Memorandum - March 28, 2025

To: NCTCOG – iSWM Implementation Subcommittee

From: Baird, Hampton, and Brown

Date: March 28, 2025

Subject: Sedimentation Basin Guidance Overview

Introduction:

The purpose of this memorandum is to assess the Sedimentation Basin guidance within the Integrated Stormwater Management (iSWM) 2020 Construction Controls Technical Manual and provide technical guidance to improve the document. This memorandum is not intended to provide an updated Technical Manual, but only to provide recommendations.

Technical Data:

The Technical Manual is not clear whether the 100-year storm should still be detained during construction or not while the sedimentation basin is active. If the project is prolonged during construction and a low frequency storm occurs, there is a potential for unmitigated runoff impacts to the downstream properties. Page CC-122 of the Technical Manual does list the adverse impact of lower frequency storms as a disadvantage but does not provide direction forward. Incorporating recommendations in the sediment basin design portion of the Technical Manual on how to detain runoff would provide clarity to contractors, engineers, and municipalities on this issue. Our recommendation would be to incorporate provision in the sediment basin design criteria to control storm overflows.

The Technical Manual, Section 3.9.3, Outlet and Spillway, page CC-125, does give general direction regarding outfall types, configurations, and some minimal design procedures. The full design procedure, for sedimentation basin outlets, is given in the Hydraulics Technical Manual in Section 2.2. However, in Section 2.2.2 the equation given for the perforated riser pipe is for a single scenario out of three possible scenarios. All three scenarios are given in the original research paper, *1988 McEnroe – Hydraulics of Perforated Riser Inlets for Underground Outlet Terraces* (McEnroe, 1988). Equation 6, below, is provided in the Hydraulics Technical Manual, Section 2.2.2, which is used when the water surface elevation in the pond generally remains within the limits of the perforations and has no tailwater within the limits of the perforations, as this is the most likely situation. Equation 8 is used when the water surface elevation is above the limits of perforations and equation 10 is used when the tailwater extends above the limits of the perforations. Including all three equations (see equations below) and their supporting documentation in the hydraulics manual would allow the full use of design of the perforated riser pipe.

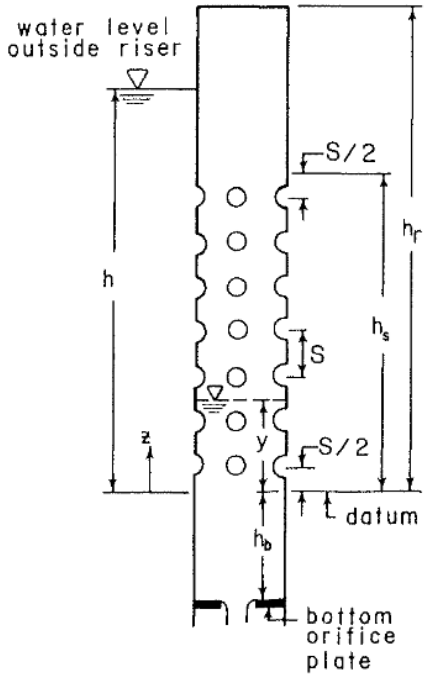

Fig. 1—Definition sketch.

Equation 6
Where $h<h_s$ and $y<0$

$$Q = \left(\frac{2}{3}\right)\left(\frac{C_s A_s}{h_s}\right)\sqrt{2g}\sqrt[3]{h}$$

Equation 8
Where $h_s<h>h_r$ and $y>0$

$$Q = \left(\frac{2}{3}\right)\left(\frac{C_s A_s}{h_s}\right)\sqrt{2g}\left(\sqrt[3]{h} - \sqrt[3]{h-h_s}\right)$$

Equation 10
Where $y>h_s$

$$Q = (C_s A_s)\sqrt{2g(h-y)}$$

(McEnroe, 1988)

Theory:

The prescribed approach to determining the pond volume peak inflow is either by the unit hydrograph or rational method - whichever method is appropriate given the project site parameters. The design of the temporary outlet in a sediment basin is typically designed using the peak flow from a triangular hydrograph. NCTCOG should consider revising their guidance to advise the use of consistent design methods. That being, if the hydrology utilizes the Unit Hydrograph method, then the outlet design method should also be through the same Unit Hydrograph software. Also, if the Rational Method/Modified Rational Method is used for hydrology, the outlet equations used should reflect the same.

The Technical Manual gives direction on the stabilization of the outlet pipe, using riprap or other materials, but no direction is given for the stabilization of a riser pipe or other non-permanent inlet structures. NCTCOG should give direction on a temporary foundation/base for the riser inlet structure, to provide stability either through structural methods of rigid installations or reinforcement being provided through gravity mass systems such as open graded aggregate embedment.

Application:

The Technical Manual does not give directions on when the temporary basin should be installed and when the basin should be removed. NCTCOG should add language that states the temporary sedimentation basin and outfall control structure should be one of the first things constructed, typically at the outset of earthmoving activities. It is recommended that the temporary sedimentation basin be removed after construction is finalized, necessary permanent erosion control is in place, and final site stabilization has occurred.

Specifications:

The Technical Manual notes in Section 3.9.4 that no specifications for construction of temporary sediment basins are currently available in the Technical Manual or in the North Central Texas Council of Governments (NCTCOG) Standard Specifications for Public Works Construction. NCTCOG should consider adding construction specifications on the commonly used inlets such as riser structures, perforated risers, skimmers, and weir outlets, by reference to the existing published specifications for permanent infrastructure installations.

Additional recommendations for improvements to the sediment basin guidance in iSWM Technical Manuals can be found in the recording of the “Multiple Perspectives on iSWM” workshop given on March 3rd, 2025. This will soon be available to view on the iSWM website.

References

McEnroe, B. M. (1988). Hydraulics of Perforated Riser Inlets for Underground-Outlet Terraces. *American Society of Agriculture Engineers*, 1082-1085.