

Groundwater study of Manoharthana Block of Jhalawar District in State of Rajasthan, India.

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Abstract: Water is found covering one-third part of the earth in various forms. In India total quantity of water is $1900,000 \times 10^{16} \text{ m}^3$. Rajasthan has paucity of water resource due to low and erratic rainfall. In Jhalawar district, Manoharthana block is one of the areas which have been facing the problem of less availability of potable water quantity-wise and quality-wise higher nitrate concentration at few locations is noticed. However, it is not posing serious health hazards in this area. The ground water is only main source of fresh water supply.

Key words: Groundwater, hydrogeology and hydrochemistry, etc.

I. Introduction

Introduction

Water is one of the most essential substances for sustenance of life on earth i.e. without which life is not possible. The sum total of all the water on the earth constitutes hydrosphere. The aqueous envelop of the earth comprising of the oceans, lakes, streams, underground water, polar and mountain glaciers, soil moisture and the vapors present in the atmosphere are part of hydrological cycle. These natural water resources are moving in cyclic manner.

Physiography And Drainage

The area of investigation is located in Manoharthana block of Jhalawar district in Rajasthan State. On the south-west and east, it touches the border of Madhya Pradesh. The area of study lie within latitude $24^{\circ}07'$ to $24^{\circ}30'N$ and longitude $76^{\circ}23'$ to $76^{\circ}58'E$ falling on survey of India Toposheet number 54/D and covering an area of about 937.46 sq. km .

Physiographically, the study area- Manohar Thana of Jhalawar district is divided in two main parts, southern part is marked by the Malwa plateau while northern part is characterized by the Mukandra mountain series. The part of the area and some hilly parts are covered by lateritic soils. The lateritic soil is marked by the excess of alumina.

The area is drained by the Chhapi River, Parwan River and Parvati River and all these Rivers are seasonal. The area has semi-arid climate and rainfall occurs by south-west monsoon system. The winter season runs from mid of December to February and summer from April to June. The period from mid of June to September is the monsoon season followed by the months- October to mid of November which constitutes the post monsoon or the retreating monsoon. The rainfall mostly occurs as storm bursts and is erratic and caused by south western monsoon system. The average rainfall from period of 2001-2010 is 751.17 mm/year. Precipitation mainly occurs in the months of June, July, August and September except few showers in winter season.

Geological Set-Up

The geology of the present study area is mainly represented by the Vindhyan super group and basaltic flow of Deccan trap. The volcanic activity had occurred during upper Cretaceous to Paleocene period.

The Jhalawar area forms the south western marginal part of the Vindhyan of Rajasthan. In this area, an alternate sequence of shale's, limestone's and sandstones of the Lower and Upper Vindhyan super group forms a major anticline structure known as the Jhalawar Anticline with its trend in NW-SE direction.

Local Geology

Local geological formation of the study area is as follows:

Super Group	Group	Formation	Lithology	Age
			Alluvium soil	Recent
			Lateritic soil and black cotton soils	Pleistocene
Deccan trap		Middle trap Flow 2 Flow 1	Basaltic flows and red bole	Cretaceous to Eocene
Base not exposed				

The local geology of the area is characterized by the middle Deccan traps of basaltic lava flows. In Manoharthana area, two types of basaltic lava flows have been observed on the basis of petrographic study and the description of these flows is given below:

First Flow: - In this flows rock is totally vesicular in nature. It is brown to pale brownish in color. The rock of first flow is characterized by the incidence of fractures and joints. This flow is separated from second lava flow by red bole layer.

Second Flow: - The second flow rock is characterized by presence of big boulders on its crown. The boulders are vesicular and jointed in nature. This flow has potential water bearing zones as it is very much weathered and jointed.

Hydrogeology

The ground water potential in hard rock's depends upon the joints and fracture system present in such rocks. The secondary porosity is also developed by weathering and fracturing. The viability, occurrence and movement of ground water depend upon the topography, structure, geomorphology and the hydraulic properties of water bearing materials. In the present study area, weathered basalts and sandstone are main water bearing formations.

The well inventory information such as the location of dug well, diameter, total depth of water level and discharge etc. in the wells were measured in seventeen selected key wells of the study area which is summarized below in tabular form.

WELL INVENTORY DATA OF SELECTD SEVENTEEN KEY WELLS FROM STUDY AREA:

S.NO	VILLAGE/TOWN	RL(ABOVE MSL)	WELL DIAMENTION	TOTAL DEPTH	WATER LEVEL(BGL)	DISCHARGE OF WELL(M ³ /DAY)
1	Aklera	322	5.50	10.0	7.79	5
2	Ametha	328	6.95	7.55	4.93	35
3	Anwelhera	346	6.10	9.20	4.71	40
4	Chhan	325	3.50	10.90	6.22	45
5	Chhitaura	360	2.90	17.50	15.53	40
6	Churaliya	340		11.0	6.20	40
7	Dangipura	370	6.60	11.60	11.09	25
8	Deorideo	407	6.70	8.75	3.27	30
9	Ganeshpura barod	322	4.30	9.95	5.60	35
10	Jhiri	360	5.20	6.60	3.78	40
11	Khatakheri	340	4.00	10.80	7.15	25
12	Lahas	320	6.1	9.20	6.70	35
13	Maharajapura	400	5.40	7.90	4.44	25
14	Manoharthana	340	4.30	17.05	14.30	10
15	Samrol	340	2.90	8.35	3.32	30
16	Sareri	320	6.60	15.60	12.74	50
17	Thaural	315	4.60	8.80	4.11	35

Groundwater Quality

Water in its chemically pure form occurs rarely in nature. In fact water is commonly containing variety of constituents. When water in its precipitate form reaches the surface of the earth, it has already captured a number of substances. Gases have also been incorporated as well as dissolved dust particles are picked up.

Atmospheric water changes its quality both upon reaching the earth's surface and during its percolation to underground water body. The dissolved salts are in part are retained in the topsoil where carbon dioxide is also released by bacterial action on organic matter. The soil water becomes charged with carbon dioxide resulting in formation of carbonic acid.

Man's influence on deterioration of quality of water is quite apparent and is now a major concern. Mixing of municipal and industrial waste, water may result in drastic changes in the quality of natural waters. Agriculturally related activities such as use of fertilizer, pesticides, herbicides, etc., may lead to pollution of both surface waters and ground water. Irrigation return water also tends to increase total salts in the groundwater. Mining activities often bring substantial water quality changes. The main constituents of ground water are major cations (Ca⁺, Mg⁺, Na⁺, K⁺) and major anions (Cl⁻, SO₄⁻, HCO₃⁻, CO₃⁻, NO₃⁻) which were analyzed and tabulated below strictly according to serial number as given in above table viz. serial number 1 means key well of Aklera and so on and so forh.

Chemical Analysis Of Selected Seventeen Ground Water Samples In Ppm

S.No	pH	TDS	EC	Na ⁺	K ⁺	Ca ⁺	Mg ⁺	Cl ⁻	SO ₄ ⁻	CO ₃ ⁻	HCO ₃ ⁻	NO ₃ ⁻	F	TH	Na%	SAR
1	7.8	464	700	65	2	56	30	14	72	-	366	42	0.64	265	34.60	1.74
2	7.6	439	920	50	4	36	60	71	5	-	378	25	0.48	335	24.19	1.19
3	7.9	455	920	78	3	78	12	71	5	-	330	43	0.40	245	40.50	2.17
4	8.0	500	950	70	15	78	22	64	67	-	293	38	0.30	285	33.33	1.85
5	7.7	450	800	18	22	26	74	99	58	-	268	19	0.30	370	8.92	0.41
6	8.0	516	890	68	22	60	24	71	67	-	317	45	0.80	250	34.74	1.87
7	7.9	416	870	62	29	56	5	35	43	-	256	58	0.30	160	40.66	2.13
8	7.8	513	800	64	22	60	24	57	130	-	256	49	0.30	265	20.97	1.28
9	7.9	384	810	40	18	36	51	92	10	-	244	15	0.10	300	21.22	1.00
10	7.6	344	540	70	7	48	7	14	5	-	330	28	0.30	150	48.87	2.48
11	7.8	549	990	115	0	60	15	43	149	-	281	28	0.80	210	58.35	3.45
12	8.0	503	930	44	0	40	73	71	1	-	488	30	1.48	400	19.27	0.96
13	7.4	343	550	45	1	40	24	57	5	-	195	74	0.88	200	32.78	1.39
14	7.8	468	800	70	4	60	24	43	101	-	244	44	1.32	250	37.35	1.92
15	7.5	572	930	70	5	80	46	142	2	-	342	55	0.58	390	27.71	1.54
16	7.8	532	860	50	5	100	33	64	120	-	281	20	0.88	385	21.70	1.11
17	8.1	455	800	70	21	42	45	71	14	-	354	15	0.60	290	32.41	1.79

II. Conclusion

It is observed that this research work provide significant information about the nature of ground water which is potable largely except higher concentration of nitrate at two –three locations in Manoharthana block of Jhalawar district. A vast data have been generated which are useful for development of a model for exploration and management of groundwater resource in Manoharthana block of Jhalawar district in state of Rajasthan.

It is observed that the present investigation is also useful for water supply department as well as for local residents. Apart from this, the data can be used for further advance research in the area by agencies engaged in groundwater studies.

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