708 – Sediment Traps & Basins

708.06 Basin Baffles (Porous & Nonporous)

Definition:

Basin baffles are barriers of porous and nonporous materials installed within the pooling areas of Temporary Sediment Traps (708.01) or Temporary Sediment Basins (708.02) to enhance sediment deposition.

Note: The word "basin" in this practice referrers to the pooling areas for both temporary sediment traps (708.01) or temporary sediment basins (708.02).

Exhibit 708.06-A. A permanent stormwater basin adapted to be function temporarily as a sediment basin using porous baffles and a floating outlet attached to the permanent stormwater basin riser.
Source: Richard A. McLaughlin, NC State University

Purpose:

Temporary sediment traps and basins are designed to temporarily pool run-off water to allow sediment to settle before the water is discharged. Unfortunately, they are can be not very efficient due to high turbulence and "short-circuiting" flows which take run-off quickly to the outlet with little interaction with most of the basin. Baffles can be implemented to overcome deficiencies associated with basin shape and inflow location characteristics and improve the basin's sediment trapping efficiency by increasing the residency time for sediment to settle out.

Specifications:

General Planning Considerations:

- Sediment basin pooling area depths need to be shallow enough to allow the type of baffle planned to be implemented.

- Whatever baffle type selected the locating of baffles within the basin should not interfere with the function of the basin dewatering device. Floating Outlet (708.03) booms and inlet heads should not touch become entangled with baffle practices.

- Baffles concentrate sediment deposition near inflow areas therefore access is needed for sediment removal.
- Where practical baffles should function to the height of the emergency spillway elevation.
- Where projects are expected to have extended duration and baffles are expected to function during harsh winter conditions, designer should consider appropriate materials and installation to prevent practice failure.

There are two types of baffles nonporous and porous. Nonporous baffles typically increase the travel time by lengthening the pathway through the basin pooling area whereas porous baffles typically reduce the velocity and turbulence of flows through the basin.

Nonporous Baffles

Use nonporous baffles to correct basin length to width ratio flow path deficiencies and/or to improve the efficiency of the basin and deposition of sediment (refer to Exhibits708.06-G and H).

Planning Considerations:

- Evaluate the use of Temporary Diversions (703.01) to direct surface flows into the basin as far away from the outlet as possible and therefore possibly eliminate or minimizing the need for a baffle system within the basin.
- To minimize the use or length of baffles combine inflows from various areas into a single inflow point.

Implementation Criteria:

- Height: Baffles should be as tall as the emergency spillway elevation when used in Sediment Basins (708.02) and when used in Sediment Traps (708.01) as tall as the trap spillway crest.
- Length: Determined by the basin design requirements to achieve the required length to width ratio.
- Durability: Baffles shall be designed and made of sufficiently durable materials to last for the anticipated life of the basin. Replacement and repairs will likely be difficult to accomplish due to wet sediment conditions.

Potential Materials:

Material selection for the baffles could complement and function as a feature of a permanent stormwater quality basin. Nonporous baffles can be formed from a variety of solid nonporous or slowly porous materials such as but not limited to the following: plywood panels, geotextile curtains, aggregate berms, or Floating Turbidity Curtains (712.05).

Porous Baffles

Porous baffles are installed to aid in the slowing and dispersion of basin flow across the entire width of the basin to promote sedimentation.

Planning Considerations:

- If in the planning process additional water quality practices are identified to protect downstream water resources, then porous baffles are a measure that can substantially improve the sediment capture of basins.
- Porous baffles do not correct deficiencies in the length to width ratio.
- Implementation of porous baffles are limited by the pool depth and the material selection.
- Locate porous baffles in the basin pooling area between the inflow point(s) and the basin outlet.

Implementation Criteria:

- Height: Baffles should be as tall as the emergency spillway elevation when used in Sediment Basins (708.02) and when used in Sediment Traps (708.01) as tall as the trap spillway crest.
- Durability: Baffles shall be designed and made of sufficiently durable materials to last for the anticipated life of the basin. Replacement and repairs will likely be difficult to accomplish due to wet sediment conditions.
- Location: The baffles are located between the inflow and the outlet.
- Width: Where possible the width of each baffle shall be equal to the entire width of the sediment basin extending up the slope to the height of the emergency spillway elevation (refer to Exhibit 708.06-I).
- Spacing (refer to Exhibit 708.06-I): The minimum spacing between baffles should be 10 feet where possible. Divide the basin into quarters to accommodate 3 rows of baffles where possible. The last row of baffles shall not impair or interfere with the basin dewatering device such as within the boom reach of Floating Outlets (708.03).

Typical Materials:

Porous baffles can be formed from a variety of porous materials such as coir or jute matting. Resources indicate that 700 to 900 g/m^2 coir matting has the strength, durability and porosity for a satisfactory porous baffle (refer to Exhibits 708.06-D and E).

Typical Installation:

The sediment basin bottom must debris free, smooth, level and dry enough to install. Installation is based upon the type of the baffle and the materials and support selected. Detailed specifications and installation procedures are to be contained in the SWP3.

Typical Maintenance:

Maintenance requirements are dependent upon the type, nonporous or porous, or kind of material used.

- Inspect prior to anticipated significant rain events and restore any practice element as needed to maintain practice function.
- At a minimum, inspect baffles within 24 hours of a rain event.
- Baffles must be maintained to minimize failures since baffles can be difficult to repair.

- Remove sediment from baffle areas when it as accumulated to one half the height of the barrier. When removing sediment take care to avoid damaging the baffles or result in undermining during cleanout and replace or repair any damaged baffles promptly.
- Ensure that baffles are functioning as designed checking for: no flow arounds the baffle cell ends or basin bank areas, no undermining or flows under baffles, and baffles have not been displaced, moved or knocked over. Make needed repairs promptly.
- Re-anchor baffles to basin bottom and sides if water is observed flowing underneath or around them.
- If basin dewatering is required to repair or replace baffles or to add additional baffles, then implement dewatering activities according to Water Pumping (713.02) practice requirements.
- Ensure that baffle heights are appropriate and have not sagged or fallen down and make needed repairs promptly.
- Maintain access corridors for basin and baffle maintenance and sediment removal.
- Inspect for in flow short circuiting and correct with run-off controls.
- Ensure that inflow areas are stable and not excessively eroding.
- When permanent stormwater basins have been modified to function as a temporary sediment basin and the contributing watershed has been permanently stabilized, remove temporary baffles and sediment from the pooling area to meet the basin design requirements.
- When baffles are a feature of a post-construction basin remove accumulated sediment once the basin watershed has been permanently stabilized.

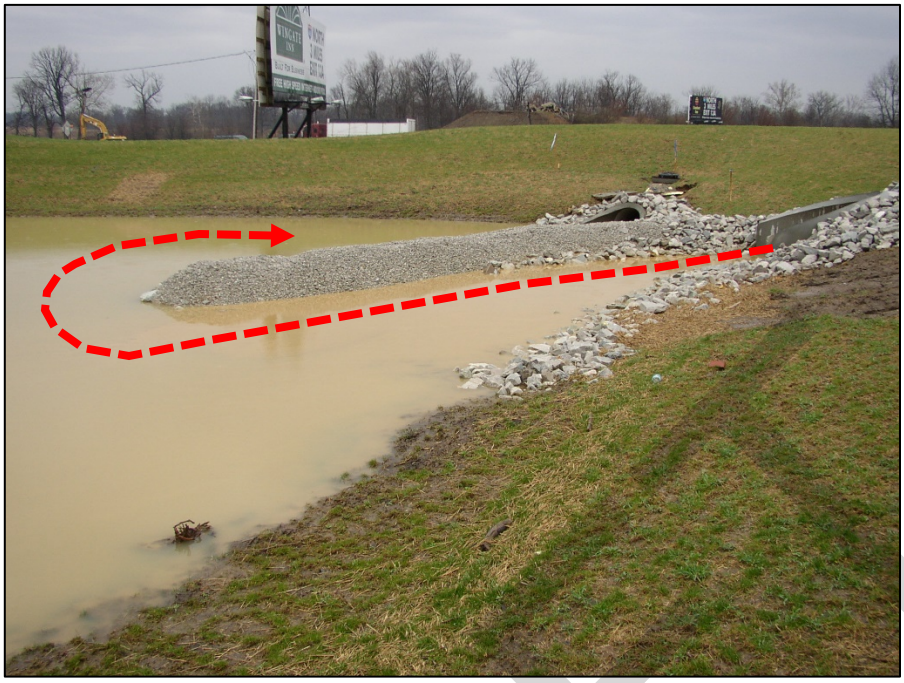


Exhibit 708.06-B. An aggregate baffle has been implemented to increase the flow path distance from the inlet culvert/storm sewer to the basin outlet. Notice the sediment-stained water is less turbid beyond the baffle.
Source: IDEM

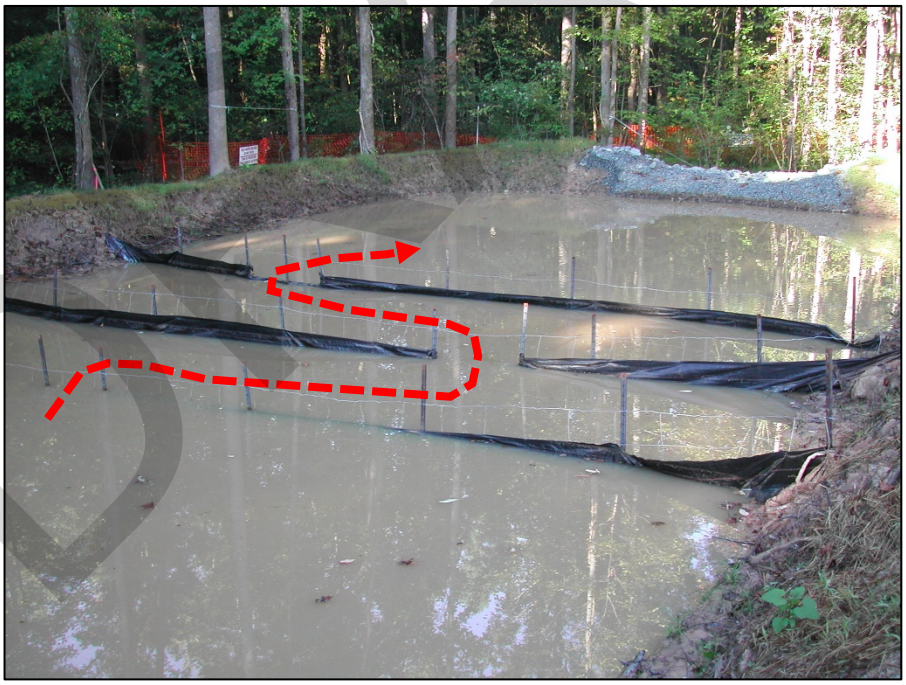


Exhibit 708.06-C. Example of a nonporous baffles installed in a sediment trap configured into cells with weirs cut at opposite sides to increase the flow path (red dashed line) for increased sediment retention (refer to Exhibit 708.06-G diagram).
Source: Richard A. McLaughlin, NC State University

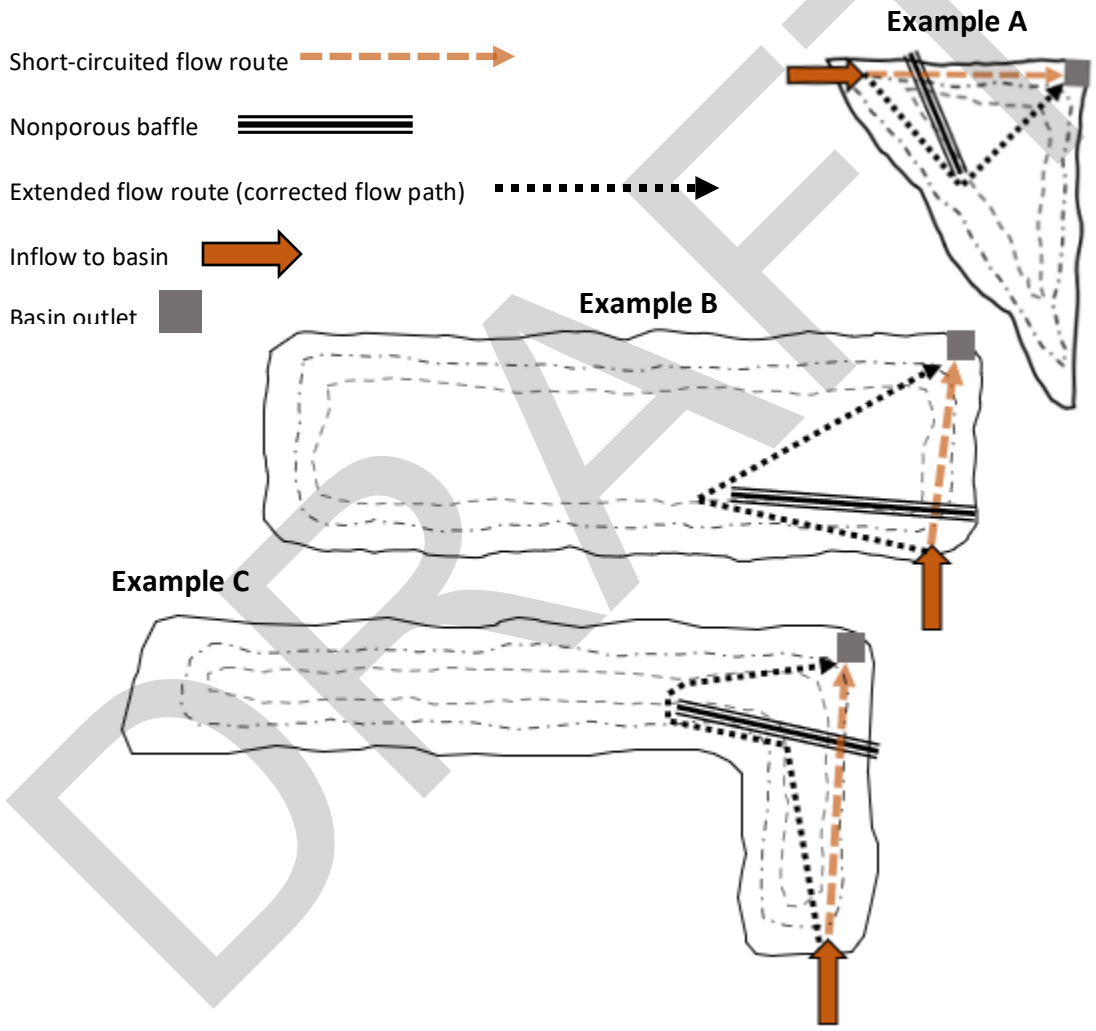
Exhibit 708.06-D. Example of porous baffles made of 700 g/m2 coir erosion control blanket as viewed from the basin outlet.
Source: North Carolina Department of Environmental Quality

Exhibit 708.06-E. Close-up of a porous baffles made of 700 g/m2 coir erosion control blanket. Notice the coir blanket has been anchored to the basin floor with blanket staples.
Source: North Carolina Department of Environmental Quality

Exhibit 708.06-F. A permanent stormwater basin has been modified to function as a sediment basin during the construction phase with a rock horseshoe on the outlet structure and a nonporous wooden baffle to increase the residency time and sediment deposition by extending the flow path length from the inflow point (red dashed line is extended flow path).
Source: IDEM

Exhibit 708.06-G

NONPOROUS BAFFLE CONFIGURATIONS TO MEET LENGTH WIDTH REQUIREMENTS
TYPICAL PRACTICE DIAGRAMS
PLAN VIEW
(NOT TO SCALE)

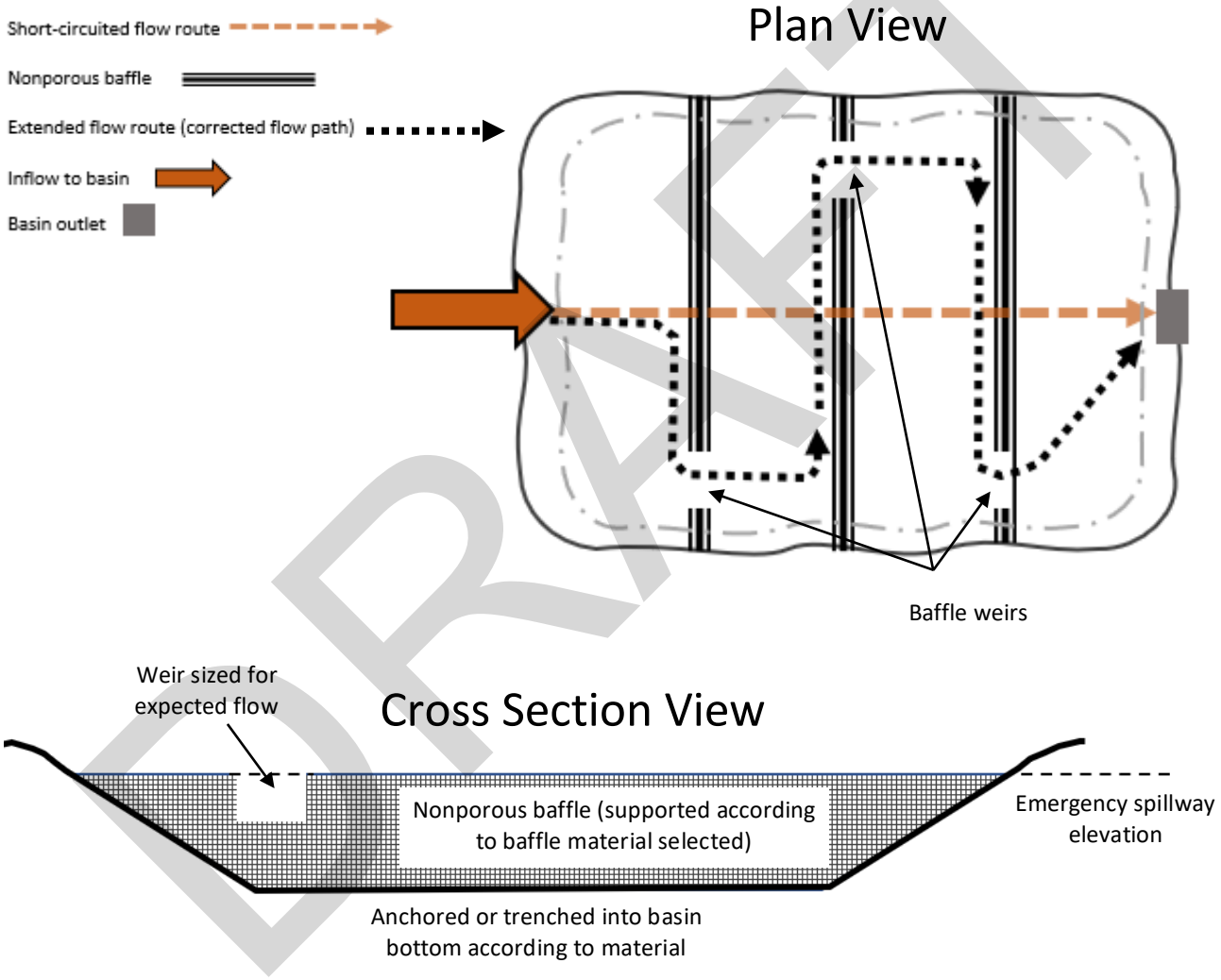


NOTE: The illustrations in this exhibit are not intended to serve as construction drawings. The diagrams are to be used to communicate the concepts for implementation of this control measure.

Source: Adapted from: New York State Standards and Specifications for Erosion and Sediment November 2016 Fig 5.22.

Exhibit 708.06-H

OPTIONAL NONPOROUS BAFFLE CONFIGURATION WITH WEIRS TYPICAL PRACTICE DIAGRAM (NOT TO SCALE)

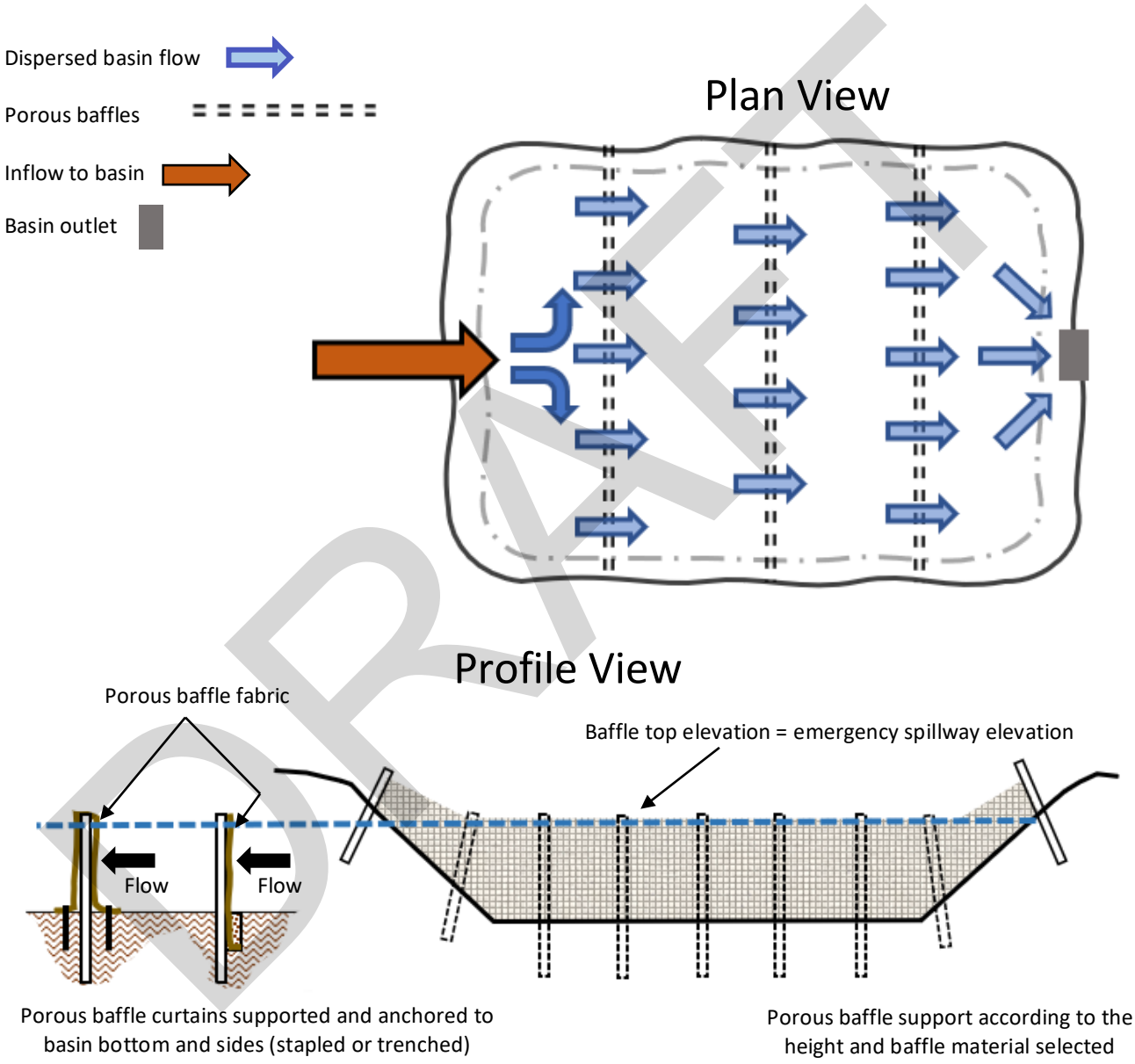


NOTE: The illustrations in this exhibit are not intended to serve as construction drawings. The diagrams are to be used to communicate the concepts for implementation of this control measure.

Source: Adapted from "Using Baffles to Improve Sediment Basins" NC State Extension Publications March 10, 2015

Exhibit 708.06-I

POROUS BAFFLE LAYOUT
TYPICAL PRACTICE DIAGRAM
(NOT TO SCALE)



NOTE: The illustrations in this exhibit are not intended to serve as construction drawings. The diagrams are to be used to communicate the concepts for implementation of this control measure.

Source: Adapted from "Using Baffles to Improve Sediment Basins" NC State Extension Publications March 10, 2015 and Rainwater and Land Development Chapter 6 - Sediment Control Practices 2006 OEPA, Division of Surface Water.