MIAC

THE STUDY OF EROSION CONTROL

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B. ENG(HONS.) CIVIL ENGINEERING

UNIVERSITI MALAYSIA PAHANG

SUPERVISOR'S DECLARATION

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 Bachelor of Civil Engineering.

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STUDENT'S DECLARATION

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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Date : June 2018

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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

UNIVERSITI MALAYSIA PAHANG

JUNE 2018

ACKNOWLEDGEMENTS

Grateful thoughts and million thanks go to Almighty Allah (S.W.T) for giving me guidance and good health to complete this Final Year Project as a requirement to graduate and acquire a bachelor degree in Civil Engineering from University Malaysia Pahang (UMP). In preparing this project report, it was never an individual report. In meticulous I wish to express my greatest sincere appreciation to my supervisor Pn Wafty Bt Abd Rahman. With all the guidance and advices given from the supervisor this final year project is able to complete on time. Her dedication and continuous assistance have led me to strive for better achievement in this final year project. I am also wish to express my gratitude to my family and friends for their support and assistance at various occasions and I want to thanks to the consultant company Wan Hussein Associated Sdn Bhd for giving me the drawing that help me in this study. I also like to take this opportunity to convey deepest gratitude to the Faculty of Civil Engineering and Earth Resources staffs who had contribute their valuable knowledge towards the success of this project. Last but not least, I also wish to all those who have contributed in any way in making this Final Year Project a possible one.

ABSTRAK

Penukaran status tanah dari hutan kepada pembangunan telah menyebabkan penebangan hutan secara meluas, pengurangan bilangan hutan dan kemusnahan tempat tinggal hidupan liar. Kebanyakan tanah yang dikurangkan bertujuan kepada pembangunan dan antaranya tanah yang subur telah digunakan untuk kawasan perumahan, rekreasi dan perindustrian. Penebangan hutan menyebabkan tanah yang terlindung didedahkan kepada pelbagai bencana alam. Ini disebabkan ketidakupayaan hutan berfungsi sebagai kawasan tadahan hujan. Apabila hujan lebat melanda kawasan, air hujan yang turun ke permukaan dan kemudiannya menghakis tanah ke sungai atau mana-mana longkang yang sedia ada. Insiden ini kebanyakkan berlaku dalam kejadian tanah runtuh. Insiden ini berlaku kerana ketiadaan akar tumbuhan yang bertindak sebagai penyokong terutamanya di tebing atau dataran tinggi. Pada Julai 2017, banjir kilat telah berlaku di Lot 1210, Lapangan Terbang Sultan Abdul Aziz Shah, Subang Selangor Darul Ehsan Malaysia. Kajian ini adalah untuk mengkaji pengangkutan sedimen dan perbandingan saiz reka bentuk kolam takungan sedimen dengan yang sedia ada. Kegagalan reka bentuk boleh menyumbang ke arah banjir kilat.

ABSTRACT

Conversion of land from forests to development has led to widespread deforestation, reducing the number of forests and the diversity of forests and wildlife. Despite the fact that most of the land reduced to development, most fertile land is use for other purposes such as housing, recreation and industrial areas. Deforestation cause protected land to be exposed to various natural disasters. This is due to inability of the forests to function as rain catchment areas. When heavy rains hit an area, the water descended on the surface and then eroded the soil into the river or any existing drain. This incident is mostly prefer in the case of landslides. This incident occurred due to the absence of plant roots that landed mainly on the cliffs or highlands. In July 2017, a flash flood had been observed in Lot 1210, Sultan Abdul Aziz Shah Airport Subang Selangor Darul Ehsan Malaysia. This research is to study the sediment transport and to compare the design size of sediment basin with the existing one. The failure of the design may affect the flash flood prediction.

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LIST OF SYMBOLS

λ, κ, θ and η	Fitting constants dependent on the rain gauge location.
σ_g	geometric standard deviation
τ_o	bottom shear stress
Υ	specific weight of water
Ψ	a coefficient that depends on characteristics of the sediment
ν	kinematic viscosity
%	Percentage

LIST OF ABBREVIATIONS

RIt	The average rainfall intensity (mm/hr) for ARI and duration t
R	Average return interval (years)
t	Duration (minutes)
T	Average recurrence interval – ARI
i	Average rainfall intensity (mm/hr)
d	Storm duration (hours)
D_{84}	84 percentage weight of the sample
D_{16}	16 percentage weight of the sample
D_g	Geometric mean diameter
R	Average return interval (years)
A	Annual soil loss, in tonnes ha-1 year-1
K	Soil erodibility factor
LS	Topographic factor
C	Cover factor
P	Management practice factor
Q_p	Peak discharge in m^3/s
Y	Sediment yield per storm event (tonnes)
t_c	Time of concentration
L	Length of overland flow (ft, m)
S	Average catchment slope (ft/ft, m/m)
n	Manning's Roughness Coefficient
S_o	Energy slope of the channel flow
V	Average velocity (fps)
V_{cr}	Average flow velocity (fps) at incipient motion
MSMA	Urban Strormwater Management Manual For Malaysia
ESCP	Erosion Sediment Control Plans
DID	Department of Irrigation and Drainage Malaysia

CHAPTER 1

INTRODUCTION

1.1 Background of Study

Sediment is grains of minerals, organic matters, or prior rocks which can be moved by water. Sediment can be relates to the erosion and sedimentation process. Erosion is the demonstration in which earth is worn away, frequently by water, wind, or ice. A comparative procedure, weathering, separates or breaks up rocks, debilitating it or transforming it into little pieces. The procedure of erosion moves bits of soil starting with one place then onto the next. Most erosion is performed by water. Sedimentation is the way toward enabling particles in suspension in water to settle out of the suspension under the impact of gravity. The particles that settle out from the suspension progress toward becoming residue, and in water treatment is known as slop. At the point when a thick layer of silt keeps on settling, this is known as solidification. At the point when solidification of sediment, is helped by mechanical means then this is known as thickening (Department of Agriculture, 2007). In construction, there are several things need to be considered after deforestation which is erosion and sedimentation process. These two of processes are important to emphasize because uncontrolled sediment flow can cause a flash flood and landslides. Sediment transport and sediment basin are the method and study of sediment control Sediment control is the procedure whereby the potential for dissolved soil being transported as well as stored past the breaking points of the development site is limited.

Sediment transport can be defined as the movement of sediment by water. If the flow increases, the sediment that had been conveyed also increase. Therefore, the sediment travel should be controlled and stored in sediment basin. Sediment basin is a temporary storage that was installed in construction site after deforestation in order to avoid flash flood happened. The volume of sediment basin was determined by according to the size of catchment area.

The location of study on sediment transport and sediment basin design is at Subang Airport, Selangor. Basically, the design of sediment basin and the effectiveness of sediment transport are included in Erosion Sediment Control Plans (ESCP). The failure of the design may affect the flash flood prediction. The design of the sediment basin and sediment transport may depend on the size of catchment area, longitudinal slope, and the rainfall intensity. The catchment area known as construction sites that developed by government which need ESCP to control the environmental impacts of erosion and sedimentation An Erosion ESCP is a practice or a plan that are commonly used for new development project nowadays. The aims of ESCP are to prevent controllable erosion and to minimise the adverse effects of sediment transport from on-site to off-site areas. Minimum areas applying for the ESCP is approximately 5 hectares and the maximum areas is approximately not more than 50 hectares. In general, an ESCP for a development project serves to provide a clear interpretation of proposed erosion and sediment control measures. The main principle of ESCP preparation is to ensure the erosion and sediment control measures are fully integrated into the development sequence.

1.2 Statement of the problem

Conversion of land from forests to development has led to widespread deforestation, reducing the number of forests and the diversity of forests and wildlife. Despite the fact that most of the land has been reduced to development, most fertile land is used for other purposes such as housing, recreation and industrial areas.

Deforestation cause protected land to be exposed to various natural disasters. This is due to the fact that forests can no longer function as rain catchment areas. When heavy rains hit an area, the water descended on the surface and then eroded the soil into the river. This incident can be seen in the case of landslides. This incident occurred due to the absence of plant roots that landed mainly on the cliffs or highlands. The river will become increasingly shallow as a result of precipitation of the mud base. This situation will cause flash floods more easily to hit.

Flash flood are the natural disaster that caused by heavy rain or low-lying areas where the rain water been flow and stored. In October 2017, a flash flood had been observed in Bangsar, Kuala Lumpur (Figure 1.0). According to the report, it caused by heavy rain, poor drainage efficiency and unavailable sediment basin or detention pond near to the construction site. (BERNAMA, 2017)

Figure 1.1 Flash flood in Bangsar, Kuala Lumpur (BERNAMA, 2017)

Improper design of Erosion Sediment Control Plans will cause some problem to the environment. Floods have some bad effects on all living things that can lead to death. Among the effects of floods are can drown the house, sweep things away, and damage other items such as electrical goods, cars and so on. This brings huge losses to the population. Flash floods may occur if the development areas ignore the ESCP. In Malaysia these guidelines are made available in the Urban Stormwater Management Manual for Malaysia (MSMA).

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