Abstract

Constructed Wetlands (CW) are systems designed to imitate and enhance naturally occurring mechanisms such as microbial degradation, nutrient uptake via vegetation, adsorption via soil in an effort to treat wastewater. This thesis proposes the design of a hybrid system using both horizontal flow free water surface (FWS) and vertical flow subsurface (SSF) CWs to reduce concentrations of total solids and organic matter in wastewater from Oakwood Beach Wastewater Treatment Plant, located in Staten Island, New York, to an acceptable level for discharge into an intermittent stream just northwest of the treatment facility. The proposal is based on a qualitative study of regional climate, local ecology and geology, available area and typical wastewater quality. The design is comprised of a three zone CW system operating in series starting with a densely vegetated horizontal flow FWS, followed by an open space vertical flow SSF and finally a third zone of densely vegetated horizontal flow FWS with detention times of 10, 6, and 4 days, respectively.

This study concludes that proposed hybrid CW system has the potential to achieve an average of 80% BOD removal and 99% TSS removal annually. Warmer months (May through October) achieve an average of 95% BOD removal per month while the coldest months (November through April) do not meet the desired effluent quality of 30 mg/L of BOD. Desired TSS removal is easily achieved throughout the year. Integrating this system as part of the Oakwood Beach Wastewater Treatment facility would help in diverting approximately 3 million gallons of water on average per year.