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Assessment of Ground Water Quality around Industrial Area in Aurangabad, Maharashtra

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Abstract: *The industrial ground water quality is one of the most important criterions to ascertain its suitability for human beings and irrigation. This paper presents the ground water quality of WalujIndustrial Area in Aurangabad district, Maharashtra. The eleven samples were collected for physico-chemical characteristics such as temperature, PH, EC, TDS, TA, TH, chloride (Cl^-), sulphates (SO_4^{2-}), phosphate (PO_4^{3-}), calcium (Ca^{2+}), Magnesium (Mg^+) sodium(Na^+), potasium (k^+), DO, and BOD.The obtained results were compared with WHO (World Health Organization) and BIS (Bureau of Indian Standards) limits. The results revealed that some parameters were in high concentration and quality of the potable water has deteriorated to a large extent at some sampling locations.*

Keywords: *Ground water, physico-chemical characteristics, TDS, DO, BOD, Waluj.*

I. Introduction

Groundwater is a globally important and valuable renewable resource for human life and economic development. It constitutes a major portion of the earth's water circulatory system known as hydrologic cycle and occurs in permeable geologic formations known as aquifers i.e. formations having structure that can store and transmit water at rates fast enough to supply reasonable amounts to wells. Having a safe drinking water is an internationally accepted human right (World Health Organization (WHO) 2004). One of the ten targets of the Millennium Development Goals Report (UN 2006) is the proportion of people without sustainable access of safe drinking water to halve by 2015.

It is therefore necessary that the quality of drinking water should be checked at regular time interval as well as to find out various sources which increased ground water pollution. Thus in this present study an attempt has been made to assess the physico chemical characteristics of ground water of different locations of Waluj MIDC.

II. Material And Method

Aurangabad District is located mainly in Godavari Basin and its some part towards North West of Tapi River Basin. This District's general down level is towards South and East and North West part comes in Purna Godavari river basin. Aurangabad is the headquarters of the district as well as the division of Marathwada. Its geographical location is latitude 19° 53 'north and longitude 75° 20' east.

The aim of the study is to assess the impact of industrialization and rapid growing developmental activities in the study area on the quality of ground water and to locate various sources and types of pollutants which are responsible for changes in ground water quality. To assess the ground water quality eleven sampling stations (bore wells), which are scattered in the main areas of Waluj MIDC. The selected sites are of approximately 1000 to 1500 m far from each other. Analysis of the samples are carried out from winter- 2014 to summer- 2015. Water samples are collected in 1000 ml polyethylene bottles in good quality screw-capped and labelled, tightly pack, transported immediately to the laboratory, and storing at 4°C for chemical analyses. The sampling bottles are thoroughly rinsed two or three times, using the groundwater to be sampled. The parameters like temperature and pH were measured in the field by using thermometer and pocket digital pH-meter while other parameters such as electrical conductivity, total dissolved solids, total hardness, total alkalinity, calcium, chloride, magnesium, sodium, sulphates, phosphate, dissolved oxygen and biological oxygen demand were estimated in the laboratory in accordance with standard methods of water chemical analysis (APHA 1992). The sampling locations are given in table 1.

Table1: Location of Sampling Station

Sample no.	Location of Sampling Station	Source
S_1	Public Bore well near Bharat petroleum pump, MIDC, Waluj	Bore Well
S_2	Public Bore well near Bajaj Industry MIDC, Waluj	Bore Well
S_3	Public Bore Well near Garware Industry MIDC, Waluj	Bore Well
S_4	Public Bore Well near Police station MIDC, Waluj,	Bore Well
S_5	Public Bore well near Bus Stand, Ranjangaon, MIDC, Waluj	Bore Well

S_6	Public Bore well near Hi-Tech Engg. College, Ranjangaon, MIDC, Waluj,	Bore Well
S_7	Public Bore well in Z.P. School, Ranjangaon, MIDC, Waluj, Aurangabad.	Bore Well
S_8	Public Bore well near 'Jame Masjid, Ranjangaon, MIDC, Waluj	Bore Well
S_9	Public Bore well in Ambedkar Nagar,Jogeshwari, MIDC, Waluj	Bore Well
S_{10}	Public Bore well near of Bus stand, Sajapur, MIDC, Waluj, Aurangabad.	Bore Well
S_{11}	Public Bore well near village panchayat, Pandharpur, MIDC, Waluj	Bore Well

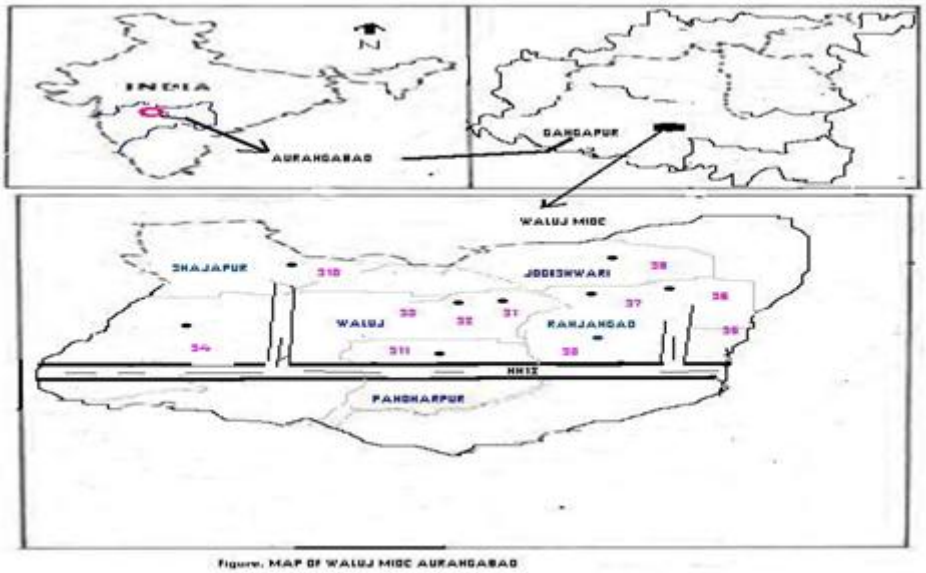


Figure: MAP OF WALUJ MIDC AURANGABAD

Fig1. Details of sample Collection Points in Waluj Industrial Area

III. Results And Discussion

Table 2a: Seasonal Variation of ground water quality parameter around Waluj industrial area

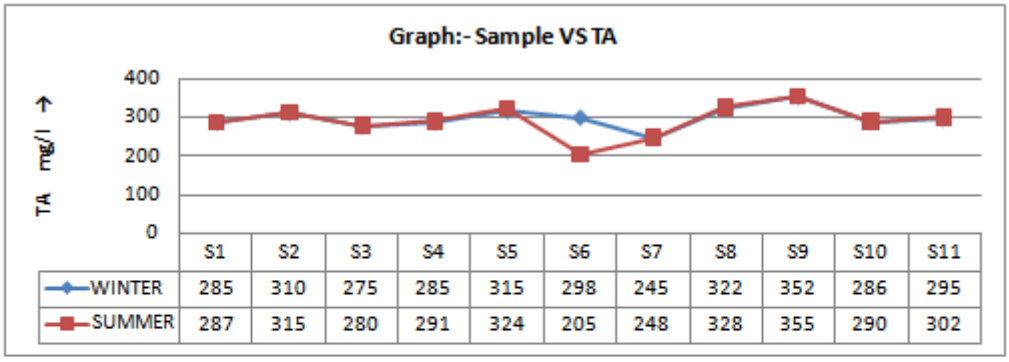
Sample No.	TEMP 1		PH 2		EC 3		TDS 4		TA 5		TH 6		Cl 7		SO_4 8	
	winter	summer	Winter	summer	winter	summer	winter	summer	winter	summer	winter	summer	winter	summer	winter	summer
S1	20.12	31.18	6.75	6.8	4585	4610	1470	1485	285	287	435	442	189	195	27.71	27.25
S2	20.15	31.8	6.85	6.85	1781	1790	2435	2445	310	315	997	1005	235	240	35.85	35.87
S3	20.12	31.05	7.50	7.55	2715	2725	2415	2424	275	280	915	925	316	322	35.81	35.85
S4	20.10	31.8	7.75	7.8	4673	4680	1785	1805	285	291	1335	1345	215	217	77.85	77.87
S5	20.14	31.78	6.45	7.65	785	790	1861	1865	315	324	425	430	255	259	26.53	26.58
S6	20.15	31.7	6.95	6.95	1767	1770	2115	2125	298	205	872	875	248	252	34.11	34.15
S7	20.10	31.4	7.60	6.85	1621	1725	1711	1727	245	248	787	790	285	293	27.50	27.55
S8	20.12	31.85	7.65	7.65	1395	1415	1725	1735	322	328	713	725	215	225	28.48	28.53
S9	20.10	31.05	6.90	6.95	1121	1130	1615	1625	352	355	458	462	268	273	39.67	39.68
S10	20.15	31.07	7.60	7.45	1327	1340	1665	1669	286	290	647	658	245	248	59.48	59.52
S11	20.08	31.1	7.15	7.55	1295	1305	1615	1628	295	302	728	735	212	217	57.20	57.26
TOTAL	221.3	345.58	79.15	81.05	16699	23180	20412	20533	3268	3325	8312	8389	2471	2741	392.99	450.61
MEAN	22.33	31.42	7.195	7.37	1518.09	2107.27	1856	1866	297.09	302	755.63	763	224.63	249	35.81	41
SD	0.023	0.32	0.042	0.434	1405.55	2663.11	310.4	309.33	26.53	27.03	260.93	261.7	39.685	35.12	16.72	16.09
CV	0.001	0.0102	0.058	0.039	0.926	1.263	0.167	0.166	0.089	0.089	0.345	0.343	0.176	0.14	0.467	0.40

SD-Standard Deviation, CV-Coefficient of Variance, All Units in mg/l (Except, Temp °C & EC µmoh/cm)

Table 2b: Seasonal Variation of ground water quality parameter around Waluj industrial area

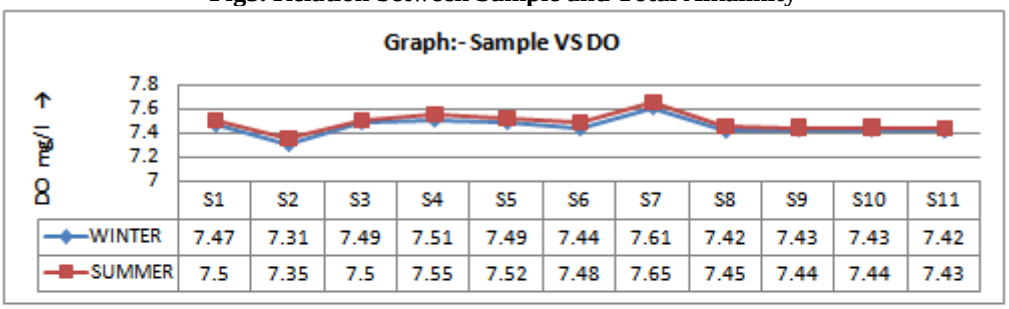
Sample No.	PO_4 9		Ca^{++} 10		Mg^{++} 11		Na^{+} 12		K^{+} 13		DO 14		BOD 15	
	winter	summer	winter	summer	winter	summer	winter	summer	winter	summer	winter	summer	winter	summer
S1	0.165	0.164	345	348	55	57	275	282	2.47	2.51	7.47	7.5	4.22	4.25
S2	0.150	0.152	115	125	100	105	135	138	1.48	1.51	7.31	7.35	3.78	3.82
S3	0.140	0.142	245	249	175	177	183	188	1.65	1.7	7.49	7.5	4.97	4.98
S4	0.130	0.132	567	569	78	79	123	128	1.05	1.08	7.51	7.55	5.51	5.55
S5	0.130	0.132	127	135	29	32	39	42	1.85	1.87	7.49	7.52	4.97	4.98
S6	0.140	0.143	264	269	65	68	87	91	3.92	3.95	7.44	7.48	4.26	4.31
S7	0.150	0.151	195	205	78	81	43	45	1.67	1.69	7.61	7.65	5.46	5.5
S8	0.135	0.137	237	242	44	47	71	72	2.10	2.15	7.42	7.45	5.14	5.19
S9	0.175	0.176	165	169	38	41	72	74	1.70	1.73	7.43	7.44	5.32	5.35
S10	0.160	0.163	215	220	57	62	67	71	2.27	2.3	7.43	7.44	5.32	5.35
S11	0.150	0.152	372	380	112	115	161	163	1.77	1.8	7.42	7.43	5.14	5.19
TOTAL	1.625	1.647	247	2911	831	864	1256	1368	20.16	22.27	82.02	82.31	54.09	54.47
MEAN	0.147	0.15	258.81	265	34.63	78	114.18	124.36	1.83	2.00	7.46	7.48	4.91	4.95
SD	0.0141	0.094	123.86	122.35	56.96	39.09	67.84	69.34	0.72	0.714	0.0705	0.070	0.546	0.570
CV	0.096	0.624	0.478	0.461	1.63	0.506	0.594	0.557	0.398	0.357	0.0094	0.0094	0.111	0.115

Fig2.Relation Between Sample and Total Alkalinity



- The Lowest TA was recorded at S7 (245 mgL^{-1}/Winter) and at S7 (248 mgL^{-1}/Summer).
- The Highest TA was recorded at S9 (352 mgL^{-1}/Winter) and at S9 (355 mgL^{-1}/Summer).
- The mean value of TA was (297.09 mgL^{-1}/Winter) and (302 mgL^{-1}/Summer).

Fig3. Relation between Sample and Total Alkalinity



- The Lowest BOD was recorded at S2 (3.78 mgL^{-1}/Winter) and at S2 (3.82 mgL^{-1}/Summer).
- The Highest BOD was recorded at S4 (5.51 mgL^{-1}/Winter) and at S4 (5.55 mgL^{-1}/Summer)
- The mean value of BOD was (4.91 mgL^{-1}/Winter) and (4.95 mgL^{-1}/Summer).

IV. Conclusions

Bore well water samples under investigation are generally used for domestic purpose and only some time for drinking purpose. But looking at the results obtained it can be concluded that bore well water is contaminated and should not be used for drinking purpose without pretreatment.

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