The Influence of Erosion Control Criteria on Stormwater Management Facility Design

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Urban development of greenfield lands is generally recognized to increase both the runoff volume and peak flow compared to the pre-developed condition. Urbanization is also recognized to reduce the infiltration potential, thereby generating surface runoff during relatively minor storm events which would typically infiltrate into the soil. If unmitigated, these increases in volume, peak, and frequency of surface runoff may increase the erosion potential within the receiving watercourse systems, compromising the stability of the watercourse and impacting aquatic habitat.

To mitigate the increased erosion potential within the receiving watercourses, current standards and practices for providing stormwater management for urban development typically include providing detention storage within end of pipe facilities (such as wet ponds or wetlands), with prolonged drawdown times (i.e. 24 hours or more), but are also recognized to include Low Impact Development Best Management Practices (LID BMPs) which promote groundwater recharge and work toward maintaining the pre-development water budget. These design criteria for the stormwater management approach (end-of-pipe facilities and LID BMPs) are often established as part of Subwatershed Studies, to afford a holistic evaluation of cumulative hydrologic impacts from development, and to define the stormwater management facility storage volume and discharge rates required to mitigate the erosion impacts and the quantum of required LID BMP storage. This requires detailed field investigations by stream morphologists to quantify the erosion threshold of receiving streams, combined with hydrologic analyses to assess the threshold exceedance. Various approaches are available to practitioners to establish benchmarks for evaluating erosion potential, as well as to assess the effectiveness of stormwater management practices in mitigating impacts, however no clear or consistent guidance is currently available within the industry to define the appropriate methodology for a given setting. This paper provides an overview of the various methodologies with specific reference to case studies, as well as the impacts to the stormwater management design criteria with the intent to further discuss the merits of each.