

QUARTERLY PROGRESS REPORT

August 31, 2014 to December 3, 2014

PROJECT TITLE: Assessing Options for On-site Leachate and Groundwater Management Strategies at Florida Landfills

PRINCIPAL INVESTIGATOR(S): Timothy G. Townsend

AFFILIATION: Professor, University of Florida
Department of Environmental Engineering Sciences

CO-PRINCIPAL INVESTIGATOR(S): Daniel E. Meeroff

AFFILIATION: Associate Professor, Florida Atlantic University
Department of Civil, Environmental and Geomatics Engineering

COMPLETION DATE: November 30, 2014

PHONE NUMBER: (352) 392-0846

PROJECT WEB SITE: <http://pages.ees.ufl.edu/townsend/research/hc13/>

Work accomplished during this reporting period:

Leachate Database

Roya has obtained most of the leachate quality data that is missing from the leachate database. Most of the data received from the landfills have been in a PDF format. The files must be converted to an excel format in order to be added to the database. This means that all the data must be manually entered into an excel sheet. So Roya, with some undergraduate help, has been getting this done. Also some preliminary data analysis was done using the leachate database for the TAG meeting that occurred in October.

Leachate Treatment Tool

Jim developed models for estimating the treatment burden of leachate on different treatment processes. This has been used to conduct an LCA analysis of three leachate treatment methods, which will be incorporated into the treatment-decision making tool. Jim is developing the final cost-estimation tools for the treatment guidance tool for the project.

Design options for sub-liner vadose zone air venting

Jaeshik has been working on the design options for sub-liner vadose zone air venting to prevent reducing condition under the landfill. Considering the oxygen utilization rate for loamy sand with ca. 1.64% of water contents was found to be 2.5×10^{-3} mg O₂/g soil/day (Neale et al., 2000), 3D numerical simulations of long-term behavior of air flow in vadose zone was tested using TOUGH2, which is a numerical flow simulator that enables multi-phase (gas and liquid) flow simulation. Based on the conditions provided in the previous study (alternating condition of blower and suction pipes with 20 m of spacing), steady-state TOUGH2 simulation results confirmed that the vadose zone was maintained with fairly high amount of gas saturation (ca.

0.2) up to 5 m depth and the venting system is expected to be effective to prevent the reducing conditions in subsurface.

Work planned for the next reporting period:

Leachate Database

The data for the leachate database will all be in excel format and then added to the master leachate database. Then a comparative leachate profile for the different types of landfills will be conducted using the leachate database. This will be included in the final report, which will begin being written this reporting period.

Leachate Treatment Tool

The cost-estimated tool for treatment guidance will be completed this reporting period.

Design options for sub-liner vadose zone air venting

Consideration of different O₂ consumption rates by different soil types (e.g., silt, sand, or loam) and head losses along the pipes will be included in the calculation of the required air injection rate and the effect of air injection/suction on the groundwater flow will be evaluated using multi-phase simulation equipped with TOUGH2. Finally, simulation results will be compared to the literatures (air-sparging, pumping data) to validate the model.

Metrics:

Name	Rank	Department	Professor	Institution
Chung, Jae Shik	PhD student	Environmental Engineering	Townsend	University of Florida
Darioosh, Roya	ME student	Environmental Engineering	Townsend	University of Florida
Wally, James	ME student	Environmental Engineering	Townsend	University of Florida