EVALUATION OF TITIWANGSA LAKE WATER QUALITY FOR AN ALTERNATIVE SOURCES OF WATER SUPPLY

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I hereby declare that I have checked this thesis and in my opinion, this thesis is adequate in terms of scope and quality for the award of the degree of the Bachelor Degree of Civil Engineering.

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Date : 25TH JUNE 2018
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I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

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Thesis submitted in fulfillment of the requirements for the award of the Bachelor Degree in Civil Engineering

Faculty of Civil Engineering and Earth Resources
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ABSTRAK

Tujuan kajian ini adalah untuk menentukan status mutu air semasa Tasik Titiwangsa dan mendapatkan klasifikasi air di tasik berdasarkan Standard Kualiti Air Negara (NWQS) dan Indeks Kualiti Air (WQI). Stesen 1 dan stesen 2 adalah dua stesen yang dipilih untuk tujuan pensampelan. Sejumlah enam belas (16) parameter dianalisis berdasarkan ujian ex-situ (dijalankan di makmal) dan ujian in-situ (dijalankan di tapak uji kaji) di mana sampel diambil pada bulan Februari dan April. Ujian in-situ termasuk suhu, pH, dan oksigen terlarut (DO) sementara ujian ex-situ termasuk jumlah mendakan (TSS), permintaan oksigen kimia (COD), permintaan oksigen biokimia (BOD), ammoniacal nitrogen, nitrate, phosphorus, bakteria, Escherichia Coli (E.coli) dan logam berat seperti Cadmium (Cd), Tembaga (Cu), Zink (Zn) dan Lead (Pb). Berdasarkan analisis dan ujian yang dilakukan, Tasik Titiwangsa telah diklasifikasikan sebagai kelas IIB dimana ianya sesuai untuk aktiviti rekreasi berdasarkan Indeks Kualiti Air (WQI). Walau bagaimanapun, terdapat banyak aktiviti yang sedang dijalankan di sekitar tasik Titiwangsa seperti sukan air (kayak), aktiviti rekreasi (berkelah), pertumbuhan alga di tasik dan kawasan penjajaan makanan di sekitar Tasik Titiwangsa boleh menyumbang kepada pencemaran tasik. Tindakan terbaik harus diambil untuk melindungi tasik dari tercemar akibat kegiatan tersebut.
ABSTRACT

The purposes of the study was to determine the current water quality status of the Titiwangsa Lake and to obtain classification of the water at the lake based on National Water Quality Standard (NWQS) and Water Quality Index (WQI). Station 1 and station 2 were the two station that were selected for the sampling purposes. Total of sixteen (16) parameter were analyzed based on ex-situ test (conduct at the laboratory) and in-situ test (conduct at the sampling site) where the sample were collected on February and April. In-situ test including temperature, pH, turbidity, and dissolved Oxygen (DO) while ex–situ test including Total Suspended Solid (TSS), Chemical Oxygen Demand (COD), Biochemical Oxygen Demand (BOD), Ammoniacal Nitrogen, Nitrate, Phosphorus, Total Coliform Bacteria, Escherichia Coli (E.coli) and Heavy Metal such as Cadmium (Cd), Copper (Cu), Zinc (Zn), and Lead (Pb). Based on the analysis and test that being done, Titiwangsa Lake was classified as Class IIB which is suitable for recreational use and suitable for body contact based on Water Quality Index (WQI) that being calculated. However, there are many activities that being conducted around Titiwangsa Lake such as water sport (kayak), recreational activities (picnic), algae growth in the lake and the food court area around Titiwangsa Lake may contribute to the pollution of the lake. Best action must be taken in order to protect the lake from being polluted due to these activities.
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### LIST OF SYMBOLS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>°C</td>
<td>Celcius</td>
</tr>
<tr>
<td>Cd</td>
<td>Cadmium</td>
</tr>
<tr>
<td>Cu</td>
<td>Copper</td>
</tr>
<tr>
<td>mg/L</td>
<td>milligram per litre</td>
</tr>
<tr>
<td>NTU</td>
<td>Nephelometric Turbidity Unit</td>
</tr>
<tr>
<td>Pb</td>
<td>Plumbum</td>
</tr>
<tr>
<td>Zn</td>
<td>Zinc</td>
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# LIST OF ABBREVIATIONS

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Form</th>
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</thead>
<tbody>
<tr>
<td>BOD</td>
<td>Biochemical Oxygen Demand</td>
</tr>
<tr>
<td>COD</td>
<td>Chemical Oxygen Demand</td>
</tr>
<tr>
<td>DO</td>
<td>Dissolved Oxygen</td>
</tr>
<tr>
<td>DoE</td>
<td>Department of Environment</td>
</tr>
<tr>
<td>TSS</td>
<td>Total Suspended Solid</td>
</tr>
<tr>
<td>NWQS</td>
<td>National Water Quality Standard</td>
</tr>
<tr>
<td>UMP</td>
<td>Universiti Malaysia Pahang</td>
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<td>WQI</td>
<td>Water Quality Index</td>
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</table>
CHAPTER 1

INTRODUCTION

1.1 Background of the Research

Water is an important element to human life and activities associated with industry, agriculture, and others and it is considers as one of the most delicate parts of the environment. Water are covalent bonding connecting two hydrogen atoms and one oxygen atom (Fawaz Al Badaii, 2013). Water can be found everywhere including lake, stream, river, oceans, and also in nature that form as water vapours, fog, and clouds in the sky but the quality of the water differ. In other words it can be state that different places where water can be found may contain different chemical or condition (Khaled S.A Said, 2012).

Lake either contain both fresh and salt water can be found in variable size where it surrounded by land. There are millions of lakes in the world. In Malaysia, we can found two types of lake, an artificial lake and natural lake. Natural lake including Bera Lake and Chini Lake where both of it located in Pahang and in Perak, we have Chenderoh Lake. While artificial lake were Temenggor Lake in Perak, Kenyir Lake in Terengganu, Timah Tasoh Lake in Perlis, Batang Ai Lake / Logan Bunut Lake in Sarawak and Titiwangsa lake located in Kuala Lumpur (Site, 2001-2018). The lakes have different type of purposes such as recreational use, as a home to various type of protected wildlife, as a catchment area, generate the electricity and also attraction places for tourism.

Titiwangsa Lake, one of the famous artificial lake that become the heart of the city centre of Malaysia, Kuala Lumpur. Titiwangsa Lake that places within the Titiwangsa Lake Garden located just beside Jalan Tun Razak and surrounded by the
famous attraction of Kuala Lumpur such as National Art Gallery, National Library and National Theatre or known as Istana Budaya. Back then when Malaysia was under British colony, mining activities were being conduct here before it was being cleaned to construct the scenic Titiwangsa Lake Garden. The total area of the garden was 95 hectares and the lake take about half of the total area of the garden (Titiwangsa Lake Garden, 2012)

![Figure 1.1 Location of the Titiwangsa Lake that located near Jalan Tun Razak](Google Maps, 2017)

Titiwangsa Lake become the main attraction for recreational activities as it were complete with the facilities such as jogging track, cycling track, kayaking, remote control car track and many other outdoor activities including event that usually being hold there such as wedding event. Despite of the activities, we can also get food or drinks around the garden (Sharifudin, 2014)
1.2 Problem Statement

Lake were varies in term of the uses depend on the type of the water and properties. In Malaysia, the lake can be used to generate electricity, water catchment area, source of water supply, home for a protected wildlife, and recreational uses. There are some lakes that were polluted due to the river pollution. As the river was polluted by the chemical that were discharged from the factory, it will flow through the river and this will affect the lake as there are connected to the rivers. In other states, some of them are used in different ways. For example in North America, The Great Lake was being used as a travel route for ship for carrying and trade raw material such as coal and iron ore and also source of food such as grains. Lake also was a permanent home for people called “uros”, an indigenous people that live in Lake Titicacain Andes Mountains. The lake completes with all facilities including food, water supply, and also houses where they build it using reeds (National Geographic, 1996-2018).

The study of the Titiwangsa Lake is conduct to find a solution regarding the shortage of water that happen because of the increase in number of population. According to (Malay Mail Online, 2016), Selangor will experience problem on water supply from 2017 to 2019 because of the delay of construction Langat2 Water Treatment Plant project and also the increase in number of people that migrate to Selangor area due to job opportunities.

1.3 Research Objective

The objective of the research are:

I. To investigate the current status of water quality in the Titiwangsa Lake catchment

II. To compare the water characteristic based on National Water Quality Standard (NWQS) and Water Quality Index (WQI) of Malaysia
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