International Journal of Engineering Science Invention (IJESI)
ISSN (Online): 2319 – 6734, ISSN (Print): 2319 – 6726
www.ijesi.org ||Volume 7 Issue 4 Ver. IV|| April 2018 || PP 36-41

A Study On Groundwater Quality From Aprupa Watershed Basin, Sangola Taluka, Solapur District, Maharashtra.-A Case Study

Karim Mujawar And Abhishek Gadade, Ravi Kshetri,Abhay Birajdar,Sham Pawar,Suhas Shingade,Suryakant Patil
Department Of Civil Engineering,NBNSCOE,Solapur.
Corresponding auther: Karim Mujawar

Abstract:*Most Human Activities Involve The Use Of Water In One Way Or Other Such As Food Production, Nutrition Etc. Which Are Dependent On Water Availability In Sufficient Quantities And Good Quality (Howari, 2005). It Is Estimated That Approximately One Third Of The World's Population Uses Groundwater For Drinking Purposes And Today More Than Half The World's Population Depends On Groundwater For Survival (Mohrir, 2002). Groundwater Is Used For Domestic And Industrial Water Supply And Also For Irrigation Purposes In The World. In The Last Few Decades, There Has Been A Tremendous Increase In The Demand For Fresh Water Due To Rapid Growth Of Population And The Accelerated Pace Of Industrialisation. With The Present Population Of India, There Is An Increasing Demand For Food, Fiber And Fuel, Resulting In Tremendous Pressure On Our Finite Land Resources, Especially Soil And Water. India Is Blessed With Monsoon For Rains And That We Can Do Little To Alter The Nature's Gift. The Study Area Shows The Basaltic Lava Flows Which Represent The Peripheral Portions Of The Deccan Traps. They Occupy The Western, Central And Southern India. In The Present Study Various Parameters Determined Are Ph, Electrical Conductivity, Solids, Total Alkalinity, Carbonate, Bicarbonate, Chloride. The Water Quality Assessment May Give Clear Information About The Subsurface Geologic Environments In Which The Water Is Presents (Raju Et Al, 2011). The Present Study Was Carried Out For Quality Analysis Based On Physico-Chemical Parameters Of Groundwater. Hydrogeochemical Data Was Analyzed To Understand The Relationship Of Groundwater Chemistry To Soil And Rock Composition And Further To Decipher Its Quality To Safeguard The Human Health. For Most Of The Parameters It Has Been Observed That Their Value Exceeds WHO (2004) And ISI (1983) Tolerance Limit.*

Keywords*: Hydrogeology, Groundwater, Physiochemical Parameter, Watershed*

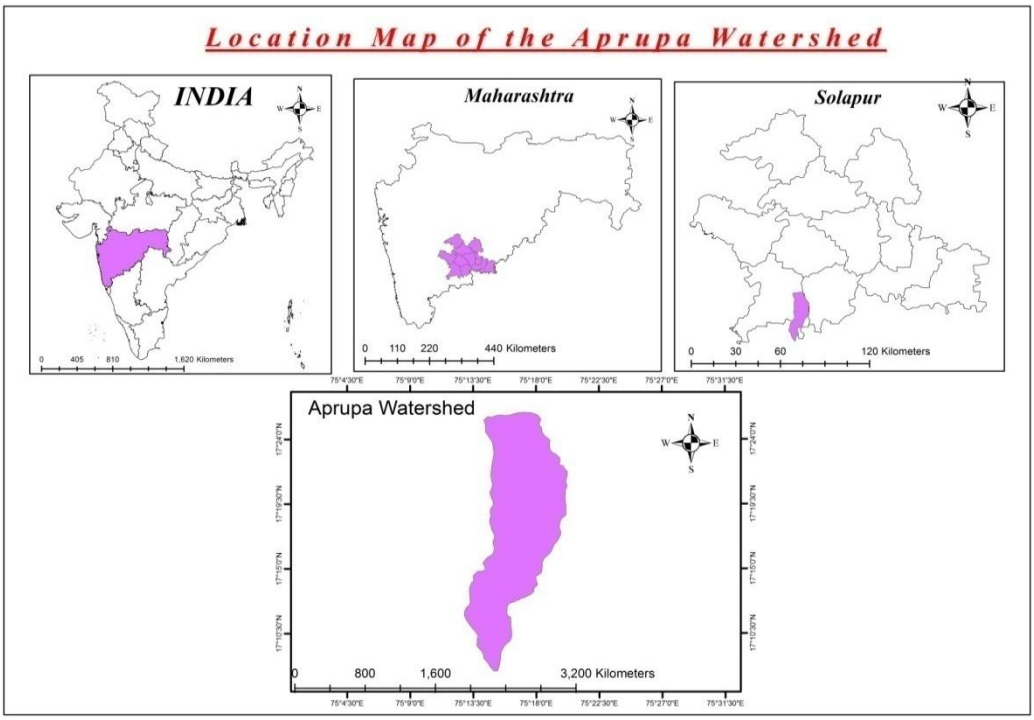
Date of Submission: 05-03-2018 Date of acceptance: 20-04-2018

I. Introduction

Recently There Has Been Overall Development In Various Fields Such As Agriculture, Industry And Urbanization In The Asian Countries Particularly In India. This Has Been Lead To Increase In The Demand Of Water Supply Which Is Met Mostly From Exploitation Of Groundwater Resources. In Hard Rock Semi-Arid Terrain That Occupies Almost Two Third Of India, Groundwater Is The Largest Fresh Water Resource. The Groundwater Potentiality In Such Region Is Largely Limited To Shallow Weathered And Fractured Zones. In Order To Meet Demand, There Has Been Indiscriminate Exploitation Of Groundwater Resources. In The Absence Of Any Planned Groundwater Withdrawal Approach, Many Times Random Drilling Of Bore Wells Results Into Failure. Most Human Activities Involve The Use Of Water In One Way Or Other Such As Food Production, Nutrition Etc. Which Are Dependent On Water Availability In Sufficient Quantities And Good Quality (Howari, 2005). It Is Estimated That Approximately One Third Of The World's Population Uses Groundwater For Drinking Purposes And Today More Than Half The World's Population Depends On Groundwater For Survival (Mohrir, 2002). Groundwater Is Used For Domestic And Industrial Water Supply And Also For Irrigation Purposes In The World. In The Last Few Decades, There Has Been A Tremendous Increase In The Demand For Fresh Water Due To Rapid Growth Of Population And The Accelerated Pace Of Industrialisation.

II. Study Area

Fig No-1 Shows The Location Map Of Aprupa Watershed Basin



The Study Area Covered 230 Sq. Km. The Upper Aprupa Watershed Basin Basin Is In Sangola,Taluka Of Solapur,District 450 Km SE Of Mumbai , 260 Km S Of Pune , 180 Km From Kolhapur , 100 Km From Solapur City . Part Of S.O.I. Toposheet 51 O/10 &13, 53 C/1 & 2, Bounded By N Latitude $17^{o}10'$-17^{o} 24' ,E Longitude $75^{o}12'$-$75^{o}20'$. Covering The Villages Alegaon, Digewadi,Ambewadi,Medsinghgi,Waghma, Shirshi,Shindewadi,Gheradi,Waki,Dikhsal,Pare,Sutarwadi,Chavanwadi Which Is Found Almost To Be Dry Throughout The Year, Excepting For Surface Water Flow For Few Days In A Year During Rainy Season.

III. Methodology

Material And Methodology:

The Field Work Included Collection Of Water Samples From Bore Wells, Collection Of Soil Samples And The Study Of Geological And Geomorphological Features Of The Area In General.

Sample Preparation And Analysis Of Water

The Field Work Included Collection Of Water Samples From Bore Wells From 20 Locations.The Samples Are Collected In Pre-Cleaned Polyethylene Bottles Of One Litre Capacity. The Groundwater Samples Are Analysed As Described By American Public Health Association (APHA, 1995) Procedure, And Suggested Precautions Are Taken To Avoid Contamination. The Various Parameters Determined Are Ph, Electrical Conductivity, Total Hardness, Total Alkalinity, Chloride,. Ph And EC Are Determined By Ph Meter And Conductivity Meter, Total Hardness And. Carbonate (CO_3^{2-}) And Bicarbonate (HCO^{3-}) Were Estimated By Titrating With H_2SO_4. Chloride (Cl^-) Was Estimated By Standard $Agno_3$ Titration.

The Water Quality Assessment May Give Clear Information About The Subsurface Geologic Environments In Which The Water Is Presents (Raju Et Al, 2011). The Present Study Was Carried Out For Quality Analysis Based On Physico-Chemical Parameters Of Groundwater.

Table No.1.-Illustrates The Quality Of Groundwater Samples With Reference To WHO (2004) And ISI (1983)

Sr. No.	Parameter	WHO Limits (Ppm)	IS Limits (Ppm)
1	P^H	8.5	8.5
2	EC	1500(Mhos/Cm)	---
3	Alkanity	200	200
5	Cl	250	250
8	TH	300	300

Result And Discussion

Distribution Of Ph In Groundwater Of Aprupa Watershed Basin

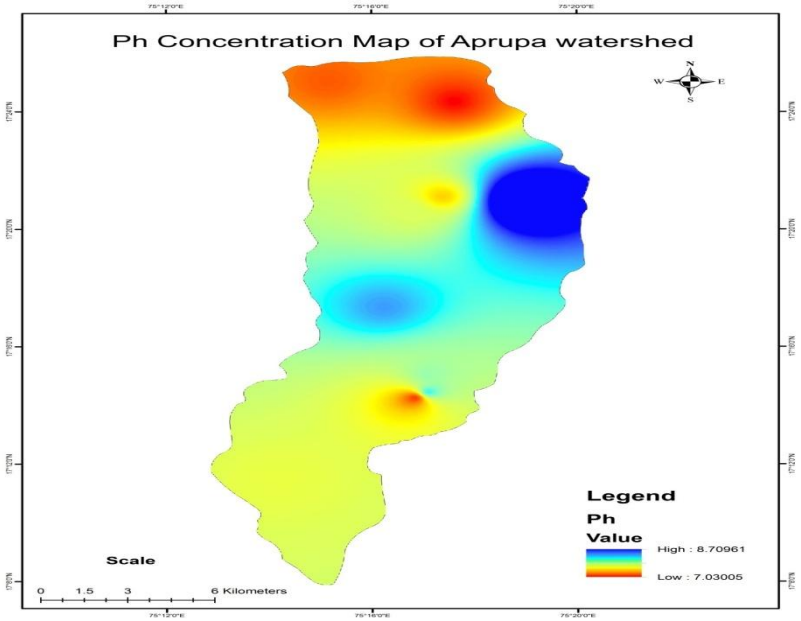


Fig No.2. Illustrates The Distribution Of Ph In Groundwater Of Aprupa Watershed Basin

The Ph Of Groundwater Indicates The Strength Of Water To React With Acidic Or Alkaline Material Present In Contact With Groundwater. The Ph Of Water Is A Critical Indicator Of Its Quality And Provides Information In Many Types Of Geochemical Equilibrium (Hem, 1991).The Figure 2 Illustrates The Distribution Of Ph Values Of Groundwater In The Aprupa Watershed. Lower Ph Values (< 8) Persist In The Entire Area Of Aprupa Watershed Basin. However, The Higher Ph Values (>8) Are Noticed At East Of Gheradi Shrinks To Smaller Region. The Ph Values 7.02 Indicate Smaller Areas Of Lower Ph Values. The Higher Ph Values Of Groundwater Are Noticed In The –Aprupa Basinis 8.71.

It Is An Indication That The Quality Of Groundwater In Terms Of Ph Seems To Have Improved. According To Todd 1984, Davis And Dewist 1970, Hanson 1984 The Groundwater Ph Range From 5.0 To 6.5 Is Critically Influenced By The Lithology Surrounding The Groundwater. In The Present Study The Basaltic Rocks, Their Types, The Clayey And Loamy Soil, Entisols And Inceptisols Govern The Ph Of Groundwater In Aprupa Watershed Basin.

Distribution Of EC In Groundwater Of Aprupa Watershed Basin

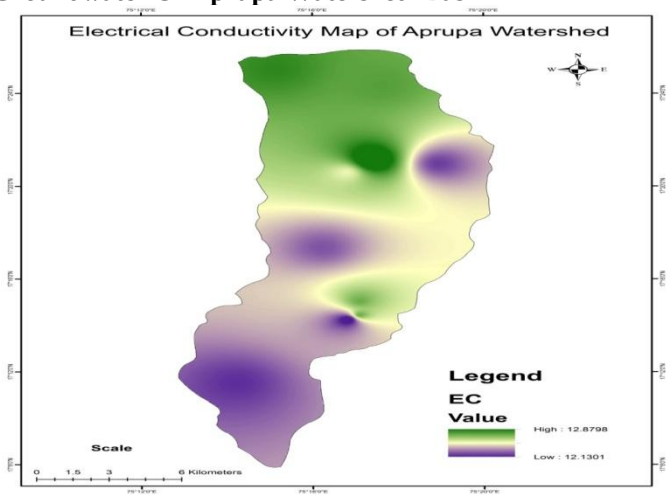


Fig No.3. Illustrates The Distribution Of EC In Groundwater Of Aprupa Watershed Basin

The Electrical Conductivity Of Ground Water Reflects The Solubility Of Salts Present In The Soil. The Electrical Conductivity Of Water Is A Critical Indicator Of Its Quality. The Electrical Conductivity Ranges In

Aprupa Watershed Is646-1475 Micro-Ohm-Second. The Figure 3 Shows The Distribution Of EC Values Of Groundwater In Aprupa Watershed Basin. On Observations Of The Figure 3 Reflects The High EC Contours Forming A Ridge Between Digewadi Ambewadi And Medsingi, The Rest Of The Aprupa Watershed Basin For The Said Season Have Electrical Conductivity Values Close To The Background Of 700 Micro-Ohm-Second. The Remaining Part Of The Basin Shows Average And Below Average Values. The Range Of EC During The Said Season Is Between 646 And 1475 Micro-Ohm-Sec. The Average Value Is 700 Micro-Ohm-Sec. It May Be Stated That In All The Three Seasons The EC Is Within The Prescribed Units Of World Health Organization (WHO) 2004.

Distribution Of Alkalinity In Groundwater Of Aprupa Watershed Basin

The Alkalinity In Groundwater Is Due To Carbonate Alkalinity, Bicarbonate Alkalinity And Hydroxyl Alkalinity. Among The Mentioned Three Types, Hydroxyl Alkalinity Is Rare. Alkalinity Of The Samples From Aprupa Watershed Basin Has Been Determined By A Standard GSI (1983) Method.

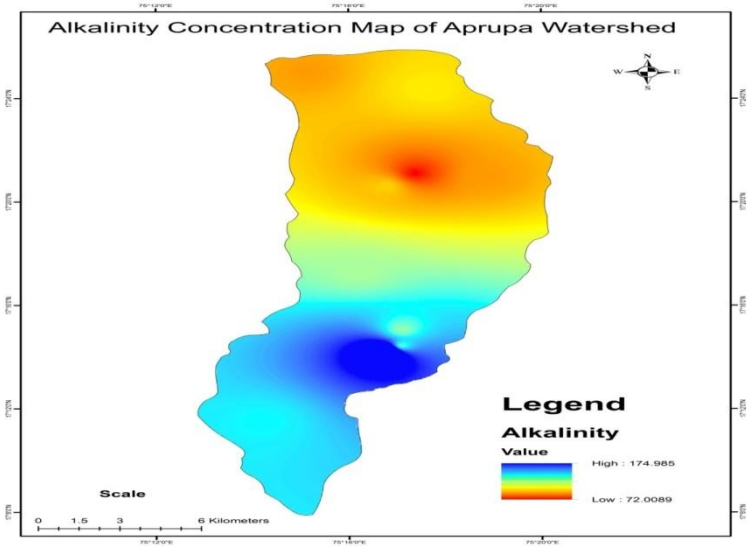


Fig No.4. Illustrates The Distribution Ofalkalinity In Groundwater Of Aprupa Watershed Basin

The Results Of The Determination Are Given In Tables No-2 Respectively. The Figures 4 Shows The Distribution Of Alkalinity In The Groundwater Of Aprupa Watershed Basin For The Above Mentioned Seasons. The Ranges Of Alkalinity In The Groundwater Of The Study Area Are 60-116 Ppm ,It May Be Noted That All The Samples Not Exceed The WHO (2004) And ISI (1983) Limits Prescribed For Human Consumption.

Distribution Of Total Hardness In Groundwater Of Aprupa Watershed Basin

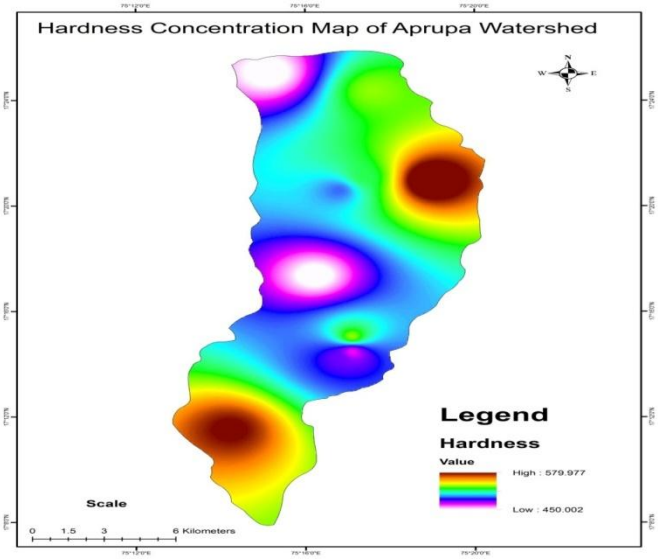


Fig No.5. Illustrates The Distribution Of Hardness In Groundwater Of Aprupa Watershed Basin

As Mentioned Earlier Hardness Results From The Presence Of Divalent Cations Of Which Ca^{2+} And Mg^{2+} Are The Most Abundant In Groundwater From Basaltic Terrain. These Ions React With Soap To Form Precipitates And With Certain Anions Present In The Water To Form Scales (Todd 1980). The Hardness In Water Is Due To The Solution Of CO_2, Released By Bacterial Action In The Soil, In Percolating Rain Water. Insoluble Carbonates Are Converted To Soluble Bicarbonates In Low Ph Conditions That Develop In Some Soils Due To Bacterial Metabolism (William Deutsch, 1997). Temporary Hardness Is Due To Carbonate And Bicarbonates In Solution That Can Be Removed / Precipitated By Boiling. However, Non-Carbonate Hardness Are Caused By Association Of Hardness Causing Cations, With Sulphate, Chloride Or Nitrate And Is Referred To As Permanent Hardness Because It Cannot Be Removed By Boiling. The Total Hardness In Groundwater From Aprupa Watershed Basin Varies 400-520ppm. The Total Hardness Ranges From 400-520 Ppm.The Distribution Of Total Hardness In The Investigated Basin Is Shows In The Figure No 5. The Locations Of Higher Concentration Contours Of Total Hardness Are At Higher Ridge And Mouth Of The Basin.

Distribution Of Chloride In Groundwater Of Aprupa Watershed Basin

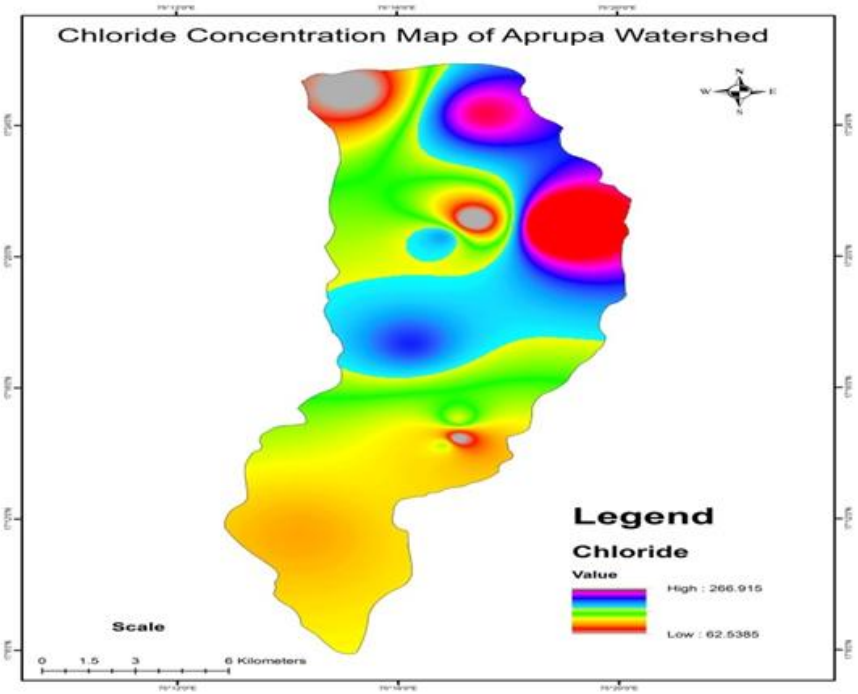


Fig No.6. Illustrates The Distribution Of Chloride In Groundwater Of Aprupa Watershed Basin

The Range For Chloride In Groundwater From Aprupa Watershed Basin Are As 71-280 Ppm. The Figures 6 Illustrates The Distribution Pattern Of Chloride In The Groundwater From Aprupa Watershed Basin. The Chloride Tolerance Limit For Drinking Purpose Has Been Fixed At 250 Ppm By WHO (2004) And ISI. It Is Observed That Digewadi And Gheradi Region Exceed The Tolerance Limits Prescribed For Drinking Purpose. The Higher Chloride Concentration In The Study Basin Could Be Due To Salts In Basaltic Terrain.

The Chloride Ion Has No Adverse Effect On Physical Properties Of Soil And Also Because All Chlorides Of Alkali And Alkaline Earth Groups Are Readily Soluble In Water Chloride Hazards As Such Have Not Entered Irrigation Water Classification System. However, In Some Specific Crops Such As That Of Citrus Varieties It May Play A Sensitive Role (Aggrawal Et Al. 1982).

Table No.2.- Illustrates The Water Quality Parameters From Study Area

Sr. No	Sample No	Ph	EC	Cl	Alkalinity	Hardness
1	A1	7.02	1265	280	92	520
2	A9	7.32	1320	62.48	72	510
3	B3	7.24	1475	122.12	108	400
4	B9	7.12	1270	71	84	450
5	B13	7.09	1300	255.6	88	470
6	B16	7.07	840	96.56	104	460
7	C7	8.71	1100	266.96	84	580
8	C9	7.73	1400	127.8	84	480

9	C8	7.49	950	164.72	89	490
10	C4	7.45	646	107.92	116	560
11	C12	7.52	1300	93.73	92	590
12	C13	7.2	1350	142	60	470
13	C14	7.08	1200	187.44	80	410
14	A11	7.33	676	275	112	470
15	B5	7.38	1150	256	89	420
16	B6	7.72	1050	113.8	87	470
17	B15	7.89	740	178.3	106	450
18	A4	7.08	1250	128.34	75	480
19	A5	7.49	1300	240	94	470
20	A13	7.62	1450	148.92	108	520

IV. Conclusion

Quality If Water Has Become A Cause Of Concern As Fresh Water Resources Are Stretched Thin. Overall Growth Has Led To The Problems Of Water Poverty And War For Water.In The Present Investigation An Attempt Has Been Made To Study The Distribution Of Various Hydrogeochemical Parameters From The Study Area. The Physico-Chemical Parameters Analyzed Were Ph,EC,Cl, TH,Alkalinity,Using Standard Methods Of Analysis. Hydrogeochemical Data Was Analyzed To Understand The Relationship Of Groundwater Chemistry To Soil And Rock Composition And Further To Decipher Its Quality To Safeguard The Human Health. For Most Of The Parameters It Has Been Observed That Their Value Exceeds WHO (2004) And ISI (1983) Tolerance Limit.

From The Above Study Due To The Clayey And Loamy Soil In The Basin, To Reduce The Concentration And Improve The Water Quality Suggested Hydro Fracturing In The Basaltic Terrain Of Watershed Basin.

Acknowledgement:

The Successful Completion Of Any Work Involves Knowledge, Efforts, Interest And Hard Work Of Many Peoples. So We Are Thankful To All Those People Who Helped Us. We Would Like To Express Our Sincere Gratitude Towards Ou HOD CED For His Support. We Are Also Thankful To Mr. Prashant Unhale (Pawar) Sir, Assistant Prof. School Of Earth Sciences, Solapur University For His Continuous Help In GIS Work.

References

[1]. Ravikumar, P., Mohammad Aneesul Mehmood And R. K. Somashekar (2013). Water Quality Index To Determine The Surface Water Quality Of Sankey Tank And Mallathahalli Lake, Bangalore Urban District, Karnataka, India. Appl Water Sci, DOI 10.1007/S13201-013-0077-2.

[2]. Vasanthavigar, M., K. Srinivasamoorthy, K. Vijayaragavan, R. Ganthi, S. Chidambaram, P. Anandhan, R. Manivannan & S. Vasudevan, (2010). Application Of Water Quality Index For Groundwater Quality Assessment: Thirumanimuttar Sub-Basin, Tamil Nadu, India. Environ Monitoring Assess, DOI 10.1007/S10661-009-1302-1.

[3]. Mohrir A. Ramteke D.S.,Moghe C.A., Wate S.R. And Sarin R. 2002. Surface And Groundwater Quality Assessment In Bina Region", IJEP.Vol.22(9).

[4]. Shrivastava, K.B.L., Mishra, S.P. And Mallick, N. (2014). Ground Water Quality Assessment Of Birsinghpur Area, Satna District, Madhya Pradesh, India. Journal Of Innovative Trends In Science, Pharmacy & Technology, 1(1): 125-133.

[5]. Giriyappanavar, B.S. And Patil, R.R. (2013) – Monitoring Water Quality Of Two Lake Of Belgaum District (Karnataka) With Special Reference To Phytoplankton's

[6]. Jena, V., Dixit, S. And Gupta, S., (2013), Assessment Of Water Quality Index Of Industrial Area Surface Water Samples, International Journal Of Chemical Technology And Research, 5(1), Pp 278-283.

[7]. Horton, R.K., "An Index Number System For Rating Water Quality", *J. Water Pollu. Cont. Fed.*, 37(3). 300-305. 1965.

[8]. Raju, N.J. And Reddy, T.V.K. (2007) Environmental And Urbanization Affect On Groundwater Resources In A Pilgrim Town Of Tirupati, Andhra Pradesh, South India. *Applied Geochemistry*, **9**, 212-223.

[9]. Ramesh, K. (2008). Hydrochemical Studies And Effect Of Irrigation On Groundwater Quality In Tondiar Basin, Tamil Nadu. Phd Thesis (Unpublished), Anna University, Chennai, India.

[10]. Subba Rao, N. (1993). Environmental Impact Of Industrial Effluents In Groundwater Regions Of Visakhapatnam Industrial Complex. Indian Journal Of Geology, 65, Pp.35–43 .

[11]. WHO (2004). Guidelines For Drinking-Water Quality Volume 1:Recommendations, 3rd Edn. WHO, Geneva

[12]. WHO. (1989). Health Guidelines For The Use Of Wastewater In Agriculture And Aquaculture. In: Report Of A WHO Scientific Group: Technical Report Series 778, WHO, Geneva, 74.

Karim Mujawar "A Study On Groundwater Quality From Aprupa Watershed Basin, Sangola Taluka, Solapur District, Maharashtra.-A Case Study"International Journal of Engineering Science Invention (IJESI), vol. 07, no. 04, 2018, pp 36-41