


TCEQ Interoffice Memorandum

To:  Susan M. Jablonski, P.E., Area Director, Central Texas Area

Thru: David Van Soest, Regional Director, Austin and Waco Regions
Lori Wilson, Assistant Regional Director, Austin and Waco Regions
Robert Sadlier, Section Manager, Edwards Aquifer Protection Program

From: Don Vandertulip, P.E., BCEE, Edwards Aquifer Protection Program
Innovative Technology (IT) Subcommittee

Date: September 9, 2020

Subject: Recommendation to Approve Hydro-International Stormwater Management Up-Flo® as a permanent best management practice (BMP) and to add the innovative technology to the TCEQ RG-348 Addendum

Brief Description: Hydro-International requests their product, Stormwater Management Up-Flo®, be included as an approved permanent best management practice in the TCEQ's regulatory guidance document, RG-348; Complying with the Edwards Aquifer Rules - Technical Guidance on Best Management Practices (2005).

Background

The Stormwater Management Up-Flo® by Hydro-International has received New Jersey Corporation for Advanced Technology (NJCAT) Technology Verification in January 2015. Field verification testing was conducted by the University of Alabama in 2011 using a New Jersey Technology Acceptance Reciprocity Program (TARP) protocol and Quality Assurance Project Plan (QAPP). Up-Flo® has also received a June 2019 Verification report from VerifiGlobal in accordance with International Organization for Standardization (ISO) 14034 Environmental Technology Verification. The Stormwater Management Up-Flo® Filter is a three stage, modular media filled filter, that traps and adsorbs particulates and pollutants.

Options and Considerations

Initial request for review began in June 2014 with review of documents submitted by Hydro-International. The review was paused until June 2018 when new submittals were requested. Proposed RG-348 addendum text was checked for accessibility by BrailleWorks and submitted by Hydro-International. Following review of proposed Addendum text and TSS Removal spreadsheet revisions, both are technically acceptable as of July 16, 2020.

Committee Recommended Option and Distribution

Accept new text sections for the RG-348 Addendum of the TCEQ Technical Guidance Manual and approve the manufacturer submitted TSS Removal and Unit Sizing spreadsheet with the three stage Stormwater Management Up-Flo® approved for 78-percent TSS removal.

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Feedback to the Committee

The recommendation is accepted as proposed.

The recommendation is accepted with the following modifications. Comments:

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The recommendation is being returned for further consideration. Comments:

Stormwater Management Up-Flo® Filter

The Stormwater Management Up-Flo® Filter is a three stage, modular media filled filter, that traps and adsorbs particulates and pollutants.

The Up-Flo® Filter is a combination device that utilizes three modes of treatment; sedimentation, screening, and high-rate upward flow filtration, all within the same structure. Stormwater enters the chamber via an inlet pipe or inlet grate and fills the filter chamber. First, trash, gross debris and sediment settle out in the sump while oil and floatables rise to the surface of the water. Second, flow is directed upwards through the filter modules through angled gross pollutant screens that remove all particles over 5 mm. Third the stormwater passes upwards through the filter media where fine particulates are removed along with some dissolved pollutants. The treated stormwater then exits the filter via an upper level enclosed channel to the outlet pipe via the Outlet Module.

Excess flows are discharged into the Outlet Module via a Siphonic Bypass, which also acts as a floatables baffle preventing the escape of oil and floatable trash. To guard against pollutant leaching and filter media degradation between storm events, the water level in the chamber is lowered to below the filter media through a slow release filtered Drain Down Port between storm events.

High loading rates means a smaller footprint while modular components can adapt to any catchment area. Systems can be configured in a variety of ways to suit your treatment goals and site conditions including vault (Figure 1) or manhole (Figure 2) (online or offline). Up-Flo® Filter systems are typically installed underground and downstream of a detention/retention system with an outlet control structure.

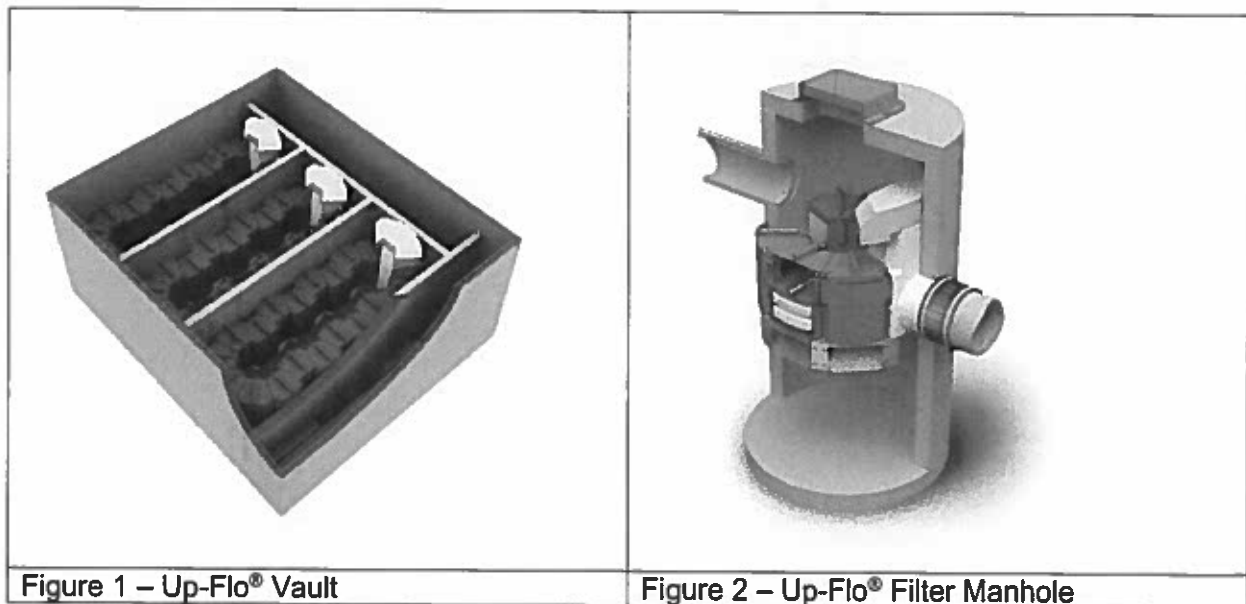


Figure 1 – Up-Flo® Vault

Figure 2 – Up-Flo® Filter Manhole

Selection Criteria

- Appropriate for space-limited areas
- No moving parts means there's less opportunity for treatment disruption or breakage
- Well suited for shallow sites where excavation is a costly concern
- Appropriate for small to medium drainage basins
- Requires a minimal amount of land since underground
- Appropriate for retrofits as well as new development
- Can be designed with an internal or external bypass to manage flow in excess of the treatment flow
- Can be installed with monitoring device to give a proper performance report and indication when service/maintenance is required

Limitations

- Requires regular (targeted annually) maintenance

Cost Considerations

Cost of the Up-Flo® Filter is generally less than that of a sand filter, particularly when installation costs are included.

Up-Flo® Filter

The Up-Flo® Filter is a passive flow-through stormwater filtration system with filter media contained in modules. Field testing in multiple locations indicates a TSS removal efficiency upwards of 78%. The Up-Flo® Filter can be used as a standalone device to treat stormwater, in a treatment train with a detention basin, or with equalization (no credit for TSS removal) to reduce the number of modules required.

Each module must be limited to a maximum specific flow rate of 25 gpm per filter module, and the total number of modules must be sufficient to treat the water quality volume (or flow depending on configuration) without bypass. The storage facility needs to be large enough to capture and treat the design storm prior to bypass around the system. When used in a treatment train following extended detention, the number of modules must be sufficient to treat the maximum discharge rate of the water quality volume from the extended detention basin. Additional modules can be used to reduce the required maintenance frequency.

Design Criteria

Design Rainfall Depth – The design rainfall depth is dependent on the characteristics of the contributing drainage area. The method for calculation of the fraction of annual rainfall to be treated (F) and the design rainfall depth is specified in Section 3.3 of this manual (Edwards Aquifer Technical Guidance Manual, June 20, 2005).

Number of Filter Modules Required – The number of modules should be sufficient to treat the water quality volume (or flow depending on configuration) without bypass at a specific flow rate of 25 gpm/filter module. Additional modules can be provided to reduce maintenance frequency by using a mass-loading approach. The mass-loading design assumes that some typical mass of pollutant is washed off a site during the year. Some portion of the mass drops out in the storage component, while the balance passes through to the filtration component. The number

of filter modules is then determined based upon the goal of removal of some balance of the mass, where each module is expected to remove a certain mass per module. The manufacturer can provide additional information to determine the optimum number of modules to balance cost with maintenance frequency.

Media Properties – The filter media should be CPZ®, a blend of Activated Carbon, Peat and Zeolite.

Sizing of Filtration Chamber – The size of the filtration component is determined based on the number of modules required. The filtration component will typically consist of three chambers: the filtration chamber, an inlet bay and the outlet bay.

Design Hyetograph to Calculate Incremental Rainfall Depth

Time (Minutes)	Incremental Rainfall Depth (in)
0	0.000
5	0.013
10	0.014
15	0.015
20	0.017
25	0.018
30	0.020
35	0.023
40	0.025
45	0.029
50	0.034
55	0.040
60	0.048
65	0.059
70	0.076
75	0.100
80	0.121
85	0.146
90	0.167
95	0.167
100	0.146
105	0.108
110	0.088
115	0.067
120	0.053
125	0.043
130	0.036
135	0.031
140	0.027
145	0.024
150	0.021
155	0.019
160	0.017
165	0.016
170	0.015

175	0.014
180	0.013

Internal Bypass

Flow in excess of the design filtration capacity discharges over a bypass weir located inside the manhole or adjacent to the vault installation.

Pollutant Capture

The Up-Flo® Filter is designed to operate as a “treatment train” by incorporating multiple treatment technologies into a single device. Trash and gross debris are removed by sedimentation and screening before they are introduced to the filtration media, preventing surface blinding of the filter media. The Up-Flo® Filter is a wet-sump device. Between storm events, oil and floatables are stored on the water surface separate from the sediment storage volume in the sump. The bypass siphon acts as a floatables baffle to prevent washout of captured floatable pollutants during high intensity events.

Reduced Clogging

The Up-Flo® Filter has been designed to minimize the occurrence of clogging and blinding and employs a unique Drain Down Filter that allows the water level in the chamber to drop below the filter media between events. The Drain Down Filter mechanism creates a reverse flow that flushes captured pollutants off the surface of the Media Bag, helping to prevent blinding. By allowing the water to drain out, the Drain Down Filter also reduces the weight of the Media Bags. This makes the bags easier and safer to remove during maintenance operations.

Overflow Protection

The Angled Screens are designed to prevent ragging and blinding and are situated below the Filter Modules, sheltering them from the direct path of the influent. Coarse debris settles in the sump before the runoff flows up through the screens, protecting them from blinding. In the unlikely event of a blockage, the high capacity siphonic Bypass Hood is designed to convey high enough flow to minimize the risk of large storm creating upstream flooding.

Up-Flo Filter® Maintenance Guidelines

The Up-Flo® Filter is a modular high-rate stormwater filtration device designed to capture trash, oil, sediment and remove fine pollutants such as dissolved and particulate metals and nutrients from stormwater runoff.

In general, a minimum of two inspections are required the first year after installation and an annual inspection frequency is required the following years to monitor sediment and gross pollutant accumulations. In order to achieve desired annual TSS removal rates using the Up-Flo® Filter, the minimum maintenance frequency specified in the maintenance section for replacement of the Media Pack and removal of accumulated sediment from the sump is mandatory.

Recommended maintenance guidelines include:

1. Set up any necessary safety equipment (such as traffic cones) to provide access to the Up-Flo® Filter. Safety equipment should notify passing pedestrian and road traffic that work is being done.
2. Remove the grate or lid to the manhole or vault.
3. Without entering the vessel, look down into the chamber to inspect the inside and to determine whether the high-water level indicator has been activated. Make note of any irregularities.
4. Without entering the vessel, use the pole with the skimmer net to remove floatables and loose debris from the chamber.
5. Using a sediment probe such as a Sludge-Judge®, measure the depth of sediment that has collected in the sump of the vessel. Maximum sediment depth is 16 inches (41 cm).
6. If the high-water level indicator has been activated after two consecutive storms, remove the Filter Module lid by turning the cam latch and remove the Filter Media Pack. Weigh the Media Bags from one or two modules. Media Bags should be replaced if the wet weight exceeds 40 lb.
7. Securely replace the grate or lid.

On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables and gross debris removed, and the depth of sediment measured. Also note any apparent irregularities such as damaged components or a high standing water level.