Office of the Incharge Hydrogeologist, S&R
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S.No. 232 Date: - 16.12.2025

RO

RSPCB, Bhilwara

Subject: - Comments on Ground Water Aquifer Quality

Reference: - Your letter no 2627 dated 19.11.2025. & following mails dated 26.11.2025, 05.12.2025.

Sir,

Groundwater department collect groundwater sample from some key wells from specific locations and then analysis these samples for parameters like E.C., TDS, pH, Na^{+1}, K^{+1}, Ca^{+2}, Mg^{+2}, Cl^{-1}, SO_4^{2-}, CO_3^{2-}, HCO_3^{-1}, NO_3^{-1}, F^{-1}, Total Hardness, Total Alkalinity, Na% etc. but does not deal with BOD, COD and heavy/ trace metals at present.

Kindly find the comments you asked in attached annexure regarding Ground Water Aquifer Quality of concern area.

Enclosed: As above

(M.P.Goswami)
I/C Hydrogeologist
GWD, Bhilwara

The Bhilwara district is primarily composed of the Bhilwara Supergroup of rocks, which are the oldest rock types in Rajasthan, dating back to the Archean age (around 2.5 to 3.3 billion years old). The majority of these rocks are metamorphic in nature, including schists and gneisses, which significantly affect the local groundwater parameters.

The intrinsic properties of the Archean-age metamorphic lithologies comprising the Bhilwara Supergroup exert profound controls on both the quantitative hydrogeological parameters and the *geochemical signature* of the local groundwater resources. The dominant lithologies, namely schists and gneisses, constitute a prototypical "hard rock" aquifer system characterized by low matrix permeability, where fluid dynamics are governed almost exclusively by secondary porosity.

The chemical quality of the groundwater is a direct manifestation of prolonged water-rock interaction (WRI) within the specific mineral assemblages of the Bhilwara Supergroup. The residence time of groundwater within these geochemically active matrices dictates the final water chemistry.

Elevated Total Dissolved Solids (TDS) and Hardness due to the dissolution of calc-silicate minerals, amphiboles, pyroxenes, and feldspars lead to the mobilization of major cations Ca^{++}, Mg^{++}, Na^{+}, K^{+} and anions HCO_3^{-} , SO_4^{--}. This process inevitably increases water hardness and overall salinity, often classifying the water as "hard to very hard.

A general observation in certain specific studies suggest that groundwater quality degrades with both time and depth in metamorphic geological setups, although not always.

The presence of accessory F^{-} bearing minerals (e.g., fluorapatite, biotite, hornblende) within the gneissose and schistose matrix is a primary driver for Geogenic Contamination Potential (Fluoride and Trace Elements). Fluoride concentrations frequently exceed the Bureau of Indian Standards (BIS) permissible limits in localized pockets; however, it should not be oversimplified.

The Bhilwara district is renowned for its metallogenic provinces. Weathering conditions can facilitate the release of potentially hazardous trace elements, including As, Pb, Mn, Fe, and Ni, into the aqueous phase but as department do not do analysis for heavy / trace metals so no comments can be made in this regard.

Based on a comparative analysis of the provided data, it can be inferred that while water hardness is primarily attributable to Geogenic factors, the abrupt fluctuations in parameters such as pH, Electrical Conductivity (EC), Total Dissolved Solids (TDS), and Chloride (Cl^-) might suggest anthropogenic influence. Furthermore, the observed discrepancies may be exacerbated by hydrogeological variations; specifically, the Groundwater Department's observation wells monitor shallow aquifers, whereas the samples in question were retrieved from tube wells tapping deeper aquifer zones. These stratigraphic differences in sampling depth and spatial distribution likely account for the variance in the analytical results.

Attached is the recent hydro-chemical inventory of nearest possible this department's observation wells of the subject area's monitoring network for your observation, decision and further study if needed.

Sr. No.	Block	Location	Latitude	Longitude	EC	TDS	pH	Ca^{+2}	Mg^{+2}	Cl^-	SO_4^{-2}	F^-	TH	TA
					µS/cm	mg/L		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
1	Hurda	Gulabpura	25.92056	74.65759	2040	1167	8.20	14	16	262	1	1.50	100	670
2	Hurda	Lamba	25.90389	74.61099	6560	3964	8.10	220	187	1390	1057	0.98	1320	60
3	Hurda	Sareri	25.72056	74.60494	1020	547	7.80	14	27	106	1	0.64	145	360
4	Mandal	Mandal	25.45389	74.56805	3000	1636	8.80	14	51	553	24	3.96	245	680
5	Mandal	Dhunwala	25.52056	74.55027	3000	1644	8.60	18	44	567	19	3.14	225	670
6	Suwana	Arjiya	25.43722	74.63318	3730	2097	8.00	68	108	1036	207	1.04	615	180
7	Suwana	Pur	25.30389	74.53738	1350	727	8.80	44	55	262	48	0.00	335	250
8	Suwana	Hameer Garh	25.18722	74.62379	1080	558	8.38	44	49	92	43	0.00	310	340
9	Suwana	Mandpiya	25.28722	74.63604	1010	530	8.80	22	61	78	115	0.00	305	250
10	Suwana	Nogawan	25.27056	74.51533	7380	4983	7.70	112	17	468	2786	0.90	350	110

(M.P.Goswami)
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