INLET PROTECTION INSTALLATION IMPROVEMENTS USING LARGE SCALE TESTING TECHNIQUES

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INLET PROTECTION

Previously it was a key component of a Stormwater Pollution Prevention Plan, as unprotected inlets become a point source for contaminants and sediments to be released into the stormwater conveyance system. Inlet protection can act as a "last chance" defense against discharging eroded sediments into receiving waterways from construction sites, it is generally more cost efficient to prevent pollution from entering waterways and a strong, effective, inlet protection plan will minimize sediment deposition into aquatic ecosystems by controlling the direct input source. Inlet protection is intended to reduce sediment discharge and typically consists of a sediment filter installed around a storm drain drop inlets or curbs inlets. This approach prevents sediments from entering drainage systems during construction and pre-stabilization phases.

WATER INTRODUCTION

Water intake rates for testing were designed to mimic the expected in situ conditions for roadway median storm drain inlets. Runoff emanating from the Alabama average 25-24h storm 44.8 in was selected to meet the efficient discharge requirements of the EPA Construction General Permit. The 25-24h method was applied basis representative of typical ALDOT roadway median cross-sections with a state-wide average hydrologic curve number for developing urban areas (88.5). The 9fi peak of the resulting runoff hydrograph was used to derive a testing flow rate of 1.25 ft³/min.

DATA COLLECTION & ANALYSIS

The data collection and analysis were conducted using a robotic total station. Erosion and deposition volumes are quantified using GIS tools. Plotting depths and flow through rates are recorded to evaluate the impoundment capabilities and dewathering rate of practices. • Grab samples are taken during sediment laden tests both up and downstream of the inlet protection and analyzed for Total Suspended Solids (TSS) and Turbidity analyses.

IMPROVED PRACTICE - SILT FENCE / FABRIC BARRIERS

The test standard practices with a 3/4-in high wire backed 3.5-in slit fence with a 6x4-in trench along the toe of the fence. T-posts were driven 24-in, into the ground at the four corners of the installation. Flow overtopped the installation 2.5 mins into testing as a result of the imposed hydrostatic pressure. Improvements were made through Phase 1 procedures to develop the MIFE. The improved installation provided 150% starting at 30v-in. spacing along with 2.4x4-in, lumber lateral and cross bracing to provide a stable frame for the slit fence barrier. To combat long dewathering times, a dewathering mechanism was developed to allow the barrier to efficiently drain without impounding large volumes of water for an extended period time. Complete dewathering of the improved installation took 90 mins.

IMPROVED PRACTICE - AGGREGATE BARRIERS

Aggregate barrier is the standard stage using the evaluation of ALDOT standard installation. The standard install calls for barrier of #4 stone placed around a 2x4-in, lumber frame. The installation provided minimal impoundment due to the high flow through rate and low barrier height. Improvement testing focused on providing a more impervious barrier with greater height.

TESTING REGIME

The developed MIFE a wrapped block and gravel barrier. The installation consists of standard Masonry block stacked two rows high. The blocks are wrapped in 8 ft filter fabric and backfilled with #4 aggregate. Dewathering was provided by turning a block on its side, and restricting the open space to a 2x4-in. visit. This improvement provided full impoundment and a controlled dewathering rate.

RESEARCH OBJECTIVES

• Establish testing protocols and thresholds for future product approval
• Provide training for designers, installers, and inspectors

SEDIMENT INTRODUCTION

The Modified Universal Soil Loss Equation (MUSLE) was used to model the expected soil erosion values from the design storm event and 1-acre roadway median drainage basin. MUSLE given by the equation below estimates sediment yields based on individual storm events:

\[ S = \frac{R \cdot (p + \frac{K}{L} \cdot S \cdot P \cdot \frac{A_y}{\rho} \cdot E_{stabilization})}{1000} \]

Where:
- \( S \) = sediment yield (ton/yr)
- \( R \) = Soil losses number, 25
- \( p \) = rainfall intensity (mm/hr)
- \( \frac{K}{L} \) = sediment yield factor (ton/m³-mm)
- \( S \) = stream channel slope
- \( P \) = event peak discharge (R²/m³)
- \( A_y \) = event duration (hr)
- \( E_{stabilization} \) = Universal Transportation

The sediment yield prescribed for testing results to 1.402 lbs. or 46.7 lb/min

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