Proposed Manufactured Treatment Devices Guidelines

Version 0.0

Information about Industry Stakeholders Feedback Process:

The City of Toronto invites industry stakeholders to provide comments on the proposed MTD Guidelines. To submit your feedback, please follow these steps:

1. Review the proposed MTD Guidelines
2. Please email your feedback using your business email account to mtd_feedback@toronto.ca. Please do not include any personal information in your email.
3. Technical Appendix B – OGS Review Sheet (Excel format) from the proposed MTD Guidelines is available upon request. Please email mtd_feedback@toronto.ca to obtain this draft document using your business email account. Please do not include any personal information in your email.
4. The deadline to submit feedback is April 10, 2020, 11:59 p.m.

The City of Toronto reserves the right to publish any or all comments including a portion or a summary of the feedback or responses received, along with industry stakeholder names and organizations.

By submitting comments to the City of Toronto in accordance with this industry stakeholders feedback process, the industry stakeholder acknowledges and agrees to any such publication by the City of Toronto of their comments, industry stakeholder name and organization.

Feedback will be considered at the City of Toronto's sole discretion.

The City reserves the right to cancel this industry feedback process at any time without notice.

TORONTO

Preface

The City of Toronto (City) has developed the proposed Manufactured Treatment Device (MTD) Guidelines to provide consistent guidance to City staff, development industry (e.g., manufacturers, design engineers) and property owners for MTD selection, design, and review, where proposed in Stormwater Management (SWM) Reports.

The proposed MTD Guidelines were developed following an extensive review of existing review practices across Canada and the U.S., with expert feedback and input from stakeholders including provincial and local regulatory bodies, third-party testing and verification agencies, manufacturers and review engineers.

The proposed MTD Guidelines are not to be considered as specifications and are intended to communicate the City's design expectations for MTDs, based on current provincial and municipal policy context, with regard for local conditions and municipal experiences related to operations and maintenance.

Upon final release and publication, the proposed MTD Guidelines are intended to *replace* the interim guidance on Oil/Grit Separators (OGS) provided in Section 2.2.2.2 (#3) and Appendix B of the City's Wet Weather Flow Management Guidelines (WWFMG) released in 2006. All other requirements of the City's WWFMG (2006) will however continue to apply and provide overarching direction and guidance on water management targets, SWM design, implementation of SWM practices, and approval requirements.

The proposed MTD Guidelines are draft and has been released for industry stakeholders feedback. No reliance should be placed on this document for MTD selection, design, and review. The proposed MTD Guidelines will be effective upon final release and publication on the City's official webpage.

Document Version	Document Description	Date
0.0	Draft MTD Guidelines for Industry Stakeholders Feedback	March 3, 2020

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1. Introduction

1.1. Background

Manufactured Treatment Devices (MTDs) are proprietary devices that are often used in Stormwater Management (SWM) to treat and remove pollutants from stormwater runoff.

MTDs are often proposed as a Stormwater Management (SWM) practice in SWM Reports prepared by design engineers, in order to achieve Water Quality Control Targets of the City of Toronto's (City) Wet Weather Flow Management Guidelines (WWFMG) (2006).

1.2. Purpose

The main purpose of the Manufactured Treatment Device (MTD) Guidelines is to provide consistent guidance to City staff, development industry (e.g., manufacturers, design engineers) and property owners for MTD selection, design, and review, taking into account the following key drivers and challenges:

- The emergence of new and varied proprietary treatment and removal technologies.
- Advancements in third-party testing procedures, verification and certification processes for performance claims.
- Changes and constraints to existing municipal and provincial approvals framework.
- Constraints related to municipal operations & maintenance and asset management.

1.3. Considerations and Limitations

- The MTD Guidelines will apply to all new or revised SWM Reports proposing new MTDs for new development and redevelopment projects submitted to the City.
- The City does not require, specify, endorse, or approve the use of any individual MTD products or brands.
- The City reviews and accepts, where appropriate, SWM Reports prepared by design engineers (i.e., Professional Engineer in Ontario) on behalf of their respective clients/owners (and not from MTD manufacturers or suppliers).
- The choice of a MTD as a SWM practice in a SWM Report is solely at the discretion of the design engineer and/or their respective clients/owners.
- The MTD Guidelines are not intended as a substitute for sound engineering knowledge and experience. It is the designer engineer's responsibility to exercise professional judgment on technical matters in the best interests of their clients/owners and users of the infrastructure.

2. Acceptable Types of MTDs

a) Where MTDs are proposed in a SWM Report to meet Water Quality Control Targets of the WWFMG, the City will only consider the following types of MTDs located within private or public property and/or right-of-way (ROW):

   i. **Oil/Grit Separator (OGS) devices** or hydrodynamic separators that target large coarse-particle suspended solids removal through gravity separation, and oil and grease removal through phase separation. Additional separation mechanisms may also be present including by-pass, swirl, screening and coalescence actions. See Section 4 for additional requirements.

   ii. **Filter devices** consisting of filtration cartridges, filter media or bio-filtration that typically target higher efficiency suspended solids removal including finer particle suspended solids, and may also other target pollutant removal (e.g., nutrients or metals). See Section 5 for additional requirements.

b) Where MTDs are proposed to improve Operations and Maintenance (O&M) of the downstream SWM practice or drainage system, but are not proposed to meet Water Quality Targets[1] of the WWFMG, the City will consider for acceptance other types of MTDs, including pre-treatment devices (e.g., catchbasin inserts/retrofits), for use on private properties only.

3. MTD Performance Requirements

The following performance requirements will be met for all new MTDs –

a) The MTD will provide **suspended solids** removal as per the following conditions:
   i. A minimum Total Suspended Solids (TSS) removal requirement for the MTD will be determined to meet the Water Quality Control Target of the WWFMG based on the overall SWM plan, and MTD application[2] for the project.
   ii. An area-weighted mass-balance approach for suspended solids removal may be used to establish the MTD-specific TSS removal requirement.

b) The MTD will provide **oil retention** functionality, in addition to targeting TSS removal, when proposed for use on:
   i. Industrial, commercial and institutional (ICI) sites; OR
   ii. Mixed-use residential sites; OR
   iii. Other oil/fuel spill-risk areas (e.g., parking lots, transit/transportation corridors, etc.).

[1] SWM Report must demonstrate Water Quality Targets are achieved through other SWM practices
[2] Applied as standalone, or in treatment train or multi-component approach to SWM

4. Requirements for Oil/Grit Separator Devices

The following requirements will be met for all new OGS devices –

4.1. Performance Testing and Verification

i. The OGS device will meet the following performance testing and verification conditions:
   - The OGS device will have been laboratory tested in accordance with the *Procedure for Laboratory Testing of Oil-Grit Separators* (TRCA/CETV Program)[3] testing protocol; **AND**
   - The OGS device will have current and valid ISO 14034: Environmental Technology Verification (ETV) verification.

4.2. Design Flow Estimation

i. The design flows to the OGS device will be estimated based on the Rational Method[4] using design rainfall intensities corresponding to percent captured rainfall volumes for the average year[5].
ii. Where upstream in-line detention for flow attenuation is proposed, the *maximum* design flow to the OGS device will be based on hydrologic modelling and hydraulic routing of the peak flow generated using the 25-mm 4-hr design storm[6].

4.3. Sizing and Scaling

i. The OGS device will be sized to meet the TSS removal objective based on the net annual sediment load removed[7] from volume-weighted design flows from the average year.
ii. The selected model for the OGS device will meet all scaling provisions relative to the tested model, as per the applicable testing protocol.

4.4. In-line/Off-line Installation

i. The OGS device will be installed in an *off-line* configuration with an upstream flow-diversion structure that ensures the by-pass of flows exceeding the design flow around the proposed OGS device.

[3] Based on the latest revision of protocol and applicable amendments at the time of verification
[4] Runoff coefficient to be based on area-weighted average of total impervious (C=0.9) and pervious (C=0.3) surface
[5] See *Technical Appendix A.1 – Average Year Volume-Intensity Analysis*
[6] Based on *Stormwater Management Planning and Design Manual* (MECP 2003) for water quality enhancement
[7] Removal efficiency to be based on the total sediment removal from *all* particle sizes from the ETV-tested PSD

ii. The OGS device may only be installed *in-line*, when the TSS effluent concentration[8] for the maximum tested scour flow rate does not exceed 25 mg/L[9], and the following condition is met:
    - The selected model contains an internal by-pass with adequate hydraulic capacity to convey all flows from the incoming drainage system. **OR**
    - Upstream in-line detention attenuates all flows to below the maximum tested scour flow rate up to the 100-yr 6-hr design storm event.

4.5. Performance Evaluation

i. The overall TSS removal claim for the OGS device will be credited as the volume-weighted average of removal efficiencies for design flows evaluated from the ETV-verified sediment capture test results corresponding, as per the *OGS Review Sheet*[10].
ii. Where applicable, the oil retention function of the OGS device will be confirmed by ETV-verified test[11] results.
iii. Where two or more MTDs are proposed in series, no additional suspended solids removal will be recognized beyond the performance claim for the primary MTD.

[8] Adjusted effluent concentration based on exceedance above background influent levels
[9] Based on CCME – CEQG for TSS increase in high flow, freshwater conditions
[10] See *Technical Appendix B - OGS Review Sheet*
[11] Light liquid re-entrainment simulation test

4.6. Operations & Maintenance

i. The OGS device will be sized to ensure a maintenance cleanout frequency of no greater than once every two years based the accumulated annual sediment loading[12] generated from the average annual precipitation volume[13].
ii. The OGS device will be accompanied by a project-specific O&M Manual[14] to ensure access for standard inspection, monitoring and maintenance.
iii. The OGS device may not adversely impact the effectiveness of TW sewer and SWM infrastructure or adversely impact the feasibility or cost of capital programs, O&M and asset management practices, as determined by the City in its sole discretion.

5. Requirements for Filter Devices

The following requirements will be met for all new filter devices –

5.1. Performance Testing and Verification

i. The filter device will meet the following performance testing and verification condition:
   - The filter device will have been *field* tested in accordance with the Washington State Technology Assessment Protocol (TAPE) or NJDEP's TARP Tier II Protocol and will have current and valid ISO 14034:ETV verification. **OR**
   - The filter device will have the State of Washington's TAPE certification for approved technologies with "General Use Level Designation (GULD)", with field testing conducted in accordance with the TAPE protocol.

5.2. Design Flow Estimation

i. The design flow to the proposed filter device will be estimated based on the runoff generated using the Rational Method and the design rainfall intensity corresponding to 90% rainfall volume capture from the average year[15].
ii. Where upstream in-line detention for flow attenuation is proposed, the *maximum* design flow to the filter device will be based on hydrologic modelling and hydraulic routing of the peak flow generated using the 25-mm 4-hr design storm[16].

[12] Conservatively assuming Event Mean Concentration (EMC) of 330 mg/L for roads (WWFMG 2006)
[13] Average annual precipitation for Toronto Pearson Airport (1939-2013): 759 mm
[14] See Section 6(e)
[15] See *Technical Appendix A - Average Year Rainfall Analysis*
[16] Based on *Stormwater Management Planning and Design Manual* (MECP 2003) for water quality enhancement

5.3. Sizing and Scaling

i. The selected model for the filter device will meet all scaling provisions relative to the tested model for applicable design parameters (e.g., treatment flow rate, filter media flux rates, etc.), as per the applicable testing protocol.

5.4. In-line/Off-line Installation

i. The filter device will be installed in an *off-line* configuration or demonstrated equivalent with the provision of an upstream flow-diversion structure that ensures by-pass of all flows exceeding the design flow.

5.5. Performance Evaluation

i. The mean removal efficiency of suspended solids up to a 95% confidence interval from the tested device for the design flow will be credited for the performance claim from the filter device.
ii. Where two or more MTDs are proposed in series, no additional suspended solids removal will be recognized beyond the performance claim for the primary MTD.

5.6. Operations & Maintenance

Due to O&M and asset management challenges to the City, new filter devices are not encouraged within public property and/or right-of-way and will only be considered on a case-by-case basis, where no other SWM practice or treatment train has been demonstrated to be feasible.

i. The filter device will be sized to ensure a cleanout frequency of no greater than *once every year* based the annual sediment loading[17] to the filter device that is generated from the average annual precipitation volume[18].
ii. Additional pre-treatment measures for the filter device will be considered and recommended to improve O&M and prevent rapid clogging and/or blockages of the filter device.
iii. The filter device will be accompanied by a project-specific O&M Manual[19] to ensure access for standard inspection, monitoring and maintenance.
iv. The filter device may not adversely impact the effectiveness of TW sewer and SWM infrastructure or adversely impact the feasibility or cost of capital programs,

[17] Conservatively assuming Event Mean Concentration (EMC) of 330 mg/L for roads (WWFMG 2006)
[18] Average annual precipitation for Toronto Pearson Airport (1939-2013): 759 mm
[19] See Section 6(e)

O&M and asset management practices, as determined by the City in its sole discretion

6. Submission Requirements

Where MTD(s) are proposed as part of a SWM Report and submitted to the City for review and acceptance, the following information will be presented:

a) Signed and sealed Stormwater Management (SWM) Report, engineering drawings, and specifications by the design engineer (Professional Engineer in Ontario) on behalf of their respective clients/owners.

b) Specific to MTD(s) proposed, the **SWM Report** will include (but not limited to):
   i. Supporting calculations to establish and rationalize project-specific performance objectives for the MTD, and demonstration the overall SWM design meets all applicable requirements of the WWFMG.
   ii. Description and configuration of MTD model, manufacturer, and technology type.
   iii. Applicable third-party testing and verification/certification statements and documentation supporting performance claims.
   iv. Site characterization and calculations for design flow estimation, including (where applicable) supporting hydrologic modelling and hydraulic routing calculations to confirm flow attenuation via upstream detention and flow controls.
   v. *Manufacturer*-provided letter/documentation confirming proposed and tested MTD model details (i.e., diameter, depth, treatment depth, max storage depth, sediment storage capacity, hydraulic capacity for bypass), and compliance with sizing and scaling provisions, as per applicable testing protocol.

c) For new OGS devices, ***design engineer***-completed **OGS Review Sheet**[20]

d) For filter devices, ***manufacturer*-provided supporting documentation confirming filter device sizing & scaling** to meet performance requirements for the design engineer-estimated design flow.

e) Project-specific **Operations & Maintenance Manual** for all proposed MTD(s). Specifically for MTDs proposed within public property and/or road right-of-way, the O&M Manual is to include (but not limited to) the following components:

   i. 8.5" x 11" plan with the location of proposed MTD(s) relative to other infrastructure, buildings, streets, with directional arrow and GIS coordinates (MTM, NAD 27, Zone 10).
   ii. Engineering detail drawing of MTD(s), components, and dimensions.
   iii. Asset Management -

[20] See *Technical Appendix B - OGS Review Sheet* for latest version at the time of submission

- Identification Description including Dimensions
- Life-Cycle Period
- Inspection Frequency (including operating assumptions and failure modes)
- Maintenance Frequency (including rehab & refurbishment)
- Component & Materials List and Sourcing (e.g., local, overseas)
- Complete Replacement Cost
- Annual O&M Component and Materials Cost
- Personnel Requirements for Inspection and Maintenance (# of staff, certification, labour hours)
- Health & Safety Considerations (e.g., confined space requirements, materials storage and handling)

iv. Operations & Maintenance –

- Accessibility (access dimensions, ease of access, confined space)
- Minimum Set-Back and Vertical Clearance Provided and Requirement (for access, equipment laydown & use, and traffic control)
- Water Supply Access and Use Requirements
- Inspection and Maintenance Equipment List
- Step-by-step Inspection Procedures
- Step-by-step Maintenance Procedures

The City reserves the right, in its sole discretion, to require additional supporting information and/or clarification beyond the submission requirements listed above. Accordingly, City review staff, may request this additional information and/or clarification from the design engineer.

TECHNICAL APPENDIX A – AVERAGE YEAR RAINFALL ANALYSIS

A.1 Average Year Volume-Intensity Analysis

% of Annual Rainfall Volume Captured	% Weight or Incremental Annual Rainfall Volume	Design Rainfall Intensity [mm/hr] [a]
10%	10%	1.0
20%	10%	2.0
30%	10%	2.5
40%	10%	3.5
50%	10%	4.5
60%	10%	6.5
70%	10%	10.5
80%	10%	13
90%	**10%**	**20.5** [b]
100%	10%	44.5

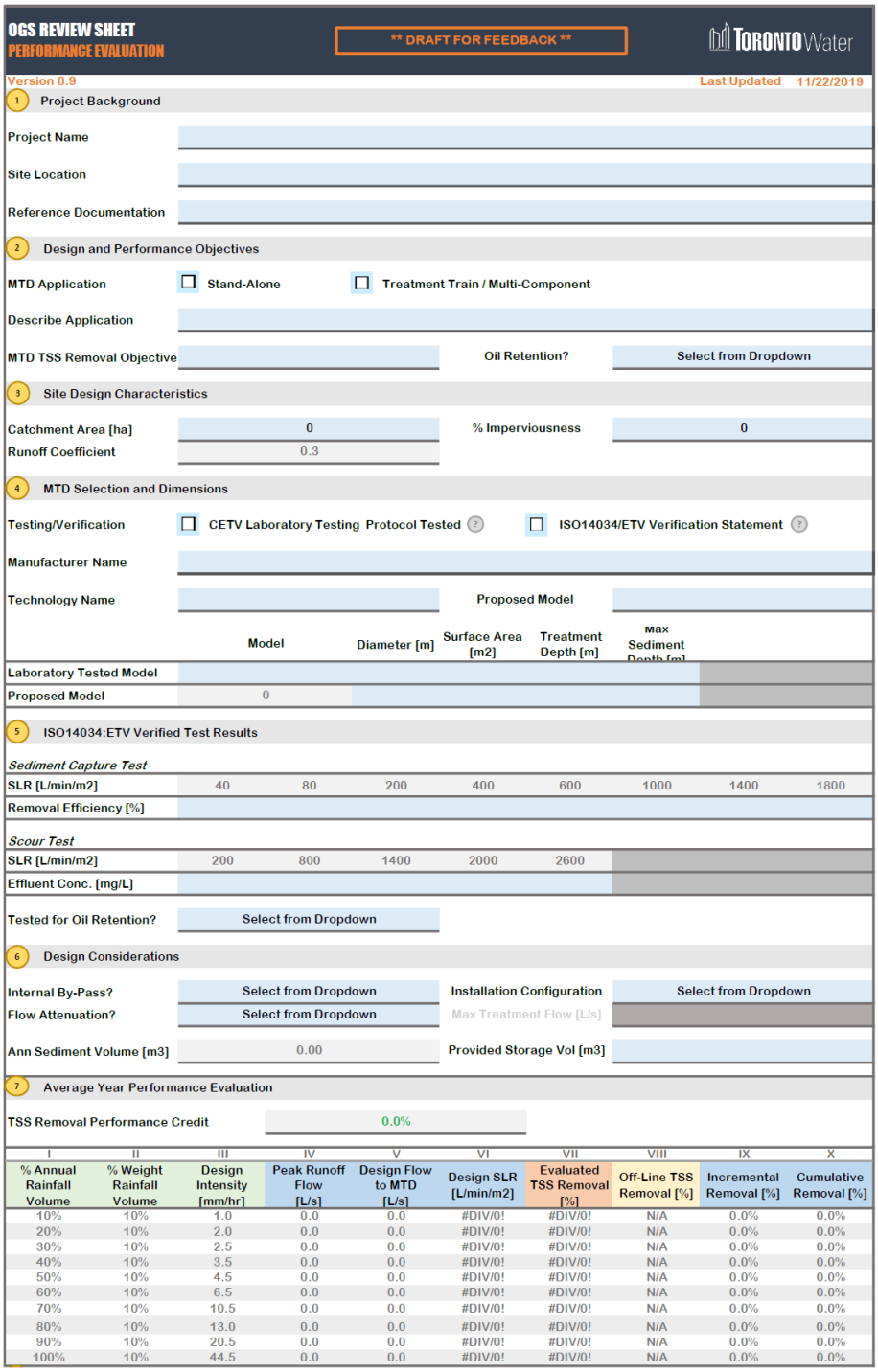
a – Design intensities analyzed based on 1991 rainfall time series rainfall data at 30-min intervals at Rain Gauge 4 (Central Station) assumed representative of long-term average annual rainfall pattern

b – Represents design rainfall intensity that captures 90% of average year rainfall volume

TECHNICAL APPENDIX B – OGS REVIEW SHEET

Upon finalization, latest version of *OGS Review Sheet* in MS Excel spreadsheet format accessible on City's official webpage.

Draft OGS Review Sheet available upon request via Industry Stakeholders Feedback Process.



OGS REVIEW SHEET
PERFORMANCE EVALUATION

** DRAFT FOR FEEDBACK **

TORONTO Water

Version 0.9 — Last Updated 11/22/2019

1 Project Background

Project Name
Site Location
Reference Documentation

2 Design and Performance Objectives

MTD Application ☐ Stand-Alone ☐ Treatment Train / Multi-Component
Describe Application
MTD TSS Removal Objective — Oil Retention? — Select from Dropdown

3 Site Design Characteristics

Catchment Area [ha]: 0 — % Imperviousness: 0
Runoff Coefficient: 0.3

4 MTD Selection and Dimensions

Testing/Verification ☐ CETV Laboratory Testing Protocol Tested ☐ ISO14034/ETV Verification Statement
Manufacturer Name
Technology Name — Proposed Model

	Model	Diameter [m]	Surface Area [m2]	Treatment Depth [m]	max Sediment Depth [m]
Laboratory Tested Model					
Proposed Model	0				

5 ISO14034:ETV Verified Test Results

Sediment Capture Test

SLR [L/min/m2]	40	80	200	400	600	1000	1400	1800
Removal Efficiency [%]								

Scour Test

SLR [L/min/m2]	200	800	1400	2000	2600
Effluent Conc. [mg/L]					

Tested for Oil Retention? — Select from Dropdown

6 Design Considerations

Internal By-Pass? — Select from Dropdown — Installation Configuration — Select from Dropdown
Flow Attenuation? — Select from Dropdown — Max Treatment Flow [L/s]
Ann Sediment Volume [m3]: 0.00 — Provided Storage Vol [m3]

7 Average Year Performance Evaluation

TSS Removal Performance Credit: 0.0%

I	II	III	IV	V	VI	VII	VIII	IX	X
% Annual Rainfall Volume	% Weight Rainfall Volume	Design Intensity [mm/hr]	Peak Runoff Flow [L/s]	Design Flow to MTD [L/s]	Design SLR [L/min/m2]	Evaluated TSS Removal [%]	Off-Line TSS Removal [%]	Incremental Removal [%]	Cumulative Removal [%]
10%	10%	1.0	0.0	0.0	#DIV/0!	#DIV/0!	N/A	0.0%	0.0%
20%	10%	2.0	0.0	0.0	#DIV/0!	#DIV/0!	N/A	0.0%	0.0%
30%	10%	2.5	0.0	0.0	#DIV/0!	#DIV/0!	N/A	0.0%	0.0%
40%	10%	3.5	0.0	0.0	#DIV/0!	#DIV/0!	N/A	0.0%	0.0%
50%	10%	4.5	0.0	0.0	#DIV/0!	#DIV/0!	N/A	0.0%	0.0%
60%	10%	6.5	0.0	0.0	#DIV/0!	#DIV/0!	N/A	0.0%	0.0%
70%	10%	10.5	0.0	0.0	#DIV/0!	#DIV/0!	N/A	0.0%	0.0%
80%	10%	13.0	0.0	0.0	#DIV/0!	#DIV/0!	N/A	0.0%	0.0%
90%	10%	20.5	0.0	0.0	#DIV/0!	#DIV/0!	N/A	0.0%	0.0%
100%	10%	44.5	0.0	0.0	#DIV/0!	#DIV/0!	N/A	0.0%	0.0%