

Appendix D Compilation of literature report of groundwater hydrochemistry from Sokoto basin

S/no	Site	Source	T°C	EC	pH	TDS	K ⁺	Na ⁺	Ca ²⁺	Cu ²⁺	Fe ³⁺	Zn ²⁺	Mg ²⁺	PO ₄ ³⁻	NO ₃ ⁻	SO ₄ ²⁻	Cl ⁻	HCO ₃ ⁻	CO ₃ ²⁻	Reference
L1	Sokoto.Rima	OW	-	607	6.1	486	4	4	7.2	-	-	-	11.3	-	12.3	23.5	3.7	6.4	4.4	[130][130][130][130][129][130][130][130][130][130][130][130] 6]. (Graham et al., 2006)
L2	Sokoto.Rima	OW	-	476	5.7	380	0.9	3.8	5.9	-	-	-	11.2	-	6.4	11.2	1.9	8.3	0	
L3	Sokoto.Rima	OW	-	204	6	164	3.3	1.4	2.5	-	-	-	2.8	-	8.9	5.5	2.3	5.4	0	
L4	Sokoto.Rima	OW	-	255	5.9	203	0.3	2.5	3.3	-	-	-	6.4	-	10.2	16.8	2.7	12.2	6	
L5	Sokoto.Rima	OW	-	244	5.9	195	1.1	2.1	0.8	-	-	-	1.9	-	8.3	6.4	3.5	13.3	1.2	
L6	Sokoto.Rima	OW	-	88	5.8	71	0.2	1.3	1.3	-	-	-	1.2	-	5.3	6.4	2	24	0	
L7	Sokoto.Rima	OW	-	822	5.8	657	8.1	5.1	9.5	-	-	-	7.5	-	13.8	10.3	2.3	5.3	3	
L8	Sokoto.Rima	OW	-	93	6	75	0.2	0.8	2.1	-	-	-	2.2	-	52.8	87.9	2.8	4.1	1.7	
L9	Sokoto.Rima	OW	-	188	5.8	152	0.6	2.5	2.7	-	-	-	3.3	-	4.5	3.8	3.7	10.9	2.1	
L10	Sokoto.Rima	OW	-	87	5.9	70	0.2	1.1	6.2	-	-	-	1.2	-	6.3	18.3	1.7	8.5	0	
L11	Sokoto.Rima	OW	-	48	6	38	0.3	0.3	1.4	-	-	-	1.3	-	5.5	7.7	1.6	10.3	0	
L12	Sokoto.Rima	OW	-	251	6	201	1.5	2.7	5	-	-	-	3.7	-	11	19.5	2.1	10.3	3.5	
L13	Bunza	OW	30.6	24.6	5.6	24.6	-	-	66.42	-	0.21	-	5.02	-	-	7	11.6	-	-	(Elinge et al., 2015)
L14	Bunza	OW	31.5	27.5	5	24.6	-	-	53.6	-	0.5	-	5.54	-	-	8	8.12	-	-	
L15	Bunza	OW	31	28.2	5.31	24.5	-	-	60	-	0.08	-	5.4	-	-	10	8.62	-	-	
L16	Bunza	OW	31	25.6	5.9	56.6	-	-	60.5	-	0.02	-	5.1	-	-	8	7.1	-	-	
L17	Jega	TW	-	0.61	6.1	486	4	4	7.2	-	-	-	11.3	-	12.2	23.5	3.7	6.4	4.4	(Ojo et al., 2014)
L18	Argungu	TW	-	0.48	5.7	380	0.9	3.8	5.9	-	-	-	11.2	-	6.4	11.2	1.9	8.3	0	
L19	B/kebbi	TW	-	0.2	6	164	3.3	1.4	2.5	-	-	-	2.8	-	8.9	5.5	2.3	5.4	0	
L20	Zuru	TW	-	0.26	5.9	203	0.3	2.5	3.3	-	-	-	6.4	-	10.2	16.8	2.7	12.2	6	
L21	Jega	TW	-	0.24	5.9	195	1.1	2.1	0.8	-	-	-	1.9	-	8.3	6.4	3.5	13.3	1.2	
L22	Argungu	TW	-	0.09	5.8	71.3	0.2	1.3	1.3	-	-	-	1.2	-	5.3	6.4	2	24	0	
L23	B/kebbi	TW	-	0.82	5.8	657	8.1	5.1	9.5	-	-	-	7.5	-	13.8	10.3	2.3	5.3	3	
L24	Zuru	TW	-	0.09	6	75.2	0.2	0.8	2.1	-	-	-	2.2	-	52.8	87.9	2.8	4.1	1.7	
L25	Jega	BH	-	0.19	5.8	152	0.6	2.5	2.7	-	-	-	3.3	-	4.5	3.8	3.7	10.9	2.1	

S/no	Site	Source	T°C	EC	pH	TDS	K ⁺	Na ⁺	Ca ²⁺	Cu ²⁺	Fe ³⁺	Zn ²⁺	Mg ²⁺	PO ₄ ³⁻	NO ₃ ⁻	SO ₄ ²⁻	Cl ⁻	HCO ₃ ⁻	CO ₃ ²⁻	Reference
L26	Argungu	BH	-	0.09	5.9	70	0.2	1.1	6.2	-	-	-	1.2	-	6.3	18.3	1.7	8.5	0	
L27	B/kebbi	BH	-	0.05	6	38	0.3	0.3	1.4	-	-	-	1.3	-	5.5	7.7	1.6	10.3	0	
L28	Zuru	BH	-	0.25	6	201	1.5	2.7	5	-	-	-	3.7	-	11.3	19.5	2.1	10.4	3.5	
L29	Jega	RZ	26	63.7	6.7	41.7	-	-	-	0.3	54.6	-	-	0.4	0.89	-	-	-	-	(Obaroh <i>et al.</i> , 2012).
L30	Jega	RZ	25.7	51.3	6.8	33.7	-	-	-	0.9	57.7	-	-	0.4	0.99	-	-	-	-	
L31	Jega	RZ	25.3	55.3	7.1	37.7	-	-	-	0.9	58.3	-	-	0.4	1.88	-	-	-	-	
L32	Kalambaina	BH	-	70.9	8.2	-	24.4	9.5	17.5	0.2	0.09	-	4	-	0.2	-	-	-	-	(Abdulhamid <i>et al.</i> , 2013)
L33	Kalambaina	BH	-	120.4	7.8	-	33.3	13.5	47.5	0.1	0.13	-	1	-	0.15	-	-	-	-	
L34	Kalambaina	BH	-	78.7	7.9	-	15.6	7.89	28.5	0.1	0.13	-	4	-	0.17	-	-	-	-	
L35	Kalambaina	BH	-	89.6	8.2	-	16.7	9.7	28	0.1	0.26	-	4	-	0.21	-	-	-	-	
L36	Kalambaina	BH	-	118.6	7.2	-	14.4	10.6	32.5	0.2	0.17	-	2	-	0.26	-	-	-	-	(Abubakar and Gaddafi, 2017)
L37	Kwalkwalawa	TW	-	-	5.8	5	1.6	-	-	-	-	-	-	0.1	0.7	3.4.7	4.5	-	-	
L38	Marmaro	TW	-	-	6	1.8	1.6	-	-	-	-	-	-	0.1	1.4	242.3	7.6	-	-	
L39	Asare	TW	-	-	6.2	2.8	0.9	-	-	-	-	-	-	0.1	0.9	257.3	1.7	-	-	
L40	Boya	TW	-	-	6.5	6.3	1.8	-	-	-	-	-	-	0.1	1.6	248.3	0	-	-	(Wali and Bakari, 2016)
L41	Kaura Abdu	TW	-	-	6.5	1.7	1.5	-	-	-	-	-	-	0.1	1.2	247.7	1.9	-	-	
L42	Malisa	BH	30.1	167	5.2	174	39	851	210	0.3	1	3.1	6	-	-	24	9159	244	-	
L43	Wuromaliki	BH	27.9	15	1.9	220	78	437	17	1.1	1.3	4.3	23	-	-	11	355	122	-	
L44	Huda	BH	28.5	2	2.5	10	117	1955	4	0.3	2.1	4.2	150	-	-	20	3586	61	-	(Wali and Bakari, 2016)
L45	Kurugu	BH	29.4	82	9.2	0.7	910	39	244	111	0.4	2.1	3.2	-	-	3	460	1598	-	
L46	Zagga	BH	26.7	3.4	2.8	370	39	529	16	1.1	1	6.2	5	-	-	1	213	244	-	
L47	Kwasara	BH	29.1	14	2.8	150	39	414	17	0.5	1.1	0.7	4	-	-	36	213	122	-	
L48	Kamtu	BH	28	24	7.7	270	78	598	51	0.3	0.5	6.3	14	-	-	22	888	61	-	
L49	Mahuta	BH	30.7	16	7.8	220	39	552	30	1.6	2	4.1	3	-	-	22	249	244	-	
L50	Amanawa	BH	25.1	7	7	150	39	345	28	0.4	1.7	3.2	3	-	-	22	71	244	-	
L51	U/maifulani	BH	-	20	7	30	-	-	12.5	-	0.02	-	6.18	-	0.01	0	13	-	-	(W a)

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L52	M/ambursa	BH	-	20	6.8	31	-	-	11.43	-	0.01	-	6.71	-	0.01	0	12.1	-	-	
L53	Dallatu	BH	-	20.2	7.2	30	-	-	12.43	-	0	-	7.01	-	0.01	0.3	11.1	-	-	
L54	M/lailaba	BH	-	20.6	7	25	-	-	21.05	-	0	-	12.3	-	0.01	0.1	6.9	-	-	
L55	N/goru	BH	-	20.1	6.9	20.1	-	-	12.13	-	0	-	6.8	-	0.01	0.2	11.2	-	-	
L56	Gwatashi	BH	-	20.3	7	21	-	-	11.1	-	0.1	-	6.7	-	0.02	0.03	11.2	-	-	
L57	M/babban rugga 1	BH	-	20.2	7	0.01	-	-	12.2	-	0.1	-	7.1	-	0	0.03	11.3	-	-	
L58	M/babban rugga 2	BH	-	20.1	6.9	20.1	-	-	11.1	-	0.01	-	7	-	0.01	0.5	10	-	-	
L59	Filin, Alh. d/daje	BH	-	20	6.8	28	-	-	12.1	-	0.02	-	7	-	0.01	0	9.03	-	-	
L60	T/asibiti	BH	-	20	6.8	29	-	-	12.5	-	0.2	-	6.6	-	0.01	0	12	-	-	
L61	M/gulma	BH	-	20	6.7	30	-	-	13	-	1.02	-	6.7	-	0.01	0	13	-	-	
L62	M/kokshe	BH	-	20	6.9	29	-	-	12	-	0.02	-	6.7	-	0.01	0	12.5	-	-	
L63	M/gesse	BH	-	20	6.8	30	-	-	13.5	-	0.02	-	6.8	-	0.01	0	13	-	-	
L64	Kara	BH	-	20	6.9	28	-	-	12.3	-	0.02	-	6.8	-	0.01	0	12	-	-	
L65	R/alabani	BH	-	20	6.8	23	-	-	10.1	-	0.01	-	6.6	-	0.01	0	12.3	-	-	
WHO, Reference guidelines			Ambient	1000	6.5-8.5	500	-	12	75-200**	2	0.3	4	2	0.3	50	200	200	250	-	
NSDWQ, Reference guidelines			Ambient	1000	6.5-8.5	500	-	12	75-200**	1	0.3	3	50-150**	0.3	50	100	200	250	-	NSDWQ, (2007)

Note: All concentrations are in mg/l except Temperature (°C), EC (µS/cm) and pH @ 25°C. ** WHO, 1997. Values in bold do not follow

WHO and NSDWQ reference guidelines. BH= Borehole, TW= Tube well, RZ= River Zamfara