Study on Ground Water of Various Locations in Dewas Industrial Area of Madhya Pradesh India

Reeta Kori[1], Alok Saxena[2], Harish Wankhade[3], Asad Baig[4], Ankita Kulshreshtha[5*], Saket Mishra[6], Smriti Sen[7]

Central Laboratory, Madhya Pradesh Pollution Control Board, Paryavaran Parisar, E-5, Arera Colony, Bhopal, India
* Corresponding author: Ankita Kulshreshtha

Abstract— *This study on the ground water quality status of various locations in Dewas industrial area of Madhya Pradesh India. Study of physico-chemical parameters of ground water was carried out during different four quarters from April 2019 to March 2020. Nine monitoring locations in Dewas industrial area were selected for this study. Ground water monitoring was performed as per standard guidelines followed by Central Pollution Control Board and analyzed by standard methods. It is concluded that high contamination w.r.t. total dissolved solids, chlorides, fluorides, nitrate, sulphate etc. in ground water observed at few locations in Dewas industrial area during this study and water quality if compare with drinking water standard BIS, 10500 (2012). The ground water quality does not meet the standard. The deterioration of ground water quality may be due to impact of industrial activities.*

Keywords— Industrial Area, Ground Water, Water Pollutants, Water Quality.

I. INTRODUCTION

The quality of ground water is of great importance in determining the suitability of particular ground water for a certain use (public water supply, irrigation, industrial application, power generation etc). The quality of ground water is the resultant of all the processes and reactions that have acted on the water from the moment it condensed in the atmosphere to the time it is discharged by a well. The quality of ground water depends on a large number of individual hydrological, physical, chemical and biological factors. Generally higher proportion of dissolved constituent is found in ground water than in surface water because of greater interaction of ground water with various materials in geologic strata. Contamination of water resources available for household and drinking purposes with heavy elements, metal ions and harmful microorganisms is one of the serious major health problems [1].

The major source of water pollution is domestic waste from urban and rural areas and industrial waste which is discharge into natural water bodies. Chemical industries also have concern with in respect of disposal hazardous waste [2].Discharged from industries contains a number of chemical pollutions, such a Ammonia, Arsenic, Phenol, Cyanide, Thiocynide, Copper, Cadmium, Zinc, Chromium, Carbonate, Bi-carbonate, Nitrite, Phosphate, Oil and Grease in addition to total suspended solids volatile solids and score of other toxicants. It is difficult to imagine production human activity, be it agriculture or forestry, Livestock, farming & fisheries, trade or industry. The chemical, physical and bacterial characteristics of ground water determined. These pollutants could bring about changed in temperature, humidity, oxygen supply, pesticide stress etc. amounting to a partial or complete alteration in the physical, chemical and physiological spheres of the biota [3].The physical and chemical properties of the substances influence their behavior in the subsurface and their likely impact on groundwater quality [4]. Partially treated industrial effluents combined with sewage and other wastes discharged on the surface cause severe groundwater pollution in the industrial belt [5].

In modern industrialization period, the most of water resources have affected enormously by seepage, leaching and mixing of industrial effluents in most of the metropolitan cities and industrial townships [6]. The industrial effluents contain toxic chemicals, hazardous compounds, suspended solids and nonbiodegradable materials. The major source of surface and ground water pollution is injudicious discharge of untreated industrial effluents directly into the surface water bodies resulting in surface and ground water pollution [7].

The industrial effluents if not treated properly controlled, can pollute and cause serious damage to the ground water resources [8]. Since, groundwater is occupying a major portion of water supply for both domestic and industrial purposes nowadays, it

is highly essential that, its quality should match the domestic water standards [9]. Though industrial use of water is very low as compared to agricultural use, the disposal of industrial effluents on land and/or on surface water bodies make water (ground and surface) resources unsuitable for other uses. Industry is a small user of water in terms of quantity, but has a significant impact on quality [10]. Ground water pollution is intrinsically difficult to detect, since the problem may well be concealed below the surface and monitoring is costly, time consuming and hard to resolve [11]. The most common and widespread health risk associated with drinking water is microbial contamination which has the potential to cause large outbreaks of water born diseases like dysentery, cholera, typhoid, skin infections etc [12]. Therefore ground water quality, especially in areas that immediately surround industrial area are of increasing interest for study. This paper is an important study on the ground water quality status of various locations in Dewas industrial area of Madhya Pradesh India.

II. METHODOLOGY

2.1 Study Area

Dewas District in Ujjain Revenue Division, is situated on the Malwa plateau in the West-central part of Madhya Pradesh, India and lies between 20°17´ and 23°20´ North latitude and 75°54´ and 77°08´ East longitude. The district is bounded by Ujjain district in the north, Indore district in the west, West-Nimar district in the south-west, East Nimar district in the south, Hoshangabad district in the South East, Sehore district in the east and Shajapur district in the North-East.

2.2 Monitoring Locations

Dewas industrial area is consist of four industrial area i.e. Industrial Area 1 , Industrial Area 2 & 3, Sia Industrial Area, Ujjain Road Industrial Area. Total nine locations in different industrial area in Dewas were selected for ground water monitoring is depicted in table 1 and figure 1.

TABLE 1
MONITORING LOCATIONS

S.N	Code	Industrial Area	Monitoring Locations	Latitude & Longitude	Ground water Source
1.	W1	Industrial Area 1	M/S White star milk and milk products , Dewas	22.5754 & 76.2453	**Borewell**
2.	W2	Industrial Area 1	M/S Tata International Ltd, Dewas	23.1064 & 77.52432	**Borewell**
3.	W3	Industrial Area 1	M/S Raj Pioneer Laboratories (India), Dewas	23.07689 & 77.55652	**Borewell**
4.	W4	Industrial Area 2 & 3	M/S Roca Bathroom Products Pvt Ltd (Parryware Industry) Dewas	23.11448 & 77.51583	**Borewell**
5.	W5	Industrial Area 2 & 3	M/S VE Commercial Vehicle Ltd unit 2 (Eicher), Dewas	23.10886 & 77.51757	**Borewell**
6.	W6	Industrial Area 2 & 3	M/S Navin Fluorine International Ltd, Dewas	23.09844 & 77.52922	**Borewell**
7.	W7	Sia Industrial Area	M/S Krishna Food Products Ltd, Dewas	23.08073 & 77.53493	**Borewell**
8.	W8	Ujjain Road Industrial Area	M/S Kriloskar Brother's Ltd, Dewas	23.07719 & 77.54176	**Borewell**
9.	W9	Ujjain Road Industrial Area	M/S Bank Note Press , Dewas	23.07449 & 77.53204	**Borewell**

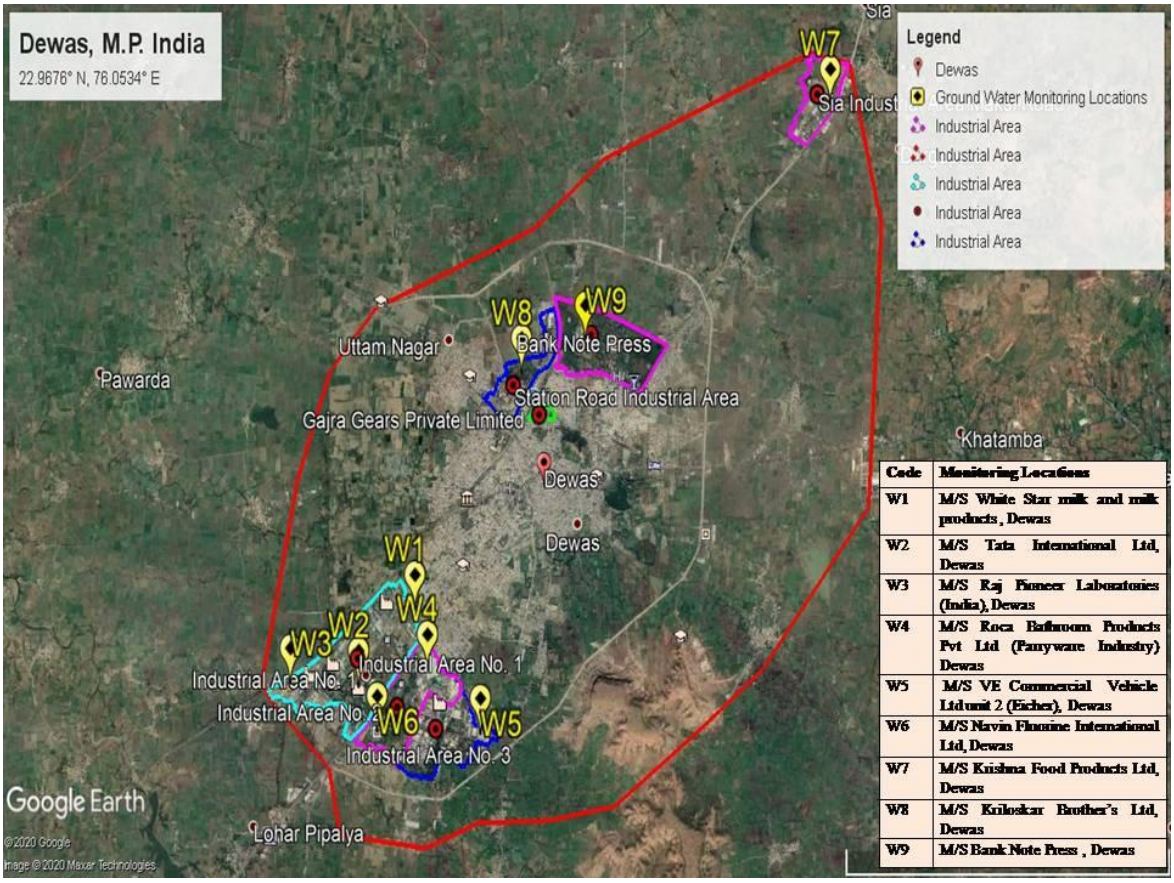

FIGURE 1: Monitoring Locations around Dewas industrial area

2.3 Monitoring and Analysis

All ground water monitoring was done as per standard guidelines followed by Central Pollution Control Board [13]. Water samples were drawn from bore wells and samples were analyzed by as per standard methods [14] during this study. All results were compared with standard limits prescribed of drinking water of BIS 10500 (2012) [15].

III. RESULT & DISCUSSION

The study of ground water quality data is depicted in table 2 and figure 2 to 13.

In figure 2, the pH ranges from 7.05 (W8) -7.36 (W2, W7) which was within the limits of BIS: 10500 (6.5-8.5) at all monitoring locations during this study.

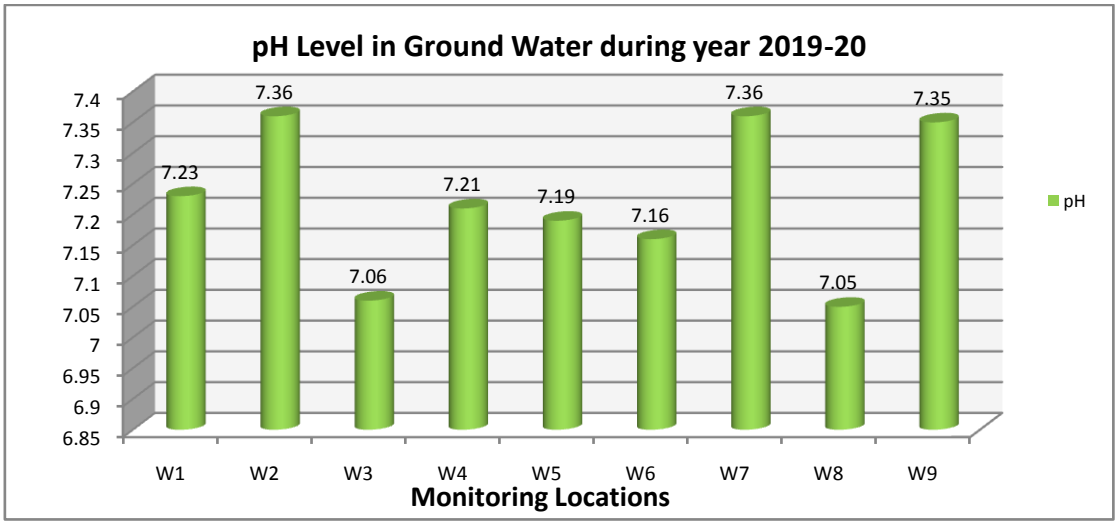

FIGURE 2: pH level of ground water

TABLE 2
PHYSICOCHEMICAL STUDY OF GROUND WATER OF DEWAS INDUSTRIAL AREA

S. N.	Analytes	Unit	BIS, 10500 (2012)		W1	W2	W3	W4	W5	W6	W7	W8	W9
			Requirement (Acceptable Limit)	Permissible Limit in the absence of alternate source									
1	Colour	Hazen unit	5	15	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	pH	pH unit	6.5-8.5	Not Relaxation	7.23	7.36	7.06	7.21	7.19	7.16	7.36	7.05	7.35
3	Turbidity	NTU	1	5	0.9	3.68	3.30	4.4	3.5	4.6	0.33	0.23	0.5
4	Total Dissolved Solids	mg/l	500	2000	889	1742	2106	1582	889	1621	1079	1268	635
5	Chloride	mg/l	250	1000	197	594	778	474	173	307	346	325	139
6	Ammonical Nitrogen	mg/l	0.5	Not Relaxation	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL	BDL
7	Nitrate	mg/l	45	Not Relaxation	82.3	33.79	70.61	39.8	50.1	61	26.07	59.8	11
8	Total Alkalinity	mg/l	200	600	285	142	247	261	243	427	203	260	254
9	Total Hardness	mg/l	200	600	660	730	1403	948	573	1160	565	670	201
10	Sulphate	mg/l	200	400	289	428	545	720	275	590	481	284	151
11	Fluoride	mg/l	1	1.5	1.22	0.81	1.09	1.1	1.2	1.64	1.07	0.81	1
12	Calcium ion	mg/l	75	200	117	196	245	220	128	221	147	204	37
13	Magnesium ion	mg/l	30	100	82	59	193	97	62	148	48	39	27
14	Mn	mg/l	0.3	0.1	0.082	0.051	0.058	0.070	0.108	0.307	0.026	0.028	0.013
15	Cu	mg/l	0.05	1.5	0.206	0.329	0.166	0.082	0.247	0.11	0.021	0.016	0.015
16	Zn	mg/l	5	15	0.373	0.414	0.299	0.082	0.413	0.107	0.048	0.212	0.127
17	Fe	mg/l	0.3	Not Relaxation	0.590	3.309	0.584	0.695	0.391	0.595	0.165	0.050	0.090
18	Cd	mg/l	0.003	Not Relaxation	0.019	0.023	0.023	BDL	0.017	0.016	0.020	0.014	0.011
19	Ni	mg/l	0.02	Not Relaxation	0.105	0.271	0.114	0.105	0.094	0.105	0.092	0.103	0.112
20	Pb	mg/l	0.01	Not Relaxation	0.152	0.153	0.168	0.316	0.149	0.147	0.077	0.102	0.062

In Figure 3, Turbidity was found in the range of 0.23 (W8) – 4.6 (W6) NTU during this study.

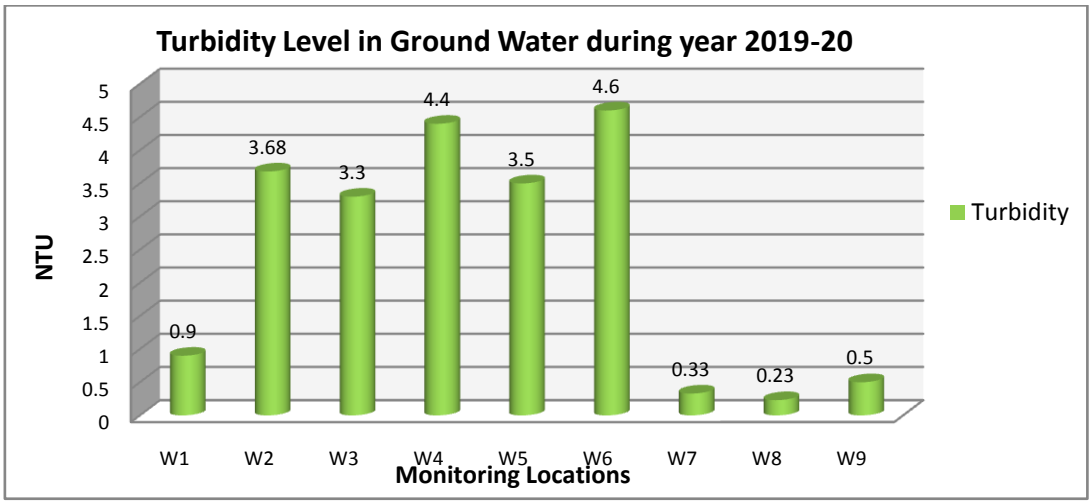

FIGURE 3: Turbidity level of ground water

In Figure 4, total dissolved solids was found in the range of 635 (W9) – 2106 (W3) mg/l during this study.

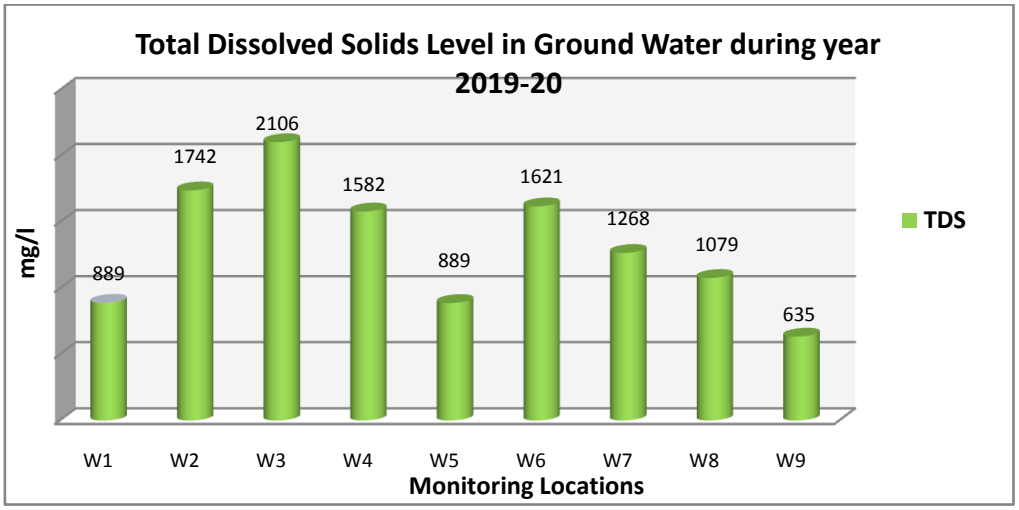

FIGURE 4: TDS level of ground water

Figure 5 is showing that minimum average concentration of total alkalinity was found 142 mg/l (W2) and maximum concentration 427 mg/l (W6) during this study.

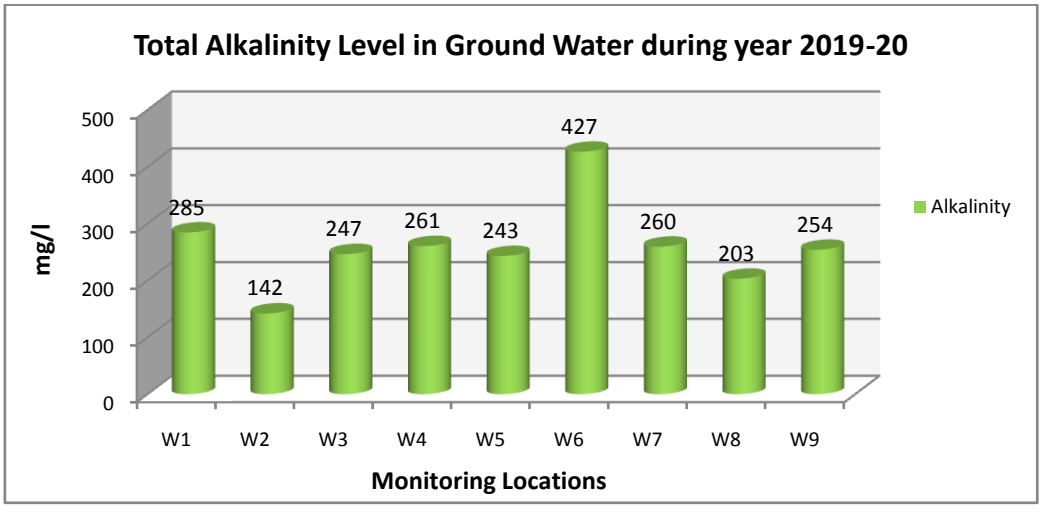

FIGURE 5: Total alkalinity level of ground water

Figure 6 is showing that minimum average concentration of chloride was found 139 mg/l (W9) and maximum concentration 778 mg/l (W3) during this study.

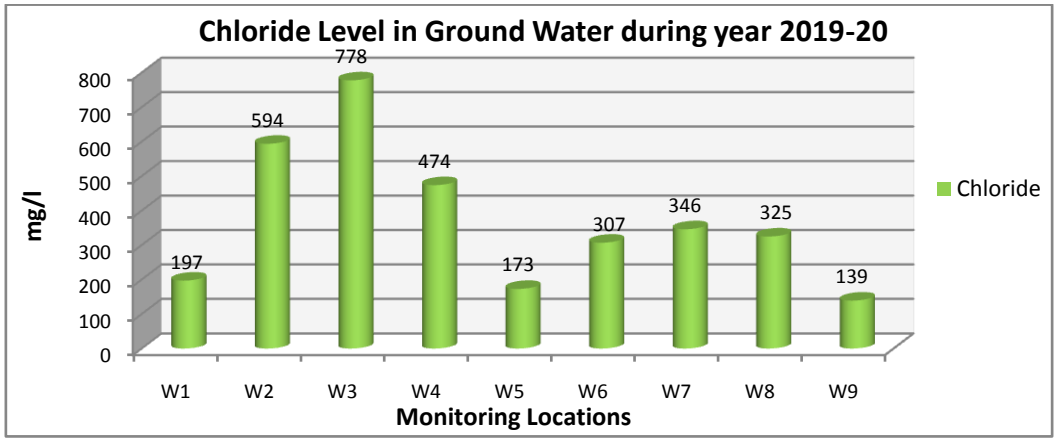

FIGURE 6: Chloride level of ground water

Ammonical nitrogen was not detected in ground water at all monitoring locations during this study. Figure 7 is showing that minimum average concentration of fluoride was found 0.81 mg/l (W2, W8) and maximum concentration 1.64 mg/l (W6) during this study.

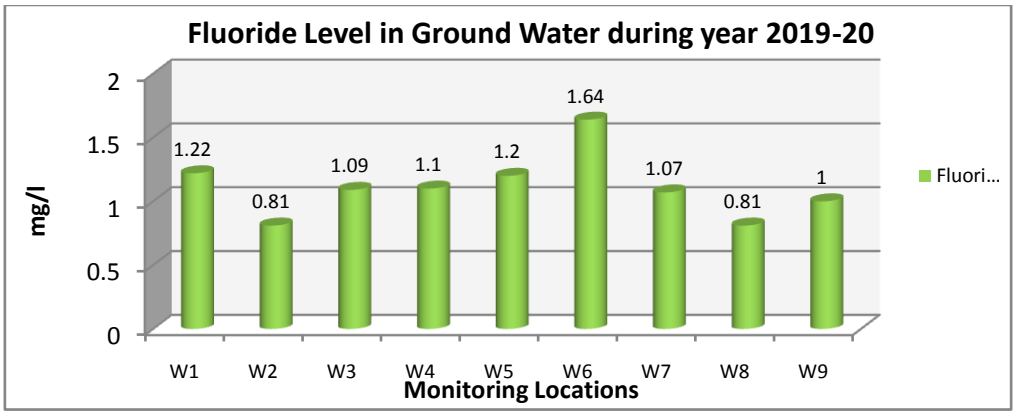

FIGURE 7: Fluoride level of ground water

Figure 8 is showing that minimum average concentration of nitrate was found 11 mg/l (W9) and maximum concentration 82.3 mg/l (W1) during this study. The presence of little higher concentration of nitrate in water is an indication of pollution in ground water may cause eutrophication as a nutrient, hence reducing water quality.

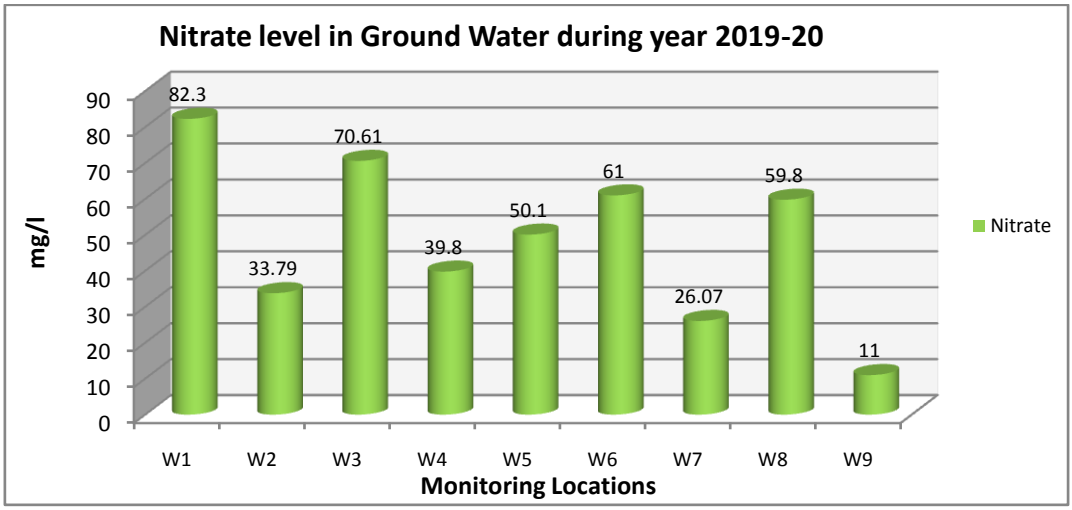

FIGURE 8: Nitrate level of ground water

Figure 9 is showing that minimum average concentration of total hardness was found 201 mg/l (W9) and maximum concentration 1403 mg/l (W3) during this study.

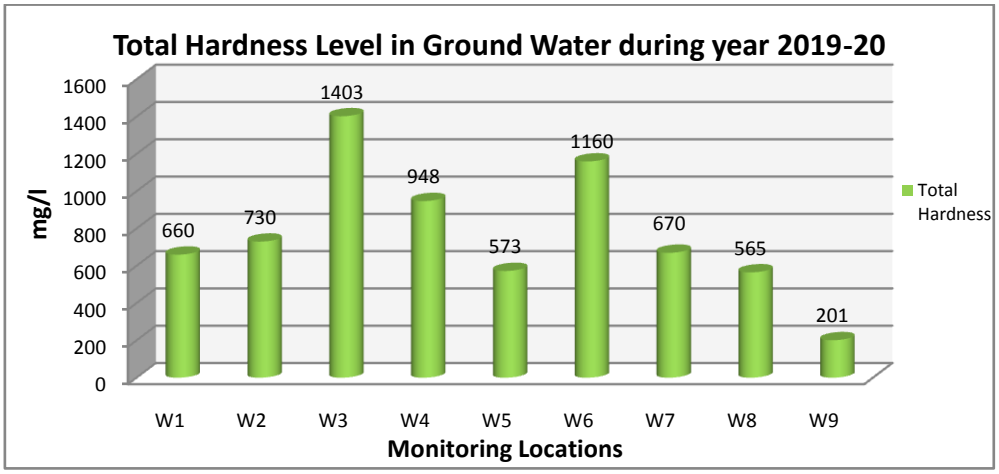

FIGURE 9: Total Hardness level of ground water

Figure 10 is showing that minimum average concentration of sulphate was found 151 mg/l (W9) and maximum concentration 720 mg/l (W4) during this study.

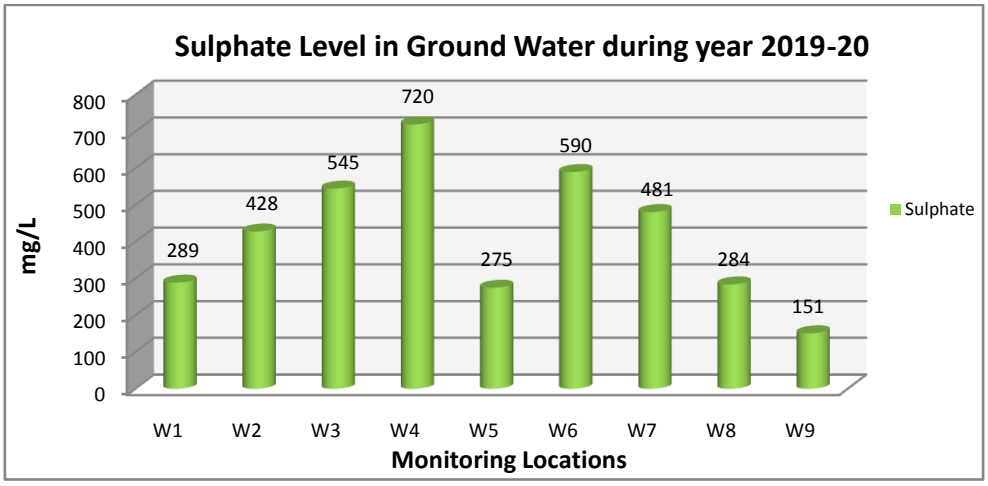

FIGURE 10: Sulphate level of ground water

Figure 11 is showing that minimum average concentration of calcium ion was found 37 (W9) and maximum concentration 245 (W3) during this study.

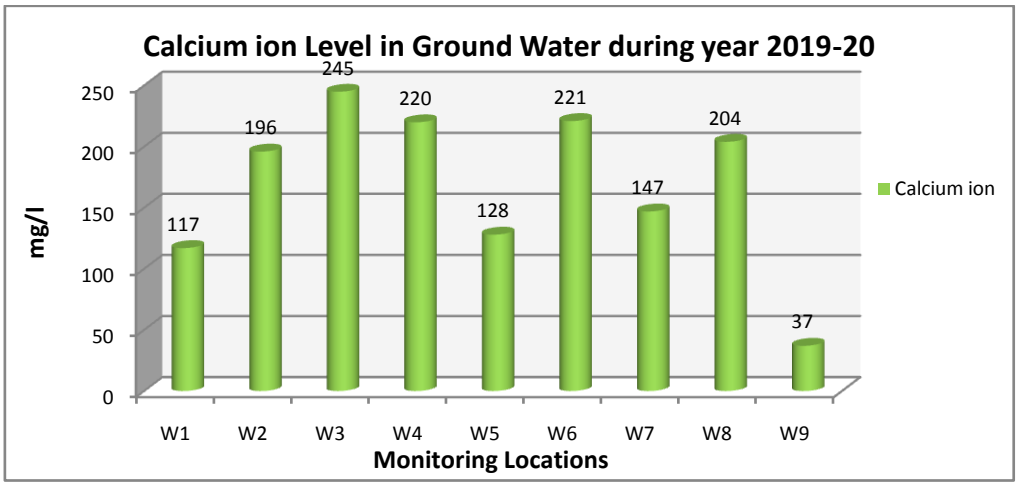

FIGURE 11: Calcium ion level of ground water

Figure 12, is showing that minimum average concentration of magnesium ion was found 27 (W9) and maximum concentration 193 (W3) during this study.

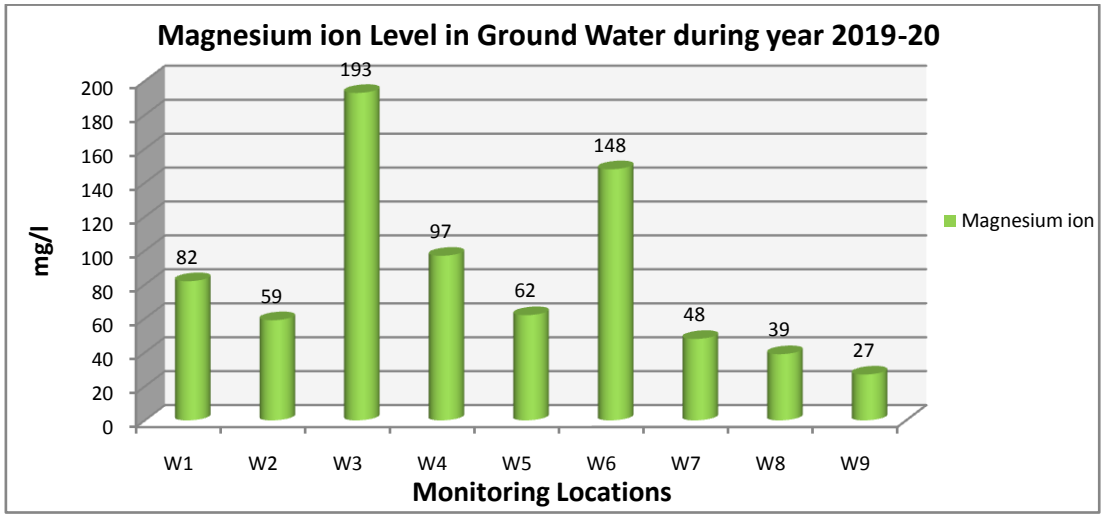

FIGURE 12: Magnesium ion level of ground water

In Figure 13, Observed order of the analyzed heavy metals were found Fe> Mn>Zn >Cu during this study.

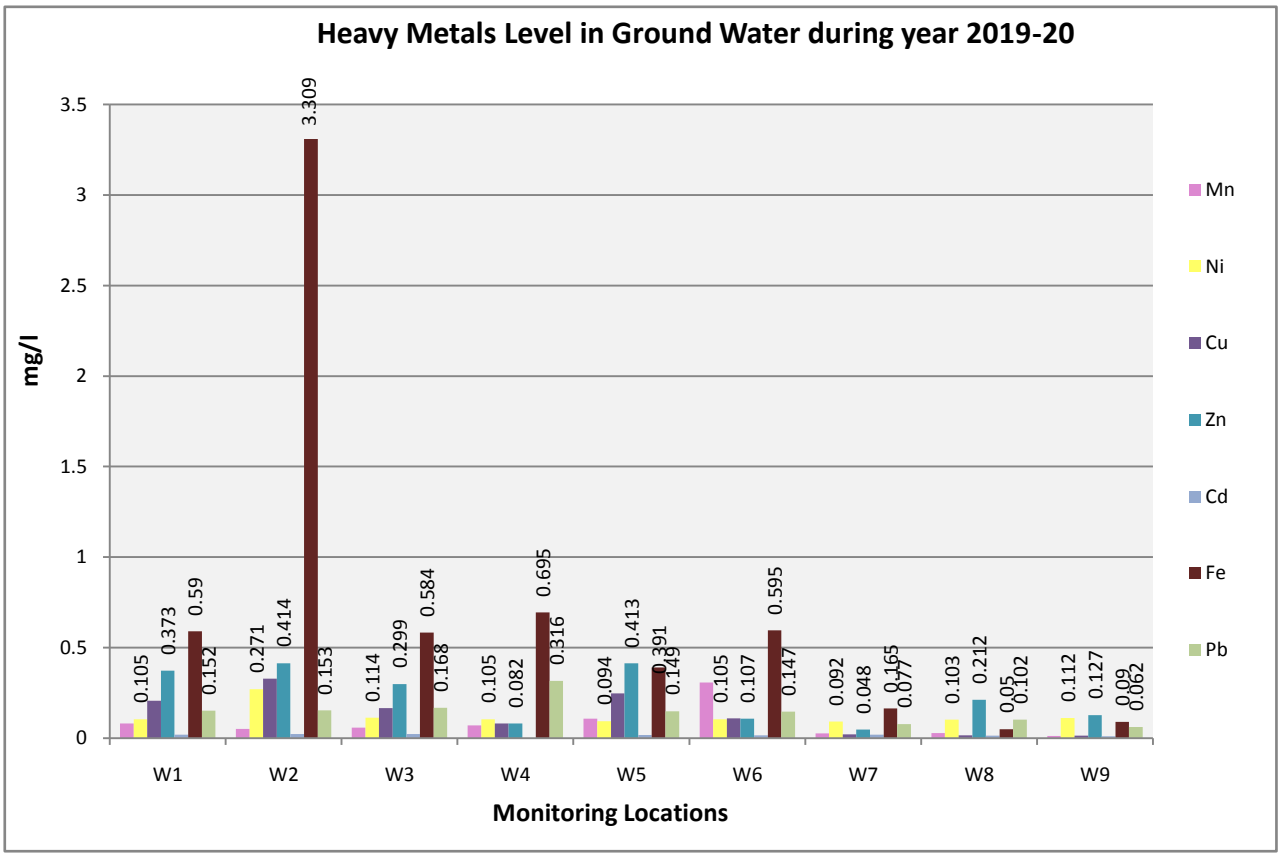

FIGURE 13: Heavy metals level of ground water

IV. CONCLUSION

It is concluded that high contamination in ground water observed at few locations around Dewas Industrial area during this study as compare with drinking water standard BIS, 10500 (2012). The ground water quality does not meet the standard. The deterioration of ground water quality may be due to impact of industrial activities. All activities, which carried out on the ground surface have direct or indirect impact on the groundwater whether associated with urban , industrial or agricultural activities large scale concentrated source of pollutants such as industrial discharge, subsurface injection of chemicals and

hazardous are obvious source of ground water pollutants. May deepness of water source, sewage source, anthropogenic, industrial activities and other sources are reason of presence of trace amount of pollutant in ground water of Dewas industrial area.

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