

## Assessment of Groundwater Quality of Tiruchanoor Town

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**Abstract:** The purpose of the study was to assess the water quality parameters of ground water of Tiruchanoortown. 20 samples were collected from different wards of Tiruchanoor town and analysed water for drinking water parameters. The value of  $p^H$  varies from 7.91 to 8.48 the values of Chloride varies from 80mg/L to 500mg/L, Hardness varies from 110mg/L to 266mg/L, Alkalinity varies from 104mg/L to 340mg/L, Acidity varies from 0mg/L to 1.5mg/L and Dissolved Oxygen varies from 4mg/L to 7.2mg/L, Sulphates varies from 46mg/L to 74mg/L, Fluorides varies from 0.1mg/L to 0.3mg/L and the MPN is negative for all 20 samples and the water quality mapping was developed using SURFER package.

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### I. Introduction

Water is one of the pivotal to both natural ecosystem and human development. It is essential for various activities such as drinking, cooking, industrial, agricultural and recreational purposes. In the human body it is also used in transporting, dissolving organic matter and replenishing nutrients while carrying away waste materials (Jayalakshmi et al., 2011). Contaminated drinking water can cause various diseases such as typhoid fever, dysentery, cholera and other intestinal diseases (AsheehShrivastava et al., 2015). Water quality provides current information about the concentration of various solutes at a given place and time, its quality parameters provide the basis for judging the suitability of water for its designated uses and to improve existing conditions (Ali et al., 2004). Water may be tested for a few characteristics of numerous natural substances & contaminants depending on their needs like drinking.

### II. Objectives

1. To study water quality of groundwater of TIRUCHANOOR town and also its suitability for drinking purposes.
2. To develop quality plots of groundwater resources in the study area using SURFER package.

### III. Materials & Methodology

pHmeter, glass wares, chemicals of EDTA, Silver Nitrate, SPANDS reagents etc., were used in the analysis of water.

20 water samples were collected from 20 wards covering the entire Tiruchanoor town. About 2 liters of sample collected from standard procedures and were tested for MPN index within 6 hours. SURFER package was used to develop the water quality mapping of Tiruchanoor town water samples.

Analysis was conducted according to the standard procedure outlined in standard methods for examination of water and wastewater prescribed by APHA, AWWA and WPCF of the United States and results are compared with drinking water standards of IS 10500:2012.

### IV. Results And Discussion

To draw contour and profile plots of water parameters, the coordinates of water samples are as shown in Table 1

**Table1:** Co-Ordinates of Water Sampling Stations

Samples	X coordinates (degrees)	Y coordinates (degrees)
1	13.609	79.442
2	13.6054	79.44
3	13.604	79.4478
4	13.6093	79.4485
5	13.6101	79.4498
6	13.6071	79.4489
7	13.6055	79.4523
8	13.6062	79.4533
9	13.6049	79.4521
10	13.6031	79.4501
11	13.6042	79.4487
12	13.611	79.4468
13	13.6119	79.4511
14	13.611	79.4503
15	13.6122	79.4501
16	13.6156	79.4479
17	13.6145	79.4471
18	13.616	79.4555
19	13.6155	79.4469
20	13.6107	79.4479

The results of various water quality parameters i.e., TDS, Alkalinity, Chlorides, Fluorides, Hardness, Sulphates and DO of 20 samples from entire TIRUCHANOORTOWN are presented in Table 2 followed by description of variation of different parameters of the water samples collected.

**Table 2. Results of water quality analysis of different wards of TIRUCHANOOR TOWN**

S.No	Ward no	pH	Total Dissolved solids(mg/L)	Chlorides (mg/L)	Hardness (mg/L)as CaCo <sub>3</sub>	Alkalinity (mg/L) as CaCo <sub>3</sub>	Acidity (mg/L)	Dissolved Oxygen (mg/L)	Sulphates (mg/L)	Fluorides (mg/L)	MPN
1	01	7.96	400	80	200	220	1.3	5.5	50	0.2	Negative
2	02	7.91	600	180	210	215	1.2	6.5	62	0.1	Negative
3	03	7.96	700	500	110	150	1.5	5.8	50	0.2	Negative
4	04	7.91	600	380	120	160	1.5	5.5	46	0.3	Negative
5	05	8.31	600	280	200	225	0	7	62	0.3	Negative
6	06	8.01	700	150	215	230	1	7.2	70	0.2	Negative
7	07	7.92	600	200	150	190	1.2	6.8	65	0.3	Negative
8	08	7.92	600	320	180	200	1.4	6.5	50	0.1	Negative
9	09	8.48	600	230	233	200	0	5.2	67	0.1	Negative
10	10	8.20	300	140	166	104	0.3	5.6	49	0.2	Negative
11	11	8.15	700	240	266	340	0.5	4.0	74	0.3	Negative
12	12	8.05	600	288	200	240	1	5.4	51	0.2	Negative
13	13	8.10	700	240	283	200	08	4.6	72	0.1	Negative
14	14	8.15	600	240	233	215	0.5	4	62	0.1	Negative
15	15	8.06	600	280	266	190	1.0	4.7	60	0.2	Negative
16	16	8.39	600	280	183	240	0	5.0	55	0.2	Negative
17	17	8.17	700	280	190	230	0.5	5.4	52	0.3	Negative
18	18	8.22	700	200	180	150	0.3	4.6	74	0.1	Negative
19	19	8.20	600	260	200	240	0.3	4	65	0.2	Negative
20	20	8.10	700	220	250	200	0.8	4.6	70	0.2	Negative

#### 4.1 pH:

As per IS 10500:2012 the permissible limits of pH are 6.5 to 8.5. The pH for the samples vary from 7.91 to 8.48. All the samples have the pH within the permissible limits as per IS 10500:2012. They are suitable for drinking purpose. The Iso concentration lines and 3D wire frame of pH values are as shown in Fig.1 and Fig.2

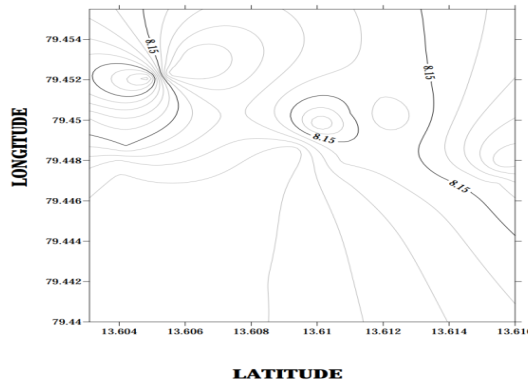


Fig.1 shows the Iso concentration lines of pH values of Tiruchanoor town water samples

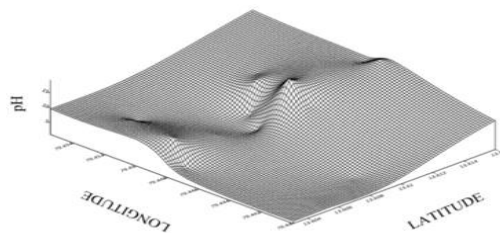


Fig.2 3 D wire frame representation of pH values of TIRUCHANOOR TOWN water samples

**4.2 TOTAL DISSOLVED SOLIDS:**

As per IS 10500-2012 the desirable and permissible limits of total dissolved solids are 500 and 1500 mg/L. The TDS values of the samples vary from 300mg/L to 700 mg/L. All the samples except 1 and 10 have the total dissolved solids more than the acceptable limits but less than the permissible limits as per IS 10500:2012. They are suitable for drinking purpose in the absence of alternate source. The high values may be due to poor drainage facilities and high percolation of the soil. The Iso concentration lines and 3D wire frame of total dissolved solids values are as shown in Fig.3 and Fig.4

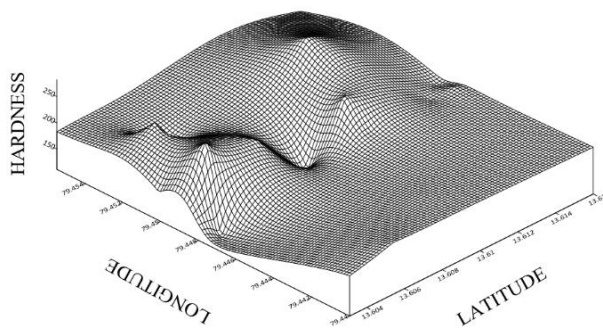


Fig.3 ISO concentration lines of TDS values of Tiruchanoor town water samples.

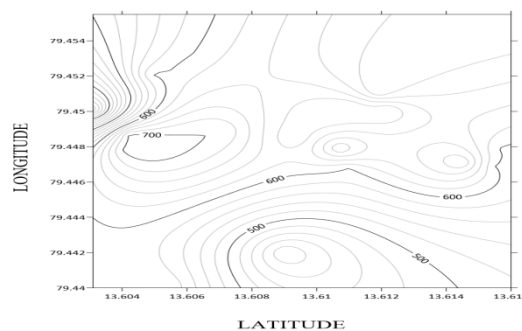
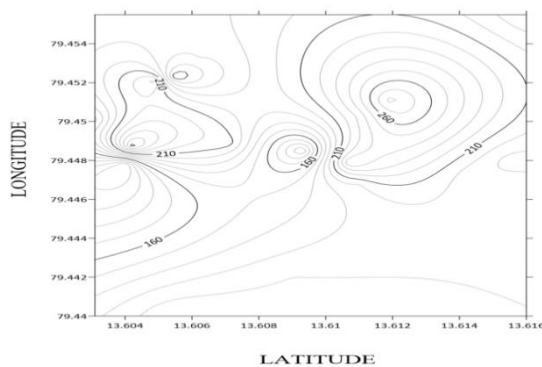


Fig.4 3D wire frame representation of TDS values of Tiruchanoor town water samples.

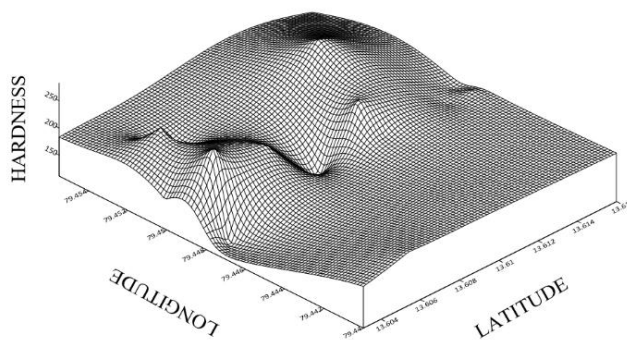
**4.3 Hardness:**

As per IS 10500:2012 the desirable and permissible limits of total dissolved solids are 200 mg /L as CaCO<sub>3</sub> and 600 mg/L as CaCO<sub>3</sub>.

The hardness values of the samples vary from 110 mg/L to 283 mg/L. The samples 2,6,9,11,13,14,15 and 20 have the hardness values more than the acceptable limits but less than the permissible limits which are suitable for drinking purpose in the absence of alternate source. The samples having the hardness values within the acceptable limit are suitable for drinking purpose. The Iso concentration lines and 3D wire frame of hardness values are as shown in Fig.5 and Fig.6



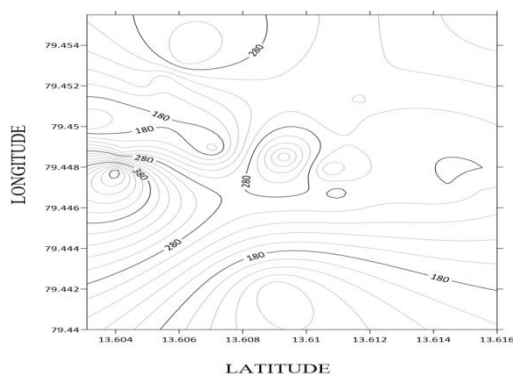
**Fig.5** ISO concentration lines of HARDNESS values of Tiruchanoor town water samples.



**Fig.6** 3D wire frame representation of HARDNESS values of Tiruchanoor town water samples.

**4.4 Chlorides:**

As per IS 10500:2012 the desirable and permissible limits of chlorides are 250 mg /L and 1000 mg/L. The chloride values of the samples vary from 80 mg/L to 500 mg/L. The samples 3, 4, 5,8,12,15,16,17 and 19 have the chloride values more than the acceptable limits but less than permissible limits and are suitable for drinking purpose in the absence of alternate source. The Iso concentration lines and 3D wire frame of chloride values are as shown in Fig.7 and Fig.8



**Fig.7** shows the Iso concentration lines of chloride values of Tiruchanoor town water samples.

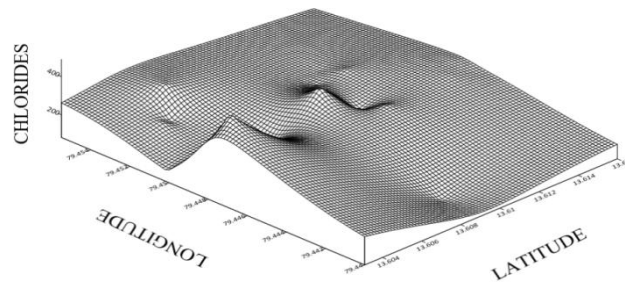


Fig.8 shows the 3D wire frame of chloride values of Tiruchanur town water samples.

**4.5 Fluorides:**

As per IS 10500:2012 the desirable and permissible limits of fluorides are 0.5 mg/L and 1.5 mg/L. The fluorides for the samples vary from 0.1 to 0.3 mg/L. All the samples have the fluoride values within the desirable limits as per IS 10500:2012 and are suitable for drinking purpose. The Iso concentration lines and 3D wire frame of fluorides values are as shown in Fig.9 and Fig.10

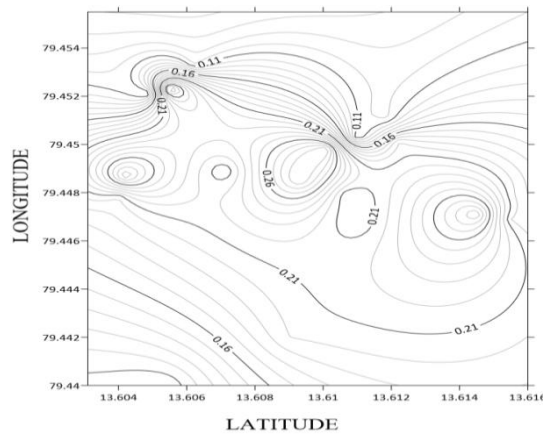


Fig.9 shows the ISO concentration lines of fluorides values of Tiruchanur town water samples

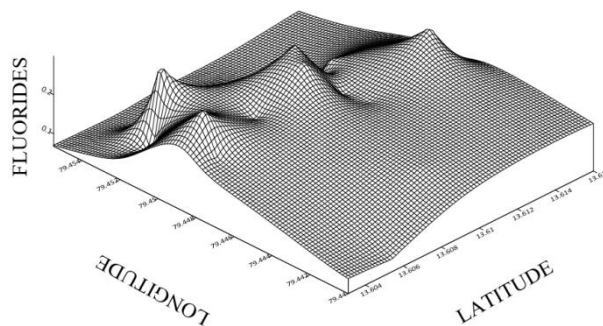
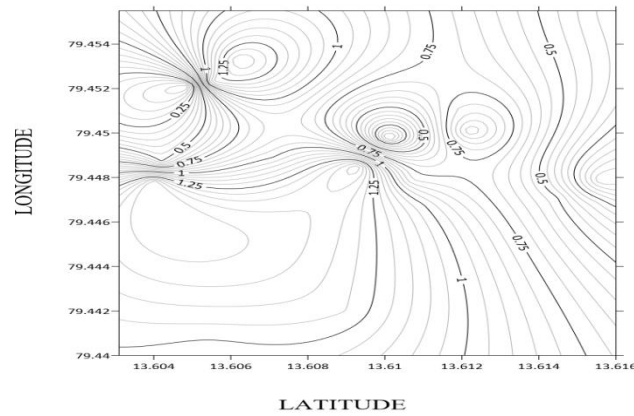


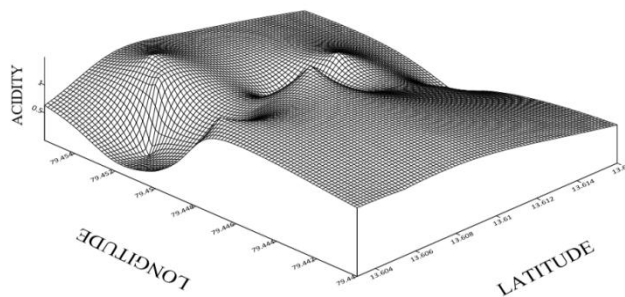
Fig.10 3D wire frame representation of FLUORIDES values of TIRUCHANOOR TOWN water samples.

**4.6 Acidity:**

There is no proper specification in IS-code values for acidity. Generally, the water is suitable for drinking purpose when the value of acidity value is less than 50 mg/L. The acidity values for the samples vary from 0 to 1.5mg/L. so it is safe for drinking purpose when there is no alternate purpose. The Iso concentration lines and 3D wire frame of acidity values are as shown in Fig.11 and Fig.12



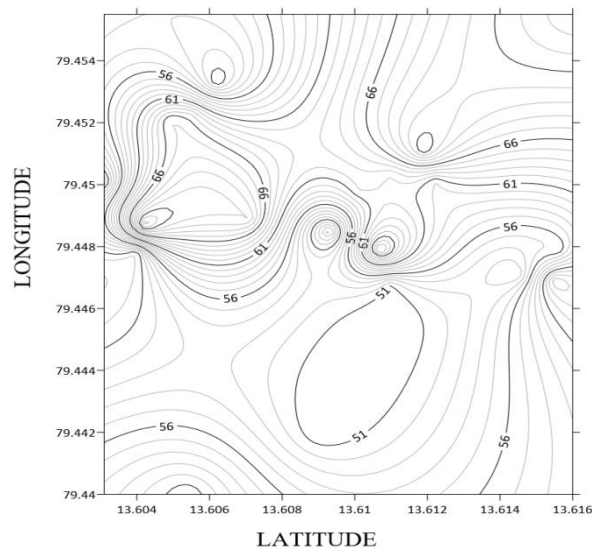
**Fig.11** ISO concentration lines of ACIDITY values of Tiruchanoor town water samples.



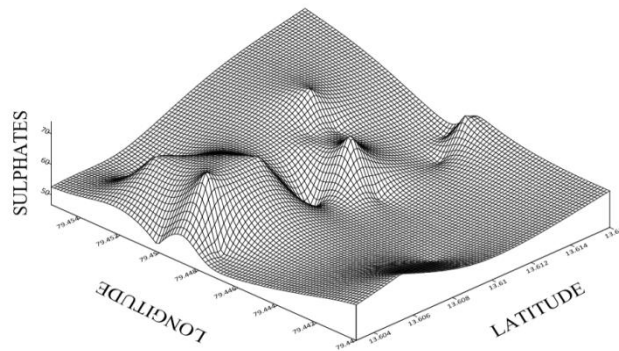
**Fig.12** 3D wire frame representation of ACIDITY values of Tiruchanoortown water samples.

**4.7 Sulphates:**

As per IS 10500:2012 the desirable and permissible limits of Sulphates are 200 mg/L and 400 mg/L. The sulphates for the samples vary from 46 mg/L to 74 mg/L. All the samples have the fluoride values within the desirable limits as per IS 10500:2012 and are suitable for drinking purpose. The Iso concentration lines and 3D wire frame of sulphates values are as shown in Fig.13 and Fig.14



**Fig.13** ISO concentration lines of SULPHATES values of Tiruchanoor town water samples.

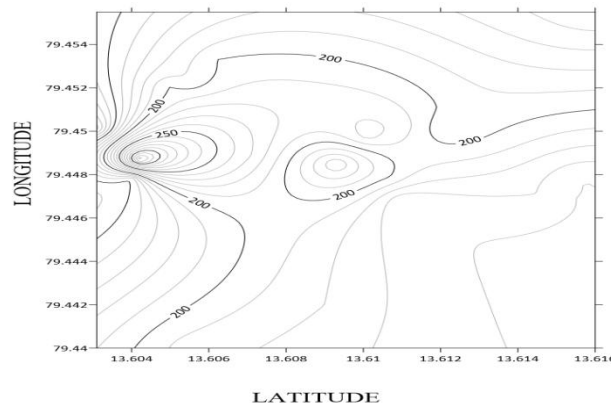


**Fig.14** 3D wire frame representation of SULPHATES values of TIRUCHANOOR TOWN water samples.

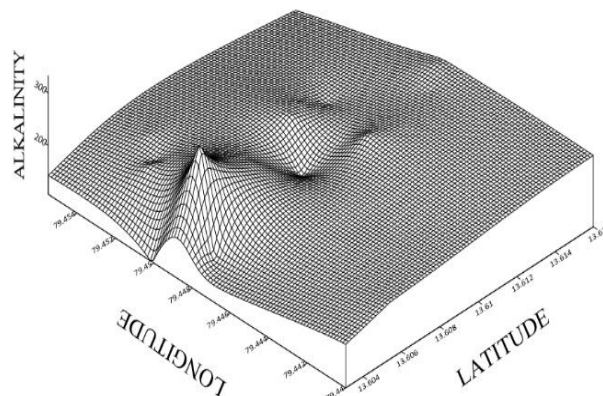
**4.8 Alkalinity:**

As per IS 10500:2012 the desirable and permissible limits of alkalinity are 200 mg /L as CaCO<sub>3</sub> and 600 mg/L as CaCO<sub>3</sub>.

The alkalinity values of the samples vary from 104 mg/L to 340 mg/L. The samples 1,2,5,6,11,12,14,16,17 and 19 have the alkalinity values more than the acceptable limits but less than the permissible limits which are suitable for drinking purpose in the absence of alternate source. The samples have the alkalinity values within the acceptable limit which are suitable for drinking purpose. The Iso concentration lines and 3D wire frame of alkalinity values are as shown in Fig. 15 and Fig.16



**Fig.15** ISO concentration lines of ALKALINITY values of Tiruchanoor town water samples.



**Fig.16** 3D wire frame representation of ALKALINITY values of Tiruchanoortown water samples.

#### 4.9 MPN:

Most Probable Number is a multiple tube fermentation test which indicates possible pollution of water sample with sewage. All the samples showed negative results which indicate the absence of pathogenic bacteria.

#### 4.10 DISSOLVED OXYGEN:

All the samples have the DO Values ranging between 4mg/L to 7.2mg/L. Hence the DO values of the samples are within the permissible limits and are suitable for drinking purpose. The Iso concentration lines and 3D wire frame of dissolved oxygen values are as shown in Fig.17 and Fig.18

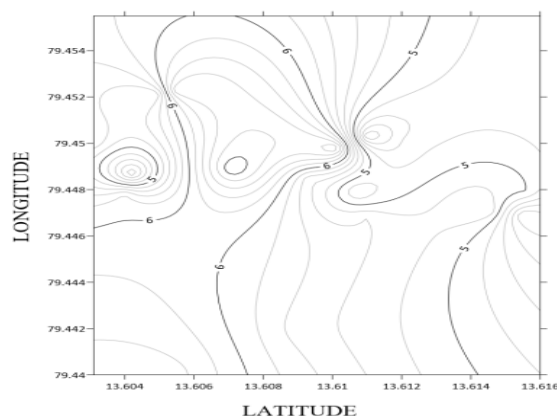


Fig.17 ISO concentration lines of DO values of Tiruchanoor town water samples.

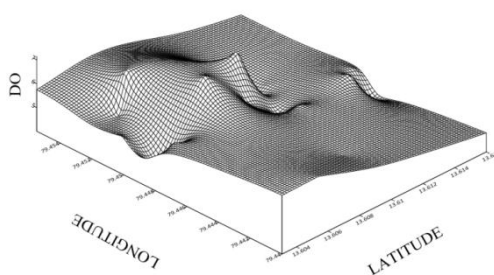


Fig.18 3D wire frame representation of DO values of Tiruchanoor town water samples.

### V. Concluding Remarks

The following are conclusions drawn from the analysis made on the ground water quality of samples collected from different locations of the study area

1. The pH, Fluorides, DO and Sulphates values of all samples are in desirable limits.
2. The Alkalinity values varies from 104mg/L to 340mg/L as  $\text{CaCO}_3$ .
3. The Hardness values varies from 110 mg/L to 283 mg/L as  $\text{CaCO}_3$ .
4. The M.P.N index values of all the samples are negative and this indicates the absence of bacterial composition.
5. The Chlorides values varies from 80 mg/L to 500 mg/L.
6. The Acidity values varies from 0 mg/L to 1.5mg/L
7. The Total Dissolved Solids values varies from 300 mg/L to 700 mg/L.
- 8 All the ground water samples collected from Tiruchanoor town are suitable for drinking purpose as per IS 10500:2012.

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