Research Paper Enviroment

Evaluation of Surface And Groundwater Quality For Potability and Irrigation - A Case Study of Ashwaraopally Village, Warangal District, Telangana State

Ch.Kranthi	M.Tech Student, Centre for Environment, IST, JNTUH, Kukatpally, Hyderabad-85.
*** V. Hema Sailaja**	Lecturer, Centre for Environment, IST, JNTUH, Kukatpally, Hyderabad-85. *Corresponding Author
Srinivasa Reddy Manchala	Environmental Engineer, Team labs and Consultants, Ameerpet, Hyderabad-38
P.Ravi Babu	Lecturer, Centre for Water Resources, IST, JNTUH, Kukatpally, Hyderabad-85.

ABSTRACT

The present study was designed to assess the physico-chemical and biological characteristics of water samples collected from Ashwaraopally village viz., Pangidi Lake, Dharmasagar Reservoir canal and well waters. The physico-chemical and Biological parameters such Colour, pH, Odour, Dissolved Oxygen, Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), Calcium, Hardness, Alkalinity, chloride, Nitrate, Potassium, Phosphorus, Magnesium and E.coli count were studied. The results obtained showed a fluctuation in this parameter's from the Standards (IS 10500; 1994) which gave an idea about the intensity of pollution caused by agricultural activities in the surrounding areas and also the human interference. The study revealed that the lake water was alkaline and other parameters concentrations were also high. Many parameters showed a significant correlation with increased surface and ground water pollution thereby impacting the potability and utilization of those waters.

KEYWORDS Physico-Chemical & biological Parameters, water Quality, potability and utilization.

Introduction:
Water being the crucial life supporting component, its quality aspect attains utter importance and its investigation reveals its impacts on the user end. The knowledge of the quality parameters present the state of pollution levels and gives a vision on the remedial measures to be taken to check the effects. The physico- Chemical and biological parameters estimated give the clear picture of the potability of the waters and its utility for other means like irrigation comparing with the recommended standards. The Present study is taken up in a village where the pollution initiated to raise.

Objective of the study:
To address the quality aspects of the surface and ground water utilization for drinking and irrigation in Ashwaraopally village of Warangal district in Telangana state. The presence of solid waste dumping site, agricultural activities, poultry activities and human intrusions resulted in the lake and ground water quality deterioration in the area of study resulting in adverse effects on the health and environment of the village.

Steps followed for the Evaluation:
1. Physico-chemical and biological characteristics of surface and ground water in the study area.
2. Identify the Pollution Sources
3. Study the health effects due to consumption of these waters
4. Prepare quality database linked with locational coordinates
5. Analyze the remedial measures

Description of the Study Area
The study area shown in the figure 1.1 is the lower part of the Pangidi cheruvu in ashwaraopalli village. The area falls in the Survey of India Topographic map number 56O/10/NE to a scale of 1:25,000. The area lies between 17.554'98" N to 17.474'53"N latitude and 79.123'93"E to79.165'50"E longitude. The area is located at Raghunathpally mandal of warangal District, Telangana state, India. It is 43km west from district head quarters Warangal and 7km from Raghunathapalle. Its total area is 1832 hectares. Agriculture is the main occupation in the village and the main crops are paddy, cotton, sunflower and chillies.

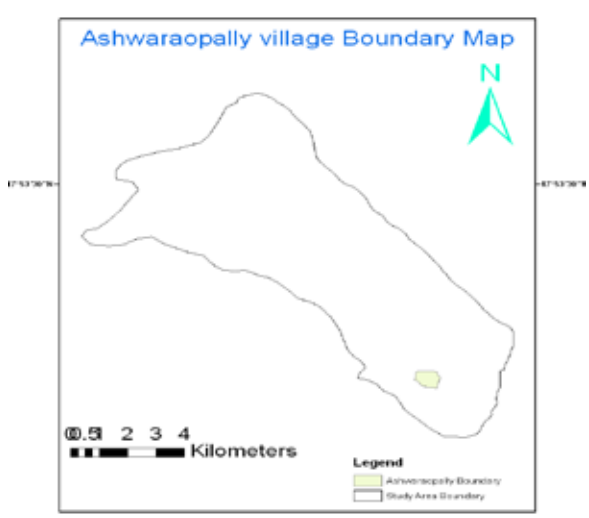

Figure: 1.1 Showing the boundary of the study area.

Water sampling and Estimation:
Water sampling is carried out following the standard procedure with care and field estimates and laboratory analysis. Water samples were analyzed for quality parameters like Col-

our, p^H, Electrical locations conductivity, Total dissolved solids, Turbidity, Alkalinity, Chlorides, Sulphates, Nitrates and Nitrites, Fluorides, Phosphates ,COD,BOD,Dissolved Oxygen ,Hardness and E.Coli by adopting the Indian Drinking Water Quality Standards as per IS 10500:1994.Each sample value is an average of three estimations of the same parameter to get accurate results.

The groundwater quality analysis has been carried out for the water samples collected from the nine locations located at Govt high school Borewell, Venkat Reddy agricultural borewll , Chittyala Mallesh agricultural borewll, Rajiv Nagar, Jawahar Nagar borewell, Watershed Pond, SC Colony borewell, Hand borewell, Y.S. R Nagar, Hanuman Temple borewell, Maloth Kiran agriculture borewell, ten surface water samples are collected from Padigi lake and five locations in the canal. The sample location lat/long is shown in fig 1.2 & 1.3 of ground and surface waters respectively.



Fig 1.2 GCP's of GW samples from wells of village

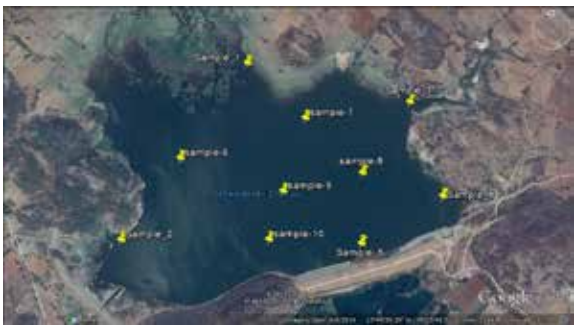

Fig 1.3 GCP's of SW samples from pangidi lake

Creation of Attribution Data Base:

Creation of attribute Data Base is done by collecting the attribute data from different organizations and Mandal office of Raghunathpalle and Field investigation of Ashwaraopalle village. All the socio-economic data collected from mandal headquarter and its concerned departments situated at Warangal district and cadastral survey maps with survey numbers are obtained from the central survey office, Hyderabad.

Software's used are ArcGIS 9.1 version and MS Excel 2010.

Results of Analysis Data:

Table 1.1 shows the analyzed quality data of the pangidi lake for twenty parameters in ten sampling locations and the average calculated out of them. Table 1.2 shows the lake water quality parameters at five locations and calculated average values. Table 1.3 show the Ground water analysis data at the nine sampling locations in the village.

Parameters	Sample 1	Sample2	Sample3	Sample4	Sample5	Sample 6	Sample 7	Sample 8	Sample 9	Sample 10	Avg of samples
Colour	Darkish green	Greenish brown	Darkish green	Darkish green	Greenish brown	Darkish browner	Darkish browner	Greenish brown	Greenish brown	Greenish brown	Darkish browner
Odour	objectionable	objectionable	objectionable	objectionable	Unobjectionable	objectionable	objectionable	Unobjectionable	Unobjectionable	Unobjectionable	objectionable
Ph	7.5	7.8	7.42	7.8	7.6	7.7	8.1	7.9	7.8	7.9	7.75
EC(µS/cm)	850	972	988	1280	1090	1098	1056	1175	1120	1014	1064.3
BOD	45	56	64	63.2	68	58	56	55	58	59	58.6
COD	300	367	389	392	380	352	345	352	390	385	365.2
DO	5.8	7.8	8.2	8.12	7.9	7.5	73.2	8.3	7.31	7.63	7.66
Alkalinity	230	239	245	255	220	233	234	256	245	268	242.5
Chloride	255	282	276	243	260	246	256	265	262	258	261.2
Hardness	364	356	418	470	385	420	354	358	375	362	394.6
Phosphorous(mg/l)	1.52	2.3	1.9	1.1	1.0	1.2	1.0	1.8	2.1	2.3	1.6
Potassium(mg/l)	5.2	4.5	3.3	4.1	5.2	5.6	5.1	5.4	5.9	5.3	4.96
Nitrate(mg/l	50	49	60	56	54	58	54	52	53	51	53.7
Calcium	84	120	115	98	85	112	99	87	94	92	98.6
Magnesium	35	42	46	38	43	48	46	42	48	42	43
Fluorides	0.7	0.85	0.64	0.82	0.78	1.0	0.9	0.91	0.88	0.87	0.8
Sulphates	223	225	262	356	355.3	368	358	362.6	360.12	359	322.9
Nitrites	2.1	2.08	3.07	3.12	3.2	3.43	3.2	3.3	3.8	3.2	2.95
Turbidity	5.1	3.2	3.2	3.8	4.2	3.1	2.3	2.2	2.9	3.1	3.31
E.Coli	Present	present	present	present	present	Present	Present	Present	Present	Present	Present

Table1.1 Analysis of Physico-chemical and biological parameters in lake water of Ashwaraopally village.

Parameter	Sample1	Sample2	Sample3	Sample4	Sample5	Avg. of five samples
Colour	clear	clear	clear	Light yellow	Clear	clear
Odour	unobjectionable	unobjectionable	unobjectionable	unobjectionable	unobjectionable	unobjectionable
Ph	7.2	7.3	7.6	8.1	7.2	7.48
EC	300	432	255	198	200	277
Sulphates	159	194	166	208	235	192.4
Nitrates	49	55	78	102	55	67.8
Alkalinity	198	232	240	193	190	210.6
Total Hardness	320	285	263	318	296	296.4
Potassium	3.2	4.5	3.0	2.8	3.0	3.3
Phosphorous	0.2	0.23	0.19	0.26	0.12	0.2

Table 1.2 Canal water physico-chemical analysis results

parameter	Govt school Borewell	Venkat Reddy Agri Borewll	Chittyala Mallesh Agri Borewll	Rajiv Nagar bore well	Watershed Pond	SC colony, Borewell	Hand Borewell, YSR Nagar	Hanuman Temple, Borewell	Maloth Kiran Agri.Borewell
pH	7.59	8.2	7.3	7.1	7.4	7.6	7.8	7.5	7.3
EC	2338	3697	7786	5542	1298	2651	1258	3018	3213
TDS	909	846	2016	2915	1955	1626	648	1049	1562
Turbidity	1.072	1.394	1.502	1.609	10.59	10.16	0.965	0.75	1.931
Alkalinity	225	112.5	92.5	122.5	nil	55	40	76	62.5
chlorides	527.34	1006	1307	1946	1866	2283	279	809.7	801
sulphates	550	3200	3500	4000	9000	1450	2150	7100	6300
Nitrates	11	0.19	4.125	0.256	1.23	0.32	0.125	0.375	0.34
Nitrites	1.1	10.3	1.6	0.2	16.9	17.6	1.65	2.5	0.8
Fl	0.0134	0.003	0.018	0.002	0.15	0.216	nil	0.012	0.0132
Phosphates	0.1	0.675	0.3	1.85	0.24	0.69	0.125	0.075	0.266

Table1.3 Analysis of Physico-chemical parameters in well water of Ashwaraopally village

Thematic maps of the drainage order present in the study area is shown in the fig 1.4. and major water bodies in fig 1.5.

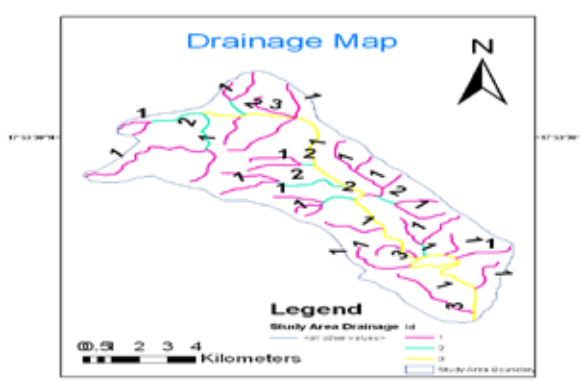

Fig 1.4 Drainage map of study area

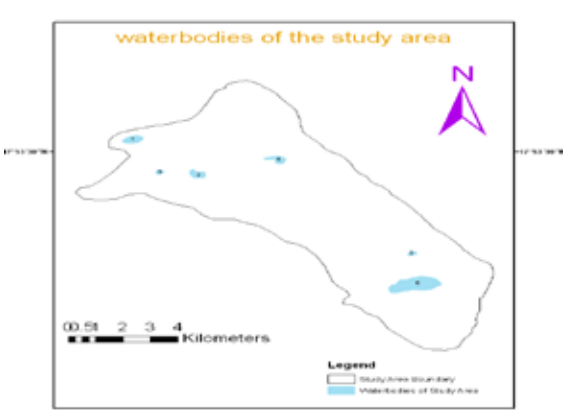

Fig 1.5 Water bodies in the study area

Diseases Reported due to consumption of the untreated water from ground and surface sources is as follows:

Cause	Water-borne diseases
Bacterial infections	Typhoid
	Cholera
	Paratyphoid fever
	Bacillary dysentery
Viral infections	Infectious Hepatitis (jaundice)
	Poliomyelitis
Protozoal infections	Amoebic dysentery

Discussion on results:

The p^H values varied between7.014 to 8.229. The highest electrical conductivity values of 3018, 3213, 3386, 3453, 3697,4396, 4770, 5542, 5682, 7786, 7977 µmhos/cm are observed at Hanuman Temple borewell, Maloth Kiran agriculture borewell, Mettu Venkat Reddy agriculture borewell ,Venkat Reddy agriculture borewell, Rajiv Nagar Jawahar Nagar borewell,Chittyala Mallesh agriculture borewell, rmaining. In the study area the total dissolved solids concentrations varied between 431-19550 ppm. The highest total dissolved solids values of 2010 ppm, 2915 ppm, 3227 ppm, 6780ppm, 19550 ppm are observed at Chittyala Mallesh agriculture borewell, Rajiv Nagar, Jawahar Nagar, SC Colony, borewell, Watershed Pond. The turbidity values in the study area are ranging between 0 to 10.59 NTU. Highest turbidity values of 10.16 NTU, 10.59 NTU are observed at SC Colony, Watershed Pond. The alkalinity values for all the samples are within the permissible limit. The chloride concentration values varied between 527.34 to 2283.2 ppm. Highest chloride concentration values of 1006.19 ppm, 1307.09 ppm, 1403.31 ppm, 1866.92 ppm, 1946.89 ppm, 2283.29 ppm are observed at Ex-service men agriculture borewell, Chittyala Mallesh agriculture borewell, Rajiv Nagar Jawahar Nagar borewell. The sulphates concentration varied between 550 ppm to 9000 ppm in the study area which shows that the presences of sulphates in the water samples are well above the permissible limit. In the study area nitrates concentration varied between 0-4.125ppm. In the study area nitrites concentration varied between from 0 ppm-17.6 ppm & Highest concentration values of 5.1ppm, 9.3 ppm, 10.3 ppm, 16.9 ppm, and 17.6 ppm are observed at Rajiv Nagar, SC Colony borewell, Mettu Venkat Reddy agricultural borewell,Watershed Pond. All most all the parameters in the lake water is found to be above the permissible limits suggesting prior treatment. Canal water is comparatively better as projected by the results. Based on the analysis, most of the area at many locations near the solid waste dumping site falls in moderately polluted to severely polluted category indicating that the water is unsuitable for drinking purpose. The influences of solid waste dumping site, aquifer material mineralogy together with semiarid climate, other anthropogenic activities and increased human interventions have adversely affected the water quality in the study area.

Conclusions and Recommendations:

Water-borne epidemics and health hazards in the aquatic environment are mainly due to improper management of water resources. Proper management of water resources has become the need of the hour as this would ultimately lead to a cleaner and healthier environment. In view of the quality detected it is very essential for the prior treatment of the water before consuming. In view of the economic variability in the region it is suggested to boil the water and filter before drinking to prevent spread of diseases. Personal hygiene is very important and use of toilets is essential preventing open disposal. Check on the point sources from the agricultural lands nearby and the poultry discharges into the lake and open sewage disposal should control the degradation of the water quality in surface and ground waters. Sanitary landfill is the

option for controlling pollution seepage in the study area. Use of disinfectants like chlorine in water would improve the quality of drinking water in the village. Set up of a STP at the conjunction of the lake and canal would drastically improve the water quality. Educating the village people on proper waste disposal also is very essential for quality management in the area.

Further investigation for proper planning in soil study and on bio fertilizers to be used is required.

REFERENCES

[1]BIS, (1994), "Indian Standards Specifications for Drinking Water", Bureau of Indian Standards, IS: 10500 -1994). | [2]WHO, (1996), "Guidelines for drinking-water quality, health criteria and other supporting information", Vol.2, 2nd edtion, World Health Organization, Geneva, pp 940-949. | [3]Mahmet Tahir A.P., (2010),"Water quality of surface waters in Lower Euphrates Basin" (Southeastern Anatolia, Turkey). Vol 9, pp 18. | [4]Agbalagba, and O.E, Ononugbo C. P., (2011), "Investigation into the physic-chemical properties and hydrochemical process of groundwater from commercial boreholes in Yenagoa", Bayelsa State, Nigeria .Vol .5,pp 473-481. | [5]Gyamfi. E.T , Ackah .M (2011), "A study to assess the suitability of potable water for domestic activities in Accra," Vol .2, pp118-127. | [6]Jagessar R.C., Sookundum L., (2011),"Determination of nitrate anion in waste water "from nine selected areas of coastal Guyana. Vol.7, 15.pdf. | [7]Devi . S, Premkumar .R , (2012)," Physico- chemical analysis of ground water samples" near Industrial Area, Cuddalore District, and Tamilnadu, India. Vol .4, N0.1, pp 29-34. | [8]Mahananda A.H.Bhuiyan, (2012), "Analysis of Ground Water of Rural Areas of Wardha City" using physico-chemical and biological parameter.Vol.2, pp803-807. | [9]Narsimha.A., Geetha.S.,(2012),"Physico-chemical analysis of drinking water quality" in Hanmkonda Area, Warangal District, Andhra Pradesh, India,(2012),Vol.4, pp.4255-4259. | [10]Nayan J. Khound, Parag Phukon ,(2012), "Physico- chemical studies on surface water quality" in the Jia-Bharali River Basin, Narth Brahmaputra Plain, India.,pp.1169-1174. | [11]Sashikesh Ganeshalingam, Jayadevan J.P.,(2012),"Physi-co-chemical analysis of pond water samples from selected areas in Valukkai Aru Drainage Channel", Jaffna, Srilanka. Vol.2, No.2, pp 12-23. | [12]Makwana S.A., Patel C.G., (2013), "Physico-chemical analysis of drinking water of Gandhinagar District ". Vol.4, pp 461-464. | [13]Naji Ebrahim, Kershi R.M., (2013), "Physio-chemical analysis of drian-age water" from Maoh(Zafar) village, Yemen.Vol.2,pp 244-247. | [14]Onwughara N.I., Nnabuenyi H. O., (2013), "Physico-chemical studies of water from selected borewells in Umuahia", North Local Government Area, in Abia State, Nigeria.Vol.2, No.1, pp 34-44. | [15]Umendum N.L., et al (2013), "Physico-chemical Analysis of Selected Surface Water in Warri", Nigeria.Vol .4, No.7, pp 229-518. | [16]Pourfallah.F, Javadian.S(2014),"Physico-chemical analysis of drinking groundwater around Tehran", Research article. | [17]Das J, Acharya BC.,(2003), "Hydrology and assessment of lotic water quality in Cuttack city, India", Water Air Soil Pollute, pp 150,163-175. | [18]APHA. (1989), "Stand-ard method for examination of water and waste water American public health association", Washington.D.C. | [19]NEERI, 340, (1986), "Manual on water and waste water analysis". National Environmental Engineering Resources Institute, Nagpur. | [20]Tong C.H., Yang X.E. and Pu P.M., 17(1), (2003), "Degradation of aquatic ecosystem in the catchment of Mu-Ge Lake its Remediation countermeasures", Journal of Soil and Water Conservation,pp 72–88. | [21]USEPA, (2000), "Nutrient Criteria Technical Guidance Manual, Lakes and Reservoirs" , US EPA, Washington D.C., EPA 822-B00-001 . | [22]C.S. Rao, 8(7),(2002). "Environmental pollution control Engineering". Water quality standards,pp 328- 329. | [23]A.K.Chatterjee.,(1994), "Water Supply, Waste Disposal and Environmental Pollution Engineering". Quality of Water Supplies,pp 160-176. |