

## Underground Water Quantity and Quality Assessment in Next Decade in Bilaspur District, Chhattisgarh

A. S. Majumdar

Research Scholar (Geology), Dr. C.V. Raman University, Kota, Bilaspur (Chhattisgarh)

### ABSTRACT

Water is most essential to life next to air and food. It is rather a part of life as the protoplasm of most living cells contain about 80% water and any major reduction in this percentage is highly detrimental. Over 70% of earth surface is covered with oceanic water which accounts of 97.2% of the total water resources present on the earth. Ocean water although, is not utilizable by man directly but it is useful in some of man's activities like navigation and renewable energy sources for welfare of mankind. The water which is essential to human life is the fresh water and it is 2.8% of the total water resources on the planet earth. Population growth and uncontrolled urbanization have created a water crisis in India, our lakes and ponds were once a natural way of recharging groundwater, but they are being destroyed through urbanisation. Our sewage goes untreated, so the rivers are contaminated. We used to be very good at managing water in India, but we are losing that ability. As a consequence of this increased groundwater withdrawal and erratic monsoon, the groundwater levels are declining in many parts of India including Madhya Pradesh as well as in Chhattisgarh region. The rapid growth of industrialization and urbanisation is the major cause of exploitation of groundwater on and average the groundwater level in Bilaspur city gone upto 30 feet down. Many places in the city, corporation people required in the summer season to down pump-motors due to down level of ground water. In the previous year, some places like Hemunagar and Chuchuhiapara, water level gone down to 30 feet and Bhartinagar, Nehrunagar, Juna Bilaspur, Sarkanda shown 10-15 feet more down of water level. It is being observed that this trend is followed year by year. The people of Bilaspur known that earlier when the Arpa river was not in course, even though the ground water was available at 20-30 feet very easily. Due to drying of river, the underground water level of Bilaspur is going down day by day, which is appearing as major problem to the growing population. By and large the growing city like Bilaspur in Chhattisgarh district is facing the problem of underground water present day and will be faced severe crisis in next decade. But the quality of underground water as data reveals that it is still remain same as was previous decades. Of course, the water quantity required for future can be managed through surface water by managing and saving river water from the encroachment and pollution.

**Keywords:** Protoplasm, Recharge, Urbanisation, Renewable.

Date of Submission: 08-May-2015

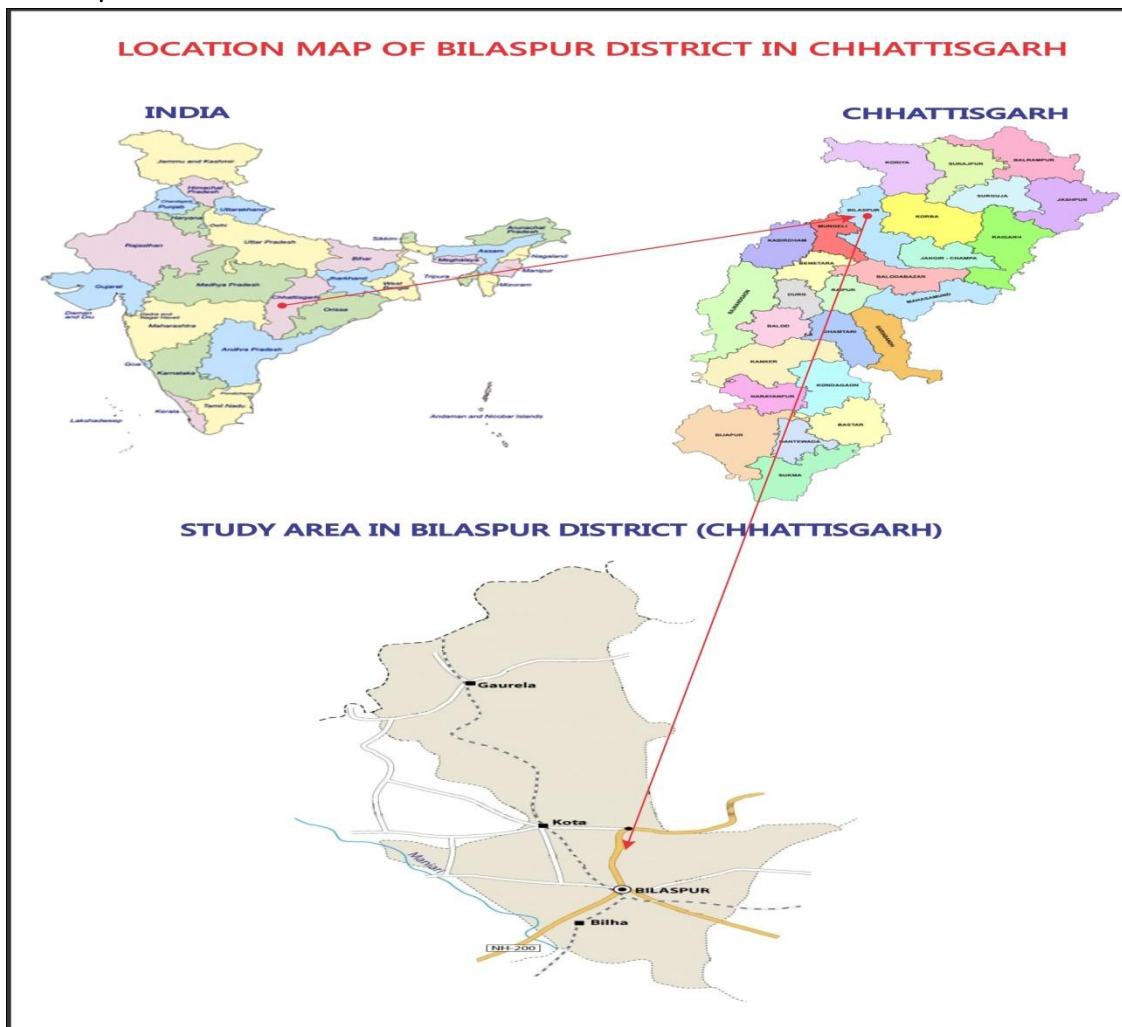


Date of Accepted: 25-May-2015

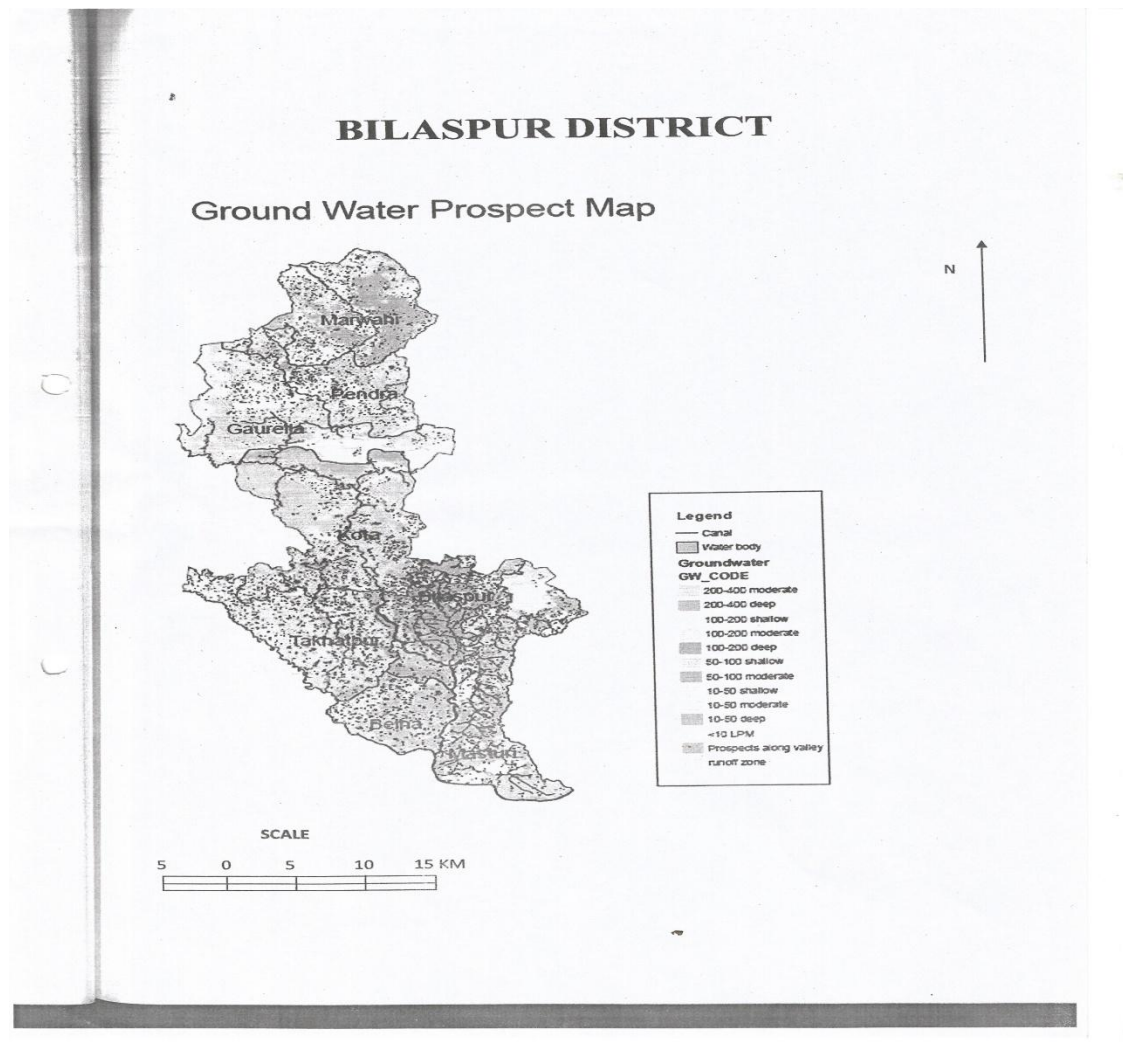
### I. INTRODUCTION

Water is most essential to life next to air and food. It is rather a part of life as the protoplasm of most living cells contain about 80% water and any major reduction in this percentage is highly detrimental. The man needs water to live life and share moments with other life. Water is one of the most stable chemical compounds, mother earth has ever produced and its history may date back to 3500 to 4000 million years, when the pristine global gases on surface comprising an ensemble of H<sub>2</sub>, O<sub>2</sub>, CH<sub>4</sub>, NH<sub>3</sub>, CO, CO<sub>2</sub> and N<sub>2</sub> must have made permutations and combinations to reach this stable chemical constituent. Water is one sense, is plentiful. Over 70% of earth surface is covered with oceanic water which accounts of 97.2% of the total water resources present on the earth. Ocean water although, is not utilizable by man directly but it is useful in some of man's activities like navigation and renewable energy sources for welfare of mankind. The water which is essential to human life is the fresh water and it is 2.8% of the total water resources on the planet earth. Of these fresh water, 2.2% is surface water and 0.6% is present in the form of ground water. 2.15% of fresh surface water is in the form of glaciers and icecaps and only 0.1% is present in lakes and reservoirs and 0.0001% in streams. Out of the total ground water 0.3% is utilizable economically and rest which occurs at depth below 800 m is uneconomical to mined (Raghunath, 1987). It is thus clear that about 0.4% of total water resources available on planet earth is available for direct utilization by man, animals and plants. As such, water is precious to man. The total water resources of the world are estimated at 1.36 X 10<sup>8</sup> million ham.

It has been estimated that out of 1460 millions acre feet of our river flows , only about 450 millions acre feet or one third can be utilized for irrigation . Ground water is that part of precipitation that soaks into the soil through the openings and keeps on moving underground.It is estimated that the average rainfall is about 30 inches . One can assume that one third of these enters into soil , i.e. 640,000 tonnes of water for every square mile. If half of these quantity could be extracted, it would yield continuous supply of one cusec for 136 days and this could be sufficient for irrigation of about 250 acres. It is well known that during 21<sup>ST</sup> century , this world is likely to face serious problems of energy, natural resources and environmental pollution. However, the greatest pressure of increasing population, agricultural and industrial growth is on the water resources and is thought to be one of the most critical factor in development. Water supply in Indian cities will fall 50 percent below demand by 2030, predicted a new U.N. Report launched in Delhi ahead of World Water Day on March 22. The report warns of an urgent need to manage the world's water, more sustainably and highlighted the problems of groundwater over extraction, particularly in India and China.It says, 20 percent of global ground water sources are already over exploited and warns the problem will only become more acute without better , management ,with demand expected to rise by 55 percent by 2050. Decades of population growth and uncontrolled urbanization have created a water crisis in India our lakes and ponds were once a natural way of recharging groundwater, but they are being destroyed through urbanisation.Our sewage goes untreated , so the rivers are contaminated. We used to be very good at managing water in India, but we are losing that ability . As a consequence of this increased groundwater withdrawal and erratic monsoon , the groundwater levels are decling in many parts of India including Madhya Pradesh as well as in Chhattisgarh region. Chhattisgarh is a new state, established in year 2000. Bilaspur region is one of the major part of this state achieving higher economic status. Keeping in view, the ill effects of the industrial activities , coalfields, urbanization and over exploration of ground water the present study is selected for research work. The geometric progression of population in urban and rural areas of Bilaspur city and continuously going down groundwater level is the most vital issue for the Chhattisgarh government



Bilaspur is a district of Chhattisgarh state of India. Bilaspur city is the headquarters of the district. As of 2011, it is the third most popular district of Chhattisgarh (out of 18) after Raipur and Durg. The name of the district derived from the city of Bilaspur. The name Bilaspur originated from Bilasa, a fisher woman who founded it according to a legend. Bilaspur district is situated between 21°47' and 23°8' north latitudes and 81.14' and 83°15' east latitude. The district is bounded by Korba(a district) on the north, Anuppur district and Dindori district of Madhya Pradesh state on the west, Kawardha on the South west, Durg and Raipur on the south and Korba and Janjgir-Champa on the east. Bilaspur district consists of 8 Tehsils. These Tehsils are Bilaspur, Pendra road, Lormi, Kota, Mungeli, Takhatpur, Bilha and Masturi. Bilaspur district, Chhattisgarh has a population of 2,663,629, equal to the nation of Kuwait or US of Nevada. This gives it a ranking of 152<sup>nd</sup> in India (out of total 640) . The district has a population density 322 inhabitants per square kilometer. Its population growth rate over the decade 2001-2011 was 33.21%. Bilaspur has a sex ratio 972 female for every 1000 males, and a literacy rate of 71.59%. Bilaspur has the zonal office of South-East- Central Railway, the 16<sup>th</sup> zone of Indian Railway, which is recognized to have the maximum loading.. The total area of Bilaspur is approximately 6377 sq.km. It is hilly towards north and plane in south which lead to quite cold and hot respectively. The maximum temperature of Bilaspur district is 45°C and average rainfall is 1220 mm. Major rivers which surround Bilaspur district are Aagaar, Maniyari and Arpa. Among this Arpa river is lifeline of Bilaspur. It is originated from Khondari-Khongsara, at Pendra and flows to meet with Seonath river at Thakur deva near Bartoti that in turn meets with Mahanadi. The river Kharang is a major tributary of Arpa river. The length of Arpa is about 147 km and average water flow is 400m<sup>3</sup>. River catching area is 2022 sq.km. Due to drying of river, the underground water level of Bilaspur is going down day by day, which is appearing as major problem to the growing population. Arpa river is a main tributary of Mahanadi which is known as the perennial source of irrigation in the state of Chhattisgarh, making the lands of the state fertile from a very long time. Mahanadi interests the various districts of Chhattisgarh. Bilaspur is one such district which positioned on the bank of one of the prominent branches of Mahanadi – Arpa river.



The geometric progression of population in urban and rural areas of Bilaspur city and continuously going down groundwater level is the most vital issue for the Chhattisgarh government. This is the reason that, unjustified and over exploration of groundwater, government will draft a law very soon. By this law, a prior permission will be required from Underground Water Authority before digging bore well or dug well in any city area or village area. Not only this, but corporation will be accountable and responsible to answer, how much water is being supplied against the population. To save the underground water through water harvesting, watershed management or water-recharge, government will try to apply water draft bill. By this bill not only people but also the parties need to answer who supply water for domestic or commercial purposes. The depletion of underground water is not only Chhattisgarh state or other states but become a burning problem for the country too. The rapid growth of industrialization and urbanisation is the major cause of exploitation of groundwater on and average the groundwater level in Bilaspur city gone upto 30 feet down. Many places in the city, corporation people required in the summer season to down pump-motors due to down level of ground water. In the previous year, some places like Hemunagar and Chuchuhiapara, water level gone down to 30 feet and Bhartinagar, Nehrunagar, Juna Bilaspur, Sarkanda shown 10-15 feet more down of water level. It is being observed that this trend is followed year by year. The people of Bilaspur known that earlier when the Arpa river was not it in course, even though the ground water was available at 20-30 feet very easily. But presently even the bank of river sometime by digging 50 feet, the drinking quality water is not available.

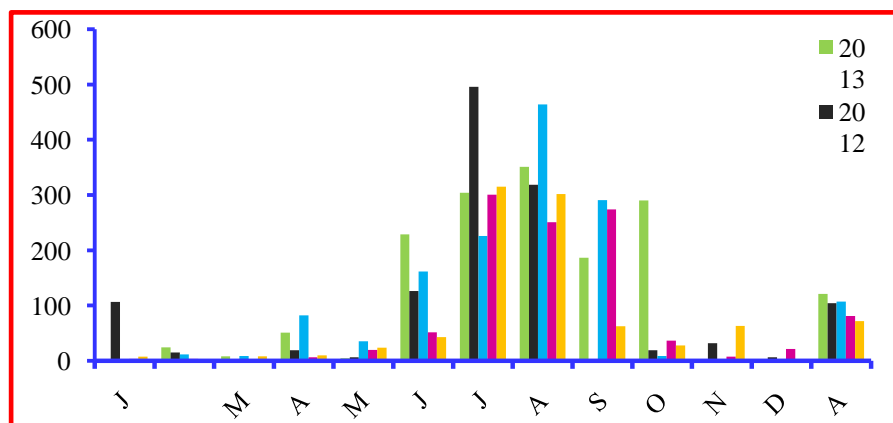
**Table No. 1 : Bilaspur District Rainfall ( mm ) For Last Five Years :**

**Arithmetic Average of Rainfall**

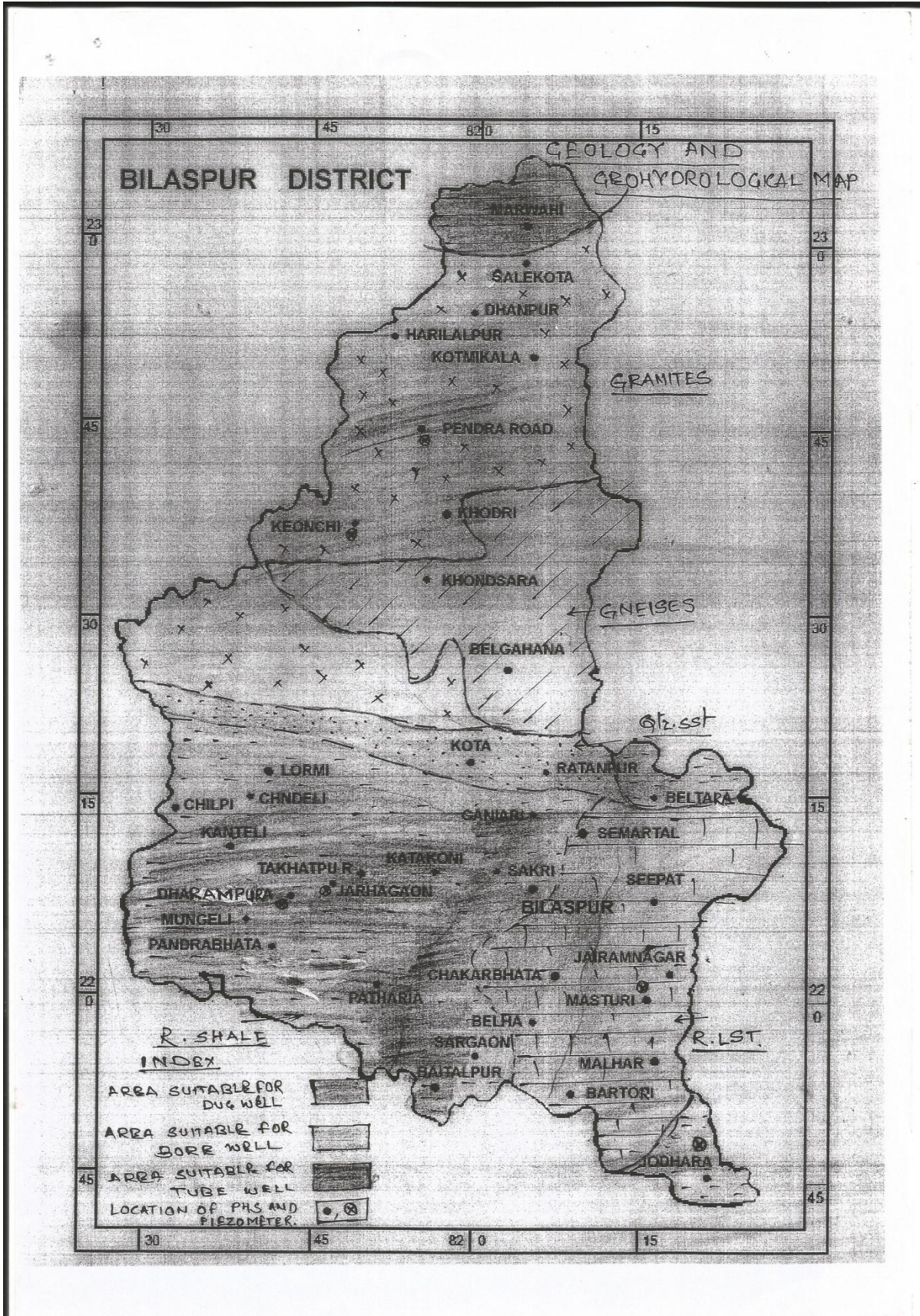
Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Avg.
1.2	24.4	8.0	50.9	4.4	229	304.3	350.7	186.3	290.3	0.0	0.0	120.8
106.3	14.8	0.0	19.1	6.4	126.3	495.9	318.6	20.4.8	19.3	32.0	6.6	104.1
0.1	11.4	8.9	82.3	35.6	161.9	226.1	463.9	290.9	9.0	0.0	0.0	107.5
3.3	3.5	0.0	6.3	19.6	51.5	300.3	250.5	273.7	36.4	7.3	21.4	306.4
7.8	0.0	8.0	9.7	23.5	43.1	314.8	301.9	62.6	28.0	63.4	0.0	71.9

**Graph No. 1 : Bilaspur District Rainfall ( mm ) For Last Five Years :**

**Arithmetic Average of Rainfall**



BILASPUR DISTRICT GEOHYDROLOGICAL MAP



S.No	Location	Source	Physical / Chemical Test										Residual Chlorine	Bacteriological
			Ph	Turbidity	Total Hardness	Ca / l	Mg / l	Chloride	Iron	Fluoride	TDS			
1	Sindhi Colony, Ward No. 5	Tap	7.01	3.80	404	98	37	80	--	0.4	460	0.10	Nil	
2	Tilak Nagar, Ward No. 6	"	7.03	2.10	346	83	33	72	--	0.4	400	0.10	Nil	
3	Rajendra Nagar, Ward No.8	"	7.10	1.64	330	82	30	75	--	0.4	393	1.10	Nil	
4	Bharitiya Nagar, Ward No. 9	"	7.11	1.34	420	100	40	82	0.00	0.4	538	Nil	Nil	
5	Majhwa Para, Ward No. 10	"	7.40	3.61	450	108	43	94	--	0.4	509	Nil	Nil	
6	Magar Para School, Ward No.11	"	7.30	1.14	350	84	34	82	--	0.6	421	Nil	Nil	
7	Tala Para Taiba Chowk, Ward No. 12	"	7.12	0.82	460	110	44	98	--	0.4	530	0.30	--	
8	Tala Para Marimata Chowk, Ward No. 13	"	7.18	0.19	430	103	41	105	0.26	0.4	520	0.10	Nil	
9	Vinoba Nagar, Ward No. 14	"	7.12	0.14	380	91	36	75	0.25	0.3	455	0.10	Nil	
10	Dipu Para Maszid Road, Ward No. 15	"	7.06	0.96	400	96	38	105	0.20	0.4	505	0.20	Nil	
11	Tarbahar Indira Nagar, Ward No. 16	"	7.06	0.99	380	91	36	107	0.20	0.3	460	0.20	Nil	
12	Mshanganj, Ward No. 17	"	7.14	0.19	290	70	28	63	0.11	0.3	354	Nil	Nil	
13	Sarju Bagicha, Ward No. 18	"	7.18	0.26	330	80	31	82	0.12	0.3	364	0.20	Nil	
14	Juni LINE Idgah Chowk, Ward No. 19	"	7.03	0.41	356	84	35	72	0.11	0.2	384	0.20	Nil	
15	Dabri Para, Ward No. 20	"	7.13	0.96	270	64	26	62	0.11	0.3	307	Nil	Nil	
16	Gond Para Darji Galli, Ward No. 21	"	7.02	1.06	190	46	18	60	0.16	0.4	257	0.10	Nil	
17	Near Gupta Lodge, Ward No. 22	"	7.10	0.91	202	50	19	52	0.21	0.3	287	0.10	Nil	
18	Lajpat Rai Nagar, Ward No. 23	"	7.06	1.47	220	54	21	48	0.21	0.4	322	0.10	Nil	
19	Teli Para, Ward No. 24	"	7.08	2.02	350	84	36	70	0.19	0.5	490	0.10	Nil	
20	Karbala, Ward No. 25	"	7.11	1.08	420	101	40	130	0.21	0.3	536	Nil	Nil	
21	Juna Bilaspur Hatri Chowk, Ward No. 26	"	7.16	1.42	300	72	29	80	0.12	0.4	378	Nil	Nil	
22	Juna Bilaspur Sao Dharmashala, Ward No.27	"	7.04	0.96	330	79	32	65	0.26	--	443	0.20	Nil	
23	Katiya Para, Ward No. 28	"	7.01	0.34	344	83	33	80	0.19	--	475	0.20	Nil	
24	Dyalbandh Madhuban Road, Ward No. 29	"	7.02	0.58	310	74	30	70	0.21	--	407	0.20	Nil	
25	Fajal Bada, Ward No. 30	"	7.08	0.49	362	87	35	90	0.22	--	405	0.20	Nil	
26	Tikra Para, Ward No. 31	"	7.09	0.21	428	115	34	125	0.28	0.3	539	0.20	Nil	
27	Dyalbandh, Ward No. 32	"	7.11	0.96	370	76	38	98	0.31	0.4	483	0.10	Nil	
28	Kansha Chowk, Ward No. 33	"	7.00	1.42	396	88	42	126	0.26	0.4	550	0.20	Nil	
29	Behind Jalaram Mandir, Ward No. 34	"	7.02	0.56	314	72	85	32	0.28	0.4	425	0.10	Nil	
30	Dyalband Gurudwara Ward No. 35	"	7.24	0.98	390	94	38	100	0.28	0.3	413	0.30	Nil	
31	Torwa Santoshi Mandir Ward No. 36	"	7.16	0.48	418	100	40	110	0.27	0.4	485	0.20	Nil	
32	Kashim Para, Ward No. 37	"	7.08	0.59	398	96	38	100	0.19	0.3	470	0.40	Nil	
33	Hemu Nagar, Ward No. 38	"	7.01	0.85	398	96	38	105	0.20	0.3	471	0.30	Nil	
34	Chuchuhia Para, Ward No. 39	"	7.31	0.84	562	135	54	203	0.29	0.5	785	0.10	Nil	
35	Chingraj Para, Ward No. 40	"	7.02	1.16	248	60	24	85	0.11	0.4	377	0.10	Nil	
36	Chingraj Para Pond, Ward No. 41	"	7.10	0.21	186	45	18	60	0.12	0.3	268	0.10	Nil	
37	Dabri Para, Ward No. 42	"	7.31	1.60	300	72	29	80	0.11	0.2	334	0.40	Nil	
38	Chatidih Kalighat, Ward No. 43	"	7.02	0.94	316	76	30	84	0.14	0.3	354	0.40	Nil	
39	Ashok Nagar, Ward No. 44	"	7.28	1.08	240	58	23	110	0.16	0.3	406	0.00	Nil	
40	Nootan Colony, Ward No. 45	"	7.21	0.48	260	63	25	85	0.14	0.3	424	0.00	Nil	
41	Sarkanda Pathak Galli, Ward No. 46	"	7.01	0.91	420	100	41	112	0.14	0.4	512	0.90	Nil	
42	Jabda Para Near River Arpa, Ward No. 47	"	7.03	0.70	260	62	25	55	0.19	0.3	334	0.30	Nil	
43	Shivghat Sarkanda, Ward No. 48	"	7.15	0.48	300	68	31	55	0.12	0.3	331	0.30	Nil	
44														

## Physical, Chemical and Bacteriological Parameters of Underground water in Bilaspur District

## II. CONCLUSION

Water is life and development of life depends on river basin. Arpa river watershed is the base of Bilaspur. Arpa river is a main tributary of Mahanadi which is known as the perennial source of irrigation in the state of Chhattisgarh, making the lands of the state fertile from a very long time. Mahanadi intersects the various districts of Chhattisgarh. Bilaspur is one such district which is positioned on the bank of one of the prominent branches of Mahanadi- Arpa river. Bilaspur district is a flourishing place which is blessed with an abundance of natural resources. In Chhattisgarh, there are vast stretches of fertile fields that are used for growing a number of high quality crops. Every year Bilaspur contributes considerably towards the state's total crop production. The reason behind such a commendable farm production is the Arpa river. Around the year, Arpa river goes on making the agricultural lands of Bilaspur more fertile. The quality of underground water is analysed by the P.H.E. (Public Health & Engineering) department and found that most of the parameters like pH, Turbidity, Total Hardness and other minerals like Ca, Mg, Chloride, Iron and Fluoride are within the limit. The Arpa river is one of the vital strong holds of Bilaspur district in Chhattisgarh. Due to drying of river, the underground water level of Bilaspur is going down day by day, which is appearing as major problem to the growing population. By and large the growing city like Bilaspur in Chhattisgarh district is facing the problem of underground water present day and will be faced severe crisis in next decade. But the quality of underground water as data reveals that it is still remain same as was previous decades. Of course, the water quantity required for future can be managed through surface water by managing and saving river water from the encroachment and pollution.

So it is responsibility of each and every civilian and inhabitant to save and conserve the precious surface and underground water available in this area not for present but future also.

**REFERENCE**

- [1]. Adyalkar, P.G. and Dubey, V.N. (1978) - Dolomitisation in the northern part of Chhattisgarh Basin, Bilaspur District, M.P.Jornl. Geol.Soc. India, Vol.19, No. 2, pp. 69 – 73.
- [2]. Adyalkar, P.G., Phadtare, P.N. and Ramana, K. (1973) - Burried Sinkhole of Dhantari in the charmuria limestone of Raipur District, M.P. and its Hydrogeological significance Current Science, Vol. XLII, No. 4, pp. 131 – 133.
- [3]. Bose, P.N. (1899 – 1900) - Unpublished Progress Report, G.S.I.
- [4]. Dutt, N.V.B.S., (1963) - Stratigraphic and correlation of the Indravati series (Purana Group) of Bastar.
- [5]. Dutt, N.V.B.S., (1964) - A suggested of the purana formation of the southern part of the Chhattisgarh, M.P. Geological Survey of India, vol.93, pt.2, pp. 143 – 148.
- [6]. Ghosh, P.K. and Shah, S.C., (1965) - On the occurrence of stromatolites from the Raipur limestone M.P. Proc. India Sc. Cong. 51<sup>st</sup> 52<sup>st</sup> Abstract, 196p.
- [7]. IS : 10500 (1991) - Indian Standard Drinking Water Specification. Bureau of Indian standards New Delhi, 5p.
- [8]. Murti, K.S., (1978)(b) - A study of the stromatolites of Chhattisgarh Basin. Symposium on Purana formation of peninsular India, Centre of Advanced Study in Geology, University of Sagar, M.P. pp. 276 – 281.
- [9]. Todd, D.K. Underground Hydrology.
- [10]. Water Testing Result From C.G. Environmental Conservation Board.
- [11]. News Paper Cutting, Dainik Bhaskar Edition, Bilaspur, 2011.
- [12]. Murty, J. V. S., Watershed Management, pp. 9, 13, 63.
- [13]. Sujit Kumar,(2002)- Water Resource Evaluation Study of the Son Barsa River basin district Rajnandgaon( Chhattisgarh) pp. 96-98.
- [14]. Nagar Nigam Bilaspur dwara preshit Nagar Nigam Kshetra ke Jal Namuno ka Parikshan Report.