All modern day landfills contain a series of perforated pipes installed beneath the waste whose purpose is to collect all liquid which drains through the cell. This system is called the leachate collection system and its primary purpose is to drain any liquid toward a central location where it is pumped and then treated, discharged, or recirculated. It has been discovered that certain landfills see a buildup of precipitates within the system which leads to clogged pipes and buildup of leachate head on top of the landfill. The formation of the precipitates is linked to the chemical and biological make-up of the leachate generated within the landfill.

In order to better understand this clogging process and thus be able to prevent it in future landfills, the chemical and biological characteristics of leachate as well as landfill design must be examined. It is now known that ash content within the waste will lead to greater clogging. This is due to the fact that ash contributes greater amounts of the calcium necessary for biofilm to grow within the drainage media. While one solution to this problem is the monofilling of ash residue in separate landfills, many operators still choose to combine MSW and ash. Since no law exists prohibiting the later it is the goal of this research to design a model which may be used by landfill operators to foresee clogging potential of their landfill and thus prevent it.

The main objective of this study is to use a “film growth approach” to simulate clogging in Florida landfills. The change of hydraulic properties and porosities of leachate drainage materials due to calcium carbonate buildup will be predicted using Florida specific leachate composition data and leachate generation data for typical landfills operated in different micro-climates of the state. The results of this investigation will be used to examine the adequacy of the current design methodology of leachate collection systems in the state of Florida. The findings of this study will then be used to estimate the service life of LCSs in different regions of the state.
The study was conducted in four stages. The first stage consisted of a literature review of previous laboratory and field tests of LCSs. It also took into account all available FDEP databases of leachate quality and quantity. The second stage aimed at modeling calcium carbonate growth within an LCS based on results obtained in the first stage. The third stage consisted of an analysis of LCS clogging results as applied to model landfills which represented typical landfills throughout the state of Florida. The performance of these model landfills and LCSs was evaluated to see what kinds of changes are noticeable in the leachate quality and quantity over the lifetime of the landfill. Clogging of drainage media was the main focus of this stage because this clogging is the biggest contributor to LCS failure. Finally the adequacy of design of LCSs in model landfills was examined and adjusted as needed based on results obtained in stages 1-3. It was also possible to estimate the service life of existing and future LCSs to make sure that no leachate ever escapes the landfill and contaminates the groundwater.