

**EVALUATING THE PERFORMANCE OF  
SUBSURFACE HORIZONTAL FLOW CONSTRUCTED  
WETLAND FOR TERTIARY TREATMENT OF  
SANITARY LANDFILL LEACHATE**

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Degree of Master of Science

Department of Civil Engineering

University of Moratuwa

Sri Lanka

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A dissertation submitted in partial fulfillment of the requirements for the degree  
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## **DECLARATION OF CANDIDATE AND THE SUPERVISOR**

I declare that this is my own work and this dissertation 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.

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Name of the supervisor: Professor M. W. Jayaweera

Professor in Environmental Engineering

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Signature of the supervisor:

Date:

## Abstract

The difficulty in detecting and quantifying the typical composition characteristics of landfill leachate, limit successful treatment of it. High quality effluent that can be discharged to surface waters could be achieved by using the two stage leachate treatment systems with a constructed wetland at the final stage. This pilot scale study was conducted with the aim of evaluating the tertiary treatment of pre-treated leachate obtained from Sanitary Landfill located at Dompe, by a subsurface horizontal flow constructed wetland comprising *Phragmites karka* and Calicut tiles as substrate. The removal efficiency of BOD<sub>5</sub>, COD, TSS, NO<sub>3</sub><sup>-</sup>-N and PO<sub>4</sub><sup>3-</sup>-P was evaluated. The study period was from June to August 2017. Sixty liters of diluted pre-treated leachate (i.e. Containing 80% of the pre-treated leachate by volume) was fed per day with a hydraulic retention time of 1 day. Concentration based average removal efficiency of the system was 63% for BOD<sub>5</sub>, 62% for COD, 96% for TSS, 49.11% for NO<sub>3</sub><sup>-</sup>-N and 85.28% for PO<sub>4</sub><sup>3-</sup>-P. Long term research is necessary to examine the effects of continuous feeding and shock loadings on the growth response of *Phragmites karka*.

Key words: Horizontal Subsurface Flow, *Phragmites karka*, Removal Efficiency

## ACKNOWLEDGEMENTS

I would like to express my sincere gratitude for my supervisor Professor M. W. Jayaweera, Professor in Environmental Engineering, Department of Civil Engineering, University of Moratuwa for his kind support, valuable guidance and constant encouragement in carrying out this research.

I would like to extend my thanks to Eng. J. M. U. Indrarathna, Deputy Director General (Waste Management) of the Central Environmental Authority for giving me permission to conducting this research at the Sanitary landfill, Dompe, to the staff of landfill for their cooperation in the construction of the experimental setup and carrying out this research on the site and to the laboratory staff of the Central Environmental Authority for supporting me in laboratory analysis. I would like to acknowledge the Research and Development unit of the Central Environmental Authority for providing partial fund for this study.

Also, I am thankful to Professor M. I. M. Mowjood, Professor in Bio Engineering, University of Peradeniya and Mr. N. S. Gamage, Director, Uva Provincial Office for their valuable guidance in carrying out this research. I am grateful to Ms. Madurangi Perera for supporting me throughout the study related to the design. I thank my family members, friends and colleagues who helped me in many ways to fulfill this task successfully.

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## LIST OF ABBREVIATIONS

Abbreviation	Description
BOD	Biochemical Oxygen Demand
COD	Chemical Oxygen Demand
DO	Dissolved Oxygen
FWS	Free Water Surface System
HF	Horizontal Flow
HRT	Hydraulic Retention Time
HSSF	Horizontal Sub-Surface Flow constructed wetland
NH <sub>4</sub> -N	Ammoniacal Nitrogen
NO <sub>2</sub> -N	Nitrite as Nitrogen
NO <sub>3</sub> -N	Nitrate as Nitrogen
P	Phosphorus
PO <sub>4</sub> -P	Phosphate as phosphorus
SSFS	Subsurface Flow System
TDS	Total Dissolved Solids
TKN	Total Kjeldal Nitrogen
TP	Total phosphorus
TS	Total Solids
TSS	Total Suspended Solids
VF	Vertical Flow
VSF	Vertical Subsurface Flow

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