ASSESSMENT OF SURFACE WATER QUALITY OF DHAKA CITY

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A thesis submitted to the Department of Civil Engineering in partial fulfillment for the degree of Bachelor of Science in Civil Engineering.

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Section: (18C)
Semester -Year (Summer-2023)

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It is stated that the project work on "ASSESSMENT OF SURFACE WATER QUALITY OF DHAKA CITY" has been performed under the supervision of Kushal Acharja Topu, Lecturer, Department of Civil Engineering, SU has been accepted for satisfactory submission in partial fulfillment of the requirements for the degree of Bachelor of Science in Civil Engineering. Any portion of this has not been submitted elsewhere for any degree or diploma.

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Dedicated

to

“Our beloved Parents and Teachers”

ACKNOWLEDGEMENTS

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ABSTRACT

This thesis paper focuses on the assessment of surface water suitability for large urban water supply systems, with a specific emphasis on Dhaka city. While rivers and lakes are valuable sources of consistent water volume for urban areas, smaller communities often prefer well and spring-fed gravity systems due to their reliability. The study conducted at the "Department of Public Health Engineering" Central Lab evaluates the effectiveness and performance of surface water within Dhaka city. Monitoring this performance is crucial, necessitating an examination of water quality from natural and artificial freshwater sources like rivers, lakes, streams, and canals. The study involves collecting samples from three distinct locations and subjecting them to various physio-chemical tests such as pH, TDS, TSS, hardness, alkalinity, and DO. The resulting test data will be comprehensively analyzed and compared among the sampling sites, providing insights into the quality of surface water and enabling informed decision-making for water supply management.

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CHAPTER 1
INTRODUCTION

1.1. Introduction

Surface water refers to all the water bodies present on the Earth's surface, from small ponds to vast oceans and everything in- between. It includes both freshwater bodies (rivers, ponds, lakes, etc.) as well as the saline water bodies (mainly oceans). Rivers. ponds, lakes, etc., constitute freshwater, while oceans have saline water. Surface water mainly originates from rainfall. It is a combination of both surface runoff and groundwater.

Surface water is closely associated with groundwater. Some surface water percolates deep into the ground through the cracks and porous spaces within rocks, sand, and soil. The surface water eventually reaches underground springs and wells to become groundwater. Groundwater is fresh and naturally uncontaminated, since the water gets filtered as it trickles through the sediment. However, groundwater is not easily accessible as it is usually located in deeper parts of the Earth, often requiring tools or machinery to access it. Surface water is more readily available, but since it is not filtered like groundwater, it is often contaminated by pollution, microbes and harmful minerals, and must be treated before it is safe to use or ingest.

The naturally-occurring water cycle helps regulate water and facilitates the exchange between the groundwater, atmosphere, and surface water. Precipitation such as rainfall or snowfall increases the amount of surface water. This surface water will either evaporate into the atmosphere until it condenses enough to form precipitation again, or percolate into the earth to become groundwater. This is how the total volume of water is maintained on Earth.

The occurrence of surface water in a given location depends on certain factors such as the rate of evaporation, infiltration, and surface runoff. The rate at which surface water gets heated up and evaporates is known as the evaporation rate. It is directly dependent on atmospheric temperature and humidity, the hotter and drier it is, the faster surface water will evaporate. Some amount of water often percolates into the ground. The rate at which the surface water penetrates below the surface of the earth is called infiltration rate. Highly porous and permeable rock and soil leads to a high rate of infiltration. Also, some amount of water, during rainfall, flows over the land along a slope. This downward movement of water is known as surface runoff.[1]

1.2. Objective of The Study

To determine parameters of surface water.

The objective for the analysis of river and lake surface water can vary depending on the specific goals of the study, but some common objectives include are as bellow:

☞ To evaluate the chemical, physical, and biological parameters of the water to assess its overall quality and determine if it meets regulatory standards for drinking water, recreation, or aquatic life support.

☞ To Identify and quantify pollutants such as heavy metals, nutrients, pesticides, and pathogens to understand potential risks to human health and the environment.

☞ To assess the health of aquatic ecosystems by examining factors like dissolved oxygen levels, pH, temperature, and the presence of indicator species.

☞ To determine the sources of pollution or contamination in the water, which can inform mitigation strategies.

1.3. Thesis Organization of Thesis

The research consists of five chapters.

The first chapter contains the introduction of the thesis, background of the study, objective of the study, outline of the methodology.

Organization of the thesis Chapter two incorporates a literature review related to.

Chapter three describes the methodology and study area, and the procedures applied for the execution of the study.

Chapter four deals with the data collection, data analysis.

Chapter five includes the conclusion of the entire study.

STRUCTURE OF THE THESIS

INTRODUCTION

LITERATURE REVIEW

STUDY AREA AND METHODOLOGY

DATA COLLECTION

Result

CHAPTER 2
LITERATURE REVIEW

2.1. Surface water collection

Groundwater in aquifers below the earth's surface is almost half of all drinking water in the world Groundwater is part of the climate change adaptation process and is often a solution for people who do not have access to safe water. Despite these impressive realities, invisible groundwater is out of sight and irrational for most people: Human activities and climate variability are rapidly increasing pressure on groundwater resources, Serious depletion and pollution problems are reported in many parts of the world. It was requested to have a complete control over a water collection mechanism in the area With the adjustment of the crust and slopes I designed in the field, I set up a channel system in the flow direction When we look at the whole project, we can see that it is arranged to collect ground water it is an important point in the middle of the city that meets the fresh water source This program works to integrate public space and light hydraulic infrastructures, thus offering an alternative to the usual strategies.

In areas where there is no construction, water returns to nature automatically In these areas, 50% of the precipitation water is absorbed by the soil and 40% of it evaporates and returns to the atmosphere. Only 10% of it becomes surface currents. In areas where settlement occurs, 55% of the precipitation becomes surface water flow [4]. The biggest factor here is the decrease in water absorbing areas with the increase in structuring Failure to take the necessary precautions (insufficiency of infrastructure and widespread treatment facilities, etc.) also triggers this problem.[2]

2.2. Surface water process

Due to the high cost of drinking water and the fact that water is not always available, more and more industries and municipalities use treated surface water. Normally the surface water needs to be treated before it has the required water quality. Surface water typically contains a high suspended solids content, bacteria, algae, organic matter, creating bad taste and odor. In some areas, like river estuaries, surface water can be brackish, reaching up to 8000 mg/L of salts. [3] .

2.3. Surface water serves many purposes

The main uses of surface water include drinking-water and other public uses, irrigation uses, and for use by the thermoelectric-power industry to cool electricity-generating equipment. The majority of water used for thermoelectric power, public supply, irrigation, mining, and industrial purposes came from surface-water sources.[4]

2.4. Surface water characteristics

Depending on the characteristics of the soil that water flows through to the reservoirs, surface water will have different chemical compositions.

In the process of dissolving different particles by exchanging on the water-air surface, surface water will self-dissolved gases such as N_2, O_2 or CO_2.

Surface water contains large amounts of suspended substances, especially in runoff. Therefore, when designing surface water treatment equipment, we cannot ignore the stage of flocculation. the formation of suspended particles. In dams containing water, due to the long-standing time of water, natural sedimentation of large particles will appear. The turbidity of the water at this time is caused by colloids

In surface water, there are many organic substances of natural origin. They are produced by the decomposition of organic matter by plants and animals living on the surface of water or in rivers, lakes. and decomposing microorganisms after death. I

Existence of floating organisms: Surface water is the habitat and development of algae and zooplankton. When facing favorable conditions, surface water ecosystems including animals, plants and fish can thrive. The change in temperature and water quality occurs daily, seasonally, depending on the amount of sunlight, the temperature difference between seasons or happens randomly due to rainstorms pollution. In areas containing surface water, the water quality of elements such as iron, manganese, phytoplankton, oxygen, etc. varies from the surface to the bottom of the reservoir, depending on the cycle of a year.

randomly due to rainstorms, pollution. In areas containing surface water, the water quality of elements such as iron, manganese, phytoplankton, oxygen, etc. varies from the surface to the bottom of the reservoir, depending on the cycle of a year.

Organic pollution will lead to eutrophication of water resources:

The source of pollution comes from the residues present in urban wastewater due to human metabolism, daily life, cooking, etc.

Sources of pollution are organic and inorganic wastes in industrial water generated by production activities.

Pollution sources come from agricultural products such as fertilizers, pesticides, pesticides, etc. or organic waste from livestock activities.[5]

2.5. Surface water quality Parameters

pH: The pH scale ranges from 0 to 14. In general, a water with a pH < 7 is considered acidic and with a pH > 7 is considered basic. The normal range for pH in surface water systems is 6.5 to 8.5 and for groundwater systems 6 to 8.5.

Alkalinity: Alkalinity in freshwater refers to the water's capacity to neutralize acid or resist decreases in pH. Natural water's alkalinity is affected by soil, bedrock, plants, and industrial waste. For example, limestone, which is softer and dissolves in water more easily, tends to make water have higher alkalinity.

Total Hardness: Measures of water hardness General guidelines for classification of waters are: 0 to 60 mg/L (milligrams per liter) as calcium carbonate is classified as soft; 61 to 120 mg/L as moderately hard; 121 to 180 mg/L as hard; and more than 180 mg/L as very hard. Sources/Usage: Some content may have restrictions.

Total Dissolved Solid (TDS): Total dissolved solids (TDS) is usually low for freshwater sources, at less than 500 ppm. Seawater and brackish (mixed fresh and sweater) water contain 500-30,000 and 30-40,000 ppm TDS, respectively. TDS is most accurately measured by weighing a filtered sample, and drying at 105°C until no further mass is lost.

Total Suspended Solid (TSS): Total suspended solids (TSS) are defined as solids in water that can be trapped by a filter. To measure TSS, the water sample is filtered through a pre-weighed filter. The residue retained on the filter is dried in an oven at 103- 105°C until the weight of the filter no longer changes.

Dissolved Oxygen: The oxygen content of surface waters of normal salinity in the summer is typically more than 8 milligrams per liter (8 mg/L); when oxygen concentrations are less than 2 mg/L, the water is defined as hypoxic (CENR, 2000).

2.6. General Water Sampling Techniques:

Water sampling can be done in any of the following three methods depending on test requirements:

(a) Grab sampling

(b) Composite sampling

(c) Integrated sampling

(a) Grab sampling

The sample was collected, and then only if the sample was properly collected- such as pH, A grab sample is a discrete sample which is collected at a specific location at a certain point in any specific time. a grab sample reflects performance only at the point in time that dissolved oxygen, chlorine residual, nitrites and temperature of a particular point and time. If the environmental medium varies spatially or temporally e.g.in case of waste effluents, then a single grab sample is not representative and more samples need to be collected at suitable time intervals and analyzed separately.

(b) Composite sampling

Composite sample is a mixture of grab samples collected at one sampling point at different times. Water being sampled is collected in a common container over the sampling period. The analysis of this material, collected over a period of time, will therefore represent the average performance of a wastewater treatment plant during the collection period. This is particularly useful in water bodies that have a lot of chemical variability either over space or over short time periods. Composite samples are often used to reduce the cast of analyzing a large number of samples.

(c) Integrated sampling

Integrated sample is a mixture of grab samples collected from different points simultaneously and mixed in equal volumes. The points may be horizontal or vertical variation. For example, river, stream or reservoir or lake that varies in composition across the width and depth.

2.7. Surface Water Sampling Techniques

☞ When the water source is accessible.

☞ Rinse the sampling vessel with water on site 3-4 times. Care must be taken to avoid contaminating water to be sampled during rinsing. Submerge the sampling vessel gently, fill it with the water sample and close it tightly.

☞ If the collected water sample may be frozen, leave some space for expansion equivalent to about 10% of the sampling vessel.

CHAPTER 3
METHODOLOGY

Methodology: During this research, "Department of public Health Engineering "central lab and different river/lake sewage were collected. And tested their physiochemical parameters, namely at Industry, pulp and paper Industry collection: Water samples were collected from "Department of public Health Engineering" central lab in the months of august 2023, and tested physical qualities and chemical contents. The samples were well-kept in 1.5 L polyethylene plastic bottles, which had been formerly cleaned with metal-free detergents, washed continually with distilled water, saturated in 10% nitric acid for 24 h and finally rinsed with deionized water. The sample bottles were labeled with date and sampling location. All samples were kept at 4 °C for further processing and analysis. Analytical methods. Standard procedures were used to analyze the physio-chemical parameters of the water sample. Gravimetric method for TSS and TS, single electrode pH meter (Microprocessor-based pH meter, HANNA PH 211) for pH, Portable Conductivity and TDS Meters (HANNA instruments HI 98130) for conductivity and total dissolved solid (TDS); turbidity meter (HANNA instruments: HI 93703) for turbidity. control dilution method, In the laboratory, the water samples were filtered using fine filter paper (Whitman filter paper 41, diameter 125 mm) to remove the suspended materials and flame emission atomic absorption spectrophotometer (FL-AAS model Shimadzu, Japan, AA6800) were used for the determination of metal concentration (Na, K, Ca, Mg. Fe, Cu, Cr, Pb, Mn As, Cd, Ni, Hg). Sample spike, blank spike and quality control (QC) protocol was followed for each type of sample analysis, including replicate analysis, checking of method blanks, standards of various parameters, etc.

3.1. pH Testing Procedure:

- ☞ Take the given samples of fruit juices like lemon, orange, pineapple, and apple in a separate test tube.
- ☞ Make sure you have taken at least 2 mL of juices in each test tube.
- ☞ Use a separate dropper to transfer each juice sample into a test tube.
- ☞ Add two drops of universal indicator.
- ☞ Mix the content thoroughly by shaking it gently.
- ☞ Refer the pH chart to match the color that appears in the test tube. (Match the color produced with standard color pH chart)
- ☞ Record your observation.[6]

Figure 3.1: pH Meter

3.2. Dissolved Oxygen (DO) Testing Procedure:

- Testing dissolved oxygen in water is either measured via chemical analysis such as a titrimetric method, electroanalytical (using galvanic & polarographic probes), optical dissolved oxygen, and colorimetric methods. However, modern techniques mainly use electrochemical probes.

- If you would like to learn more about other water quality measurements, characteristics, or applications for DO, do not hesitate to contact our world-class team at Atlas Scientific.[7]

Figure 3.2: DO Testing Kit

3.3. Hardness Testing Procedure:

There are few methods for measuring water hardness. In this article I have explained three methods of measuring hardness of water.

- Ammonia- Ammonium Chloride Buffer Solution:
  Dissolve 67gm. Ammonium Chloride to 570 ml concentrated Ammonia and then make up the solution to one Liter by distilled water.

- Erichrome Black – T Solution:
  Dissolve 75 ml Tri-ethanolamine to 25 ml Ethanol and then add 0.5 gm Erichrome Black – T in 100 ml volumetric flask.

- 0.01M EDTA standard solution:
  Dissolve 3.722gm EDTA(Ethylene Diamine Terra Acetic Acid) to one Liter distilled water.[8]

Figure 3.3: Hardness Testing Kit

Testing Procedure:

Take 100 ml of Sample in a Beaker + 5 ml $(NH_4)Cl$ buffer solution + 1-2 drops of Black – T and Titrate it against EDTA (0.01M)

3.4. Total Suspended Solid (TSS) Procedure:

☞ Assemble the filtering apparatus and initiate suction.

☞ Wet the filter with a small volume of distilled water to ensure it is properly seated against the fritted support.

☞ Vigorously shake the sample and quantitatively transfer the predetermined sample volume determined in step 7.2 to the filter, using a graduated cylinder.

Figure 3.4: TSS Testing Kit

☞ Continue applying vacuum to remove all traces of water after the sample has passed through.

☞ While maintaining suction, wash the graduated cylinder, filter, non-filterable residue, and the walls of the filter funnel with three portions of distilled water, ensuring complete drainage between each wash. Remove all traces of water by continuing to apply vacuum after the water has passed through.

☞ Carefully detach the filter from the filter support, or alternatively, remove the crucible and filter from the crucible adapter.

☞ Dry the filter for at least one hour at 103-105°C. Allow it to cool in a desiccator and then weigh it.

☞ Repeat the drying cycle until a constant weight is obtained (weight loss is less than 0.5 mg).

☞ Calculate the non-filterable residue.[9]

Total Suspended Solid (TSS) calculation formula: (dry weight of residue and filter - dry weight of filter alone, in grams) / mL of sample * 1,000,000 [$TSS = (m_3 - m_{filter}) / V_{sample}$]

3.5. Total Dissolved Solid (TDS) Testing Procedure:

☞ There are two principal methods of measuring total dissolved solids: gravimetic and conductivity. The standard method is gravimetric, which is considered the most accurate and involves evaporating the sample to dryness at 103 °C, then to 180 °C to remove any occluded water, (water molecules trapped in mineral matrix), then weighing it with a precision analytical balance (normally capable of 0.0001-gram accuracy). This method is generally considered best, although it is slow and has inaccuracies from low-boiling-point chemicals which evaporate with the water.

☞ TDS of water is directly related to the conductivity of dissolved ionized solids in the water. Ions from the dissolved solids create the ability for water to conduct an electrical current, which is measured by the IC Controls 210-C(TDS) analyzer, and immediately displayed as sodium chloride ppm or mg/L or µS/cm conductivity. When periodically standardized with IC Controls TDS standards or by laboratory gravimetric TDS measurement, TDS analyzers based on conductivity provide a quick accurate value of the TDS.

Figure 3.5: TDS Testing Kit

3.6. Alkalinity Testing Procedure:

☞ Using a centrifuge, spin down the digester samples for 30-45 minutes.

☞ While sample is stirring take the pH of the un-spun digester sample. Record this pH. ———————————— (ii)

☞ Take 25 mL of the supernatant and determine the pH. (The pH of the supernatant is typically greater than the pH recorded in ii) Using the HCl solution in the burette, adjust the pH to match the pH recorded in (ii).

☞ This is the start point for the total alkalinity titration. Note the volume contained in the burette at this point.

Figure 3.6: Alkalinity Testing Kit

☞ Titrate the supernatant until a pH of 5.75 is reached. This is the first end-point. Record the volume of HCl in the burette.

☞ Continue to titrate the sample until a pH of 4.00 is reached. This is the final end-point. Record the volume of HCl in the burette.

☞ Using the volumes recorded in 6.1.4 and 6.1.5, calculate the alkalinity at pH 5.75 and pH 4.00 as outlined in 7.4. [10]

CHAPTER 4
DATA COLLECTION AND DATA ANALYSIS

Objective: This report describes the process in which we collected water sample for testing different characteristics of water.

4.1. Location, Date & Time of sampling:

Location: Shitalakkhya River

Date: 16 August 2023

Time: around 2 pm

Google Map Location

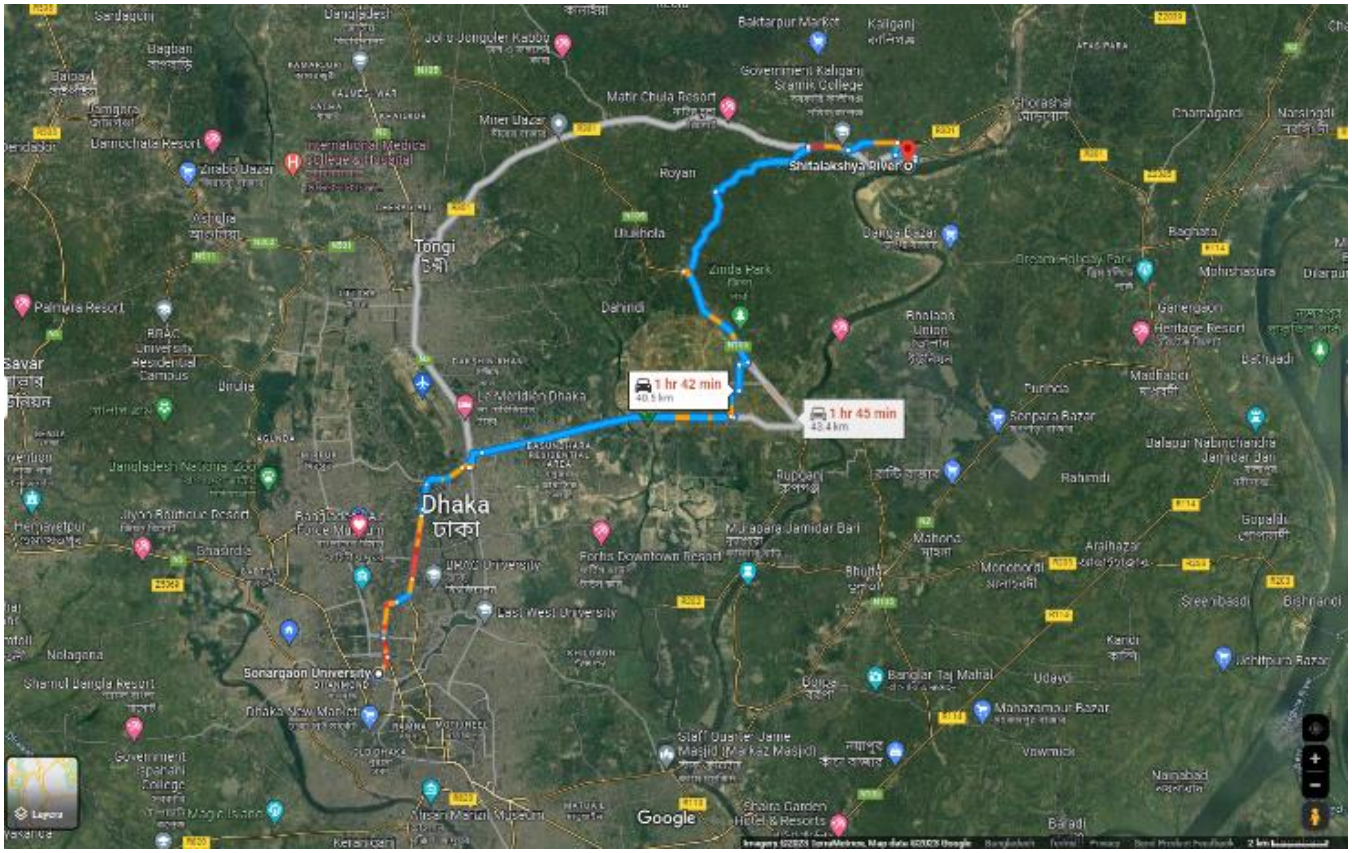

Figure 4.1: Site Location From Google Map (Shitalakkhya River)

4.2. Location, Date & Time of sampling:

Location: Hatir Jheel Lake

Date: 17 August 2023

Time: around 10 am

Google Map Location

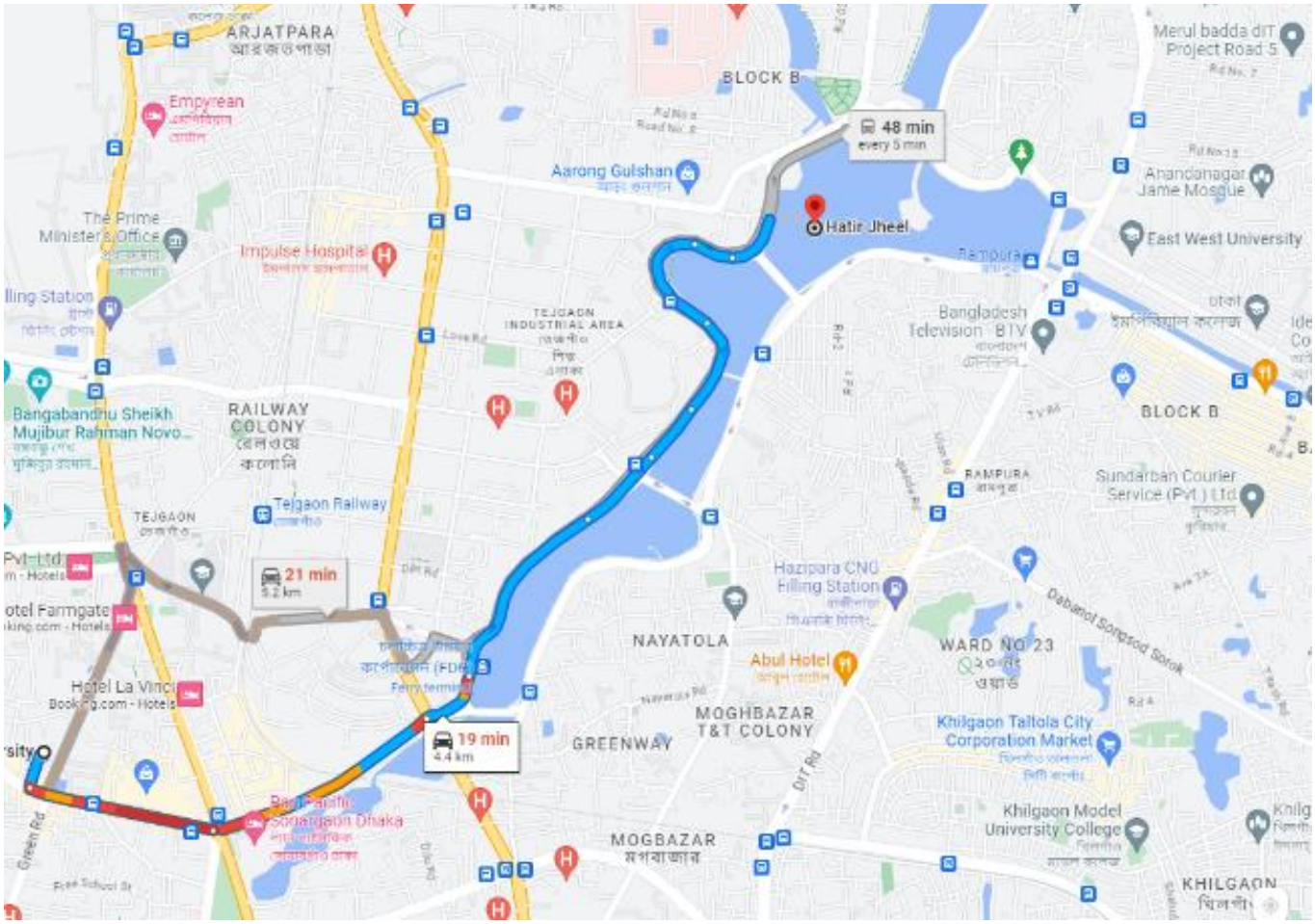

Figure 4.2: Site Location From Google Map (Hatir Jheel Lake)

4.3. Location, Date & Time of sampling:

Location: Gulshan Lake

Date: 17 August 2023

Time: around 3 pm

Google Map Location

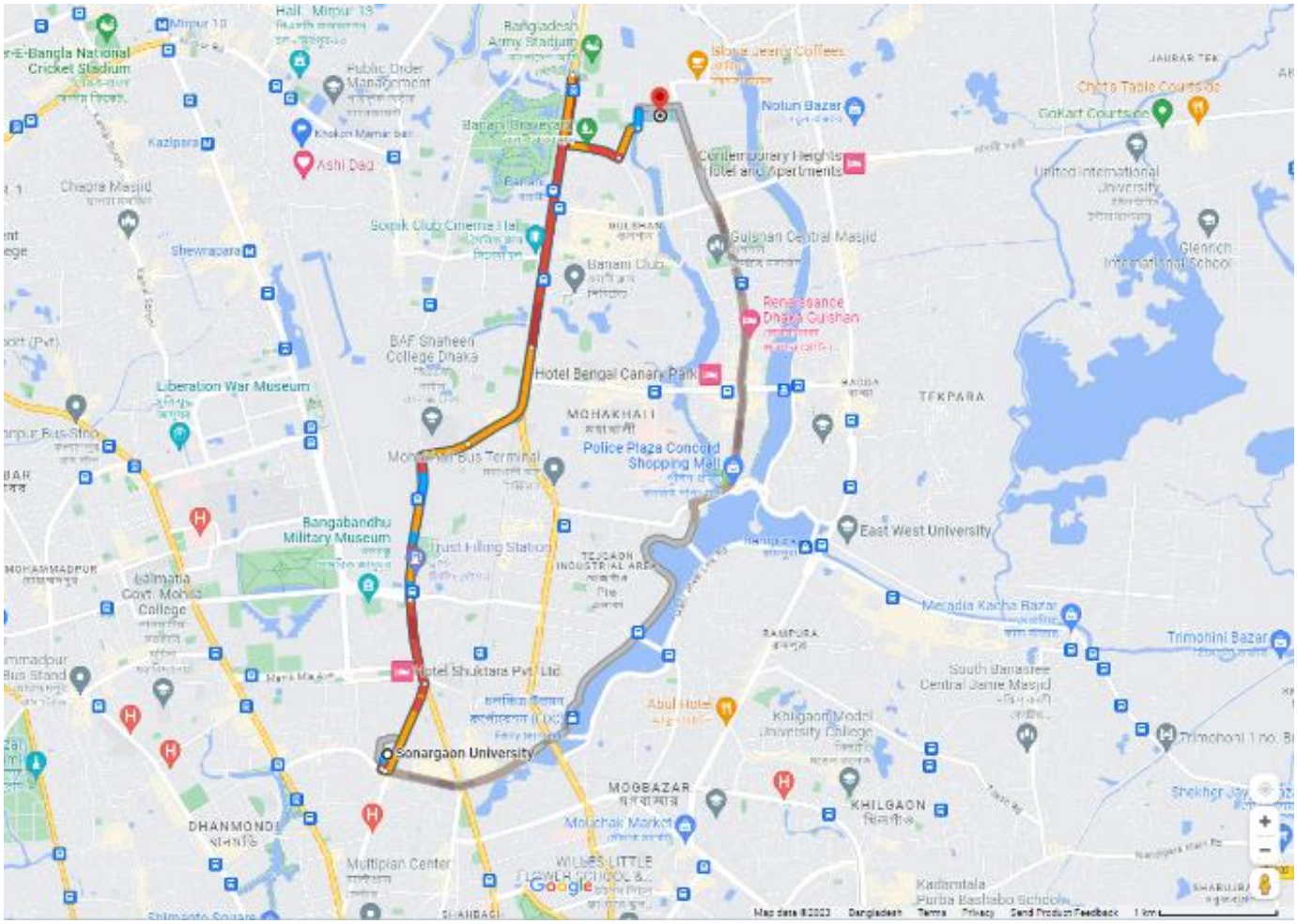

Figure 4.3: Site Location From Google Map (Gulshan Lake)

4.4. Collected Sample:

These techniques include, for example, the use of laboratory-supplied sampling equipment, gloves, and plastic bags to prevent sample contact with unclean surfaces. Under hostile sampling conditions, sample preservation is delayed until exposure of the sample can be minimized.

Water sources can include:

- ☞ Surface water (for example, a lake, river, or reservoir)
- ☞ Ground water (for example, an aquifer)
- ☞ Recycled water (also called reused water)

Figure 4.4: Collected Sample

4.5. Main value of different-Chemical characteristics of surface water:

Table 4.5.1. Location Shitalakkhya River

Water quality parameters	Bangladesh standard	Concentration present	Analysis method
Alkalinity	-	30	Titrimetric
Dissolved Oxygen (DO)	6.0	5.60	Multimeter
Hardness	200-500	102	Titrimetric
pH	6.5-8.5	8.0	pH Meter
Total Dissolved Solid (TDS)	1000	79	Multimeter
Total Suspended Solid (TSS)	10	6	Gravimetric Method

Table 4.5.2. Location Hatir Jheel Lake

Water quality parameters	Bangladesh standard	Concentration present	Analysis method
Alkalinity	-	35	Titrimetric
Dissolved Oxygen (DO)	6.0	5.65	Multimeter
Hardness	200-500	100	Titrimetric
pH	6.5-8.5	7.7	pH Meter
Total Dissolved Solid (TDS)	1000	183	Multimeter
Total Suspended Solid (TSS)	10	5	Gravimetric Method

Table 4.5.3. Location Gulshan Lake

Water quality parameters	Bangladesh standard	Concentration present	Analysis method
Alkalinity	-	38	Titrimetric
Dissolved Oxygen (DO)	6.0	5.40	Multimeter
Hardness	200-500	143	Titrimetric
pH	6.5-8.5	7.9	pH Meter
Total Dissolved Solid (TDS)	1000	162	Multimeter
Total Suspended Solid (TSS)	10	3	Gravimetric Method

4.6. Main value of different-chemical characteristics of surface water flow chart

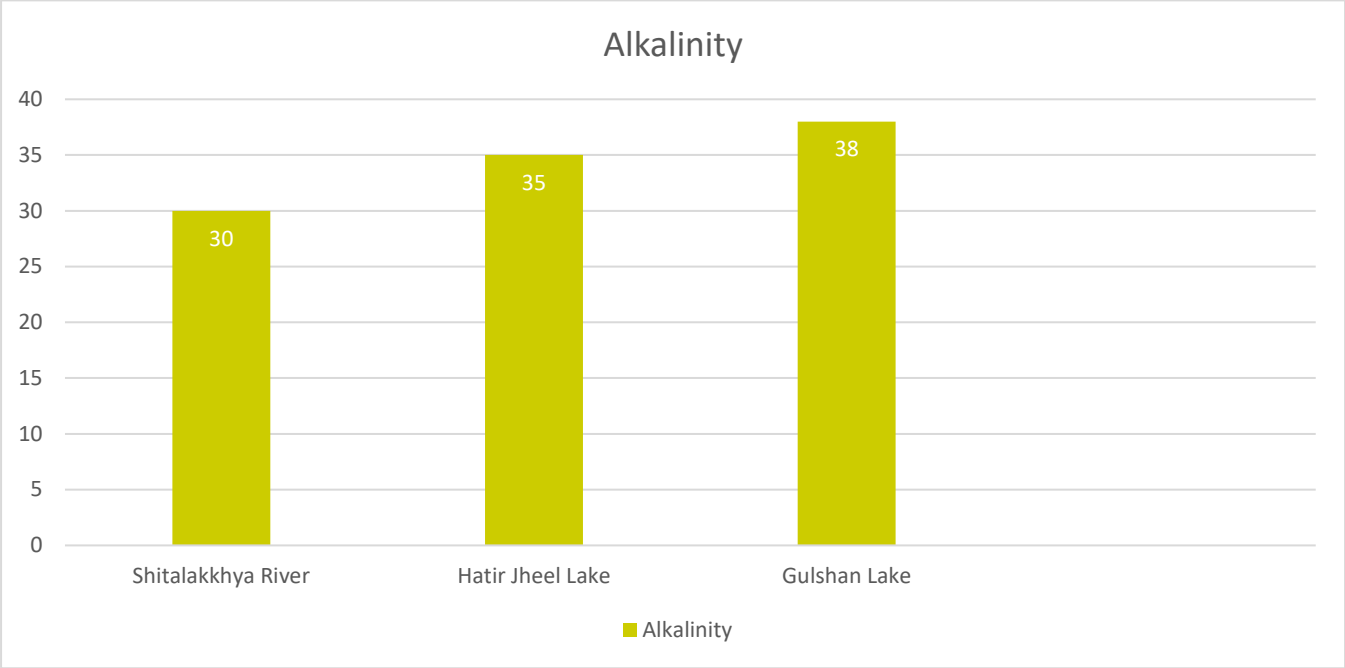

Figure 4.6.1: Comparison of alkalinity level across various locations

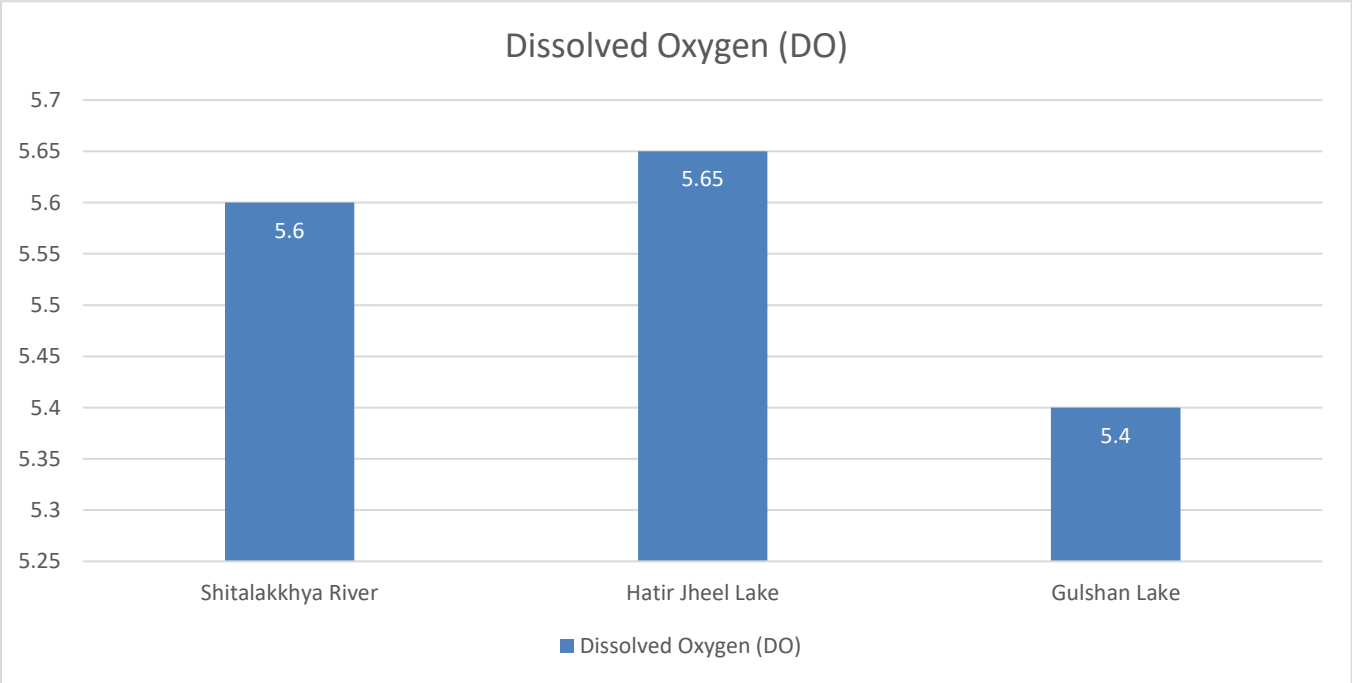

Figure 4.6.2: Comparison of dissolved oxygen level across various locations

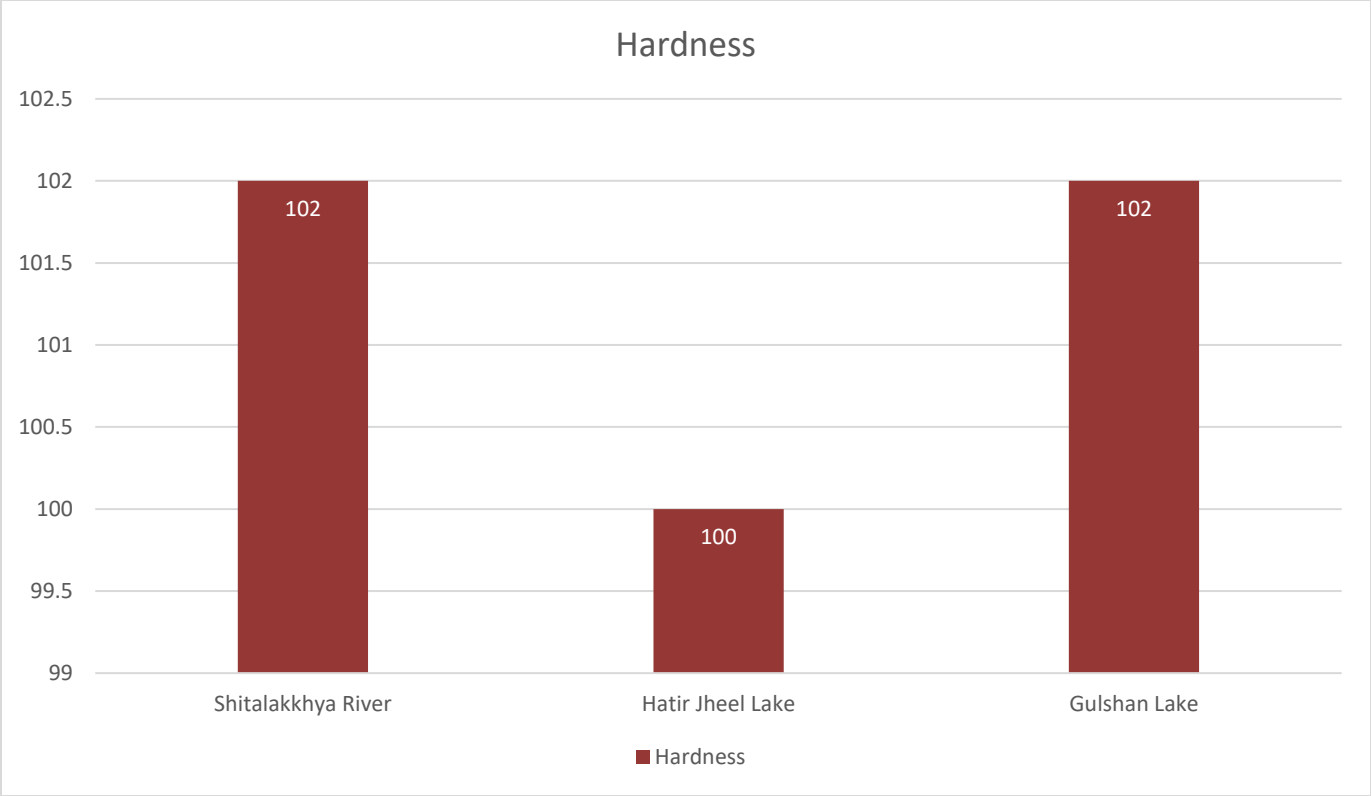

Figure 4.6.3: Comparison of hardness level across various locations

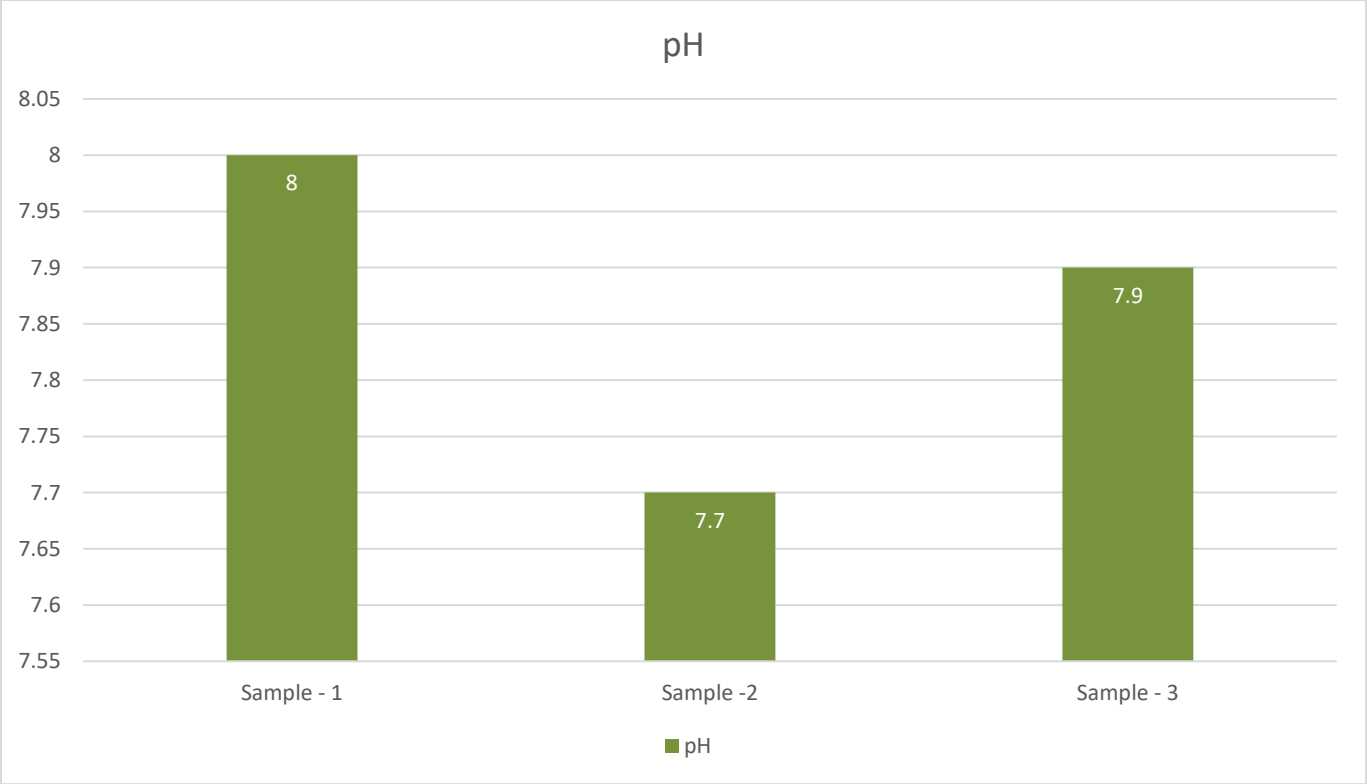

Figure 4.6.4: Comparison of pH level across various locations

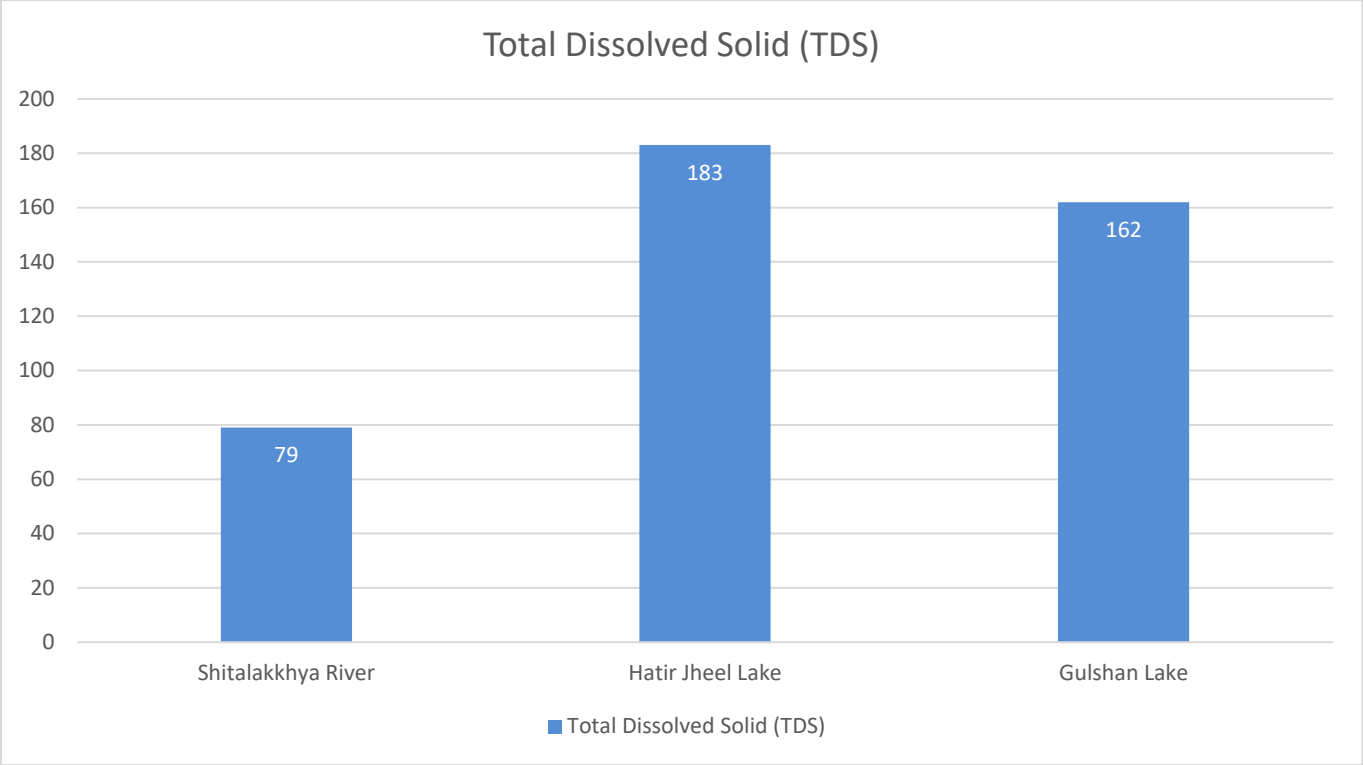

Figure 4.6.5: Comparison of total dissolved solid level across various locations

Figure 4.4.6: Comparison of total suspended solid level across various locations

CHAPTER 5
CONCLUSIONS AND RECOMMRNDATIONS

This study was primarily aimed to evaluate compressive strength of concrete using normal aggregates & concrete using recycling aggregates. Compressive strength using different mixing ratio of normal aggregates & recycling aggregates were also compared in the previous chapter. Based on the obtained results and scope of the study, following conclusions and recommendations are suggested.

5.1 CONCLUSIONS

Based on the study the main conclusions can be summarized as follows:

☞ Many rivers are fed by springs, which occur at points where groundwater reaches the surface. Springs can occur in different geological settings, forming valley springs, stratum springs or solution channel springs.

☞ The water in a river originates from overland flow, from interflow and from base flow. Base flow forms a higher proportion of river water in summer than in winter, and in rivers flowing over good aquifers.

☞ River discharge at a particular point is usually determined by measuring the stage, which is the water level in the river, and then reading off a value for the discharge from the rating curve - a plot of measured discharge for various stages. A river discharge hydrograph is a record of the discharge over a period of time. The shape of a short-period hydrograph (the record for a few days) depends on the size, shape, geology, vegetation and land use of the river catchment. The shape of the long-period hydrograph (e.g., for a year).

☞ Reservoirs increase the amount of water stored on the land surface. They can be used as direct supply reservoirs

5.2 RECOMMENDATIONS

There are no other options and we should must drink surface water, we may can follow these steps to minimize the risk of surface water:

☞ We should protect our surface water sources from livestock, septic tank overflows, and chemical spills.

☞ We should check upstream for contamination sources. Heavy rain may wash pollution into the water source upstream, blue-green algae can grow during the warmer months, and there may be a source of chemical contamination.

☞We should may can install a filter to remove particles from the water and increase the disinfection rate.

☞ We should test the water for chemical contaminants.

☞ We should comply with the Code of practice – onsite wastewater management, and contact our local council for further advice.

☞ Businesses and community groups using surface water for drinking and food preparation we may can find guidance in making sure our private water supply is safe on surface water.

☞ In pursuant to the last 10years populations of the Dhaka Metro Area the average population growth rate is about 3.2% per year. However, we think, the subsurface water is not sufficient for the present as well as the upcoming populations, according to the present situation of Dhaka Metro Area, we have no other option except using the surface water. So, we should proper utilize our surface water by proper water treatment process as well.

REFERENCE

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APPENDIX

Government of the People's Republic of Bangladesh
Office of the Chief Chemist
Department of Public Health Engineering
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212
Phone: 88-02-9881927, Fax: 88-02-9882003 , Email: wqmsc_central_lab@yahoo.com

Lab Memo: 167/ CC, DPHE, CL, Dhaka

Date: 24-08-2023

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2023080132	Sample Receiving date: 20-08-2023
Ref. Memo No: SU/2023/Nill & Dated: 20-08-2023	Sample Source: Surface Water
Sent by:Md. Tanveer Rahman ,Student , Sonargaon University, Dhaka.	Dist:Narayanganj, Upa:
Care Taker: Md. Tanveer Rahman (Sample : 02)	Union:, Vill.:Shitalakhya river
Sample Collection date:	Date of Testing: 20/08/2023-24/08/2023

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Alkalinity	-	30	mg/L	Titrimetic	-
2	Dissolved Oxygen (DO)	6.0	5.60	mg/L	Multimeter	-
3	Hardness	200-500	102	mg/L	Titrimetic	-
4	pH	6.5-8.5	8.0	-	pH Meter	-
5	Total Dissolved Solid (TDS)	1000	79	mg/L	Multimeter	-
6	Total Suspended Solid (TSS)	10	6	mg/L	Gravimetric Method	-

Comments: Sample was collected & supplied by client.
N.B: LOQ - Limit of Quantitation.

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	Alam 24.08.2023	1.) Name: Mita Sarker Designation: Senior Chemist	B Hossain 24/08/2023
2.) Name: Taslima Akhter Designation: Sample Analyzer	24.08.2023	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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Office of the Chief Chemist
Department of Public Health Engineering
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212
Phone: 88-02-9881927, Fax: 88-02-9882003 , Email: wqmsc_central_lab@yahoo.com

Lab Memo: 167/ CC, DPHE, CL, Dhaka

Date: 24-08-2023

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2023080133	Sample Receiving date: 20-08-2023
Ref. Memo No: SU/2023/Nill & Dated: 20-08-2023	Sample Source: Surface Water
Sent by:Md. Tanveer Rahman ,Student , Sonargaon University, Dhaka.	Dist:Dhaka, Upa:
Care Taker: Md. Tanveer Rahman (Sample : 03)	Union:, Vill.:Hatirjheel lake
Sample Collection date:	Date of Testing: 20/08/2023-24/08/2023

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Alkalinity	-	35	mg/L	Titrimetic	-
2	Dissolved Oxygen (DO)	6.0	5.65	mg/L	Multimeter	-
3	Hardness	200-500	100	mg/L	Titrimetic	-
4	pH	6.5-8.5	7.7	-	pH Meter	-
5	Total Dissolved Solid (TDS)	1000	183	mg/L	Multimeter	-
6	Total Suspended Solid (TSS)	10	5	mg/L	Gravimetric Method	-

Comments: Sample was collected & supplied by client.
N.B: LOQ - Limit of Quantitation.

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	Alam 24.08.2023	1.) Name: Mita Sarker Designation: Senior Chemist	24/08/2023
2.) Name: Taslima Akhter Designation: Sample Analyzer	Lima 24.08.2023	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka

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Lab Memo: 167/ CC, DPHE, CL, Dhaka

Date: 24-08-2023

Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2023080131	Sample Receiving date: 20-08-2023
Ref. Memo No: SU/2023/Nill & Dated: 20-08-2023	Sample Source: Surface Water
Sent by:Md. Tanveer Rahman ,Student , Sonargaon University, Dhaka.	Dist:Dhaka, Upa:
Care Taker: Md. Tanveer Rahman (Sample : 01)	Union:, Vill.:Gulshan Lake
Sample Collection date:	Date of Testing: 20/08/2023-24/08/2023

LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Alkalinity	-	38	mg/L	Titrimetic	-
2	Dissolved Oxygen (DO)	6.0	5.40	mg/L	Multimeter	-
3	Hardness	200-500	143	mg/L	Titrimetic	-
4	pH	6.5-8.5	7.9	-	pH Meter	-
5	Total Dissolved Solid (TDS)	1000	162	mg/L	Multimeter	-
6	Total Suspended Solid (TSS)	10	3	mg/L	Gravimetric Method	-

Comments: Sample was collected & supplied by client.
N.B: LOQ - Limit of Quantitation.

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	24.08.2023	1.) Name: Mita Sarker Designation: Senior Chemist	24/08/2023
2.) Name: Taslima Akhter Designation: Sample Analyzer	24.08.2023	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	Md. Biplab Hossain Chief Chemist Department of Public Health Engineering Central Laboratory Mohakhali, Dhaka