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A Comprehensive Analysis of Kham River Water, At Aurangabad, Maharashtra (India)

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--*ABSTRACT*--
Water is an essential component of the environment and it sustains life on the earth. Human beings depend on water for their survival. The river water contamination with domestic and municipal sewage disposal, leaching of fertilizers, agricultural runoff and industrial effluents is becoming a common phenomenon. A laboratory study was conducted to monitor the physicochemical characteristics of water samples of Kham River for a period of ten months during July 2010 to April 2012.The analysis was done for the parameters like sulphates, phosphates, nitrates, DO, BOD, COD and TSS as per the standard methods given by APHA. The estimated values of selected physicochemical parameters of water were compared with standard values. Present research work shows that the water quality of Kham River is potentially deteriorated possibly due to increased artificial activities and improper release of industrial effluents in the river. Wise planning and proper management are needed to protect river water for sustainable utilization.

Keywords: -waterphysico-chemicalanalysis, Kham river,

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I. INTRODUCTION:

Rivers are the most important freshwater resource in the world. In most of countries, water becomes a commodity (Usharani *et al.*, 2010). The rapid increase in human population, industrialization influences the environment particularly the freshwater and results in decline in water quality (Goudie., 2000; Crivelli., 2002; Kulshrestha and Sharma, 2006; Mustapha and Nabegu, 2011). Water is also a raw material for photosynthesis andtherefore, is important for crop production. Obviously, an optimum agricultural productiondepends on water and soil quality(Shamruck *et al.*, 2001).Potable water is an animating liquid while contaminated water is actual curse for living beings. Almost all of so the liquor freshwater is a finite and limited resource (Anderson, 2003).Water is being used by man for different uses such as drinking purpose, industrial production, mining industry, farming activities, household use, and power generation. Rivers contribute a main role in shaping and integrating the landscape, and molding the environmental surroundings of a basin. They are key in controlling the global water cycle and are the most dynamic agents of transport in the hydrological cycle (Arimoro, 2008; Otieno *et al.,* 2017).The degradation of water superiority and quantity makes the water unavailable for use (Shiklomanov, 1993). Natural waters are enormously differs in chemical composition and the features monitoring the composition include physical, chemical and biological method (Bhosle, 2001). The quantity of this usable water is very much limited on the earth planet. Though, water is continuously purified by the natural processes like evaporation and precipitation. Contamination of water has emerged as one of the most harmful environmental problems of recent times (Solanki, 2011). Human's household and industrial actions produce contaminants and which can be contaminated in nature to human and marine life. The manufacturing and the household wastes are discharging in the water bodies before management and gradually polluting the water resources. Because of the disposal unprocessed waste from different sources in water resource cumulatively adding pollutants and making water resource non usable to the man. The increasing problem of degradation of our river ecology has required the monitoring of water contamination and water quality of several rivers all above the nation to evaluate their production, utility potential, capacity, and to strategy restorative measures (Kumar *et al.,* 2012).

II. MATERIAL AND METHODS

Aurangabad is the headquarters of the district as well as the division – Marathwada. It is situated on the Kham River. The entire city is situated at the latitude of 19^o53'50" N and longitude of 75^o22'46" E. Aurangabad District is located mainly in the Godavari river basin and partly in the Tapi river basin. The city is surrounded by the hills of the Vindhya ranges and the river Kham passes through it. The water samples were collected for physico-chemical analysis from Kham River. Water sample are analyzed at regular intervals of one month for a period of ten months for three years from July 2010 to April 2012. The samples were well mixed and stored in 1.5 liter plastic cans for the analysis work. Sample collection was usually completed during morning hours between 6.00 am to 9.00 am every for further analysis. The Water temperature and Hydrogen ion concentration (pH) were estimated on the spot at the time of sampling while other parameters were estimated in the laboratory. Standard methods as prescribed APHA(1998) and Trivedy and Goel (1984)were followed for examination of various physical and chemical parameters of water. Water transparency was measured by Secchi disc having a diameter of 20 cm and divided into black and white quadrants. The depth at which the Secchi disc was visible was determined. After the analysis the results were compared with the standard values given in the table No-2.

III. RESULTS AND DISCUSSION

The physico-chemical parameter of any aquatic ecosystem indicates the type, composition and diversity of biotic components of that ecosystem.

Table 1: Average values of physic-chemical parameters (mg/liter) (Year 2010, 2011 and 2012)

Year	2010			2011			2012			**Average**	**Max.**	**Min.**
Season/ Parameters	**Summer**	**Rainy**	**Winter**	**Summer**	**Rainy**	**Winter**	**Summer**	**Rainy**	**Winter**			
Sulphates	207	210.6	215.4	203.2	215	194.6	219.4	208.8	203	208.56	219.4	194.6
Phosphates	1.143	0.415	1.294	1.42	0.774	1.25	0.819	0.695	1.255	1.01	1.42	0.415
Nitrates	2.864	4.529	4.403	3.226	2.232	1.129	3.642	2.7035	2.232	3.00	4.529	1.129
DO	2.37	2.85	4.36	2.26	3.29	4.21	2.68	4.34	4.28	3.40	4.36	2.26
BOD	30.54	16.26	22.01	31	13.39	21.08	28.55	25.82	20.76	23.27	31	13.39
COD	42.36	22.41	59.47	44.72	26.16	27.01	50.24	27.36	40.529	37.81	59.47	22.41
TSS	1221.1	983.5	999.2	1207.8	1120.6	1078.1	1214.7	1007.2	1161.5	1110.41	1221.1	983.5

The values on physicochemical parameters found from the study area for the three years i.e. 2010 to 2012 presented in the table no. 1 and graphically presented in Fig. 1 to 7 respectively.

Sulphate:

High concentrations of sulphides and sulphate were also detected in a number of eutrophic dams and lakes waters. The concentration of sulphate was upper in summer may be due to lentic atmosphere and inflow of sewage wastewater in to the river through river in rainy season (Kemp *et al.*, 1972). The recommended maximum concentration is 500 mg/L. Excess sulphate levels may have a laxative effect on new users and produce an objectionable taste.The data revealed that the average sulphate of three years was 208.56 mg/litre. Maximum sulphate concentration 219.4 from found in summer 2012 whereas minimum 194.6 from winter 2011.

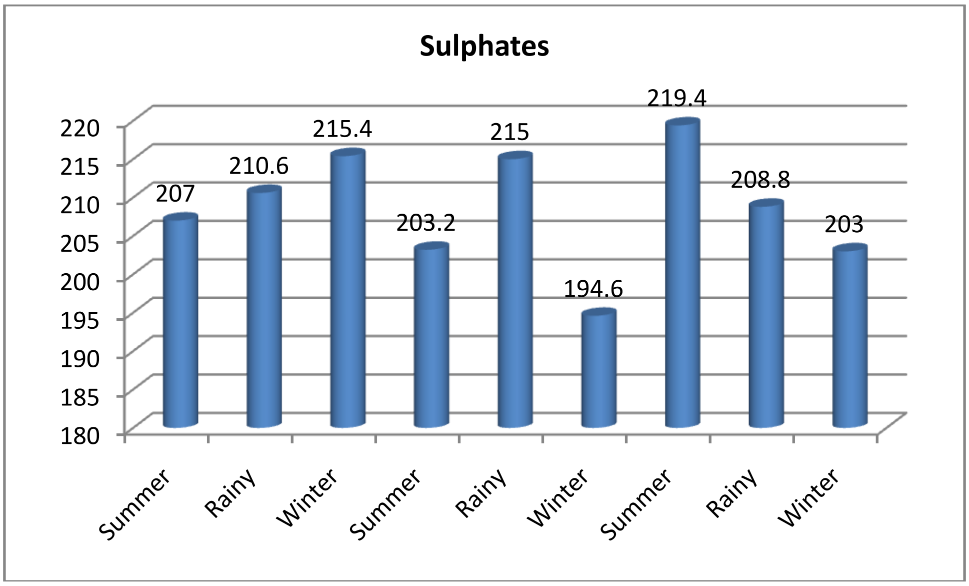

Fig.1: Yearly and seasonal values of Sulphates

Phosphate:
The furthermost of Indian lake is subjected to pollution from local sewage rises the level of phosphates and exhibits all signs of eutrophication (Kodarkar, 1995). Low rate of phosphate in summertime indicates low efficiency (Pondhe and Jadhav, 2000).Observed average phosphate concentration 1.01 mg/litre from three years. Maximum phosphate concentration 1.42 from found in summer 2011 whereas minimum 0.415 from rainy 2010.

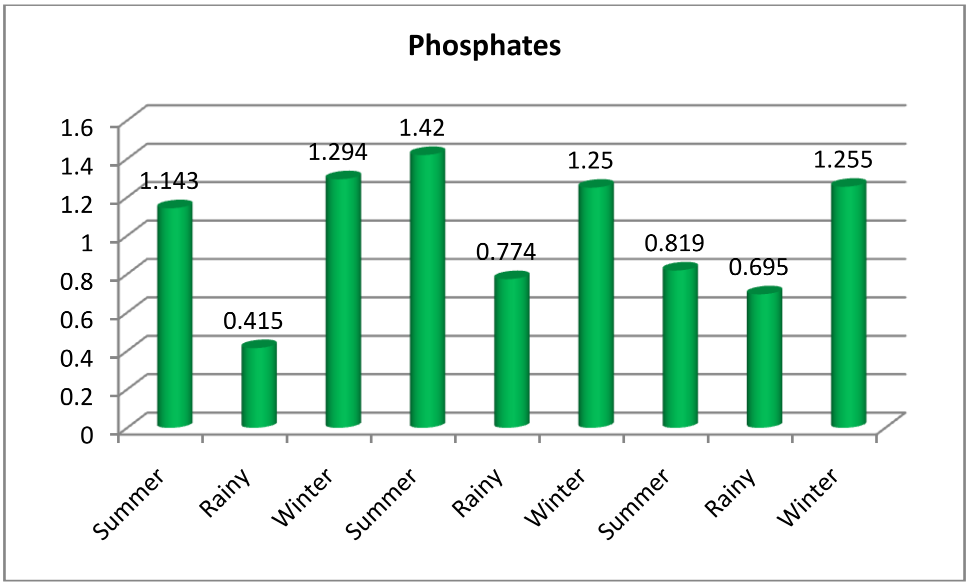

Fig.2: Yearly and seasonal values of Phosphates

Nitrate:
The metropolitan water bodies collect excess of nitrates through unprocessed local sewage (Chandrasekhar and Kodarkar, 1995). Nitrate ions react with brucine in strong sulphuric acid solution to form a yellow color, which is evaluated spectrophotometrically.In the case of inorganic nitrogen, nitrates considered as most stable form (Nassar and Khairy, 2014). Maximum nitrate concentration recorded at impacted site. It may due to maximum anthropogenic activities at this site. High levels of nitrate showed the effect of anthropogenic activities and agricultural runoffs (Kannel *et al.*, 2007). Average nitrates concentration 3.0mg/litre found from three years. Maximum nitrates concentration 4.529 from found in rainy 2010 whereas minimum 1.129 from winter 2011.

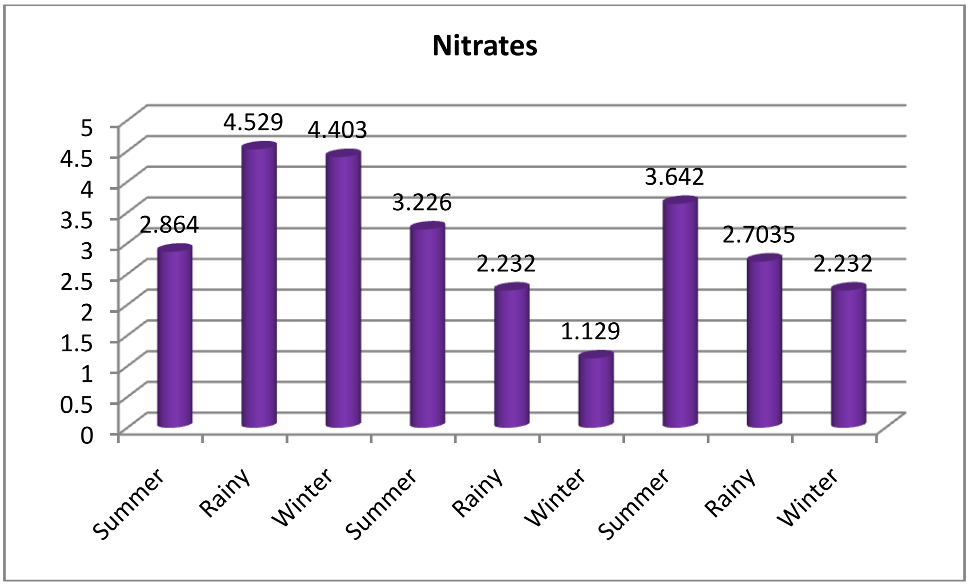

Fig.3: Yearly and seasonal values of Nitrates

Dissolved Oxygen (DO):

Observed average Dissolved oxygen (DO) concentration 3.40 mg/litre from three years. Maximum DO concentration 4.36 from found in winter 2010 whereas minimum 2.26 from summer 2011. Investigation of dissolved oxygen shows a significant role in controlling water contamination activities and water treatment practices. Oxygen is very vital and dynamic for all the existing organisms because it is essential to keep the metabolic manners responsible for the production of energy for reproduction and development. The solubility of atmospheric oxygen depends on temperature. The elements, which are responsible for the status of dissolved oxygen in water, are temperature, light and turbidity (Pawar and Mane, 2006).

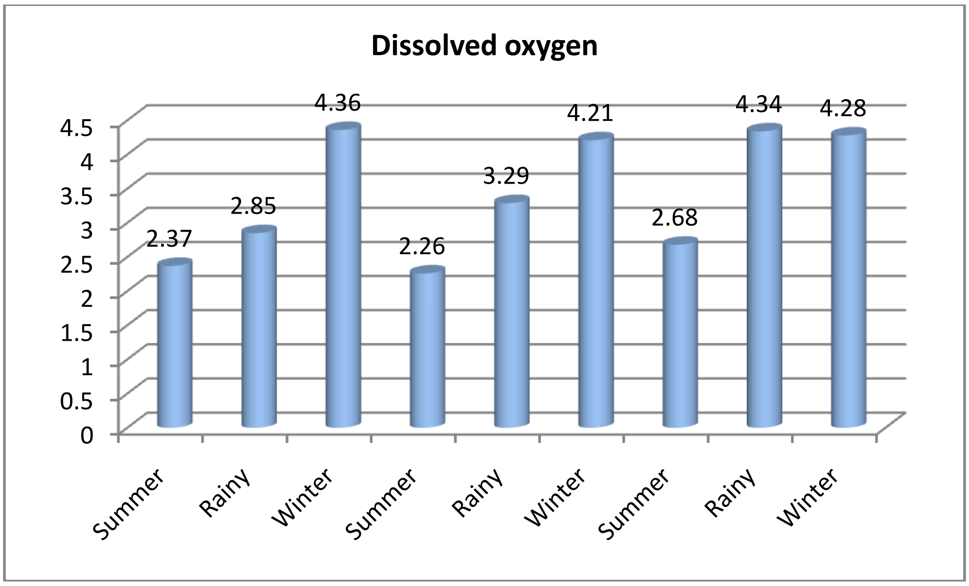

Fig.4: Yearly and seasonal values of Dissolved oxygen

BOD

BOD gives a quantitative index of the degradable organic substances in water and is used as a measure of waste strength. The low BOD value in all samples showed good sanitary condition of the water. It is found that all the water supplied to the institute is within the permissible limit.

Recorded average Biochemical Oxygen Demand (BOD) concentration 23.27 mg/litre from three years. Maximum BOD concentration 31 mg/litre from found in summer 2011 whereas minimum 13.39 from rainy 2011.

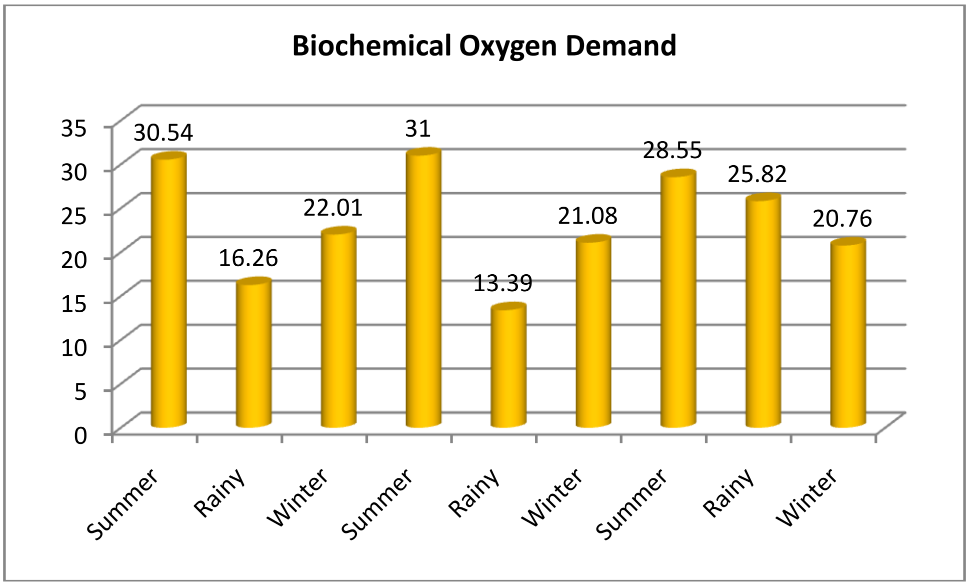

Fig.5: Yearly and seasonal values of Bio-chemical Oxygen Demand

Chemical Oxygen Demand (COD):

It is the amount of oxygen necessitates tooxidize the organic and inorganic matter present in water by means of chemical reaction (Hassan *et al.,* 2013). Trivedy and Goel (1986) suggested, chemical oxygen demand (COD) is the amount of oxygen consumed through oxidation of the oxidizable organic matter by a strong oxidizing agent potassium dichromate in the presence of sulphuric acid in determination of COD.The data revealed that the average Chemical Oxygen Demand (COD) concentration 37.81 mg/litre from three years. Maximum COD concentration 59.47 mg/litre from found in winter 2010 whereas minimum 22.41 from rainy 2010.

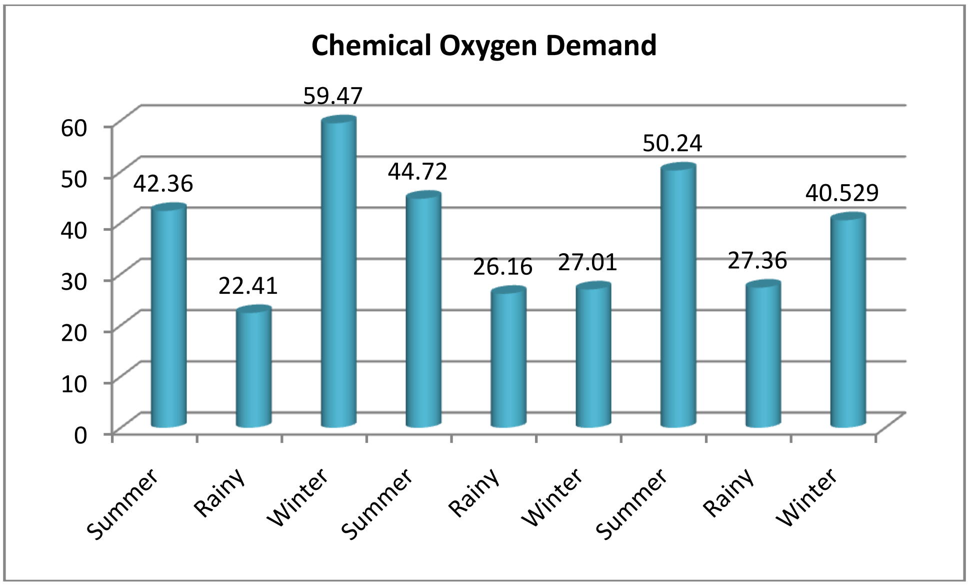

Fig.6: Yearly and seasonal values of Chemical Oxygen Demand

TSS

Total suspended Solids may be considered as one of the crucial indicator for classification of groundwater. The TSS in groundwater is due to the presence of various impurities carried out by the natural and artificial forces results into the turbid nature.TSS and Conductivity may have relations in terms of the conductivity. Conductivity expresses the ability of water to carry electric current (Shinde *et al.*, 2011). It directly related to turbidity and total dissolved solids. It has positive correlation with turbidity and TDS. More the value of dissolve solids more will be ions in water (Bhatt *et al.,* 1999).

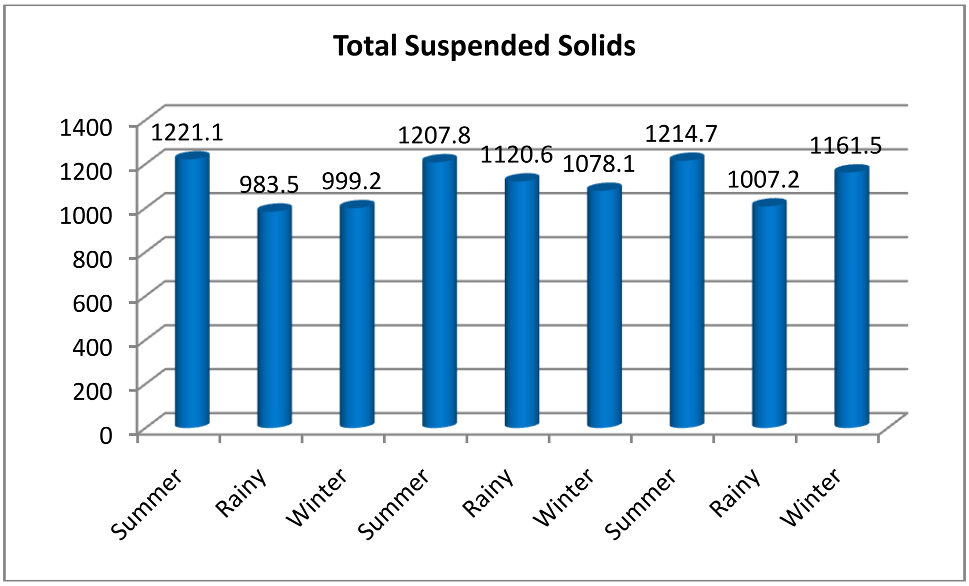

Fig.7: Yearly and seasonal values of Total suspended solids

Observed average Total Suspended Solids (TSS) concentration 1110.41 mg/litre from three years. Maximum TSS concentration 1221.1 mg/litre from found in summer 2010 whereas minimum 983.5 from rainy 2010. TSS concentration found in very high amounts which indicates adverse nature of water quality.

Table 2. Standards of various physico-chemical parameters of water

Sr.No	Parameters	USPHStandards	ISI Standards	WHOStandards	BIS Standards
1	pH	6.0-8.5	6.0-9.0	-	-
2	Conductivity	300 µmhocm-1	-	-	-
3	Turbidity	<5 NTU	-	-	-
4	TDS	500 mg/lit	-	-	-
5	Free CO_2	-	-	-	-
6	Alkalinity	-	200 mg/lit	-	-
7	Total Hardness	-	300 mg/lit	-	-
8	Calcium	0.05	100-500 mg/lit	150 mg/lit	-
9	Magnesium	<10 mg/lit	30-50 mg/lit	150 mg/lit	-
10	Chlorides	250 mg/lit	600 mg/lit	500 mg/lit	600 mg/lit
11	Sulphates	<0.3 mg/lit	-	200-400 mg/lit	1000 mg/lit
12	Iron	<0.3 mg/lit	0.3 mg/lit	0.1-1.0 mg/lit	-
13	DO	4-6 ppm	3.0 ppm	-	-
14	COD	4.0 ppm	10.0ppm	-	-

IV. CONCLUSION:

The water quality is being affected by various human's actions especially developmental activities are responsible for disposal of various kinds of contaminants in it. A laboratory study was conducted to monitor the physicochemical characteristics of water samples of Kham River for a period of ten months during July 2010 to April 2012. The analysis was carried out to analyse the physico-chemical parameters done for the parameters like sulphates, phosphates, nitrates, DO, BOD, COD and TSS as per the standard methods given by APHA. The estimated values of physicochemical parameters of water were compared with standard values. The water quality and human health are related with each other.The present research work shows that the greater fluctuations in the values of physico-chemical parameters of Kham River water. The water of Kham River is mostly not suitable for drinking purpose and other human use. To fulfill the demand of water it is suggested that to go with sustainable utilization of water with some advanced treatment and preventive measures. Present study provides essential data needed for proper management of water resources of rivers.

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