UNIVERSITAS
GADJAH MADA
Analysis of Matric Suction Value on Slope Stability and The Influence on Soil Collapse Behavior
Aizna Syachkalita, Prof. Ir. T. Faisal Fathani, Ph.D., IPU., ASEAN.Eng.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

TABLE OF CONTENTS

APPROVAL PAGE iii
ENDORSEMENT PAGE iv
STATEMENT PAGE v
PREFACE vi
TABLE OF CONTENTS vii
LIST OF TABLES ix
LIST OF FIGURES x
INTISARI xii
ABSTRACT xiii
CHAPTER 1 INTRODUCTION 1
1.1 General Background 1
1.2 Problem Statement 2
1.3 Objectives 2
1.4 Scope and Limitation 2
1.5 Research Benefits 3
1.6 Thesis Structure 3
CHAPTER 2 LITERATURE REVIEW 5
2.1 Previous Studies 5
2.2 Research Authenticity 10
CHAPTER 3 THEORETICAL BACKGROUND 11
3.1 Slope Movement 11
3.1.1 Fall 11
3.1.2 Topple 11
3.1.3 Slide 11
3.1.4 Lateral spreading 11
3.1.5 Flow 12
3.2 Landslide Triggering Factors 12
3.3 Hydrological Analysis 14
3.4 Rainfall Modeling 15
3.5 Unsaturated Soil Concept 17
3.6 Soil Suction 19
3.7 Soil Matric Suction Test using Filter Paper 21
3.8 Grain Size Distribution Fitting 23
3.9 Soil Water Characteristic Curve (SWCC) Estimation 25
3.10 Soil Water Characteristic Curve (SWCC) Fitting 28
3.11 Hydraulic Conductivity Estimation 29
3.12 Infiltration 30
3.12.1 Infiltration rate value with Green-Ampt equation 32
3.12.2 Continuity 35
3.12.3 Momentum 36
3.13 Ponding time 37

UNIVERSITAS
GADJAH MADA
Analysis of Matric Suction Value on Slope Stability and The Influence on Soil Collapse Behavior
Aizna Syachkalita, Prof. Ir. T. Faisal Fathani, Ph.D., IPU., ASEAN.Eng.
Universitas Gadjah Mada, 2025 | Diunduh dari http://etd.repository.ugm.ac.id/

3.14 Dynamic Analysis 39
3.15 Back Analysis 41
3.16 Slope Stability Analysis 41
3.17 Soil Shear Strength Parameters 43
3.18 Effect of Infiltration on Slope Stability 45
CHAPTER 4 RESEARCH METHODS 47
4.1 Location 47
4.2 Tools and Materials 49
4.2.1 Tools 49
4.2.2 Materials 49
4.3 Research Procedure 49
4.3.1 Literature review 49
4.3.2 Preliminary testing 49
4.3.3 Matric suction test 50
4.3.4 Rainfall data analysis 52
4.3.5 Earthquake data analysis 52
4.3.6 Topographic data processing 53
4.3.7 Slope modelling 53
4.4 Analysis Method 53
CHAPTER 5 RESULTS AND DISCUSSIONS 55
5.1 Result of Research 55
5.1.1 Field observation 55
5.1.2 Slope Profile 55
5.1.3 Soil sampling and testing 58
5.1.4 Matric suction measurement 59
5.1.5 SWCC value prediction 59
5.2 Discussion 63
5.2.1 Matric suction and soil shear strength 63
5.2.2 Matric suction and CBR value 67
5.2.3 Vehicle load 70
5.2.4 Rainfall analysis 72
5.2.5 Numerical simulation 77
5.2.6 Change of pore water pressure 78
5.2.7 Dynamic analysis 79
5.2.8 Stability analysis 81
CHAPTER 6 CONCLUSION AND RECOMMENDATION 85
6.1 Conclusions 85
6.2 Recommendation 85
BIBLIOGRAPHY 86
APPENDIX 94