



Bushfire Hazard Management Plan Report, Subdivision - 33 Elderslie Road, Brighton

Client: Burbury Consulting Pty Ltd
Date: June 2023 - Rev1

Prepared By: Rhys Menadue

BUSHFIRE PRONE DEVELOPMENT SOLUTIONS — 14 Reynolds Court, Dynnyrne, TAS 7005

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1. Introduction

The intent of this report is to analyse and confirm the suitability of the bushfire prone land to be successfully developed for subdivision in accordance with the Tasmania Planning Scheme – Brighton, Code C13.0 Bushfire-Prone Areas Code (the Code) and the Building Regulations.

The Bushfire Hazard assessment describes the site and surrounding area, classifying the vegetation, assessing the slopes and environmental features. This report should be included with approval documentation in support of the Bushfire Hazard Management Plan (BHMP) and accompanying Certifications. The Bushfire Hazard Management Plan in conjunction with this Report make up the certified documentation intended to satisfy the Code & Building Regulations.

The applicable section of the Planning Code is C13.6 Development Standards for Subdivision. The body of this report describes the site and assesses the requirements to be implemented to satisfy the Code.

2. Limitation of Report & Bushfire Hazard Management Plan

This report has been prepared for the abovementioned clients for their use and distribution only. The main intent of the report is to be used as supporting documentation for the Development Application and forms part of the subdivision Bushfire Hazard Management Plan. Should submitted Development Application Plans differ from the Plans in this reports Appendix then an amended design review should be conducted to determine the suitability of any amendments in relation to the Bushfire Prone Area Requirements of AS3959-2018 and the Planning Scheme. It is the responsibility of the regulatory authorities to determine consistency between the Bushfire Hazard Management Plan and the Development Plans.

It is also to be noted that the assessment has been conducted according to the site assessment being conducted in May 2023 and does not take into account the possibility of altered site conditions either naturally occurring or where currently maintained/excluded vegetation conditions change due to a lack of ongoing maintenance.

It should be noted that compliance with the recommendations contained in this assessment does not mean that there is no residual risk to life safety or property as a result of bushfire. A residual level of risk remains which recognizes that removing the risk to life and property in absolute terms is not achievable while people continue to build in bushfire prone areas. This limitation is expressed in the following extract from AS 3959 (2018) which states (in the forward),

It should be borne in mind that the measures contained in this Standard cannot guarantee that a building will survive a bushfire event on every occasion. This is substantially due to the degree of vegetation management, the unpredictable nature and behavior of fire, and extreme weather conditions.

This level of residual risk is inherent in all bushfire standards and also applies to this assessment.

3. Site Description and Proposal

The 33 Elderslie Road, Brighton Subdivision Development consists of one existing land parcel (CT: 178982/1) located in the municipality of the Brighton Council.

The development proposal is for a planning permit for subdivision pursuant to the Land Use Planning and Approvals Act at 33 Elderslie Road, Brighton – CT: 178982/1.

The property that forms the proposed Subdivision is an existing lot zoned General Residential.

The proposed subdivision (shown in Figure 1) seeks to create 107 subdivided lots, roads, reserves and Public Open Space. All lots will have direct vehicle access to existing/new municipal Road and a new municipal fire fighting water supply. This subdivision application is not anticipated to be staged.

3.1 Property Details

Address: 33 Elderslie Road, Brighton 7030

Municipality: Brighton Council

Zoned: General Residential (Southern Midlands Local Provisions Schedule)

Overlay: Bushfire Prone Areas

Proposed Zone: No Change - As above

Lot Number: 178982/1

Type of Development: Subdivision

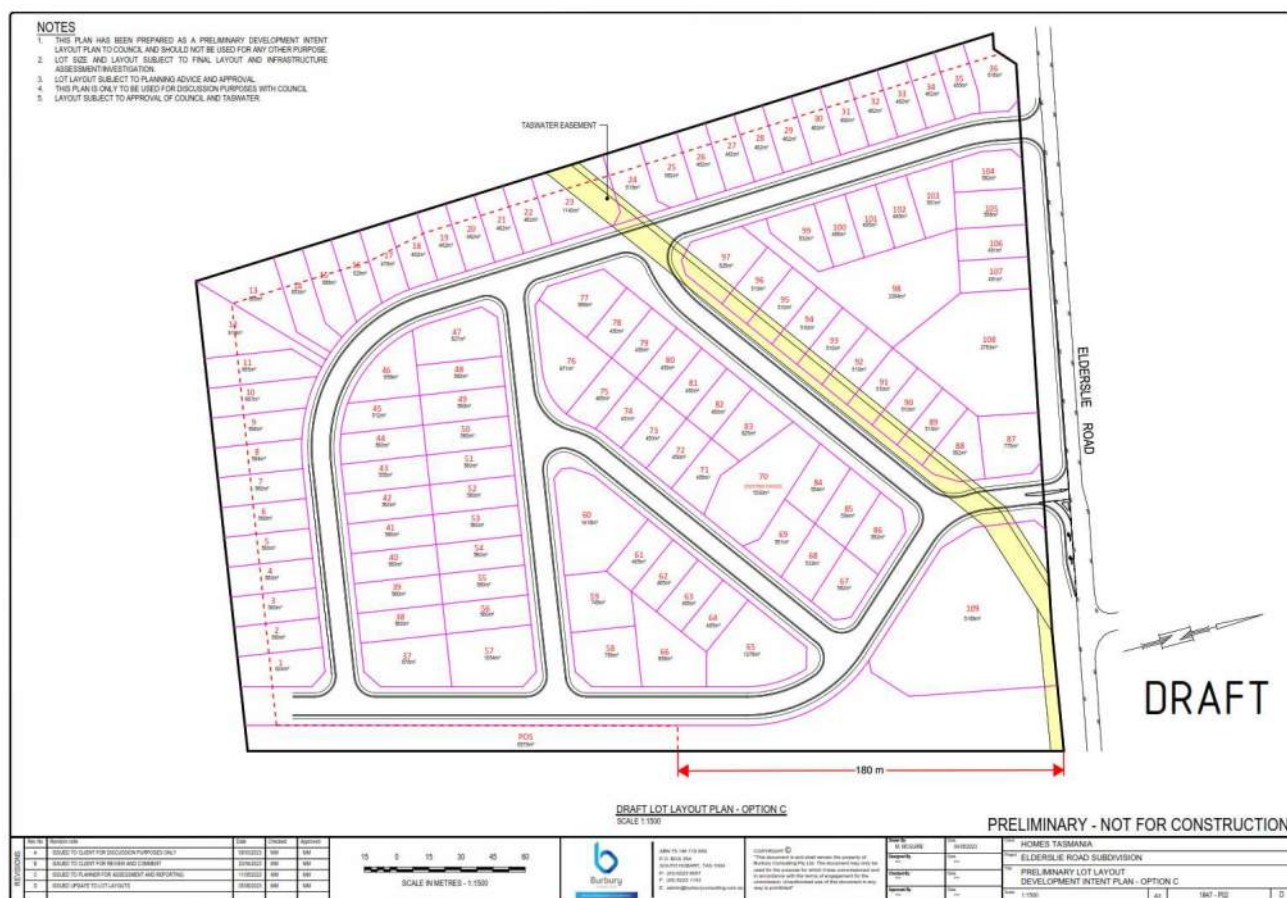


Figure 1 - Subdivision Civil Works Plan

4. Classification of Vegetation

The existing lot is currently developed for residential use in accordance with its current zoning. The proposed subdivision will create 106 new residential lots, a business zone lot (Lot 109), roads and a remaining Public Open Space lot.

The property is currently partially cleared and maintained to a low threat level as well as some hazardous vegetation within and external to the property.

The vegetation affecting the development has been classified in accordance with Clause 2.2.3 of AS 3959-2018.

In Tasmania, in accordance with Clause 2.2.2 of AS 3959-2009, the relevant Fire Danger Index applied for Tasmania is 50 (FDI 50).

When considering the definition of Bushfire Prone Area under the Code we have determined the proposed building area location is land that is within the boundary of a bushfire-prone area shown on an overlay on a planning scheme map is therefore considered 'Bushfire Prone'.

From and within the proposed development site an assessment survey has been conducted to determine the vegetation types, their proximities and slopes under the vegetation. In this case the Grassland hazard to the South is of the highest hazard rating.

Figure 2, below indicates the Bushfire Prone Vegetation described.



Figure 2 – Indicative Grassland and Woodland Bushfire Prone Vegetation – subject site highlighted yellow and pinned – NTS

4.1 Slope

The Effective slope of the land under the classified vegetation is determined in accordance with Clause 2.2.5 of AS 3959-2018.

The *effective* slope under the bushfire prone vegetation within 100 metres of all building areas is Downslope 0-5° to the East and all other azimuths are Upslope/0°.

In accordance with Clause 2.2 of AS 3959-2018, the Simplified Procedure has been applied to determine the Bushfire Attack Level (BAL) for the proposed development. In accordance with the Code, fire-fighting water supply and vehicle access are also considered and discussed in relation to the proposed development.

4.2 Subdivision Bushfire Attack Level

Considering the current conditions site and surrounding vegetation and topography conditions we have undertaken a Bushfire Attack Level Assessment in accordance with AS3959-2018. The development is capable of achieving the minimum standard required by the Code.

The highest BAL rating to be applied to any Bushfire Prone lot in this instance is BAL-19 – the building areas are located on the proposed lots so as to provide a hazard management area between the bushfire prone vegetation and

the building areas of a distance equal to or greater than the BAL-19 separation distances nominated by AS3959-2018; when vegetation types and slopes are considered in accordance with Section 2.2 of AS3959-2018.

The HMA between the hazardous vegetation and the building area is nominated on the Lot Detail Plan as "BAL-19 HMA Setback". Table 1 below is a general 360° Bushfire Attack Level Assessment undertaken to identify the bushfire prone vegetation types, determine the effective slopes under the bushfire prone vegetation and from these inputs the required clearance distances can be determined to achieve the minimum size of required BAL-19 HMA. The BAL Rating for each lot are nominated on the approved Bushfire Hazard Management Plan.

The Tasmania Fire Service have also provided the Southern Midlands Council with Bushfire Risk Advice via email following a site assessment. This advice has been confirmed and the BAL ratings and BHMP are consistent with this advice. Refer to **Appendix C** for an extract from the Tasmania Fire Service email advice.

Table 1 - Bushfire Attack Level Assessment Summary

Relevant fire danger index: (see clause 2.2.2)

FDI 50

Assess the vegetation within 100m in all directions (tick relevant group)

Note 1: Refer to Table 2.3 and Figures 2.3 & 2.4 for description and classification of vegetation.

Note 2: If there is no classified vegetation within 100 m of the site then the BAL is LOW for that part of the site.

Vegetation classification (see Table 2.3)	North <input checked="" type="checkbox"/> North-East <input checked="" type="checkbox"/>	South <input checked="" type="checkbox"/> South-West <input checked="" type="checkbox"/>	East <input checked="" type="checkbox"/> South-East <input type="checkbox"/>	West <input checked="" type="checkbox"/> North-West <input type="checkbox"/>
Group B - Woodland	-	Yes	-	YES
Group G - Grassland	-	YES	YES	YES

Exclusions (where applicable)	Highlight relevant paragraph descriptor from clause 2.2.3.2.			
	(b) (c) (d) (e) (f)	(b) (c) (d) (e) (f)	(b) (c) (d) (e) (f)	(b) (c) (d) (e) (f)

	North & North-East	South & South-West	East	West
Distance Required to achieve BAL-19	-	15m (lots 1-12)	11m (POS lot)	15m (lots 12-18) 10m (lots 19-34)
Effective slope	Upslope			
Slope under the classified vegetation	Upslope/0° <input checked="" type="checkbox"/>	Upslope/0° <input checked="" type="checkbox"/>	Upslope/0° <input type="checkbox"/>	Upslope/0° <input checked="" type="checkbox"/>
	Downslope			
	0-5° <input type="checkbox"/>	0-5° <input type="checkbox"/>	0-5° <input checked="" type="checkbox"/>	0-5° <input type="checkbox"/>
BAL value for each side of the site. Achievable BAL rating in (xx)	BAL-19	BAL-19	BAL-19	BAL-19

Determination of Bushfire Attack Level (BAL)

Achievable BAL for this development is:	BAL-19
Comments / Options / Limitations	<p>The BAL rating is based upon the condition of vegetation encountered at the time of inspection. The vegetation within the site and all created lots shall be maintained to a <i>Low Threat</i> Level (in accordance with AS3959-2018).</p> <p>North-East external to the site has been assessed Low Threat Vegetation due to the current development of the New Brighton High School - this accounts for the 180m setback from Elderslie Road for the commencement of the BAL-19 HMA Setback - this has an impact on the BAL Rating of lots within the proposed subdivision.</p> <p>North external to the has been assessed Low Threat Vegetation due to the General Residential Zone being developed and well maintained throughout.</p> <p>The HMA must provide a BAL-19 setback buffer - as dimensioned on the approved BHMP.</p> <p>Vegetation external to the site may be subject to change over time - this BAL rating does not account for any future change to the state of/hazard levels of vegetation within or external to the site.</p>

5. Subdivision C13.6.2 Public and fire fighting access

The primary access to the subdivided lots is to be a newly formed municipal roads, which are to be designed and constructed in accordance with the below table.

The access' serving each building area shall meet the intended requirements of the Code – not required as fire fighting vehicles will be connected to a fire fighting water supply on the new roads.

It is recommended that Council condition all permits for the future lot level developments must include property access in accordance with Table C13.2 of the Code – where required to enter the property to connect to a fire fighting water point.

New roads link to existing sealed roads which facilitate vehicle turning and through roads. The road design has provision for through road access and also facilitates turning at a termination for future developments.

The subdivision access roads serving Bushfire-Prone lots are to be designed and constructed in accordance with Compliance Standard for Property Access of each lot shall be in accordance with the requirements set out in Table C13.1 – the requirements to be met are as follows:

Table C13.1: Standards for Roads

Element		Requirement
A.	Roads	<p>Unless the development standards in the zone require a higher standard, the following apply:</p> <ul style="list-style-type: none"> (a) two-wheel drive, all-weather construction; (b) load capacity of at least 20t, including for bridges and culverts; (c) minimum carriageway width is 7m for a through road, or 5.5m for a dead-end or cul-de-sac road; (d) minimum vertical clearance of 4m; (e) minimum horizontal clearance of 2m from the edge of the carriageway; (f) cross falls of less than 3 degrees (1:20 or 5%); (g) maximum gradient of 15 degrees (1:3.5 or 28%) for sealed roads, and 10 degrees (1:5.5 or 18%) for unsealed roads; (h) curves have a minimum inner radius of 10m; (i) dead-end or cul-de-sac roads are not more than 200m in length unless the carriageway is 7 metres in width; (j) dead-end or cul-de-sac roads have a turning circle with a minimum 12m outer radius; and (k) carriageways less than 7m wide have 'No Parking' zones on one side, indicated by a road sign that complies with Australian Standard AS1743-2001 Road signs-Specifications.

Table C13.2 Standards for Property Access

A.	Property access length is less than 30m; or access is not required for a fire appliance to access a fire fighting water point.	<p>There are no specified design and construction requirements.</p> <p>If a fire fighting vehicles needs to enter the property to connect to the fire fighting water point the property access must comply with section B. below.</p> <p>It is recommended that the fire fighting water point be located so that fire fighting vehicles do not have to enter the property, however fire fighting vehicle hardstands must be within 3 metres of the fire fighting water point.</p>
B.	Property access length is 30m or greater; or access is required for a fire appliance to a fire fighting water point.	<p>The following design and construction requirements apply to property access:</p> <ul style="list-style-type: none"> a) all-weather construction; b) load capacity of at least 20t, including for bridges and culverts; c) minimum carriageway width of 4m; d) minimum vertical clearance of 4m; e) minimum horizontal clearance of 0.5m from the edge of the carriageway; f) cross falls of less than 3 degrees (1:20 or 5%); g) dips less than 7 degrees (1:8 or 12.5%) entry and exit angle; h) curves with a minimum inner radius of 10m; i) maximum gradient of 15 degrees (1:3.5 or 28%) for sealed roads, and 10 degrees (1:5.5 or 18%) for unsealed roads; and

		<p>j) terminate with a turning area for fire appliances provided by one of the following:</p> <ul style="list-style-type: none"> i. a turning circle with a minimum outer radius of 10m; or ii. a property access encircling the building; or <p>a hammerhead "T" or "Y" turning head 4m wide and 8m long.</p>
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6. Subdivision C13.6.3 Provision of water supply for fire fighting purposes

The Subdivision is to be served by a water corporation reticulated hydrant system.

The reticulated hydrant system serving each building area shall meet the intended requirements of the Code.

Ensure that future multi residential and commercial developments are provided with fire fighting water supplies in accordance with Table C13.4 of the Code.

The development is not intended to be staged and all lots will be served by a compliant reticulated hydrant system prior to the sealing of titles.

The subdivision reticulated hydrant system serving Bushfire-Prone lots are to be designed and constructed in accordance with Compliance Standard for *Reticulated water supply for fire fighting* in accordance with the requirements set out in Planning Code C13.6.3 Table C13.4 – the requirements to be met are as follows:

Table C13.4: Reticulated water supply for fire fighting		
Element		Requirement
<u>A.</u>	Distance between building area to be protected and water supply.	<p>The following requirements apply:</p> <ul style="list-style-type: none"> (a) the building area to be protected must be located within 120m of a fire hydrant; and (b) the distance must be measured as a hose lay, between the fire fighting water point and the furthest part of the building area.
<u>B.</u>	Design criteria for fire hydrants	<p>The following requirements apply:</p> <ul style="list-style-type: none"> (a) fire hydrant system must be designed and constructed in accordance with TasWater Supplement to Water Supply Code of Australia WSA 03 – 2011-3.1 MRWA 2nd Edition; and (b) fire hydrants are not installed in parking areas.
<u>C.</u>	Hardstand	<p>A hardstand area for fire appliances must be:</p> <ul style="list-style-type: none"> (a) no more than 3m from the hydrant, measured as a hose lay; (b) no closer than 6m from the building area to be protected; (c) a minimum width of 3m constructed to the same standard as the carriageway; and (d) connected to the property access by a carriageway equivalent to the standard of the property access

7. Hazard Management Areas C13.6.1

As part of the subdivision development it is required that vegetation hazards within all lots and the Hazard Management Area (HMA) will be cleared so that they can be classified as Low Threat Vegetation in accordance with AS3959-2018.

Hazardous vegetation impacting upon the development as discussed above comprises Woodland and Grassland indicated in Figure 2 above. It is expected the subdivision development will require modification of vegetation within the subdivided lots, ongoing hazard management for the benefit of the subdivided lots building areas is required.

The entirety of the lots (lots 1 to 107 & POS) is to be established and maintained Low Threat vegetation in accordance with AS3959-2018. For perpetuity, all areas of privately owned land and POS are nominated on the BHMP as Hazard Management Areas are to be continually managed to a low threat level - as per Clause 2.2.3.2 of AS3959-2018. These areas are nominated on the Bushfire Hazard Management Plan as the Hazard Management Area (HMA) – being the red shaded area, red shaded cross hatch areas.

Proposed Roadways and Public Open Space areas are assumed to become the responsibility of the Council for future ongoing maintenance and are also to be considered Low Threat vegetation in accordance with AS3959-2018.

The Certified Bushfire Hazard Management Plan indicates the BAL Ratings, which apply across all residential lots in the development.

The HMA refers to land that is managed in a minimum fuel condition to reduce the potential exposure of habitable buildings and occupants to radiant heat and flames and to provide defensible space. The effectiveness of the hazard management areas is reliant on ongoing maintenance by landowners. HMA's need to be implemented prior to sealing titles and it is recommended that a suitable instrument, such as an easement or restrictive covenant that requires - land owners to not allow for fuel to accumulate and create a fire hazard - be placed on each title. The main purpose of this being each lot will be relying on the maintenance of the adjoining lot to achieve required separation distances in order to achieve the specified BAL rating. The developer will be responsible for the management of vegetation on each lot until such time as the lots are sold. The developer is also responsible for maintaining unsold lots and the undeveloped balance of each stage and that management involves maintain the vegetation as low threat as described in AS3959 part 2.2.3.2.

The minimum extents of the HMA are demonstrated on the BHMP. As the proposed HMAs rely upon one another for mutual protection, they must be established prior to the sealing of titles and maintained in perpetuity by the respective owners. Management prescriptions for the proposed HMA are provided in Table 2.

Table 2 - Bushfire Hazard Management Plan - Vegetation Management Requirement

Zone Name	Ongoing Maintenance Requirements
Within approved lots and nominated Hazard Management Area (HMA)	<p>Vegetation is to be continually managed to a low threat in accordance with AS3959-2018. In this case low threat vegetation can be a combination of :</p> <ul style="list-style-type: none">• Non-vegetated areas, including waterways, roads, footpaths, buildings and rocky outcrops; and• Low threat vegetation, including grassland managed in a minimal fuel condition, maintained lawns and cultivated gardens. <p>NOTE: Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack (recognizable as short-cropped grass for example, to a nominal height of 100 mm).</p>

	<p>Maintenance shall include (but is not limited to):</p> <ul style="list-style-type: none">• Removal of fallen limbs, leaf and bark litter;• Cut grasses short (less than 100mm) and maintain;• Remove vegetation debris;• Complete under-brushing and thin out the under storey;• Cut tree limbs within 2 metres of the ground;• Maintain horizontal and vertical canopy separation;• Prevent encroachment of Bushfire Prone Vegetation into the HMA.
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NOTE: All lots within the subdivision (excluding the balance lot) is to be maintained to a Low Threat Level for ongoing hazard management for the benefit of all the newly created lots.

The proposal complies with A1(b)(i) of C13.6.1 Subdivision: Provision of hazard management areas - of the planning scheme as the attached proposed plan of subdivision includes all of the lots that are proposed within a bushfire prone area as well as those that are not.

The proposal complies with A1(b)(ii) and (iii) as the plan of subdivision shows building areas for each lot and hazard management areas between the building areas and bushfire prone vegetation greater than the separation distances required for BAL-19 in AS3959:2018.

A1(b)(iv) is also met as the attached BHMP also shows hazard management areas between the building areas and bushfire prone vegetation equal to or greater than the separation distances required for BAL-19 in AS3959:2018 and is certified by an accredited person.

Upon commencement of constructed the development shall be cleared and maintained to a low threat state.

8. Conclusion

The Bushfire Hazard Management Plan demonstrates BAL-19 (the minimum requirement for subdivision) compliant nominated clearances and specifies the maintenance of this zone in accordance with the HMA, low threat vegetation requirements of AS 3959-2018. This demonstrates sufficient access to the building area possible to protect both fire fighters and occupants exposed to bushfire when defending the property.

The plan demonstrates suitable access and egress options for property occupants and emergency services. A reticulated firefighting water supply must be provided which allows for fire-fighting access to the most disadvantaged part of all lots building areas.

The proposed Bushfire Hazard Management Plan, accompanied by this report and its compliance standards as supporting documentation, along with the Certification of referenced documents demonstrates likely compliance with the applicable Sections of the Code.

9. Recommendations

It is recommended the following be included as conditions of the Regulatory Approval documentation.

- HMA's are to be implemented prior to sealing titles and it is recommended that a suitable instrument, such as an easement or restrictive covenant, that requires landowners to not allow for fuel to accumulate and create a fire hazard be placed on each title. The purpose of this covenant being that each lot will be relying on the

maintenance of the adjoining lot to achieve required separation distances to achieve the specified BAL ratings.

10. References

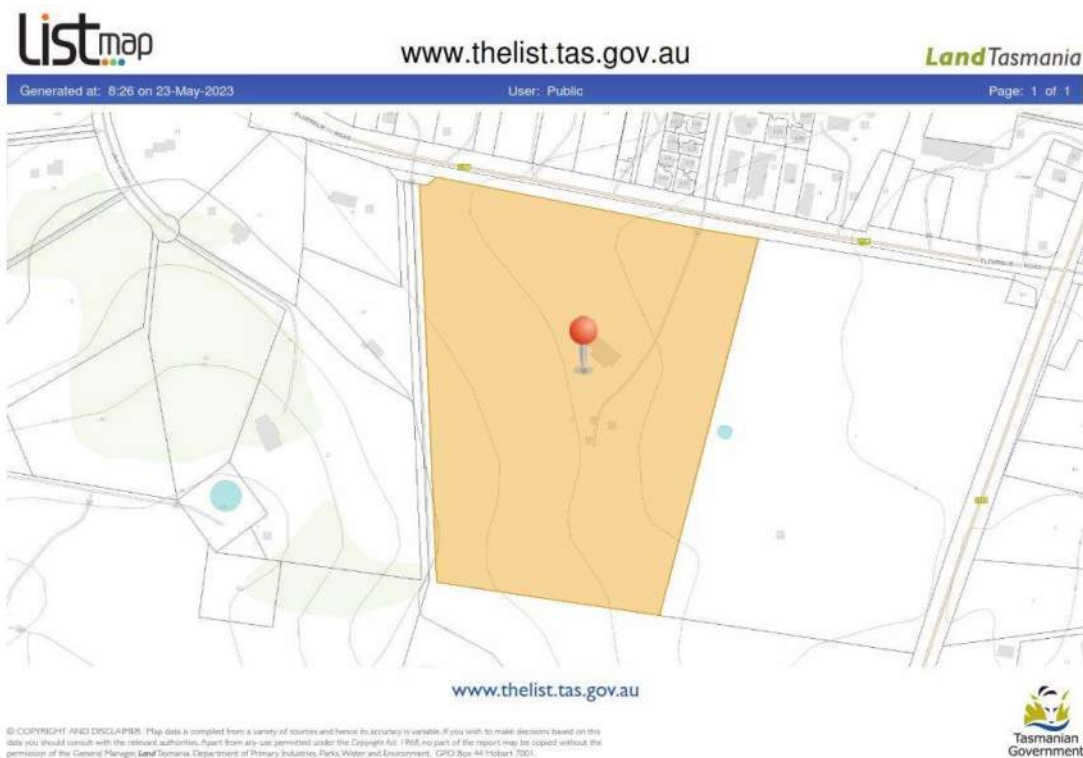
Tasmanian Planning Scheme – Brighton – Part C13.0 Bushfire-Prone Areas Code

LIST map version. Aerial Photograph [online]. Available from: <<http://www.thelist.tas.gov.au/listmap/listmap>>

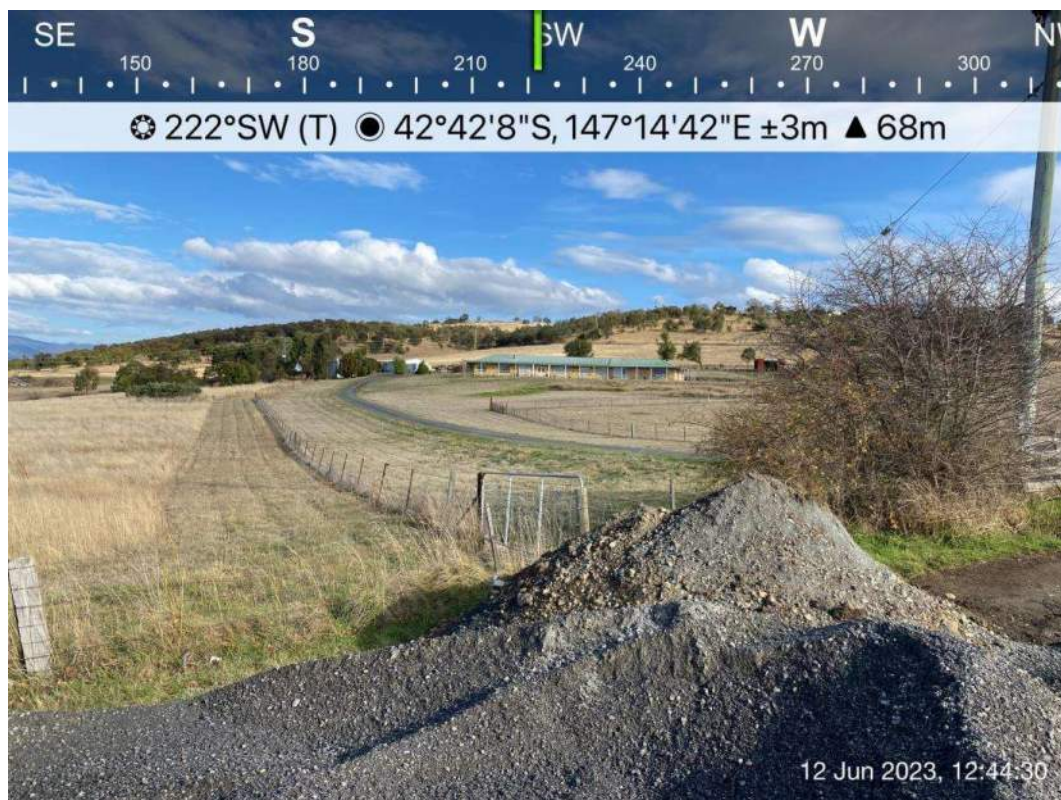
Standards Australia 2018, *Construction of buildings in bushfire prone areas*, AS 3959-2018.

Appendix A – Site Images

Location Plan – subject site highlighted yellow and pinned – Not to Scale











Appendix B – Bushfire Hazard Management Plan, certified date 12.06.2023; Bushfire Prone Areas Code Certificate & Certificate of Specialist or Other Person (Form 55) 2023.06 – 33 Elderslie

NOTES

- THIS PLAN HAS BEEN PREPARED AS A PRELIMINARY DEVELOPMENT INTENT. LAYOUT PLAN TO COUNCIL AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE.
- LOT SIZE AND LAYOUT SUBJECT TO FINAL LAYOUT AND INFRASTRUCTURE ASSESSMENT/INVESTIGATION.
- LOT LAYOUT SUBJECT TO PLANNING ADVICE AND APPROVAL.
- THIS PLAN IS ONLY TO BE USED FOR DISCUSSION PURPOSES WITH COUNCIL.
- LAYOUT SUBJECT TO APPROVAL OF COUNCIL AND TASFATER.

ENSURE THAT DETAILED DESIGN DOCUMENTATION PROVIDES FOR:
PUBLIC AND FIRE FIGHTING ACCESS IN ACCORDANCE WITH C13.6.2 OF THE
TASMANIAN PLANNING SCHEME INCLUDING TABLES C13.1 & C13.2.

AND PROVISION OF WATER SUPPLY FOR FIRE FIGHTING PURPOSES IS IN
ACCORDANCE WITH C13.4 OF THE TASMANIAN PLANNING SCHEME
INCLUDING TABLE C13.4.

This plan demonstrates compliance with Bushfire Prone
Areas Code C13.0 of the Tasmanian Planning Scheme;

The Hazard Management Areas (HMA) indicated on this
plan must be established and maintained as per the plan
and nominated setback distances. All lots throughout
the subdivision comprise the Hazard
Management Areas (HMA) & must be
maintained to a Low Threat Level in
accordance with AS3959-2018.

Public and fire fighting access
arrangements must comply with
Code C13.6.2, Table C13.1 &
Table C13.2 of the Tasmanian
Planning Scheme.

Fire fighting water supply complies with
AS3959 and Code C13.6.3 Table C13.4
of the Tasmanian Planning Scheme.

For design and compliance specifications
refer to sections 5 to 7 of the Bushfire
Hazard Management Plan Report,
Subdivision - 33 Elderslie Road, Brighton
for Burbury Consulting Pty Ltd
dated June 2023.

The Subdivision HMA is to be established
as early as possible to provide the required
HMA buffer for all proposed lots.

BAL Rating Schedule:

- BAL-19 - Lots 1 to 36.
- BAL-12.5 - Lots 37 to 58, 66, 76 & 77.
- BAL-LOW - Lots 59 - 64, 67 - 75, 78 - 109

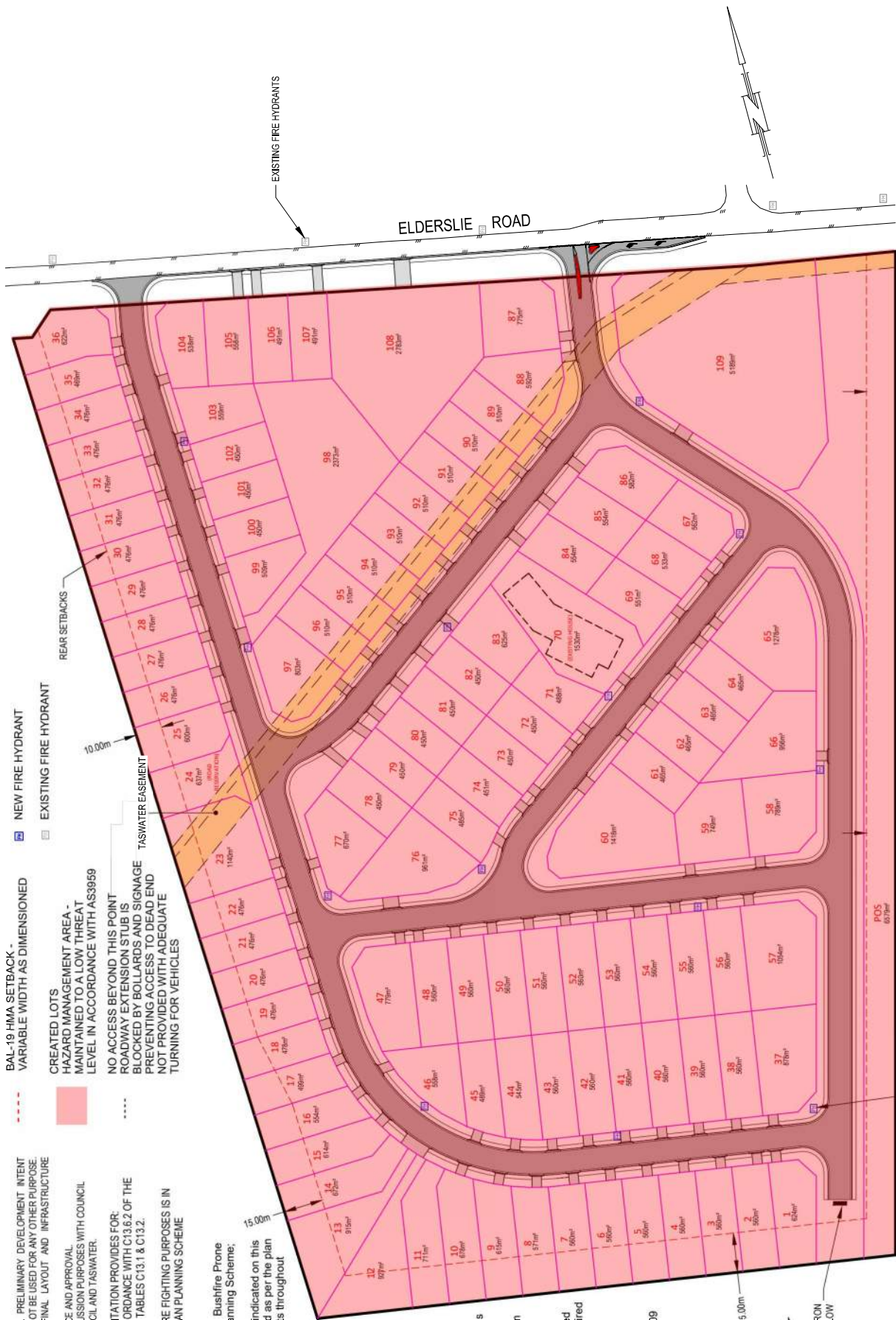
Certified By: Rhys Menadue -
BFP-106
Certificate No: 2023.06 - 33 Elderslie
Date: 12.06.2023

ROAD CLOSED SIGN AND CHEVRON
AS PER EXAMPLE BELOW

ROAD CLOSED SIGN



- BAL-19 HMA SETBACK -
VARIABLE WIDTH AS DIMENSIONED
- CREATED LOTS
- HAZARD MANAGEMENT AREA -
MAINTAINED TO A LOW THREAT
LEVEL IN ACCORDANCE WITH AS3959
- NO ACCESS BEYOND THIS POINT -
ROADWAY EXTENSION STUB IS
BLOCKED BY BOLLARDS AND SIGNAGE
PREVENTING ACCESS TO DEAD END
NOT PROVIDED WITH ADEQUATE
TURNING FOR VEHICLES



PROPOSED FIRE HYDRANTS, SUBJECT
TO FINAL ENGINEERING DESIGN

BHMP LAYOUT
SCALE 1:1500

PRELIMINARY - NOT FOR CONSTRUCTION

Rev No	Revision note	Date	Checked	Approved
A	ISSUED FOR APPROVAL	08/06/23	MM	MM
REVISIONS				
Client: HOMES TASMANIA				
Project: ELDESLIE ROAD SUBDIVISION				
Title: BUSHFIRE HAZARD MANAGEMENT PLAN				
Scale: 1:1500				
Date: 18/07 - P50				
A				

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Burbury
CONSULTING

BUSHFIRE-PRONE AREAS CODE

CERTIFICATE¹ UNDER S51(2)(d) *LAND USE PLANNING AND APPROVALS ACT 1993*

1. Land to which certificate applies

The subject site includes property that is proposed for use and development and includes all properties upon which works are proposed for bushfire protection purposes.

Street address:

33 Elderslie Road, Brighton 7030

Certificate of Title / PID:

CT: 178982/1

2. Proposed Use or Development

Description of proposed Use and Development:

Subdivision

Applicable Planning Scheme:

Tasmanian Planning Scheme - Brighton

3. Documents relied upon

This certificate relates to the following documents:

Title	Author	Date	Version
Bushfire Hazard Management Plan and Specification, Subdivision – 33 Elderslie Road, Brighton	Rhys Menadue	Certified Date: June 2023	1
Bushfire Hazard Management Plan Report, Subdivision – 33 Elderslie Road, Brighton and all Appendices	Rhys Menadue	June 2023	1

¹ This document is the approved form of certification for this purpose and must not be altered from its original form.

4. Nature of Certificate

The following requirements are applicable to the proposed use and development:

<input type="checkbox"/>	E1.4 / C13.4 – Use or development exempt from this Code	
	Compliance test	Compliance Requirement
<input type="checkbox"/>	E1.4(a) / C13.4.1(a)	Insufficient increase in risk

<input type="checkbox"/>	E1.5.1 / C13.5.1 – Vulnerable Uses	
	Acceptable Solution	Compliance Requirement
<input type="checkbox"/>	E1.5.1 P1 / C13.5.1 P1	<i>Planning authority discretion required. A proposal cannot be certified as compliant with P1.</i>
<input type="checkbox"/>	E1.5.1 A2 / C13.5.1 A2	Emergency management strategy
<input type="checkbox"/>	E1.5.1 A3 / C13.5.1 A2	Bushfire hazard management plan

<input type="checkbox"/>	E1.5.2 / C13.5.2 – Hazardous Uses	
	Acceptable Solution	Compliance Requirement
<input type="checkbox"/>	E1.5.2 P1 / C13.5.2 P1	<i>Planning authority discretion required. A proposal cannot be certified as compliant with P1.</i>
<input type="checkbox"/>	E1.5.2 A2 / C13.5.2 A2	Emergency management strategy
<input type="checkbox"/>	E1.5.2 A3 / C13.5.2 A3	Bushfire hazard management plan

<input checked="" type="checkbox"/>	E1.6.1 / C13.6.1 Subdivision: Provision of hazard management areas	
	Acceptable Solution	Compliance Requirement
<input type="checkbox"/>	E1.6.1 P1 / C13.6.1 P1	<i>Planning authority discretion required. A proposal cannot be certified as compliant with P1.</i>
<input type="checkbox"/>	E1.6.1 A1 (a) / C13.6.1 A1(a)	Insufficient increase in risk
<input checked="" type="checkbox"/>	E1.6.1 A1 (b) / C13.6.1 A1(b)	Provides BAL-19 for all lots (including any lot designated as 'balance')
<input type="checkbox"/>	E1.6.1 A1(c) / C13.6.1 A1(c)	Consent for Part 5 Agreement

<input checked="" type="checkbox"/>	E1.6.2 / C13.6.2 Subdivision: Public and fire fighting access	
	Acceptable Solution	Compliance Requirement
<input type="checkbox"/>	E1.6.2 P1 / C13.6.2 P1	<i>Planning authority discretion required. A proposal cannot be certified as compliant with P1.</i>
<input type="checkbox"/>	E1.6.2 A1 (a) / C13.6.2 A1 (a)	Insufficient increase in risk
<input checked="" type="checkbox"/>	E1.6.2 A1 (b) / C13.6.2 A1 (b)	Access complies with relevant Tables

<input checked="" type="checkbox"/>	E1.6.3 / C13.1.6.3 Subdivision: Provision of water supply for fire fighting purposes	
	Acceptable Solution	Compliance Requirement
<input type="checkbox"/>	E1.6.3 A1 (a) / C13.6.3 A1 (a)	Insufficient increase in risk
<input checked="" type="checkbox"/>	E1.6.3 A1 (b) / C13.6.3 A1 (b)	Reticulated water supply complies with relevant Table
<input checked="" type="checkbox"/>	E1.6.3 A1 (c) / C13.6.3 A1 (c)	Water supply consistent with the objective
<input type="checkbox"/>	E1.6.3 A2 (a) / C13.6.3 A2 (a)	Insufficient increase in risk
<input type="checkbox"/>	E1.6.3 A2 (b) / C13.6.3 A2 (b)	Static water supply complies with relevant Table
<input type="checkbox"/>	E1.6.3 A2 (c) / C13.6.3 A2 (c)	Static water supply consistent with the objective

5. Bushfire Hazard Practitioner

Name: Rhys Menadue

Phone No: 0407 595 317

Postal Address: 14 Reynolds Court
Dynnyrne TAS 7005

Email Address: rhmenadue@gmail.com

Accreditation No: BFP – 106

Scope: 1, 2, 3a, 3b, 3c

6. Certification

I certify that in accordance with the authority given under Part 4A of the *Fire Service Act 1979* that the proposed use and development:

☐ Is exempt from the requirement Bushfire-Prone Areas Code because, having regard to the objective of all applicable standards in the Code, there is considered to be an insufficient increase in risk to the use or development from bushfire to warrant any specific bushfire protection measures, or

☒ The Bushfire Hazard Management Plan/s identified in Section 3 of this certificate is/are in accordance with the Chief Officer's requirements and compliant with the relevant **Acceptable Solutions** identified in Section 4 of this Certificate.

Signed:
certifier



Name: Rhys Menadue

Date: June 2023

Certificate Number: 2023.06 – 33 Elderslie

(for Practitioner Use only)

CERTIFICATE OF QUALIFIED PERSON – ASSESSABLE ITEM

Section 321

Form **55**

To: Owner /Agent

Address

Suburb/postcode

Qualified person details:

Qualified person:

Address:

Phone No:

Fax No:

Licence No:

Email address:

Qualifications and Insurance details:

(description from Column 3 of the Director of Building Control's Determination)

Speciality area of expertise:

(description from Column 4 of the Director of Building Control's Determination)

Details of work:

Address:

Lot No:

Certificate of title No:

The assessable item related to this certificate:

(description of the assessable item being certified)

Assessable item includes –

- a material;
- a design
- a form of construction
- a document
- testing of a component, building system or plumbing system
- an inspection, or assessment, performed

Certificate details:

Certificate type:

(description from Column 1 of Schedule 1 of the Director of Building Control's Determination)

This certificate is in relation to the above assessable item, at any stage, as part of - (tick one)

building work, plumbing work or plumbing installation or demolition work: ☒

or

a building, temporary structure or plumbing installation: ☐

In issuing this certificate the following matters are relevant –

Documents:

- Bushfire Hazard Management Plan Report, Subdivision – 33 Elderslie Road, Brighton, by Rhys Menadue dated June 2023.

Relevant
calculations:

- In Accordance with AS3959-2018; and
- the Building Regulations (TAS).

References:

- AS3959-2018;
- the Building Regulations (TAS); and
- Building Code of Australia (BCA).

Substance of Certificate: (what it is that is being certified)

BAL Ratings

Scope and/or Limitations

The assessment has been conducted according to information provided by the designer/client and freely available historical data and does not take into account the possibility of altered site conditions from the data relied upon.

It should be noted compliance with the recommendations contained in the certified documents does not mean that there is no residual risk to life safety and property as a result of bushfire. The limitation is expressed in the following extract from AS3959-2018, which states:

It should be borne in mind that the measures contained in this Standard cannot guarantee that a building will survive a bushfire event on every occasion. This is substantially due to the degree of vegetation management, the unpredictable nature and behaviour of fire, and extreme weather conditions.

The level of residual risk is inherent in all bushfire standards and also applies to this certification.


The assessment has been undertaken and certification provided on the understanding that; -

1. The certificate only deals with the potential bushfire risk all other statutory assessments are outside the scope of this report.
2. The report only identifies the size, volume and status of vegetation at the time the site inspection was undertaken and cannot be relied upon for any future development.

Impacts of future development and vegetation growth have not been considered.

I certify the matters described in this certificate.

Qualified person:

Signed: 

Certificate No:

2023.06 – 33
Elderslie

Date:

12.06.2023

To: Leigh Wighton – Brighton Council

Project: Elderslie Road subdivision

From: Morgan McGuire

Date: 05/03/2024

Subject: Stormwater Treatment

Job No. 1847

Referring to the RFI received from Council dated 15th February 2024 in relation to the current treatment train proposed we provide the following comments.

5. It is generally preferred to limit the variety of Stormwater Quality Improvement Devices (SQID) that are handed over to Council. As each different SQID has its own maintenance requirements, keeping the range of systems low will reduce the ongoing maintenance burden for Council's works crew.

Stormwater treatment innovation by proprietary devices is an ongoing improvement and management towards our environment. Whilst there are a number of Enviropods, they take between 5-10 minutes to empty compared to a large scale CDS style GPT.

6. For SQIDs that are to be handed over to Council, continuous deflection separation devices (e.g. CDS, Vortceptor, OceanSave) are typically preferred due to performance and ease of maintenance. That said, these systems do fill a slightly different role to the UpFlo units suggested

The Up Flo Filter is an all-in-one stormwater treatment system that is specifically designed to capture GP, TSS, TP and TN. If Council wants to have a CDS style GPT then this can be achieved however this is not necessary with the treatment train that has been proposed i.e. EnviroPod™, Up Flo Filter™ and Hydro BioFilter™. If Council requires a single GPT upstream of the UFF then it is important to understand the reasons why and what storage volume is acceptable in conjunction with Council maintenance regimes. i.e. Pollutant export vs storage volume vs maintenance intervals/yr.

The UFF filter media can not be blocked unless there is lack of monitoring and maintenance. Maintenance should be based upon the UFF operations and maintenance manual (see attached).

7. While there would be aesthetic value in the Biofilter systems, it may be a better long-term outcome to exclude these systems and to upgrade the UpFlo (or similar) units as necessary, as this would reduce the number of filtration-based units requiring maintenance from 11 to 2. This would also reduce the complexity of installation, as Biofilter systems must be carefully installed in relation to the adjacent road. Similarly, replacing the eight EnviroPod units with two CDS-style units immediately upstream of the proposed UpFlo would bring the total devices requiring ongoing maintenance from 19 to 4

Council should consider the time it takes to maintain such devices. The Enviropod units will take between 5-10 minutes to empty the contents. Cleaning a CDS style GPT will take 1-2 days for each system. Biofilter systems also have the benefit of the achieving landscaping elements that have been requested.

Please refer to letter from General Manager – Emerging Markets of Hydro International confirming the products

As it is proven that a stormwater treatment train can be achieved for the relevant pollutant target reductions, we suggest that any further requests and discussions with Council can be conditioned in a Development Use Permit and undertaken during detailed design with more collaboration with Council.

Yours faithfully,



Morgan McGuire

Team Leader – Civil Design

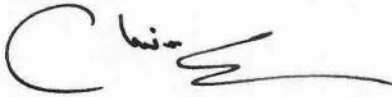
19 February 2024

To Whom It May Concern

Hydro International Ltd hereby confirm that the Hydro StormScape® and Hydro Biofilter™ products are available to be sold in the Australian market and that Stormwater Environmental Solutions Pty Ltd. has our permission to promote and supply products to customers within Australia.

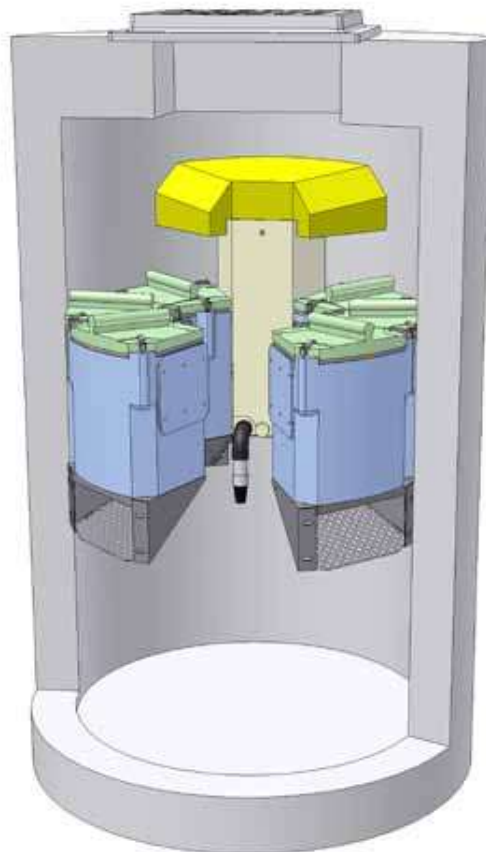
Should you require any further information please do not hesitate to contact me.

Yours faithfully,



Clive Evans
Managing Director – Emerging Markets





Operation and Maintenance Manual

Up-Flo® Filter

Filtration System for Stormwater Treatment

Stormwater Solutions

Turning Water Around ...®

Table of Contents

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5	Inspection & Maintenance <ul style="list-style-type: none">- Overview- First-Year Monitoring- Inspection- Maintenance Activities Not Requiring Man Entry - Floatables, Oil and Sump Cleanout- Maintenance Activities Requiring Man Entry - Replacement of Media Packs and Drain Down Filter- Solids Disposal
13	Up-Flo® Filter Installation Log
14	Up-Flo® Filter Inspection Log
16	Up-Flo® Filter Maintenance Log
17	Stormwater BMP Maintenance Certification Program

IMPORTANT - ORDER REPLACEMENT PARTS FOR MAINTENANCE - IMPORTANT

Annual maintenance requires replacement of the Media Packs and the Drain Down Filter. Contact Hydro International to order replacements. Allow 2-4 weeks for delivery.

Office hours Monday thru Friday 8:00 A.M. to 5:00 P.M. EST
Toll free: 1-800-848-2706
Phone: 207-756-6200
Fax: 207-756-6212
Email: stormwaterinquiry@hydro-int.com

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DISCLAIMER: Information and data contained in this manual is exclusively for the purpose of assisting in the operation and maintenance of Hydro International plc's Up-Flo® Filter. No warranty is given nor can liability be accepted for use of this information for any other purpose. Hydro International plc have a policy of continuous product development and reserve the right to amend specifications without notice.



Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Product Overview

The Up-Flo® Filter is a modular high-rate stormwater filtration device. As shown below, it is typically installed into a 4-ft diameter catch basin structure. Each Filter Module has a screen and support bracket that is attached to the concrete manhole and each contains a Media Pack that includes Flow Distribution Media and two Media Bags (Fig.1). Modules can attach to each other to form a "ring" of up to six modules. Up to two of the modules are attached to an Outlet Module that has a Bypass Hood and Drain Down Filter. The modular design can be supplied in different configurations depending on the application as shown in the following illustrations.

An upward flow path through the Filter Modules allows stormwater to be screened and filtered. In addition to the screening and filtering processes, gross pollutants will also settle into the sump or float to the surface of the water held within the manhole. The standard units are supplied with a 3-ft (0.9m) sump to allow for sediment and gross pollutant accumulations between maintenance intervals.

The following manual describes the operation of the Up-Flo® Filter and provides general maintenance requirements that will ensure the filter will continue to operate and perform as intended. In general, a minimum of two inspections are required per year to monitor sediment and gross pollutant accumulations. In order to achieve an annual TSS removal rate of 80% for 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.

Hydro International offers recommendations for certified maintenance contractors. It is hoped that owners will take advantage of this service as these contractors have been trained and certified to ensure that maintenance will be performed properly. Should the owner choose to conduct maintenance procedures themselves, it is recommended that Hydro International be contacted to discuss the following procedures and consider contracting a representative from Hydro International for the first maintenance cycle.

See page 17 for more about Hydro International's Stormwater BMP Maintenance Contractor Certification Program.

Up-Flo® Filter Components

1. Inlet Grate
2. Siphonic Bypass Hood with Floatables Baffle
3. Filter Module
4. Outlet Module
5. Media Pack
6. Angled Screen
7. Drain Down Filter Assembly (*refer to Fig.10 for closer view*)
8. Sump

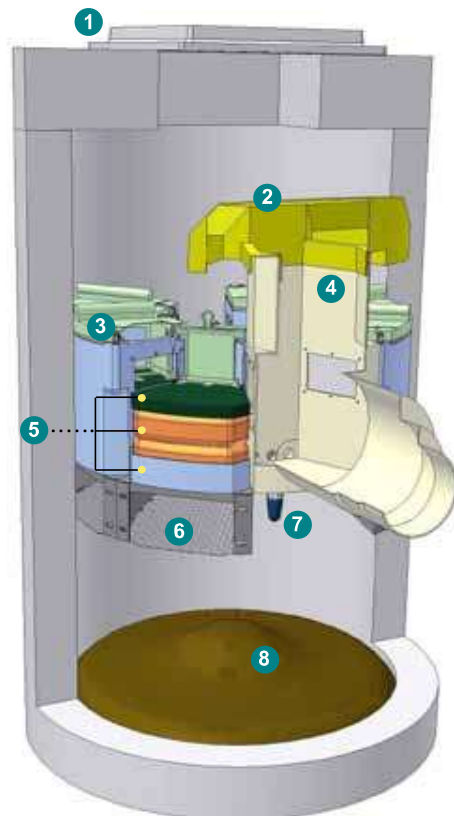


Fig.1 The components of the Up-Flo® Filter.

Operation

Introduction

The Up-Flo® Filter operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirements and is fabricated with durable non-corrosive components. Personnel are not required to operate the unit and maintenance is limited to periodic inspections, sediment and floatables removal, Media Pack replacement and Drain Down Filter replacement.

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 (see Fig.2). The high-capacity 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. The Up-Flo® Filter 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. The Angled Screens 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.

Good Housekeeping & Best Practices

Good housekeeping practices upstream of the Up-Flo® Filter can significantly extend Media Bag life. For example, sweeping paved surfaces, collecting leaves and grass trimmings, and protecting bare ground from erosion will reduce loading to the system. Media Packs should not be installed in the Filter Modules until construction activities are complete and site stabilization is effective.

Damage Due to Lack of Maintenance

Delayed maintenance would result in clogged Media Bags and/or blinded Angled Screens. In that situation, the Up-Flo® Filter would go into bypass and there would be no treatment of the incoming stormwater. Because the Bypass Weir can easily convey all of the flow to the Outlet Module, there would be no lasting damage to the system. Replacement of the Media Bags and removal of sediment from the sump would restore the Up-Flo® Filter to its original treatment efficiency. Establishing and adhering to a regular maintenance schedule ensures optimal performance of the system.

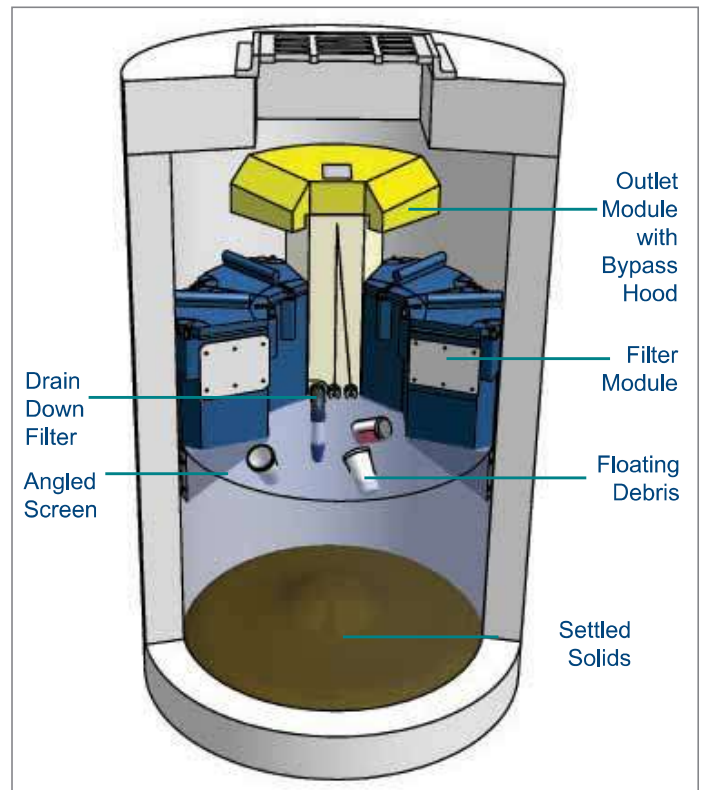


Fig.2 Pollutants captured in the Up-Flo® Filter.

Inspection & Maintenance

Overview

The Up-Flo® Filter protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the proper functioning of the Up-Flo® Filter.

Maintenance activities can be categorized as those that may be performed from outside the Up-Flo® vessel and those that are performed inside the vessel. Maintenance performed from outside the vessel includes removal of floatables and oils that have accumulated on the water surface and removal of sediment from the sump. Maintenance performed inside the vessel includes removal and replacement of Media Bags, Flow Distribution Media and the Drain Down Filter. A vactor truck is required for removal of oils, water, sediment, and to completely pump out the vessel to allow for maintenance inside. OSHA Confined Space Entry procedures must be followed when entering the Up-Flo® vessel.

The Up-Flo® Filter design allows for easy and safe inspection, monitoring and clean-out procedures. It has a wide central opening between the Filter Modules for easy and comfortable access to all of the components (see Fig.3). Completion of all the maintenance activities for a typical manhole Up-Flo® Filter takes less than one hour. In the case of inspection and floatables removal, a vactor truck is not required. Otherwise, a vactor truck is normally required for oil removal, removal of sediment from the sump, and replacement of the Media Packs and Drain Down Filter. In most cases, entry into the Up-Flo® Filter vessel is required for replacement of the Media Packs and Drain Down Filter, and OSHA Confined Space Entry procedures will have to be followed.

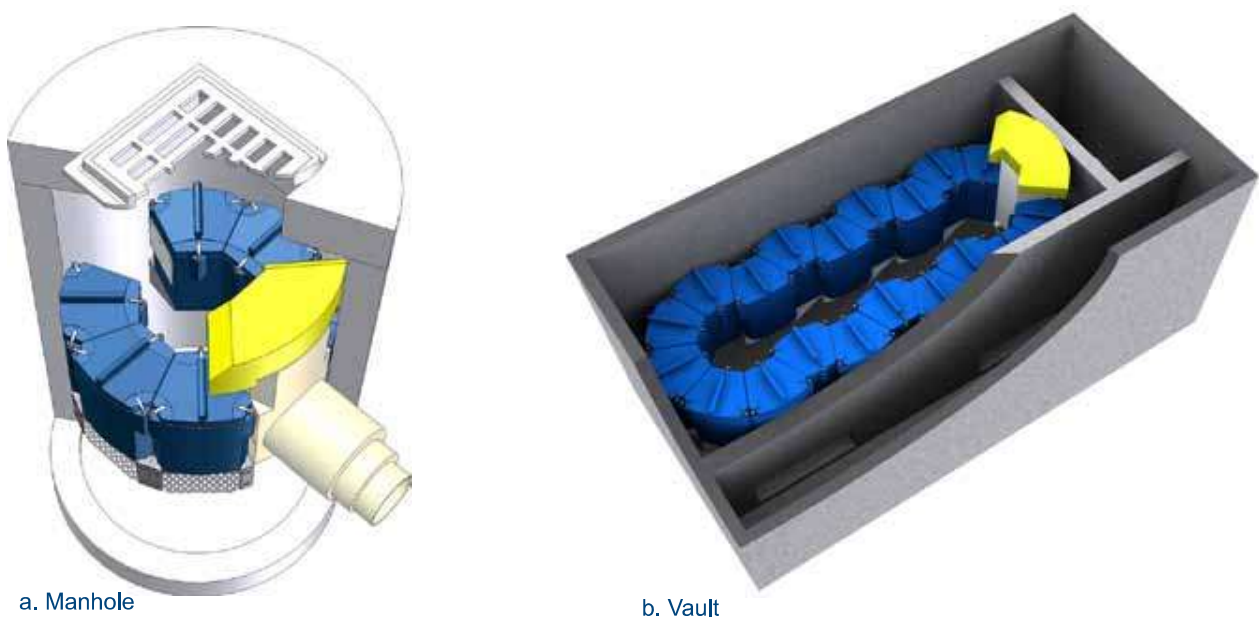


Fig.3 The Up-Flo® Filter is installed in a) 4-ft (1.2m) round manholes or b) in rectangular precast vaults. Both configurations have a wide central opening in the Up-Flo® Filter.

Maintenance activities include inspection, floatables removal, oil removal, sediment removal, Media Pack replacement, and Drain Down Filter replacement. The minimum required frequency for replacement of the Media Pack is annually, whereas the minimum required frequency for removal of accumulated sediment from the sump is dependent on the Up-Flo® Filter configuration. Configurations with a larger sediment storage volume per module will require less frequent removal of accumulated sediment. Regardless, whenever sediment depth in the sump is found to be greater than 16 inches, sediment removal is required.

First Year Inspection and Maintenance

The frequency of inspection and maintenance can be determined in the field after installation. The frequency of ongoing maintenance needs is based on site characteristics such as contributing area, types of surfaces (e.g., paved and/or landscaped), site activities (e.g., short-term or long-term parking), and other site maintenance (e.g., sanding and sweeping). At a minimum, inspection and maintenance should be conducted at intervals of no more than six months during the first year of operation. Maintenance personnel should observe and record pollutant accumulations during the first year of service in order to benchmark the maintenance intervals that will later be established for the site. Pollutant accumulations should be measured or monitored using the following procedures:

- **Measurement of sediment depth in the sump:** A minimum of 8 inches (20 cm) should separate the Drain Down Filter inlet from stored sediment in the sump in order to minimize sediment migration into the Drain Down Filter. A simple probe, such as the Sludge-Judge®, can be used to determine the depth of the solids in the sump. In a typical 4-ft (1.2m) diameter manhole installation, the sediment depth should be no more than 16 inches (41 cm).
- **Maintenance personnel should then enter the structure, remove the Media Pack from one of the Filter Modules, and weigh the Media Bags.** Media Bags with a wet weight of approximately 40 lbs (18 kg) or more are an indication that the filter media has become full and that the Media Packs in all of the Filter Modules will require replacement (Fig.4). Minimum filtration rate is generally reached when the Media Bags have accumulated approximately 20 lbs (9 kg) of sediment. Determining the amount of accumulated sediment will be accomplished by removing both of the Media Bags from one of the Media Packs and weighing the bags separately. Since a new Media Bag weighs approximately 30 lbs (14 kg) wet, the difference in weight will approximately equal the weight of solids that have accumulated in the bag. A spent Media Bag weighs approximately 50 lbs (23 kg) wet.
- **Measurement of oil layer on water surface:** Since water in the Up-Flo® vessel drains down to an elevation below the bottom of the Filter Modules when the system is idle, the amount of accumulated oil must be minimized so that oil is not entrained in the Media Pack when stormwater begins to fill the vessel at the start of a storm event. Oil accumulation should be limited to 1.5 inches (4 cm) or less. Probes can be used to measure oil thickness.
- **Monitoring for Drain Down Filter clogging:** The water level in the Up-Flo® Filter should be monitored to ensure that the Drain Down Filter is operating properly. The Drain Down Filter is designed to lower the water level in the Up-Flo® vessel to an elevation below the bottom of the Filter Modules between storm events. Periodically conduct an inspection one to two days after a storm event during the first year of operation. Approximately 36 hours after a 1-in (2.5-cm) rainfall, the water level inside the vessel should have dropped to a point where it is equal with the base of the Filter Modules. If the water level has not reached that point, then the Drain Down Filter has either become clogged or blinded by trash or debris (Fig.5 a and b). If there is no evidence of trash or debris around the Drain Down Filter inlet, then it has likely become clogged with particles.
- **Monitoring for slime and debris covering the Flow Distribution Media or Angled Screens:** After removal of the Media Bags, the bottom Flow Distribution Media should be removed and inspected to determine if it is coated with slime or debris. Similarly, the Angled Screen should be inspected for blockages and ragging.



Fig.4 a) A new Media Bag of Hydro Filter Sand. b) A spent media bag of Hydro Filter Sand.

- Monitoring for floatables on the water surface: Similar to oil, the amount of accumulated floatables must be minimized to prevent trash and loose debris from becoming trapped on the Angled Screens when stormwater begins to fill the Up-Flo® vessel at the start of a storm event. Visual inspection is adequate to determine the amount of floatables. Floatables should be removed before they form a mat on the surface of the water.

The solids loading rate in the sump will be calculated by measuring the sediment depth in the sump and dividing the depth by the correlating interval of time since the sump was last cleaned. Similarly, starting with fresh Media Bags, the solids loading rate in the Media Packs will be calculated by weighing the Media Bags and dividing the weights by the correlating interval of time since they were installed. The wet weight of the heaviest bag will be used to determine the loading rate. As previously mentioned, a spent Media Bag weighs approximately 50 lbs (23 kg) wet. The spent Media Bag weight estimate was based on calculations of sediment loading in an Up-Flo® Filter that was run to exhaustion during laboratory testing.

The rate of oil accumulation will be calculated by measuring the thickness of the oil layer and dividing the thickness by the correlating interval of time since the sump was last cleaned. Ordinarily, oil thickness will not be measurable unless a spill has occurred. Consequently, any oil will typically be removed along with water when cleaning the sump.

Monitoring the Drain Down Filter for clogging, monitoring the Flow Distribution Media and Angled Screens for slime and debris, and monitoring the accumulation of floatables will provide an estimate of how long the Up-Flo® Filter can operate before its performance can become impaired by one of these factors.

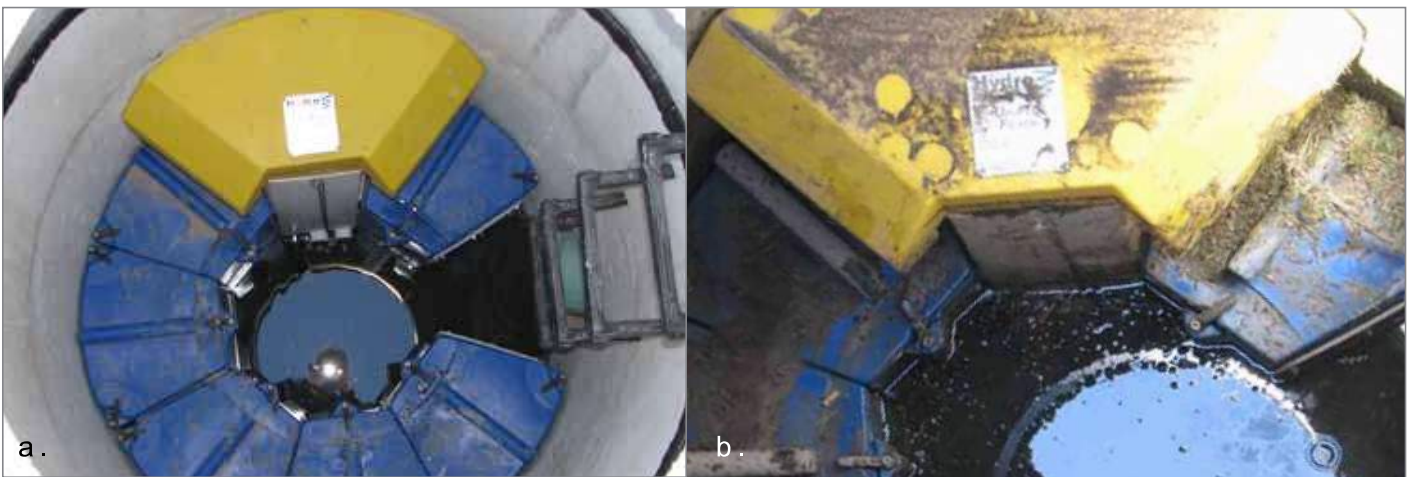


Fig.5 a) The water level in a properly functioning Up-Flo® Filter will drain down to the base of the Filter Modules. b) When the Drain Down Filter becomes clogged, the base of the Filter Modules will be submerged in standing water. Note, above right, that the Drain Down Filter is submerged in standing water.

Routine Inspection and Maintenance

After completion of the first year of operation, determining and then following the established inspection and maintenance intervals will keep pollutant loadings within their respective limits. Removal of oils and floatables, replacement of the Drain Down Filter, replacement of Flow Distribution Media (see Fig.9, pg 11), and cleaning of Angled Screens will occur at the same frequency as cleaning of the sump and replacement of Media Bags unless the first year of operation indicates otherwise. Keeping to the established maintenance intervals will keep treatment flow rates at, or above, the design flow rate. Typically, annual maintenance is adequate.

In addition to scheduled maintenance, occasional checks for Up-Flo® Filter clogging can be performed by removing the manhole cover during a storm, monitoring the water level in the manhole or vault, and determining whether the filter is in bypass. A properly-sized filter (on-line or off-line) that is in bypass during a storm that is producing runoff at, or below, the filter's design filtration rate needs maintenance.

Routine Inspection

Inspection is a simple process that requires monitoring pollutant accumulations. Maintenance crews should be familiar with the Up-Flo® Filter and its components prior to inspection.

Scheduling

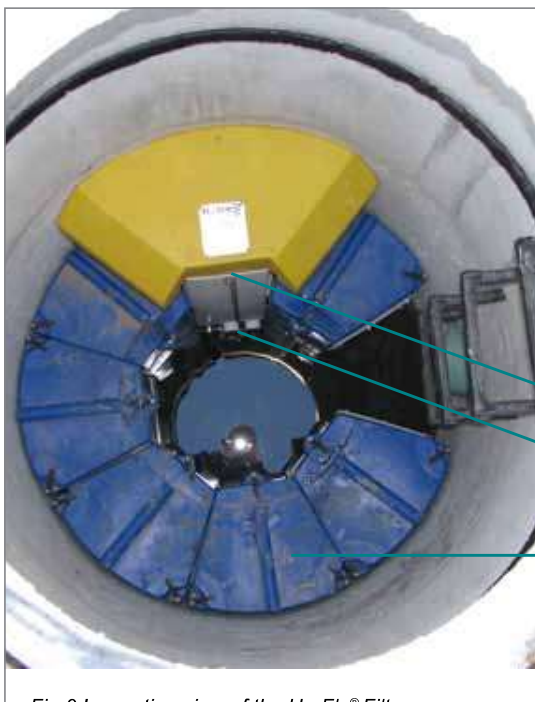
- Inspection may be conducted during any season of the year but should occur shortly after a predicted rainfall to ensure components are operating properly.

Recommended Equipment

- Safety Equipment and Personal Protective Equipment (traffic cones, work gloves, etc.)
- Scale to measure the weight of the Media Bags
- Crow bar to remove grate or lid
- Pole with skimmer or net
- Sediment probe (such as a Sludge-Judge®)
- Hydro International Up-Flo® Filter Maintenance Log
- Trash bags for removed floatables

Routine Inspection Procedures

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. See Fig.6 for a typical Inspection View.
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 (refer to page 11 Replacement Procedures). Weigh the Media Bags from one or two modules. Media Bags should be replaced if the wet weight exceeds 40 lbs (18 kg).
7. 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 (see Fig.6 for the standard standing water level).
8. Securely replace the grate or lid.
9. Remove safety equipment.
10. Contact Hydro International at (800) 848-2706 to discuss any irregularities noted during inspection.



Bypass siphon sits evenly on Outlet Module.

Standing water level is no higher than the base of the Filter Module. The Drain Down Filter will be visible if the water level is correct.

Filter Module Lids are closed.

Fig.6 Inspection view of the Up-Flo® Filter.

Routine Maintenance

Maintenance activities are grouped into two categories:

- **Activities *Not Requiring* Man Entry Into the Up-Flo® Filter**
These activities include floatables removal, oil removal and removal of sediment from the sump.
- **Activities *Requiring* Man Entry Into the Up-Flo® Filter**
Media Pack replacement and Drain Down Filter replacement.

Maintenance intervals are determined from monitoring the Up-Flo® Filter during its first year of operation. Depending on the site, some maintenance activities may have to be performed on a more frequent basis than others. In the case of floatables removal, a vactor truck is not required. Floatables and loose debris can be netted with a skimmer and pole.

A vactor truck is normally required for oil removal, removal of sediment from the sump, and to dewater the vessel for replacement of the Media Packs and Drain Down Filter (Fig.7). All inspection and maintenance activities would be recorded in an Inspection and Maintenance Log.

Completion of all the maintenance activities for a typical 4-ft (1.2m) diameter manhole installation takes less than one hour. Approximately 360 gallons of water and up to 0.6 yd³ (0.5 m³) of sediment may be removed in the process. In an installation equipped with six Filter Modules, 12 Media Bags (2 bags per module) would be removed and replaced. Assuming a spent Media Bag weight of 50 lbs (23 kg), up to 600 lbs (272 kg) of spent Media Bags would be removed. All consumables, including Media Bags, Flow Distribution Media, and replacement Drain Down Filters are supplied by Hydro International.

The access port located at the top of the manhole provides unobstructed access for a vactor hose and/or skimmer pole to be lowered to the base of the sump.



Fig.7 Sediment is removed from the sump with a vactor hose. Man entry is not required for this step.

Maintenance Activities Not Requiring Man Entry

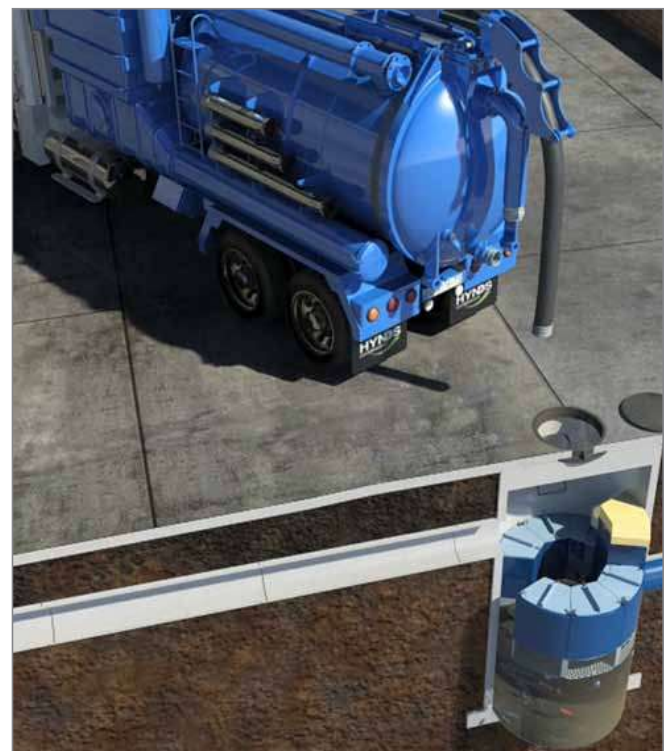
These activities include floatables removal, oil removal and removal of sediment from the sump.

Scheduling

- Floatables and sump cleanout may typically be done during any season of the year - before and after rainy season
- Floatables and sump cleanout should occur as soon as possible following a contaminated spill in the contributing drainage area

Recommended Equipment

- Safety Equipment (traffic cones, etc)
- Crow bar to remove grate or lid
- Pole with skimmer or net (if only floatables are being removed)
- Sediment probe (such as a Sludge-Judge®)
- Vactor truck (flexible hose preferred)
- Pressure nozzle attachment or other screen-cleaning device
- Hydro International Up-Flo® Filter Maintenance Log



Maintenance Procedures Not Requiring Man Entry: Floatables, Oil and Sediment Clean Out

1. Set up any necessary safety equipment (such as traffic cones) around the access of 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. Make note of any irregularities.
4. If the standing water level in the sump is above the base of the Filter Modules (see Fig.8), tug the Pull Chain(s) to release the Drain Down Filter plug(s). Allow the excess water to drain out of the chamber.
5. Use the skimmer pole to fit the Drain Down Filter plug back into the open port.
6. Once all floatables and oil have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris from the sump floor. Up to 0.3 yd³ (0.2 m³) of sediment and 360 gallons (1,363 L) of water will be removed from a typical manhole Up-Flo® Filter during this process.
7. Retract the vactor hose from the vessel.
8. Inspect the Angled Screens for blockages and ragging. If present, remove the obstruction or ragging materials from the surface using a hose or other screen-cleaning device.
9. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables, oils, and gross debris removed, and the depth of sediment measured. Note any apparent irregularities such as damaged components or blockages.
10. Securely replace the grate or lid. Remove safety equipment.
11. Dispose of sediment and gross debris following local regulations.
12. Dispose of oil and sump water at a licensed water treatment facility or following local regulations.
13. Contact Hydro International at (800) 848-2706 to discuss any irregularities noted during cleanout.

Maintenance Activities Requiring Man Entry

These activities include replacement of the Media Packs and Drain Down Filter.

Unless the Up-Flo® Filter has been installed as a very shallow unit, it is necessary to have an OSHA-confined space entry trained person enter the vessel to replace Media Packs.

The access port located at the top of the manhole or vault provides access to the Up-Flo® vessel for maintenance personnel to enter the vessel and remove and replace Media Packs. The same access would be used for maintenance personnel working from the surface to net or skim debris and floatables or to vactor out sediment, oil, and water. Unless the Up-Flo® Filter has been installed in a very shallow configuration, it is necessary to have personnel with OSHA Confined Space Entry training performing the maintenance that occurs inside the vessel.

Scheduling

- Call Hydro International to order replacement Media Packs and Drain Down Filter prior to scheduling maintenance.
- Because Media Pack replacement requires entry into the Up-Flo® chamber, maintenance events should be scheduled during dry weather.
- Media Pack replacement should occur immediately after a contaminated spill in the contributing drainage area.

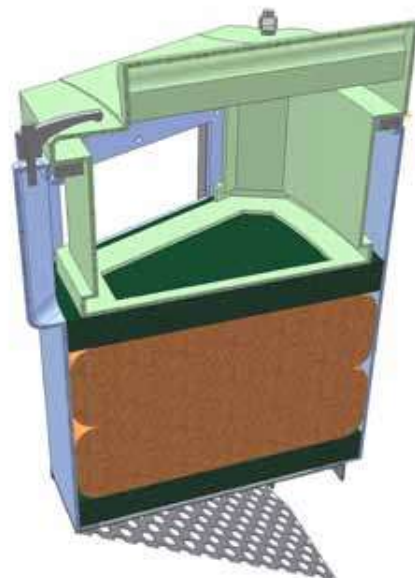


Fig.8 Cutaway view of the Filter Module

Recommended Equipment

- Safety Equipment (traffic cones, etc.)
- Crow bar to remove grate or lid
- Pole with skimmer or net (if floatables removal is not to be done with vacator hose)
- Sediment probe (such as a Sludge-Judge®)
- Vacator truck (flexible hose preferred)
- OSHA Confined Space Entry Equipment
- Up-Flo® Filter Replacement Media Packs (available from Hydro International)
- Hydro International Up-Flo® Filter Maintenance Log
- Screwdriver (flat head)
- Replacement Drain Down Filter components supplied by Hydro International

*Maintenance Procedures Requiring Man Entry:**Media Pack and Drain Down Filter Replacement Procedures*

1. Follow Floatables and Sump Cleanout Procedures, 1 – 13.

2. Following OSHA Confined Space Entry procedures, enter the Up-Flo® Filter Chamber.
3. Open the Filter Module by turning the three cam latches on the front and sides of the module. Remove the lid 1 to gain access to the Media Pack (Fig.9).
4. Remove and discard the spent Media Pack. The Media Pack contents include:
 - A top layer of green 2 Flow Distributing Media.
 - Two (2) Media Bags 3 equipped with nylon handles.
 - A bottom layer of green 2 Flow Distributing Media.
5. Insert a new Media Pack, supplied by Hydro International.
 - First, insert a bottom layer of green Flow Distributing Media. Be sure that the media sits snugly and level at the bottom of the Filter Module.
 - Next, insert the first of two (2) replacement Media Bags. Smooth the bag out with your hands to make sure that the bag extends snugly to the walls and corners of the Filter Module.
 - Insert the second Media Bag, following the same procedure.

1. Filter Module Cover and Media Restraint
2. Flow Distributing Media
3. Filter Media Bags
4. Replaceable Media Pack
5. Cam Latch
6. Conveyance Channel
7. Filter Module
8. Support Bracket / Angled Screen

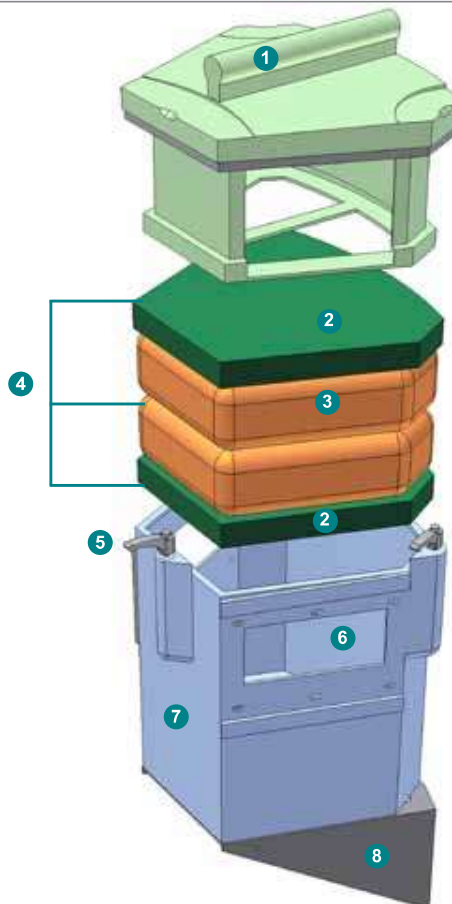


Fig.9 The Filter Module houses the Media Restraint and the Media Pack.

- Insert the top layer of green Flow Distributing Media. Be sure that the piece fits snugly against the walls and corners of the Filter Module.
 - Put the lid on and secure the three latches. Check to make sure that the latches are closed properly.
6. Use a screwdriver to unscrew the Drain Down Filter from the face of the Outlet Module (see Fig.10). **DO NOT DISCARD THIS PIECE.**
 7. Install new Drain Down Filter supplied by Hydro International.
 8. Exit the Up-Flo® Filter chamber and securely replace the grate or lid.
 9. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables, oil and gross debris removed, and the depth of sediment measured. Note the number of Media Packs replaced. Note any irregularities such as damaged components or blockages.

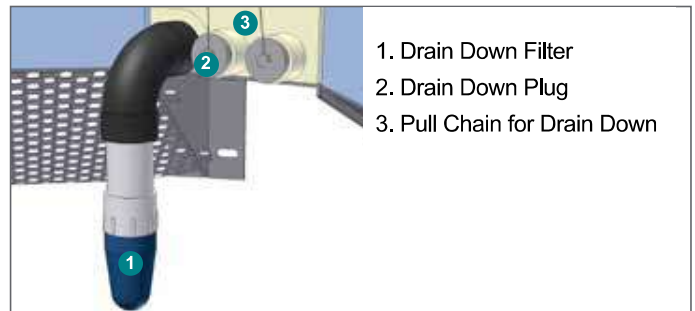


Fig.10 The Drain Down Filter.

10. Remove safety equipment.
11. Dispose of spent media packs at your local landfill, following local regulations.
12. Return the spent Drain Down Filter to Hydro International.
13. Contact Hydro International to discuss any irregularities noted during annual maintenance.

Solids Disposal

Sediment, floatables, gross debris, and spent Media Bags can generally be disposed of at the local landfill in accordance with local regulations. The toxicity of the residues captured will depend on the activities in the contributing drainage area, and testing of the residues may be required if they are considered potentially hazardous.

Sump water can generally be disposed of at a licensed water treatment facility but the local sewer authority should be contacted for permission prior to discharging the liquid. Significant accumulations of oil removed separately from sump water should be transported to a licensed hazardous waste treatment facility for treatment or disposal. **In all cases, local regulators should be contacted about disposal requirements.**

Maintenance at a Glance

Activity	Frequency
Inspection	<ul style="list-style-type: none"> - Regularly during first year of installation - Every 6 months after the first year of installation
Floatables/Oils Removal	<ul style="list-style-type: none"> - Twice per year or as needed - Following a contaminated spill in the drainage area
Sediment Removal	<ul style="list-style-type: none"> - Every six to 12 months, depending on the Up-Flo® Filter Configuration - The maximum allowable sediment depth in any Up-Flo Filter configuration is 16 inches (41 cm) - Following a contaminated spill in the drainage area
Media Pack Replacement	<ul style="list-style-type: none"> - Once per year - Replacement is required anytime inspection reveals that the high-water level indicator has been activated after two consecutive storms and the subsequent weighing of the Media Bags shows a wet weight greater than 40 lbs - Following a contaminated spill in the drainage area
Drain Down Filter Replacement	<ul style="list-style-type: none"> - Once per year with Media Pack replacement - Replacement is required anytime inspection reveals that the water level inside the vessel has not reached a level equal with the base of the Filter Modules approximately 36 hours after a 1-inch (2.5 cm) rainfall - As needed, in the event of continuous base flow conditions

Up-Flo® Filter Installation Log



SITE REFERENCE NAME OR NUMBER FOR THIS UP-FLO® FILTER LOCATION:	
SITE NAME:	
SITE LOCATION:	
OWNER:	SITE CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

CONFIGURATION (CIRCLE ONE): MANHOLE VAULT SYSTEM

TOTAL NUMBER OF UP-FLO® FILTER MODULES: _____



Up-Flo® Filter Inspection Log

Site Name: _____ Owner Change since last inspection? Y N

Location: _____

Owner Name: _____

Address: _____ Phone Number: _____

Site Status: _____

Date: _____ Time: _____ Site conditions*: _____

*(Stable, Under Construction, Needing Maintenance, etc.)

Inspection Frequency Key: A=annual; M=monthly; S=after major storms

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Debris Removal				
Adjacent area free of debris?	M			
Inlets and Outlets free of debris?	M			
Facility (internally) free of debris?	M			
Vegetation				
Surrounding area fully stabilized? (no evidence of eroding material into Up-Flo® Filter)	A			
Grass mowed?	M			
Water retention where required				
Water holding chamber(s) at normal pool?	A			
Evidence of erosion?	A			
Sediment Deposition				
Filtration Chamber free of sediments?	A			
Sedimentation sump not more than 50% full?	A			
Structural Components				
Any evidence of structural deterioration?	A			
Grates in good condition?	A			
Spalling or cracking of structural parts?	A			
Outlet/Overflow Spillway	A			
Other				
Noticeable odors?	A			
Any evidence of filter(s) clogging?	M			
Evidence of flow bypassing facility?	A			



Inspector Comments: _____

Overall Condition of Up-Flo® Filter**: ☐ Acceptable ☐ Unacceptable

**"Acceptable" would mean properly functioning; "unacceptable" would mean damaged or required further maintenance.

If any of the above Inspection Items are checked "Yes" for "Maintenance Needed", list Maintenance actions and their completion dates below or on the Maintenance Log provided on page 15 of the Up-Flo® Filter Operation & Maintenance Manual:

Maintenance Action Needed	Due Date

The next routine inspection is schedule for approximately: (date) _____

Inspected by: (signature) _____

Inspected by: (printed) _____



Up-Flo® Filter Maintenance Log

Site Name: _____ Owner Change since last inspection? Y N

Location: _____

Owner Name: _____

Address: _____ Phone Number: _____

Site Status: _____

Date: _____ Time: _____ Site conditions: _____
*(Stable, Under Construction, Needing Maintenance, etc.)

Estimated volume of oil/floatable trash removed: _____

Sediment depth measured in sump prior to removal: _____

Number of Filter Modules fitted with new media packs: _____

Inspector Comments: _____

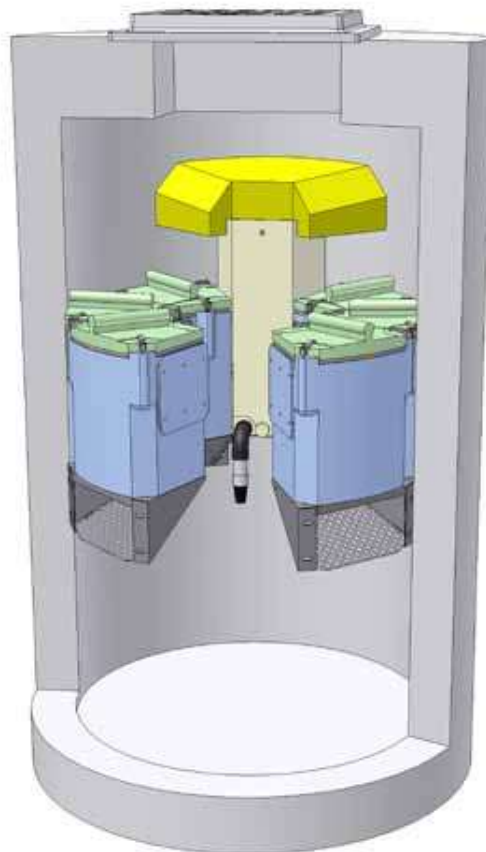
Overall Condition of Up-Flo® Filter: ☐ Acceptable ☐ Unacceptable

****"Acceptable" would mean properly functioning; "unacceptable" would mean damaged or required further maintenance.**

Maintained by: (signature) _____

Maintained by: (printed) _____





Operation and Maintenance Manual

Up-Flo® Filter

Filtration System for Stormwater Treatment

Stormwater Solutions

Turning Water Around ...®

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17	Stormwater BMP Maintenance Certification Program

IMPORTANT - ORDER REPLACEMENT PARTS FOR MAINTENANCE - IMPORTANT

Annual maintenance requires replacement of the Media Packs and the Drain Down Filter. Contact Hydro International to order replacements. Allow 2-4 weeks for delivery.

Office hours Monday thru Friday 8:00 A.M. to 5:00 P.M. EST
Toll free: 1-800-848-2706
Phone: 207-756-6200
Fax: 207-756-6212
Email: stormwaterinquiry@hydro-int.com

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DISCLAIMER: Information and data contained in this manual is exclusively for the purpose of assisting in the operation and maintenance of Hydro International plc's Up-Flo® Filter. No warranty is given nor can liability be accepted for use of this information for any other purpose. Hydro International plc have a policy of continuous product development and reserve the right to amend specifications without notice.



Hydro International (Stormwater), 94 Hutchins Drive, Portland ME 04102
Tel: (207) 756-6200 Fax: (207) 756-6212 Web: www.hydro-int.com

Product Overview

The Up-Flo® Filter is a modular high-rate stormwater filtration device. As shown below, it is typically installed into a 4-ft diameter catch basin structure. Each Filter Module has a screen and support bracket that is attached to the concrete manhole and each contains a Media Pack that includes Flow Distribution Media and two Media Bags (Fig.1). Modules can attach to each other to form a "ring" of up to six modules. Up to two of the modules are attached to an Outlet Module that has a Bypass Hood and Drain Down Filter. The modular design can be supplied in different configurations depending on the application as shown in the following illustrations.

An upward flow path through the Filter Modules allows stormwater to be screened and filtered. In addition to the screening and filtering processes, gross pollutants will also settle into the sump or float to the surface of the water held within the manhole. The standard units are supplied with a 3-ft (0.9m) sump to allow for sediment and gross pollutant accumulations between maintenance intervals.

The following manual describes the operation of the Up-Flo® Filter and provides general maintenance requirements that will ensure the filter will continue to operate and perform as intended. In general, a minimum of two inspections are required per year to monitor sediment and gross pollutant accumulations. In order to achieve an annual TSS removal rate of 80% for 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.

Hydro International offers recommendations for certified maintenance contractors. It is hoped that owners will take advantage of this service as these contractors have been trained and certified to ensure that maintenance will be performed properly. Should the owner choose to conduct maintenance procedures themselves, it is recommended that Hydro International be contacted to discuss the following procedures and consider contracting a representative from Hydro International for the first maintenance cycle.

See page 17 for more about Hydro International's Stormwater BMP Maintenance Contractor Certification Program.

Up-Flo® Filter Components

1. Inlet Grate
2. Siphonic Bypass Hood with Floatables Baffle
3. Filter Module
4. Outlet Module
5. Media Pack
6. Angled Screen
7. Drain Down Filter Assembly (*refer to Fig. 10 for closer view*)
8. Sump

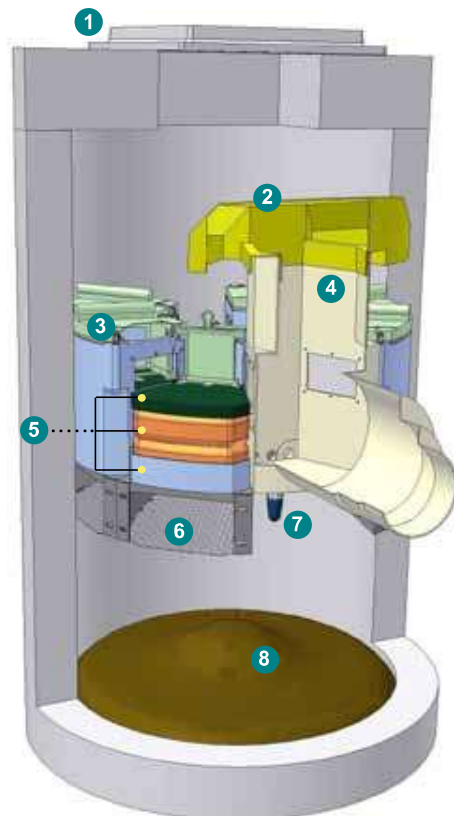


Fig.1 The components of the Up-Flo® Filter.

Operation

Introduction

The Up-Flo® Filter operates on simple fluid hydraulics. It is self-activating, has no moving parts, no external power requirements and is fabricated with durable non-corrosive components. Personnel are not required to operate the unit and maintenance is limited to periodic inspections, sediment and floatables removal, Media Pack replacement and Drain Down Filter replacement.

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 (see Fig.2). The high-capacity 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. The Up-Flo® Filter 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. The Angled Screens 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.

Good Housekeeping & Best Practices

Good housekeeping practices upstream of the Up-Flo® Filter can significantly extend Media Bag life. For example, sweeping paved surfaces, collecting leaves and grass trimmings, and protecting bare ground from erosion will reduce loading to the system. Media Packs should not be installed in the Filter Modules until construction activities are complete and site stabilization is effective.

Damage Due to Lack of Maintenance

Delayed maintenance would result in clogged Media Bags and/or blinded Angled Screens. In that situation, the Up-Flo® Filter would go into bypass and there would be no treatment of the incoming stormwater. Because the Bypass Weir can easily convey all of the flow to the Outlet Module, there would be no lasting damage to the system. Replacement of the Media Bags and removal of sediment from the sump would restore the Up-Flo® Filter to its original treatment efficiency. Establishing and adhering to a regular maintenance schedule ensures optimal performance of the system.

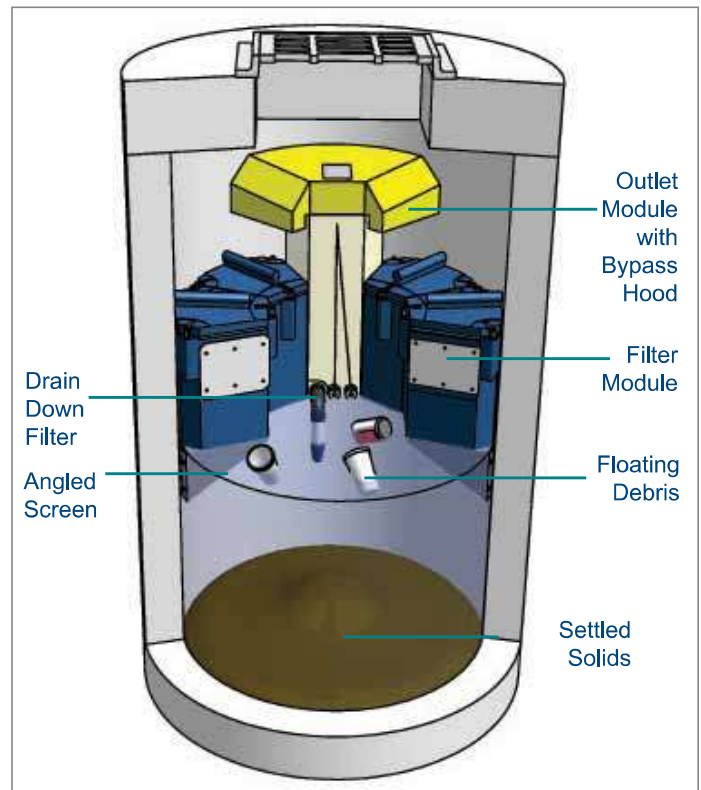


Fig.2 Pollutants captured in the Up-Flo® Filter.

Inspection & Maintenance

Overview

The Up-Flo® Filter protects the environment by removing a wide range of pollutants from stormwater runoff. Periodic removal of these captured pollutants is essential to the proper functioning of the Up-Flo® Filter.

Maintenance activities can be categorized as those that may be performed from outside the Up-Flo® vessel and those that are performed inside the vessel. Maintenance performed from outside the vessel includes removal of floatables and oils that have accumulated on the water surface and removal of sediment from the sump. Maintenance performed inside the vessel includes removal and replacement of Media Bags, Flow Distribution Media and the Drain Down Filter. A vactor truck is required for removal of oils, water, sediment, and to completely pump out the vessel to allow for maintenance inside. OSHA Confined Space Entry procedures must be followed when entering the Up-Flo® vessel.

The Up-Flo® Filter design allows for easy and safe inspection, monitoring and clean-out procedures. It has a wide central opening between the Filter Modules for easy and comfortable access to all of the components (see Fig.3). Completion of all the maintenance activities for a typical manhole Up-Flo® Filter takes less than one hour. In the case of inspection and floatables removal, a vactor truck is not required. Otherwise, a vactor truck is normally required for oil removal, removal of sediment from the sump, and replacement of the Media Packs and Drain Down Filter. In most cases, entry into the Up-Flo® Filter vessel is required for replacement of the Media Packs and Drain Down Filter, and OSHA Confined Space Entry procedures will have to be followed.

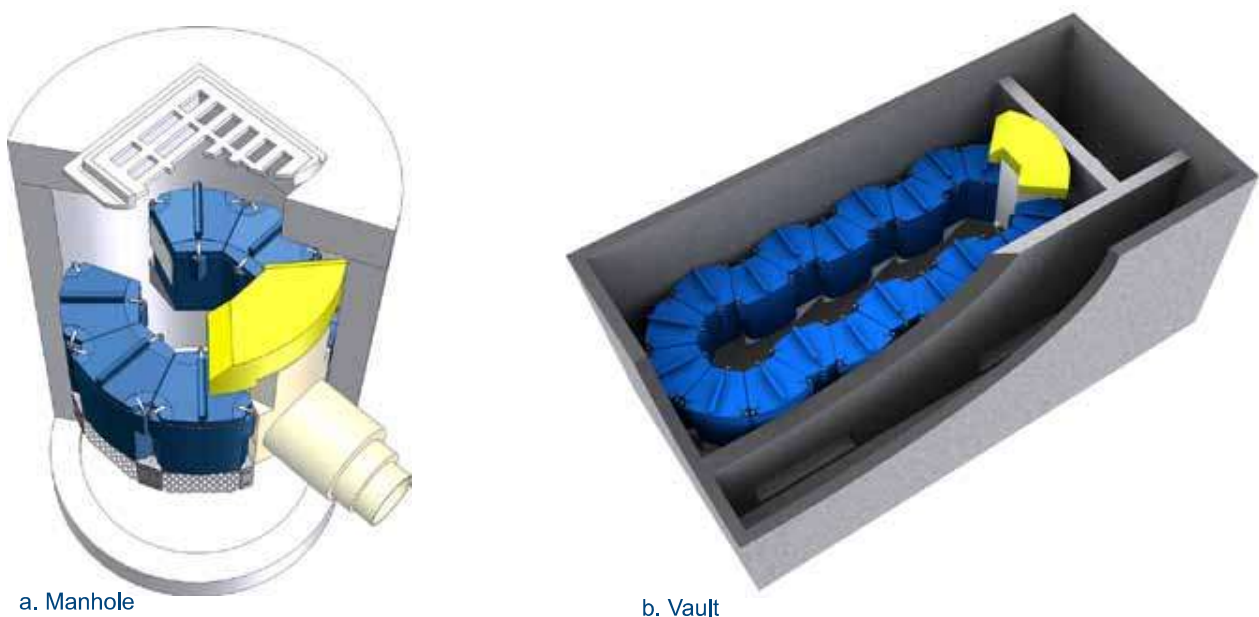


Fig.3 The Up-Flo® Filter is installed in a) 4-ft (1.2m) round manholes or b) in rectangular precast vaults. Both configurations have a wide central opening in the Up-Flo® Filter.

Maintenance activities include inspection, floatables removal, oil removal, sediment removal, Media Pack replacement, and Drain Down Filter replacement. The minimum required frequency for replacement of the Media Pack is annually, whereas the minimum required frequency for removal of accumulated sediment from the sump is dependent on the Up-Flo® Filter configuration. Configurations with a larger sediment storage volume per module will require less frequent removal of accumulated sediment. Regardless, whenever sediment depth in the sump is found to be greater than 16 inches, sediment removal is required.

First Year Inspection and Maintenance

The frequency of inspection and maintenance can be determined in the field after installation. The frequency of ongoing maintenance needs is based on site characteristics such as contributing area, types of surfaces (e.g., paved and/or landscaped), site activities (e.g., short-term or long-term parking), and other site maintenance (e.g., sanding and sweeping). At a minimum, inspection and maintenance should be conducted at intervals of no more than six months during the first year of operation. Maintenance personnel should observe and record pollutant accumulations during the first year of service in order to benchmark the maintenance intervals that will later be established for the site. Pollutant accumulations should be measured or monitored using the following procedures:

- **Measurement of sediment depth in the sump:** A minimum of 8 inches (20 cm) should separate the Drain Down Filter inlet from stored sediment in the sump in order to minimize sediment migration into the Drain Down Filter. A simple probe, such as the Sludge-Judge®, can be used to determine the depth of the solids in the sump. In a typical 4-ft (1.2m) diameter manhole installation, the sediment depth should be no more than 16 inches (41 cm).
- **Maintenance personnel should then enter the structure, remove the Media Pack from one of the Filter Modules, and weigh the Media Bags.** Media Bags with a wet weight of approximately 40 lbs (18 kg) or more are an indication that the filter media has become full and that the Media Packs in all of the Filter Modules will require replacement (Fig.4). Minimum filtration rate is generally reached when the Media Bags have accumulated approximately 20 lbs (9 kg) of sediment. Determining the amount of accumulated sediment will be accomplished by removing both of the Media Bags from one of the Media Packs and weighing the bags separately. Since a new Media Bag weighs approximately 30 lbs (14 kg) wet, the difference in weight will approximately equal the weight of solids that have accumulated in the bag. A spent Media Bag weighs approximately 50 lbs (23 kg) wet.
- **Measurement of oil layer on water surface:** Since water in the Up-Flo® vessel drains down to an elevation below the bottom of the Filter Modules when the system is idle, the amount of accumulated oil must be minimized so that oil is not entrained in the Media Pack when stormwater begins to fill the vessel at the start of a storm event. Oil accumulation should be limited to 1.5 inches (4 cm) or less. Probes can be used to measure oil thickness.
- **Monitoring for Drain Down Filter clogging:** The water level in the Up-Flo® Filter should be monitored to ensure that the Drain Down Filter is operating properly. The Drain Down Filter is designed to lower the water level in the Up-Flo® vessel to an elevation below the bottom of the Filter Modules between storm events. Periodically conduct an inspection one to two days after a storm event during the first year of operation. Approximately 36 hours after a 1-in (2.5-cm) rainfall, the water level inside the vessel should have dropped to a point where it is equal with the base of the Filter Modules. If the water level has not reached that point, then the Drain Down Filter has either become clogged or blinded by trash or debris (Fig.5 a and b). If there is no evidence of trash or debris around the Drain Down Filter inlet, then it has likely become clogged with particles.
- **Monitoring for slime and debris covering the Flow Distribution Media or Angled Screens:** After removal of the Media Bags, the bottom Flow Distribution Media should be removed and inspected to determine if it is coated with slime or debris. Similarly, the Angled Screen should be inspected for blockages and ragging.



Fig.4 a) A new Media Bag of Hydro Filter Sand. b) A spent media bag of Hydro Filter Sand.

- Monitoring for floatables on the water surface: Similar to oil, the amount of accumulated floatables must be minimized to prevent trash and loose debris from becoming trapped on the Angled Screens when stormwater begins to fill the Up-Flo® vessel at the start of a storm event. Visual inspection is adequate to determine the amount of floatables. Floatables should be removed before they form a mat on the surface of the water.

The solids loading rate in the sump will be calculated by measuring the sediment depth in the sump and dividing the depth by the correlating interval of time since the sump was last cleaned. Similarly, starting with fresh Media Bags, the solids loading rate in the Media Packs will be calculated by weighing the Media Bags and dividing the weights by the correlating interval of time since they were installed. The wet weight of the heaviest bag will be used to determine the loading rate. As previously mentioned, a spent Media Bag weighs approximately 50 lbs (23 kg) wet. The spent Media Bag weight estimate was based on calculations of sediment loading in an Up-Flo® Filter that was run to exhaustion during laboratory testing.

The rate of oil accumulation will be calculated by measuring the thickness of the oil layer and dividing the thickness by the correlating interval of time since the sump was last cleaned. Ordinarily, oil thickness will not be measurable unless a spill has occurred. Consequently, any oil will typically be removed along with water when cleaning the sump.

Monitoring the Drain Down Filter for clogging, monitoring the Flow Distribution Media and Angled Screens for slime and debris, and monitoring the accumulation of floatables will provide an estimate of how long the Up-Flo® Filter can operate before its performance can become impaired by one of these factors.

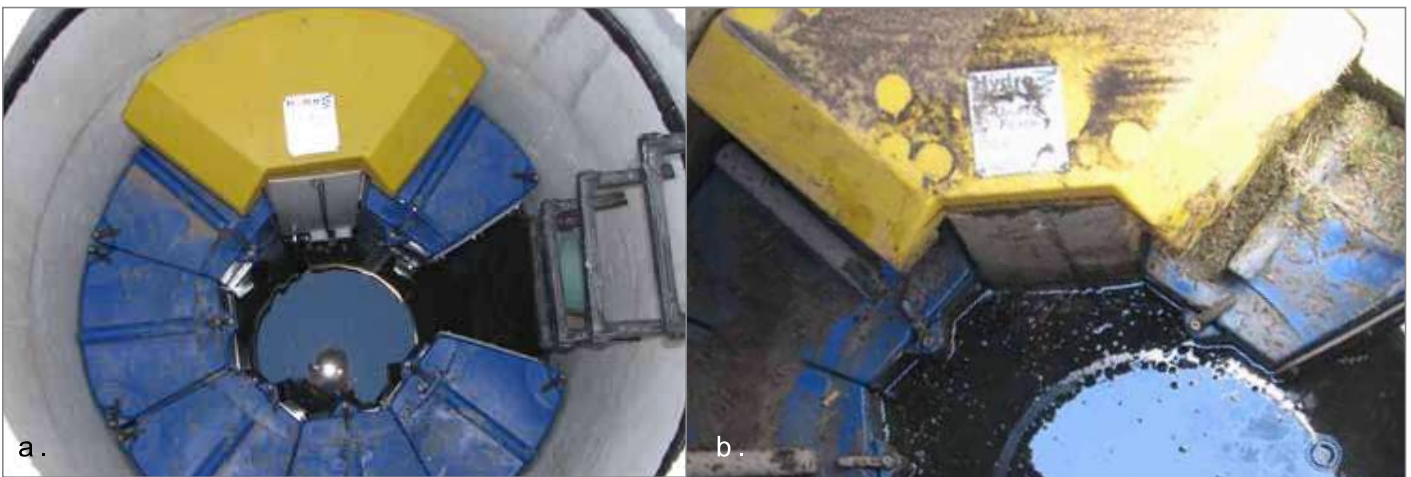


Fig.5 a) The water level in a properly functioning Up-Flo® Filter will drain down to the base of the Filter Modules. b) When the Drain Down Filter becomes clogged, the base of the Filter Modules will be submerged in standing water. Note, above right, that the Drain Down Filter is submerged in standing water.

Routine Inspection and Maintenance

After completion of the first year of operation, determining and then following the established inspection and maintenance intervals will keep pollutant loadings within their respective limits. Removal of oils and floatables, replacement of the Drain Down Filter, replacement of Flow Distribution Media (see Fig.9, pg 11), and cleaning of Angled Screens will occur at the same frequency as cleaning of the sump and replacement of Media Bags unless the first year of operation indicates otherwise. Keeping to the established maintenance intervals will keep treatment flow rates at, or above, the design flow rate. Typically, annual maintenance is adequate.

In addition to scheduled maintenance, occasional checks for Up-Flo® Filter clogging can be performed by removing the manhole cover during a storm, monitoring the water level in the manhole or vault, and determining whether the filter is in bypass. A properly-sized filter (on-line or off-line) that is in bypass during a storm that is producing runoff at, or below, the filter's design filtration rate needs maintenance.

Routine Inspection

Inspection is a simple process that requires monitoring pollutant accumulations. Maintenance crews should be familiar with the Up-Flo® Filter and its components prior to inspection.

Scheduling

- Inspection may be conducted during any season of the year but should occur shortly after a predicted rainfall to ensure components are operating properly.

Recommended Equipment

- Safety Equipment and Personal Protective Equipment (traffic cones, work gloves, etc.)
- Scale to measure the weight of the Media Bags
- Crow bar to remove grate or lid
- Pole with skimmer or net
- Sediment probe (such as a Sludge-Judge®)
- Hydro International Up-Flo® Filter Maintenance Log
- Trash bags for removed floatables

Routine Inspection Procedures

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. See Fig.6 for a typical Inspection View.
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 (refer to page 11 Replacement Procedures). Weigh the Media Bags from one or two modules. Media Bags should be replaced if the wet weight exceeds 40 lbs (18 kg).
7. 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 (see Fig.6 for the standard standing water level).
8. Securely replace the grate or lid.
9. Remove safety equipment.
10. Contact Hydro International at (800) 848-2706 to discuss any irregularities noted during inspection.

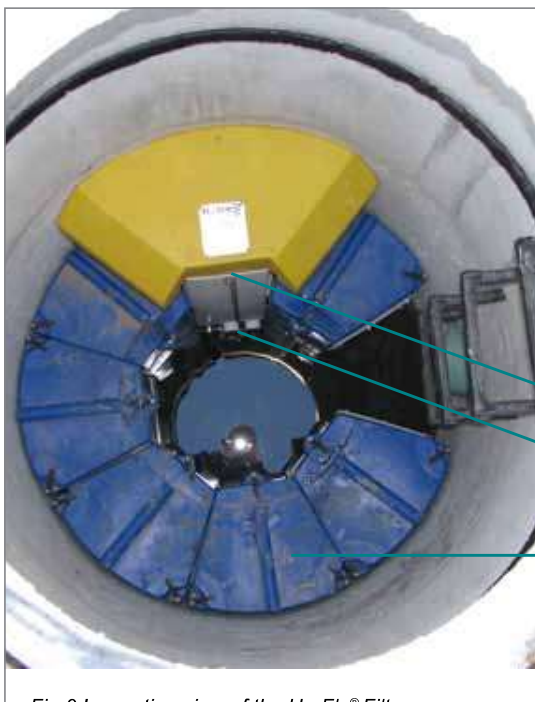


Fig.6 Inspection view of the Up-Flo® Filter.

Routine Maintenance

Maintenance activities are grouped into two categories:

- **Activities *Not Requiring* Man Entry Into the Up-Flo® Filter**
These activities include floatables removal, oil removal and removal of sediment from the sump.
- **Activities *Requiring* Man Entry Into the Up-Flo® Filter**
Media Pack replacement and Drain Down Filter replacement.

Maintenance intervals are determined from monitoring the Up-Flo® Filter during its first year of operation. Depending on the site, some maintenance activities may have to be performed on a more frequent basis than others. In the case of floatables removal, a vactor truck is not required. Floatables and loose debris can be netted with a skimmer and pole.

A vactor truck is normally required for oil removal, removal of sediment from the sump, and to dewater the vessel for replacement of the Media Packs and Drain Down Filter (Fig.7). All inspection and maintenance activities would be recorded in an Inspection and Maintenance Log.

Completion of all the maintenance activities for a typical 4-ft (1.2m) diameter manhole installation takes less than one hour. Approximately 360 gallons of water and up to 0.6 yd³ (0.5 m³) of sediment may be removed in the process. In an installation equipped with six Filter Modules, 12 Media Bags (2 bags per module) would be removed and replaced. Assuming a spent Media Bag weight of 50 lbs (23 kg), up to 600 lbs (272 kg) of spent Media Bags would be removed. All consumables, including Media Bags, Flow Distribution Media, and replacement Drain Down Filters are supplied by Hydro International.

The access port located at the top of the manhole provides unobstructed access for a vactor hose and/or skimmer pole to be lowered to the base of the sump.



Fig.7 Sediment is removed from the sump with a vactor hose. Man entry is not required for this step.

Maintenance Activities Not Requiring Man Entry

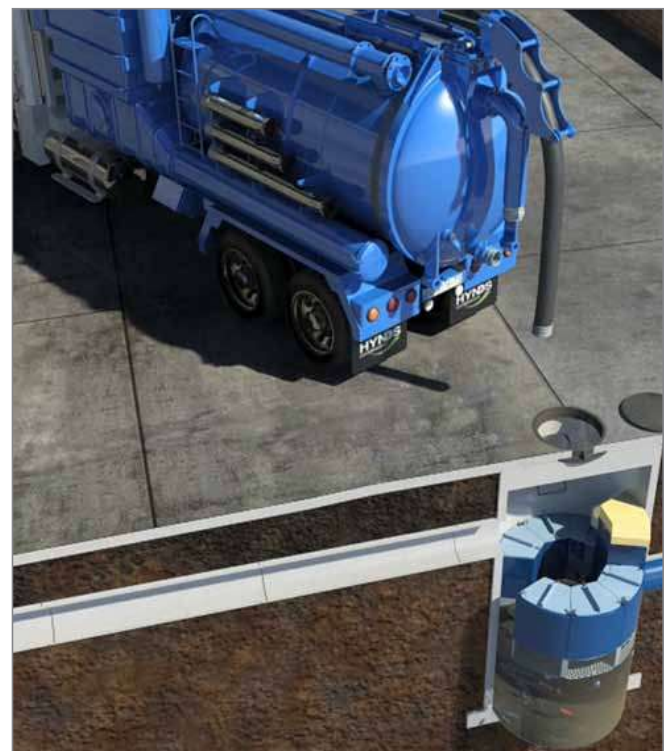
These activities include floatables removal, oil removal and removal of sediment from the sump.

Scheduling

- Floatables and sump cleanout may typically be done during any season of the year - before and after rainy season
- Floatables and sump cleanout should occur as soon as possible following a contaminated spill in the contributing drainage area

Recommended Equipment

- Safety Equipment (traffic cones, etc)
- Crow bar to remove grate or lid
- Pole with skimmer or net (if only floatables are being removed)
- Sediment probe (such as a Sludge-Judge®)
- Vactor truck (flexible hose preferred)
- Pressure nozzle attachment or other screen-cleaning device
- Hydro International Up-Flo® Filter Maintenance Log



Maintenance Procedures Not Requiring Man Entry: Floatables, Oil and Sediment Clean Out

1. Set up any necessary safety equipment (such as traffic cones) around the access of 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. Make note of any irregularities.
4. If the standing water level in the sump is above the base of the Filter Modules (see Fig.8), tug the Pull Chain(s) to release the Drain Down Filter plug(s). Allow the excess water to drain out of the chamber.
5. Use the skimmer pole to fit the Drain Down Filter plug back into the open port.
6. Once all floatables and oil have been removed, drop the vactor hose to the base of the sump. Vactor out the sediment and gross debris from the sump floor. Up to 0.3 yd³ (0.2 m³) of sediment and 360 gallons (1,363 L) of water will be removed from a typical manhole Up-Flo® Filter during this process.
7. Retract the vactor hose from the vessel.
8. Inspect the Angled Screens for blockages and ragging. If present, remove the obstruction or ragging materials from the surface using a hose or other screen-cleaning device.
9. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables, oils, and gross debris removed, and the depth of sediment measured. Note any apparent irregularities such as damaged components or blockages.
10. Securely replace the grate or lid. Remove safety equipment.
11. Dispose of sediment and gross debris following local regulations.
12. Dispose of oil and sump water at a licensed water treatment facility or following local regulations.
13. Contact Hydro International at (800) 848-2706 to discuss any irregularities noted during cleanout.

Maintenance Activities Requiring Man Entry

These activities include replacement of the Media Packs and Drain Down Filter.

Unless the Up-Flo® Filter has been installed as a very shallow unit, it is necessary to have an OSHA-confined space entry trained person enter the vessel to replace Media Packs.

The access port located at the top of the manhole or vault provides access to the Up-Flo® vessel for maintenance personnel to enter the vessel and remove and replace Media Packs. The same access would be used for maintenance personnel working from the surface to net or skim debris and floatables or to vactor out sediment, oil, and water. Unless the Up-Flo® Filter has been installed in a very shallow configuration, it is necessary to have personnel with OSHA Confined Space Entry training performing the maintenance that occurs inside the vessel.

Scheduling

- Call Hydro International to order replacement Media Packs and Drain Down Filter prior to scheduling maintenance.
- Because Media Pack replacement requires entry into the Up-Flo® chamber, maintenance events should be scheduled during dry weather.
- Media Pack replacement should occur immediately after a contaminated spill in the contributing drainage area.

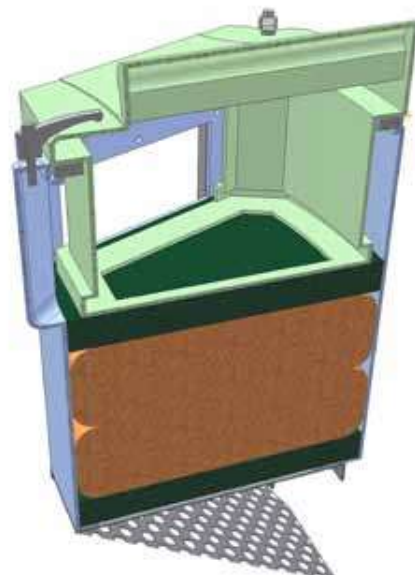


Fig.8 Cutaway view of the Filter Module

Recommended Equipment

- Safety Equipment (traffic cones, etc.)
- Crow bar to remove grate or lid
- Pole with skimmer or net (if floatables removal is not to be done with vacator hose)
- Sediment probe (such as a Sludge-Judge®)
- Vacator truck (flexible hose preferred)
- OSHA Confined Space Entry Equipment
- Up-Flo® Filter Replacement Media Packs (available from Hydro International)
- Hydro International Up-Flo® Filter Maintenance Log
- Screwdriver (flat head)
- Replacement Drain Down Filter components supplied by Hydro International

*Maintenance Procedures Requiring Man Entry:**Media Pack and Drain Down Filter Replacement Procedures*

1. Follow Floatables and Sump Cleanout Procedures, 1 – 13.

2. Following OSHA Confined Space Entry procedures, enter the Up-Flo® Filter Chamber.
3. Open the Filter Module by turning the three cam latches on the front and sides of the module. Remove the lid 1 to gain access to the Media Pack (Fig.9).
4. Remove and discard the spent Media Pack. The Media Pack contents include:
 - A top layer of green 2 Flow Distributing Media.
 - Two (2) Media Bags 3 equipped with nylon handles.
 - A bottom layer of green 2 Flow Distributing Media.
5. Insert a new Media Pack, supplied by Hydro International.
 - First, insert a bottom layer of green Flow Distributing Media. Be sure that the media sits snugly and level at the bottom of the Filter Module.
 - Next, insert the first of two (2) replacement Media Bags. Smooth the bag out with your hands to make sure that the bag extends snugly to the walls and corners of the Filter Module.
 - Insert the second Media Bag, following the same procedure.

1. Filter Module Cover and Media Restraint

2. Flow Distributing Media

3. Filter Media Bags

4. Replaceable Media Pack

5. Cam Latch

6. Conveyance Channel

7. Filter Module

8. Support Bracket / Angled Screen

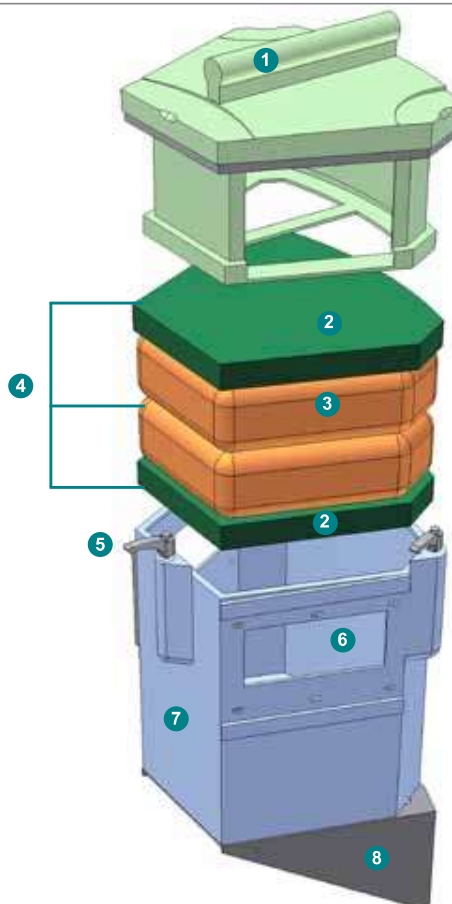


Fig.9 The Filter Module houses the Media Restraint and the Media Pack.

- Insert the top layer of green Flow Distributing Media. Be sure that the piece fits snugly against the walls and corners of the Filter Module.
 - Put the lid on and secure the three latches. Check to make sure that the latches are closed properly.
6. Use a screwdriver to unscrew the Drain Down Filter from the face of the Outlet Module (see Fig.10). **DO NOT DISCARD THIS PIECE.**
 7. Install new Drain Down Filter supplied by Hydro International.
 8. Exit the Up-Flo® Filter chamber and securely replace the grate or lid.
 9. On the Maintenance Log provided by Hydro International, record the date, unit location, estimated volume of floatables, oil and gross debris removed, and the depth of sediment measured. Note the number of Media Packs replaced. Note any irregularities such as damaged components or blockages.

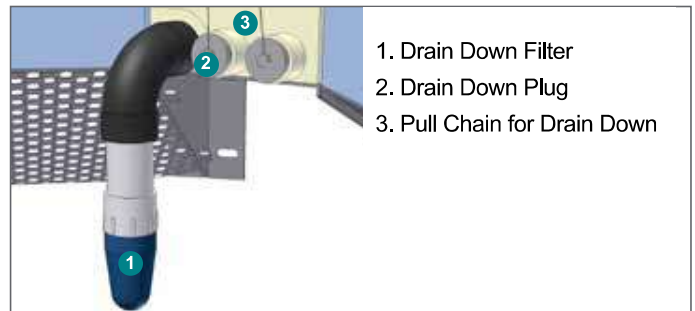


Fig.10 The Drain Down Filter.

10. Remove safety equipment.
11. Dispose of spent media packs at your local landfill, following local regulations.
12. Return the spent Drain Down Filter to Hydro International.
13. Contact Hydro International to discuss any irregularities noted during annual maintenance.

Solids Disposal

Sediment, floatables, gross debris, and spent Media Bags can generally be disposed of at the local landfill in accordance with local regulations. The toxicity of the residues captured will depend on the activities in the contributing drainage area, and testing of the residues may be required if they are considered potentially hazardous.

Sump water can generally be disposed of at a licensed water treatment facility but the local sewer authority should be contacted for permission prior to discharging the liquid. Significant accumulations of oil removed separately from sump water should be transported to a licensed hazardous waste treatment facility for treatment or disposal. **In all cases, local regulators should be contacted about disposal requirements.**

Maintenance at a Glance

Activity	Frequency
Inspection	<ul style="list-style-type: none"> - Regularly during first year of installation - Every 6 months after the first year of installation
Floatables/Oils Removal	<ul style="list-style-type: none"> - Twice per year or as needed - Following a contaminated spill in the drainage area
Sediment Removal	<ul style="list-style-type: none"> - Every six to 12 months, depending on the Up-Flo® Filter Configuration - The maximum allowable sediment depth in any Up-Flo Filter configuration is 16 inches (41 cm) - Following a contaminated spill in the drainage area
Media Pack Replacement	<ul style="list-style-type: none"> - Once per year - Replacement is required anytime inspection reveals that the high-water level indicator has been activated after two consecutive storms and the subsequent weighing of the Media Bags shows a wet weight greater than 40 lbs - Following a contaminated spill in the drainage area
Drain Down Filter Replacement	<ul style="list-style-type: none"> - Once per year with Media Pack replacement - Replacement is required anytime inspection reveals that the water level inside the vessel has not reached a level equal with the base of the Filter Modules approximately 36 hours after a 1-inch (2.5 cm) rainfall - As needed, in the event of continuous base flow conditions

Up-Flo® Filter Installation Log



SITE REFERENCE NAME OR NUMBER FOR THIS UP-FLO® FILTER LOCATION:	
SITE NAME:	
SITE LOCATION:	
OWNER:	SITE CONTRACTOR:
CONTACT NAME:	CONTACT NAME:
COMPANY NAME:	COMPANY NAME:
ADDRESS:	ADDRESS:
TELEPHONE:	TELEPHONE:
FAX:	FAX:

INSTALLATION DATE: / /

CONFIGURATION (CIRCLE ONE): MANHOLE VAULT SYSTEM

TOTAL NUMBER OF UP-FLO® FILTER MODULES: _____



Up-Flo® Filter Inspection Log

Site Name: _____ Owner Change since last inspection? Y N

Location: _____

Owner Name: _____

Address: _____ Phone Number: _____

Site Status: _____

Date: _____ Time: _____ Site conditions*: _____

*(Stable, Under Construction, Needing Maintenance, etc.)

Inspection Frequency Key: A=annual; M=monthly; S=after major storms

Inspection Items	Inspection Frequency	Inspected? (Yes/No)	Maintenance Needed? (Yes/No)	Comments/Description
Debris Removal				
Adjacent area free of debris?	M			
Inlets and Outlets free of debris?	M			
Facility (internally) free of debris?	M			
Vegetation				
Surrounding area fully stabilized? (no evidence of eroding material into Up-Flo® Filter)	A			
Grass mowed?	M			
Water retention where required				
Water holding chamber(s) at normal pool?	A			
Evidence of erosion?	A			
Sediment Deposition				
Filtration Chamber free of sediments?	A			
Sedimentation sump not more than 50% full?	A			
Structural Components				
Any evidence of structural deterioration?	A			
Grates in good condition?	A			
Spalling or cracking of structural parts?	A			
Outlet/Overflow Spillway	A			
Other				
Noticeable odors?	A			
Any evidence of filter(s) clogging?	M			
Evidence of flow bypassing facility?	A			



Inspector Comments: _____

Overall Condition of Up-Flo® Filter**: ☐ Acceptable ☐ Unacceptable

**"Acceptable" would mean properly functioning; "unacceptable" would mean damaged or required further maintenance.

If any of the above Inspection Items are checked "Yes" for "Maintenance Needed", list Maintenance actions and their completion dates below or on the Maintenance Log provided on page 15 of the Up-Flo® Filter Operation & Maintenance Manual:

Maintenance Action Needed	Due Date

The next routine inspection is schedule for approximately: (date) _____

Inspected by: (signature) _____

Inspected by: (printed) _____



Up-Flo® Filter Maintenance Log

Site Name: _____ Owner Change since last inspection? Y N

Location: _____

Owner Name: _____

Address: _____ Phone Number: _____

Site Status: _____

Date: _____ Time: _____ Site conditions: _____

*(Stable, Under Construction, Needing Maintenance, etc.)

Estimated volume of oil/floatable trash removed: _____

Sediment depth measured in sump prior to removal: _____

Number of Filter Modules fitted with new media packs: _____

Inspector Comments: _____

Overall Condition of Up-Flo® Filter: ☐ Acceptable ☐ Unacceptable

**"Acceptable" would mean properly functioning; "unacceptable" would mean damaged or required further maintenance.

Maintained by: (signature) _____

Maintained by: (printed) _____





Burbury
CONSULTING



PROJECT

33 Elderslie Road subdivision

CLIENT

Homes Tasmania

DATE

15/10/2023

▲ CIVIL ▲ STRUCTURAL ▲ MARITIME ▲ PROJECT MANAGEMENT

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STORMWATER MANAGEMENT PLAN

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Rev	Date	Revision Description	Author	Checked	Approved	Principal

1. INTRODUCTION

Burbury Consulting (Burbury) have been commissioned by Homes Tasmania to undertake the subdivision design for the proposed development at 33 Elderslie Road, Brighton. The site has a property identification number (PID) of 9029664 and Certificate of Title CT 178982/1.

The following report has been prepared by Burbury to address a further information request by Brighton Council (Council) to support the development application.

The report outlines the stormwater impact of the development and preliminary design measures implemented to achieve the pre-development flow rate targets during a 5% AEP (1:20 ARI) storm event.

An analysis with the 1% AEP has been also included upon request from Council to determine the level of capacity the detention tanks have for the larger event.

This report relates to the conceptual design of stormwater infrastructure for the proposed subdivision development. It should be recognised that this may vary from the final detailed design, however the basis of this report forms the basis of a Stormwater Management Report.

The purpose of this report is to outline the preliminary stormwater layout for the site and an assessment of the on-site detention requirements for the site.

It is noted that this report is specifically associated with demonstrating maintaining non-worsening of the stormwater condition of the subject site associated with the subject application for land development. As no future lot usage is known or works are proposed as part of the subject development proposal, this report will demonstrate the expected assumed developments likely.

This report does not investigate actual existing services or capacity of the existing Council system but does provide information to make an assessment on the likely impact downstream network.

2. SITE CHARACTERISTICS

2.1 Existing Site and property detail

The development encompasses a largely pastured site with a single dwelling and numerous outbuildings which is approximately 10.70 hectares in total area as indicated in Figure 1 with a site perspective view in Figure 2.

Figure 1 – Aerial view of site



Figure 2 – Perspective view of southern embankment

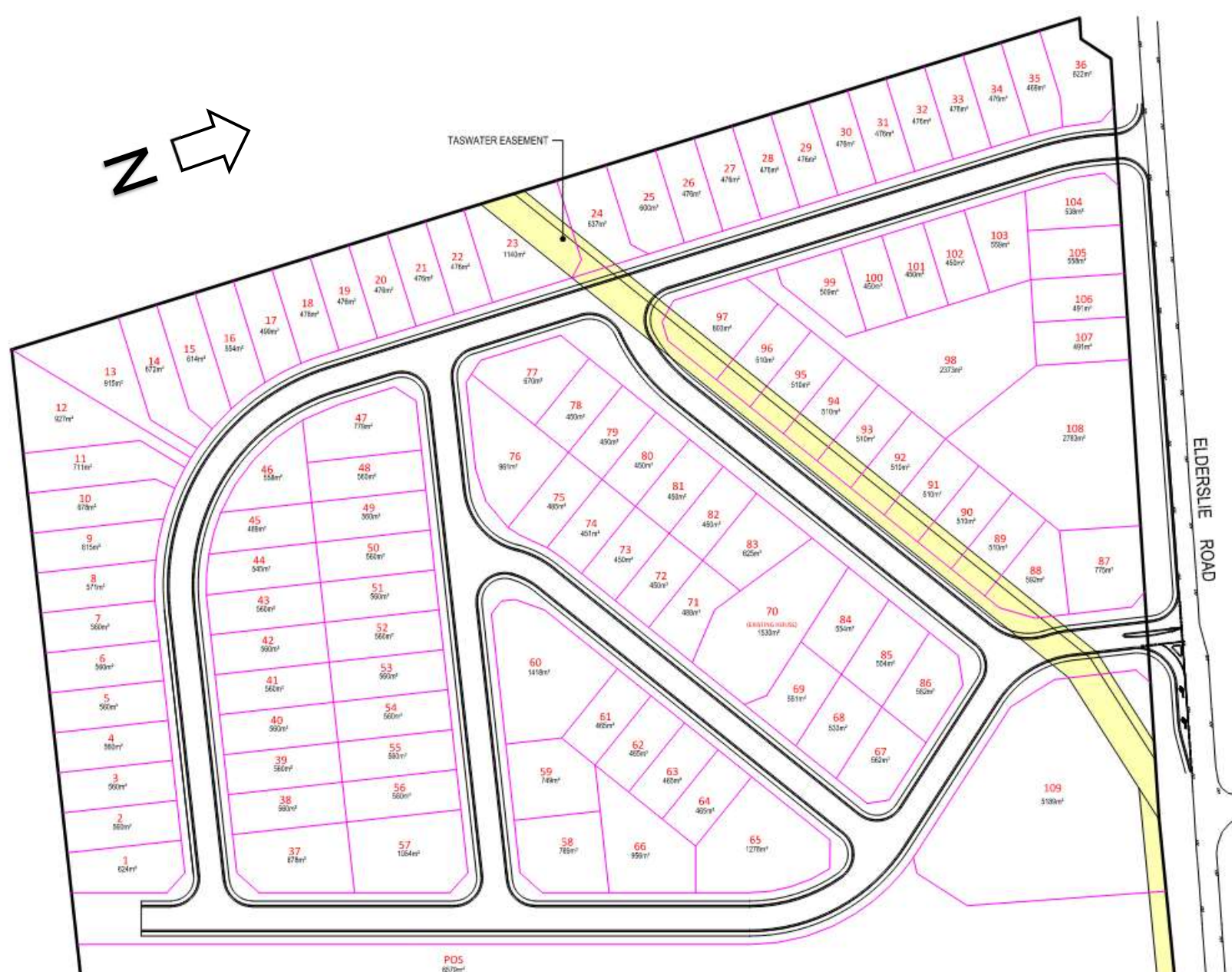


The site was surveyed by Woolcott Surveys in November of 2022. The site generally falls to the east at a varying grade with an average of about 8%.

2.2 Proposed Development

The proposed development will involve subdividing the current land into 109 total allotments as shown in Figure 3. Further development on these lots will be subject to additional development controls by the Council but this stormwater report provides proposals for each allotment to reduce the post development flow rate to an acceptable level.

Figure 3 – Proposed lot layout



A Council request for additional information requested that the development to be a piped stormwater drainage system able to accommodate a 5% AEP when the land serviced by the system is fully developed.

The Council advised and approved discharge point is via the adjacent site of 1 Elderslie Road. This pipe network to connect the proposed development is a 375mm diameter pipeline, but this approved design discharges into an existing, recently constructed, stormwater line on Brighton Road of 300mm diameter. On this basis, the development intent is to minimise post development flows as much as possible.

2.3 External Catchments

By examining contours of the surrounding area as well as site visits, it has been established that this site is near the upper level of contributing catchments. The existing upper catchment is seen to be split via Elderslie Road and also existing driveways that direct the runoff to Elderslie Road.

As Elderslie Road has been advised to be upgraded as part of this development with traditional kerb and channel with road stormwater drainage, this upper external catchment is expected to be directed into this network as currently the case with the open drainage. Therefore, the impact of any external flows on the proposed development site is negligible.

3. HYDROLOGY AND ANALYSIS

Burbury modelled the existing site at its current state using software by Autodesk – *Storm and Sanitary Analysis* (SSA) to assess the pre-development and post-development hydraulics.

A modified rational method was then utilized to determine the predevelopment and expected flows for a range of storm events using a concept design stormwater system inclusive of storage nodes and low flow orifices to reduce flow rates.

A concept design was used as an underlay in the model so that the post development catchments could be laid out graphically to ensure accuracy. The sub-catchments were predominately separated as roof areas, pervious landscaping areas, driveways areas and roadways.

Storm and Sanitary Analysis is used to simultaneously model the complex site hydraulics inclusive of detention requirements and the controlled flows leaving these devices into the piped system.

The green regions in Figure 4 represent each of the sub catchments with the junctions and pipework shown as red dots and black lines respectively.

In discussions with Council, each lot, irrespective of lot size, has an 50% impervious attribute, and likewise a 50% impervious attribute associated with them for the purposes of the modelling.

The coefficient used for the pervious areas post development was 0.40 with the impervious being 0.90. This is consistent with other municipal Councils in Southern Tasmania that have a Stormwater Management Policy in place.

The development road reservations inclusive of the pavement in Figure 4 have been included in the model but the hatch has been removed for clarity.

In addition to the Figure 5, IFD table for Brighton, a Climate Change Factor of 16.6% have been included in 5% and 1% AEP figures

Figure 4 – Modelled post development scenario

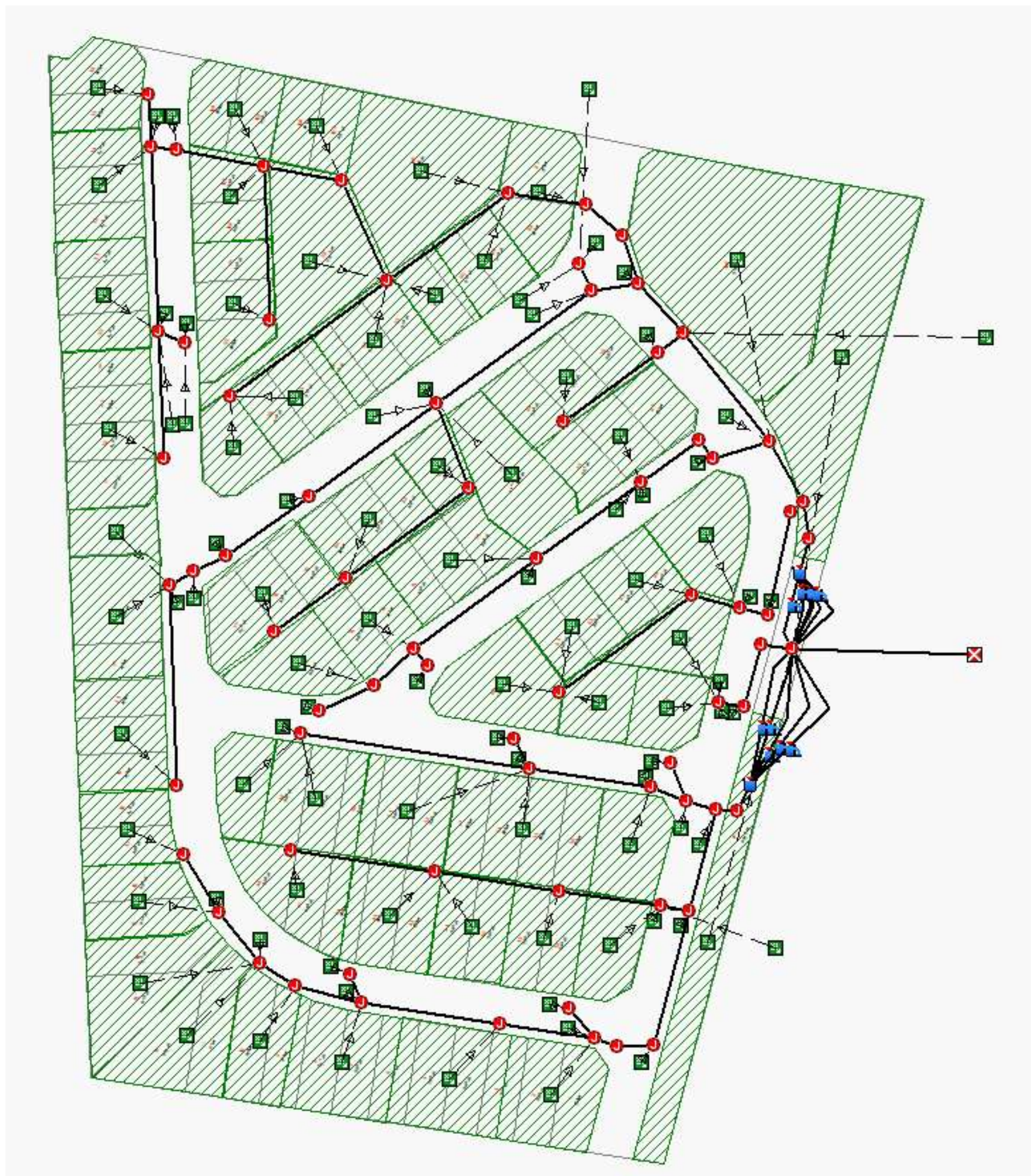


Figure 5 – IFD table for Brighton

Location

Label: Brighton

Latitude: -42.7 [Nearest grid cell: 42.6875 (S)]

Longitude: 147.24 [Nearest grid cell: 147.2375 (E)]

IFD Design Rainfall Intensity (mm/h)

Issued: 16 October 2023

Rainfall intensity for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).

[FAQ for New ARR probability terminology](#)

Duration	Annual Exceedance Probability (AEP)						
	63.2%	50%#	20%*	10%	5%	2%	1%
1 min	59.3	67.2	94.0	114	135	164	189
2 min	51.1	57.6	78.7	93.6	109	126	140
3 min	45.1	50.9	69.9	83.4	97.1	114	128
4 min	40.6	45.9	63.5	76.1	89.1	106	120
5 min	37.1	42.0	58.4	70.3	82.6	99.5	113
10 min	26.9	30.6	43.0	52.2	62.0	76.4	88.5
15 min	21.9	24.8	34.9	42.5	50.6	62.5	72.5
20 min	18.7	21.3	29.9	36.3	43.1	53.2	61.5
25 min	16.6	18.8	26.3	32.0	37.9	46.5	53.7
30 min	15.0	17.0	23.7	28.7	34.0	41.5	47.7
45 min	11.9	13.5	18.7	22.6	26.5	31.9	36.4
1 hour	10.1	11.5	15.8	19.0	22.1	26.4	29.8
1.5 hour	8.06	9.12	12.5	14.8	17.2	20.3	22.6
2 hour	6.85	7.75	10.6	12.5	14.4	16.8	18.7
3 hour	5.44	6.16	8.37	9.84	11.3	13.1	14.5
4.5 hour	4.32	4.89	6.64	7.79	8.88	10.3	11.4
6 hour	3.65	4.14	5.63	6.60	7.53	8.76	9.69
9 hour	2.86	3.25	4.44	5.22	5.97	7.00	7.77
12 hour	2.39	2.72	3.74	4.41	5.06	5.96	6.66
18 hour	1.84	2.10	2.90	3.44	3.97	4.73	5.33
24 hour	1.51	1.72	2.40	2.86	3.32	3.98	4.50
30 hour	1.29	1.47	2.05	2.46	2.87	3.45	3.92
36 hour	1.13	1.29	1.80	2.16	2.53	3.05	3.47
48 hour	0.906	1.03	1.45	1.75	2.05	2.48	2.83
72 hour	0.656	0.746	1.05	1.26	1.49	1.80	2.05
96 hour	0.518	0.588	0.820	0.989	1.16	1.40	1.59
120 hour	0.429	0.487	0.675	0.811	0.950	1.14	1.28
144 hour	0.368	0.417	0.574	0.686	0.799	0.954	1.08
168 hour	0.324	0.366	0.501	0.594	0.688	0.820	0.922

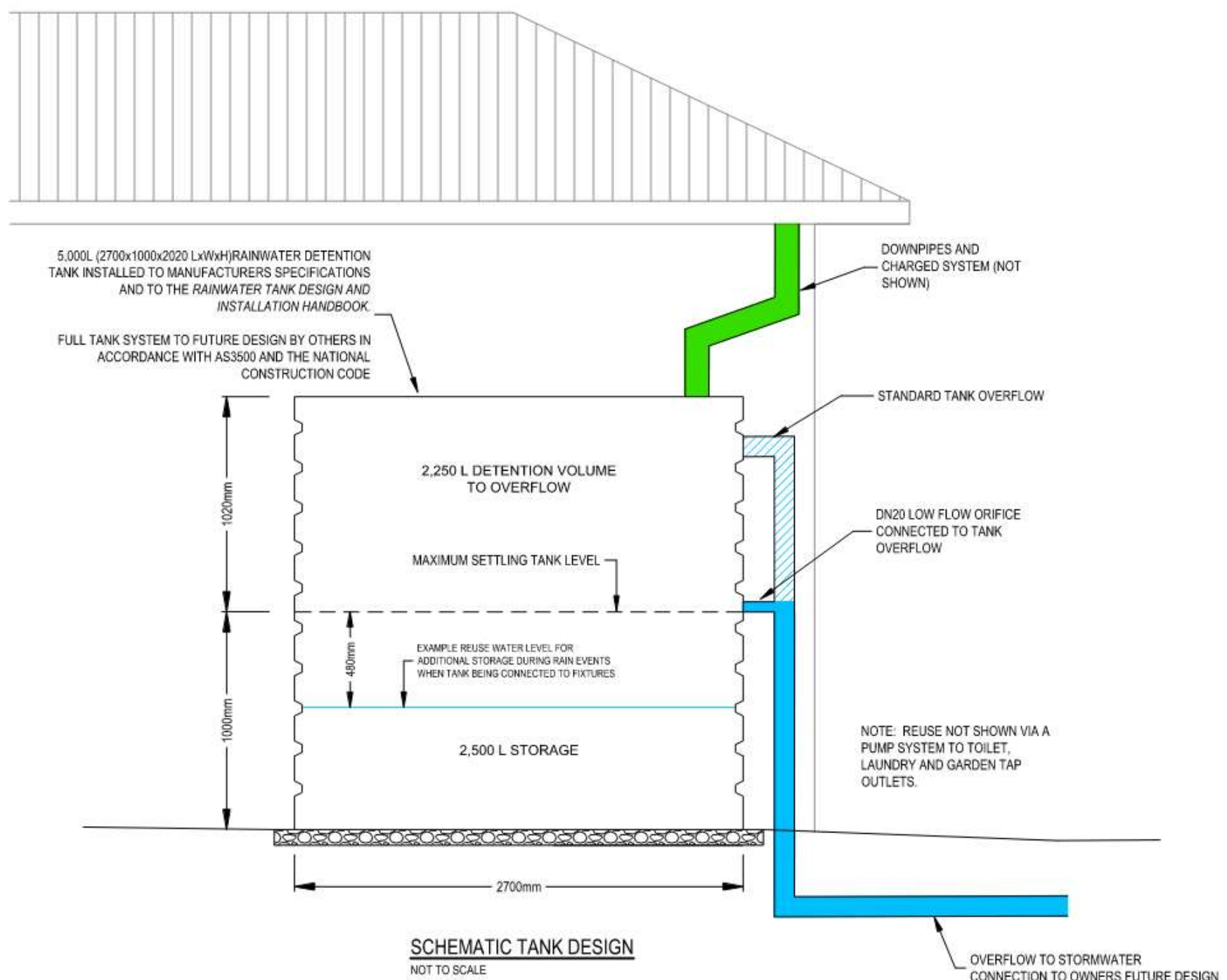
4. STORMWATER MANAGEMENT STRATEGY

It was proposed to have rainwater tanks for each property for the benefit of detention and retention for sustainability and water saving initiatives. For a whole of subdivision perspective Council have advised that this is not a preferable manner of detention and whilst will be entertained should a property owner wish to install a tank the development, it can not rely on the detention in the private tanks as public detention.

An example of this is shown below with the TasWater mains supply top up for the use of the reuse fixtures when rainwater tank volume not sufficient would be proposed to be via the *Davey Rainbank* (or similar) pump system which has been deployed around Tasmania which eliminates mains top up direct to the tank. If property owners wish these to be deployed in this manner, the tanks will provide additional detention to the development.

The modelled scenario is based on no private rainwater tanks in the system, but any installation of any such tanks will result in further attenuation.

Figure 6 – Typical rainwater tank schematic



The proposed end of line detention system is to be underground and installed in the Public Open Space and is a corrugated pipe detention tank of 1600mm diameter with varying parallel barrel configurations

and varying length to suit the contributing catchment as shown in the included drawings. These underground detention tanks are currently in use around Tasmania.

Figure 7 – Example of underground *Tefco Corrutank* system (or equiv).



The Corrutank system above is one possible method of underground detention. During detailed design the exact product type may be different but will require to have the same minimum attenuated flow requirements.

The Corrutanks will be interlinked in series by pipeworks and also have breather pipes in the detailed design and has the ability to have risers preinstalled into the barrels for maintenance and accessibility if required.

Each 1600mm diameter barrel at the exit point has a 100mm diameter orifice at the base, similar to the photo above, with the addition of a singular 150mm diameter overflow arrangement for the central barrel which is connected to the other barrels. This reduced orifice diameter, in addition to the current layout of the detention systems, reduces the piped outflow to Council's downstream infrastructure.

5. MODELLLED SCENARIOS

A number of scenarios were modelled in assessing the development in addition to the pre-development peak flow discharges at the calculated time of concentration. The time of concentration was calculated as 7 minutes.

Table 1: Peak discharges pre development for $t_c=7\text{min}$

AEP	Time concentration (minutes)	Q_{\max} (m ³ /s) Pre-Development
20%	7	0.70
10%	7	0.84
5%	7	0.99

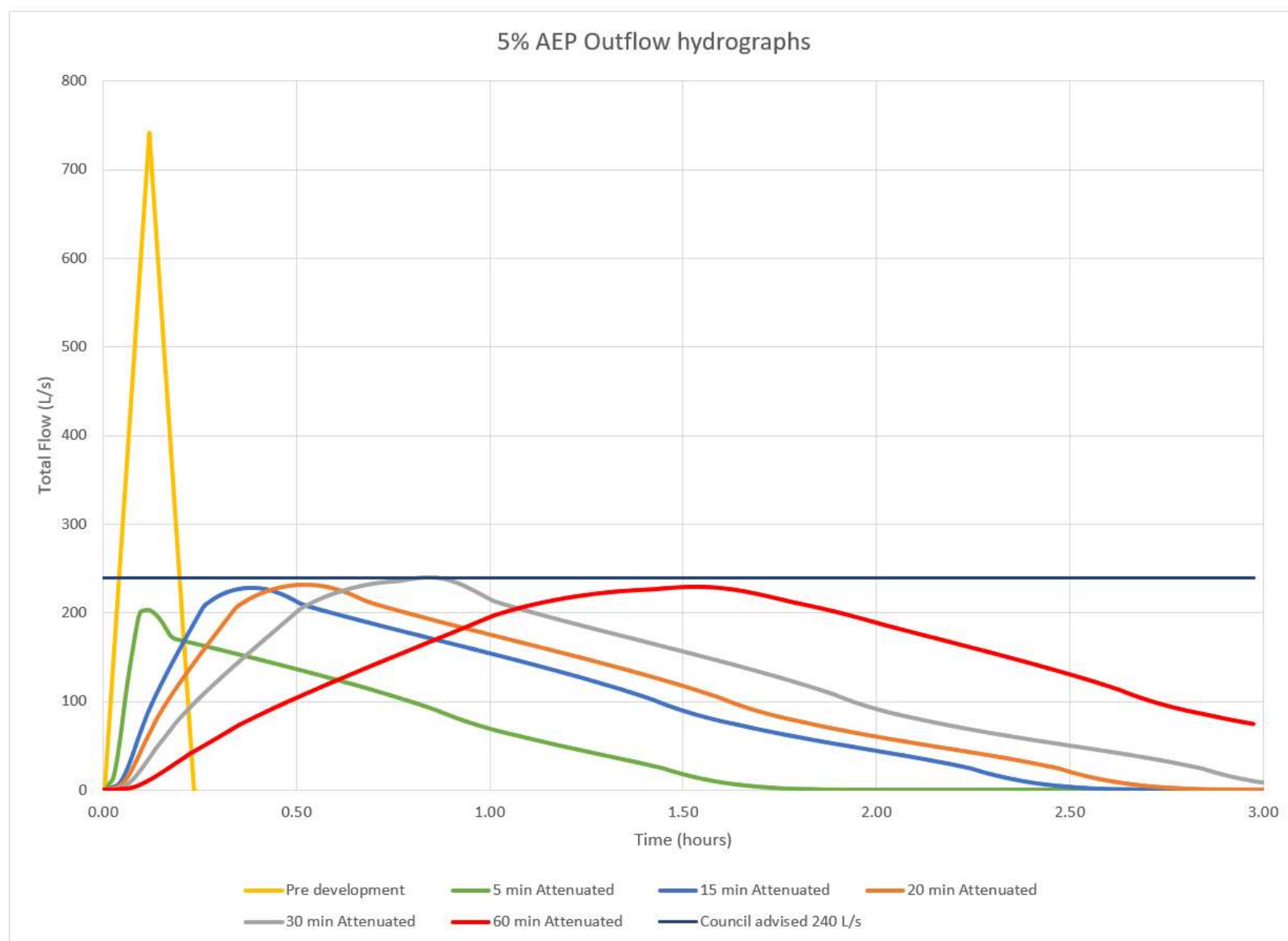
The same design layout and conditions have been applied to numerous durations of the 5% AEP with the results summarised below. It is typical that the 5 minute duration is applied to allotment scale design as this is typical maximum outflow for allotment scale but based on whole site the 15 minute duration results in the peak post development flow rate.

Table 2: Summary of attenuated flows vs duration for 5% AEP

Duration	Intensity (mm/hr)	Attenuated Outflow Q_{\max} (L/s)	Depth in detention pipes (mm)
5 min	96.0	204	830
15 min	59.0	228	1.28
20 min	50.0	232	1.37
30 min	39.6	240	1.50
1 hr	25.8	229	1.47
2 hr	16.80	195	1.22

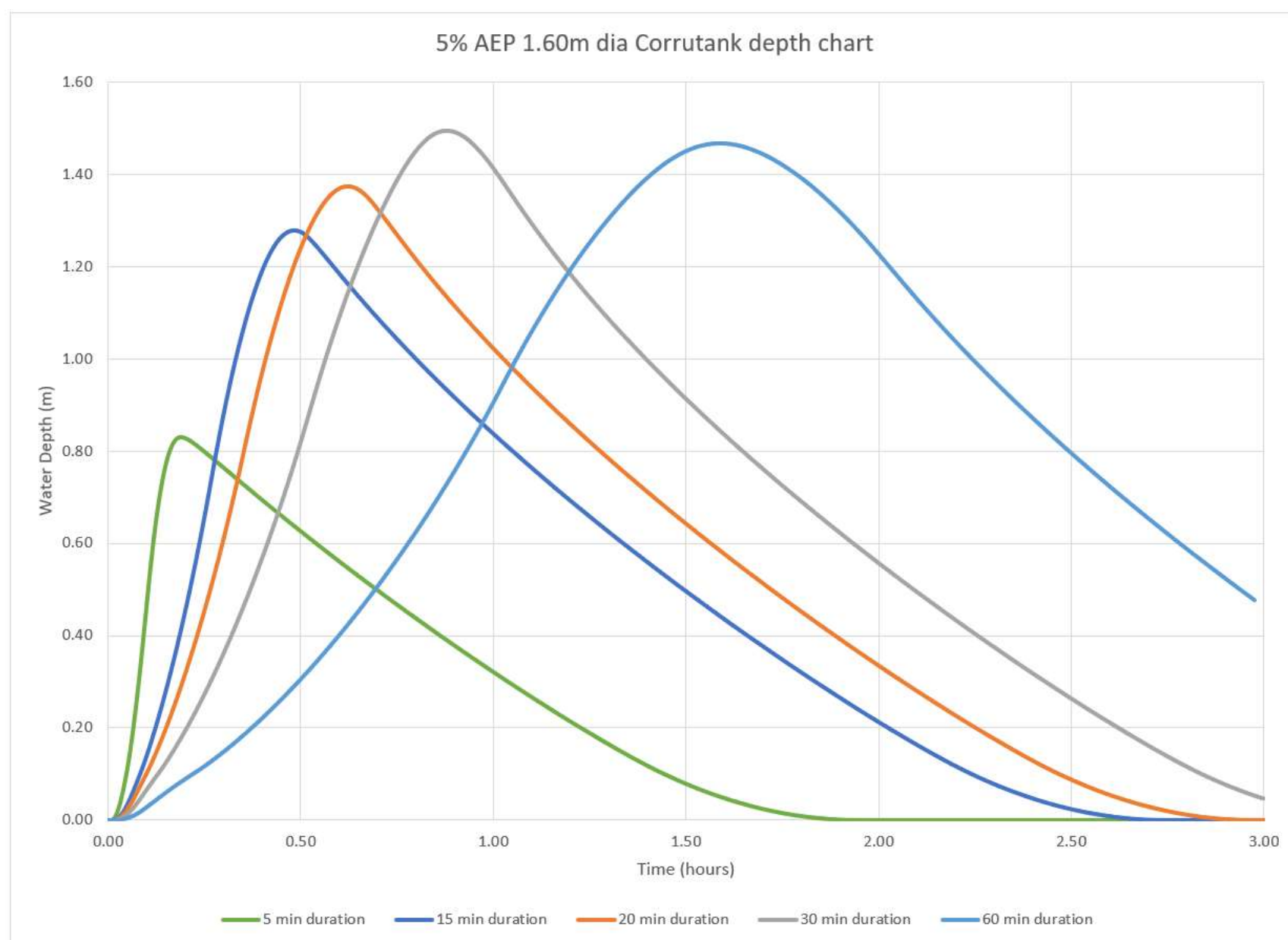
As outlined in the tables above, and in Figure 8 below the peak post development discharge for the allotment is lower for all the return periods modelled due to the modelled scenarios of the underground detention to attenuate flows prior to leaving the development.

Figure 8 – Outfall flows for 5% AEP



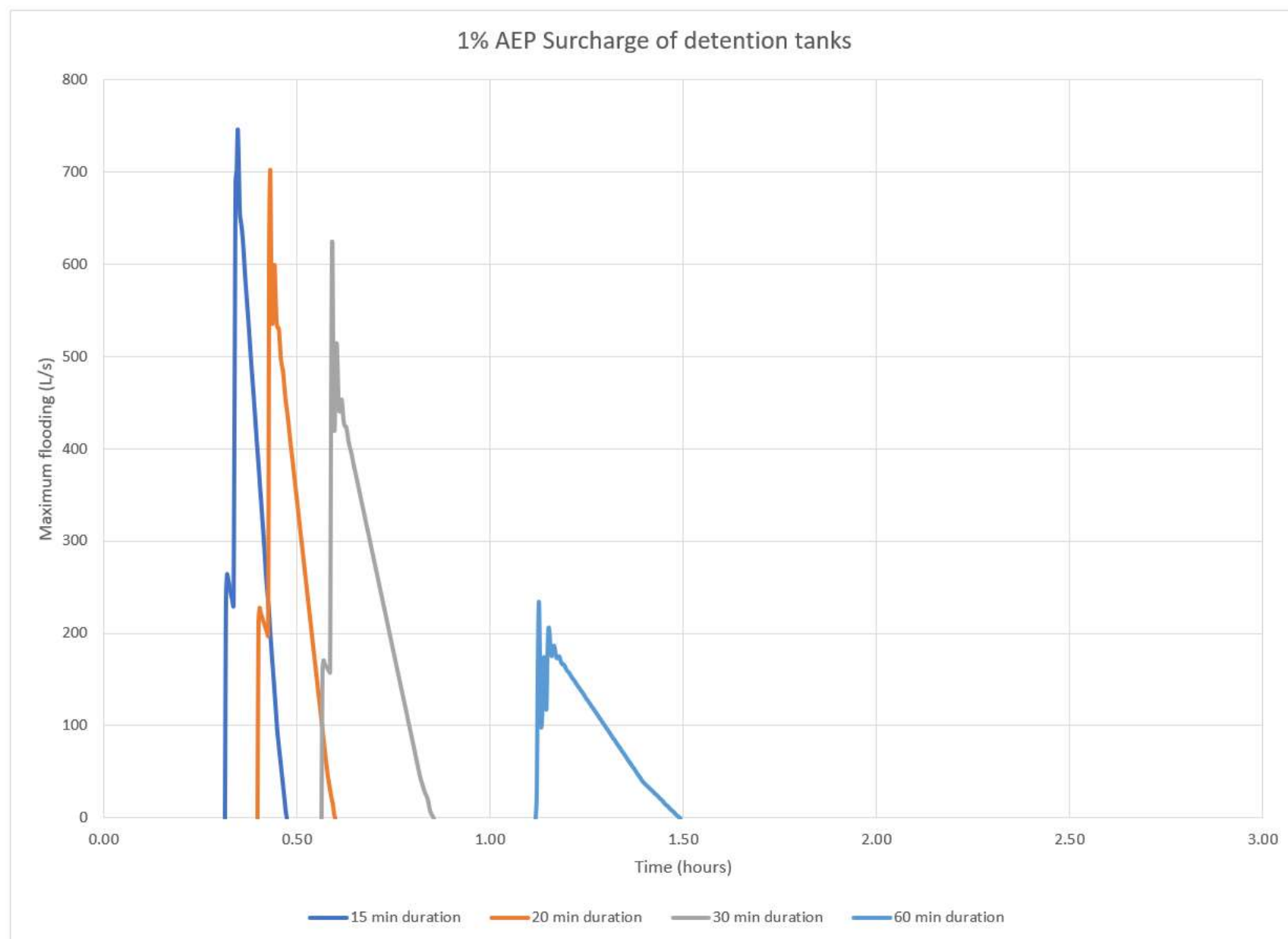
As can be seen above, with the inclusion of more detention capacity, all durations for the 5% AEP are below the Council requested 240L/s figure due to downstream infrastructure capacity issues.

Figure 9 – 5% AEP detention depth chart



The depth charts shown above exclude the minor additional storage that the interconnectivity pipes to join the barrels will have in addition to a number of breather pipes that can be deployed throughout the barrel run. Whilst the 5% AEP durations don't go above the obvert of the pipe, in a 1% AEP storm event the additional volume the breather pipes and interconnectivity pipes will be slightly beneficial, even if a minor improvement.

Figure 10 – 1% AEP total detention surcharge flows



The 1% AEP model run reveals that, as expected, the detention can not contain the full durations. The lesser 5 minute burst is contained, but the durations shown above all surcharge the detention modules to some extent. Whilst the flow rates are provided, due to the storage that is provided and the sudden surcharge, the volume of surcharge isn't large and is in the order of 200-250m³.

It has been advised the channel constructed downstream of this development has been designed and accommodated to suit a larger flow rate than the surcharge events. During detailed design, further methods could be explored subject to Councils preference to potentially detain the overflow volume prior to flow downstream but this has not been accounted for currently at this concept and development application phase of the project as it has been advised the downstream channel can accommodate this flow.

6. STORMWATER QUALITY

A MUSIC model and treatment train has been developed incorporating multiple treatment types to have a pollutant reduction percentage of 80/45/45/90% or TSS/TP/TN and GP. The type of treatment devices, the report and the product manuals are attached as an Appendix A to this report.

Figure 11 – Treatment Train

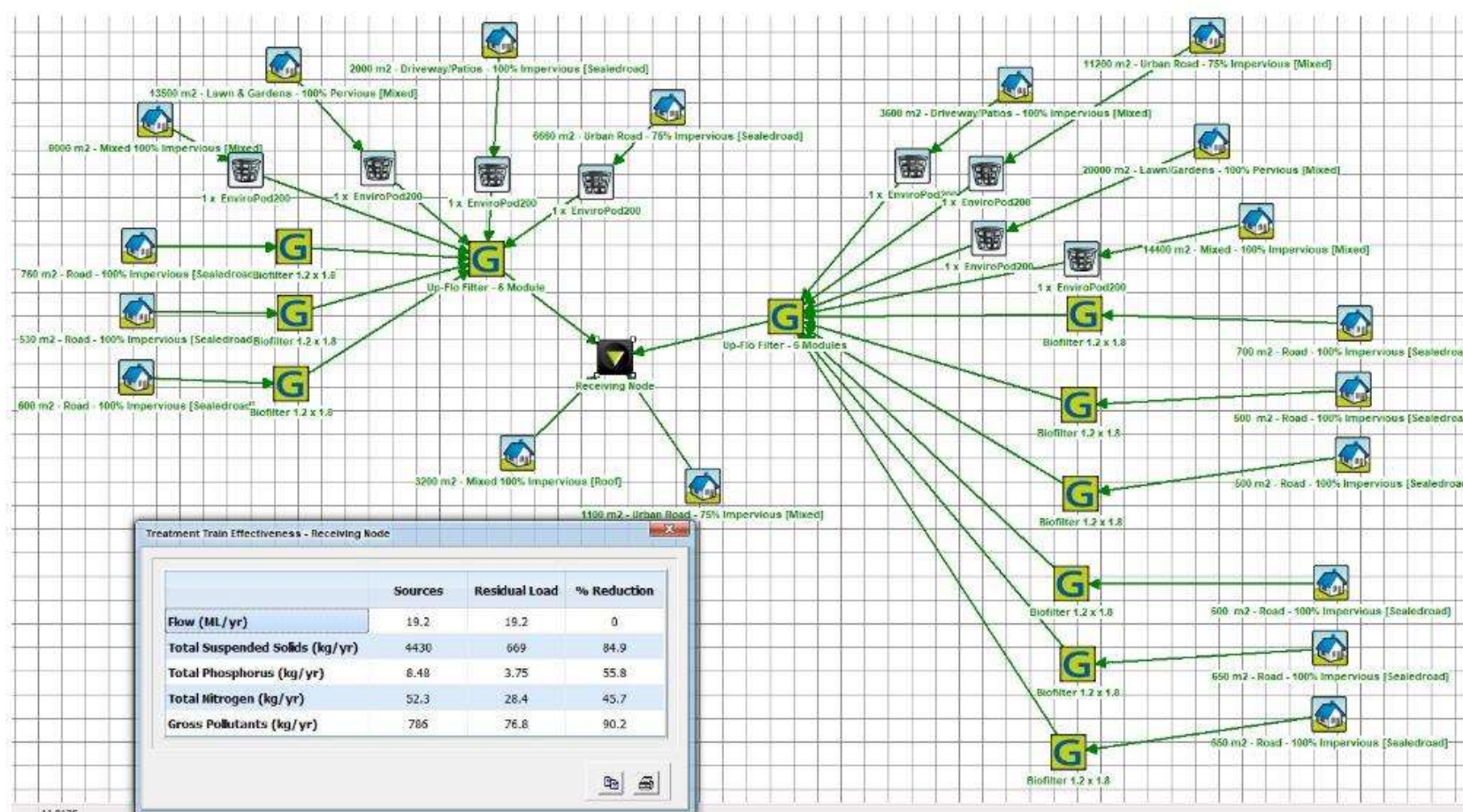


Figure 12 – Pollutant reductions

	Sources	Residual Load	% Reduction	Target %
Total Suspended Solids (kg/yr)	4430	669	84.9	80
Total Phosphorous (kg/yr)	8.48	3.75	55.8	45
Total Nitrogen (kg/yr)	52.3	28.4	45.7	45
Gross Pollutants (kg/yr)	786	76.8	90.2	90

7. CONCLUSION

As can be seen in the tabular and graphical results provided in this report, the peak post development flow rates are below the requested amount.

The concept stormwater layout incorporating below ground detention tanks demonstrate that flows can be attenuated for the development less than the pre-development flows for a 5% AEP event. The larger 1% AEP storm event will have an overflow path through the development via roads and the existing catchment valley through to Brighton Road as currently the situation.

No assessment has been undertaken as to whether any downstream infrastructure is affected due to this development. How Council manages the impact of the recommendations contained within this report, if any, is not considered in this report.

This report has demonstrated that the Stormwater Management Strategy for the proposed development will meet the stormwater quantity obligations under the guidelines and therefore request that the Brighton Council supports the development application for this site.

The current proposed Lot 109 of 5189m² is connected to the on-site end of line detention system, but should Council entertain and exercise relevant powers under the Act, then this Lot could be separated from the subdivision and detention, and connected to the spur that was constructed in the north west corner of the School site that was constructed by Council as part of the Elderslie Road upgrade works. This has the ability to have its own separate detention prior to connecting into this line and will alleviate furthermore the flows entering the currently provided detention system which, as it will remain the same size, provide additional capacity.

Concluding, should Council wish to further investigate other detention means or alternatives, any such alteration to the proposed design can be undertaken during the detailed design phase of the projects subject to Council approvals and included as a Permit Condition. It has been shown that via the end of line detention, and other alternatives, that the post development flow rate leaving the site is in accordance with Council's requirements and any deviations and alterations to the proposal can be explored during detailed design in conjunction with Council.

Yours faithfully,



Morgan McGuire

Burbury Consulting Pty Ltd

Tel 03 6223 8007

mmcguire@burburyconsulting.com.au

APPENDIX A – STORMWATER TREATMENT



Stormwater Management Plan (SWMP)

Project

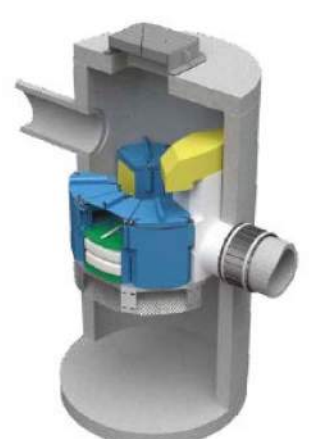
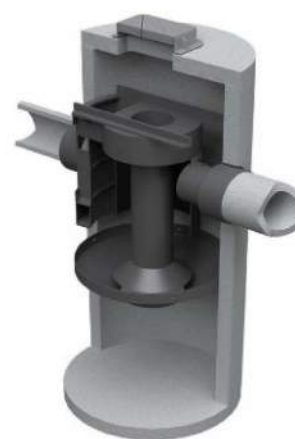
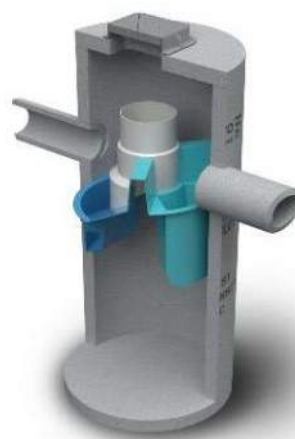
Elderslie Road TAS

SES Reference

V122 Elderslie Road, Brighton TAS

Issue Date

31st January 2024



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www.sesaus.com.au

Products that protect and manage our environment

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Executive Summary

This report is a conceptual stormwater management plan for the proposed development located at Elderslie Road, Brighton Tasmania 7030.

The stormwater quality modelling was undertaken using MUSIC version 6.3. The output from the model (Table 1 – Treatment Train Effectiveness) indicates that the following reduction targets of the receiving waters for the proposed development can be achieved:

- Total Suspended Solids (TSS): 80%
- Total Phosphorus (TP) : 45%
- Total Nitrogen (TN) : 45%
- Gross Pollutants (GP) : 70%

	Sources	Residual Load	% Reduction	Target %
Flow (ML/yr)	19.2	19.2	0	0
Total Suspended Solids (kg/yr)	4430	669	84.9	80
Total Phosphorous (kg/yr)	8.48	3.75	55.8	45
Total Nitrogen (kg/yr)	52.3	28.4	45.7	45
Gross Pollutants (kg/yr)	786	76.8	90.2	90

Table 1

The reduction targets are achieved using the following Products:

Product Name	Quantity
Up-Flo® Filter – 6 Modules	2
SES Enviropod200	8
BioFilter	9

Table 2

Site Layout

The proposed development is shown below in Figure 1. The development consists of the following:

- Catchment 1: Discharging into
 - Residential [Mixed] area (8,000 m2) with 6 filter module SES Up-Flo® Filter chamber
 - Lawns and Gardens [Mixed] area (13,500 m2) with 1 x SES EnviroPod200
 - Driveway/Patios [Sealed road] (2000 m2) with 1 x SES EnviroPod200
 - Urban Road [Sealed road] (6,660 m2) with 1 x SES EnviroPod200
 - Road (760 m2) with 1 x SES BioFilter 1.2 x 1.8 m
 - Road (530 m2) with 1 x SES BioFilter 1.2 x 1.8 m
 - Road (600 m2) with 1 x SES BioFilter 1.2 x 1.8 m
- Catchment 2: Discharging into
 - Driveway/Patios [Mixed] (3,600 m2) with 6 filter module SES Up-Flo® Filter chamber
 - Urban Road [Mixed] (11,200 m2) with 1 x SES EnviroPod200
 - Lawns/Gardens [Mixed] (20,000 m2) with 1 x SES EnviroPod200
 - Residential [Mixed] (14,400 m2) with 1 x SES EnviroPod200
 - Road (700 m2) with 1 x SES BioFilter 1.2 x 1.8 m
 - Road (500 m2) with 1 x SES BioFilter 1.2 x 1.8 m
 - Road (500 m2) with 1 x SES BioFilter 1.2 x 1.8 m
 - Road (600 m2) with 1 x SES BioFilter 1.2 x 1.8 m
 - Road (650 m2) with 1 x SES BioFilter 1.2 x 1.8 m
 - Road (650 m2) with 1 x SES BioFilter 1.2 x 1.8 m
- Sub catchment (3,200 m2 + 1,100 m2) discharging directly into LPOD without any treatment.

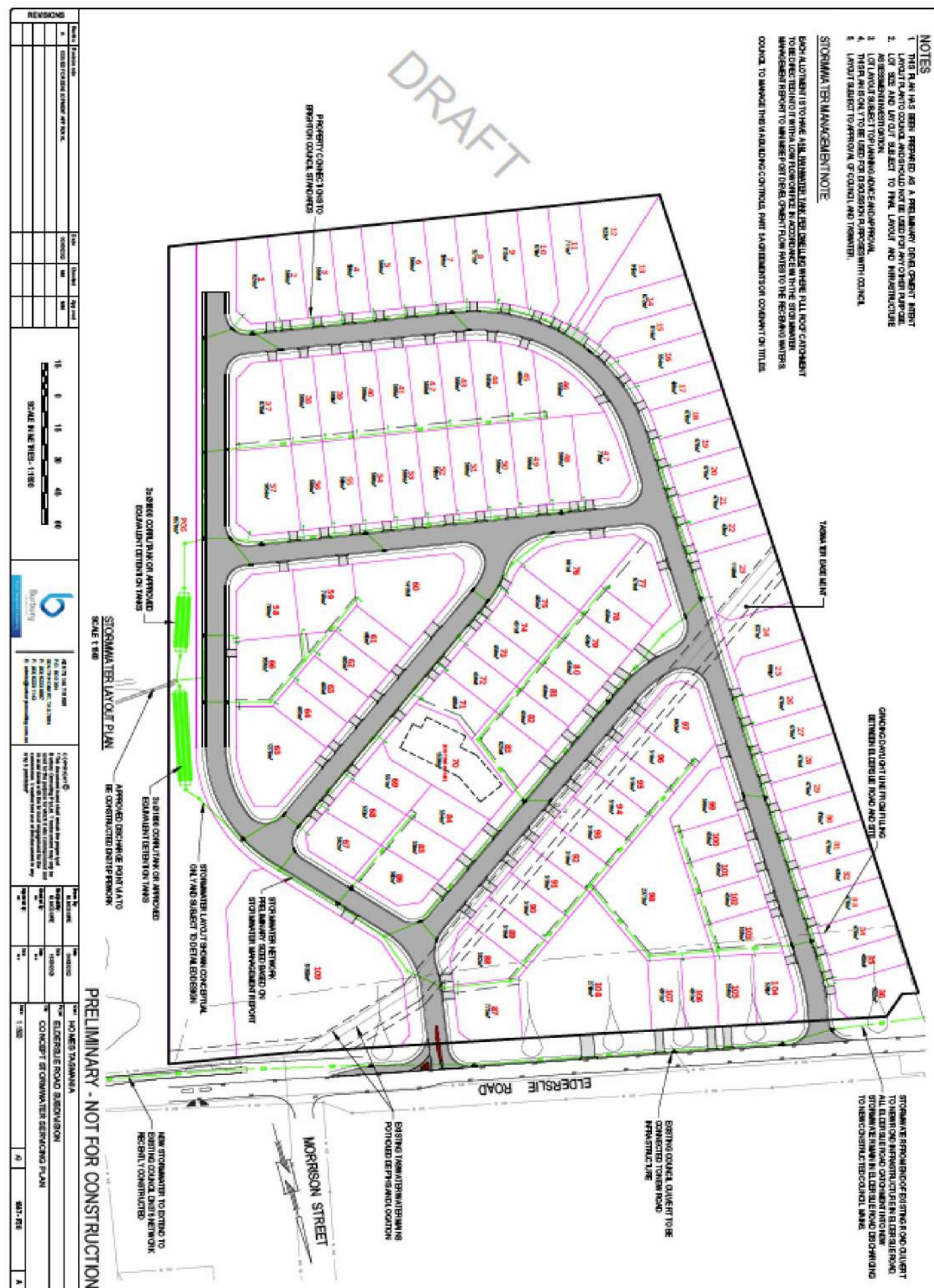


Figure 1

Stormwater Quality Management Strategy (MUSIC)

Rainfall Data

The rainfall data used in the model was based on the Bureau of Meteorology data from rainfall station 94029 Hobart. The model was run for a 10-year period from 30 April 1999 to 31 July 2010. The modelling time step was 6 minutes.

Rainfall runoff properties

In accordance with the recommendations of Melbourne Water MUSIC Guidelines 2018, following rainfall runoff parameters have been used:

Rainfall Runoff Parameters	Value
Rainfall Threshold (mm)	1
Soil Storage Capacity (mm)	120
Initial Storage (% of capacity)	25
Field Capacity (mm)	80
Infiltration Capacity Co-efficient a	200
Infiltration Capacity Co-efficient b	1.00
Initial Depth (mm)	10
Daily Recharge Rate (%)	25.00
Daily Base Flow Rate (%)	5.00
Daily Deep Seepage Rate (%)	0.00

Table 1: MUSIC rainfall runoff parameters (Industrial)

Pollutant Export Parameters

Specific Pollutant Export Parameters must be applied to each node type as per Melbourne Water MUSIC Guidelines 2018. The values shown in Table 3 are for split catchment areas.

Runoff pollutant concentrations are generated stochastically from the defined mean and standard deviation.

		Log10 TSS (mg/L)		Log10 TP (mg/L)		Log10 TN (mg/L)	
		Base flow	Storm flow	Base flow	Storm flow	Base flow	Storm flow
Roof	Mean	0	1.3	0	-0.89	0	0.25
	Std. Dev.	0	0.44	0	0.36	0	0.32
Roads	Mean	0.78	2.43	-1.11	-0.3	0.14	0.25
	Std. Dev.	0.45	0.44	0.48	0.36	0.2	0.32
Landscaping	Mean	0.78	1.92	-1.11	-0.59	0.14	0.25
	Std. Dev.	0.45	0.44	0.48	0.36	0.2	0.32

Table 2: Pollutant export parameters (Industrial)

Water Quality Objectives

The pollution load reduction targets required for this site are summarised in Table 4 below.

Total Suspended Solids (TSS) % Reduction	Total Nitrogen (TN) % Reduction	Total Phosphorous (TP) % Reduction	Litter/ Gross Pollutants % Reduction
80	45	45	90

Table 3: Pollution reduction targets

Treatment Plan

In order to achieve the pollutant load reduction targets for the proposed development on catchment 1 and 2, it is proposed to use multiple treatment methods to treat the runoff prior to discharging from the development site.

Stormwater runoff from the roof, lawns, gardens, driveways and urban roads will be treated with an SES Enviropod200 and an SES Up-Flo® Filter system. Run off from roads with be treated with SES BioFilter and SES Up-Flo® Filter before discharging into LPOD.

MUSIC Results

The resulting percentage-based load reductions at the site outlet are shown in Table 5 below, together with the Water Quality Objectives for the receiving waters.

	Sources	Residual Load	% Reduction	Target %
Total Suspended Solids (kg/yr)	4430	669	84.9	80
Total Phosphorous (kg/yr)	8.48	3.75	55.8	45
Total Nitrogen (kg/yr)	52.3	28.4	45.7	45
Gross Pollutants (kg/yr)	786	76.8	90.2	90

Table 4: Treatment train effectiveness (6-month maintenance interval)

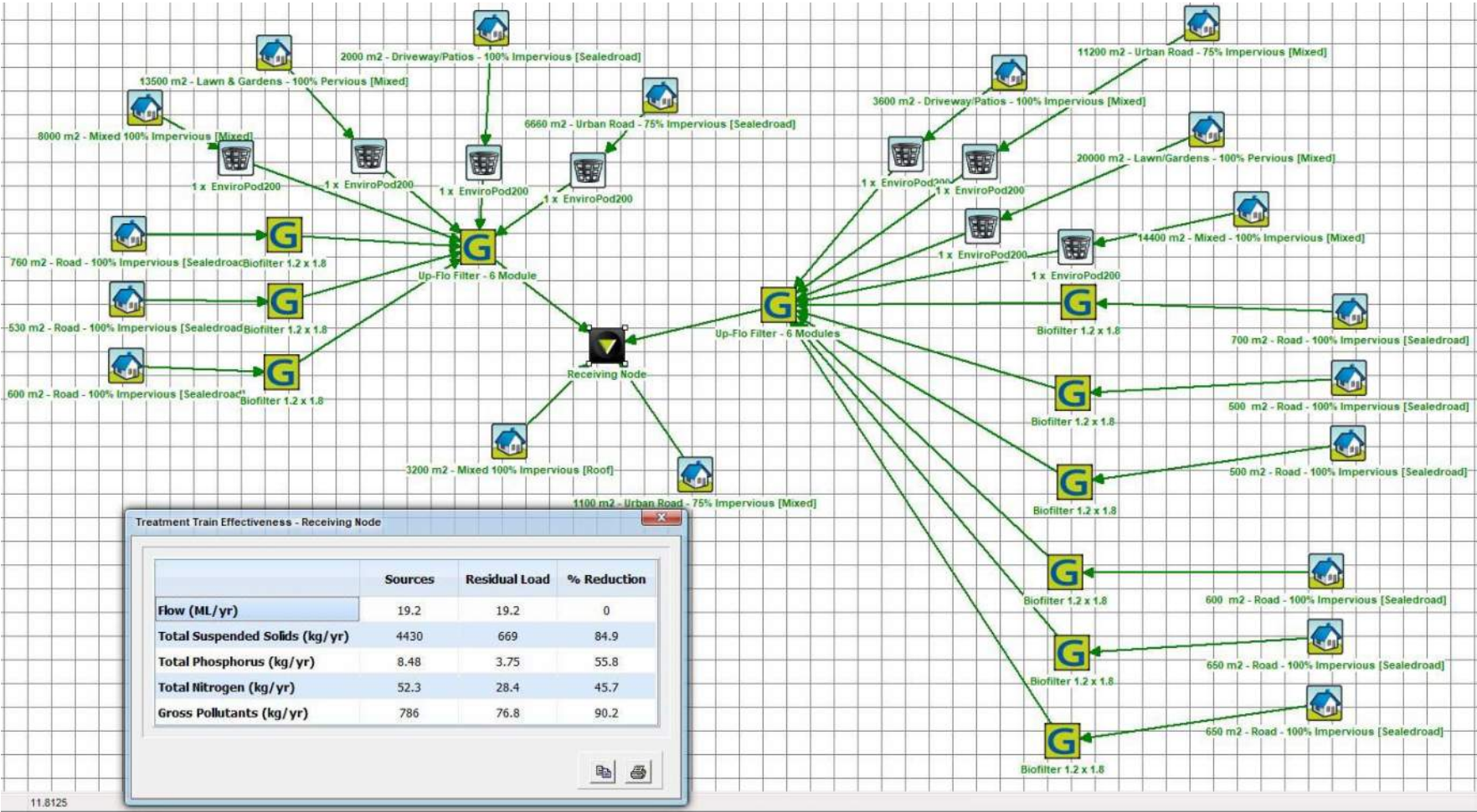


Figure 1: MUSIC Model (6-month maintenance interval)

About Stormwater Environmental Solutions (SES)

Stormwater Environmental Solutions Pty Ltd (SES) is a 100% privately owned Australian company and was established in 2022 to provide respectful technological solutions to the construction industry through reputable international brands such as Hydro International. SES provides services in the product specification and educational front to consulting engineers and councils. Estimating services and products are offered to plumbers, civil contractors, and builders during all stages of the project from feasibility, tendering to construction projects in Australia. SES's head office is based in Melbourne, Victoria with satellite offices around Australia.

The following are product categories which SES provides but are not limited:

- ✓ Stormwater treatment
 - pit baskets
 - gross pollutant traps
 - hydrodynamic separators
 - engineered media filtration technology
- ✓ Oil/water separation technology including triple interceptors
- ✓ Stormwater and sewerage pump stations
- ✓ Detention and retention systems (above and below ground)
- ✓ Various drainage channel solutions and
- ✓ Stormwater treatment and pump maintenance services

About Hydro International Ltd

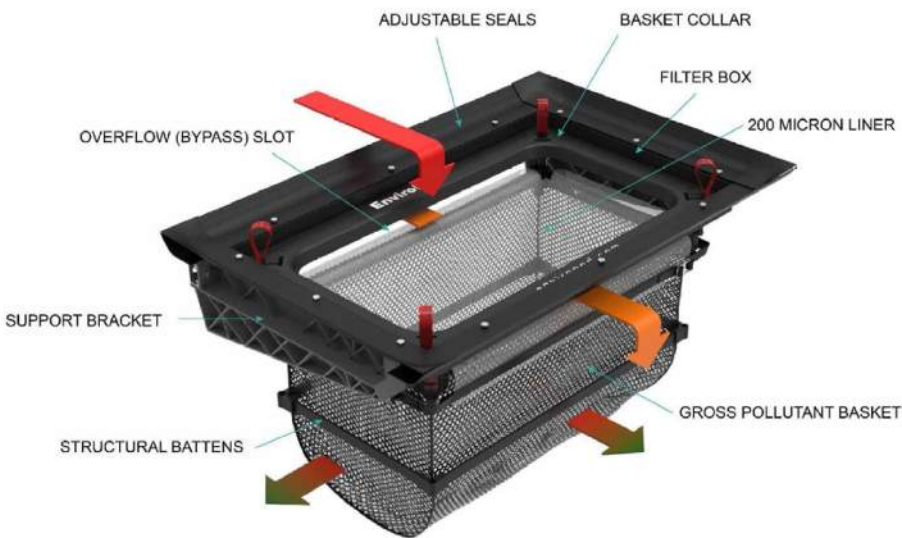
Hydro International Ltd is a global company that provides advanced products, services and expertise to help municipal, industrial and construction customers to improve their water management processes, increase operational performance and reduce environmental impact.

With over 40 years of experience and a reputation for engineering excellence, businesses and public organisations all over the world rely on Hydro International products and services to reduce flood risk, improve water treatment and protect the environment from water pollution.

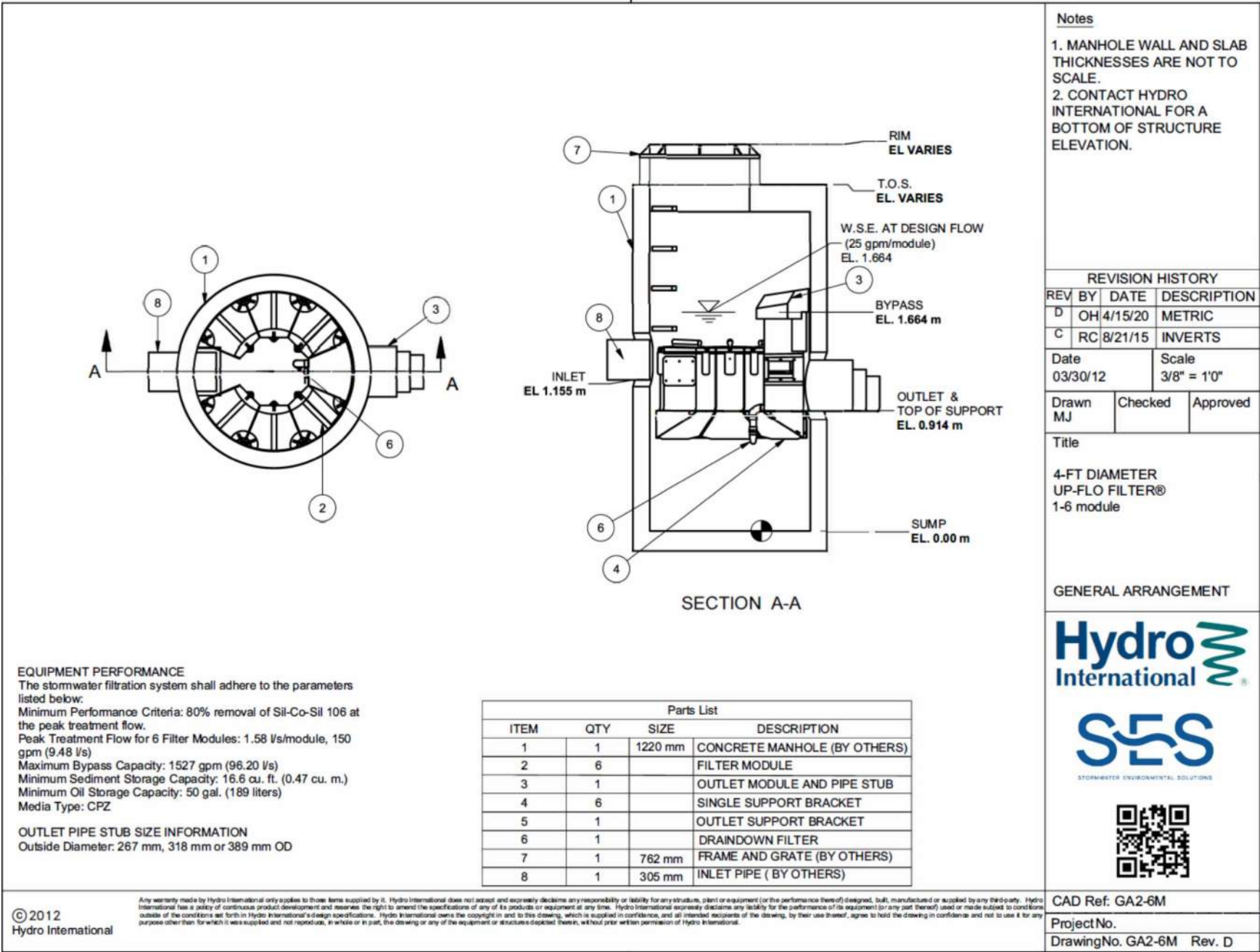
Headquartered in Clevedon, UK, Hydro International has a network of over 80 distribution partners and serves customers in more than 40 countries.

Product drawings

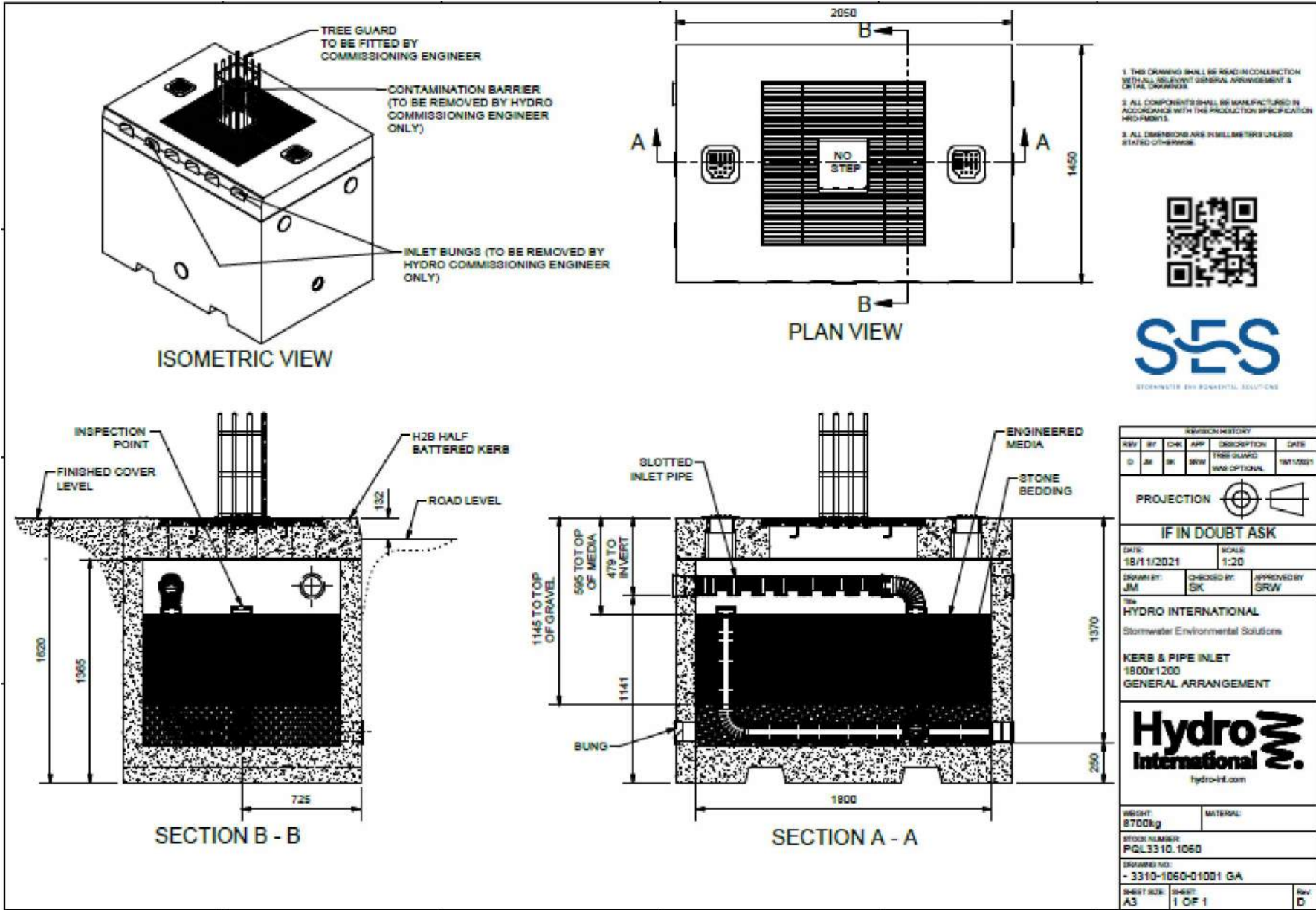
SES Enviopod



SES Up Flo Filter



Bio Filter Drawing





EnviroPod200™

Gullypit Basket Pre-treatment System

Products that protect and manage our environment



The SES EnviroPod200 is the leading stormwater gullypit basket in Australia, with over 20,000 installs nationwide.

Improvements over the last two decades have made the design easier for the contractor while still providing the same level of pollutant removal.

MEETING REGULATORY REQUIREMENTS IN AUSTRALIA SINCE 1998

USED AND APPROVED BY CITY COUNCILS ACROSS AUSTRALIA

THE ENVIROPOD200™ IS THE LEADING STORMWATER GULLY PIT BASKET IN AUSTRALIA.

Easy installation and operation, the EnviroPod200™ is ideal for use as pre-treatment to remove gross pollutants, debris, and associated nutrients and pollutants.

The EnviroPod200™ is available in several standard sizes, designed to fit pits ranging from 450mm × 450mm up to 1200mm × 1200mm. Custom designs are also available.

EASY to source, ship and handle.

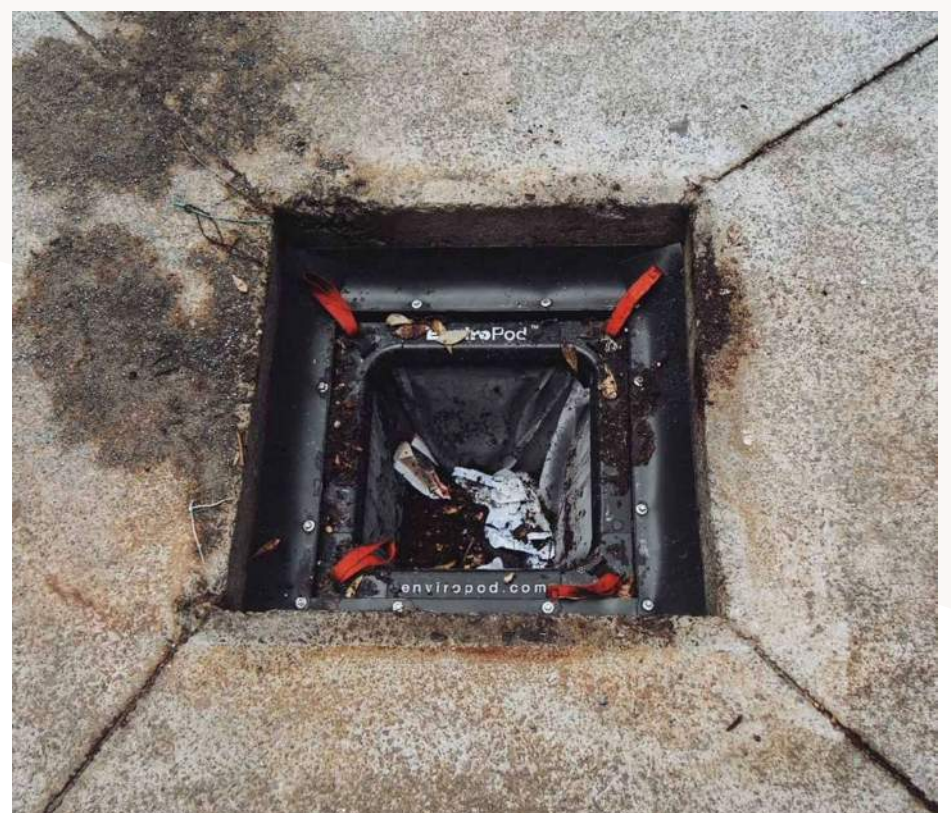
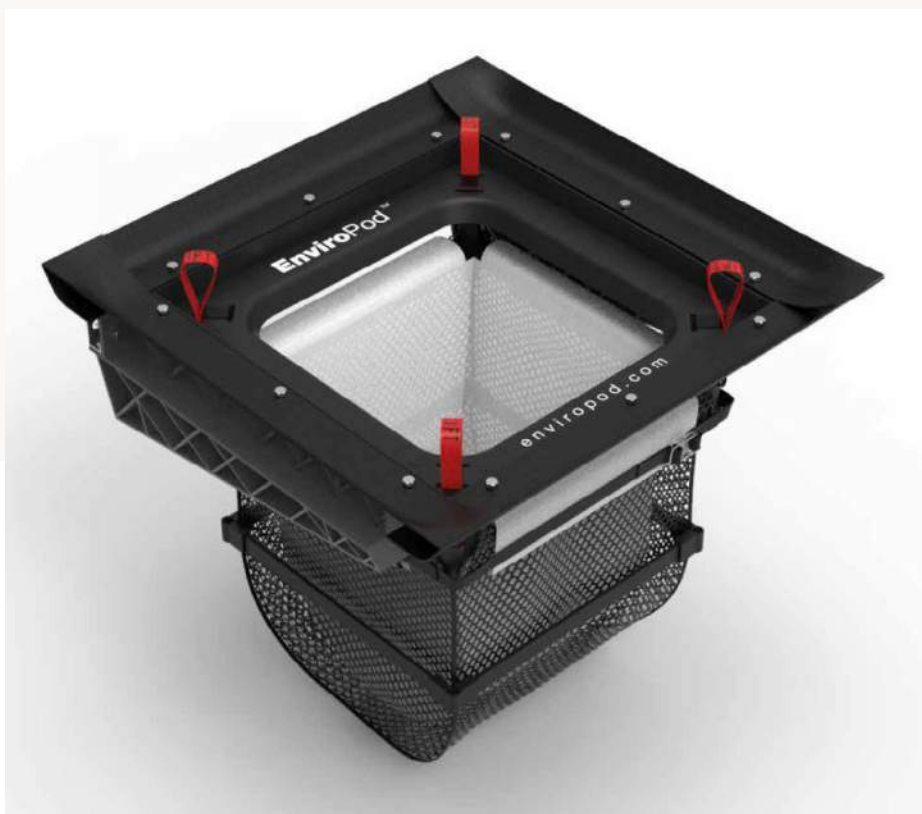
EASY INSTALLATION with fewer parts and a lighter frame, the installation process is quicker and saves you time.

FLEXIBILITY The flexible design allows the system to be easily adjusted to fit any gullypit configuration.

HAND MAINTENANCE The SES EnviroPod200 can be maintained quickly and easily by hand or by vacuum truck.

LIGHTWEIGHT & DURABLE The lightweight yet durable design of the SES EnviroPod200 is a safer and a longer-lasting product than the alternatives.

WARRANTY The SES EnviroPod200 has an eight-year limited warranty.



MUSIC Modelling

Product and design information including access to the MUSIC modelling are available at sesaus.com.au.



EASY MAINTENANCE

Maintenance is a simple process that requires no confined space entry. Maintenance can be quickly undertaken using a vacuum truck or it can be maintained manually by hand.

MAINTENANCE STEPS

- 1. **LIFT** the SES EnviroPod200 out of the gullypit using the lift handles,
- 2. **TIP** the contents out of SES EnviroPod200 into a suitable receptacle for contents,
- 3. **RINSE** the liner bag to prevent clogging,
- 4. **REUSE** the SES EnviroPod200 by placing securely back into the surrounding frame and seal, and close grate.



Step 1 — LIFT



Step 2 — TIP



Step 3 — RINSE



Step 4 — REUSE

INSTALLATION

The SES EnviroPod200 is quick and easy to install. Download installation instructions available at sesaus.com.au.



MODELS AND SPECIFICATION

SES EnviroPod200 model	Catch basin size (mm)	Standard manhole size*	Min basin size (mm)		Max basin size (mm)	
			Length	Width	Length	Width
SES-EP4545-200	450×450	DN600, DN750	435	377	470	470
SES-EP6060-200	600×600	DN1050	570	512	620	620
SES-EP9060-200	900×600	-	872	447	920	620
SES-EP9060-200**	900×900	-	872	447	920	620
2× SES-EP9060-200***	1200×1200	-	872	447	1230	1230

* Manhole adaptor bracket and seal kit included ** With 900 × 900 seal kit adaptor kit *** With 1200 × 1200 seal kit adaptor kit



STORMWATER ENVIRONMENTAL SOLUTIONS

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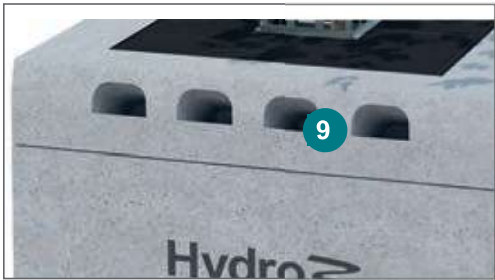
Products that protect and manage our environment

The Hydro Biofilter™ is an innovative bioretention and biofiltration system that harnesses the natural treatment action of vegetation and the filtration power of specially engineered soils.

Hydro Biofilter™ engineers in nature’s way to enhance any urban environment even where space is at a premium or where a retrofit surface water treatment solution is required. Suitable for residential or commercial settings, car parks and highways.

- 1) Robust chamber suitable for installation alongside highways.
- 2) Cover slab incorporating half-battered kerb and integrated kerb inlet slots (9).
- 3) Engineered filter media.
- 4) Enhanced mulch.
- 5) Tree or shrub.
- 6) Underdrain system.
- 7) Protective tree grate.
- 8) Pipe clean-out port (where required).
- 9) Half-battered kerb profile, complete with high capacity inlet slots for UK applications.
- 10) Tree guard

Note: Energy dissipater stones (omitted from drawing for clarity).



Components

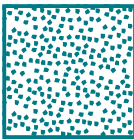
From the surface Hydro Biofilter™ looks like a tree box, with a suitable shrub or small tree protruding through a decorative grating in a concrete slab at pavement level. Underneath, the pre-cast concrete chamber contains a layer of enhanced mulch, on top of a unique soil filter medium to deliver high levels of surface water treatment.

Similar in application and concept to a traditional bioretention system, the Hydro Biofilter™ has been optimised for high volume flow whilst retaining high pollutant removal efficiencies.

Figure 1 - The Hydro Biofilter™ Bioretention System

Repeatable, reliable performance

Surface water is channelled into the unit through a kerbside inlet, through an inlet pipe or directly from the surface and is filtered through the mulch and engineered soil-based media to provide effective removal and remediation of a number of pollutants including:



Very fine particles

Constructed to be functionally similar to an enhanced dry swale, comparable removal rates of 70-96% of total suspended solids can be achieved.



Sediment bound heavy metals

Plants assimilate metals and other contaminants into their bio-mass. Removal efficiencies are in the order of 50-98%.



Gross pollutants

The integrated kerb inlet slots prevent larger litter from entering the system and are shaped to inhibit any smaller debris from becoming lodged within the inlet channels.



Sediment bound nutrients

Nutrients including Nitrogen and Phosphorus are taken up by the plant and used for growth and other biological processes. Removal rates of 40-90% can be achieved.



Liquid and sediment bound hydrocarbons

A substrate for natural bacteria is provided within the mulch layer for degradation of hydrocarbons. Removal efficiencies of 70-90% can be expected.



Dissolved pollutants

Chemical and biological interactions within the soil ecosystem also work to isolate and remove dissolved pollutants.

As several processes are at work, there is an element of redundancy in the pollutant removal, which improves the overall reliability of the system.

The Simple Index Approach (SIA)

The Simple Index Approach outlined in CIRIA C753 The SuDS Manual is a water quality design method for sites with a low to medium risk pollution hazard level. Sites with a high risk pollution hazard level should consider a more precautionary approach.

The approach assigns pollution hazard indices to the given land use for three pollutant groups, total suspended solids (TSS), metals and hydrocarbons. SuDS components are then selected until their combined pollution mitigation index score is greater than the pollution hazard index for each pollutant group.

Hydro Biofilter™ SuDS Mitigation Indices ^(a)		
Total Suspended Solids (TSS)	Metals	Hydrocarbons
0.9	0.92	0.8
Notes: (a) All mitigation indices supplied by Hydro International Ltd are independently verified and calculated using the methods laid out in the British Water How To Guide: Applying the CIRIA SuDS Manual Simple Index Approach to Proprietary / Manufactured Stormwater Treatment Devices.		

Table 1 - SuDS mitigation indices for Hydro Biofilter™

Sizing

Section 4.3.2 of CIRIA C609 states that “To remove the major proportion of pollution it is necessary to capture and treat the runoff from frequent small scale events and a proportion of the runoff (first flush) from larger and rarer events.... The depths of rainfall will be country specific and should be determined using UK rainfall data for the specific site location.”

Designed as an inlet system, the Hydro Biofilter™ inlet structure has the capacity to accept flows associated with these frequent smaller events and first flush via a kerbside inlet, through an inlet pipe or channel or directly from the surface. A clearance is maintained beneath the cover slab to allow for some surface ponding.

The Hydro Biofilter™ unit will typically be designed to treat in excess of 90% of the average annual rainfall runoff volume. The remaining 10% of runoff can be diverted to appropriate temporary storage areas via an internal or external bypass arrangement.

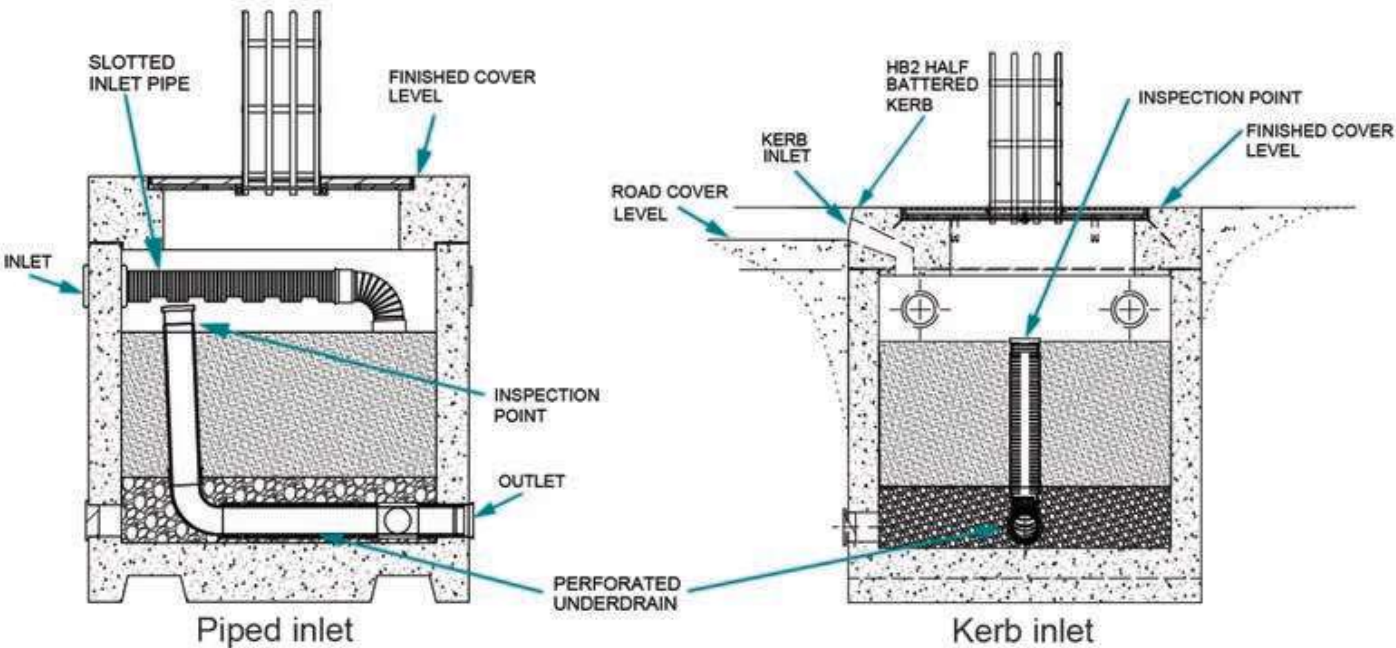
For initial sizing, it can be assumed that the filter surface area to drained area ratio will be between 0.2-0.3% for the UK.

Hydro Biofilter™ Sizes			Drained Area (m²)		Outlet Flow Rate
Width (m)	Length (m)	Filter Surface Area (m²)	Minimum	Maximum	
1.2	1.2	1.44	480	720	1.0 l/s
1.2	1.8	2.16	720	1080	1.5 l/s
1.2	2.4	2.88	960	1440	2.0 l/s

Table 2 - Hydro Biofilter™ design information.

Configuration options

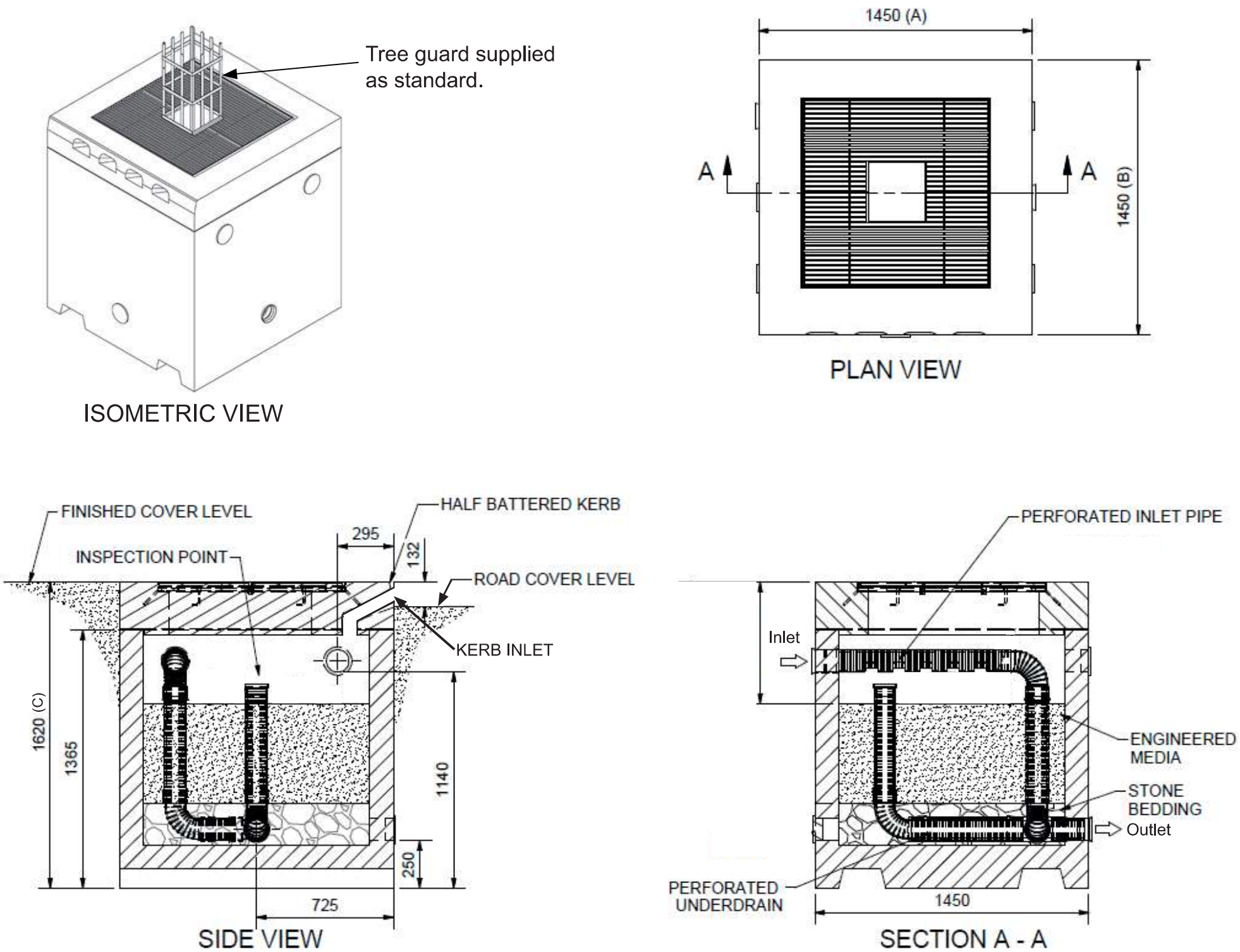
The piped or kerb inlet configurations are our most popular, but grille inlet only or a combined kerb and piped inlet configuration are also available.



Chamber dimensions and weights

The dimensions in Table 3 are given as a guide.

An indicative chamber drawing of the 1.2 m x 1.2 m Hydro Biofilter™ unit, as delivered to site, is shown below. Detailed installation drawings of each chamber size are available from Hydro International.



Dimensions and Weights				
Hydro Biofilter™ Unit Size (internal dimensions) (mm)	A (mm)	B (mm)	C (mm)	Total Chamber Weight (kg), including all contents, fixtures and fixings.
1200 x 1200	1450	1450	1620	6300
1200 x 1800	2050	1450	1620	8700
1200 x 2400	2650	1450	1620	11200

Note: Chamber wall thickness is 125 mm.

Table 3 - Hydro Biofilter™ dimensions and weights.

Maintenance

As a living system, the complex physical, chemical and biological processes at work within the Hydro Biofilter™ system act to recharge the filter media between storm events and so maintain the pollutant removal capabilities of the system.

The amount and type of maintenance required may vary from site to site depending on location, pollutant loading, storm conditions and local environmental strategy. However, the need for maintenance will generally be at a level consistent with the routine periodic maintenance of any landscaped area. This will maintain the appearance of the treatment area and its ability to infiltrate surface water and will include litter removal, pruning of plant, weeding and mulch replacement.

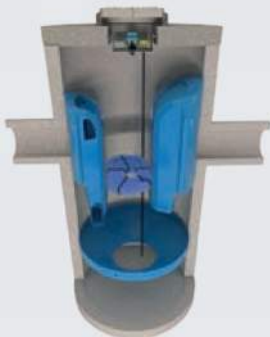
Expert Design Service

Hydro's professional engineers are able to utilise XP Solutions' Pluvius software, which contains over 700 years of UK rainfall data from the Met Office DELUGE® Database, to determine the local rainfall characteristics on a site-by-site basis. We can also provide estimated maintenance intervals, whole life cost estimates and predicted pollutant removal performance.

Call the Stormwater Hotline on: 01275 337937 or email stormwater@hydro-int.com

Our full range of stormwater treatment solutions

We have a range of stormwater treatment devices to treat stormwater flows of varying quality. All our solutions can work alongside, enable or enhance natural SuDS, helping to meet or improve on biodiversity and amenity targets.



Downstream Defender® Select



Up-Flo™ Filter



Hydro Biofilter™

Product		Description	Targeted pollutants						
			Sediments		Litter, debris	Liquid hydrocarbons	Sediment bound hydrocarbons, nutrients and heavy metals	Dissolved metals	Nutrients
Downstream Defender® Select	Vortex	Vortex separator	Coarse & fine	Retained up to 2 x treatment flow rate	✗	✗	✓	✗	✗
	Vortex Plus	Vortex plus separator	Coarse & fine	Retained up to 2 x treatment flow rate	✓	✓ Option for increased retention on request	✓	✗	✗
	Advanced Vortex	Advanced hydrodynamic vortex separator	Coarse & fine	Retained up to 4 x treatment flow rate	✓	✓ Option for increased retention on request	✓	✗	✗
Up-Flo™ Filter	Sand	Fluidised bed up flow filtration system with Sand media	Very fine sediment		✓	✓	✓	✗	✓
	CPZ	Fluidised bed up flow filtration system with CPZ media	Very fine sediment		✓	✓	✓	✓	✓
Hydro Biofilter™		Biofiltration system	Very fine and dissolved sediments		✓	✓	✓	✓	✓

To find out more about our range of stormwater treatment solutions visit hydro-int.com.

[Downstream Defender® Select](#)

[Up-Flo™ Filter](#)

[Hydro-Biofilter™](#)

Patent: www.hydro-int.com/patents

Tel: +61 425 425 068

ben@sesus.com.au

Stormwater Environmental Solutions Pty Ltd

www.sesus.com.au



hydro-int.com



Hydro Biofilter™

Operation & Maintenance Manual

Site Name:.....

Location on Site: **Biofilter**

Hydro International Ref No:

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DISCLAIMER: Information and data contained in this manual is exclusively for the purpose of assisting in the operation and maintenance of the Hydro Biofilter™. No warranty is given nor can liability be accepted for use of this information for any other purpose. Hydro International Ltd have a policy of continuous product development and reserve the right to amend specifications without notice.

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Hydro Biofilter™ Operation & Maintenance Manual

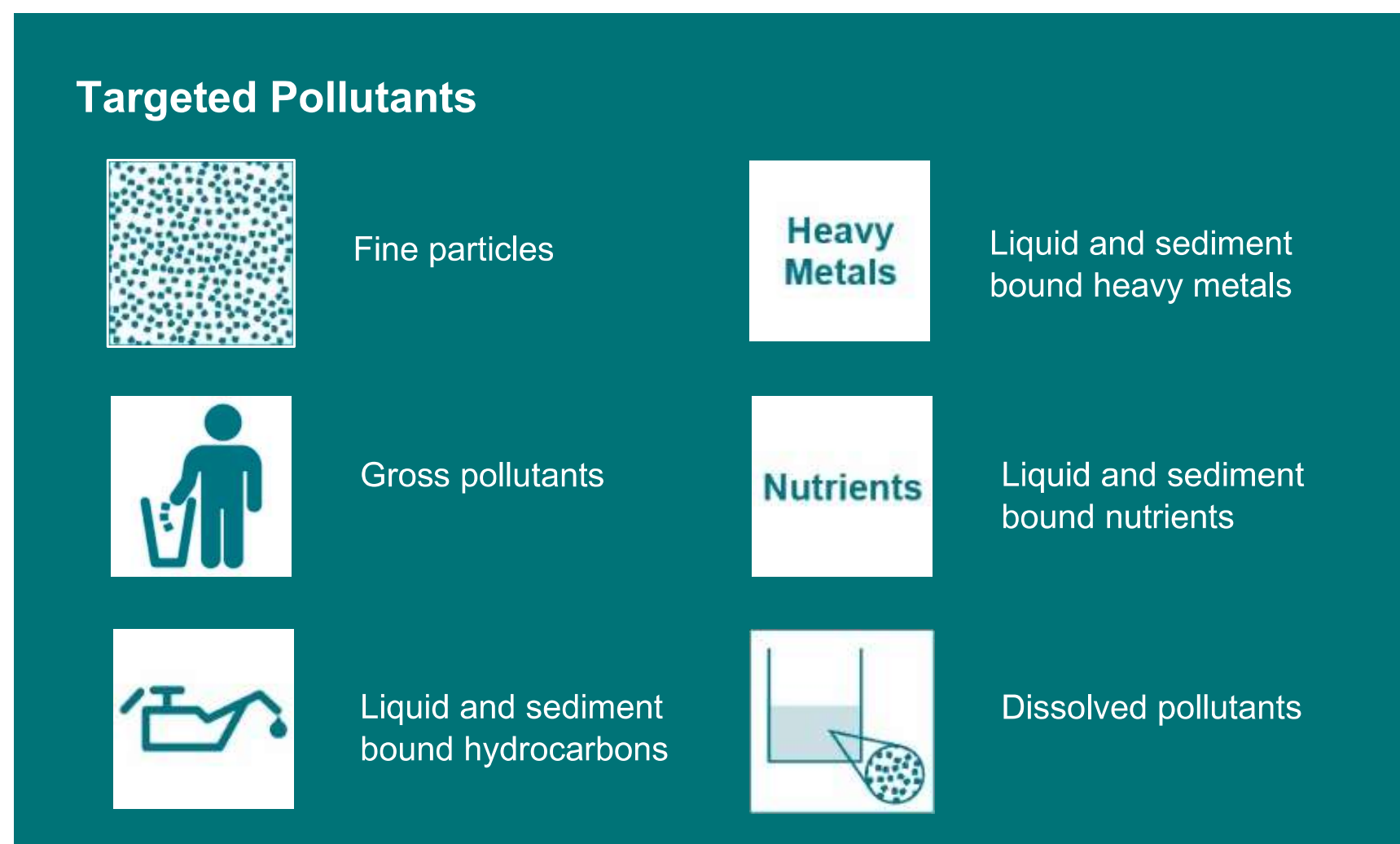
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Your Hydro Biofilter™

Your Hydro Biofilter™ is an innovative biofiltration system that harnesses the natural treatment action of vegetation and the filtration power of specially engineered soils.

Your Hydro Biofilter™ engineers in nature's way to enhance any urban environment even where space is at a premium or where a retrofit surface water treatment solution is required. Suitable for residential or commercial settings, car parks and highways.

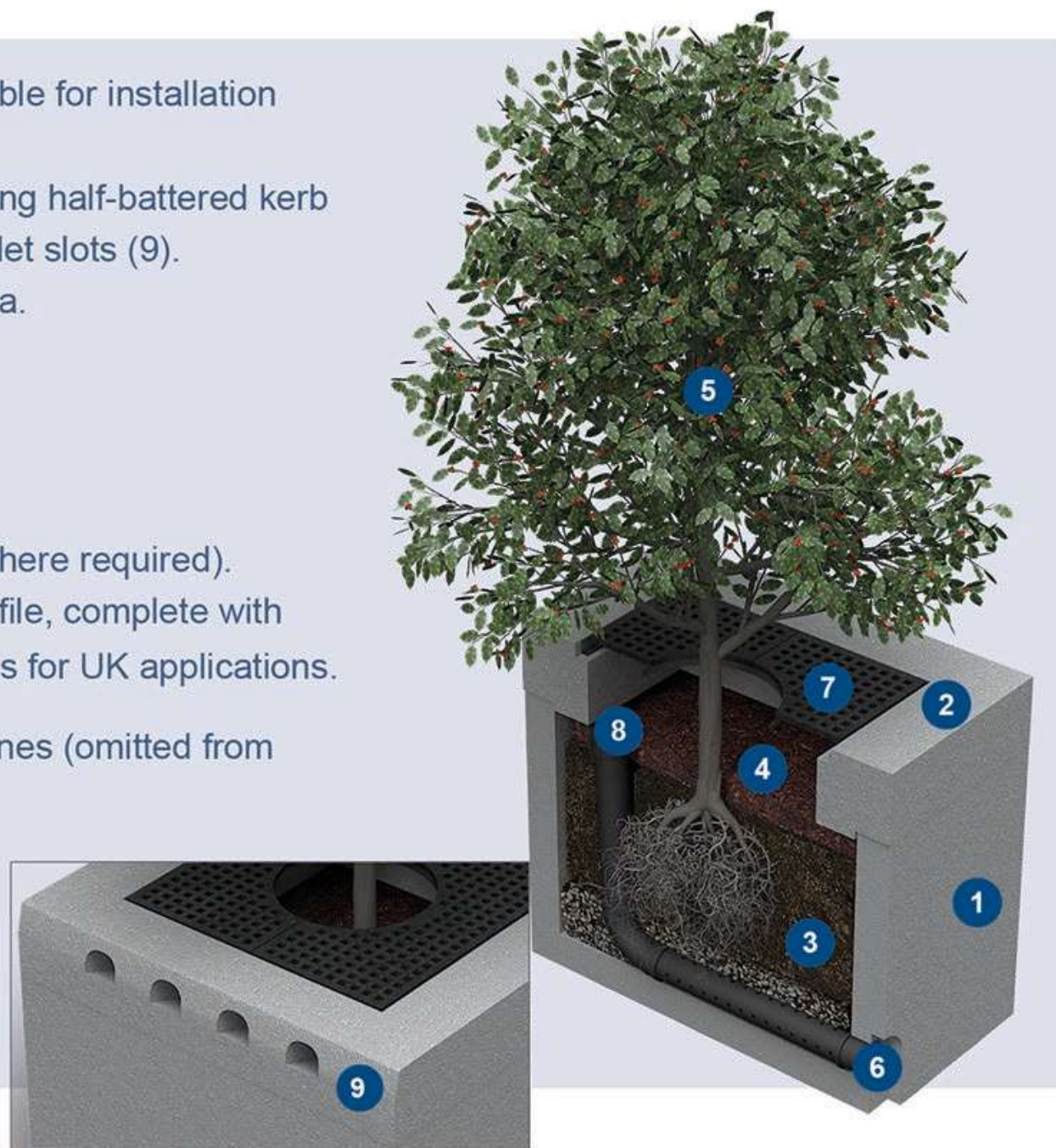


How it works

Surface water is channelled into the unit through a kerbside inlet, through an inlet pipe or directly from the surface and flows through the mulch and soil filter media, providing high-performance, high-flow filtration that targets sediment, hydrocarbons, heavy metals and nutrients.

- 1) Robust chamber suitable for installation alongside highways.
- 2) Cover slab incorporating half-battered kerb and integrated kerb inlet slots (9).
- 3) Engineered filter media.
- 4) Enhanced mulch.
- 5) Tree or shrub.
- 6) Underdrain system.
- 7) Protective tree grate.
- 8) Pipe clean-out port (where required).
- 9) Half-battered kerb profile, complete with high capacity inlet slots for UK applications.

Note: Energy dissipater stones (omitted from drawing for clarity).



Benefits of the Hydro Biofilter™

Repeatable, Reliable Performance

As a living system, the complex physical, chemical and biological processes at work within your Hydro Biofilter™ system act to recharge the filter media between storm events and so maintain the pollutant removal capabilities of the system.

Attractive and Space-saving

Your Hydro Biofilter™ contributes to attractive urban areas and street scenes and supports local biodiversity. Its compact design makes it ideal for both new build and retrofit applications.

Versatile

The treated water is discharged via the under drain system to a drainage outflow, watercourse, or onwards for infiltration if soil conditions allow. It can also be integrated with our Stormcell® or Stormbloc® Optimum storage and infiltration systems.

Low-cost Maintenance

As a living system, the complex physical, chemical and biological processes at work within the Hydro Biofilter™ system act to recharge the filter media between storm events and so maintain the pollutant removal capabilities of the system.

The amount and type of maintenance required may vary from site to site depending on location, pollutant loading, storm conditions and local environmental strategy. However, the need for maintenance will generally be at a level consistent with the routine periodic maintenance of any landscaped area. This will maintain the appearance of the treatment area and its ability to infiltrate surface water and will include litter removal, pruning of plant, weeding and mulch replacement.

Easy, Cost-effective Installation

While the chemical and biological processes behind Hydro Biofilter™ are complex, installation is simple. The filter media and ready-fitted internal components are pre-packaged in the concrete chamber to facilitate easy drop-in-place construction.

Applications

Hydro Biofilter™ engineers in nature's way to enhance any urban environment even where space is at a premium or where a retrofit surface water treatment solution is required. Suitable for residential or commercial settings, car parks and highways.

Operation

Introduction

The Hydro Biofilter™ is an innovative biofiltration system that harnesses the natural treatment action of vegetation and the filtration power of specially engineered soils.

From the surface Hydro Biofilter™ looks like a normal tree box, with a suitable shrub or small tree protruding through a decorative grating in a concrete slab at pavement level. Underneath, the pre-cast concrete chamber contains a layer of enhanced mulch, on top of a unique soil filter medium to deliver high levels of surface water treatment.

Surface water is channelled into the unit through a kerbside inlet, through an inlet pipe or directly from the surface and flows through the mulch, plant and soil filter media, providing high-performance, high-flow filtration that targets sediment, hydrocarbons, heavy metals and nutrients.

No manual procedures are required to operate the unit and maintenance is limited to monitoring accumulations of stored pollutants with a measured inspection and service. The Hydro Biofilter™ has been designed to allow for easy and safe access for inspection/monitoring and clean-out procedures.

Pollutant Capture and Retention

Contaminated surface water drains from the impermeable surface through the kerb inlet slots incorporated into the Hydro Biofilter™ cover slab or through an inlet pipe onto the mulch layer, where energy dissipater stones are applied to prevent erosion of the mulch and engineered media. The runoff flows through the mulch and media layers where pollutants are captured and immobilised. Treated water is collected in an underdrain carrier pipe, which exits the chamber via a standard pipe coupler cast in to the wall of the chamber for downstream discharge.

Hydro Biofilter™ Biofiltration Treatment pathway

Sedimentation - Mulch layer captures most of the larger sediment particles and heavy metals are then removed through sedimentation and chemical reactions with the organic material in the mulch.

Inert Filtration - Water passes through the engineered soil media where the finer particles are removed.

Reactive Filtration - Chemical reactions take place to immobilise and capture pollutants in the engineered soil media.

Media Recharge - Once the pollutants are captured in the engineered soil, the bacteria begin to break down and metabolise the materials and the plants begin to uptake and metabolise the pollutants.

Blockage Protection

Should the Hydro Biofilter™ experience surface water in excess of the design loading or should the filtration process become restricted or blocked then flooding issues are avoided by installing an external bypass system as recommended and defined in our eguide.



<https://www.hydro-int.com/en-gb/hydro-biofilter-urban-stormwater-eguide>

Commissioning and Maintenance

Commissioning

Hydro International will undertake a commissioning check to ensure that the Hydro Biofilter™ is ready for full operation. Commissioning check will include: verification that the unit is installed correctly with the kerb and gutters correctly connected. Hydro International will install the approved mulch, the selected approved plant and will remove the temporary Hydro Biofilter™ protection.

Note: For commissioning to take place the Hydro Biofilter™ contributing influence zone must be complete (full landscaping, grass cover, final paving and street sweeping completed).

Maintenance

The Hydro Biofilter™ protects the environment by filtering, capturing and treating pollutants from stormwater runoff and periodic maintenance of the Hydro Biofilter™ is required to ensure continued and effective pollutant removal prior to discharge. An appropriate maintenance procedure extends the longevity of the living bio filter system and is essential for the continuous, long-term functionality of the Hydro Biofilter™.

Correct maintenance of your Hydro Biofilter™ Investment ensures:

- Performance continuity to meet design requirements for surface water treatment leaving site.
- Prolong the expected lifespan of the engineered soil media and the ongoing biofiltration performance.
- Regular replacement of the mulch stops accumulation of detrimental sediment.

Please refer to your Hydro Biofilter™ Log Book for detailed inspection and maintenance instructions and trouble-shooting.

Varying location environments can affect the required maintenance frequency; eg.

- Around some fast food restaurants where more frequent litter removal may be necessary.
- Contributing drainage areas that are subject to or influenced by new development.
- Sites subject to heavy sediment or gross debris loads.



We can provide full **inspection** and **maintenance** services for your Hydro Biofilter™, as well as for any other Sustainable Drainage Systems on your site – providing peace of mind and saving you time and money.

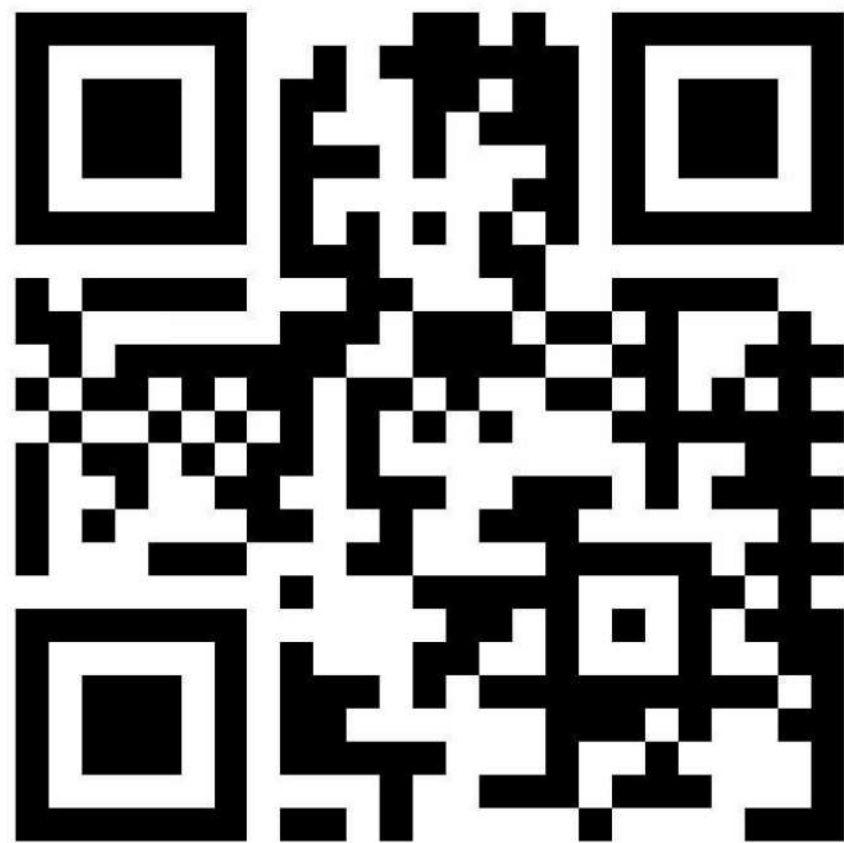
To discuss your site-specific requirements please contact us:

Call us on **+44 (0)1275 878371** or e-mail sudsservices@hydro-int.com.

Contact

SSES

STORMWATER ENVIRONMENTAL SOLUTIONS



Up-Flo® Filter

The Clever Kind of Clean

Product Profile

The Up-Flo® Filter is a multi-stage stormwater treatment system that combines pretreatment with fluidized bed filtration technology for superior filtration rates and media longevity. The Up-Flo® Filter optimizes the balance between high treatment performance and total cost of ownership.

Applications

- Removal of sediment, nutrients and metals from runoff
- Source control for redevelopment or new construction
- Treatment downstream of Water Quality Volume detention systems
- Sites operating under an industrial or multi-sector general permits
- Protection for groundwater recharge systems
- LEED® construction projects

System Components

- | | |
|---|---|
| 1. Inlet grate (pictured) or Inlet Pipe (not shown) | 5. Bypass Hood/Siphon |
| 2. Precast Filtration Chamber | 6. Outlet Module with Drain Down Filter |
| 3. Filter Module | 7. Pollutant Storage Sump |
| 4. 4mm Screening | 8. Media bags |

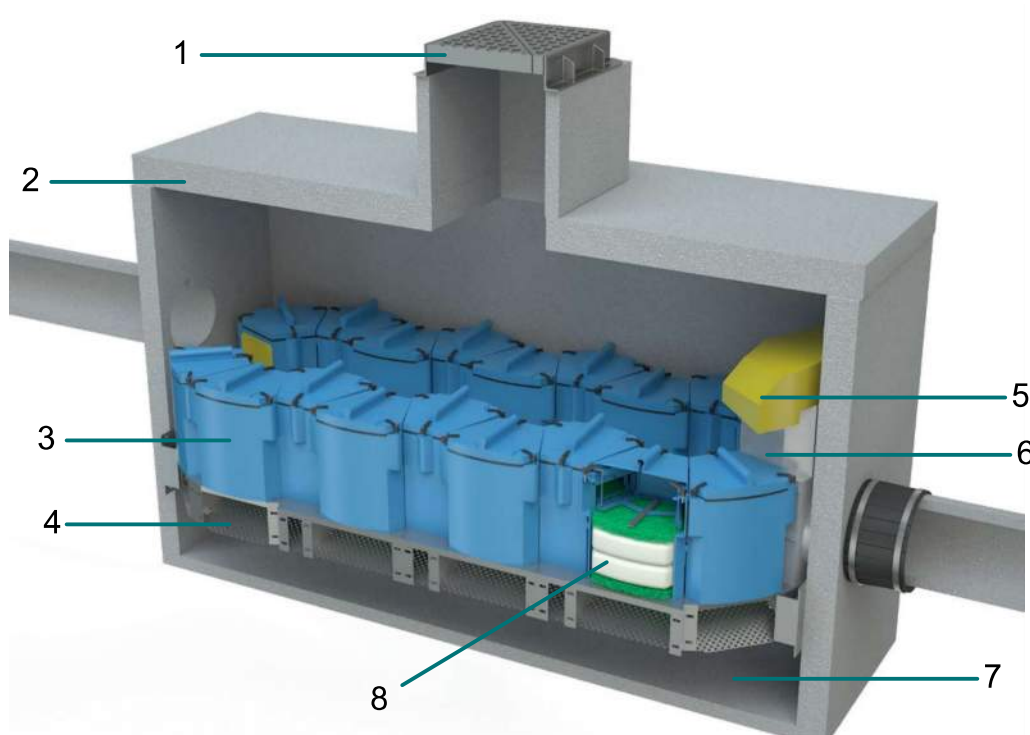


Fig.1 The Up-Flo® Filter includes sedimentation, screening and filtration in a single device.

Advantages

- Sedimentation, screening and filtration in one structure
- Upflow fluidized bed technology prevents clogging of filter media
- Includes an integral high flow bypass and trap for oils and trash
- Economical media bag replacement process requires neither heavy lifting equipment nor purchase of entirely new cartridge
- Independently verified through TARP field monitoring program

How it Works

1. **Pretreatment:** Oil and floatables rise to the surface while sediment settles in the sump.
2. **Screening:** Flow is directed upward through an angled screen to remove debris before entering the filter module.
3. **Filtration:** Water flows upwards through engineered media bags (see **Fig.2**) before leaving the outlet module to be discharged through the outlet pipe.

During peak flows, excess water is siphoned through the yellow bypass hood which also prevents the escape of oil and trash. As water levels return to normal, captured pollutants are washed off media bags, preventing blinding and prolonging media life.

Filter Module Components

Each Filter Module contains two filter bags containing an engineered media mix designed to optimize pollutant removal by evenly spreading the flow across the entire surface area.

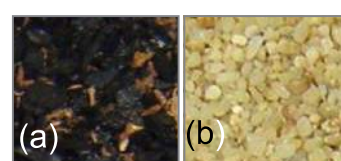
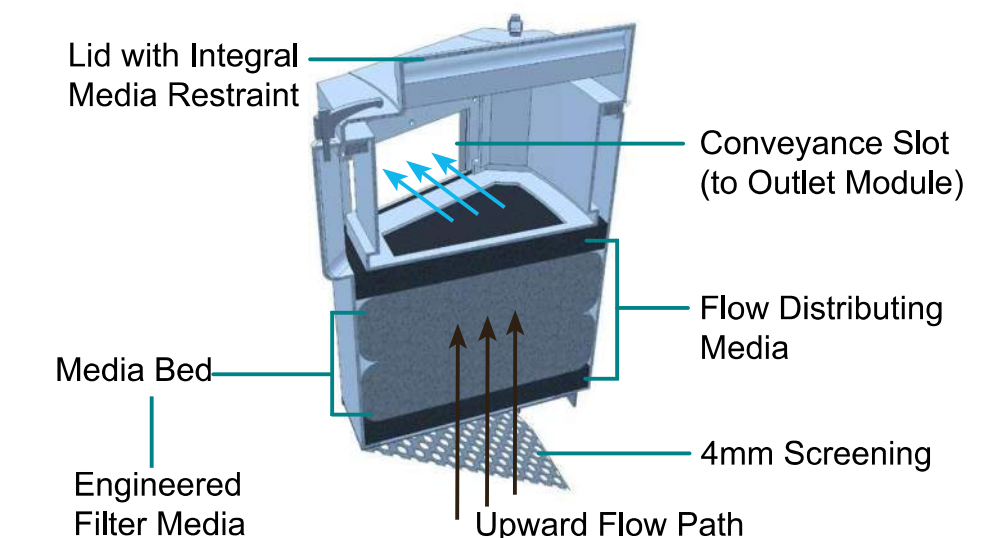


Fig.2 Engineered media mixes, include (a) CPZ™ Mix for TSS, Nutrients, Metals and Organics removal or (b) Hydro Filter Sand for TSS, Particle-bound Nutrients, and Metals removal.

Up-Flo® Filter

Sizing & Design

The modular design of the Up-Flo® Filter ensures that project specific treatment goals are easily met.

Standard and typical dimensions listed below. Use our sizing calculator to determine appropriate site-specific sizing.

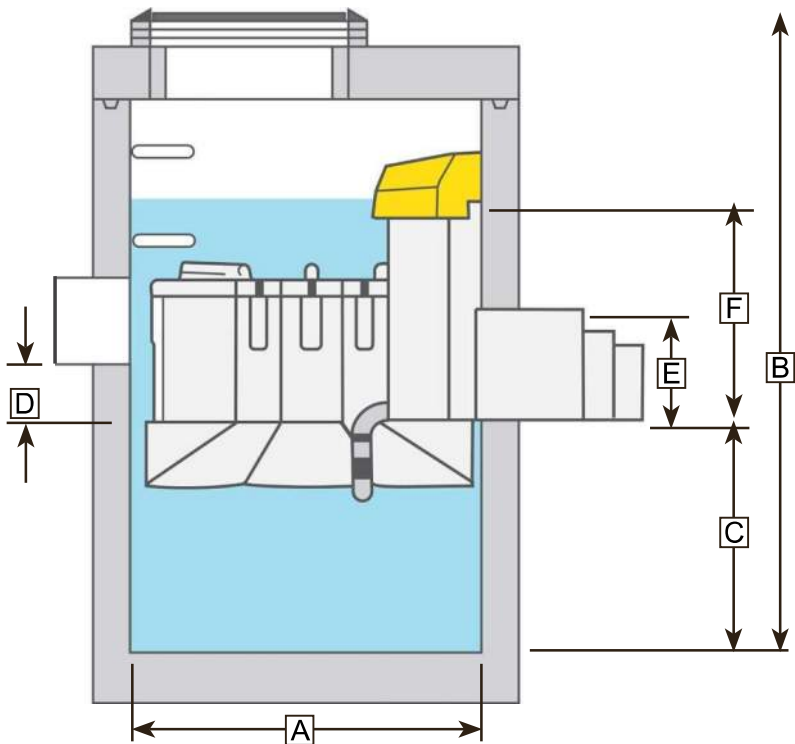


Fig.3 Key dimensions of the Up-Flo® Filter.

FREE Up-Flo® Filter Sizing Calculator for Engineers



This simple tool will recommend the best filter size and arrangement based on site-specific data entered by the user.

Go to hydro-int.com/filtersizing to access the tool

Chamber	A Diameter (ft/m)	Maximum Filter Modules (No.)	B Height (ft/m)	C Sump Depth (ft/m)	D Inlet/ Outlet Drop (ft/m)	E Maximum Pipe Diameter (in/mm)	F Operating Head (ft/m)	Maximum Treatment Flow (cfs/L/s)
Round Manhole	4 / 1.2	6	7.5 / 2.29	3.0 / 0.91	0.8 / 0.24	15 / 375	2.5 / 0.76	0.056 cfs per module
Rectangular Vault	6 x 8 / 1.8 x 2.4	7	6.5 / 1.98	2.0 / 0.60		24 / 609		
	6 x 13 / 1.8 x 3.9	18						
	8.5 x 13 / 2.5 x 3.9	36						
	15 x 13 / 4.5 x 3.9	54						

Inspection & Maintenance

Nobody maintains our systems better than we do. To ensure optimal, ongoing device performance, be sure to recommend Hydro International as a preferred service and maintenance provider to your clients.

Call 1 (800) 848-2706 to schedule an inspection and cleanout or learn more at hydro-int.com/service

Filter modules are situated along chamber walls enabling easy sump access for vacor trucks.

Our light-weight media bags can be manually replaced without removing the entire module

