APPLICATION OF GROUND RESISTIVITY SURVEYING IN SUBSURFACE CHARACTERIZATION

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Degree of Master of Science

Department of Civil Engineering
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Thesis submitted in partial fulfillment of the requirements for the degree of Master of Science in Geotechnical Engineering

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DECLARATION

I declare that this is my own work and this thesis does not incorporate without acknowledgement any material previously submitted for a degree or diploma in any other University or Institute of higher learning and to the best of my knowledge and belief it does not contain any material previously published or written by another person except where the acknowledgement is made in the text. I retain the right to use this content in whole or part in future works (such as articles or books).

Signature: Date:

The above candidate has carried out research for the Masters thesis under my supervision. I confirm that the declaration made above by the student is true and correct.

Name of Supervisor: Professor U.G.A. Puswewala

Signature of the Supervisor: Date:

DEDICATION

I dedicate this research project report to,

My supervisor, Professor U.G.A. Puswewala, Senior Professor, Department of Civil Engineering, University of Moratuwa,

Course Coordinators, Professor L.I.N. Silva and Dr. A.S. Ranathunga and other staff members of the Department of Civil Engineering,

All the students, authorities and researchers who are interested in and who will be benefited from this research findings.

ACKNOWLEDGEMENT

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ABSTRACT

Geophysical methods have become instrumental in ground exploration as these techniques offer non-invasive and efficient means to investigate subsurface conditions without the need for extensive excavation or disruption. Ground electrical resistivity is a geophysical method which can be used for subsurface profiling in addition to borehole investigations. With the recent improvements to the resistivity surveying instruments, 2D and 3D profiling can be done and 2D profiling can be done up to a maximum depth of 100 m. However, lack of reliable correlations with ground resistivity and subsurface properties have been identified as a major drawback for implementing this method in many investigation projects. This study was based on correlating borehole data with ground electrical resistivity. For that, borehole data from several sites were used and ground electrical resistivity surveys were conducted at the same locations in order to get borehole data and resistivity values of the same locations and depths. The results were analyzed by categorizing the data according to rock type. Five major rock types were considered in this study. After the analysis, variation of core recovery, RQD and weathering grade with the variation of ground electrical resistivity have been identified for five major rock types and the results were presented graphically. For Lugeon analysis, reliable results were obtained only for Calc Gneiss. With the graphically presented results, subsurface properties can be predicted if rock type and ground electrical resistivity is known.

Keywords: Ground Electrical Resistivity, Subsurface Characterization, Geotechnical Investigations, Rock Properties

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LIST OF ABBREVIATIONS

Abbreviation	Description
ABEM	Aktiebolaget Elektrisk Malmletning
CR	Core Recovery
ERT	Electrical Resistivity Tomography
GPR	Ground Penetrating Radar
RMS	Root Mean Square
RQD	Rock Quality Designation
SPT	Standard Penetration Test

LIST OF APPENDICES