

Groundwater Well Inventory Data Analysis along the Outer Ring Road (ORR) Stretch of Hyderabad, Telangana State, India

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Abstract- The Study area outer ring road (ORR) has a length of 158 km and it is bounded between 17°36'31.78" N latitude and 78°26'28.14" E longitude in north of area and 17°12'13.28" latitude and 78°28'59.13" E longitude in South and falls in the Survey of India Topographical map numbers 56 K/2, 3, 6,7,8,10,11 and 12 in 1: 50,000 Scale. The study of bore well inventory data along the outer ring road area is carried out and data of 82 bore wells were collected. The minimum depth of bore wells drilled is 137 m and maximum depth drilled is 365 m. The minimum inserted casing is 5.5 m and maximum is 25 m. The minimum yield of groundwater is 0.4304 lps and 2.1558 lps pre-monsoon and post-monsoon seasons respectively. Whereas maximum yield of groundwater observed in bore wells are 0.7823 lps and 2.1558 in pre-monsoon and post-monsoon seasons respectively. The bore well inventory analysis reveal that 92% of bore wells having good yield and 8% having low yield in pre-monsoon season whereas, in post-monsoon season 96% of bore wells having good yield and 4% having low yield.

Index Terms- Groundwater bore well Inventory, pre-monsoon, post-monsoon, Outer Ring Road, Hyderabad

INTRODUCTION

The Outer Ring Road is a road-cum-area development project, since its aim is the development of well-planned and well-connected urban settlements around the Hyderabad Metropolitan area. The ORR is developed as an expressway of 8 lanes divided with access control, and has a total of 19 access points. The ORR has a length of 158 km connecting several areas such as Narsing - Kokapet - Patancheru - Medchal - Shamirpet - Ghatkesar - Pedda Amberpet - Shamshabad - TSPA - Narsing -Nankramguda - Gachibowli. Further, along the ORR, service roads are

developed with 2 lanes undivided section, on both sides of Outer Ring Road (ORR).

Groundwater is a valued natural resource, which constitutes about two-third of the fresh water reserves of the world (Chilton, 1992). A major portion of India's irrigation wells is located in the hard rock areas where both recharge and discharge potential presently face severe stress (Nagaraj and Chandrakanth, 1995). The hard rock areas have hard nonporous, igneous and metamorphic rocks, expected to store not more than 10% of the annual rainfall (Radhakrishna, 1971). The occurrence and movement of groundwater in hard rock terrains, especially in fractured bedrock aquifers is governed by factors such as topography, lithology, geological structures and its extension, geomorphology, slope, depth of weathering, drainage pattern and climatic conditions. In newly developed area in many villages, town and cities in rural areas of our country, groundwater is the major source of water for drinking, domestic, agriculture and industrial purposes. The demand of water increasing rapidly and would continue to increase in future. That necessitates the estimation and management of water to fulfill the increasing demand (Karanth, 1987). This study deals with position of aquifer and its fluctuation recorded during pre and post monsoon seasons in the area. The increasing in demand of water results into exploration of water resources. Groundwater is the massive available resource of fresh water found below. Depletion of ground water is a long – term declination, caused due to continuous under water pumping. Due to rapid development and urbanization, declining of water table causes shallow wells to dry up. Because of the massive construction activity, the foundation work which is distributed throughout the study area is the

main reason for the decline of groundwater levels. In 21st century, water security is expected to be the biggest challenge (Snyder, 2019). Groundwater table in the study area (Hyderabad) is going down rapidly as the extraction rate is high.

STUDY AREA

The Study area is bounded between 17°36'31.78" N latitude and 78°26'28.14" E longitude in north of area and 17°12'13.28" latitude and 78°28'59.13" E longitude in South and falls in the Survey of India Topographical map numbers 56 K/2,3,6,7,8,10,11 and 12 in 1: 50,000 Scale. The area receives moderate rainfall of about 750 mm/year. In general the altitude variation from West to East is between 531m and 486m and North to South is between 599m and 607m. The low lying region is situated in West - East direction. The altitude 531m, 504m, 483m and 486m is observed in eastern part of the area. The streams are flowing from the higher altitude towards East. The area has a dendritic drainage pattern, characterized by ephemeral nature. The Musi River runs from west to east, with a 2 m/km slope, and most rivers are naturally transitory. In Hyderabad, the Musi River is the primary river. This river originates in the Anantagiri hills in the Vikarabad region of Ranga Reddy district and runs for 70 kilometers before joining the Osman and Himayat Sagar lakes in Hyderabad.

The bore well inventory data were collected from 82 Government bore wells during pre and post monsoon seasons (Fig.1). These bore wells are fitted with submersible pump of 1 H.P. or 8 H.P. The yield of bore wells was measured by using 900 Vee notch methods (Despande, 2003). In bore well inventory it is observed that the minimum depth of bore wells drilled is 137 m and maximum depth drilled is 365 m. The minimum inserted casing is 5.5 m and maximum is 25 m. The minimum yield of groundwater is 0.4304 lps and 2.1558 lps pre-monsoon and post-monsoon seasons respectively. Whereas, maximum yield of groundwater observed in bore wells are 0.7823 lps and 2.1558 lps in premonsoon and post-monsoon seasons respectively.

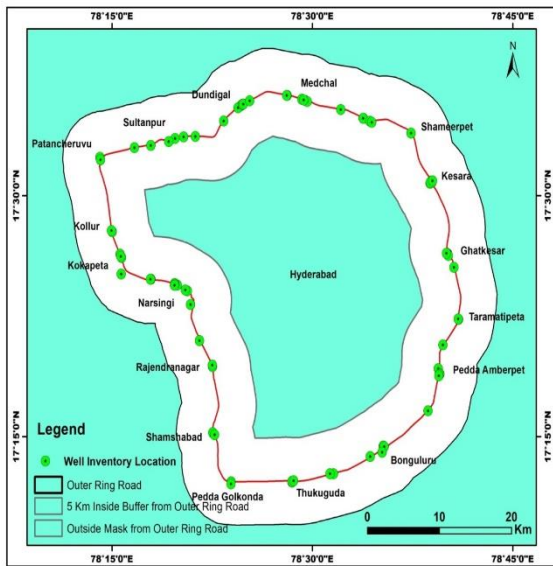
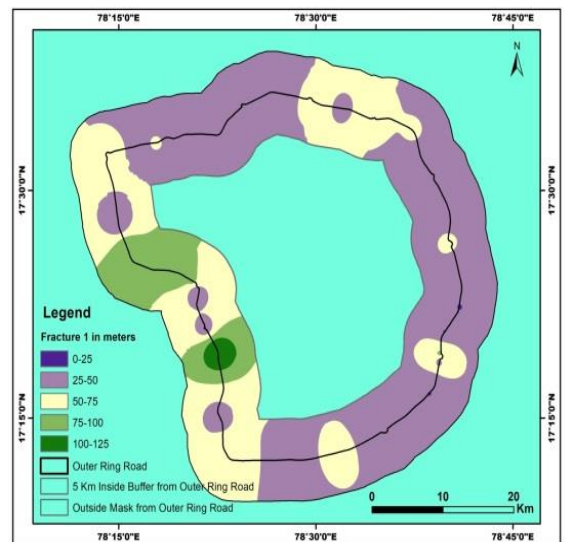
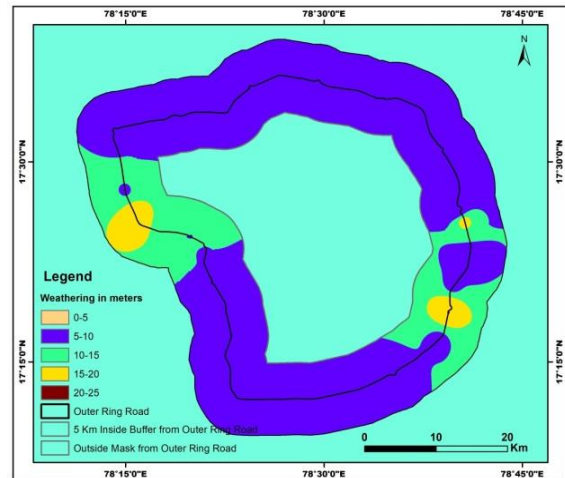
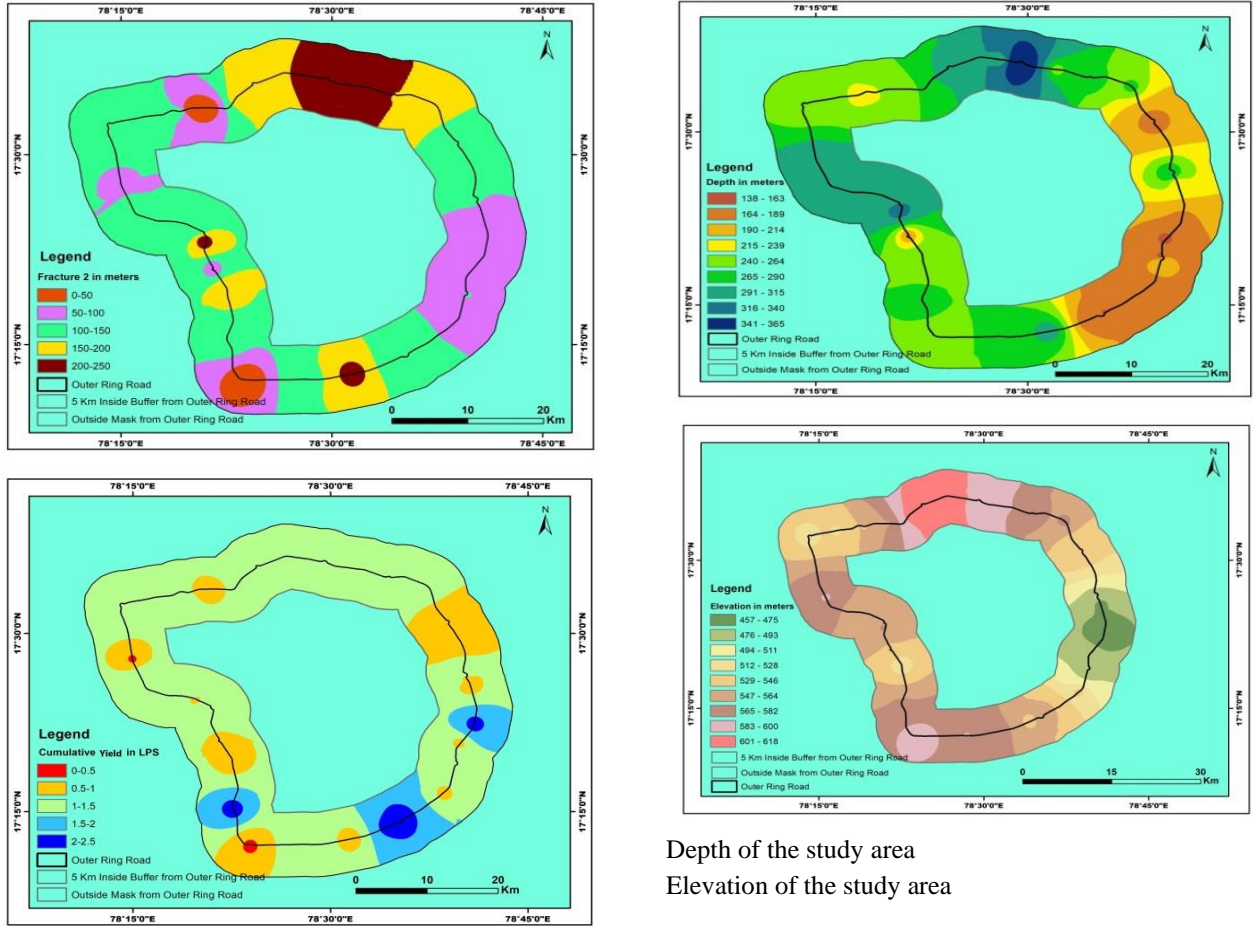


Figure 1 Location map of the study area

METHODOLOGY



Weathering of the study area Fracture 1 of the study area



Depth of the study area
Elevation of the study area

Figure 2 various maps of the study area

Fracture 2 of the study area
Cumulative yield of the study area

Table 1 Well Inventory Data Analysis										
Site Name	Longitude	Latitude	Weathering(m)	Water Level (m)	Fracture 1 (m)	Fracture 2 (m)	Yield (LPS)	Total Depth (m)	Elevation (m)	Type of well
Annojiguda Near to Ghatkesar	78.6765	17.4258	19	11.8	37	67	0.7823	212	463	BW
Appa Junction	78.3591	17.3496	7.6	5.1	30	55	0.7823	183	544	BW
APPA Junction towards Vikarabad Road	78.3591	17.3496	7.5	5	32	56	0.7823	185	545	BW
Bollaram, Puri jagannath Temple	78.3393	17.5611	6.1	18.8	34	0	0.7823	244	563	BW
Bonguloor 1	78.5883	17.2403	9	4	38	115	2.1558	165	553	BW
Bonguloor 2	78.5895	17.2395	8.5	4.5	39	117	2.1558	160	554	BW
Bonguloor 3	78.5869	17.2338	9	4	40	119	2.1558	167	555	BW
Bonguloor 4	78.5722	17.2293	9.1	4.2	40	119	2.1558	168	537	BW
Dundigal	78.4113	17.5938	9.1	19.1	34	183	1.4488	290	606	BW
Dundigal Toll plaza, towards Shameerpet road	78.4112	17.5935	9.5	17	38	181	1.4488	300	621	BW
Dundigal Toll plaza, towards Sultanpur Road	78.4071	17.5912	9.8	18	36	185	1.4488	300	618	BW

Dundigal towards Patancheruvu1	78.4126	17.5947	10	18	35	180	1.4488	290	605	BW
Dundigal towards Patancheruvu2	78.4137	17.595	9.7	19	33	184	1.4488	290	606	BW
Dundigal towards Shameerpet 1	78.4216	17.5984	9.2	19.4	37	182	1.4488	290	604	BW
Dundigal towards Shameerpet2	78.3894	17.5775	9.8	19.7	36	186	1.4488	290	605	BW
Gandigudem	78.3286	17.5595	7.2	17	37	0	0.7823	250	554	BW
Ghatkesar	78.6696	17.4381	6.1	4.1	55	107	0.7823	290	495	BW
Ghatkesar towards Narapally Road	78.6672	17.4403	6	5	55	110	1.4488	291	489	BW
Goudavalli1	78.4684	17.6041	9.5	15	39	205	1.4488	300	602	BW
Goudavalli2	78.4678	17.6042	9.3	15.7	37	208	1.4488	295	600	BW
Kazipally	78.3539	17.5616	7.9	16	34	0	0.7823	250	563	BW
kesara towards Ghatkesar	78.6492	17.5153	6.7	5.5	31	130	0.7823	185	533	BW
kesara towards Ghatkesar1	78.6484	17.5151	6.4	5.9	32	131	0.7823	181	534	BW
kesara towards Ghatkesar2	78.6469	17.5128	6.5	5.7	29	132	0.7823	186	535	BW
Kesara towards medchal Road	78.6491	17.5139	6.6	5.5	32	135	0.7823	185	537	BW

kesara towards Shameerpet	78.647	17.5139	6.1	5.1	30	131	0.7823	183	534	BW
kesara towards Shameerpet1	78.6498	17.5154	6	5	28	129	0.7823	184	534	BW
Koheda	78.6443	17.2767	6.1	9.6	24	79	0.7823	183	533	BW
Kokapet besides Toll Plaza	78.3313	17.4072	9	9.3	83	100	0.7823	305	555	BW
KoKapet opposite to steel factory	78.3281	17.4089	15	6.5	84	101	1.4488	300	546	BW
Kokapet towards Kokapet road	78.3284	17.4076	9.2	9.1	85	97	0.7823	305	555	BW
Kokapet towards Patancheruvu1	78.3438	17.4013	10	9	80	105	1.4488	305	550	BW
Kokapet towards Patancheruvu2	78.3413	17.4023	12	8	82	107	1.4488	302	556	BW
Kokapet towards Patancheruvu3	78.2984	17.4133	14	7	81	104	1.4488	305	562	BW
Kokapet towards Patancheruvu4	78.2978	17.4133	15	8	84	105	1.4488	305	560	BW
Kokapet towards Patancheruvu5	78.2613	17.4186	18	8.5	85	107	1.4488	305	571	BW
Kokapet towards Patancheruvu6	78.26	17.4393	17.5	9	90	102	1.4488	305	581	BW
Kokapet towards Patancheruvu7	78.2617	17.4359	16.7	8.9	89	100	1.4488	305	582	BW
Kokapet towards Patancheruvu8	78.2609	17.437	16.8	8.6	87	106	1.4488	305	588	BW
Kokapeta	78.3278	17.407	9.1	9.1	85	104	0.7823	305	544	BW
Kollur	78.2502	17.4627	9.1	20	26	85	0.4304	305	566	BW
Kollur towards Nagulapalli railway road	78.2492	17.4637	9.2	20	25	87	0.4304	305	566	BW
Medchal	78.4914	17.5986	6.1	17	55	207	1.4488	366	599	BW
Medchal towards Shameerpet 1	78.4934	17.5978	6	17.4	55	210	1.4488	365	599	BW
Medchal towards Shameerpet 2	78.4869	17.6001	6.3	16.7	53	207	1.4488	365	597	BW
Medchal towards Sultanpur 1	78.4866	17.6001	6.2	16.9	57	208	1.4488	365	598	BW
Medchal towards Sultanpur 2	78.489	17.5994	6.7	16	55	203	1.4488	365	597	BW
Muthangi	78.2348	17.5399	10	6	55	149	1.4488	250	519	BW
Muthangi towards kollur	78.2355	17.5373	11	5.9	53	148	1.4488	250	531	BW
Nanakramguda	78.3571	17.4186	7.6	7.3	34	73	1.4488	183	572	BW
Nanakramguda towards Gachibowli road	78.3562	17.4199	7.5	7.1	35	75	1.4488	185	573	BW
Narsingi	78.3478	17.3869	9.1	19.6	26	248	1.4488	335	566	BW

Narsingi towards KoKaped	78.3478	17.387	10	20	25	245	1.4488	330	567	BW
Pasumamula	78.6628	17.3452	6.1	15.3	24	61	0.7823	152	482	BW
Patancheruvu	78.2356	17.5373	6.1	3.9	49	146	1.4488	244	523	BW
Patancheruvu1	78.2777	17.5498	7	4	49	145	1.4488	245	524	BW
Pedda Amberpet ORR Circle towards Ghatkesar Road	78.6569	17.3204	19	11.5	85	91	7.7309	137	491	BW
Pedda Amberpet ORR Circle towards Raviryala Road	78.6592	17.315	13	10.4	96	145	1.4488	194	490	BW
Pedda Amberpet ORR Circle towards Raviryala Road	78.6582	17.3144	15	11	24	37	1.4488	212	485	BW
Pedda Amberpet ORR Circle towards Raviryala Road	78.6577	17.3131	25	10.8	37	115	1.4488	213	485	BW
Pedda Golconda	78.3986	17.2031	10	1.5	62	0	0.4304	245	591	BW
Pedda Golkonda	78.3984	17.201	9.1	1.4	61	0	0.4304	244	592	BW
Rajender nagar opposite to toll plaza office	78.3753	17.3226	7.9	19.8	124	182	0.7823	245	521	BW
Rajendranagar	78.3751	17.3243	7.6	19.2	122	183	0.7823	244	521	BW
Ravirayala 2	78.5263	17.2114	8	3.2	69	222	0.7823	305	567	BW
Raviryala 1	78.5218	17.2113	7.6	3	67	226	0.7823	305	567	BW
Shameerpet	78.623	17.565	6.1	4.3	55	198	1.4488	274	568	BW
Shameerpet	78.5635	17.5803	5.5	5	52	205	1.4488	275	569	BW
Shameerpet	78.5633	17.5803	6.3	5.5	55	204	1.4488	275	570	BW
Shameerpet 2	78.5352	17.5894	6	4	45	200	1.4488	250	585	BW
Shameerpet towards Dundigal Road	78.5717	17.5774	6	4.5	55	201	1.4488	275	569	BW
Shameerpet towards Kesara Road	78.5739	17.576	6.7	4.7	57	197	1.4488	275	568	BW
Shamsabad	78.3755	17.254	9.1	1.7	46	122	2.1558	274	565	BW
Shamshabad towards Airport road	78.3779	17.2519	9.8	1.6	45	122	2.1558	275	566	BW
Sultanpur	78.3207	17.5561	6.1	1.2	49	146	1.4488	229	544	BW
Sultanpur 2	78.2983	17.5522	9	3	52	149	1.4488	230	542	BW
Sultanpur1	78.2983	17.5522	6.2	1.5	51	145	1.4488	225	545	BW
Taramatipeta 1	78.6823	17.3718	6.1	0	24	79	2.1558	183	457	BW
Taramatipeta 2	78.6819	17.3722	6	0	25	80	2.1558	183	457	BW
Thukkuguda	78.4744	17.2029	6.1	15.4	27	146	1.4488	274	581	BW
Tukkuguda towards Airport road	78.4745	17.2034	6	15	28	145	1.4488	275	583	BW
Tukkuguda towards Srisailam road	78.4765	17.2042	6	16	26	142	1.4488	275	582	BW

RESULTS AND DISCUSSION

The study of bore well inventory data along the outer ring road area was carried out and data of 82 bore wells were collected. The bore well inventory analysis reveal that 92% of bore wells having good yield and 8% having low yield in pre-monsoon season whereas, in post-monsoon season 96% of bore wells having

good yield and 4% having low yield. The minimum yield of groundwater is well inventory data in minimum depth of bore wells drilled is 137 m and maximum depth drilled is 365 m. The minimum inserted casing is 5.5m and maximum is 25 m. The minimum yield of groundwater is 0.4304 lps and 2.1558 lps pre-monsoon and post-monsoon seasons respectively. The geological and structural aspects

play an important role for deeper granitic aquifers in the study area.

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