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

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A dissertation submitted in partial fulfillment of the requirements for the degree Master of Science in Environmental Management

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DECLARATION OF CANDIDATE AND THE SUPERVISOR

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Name of the supervisor: Professor M. W. Jayaweera

Professor in Environmental Engineering

Department of Civil Engineering

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_5, COD, TSS, NO_3^--N and PO_4^{3-}-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_5, 62% for COD, 96% for TSS, 49.11% for NO_3^--N and 85.28% for PO_4^{3-}-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

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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_4-N	Ammoniacal Nitrogen
NO_2-N	Nitrite as Nitrogen
NO_3-N	Nitrate as Nitrogen
P	Phosphorus
PO_4-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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