TREND ANANLYSIS OF WASTE WATER QUALITY PARAMETER OF JOJARI RIVER (FROM APRIL-2023 TO MARCH- 2024)

REGIONAL LABORATORY,
RAJASTHAN STATE POLLUTION CONTROL BOARD,
JODHPUR

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1. INTRODUCTION

1.1 Area and Demography:

Jodhpur district extends between 25º51'08" & 27º37'09" North latitude and 71º 48' 09" & 73º 52' 06" East longitude covering a geographical area of 22,850 sq. km. Jodhpur district ranks 2nd in terms of population, 4thin terms of area and 29th in terms of population density. Jodhpur district has seven tehsils, in which Shergarh tehsil has the highest number of villages (507) whereas Bilara tehsil has lowest number of villages (103). Jodhpur district consists 65.7 percent rural and 34.3 percent urban population whereas the State percent of rural and urban population is 75.1 and 24.9 respectively. According to the Census of 2011, the district of Jodhpur has a population of 36, 87,165 out of which 19, 23,928 are males and 17, 63,237 are females. It accounts for 5.38 percent of the State population. The Geographical area of the district is 22,850 sq. km which is 6.68 percent of the total state area. The district is bounded on the north by Bikaner District, on the northeast by Nagaur District, on the southeast and south by Pali District, on the southwest by Barmer District, and on the west and northwest by Jaisalmer District. Jodhpur has a sex ratio of 916 females for every 1000 males, and a literacy rate of 65.94%. As the census of 2011, there were seven sub-divisions (Jodhpur, Bhopalgarh, Luni, Osian, Phalodi, Bilara and Shergarh) in the district and eleven tehsils (Jodhpur, Bhopalgarh, Bawadi, Luni, Osian, Tinwari, Phalodi, Bap, Bilara, Shergarh, and Balesar).

1.1.1 Creation of New District:

The Finance and Appropriations Bill was presented by Rajasthan Government March 17, 2023. Where a number of announcements were made. The recent announcement of 19 districts in Rajasthan is the largest announcement. As a result, Rajasthan will now have 50 districts. Jodhpur is also divided into two parts. Jodhpur East and Jodhpur West have been declared as two districts. Phalodi will also be created as a new district in Jodhpur.

1.2 Topography;

Major physiographic units of Jodhpur are Sand Dunes, Alluvial plains, Ridges and Hillocks which lies scattered in the area, while major drainage is offered by Luni River and Mithari River. Jodhpur district forms part of Great Thar Desert of Rajasthan. This district is situated at the height between 125-350 meters above sea level.

1.3 Climate:

Jodhpur exhibits similar climatic conditions as in the dessert namely; arid to semi-arid type of climate with extreme of heat in summer and cold in winter. The temperature varies from 49 degree in summer to 1 degree in winter. Both day and night temperature increases gradually and reaches their maximum values in May and June respectively. The average rainfall in this region is about 300mm. Atmosphere is generally dry except during the monsoon period. The humidity is highest in August with mean daily relative humidity of 81%. The annual maximum potential evapo-transpiration in the district is quite high.

1.4 Soils:

Soil of the district is classified mainly as sandy and loamy. The types of soils found in the area are: Red soils, Desert soils, Lithosol and Regosols of hills.

1.5 Vegetation:

Bajra (pearl millet) is the major crop during Kharif season in Jodhpur. In Rabi season wheat, pulses and a variety of masala like jeera, dhania and red chilly are also grown. The main species of trees are Kumat, Kair, Khejri, Babul, Bir, Jal khara, Pilu, etc. The fauna of the district include Jackal, Jungle Cat, Indian Fox, Black Buck, Chinkara, common Hare, etc.

1.6 Industry Classification and distribution in Jodhpur:

Main industries of Jodhpur are textiles, handicrafts, steel re-rolling and patapatti, guar gum, chemicals and minerals, stone cutting and processing and food processing units. Most of the industrial areas in the cluster are located to the South and South West of Jodhpur city; while Mandore is located to the north of the city. Light and Heavy Industrial Area, Industrial Estate, BNPH, Basni (Phase I & II), Tanawada, Salawas, Sangaria and Bornada are proximal to each other, mostly sandwiched between NH-112 and NH-65. Mandore Industrial Area is approached by NH-65 and SH–61. The textile industries of Jodhpur are mostly engaged in screen-printing process. The finished products in 60% of industries are printed fabric where as 40% are dyed and bleached fabrics.

1.7 Brief Introduction about Jojari River:

The Jojari River originates from the hills of Pundlu village of Nagaur district in Rajasthan. Jojari River flows through Jodhpur and enters Barmer in the south-west and then joins the Luni River near Siwana. The length of this river is 150 km. It is the longest river among the

tributaries of Luni. Jojari flows from the north-east to south-west, 83 km from the hills near Pondlu village in Nagaur district. Before it meets the Luni River near Khejalda Khurd in Jodhpur district, small streams join the jojari in the upper part.

1.8 Status of Common Effluent Treatment Plants (CETPs) and Sewage Treatment Plants (STPs)

1.8.1 CETP at Industrial Area, Sangaria, Jodhpur, Rajasthan:

This common effluent treatment plant (CETP) is located in industrial area, Sangaria, Jodhpur, Rajasthan, which is managed by Jodhpur Pradushan Niwaran Trust (JPNT). The total capacity of treatment systems is 20 MLD. Closed conduit pipelines are laid for the conveyance of untreated effluent from textile and steel rerolling units up to CETP. These pipelines are operated and maintained by JPNT. The CETP consists of different unit operations such as Screening chamber, Equalization tank, Neutralization tank, Flash mixer, Primary settling tank, Aeration tank, Secondary clarifier, treated water collection (holding) tank, tertiary treatment by using pressure sand filter (PSF) and activated carbon filter (ACF).

1.8.2 STP at Salawas (Phase I & Phase II), Jodhpur, Rajasthan

This sewage treatment plant (STP) is located in Salawas village, Jodhpur which is essentially based on activated sludge process (ASP). This plant is designed for treatment of 50.0 MLD-Salawas Phase-I and 50 MLD-Salawas Phase-II of domestic wastewater. The STP is based on physico-chemical treatment followed by activated sludge process (ASP) of biological treatment and sludge digestion. It consists of different process units such as screens and grit removal chamber, primary clarifier, Aeration tank, Secondary clarifier, Primary and secondary thickeners, digesters, centrifuges etc.

1.8.3 STP at Nandari, Jodhpur, Rajasthan

This sewage treatment plant is located just upstream of Jojari river in Nandari village, Jodhpur, which is essentially based on Waste Stabilization Ponds (WSP) treatment technology to treat the sewage of upstream of Jodhpur. This plant is designed for treatment of 20 MLD of domestic wastewater. The Sewage collected through drains comes to STP and is treated through the system which comprises of 1 inlet chamber (1 No.), fine screens (2 Nos.), Grit Chamber (2 Nos.), Anaerobic ponds (3 Nos.) & Facultative ponds (2 Nos.). The wastewater is firstly treated in anaerobic ponds (with one day retention time) which is further treated in facultative ponds (with five days' retention time) before disposing treated sewage water into

river Jojari.

1.9 Problem associated with Jojari River:

Jojari River considered into the most polluted River in India because of the combined waste water including the treated waste water from the CETP, STP and due to excess of over flow from the closed conduit pipeline of factories, Breakage of pipeline, Heavy rains, and this polluted waste water reaches into the RIICO Drain and RIICO drain carries mixed sewage, effluent from the industrial areas and from nearby colonies. Besides, a significant amount of untreated effluent has been discharged directly into the RIICO storm-water drain from various member units which finally joins Jojari River. Jojari River has been polluted due to disposal of industrial effluents. This effluent and sewage mixed water is also used by farmer for sawn many important crops like Pearl millet, Moth-bean and Sorghum etc. Heavy metals and other pollutants accumulate in crops and causes cancer and many diseases.

1.10 Objective of the Study:

The objective of this study is to determine physio-chemical parameter of Jojari River from Upstream (Uchiyarda village) to downstream (Lunawas Kalla village), total ten site (Uchiyarda Sewage Drain, Uchiyarda River, Basni Benda Sewage Drain, Basni Benda River, Vivek Vihar Sewage Drain, Vivek Vihar River, Salawas River, Bhandu River, Lunawas River, and RIICO Drain) are selected along with the Jojari River. Month wise total five parameter (pH, Total Suspended Solid, Chemical Oxygen Demand, Biochemical Oxygen Demand and oil & Grease) are selected for analysis of waste water.

. GENERAL STANDARDS FOR DISCHARGE OF ENVIRONMENTAL POLLUTANTS PART-A: EFFLUENTS

Table. 1 General Standard for Discharge of Environmental Pollution - Effluents

S.N	Parameter	Standard (Inland Surface Water)
1.	pH	5.5 – 9.0
2.	Total Suspended Solid (mg/l)	100
3.	Biochemical Oxygen Demand (BOD) mg/l	30
4.	Chemical Oxygen Demand (COD) mg/l	250
5.	Oil & Grease (mg/l)	10

2. SAMPLING SITE

Upstream (Uchiyarda village) to downstream (Lunawas Kalla village) total ten site (Uchiyarda Sewage Drain, Uchiyarda River, Basni Benda Sewage Drain, Basni Benda River, Vivek Vihar Sewage Drain, Vivek Vihar River, Salawas River, Bhandu River, Lunawas River, RIICO Drain) are selected along with the Jojari River. Month wise total five parameter (pH, Total Suspended Solid, Chemical Oxygen Demand, Biochemical Oxygen Demand and oil & Grease) are selected for analysis of waste water.

Table. 2 Sampling Point along with the Jojari River and their Latitude & Longitude.

S.N.	Name	Latitude	Longitude
1.	**J R 1** Jojari River Near Uchiyarda Village, Jodhpur (Upstream) After Confluence To Jojari River)	26.269867	73.107760
2.	**J R 2** Municipal Drain Near Uchiyarda Village Jodhpur (Before Confluence To Jojari River)	26.267956	73.106380
3.	**J R 3** Municipal Drain Near Basni Benda Village Jodhpur (Before Confluence To Jojari River)	26.243900	73.088510
4.	**J R 4** Jojari River Near Basni Benda Village, Jodhpur (Upstream) After Confluence To Jojari River)	26.239828	73.084593
5.	**J R 5** Jojari River Near Vivek Vihar Colony, Jodhpur (Upstream)After Confluence To Jojari River)	26.190109	73.043689
6.	**J R 6** Municipal Drain Near Vivek Vihar Colony, Jodhpur (Before Confluence To Jojari River)	26.189260	73.038155
7.	**J R 7** Jojari River Near RIICO Drain, Jodhpur	26.197628	73.007455
8.	**J R 8** Jojari River Near Salawas Village, Jodhpur	26.124487	72.974148
9.	**J R 9** Jojari River Near Bhandu Village, Jodhpur	26.110110	72.891019
10.	**J R 10** Jojari River Near Lunawas Village, Jodhpur	26.087705	72.806957

Table. 3 List of parameter and their method of analysis & Instrument.

S.N	Parameter	Method
1.	pH	Digital pH Meter
2.	Total Suspended Solid (mg/l)	Filtration Method
3.	Chemical Oxygen Demand (mg/l)	Open Reflux Method
4.	Biochemical Oxygen Demand (mg/l)	Titrimetric Method
5.	Oil & Grease (mg/l)	Partition Gravimetric Method

Figure. 1 Location of Jojari River in Jodhpur City of Rajasthan

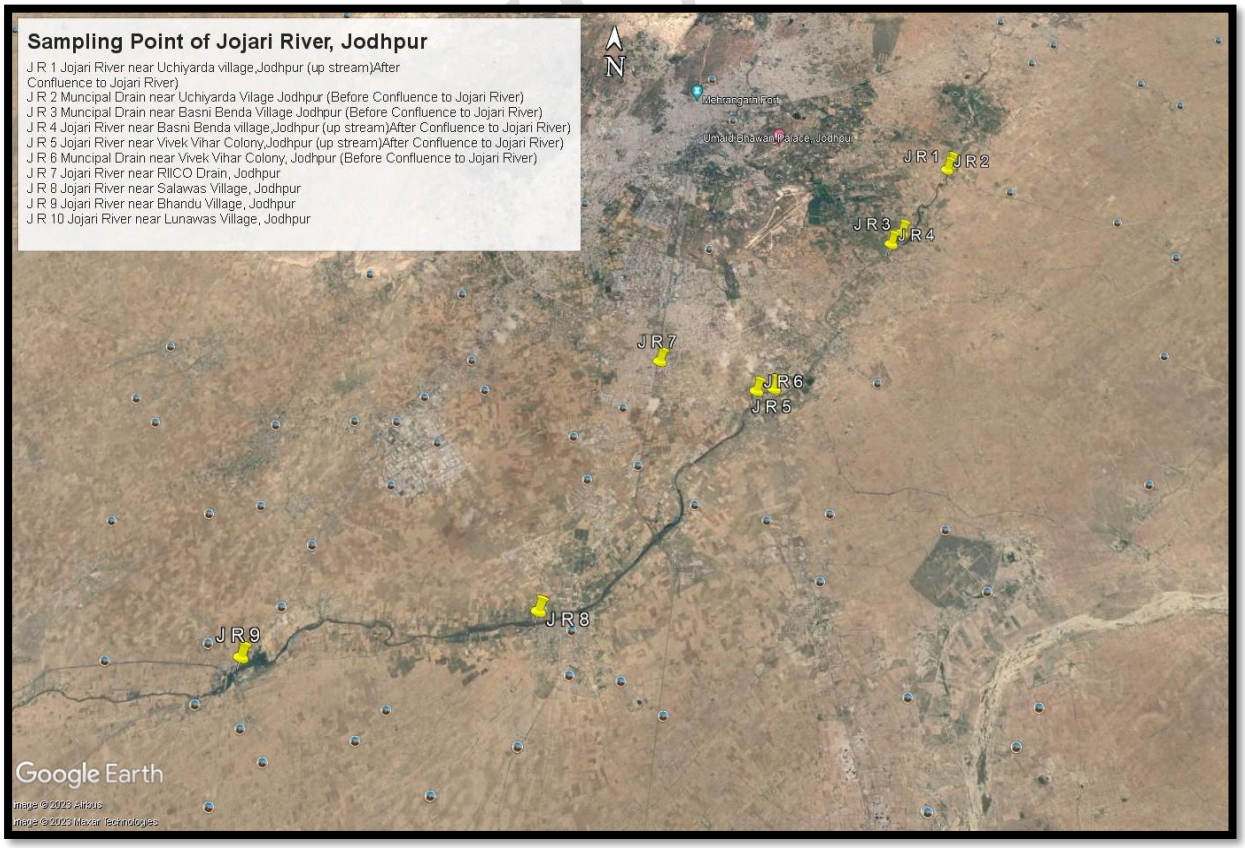


Figure. 2 Sampling Point along with the Jojari River from upstream to downstream

3. OBSERVATION TABLE

Table. 4 Month wise Comparative Table of Different Parameter Along with The Jojari River, Jodhpur (2023-2024).

S.N	Parameter	Month	Uchiyarda Sewage Drain	Uchiyarda River	Basni Benda Sewage Drain	Basni Benda River	Vivek Vihar Sewage Drain	Vivek Vihar River	Salawas River	Bhandu River	Lunawas River	RIICO drain
1	**pH**	April	6.4	6.39	6.52	6.4	7.38	7.26	7.12	7.26	7.18	7.11
2	**pH**	May	7.55	7.63	6.54	6.76	8.64	7.34	7.61	7.59	7.82	8.63
3	**pH**	June	6.98	7.1	6.38	6.82	7.67	7.04	7.45	7.83	7.92	7.05
4	**pH**	July	7.35	7.52	6.94	7.43	8.08	7.59	7.65	8.34	8.26	8.58
5	**pH**	Aug	7.12	7.15	6.42	6.69	7.2	7.06	7.2	7.42	7.38	7.54
6	**pH**	Sep	7.68	7.7	6.75	6.67	8.4	7.43	7.3	7.65	7.91	8.19
7	**pH**	Oct	6.62	6.54	6.82	6.78	7.21	6.96	7.01	7.15	7.29	7.24
8	**pH**	Nov	7.01	6.82	7.28	7.11	7.38	7.08	7.15	7.36	7.46	7.82
9	**pH**	Dec	7.64	7.67	6.87	7.35	8.98	7.59	7.44	7.62	7.63	9.14
10	**pH**	Jan	7.27	7.44	7.01	7.52	8.54	7.74	8.04	7.95	8.21	9.49
11	**pH**	Feb	7.41	7.53	7.13	7.44	8.34	7.92	8.11	8.05	8.35	9.38
12	**pH**	March	7.68	7.31	7.28	7.61	8.13	7.51	8.21	8.34	8.42	9.18

S.N	Parameter	Month	Uchiyarda Sewage Drain	Uchiyarda River	Basni Benda Sewage Drain	Basni Benda River	Vivek Vihar Sewage Drain	Vivek Vihar River	Salawas River	Bhandu River	Lunawas River	RIICO drain
1.	**TSS mg/l**	April	121	140	189	295	156	137	226	161	157	867
2.	**TSS mg/l**	May	39	34	369	133	113	58	400	300	267	654
3.	**TSS mg/l**	June	48	51	345	142	121	64	381	278	234	628
4.	**TSS mg/l**	July	72	67	295	157	135	75	315	289	241	701
5.	**TSS mg/l**	Aug	92	85	271	181	159	105	278	308	255	748

6.	**TSS mg/l**	Sep	98	79	315	216	178	137	328	342	278	811
7.	**TSS mg/l**	Oct	108	122	198	269	175	146	236	142	161	816
8.	**TSS mg/l**	Nov	135	148	213	301	225	178	257	162	184	915
9.	**TSS mg/l**	Dec	152	167	246	318	251	202	274	197	215	1013
10.	**TSS mg/l**	Jan	215	199	314	418	281	241	238	235	254	987
11.	**TSS mg/l**	Feb	228	205	298	395	304	268	315	257	272	918
12.	**TSS mg/l**	March	241	218	258	272	286	237	373	298	311	878

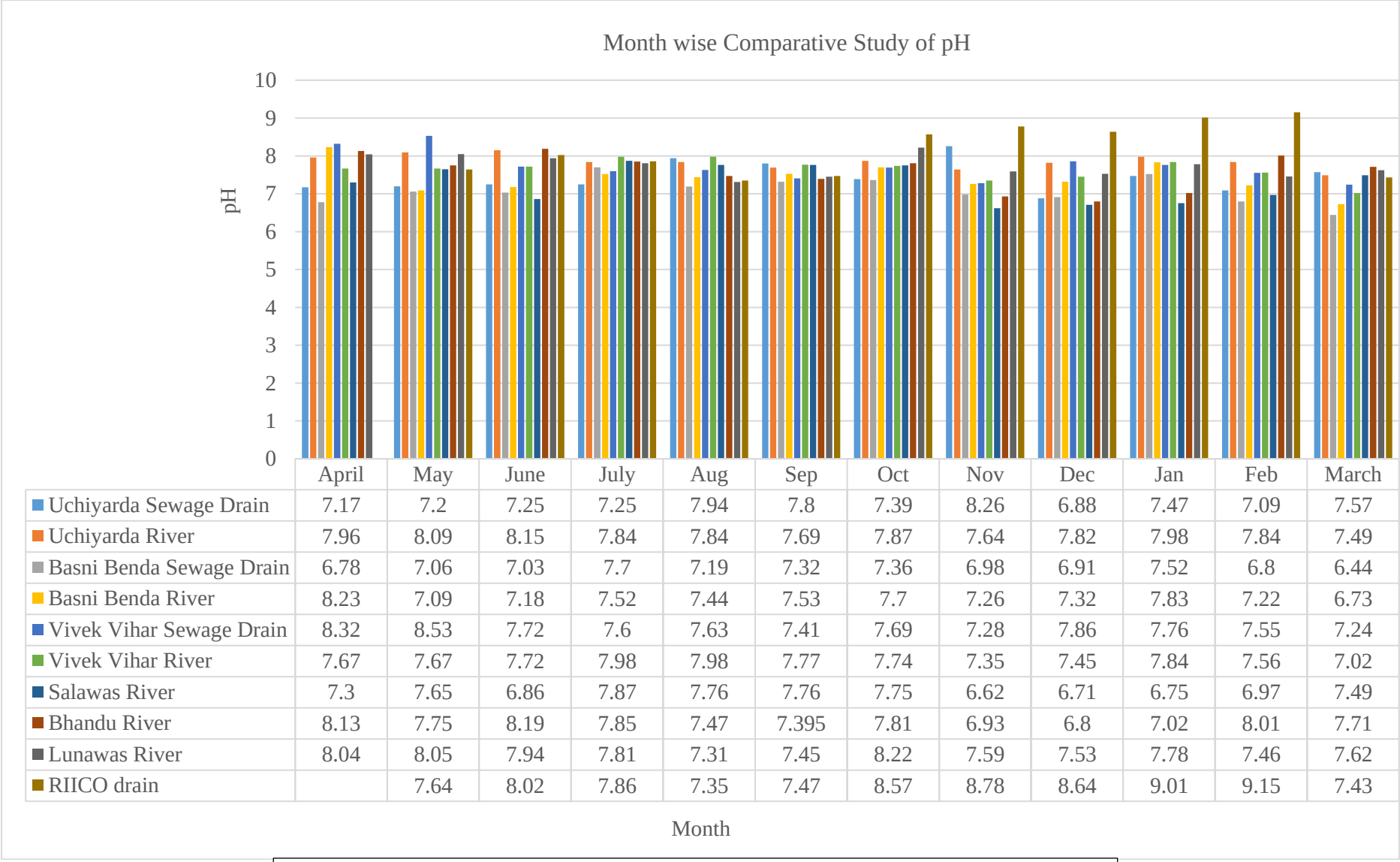
S.N	**Parameter**	**Month**	**Uchiyarda Sewage Drain**	**Uchiyarda River**	**Basni Benda Sewage Drain**	**Basni Benda River**	**Vivek Vihar Sewage Drain**	**Vivek Vihar River**	**Salawas River**	**Bhandu River**	**Lunawas River**	**RIICO drain**
1.	**COD mg/l**	April	110	94	394	142	173	189	157	236	315	945
2.	**COD mg/l**	May	142	126	315	157	205	220	173	252	331	866
3.	**COD mg/l**	June	158	142	283	125	189	236	157	220	299	898
4.	**COD mg/l**	July	205	173	331	189	220	268	236	315	362	945
5.	**COD mg/l**	Aug	220	189	315	205	236	283	252	331	346	866
6.	**COD mg/l**	Sep	268	220	331	236	252	299	268	346	378	445
7.	**COD mg/l**	Oct	126	142	315	157	205	220	205	315	394	1102
8.	**COD mg/l**	Nov	157	189	394	205	220	252	236	346	425	1181
9.	**COD mg/l**	Dec	112	144	272	128	205	252	283	378	394	1338
10.	**COD mg/l**	Jan	236	268	409	236	268	252	315	394	472	1260
11.	**COD mg/l**	Feb	252	315	378	268	299	236	331	378	409	1338
12.	**COD mg/l**	March	236	331	315	299	252	268	378	409	441	1181

S.N	**Parameter**	**Month**	**Uchiyarda Sewage Drain**	**Uchiyarda River**	**Basni Benda Sewage Drain**	**Basni Benda River**	**Vivek Vihar Sewage Drain**	**Vivek Vihar River**	**Salawas River**	**Bhandu River**	**Lunawas River**	**RIICO drain**
1.	**BOD mg/l**	April	24	20	94	28	40	42	34	40	74	128

2.	**BOD mg/l**	May	30	24	84	34	38	40	32	44	70	224
3.	**BOD mg/l**	June	34	32	38	28	34	38	28	24	44	236
4.	**BOD mg/l**	July	38	36	44	32	42	44	34	28	52	264
5.	**BOD mg/l**	Aug	44	42	48	36	46	42	38	32	58	278
6.	**BOD mg/l**	Sep	42	48	54	42	50	46	42	36	54	254
7.	**BOD mg/l**	Oct	28	24	82	22	36	32	38	44	64	202
8.	**BOD mg/l**	Nov	32	28	74	24	42	36	44	48	82	194
9.	**BOD mg/l**	Dec	24	20	54	24	28	56	44	56	64	248
10.	**BOD mg/l**	Jan	40	36	96	32	48	68	56	68	74	274
11.	**BOD mg/l**	Feb	36	48	88	44	60	84	72	74	92	288
12.	**BOD mg/l**	March	28	44	64	52	48	72	88	92	80	248

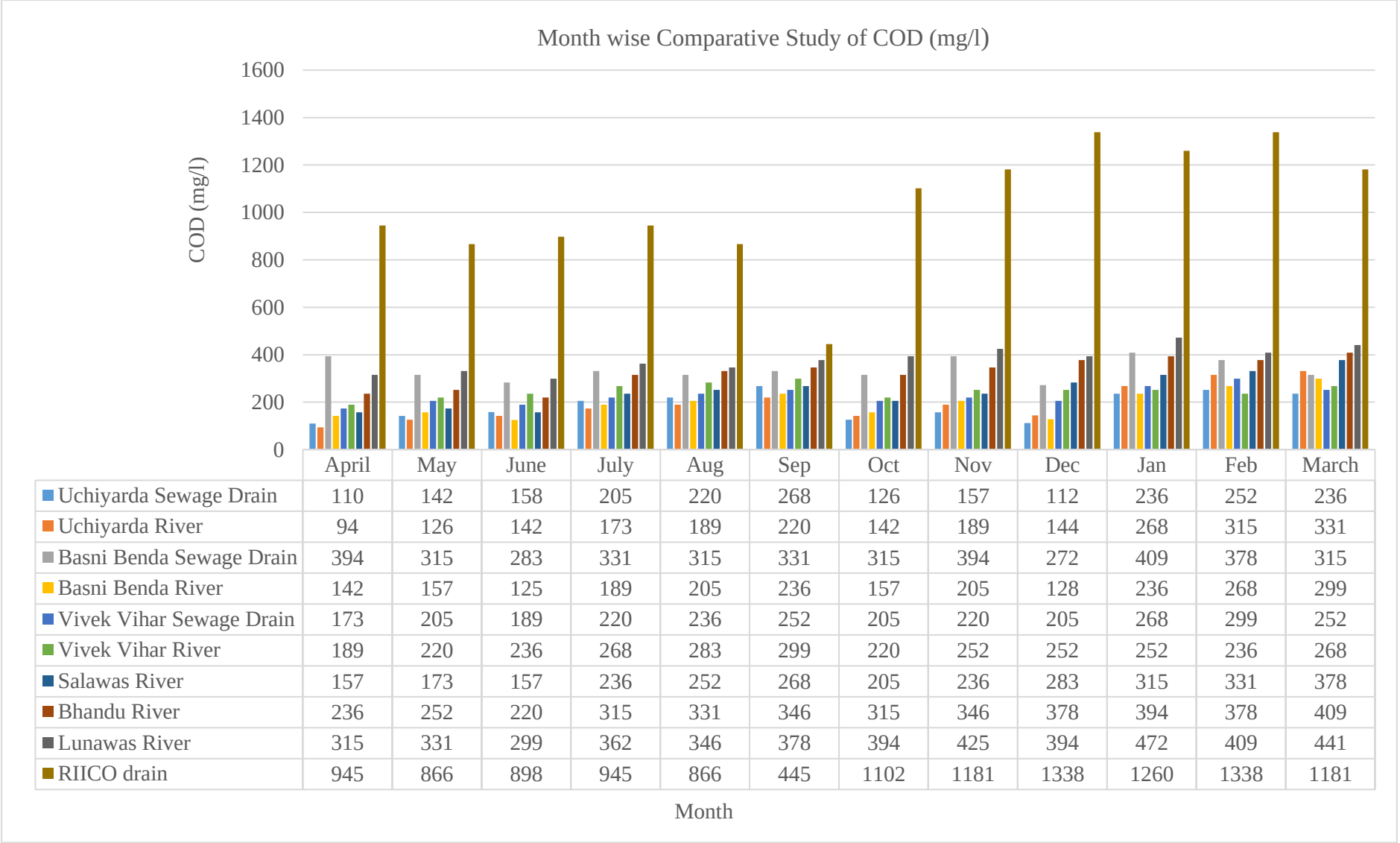
S.N	**Parameter**	**Month**	**Uchiyarda Sewage Drain**	**Uchiyarda River**	**Basni Benda Sewage Drain**	**Basni Benda River**	**Vivek Vihar Sewage Drain**	**Vivek Vihar River**	**Salawas River**	**Bhandu River**	**Lunawas River**	**RIICO drain**
1	**O & G mg/l**	April	7	6	6	7	6	7	9	12	8	18
2	**O & G mg/l**	May	8	7	8	6	8	7	8	11	9	10
3	**O & G mg/l**	June	9	8	7	8	6	8	7	10	8	12
4	**O & G mg/l**	July	8	10	9	7	7	9	9	11	10	13
5	**O & G mg/l**	Aug	9	11	8	8	9	8	11	10	9	14
6	**O & G mg/l**	Sep	8	12	11	9	8	10	13	12	11	13
7	**O & G mg/l**	Oct	9	8	9	11	8	9	11	11	10	13
8	**O & G mg/l**	Nov	13	11	11	10	12	10	13	15	15	17
9	**O & G mg/l**	Dec	11	10	9	12	11	10	11	13	12	15
10	**O & G mg/l**	Jan	13	11	11	10	13	9	14	16	13	19
11	**O & G mg/l**	Feb	16	12	13	8	15	10	18	14	15	21
12	**O & G mg/l**	March	13	10	9	11	12	14	13	16	11	19

Note: Yellow colour showing the data are exceeded the prescribed standard.



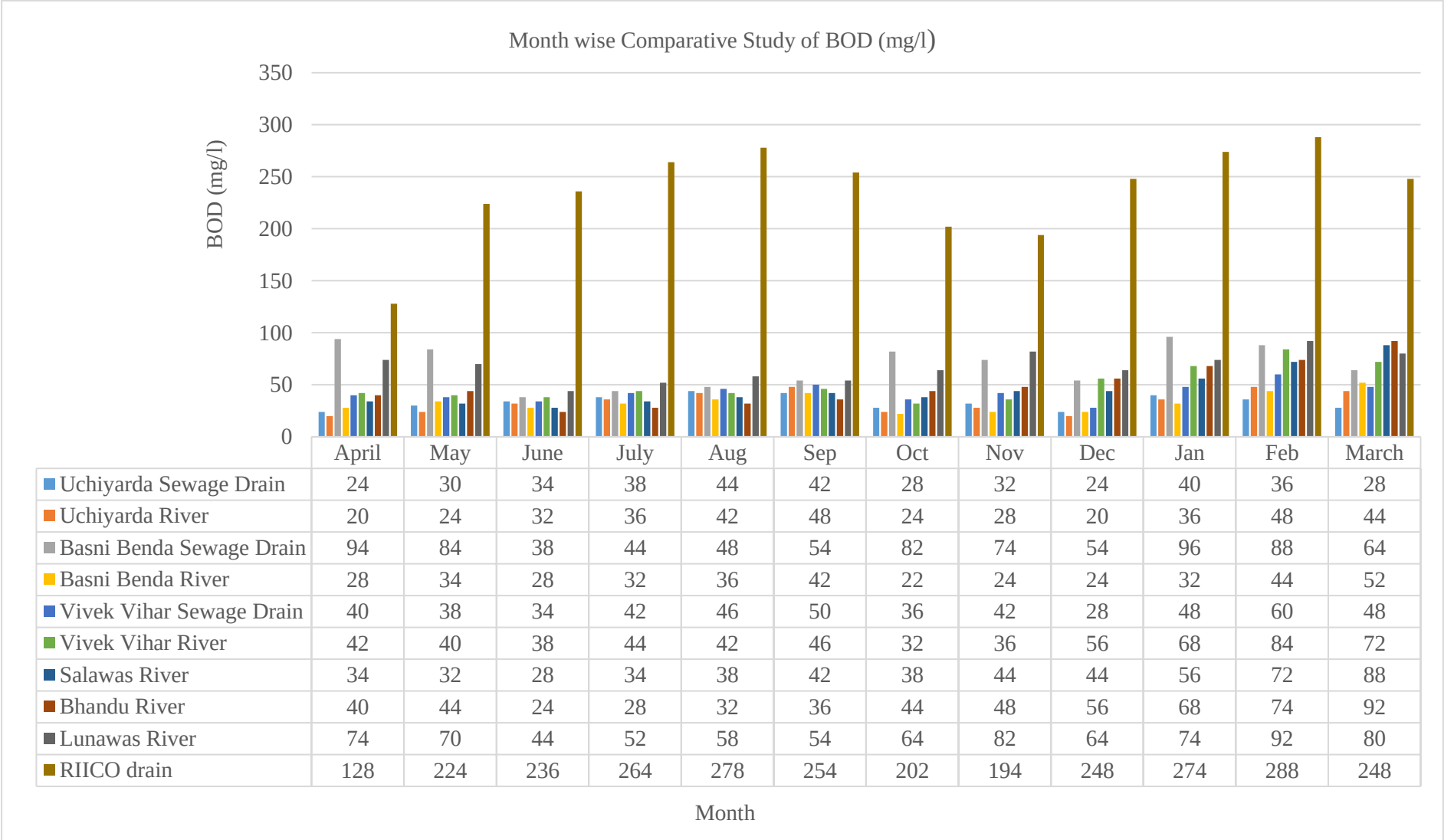
	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March
Uchiyarda Sewage Drain	7.17	7.2	7.25	7.25	7.94	7.8	7.39	8.26	6.88	7.47	7.09	7.57
Uchiyarda River	7.96	8.09	8.15	7.84	7.84	7.69	7.87	7.64	7.82	7.98	7.84	7.49
Basni Benda Sewage Drain	6.78	7.06	7.03	7.7	7.19	7.32	7.36	6.98	6.91	7.52	6.8	6.44
Basni Benda River	8.23	7.09	7.18	7.52	7.44	7.53	7.7	7.26	7.32	7.83	7.22	6.73
Vivek Vihar Sewage Drain	8.32	8.53	7.72	7.6	7.63	7.41	7.69	7.28	7.86	7.76	7.55	7.24
Vivek Vihar River	7.67	7.67	7.72	7.98	7.98	7.77	7.74	7.35	7.45	7.84	7.56	7.02
Salawas River	7.3	7.65	6.86	7.87	7.76	7.76	7.75	6.62	6.71	6.75	6.97	7.49
Bhandu River	8.13	7.75	8.19	7.85	7.47	7.395	7.81	6.93	6.8	7.02	8.01	7.71
Lunawas River	8.04	8.05	7.94	7.81	7.31	7.45	8.22	7.59	7.53	7.78	7.46	7.62
RIICO drain		7.64	8.02	7.86	7.35	7.47	8.57	8.78	8.64	9.01	9.15	7.43

Figure. 3 Month wise Comparative Study of pH along with Jojari River, Jodhpur



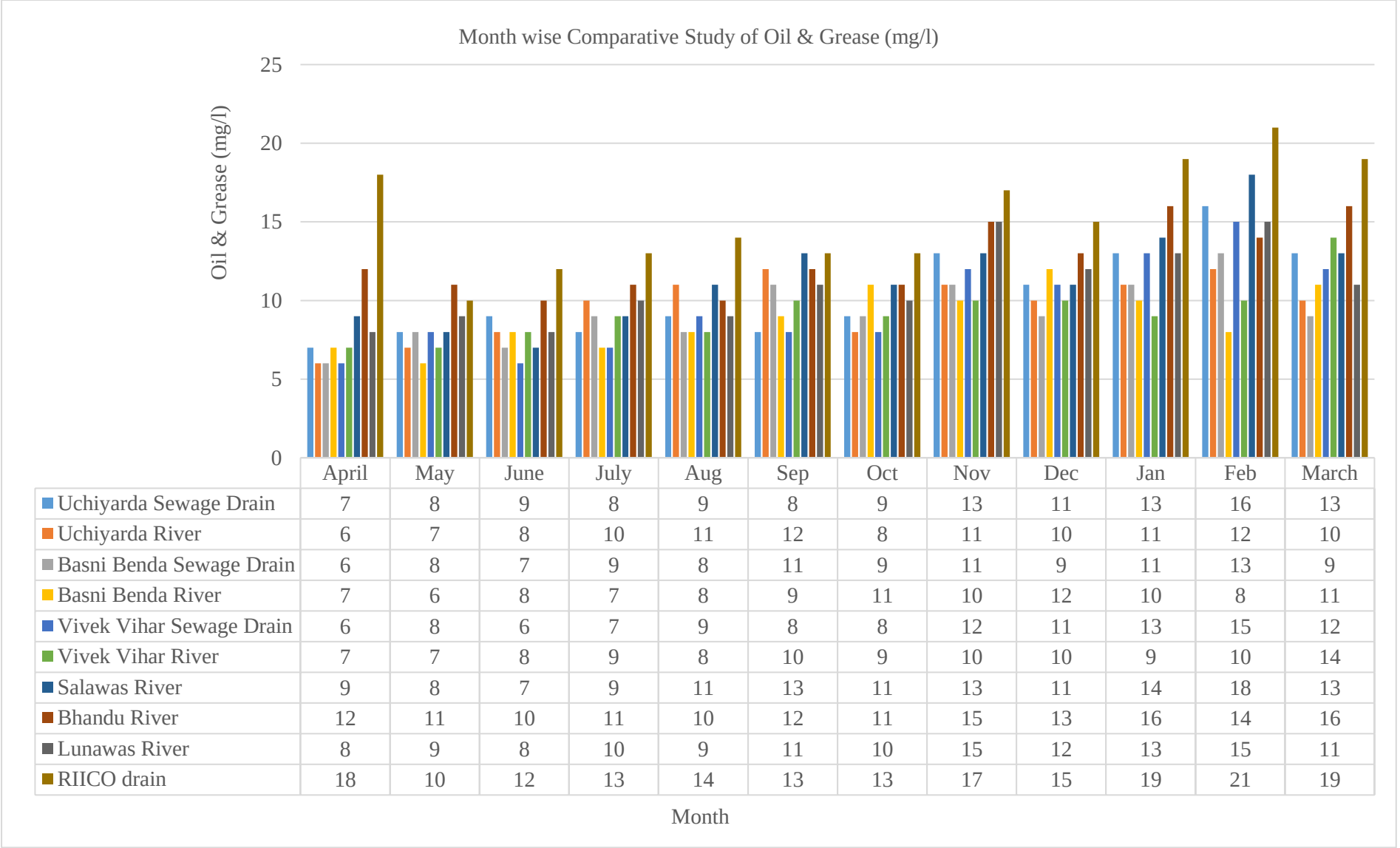
	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March
Uchiyarda Sewage Drain	110	142	158	205	220	268	126	157	112	236	252	236
Uchiyarda River	94	126	142	173	189	220	142	189	144	268	315	331
Basni Benda Sewage Drain	394	315	283	331	315	331	315	394	272	409	378	315
Basni Benda River	142	157	125	189	205	236	157	205	128	236	268	299
Vivek Vihar Sewage Drain	173	205	189	220	236	252	205	220	205	268	299	252
Vivek Vihar River	189	220	236	268	283	299	220	252	252	252	236	268
Salawas River	157	173	157	236	252	268	205	236	283	315	331	378
Bhandu River	236	252	220	315	331	346	315	346	378	394	378	409
Lunawas River	315	331	299	362	346	378	394	425	394	472	409	441
RIICO drain	945	866	898	945	866	445	1102	1181	1338	1260	1338	1181

Figure. 4 Month Wise Comparative Study of C.O.D (mg/l), along with the Jojari River, Jodhpur



	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March
Uchiyarda Sewage Drain	24	30	34	38	44	42	28	32	24	40	36	28
Uchiyarda River	20	24	32	36	42	48	24	28	20	36	48	44
Basni Benda Sewage Drain	94	84	38	44	48	54	82	74	54	96	88	64
Basni Benda River	28	34	28	32	36	42	22	24	24	32	44	52
Vivek Vihar Sewage Drain	40	38	34	42	46	50	36	42	28	48	60	48
Vivek Vihar River	42	40	38	44	42	46	32	36	56	68	84	72
Salawas River	34	32	28	34	38	42	38	44	44	56	72	88
Bhandu River	40	44	24	28	32	36	44	48	56	68	74	92
Lunawas River	74	70	44	52	58	54	64	82	64	74	92	80
RIICO drain	128	224	236	264	278	254	202	194	248	274	288	248

Figure. 5 Month wise Comparative Study of BOD (mg/l), along with Jojari River, Jodhpur



	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	March
Uchiyarda Sewage Drain	7	8	9	8	9	8	9	13	11	13	16	13
Uchiyarda River	6	7	8	10	11	12	8	11	10	11	12	10
Basni Benda Sewage Drain	6	8	7	9	8	11	9	11	9	11	13	9
Basni Benda River	7	6	8	7	8	9	11	10	12	10	8	11
Vivek Vihar Sewage Drain	6	8	6	7	9	8	8	12	11	13	15	12
Vivek Vihar River	7	7	8	9	8	10	9	10	10	9	10	14
Salawas River	9	8	7	9	11	13	11	13	11	14	18	13
Bhandu River	12	11	10	11	10	12	11	15	13	16	14	16
Lunawas River	8	9	8	10	9	11	10	15	12	13	15	11
RIICO drain	18	10	12	13	14	13	13	17	15	19	21	19

Figure. 6 Month wise Comparative Study of O & G (mg/l), along with Jojari River, Jodhpur

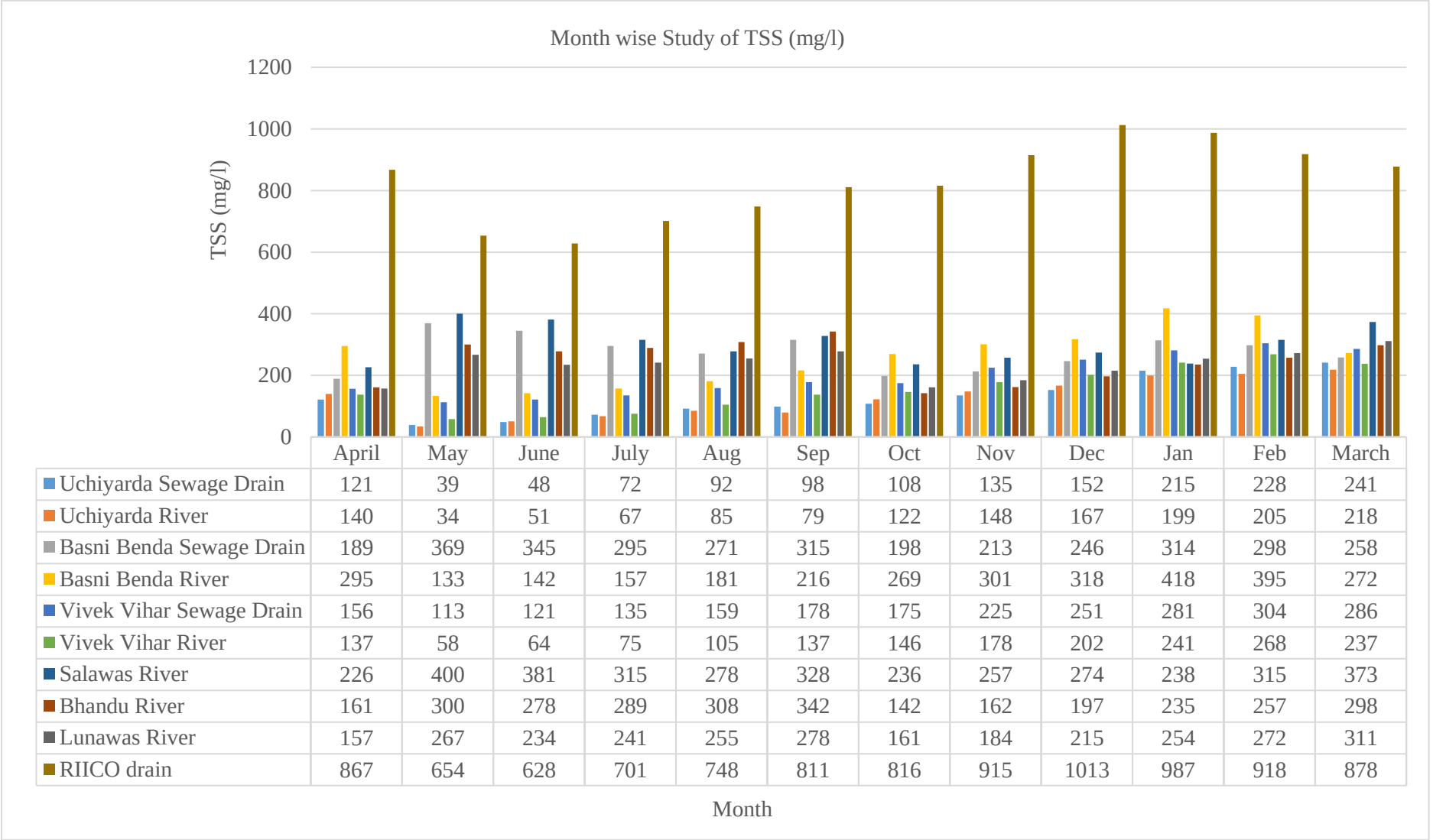


Figure. 7 Month wise Comparative Study of TSS (mg/l), along with Jojari River, Jodhpur

4. RESULT & DISCUSSION

1. **pH:** The pH varied between **6.38 - 9.49**. The **minimum pH** values are **6.38** found in **Basni Benda Sewage Drain** in the month of **June** and **maximum pH** values are **9.49** found in **RIICO Drain** the month of **January.**

2. **TSS (mg/l):** The **TSS mg/l** varied between **34 – 1013 mg/l.** The **minimum TSS mg/l** values are **34 mg/l** found in **Uchiyarda River** in the month of **May** and **maximum TSS mg/l** values are **1013 mg**/l found in **RIICO Drain** the month of **December.**

3. **COD (mg/l):** The **COD mg/l** varied between **94 – 1338 mg/l.** The **minimum COD mg/l** values are **94 mg/l** found in **Uchiyarda River** in the month of **April** and **maximum COD (mg/l)** values are **1338 mg**/l found in **RIICO Drain** the month of **February.**

4. **BOD (mg/l):** The **BOD mg/l** varied between **20 – 288 mg/l.** The **minimum BOD mg/l** values are **20 mg/l** found in **Uchiyarda River** in the month of **December** and **maximum BOD mg/l** values are **288 mg**/l found in **RIICO Drain** the month of **February.**

5. **O & G (mg/l):** The **O & G mg/l** varied between **06 – 21 mg/l.** The **minimum O & G mg/l** values are **06 mg/l** found in **Uchiyarda River, Vivek Vihar Sewage Drain Basni Benda Sewage Drain** and **Basni Benda River** in the month of April, May and June and **maximum O & G (mg/l)** values are **21 mg**/l found in **RIICO Drain** the month of **February.**

5. CONCLUSION

In the month of December, January and February and March pH are exceed 9.14, 9.49, 9.38 and 9.18 respectively in RIICO Drain Site. The remaining site pH are found in prescribed limit/Standard. Four Parameter (Total Suspended Solid, Chemical Oxygen Demand, Biochemical Oxygen Demand and Oil & Grease) are also exceeded the prescribed limit/Standard at all the site along with the Jojari River.

6. FLOW MEASUREMENT OF JOJARI RIVER FROM UPSTREAM TO DOWNSTREAM

S.N.	Name	Flow in MLD
1.	**J R 1** Jojari River Near Uchiyarda Village, Jodhpur (Upstream) After Confluence To Jojari River)	0.805 MLD
2.	**J R 2** Municipal Drain Near Uchiyarda Village Jodhpur (Before Confluence To Jojari River)	1.301 MLD
3.	**J R 3** Municipal Drain Near Basni Benda Village Jodhpur (Before Confluence To Jojari River)	1.225 MLD
4.	**J R 4** Jojari River Near Basni Benda Village, Jodhpur (Upstream) After Confluence To Jojari River)	0.616 MLD
5.	**J R 5** Jojari River Near Vivek Vihar Colony, Jodhpur (Upstream) After Confluence To Jojari River)	1.205 MLD
6.	**J R 6** Municipal Drain Near Vivek Vihar Colony, Jodhpur (Before Confluence To Jojari River)	0.620 MLD
7.	**J R 7** Jojari River Near RIICO Drain, Jodhpur	2.504 MLD
8.	**J R 8** Jojari River Near Salawas Village, Jodhpur.	**9.811 ML/Hr.** ***24 Hour Flow Rate** **= 9.811*24 = 235.464 MLD**
9.	**J R 9** Jojari River Near Bhandu Village, Jodhpur.	1.502 MLD
10.	**J R 10** Jojari River Near Lunawas Village, Jodhpur.	**0.550 MLD**

Note:

1. **Maximum** flow rate found in **Salawas Village (235.464 MLD).**
2. **Minimum** flow rate found in L**unawas Village (0.550 MLD).**
3. **Upstream** (Uchiyarda Village) and **Downstream** (Lunawas Village) flow rate found **0.805 MLD** and **0.550 MLD.**

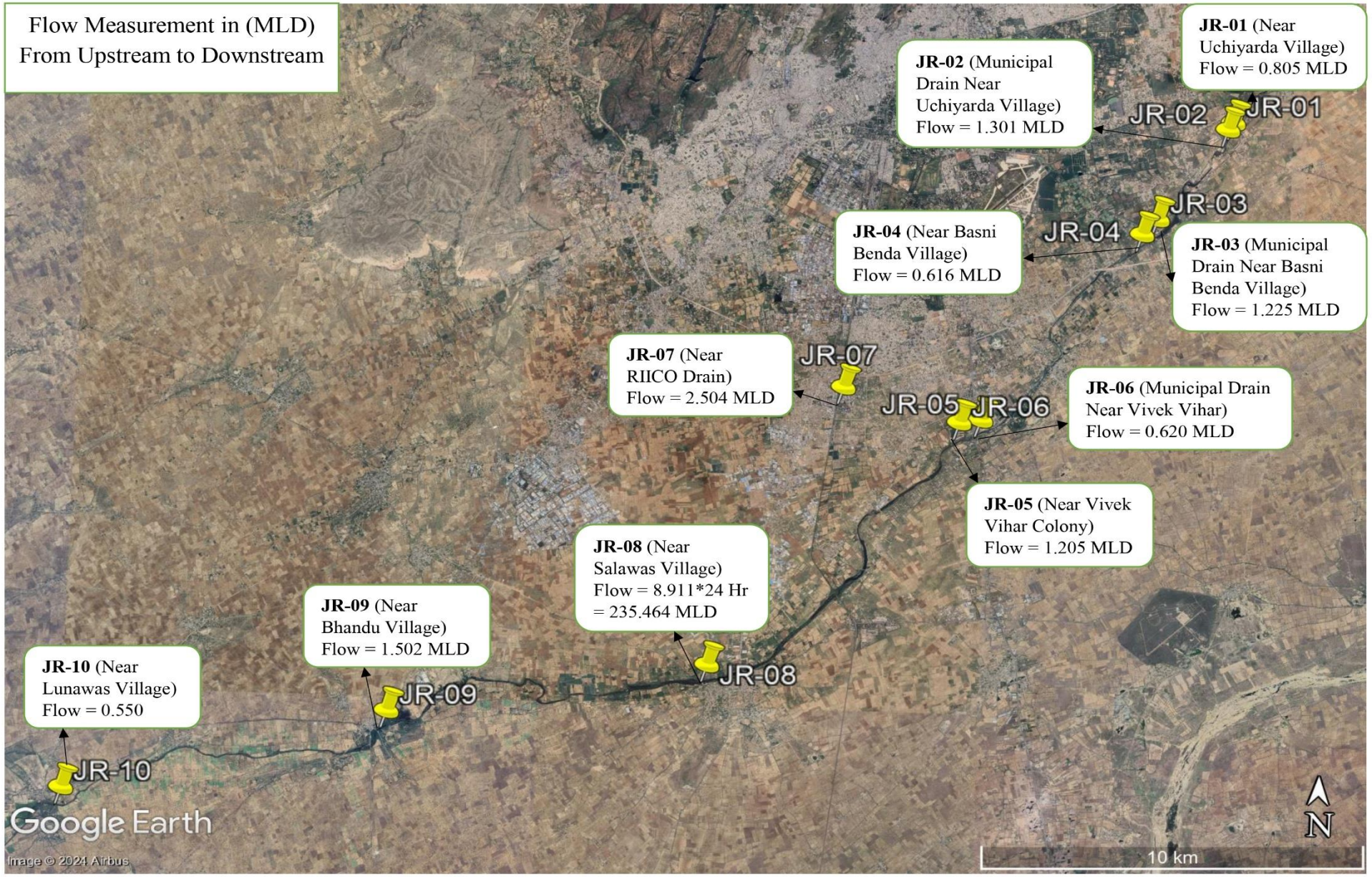

Flow Measurement in (MLD)
From Upstream to Downstream
JR-01 (Near Uchiyarda Village) Flow = 0.805 MLD
JR-02 (Municipal Drain Near Uchiyarda Village) Flow = 1.301 MLD
JR-01
JR-02
JR-03
JR-04
JR-04 (Near Basni Benda Village) Flow = 0.616 MLD
JR-03 (Municipal Drain Near Basni Benda Village) Flow = 1.225 MLD
JR-07 (Near RIICO Drain) Flow = 2.504 MLD
JR-07
JR-05
JR-06
JR-06 (Municipal Drain Near Vivek Vihar) Flow = 0.620 MLD
JR-05 (Near Vivek Vihar Colony) Flow = 1.205 MLD
JR-08 (Near Salawas Village) Flow = 8.911*24 Hr = 235.464 MLD
JR-09 (Near Bhandu Village) Flow = 1.502 MLD
JR-08
JR-09
JR-10 (Near Lunawas Village) Flow = 0.550
JR-10
Google Earth
Image © 2024 Airbus
N
10 km

Figure.8 Waste water Sample Collection and flow measurement at Salawas Village, Jodhpur.

7. RECOMMENDATIONS & REMEDIAL MEASURES FOR CONTROL OF JOJARI RIVER POLLUTION

1. Industries should treat their waste water carefully before disposing of chemicals and other materials into water bodies directly. Sewage treatment plants and primary wastewater treatment plants must be established to treat the effluent generated during the process of dyeing, printing washing of clothes, steel rerolling mills process & other water-polluting industries.
2. The Authorities (Municipal Corporation) should take immediate action against those dumping Municipal Solid Waste directly into the Jojari River.
3. Strict implementation of guidelines/orders issued by the Hon'ble Supreme Court, NGT, CPCB & RSPCB.
4. Regular inspection and sampling of water-polluting industries to check out the leakage (Bypass arrangement) for discharge of trade effluent into the RIICO drain/Sewage line.
5. ETP/STP should be mandatory for all types of wastewater-generating units.
6. The water of the Jojari River is used by the farmers for agricultural purposes. Consumption of such agricultural produce may cause harmful effects on the human body due to the presence of toxic heavy metals in the wastewater.
7. The efficiency of treatment plants at the primary level in the industries should be improved to achieve standards at the outlet of the Primary Effluent Treatment Plant (PETP).
8. More trees should be planted along the Jojari River because the plant has phytoremediation capability.
9. Farmers should use bio-fertilizers/organic fertilizers in place of chemical fertilizers.
10. Uses of Phytoremediation crops like Brassica Juncea (Mustard) and Helianthus Annuus (Sunflower) can remediate Cu, Cd, Cr, Ni, Pb and Zn from water but these crop having health hazard for living organisms because the contamination enters into the food chain.
11. Development of Green Beach along with the Jojari River and growing of phytoremediation crops (Mustard, Sunflower) and plants (*Bambusa vulgaris* (Bamboo), *Acacia nilotica* (Babool), *Dalbergia sissoo* (Sisam).
12. Growing plants which are used in the handicraft industry like *Dalbergia sissoo* because the contamination accumulates into the plant but does not enter into the food chain & web.

13. CSTPs & CETPs are required to be upgraded upto ZLD (Zero liquid discharge) level and reuse treated water in integrated Captive Power Plant.
14. ETP/STP/CETPs sludge may be use with municipal solid waste as a fuel in Captive Power Plant.
15. Adequate storm water drainage system to be provided or improved.

8. THE TEAM - PREPARATION OF JOJARI RIVER REPORT (APRIL, 2023 TO MARCH, 2024)

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9. PHOTOGRAPHS DURING SAMPLING

Figure. 9 Collection of water Sample at Basni Benda Sewer Drain, RIICO Drain and Salawas River along with Jojari River and mixing of Sewage water at Basni Benda Sewage Drain & dumping off Municipal waste directly into the Jojari River.

Figure. 10 Flow Measurement at Salawas River by Board Officials.