ASSESSMENT OF PHYSICOCHEMICAL PROPERTIES OF WATER IN CUBAY CREEK

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ABSTRACT

Water is a universal substance that is essential for all known forms of life and due to urbanization and diversified domestic uses, the quality of water gets deteriorated. This study aimed to assess the physicochemical properties of water in Cubay Creek by comparing the temperature, Total Suspended Solids (TSS), and pH values with the Department of Environment and Natural Resources (DENR) water quality standards of Class C Inland Waters. The objectives of the study were to determine the temperature, TSS and pH values of the water found in Cubay creek. The sampling procedure used in the study was purposive sampling. Sampling areas 1, 2, 3 were near the residential areas along Cubay creek, beside Balabago road, near the agricultural areas along Cubay creek respectively. Three samples were taken from each area and each was tested for temperature and pH. The samples were then brought to the Philippine Science High School Western Visayas Laboratory for the computation of TSS values. The temperature values for areas 1, 2, 3 were 34°C, 31°C, 31°C which all passed the DENR standard which was ± 3°C from the initial source of water. The TSS values for areas 1, 2, and 3 were 91.67 mg/mL, 11.11 mg/mL, 25.02 mg/mL respectively. Only area 1 did not pass the DENR standard for TSS which was 0 mg/mL to 90 mg/mL. The pH values for areas 1, 2, 3 were 8.50, 8.37, 8.56 respectively. All the pH values passed the DENR standard for pH which was 6.50 to 9.00. For better analysis, It is recommend future researchers to include biological which may affect the physicochemical factors of water in Cubay creek. Also, it is recommend using a digital thermometer and include and increase periodical monitoring for greater accuracy.

Keywords: Water Quality, pH, Total Suspended Solids, Temperature

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CHAPTER 1
INTRODUCTION

A. Background of the Study

Water is a universal substance that is essential for all known forms of life. It is needed for most industrial and life processes. Due to urbanization, land degradation, increase in population, and diversified domestic uses, the quality of water gets deteriorated. Lack of good management of water can contribute significantly to water-borne health risks which lead to dilapidation of water quality.

Cubay creek has served as the sewage canal of Barangay Balabago in Iloilo City. The water that flows here goes directly to the open sea. With heightened human activity, pollutants mix into the water and water quality is sure to worsen. The quality of water, however, can be constantly monitored and observed. With information on water quality, steps on improving it can be implemented.

Water quality can be assessed by evaluating the water with different parameters. Physical properties like temperature and total suspended solids (TSS) and chemical properties like pH provide us crucial information on how much human activity has affected the water and its possible effects on the environment. With the obtained information, analysis can be done and various steps like tracing pollutant sources, treatment and appropriate wastewater management can be made to improve the quality of water.

B. Statement of the Problem

This study aimed to assess the physicochemical properties of water in Cubay Creek by comparing the temperature, Total Suspended Solids (TSS), and pH values with the Department of Environment and Natural Resources (DENR) water quality standards of Class C Inland Waters.

C. Objectives of the Study

The study aimed to determine the temperature (° Celsius), the total amount of suspended solids (mg/mL) and the pH of Cubay creek water taken on the last week of February 2010.

D. Significance of the Study

The Cubay creek located along Cubay, Iloilo City has its source from the municipality of Pavia. From Pavia, the creek stretches into the urbanized areas of Jaro, Iloilo City and connects to the Iloilo Strait.

The water level in the creek depends on the month of the year – highest during rainy seasons and lowest during the summers. During the rainy season, the creek becomes the source of water to irrigate agricultural lands located within its vicinity. It is also observed that some people go fishing along the creek, suggesting that the creek supports fish life. Since some areas of the creek are near residential areas and other establishments, it has also become receiver of sewage water coming from houses and establishments.

Since the creek is one of the tributaries of the Iloilo strait, the creek also contributes to the water quality of the Iloilo strait. The assessment of the creek's physicochemical properties such as temperature, total dissolve solids and pH values will therefore provide the DENR, the residents of Cubay, future researchers and other concerned individuals the necessary baseline information regarding the creek's status as a Class C Inland Waters. This information will provide the necessary support for the protection and conservation of the creek.

E. Scope and Delimitations

The measurements were limited to the three sampling sites chosen along Cubay creek. These three sampling sites were in range within 30 meters from the main road. Site 1 was near residential area, site 2 was near agricultural land and site 3 was near the Balabago road. The three sampling sites were chosen purposively based on the human activity within its range like residential and agricultural. Four parameters were tested: odor, temperature, Total Suspended Solids (TSS) and pH. However, the first parameter – odor, was excluded since no reliable, established and standard method was available to generate conclusive result. Odor parameter can be more biased and subjective measurement. Water sampling was conducted on the last week of February 2010. Measurements of the temperature and pH were conducted in situ, while total suspended solids measurements were conducted at the Philippine Science High School Western Visayas research laboratory. Digital pH meter (Satorious Portable pH Meter) was used to record the pH and a mercury filled glass thermometer was used to measure temperatures. All weight measurements were done using a digital analytical balance (Mettler Digital Analytical Balance).

F. Definition of Terms

pH refers to the term Power of Hydrogen. It is the measure of the concentration of hydrogen ions in a solution. Solutions with high amounts of hydrogen ions have a pH of less than seven while low amounts of hydrogen ions have a pH of greater than seven. The pH scale ranges from 0 to 14. Solutions with pH less than seven are considered acidic, with pH greater than seven are considered as basic and pH equal to seven as neutral. In this study, pH refers to the concentration of hydrogen ions of water in Cubay Creek (Myers 2009).

Temperature is the measure of vibrational molecular energy. In short it is the degree of hotness or coldness of an object. In this study, temperature refers to the degree of hotness or coldness of the water samples from Cubay Creek (United States Geological Survey 2009)

Total Suspended Solids (TSS) are solids in water that can be trapped by a filter. TSS can include a wide variety of material, such as silt, decaying plant and animal matter, industrial wastes, and sewage. In this study Total Suspended Solids refer to the amount of solids that can be trapped by a filter in the water of Cubay Creek (United States Geological Survey 2009).

Class C Inland Waters is defined by the DENR based on water usage as water that may be used as fishery water used in propagation and growth of fish and other aquatic resources and as agricultural water used in irrigation, livestock and watering. In this study, Class C Inland waters refer to the classification of Cubay Creek (DENR 1990).

CHAPTER 2
REVIEW OF RELATED LITERATURE

A. Background Information

A.1. Water Quality

Water quality is the assessment of water by a set of standards. It is mainly used in determining the condition of water and its possible usage and effects in the environment. Water quality is measured using a set of parameters. These parameters include physical and chemical properties of water. Physical properties include temperature and total suspended solids (TSS) and chemical properties include pH. Temperature measures the degree of hotness or coldness of the water. TSS is the measure of how many particulates can be found in the water. pH is the measure of how acidic or basic the water is (United States Geological Survey 2009).

Using these set of parameters, water quality can be analyzed and steps in improving water quality can be done. Usage of water can be optimized and harmful effects on the environment can be minimized. Also, human activity can be assessed and industries that rely on water like fishing and agriculture can benefit.

A.2. Temperature

The temperature of water has extremely important ecological consequences. Water temperature exerts a major influence on aquatic organisms with respect to the level of activity of the organisms. In general, increasing water temperature results in greater biological activity and more rapid growth. All aquatic organisms have preferred temperature in which they can survive and reproduce optimally (United States Geological Survey 2009).

Temperature also is an important factor on water chemistry. Rates of chemical reactions also generally increase with increasing temperature. The solubility of important gases, such as oxygen and carbon dioxide decreases as temperature increases (United States Geological Survey 2009).

The Department of Environment and Natural Resources temperature standard for Class C Inland Waters is that it must not rise 3°C from the initial source of water (DENR 1990).

A.3. Total Suspended Solids

TSS can include a wide variety of material, such as silt, decaying plant and animal matter, industrial wastes, and sewage. High concentrations of TSS can lower water quality by absorbing light. Water then becomes warmer which lessens the ability of the water to hold oxygen necessary for aquatic life. Aquatic plants also receive less light which results to less photosynthesis and less oxygen levels. High TSS in a water body can often mean higher concentrations of bacteria, nutrients, pesticides, and metals in the water. These pollutants may attach to sediment particles on the land and be carried into water bodies with storm water (Lenntech 2009).

The Department of Environment and Natural Resources TSS standard for Class C Inland Waters is that it must not exceed 90 mg/mL (DENR 1990).

A.4. pH

The term pH refers to the Power of the Hydrogen and is the measure of the concentration of hydrogen ions in a solution. The pH level indicates if a solution is acidic or basic. The pH scale reads 0 to 14. Seven (7) is neutral, below 7 is acidic, and above 7 is basic the farther from 7, the stronger the pH. For example a solution with a pH of 4 is more acidic (has more hydrogen ions) than a solution with a pH of 6. Likewise, a solution with a pH of 10 is

more basic (has more hydroxyl ions) than a solution with a pH of 8 (Myers 2009).

Most aquatic plants and animals are adapted to a specific pH range, and natural populations may be harmed by water that is too acidic or alkaline. Immature stages of aquatic insects and young fish are extremely sensitive to pH values below 5. Even microorganisms which live in the bottom sediment and decompose organic debris cannot live in conditions which are too acidic (Myers 2009).

The Department of Environment and Natural Resources pH standard for Class C Inland Waters is that the pH of the water must be within the range of 6.5 to 9.0 (DENR 1990).

A.5. Area Description

Cubay creek is a body of water that starts from McArthur drive and flows into Guimaras Strait. It passes through various areas such as near houses, roads and rice fields. The water that flows in Cubay creek is highly affected by human activity that occurs near it. Waste water from households and urban runoff flows into the creek every possible time. It is necessary to evaluate the quality of water as it plays a very important role in the environment. Three sampling areas were chosen in the study.

A.5.a Sampling Area 1

Sampling area 1 was the area near the residential areas of Barangay Cubay. Cubay creek flows directly between the groups of houses. Sampling area 1 had large amounts of vegetation as grasses grow in this area of the creek. Small fishes and tadpoles also inhabited the creek. Sampling area was the shallowest of all the areas. It also

was the most exposed to sunlight as nothing shade the area from direct sunlight.

A.5.a Sampling Area 2

Sampling area 2 was the area beside Balabago road. At this area, Cubay creek crosses Balabago road. Sample area 2 had vegetation as grasses grow in this area of the creek. Small fishes and tadpoles were also present only in small amounts and lesser than area 1. Trees grow near area 2 which provides as a shade from sunlight. Area 2 was deeper than area 1 but was shallower than area 3.

A.5.a Sampling Area 3

Sampling area 3 was the area near the rice fields of Barangay Cubay. It was located in the agricultural areas of Barangay Cubay. Cubay creek flows directly between the rice fields. There was no vegetation in area 3 since there were no grasses growing in this area. There were no noticeable organisms in area 3. Area 3 was the deepest among the sampling areas.

B. Science Principles

B.1. Heat

Heat is the most common and least valued form of energy. It is energy in its simplest form. It can be transferred from one thing to another. It is measurable and calculable. Most processes produce heat as a by-product which highly affects its surroundings. Heat is directly proportional to the absolute temperature of an object. The greater heat an object has, the greater is its temperature and the lesser the heat, the lesser is its temperature (Smith et al 2005).

Water is an object capable of heat transfer. As heat is transferred in the water, its temperature rises and as heat is removed, its temperature decreases. Most of the heat that is received by natural bodies of water comes from the sun. The sun provides radiation that is then transformed to heat as objects absorb it. The heat in these bodies of water; however, are affected by human activity. Chemicals that are mixed may into the water have stored energy within them which may affect the heat of the water. Also, chemical properties of the water may change as different compounds are mixed with it which could affect the water's receptiveness to heat (Smith et al 2005).

B.2. Filtration

Filtration is a technique that is commonly used to separate suspended solids from liquid material. It is done by letting the liquid pass through a material that strains the solid from the liquid, hence, a filter. The liquid passes through the filter since the size of its molecules is smaller than that of the pores of the filter. The solids; however, do not pass the filter in this process which leaves the solids and liquid separated (Lenntech 2009).

Filtration has many uses. It is commonly used for sanitary purposes like water treatment and sewage management. Filtration; however, in this study was used for measuring TSS. It was used in separating the suspended solids in the water. The sample water is run through a filter and the filtered material is then weighed. The weight of the filtered material is then used to compute for the TSS values (Lenntech 2009).

B.3. Acidity and Alkalinity of Water

Acidity and alkalinity of water refers to the concentration of hydrogen and hydroxyl ions. The more hydrogen ions present in the water means the water is acidic while the more hydroxyl ions present means the water is alkaline. The measure of acidity and alkalinity is represented by a number

from 0 to 14 which known as pH level. Pure water, however, has a pH of 7 which is neutral. This means that the amount of hydrogen ions is equal to the amount of hydroxyl ions (Myers 2009).

The pH of water is highly affected by human activity. Since pure water has a pH level of 7, any liquid that has a pH level that is not equal to 7 is not pure water. Chemicals that combine with the water will give a different pH level than that of pure water. Common household materials like soap and detergents will give an alkaline pH value while vinegar and orange juice will give an acidic pH value (Myers 2009).

C. Related Studies

In the 2001-2005 report of the Environmental Management Bureau, only 20 percent of the meant to be sources of water supply meet the criterion for TSS.

In the 2004 report on the water quality of Mogpoc River, the pH values that were found ranged from 3.0 to 7.8 which reflected how contaminated the river was with acidic substances. Also, the values of pH were unsafe for fishes and amphibians since most of them will die at a pH of 3.5. In the study conducted by Gorme and others, Pasig River was reported to have failed the DENR standard for TSS. Large amounts of silt and decaying plants which came most from domestic discharge contributed to high TSS levels. Also, the temperature varied from 27°C to 29°C. Domestic and industrial wastes have contributed to the increase of pollutants in the Pasig River

Chapter 3
Methodology

A. Materials and Equipment

The following materials and equipment were obtained from PSHS WV: one (1) 1000-mL filtering flask, one (1) Buckner funnel, nine (9) pieces 500-mL Erlenmeyer flask, five (5) forceps, Digital Weighing Scale (Mettler), digital pH meter (Satorious), one (1) Mercury-Filled Thermometer. The following materials were purchased from laboratory suppliers: nine (9) pieces Whatman # 16 Filter Paper, 1-L distilled water, paper towels and nine (9) pieces sample bottles.

B. Sampling Plan

The sampling plan used in this study is purposive sampling. Water samples were collected from Cubay creek located along barangay Cubay, Jaro, Iloilo City during the fourth week of February 2010. Three sampling areas were chosen by the researcher, area 1 was located near the residential areas of Barangay Cubay, area 2 was located near Balabago road and area 3 was near an agricultural area still along Balabago Road. Water samples were collected on mid-day. Temperature and pH measurements were taken in situ. Total suspended solid (TSS) values were determined using gravimetric method. Laboratory experiments were performed at the Philippine Science High School Western Visayas (PSHSWV) research laboratory.

C. Sampling Procedure

The collection bottle and cap were previously washed with nitric acid to completely remove organic and solid particles. Before final collection of water samples, the containers were washed with the sample water three times. The bottles were filled up to the brim and tightly sealed with its cap. Three samples were taken

from each sampling site. All samples were brought into the PSHSWV laboratory within an hour after collection and immediately TSS values were determined.

D. Measurement of Parameters

D.1. Temperature

The temperature measurements were conducted at the sampling site. The thermometer was calibrated before use. The thermometer was lowered 10 cm into the water and was allowed to stabilize for 3 minutes. After 3 minutes the thermometer was read at eye level. This was done while the thermometer was kept dipped in the water. The thermometer was remained submerged in the water for another minute before the next reading was recorded. A total of three readings per trial were taken. The average of the three measurements were computed and recorded.

D.2. pH

The pH was measured at the sampling site. The pH probe was first calibrated according to the manufacturer's instructions. Two buffers, pH 4 and pH 7 were used to calibrate the meter. The probe was rinsed with distilled water and was dried using paper towel before it was submerged into the sampling sample, making sure that the tip of the probe was completely submerged. The probe was remained submerged in the water for 3 minutes before the pH was recorded. The probe was kept for another minute in the water before the next measurement was recorded. The pH values were then compared and checked if they agree to the ± 0.01. A total of three pH readings per trial were taken. They were averaged and recorded.

D.3. Total Suspended Solids

The filter papers were prepared by soaking them in distilled water. The filter papers were then dried inside the oven at 103°C, cooled at room temperature and weighed to a constant weight. Suction filtration was set-up

according to standard procedure using 500 mL filtering flask, Buchner funnel and water pump. The dried filter papers were placed onto the Buchner funnel and 400 mL water samples were poured into the filter with constant suction. The filter papers were then dried in an oven at 103°C, cooled to room temperature, and weighed. Drying and weighing of the filter papers were continued until a constant weight was reached. The end weight was recorded and TSS values were calculated using the equation:

$$TSS\ (mg/L) = ([A-B]*1000)/C$$

where, A = End weight of the filter

B = Initial weight of the filter

C = Volume of water

E. Proper Handling

Before taking measurements at the sampling areas, the thermometer and the pH probe were first rinsed with distilled water and were wiped dry. Also, both were rinsed with distilled every after trial and before being returned to PSHSWV. Before sampling, all sample containers were first washed to ensure that no solid particles were present in the sample container before sampling. After sampling, the containers were immediately taken to the PSHSWV laboratory for TSS evaluation. Sample water were then transferred to Erlenmeyer flasks and filtered. The filter papers were then dried in the oven and weighed in a close container to ensure that no foreign particles may affect the weight measurement. After use, the oven and the analytic balance were made sure to return to their original state before use and were turned off.

F. Waste Disposal

The sample water, after being filtered was drained in the sink with running water. After use, the sample bottles were again washed to ensure that no traces of the water sample remain and were disposed as recyclables. The used filter papers were then thrown in the trash bin together with other organic materials.

CHAPTER 4
RESULTS AND DISCUSSION

A. Results

The data in tables 1, 2 and 3 showed the temperature, TSS and pH measurements of the three sampling areas of Cubay creek respectively. The values for temperature were the same for the area beside Balabago road and the area near the rice fields of Barangay Cubay, however, TSS varied for the three sampling areas. Generally, the pH values were almost the same for the three sampling areas.

The water flow was minimal for all sampling areas. Also, the area near the residential areas of Barangay Cubay had the least water depth and the area near rice fields of Barangay Cubay had the greatest water depth. Moreover, water samples collected from the area near the residential areas of Barangay Cubay had the most number of visible particulates while samples from the area beside Balabago road had the least visible particulates. Among the three sampling areas, the area near the residential areas of Barangay Cubay had the greatest amount of vegetation and had fishes and the area beside Balabago road had smallest amount of vegetation while no vegetation was observed in the area near rice fields of Barangay Cubay.

Table 1. Measurement of the temperature of the three sampling areas along Cubay creek

Sampling Area	Mean Temperature (°C)	Standard Temperature (34°C ± 3°C)	Remarks
Area near residences	34	31-37	Passed
Area beside road	31	31-37	Passed
Area near rice fields	31	31-37	Passed

Table 2. Measurement of the TSS values of the three sampling areas

Sampling Area	Mean TSS Values (mg/mL)	Standard TSS Values (mg/mL)	Remarks
Area near residences	91.67	0-90	Failed
Area beside road	11.11	0-90	Passed
Area near rice fields	25.02	0-90	Passed

Table 3. Measurement of the pH values of the three sampling areas

Sampling Area	Mean pH Values	Standard pH Value	Remarks
Area near residences	8.50	6.50-9.00	Passed
Area beside road	8.37	6.50-9.00	Passed
Area near rice fields	8.56	6.50-9.00	Passed

B. Discussion

The area near the residential areas of Barangay Cubay had the highest temperature at 34°C while the area beside Balabago road and the area near rice fields of Barangay Cubay both measured 31°C. According to the Department of Environment and Natural Resources (DENR), temperatures of Class C Inland Waters measured at different areas should not rise above 3° from the source of water. From the data in table 1, considering the area near the residential areas of Barangay Cubay as the source of the water of the area beside Balabago road and the area near rice fields of Barangay Cubay, it was observed that the water temperature decreased by 3 degrees. This is however in agreement to the standard set by the DENR. Therefore, it passed the DENR standard of Class C Inland Waters for temperature. This decreased in the temperature of the water from the area near the residential areas of Barangay Cubay to the area beside Balabago road and the area near rice fields of Barangay Cubay could be explained by the increase in water depth. There is a correlation

between water depth and water temperature, the greater the water depth the lower the temperature. This phenomenon can also be explained by the laws of thermodynamics. Naturally these sampling areas receive equal amount of energy from the sun. Thus, at lower depth where the amount of water is less the same amount of energy will result to higher temperature as compared to greater depths (United States Geological Survey 2009).

Based on the data on table 2, the area near the residential areas of Barangay Cubay had the highest amount of suspended solids with 91.67 mg/mL, while samples from the area beside Balabago Road had the lowest amount, with 11.11 mg/mL of suspended solids. TSS values of the area beside Balabago Road (11.11 mg/mL) and the area near rice fields of Barangay Cubay (25.02 mg/mL) were within range of the standards of total suspended solids for Class C Inland Waters while TSS value of the area near the residential areas of Barangay Cubay (91.67 mg/mL) was out of range. The standard of Class C Inland Waters for TSS is that it must not be above 90 mg/mL. The area near the residential areas of Barangay Cubay did not pass the standard and posed an environmental problem for there is an excess number of particulates which may be considered as pollutants found in the water samples taken near the residential areas of Barangay Cubay. It may be that residential areas near the sampling site, high amount of vegetation and presence of fishes contributed to the production of excess particulates which may affect the biodiversity of the creek (United States Geological Survey 2009).

Greater depth of the area near the residential areas of Barangay Cubay is also another factor for the observed higher TSS value. At lower depth, the flow of water is more turbulent thus more disturbances to creek floor and resulting to greater suspended particulate solids.

Based on the data on table 3, all the pH values of the water from the three sampling areas ranged from 6.50-9.00. Waste water and sewage from the residential areas near Cubay creek may have affected the pH of the water resulting to a more basic pH of the water. Chemicals from fertilizers from the rice fields near Cubay

creek also might have mixed into the creek water which may have also caused the basic pH reading. Although the pH might have been affected by human activity, the values of pH are within range of the standard pH of Class C Inland Waters therefore it passed the DENR standard of Class C Inland Waters for pH.

CHAPTER 5
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

A. Summary of Findings

The temperature of the area near the residential areas of Barangay Cubay was 34°C and the temperature of the area beside Balabago road and the area near the rice fields of Barangay Cubay were both 31°C. The standard of Class C Inland Water is that the values of temperature must not rise above 3° from the source of water. The values of the temperature of the area beside Balabago road (31°C) and the area near the rice fields of Barangay Cubay (31°C) were three degrees less from that of the area near the residential areas of Barangay Cubay (34°C) which is the initial source of water based on the sampling sites therefore it passed the DENR standard of Class C Inland Waters for temperature (DENR, 1990).

Among the three sampling sites, the area near the residential areas of Barangay Cubay had the highest amount of suspended solids with 91.67 mg/mL, while the area beside Balabago road had the lowest amount, with 11.11 mg/mL of suspended solids. TSS values of the area beside Balabago road (11.11 mg/mL) and the area near the rice fields of Barangay Cubay (25.02 mg/mL) had suspended solids within range of the standard amount of suspended solids for Class C Inland Water while the TSS value of the area near the residential areas of Barangay Cubay (91.67 mg/mL) was out of range. The standard of Class C Inland Waters for TSS is that it must not be above 90 mg/mL (DENR, 1990).

The values of pH were almost the same for the three sampling areas. The values of pH are within range of the standard pH of Class C Inland Waters (DENR, 1990).

B. Conclusion

All three areas passed the pH and temperature standards of the Department of Environment and Natural Resources (DENR) Class C Inland Waters. Both the area

beside Balabago road and the area near the rice fields of Barangay Cubay passed the DENR Class C Inland Waters Standard for TSS while the area near the residential areas of Barangay Cubay did not pass the DENR Class C Inland Waters Standard for TSS.

C. Recommendations

It is recommended that future studies on Cubay creek shall:

1. Include biological factors like Dissolved Oxygen and Fecal Coliform which may affect the physicochemical factors of water in Cubay creek;
2. Use a digital thermometer to measure the temperature of the water found in the sampling sites for accuracy;
3. Include weekly, monthly or seasonal monitoring of the water quality of water found in Cubay creek for accuracy; and
4. Increase the number of sampling sites found along Cubay creek for accuracy.

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APPENDIX A

RAW DATA

A. Temperature (°C) Measurement of Sampling Areas

	Temperature		
	Site 1	Site 2 (°C)	Site 3 (°C)
Trial 1	34	31	31
Trial 2	34	31	31
Trial 3	34	31	31
Average	34	31	31

B. Weight (grams) of Filter Papers before and after Filtration

		Weight (grams)		
		Before Filtration	After Filtration	Difference
Area 1	Filter 1	1.06	1.13	0.07
	Filter 2	1.06	1.09	0.03
	Filter 3	1.06	1.07	0.01
Area 2	Filter 1	1.04	1.06	0.02
	Filter 2	1.02	1.03	0.01
	Filter 3	1.05	1.06	0.01
Area 3	Filter 1	1.04	1.06	0.02
	Filter 2	1.02	1.03	0.01
	Filter 3	1.05	1.06	0.01

C. Total Suspended Solids Values (mg/mL) of the Water Samples

	TSS Values (mg/mL)		
	Site 1	Site 2	Site 3
Filter 1	175.00	16.65	8.33
Filter 2	75.00	8.33	33.35
Filter 3	1.07	8.33	33.35
Average	91.67	11.11	25.02

D. pH Values of the Water Found in the Sampling Sites

	pH Values		
	Site 1	Site 2	Site 3
Trial 1	8.52	8.37	8.56
Trial 2	8.51	8.37	8.55
Trial 3	8.49	8.36	8.57
Average	8.50	8.37	8.56

APPENDIX B

PICTURES

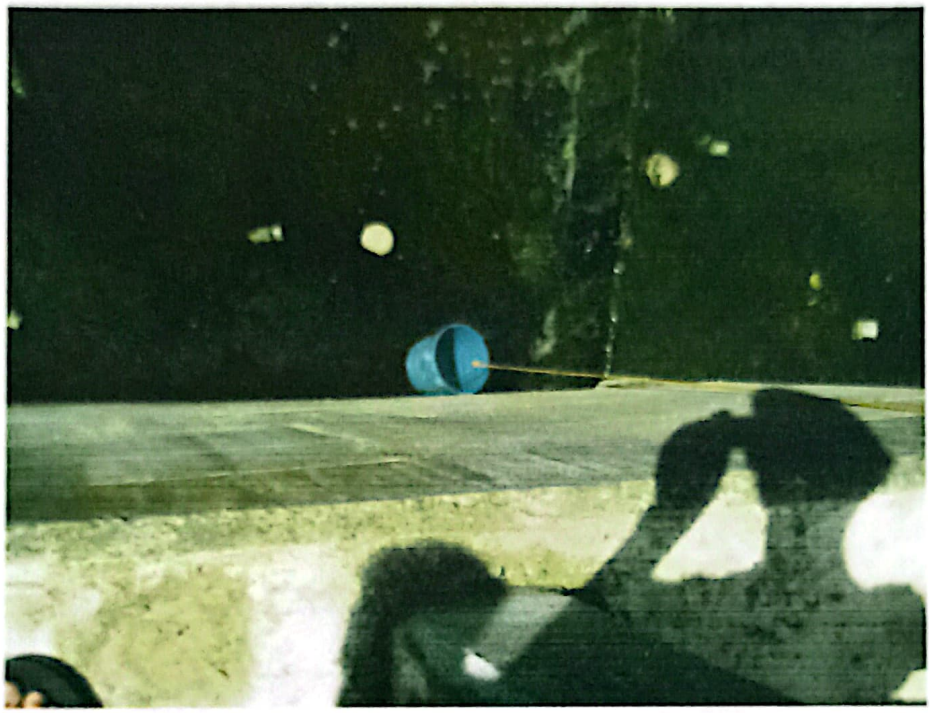

Plate 1. Grab Sampling

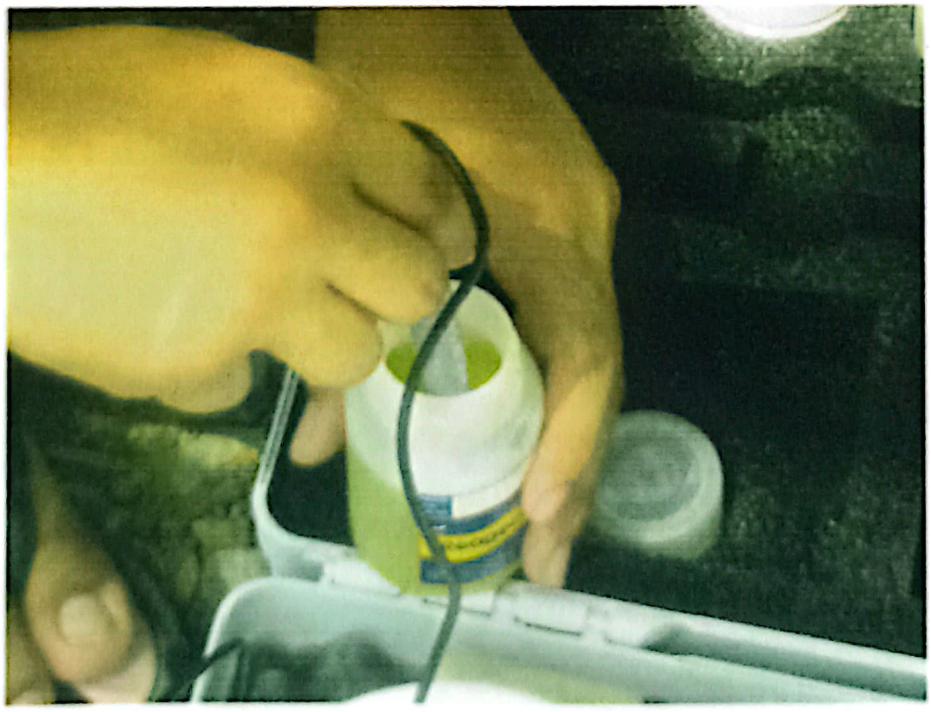

Plate 2. Calibrating the pH meter using 4.0 buffer solution

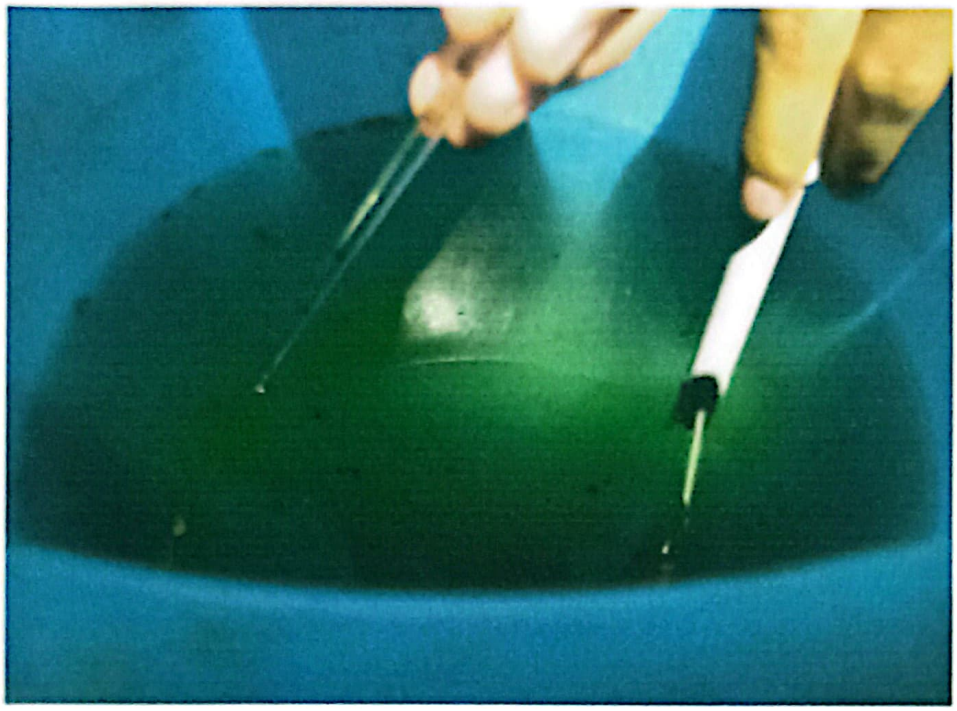

Plate 3. Taking temperature and pH

Plate 4. Sampling for TSS