can be developed for mitigating the water supply requirements. Micro-level planning is required to develop these aquifers based on the available data of aquifer geometry, parameters and water resources. Tube wells shall be constructed by tapping good quality aquifers free from any contamination.
- Fast developing urban & industrial areas need special attention/quality surveillance by the State government authorities. Proper monitoring for trace elements in industrial areas like Bari-Brahmana, Gangyal and other industrial cluster located in Kashmir valley shall be taken up. Monitoring network stations shall be established all along the nalas and drains carrying industrial effluents.
- There is lack of proper sewage and sanitation in all over the UT resulting into groundwater and surface water contaminations. This issue needs to be addressed immediately by the authorities. Village sewages shall be disposed off properly after proper treatment. In water logging areas, where groundwater is being contaminated by polluted surface water, proper drainage shall be created for avoiding the water logging conditions.
- The existing data base on quality with different organizations like CGWB, PHED, State pollution control board, academic institutions like Jammu university and Kashmir university

need to integrated and a comprehensive data base need to be established so that better management of groundwater system is prepared.

- Proper management strategies need to be drawn up to combat the problems of geo-genic contamination. Cost effective community level treatment plants need to be established to provide better drinking water facility in the rural areas. The treatment plants as recommended in this report shall be constructed with trained manpower as in charges so that these treatment plants may work efficiently for longer periods.

4. RECOMMENDATIONS

1. Groundwater in Jammu and Kashmir UT is fresh and potable in most of the areas. Water supply in this state is mainly dependant on groundwater whether it is spring source, shallow groundwater or deep groundwater. Groundwater is the main source for surface water bodies in the form of base flow in lean periods. Proper protection measures need to be taken to avoid contamination of groundwater.
2. Even though salinity is not a major concern in the UT, based on the previous studies, there are problems of groundwater contamination like iron (Fe) (in Tertiary belt and in Kashmir valley) marshy gases (in shallow and deep aquifers of Kashmir valley), Fluoride in localized areas like in parts of Doda dist. Nitrate contamination, Bacteriological contaminations, groundwater pollution is due to pesticides/ fertilizers in agriculture and horticulture. The quality surveillance needs to be increased by State Government Organisations. Groundwater quality shall be monitored once in a year for all major elements, trace metals and bacteriological contaminations.
3. Most of the groundwater is hard to very hard category causing gastro-intestinal problems. This type of water may be treated properly before supplying the water for drinking purposes.
4. Deeper aquifers in both Jammu region and Kashmir valley can be developed for mitigating the water supply requirements. Micro-level planning is required to develop these aquifers based on the available data of aquifer geometry, parameters and water resources. Groundwater from deeper aquifers in Kashmir valley consists of iron and marshy gasses which need to be treated properly before supplying the water. It is better to identify the iron free aquifers through scientific groundwater exploration techniques couples with modern techniques of geophysics so that iron problem can be mitigated. Tube wells shall be constructed by tapping only iron free aquifers and avoiding iron rich aquifers through cement sealing and putting gravel pack only around the iron free aquifers.
5. The reality of climate change is the most significant long term threat to water resources. In hilly region water supply is still based on springs, where discharges of springs are drastically being reduced. Systematic enumeration/inventory of springs including its quality, snow water harvesting techniques and other available techniques is required to develop groundwater resources on sustainable basis need to be adopted.
6. Fast developing urban & industrial areas need special attention/quality surveillance by the State government authorities. Proper monitoring for trace elements in industrial areas like Bari-Brahmana, Gangyal and other industrial areas located in Kashmir valley shall be taken up. Monitoring network stations shall be established all along the nalas and drains carrying industrial effluents.

7. As the water supplies in Jammu city and parts of areas in Srinagar city are groundwater based, proper well head protection measures need to be taken to avoid bacteriological contamination like coliform bacteria and E-coli.
8. There is lack of proper sewage and sanitation in all over the state resulting into groundwater and surface water contaminations. This issue need to be addressed immediately by the authorities. Village sewages shall be disposed of properly after proper treatment. In water logging areas, where groundwater is being contaminated by polluted surface water, proper drainage shall be created for avoiding the water logging conditions.
9. Groundwater contamination by improper disposal of domestic and industrial solid wastes is of another concern. Special efforts shall be made to address this problem.
10. There is an urgent need to take-up comprehensive studies on groundwater quality of both shallow and deep groundwaters analysing major elements, heavy metals, pesticides, microbial contamination is the need of the hour. Areas identified in this report where higher concentrations of heavy metals, nitrates and fluorides need to be given special attentions.
12. The existing data base on quality with different organizations like CGWB, PHED, State pollution control board, academic institutions like Jammu university and Kashmir university need to integrated and a comprehensive data base need to be established.
13. Scientific research projects on groundwater contamination especially geo-genic contamination like Iron, gasses and fluoride need to be taken up immediately
14. Proper management strategies need to be drawn up to combat the problems of geo-genic contamination. Cost effective community level treatment plants need to be established. The treatment plants as recommended in this report shall be constructed with trained manpower as in charges so that these treatment plants may work efficiently for longer periods.
16. As the groundwater is hard to very hard type and consists of iron, proper treatment shall be followed before using this water for irrigation through modern irrigation methods like sprinkler and drip irrigation systems. This type of water may choke the sprinklers and drips.

ANNEXURE – I

Depth to Water Level Data of Dug Wells (in m) for all Seasons (Jammu Region)

Sl. No.	Location	District	Structure	May-21	Aug-21	Nov-21	Jan-22
1	Agre Chak	JAMMU	Dug Well	4.71	1.39	2.38	2.08
2	Akhnoor (Batera)	JAMMU	Dug Well	15.80	11.05	5.00	15.48
3	Alla	JAMMU	Dug Well	3.82	3.82	3.93	3.28
4	Arnia	JAMMU	Dug Well			9.27	8.07
5	Badsoo	JAMMU	Dug Well	7.30	0.90	0.50	0.25
6	Bakore	JAMMU	Dug Well	5.47	3.18	2.70	3.69
7	Baradow	JAMMU	Dug Well	6.60	6.49	5.60	6.12
8	Batera	JAMMU	Dug Well	11.02	7.70	8.10	9.02
9	Bega	JAMMU	Dug Well	3.66	3.13	2.13	2.60
10	Bera	JAMMU	Dug Well			2.54	2.15
11	Bhagwanachak	JAMMU	Dug Well	23.40	28.05	25.00	25.20
12	Bishnah	JAMMU	Dug Well	2.87	2.12	2.59	1.84
13	Chatta	JAMMU	Dug Well		4.87	5.90	4.49
14	Chowki chowra	JAMMU	Dug Well	7.67	1.45	1.85	3.10
15	Devipur	JAMMU	Dug Well	6.68	5.26	6.50	6.80
16	Dhanpur	JAMMU	Dug Well	7.65	4.20	3.30	4.36
17	Dharam Khu	JAMMU	Dug Well	26.90	22.80	9.80	23.91
18	Dhora	JAMMU	Dug Well	4.34		3.26	4.20
19	Gajansoo	JAMMU	Dug Well		2.20	2.80	3.08
20	Garhi (Jammu)	JAMMU	Dug Well		6.14	7.80	6.74
21	Gho-Manhasan	JAMMU	Dug Well	1.40	1.10	1.85	1.28
22	Gigrial	JAMMU	Dug Well	4.60	3.40	2.50	4.75
23	Greater Kailash	JAMMU	Dug Well	12.42	11.01	12.21	11.65
24	Gura	JAMMU	Dug Well	14.62	12.36	11.60	13.07
25	Hamirpur Kohna	JAMMU	Dug Well		3.42	2.40	3.04
26	Hamirpur Sidhar	JAMMU	Dug Well	5.77	4.08	2.70	3.35
27	Jagati	JAMMU	Dug Well	4.32	0.67	1.01	0.19
28	Jaswan	JAMMU	Dug Well	4.90	3.47		
29	Jhiri	JAMMU	Dug Well	5.50	2.87	5.20	5.01
30	Jindrah	JAMMU	Dug Well				11.87
31	Jogwan	JAMMU	Dug Well	6.75	5.70	2.60	2.89
32	Jourian	JAMMU	Dug Well	6.08	2.40	2.50	3.88
33	Kachrial	JAMMU	Dug Well	3.60	2.40	1.30	1.59
34	Kalah	JAMMU	Dug Well	4.80	2.39	1.90	1.74
35	Kaluchak	JAMMU	Dug Well			5.52	
36	Kamila	JAMMU	Dug Well		5.00	4.85	5.20
37	Kana Chak	JAMMU	Dug Well	4.95	2.17	2.90	3.95
38	Kangar	JAMMU	Dug Well	18.80	10.20	8.20	15.29
39	Karnaile Chak	JAMMU	Dug Well	8.00	7.77		
40	Katcha-Pind Dansal	JAMMU	Dug Well	3.70	2.10	1.98	1.87
41	Khairi (Raipur)	JAMMU	Dug Well	9.42	9.30	11.60	9.19
42	Khanpur Nagrota	JAMMU	Dug Well	6.90	0.55	3.06	6.28
43	Khour	JAMMU	Dug Well		1.90	2.50	3.51

Sl. No.	Location	District	Structure	May-21	Aug-21	Nov-21	Jan-22
44	Kot Kaswal	JAMMU	Dug Well	5.80	0.40	0.32	0.26
45	Kothey Saini	JAMMU	Dug Well	6.38	4.30	4.30	4.00
46	Kotli Charkan	JAMMU	Dug Well	2.45	2.34	2.92	2.46
47	Kunihala	JAMMU	Dug Well	3.00	1.26	1.31	0.91
48	Lalyal	JAMMU	Dug Well	4.29	3.30	3.68	3.14
49	Lam	JAMMU	Dug Well	3.30	2.10	2.40	1.68
50	Laswara	JAMMU	Dug Well	1.68	1.04	1.64	1.16
51	Leherian	JAMMU	Dug Well	9.90	8.00	8.80	9.23
52	Makwal	JAMMU	Dug Well	3.63	2.35	2.81	2.07
53	Marh	JAMMU	Dug Well	2.03	1.53	2.25	2.80
54	Miran Sahib	JAMMU	Dug Well	8.15	7.24	7.74	6.85
55	Muthi	JAMMU	Dug Well	5.47	1.06	2.30	1.71
56	Nagbani	JAMMU	Dug Well	5.12	2.70	3.30	4.00
57	Nagrota (Kandoli)	JAMMU	Dug Well	5.35	3.10		
58	Nagrota (Uttarbani)	JAMMU	Dug Well	7.34	6.11	6.40	6.35
59	Nandpur	JAMMU	Dug Well	2.93			
60	Nikowal	JAMMU	Dug Well	5.84	4.79	3.47	5.02
61	Painthi	JAMMU	Dug Well	9.50	6.52	7.65	8.90
62	Palatan	JAMMU	Dug Well	2.77	1.70	1.70	1.41
63	Pallanwala	JAMMU	Dug Well		1.00	1.50	1.27
64	Pangli Colony	JAMMU	Dug Well	3.80	1.20	1.40	2.29
65	Pata Khu	JAMMU	Dug Well	22.80	21.26	20.80	21.87
66	Patyale Chak	JAMMU	Dug Well	4.90	3.11	3.30	3.88
67	Poal	JAMMU	Dug Well		2.27	3.00	1.65
68	Purkhoo	JAMMU	Dug Well	21.20		18.40	18.04
69	Rangoora	JAMMU	Dug Well	3.30	1.36	1.18	1.16
70	Rehal	JAMMU	Dug Well	6.23	5.84	5.65	5.64
71	Sajwal	JAMMU	Dug Well	2.50	1.85	2.30	2.83
72	Salehar	JAMMU	Dug Well	3.38	3.40	2.70	1.80
73	Sandhwan	JAMMU	Dug Well		3.20	3.10	3.35
74	Satwari	JAMMU	Dug Well		11.20	12.32	
75	Sei Khurd	JAMMU	Dug Well	4.98	3.41	3.65	4.10
76	Senth	JAMMU	Dug Well	3.90	2.50	1.70	2.08
77	Shame Chak	JAMMU	Dug Well	6.20	4.10	5.10	6.20
78	Sidhra	JAMMU	Dug Well	6.10	4.60	3.71	3.60
79	Sobka	JAMMU	Dug Well		21.00	21.40	22.78
80	Sohanjana	JAMMU	Dug Well	4.76	3.10	3.63	3.23
81	Suchetgarh-II	JAMMU	Dug Well	5.68	4.16	1.78	0.87
82	Sugetar	JAMMU	Dug Well	7.00	2.90	2.58	2.92
83	Sumah	JAMMU	Dug Well	4.60	3.15	3.00	2.96
84	Surinsar	JAMMU	Dug Well	2.44	0.95	0.90	0.52
85	Tanda Sheoda	JAMMU	Dug Well	3.30	1.70	3.30	1.43
86	Taryai	JAMMU	Dug Well	35.60	35.10	31.80	35.50
87	Trikuta Nagar	JAMMU	Dug Well	4.68	4.27	3.95	2.90
88	Upperla kanhal	JAMMU	Dug Well	5.52	3.42	3.18	3.26
89	Uttarbani	JAMMU	Dug Well	2.08	1.99	1.80	1.65

Sl. No.	Location	District	Structure	May-21	Aug-21	Nov-21	Jan-22
90	Barni	KATHUA	Dug Well	7.67	4.60	6.75	8.30
91	Bhagwal	KATHUA	Dug Well	18.72	7.52	14.04	18.62
92	Chak hariya	KATHUA	Dug Well		0.92	1.59	2.15
93	Chakara	KATHUA	Dug Well	4.76	2.60	3.35	4.05
94	Chan ranga	KATHUA	Dug Well	15.68	6.02	8.27	12.57
95	Chann Khatrian	KATHUA	Dug Well	13.08	2.73	6.73	10.25
96	Chapki Kalan	KATHUA	Dug Well	19.48	9.29	7.58	13.18
97	Feru chak	KATHUA	Dug Well	5.10	1.38	2.20	6.44
98	Gangu chak	KATHUA	Dug Well	2.84	1.58	2.28	2.20
99	Gond More	KATHUA	Dug Well		1.45	2.10	2.33
100	Hore	KATHUA	Dug Well	3.80	0.70	1.23	1.25
101	Jandi	KATHUA	Dug Well	3.76	3.71	5.35	5.53
102	Jindore	KATHUA	Dug Well	9.18		8.5	
103	Karol Krishna	KATHUA	Dug Well	9.56	6.83	7.73	8.85
104	Kathua	KATHUA	Dug Well	3.30	0.37	0.73	1.06
105	Kerian Gandyal-II	KATHUA	Dug Well		2.75	3.10	
106	Kerian Ramnagar	KATHUA	Dug Well			2.75	3.30
107	Khanpur	KATHUA	Dug Well	2.62	0.24	1.52	1.52
108	Khukhial	KATHUA	Dug Well	1.56	0.66	1.53	1.36
109	Konthal	KATHUA	Dug Well	5.57	4.88	5.10	5.40
110	Kote punnu	KATHUA	Dug Well	2.44	0.86	1.78	1.19
111	Kothian	KATHUA	Dug Well	1.71	0.88	0.41	1.18
112	Lakhanpur	KATHUA	Dug Well	5.35	4.93	6.30	7.35
113	Lakri	KATHUA	Dug Well	2.70	2.00	2.50	2.33
114	Londi	KATHUA	Dug Well	6.27	5.26	5.49	5.92
115	Mandli	KATHUA	Dug Well	2.00	1.45	1.90	1.67
116	Mukandpur	KATHUA	Dug Well	3.95	3.49	3.85	3.85
117	Nagri	KATHUA	Dug Well	2.16	0.40	1.76	1.70
118	Nagrota-Gujaroo	KATHUA	Dug Well	6.90	3.80	5.12	3.58
119	Nanke Chak (Sherpur)	KATHUA	Dug Well	1.49	0.30	0.87	1.83
120	Pallan	KATHUA	Dug Well	1.60	0.80	0.74	0.69
121	Pansar	KATHUA	Dug Well	5.93	5.94	5.95	5.98
122	Patyari	KATHUA	Dug Well		4.13	5.64	8.20
123	Patyari II	KATHUA	Dug Well	3.87	2.29	2.61	2.73
124	Phinter	KATHUA	Dug Well	7.90	4.50	5.18	3.90
125	Ramkot	KATHUA	Dug Well	8.10	6.00	7.20	4.72
126	Saida	KATHUA	Dug Well		1.39	1.86	2.68
127	Sumwan	KATHUA	Dug Well	14.20	9.54	9.81	9.18
128	Ainpur	RAJOURI	Dug Well	3.70	1.50	0.90	0.50
129	Bagnoti	RAJOURI	Dug Well	7.98	3.90	4.10	4.85
130	Bajabain	RAJOURI	Dug Well	4.80	3.53	2.60	0.37
131	Bakhar	RAJOURI	Dug Well	2.30	1.28	0.83	1.44
132	Banpari	RAJOURI	Dug Well	4.00	1.30	1.70	1.52
133	Bareri	RAJOURI	Dug Well	5.90	3.46	1.90	3.50
134	Bhatta Mohra	RAJOURI	Dug Well	1.88	1.35	1.80	2.45
135	Channi Parat	RAJOURI	Dug Well	4.00	1.16	0.50	2.80

Sl. No.	Location	District	Structure	May-21	Aug-21	Nov-21	Jan-22
136	Chittiar	RAJOURI	Dug Well	1.70	1.17	1.00	1.55
137	Chowki Handa	RAJOURI	Dug Well	3.60	2.03	2.30	4.25
138	Darhal Quila	RAJOURI	Dug Well	3.93	2.09	3.50	4.70
139	Dharamsal	RAJOURI	Dug Well	3.88	1.55	2.00	3.50
140	Dhok Baniar	RAJOURI	Dug Well	2.66	2.10	1.30	1.18
141	Ding	RAJOURI	Dug Well	6.80	2.30	3.10	1.65
142	Dyala	RAJOURI	Dug Well	2.90	2.26	2.20	2.44
143	Gagrote	RAJOURI	Dug Well	6.80	2.47	3.60	5.00
144	Jabah	RAJOURI	Dug Well	3.75	1.42	1.80	2.64
145	Jhangar	RAJOURI	Dug Well	5.55	4.23	4.80	5.22
146	Kalal	RAJOURI	Dug Well	6.70	4.68	2.95	3.03
147	Kalsian	RAJOURI	Dug Well	1.70	0.60	1.20	2.52
148	Kangri (Grid Station)	RAJOURI	Dug Well	3.80	1.80	1.70	1.36
149	Lam Rajouri	RAJOURI	Dug Well	5.20	2.48	5.40	5.50
150	Laroka	RAJOURI	Dug Well	2.10	1.10	1.40	1.75
151	Lower Kharak	RAJOURI	Dug Well	1.80	0.60	0.60	0.41
152	Marchola	RAJOURI	Dug Well	4.65	1.62	1.20	1.28
153	Narian	RAJOURI	Dug Well	6.30	4.60		
154	Naunihal	RAJOURI	Dug Well		2.04	1.95	
155	Panja	RAJOURI	Dug Well	1.30	1.12	1.20	1.65
156	Potha	RAJOURI	Dug Well	3.27	1.54		
157	Pukharni	RAJOURI	Dug Well	1.20	0.89	1.14	1.35
158	Rumli Dara	RAJOURI	Dug Well	5.18	2.75	2.35	3.00
159	Salote	RAJOURI	Dug Well	3.00	1.10	0.70	0.87
160	Seri	RAJOURI	Dug Well	3.70	2.50	0.80	2.25
161	Sial	RAJOURI	Dug Well	2.00	1.60	0.50	0.19
162	Siot	RAJOURI	Dug Well	2.97	3.10	2.60	2.92
163	Solki	RAJOURI	Dug Well	3.20	1.86	1.60	2.38
164	Thanda Paani	RAJOURI	Dug Well	3.40	1.10	0.95	
165	Aliyah	REASI	Dug Well	2.46	1.34	1.55	2.00
166	Bhamla	REASI	Dug Well	4.66	2.35	1.20	2.40
167	Dadua	REASI	Dug Well	3.00	1.74	1.75	3.10
168	Garan Jagir	REASI	Dug Well	6.14	2.00	2.70	2.80
169	Nanora	REASI	Dug Well	4.55	1.83	1.90	2.50
170	Riasi	REASI	Dug Well	26.50	25.30	25.05	24.88
171	Talwara	REASI	Dug Well	5.00	5.40	5.20	5.69
172	Thangrot	REASI	Dug Well	4.95	0.77	0.85	1.63
173	Bassi Kalan	SAMBA	Dug Well	5.65	2.59	4.03	4.88
174	Bengular	SAMBA	Dug Well		7.71	7.44	7.38
175	Birpur	SAMBA	Dug Well	15.82	13.75	16.10	14.27
176	Channi Mansar	SAMBA	Dug Well	3.55	0.50	1.00	0.18
177	Daboh	SAMBA	Dug Well		3.89	4.33	4.84
178	Didyal	SAMBA	Dug Well	2.25	1.43	1.63	1.43
179	Dulme Chak	SAMBA	Dug Well	4.00	3.30	3.42	1.63
180	Gho-Brahamna	SAMBA	Dug Well	8.86	8.63	8.32	8.52
181	Gho-Rakwalan	SAMBA	Dug Well	4.37	4.83	4.52	4.05

Sl. No.	Location	District	Structure	May-21	Aug-21	Nov-21	Jan-22
182	Gudwal	SAMBA	Dug Well	3.88	3.85	4.03	3.75
183	Jasath	SAMBA	Dug Well	15.25		10.9	
184	Kainthpur	SAMBA	Dug Well	4.68	3.89	4.25	3.90
185	Khairi (Bishnah)	SAMBA	Dug Well	5.20	3.33	4.88	4.38
186	Kootah	SAMBA	Dug Well	26.11	21.35	23.40	24.33
187	Lale Chak	SAMBA	Dug Well	3.36	1.25	2.03	2.67
188	Lokli	SAMBA	Dug Well	8.32		4.08	5.68
189	Madun	SAMBA	Dug Well	3.07	1.74	2.24	2.35
190	Mahal Shah Kalandrian	SAMBA	Dug Well	5.46	7.05	4.88	5.47
191	Maheen Charkan	SAMBA	Dug Well		8.10	8.70	9.45
192	Majua Laxmi	SAMBA	Dug Well	6.43	5.91	4.99	4.80
193	Nagrota	SAMBA	Dug Well			3.63	3.50
194	Naran	SAMBA	Dug Well	8.24	6.81	6.54	7.57
195	Nauni	SAMBA	Dug Well	7.22	1.32	1.25	1.38
196	Nilcha	SAMBA	Dug Well	11.58	9.62	10.37	11.40
197	Nud	SAMBA	Dug Well	5.20	2.84	3.51	4.00
198	Palli	SAMBA	Dug Well	3.21	1.92	1.99	1.74
199	Pangdour	SAMBA	Dug Well	4.43	4.41	4.42	4.45
200	Patli	SAMBA	Dug Well	10.58	7.69	8.17	4.42
201	Phalora	SAMBA	Dug Well	2.43	1.27	1.88	1.93
202	Raghu chak	SAMBA	Dug Well	2.68	0.52	1.22	2.70
203	Raiyan	SAMBA	Dug Well	22.04	21.28	19.24	20.74
204	Sadoh	SAMBA	Dug Well	8.81	8.63	8.52	8.67
205	Sagoon	SAMBA	Dug Well	4.70	2.20	2.26	1.41
206	Samba	SAMBA	Dug Well	17.79	17.46	17.00	
207	Sanoora	SAMBA	Dug Well	0.85	0.82	0.91	0.60
208	Supwal	SAMBA	Dug Well	8.43	5.60	4.40	5.33
209	Badola	UDHAMPUR	Dug Well	5.00	1.90	1.75	1.51
210	Battal Ballian	UDHAMPUR	Dug Well	7.35	4.30	4.05	5.13
211	Birmah	UDHAMPUR	Dug Well	3.00	2.00	2.26	1.94
212	Dalsar	UDHAMPUR	Dug Well	1.30	0.25	0.45	0.11
213	Dehari	UDHAMPUR	Dug Well	4.80	0.70	1.85	0.50
214	Dhanu Kanal	UDHAMPUR	Dug Well	2.00	0.82	0.65	0.66
215	Eastern Mand	UDHAMPUR	Dug Well	6.50	2.30	1.60	1.11
216	Garhi (Udh)	UDHAMPUR	Dug Well	2.10	1.10	0.90	0.60
217	Jallow	UDHAMPUR	Dug Well	4.00	0.50	0.85	0.22
218	Jhakkar	UDHAMPUR	Dug Well	6.10	2.15	1.12	0.61
219	Kahpotha	UDHAMPUR	Dug Well	5.20	0.70	0.68	0.78
220	Kotli Pain Megaini	UDHAMPUR	Dug Well	1.20	0.85	0.74	0.57
221	Kuperlah	UDHAMPUR	Dug Well	5.60	0.29	2.09	1.19
222	Manwall	UDHAMPUR	Dug Well	9.70	7.10	7.45	8.06
223	Nagrota Panjgarain	UDHAMPUR	Dug Well	2.14	1.50	1.60	1.47
224	Phangyal	UDHAMPUR	Dug Well	7.90	2.40	1.50	1.52
225	Rakh Badali	UDHAMPUR	Dug Well	4.70	2.70	2.70	1.48
226	Ramnagar	UDHAMPUR	Dug Well	5.80	4.55	5.23	3.43
227	Ritti	UDHAMPUR	Dug Well	4.40	0.40	0.61	0.29

Sl. No.	Location	District	Structure	May-21	Aug-21	Nov-21	Jan-22
228	Salabra	UDHAMPUR	Dug Well	4.80	1.43	1.53	1.36
229	Seen Thakaran	UDHAMPUR	Dug Well	3.30	2.80	2.75	2.43
230	Sunal	UDHAMPUR	Dug Well	3.70	1.30	2.10	1.11
231	Talpad	UDHAMPUR	Dug Well	3.37	0.60	0.81	0.54
232	Upper Ban	UDHAMPUR	Dug Well	8.35	4.70	1.64	1.08

ANNEXURE – II

Depth to Water Level Data of Dug Wells (in m) for all Seasons (Kashmir Region)

Sl. No.	Location	DISSTRIC	May-21	Aug-21	Nov-21
1	Aripanthan	BARAMULA	1.86	1.99	
2	Authoora	BARAMULA		0.73	
3	Badran	BARAMULA	6.44	4.41	
4	Binner	BARAMULA	1.18	3.8	
5	Bomai	BARAMULA	1.2	1.25	
6	Dusilpora	BARAMULA		2.71	
7	Gandhasi Bhat	BARAMULA	0.97	1	
8	Hadipora	BARAMULA	3.33	3.92	
9	Ibrahim Colony (Sopore)	BARAMULA		1.39	
10	Jambazpora	BARAMULA	1.5	2.08	
11	Lolipora	BARAMULA		3.02	
12	Mandji	BARAMULA		2.57	
13	Mazbugh (Sopore)	BARAMULA		0.93	
14	Mirgund Silk Centre	BARAMULA	1.85	2.19	
15	Najar Mohalla Dangerpora	BARAMULA		1.42	
16	Saidpora	BARAMULA		0.82	
17	Sangrama	BARAMULA	1.07	1.14	
18	Sopore Model Town	BARAMULA	0.56	0.64	
19	Waripora	BARAMULA	0.54	3.83	
20	Batpora Bala	KUPWARA		2.63	
21	Bramri	KUPWARA	2.4	2.65	
22	Chanjmul	KUPWARA		5.54	
23	Chowgal	KUPWARA	2.09	2.35	
24	Dohama	KUPWARA		3.75	
25	Dolipora	KUPWARA		3.14	
26	Drugmulla	KUPWARA	5.18	5.35	
27	Goose - II	KUPWARA		11.5	
28	Gulgam	KUPWARA		3.8	
29	Hampora	KUPWARA		3.14	
30	Handwara Al-Mustafa colony	KUPWARA	1.5	2.3	
31	Khanpora	KUPWARA		2.41	
32	Kupwara Main Chowk	KUPWARA	3.08	3.27	
33	Langate	KUPWARA		2.95	
34	Magam	KUPWARA		2.35	
35	Palpoora	KUPWARA	1.82	1.47	
36	Panzgam - II	KUPWARA		2.26	
37	Radbug	KUPWARA		3.36	
38	Taratpura	KUPWARA		1.58	
39	Tarich	KUPWARA		2.88	
40	Trehgam	KUPWARA		4.15	
41	Wadipora	KUPWARA		4.3	
42	Wasarkhoto	KUPWARA		2.45	
43	Zachaldara	KUPWARA		6.5	
44	Sambura-Kakapura	PULWAMA	5.69	5.48	
45	Tral	PULWAMA	15.66	15	
46	Urwan (Warwan)	PULWAMA		0.95	
47	Regal Chowk, Srinagar	SRINAGAR	4.02	3.84	

Result of Chemical Analysis of water samples of NHS collected during May 2021 Jammu & Kashmir

Sr. No.	District	Block	Location	pH	EC (µs/cm) at 25° C	TDS	CO3 (mg/l)	HCO ₃ (mg/l)	Total Alkalinity	Cl (mg/l)	NO3 (mg/l)	F (mg/l)	SO4 mg/l	PO4 (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	TH CaCO3 (mg/l)	U (µg/l)
1	Baramulla	Gulmarg	Badran	8.32	223	138.26	13.02	145.65	141.09	11.3	6.4	0.43	7.4	0	40.9	10.1	9.2	1.5	143.92	0.15
2	Baramulla	Gulmarg	Aripattan	8.35	659	408.58	26.04	291.31	282.18	12.9	34.8	0.27	2.8	0	42.8	17.1	66.9	2.8	177.54	1.9
3	Baramulla	Gulmarg	Waripora	6.69	220	136.4	0	119.00	97.54	10.7	9.9	0.52	7.1	0	35	5.8	8.1	2.6	111.43	0.24
4	Baramulla	Baramulla	Mirgund	8.44	715	443.3	26.04	211.86	217.06	19.4	20.7	0.77	25.8	0	32	33	24.8	8.1	216.14	3.08
5	Baramulla	Baramulla	Sangrama	8.32	204	126.48	13.02	78.00	85.63	7.7	5.12	0.44	8.9	0.89	33.9	5.1	3.2	1.7	105.79	0.063
6	Baramulla	Baramulla	Zambodzpora	7.43	610	378.2	0	211.86	173.66	23.3	8.4	1.05	12.98	0	40.1	18.6	25.5	2.9	176.98	0.47
7	Baramulla	Baramulla	Binner	7.25	907	562.34	0	225.00	184.43	35.5	9.9	1.17	17.9	0	40	27.2	22.8	4.1	212.21	1.72
8	Baramulla	Rohama	Hadipora	8.36	896	555.52	13.02	158.00	151.21	118.4	98.4	0.77	56.5	1.72	97.9	24.7	55.7	3.7	346.65	0.024
9	Baramulla	Sopore	Bomai	8.4	970	601.4	13.02	304.00	270.88	90.9	8.4	0.71	43.2	0	71	37.2	57.4	8.2	330.97	5.6
10	Baramulla	Sopore	Sopore Model Town	8.45	975	604.5	52.08	344.27	368.99	53.1	17.8	0.6	31.6	0	111.7	23.3	43.1	19.2	375.37	1.3
11	Jammu	Jammu	Surinsar	8.04	720	446.4	0	444.00	363.93	9.5	3.1	0.29	6.9	0	114.4	15.2	6.7	7.4	348.71	4.7
12	Jammu	Jammu	Jagati	7.68	476	295.12	0	301.00	246.72	12.7	12.9	0.19	19.6	0	80.1	19.9	6.3	8.5	282.35	6.46
13	Jammu	Jammu	Khanpur (Nagrota)	7.91	437	270.94	0	301.00	246.72	7.1	7.8	0.18	4.5	0	67.3	16.4	6.1	7.9	235.91	0.81
14	Jammu	Jammu	Nagrota	7.43	907	562.34	0	460.00	377.05	37.3	42.2	0.22	37.2	0	141	29	11.7	15.2	472.14	8.6
15	Jammu	Jammu	Upper Ban	7.68	280	173.6	0	198.62	162.80	6.1	3.7	0.14	6	0.38	44	11.2	6	7.5	156.20	0.65
16	Jammu	Jammu	Sugetar	7.9	754	467.48	0	423.72	347.31	22.3	5.4	0.21	23	0	78.8	18	55.4	8.1	271.26	4.4
17	Jammu	Jammu	Katcha Pind (Dansal)	7.7	908	562.96	0	535.00	438.52	40.4	10.8	0.22	41.4	0	132.4	43.3	12	14.7	509.63	2.8
18	Jammu	Jammu	Badsoo	8.05	475	294.5	0	278.07	227.92	13	7	0.28	9	0.51	69.5	14.7	5.9	8.3	234.39	1.1
19	Jammu	Jammu	Kah Pahuta	7.9	538	333.56	0	331.03	271.34	17.5	8	0.24	17.1	0	74.8	19.2	17	7.2	266.21	1.48
20	Jammu	Jammu	Kunihala	7.92	599	371.38	0	342.00	280.33	17	5.5	0.19	15.8	0	93.3	15.2	6.2	8	295.96	1.3
21	Jammu	Jammu	Kot Kaswal	7.74	805	499.1	0	491.00	402.46	25.7	17.6	0.32	27.2	0	132	28.7	11.9	13.4	448.40	5.16
22	Jammu	Bhalwal	Khairi (Raipur)	6.58	668	414.16	0	331.03	271.34	18.8	53.6	0.46	32	0	92	26.53	18.6	6.9	339.45	0.83
23	Jammu	Bhalwal	Kangar	7.1	650	403	0	436.00	357.38	7.7	7	0.23	9.5	0	99.3	25.7	12.9	7.6	354.27	2.5
24	Jammu	Bhalwal	Pata Khu	6.78	611	378.82	0	410.48	336.46	8.5	19.1	0	12.9	0	96.6	26.6	13.7	9.1	351.24	1.97
25	Jammu	Bhalwal	Dharam Khu	6.57	581	360.22	0	317.79	260.49	6.6	8.9	0.12	19.2	0	70	23	11.4	8.3	269.88	0.95
26	Jammu	Bhalwal	Marjholi	6.7	644	399.28	0	317.00	259.84	7.4	10.8	0.2	19.6	0	66.8	25.5	12.7	8.6	272.20	1
27	Jammu	Bhalwal	Sobka	7.03	342	212.04	0	211.86	173.66	7.8	10.4	0.11	27.5	0	54	14.7	10.3	8.9	195.64	1.26
28	Jammu	Bhalwal	Batera	7.1	541	335.42	0	317.79	260.49	9.7	17.9	0.11	35.2	0	74	28.2	12.2	8.6	301.34	0.9

Sr. No.	District	Block	Location	pH	EC (µs/cm at 25° C)	TDS	CO3 (mg/l)	HCO3 (mg/l)	Total Alkalinity	Cl (mg/l)	NO3 (mg/l)	F (mg/l)	SO4 mg/l	PO4 (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	TH CaCO3 (mg/l)	U (µg/l)
29	Jammu	Chowkichora	Chowkichora	8.32	549	340.38	13.02	211.86	195.36	20.9	4.3	0.24	8.7	0	37	13.5	39.8	3.4	148.19	6.6
30	Jammu	Akhnoor	Tanda Sheeda	8.32	351	217.62	26.04	185.38	195.35	8.8	6.2	0.14	6.2	0	58.2	13.4	7.2	4.4	200.78	0.04
31	Jammu	Marh	Patyale Chak	8.35	937	580.94	39.06	489.93	466.68	28	10.6	1.4	74.9	0	74	66	73	4.1	457.28	5.6
32	Jammu	Marh	Muthi	8.31	704	436.48	26.04	305.00	293.40	31.9	0	0	75.7	0	81.2	38.4	26.9	3.7	361.42	0.76
33	Jammu	Marh	Nagbani	8.32	630	390.6	13.02	331.03	293.04	19.1	4	0.98	18.4	0	59.8	25.6	38.7	2.7	255.11	1.1
34	Jammu	Marh	Marh	8.37	914	566.68	39.06	264.00	281.49	42.9	24.1	0.31	84.4	0	85.9	42.9	31.3	4.3	391.73	2.25
35	Jammu	Marh	Jaswan	8.4	452	280.24	13.02	264.83	238.77	11.4	7.2	0.24	27.1	0	65.6	24.4	8.1	3.6	264.66	0.23
36	Jammu	Marh	Shama Chak	8.36	515	319.3	13.02	251.59	227.92	11.7	19.4	0.28	29.2	0	71.1	22.5	8.8	6	270.57	0.72
37	Jammu	Marh	Jhiri	8.45	503	311.86	13.02	291.31	260.48	10.1	12.7	0.23	31.5	0	75.9	24.2	8.3	5.4	289.58	0.99
38	Jammu	Marh	Kana Chak	8.37	520	322.4	13.02	198.62	184.50	7.7	10.3	0.31	23.4	0	46.5	22.4	6.4	2.5	208.66	0.6
39	Jammu	Marh	Gho Manhasan (Talab Tillo)	8.45	926	574.12	39.06	291.31	303.88	55.5	11.4	0.69	116.2	0	86.1	55	37.8	3.8	442.15	13.3
40	Jammu	Marh	Sandhwan	8.3	409	253.58	26.04	198.00	205.70	10.3	13.5	0.15	7.6	0	52	19.6	11.2	2.6	210.86	1.21
41	Jammu	Bhalwal	Purkhoo	8.35	780	483.6	13.02	370.00	324.98	14.45	29.9	0.31	12.97	0	88.9	32.2	16.63	3.2	355.09	0.68
42	Jammu	Bhalwal	Garhi (Jammu)	8.32	634	393.08	39.06	317.79	325.59	14	9.5	0.24	19.9	0	107.4	19.46	11.3	2.06	348.78	0.69
43	Jammu	Marh	Gajansoo	8.37	830	514.6	13.02	409.00	356.95	24	24.5	0.39	41.97	0	76.5	23.96	20.4	80.96	290.09	1.33
44	Jammu	Jammu	Hazuribag	8.25	667	413.54	0	317.79	260.49	21.5	27.4	0.14	29	0	85.3	26.9	14.2	1.9	324.22	0.45
45	Jammu	Bhalwal	Lower Barnai	7.16	549	340.38	0	304.55	249.63	12.4	14.3	0	24.7	0	75.5	17.5	8.7	19	260.94	0
46	Jammu	Akhnoor	Akhnoor	8.36	422	261.64	26.04	172.00	184.38	8.9	12.9	0.24	26.6	0	59.1	15.8	7.3	4.2	212.93	1.07
47	Jammu	Pargwal	Hamirpur Kohna	7.14	1012	627.44	0	477.00	390.98	23.7	64.8	0.31	80.9	0	119.6	36.5	20.8	36.1	449.58	18.1
48	Jammu	Pargwal	Sajwal	8.39	591	366.42	39.06	264.83	282.17	6.8	3.8	0.58	53.8	0	90.5	27.65	7.2	8.6	340.32	1.94
49	Jammu	Akhnoor	Sumah	8.33	438	271.56	26.04	238.34	238.76	10.4	5.2	0.15	8.6	0	62	22.9	9.9	3.7	249.47	0.66
50	Jammu	Akhnoor	Gura (Akhnoor)	7.3	770	477.4	0	410.48	336.46	20.4	40.7	0.31	22.8	0	91.7	36.2	18.3	2.6	378.59	0.4
51	Jammu	Akhnoor	Leherian	7.17	544	337.28	0	278.07	227.92	11.4	14.9	0.25	22.2	0	48	27	16	3.7	231.39	0.33
52	Jammu	Jourian	Devipura	8.37	486	301.32	26.04	278.07	271.32	6.9	13.3	0.17	22.9	0	77.6	24.2	5.3	2.1	293.83	1.1
53	Jammu	Jorian	Jourian	7.18	637	394.94	0	305.00	250.00	20.4	39.1	0.23	36	0	94.4	16.4	15.2	5	303.66	1.38
54	Jammu	Khaur	Bakore	7.34	644	399.28	0	265.00	217.21	32.7	19.8	0.29	56.7	0.83	76.4	18.5	17.5	36.8	267.32	0.72
55	Jammu	Khaur	Dhanpur	8.42	492	305.04	13.02	145.65	141.09	20.1	16.4	0.13	30	0	55.8	10.6	8.6	1.9	183.23	0.44
56	Jammu	Khaur	Pangli Colony	8.45	513	318.06	39.06	264.83	282.17	9	5.6	0.33	17.3	0	100.2	10.2	8.6	7	292.58	1.27
57	Jammu	Khaur	Hamirpur Sidhar	7.11	1131	701.22	0	423.72	347.31	73.1	43.2	0.35	144.9	0	141	38	45.8	7.9	509.27	6.8
58	Jammu	Khaur	Sainth	8.32	599	371.38	39.06	278.00	292.97	17.4	5.4	0.32	27.8	0	98.5	15.5	18.1	5.5	310.19	0
59	Jammu	Khaur	Khaur	8.43	695	430.9	26.04	317.80	303.89	14.5	52.3	0.09	44.4	0	132.5	11.2	11.3	1.9	377.45	3.3
60	Jammu	Akhnoor	Taryai	8.33	377	233.74	26.04	185.38	195.35	14.7	33.4	0.12	6.8	0	58.8	12.1	18.7	2.8	196.92	0.29

Sr. No.	District	Block	Location	pH	EC (µs/cm at 25° C)	TDS	CO3 (mg/l)	HCO ₃ (mg/l)	Total Alkalinity	Cl (mg/l)	NO3 (mg/l)	F (mg/l)	SO4 mg/l	PO4 (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	TH CaCO3 (mg/l)	U (µg/l)
61	Jammu	Bhalwal	Bhagwanchak	8.42	857	531.34	39.06	317.79	325.59	36.4	73.2	0.43	44.1	0	112	33.5	35.4	4.3	418.20	1.5
62	Jammu	Samwan	Kachrial	7.64	345	213.9	0	198.00	162.30	11.2	12.6	0.22	23.6	0	66.1	7.9	8.4	2.3	197.84	0.17
63	Jammu	Khaur	Palatan	7.1	552	342.24	0	251.59	206.22	12.12	20.3	0.13	37.9	0	77.1	13.3	13.3	2.2	247.62	1.65
64	Jammu	Khaur	Palanwala	7.49	787	487.94	0	410.00	336.07	37.8	43.2	0.27	44.1	1.6	103.1	22.4	31.8	38.3	350.16	0.66
65	Jammu	Khaur	Lam	7.7	623	386.26	0	410.48	336.46	11.3	7.1	0.19	5.2	3.3	105.9	12.3	10.1	15.9	315.49	0.88
66	Jammu	Khaur	Gigrial	6.78	1242	770.04	0	410.00	336.07	70	118	0.35	100	0.6	117	27.7	39.2	92.3	406.77	5.4
67	Jammu	Samwan	Baradow	7	675	418.5	0	423.70	347.30	16.7	28.7	0.13	16.6	0	125.2	15.6	17.3	2.9	377.36	3.17
68	Jammu	Samwan	Jogwan	7.1	765	474.3	0	225.10	184.51	22.7	59.2	0.2	31.4	0	69.5	10.7	24.3	14.2	217.89	0.94
69	Jammu	Samwan	Kalah	7.8	843	522.66	0	384.00	314.75	44.1	97.4	0.79	54.9	0	106.4	29.1	56.5	3.3	386.05	6.13
70	Jammu	Jammu	Karnail Chak	8.32	397	246.14	26.04	119.17	141.08	9.8	12.9	0.17	14.7	0	36.3	16.2	9.2	3.2	157.58	1.03
71	Jammu	Jammu	Sohanjana	7.22	756	468.72	0	225.00	184.43	20.6	11.7	0.18	44.1	0	51.9	24.8	14.5	4.1	232.06	3.97
72	Jammu	Jammu	Makwal	8.31	270	167.4	26.04	105.93	130.23	7.7	3.2	0.12	10.8	0	30.6	13.4	9.4	2.7	131.78	2.4
73	Jammu	Jammu	Lalyal	8.33	565	350.3	26.04	172.14	184.50	20.2	10.4	0.13	33.3	0	44.4	23.7	18.9	5.9	208.77	1.8
74	Jammu	Jammu	Trikuta Nagar	6.98	602	373.24	0	305.00	250.00	30	87.7	0.33	25	0	59	34	34	11	287.76	4.4
75	Jammu	Jammu	Greater Kailash	8.34	560	347.2	13.02	172.14	162.80	17.1	40.2	0.15	21.6	0	62.2	12.9	13.9	2.8	208.72	2.99
76	Jammu	Jammu	Kaluchak	8.5	755	468.1	78.12	331.00	401.51	16.9	4.9	0.54	25.6	0	19.6	39.9	102.1	5.8	213.60	1.23
77	Jammu	Bishna	Palli	8.36	931	577.22	39.06	291.00	303.62	45.8	21.5	0.93	45.4	0	24.9	53.6	72.2	5.8	283.37	12.06
78	Jammu	Bishna	Bishnah	8.41	727	450.74	26.04	145.65	162.79	12.6	3.1	0.51	29.6	0	43.5	18.5	12.3	2.2	185.07	1.35
79	Jammu	R.S.Pora	Miran Sahib	8.35	1270	787.4	13.02	118.00	118.42	69.2	153.2	0.55	65.1	0	51	42.9	53.4	3	304.48	1
80	Jammu	R.S.Pora	Bera	7.27	544	337.28	0	158.00	129.51	8.3	9.3	1.04	28.7	0	30.4	17.3	8.7	11.5	147.37	1.1
81	Jammu	R.S.Pora	Bega	8.43	625	387.5	13.02	185.38	173.65	8.5	6.4	1.06	25.5	0	23.4	28.1	21.9	2.7	174.42	3.3
82	Jammu	R.S.Pora	Agre Chak	7.34	680	421.6	0	198.00	162.30	11.7	10.9	0.76	37.1	0	29.9	27.3	15.3	1.7	187.37	2.69
83	Jammu	R.S.Pora	Suchetgarh II	7.46	1236	766.32	0	476.00	390.16	58.4	6.9	1.9	63.9	0	10.8	70.7	109	4.6	318.67	2.9
84	Jammu	R.S.Pora	Sei Khurd	7.55	560	347.2	0	291.00	238.52	7	3.2	0.64	5.7	0	20.8	30.4	37.9	3.1	177.41	10.3
85	Jammu	R.S.Pora	Nikowal	8.42	608	376.96	39.06	278.00	292.97	8.2	3.2	1.23	7.77	0	14.7	25.9	74.8	2.9	143.60	1.1
86	Jammu	Bishna	Kotli Charkan	7.45	778	482.36	0	118.00	96.72	46	3.3	0.67	49.5	0	12.5	29.3	23.2	14.3	152.12	14.7
87	Jammu	Bishna	Laswara	8.45	395	244.9	13.02	52.97	65.11	13.5	3.3	0.96	30.3	0.89	22	9.2	10.5	3.7	92.95	0.588
88	Jammu	Bishna	Salehar II	8.33	1000	620	52.08	198.62	249.60	44.1	6	1.21	64	0	22.7	34.9	33.9	82.3	200.73	1.4
89	Jammu	Bishna	Kothey Saini	8.39	1130	700.6	13.02	211.86	195.36	74.2	154.3	1.76	75.7	0	74	39.9	60.9	7.1	349.60	2.05
90	Jammu	Bishna	Khairi (Bishnah)	8.42	1471	912.02	143.2	225.10	423.21	84.9	60.1	0.61	68.6	0	10.8	56.9	109.1	110.6	261.74	4.4
91	Jammu	Bishna	Allah	8.45	1487	921.94	39.06	317.79	325.59	74.9	16.9	0.37	134.7	0	42	53.9	60.6	81.7	327.36	3.88
92	Jammu	Bishna	Rehal	8.32	505	313.1	13.02	172.14	162.80	18.9	36.6	0.68	33.7	0	53.6	16.8	23.1	10.2	203.31	0.896

Sr. No.	District	Block	Location	pH	EC (µs/cm at 25° C)	TDS	CO3 (mg/l)	HCO ₃ (mg/l)	Total Alkalinity	Cl (mg/l)	NO3 (mg/l)	F (mg/l)	SO4 mg/l	PO4 (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	TH CaCO3 (mg/l)	U (µg/l)
93	Kathua	Billawar	Ramkot	7.28	755	468.1	0	344.00	281.97	34	6.9	0	36	0.28	84	24	29	12.6	309.01	2.7
94	Kathua	Billawar	Nagrota°Gujroo	7.19	1280	793.6	0	529.65	434.14	115.6	27.9	0.19	63.1	0	110	37.6	111.4	22.2	430.12	1.79
95	Kathua	Billawar	Lakri	7.59	679	420.98	0	238.00	195.08	43.2	26.5	0.89	31.8	0	63.1	19	33.7	9.4	236.13	1.7
96	Kathua	Billawar	Mandli	7.28	950	589	0	384.00	314.75	62.7	11.7	0.27	31.7	0	74	26	70	15.5	292.26	2
97	Kathua	Billawar	Phinter	7.01	468	290.16	0	215.00	176.23	35.3	62	0.2	21.8	0	62.8	20.1	23.3	12	239.92	0
98	Kathua	Billawar	Billawar	7.23	749	464.38	0	370.76	303.90	33	30	0.15	12.1	0	80.5	18.8	38.5	10.7	278.81	0
99	Kathua	Billawar	Pallan	6.97	382	236.84	0	172.14	141.10	17.1	7.2	0.15	14.3	0	48	9	14	5	157.13	0
100	Kathua	Hiranagar	Naran	8.51	287	177.94	13.02	264.83	260.48	6.8	6.2	0.23	9.1	0	48.3	25.6	19.8	2.7	226.36	2.13
101	Kathua	Hiranagar	Kootah	8.46	567	351.54	13.02	291.31	141.09	14.8	27.5	0.22	20.9	0	77	15.4	30.2	9.4	256.03	0.067
102	Kathua	Hiranagar	Nichla	8.35	348	215.76	13.02	145.65	217.06	6.8	9.2	0.14	7.2	0	43	8.3	7.7	1.9	141.74	1.14
103	Kathua	Hiranagar	Patyari	8.42	623	386.26	13.02	238.34	129.90	21.3	6.4	0.3	13.7	0	60	18.1	21.7	3.1	224.67	2.5
104	Kathua	Hiranagar	Lokli	8.32	271	168.02	13.02	132.00	173.34	6.9	6.9	0.2	8.4	0	48.1	4.9	6.1	2.1	140.46	0
105	Kathua	Hiranagar	Nauni	8.71	362	224.44	13.02	185.00	184.00	14.6	8.3	0.16	17.9	0	56.9	10.9	9.1	6.4	187.22	0.46
106	Kathua	Hiranagar	Phalora	8.3	813	504.06	39.06	238.34	217.06	23.8	9.8	0.54	39.9	0	19.4	24.7	82.4	2.8	150.40	3.4
107	Kathua	Hiranagar	Madun	8.77	665	412.3	13.02	238.34	141.09	26.5	24.8	0.38	17.2	0	28.1	33.1	37.8	3.6	206.80	12.59
108	Kathua	Hiranagar	LaleChak	8.56	538	333.56	13.02	145.65	238.91	35.2	4.9	0.31	21.4	0	35	16	25.1	2.5	153.51	4.9
109	Kathua	Hiranagar	DulmeChak	8.34	431	267.22	13.02	265.00	552.72	5.6	4.7	0.22	4.7	0	53.6	18.5	18	2.1	210.32	2.56
110	Kathua	Hiranagar	Londi	8.3	1384	858.08	91.14	489.00	151.60	95.4	179.3	1.05	136.9	0	84.3	104.2	157.3	24.3	640.62	8
111	Kathua	Hiranagar	Chan Khatriya	8.39	282	174.84	26.04	132.00	151.94	8.6	14.2	0.22	9.1	0	50.1	7.2	11.8	3.1	154.95	0.39
112	Kathua	Hiranagar	Feruchak	7.59	471	292.02	0	304.55	195.08	10.9	13.9	0.35	13	0	73.6	14.5	16.1	2.2	243.82	2.09
113	Kathua	Hiranagar	Jandi	7.82	818	507.16	0	238.00	704.32	41.9	84.1	0.32	37.8	0	63.9	21.8	54.8	3.4	249.68	1.3
114	Kathua	Hiranagar	Karol Krishna	8.72	1837	1138.94	117.18	621.00	249.62	131	19	1.03	118.2	0	27	65	176.2	275.8	335.65	8.9
115	Kathua	Hiranagar	GanguChak	8.31	1953	1210.86	26.04	251.59	141.09	212.2	275.6	0.39	147.5	0	128.4	78.5	124	15.1	644.84	5.89
116	Kathua	Kathua	Lakhanpur Fort	6.5	324	200.88	0	132.00	108.20	16.7	17.1	0.47	25.6	3.44	39.3	8.7	16.1	6.4	134.14	0
117	Kathua	Kathua	Jindore	6.15	480	297.6	0	198.62	162.80	11.3	12.2	0.81	17.3	4.22	53.6	9.9	14.7	3.6	174.84	0.26
118	Kathua	Kathua	Barni	6.9	470	291.4	0	198.62	162.80	9.9	8.5	0.94	7.3	0	43.1	12.6	12.2	2.3	159.73	0
119	Kathua	Kathua	KerianGandyal II	7.55	600	372	0	211.86	173.66	16.6	5.9	0.89	29.7	0	50.5	16.9	13.8	7.4	195.97	0.55
120	Kathua	Kathua	KerianRamnagar	7.32	772	478.64	0	238.34	195.36	10.4	5.7	0.89	84.7	0	72.9	22.9	11.4	6.1	276.72	12.3
121	Kathua	Kathua	Kathua	7.15	394	244.28	0	185.38	151.95	25.5	11.4	0.59	22.7	0	35.3	9.2	43.8	5.9	126.20	0
122	Kathua	Kathua	Kothian	6.8	315	195.3	0	132.00	108.20	17.8	31.7	0.48	29.7	0	46.1	10.9	13.4	2.4	160.22	0
123	Kathua	Kathua	NankeChak	6.9	248	153.76	0	119.17	97.68	14.6	30.1	0	23.9	3.43	42	8.4	11.8	6.7	139.65	0
124	Kathua	Kathua	Khukhial	7.96	900	558	0	529.65	434.14	46.4	10.3	0.63	33.4	0	115	28	41.7	51.1	403.01	1.45

Sr. No.	District	Block	Location	pH	EC (µs/cm at 25° C)	TDS	CO3 (mg/l)	HCO ₃ (mg/l)	Total Alkalinity	Cl (mg/l)	NO3 (mg/l)	F (mg/l)	SO4 mg/l	PO4 (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	TH CaCO3 (mg/l)	U (µg/l)
125	Kathua	Kathua	Nagri	7.58	397	246.14	0	212.00	173.77	9.8	5.1	0.92	19.2	0	34	18	17.5	7.1	159.26	0.08
126	Kathua	Kathua	Gond More	7.55	550	341	0	145.00	118.85	15.3	8.3	0.73	8.2	0	23.5	12.9	17.3	5.3	111.97	0.97
127	Kathua	Hiranagar	Jasath	7.59	595	368.9	0	251.00	205.74	23.2	16.4	1.31	20	0	50.2	25.3	17	4.3	229.87	1.2
128	Kathua	Hiranagar	Sanoora	6.82	402	249.24	0	158.90	130.24	11.3	3.1	0.49	9.7	0	34	16	3.3	1.4	151.01	1.48
129	Kathua	Hiranagar	Raghu Chak	7.39	463	287.06	0	172.14	141.10	10.2	7.1	0.56	12.6	0	44	15	0.36	2	171.88	1.25
130	Kathua	Hiranagar	Chanranga	6.82	271	168.02	0	146.00	119.67	6.6	6.9	0.42	8.6	0	42	6.8	2.5	1	133.05	0
131	Kathua	Hiranagar	Chapki Kalan	6.58	320	198.4	0	172.00	140.98	6.6	11.5	0.47	9.9	0	47	11.6	0.38	1.8	165.35	0
132	Kathua	Hiranagar	Khanpur	6.99	364	225.68	0	185.38	151.95	9.3	11.9	0.57	11.3	0	51	12	2.5	1.4	177.00	0.5
133	Kathua	Hiranagar	Chakhariya	6.99	368	228.16	0	185.38	151.95	6.5	8.3	0.32	8.1	0	52	10	0.38	1.5	171.25	0.5
134	Kathua	Kathua	Mukandpur	7.12	860	533.2	0	476.69	390.73	25.9	30.5	0.78	16.5	0	90	20	37	71.6	307.51	0.7
135	Kathua	Kathua	Kotepanu	6.85	557	345.34	0	225.10	184.51	10.6	5.5	0.54	42.8	0	66	16	2.6	5.7	231.01	0.19
136	Kathua	Hiranagar	Pansar	7.21	782	484.84	0	410.48	336.46	8.7	7.9	0.72	8.4	0	32	37.2	50.9	8.9	233.47	8
137	Kathua	Kathua	Hore	6.55	296	183.52	0	145.65	119.39	8.9	14.8	0.76	10.4	0	43	10.1	0.39	0.73	149.17	0.045
138	Kathua	Hiranagar	Konthal	7.03	790	489.8	0	291.31	238.78	43.3	54	1.04	33.4	0	80	27	31.2	3.9	311.39	2.4
139	Kathua	Hiranagar	Chakara	7.7	286	177.32	0	158.90	130.25	8.1	10.2	0.54	18.6	0	41.9	6.9	14.5	1.2	133.22	0.97
140	Kathua	Kathua	Patitari	6.58	238	147.56	0	132.00	108.20	7.9	9.3	0.56	14.3	0	44.1	6.6	2.3	0.9	137.48	0
141	Kathua	Kathua	Sumwan	6.92	442	274.04	0	158.90	130.24	7.4	10.2	0.47	18.5	0	42	12	2.9	1.8	154.50	1.5
142	Kathua	Hiranagar	Bhagwal	6.66	456	282.72	0	251.59	206.22	9.5	18.3	0.54	12.4	0	68	16	3.2	1.3	236.01	0
143	Kupwara	Rajwar	Palpoora	7.1	310	192.2	0	185.38	151.95	13.8	7.8	0.64	7.38	0	37	11	18	3.7	137.88	0.22
144	Kupwara	Handwara	Chowgal	8.36	560	347.2	26.04	92.69	119.37	10.6	9.1	0.37	17.8	0	26.2	19	8.7	1.3	143.88	1.8
145	Kupwara	Handwara	HandwaraAlmustafa Colony	6.8	410	254.2	0	172.14	141.10	28.6	5.7	0.69	16.5	0	44.6	11.3	23.6	1.8	158.12	0.32
146	Kupwara	Kupwara	Bramri	6.95	980	607.6	0	225.00	184.43	127.6	49.1	0.54	58.6	0	57.5	34.1	84.3	9.2	284.43	0.3
147	Kupwara	Kupwara	Drugmulla	8.45	350	217	13.02	185.38	173.65	13.2	8.8	0.36	10.1	0	62.2	8.2	11.4	2.1	189.33	0.23
148	Kupwara	Kupwara	Kupwara Main Chowk	7.32	408	252.96	0	198.62	162.80	34.4	8.4	0.87	13.9	0	29.5	16.5	38.7	3	141.82	1.04
149	Kupwara	Kupwara	Guse	8.35	391	242.42	26.04	185.38	195.35	23.6	37.1	1.19	16	0	75.9	13.5	15.8	2.1	245.44	0.19
150	Poonch	Balakot	A T Coy, BG	8.76	509	316	52	340.00	365.36	14.4	3.50	1.19	13.90	ND	22.5	12.2	128.3	4.7	106.46	1.840
151	Poonch	Surankote	Daraba	7.5	357	221	0	198.00	162.30	23.6	14.20	0.34	28.40	ND	66.9	10.7	14.8	2.1	211.28	0.000
152	Pulwama	Pulwama	Gandhasi Bhat	7.63	411	254.82	0	264.00	216.39	7.3	22.1	0.33	2.8	0	49	15.4	23.8	2.4	186.03	0.57
153	Pulwama	Tral	Tral	7.65	618	383.16	0	212.00	173.77	20.8	23.9	0.41	7.9	0	61.3	13.5	9.3	1.8	208.94	1.6
154	Pulwama	Pulwama	Sambura Kakapora	6.97	965	598.3	0	357.00	292.62	29.6	15	0.46	31.9	0	89.6	26.4	25.2	2.7	332.91	4.1
155	Rajouri	sunderbani	Banpari	6.9	629	389.98	0	423.72	347.31	10	11.8	0.34	12.74	0	101.7	19.8	17.2	7.8	335.93	1.14
156	Rajouri	sunderbani	Ainpur	8.2	392	243.04	0	264.83	217.07	9.9	5.6	0.33	10	0	58	14.9	18.8	6.9	206.47	0.417

Sr. No.	District	Block	Location	pH	EC (µs/cm at 25° C)	TDS	CO3 (mg/l)	HCO ₃ (mg/l)	Total Alkalinity	Cl (mg/l)	NO3 (mg/l)	F (mg/l)	SO4 mg/l	PO4 (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	TH CaCO3 (mg/l)	U (µg/l)
157	Rajouri	Dhok Baniar	Dhok Baniar	6.89	866	536.92	0	423.00	346.72	21.8	12.5	0.22	16.2	0	86.8	27.7	30	13.1	331.27	2.67
158	Rajouri	bajabain	Bajabain	7.93	830	514.6	0	490.00	401.64	21	18.5	0	15	0	88	25	47	15	323.14	1.87
159	Rajouri	Bajabain	Kangri (grid Station)	6.64	666	412.92	0	370.76	303.90	16.5	7.1	0.18	23.4	0	90	21.1	21.6	7.1	312.05	3.83
160	Rajouri	Seri	Jabah	6.73	734	455.08	0	303.00	248.36	26.3	6.9	0.25	25.3	0	70.6	23.4	22.6	6.8	273.03	2.78
161	Rajouri	Seri	Sial	6.32	598	370.76	0	397.00	325.41	7.8	10.9	0.44	11	0	92.1	18.6	21.6	7.1	306.98	2.75
162	Rajouri	Seri	Ding	8.3	488	302.56	0	225.10	184.51	20.5	29.4	0.36	27.3	0	53	17	25.4	8.4	202.63	3.6
163	Rajouri	Seri	Kalal	6.62	728	451.36	0	305.00	250.00	17.1	31.9	0.18	19.1	0	59.5	25.8	28.5	8.1	255.19	2.07
164	Rajouri	seri	Seri	6.74	759	470.58	0	410.48	336.46	20.8	17.9	0.34	32.4	0	105.1	24.8	26.1	7.5	365.06	3.3
165	Rajouri	Seri	Gagrote	8.2	717	444.54	0	397.00	325.41	10.6	8.9	0.14	32	0	74.6	30.3	32.8	6.8	311.50	2.75
166	Rajouri	Seri	Rumli Dara	6.85	663	411.06	0	423.72	347.31	15.9	11.2	0.39	24.5	0	101.6	23.8	24.8	7.4	352.18	1.9
167	Rajouri	Seri	Bareri	6.83	1678	1040.36	0	490.00	401.64	209	82	0.66	85	0	158	59	97	31	638.40	18
168	Rajouri	lamberi	Bagnoti	6.98	862	534.44	0	305.00	250.00	68.7	36.6	0.24	40.6	0	91	23	44	12.5	322.38	4.76
169	Rajouri	Siot	Siot	6.57	601	372.62	0	384.00	314.75	19.3	12.2	0.3	19.3	0	94	19.9	20.7	9.4	317.10	3.28
170	Rajouri	sunderbani	Thangrot	6.84	684	424.08	0	370.76	303.90	22.7	12.6	0.23	19.2	0	83.7	26.8	25.4	2.3	319.81	1.5
171	Rajouri	Nowshera	Chowki Handa	8.22	559	346.58	0	264.83	217.07	24.3	28.8	0.26	30.1	0	83.9	16.9	15.2	2.2	279.47	0.72
172	Rajouri	Nowshera	Kalsian	8.32	460	285.2	13.02	225.00	206.13	12.1	12.2	0.41	15.1	0	68	11.42	12.5	2.5	217.11	1.42
173	Rajouri	Nowshera	Jhangar	8.71	1079	668.98	13.02	357.00	314.32	69.9	118.6	0.26	56.4	0	109.7	45.7	53.3	5.9	462.78	1.22
174	Rajouri	Quilla Darhal	Laroka	8.44	747	463.14	13.02	410.48	358.16	40.5	4.8	0.22	21.7	0	121.9	14.8	34.4	2.5	365.81	2.15
175	Rajouri	Quilla Darhal	Lam	7.88	516	319.92	0	238.00	195.08	25.4	25.3	0.22	48.3	0	79.6	16.7	12.8	11.1	267.89	1.27
176	Rajouri	Quilla Darhal	Phukarni	7.99	800	496	0	317.79	260.49	15.2	13.1	0.23	13.4	0	61.5	23.8	23.2	3	251.93	1.78
177	Rajouri	Quilla Darhal	Darhal Quilla	8.2	441	273.42	0	264.83	217.07	10.3	14.5	0.3	15	0	79.5	7.4	6.9	3.8	229.28	1.2
178	Rajouri	Quilla Darhal	Bhatta Morh	7.7	622	385.64	0	304.55	249.63	9.5	7.8	0.35	11.2	0	58.5	16.4	28.2	2.8	213.91	2.4
179	Rajouri	Siot	Bakhar	8.15	586	363.32	0	185.38	151.95	11.2	15.6	0.34	18.6	0	48	11.7	11.4	2.4	168.27	1.7
180	Rajouri	Siot	Dharamsal	7.81	937	580.94	0	476.00	390.16	31.4	23.8	0.25	21.4	0	47.7	61.7	47.7	6	373.79	0
181	Rajouri	Kalakote	Lower Kharak	7.44	757	469.34	0	264.83	217.07	12.7	13.6	0.16	11.4	0	49.8	22.5	17.2	2.9	217.32	3.45
182	Rajouri	Kalakote	Solki	7.94	804	498.48	0	370.00	303.28	19	17	0.26	16.8	0	88.1	25.3	20.6	5.3	324.62	1.7
183	Rajouri	Kalakote	Panja	8.7	883	547.46	26.04	198.00	205.70	30.3	33.9	0.31	27.1	0	67.5	24.7	18.9	3.1	270.65	2.64
184	Rajouri	Kalakote	Dyala	8.3	474	293.88	13.02	264.00	238.09	9.2	14.8	0.18	11.66	0.25	84.8	9.9	11.9	2.4	252.84	0.75
185	Rajouri	Dhangri	Potha	7.88	714	442.68	0	225.10	184.51	13.8	23	0.26	17.9	0	53.2	16.8	17.8	4.8	202.31	1.67
186	Rajouri	Manjakote	Chittiar	8.34	401	248.62	13.02	158.00	151.21	6.2	3.3	0.17	5.7	0	44	9.8	8	1.4	150.43	0.157
187	Rajouri	Nowshera	Nariyan	8.35	443	274.66	13.02	172.14	162.80	12.6	9.2	0.18	9.6	0	47.3	12	10.9	2.6	167.75	0.393
188	Rajouri	Nowshera	Naunihal	6.76	840	520.8	0	238.00	195.08	29.2	36	0.25	29.3	0	53.5	25.7	28.8	2.7	239.77	4

Sr. No.	District	Block	Location	pH	EC (µs/cm at 25° C)	TDS	CO3 (mg/l)	HCO ₃ (mg/l)	Total Alkalinity	Cl (mg/l)	NO3 (mg/l)	F (mg/l)	SO4 mg/l	PO4 (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	TH CaCO3 (mg/l)	U (µg/l)
189	Rajouri	siot	Channi Parat	8.33	498	308.76	13.02	211.86	195.36	20.9	13.9	0.41	12.5	0	57.4	13.2	19.6	2.6	197.96	3
190	Rajouri	siot	Marchola	8.52	609	377.58	13.02	251.59	227.92	13.4	15	0.14	13.3	0	76.6	11.5	12.3	2.9	238.94	0.79
191	Rajouri	Siot	Thandapani	8.59	618	383.16	13.02	198.00	184.00	19.9	12.1	0.16	20.1	0	61	11.7	21.3	1.6	200.77	2.9
192	Rajouri	Sunderbani	Salote	8.1	526	326.12	0	251.00	205.74	37.9	14.1	0.42	28.8	0	81.2	17.8	14.7	1.9	276.43	1
193	Rajouri	Darhal Qilla	Darhal Qilla	8.85	838	520	52	370.00	389.95	25.9	4.70	0.15	19.20	ND	13.9	9.9	160	7.8	75.49	1.270
194	Rajouri	Naushera	Jhanger	8.40	430	267	26	225.00	227.76	7.7	3.10	0.17	11.30	ND	29.3	24.2	40	2	172.84	1.130
195	Rajouri	Naushera	Jhanger	6.86	630	391	0	478.00	391.80	15.4	5.10	0.38	14.40	ND	100.5	26.0	41.1	1.4	358.25	0.270
196	Ramban	Ramban	Kunfer (Chandrakot)	7.10	602	373	0	212.00	173.77	15.6	31.10	0.27	93.80	ND	57.7	37.6	5.9	5.1	298.98	0.430
197	Reasi	Reasi	Dhanu Kannal	7.8	632	391.84	0	357.52	293.05	5.4	3.6	0.13	5.9	0	83.6	22.2	5.9	6.6	300.58	2
198	Reasi	Reasi	Talwara	7.98	652	404.24	0	436.96	358.17	8.3	19.2	0.18	12.8	0	93	36.5	6	8.3	383.08	0.89
199	Reasi	Reasi	Reasi	7.9	918	569.16	0	662.07	542.68	22.4	6.1	0.24	12.1	0	88	78	17.1	24.1	541.78	0.55
200	Reasi	Pouni	Dadua	7.95	774	479.88	0	370.76	303.90	22.5	11.5	0.18	13.4	0	93.5	21.4	18.6	6.8	322.03	1.5
201	Reasi	Pouni	Garan Jagir	7.97	651	403.62	0	436.96	358.17	9.5	8.4	0.33	16.2	0	99.3	25.8	22.6	7.4	354.69	5.2
202	Reasi	Pouni	Nanora	7.64	861	533.82	0	542.89	445.00	15	11.6	0.28	15.2	0	120.5	28.8	26.5	15.4	420.06	1.5
203	Reasi	Pouni	Aliyah	8.29	693	429.66	0	384.00	314.75	8.18	8.5	0.24	9.8	0	103	17.2	9.2	2.3	328.46	0.58
204	Reasi	Pouni	Bhamla	7.82	805	499.1	0	423.72	347.31	38.8	14.5	1.9	36.1	0	66.8	23.9	88.6	7.1	265.60	5.5
205	Reasi	Arnas	Thanpal SDT step1	7.19	610	378	0	271.00	222.13	88.6	5.80	0.48	6.30	ND	63.5	24.8	49.6	2.5	260.81	0.221
206	Reasi	Arnas	Thanpal SDT step2	7.18	620	384	0	268.00	219.67	89.5	12.50	1.18	6.50	ND	66.3	24.4	48.5	2.9	266.16	0.050
207	Reasi	Arnas	Thanpal SDT step3	7.17	620	384	0	278.00	227.87	89.1	11.80	1.10	6.60	ND	66.5	24.5	48.2	2.8	267.07	0.006
208	Reasi	Arnas	Thanpal APT 1	7.18	630	391	0	291.00	238.52	89.2	12.90	1.02	6.60	ND	67.1	24.6	48.3	2.7	268.98	0.020
209	Reasi	Arnas	Thanpal APT 2	7.23	630	391	0	305.00	250.00	88.5	3.90	0.41	6.70	ND	70.3	24.7	47.7	2.5	277.40	0.008
210	Reasi	Pouni	Dadua 120 min	6.99	649	402	0	280.00	229.51	15.8	8.70	0.50	16.80	ND	68.9	12.6	20.4	1.2	224.10	2.830
211	Reasi	Pouni	Dadua 300 Min	7.01	705	437	0	476.00	390.16	15.4	8.20	1.20	15.90	ND	130.5	13.1	20.5	1.4	380.16	3.030
212	Reasi	Reasi	Panasa	7.45	370	229	0	146.00	119.67	15.3	6.10	0.53	38.00	ND	25.3	25.0	5.8	0.9	166.22	Nil
213	Samba	Samba	Sagoon	7.45	735	455.7	0	421.00	345.08	19.1	16.2	0.15	13.9	0	91.7	14.6	41.9	8.8	289.48	11.4
214	Samba	Samba	Sidhra	7.75	1058	655.96	0	450.21	369.02	36.9	89	0.21	61	0	125.1	21.1	59	7.7	399.80	18.96
215	Samba	Samba	Rangoora	7.85	735	455.7	0	390.00	319.67	18.4	38.3	0	26.9	0	100.3	28.9	6.2	7.7	369.97	4.14
216	Samba	Samba	Birpur	8.37	349	216.38	13.02	172.14	162.80	12.6	14.9	0.27	9.7	0	57.8	7.3	9.7	2.6	174.62	1.47
217	Samba	Samba	Patli	8.6	842	522.04	104.1	290.00	411.30	43.9	14.5	0.85	38.1	0	12.5	22	191.6	5.1	122.01	0.98
218	Samba	Samba	Kamila	8.33	346	214.52	26.04	132.00	151.60	10.3	6.7	0.31	17.1	0	52.5	6.5	11.4	3.1	158.07	1.04
219	Samba	Samba	Nagrota Uttarbani	8.32	860	533.2	26.04	172.14	184.50	58.6	120	0.44	50.4	0	89	27.2	31.2	22.8	334.71	4.6
220	Samba	Samba	Uttarbani	8.31	619	383.78	39.06	158.90	195.34	20.6	3.7	0.16	21.1	0	27.2	33.4	18.8	9.2	205.79	1.88

Sr. No.	District	Block	Location	pH	EC (µs/cm at 25° C)	TDS	CO3 (mg/l)	HCO ₃ (mg/l)	Total Alkalinity	Cl (mg/l)	NO3 (mg/l)	F (mg/l)	SO4 mg/l	PO4 (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	TH CaCO3 (mg/l)	U (µg/l)
221	Samba	Samba	Supwal	8.42	815	505.3	13.02	251.00	227.44	36.2	42.1	0.21	18.6	0	66	24	34.3	3.9	264.01	2.79
222	Samba	Samba	Kainthpur	8.41	759	470.58	39.06	119.00	162.64	16.6	11.5	0.22	12.3	0	45	14.5	16	2.2	172.32	3.4
223	Samba	Samba	Bassi Kalan	8.41	753	466.86	26.04	158.90	173.64	34.3	14.4	0.17	14.8	0	40.7	24.7	17.5	3.9	203.65	4.7
224	Samba	Samba	Upperla Kanhal	8.32	1372	850.64	39.06	410.00	401.17	80.9	10.9	0.34	45.2	0	60	38	127.5	3.1	306.77	2.28
225	Samba	Samba	Raiyan	9.03	361	223.82	13.02	198.00	260.49	8	13.8	0.536	7.7	0	57.4	8.7	14.8	3.1	179.39	1.5
226	Samba	Samba	Sadoh	8.23	707	438.34	0	317.79	314.75	25.7	59.4	0.28	33	0	76.8	30.3	24.7	5.8	317.00	1.98
227	Samba	Samba	Pangdour	8.25	519	321.78	0	384.00	281.97	8.4	10.8	0.61	17.8	0	87.9	20.1	16.9	4.4	302.67	1.85
228	Samba	Samba	Benglar	8.22	1111	688.82	0	344.00	260.46	62.5	91.3	0.36	79.2	0	32.1	35	144.3	4.7	224.64	1.02
229	Samba	Samba	Painthi	8.31	274	169.88	13.02	158.90	151.94	9.2	9.2	0.21	11.8	0	59.3	5.1	7.9	2.5	169.29	0.08
230	Samba	Samba	Dhora	8.48	610	378.2	13.02	158.90	151.95	30.5	12.4	0.74	50.9	0	49.9	14.2	24.8	13.8	183.33	3.08
231	Samba	Samba	Nud	8.28	733	454.46	0	185.38	249.63	52.6	26.3	0.26	55.3	0	68.5	13.3	31.9	5.2	226.12	13.3
232	Samba	Samba	Majua Laxmi	8.35	962	596.44	26.04	211.86	217.06	43	41.7	0.68	73.1	0	30	45.6	23.6	47.5	263.12	0.98
233	Samba	Samba	Nandpur	7.22	1330	824.6	0	384.00	314.75	54.4	132.3	0.4	96.7	0	84.8	43.3	72.1	39.6	390.63	0
234	Samba	Samba	Gho Brahmna	8.49	1870	1159.4	39.06	79.45	130.22	216.8	264.3	0.87	181.5	0	17.7	105.5	162.3	9.8	479.48	0.76
235	Samba	Samba	Gho Rakawalan	8.54	1218	755.16	78.12	118.00	226.92	92.8	7.2	0.7	26.4	0	10.2	47.8	83.5	3.1	222.69	10.4
236	Samba	Samba	Mahal Kalandrian	8.46	1035	641.7	39.06	291.31	303.88	35.1	13.9	1.58	30.3	0	23.6	34.6	83.9	3.9	201.74	7.6
237	Samba	Samba	Didyal	8.35	590	365.8	13.02	185.38	173.65	14.1	3.1	0.94	7.1	0	37.9	13.9	19.9	2.2	152.09	0.14
238	Samba	Samba	Gudwal	7.31	535	331.7	0	198.00	162.30	31.9	5.7	0.22	12.5	0	33	16	28	8.4	148.51	0.65
239	Samba	Samba	Badheri Step 1	6.67	618	383	0	403.00	330.33	13.4	11.00	0.56	5.50	ND	93.3	17.9	19.7	2.7	306.91	1.600
240	Samba	Samba	Badheri Step 2	6.76	628	389	0	397.00	325.41	12.1	10.90	0.53	5.30	ND	95.1	18.2	19.6	2.6	312.65	1.680
241	Samba	Samba	Gujwal	7.50	290	180	0	215.00	176.23	9.4	3.10	0.74	16.80	ND	23.7	13.8	38.7	2.6	116.04	4.720
242	Samba	Samba	Badheri Step 1	7.60	380	236	0	385.00	315.57	13.6	10.20	1.32	5.60	ND	89.0	17.4	19.3	2.7	294.10	1.570
243	Samba	Samba	Badheri Step 2	7.59	370	229	0	385.00	315.57	13.0	10.40	0.98	5.50	ND	90.7	17.3	18.9	2	297.94	1.660
244	Srinagar	Srinagar	Regal Chowk	8.46	586	363.32	13.02	198.62	184.50	36.1	3.9	0.67	19.3	0	46.4	29.2	14.8	1.9	236.46	1.97
245	Srinagar	Srinagar	Rainawari	8.35	878	544.36	13.02	238.00	216.78	39.8	72.9	0.87	67.6	0	34.5	40.5	44.7	45.4	253.33	5.3
246	Udhampur	Udhampur	Battal Ballian	7.45	790	489.8	0	245.00	200.82	68.1	51.6	0.26	81.5	0	106.7	29.5	11.9	14.3	388.45	2.3
247	Udhampur	Udhampur	Phangyal	7.33	333	206.46	0	191.00	156.56	24.7	3.3	0.18	13.7	0	48.4	17.2	6.3	7.9	191.96	0.029
248	Udhampur	Udhampur	Talpad	7.29	331	205.22	0	205.00	168.03	15.6	3.6	0.13	11.4	0	46	15.9	6.2	7.3	180.59	1.4
249	Udhampur	Udhampur	Nagrota Panjgrain	7.5	422	261.64	0	258.20	211.64	11.6	7.7	0.2	10.8	0	60	20.4	6.1	7.6	234.16	0.45
250	Udhampur	Ramnagar	Dalsar	7.66	828	513.36	0	476.69	390.73	18.7	6.1	0.29	20.7	0	90	16	64	13.7	291.01	2.5
251	Udhampur	Ramnagar	Ramnagar	7.58	485	300.7	0	245.00	200.82	20.9	18.8	0	14.1	0.46	68.9	16.2	6	8.9	239.08	0.25
252	Udhampur	Ramnagar	Dehari	7.75	928	575.36	0	556.14	455.85	29.6	6.2	2.5	26.9	0	69	15.7	138.6	14.5	237.27	5.5

Sr. No.	District	Block	Location	pH	EC (µs/cm) at 25° C	TDS	CO ₃ (mg/l)	HCO ₃ (mg/l)	Total Alkalinity	Cl (mg/l)	NO ₃ (mg/l)	F (mg/l)	SO ₄ mg/l	PO ₄ (mg/l)	Ca (mg/l)	Mg (mg/l)	Na (mg/l)	K (mg/l)	TH CaCO ₃ (mg/l)	U (µg/l)
253	Udhampur	Ramnagar	Jallow	7.65	930	576.6	0	529.00	433.61	25.9	12.9	0.6	18.9	0	55	27.5	115	16.6	250.95	15.3
254	Udhampur	Udhampur	Ritti	7.76	814	504.68	0	516.41	423.29	16.8	6.5	0.66	14.6	0	48	16.65	129	14.8	188.69	7.1
255	Udhampur	Udhampur	Kuperlah	7.5	451	279.62	0	301.00	246.72	8.3	6.6	0.13	9.8	0	73.8	14.4	5.9	6.9	243.91	27.3
256	Udhampur	Udhampur	Badola	7.59	600	372	0	301.00	246.72	26.1	30.9	0.15	18.3	0	101	14.9	5.9	7.3	313.97	2.565
257	Udhampur	Udhampur	Jhakkar	7.04	376	233.12	0	252.00	206.56	13.3	4.2	0.18	14.9	0	60	14	17	7.9	207.76	0.34
258	Udhampur	Udhampur	Rakh Badali	7.57	354	219.48	0	278.00	227.87	8.7	3.1	0.34	7.5	0	55	15	24	8.1	199.38	0
259	Udhampur	Udhampur	Birmah	7.48	575	356.5	0	370.76	303.90	22.7	5.4	0.18	21.6	0	85	14.9	35.5	9.1	273.97	0.57
260	Udhampur	Udhampur	Garhi (Udh)	7.5	850	527	0	344.00	281.97	34.5	24.2	0.34	44	0	99	25	22	11	350.64	0.58
261	Udhampur	Udhampur	Kotli Pain	7.56	537	332.94	0	344.27	282.19	13.9	7.4	0.25	20.8	0	87.7	20.3	6.2	7.2	303.00	2.47
262	Udhampur	Udhampur	Seen Thakaran	7.71	662	410.44	0	423.00	346.72	6.7	3.6	0.12	11.9	0	76.2	22.6	30.9	7.5	283.73	0.11
263	Udhampur	Udhampur	Eastern Mand	7.67	887	549.94	0	450.21	369.02	39	36.4	0.28	33.6	0	108	24.7	53.8	14.8	371.90	2.5
264	Udhampur	Ramnagar	Manwall	7.05	575	356.5	0	338.00	277.05	17.1	15.9	0.09	8.9	0	98.6	15	6.1	7.1	308.38	1.8
265	Udhampur	Ramnagar	Chhani Mansar	7.16	648	401.76	0	423.00	346.72	8.7	4.1	0.28	9.9	0	93	20	16	7	315.01	2.6
266	Udhampur	Ramnagar	Salabra	7.3	581	360.22	0	317.00	259.84	9.3	4.5	0.24	11.6	0	68.7	22.1	6.1	6.7	262.92	2.9
267	Udhampur	Ramnagar	Sunal	7.18	621	385.02	0	357.00	292.62	14.6	6.5	0.16	17.6	0	84.6	23	6.1	6.7	306.38	2.9