PROJECT - REPORT

DRINKING WATER ANALYSIS IN VARIOUS PARTS OF KANNUR DISTRICT

SCHOOL: KOTTILA GHSS

SUBMITTED BY

BENWIN BENNY (Lead)
12 Standard

VISHNUDAS M
12 Standard

GUIDED BY :

SUDHA. P P
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Chemistry Dept.

OVERVIEW

ARE WE AWARE OF THE PURITY OF WATER THAT WE DAILY INGEST? APART FROM BREATHING, WATER IS JUST ABOUT THE MOST ESSENTIAL ELEMENT OF HUMANS. THIS RESEARCH WILL COME UP WITH SOME INSIGHTS FROM A DRINKING WATER ANALYSIS CONDUCTED IN VARIOUS PARTS OF THE KANNUR DISTRICT. THE PROJECT WILL PROVIDE AN OVERVIEW OF THE CHEMICAL, PHYSICAL, AND LIVING COMPONENTS PRESENT IN OUR WATER BODIES AND HOW IT AFFECTS THE WATER THAT WE USE FOR DAILY CONSUMPTION.

OBJECTIVE:

➔ To analyze the drinking water quality in various parts of Kannur district and compare it with the Central pollution control bureau Drinking water specifications, in order to identify the extent and sources of water contamination, assess the health and environmental risks of polluted water, and suggest effective solutions and strategies to improve the water quality and management

ABSTRACT:

S.D- STANDARD DEVIATIONS

EPA- ENVIRONMENT PROTECTION AGENCY

BIS: BUREAU OF INDIAN STANDARDS

INTRODUCTION

Drinking water quality is a global issue that affects human health, environment, and development. According to the World Health Organization (WHO), more than two billion people use a drinking water source contaminated with feces, which can cause various waterborne diseases, such as cholera, diarrhea, dysentery, and polio1. Contaminated drinking water and poor sanitation are linked to transmission of diseases that account for an estimated 3.4% of all deaths and 3.7% of the global burden of disease in disability-adjusted life years. Moreover, poor drinking water quality can also have negative impacts on the environment, such as the degradation of aquatic ecosystems, the depletion of groundwater resources, and the exacerbation of climate change.

In India, drinking water quality is a major challenge, especially in rural areas, where most of the population depends on groundwater sources. It is estimated that around 37.7 million Indians are affected by waterborne diseases annually, 1.5 million children die of diarrhea alone, and 73 million working days are lost due to waterborne diseases each year. The main causes of water contamination in India are the lack of adequate water supply and sanitation infrastructure, the indiscriminate disposal of domestic and industrial wastewater, the excessive use of fertilizers and pesticides in agriculture, and the natural occurrence of geogenic contaminants, such as fluoride and arsenic.

The government has undertaken various programmes since independence to provide safe drinking water to the rural masses, such as the National Rural Drinking Water Programme (NRDWP), the Swachh Bharat Mission (SBM), and the Jal Jeevan Mission (JJM). However, despite the huge expenditure and efforts, the situation of drinking water quality in India is far from satisfactory, and there is a need for more effective and sustainable solutions and strategies to address this issue.

The aim of this research project is to analyze the drinking water quality in various parts of Kannur district, Kerala, and compare it with the Central pollution control bureau drinking water specifications. The project will also identify the sources and factors affecting the water quality, assess the health and environmental risks of polluted water, and suggest some solutions and strategies to improve the water quality and management. The project will contribute to the existing knowledge and practice on water quality and public health and will provide useful information and recommendations for the stakeholders and policymakers involved in this issue.

METHODOLOGY

1. COLLECTED WATER SAMPLES FROM A NEARBY WATER BODY - A STREAM AND WELL IN VILAYANCODE VILLAGE, Nr. PARIYARAM MEDICAL COLLEGE, PARIYARAM, KANNUR DISTRICT USING STERILE BOTTLES AND LABELS.
2. SELECTING A REPRESENTATIVE SAMPLE SIZE AND DESIGN, SUCH AS RANDOM, STRATIFIED, OR SYSTEMATIC TO ENSURE THE ACCURACY AND RELIABILITY OF THE RESULTS.
3. TRANSPORTED THE WATER SAMPLES COLLECTED FROM STREAM AND WELL TO A LABORATORY AND ANALYZING THEM AS SOON AS POSSIBLE.
4. CALIBRATED AND FOLLOWED THE STANDARD OPERATING PROCEDURES FOR EACH TEST.
5. TESTED THE WATER SAMPLES FOR VARIOUS PHYSICAL, CHEMICAL, AND BIOLOGICAL PARAMETERS- SUCH AS pH, TURBIDITY, CONDUCTIVITY, HARDNESS, CHLORIDE, FLUORIDE, NITRATE, IRON, ARSENIC, COLIFORM, AND E. COLI USING STANDARD METHODS AND INSTRUMENTS.
6. REPORTED AND DOCUMENTED THE DATA USING TABLES, AND CHARTS, PROVIDING THE UNITS, SOURCES, AND REFERENCES FOR EACH PARAMETER.
7. ANALYZED THE DATA USING STATISTICAL AND GRAPHICAL TOOLS, SUCH AS MEAN, S.D, MINIMUM AND MAXIMUM, RANGE, PERCENTAGE, FREQUENCY TO INTERPRET AND COMPARE THE RESULTS.
8. EVALUATED THE WATER QUALITY STATUS AND SUSTAINABILITY FOR DRINKING AND OTHER PURPOSES BASED ON THE NATIONAL AND INTERNATIONAL STANDARDS AND GUIDELINES SUCH AS BIS, WHO, EPA.

KERALA WATER AUTHORITY

QUALITY CONTROL REGIONAL LABORATORY

KANNUR

Report on Analysis of WATER

Name : Krishnan. C.M. (BN 20/17, P 73.)
Address Pariyaram
Date of Receipt : 17/03/2017
Date of Testing : 17/03/2017

Sl No.	Characteristics	Unit	Desirable limits as per IS 10500 : 2012	Permissible limits	Actual Contents Sampling Points 1
1	Turbidity (NTU)	NTU	1	5	1.6
2	pH		6.5-8.5	No relaxation	5.5
3	Electrical Conductivity	µs/cm			68.6
4	Temperature	° C			28.6
5	Acidity	mg/litre			40.0
6	Alkalinity	mg/litre	200	600	6.0
7	Total Hardness as (CaCO3)	mg/litre	200	600	12.0
8	Calcium (Ca)	mg/litre	75	200	3.21
9	Magnesium (Mg)	mg/litre	30	100	0.97
10	Chloride as (Cl)	mg/litre	250	1000	17.02
11	Iron (as Fe)	mg/litre	0.3	No relaxation	0.05
12	Nitrate (as NO3)	mg/litre	45	No relaxation	10.0
13	Phosphate (as PO4)	mg/litre			Nil
14	Ammonia	mg/litre	0.5	No relaxation	Nil

Sampling Points

1 Open well (Sample brought by the party)

Remarks:

Low pH.

Signature of Chemist

BACTERIOLOGICAL ANALYSIS

Sl No.	Source	MPN of coliforms in 100 ml	MPN of E.Coli
1	Open well (Sample brought by the party)	23	23

Remarks:

Bacteria detected and E.Coli present.

Signature of Bacteriologist

ASSISTANT ENGINEER.
QUALITY CONTROL REGIONAL LABORATORY
KERALA WATER AUTHORITY
KANNUR - 12

KERALA WATER AUTHORITY
QUALITY CONTROL SUB DISTRICT LABORATORY, PAYYANNUR
WATER ANALYSIS REPORT

Tele phone No : 04985290734
email : kwaqualitysdlpayyannur@gmail.com

Report No - KWA/QA/R/10/3486/R/2/2(1627)		Date : 21/10/2023
Customer Name and Address	1. Date of receipt	:17/10/2023
KRISHNAN C M SHARMI NIVAS ALAKKYAMPALAM VILAYANCODE P O KANNUR KERALA (DOMESTIC PURPOSES)	2. Sampling provided by	: Customer(QUA_89366)
	3. Sample Code	: 02/23 (1634)
	4. Source of Sample	: Stream
	5. Sample quantity	: 100ml
	6. Test performing dates From: 17/08/2023 To: 18/08/2023	

Sl No	Characteristics	Unit	Test Method	Acceptable limits as per IS 10500-2012	Result
1	Total Coliforms	CFU /100 ml	IS 15185:2016;ISO 93081:2014	Nil	300+
2	E.Coli	CFU /100 ml	IS 15185:2016;ISO 93081:2014	Nil	228

Remarks:

The results stated above related only to the sample(s) submitted for testing. This test certificate shall not be reproduced except in full without the written approval of the laboratory

Authorised By

BACTERIOLOGIST
QUALITY CONTROL SUBDISTRICT LAB PAYYANNUR
KERALA WATER AUTHORITY
PAYYANNUR - 670 307

* End Of Report*

KWA/QC/SDL/PNR/R/17 Issue No: 01 Issue Date : 01.12.2021 Rev No: 00 Rev Date: 00

KERALA WATER AUTHORITY
QUALITY CONTROL SUB DISTRICT LABORATORY, PAYYANNUR
WATER ANALYSIS REPORT

Tele phone No : 04985290734
email : kwaqualitysdlpayyannur@gmail.com

Report No - KWA/QA/R/10/4179/J/19/4138		Date : 21/10/2023
Customer Name and Address	1. Date of receipt	:17/10/2023
KRISHNAN C M SHARMI NIVAS ALAKKYAMPALAM VILAYANCODE P O KANNUR KERALA (DOMESTIC PURPOSES)	2. Sampling provided by	: Customer(QUA_89366)
	3. Sample Code	: 02/23 (1634)
	4. Source of Sample	: Stream
	5. Sample quantity	: 1 lit
	6. Test performing dates From : 17/10/2023	To : 18/10/2023

Sl No	Characteristics	Unit	Test Method	Acceptable limits as per IS 10500-2012	Result
1	Electrical Conductivity at 25°C	(micro mhos/cm)	IS 3025 (part 14) -2013 (Reaffirmed 2019)		56.94
2	Acidity	(mg/litre)	IS 3025 (part 22) -1986 (Reaffirmed 2019)		10.00
3	Sulphate (as SO_4)	(mg/litre)	APHA23rd Edition (Turbidimetric method)	200	1.00
4	Fluoride (as F)	(mg/litre)	IS 3025 (part 60) -2008 (Reaffirmed 2013)	1	BDL
5	Iron (as Fe)	(mg/litre)	IS 3025 (part 53) -2003 (Reaffirmed 2014)	1	0.40
6	Nitrate (as NO_3)	(mg/litre)	APHA23rd Edition (UV Screening method)	45	1.00
7	Residual Chlorine	(mg/litre)	IS 3025 (part 26)- 2021	0.2	BDL

Remarks:
The results stated above related only to the sample(s) submitted for testing. This test certificate shall not be reproduced except in full without the written approval of the laboratory

*BDL : Below Detection Limit

Authorised By **Dona Joy**
Deputy Quality Manager
DEPUTY QUALITY MANAGER
QUALITY CONTROL SUBDISTRICT LAB PAYYANNUR
KERALA WATER AUTHORITY PAYYANNUR
KANNUR DISTRICT

* End Of Report*

KWA/QC/SDL/PNR/R/17 Issue No: 01 Issue Date : 01.12.2021 Rev No: 00 Rev Date: 00

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KERALA WATER AUTHORITY
QUALITY CONTROL SUB DISTRICT LABORATORY, PAYYANNUR
WATER ANALYSIS REPORT

Tele phone No : 04985290734
email : kwaqualitysdlpayyannur@gmail.com

Report No - KWA/QA/R/10/4179/J/19/4138		Date : 21/10/2023
Customer Name and Address	1. Date of receipt	:17/10/2023
KRISHNAN C M SHARMI NIVAS ALAKKYAMPALAM VILAYANCODE P O KANNUR KERALA (DOMESTIC PURPOSES)	2. Sampling provided by	: Customer(QUA_89366)
	3. Sample Code	: 02/23 (1634)
	4. Source of Sample	: Stream
	5. Sample quantity	: I lit
	6. Test performing dates From : 17/10/2023	To : 18/10/2023

Sl No	Characteristics	Unit	Test Method	Acceptable limits as per IS 10500-2012	Result
1	Colour	HAZEN	IS 3025 (part 04) -2021	5	BDL
2	Odour		IS 3025 (part 5) -2018	Agreeable	Agreeable
3	Turbidity	(NTU)	IS 3025 (part 10) -2023	1	7.18
4	pH		IS 3025 (part 11) -2022	6.5 to 8.5	6.70
5	Total Alkalinity (as CaCO3)	(mg/litre)	IS 3025 (part 23) -1986 (Reaffirmed 2019)	200	12.24
6	Total Dissolved Solids (TDS)	(mg/litre)	IS 3025 (part 16) -2023	500	37.00
7	Total Hardness (as $CaCO_3$)	(mg/litre)	IS 3025 (part 21) -2009 (Reaffirmed 2019)	200	12.00
8	Calcium (as Ca)	(mg/litre)	IS 3025 (part 40) -1991 (Reaffirmed 2019)	75	4.01
9	Magnesium (as Mg)	(mg/litre)	IS 3025 (part 46) -1994 (Reaffirmed 2019)	30	0.48
10	Chloride (as Cl)	(mg/litre)	IS 3025 (part 32) -1988 (Reaffirmed 2019)	250	9.74

Remarks:
The results stated above related only to the sample(s) submitted for testing. This test certificate shall not be reproduced except in full without the written approval of the laboratory

*BDL : Below Detection Limit

Authorised By Dona Joy
Deputy Quality Manager
DEPUTY QUALITY MANAGER
QUALITY CONTROL SUBDISTRICT LAB PAYYANNUR
KERALA WATER AUTHORITY PAYYANNUR
KANNUR DISTRICT

* End Of Report*

KWA/QC/SDL/PNR/R/17 Issue No: 01 Issue Date : 01.12.2021 Rev No: 00 Rev Date:00

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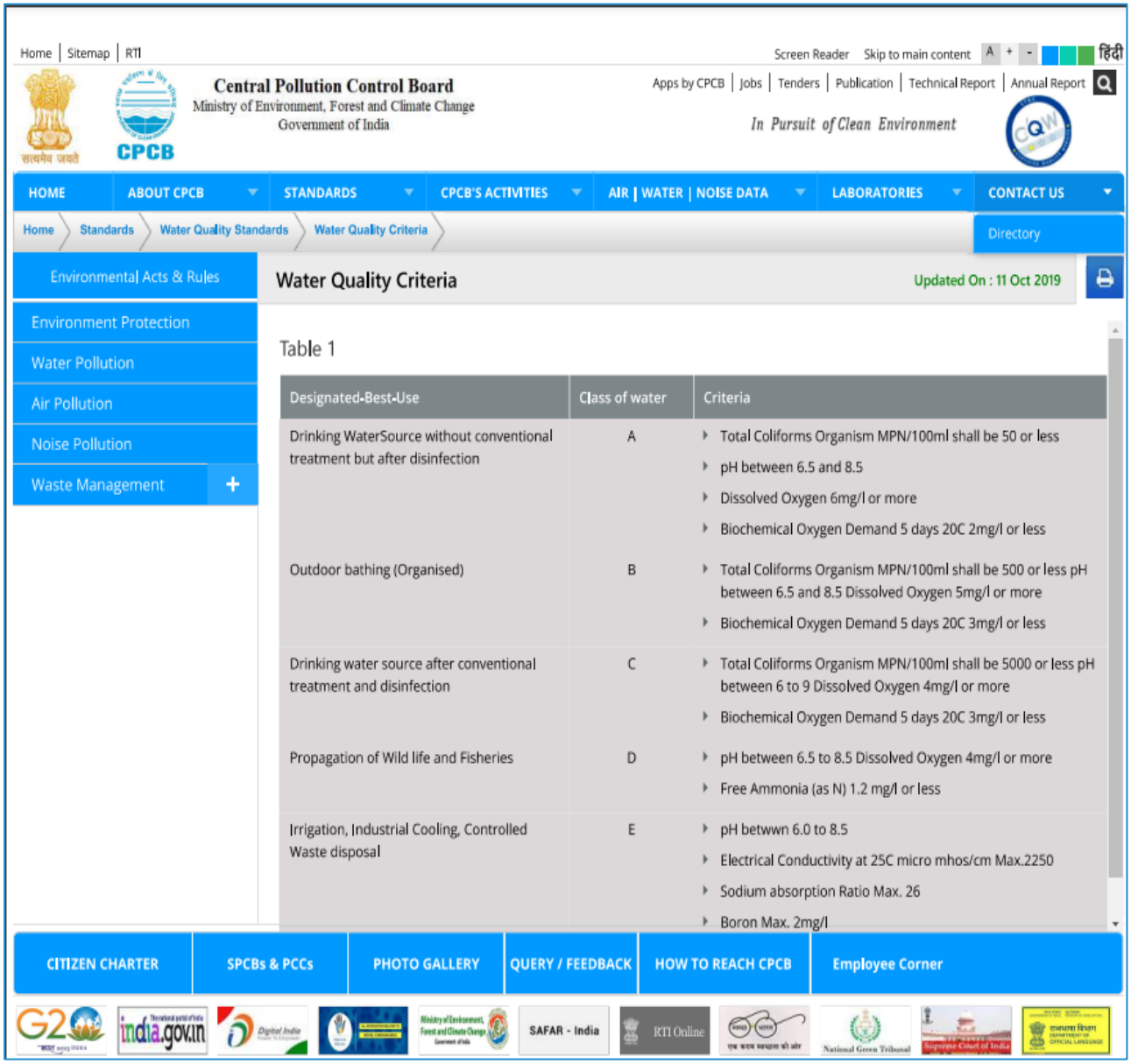

Water quality criteria as per Central Pollution Control Bureau [NPCB]

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Ministry of Environment, Forest and Climate Change
Government of India

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WHO Drinking Water Specifications Updated On : 11 Oct 2019

agencies, in consultation with the WHO Expert Advisory Panel.

Parameters	Standard limits as per WHO guidelines (mg/L)
Acrylamide	0.0005
Alachor	0.02
Aldicarb	0.01
Aldrin and Dieldrin	0.00003
Ammonia	1.5
Antimony	0.02
Arsenic	0.01
Atrazine	0.002
Barium	0.7
Benzene	0.01
Benzo(?)pyrene	0.0007
Boron	0.5
Bromate	0.01
Bromodichloromethane (BDCM)	0.06

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Drinking Water quality as per Central Pollution Control Bureau

Table 2 General Parameters Concerning Substances Undesirable in Excessive Amounts

(*Foreword* and *Clause* 4)

Sl No.	Characteristic	Requirement (Acceptable Limit)	Permissible Limit in the Absence of Alternate Source	Method of Test, Ref to	Remarks
(1)	(2)	(3)	(4)	(5)	(6)
i)	Aluminium (as Al), mg/l, *Max*	0.03	0.2	IS 3025 (Part 55)	—
ii)	Ammonia (as total ammonia-N), mg/l, *Max*	0.5	No relaxation	IS 3025 (Part 34)	—
iii)	Anionic detergents (as MBAS) mg/l, *Max*	0.2	1.0	Annex K of IS 13428	—
iv)	Barium (as Ba), mg/l, *Max*	0.7	No relaxation	Annex F of IS 13428* or IS 15302	—
v)	Boron (as B), mg/l, *Max*	0.5	1.0	IS 3025 (Part 57)	—
vi)	Calcium (as Ca), mg/l, *Max*	75	200	IS 3025 (Part 40)	—
vii)	Chloramines (as Cl_2), mg/l, *Max*	4.0	No relaxation	IS 3025 (Part 26)* or APHA 4500-Cl G	—
viii)	Chloride (as Cl), mg/l, *Max*	250	1 000	IS 3025 (Part 32)	—
ix)	Copper (as Cu), mg/l, *Max*	0.05	1.5	IS 3025 (Part 42)	—
x)	Fluoride (as F) mg/l, *Max*	1.0	1.5	IS 3025 (Part 60)	—
xi)	Free residual chlorine, mg/l, *Min*	0.2	1	IS 3025 (Part 26)	To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be minimum 0.5 mg/l
xii)	Iron (as Fe), mg/l, *Max*	0.3	No relaxation	IS 3025 (Part 53)	Total concentration of manganese (as Mn) and iron (as Fe) shall not exceed 0.3 mg/l
xiii)	Magnesium (as Mg), mg/l, *Max*	30	100	IS 3025 (Part 46)	—
xiv)	Manganese (as Mn), mg/l, *Max*	0.1	0.3	IS 3025 (Part 59)	Total concentration of manganese (as Mn) and iron (as Fe) shall not exceed 0.3 mg/l
xv)	Mineral oil, mg/l, *Max*	0.5	No relaxation	Clause **6** of IS 3025 (Part 39) Infrared partition method	—
xvi)	Nitrate (as NO_3), mg/l, *Max*	45	No relaxation	IS 3025 (Part 34)	—
xvii)	Phenolic compounds (as C_6H_5OH), mg/l, *Max*	0.001	0.002	IS 3025 (Part 43)	—
xviii)	Selenium (as Se), mg/l, *Max*	0.01	No relaxation	IS 3025 (Part 56) or IS 15303*	—
xix)	Silver (as Ag), mg/l, *Max*	0.1	No relaxation	Annex J of IS 13428	—
xx)	Sulphate (as SO_4) mg/l, *Max*	200	400	IS 3025 (Part 24)	May be extended to 400 provided that Magnesium does not exceed 30
xxi)	Sulphide (as H_2S), mg/l, *Max*	0.05	No relaxation	IS 3025 (Part 29)	—
xxii)	Total alkalinity as calcium carbonate, mg/l, *Max*	200	600	IS 3025 (Part 23)	—
xxiii)	Total hardness (as $CaCO_3$), mg/l, *Max*	200	600	IS 3025 (Part 21)	—
xxiv)	Zinc (as Zn), mg/l, *Max*	5	15	IS 3025 (Part 49)	—

NOTES

1 In case of dispute, the method indicated by '*' shall be the referee method.

2 It is recommended that the acceptable limit is to be implemented. Values in excess of those mentioned under 'acceptable' render the water not suitable, but still may be tolerated in the absence of an alternative source but up to the limits indicated under 'permissible limit in the absence of alternate source' in col 4, above which the sources will have to be rejected.

CONCLUSION

The results of the analysed water indicate that the water is not suitable for drinking and poses a substantial risk of waterborne diseases. The conclusion can be drawn based on the following comparisons with the Central pollution control bureau drinking water specifications:

Total coliforms: The acceptable limit is 0 MPN/100 ml, and the permissible limit is 10 MPN/100 ml. The analysed water has more than 300 MPN/100 ml, which is far above the permissible limit and indicates faecal contamination (Appendix.1).

Escherichia coli - E. coli: The acceptable limit is 0 MPN/100 ml, and the permissible limit is 0 MPN/100 ml. The analysed water has 228 MPN/100 ml, which is above the permissible limit and indicates faecal contamination.

Turbidity: The acceptable limit is 1 NTU and the permissible limit is 5 NTU. The analysed water has 7.8 NTU, which is above the permissible limit and indicates the presence of suspended solids, organic matter, or microorganisms.

Total hardness: The acceptable limit is 200 mg/l and the permissible limit is 600 mg/l. The analysed water has 12 mg/l, which is within the acceptable limit and indicates soft water.

Total alkalinity: The acceptable limit is 200 mg/l and the permissible limit is 600 mg/l. The analysed water has 12.24 mg/l, which is within the acceptable limit and indicates low alkalinity.

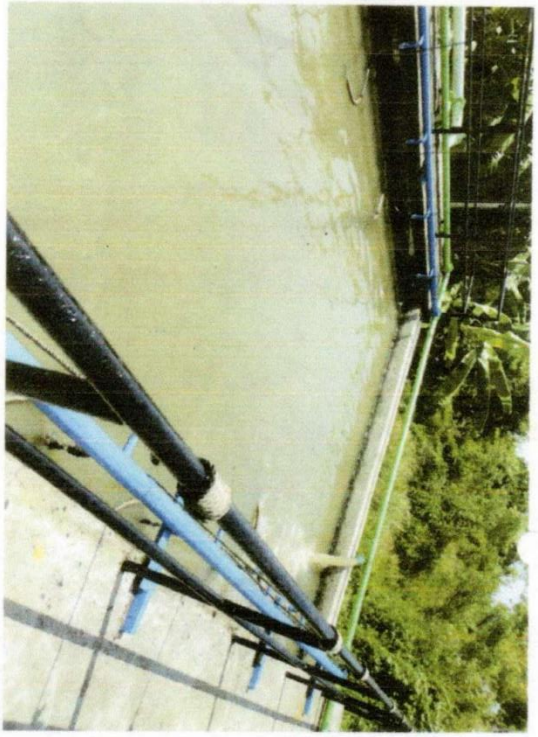
Chloride: The acceptable limit is 250 mg/l and the permissible limit is 1000 mg/l. The analysed water has 17.02 mg/l, which is within the acceptable limit and indicates low salinity (Appendix.2).

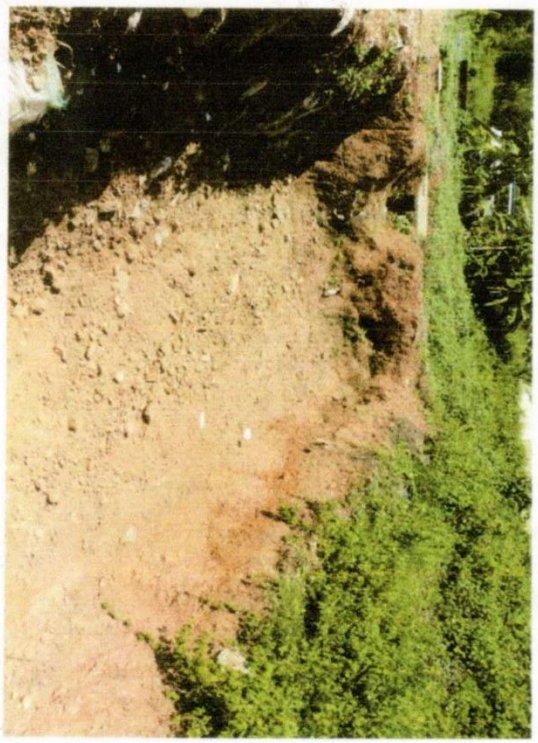
Sulphate: The acceptable limit is 200 mg/l and the permissible limit is 400 mg/l. The analysed water has 1 mg/l, which is within the acceptable limit and indicates low sulphate content.

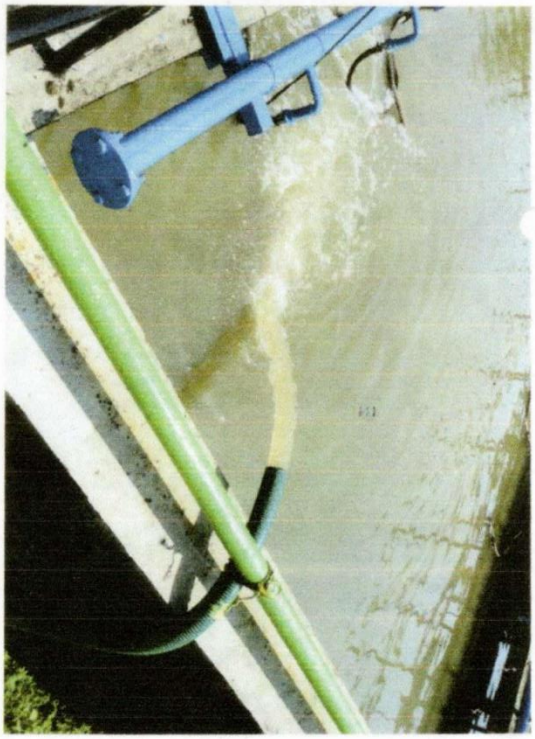
pH: The acceptable range is 6.5 to 8.5 and the permissible range is 6.5 to 8.5. The analysed water has 5.5, which is below the permissible range and indicates acidic water (Appendix.3).

→ Therefore, the analysed water does not meet the drinking water standards and needs to be treated or disinfected before consumption.

→ IDENTIFIED SOURCE OF CONTAMINATION : UNTREATED WASTE WATER DISPOSAL FROM - PARIYARAM MEDICAL COLLEGE HOSPITAL







RECOMMENDATION

- The hospital should install and operate a proper wastewater treatment system that can remove or reduce the hazardous substances, such as pharmaceuticals, pathogens, and radionuclides, from the hospital effluent before discharging it into the environment.

- The hospital should follow the existing regulations and guidelines for hospital wastewater management, such as the WHO guidelines, EPA guidelines, and guidelines for radionuclide releases, and monitor and report the quality and quantity of the hospital effluent regularly.

- The hospital should adopt some preventive measures to minimize the generation and contamination of hospital wastewater, such as the segregation and disposal of hazardous waste, the rational use of pharmaceuticals and chemicals, the implementation of infection prevention and control practices, and the promotion of water conservation and recycling.

- The public should use a water filter or purifier at the point of use, such as a faucet or a pitcher, to remove contaminants from the drinking water, especially if the water source is near or downstream of the hospital wastewater discharge point.

- The public should boil or treat the drinking water before consumption, and use bottled, boiled, or treated water for drinking, cooking, and personal -hygiene, especially if the water quality is unknown or suspected to be contaminated.

- The public should report any water quality issues or concerns to the authorities and demand action to improve the water supply and sanitation infrastructure, especially in rural areas where the majority of the population depends on groundwater sources.

- The public should participate in community-based initiatives to protect and restore the water sources, such as watershed management, reforestation, or pollution prevention, and educate themselves and others about the health and environmental risks of contaminated water and the prevention strategies.

REFERENCE

*CENTRAL POLLUTION CONTROL BUREAU- DRINKING WATER SPECIFICATIONS

*BIS - BUREAU OF INDIAN STANDARDS

*EPA - ENVIRONMENTAL PROTECTION AGENCY

APPENDICES

Appendix.1

Total coliform bacteria	
IS 10500-2012	Nil/100ml
Risks or effects	Gastrointestinal tract infections
Sources	Contaminated animal waste, sewage contaminated with faecal matter, household wastewater, polluted storm water and agricultural runoffs Naturally occurring
Treatment	Chlorination, Ultraviolet light, Distillation, Ozonation

Appendix.2

Chloride (as Cl), mg/l, Max	
IS 10500: 2012	Acceptable limit: 250 mg/l Permissible limit: 1000 mg/l
Risks or effects	High blood pressure, salty taste, corroded pipes, fixtures and appliances, blackening and pitting of stainless steel
Sources	Fertilisers, Industrial wastes, Minerals in soil, seawater
Treatment	Reverse Osmosis , Distillation, Activated Carbon

Appendix.3

pH	
IS 10500-2012	Acceptable limit: 6.5-8.5, Permissible: No relaxation
Risks or effects	Low pH – corrosion leading to metallic taste High pH – bitter/soda taste, leads to deposits
Sources	Natural
Treatment	Increase pH by soda ash Decrease pH with white vinegar / citric acid

CREDIT : BIS