Memorandum

Project: Updates to Volume 3 Chapter 4

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Date: November 30, 2022

Subject: Basis for EDB Recommendations: Upstream Impervious Area Versus WQCV Orifice Size for EDBs

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This memorandum documents an assessment of upstream impervious area versus orifice size necessary to drain the water quality capture volume (WQCV) in extended detention basins (EDBs). The objective is to provide the basis for EDB recommendations in the Urban Storm Drainage Criteria Manual (USDCM) based on how the size of the upstream impervious areas impacts the design of the trash rack and orifices.

Three sources of information were used to develop a relationship between upstream impervious area and WQCV orifice size:

1. The MHFD-Detention spreadsheet was used to develop an approximate WQCV orifice size for residential and commercial land uses in subcatchments ranging from 1 to 20 acres.
2. Design data were summarized for six EDBs (combined with full spectrum detention) recently constructed in the Looking Glass community in Parker, Colorado.
3. Design data were summarized for two EDBs (combined with full spectrum detention) to be constructed in the Tanterra development in Parker, Colorado.

In each case, two WQCV orifices were assumed. This is consistent with the proposed criteria for the Volume 3 Chapter 4 update and is intended to maximize the size of WQCV orifices while still providing redundancy in case one of the orifices becomes clogged; also, the elevated orifice allows release of runoff that is expected to have slightly lower sediment concentrations compared to discharging the WQCV just from the bottom of this storage volume.

Table 1 summarizes the relationship between upstream impervious area and orifice size based on the three sources of information listed above while Figure 1 depicts a graphic representation of the data. Upstream impervious areas ranged from approximately 0.5 acre to 33 acres and

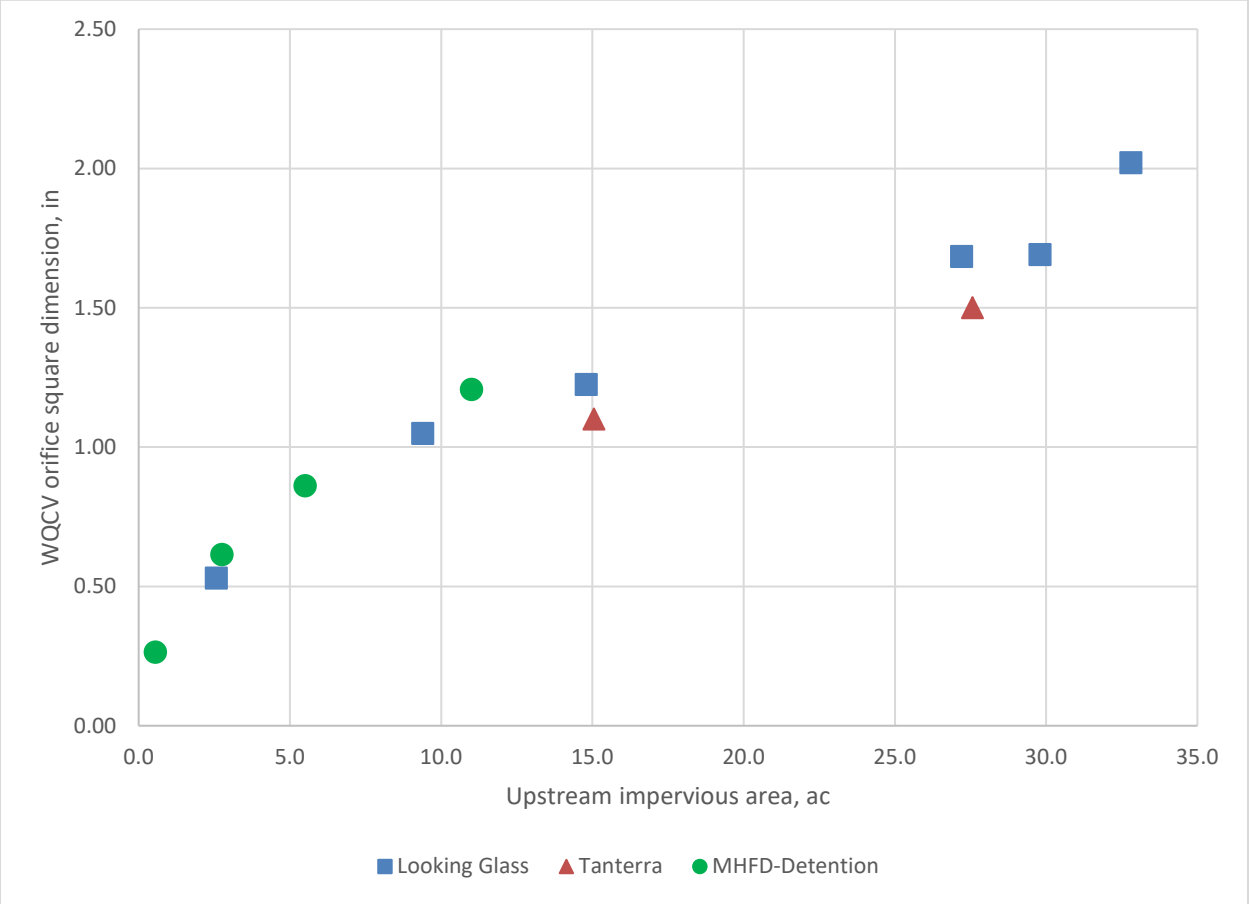
orifice size (based on one side of a square orifice) ranged from approximately 0.25 inch to over 2 inches.

Table 1. Summary of upstream impervious area and orifice size data

Source	Total Basin Area (Ac)	% Impervious	Impervious Area (Ac)	WQCV Orifice Area (in^2)	WQCV Orifice Square Dimension (in)
Looking Glass	71.8	45.7%	32.8	4.1	2.0
	63.9	42.6%	27.2	2.8	1.7
	31.1	47.6%	14.8	1.5	1.2
	21.3	44.1%	9.4	1.1	1.0
	5.9	43.8%	2.6	0.3	0.5
	72.6	41.0%	29.8	2.9	1.7
Tanterra	62.0	44.5%	27.6	2.3	1.5
	32.1	46.9%	15.1	1.2	1.1
MHFD-Detention	1.0	55.0%	0.6	0.1	0.3
	5.0	55.0%	2.8	0.4	0.6
	10.0	55.0%	5.5	0.7	0.9
	20.0	55.0%	11.0	1.5	1.2

The updated draft of Volume 3 Chapter 4 states that a well screen is required for WQCV orifices of 1.25 inches or less. Based on Figure 1, this equates to an upstream impervious area of approximately 15 to 20 acres.

Figure 1. Relationship between upstream impervious area and orifice size



Even with a well screen, if an orifice is less than 0.5-inch it is considered problematic due to plugging and maintenance concerns. Based on Figure 1, this equates to an upstream impervious area of approximately 2 acres. The draft update to Volume 3 Chapter 4 recommends that EDBs should not be designed for upstream impervious areas less than 2 acres and that infiltration measures should be considered not only for impervious areas less than 2 acres, but also for larger areas where EDB orifices would be small enough to require well screen.