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CERTIFICATE

This is to certify that the research work embodied in this dissertation entitled "**Simulation of Contaminant Transport from Landfill Site: A Case Study of Okhla Landfill**" has been carried out in the Department of Environmental Engineering, Delhi Technological University, New Delhi. This work is original and has not been submitted in part or full for any other degree or diploma to any university or institute. The work is approved for submission.

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Date: .07.2014

Place: Delhi

Dedicated

To

My Mentor and Parents

Acknowledgement

As I write this acknowledgment, I must clarify that this not just a formal acknowledgment but also a sincere note of thanks and regard from my side. I feel a deep sense of gratitude and affection for those who were associated with the project and without whose co-operation and guidance this project could not have been conducted properly.

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Archana Chawla

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Nomenclature

MSW	Municipal solid waste
n	Effective porosity
v_a	Advective Velocity
c	Concentration of contaminant at particular point and time
A	Area of landfill
D_e	Effective molecular diffusion
D_{md}	Mechanical dispersion or dispersion coefficient
D_h	Hydrodynamic dispersion coefficient
τ	Tortuosity
α	Longitudinal Dispersivity
f_a	Advective mass flux
f_d	Diffusion flux
f_{md}	Dispersion flux
S	Mass of contaminant absorbed by liner
R	Retardation coefficient
ρ_d	Dry density
K_d	Permeability
R_f	Retardation coefficient for freundlich isotherm or Retardation factor

Abstract

India is the second fastest growing economy and the second most polluted country in the world. Delhi, capital of India, generates approximately 7,000 metric tons of MSW daily. At present, there are three landfill site in Delhi – Bhalsawa, Gazipur, and Okhla. All the three are unlined and fall under the category of uncontrolled solid waste disposal facility. The leachate generated mostly percolated down the ground surface and the excess quantity gets collected in some low lying areas and sometimes gets mixed up with sewer and drainage systems thereby polluting groundwater and surface water sources. To protect the groundwater from contamination, it is quite essential to provide the bottom barrier of suitable thickness.

The present study was undertaken to determine the rate of movement of potential contaminants from the bottom of the landfill, to achieve this mathematical model was formulated to express the mass transport of contaminants from a landfill due to the migration of leachate. Various mechanism of contaminants migration from the bottom of landfill was taken into account. The solution of model in the form of concentration profile of potential contaminants below landfill was obtained using the explicit Finite Difference Method (with upwind correction) implemented in MatLab 7.0. Model developed in this study was validated for two parameters of field data estimated by T.L.T. Zhan et al. 2014 were used for an uncontrolled landfill at Huainan, China.

Landfills are an indispensable part of everyday living, they may pose a long-term threats to groundwater as well as surface waters that are hydrologically connected. In the recent decades, groundwater resources have become increasingly threatened by the leaching of contaminant from uncontrolled landfills, containing industrial and household waste. The present study was conducted at Okhla landfill site having high concentration of chloride, iron and some heavy metals. The impact of this concentration to the underlying groundwater over the period of time is determined by sampling and analysis of leachate and groundwater from nearby locations. This concentration was found to be in a consonance with the simulated concentration with chloride in ground water considering one dimensional transport model.

Analysis of model results was carried out to determine the impact of model parameters i.e. time period of simulation, equivalent height of leachate, depth on the transport of contaminant from Okhla landfill. The observed concentration is simulated with the concentration of chloride at 120 m radial distance from Okhla landfill site.