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Evaluation of an Anaerobically Enhanced Bioretention Cell's Treatment of Highway Runoff

This work investigated the effectiveness of an anaerobically enhanced bioretention cell (BRC) for the treatment of highway runoff. The enhanced bioretention cell was design to capture the first half inch of runoff from the impervious surface of a highway intersection. The enhanced cell design included a bottom layer not traditionally found in bioretention systems whereby the process of denitrification could occur. Highway runoff and BRC discharge data were monitored and sampled for both water quantity and quality parameters. Common pollutants such as zinc, copper, nitrate, phosphate, oil, grease, and total petroleum hydrocarbons (TPH) were analyzed. Samples were also drawn from the anoxic layer of the bioretention cell to determine the occurrence of denitrification. Analysis of data showed that zinc removal efficiency was similar to that of previous BRC research at 95%. Copper removal was unexpectedly low at 35%. Phosphate removal was moderate and erratic averaging 40%. Nitrate removal was much higher than previous BRCs at 59%. Results indicated that denitrification was occurring in the anoxic zone. Oil, grease and total petroleum hydrocarbon results were erratic and often below the detection limit. Results showed a significant reduction in peak runoff discharge at an average of 75%. Findings indicated that, overall, the anaerobically enhanced bioretention cell was an effective quantity and quality best management practice for stormwater runoff management. Results also showed that the anaerobically enhanced BRC design greatly improved the poor nitrate removal problem of conventional BRCs.

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