CHAPTER 1

INTRODUCTION

1.1. BACKGROUND

Along with the increasing times and the needs of the community to mobilize, the availability of infrastructure is required to increase. Procurement of increased infrastructure can support the life of an area to be more advanced than before.

Infrastructure development is a real material development. One of the infrastructure developments currently being intensively developed by the government is road construction. Procurement of roads is one form of realizing the equitable and balanced development of a region. It is hoped that with the procurement of these roads, economic activities can be faster and can achieve the desired community welfare.

The Ministry of Public Works of the Republic of Indonesia continues to develop infrastructure, including connecting toll roads with productive areas and growth centers, according to President Joko Widodo's development vision for the next five years (2020-2024). The construction of the Porong-Gempol toll road is divided into 2 work packages, namely packages 3A and 3B. Package 3A work starts at STA 39+250 – 46+650 and package 3B work starts at STA 46+650 – 48+366.

In construction development, especially in road construction, slope slides are often encountered, which mostly occur during the rainy season. This occurs due to an increase in pore water on the slopes which results in a decrease in soil shear strength and internal shear angle. Factors that affect slope stability can produce shear stresses throughout the soil mass, and a movement will occur unless

the shear resistance at each failure surface which may occur is greater than the acting shear stress *(Bowles, 1991).*

In 2014 there was a landslide in package 3B which caused the houses of residents around the project area to be damaged, and the retaining wall shifted ± 2.5 meters. Landslides did not occur on the south side of the embankment, only experienced a forward movement of 10 to 20 cm. Reinforcement in the form of retaining wall (retaining wall) is also cracked, so it can not withstand the occurrence of landslides in package 3B. It is feared that the landslide incident on the package 3B embankment will also occur in the package 3A embankment, considering the height of the embankment in packages 3A and 3B are almost the same, which is about 7 meters and built on an equally soft subgrade. Therefore, it is necessary to analyze the stability of the embankment soil. In addition, a suitable alternative is needed to prevent a landslide in the 3A package.

One of the improvements that can be done is to provide reinforcement so that it can increase the bearing capacity of the soil. To overcome this problem, a synthetic layer that has high resistance to weathering processes has been found which is placed on the subgrade before filling the soil for the road body, which is called geotextile. Geotextile as a breakthrough in soil improvement and reinforcement engineering which is expected to increase the bearing capacity of the soil. Geosynthetics for strengthening subgrade structures that have a soft soil layer such as clay, one of which can be in the form of geotextiles. In general, geotextiles are basic materials made of polymeric materials such as Polyesther (PET) or Polypropylene (PP).

The use of geotextiles is very easy to apply and apply in the field, therefore this method is starting to be often used in civil works because of its affordable price, easy to obtain materials and quite helpful in strengthening the soil, especially in the subgrade or subgrade *(Soegeng, 2018).*

This study analyzes the stability of the embankment/slope using geotextile reinforcement with a computer program, namely *Bentley PLAXIS 2D V20*. The analysis was carried out with the aim of knowing the magnitude of the safe number and the potential landslide area on the soil so that retrofitting efforts can be effective and the toll road sections that have been built can function optimally.

1.2. FORMULATION OF THE PROBLEM

Based on the subject of the location that occurred in the Porong-Gempol Toll Road relocation project, package 3A STA 41+570, the problem formulation was obtained as follows:

1. What is the safe value of the original/unreinforced embankment against sliding using the *Bentley PLAXIS 2D V20* program?
2. What is the ratio of the safe values for the original/unreinforced embankment and geotextile-reinforced embankment 7 m and with variations in embankment height of 2 m, 4 m, and 6 m using the *Bentley PLAXIS 2D V20* program?
3. What is the ratio of the settlement/consolidation value of the original/unreinforced embankment and geotextile reinforced embankment 7 m and with variations in embankment height of 2 m, 4 m, and 6 m using the *Bentley PLAXIS 2D V20* program?

1.3. RESEARCH PURPOSES

In this study, there are several objectives to be achieved, including the following:

1. Analyzing and knowing the safe value of the original/unreinforced embankment soil condition against landslides using the *Bentley PLAXIS 2D V20* program.
2. Analyzing and knowing the comparison of the safe values for the original/unreinforced embankment and geotextile-reinforced embankment 7 m and with variations in embankment height of 2 m, 4 m, and 6 m using the *Bentley PLAXIS 2D V20* program.
3. Analyzing and knowing the comparison of settlement/consolidation values in the original/unreinforced embankment and geotextile reinforced embankment 7 m and with variations in embankment height of 2 m, 4 m, and 6 m using the *Bentley PLAXIS 2D V20* program.

1.4. RESEARCH BENEFITS

The benefit of this research is to provide insight to the reader about the effect of using geotextiles in assisting in soil reinforcement and overcoming problems in the subgrade and increasing soil stability.

1.5. RESEARCH SITES

The research location analyzed in the Porong-Gempol Toll Road Relocation Development Project is in package 3A STA 41+570.

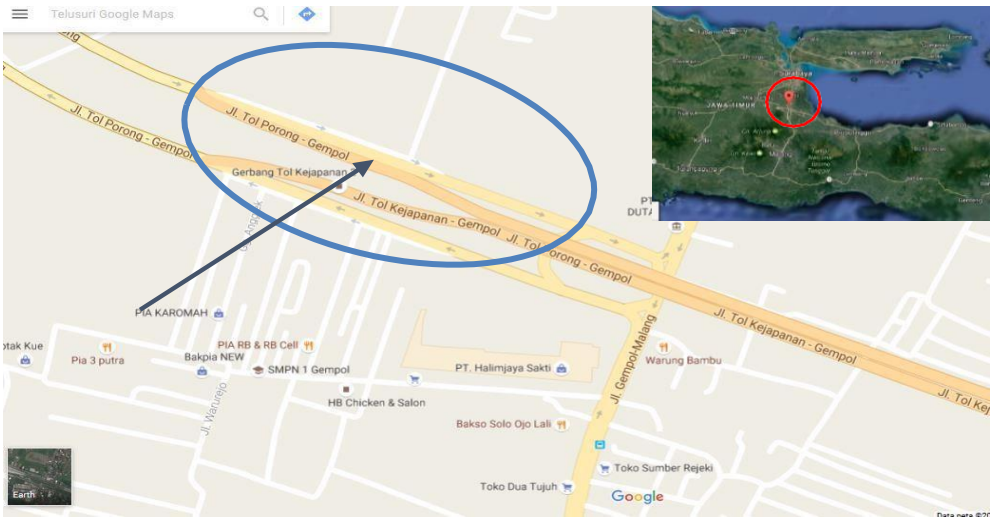

Figure 1.1 Location of the Porong-Gempol Toll Road

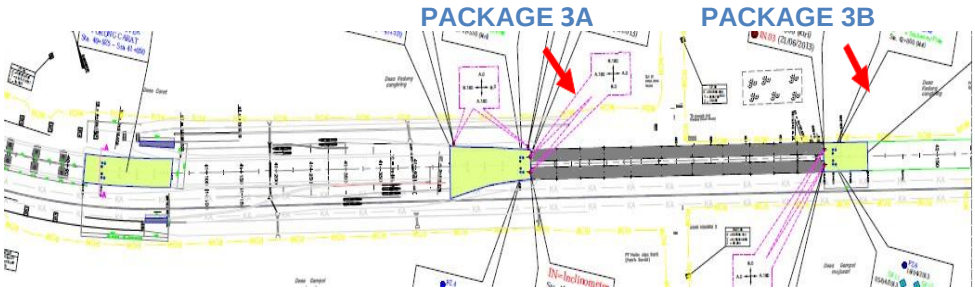

Figure 1.2 Porong-Gempol Toll Road Work Location Packages 3A and 3B

1.6. SCOPE OF PROBLEM

In the preparation of this research, there are problem limitations that are intended to focus research on the following activities:

1. The analysis was carried out using the *Bentley PLAXIS 2D V20* program.
2. Analysis of manual calculations using the *Fellenius Method*.
3. The soil data used is secondary data obtained from the Porong-Gempol Toll Road relocation project package 3A STA 41+570.
4. Only analyze the stability of the embankment and the settlement that occurs.

5. The type of geotextile used is Woven UW-250 with a tensile strength of 52 kN/m from *PT. Teknindo Geosistem Unggul, 2020.*
6. The earthquake load used refers to the earthquake zoning map *(SNI 1726-2019).*
7. The original height of embankment and variation height is 2 m, 4 m, and 6 m.

1.7. WRITING SYSTEM

In writing this thesis with the title **SLOPE STABILITY ANALYSIS USING GEOTEXTILE WITH PLAXIS COMPUTER PROGRAM IN THE RELOCATION DEVELOPMENT PROJECT OF PORONG-GEMPOL TOLL ROAD, PACKAGE 3A STA 41+570** the composition of the writing consists of 5 (five) chapters, each chapter consists of several subjects with systematic writing as follows:

a. **CHAPTER I INTRODUCTION,** explain the research background, problem formulation, research objectives, research benefits, research location, problem boundaries, and writing systematic.

b. **CHAPTER II THEORETICAL BASIS,** about contain similar research is never a good thing from books, journals and electronic information media (internet).

c. **CHAPTER III RESEARCH METHODS,** research methods chapter contains details of data collection methods, type and source data, techniques, data collection, objects, and location research.

d. **CHAPTER IV DATA ANALYSIS AND DISCUSSION,** analysis and discussion section will describe the findings of research that has been done by observing jump and will be discussed solution that will be done in the initial study.

e. **CHAPTER V CONCLUSIONS AND SUGGESTIONS,** conclusions and recommendations section conclusion explain research findings fit focus problem and suggestions applicable

conclusion must every statement is supported by the findings of the analysis, the previous chapters illustrated hearts. Similarly, should suggestions writen by statement analysis, assessment and conclusion.