



# **Engineering Assessment Report**

Proposed Residential Development, Brookfield Road, Fettercairn, Tallaght, Dublin 24

November 2023

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### Quality Assurance – Approval Status

This document has been prepared and checked in accordance with Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015)

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# Content

1.	Introduction1
2.	Subject Site2
2.1.	Existing Site Location2
2.2.	Existing Site Description3
2.3.	Proposed Development4
3.	Foul Water Drainage5
3.1	Irish Water Confirmation of Feasibility5
3.2	Existing Foul Drainage5
3.3	Proposed Foul Drainage - Calculations6
3.4	Proposed Foul Drainage Network6
4.	Surface Water Drainage
4.1	Existing Surface Water Drainage8
4.2	Proposed Surface Water Strategy9
4.3	Post-Development Runoff Rate10
4.4	Proposed Surface Water Design11
4.5	On-Site Attenuation
16	SUDS Assessment 14
4.0	
4.7	SUDS Maintenance
4.7 <b>5</b> .	SUDS Maintenance
4.7 <b>5</b> .1	SUDS Maintenance       17         Water Supply       21         Irish Water Confirmation of Feasibility       21
4.7 <b>5.</b> 5.1 5.2	SUDS Maintenance       17         Water Supply       21         Irish Water Confirmation of Feasibility       21         Existing Infrastructure       21
4.0 4.7 5.1 5.2 5.3	SUDS Maintenance       17         Water Supply       21         Irish Water Confirmation of Feasibility       21         Existing Infrastructure       21         Watermain Network Design       21
4.7 5.1 5.2 5.3 5.4	SUDS Maintenance       17         Water Supply       21         Irish Water Confirmation of Feasibility       21         Existing Infrastructure       21         Watermain Network Design       21         Water Demand Calculation       23
4.7 5.1 5.2 5.3 5.4 5.5	SUDS Maintenance       17         Water Supply       21         Irish Water Confirmation of Feasibility       21         Existing Infrastructure       21         Watermain Network Design       21         Water Demand Calculation       23         Water Conservation       23
4.7 5.1 5.2 5.3 5.4 5.5 6.	SUDS Maintenance       17         Water Supply       21         Irish Water Confirmation of Feasibility       21         Existing Infrastructure       21         Watermain Network Design       21         Water Demand Calculation       23         Water Conservation       23         Roads       25
4.7 5.1 5.2 5.3 5.4 5.5 6.1	SUDS Maintenance       17         Water Supply       21         Irish Water Confirmation of Feasibility       21         Existing Infrastructure       21         Watermain Network Design       21         Water Demand Calculation       23         Water Conservation       23         Proposed Roads       25
4.7 5.1 5.2 5.3 5.4 5.5 6. 6.1 6.2	SUDS Maintenance       17         Water Supply       21         Irish Water Confirmation of Feasibility       21         Existing Infrastructure       21         Watermain Network Design       21         Water Demand Calculation       23         Water Conservation       23         Proposed Roads       25         Proposed Sightlines       25
4.7 5.1 5.2 5.3 5.4 5.5 6.1 6.2 7.	SUDS Maintenance       17         Water Supply       21         Irish Water Confirmation of Feasibility       21         Existing Infrastructure       21         Watermain Network Design       21         Water Demand Calculation       23         Water Conservation       23         Proposed Roads       25         Proposed Sightlines       25         Transport       26
4.7 5.1 5.2 5.3 5.4 5.5 6.1 6.2 7. 7.1	SUDS Maintenance       17         Water Supply       21         Irish Water Confirmation of Feasibility.       21         Existing Infrastructure.       21         Watermain Network Design       21         Water Demand Calculation       23         Water Conservation.       23         Roads       25         Proposed Roads.       25         Proposed Sightlines       25         Transport       26         Pedestrian Site Access.       26
4.7 5.1 5.2 5.3 5.4 5.5 6.1 6.2 7.1 7.2	SUDS Maintenance       17         Water Supply       21         Irish Water Confirmation of Feasibility.       21         Existing Infrastructure       21         Watermain Network Design       21         Water Demand Calculation       23         Water Conservation.       23         Roads       25         Proposed Roads       25         Proposed Sightlines       25         Transport       26         Pedestrian Site Access       26         Cyclist Site Access       26
4.7 5.1 5.2 5.3 5.4 5.5 6.1 6.2 7.1 7.2 7.3	SUDS Maintenance       17         Water Supply       21         Irish Water Confirmation of Feasibility.       21         Existing Infrastructure.       21         Watermain Network Design       21         Water Demand Calculation       23         Water Conservation.       23         Roads       25         Proposed Roads.       25         Proposed Sightlines       25         Transport       26         Pedestrian Site Access       26         Proposed Site Access       26         Proposed Site Access       26         Proposed Site Access       26         Proposed Site Access       26
4.7 5.1 5.2 5.3 5.4 5.5 6. 6.1 6.2 7. 7.1 7.2 7.3 7.4	SUDS Maintenance       17         Water Supply       21         Irish Water Confirmation of Feasibility       21         Existing Infrastructure       21         Watermain Network Design       21         Water Demand Calculation       23         Water Conservation       23         Roads       25         Proposed Roads       25         Proposed Sightlines       25         Transport       26         Pedestrian Site Access       26         Proposed Sight Access       26         Proposed Site Access       26         Parking       28

# List of Figures

Figure 2-1: Site Location Map	2
Figure 2-2: 3D Image of Existing Site – taken from Google Earth	3
Figure 3-1 Existing Foul Drainage Network – As per Irish Water GIS	5
Figure 3-2 Proposed connections into the existing foul network.	7
Figure 4-1: Existing Surface Water Drainage in the Vicinity of the Site – as per GIS records	8
Figure 4-2 Proposed connection into existing surface water infrastructure	9
Figure 4-3: Proposed SuDS Treatment Train Flow Diagram	15
Figure 5-1: Existing Water Supply Network – As per Irish Water GIS records	21
Figure 5-2: Proposed location of Water Connection– As per Irish Water GIS records	22
Figure 5-3: Water use patterns for 3-person households	23
Figure 7-1: Surrounding Roads and Proposed Site Access	27
Figure 7-2: Site location relative to surrounding national roads	27
Figure 7-3: Public Transport in the Vicinity of the Subject Site	31

# List of Tables

Table 3-1: Calculation of proposed Foul Water Demand	6
Table 4-1: Summary of site catchment characteristics and discharge rates	11
Table 4-2: Summary of SuDS area and proportional site coverage	12
Table 4-3: Summary of SuDS Attenuation Storage Provided	13
Table 4-4: Summary of the Site Attenuation Storage Comparison	14
Table 4-5: Selected SuDS Measures	16
Table 4-6: Permeable Paving Maintenance Schedule	17
Table 4-7: Green Roof Maintenance Schedule	18
Table 4-8: Swale and Filter Strips Maintenance Schedule	19
Table 4-9: Bio-retention Maintenance Schedule	20
Table 5-1: Total Water Demand Calculation	23
Table 7-1 Maximum Car Parking Spaces according to the South Dublin Development Plan (2022-2028),	28
Table 7-2: No. of Car Parking Spaces Required as per the South Dublin Development Plan (2022-2028)	28
Table 7-3: Minimum Bicycle Parking according to the South Dublin Development Plan (2022-2028)	29
Table 7-4 No. of Cycle Parking Spaces Required as per the South Dublin Development Plan (2022         2028)	2- 29
Table 7-5 Existing Transport Links	30

# Appendices

- A. Irish Water Confirmation of Feasibility Letter
- B. Brownfield Run-off Rates Calculation (Causeway FLOW)
- C. Greenfield Run-off Rates Estimation
- D. Post-development runoff estimation excluding SuDS (Causeway FLOW)
- E. Post-development design model with SuDS (Causeway FLOW)
- F. Estimated Attenuation Volume (Causeway FLOW)
- G. SuDS Volume alculations

## 1. Introduction

This report has been prepared by Waterman Moylan, on behalf of South Dublin County Council, as part of a S179A planning submission to South Dublin County Council, for the proposed 16-unit residential development on a site located at, Brookfield Road, Fettercairn, Tallaght, Dublin 24.

The proposal includes two new Social Housing apartment blocks, separated by a new entrance road and gate to the Brookfield Enterprise Centre and grouped around a communal garden space.

Block 1 is three storeys consisting of 11 separate apartments units with own-door access. Block is two storeys with a three storey corner pop-up, consisting of 5 separate apartment units with own-door access.

Each unit is provided with a private front entrance along street boundaries and private bin storage. The ground floor units have private back garden space and private open space for the first floor and second floor apartments are provided with balcony spaces, designed in accordance with DHPLG guidelines. Private terrace spaces vary throughout – recessed terraces featuring in both blocks of the scheme.

This report aims to provide a comprehensive overview of the engineering design criteria of the proposed development.

This report shall be read in conjunction with the detailed architectural planning submission.

# 2. Subject Site

### 2.1. Existing Site Location

The site is located along Brookfield Road, Fettercairn, Tallaght, Dublin 24. The subject site is located within a well-developed area, surrounded by various elements including Brookfield Road, an open green space and private houses to the west; the junction of Brookfield Road and Rossfield Avenue as well as residential apartments to the North; Brookfield Health Centre and Brookfield Enterprise Centre and Pharmacy to the South, and additional private residences to the East.

The approximate coordinates for the centroid of the subject site are N53°17'19" W06°24'13". The location of the site and surrounding areas, including a zoomed-in view of the site, can be seen in Figure 2-1 below.



Figure 2-1: Site Location Map

### 2.2. Existing Site Description

The subject site is currently in a brownfield state, consisting of an existing building, a central dividing access road, hardstanding, footpaths and unsurfaced natural planted areas (mostly overgrown).

The existing site topography has a continuous gradient of approximately 1:50 from the southeastern corner of the site to the northwestern boundary. The highest existing level on the site is approximately 108.144m OD Malin, which is found along the southern boundary whilst the lowest existing level is 106.676m OD Malin along the northern boundary of Rossfield Avenue.

Refer to Figure 2-2 for a Google Earth 3D-image of the site and approximate site boundary.



Figure 2-2: 3D Image of Existing Site – taken from Google Earth

### 2.3. Proposed Development

The total site area of 0.2487 ha includes the construction of 16 no. apartment units, green spaces, and all associated civil infrastructure including water supply, surface water and foul water drainage networks, footpaths and roads serving the proposed development. Refer to the architect's drawing 2235-PA-001-SITE LAYOUT PLAN for the current layout of the proposed development.

The final finished floor levels (FFLs) of the development will be set at a minimum of 117.20 m OD Malin.

The existing access road into Brookfield Enterprise Centre that passes through the site will remain a live road and will be maintained partially open in safe operating conditions during the construction works. A proposed controlled access gate will be installed to access the Enterprise Centre. The internal roads will be constructed such that adjacent FFLs are circa (c.) 300 mm above the road level. Appropriate road levels will be designed to ensure compliance with DMURS and will tie into the existing road network on either end.

The surrounding paths, and roadways – including the access road into Brookfield Enterprise Centre – are already in the charge of South Dublin County Council.

Surface water will be captured, intercepted, and reduced via various Sustainable Urban Drainage Systems (SUDS) with green roofs proposed for the apartment blocks as well as the use of permeable paving, bioretention rainwater gardens and bio-retention tree pits. It is proposed that the development will attenuate the surface water via these SUDS measures, on site, before discharging it, at a restricted rate, to the existing surface water network located on Rossfield Avenue. The restricted rate (limited outflow) will be significantly less than the current brownfield runoff rate and designed in line with the Greater Dublin Strategic Drainage Study and the Institute of Hydrology report No 124 "Flood Estimation for Small Catchments", using the UK SUDS Website.

The proposal includes the provision of 12 no. car parking spaces (including 2 no. accessible parking spaces), as agreed with SDCC during pre-planning.

Refer to the latest Architect's planning submission for a detailed description of the development.

# 3. Foul Water Drainage

### 3.1 Irish Water Confirmation of Feasibility

A pre-connection enquiry for the water and wastewater connection requirements of the proposed development was submitted by Waterman Moylan to Irish Water on 07 July 2023. A Confirmation of Feasibility (COF) with reference no. CDS23005099 was received from Irish Water on 18 July 2023. The COF confirm that both water and foul water connection are feasible without an upgrade of Irish Water infrastructure. Refer to Appendix A for the Irish Water COF.

### 3.2 Existing Foul Drainage

There are two existing public foul water sewers located to the west of the subject site on Brookfield Road, 1 no. 225 mm diameter foul water sewer and 1no. 525mm diameter foul water sewer. There is an existing 225 mm diameter public foul water sewer located to the north of the subject site within Rossfield Avenue, as shown in *Figure 3-1* below.

It is proposed that the foul water connection will be into the 225mm diameter foul water network located on Rossfield Avenue at the junction of the site access road and Rossfield Avenue.

All of the above-mentioned foul water networks ultimately discharge at the rings end wastewater treatment works.



Figure 3-1 Existing Foul Drainage Network – As per Irish Water GIS

### 3.3 **Proposed Foul Drainage - Calculations**

The proposed residential development will consist of 16 no. apartment units.

Based on the Irish Code of Practice for Wastewater Infrastructure and the EPA Wastewater Treatment Manual Guidelines as a reference, the foul flow from the proposed development will be as follows:

#### Table 3-1: Calculation of proposed Foul Water Demand

Description	No. of Units	Population	Flow l/h/day	Infiltration Factor	Total Discharge	(l/d)	
Standard Residential	16	2.7	150	1.1	7,128		
Calculation of Proposed Peak Foul Flow							
Total Daily Discharge (from above table)						ℓ/d	
Dry Weather Flow (DWF) 0.082							
Peak Foul Flow (= 6 x DWF)0.495							

The proposed total peak foul flow from the development is **0.495** *l*/s.

### 3.4 Proposed Foul Drainage Network

It is intended to connect the proposed foul sewer network from the subject site to the existing foul drainage network north of the site on Rossfield Avenue, tying into the existing public foul water network via an existing manhole. Only one connection is required for the site.

The proposed foul water outfall from the development is one 225mm diameter pipe laid at a minimum gradient of 1:150, giving a capacity of 52.95 l/s. Therefore, the proposed outfall has adequate capacity to cater to the flows from the development.

Foul water sewers will consist of uPVC or concrete socket and spigot pipes (to IS 6) and will lay strictly in accordance with the Irish Water's code of practice or Wastewater Infrastructure and requirements for taking charge.

All manholes will be constructed in block work or cast in-situ concrete. Construction details for the proposed drainage systems are included in the accompanying planning submission drawings.

In accordance with the Irish Water "Code of Practice for Wastewater Supply", 150mm nominal internal diameter sewers have been proposed for carrying wastewater from 20 properties or less; whilst 225mm nominal internal diameter carrying Wastewater from more than 20 properties. Furthermore, where there are at least ten dwelling units connected, the 150mm diameter pipes are laid at a minimum gradient of 1:150 and a steeper gradient of 1:60 for up to nine connected dwelling units.

For the private drainage, house drains will be uPVC and will be laid to comply with the Building Regulations 2010, and in accordance with the recommendations contained in the Technical Guidance Documents, Section H.

As depicted in *Figure 3-2* below, it is proposed that the proposed foul water sewer shall discharge into the existing public foul water sewer in Rossfield Avenue. Refer to Waterman Moylan Drainage layout "BRFD-C-ZZ-00-GA-P-0200 - Proposed Drainage Layout".





# 4. Surface Water Drainage

### 4.1 Existing Surface Water Drainage

The subject site is currently in a brownfield state, consisting of an existing building, an existing access road, hardstanding, footpaths and unsurfaced natural planted areas (mostly overgrown).

Due to the limited size of the development area, the site is considered as 1 single small urban catchment area. The existing site topography has a continuous gradient of approximately 1:50 from the southeastern corner of the site to the northwestern boundary. The highest existing level on the site is approximately 108.144m OD Malin, which is found along the southern boundary whilst the lowest existing level is 106.676m OD Malin along the northern boundary of Rossfield Avenue.

There is an existing 900mm diameter public surface water pipe located to the west of the subject site within Brookfield Road, the exact location of said pipe is to be determined by a detailed site survey. There is an existing 375mm diameter public surface pipe located to the north of the subject site on Rossfield Avenue that connects to the aforementioned western-located 900mm diameter surface water pipe along Brookfield Road. This is depicted in Figure 4-1.

The current hardstanding areas drain into the existing public surface water network located to the north of the site on Rossfield Avenue via a piped connection.

The existing brownfield site is approximately 62% hard standing. There is no evidence on records drawings and site records of any existing attenuation, and it is assumed that the existing hardstanding is discharging into the existing public surface water network in Rosefield Avenue unattenuated.

Refer to Appendix B for a simulation estimating the surface water discharge from the brownfield site.

The post-development surface water runoff shall discharge at a restricted rate, in line with the GDSDS, to the existing public surface water network located to the north of the subject site on Rossfield Avenue.



Figure 4-1: Existing Surface Water Drainage in the Vicinity of the Site - as per GIS records

### 4.2 **Proposed Surface Water Strategy**

The drainage strategy for the proposed site intends to manage rainfall in such a manner that mimics natural drainage processes and reduces the impact of development on the receiving environment. It is proposed that the surface water from the proposed development will be captured by various on-site SuDS interventions prior to discharging to the existing public surface water network. The proposed SuDS interventions have been implemented to ensure runoff is treated to the standards and requirements set out in:

- the Greater Dublin Strategic Drainage,
- the SDCC Development Plan 2022-2028 Policy GI4: Sustainable Urban Drainage Systems,
- the SDCC Sustainable Drainage Explanatory Design and Evaluation Guide 2022, and
- the Ciria SuDS Manual.

Refer to Waterman Moylan drawing BRFD-WMC-ZZ-XX-DR-C - P200 for the proposed drainage network design and BRFD-WMC-ZZ-00-GA-P-0201 - Proposed SuDS Layout.

It is proposed that surface water in the development will be attenuated within the proposed SuDS measure, including bio-retention rain gardens, bio-retention tree pits, permeable paving, a filter strip and potential greenroofs. Overflow pipes and interconnecting pipe networks linking the SuDS treatment train shall ultimately discharge to the existing public surface water network in Rossfield Avenue via a flow control device.

In line with the SDCC Sustainable Drainage Explanatory Design and Evaluation Guide 2022, an allowance for 20% climate change has been allowed. No urban creep has been allowed for by a percentage increase, but the private landscaping has been simulated as 100% runoff as an allowance.



Figure 4-2 Proposed connection into existing surface water infrastructure

The allowable flow discharging from the development is referred to as the 'outflow limit', also referred to as the greenfield runoff rate of a site. This is calculated in accordance with the Institute of Hydrology report No 124 "Flood Estimation for Small Catchments", using the below equations:

Qbar = 0.00108(Area) 0.89 x (SAAR) 1.17 x (SOIL) 2.1

Q<sub>bar</sub> is the max. annual peak flow rate

Greenfield Run-off = Qbar x ("n-year" factor)

Allowable Discharge = Greenfield Run-off x Area

Greenfield run-off is the equivalent flow
rate of the undeveloped site

Subject Site		Definitio	on			
Area		50 ha (0.	5km²)	Site area in km <sup>2</sup> (Or 50 hectares if the site is less than 50 Hectares)		
SAAR		808.5mm	۱	As per Met Eireann Historical Rainfall Data Records		
	SOIL	Type 2 (S	SPR of 3)	Runoff constant (Varies between 0.1 and 0.53: Given as 0.3 for an average soil)		
Thus,	Qbar	rural =	0.00108(0.5	5) <sup>0.89</sup> x (808.5) <sup>1.17</sup> x (0.3) <sup>2.17</sup>		
	Qbar	rural = =	0.107 m³/s 107.85 <b>{</b> /s	(for a 50-ha site)		
	Qbar	rural =	2.16 {/s/ha			

According to the Greater Dublin Regional Code of Practice, the maximum discharge rate for the site will be the Qbar or 2  $\ell$ /s/ha, whichever is greater. Therefore, the Qbar for the site remains at 2.16  $\ell$ /s/ha.

Hence, the permitted outflow (greenfield runoff rate) for the subject site with a total area of 0.2487 ha is 0.54  $\ell$ /s. Refer to Appendix C for the greenfield runoff rate estimation for sites - <u>www.ukSuDS.com</u>.

### 4.3 Post-Development Runoff Rate

The required ultimate flow control (hydrobrake or similar approved) for the site is unable to achieve a discharge of 0.54l/s and maintain a practical orifice diameter limiting potential blockage and maintenance issues. To this effect, and in line with the requirements of the GDSDS Clause 6.3.3.1, a hydrobrake of orifice diameter of 75mm shall be employed which is estimated to restrict the post-development discharge to a maximum of 2.0/s. The **post-development discharge rate of 2.0/s** (in the worst-case scenario) is 3.8% of the current brownfield surface water discharge, providing a significant improvement to the site's surface water discharge.

With acknowledgement for the SDCC Sustainable Drainage Explanatory Design and Evaluation Guide 2022, Section 8.4.11.1, "Small sites and sub-catchments of larger sites may need to meet minimal outflow flow rates. Flows can be controlled down to 0.5 - 2 l/s using small openings (15-20mm diameter) with shallow depth of storage." The outlet from each source control shall limit said individual control utilising a suitably sized small opening, ensuring each individual control measure is providing relative attenuation to the interception area.

A summary of the subject site's pre- and post-development discharge/runoff rate is shown in Table 4-1.

	Pre-development/Current - Brownfield					
			Factored			
	C-factor A	rea (m <sup>2</sup> )	Area (m <sup>2</sup> )			
Hardstanding	0.95	1392	1322.4			
Landscaped	0.2	1095	219	19		
		2487	1541.4	62%	hardstanding coverage	
			Post-	developm	ent	
			Factored			
	C factor A	rea (m <sup>2</sup> )	Area (m <sup>2</sup> )			
Hardstanding	0.95	2270	2156.5			
Landscaped	0.2	217	43.4			
		2487	2199.9	88%	hardstanding coverage	
				26%	Increase in hardstandir	ng
				rface Wate	r Discharge Bate (I/a)	
			<u> </u>			
Detum Deried		. (; . l . l *	(B) Cu	rrent -	(C) Post-Development	(D) Post-development with
	(A) Greer		BIOWI			5005
1.10	0.40	)	10	. <u>1</u> 2	23.9	1.0
1:10	- 1 1/	1		. <u> </u>	57.7	1.7
1:100	1.1	<b>T</b>	51	. <u>+</u> 7	88 7**	2 0**
*Obar = 2 17l/s/ba - as	ner areenfie	d runoff	rate estimati	on for sites	- www.uksuds.com	2.0
**100+20%Climate Ch	ande					
	ungo					
(A) The catchm	ent area in G	Greenfield	condition			
(B) The current	brownfield s	ite as it st	ands			
(C) The proposed site without consideration for any SUDS measures						
(D) The proposed site with the full compliment of the proposed SUDS and Flow Control (75mm diameter).						
Notes: In line with GDSD	S Clause 6.3.3	3.1 and the	e Institute of H	ydrology repo	ort No 124 "Flood Estimation	for Small Catchments", where
the Greenfields discharge	rates are less	s than 5l/s	, the flow cont	rol device has	s been set to a reasonably pr	actical discharge rate of 21/s for
the 1:100+20% year retur	he 1:100+20% year return period with a minimum orifice size of 75mm diameter.					

#### Table 4-1: Summary of site catchment characteristics and discharge rates.

Refer to the following appendices for the relative drainage calculations;

- Appendix C Greenfield runoff estimation
- Appendix B Brownfield runoff estimation Flow Causeway
- Appendix D- Post-development runoff estimation excluding SuDS Flow Causeway
- Appendix E Post-development design model with SuDS Flow Causeway

#### 4.4 **Proposed Surface Water Design**

The total area of the catchment, including roads, car parking, green areas, and potential green roofs, is approximately 0.2487 ha, with a net hardstanding contributing area of 0.2199 ha, which equates to approximately 88% hardstanding area.

It is proposed that surface water will be attenuated within the proposed SuDS measures, including bioretention rain gardens, bio-retention tree pits, permeable paving, a filter strip and green roofs. Overflow pipes and interconnecting pipe networks linking the SuDS treatment train shall ultimately discharge to the existing public surface water network in Rossfield Avenue via a flow control device.

The green roof has been agreed with SDCC Planning Department to a restricted portion of the full roof area on a trial basis, as proposed by SDCC Planning Department. Depending on the outcome of the SDCC trial period, the green roof shall remain in its current proposed location or be retrofitted to cover the full complement of the proposed green roof area. It is proposed that the full roof area be designed to cater for the structural loading of the green roof which shall be determined during detailed design.

Of the total site area, a minimum of 23% of the site area shall be covered by SuDS measures excluding the potential trial green roof area. If the potential green roof area is included the SuDS of the site shall increase to a total coverage of 44%. The SuDS areas for the proposed design are shown in Table 4-2.

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The proportional area of the post-development hardstanding covered by SuDS features as follows.						
	Area (m²)	% of proposed hardstanding	% of proposed total site area			
Private Permeable Paving (300mm thick)	200	8.8%	8.0%			
Public Permeable Paving (450mm thick)	230	10.1%	9.2%			
Proposed green roof for construction	40	1.8%	1.6%			
Bioretention tree pit	43	1.9%	1.7%			
Private Bioretention tree Pit	22.2	1.0%	0.9%			
Rain garden	38	1.7%	1.5%			
23% Total proposed proportion of SUDS within Post of	23% Total proposed proportion of SUDS within Post development area - excluding potential green roof					
Future Potential green roof for construction	510	22.5%	20.5%			
44% Total proposed proportion of SUDS within Post development area-including potential green roof						

Table 4-2: Summary of SuDS area and proportional site coverage.

Calculations for pipe sizes and gradients are based on stormwater management modelling conducted in Causeway Flow, simulating the relative return period rainfall, surface runoff and function of the proposed infrastructure. The rainfall input data is based on historical rainfall data obtained from Met Eireann.

Strict separation of surface water and wastewater will be implemented within the development. Drains will be laid out to minimise the risk of inadvertent connection of waste pipes etc. to the surface water system.

Surface water local drains will be a minimum of 225mm dia. and generally will consist of PVC (to IS 123) or concrete socket and spigot pipes (to IS 6). These drains will be laid to comply with the requirement of the Building Regulations 2010, and in accordance with the recommendations contained in the Technical Guidance Documents, Section H and will be laid strictly in accordance with the requirements of South Dublin County Council Taking in Charge policy.

### 4.5 **On-Site Attenuation**

The existing brownfield site is approximately 62% hardstanding. There is no evidence on records drawings and site records of any existing attenuation, and it is assumed that the existing hardstanding is discharging into the existing public surface water network in Rosefield Avenue unattenuated.

The proposed development increases the overall hardstanding by 26% to a total of 88% hardstanding, however, a significant portion of the proposed hardstanding shall be covered by SuDS measures. As previously mentioned, the site shall restrict the post-development discharge rate to a maximum of 2.0l/s.

The estimated required storage is approximately  $108.66m^3$  for the 1:100 + 20% critical storm event, as per the attenuation estimation found in Appendix F. The proposed SuDS volumes, excluding the potential green roof, are able to provide a total storage volume of  $111.0m^3$ , allowing for a rainfall point depth of 44.63mm across the site area. When the full complement of the green roof is considered, this increases to a total SuDS storage volume of  $171.2 m^3$ , allowing for a rainfall point depth of 68.83mm across the site area. Refer to Table 4-2 for a summary of the SuDS storage volumes. Refer to the SuDS volume calculations in Appendix G.

SuD	S Volumes			
	Area (m²)	Depth (m)	Porosity (%)	Volume (m <sup>3</sup> )
Private Permeable Paving (300mm thick)	200	0.35	40%	28.0
Public Permeable Paving (450mm thick)	230	0.45	40%	41.4
Proposed green roof trial portion	40			
Soil Component		0.2	40%	3.2
Drainage Core Component		0.04	95%	1.5
Private Bioretention Rain gardens	22.2	0.5	40%	4.4
Bioretention tree Pit	43	0.5	40%	8.6
Propopriety Cellular Storage	20.5	0.66	96%	13.0
Drainage Core Component	43	0.1	40%	1.7
Rain garden	38	0.6	40%	9.1
Proposed SUDS Volumes -	excluding Po	tential Green Ro	oofs	
Total Volume =	111.0	m <sup>3</sup>		
(m <sup>3</sup> of runoff stored)/(m <sup>2</sup> of development)	0.045	m <sup>3</sup>		
(mm depth of runoff stored)/(m <sup>2</sup> of development)	44.63	mm		
Potential SUDS Volumes -	Including Pot	tential Green Ro	oofs	
	Area (m²)	Depth (m)	Porosity (%)	Volume (m <sup>3</sup> )
Potential Green Roofs	510			
Soil Component		0.2	40%	40.8
Drainage Core Component		0.04	95%	19.38
Total Volume =	171.2	m <sup>3</sup>		
(m <sup>3</sup> of runoff stored)/(m <sup>2</sup> of development)	0.069	m <sup>3</sup>		
(mm depth of runoff stored)/(m <sup>2</sup> of development)	68.83	mm		

#### Table 4-3: Summary of SuDS Attenuation Storage Provided

In all instances, the provided attenuation storage is of a suitable volume and is a significant increase from the current brownfield development. Refer to Table 4-4 for a summary of the site attenuation storage comparison.

		(A) Current	(B) Estimated required	(C) Post-Development	(D) Post-Development
Rotun Por	iod	(A) Current - Brownfield	disharge	green roofs	green roofs
1:	1	0	21	111.0	171.2
1:	10	0	46.42	111.0	171.2
1:	30	0	63.21	111.0	171.2
1:	100+20%	0	108.66	111.0	171.2

Table 4-4: Summary of the Site Attenuation Storage Comparison

### 4.6 **SUDS Assessment**

Sustainable Urban Drainage systems (SuDS) have been developed and are in use to alleviate the detrimental effects of traditional urban stormwater drainage practices that typically consist of piping runoff of rainfall from developments to the nearest receiving watercourse. Surface water drainage methods that take account of quantity, quality and amenity issues are collectively referred to as sustainable urban drainage systems; they are typically made up of one or more structures built to manage surface water runoff.

Strict separation of surface water and wastewater will be implemented within the development. Drains will be laid out to minimise the risk of inadvertent connection of waste pipes etc. to the surface water system.

Sustainable drainage systems aim towards maintaining or restoring a more natural hydrological regime, such that the impact of urbanisation on downstream flooding and water quality is minimised. Originally, SuDS were introduced primarily as single-purpose facilities however this has now evolved into more integrated systems which serve a variety of purposes, including habitat and amenity enhancement. The main advantages of an integrated SuDS facility are the savings on land take and maintenance.

SuDS minimizes the impacts of urban runoff by capturing runoff as close to the source as possible and then releasing it slowly. The use of SuDS to control runoff also provides the additional benefit of reducing pollutants in the surface water by settling out suspended solids, and in some cases providing biological treatment.

The target development and design criteria for SuDS, set out in the CIRIA SuDS manual, are as follows:

- Water Quantity Ensuring that the surface water runoff from the proposed development does not have a detrimental impact on the people, property and environment.
- Water Quality Reducing urban runoff by SuDS and increasing the quality of the water
- **Amenity** Aims to deliver pleasant, attractive and good-looking urban environments.
- **Biodiversity** Creating new habitats and rehabilitating or enhancing habitats through SuDS measures.

The SUDS selection process used for this site is in accordance with the SuDS selection flow chart, Volume 3, Section 6.5, Figure 48 of the GDSDS and the SDCC SuDS Guideline Section 8.12.4. The characteristics of the site are utilised to select the various SuDS techniques that would be applicable.

The applicant has considered the use of all appropriate SuDS devices as part of the site SuDS strategy and has concluded that the following SuDS devices are most appropriate for the subject site. The SuDS treatment train flow diagram for the site is shown in Figure 4-2.

- Green Roofs
- Permeable Paving
- Bio-retention Ran Gardens
- Bio-retention Tree Pits
- Filter strip



\*GREEN ROOF AREA RESTRICTED TO TRIAL PORTION. THE REMAINEDER OF THE ROOF IS STRUCTURALLY DESIGNED TO BE RETROFITTED FOR A GREENROOF.

INFILTRATION - subject to detailed ground investigation

Figure 4-3: Proposed SuDS Treatment Train Flow Diagram

15 Engineering Assessment Report Project Number: 23-044 Document Reference: 23-044r.001 The applicant has considered the use of all appropriate SUDS measures as part of the site SuDS strategy, details are outlined in Table 4-5.

SUDS Stage	SUDS Measure	Measure Outline	Use on site
	Green Roofs	Green Roofs are roofs with a vegetated surface that can provide attenuation and treatment of rainwater. They also provide evapotranspiration from the roof's plants and substrate, reducing run-off volumes and the burden on the drainage network and improving the quality of water.	It is proposed to use Green Roofs on both the apartment blocks for both treatment and restriction of flow. The roof will provide surface water attenuation storage. The green roofs will initially be constructed to a restricted portion of the roof as a trial.
Source Control	Permeable Paving	Permeable paving provides a suitable pavement for vehicular traffic while allowing rainwater to infiltrate the surface and flow into the underlying structural layers. The rainwater is	It is proposed to use permeable paving for all parking and selected private hardstanding areas. Rainfall will be caught and treated at the source.
		temporarily stored beneath the surface before infiltrating into the ground, or a controlled discharge point.	Infiltration shall be limited to a minimum of 2m away from the structure and shall be in accordance with the SDCC's "using SuDS close to Buildings"
	Filter Drains	Filter Drains are shallow trenches filled with gravel and wrapped in a geotextile membrane to treat and temporarily store surface water run-off.	Filter Drains are provided for the footpath and podium level surface water treatment to treat surface water at source before conveying it to the adjacent bio-retention rain garden.
Site Control	Bio-Retention Tree Pits & Rainwater Gardens	Bio-retention systems (including rain gardens) are shallow landscaped depressions that can reduce runoff rates and volumes and treat pollution through the use of engineered soils and vegetation. These are particularly effective in delivering interception of rainfall.	It is proposed to use Bio-retention tree pits, positioned at the front and side of one apartment block, along with a rainwater garden situated at the rear of the other block. These SuDS features will intercept and treat rainfall directly before discharging into the surface water network.
Regional Control	Flow control (Hydro- Brake)	Hydro-Brake or similar vortex flow control structures are used to restrict the outfall from the attenuation tank to the equivalent of the existing greenfield run-off. This ensures the development will not give rise to any impact downstream of the site.	A Hydro-Brake (or similar approved) will be installed downstream of the surface water network, before connecting into the existing surface water network, to ensure the outfall flow is restricted to 2.0 {/s.

#### Table 4-5: Selected SuDS Measures

Refer to Waterman Moylan Drawings for the proposed drainage and SuDS design;

- BRFD-WMC-ZZ-00-GA-P-0200 Proposed Drainage Layout
- BRFD-WMC-ZZ-00-GA-P-0201 Proposed SuDS Layout
- BRFD-WMC-ZZ-00-GA-P-0202 Proposed SuDS Standard Details

All SuDS measures shall be constructed in lien with the SDCC taking in Charge policy.

#### 4.7 SUDS Maintenance

For the SuDS strategy to work as designed it is important that the entire drainage system is well maintained. It will be the responsibility of the landowners and site management team to ensure the drainage system is maintained. Maintenance and cleaning of gullies, and manholes will ensure adequate performance. The recommended program is outlined in the tables below.

SUDS Element	Maintenance					
	Maintenance period	Maintenance Task	Frequency			
iving	Regular	Brushing and vacuuming (standard cosmetic sweep over the whole surface)	Once a year, after autumn leaf fall, or as required, based on site-specific observations of clogging or manufacturer's recommendations.			
еРа	Occasional	Removal of weeds	As required			
Permeabl	Remedial work	Remediation work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users	As required			
	Monitoring	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually			
		Monitor inspection chambers	Annually			

#### Table 4-7: Green Roof Maintenance Schedule

SUDS Element	Maintenance				
	Maintenance period	Maintenance Task	Frequency		
		Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms		
	Regular Inspections	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms		
		Inspect drains inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms		
		Inspect underside of roof for evidence of leakage	Annually and after severe storms		
Green Roof		Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six month and annually or as required		
		During establishment (ie year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer) Annually (in Autumn)		
	Dogular	Post establishment, replace dead plants as required (Where > 5% of coverage)			
	maintenance	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required		
		Remove nuisance and invasive vegetation, including weeds	Six monthly or as required		
		Mow grasses, prune shrubs and manage other planting (if appropriate) as required – Clippings should be removed and not allowed to accumulate	Six monthly or as required		
	Remedial actions	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and source of erosion damage should be identified and controlled	As required		
		If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required		

### Table 4-8: Swale and Filter Strips Maintenance Schedule

	Maintenance period	Maintenance Task	Frequency	
		Remove the litter and debris	Monthly, or as required	
		Cut grass – to retain height within specified design range.	Monthly (during growing season), or as required	
		Manage other vegetation and remove nuisance plants.	Monthly at start, then as required Monthly Monthly for 6 months, quarterly	
	Regular	Inspect inlets, outlets and overflows for blockages, and clear if required.		
		Inspect infiltration coverage	Monthly for 6 months, quarterly for 2 years, then half yearly	
Filter Strips		Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Monthly (during growing season), or as required Monthly at start, then as required Monthly Monthly Monthly for 6 months, quarterly for 2 years, then half yearly Half yearly As required or if soil is exposed over 10% or more of the swale treatment area As required As required	
	Occasional	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if soil is exposed over 10% or more of the swale treatment area	
		Repair erosion or other damage by re- turfing or re-seeding	As required	
		Re-level uneven surfaces and reinstate design levels	Monthly, or as required Monthly (during growing season), or as required Monthly at start, then as required Monthly Monthly for 6 months, quarterly for 2 years, then half yearly Half yearly As required or if soil is exposed over 10% or more of the swale treatment area As required As required As required As required	
	Remedial actions	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required	
		Remove and dispose of oils or petrol residues using safe standards practices	As required	

#### Table 4-9: Bio-retention Maintenance Schedule

	Maintenance period	Maintenance Task	Frequency
		Remove the litter and debris	Monthly, or as required
		Cut grass – to retain height within specified design range.	Monthly (during growing season), or as required
		Manage other vegetation and remove nuisance plants.	Season), or as required Monthly at start, then as required Monthly Monthly for 6 months, quarterly for 2 years, then half yearly
	Regular	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
Ę		Inspect infiltration coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
io-retentic		Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Ω	Occasional	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if soil is exposed over 10% or more of the swale treatment area
		Repair erosion or other damage by re- turfing or re-seeding	As required
		Re-level uneven surfaces and reinstate design levels	Monthly, or as required Monthly (during growing season), or as required Monthly at start, then as required Monthly Monthly for 6 months, quarterly for 2 years, then half yearly Half yearly As required or if soil is exposed over 10% or more of the swale treatment area As required As required As required
	actions	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
		Remove and dispose of oils or petrol residues using safe standards practices	As required

# 5. Water Supply

### 5.1 Irish Water Confirmation of Feasibility

A pre-connection enquiry for the water and wastewater connection requirements of the proposed development was submitted by Waterman Moylan to Irish Water on 07 July 2023. A Confirmation of Feasibility (COF) with reference no. CDS23005099 was received from Irish Water on 18 July 2023. The COF confirm that both water and foul water connection are feasible without an upgrade of Irish Water infrastructure. Refer to Appendix A for the Irish Water COF.

### 5.2 Existing Infrastructure

There is an existing 200mm diameter watermain located to the west of the site on Brookfield Road. There is an existing 100mm diameter watermain located to the north of the site along Rossfield Avenue, onto which it is proposed that the site shall connect into.



Figure 5-1: Existing Water Supply Network – As per Irish Water GIS records

### 5.3 Watermain Network Design

It is proposed that a new 100mm diameter loop network be connected to the existing 100mm diameter water network is Rossfield Avenue.

The water supply design has been designed and shall be constructed in line with the Irish Water Code Of PraticeWater mains suitable for works and approved by Irish Water shall be polyethylene (PE), with PE80 or PE100 rating (MDPE, HDPE or HPPE).

The minimum depth of cover from the finished ground level to the external crown of a watermain shall be 900mm. A greater depth of cover and/or greater strength pipe and/or a higher class of bedding may be required where high traffic loading is anticipated. Depths may be altered to avoid obstructions, including separation distances between other utility services. The desirable maximum cover for a Service Connection pipe or a Water Main should be 1200 mm, where practicable.

Refer to Waterman Moylan drawing no. BRFD-WMC-ZZ-00-GA-P-0300 details of the watermain to serve the subject lands. It is proposed to connect to the existing 100 mm diameter watermain pipe along Rossfield Avenue as shown in *Figure 6-2*.



Figure 5-2: Proposed location of Water Connection- As per Irish Water GIS records

### 5.4 Water Demand Calculation

An estimate of water demand from the public water supply system for the proposed site has been based on the development of 16 no. residential units using Irish Waters expected household demand of  $150 \ell//h/d$ Details of the water demand calculation are included below.

Table 5-1: Total Water Demand	d Calculation
-------------------------------	---------------

Description	No. of Units	Flow (ℓ/h/day)	Population per Unit	Total Discharge ({/d)
Residential Units	16 no.	150	2.7	6,480

The total water requirement, from the public supply, for the development, is estimated at 6.48 m<sup>3</sup>/day.

### 5.5 Water Conservation

The water demand for the development can be subdivided as follows:

- Potable / Non-potable Breakdown

Detailed studies have quantified the breakdown between potable and non-potable uses for residential uses. According to the guideline: Promoting Sustainable Household Water Consumption, issued by Irish Water in September 2019, Figure 2.3 of the document (shown in 3 below) illustrates the water use patterns that have been documented for a three-person household in the UK (insufficient data is available from Ireland households).



Figure 5-3: Water use patterns for 3-person households

The following water conservation measures will be used, to reduce overall water demand – water saving device installations including:

- Kitchen tap swivel aerator
- Water saving shower heads
- Spray taps
- Low volume flush / dual flush WC's
- Draw off tap controls
- Leak detection measures through the metering of supply

## 6. Roads

### 6.1 Proposed Roads

Site access shall be gained for the existing access road off Rossfield Avenue. The existing access road shall be reduced to a width of 5m. The existing junction radii shall be tightened to R3.5m as per DMURS advise notice 6. In line with DMURS Advise notice 6, the 3m concrete footpath shall be continued across the road in the form of a raised table where the concrete footpath across the road shall provide a material contrast for the pedestrian crossing.

The existing vehicular and pedestrian access gate shall be relocated southward toward the existing commercial development.

The on-site corner radius for the junction of Rossfield Avenue to Brookfield Road shall be tightened to 4.5m, reducing the pedestrian crossing distance across the existing junction. The existing footpath and driveway access to the northeast of the site shall be extended to be in line with the existing restricted road crossing.

Refer to the architect site layout drawing and the BRFD-WMC-ZZ-00-GA-P-0100 - Proposed General Arrangement & Levels Layout and BRFD-WMC-ZZ-00-GA-P-0101 - Proposed Kerbing Layout and Cross Section.

The proposed road amendments have been analysed for vehicular access and tracking for both fire truck and refuse vehicles, refer to BRFD-WMC-ZZ-00-GA-P-0104 - Proposed Fire Tender and Refuse Vehicle Autotrack Analysis.

### 6.2 Proposed Sightlines

Stopping Sight Distances (SSD) is defined as the minimum distance a driver would require to safely stop their vehicle, should an object unexpectedly enter its path. The SSD is determined using the design speed of the roadway. The SSD has been implemented into this design to ensure adequate driver safety for vehicles along Brookfield Road and the vehicles entering/exiting the proposed development.

The existing Brookfield Road has a design speed of 50 km/hr. As a bus route exists along this road, the corresponding SSD standard is 49m according to DMURS table 4.2. The new proposed parallel on the southern arm of Brookfield Road is located outside of the junction sightlines.

The junction of the site access road onto Rossfield Avenue has an SSD of 45 m according to DMURS table 4.2. The existing western visibility splay is the critical sight line 34m to the centreline of Brookfield Road.

Refer to Waterman Moylan Drawing no. BRFD-WMC-ZZ-00-GA-P-0113 - Proposed Visibility Splays which has been prepared to show that the minimum SSD requirements are met for both the intersection with Brookfield Road and Rossfield Avenue.

# 7. Transport

### 7.1 Pedestrian Site Access

The existing surrounding footpath on Brookfield Road and Rossfield Avenue currently provides access to the existing site and shall be maintained as the pedestrian access to the site the existing footpath along the western site boundary shall be upgraded to a 3.2m wide footpath seated behind the new proposed parallel parking. The southwestern connection into the existing southbound pedestrian footpath and Brookfield pedestrian road crossing shall be maintained.

The east-west footpath to the north of the site, along Rossfield Avenue, shall be upgraded to a 3m wide footpath, seated behind the new proposed parallel disabled parking and bio-retention tree pit. Where the 3m footpath crosses the site access road, it is proposed that there is a DMURS-compliant raised crossing in line with DMURS advise notice 6. At said crossing, the road corner radii shall be reduced to R3.5m to limit the pedestrian crossing width.

It is proposed that a 2.5m footpath shall be provided on either side of the access road providing suitable access to the existing Brookfield Health Centre and Brookfield Enterprise Centre and Pharmacy.

### 7.2 Cyclist Site Access

There is no dedicated cycling infrastructure in fhte form of off street cycle lanes in the surrounding area, any cyclists in the area currently share the road infrastructure with vehicles.

### 7.3 Proposed Site Access

The proposed site is located to the east of Brookfield Road which links to the R136 140m to the north of the subject site, as indicated in Figure 7-1. Via the R136, the N81 is approximately 1.5km to the southeast of the site and the N7 is approximately 2km northwest, as indicated in Figure 7-2.

The planned access to the site will be through the road linked to the Brookfield Enterprise Centre located to the south of the site. This road will be maintained in part through the development construction to ensure its continual operation throughout and after the construction period. Furthermore, there is a proposal to incorporate a gate along the access road leading to the Brookfield Enterprise Centre.



Figure 7-1: Surrounding Roads and Proposed Site Access



Figure 7-2: Site location relative to surrounding national roads

### 7.4 Parking

#### 7.4.1 Car Parking

Maximum parking rates are outlined by the SDCC in the South Dublin Development Plan (2022-2028), as follows:

- Zone 1: General rate applicable throughout the County
- Zone 2: (Non-Residential): More restrictive rates for application within town and village centres, within 800 metres of a train or Luas station and within 400 metres of a high-quality bus service (including proposed services that have proceeded to construction).
- Zone 2 (Residential): More restrictive rates for application within town and village centres, within 400 metres of a high-quality public transport service (includes a train station, Luas station or bus stop with a high-quality service).

Table 7-1 obtained from the South Dublin Development Plan (2022-2028), shows the maximum number of car spaces for different zones.

Dwelling Type	No. of Bedrooms	Zone 1	Zone 2
	1 Bed	1 space	0.75 space
Apartment	2 Bed	1.25 spaces	1 space
	3 Bed+	1.5 spaces	1.25 spaces
	1 Bed	1 space	1 space
House	2 Bed	1.5 spaces	1.25 spaces
	3 Bed+	2 spaces	1.5 spaces

#### Table 7-1 Maximum Car Parking Spaces according to the South Dublin Development Plan (2022-2028),

The subject site is a 40m away from the Dublin Bus Route no. 27 and 300m away from the Cheeverstown Luas Station hence it falls into the Zone 2 Residential parking rates.

Table 7-2. No. of Cal Farking Spaces Required as per the South Dublin Development Flan (2022-2020	Table 7-2: No. o	of Car Parking	Spaces Re	quired as pe	r the South Du	ublin Develop	oment Plan	(2022 - 2028)
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	No. of Apartments	Zone 2	No. of spaces
1 Bed	7	0.75	5.25
2 Bed	5	1	5
<b>3 Bed</b> 4		1.25	5
	15.25		

The total maximum number of spaces that should be provided is 15.25. It has been agreed with the SDCC that 12 no. parking spaces will be provided including 2 disabled access spaces.

#### 7.4.2 Cycle Parking

SDCC cycle parking standards are set out in the South Dublin Development Plan (2022-2028) and are divided into two main categories:

**Long Term**: These are to be designed for use by residents and employees. Such spaces should be located in a secure area that is not freely accessible to the general public.

**Short Stay**: These are to be designed for ease of use by the general public. Such spaces should be located in highly visible areas that are easy to access.

Table 7-2, obtained from the South Dublin Development Plan (2022-2028) shows the number of spaces required for different types of accommodation.

Table 7-3: Minimum Bicycle Parking according to the South Dublin Development P	an (2022-2028)
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Category	Land-Use	Long Term	Short Stay
	Hotel <sup>1</sup>	1 per 5 staff	1 per 10 bedrooms
	Nursing Home	1 per 5 staff	1 per 10 residents
Accommodation	Residential Apartment	1 per bedroom	1 per two apartments
	Student Accommodation	1 per bedroom	1 per 5 bedrooms

The proposed development is a residential apartment, hence the cycle parking spaces required on site are long term.

Refer to Table 7-3 for the number of cycle parking spaces required for the subject site.

	No. of Apartments	No. of Bedrooms
1 Bed	7	7
2 Bed	5	10
<b>3 Bed</b> 4		12
Total No. of Bedrooms		29

#### Table 7-4 No. of Cycle Parking Spaces Required as per the South Dublin Development Plan (2022-2028)

As the proposed development has 29 bedrooms, and the SDCC requirements are a minimum of 1 no. space per bedroom, then the minimum no. of cycle parking spaces required is 29.

All bicycle parking spaces shall be designed in accordance with the requirements of the Cycle Design Manual, NTA (2023).

### 7.5 Public Transport

The subject site is located in a well-developed area where the existing public transport network surrounding the site is well-established.
The subject site is within a 2-minute walk of Dublin Bus Stops 2628 and 4441, serving Dublin Bus Routes 27 (Jobstown-Clarehall) and W62 (The Square-Newcastle). Additionally, within a few minutes' walk, are Dublin Bus Stops 2624, 2629, and 8087, all part of Dublin Bus route W4.

The Luas Red Line Cheeverstown Stop is located 350mm walking distance from the subject site. The Station operates between 05:50hrs to 00:59hrs from Monday to Friday, from 06:49hrs to 00:51hr on Saturdays, and from 07:19hrs to 23:52hrs on Sundays and Bank Holidays.

Refer to Table 7-5 for a summary of the existing public transport links in the vicinity of the proposed site.

		Brookfield, Tallaght		
Stop	Service	Service Route	Frequency	Distance from Site (m)
Cheeverstown	Luas Red Line	Eastbound: Connoly/The Point Westbound; Saggart	3-20 min	350
Stop 2628	Bus - 27	Clare Hall - Jobstown	10 min	90
Stop 2628	Bus – W62	The Square - Newcastle	30 min	90
Stop 4441	Bus - 27	Jobstown – Clare Hall	10 min.	100
Stop 4441	Bus – W62	Newcastle – The Square	30 min	100
Stop 2624	Bus – W4	The Square - Blanchardstown	30 min	300
Stop 2629	Bus – W4	Blanchardstown - The Square	30 min	450
Stop 8087	Bus – W4	Blanchardstown - The Square	30 min	450

#### Table 7-5 Existing Transport Links

Refer to Figure 7-3 for the public transport in the vicinity of the proposed development.



Figure 7-3: Public Transport in the Vicinity of the Subject Site

### **APPENDICES**

Engineering Assessment Report Project Number: 23-044 Document Reference: 23-044r.001 A. Irish Water Confirmation of Feasibility Letter

Engineering Assessment Report Project Number: 23-044 Document Reference: 23-044r.001



### **CONFIRMATION OF FEASIBILITY**

Jason Burger

Waterman Moylan Block S Eastpoint Business Park Alfie Byrne Road Eastwall D03K7W7 Dublin **Uisce Éireann** Bosca OP448 Oifig Sheachadta na Cathrach Theas Cathair Chorcaí

Irish Water PO Box 448, South City Delivery Office Cork City.

www.water.ie

18 July 2023

### Our Ref: CDS23005099 Pre-Connection Enquiry Brookfield Road, Fettercairn, Dublin 24, Dublin

Dear Applicant/Agent,

### We have completed the review of the Pre-Connection Enquiry.

Irish Water has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 16 unit(s) at Brookfield Road, Fettercairn, Dublin 24, Dublin, (the **Development**).

Based upon the details provided we can advise the following regarding connecting to the networks;

_ 1	Water Connection	-	Feasible without infrastructure upgrade by
•	water Connection		Irish Water

- A water booster pump may be required for the connection subject to available water pressure at a connection application stage.
- The proposed Development indicates that Uisce Éireann assets are present on the site. The Developer has to demonstrate that proposed structures and works will not inhibit access for maintenance or endanger structural or functional integrity of the assets during and after the works. Drawings (showing clearance distances, changing to ground levels) and Method Statements should be included in the Detailed Design of the Development. A wayleave in favour of Uisce Éireann will be required over the assets that are not located within the Public Space. For design submissions and queries related to diversion/build near or over, please contact UÉ Diversion Team via email address <u>diversions@water.ie</u>

Stiúrthóirí / Directors: Tony Keohane (Chairman), Niall Gleeson (CEO), Christopher Banks, Fred Barry, Gerard Britchfield, Liz Joyce, Patricia King, Eileen Maher, Cathy Mannion, Michael Walsh

Oifig Chláraithe / Registered Office: Teach Colvill, 24–26 Sráid Thalbóid, Baile Átha Cliath 1, D01 NP86 / Colvill House, 24–26 Talbot Street, Dublin 1 D01 NP86 Is cuideachta ghníomhaíochta ainmnithe atá faoi theorainn scaireanna é Uisce Éireann / Irish Water is a designated activity company, limited by shares. Uimhir Chláraithe in Éirinn / Registered in Ireland No.: 530363

- Wastewater Connection Feasible without infrastructure upgrade by Irish Water
- The proposed Development indicates that Uisce Éireann assets are present on the site. The Developer has to demonstrate that proposed structures and works will not inhibit access for maintenance or endanger structural or functional integrity of the assets during and after the works. Drawings (showing clearance distances, changing to ground levels) and Method Statements should be included in the Detailed Design of the Development. A wayleave in favour of Uisce Éireann will be required over the assets that are not located within the Public Space. For design submissions and queries related to diversion/build near or over, please contact UÉ Diversion Team via email address <u>diversions@water.ie</u>

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before the Development can be connected to our network(s) you must submit a connection application <u>and be granted and sign</u> a connection agreement with Irish Water.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at <a href="http://www.water.ie/connections/get-connected/">www.water.ie/connections/get-connected/</a>

### Where can you find more information?

- Section A What is important to know?
- Section B Details of Irish Water's Network(s)

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Irish Water's network(s). This is not a connection offer and capacity in Irish Water's network(s) may only be secured by entering into a connection agreement with Irish Water.

For any further information, visit <u>www.water.ie/connections</u>, email <u>newconnections@water.ie</u> or contact 1800 278 278.

Yours sincerely,

onne flace

Yvonne Harris Head of Customer Operations

## Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Irish Water's network(s).
	<ul> <li>Before the Development can connect to Irish Water's network(s), you must submit a connection application <u>and</u> <u>be granted and sign</u> a connection agreement with Irish Water.</li> </ul>
When should I submit a Connection Application?	A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	Irish Water connection charges can be found at: <u>https://www.water.ie/connections/information/charges/</u>
Who will carry out the connection work?	<ul> <li>All works to Irish Water's network(s), including works in the public space, must be carried out by Irish Water*.</li> </ul>
	*Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine.
	What to do? - Contact the relevant Local Fire Authority
Plan for disposal of storm water	The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters.
	What to do? - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Irish Water's network(s)?	<ul> <li>Requests for maps showing Irish Water's network(s) can be submitted to: <u>datarequests@water.ie</u></li> </ul>

What are the design requirements for the connection(s)?	<ul> <li>The design and construction of the Water &amp; Wastewater pipes and related infrastructure to be installed in this Development shall comply with <i>the Irish Water</i> <i>Connections and Developer Services Standard Details</i> <i>and Codes of Practice,</i> available at <u>www.water.ie/connections</u></li> </ul>
Trade Effluent Licensing	<ul> <li>Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended).</li> </ul>
	<ul> <li>More information and an application form for a Trade Effluent License can be found at the following link: <u>https://www.water.ie/business/trade-effluent/about/</u></li> <li>**trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)</li> </ul>

### Section B – Details of Irish Water's Network(s)

The map included below outlines the current Irish Water infrastructure adjacent the Development: To access Irish Water Maps email datarequests@water.ie



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**Note:** The information provided on the included maps as to the position of Irish Water's underground network(s) is provided as a general guide only. The information is based on the best available information provided by each Local Authority in Ireland to Irish Water.

Whilst every care has been taken in respect of the information on Irish Water's network(s), Irish Water assumes no responsibility for and gives no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided, nor does it accept any liability whatsoever arising from or out of any errors or omissions. This information should not be solely relied upon in the event of excavations or any other works being carried out in the vicinity of Irish Water's underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Irish Water's underground network(s) is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

B. Brownfield Run-off Rates Calculation (Causeway FLOW)

Engineering Assessment Report Project Number: 23-044 Document Reference: 23-044r.001

		Watermar	n Moylan C	onsulting	File: Bro	wnfield.pfd		Page 1	
AUSE\					Network	: Storm Ne	twork	23-044 Bro	okfield
	1				Lydia Mu	ugo 1go		Brownfield	
					24/11/2	023			
				<u>Design</u>	<u>Settings</u>				
Rai	infall Methodo	ology FSR		М	aximum Tii	me of Conc	entration (r	nins) 30.00	
Re	turn Period (y	ears) 5				Maximum I	Rainfall (mn	n/hr) 50.0	
A	Additional Flov	v (%) 0				Minimu	m Velocity (	m/s) 1.00	
	FSR Re	egion Engla	nd and Wa	les	N 41-1	(	Connection	Type Level S	Soffits
	IVI5-60 (	mm) 16.60	0		IVIIn	Imum Back	arop Heigh	t(m) = 0.200	
	Кd	CV 0.270	)		In	clude Inter	mediate Gro	1(11) 1.200	
Ti	ime of Entry (r	nins) 4.00			Enforc	e best prac	tice design	rules x	
		-,		,	alaa				
		Norma	<b>A</b>		<u>odes</u>	Diamatan	Dauth		
		Name	e Area (ba)	I OT E (mins)	Lovel	(mm)	Ueptn (m)		
			(114)	(111113)	(m)	()	(111)		
		1	0.154	4.00	107.000	1900	1.629		
		MHS0	4		106.850	1900	2.105		
				Li	nks				
Namo		Longth	ks (mm)			Fall	Slono I		Pain
Name	Node Nod	e (m)	n n	(m)	(m)	(m)	(1:X) (r	nm) (mins)	(mm/hr)
1.000	1 MHS	04 4.000	0.600	105.37	1 104.74	5 0.626	6.4 1	.000 4.01	50.0
	Name	Vel Ca	p Flow	US Donth	DS :	ΣArea Σ	Add Pro	) Pro	
	(	m/s) (1/s	s) (1/s)	Deptn (m)	Depth (m)	(na) in (	flow Dep I/s) (mn	n) (m/s)	
	1.000 13	3.267 1041	.9.8 20.9	0.629	1.105	0.154	0.0 3	32 2.730	
				<u>Pipeline</u>	Schedule				
Link	Length Slo	ope Dia	Link	US CL	US IL	US Depth	DS CL	DS IL	DS Depth
4 000	(m) (1	:X) (mm)	Туре	(m)	(m)	(m)	(m)	(m)	(m)
1.000	4.000	6.4 1000	Circular	107.000	105.371	0.629	106.850	104.745	1.105
	link I	US Dia	Node	мн	DS	Dia	Node	мн	
	N	ode (mm)	Type	Туре	Nod	e (mm)	Type	Туре	
	1.000 1	1900	Manhole	Adopta	ble MHS	04 1900	Manhole	Adoptable	
				Manhol	Schodulo				
					<u>s scriedure</u>				
	Node	e CL (m)	Depth (m)	Dia (mm)	Connection		( IL (m)	Dia (mm)	
	1	107.000	1.629	1900					
					$\bigcirc$				
					$\bigcirc$	0 1 00	0 105 274	1000	
	MHSO	4 106.850	2,105	1900		1 1 00	0 103.371 0 104 74ª	5 1000	
					$\bigcirc$		- 10 m/ to		
					$\bigcirc$				



### Simulation Settings

Rainfall Methodology FSR Region M5-60 (mm) Ratio-R Summer CV Winter CV	FSR England and Wales 16.600 0.270 0.750 0.840	Ski Drain Dow Additional S Check Diso Check Diso	Analysis Speed p Steady State yn Time (mins) torage (m³/ha) charge Rate(s) charge Volume	Normal x 240 20.0 x x
15 30 60 120	<b>Storm Du</b> 180 240 3	arations 360 480	600 720	960 1440
Return Period (years)	Climate Change A (CC %)	Additional Area (A %)	Additional Flov (Q %)	N
1	0	0		0
5	0	0		0
10	0	0		0
30	0	0		0
100	0	0		0



### Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	U No	S I de (I	Peak mins)	Le (r	vel n)	Dep (m	th I )	nflow (I/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winte	r 1		10	105	.403	0.0	32	16.7	0.1528	0.0000	OK
15 minute winte	r MH	S04	10	104	.775	0.0	29	16.7	0.0000	0.0000	ОК
Link Event (Upstream Depth)	US Node	Link	D: No	S de	Outfl (l/s	ow 5)	Velo (m/	city /s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m <sup>3</sup> )
15 minute winter	1	1.000	MHS	S04	1	6.7	2.	453	0.002	0.0272	7.3



### Results for 5 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	U No	S l de (i	Peak mins)	Lev (n	vel 1)	Dep (m	th )	Inflow (I/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winte	r 1		10	105.	413	0.04	42	28.1	0.1980	0.0000	OK
15 minute winte	r MH	S04	10	104.	783	0.03	37	28.1	0.0000	0.0000	ОК
Link Event (Upstream Depth)	US Node	Link	D: No	S de	Outfl (I/s	ow )	Velo (m,	city /s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	MHS	504	2	8.1	2.	811	0.003	0.0400	12.3



### Results for 10 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	U No	S I de (I	Peak mins)	Le (r	vel n)	Dep (m	th )	Inflow (I/s)	v Node Vol (m³)	Flood (m³)	Status
15 minute winte	r 1		10	105	.416	0.0	45	32.2	0.2120	0.0000	ОК
15 minute winte	r MH	S04	10	104	.785	0.0	40	32.2	0.0000	0.0000	ОК
Link Event (Upstream Depth)	US Node	Link	D: No	S de	Outfl (I/s	ow ;)	Velo (m	ocity i/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m <sup>3</sup> )
15 minute winter	1	1.000	MHS	S04	3	2.2	2	.909	0.003	0.0444	14.1



### Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	U No	S i de (i	Peak mins)	Le <sup>.</sup> (r	vel n)	Dep (m	th )	Inflow (I/s)	v Node Vol (m³)	Flood (m³)	Status
15 minute winte	r 1		10	105	.421	0.0	50	40.4	0.2369	0.0000	ОК
15 minute winte	r MH	S04	10	104	.790	0.0	45	40.4	0.0000	0.0000	ОК
Link Event (Upstream Depth)	US Node	Link	D: No	S de	Outfl (I/s	ow 5)	Velo (m	ocity I/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	MHS	S04	4	0.4	3	.052	0.004	0.0529	17.6



### Results for 100 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	U: No	S I de (I	Peak mins)	Lev (n	vel n)	Dep (m	th )	Inflow (I/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winte	r 1		10	105	.428	0.0	57	51.6	0.2698	0.0000	OK
15 minute winte	r MHS	504	10	104	.795	0.0	50	51.7	0.0000	0.0000	ОК
Link Event (Upstream Depth)	US Node	Link	D: Not	S de	Outfl (I/s	ow ;)	Velo (m	ocity /s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m <sup>3</sup> )
15 minute winter	1	1.000	MHS	504	5	1.7	3.	.236	0.005	0.0639	22.6

### C. Greenfield Run-off Rates Estimation

Engineering Assessment Report Project Number: 23-044 Document Reference: 23-044r.001



# Greenfield runoff rate estimation for sites

ool

				www.uksuds.o	com   Greenfield runof						
Calculated by:	Jason Bur	ger		Site Details							
Site name:	Rossfield Part 8	Avenue SDCC		Latitude:	53.28856° N						
Site location:				Longitude:	6.40375° W						
This is an estimation oractice criteria in l for developments", statutory standards may be the basis fo sites.	n of the greenf ine with Enviro SC030219 (2013 s for SuDS (Defr r setting conse	field runoff rates t nment Agency gui ) , the SuDS Manu a, 2015). This infor ents for the draina	that are used to m Idance "Rainfall ru al C753 (Ciria, 2015 rmation on green age of surface wa	neet normal best noff management <b>Reference:</b> and the non- ield runoff rates ter runoff from <b>Date:</b>	3597277626 Nov 17 2023 12:00						
Runoff esti	mation a	approach	IH124								
Site charac	teristic	S		Notes							
īotal site area (h	n <b>a):</b> <sup>0.2487</sup>			(1) Is Q <sub>BAB</sub> < 2.0 l/s/ha	?						
Methodolo	gy										
Q <sub>BAR</sub> estimation I	method:	alculate from S	SPR and SAAR	When Q <sub>BAR</sub> is < 2.0 l/s/ha th rates are set at 2.0 l/s/ha.	en limiting discharge						
SPR estimation n	nethod: C	alculate from S	SOIL type								
Soil charac	teristics	S Default	Edited	(2) Are flow rates < 5	.0 l/s?						
SOIL type:		2	2								
HOST class:		N/A	N/A	for discharge is usually se	t at 5.0 l/s if blockage						
SPR/SPRHOST:		0.3	0.3	from vegetation and other	materials is possible.						
	-1			Lower consent flow rates	may be set where the						
characteri	stics	Default	Edited	drainage elements.							
SAAR (mm):		1005	808.5								
lydrological reg	ion:	12	12	(3) Is SPR/SPRHOST ≤	0.3?						
Growth curve fac	ctor 1 year.	0.85	0.85	Where groundwater levels	are low enough the						
Growth curve fac l/ears:	ctor 30	2.13	2.13	use of soakaways to avoid	discharge offsite						
Growth curve fac	ctor 100	2.61	2.61	would normally be preterred for disposal of surface water runoff.							
Growth curve fac	ctor 200	2.86	2.86								

### . .

years:

Greenfield runoff rates	Default	Edited
Q <sub>BAR</sub> (I/s):	0.69	0.54
l in 1 year (l/s):	0.59	0.46

1 in 30 years (l/s):	1.47	1.14
1 in 100 year (l/s):	1.81	1.4
1 in 200 years (l/s):	1.98	1.53

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

D. Post-development runoff estimation – excluding SuDS – (Causeway FLOW)

Engineering Assessment Report Project Number: 23-044 Document Reference: 23-044r.001

AUSEWAY 🛟	Waterman Moylan C	onsulting	File: Post de Network: S Lydia Mugo 24/11/2023	evelopme torm Netv 3	nt.pfd work	Page 1 23-044 Broc Post Develo	okfield pment
		<u>Design</u>	<u>Settings</u>				
Rainfall Methodo Return Period (ye Additional Flow FSR Re M5-60 ( Rai	logy FSR ears) 5 (%) 0 gion England and Wa mm) 16.600 tio-R 0.270 CV 0.750 nins) 4.00	Iles	aximum Time Ma Minim Pr Inclu Enforce b	of Conce aximum R Minimum Co um Backc eferred C de Interm eest practi	ntration (m ainfall (mm, on Velocity (n onnection T lrop Height over Depth nediate Grou ce design ru	ins) 30.00 /hr) 50.0 n/s) 1.00 ype Level S (m) 0.200 (m) 1.200 und √ ules x	offits
		<u>No</u>	<u>des</u>				
	Name Area (ha)	(mins)	Level ( (m)	mm)	(m)		
	MHS04	4.00 1	107.000	1900	2.105		
		<u>Lir</u>	<u>nks</u>				
NameUSDSNodeNode1.0001	Length ks (mm) , e (m) n )4 4.000 0.600	/ US IL (m) 0 105.372	<b>DS IL</b> (m) 1 104.745	Fall (m) 0.626	Slope D (1:X) (m 6.4 10	ia T of C m) (mins) 000 4.01	Rain (mm/hr) 50.0
Name (1 1.000 <b>1</b> 3	Vel         Cap         Flow           n/s)         (l/s)         (l/s)           8.267         10419.8         29.8	y US Depth (m) 3 0.629	DS ΣA Depth (h (m) 1.105 0.3	area ΣA na) Infl (I) 220	dd Pro low Depti (s) (mm) 0.0 38	Pro h Velocity ) (m/s) 8 3.048	
		<u>Pipeline</u>	<u>Schedule</u>				
Link Length Slo (m) (1 1.000 4.000	pe Dia Link :X) (mm) Type 6.4 1000 Circular	US CL (m) 107.000	US IL U (m) 105.371	JS Depth (m) 0.629	<b>DS CL</b> (m) 106.850	<b>DS IL C</b> (m) 104.745	OS Depth (m) <u>1.105</u>
Link U No 1.000 1	JS Dia Node ode (mm) Type 1900 Manhole	MH Type Adoptab	DS Node MHS04	Dia (mm) 1900	Node Type Manhole	MH Type Adoptable	
		<u>Manhole</u>	<u>Schedule</u>				
Node	CL Depth (m) (m)	Dia ( (mm)	Connections	Link	IL (m)	Dia (mm)	
_			$\bigcirc$	0 1 000	105 271	1000	
		1000		1 1 000	103.371	1000	



### Simulation Settings

Rainfall Methodology FSR Region M5-60 (mm) Ratio-R Summer CV Winter CV	FSR England and Wale 16.600 0.270 0.750 0.840	s Ski Drain Dov Additional S Check Dis Check Dis	Analysis Speed p Steady State yn Time (mins) torage (m³/ha) charge Rate(s) charge Volume	Normal x 240 20.0 x x
15 30 60 120	<b>Storm D</b> 180 240	Ourations 360 480	600 720	960 1440
Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flov (Q %)	N
1	0	0		0
5	0	0		0
10	0	0		0
30	0	0		0
100	20	0		0



### Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	U No	S i de (i	Peak mins)	Le <sup>.</sup> (r	vel n)	Dep (m	th Ir )	nflow (I/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winte	r 1		10	105	.410	0.03	39	23.9	0.2138	0.0000	ОК
15 minute winte	r MH	S04	10	104	.780	0.03	35	23.9	0.0000	0.0000	ОК
Link Event (Upstream Depth)	US Node	Link	D: No	S de	Outfl (I/s	ow ;)	Veloc (m/s	ity s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m <sup>3</sup> )
15 minute winter	1	1.000	MHS	504	2	3.9	2.6	99	0.002	0.0354	10.4



### Results for 5 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	U No	S l de (i	Peak mins)	Level (m)		Dep (m	th )	Inflow (I/s)	v Node Vol (m³)	Flood (m³)	Status
15 minute winte	r 1		10	105	.421	0.0	50	40.2	0.2768	0.0000	OK
15 minute winte	r MH	S04	10	104	.790	0.0	45	40.2	0.0000	0.0000	ОК
Link Event (Upstream Depth)	US Node	Link	D: No	S de	Outfl (I/s	ow 5)	Velo (m	ocity 1/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	MHS	S04	4	0.2	3	.049	0.004	0.0527	17.5



### Results for 10 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	U No	S I de (r	Peak mins)	Level ) (m)		Depth (m)		Inflow (I/s)	v Node Vol (m³)	Flood (m³)	Status
15 minute winte	r 1		10	105	.425	0.0	54	46.0	0.2972	0.0000	ОК
15 minute winte	r MH	S04	10	104	.792	0.0	47	46.1	0.0000	0.0000	ОК
Link Event (Upstream Depth)	US Node	Link	D: Not	S de	Outfl (I/s	ow 5)	Vel (n	ocity n/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	MHS	504	4	6.1	Э	3.149	0.004	0.0585	20.1



### Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	U No	S F de (r	Peak Le mins) (r		vel m)	Dep (m	oth 1)	Inflov (I/s)	v Node Vol (m³)	Flood (m³)	Status
15 minute winte	r 1		10	105	.432	0.0	61	57.6	0.3358	0.0000	ОК
15 minute winte	r MH	S04	10	104	.797	0.0	52	57.7	0.0000	0.0000	ОК
Link Event (Upstream Depth)	US Node	Link	D: No	S de	Outfl (I/s	ow s)	Vel (n	ocity n/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	MHS	504	5	7.7	3	3.323	0.006	0.0694	25.2



### Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	U: No	S P de (n	eak nins)	Level (m)		Depth (m)		Inflow (I/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winte	r 1		10	105.	448	0.0	77	88.6	0.4250	0.0000	ОК
15 minute winte	r MHS	504	10	104.809		0.064		88.7	0.0000	0.0000	OK
Link Event (Upstream Depth) 15 minute winter	US Node 1	<b>Link</b> 1.000	DS Noc MHS	<b>5 de</b> 504	Outfl (I/s 8	<b>ow</b> ) 8.7	Velo (m 3	<b>ocity</b> /s) .686	Flow/Cap 0.009	Link Vol (m³) 0.0965	Discharge Vol (m <sup>3</sup> ) 38.7

E. Post-development design model – with SuDS – (Causeway FLOW)

Engineering Assessment Report Project Number: 23-044 Document Reference: 23-044r.001



Page 1 Brookfield Storm Network

### Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	5	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	16.600	Minimum Backdrop Height (m)	0.200
Ratio-R	0.270	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	$\checkmark$
Time of Entry (mins)	4.00	Enforce best practice design rules	х

#### <u>Nodes</u>

Name	Area (ha)	T of E (mins)	Add Inflow (I/s)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
MHS01	0.016	4.00		107.300	1200	706432.902	727638.996	1.425
MHS02				107.510	1200	706421.335	727651.915	1.810
MHS03				106.897	1200	706443.440	727672.286	1.526
MHS04				106.850	1200	706447.062	727674.530	1.493
GR2		4.00	0.1	107.618		706422.260	727674.444	0.118
MHS03B				106.898	1200	706439.066	727675.273	1.198
MHS03A				107.100	1200	706424.857	727689.017	1.100
ICS05				107.400	1200	706421.721	727686.522	1.270
ICS01				107.400	1200	706402.068	727668.315	1.000
private perm 2	0.008	4.00		107.400		706419.785	727682.577	0.130
PrivBRRG2				107.400		706418.453	727685.625	1.000
GR1		4.00		107.618		706408.985	727662.263	0.118
private perm 1	0.010	4.00		107.400		706400.944	727665.689	0.350
PrivBRRG1				107.400		706400.230	727669.115	1.000
PP1	0.021	4.00		107.400		706416.598	727692.524	0.450
PP3	0.006	4.00		107.000		706434.059	727686.291	0.450
BRTP	0.047	4.00		107.000		706431.633	727684.435	1.100
PRIVATE PERM 3	0.004	4.00		107.000		706426.385	727681.588	0.350
PP5	0.017	4.00		107.500		706440.262	727666.247	0.450
PRIVATE PERM 4	0.005	4.00		107.300		706442.984	727661.678	0.350
PRIVATE PERM 5	0.002	4.00		107.400		706435.304	727654.521	0.350
GR4		4.00	0.2	107.618		706442.201	727650.944	0.118
GR3		4.00		107.618		706439.768	727654.569	0.118
NEW PP		4.00		107.618		706423.785	727643.146	0.118
BRRG2	0.005	4.00		107.300		706430.217	727637.099	1.000
BRRG1				107.300		706437.416	727634.795	1.000
PP4	0.015	4.00		106.900		706447.978	727667.120	0.500

CA	CAUSEWAY					onsulting File: Drainage design R6.pfd Network: Storm Network Lydia Mugo 07/12/2023						Page 2 Brookfield Storm Network			
					L	<u>inks</u>									
Name	US	DS	L	ength	ks (mm)	/ US	IL	DS IL	Fall	Slope	Dia	T of C	Rain		
	Node	Node		(m)	n	(n	n)	(m)	(m)	(1:X)	(mm)	(mins)	(mm/hr)		
1	MHS01	MHS02	1	7.341	0.012	2 105.	.875	105.700	0.175	99.1	225	4.55	50.0		
1.003	MHS02	MHS03	З	0.060	0.012	2 105.	.700	105.400	0.300	100.2	225	4.96	50.0		
1.004	MHS03	MHS04		4.261	0.012	2 105.	.400	105.357	0.043	99.1	225	5.02	50.0		
5.000	GR2	private peri	m 2	8.501	0.60	) 107.	.500	107.270	0.230	37.0	100	4.11	50.0		
4.003	ICS01	ICS05	2	6.791	0.60	106.	.400	106.130	0.270	99.2	150	4.61	50.0		
4.004	ICS05	MHS03A		4.007	0.60	106.	.130	106.000	0.130	30.8	150	4.65	50.0		
4.005	MHS03A	BRTP		8.180	0.60	106.	.000	105.900	0.100	81.8	150	4.77	50.0		
4.007	MHS03B	MHS03		5.297	0.60	105.	.700	105.400	0.300	17.7	150	4.96	50.0		
4.000	GR1	private peri	n 1	8.740	0.60	107.	.500	107.270	0.230	38.0	100	4.12	50.0		
6.000	PP1	MHS03A		8.973	0.60	106.	.950	106.000	0.950	9.4	100	4.06	50.0		
8.000	PP3	BRTP		3.055	0.60	106.	.550	105.900	0.650	4.7	100	4.01	50.0		
4.006	BRTP	MHS03B	1	1.798	0.60	105.	.900	105.700	0.200	59.0	150	4.92	50.0		
7.000	PRIVATE PERM 3	BRTP		5.971	0.60	106.	.650	105.900	0.750	8.0	100	4.04	50.0		
2.000	NEW PP	BRRG2		8.828	0.012	2 107.	.500	106.300	1.200	7.4	50	4.09	50.0		
2.001	BRRG2	MHS01		3.288	0.60	106.	.300	105.875	0.425	7.7	225	4.10	50.0		
1.001	BRRG1	MHS01		6.166	0.60	106.	.300	106.238	0.062	99.5	150	4.32	50.0		
1.000	GR4	BRRG1	1	.6.843	0.60	) 107.	.500	106.300	1.200	14.0	50	4.22	50.0		
9.000	GR3	MHS03	1	.8.094	0.60	) 107.	.500	105.371	2.129	8.5	100	4.11	50.0		
10.000	PRIVATE PERM 4	MHS03	1	.0.618	0.60	106.	.950	105.371	1.579	6.7	100	4.06	50.0		
11.000	PP4	MHS03		6.876	0.60	106.	.400	105.371	1.029	6.7	150	4.03	50.0		
12.000	PP5	MHS03		6.824	0.60	107.	.050	105.371	1.679	4.1	100	4.03	50.0		
3.001	private perm 1	PrivBRRG1		3.500	0.60	107.	.050	106.400	0.650	5.4	100	4.13	50.0		
3.002	PrivBRRG1	ICS01		2.005	0.60	106.	.400	106.400	0.000	0.0	100	4.17	50.0		
4.001	private perm 2	PrivBRRG2		3.326	0.60	0 107.	.270	106.400	0.870	3.8	100	4.13	50.0		
	Nan	ne Vel	Сар	Flow	US	DS	ΣAre	ea ΣAd	d Pro	o I	Pro				
		(m/s)	(I/s)	(I/s)	Depth (m)	Depth (m)	(ha	) Inflo (I/s	w Dep ) (mr	n) (r	locity n/s)				
	1	1 229	48 9	39	1 200	1 585	0.02	21 0	2	44 (	0 741				
	1 00	3 1 222	48.6	39	1 585	1 272	0.02	0 21 0	2	44	0 737				
	1.00	4 1.229	48.9	28.2	1.272	1.268	0.1	55 0	.3 1	23	1.273				
	5.00	0 1.272	10.0	0.1	0.018	0.030	0.00	0 00 0	.1	7 (	0.404				
	4.00	3 1.009	17.8	1.7	0.850	1.120	0.0	10 0	.0	32 (	0.645				
	4.00	4 1.820	32.2	3.4	1.120	0.950	0.0	18 O	.1	33	1.179				
	4.00	5 1.112	19.7	7.1	0.950	0.950	0.03	39 O	.1	62	1.024				
	4 00	7 2.408	42.6	17.2	1.048	1.347	0.0	95 O	.1	67	2.286				
	4.00	0 1 255	0.0		0.010	0.020	0.00		0	0	000				

4.003	1.009	17.8	1.7	0.850	1.120	0.010	0.0	32	0.645
4.004	1.820	32.2	3.4	1.120	0.950	0.018	0.1	33	1.179
4.005	1.112	19.7	7.1	0.950	0.950	0.039	0.1	62	1.024
4.007	2.408	42.6	17.2	1.048	1.347	0.095	0.1	67	2.286
4.000	1.255	9.9	0.0	0.018	0.030	0.000	0.0	0	0.000
6.000	2.530	19.9	3.7	0.350	1.000	0.021	0.0	29	1.939
8.000	3.591	28.2	1.0	0.350	1.000	0.006	0.0	13	1.674
4.006	1.312	23.2	17.2	0.950	1.048	0.095	0.1	96	1.434
7.000	2.756	21.6	0.7	0.250	1.000	0.004	0.0	12	1.232
2.000	1.655	3.2	0.0	0.068	0.950	0.000	0.0	0	0.000
2.001	4.733	188.2	0.9	0.775	1.200	0.005	0.0	11	1.197
1.001	1.007	17.8	0.2	0.850	0.912	0.000	0.2	11	0.331
1.000	1.303	2.6	0.2	0.068	0.950	0.000	0.2	10	0.773
9.000	2.667	20.9	0.0	0.018	1.426	0.000	0.0	0	0.000
10.000	3.000	23.6	0.9	0.250	1.426	0.005	0.0	14	1.452
11.000	3.923	69.3	2.7	0.350	1.376	0.015	0.0	20	1.906
12.000	3.863	30.3	3.1	0.350	1.426	0.017	0.0	21	2.478
3.001	3.354	26.3	1.7	0.250	0.900	0.010	0.0	18	1.904
3.002	1.000	7.9	1.7	0.900	0.900	0.010	0.0	0	~
4.001	3.983	31.3	1.6	0.030	0.900	0.008	0.1	15	2.068

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CAUS	SEV		<b>*</b>	'atermar	Moylan	Consulting	File: D Netwo Lydia N 07/12,	rainage o ork: Storr ⁄Iugo ⁄2023	design n Netv	R6.pfd /ork	Page 3 Brookfie Storm N	ld etwork	
						<u>l</u>	<u>inks</u>						
Name		US	C	)S Le	ength k	(mm) /	US IL	DS IL	F	all Sic	pe Dia	T of C	Rain
		Node	No	ode	(m)	n	(m)	(m)	(1	m) (1	:X) (mm)	(mins)	(mm/hr)
4.002	PrivE	BRRG2	ICS	05	3.389	0.600	106.400	106.13	30 <mark>0</mark> .	270 1	2.6 100	4.15	50.0
8.000_1	PRIV	ATE PERM	15 MH	ISO3 1	9.539	0.600	107.050	105.37	'1 1.	579 1	1.6 100	4.14	50.0
		Nam	ie V (m	el Ca /s) (l/s	p Flow s) (l/s)	v US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Ade Inflov (I/s)	d Pro v Dept (mm	Pro h Velocity ) (m/s)	,	
		4.002	2.1	.93 17	2 1.6	0.900	1.170	0.008	0.	1 2	1 1.373	}	
		8.000	_1 2.2	78 17	9 0.3	0.250	1.426	0.002	0.	0 1	0 0.881		
						<u>Pipelin</u>	<u>e Schedul</u>	<u>e</u>					
	Link	Length	Slope	Dia	Link	US CL	US IL	US D	epth	DS CL	DS IL	DS Dept	n
		(m)	(1:X)	(mm)		(m)	(m)	(r	n)	(m)	(m)	(m)	•
1		17.341	99.1	225	Circular	107.300	105.87	5 S	, 1.200	107.510	) 105.700	1.58	5
1	.003	30.060	100.2	225	Circular	107.510	105.70	0 1	L.585	106.897	/ 105.400	1.272	2
1	.004	4.261	99.1	225	Circular	106.897	105.40	0 1	l.272	106.850	105.357	1.268	8
5	.000	8.501	37.0	100	Circular	107.618	107.50	0 (	0.018	107.400	) 107.270	0.030	D
4	.003	26.791	99.2	150	Circular	107.400	106.40	0 (	0.850	107.400	) 106.130	1.120	)
4	.004	4.007	30.8	150	Circular	107.400	106.13	0 1	L.120	107.100	) 106.000	0.950	)
4	.005	8.180	81.8	150	Circular	107.100	106.00		).950	107.000	105.900	0.950	) 7
4	.007	5.297	17.7	150	Circular	105.898	105.70		L.U48	105.897	105.400	1.34	
4		0.740 8 973	56.U Q Л	100	Circular		107.50		) 320	107.400	107.270	1 000	ן ר
8	3.000	3.055	4.7	100	Circular	107.000	106.55	0 (	).350	107.000	) 105.900	1.000	5
4	.006	11.798	59.0	150	Circular	107.000	105.90	0 (	0.950	106.898	3 105.700	1.048	8
7	.000	5.971	8.0	100	Circular	107.000	106.65	0 (	).250	107.000	105.900	1.000	0
2	.000	8.828	7.4	50	Circular	107.618	107.50	0 (	0.068	107.300	106.300	0.950	C
2	.001	3.288	7.7	225	Circular	107.300	106.30	0 (	).775	107.300	) 105.875	1.200	D
1	.001	6.166	99.5	150	Circular	107.300	106.30	0 (	).850	107.300	106.238	0.912	2
1	000	16.843	14.0	50 100	Circular		107.50	0 (	0.068	107.300	106.300	0.95	) -
9	0.000	18.094	8.5	100	Circular	107.018	107.50	0 (	5.018	100.897	105.371	1.420	0
	Link	ι	JS	Dia	Noc	le N	1H	DS		Dia	Node	МН	
		N	ode	(mm	) Тур	е Ту	pe	Node	9	(mm)	Туре	Туре	
	1	MHS01		1200	) Manh	iole Adop	otable N	1HS02		1200	Manhole	Adoptable	
	1.003			1200	) Mank	iole Adop	otable IV			1200	Manholo	Adoptable	
	5 000	GR2		1200	lunct	ion Auor	n n	rivate ne	rm 2	1200	lunction	Auoptable	
	4.003	ICS01		1200	) Manh	nole Ador	ptable IC	S05		1200	Manhole	Adoptable	
	4.004	ICS05		1200	) Manh	nole Adop	otable N	1HS03A		1200	Manhole	Adoptable	
	4.005	MHS03	Ą	1200	) Manh	nole Adop	otable B	RTP			Junction		
	4.007	MHS03	В	1200	) Manh	nole Adop	otable N	1HS03		1200	Manhole	Adoptable	
	4.000	GR1			Junct	ion	р	rivate pe	erm 1		Junction		
	6.000	PP1			Junct	ion	Ν	1HS03A		1200	Manhole	Adoptable	
	8.000	PP3			Junct	ion	В	RTP		1200	Junction	ا جا جا م	
	4.006	8K1P		2	Junct	ion	N N			1200	lunction	Adoptable	
	2 000		. F LINIVI 3 )		lunct	ion	D R	RRG2			lunction		
	2.001	BRRG2			Junct	ion	N	1HS01		1200	Manhole	Adoptable	

MHS01

BRRG1

MHS03

Adoptable

1200 Manhole

Junction

1200 Manhole Adoptable

Junction

Junction

Junction

1.001 BRRG1

1.000 GR4

9.000 GR3

AUSEV	<b>Wa</b>	aterman	Moylan Co	onsulting	File: Drain Network: Lydia Mug 07/12/202	age design F Storm Netwo 30 23	Page 4 Brookfield Storm Network			
					Pipeline S	Schedule	23			
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
10.000	10.618	6.7	100	Circular	107.300	106.950	0.250	106.897	105.371	1.426
11.000	6.876	6.7	150	Circular	106.900	106.400	0.350	106.897	105.371	1.376
12.000	6.824	4.1	100	Circular	107.500	107.050	0.350	106.897	105.371	1.426
3.001	3.500	5.4	100	Circular	107.400	107.050	0.250	107.400	106.400	0.900
3.002	2.005	0.0	100	Circular	107.400	106.400	0.900	107.400	106.400	0.900
4.001	3.326	3.8	100	Circular	107.400	107.270	0.030	107.400	106.400	0.900
4.002	3.389	12.6	100	Circular	107.400	106.400	0.900	107.400	106.130	1.170
8.000_1	19.539	11.6	100	Circular	107.400	107.050	0.250	106.897	105.371	1.426

Link	US	Dia	Node	MH	DS	Dia	Node	MH
	Node	(mm)	Туре	Туре	Node	(mm)	Туре	Туре
10.000	PRIVATE PERM 4		Junction		MHS03	1200	Manhole	Adoptable
11.000	PP4		Junction		MHS03	1200	Manhole	Adoptable
12.000	PP5		Junction		MHS03	1200	Manhole	Adoptable
3.001	private perm 1		Junction		PrivBRRG1		Junction	
3.002	PrivBRRG1		Junction		ICS01	1200	Manhole	Adoptable
4.001	private perm 2		Junction		PrivBRRG2		Junction	
4.002	PrivBRRG2		Junction		ICS05	1200	Manhole	Adoptable
8.000_1	PRIVATE PERM 5		Junction		MHS03	1200	Manhole	Adoptable

### Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
MHS01	706432.902	727638.996	107.300	1.425	1200	<u>م</u> 1	2.001	105.875	225
						2	1.001	106.238	150
						<sup>2</sup> 0	1	105.875	225
MHS02	706421.335	727651.915	107.510	1.810	1200		1	105.700	225
						1 0	1.003	105.700	225
MHS03	706443.440	727672.286	106.897	1.526	1200	1	12.000	105.371	100
						° 2	11.000	105.371	150
						3	10.000	105.371	100
						'5 <sup>"/  2</sup> 4	9.000	105.371	100
						5	8.000_1	105.371	100
						6	4.007	105.400	150
						7	1.003	105.400	225
						0	1.004	105.400	225
MHS04	706447.062	727674.530	106.850	1.493	1200	1	1.004	105.357	225
GR2	706422.260	727674.444	107.618	0.118		° L			
						0	5.000	107.500	100
MHS03B	706439.066	727675.273	106.898	1.198	1200		4.006	105.700	150
						0	4.007	105.700	150



#### Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connectior	ıs	Link	IL (m)	Dia (mm)
MHS03A	706424.857	727689.017	107.100	1.100	1200		1	6.000	106.000	100
							2	4.004	106.000	150
						2 0	0	4.005	106.000	150
ICS05	706421.721	727686.522	107.400	1.270	1200	0	1	4.002	106.130	100
						1-0	2	4.003	106.130	150
						2	0	4.004	106.130	150
ICS01	706402.068	727668.315	107.400	1.000	1200	1	1	3.002	106.400	100
							0	4.003	106.400	150
private perm 2	706419.785	727682.577	107.400	0.130		O O	1	5.000	107.270	100
						1	0	4.001	107.270	100
PrivBRRG2	706418.453	727685.625	107.400	1.000		×0	1	4.001	106.400	100
						1	0	4.002	106.400	100
GR1	706408.985	727662.263	107.618	0.118		0 ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~				
							0	4.000	107.500	100
private perm 1	706400.944	727665.689	107.400	0.350		0	1	4.000	107.270	100
							0	3.001	107.050	100
PrivBRRG1	706400.230	727669.115	107.400	1.000		<b>↑</b> →0	1	3.001	106.400	100
<b>DD1</b>	706446 500	727602 524	107 100	0.450		1	0	3.002	106.400	100
PPI	706416.598	727692.524	107.400	0.450		°->0	0	6.000	106.950	100
PP3	706434.059	727686.291	107.000	0.450						
						0 4	0	8 000	106 550	100
BRTP	706431 633	727684 435	107 000	1 100			1	8,000	105 900	100
BRIT	/00431.033	/2/004.435	107.000	1.100		3 1	2	7.000	105.900	100
						2	3	4.005	105.900	150
						2 3	0	4.006	105.900	150
PRIVATE PERM 3	706426.385	727681.588	107.000	0.350		°~~70				
							0	7.000	106.650	100
PP5	706440.262	727666.247	107.500	0.450		ſ				
							0	12.000	107.050	100



Page 6 Brookfield Storm Network

			Manh	ole Sche	<u>dule</u>					
Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connectio	ns	Link	IL (m)	Dia (mm)
PRIVATE PERM 4	706442.984	727661.678	107.300	0.350		o ↓				
							0	10.000	106.950	100
PRIVATE PERM 5	706435.304	727654.521	107.400	0.350		Ŷ				
							0	8.000_1	107.050	100
GR4	706442.201	727650.944	107.618	0.118		Ĵ				
	700 420 700	727654 560	107 (10	0.110		0	0	1.000	107.500	50
GR3	/06439.768	/2/654.569	107.618	0.118		Ĵ				
							0	9.000	107.500	100
NEW PP	706423.785	727643.146	107.618	0.118		م				
						0	0	2.000	107.500	50
BRRG2	706430.217	727637.099	107.300	1.000		1	1	2.000	106.300	50
							0	2.001	106.300	225
BRRG1	706437.416	727634.795	107.300	1.000		° ~1	1	1.000	106.300	50
							0	1.001	106.300	150
PP4	706447.978	727667.120	106.900	0.500		0				
							0	11.000	106.400	150
			<u>Simul</u>	ation Set	<u>tings</u>					
	Rainfall Met FS M5	hodology FSI SR Region Sco -60 (mm) 16	R otland and .600	Ireland	Dra Addit	Skip Stead ain Down Time tional Storage	dy Sta e (mir (m³∕h	ite x ns) 240 na) 0.0		

**Storm Durations** 360

480

600

720

960

1440

Check Discharge Rate(s) x

Check Discharge Volume x

2160

2880

Ratio-R 0.270

60

120

180

240

Summer CV 1.000

Analysis Speed Normal

15

30

CAUSEWAY 🛟	Waterman Moy	lan Consulting	File: Drainage of Network: Storr Lydia Mugo 07/12/2023	design R6.pfd m Network	Page 7 Brookfield Storm Network
Re	turn Period Cli (vears)	imate Change (CC %)	Additional Area	Additional Flo	w
	1	(ee //) 0	(~,~)	)	0
	5	0	c C	)	0
	10	0	C	)	0
	30	0	0	)	0
	100	20	C	)	0
	Node	MHS03 Online	Hydro-Brake <sup>®</sup> Co	ontrol	
			-		
Fla	ap Valve x		Objectiv	ve (CL) Minimise	e blockage risk
Replaces Downstre	am Link x		Sump Availab	le √	
Invert L	evel (m) 105.4.	00	Product Numbe	er CTL-SCL-0058	8-2000-1500-2000
Design De	epth (m) 1.500	Min O	utlet Diameter (n	n) 0.075	
Design F	low (l/s) 2.0	Min No	de Diameter (mn	n) 1200	
	Nod	e GR2 Depth/Ai	rea Storage Struc	<u>cture</u>	
			1		
Base Inf Coefficient	(m/hr) 0.0000	0 Safety Fa	ctor 2.0	Invert L	evel (m) 107.500
Side Inf Coefficient	(m/hr) 0.0000	0 Porc	osity 1.00	Time to half empt	y (mins)
Depth / (m) (	Area Inf Area (m²) (m²)	Depth Ard (m) (m	ea Inf Area <sup>2</sup> ) (m <sup>2</sup> )	Depth Area (m) (m²)	Inf Area (m²)
0.000	57.4 0.0	0.118 57	.4 0.0	0.119 0.0	0.0
	<u>Node pr</u>	ivate perm 2 Ca	arpark Storage St	<u>tructure</u>	
Base Inf Coefficient ( Side Inf Coefficient ( Safety I Po	m/hr) 0.00000 m/hr) 0.00000 Factor 2.0 prosity 0.40	Time to ha	Invert Level (m) alf empty (mins) Width (m) Length (m)	107.270 2.500 In 20.348	Slope (1:X) 100.0 Depth (m) 0.300 f Depth (m)
	<u>Node Pr</u>	ivBRRG2 Depth	/Area Storage St	tructure	
Base Inf Coefficient Side Inf Coefficient	(m/hr) 0.0000 (m/hr) 0.0000	0 Safety Fa 0 Porc	ctor 2.0 osity 0.40	Invert L Time to half empt	evel (m) 106.400 y (mins) 285
Denth (	Area Inf Area	Donth Ar	aa Inf Area	Denth Area	Inf Area
(m)	$(m^2)$ $(m^2)$	(m) (m	$(m^2)$	$(m)$ $(m^2)$	(m <sup>2</sup> )
0.000	14.2 0.0	0.600 14	2 00	0.601 0.0	0.0
0.000	14.2 0.0	CD1 Donth (A)		0.001 0.0	0.0
	Nou				
Base Inf Coefficient Side Inf Coefficient	(m/hr) 0.0000 (m/hr) 0.0000	0 Safety Fa 0 Porc	ctor 2.0 sity 1.00	Invert L Time to half empt	evel (m) 107.500 y (mins)
Depth A	Area Inf Area	Depth Ar	ea Inf Area	Depth Area	Inf Area
(m) (	m²) (m²)	(m) (m	1²) (m²)	(m) (m²)	(m²)
0.000 19	96.6 0.0	0.118 19	6.6 0.0	0.119 0.0	0.0
	Node pi	ivate perm 1 Ca	arpark Storage St	tructure	
Base Inf Coefficient (	m/hr) 0.00000		Invert Level (m)	107.050	Slope (1:X) 100.0
Side Inf Coefficient (	m/hr) 0.00000	Time to ha	alf empty (mins)	0	Depth (m) 0.300
Safety I	Factor 2.0		Width (m)	2.500 In	f Depth (m)
Ро	rosity 0.40		Length (m)	22.200	

JSEWAY				File: Drainage Network: Sto Lydia Mugo 07/12/2023	fd Page 8 Brookfield Storm Netv	Page 8 Brookfield Storm Network		
		Node Prive	<u> 3RRG1 Depth</u>	/Area Storage	<u>Structure</u>			
Base Inf Coefficier Side Inf Coefficier	ıt (m/hr) ıt (m/hr)	0.00000 0.00000	Safety Fac Poro	ctor 2.0 sity 0.40	lı Time to hal	nvert Level (m) 10 f empty (mins) 28	06.400 85	
<b>Depth</b> (m) 0.000	Area I (m²) 3.7	nf Area (m²) 0.0	Depth         Are           (m)         (m <sup>2</sup> )           0.600         3.	ea Inf Area <sup>2</sup> ) (m²) .7 0.0	Depth (m) 0.601	<b>Area Inf Area</b> (m <sup>2</sup> ) (m <sup>2</sup> ) 0.0 0.0		
		Node	e PP1 Carpark	Storage Struct	<u>ture</u>			
Base Inf Coefficien Side Inf Coefficien Safet	: (m/hr) t (m/hr) y Factor Porosity	0.00000 0.00000 2.0 0.40	Time to ha	Invert Level (m If empty (mins Width (m Length (m	) 106.950 ) 0 ) 2.500 ) 32.040	Slope (1:X) Depth (m) Inf Depth (m)	40.0 0.450	
		<u>Node</u>	PP3 Carpark	Storage Struct	<u>ture</u>			
Base Inf Coefficien Side Inf Coefficien Safet	: (m/hr) t (m/hr) y Factor Porosity	0.00000 0.00000 2.0 0.40	Time to ha	Invert Level (m If empty (mins Width (m Length (m	) 106.550 ) ) 13.600 ) 2.500	Slope (1:X) Depth (m) Inf Depth (m)	40.0 0.450	
		<u>Node Bl</u>	RTP Depth/Ai	rea Storage Str	ucture			
Base Inf Coefficier Side Inf Coefficier	ıt (m/hr) ıt (m/hr)	0.00000 0.00000	Safety Fac Poro	ctor 2.0 sity 1.00	lı Time to hal	nvert Level (m) 10 f empty (mins)	05.900	
<b>Depth</b> (m) 0.000	Area I (m²) 22.6	nf Area (m²) 0.0	Depth Are (m) (m <sup>2</sup> 0.650 22	ea Inf Area <sup>2</sup> ) (m <sup>2</sup> ) .6 0.0	<b>Depth</b> (m) 0.651	Area Inf Area (m²) (m²) 0.0 0.0		
		Node PRIVA	ATE PERM 3 C	arpark Storage	<u>Structure</u>			
Base Inf Coefficien Side Inf Coefficien Safet	: (m/hr) t (m/hr) y Factor Porosity	0.00000 0.00000 2.0 0.40	Time to ha	Invert Level (m If empty (mins Width (m Length (m	) 106.650 ) 300 ) 2.100 ) 12.570	Slope (1:X) Depth (m) Inf Depth (m)	100.0 0.300	
		Node	PP5 Carpark	Storage Struct	<u>ture</u>			
Base Inf Coefficien Side Inf Coefficien Safet	: (m/hr) t (m/hr) y Factor Porosity	0.00000 0.00000 2.0 0.40	Time to ha	Invert Level (m If empty (mins Width (m Length (m	) 107.050 ) 0 ) 2.500 ) 20.268	Slope (1:X) Depth (m) Inf Depth (m)	40.0 0.450	
		Node PRIVA	ATE PERM 4 C	arpark Storage	<u>Structure</u>			
	: (m/hr)	0.00000	Time to ha	Invert Level (m If empty (mins	) 106.950 ) 0	Slope (1:X) Depth (m)	100.0 0.300	
	Waterman Moylar	Consulting	File: Drainage	e design R6.pfd	Page 9			
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			Network: Sto	orm Network	Brookfield			
CAUSEVVAI 💕			Lydia Mugo		Storm Network			
			07/12/2023					
	Node PRIV	ATE PERM 5 C	arpark Storage	<u>e Structure</u>				
Base Inf Coefficient	(m/br) 0.00000		nvert Level (m	0) 107.050	Slone (1·X) 100.0			
Side Inf Coefficient	(m/hr) = 0.00000	Time to ha	lf empty (mins	s) 0	Depth (m) $0.300$			
Safety	Factor 2.0		Width (m	n) 2.070 In	f Depth (m)			
P	orosity 0.40		Length (m	n) 8.455				
	<u>Node C</u>	R4 Depth/Ar	ea Storage Str	ucture				
Deep Inf Coofficient	(m /hr) 0.00000	Cafatu Faa	tor 20	line in the	aval (m) 107 500			
Side Inf Coefficient	t (m/hr) 0.00000 t (m/hr) 0.00000	Safety Fac Poros	sity 1.00	Time to half empt	evel (m) 107.500 y (mins)			
Depth	Area Inf Area	Depth Are	a Inf Area	Depth Area	Inf Area			
(m)	(m²) (m²)	(m) (m	²) (m²)	(m) (m²)	(m²)			
0.000	126.0 0.0	0.118 126	.0 0.0	0.119 0.0	0.0			
	<u>Node C</u>	iR3 Depth/Ar	ea Storage Str	<u>ucture</u>				
Base Inf Coefficient	(m/br) = 0.00000	Safety Fac	tor 20	Invert I	evel (m) 107 500			
Side Inf Coefficient	t (m/hr) 0.00000	Poros	sity 1.00	Time to half empt	y (mins)			
Depth	Area Inf Area	Depth Are	a Inf Area	Depth Area	Inf Area			
(m)	(m²) (m²)	(m) (m <sup>2</sup>	<sup>2</sup> ) (m²)	(m) (m²)	(m²)			
0.000	69.5 0.0	0.118 69.	5 0.0	0.119 0.0	0.0			
	<u>Node N</u>	IEW PP Carpa	rk Storage Stru	<u>ucture</u>				
Base Inf Coefficient	(m/hr) 0.00000		nvert Level (m	) 107 500	Slope (1·X) 100.0			
Side Inf Coefficient	(m/hr) = 0.00000	Time to ha	lf empty (mins	s)	Depth (m) $0.300$			
Safety	Factor 2.0		Width (m	n) 5.500 In	f Depth (m)			
P	orosity 0.40		Length (m	n) 7.200	. – op ()			
	Node BF	RG2 Depth/A	rea Storage St	tructure				
Dasa Inf Coofficiant	(m/br) = 0.00000	Cofoty For	tor 20	Invort I	$a_{\rm rel}(m) = 106.200$			
Side Inf Coefficient	(m/hr) = 0.00000	Safety Fac	tor 2.0	Time to half emp	ever (m) 106.300			
			,		,, (			
Depth	Area Inf Area	Depth Are	a Inf Area	Depth Area	Inf Area			
(m)	(m <sup>2</sup> ) (m <sup>2</sup> )	(m) (m <sup>2</sup>	<sup>2</sup> ) (m²)	(m) (m²)	(m²)			
0.000	13.2 0.0	0.600 13.	2 0.0	0.601 0.0	0.0			
	<u>Node BF</u>	RG1 Depth/A	rea Storage St	tructure				
Base Inf Coefficient Side Inf Coefficient	t (m/hr) 0.00000 t (m/hr) 0.00000	Safety Fac Poros	tor 2.0 sity 1.00	Invert L Time to half emp	evel (m) 106.300 ty (mins)			
Denth	Area Inf Area	Denth Are	a Inf Δrea	Denth Area	Inf Area			
(m)	(m <sup>2</sup> ) (m <sup>2</sup> )	(m) (m <sup>2</sup>	(m <sup>2</sup> )	(m) (m <sup>2</sup> )	(m <sup>2</sup> )			
0.000	50.0 0.0	0.600 50.	0 0.0	0.601 0.0	0.0			
	Nod	DD4 Carpark	Storage Struc	*****				
	NOU		<u>Storage Struc</u>	ture				
Base Inf Coefficient	(m/hr) 0.00000		nvert Level (m	) 106.400	Slope (1:X) 40.0			
Side Inf Coefficient	(m/hr) 0.00000	Time to ha	lf empty (mins	5)	Depth (m) 0.450			
Safety	Factor 2.0		Width (m	i) 4.150 In	f Depth (m)			
P	orosity 0.40		Length (m	n) 15.420				



File: Drainage design R6.pfd Network: Storm Network Lydia Mugo 07/12/2023 Page 10 Brookfield Storm Network

#### Results for 1 year Critical Storm Duration. Lowest mass balance: 95.68%

Node Event	US Node	P	eak	Level (m)	Depth	Inflov (I/c)	v Node	Flood	Stat	us
180 minute sum	mor MHS01	(ii	217	106 204	0 / 1 8	(1/3)	0 0 1732		спрени	PGED
480 minute sum	mer MHS01		212 212	106.294	0.410	0.:	9 0.4733	0.0000		
480 minute sum	mer MHS02		212	106.294	0.393	2.9	2 0.0712 8 1.0722	0.0000		RGED
30 minute summ	or MHS04		156	105 385	0.022	1.0	6 0.0000	0.0000		NOLD
960 minute sum	mer GR2		1110	107.502	0.028	0.4	0 0.0000 1 0.4473	0.0000	OK	
180 minute sum	mer MHS03B		212	106 29/	0.000	2	1 0.4475 3 0.6715	0.0000		RGED
480 minute sum	mer MHS03A		312	106.204	0.334	2	0 3 3 2 7	0.0000	SURCHA	RGED
480 minute sum	mer ICS05		312	106 294	0.254	0.	4 0.3327 7 0.1857	0.0000	SURCHA	RGED
15 minute summ	ler ICS01		10	106.430	0.104	1 (	6 0.0338	0.0000	OK	NOLD
15 minute summ	ier private pern	n 2	10	107 284	0.030	14	4 0.0118	0.0000	OK	
15 minute summ	er PrivBRRG2		10	106 419	0.019	1. 1.	4 0 1068	0.0000	OK	
15 minute summ	er GR1		1	107.500	0.000	0.0	0.0000	0.0000	OK	
15 minute summ	er private pern	n 1	10	107.067	0.017	1 (	6 0.0157	0.0000	OK	
15 minute summ	er PrivBRRG1		10	106.447	0.047	1.0	6 0.0693	0.0000	OK	
15 minute summ	er PP1		10	106.978	0.028	3.3	3 0.0113	0.0000	OK	
15 minute summ	er PP3		10	106.562	0.012	0.9	9 0.0175	0.0000	OK	
480 minute sum	mer BRTP		312	106.294	0.394	3.3	3 8.9069	0.0000	SURCHA	RGED
15 minute summ	er PRIVATE PER	RM 3	10	106.662	0.012	0.0	6 0.0067	0.0000	OK	
15 minute summ	er PP5		10	107.070	0.020	2.	7 0.0092	0.0000	OK	
15 minute summ	er PRIVATE PER	RM 4	10	106.963	0.013	0.8	8 0.0080	0.0000	OK	
15 minute summ	er PRIVATE PEF	RM 5	11	107.059	0.009	0.3	3 0.0043	0.0000	OK	
720 minute sum	mer GR4		885	107.510	0.009	0.2	2 1.1958	0.0000	OK	
15 minute summ	er GR3		1	107.500	0.000	0.0	0 0.0000	0.0000	OK	
15 minute summ	er NEW PP		1	107.500	0.000	0.0	0 0.0000	0.0000	OK	
15 minute summ	er BRRG2		11	106.310	0.009	0.8	8 0.1253	0.0000	OK	
						-			-	
						_				
Link Event	US	Link		DS	Outf	low ۱	/elocity Flo	ow/Cap	Link	Discharge
Link Event (Upstream Depth)	US Node	Link		DS Node	Outf (I/	low \ s)	/elocity Flo (m/s)	ow/Cap	Link Vol (m³)	Discharge Vol (m³)
Link Event (Upstream Depth) 480 minute summer	US Node MHS01	Link	M	DS Node HS02	Outf (I/	low \ s) 0.9	/elocity Flo (m/s) 0.384	ow/Cap	Link Vol (m <sup>3</sup> ) 0.6897	Discharge Vol (m³)
Link Event (Upstream Depth) 480 minute summer 480 minute summer	US Node MHS01 MHS02	Link 1 1.003	MI	DS Node HS02 HS03	Outf (I/	low \ s) 0.9 0.8	/elocity Flo (m/s) 0.384 0.082	0.018 0.016	Link Vol (m <sup>3</sup> ) 0.6897 1.1955	Discharge Vol (m <sup>3</sup> )
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer	US Node MHS01 MHS02 MHS03	Link 1 1.003 1.004	MI MI	<b>DS</b> <b>Node</b> HS02 HS03 HS04	Outf (I/	low \ s) 0.9 0.8 1.6	/elocity Fla (m/s) 0.384 0.082 0.539	0.018 0.016 0.032	Link Vol (m³) 0.6897 1.1955 0.0126	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 960 minute summer	US Node MHS01 MHS02 MHS03 GR2	Link 1 1.003 1.004 5.000	MI MI MI	DS Node HS02 HS03 HS04 ivate perm	Outf (I/ 2	low \ s) 0.9 0.8 1.6 0.1	/elocity Flo (m/s) 0.384 0.082 0.539 0.528	0.018 0.016 0.032 0.011	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0126 0.0021	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 960 minute summer 480 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B	Link 1 1.003 1.004 5.000 4.007	MI MI pri	DS Node HS02 HS03 HS04 ivate perm HS03	Outf (I/	low ( s) 0.9 0.8 1.6 0.1 3.1	/elocity Fla (m/s) 0.384 0.082 0.539 0.528 0.439	0.018 0.016 0.032 0.011 0.072	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0126 0.0021 0.0933	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A	Link 1 1.003 1.004 5.000 4.007 4.005	MI MI MI BR	DS Node HS02 HS03 HS04 ivate perm HS03 CTP	Outf (I/	low (V s) 0.9 0.8 1.6 0.1 3.1 1.4	/elocity Fla (m/s) 0.384 0.082 0.539 0.528 0.439 0.453	0.018 0.016 0.032 0.011 0.072 0.070	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05	Link 1 1.003 1.004 5.000 4.007 4.005 4.005	MI MI Pri BR	DS Node HS02 HS03 HS04 ivate perm HS03 ATP HS03A	Outf (I/	low X s) 0.9 0.8 1.6 0.1 3.1 1.4 0.7	/elocity Fla (m/s) 0.384 0.082 0.539 0.528 0.439 0.453 0.455	0.018 0.016 0.032 0.011 0.072 0.070 0.022	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440 0.0705	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003	MI MI MI BR MI	DS Node HS02 HS03 HS04 ivate perm HS03 ATP HS03A 505	Outf (I/	low X s) 0.9 0.8 1.6 0.1 3.1 1.4 0.7 1.5	/elocity Fla (m/s) 0.384 0.082 0.539 0.528 0.439 0.453 0.455 0.613	0.018 0.016 0.032 0.011 0.072 0.070 0.022 0.086	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440 0.0705 0.0670	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001	MI MI MI BR MI ICS	DS Node HS02 HS03 HS04 ivate perm HS03 TP HS03A 505 ivBRRG2	Outf (I/	low X s) 0.9 0.8 1.6 0.1 3.1 1.4 0.7 1.5 1.4	/elocity Fla (m/s) 0.384 0.082 0.539 0.528 0.439 0.453 0.455 0.613 1.784	0.018 0.016 0.032 0.011 0.072 0.070 0.022 0.086 0.045	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440 0.0705 0.0670 0.0028	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002	MI MI MI BR MI ICS	DS Node HS02 HS03 HS04 ivate perm HS03 CTP HS03A S05 ivBRRG2 S05	Outf (I/	low X s) 0.9 0.8 1.6 0.1 3.1 1.4 0.7 1.5 1.4 1.3	/elocity Fla (m/s) 0.384 0.082 0.539 0.528 0.439 0.453 0.455 0.613 1.784 0.907	0.018 0.016 0.032 0.011 0.072 0.070 0.022 0.086 0.045 0.076	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440 0.0705 0.0670 0.0028 0.0051	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000	MI MI MI BR MI ICS Pri ICS	DS Node HS02 HS03 HS04 ivate perm HS03A S05 ivBRRG2 S05 ivate perm	Outf (I/ 2	low X s) 0.9 0.8 1.6 0.1 3.1 1.4 0.7 1.5 1.4 1.3 0.0	/elocity Fla (m/s) 0.384 0.082 0.539 0.528 0.439 0.453 0.455 0.613 1.784 0.907 0.907	0.018 0.016 0.032 0.011 0.072 0.070 0.022 0.086 0.045 0.076 0.000	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440 0.0705 0.0670 0.0028 0.0051 0.0000	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001	MI MI MI BR MI ICS Pri ICS Pri	DS Node HS02 HS03 HS04 ivate perm HS03A S05 ivBRRG2 S05 ivate perm ivBRRG1	Outf (I/ 2	low X s) 0.9 0.8 1.6 0.1 3.1 1.4 0.7 1.5 1.4 1.3 0.0 1.6	/elocity Fla (m/s) 0.384 0.082 0.539 0.528 0.439 0.453 0.455 0.613 1.784 0.907 0.000 1.005	0.018 0.016 0.032 0.011 0.072 0.070 0.022 0.086 0.045 0.076 0.000 0.061	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440 0.0705 0.0670 0.0028 0.0051 0.0000 0.0078	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002	MI MI MI BR MI ICS Pri ICS Pri	DS Node HS02 HS03 HS04 ivate perm HS03A S05 ivBRRG2 S05 ivate perm ivBRRG1 S01	Outf (I/ 2	low X s) 0.9 0.8 1.6 0.1 3.1 1.4 0.7 1.5 1.4 1.3 0.0 1.6 1.6	/elocity         Flag           (m/s)         0.384           0.082         0.539           0.528         0.439           0.453         0.455           0.613         1.784           0.907         0.000           1.005         0.569	0.018 0.016 0.032 0.011 0.072 0.070 0.022 0.086 0.045 0.076 0.000 0.061 0.200	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440 0.0705 0.0670 0.0028 0.0051 0.0000 0.0078 0.0056	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000	MI MI MI BR MI ICS Pri ICS Pri ICS	DS Node HS02 HS03 HS04 ivate perm HS03A S05 ivBRRG2 S05 ivate perm ivBRRG1 S01 HS03A	Outf (I/ 2	low X s) 0.9 0.8 1.6 0.1 3.1 1.4 0.7 1.5 1.4 1.3 0.0 1.6 1.6 3.3	Velocity (m/s)         Flat 0.384           0.384         0.082           0.539         0.528           0.439         0.453           0.453         0.613           1.784         0.907           0.000         1.005           0.569         1.175	0.018 0.016 0.032 0.011 0.072 0.070 0.022 0.086 0.045 0.076 0.000 0.061 0.200 0.166	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440 0.0705 0.0670 0.0028 0.0051 0.0000 0.0078 0.0056 0.0056 0.0299	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A tTP	Outf (I/ 2	low X s) 0.9 0.8 1.6 0.1 3.1 1.4 0.7 1.5 1.4 1.3 0.0 1.6 1.6 3.3 0.9	Velocity (m/s)         Flat 0.384           0.384         0.082           0.539         0.539           0.528         0.439           0.453         0.455           0.613         1.784           0.907         0.000           1.005         0.569           1.175         0.944	0.018 0.016 0.032 0.011 0.072 0.070 0.022 0.086 0.045 0.076 0.000 0.061 0.200 0.166 0.032	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440 0.0705 0.0670 0.0028 0.0051 0.0000 0.0078 0.0056 0.0299 0.0123	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer 480 minute summer 480 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006	MI MI MI BR MI ICS Pri ICS MI BR	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A TP HS03A	Outf (I/ 2	low X s) 0.9 0.8 1.6 0.1 3.1 1.4 0.7 1.5 1.4 1.3 0.0 1.6 3.3 0.9 2.3	/elocity         Flag           (m/s)         0.384           0.082         0.539           0.528         0.439           0.453         0.455           0.613         1.784           0.907         0.000           1.005         0.569           1.175         0.944           0.860         0.860	0.018 0.016 0.032 0.011 0.072 0.070 0.022 0.086 0.045 0.076 0.000 0.061 0.200 0.166 0.032 0.099	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440 0.0705 0.0670 0.0028 0.0051 0.0000 0.0078 0.0078 0.0056 0.0299 0.0123 0.0123	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer 480 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PRIVATE PERM 3	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000	MI MI MI BR MI ICS Pri ICS MI BR MI BR	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A CTP HS03A CTP	<b>Outf</b> (I/ 2	low X s) 0.9 0.8 1.6 0.1 3.1 1.4 0.7 1.5 1.4 1.3 0.0 1.6 3.3 0.9 2.3 0.6	/elocity (m/s)         Flat 0.384           0.384         0.082           0.539         0.528           0.439         0.453           0.455         0.613           1.784         0.907           0.000         1.005           0.569         1.175           0.944         0.860           0.459         1.222	0.018         0.016         0.032         0.011         0.072         0.070         0.022         0.086         0.045         0.061         0.200         0.166         0.032         0.028	Link Vol (m³) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440 0.0705 0.0670 0.0028 0.0051 0.0000 0.0078 0.0056 0.0299 0.0123 0.2077 0.0239	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PRIVATE PERM 3 PP5	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000	MI MI MI BR MI ICS Pri ICS MI BR MI BR MI	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A CTP HS03B CTP HS03B CTP	Outf (I/ 2	low X s) 0.9 0.8 1.6 0.1 3.1 1.4 0.7 1.5 1.4 1.3 0.0 1.6 1.6 3.3 0.9 2.3 0.6 2.7	Velocity (m/s)         Flat 0.384           0.384         0.082           0.539         0.528           0.439         0.453           0.455         0.613           1.784         0.907           0.000         1.005           0.569         1.175           0.944         0.860           0.459         1.238	0.018 0.016 0.032 0.011 0.072 0.070 0.022 0.086 0.045 0.076 0.000 0.061 0.200 0.166 0.032 0.099 0.028 0.089 0.028	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440 0.0705 0.0670 0.0028 0.0051 0.0000 0.0078 0.0056 0.0299 0.0123 0.2077 0.0239 0.0305	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000	MI MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A tTP HS03B tTP HS03B tTP	Outf (I/ 2	low X s) 0.9 0.8 1.6 0.1 3.1 1.4 0.7 1.5 1.4 1.3 0.0 1.6 1.6 3.3 0.9 2.3 0.6 2.7 0.8	Velocity (m/s)         Flat 0.384           0.384         0.082           0.539         0.528           0.439         0.453           0.453         0.455           0.613         1.784           0.907         0.000           1.005         0.569           1.175         0.944           0.860         0.459           1.238         0.229	0.018 0.016 0.032 0.011 0.072 0.070 0.022 0.086 0.045 0.076 0.000 0.061 0.200 0.166 0.032 0.099 0.028 0.089 0.034	Link Vol (m³) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440 0.0705 0.0670 0.0028 0.0051 0.0000 0.0078 0.0056 0.0299 0.0123 0.2077 0.0239 0.0305 0.0446	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PP3 BRTP PP3 BRTP PP3 PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000 8.000_1 1.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI I MI	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A CTP HS03A CTP HS03B CTP HS03B HS03 HS03 HS03 HS03	Outf (I/ 2	low X s) 0.9 0.8 1.6 0.1 3.1 1.4 0.7 1.5 1.4 1.3 0.0 1.6 1.6 3.3 0.9 2.3 0.6 2.7 0.8 0.3 0.3	Velocity (m/s)         Flat 0.384           0.384         0.082           0.539         0.539           0.528         0.439           0.453         0.455           0.613         1.784           0.907         0.000           1.005         0.569           1.175         0.944           0.860         0.459           1.238         0.229           0.062         0.842	Dw/Cap           0.018           0.016           0.032           0.011           0.072           0.070           0.022           0.086           0.045           0.076           0.000           0.166           0.032           0.099           0.028           0.034           0.017	Link Vol (m³) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440 0.0705 0.0670 0.0028 0.0051 0.0000 0.0078 0.0056 0.0299 0.0123 0.2077 0.0239 0.0305 0.0446 0.0799	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000 8.000_1 1.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI BR	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A CTP HS03A CTP HS03B CTP HS03B CTP HS03 HS03 HS03 HS03 HS03 HS03 HS03 HS03	Outf (I/ 2	low X s) 0.9 0.8 1.6 0.1 3.1 1.4 0.7 1.5 1.4 1.3 0.0 1.6 1.6 3.3 0.9 2.3 0.6 2.7 0.8 0.3 0.2 2.2	Velocity (m/s)         Flat 0.384           0.384         0.082           0.539         0.539           0.528         0.439           0.453         0.455           0.613         1.784           0.907         0.000           1.005         0.569           1.175         0.944           0.860         0.459           1.238         0.229           0.062         0.848	0.018 0.016 0.032 0.011 0.072 0.070 0.022 0.086 0.045 0.076 0.045 0.076 0.045 0.076 0.045 0.076 0.0450	Link Vol (m³) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440 0.0705 0.0670 0.0028 0.0051 0.0000 0.0078 0.0056 0.0299 0.0123 0.2077 0.0239 0.0123 0.2077 0.0239 0.0305 0.0446 0.0799 0.0050	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PP5 GR4 GR3 NIW CD	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 8.000 12.000 8.000 12.000 8.000 2.000 1.000 8.000 2.000 1.	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI BR MI BR	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A CTP HS03A CTP HS03B CTP HS03B HS03 HS03 HS03 HS03 HS03 HS03 HS03	Outf (I/	low X s) 0.9 0.8 1.6 0.1 3.1 1.4 0.7 1.5 1.4 1.3 0.0 1.6 1.6 3.3 0.9 2.3 0.6 2.7 0.8 0.2 0.0 0.2 0.0	/elocity (m/s)         Flat 0.384           0.384         0.082           0.539         0.528           0.439         0.453           0.455         0.613           1.784         0.907           0.000         1.005           0.569         1.175           0.944         0.860           0.459         1.238           0.229         0.062           0.848         0.000	0.018         0.016         0.032         0.011         0.072         0.070         0.022         0.086         0.045         0.061         0.200         0.166         0.032         0.089         0.028         0.034         0.077         0.076	Link Vol (m³) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440 0.0705 0.0670 0.0028 0.0051 0.0000 0.0078 0.0056 0.0299 0.0123 0.2077 0.0239 0.0123 0.2077 0.0239 0.0305 0.0446 0.0799 0.0050 0.0708	Discharge Vol (m <sup>3</sup> ) 48.1
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PrivBRRG1 PP1 PP3 BRTP PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 4 PRIVATE PERM 4 PRIVATE PERM 4 PRIVATE PERM 4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000 8.000_1 1.000 9.000 2.000 2.000 2.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI BR MI BR MI BR	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A CTP HS03B CTP HS03B CTP HS03B CTP HS03 HS03 HS03 RG1 HS03 RG1 HS03	Outf (I/ 2	low X s) 0.9 0.8 1.6 0.1 3.1 1.4 0.7 1.5 1.4 1.3 0.0 1.6 1.6 3.3 0.9 2.3 0.6 2.7 0.8 0.3 0.2 0.0 0.0 0.0	Velocity (m/s)         Flat 0.384           0.384         0.082           0.539         0.528           0.439         0.453           0.455         0.613           1.784         0.907           0.000         1.005           0.569         1.175           0.944         0.860           0.459         1.238           0.229         0.062           0.848         0.000           0.000         0.282	Dw/Cap           0.018           0.016           0.032           0.011           0.072           0.070           0.022           0.086           0.045           0.076           0.000           0.166           0.032           0.099           0.028           0.089           0.034           0.017           0.078           0.000           0.000	Link Vol (m³) 0.6897 1.1955 0.0126 0.0021 0.0933 0.1440 0.0705 0.0670 0.0028 0.0051 0.0000 0.0078 0.0056 0.0299 0.0123 0.2077 0.0239 0.0123 0.2077 0.0239 0.0305 0.0446 0.0799 0.0305 0.0446 0.0799 0.0050	Discharge Vol (m <sup>3</sup> ) 48.1

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Page 11 Brookfield Storm Network

#### Results for 1 year Critical Storm Duration. Lowest mass balance: 95.68%

Node Event		US Node	Peak (mins)	Lev (n	vel n)	Dept (m)	h In	nflow (I/s)	Node Vol (m³)	Flood (m³)	Status
600 minute sum	mer	BRRG1	840	106	.311	0.01	1	0.2	0.5715	0.0000	OK
15 minute summ	ier	PP4	10	106	.419	0.01	9	2.4	0.0140	0.0000	ОК
Link Event	US	Lir	ık	DS	Out	flow	Velo	city	Flow/Cap	Link	Discharge
(Upstream Depth)	Nod	е	N	lode	(1)	(S)	(m/	s)		vol (m²)	Vol (m <sup>2</sup> )
600 minute summer	BRRG	61 1.00	01 M	HS01		0.2	0.3	332	0.011	0.0177	
15 minute summer	PP4	11.0	000 M	HS03		2.4	0.9	972	0.035	0.0650	



File: Drainage design R6.pfd Network: Storm Network Lydia Mugo 07/12/2023 Page 12 Brookfield Storm Network

Results for 5	year Critical Storm	Duration. Lowest	t mass balance: 95.68%

Node Event	US	F	Peak	Level (m)	Depth (m)	Inflov (I/s)	w Node	Flood (m <sup>3</sup> )	Stat	us
180 minute sum	mor MHSO1	i (i	278	106 / 11	0 5 3 5	(1/3)	7 0 6056		SURCHA	RGED
480 minute sum	mer MHS02		220	106.411	0.555	2.	1 0.0000	0.0000		
480 minute sum	mer MHS03		320	106.410	1 030	2. 1	1 1 1 755	0.0000		RGED
480 minute sum	mer MHS04		320	105 386	0.029	ч. 1	7 0.0000	0.0000		
960 minute sum	mer $GR^2$		1155	107.500	0.029	1.	1 0.0000	0.0000	OK	
180 minute sum	mer MHS03B		278	106 / 11	0.000	2	5 0.8037	0.0000		RGED
480 minute sum	mer MHS03A		326	106 /12	0./11	2. 1	6 0.0057	0.0000		PGED
480 minute sum	mer $ICS05$		336	106.412	0.412	1.	0 0.4038	0.0000		RGED
15 minute summ	ler ICS01		10	106.427	0.202	2	1 0.0118	0.0000		
15 minute summ	er private per	-m 2	10	107 288	0.037	2.	1 0.0410	0.0000	OK	
15 minute summ	er PrivBRRG2	111 2	10	106 423	0.010	2.	1 0.0171	0.0000	OK	
15 minute summ	er GR1		1	107 500	0.025	2.	0.1323	0.0000	OK	
15 minute summ	er nrivate ner	-m 1	10	107.070	0.000	2	4 0.0228	0.0000	OK	
15 minute summ	er PrivBRRG1		10	106.458	0.020	2.	4 0.0220 4 0.0851	0.0000	OK	
15 minute summ	er PP1		10	106 984	0.030	2. 5	0 0.0001	0.0000	OK	
15 minute summ	er PP3		10	106 565	0.004	1	3 0.0246	0.0000	OK	
480 minute sum	mer BRTP		328	106 411	0.010	4	0 11 5516	0.0000		RGED
15 minute summ	er PRIVATE PR	RM 3	10	106 665	0.015	ч. 1	0 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0 0 1 0	0.0000	OK	
15 minute summ	er PP5		10	107.075	0.015	1. 4	2 0.0136	0.0000	OK	
15 minute summ	er PRIVATE PR	RM 4	10	106.966	0.025	1	3 0.0123	0.0000	OK	
15 minute summ	er PRIVATE PR	RM 5	10	107.062	0.012	0	5 0.0066	0.0000	OK	
720 minute sum	mer GR4		885	107 510	0.009	0.	2 1 1 9 5 8	0.0000	OK	
15 minute summ	er GR3		1	107.510	0.000	0.	0 0 0000	0.0000	OK	
15 minute summ	er NFW PP		1	107 500	0.000	0.	0 0,000	0.0000	OK	
480 minute sum	mer BRRG2		328	106 410	0.000	1	2 1 4 5 7 9	0.0000	OK	
	Diritor		020	100.110	0.110	<u> </u>	2 1.1075	0.0000	ÖN	
								_		
Link Event	US	Link		DS	Outf	low \	Velocity F	ow/Cap	Link	Discharge
Link Event (Upstream Depth)	US Node	Link		DS Node	Outf (I/	low s)	Velocity Fl (m/s)	ow/Cap	Link Vol (m³)	Discharge Vol (m <sup>3</sup> )
Link Event (Upstream Depth) 480 minute summer	US Node MHS01	Link	MI	DS Node HS02	Outf (I/	low v s) -2.1	Velocity Fl (m/s) 0.381	ow/Cap	Link Vol (m <sup>3</sup> ) 0.6897	Discharge Vol (m³)
Link Event (Upstream Depth) 480 minute summer 480 minute summer	US Node MHS01 MHS02	Link 1 1.003	MI	DS Node HS02 HS03	Outf (I/	low s) -2.1 -2.1	Velocity Fl (m/s) 0.381 0.266	ow/Cap -0.043 -0.044	Link Vol (m <sup>3</sup> ) 0.6897 1.1955	Discharge Vol (m <sup>3</sup> )
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer	US Node MHS01 MHS02 MHS03	Link 1 1.003 1.004	MI MI	DS Node HS02 HS03 HS04	Outf (I/	low s) -2.1 -2.1 1.7	Velocity F (m/s) 0.381 0.266 0.546	ow/Cap -0.043 -0.044 0.034	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129	Discharge Vol (m <sup>3</sup> ) 57.7
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer	US Node MHS01 MHS02 MHS03 GR2	Link 1 1.003 1.004 5.000	MI MI MI	DS Node HS02 HS03 HS04 ivate perm	Outf (I/	low s) -2.1 -2.1 1.7 0.1	Velocity F (m/s) 0.381 0.266 0.546 0.528	ow/Cap -0.043 -0.044 0.034 0.011	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023	Discharge Vol (m <sup>3</sup> ) 57.7
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 960 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B	Link 1 1.003 1.004 5.000 4.007	MI MI pri MI	DS Node HS02 HS03 HS04 ivate perm HS03	<b>Outf</b> (I/	low s) -2.1 -2.1 1.7 0.1 2.8	Velocity Fl (m/s) 0.381 0.266 0.546 0.528 0.218	ow/Cap -0.043 -0.044 0.034 0.011 0.065	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933	Discharge Vol (m <sup>3</sup> ) 57.7
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A	Link 1 1.003 1.004 5.000 4.007 4.005	MI MI MI BR	DS Node HS02 HS03 HS04 ivate perm HS03 TP	Outf (l/ 2	low (* * * * * * * * * * * * * * * * * * *	Velocity F (m/s) 0.381 0.266 0.546 0.528 0.218 0.472	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440	Discharge Vol (m <sup>3</sup> ) 57.7
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05	Link 1 1.003 1.004 5.000 4.007 4.005 4.004	MI MI MI BR MI	DS Node HS02 HS03 HS04 ivate perm HS03 ATP HS03A	Outf (I/	low s) -2.1 -2.1 1.7 0.1 2.8 1.4 0.8	Velocity F (m/s) 0.381 0.266 0.546 0.528 0.218 0.472 0.463	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071 0.024	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440 0.0705	Discharge Vol (m <sup>3</sup> ) 57.7
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003	MI MI MI BR MI	DS Node HS02 HS03 HS04 ivate perm HS03 TP HS03A 505	Outf (I/	low Y s) -2.1 -2.1 1.7 0.1 2.8 1.4 0.8 2.3	Velocity F (m/s) 0.381 0.266 0.546 0.528 0.218 0.472 0.463 0.687	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071 0.024 0.129	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440 0.0705 0.0899	Discharge Vol (m <sup>3</sup> ) 57.7
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001	MI MI MI BR MI ICS	DS Node HS02 HS03 HS04 ivate perm HS03 TP HS03A S05 ivBRRG2	Outf (I/	low Y s) -2.1 -2.1 1.7 0.1 2.8 1.4 0.8 2.3 2.1	Velocity F (m/s) 0.381 0.266 0.546 0.528 0.218 0.472 0.463 0.687 1.924	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071 0.024 0.129 0.067	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440 0.0705 0.0899 0.0038	Discharge Vol (m <sup>3</sup> ) 57.7
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002	MI MI MI BR MI ICS Pri	DS Node HS02 HS03 HS04 ivate perm HS03 CTP HS03A S05 ivBRRG2 S05	Outf (I/ 2	low Y s) -2.1 1.7 0.1 2.8 1.4 0.8 2.3 2.1 2.0	Velocity Fl (m/s) 0.381 0.266 0.546 0.528 0.218 0.472 0.463 0.687 1.924 1.027	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071 0.024 0.129 0.067 0.118	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440 0.0705 0.0899 0.0038 0.0068	Discharge Vol (m <sup>3</sup> ) 57.7
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000	MI MI MI BR MI ICS Pri ICS	DS Node HS02 HS03 HS04 ivate perm HS03 CTP HS03A S05 ivBRRG2 S05 ivate perm	Outf (I/ 2	low Y s) -2.1 1.7 0.1 2.8 1.4 0.8 2.3 2.1 2.0 0.0	Velocity (m/s) 0.381 0.266 0.546 0.528 0.218 0.472 0.463 0.687 1.924 1.027 0.000	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071 0.024 0.129 0.067 0.118 0.000	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440 0.0705 0.0899 0.0038 0.0068 0.0000	Discharge Vol (m <sup>3</sup> ) 57.7
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001	MI MI MI BR MI ICS Pri ICS Pri	DS Node HS02 HS03 HS04 ivate perm HS03A S05 ivBRRG2 S05 ivate perm ivBRRG1	Outf (I/ 2	low Y s) -2.1 1.7 0.1 2.8 1.4 0.8 2.3 2.1 2.0 0.0 2.4 2.4	Velocity (m/s) 0.381 0.266 0.546 0.528 0.218 0.472 0.463 0.687 1.924 1.027 0.000 1.360	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071 0.024 0.129 0.067 0.118 0.000 0.091	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440 0.0705 0.0899 0.0038 0.0068 0.0000 0.0102	Discharge Vol (m <sup>3</sup> ) 57.7
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.001	MI MI MI BR MI ICS Pri ICS Pri	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501	<b>Outf</b> (I/ 2	low Y s) -2.1 -2.1 1.7 0.1 2.8 1.4 0.8 2.3 2.1 2.0 0.0 2.4 2.4 2.4	Velocity (m/s) 0.381 0.266 0.546 0.528 0.218 0.472 0.463 0.687 1.924 1.027 0.000 1.360 0.652	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071 0.024 0.129 0.067 0.118 0.000 0.091 0.302	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440 0.0705 0.0899 0.0038 0.0068 0.0000 0.0102 0.0073	Discharge Vol (m <sup>3</sup> ) 57.7
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000	MI MI MI BR MI ICS Pri ICS Pri	DS Node HS02 HS03 HS04 ivate perm HS03A S05 ivBRRG2 S05 ivate perm ivBRRG1 S01	Outf (I/ 2	low Y s) -2.1 -2.1 1.7 0.1 2.8 1.4 0.8 2.3 2.1 2.0 0.0 2.4 2.4 5.0	Velocity (m/s) 0.381 0.266 0.546 0.528 0.218 0.472 0.463 0.687 1.924 1.027 0.000 1.360 0.652 1.245	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071 0.024 0.129 0.067 0.118 0.000 0.091 0.302 0.252	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440 0.0705 0.0899 0.0038 0.0068 0.0000 0.0102 0.0073 0.0405	Discharge Vol (m <sup>3</sup> ) 57.7
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR	DS Node HS02 HS03 HS04 ivate perm HS03A S05 ivBRRG2 S05 ivate perm ivBRRG1 S01 HS03A CTP	Outf (I/ 2	low Y s) -2.1 -2.1 1.7 0.1 2.8 1.4 0.8 2.3 2.1 2.0 0.0 2.4 2.4 5.0 1.3	Velocity (m/s) 0.381 0.266 0.546 0.528 0.218 0.472 0.463 0.687 1.924 1.027 0.000 1.360 0.652 1.245 0.973	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071 0.024 0.129 0.067 0.118 0.000 0.091 0.302 0.252 0.046	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440 0.0705 0.0899 0.0038 0.0068 0.0000 0.0102 0.0073 0.0405 0.0130	Discharge Vol (m <sup>3</sup> ) 57.7
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer 480 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006	MI MI MI BR MI ICS Pri ICS MI BR	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A tTP HS03A	Outf (I/ 2	low Y s) -2.1 1.7 0.1 2.8 1.4 0.8 2.3 2.1 2.0 0.0 2.4 2.4 5.0 1.3 2.5	Velocity (m/s) 0.381 0.266 0.546 0.528 0.218 0.472 0.463 0.687 1.924 1.027 0.000 1.360 0.652 1.245 0.973 0.856	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071 0.024 0.129 0.067 0.118 0.000 0.091 0.302 0.252 0.046 0.106	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440 0.0705 0.0899 0.0038 0.0068 0.0000 0.0102 0.0073 0.0405 0.0130 0.0130	Discharge Vol (m <sup>3</sup> ) 57.7
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 1 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PRIVATE PERM 3	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 5.000	MI MI MI BR MI ICS Pri ICS MI BR MI BR	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A TP HS03A TP	<b>Outf</b> (I/ 2	low Y s) -2.1 1.7 0.1 2.8 1.4 0.8 2.3 2.1 2.0 0.0 2.4 2.4 5.0 1.3 2.5 1.0	Velocity (m/s) 0.381 0.266 0.546 0.528 0.218 0.472 0.463 0.687 1.924 1.027 0.000 1.360 0.652 1.245 0.973 0.856 0.608	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071 0.024 0.129 0.067 0.118 0.000 0.091 0.302 0.252 0.046 0.106 0.106 0.046	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440 0.0705 0.0899 0.0038 0.0008 0.0000 0.0102 0.0073 0.0405 0.0130 0.2077 0.2255	Discharge Vol (m <sup>3</sup> ) 57.7
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PRIVATE PERM 3 PP5	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000	MI MI MI BR MI ICS Pri ICS MI BR MI BR MI	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A CTP HS03B CTP HS03B	<b>Outf</b> (I/ 2	low Y s) -2.1 1.7 0.1 2.8 1.4 0.8 2.3 2.1 2.0 0.0 2.4 2.4 5.0 1.3 2.5 1.0 4.2	Velocity (m/s) 0.381 0.266 0.546 0.528 0.218 0.472 0.463 0.687 1.924 1.027 0.000 1.360 0.652 1.245 0.973 0.856 0.608 1.323	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071 0.024 0.129 0.067 0.118 0.000 0.091 0.302 0.252 0.046 0.106 0.046 0.138	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440 0.0705 0.0899 0.0038 0.0008 0.0000 0.0102 0.0073 0.0405 0.0130 0.2077 0.0255 0.0319	Discharge Vol (m <sup>3</sup> ) 57.7
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000	MI MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A CTP HS03B CTP HS03B CTP HS03 HS03	Outf (I/ 2	low Y -2.1 -2.1 1.7 0.1 2.8 1.4 0.8 2.3 2.1 2.0 0.0 2.4 2.4 5.0 1.3 2.5 1.0 4.2 1.3 2.5	Velocity (m/s) 0.381 0.266 0.546 0.528 0.218 0.472 0.463 0.687 1.924 1.027 0.000 1.360 0.652 1.245 0.973 0.856 0.608 1.323 0.250	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071 0.024 0.129 0.067 0.118 0.000 0.091 0.302 0.252 0.046 0.106 0.046 0.138 0.055	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440 0.0705 0.0899 0.0038 0.0008 0.0000 0.0102 0.0073 0.0405 0.0130 0.2077 0.0255 0.0319 0.0458	Discharge Vol (m <sup>3</sup> )
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 4.000	MI MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI 1 MI	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A tTP HS03A tTP HS03B tTP HS03B tTP HS03 HS03 HS03	Outf (I/ 2	low ( s) -2.1 -2.1 1.7 0.1 2.8 1.4 0.8 2.3 2.1 2.0 0.0 2.4 2.4 5.0 1.3 2.5 1.0 4.2 1.3 0.5	Velocity (m/s) 0.381 0.266 0.546 0.528 0.218 0.472 0.463 0.687 1.924 1.027 0.000 1.360 0.652 1.245 0.973 0.856 0.608 1.323 0.250 0.100	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071 0.024 0.129 0.067 0.118 0.000 0.091 0.302 0.252 0.046 0.106 0.046 0.138 0.055 0.028	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440 0.0705 0.0899 0.0038 0.0068 0.0000 0.0102 0.0073 0.0405 0.0130 0.2077 0.0255 0.0319 0.0458 0.0813	Discharge Vol (m <sup>3</sup> )
Link Event (Upstream Depth) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 1 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PRIVATE PERM 4 PP5 PRIVATE PERM 4 PRIVATE PERM 4 PRIVATE PERM 4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000 8.000_ 1.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI BR	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A TP HS03A TP HS03B TP HS03B TP HS03 HS03 HS03 HS03 HS03	Outf (I/ 2	low ( s) -2.1 -2.1 1.7 0.1 2.8 1.4 0.8 2.3 2.1 2.0 0.0 2.4 2.4 5.0 1.3 2.5 1.0 4.2 1.3 0.5 0.2	Velocity (m/s) 0.381 0.266 0.546 0.528 0.218 0.472 0.463 0.687 1.924 1.027 0.000 1.360 0.652 1.245 0.973 0.856 0.608 1.323 0.250 0.100 0.848	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071 0.024 0.129 0.067 0.118 0.000 0.091 0.302 0.252 0.046 0.106 0.046 0.138 0.055 0.028 0.078	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440 0.0705 0.0899 0.0038 0.0068 0.0000 0.0102 0.0073 0.0405 0.0130 0.0405 0.0130 0.2077 0.0255 0.0319 0.0458 0.0813 0.0186	Discharge Vol (m <sup>3</sup> )
Link Event (Upstream Depth)) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 1 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 4 PRIVATE PERM 4 PRIVATE PERM 4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 5.000 1.000 9.000 9.000	MI MI MI BR MI ICS Pri ICS MI BR MI BR MI BR MI 1 MI 1 MI	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A CTP HS03A CTP HS03B CTP HS03B CTP HS03 HS03 HS03 HS03 HS03 HS03 HS03	Outf (I/ 2	low Y s) -2.1 1.7 0.1 2.8 1.4 0.8 2.3 2.1 2.0 0.0 2.4 2.4 5.0 1.3 2.5 1.0 4.2 1.3 0.5 0.2 0.0	Velocity (m/s) 0.381 0.266 0.546 0.528 0.218 0.472 0.463 0.687 1.924 1.027 0.000 1.360 0.652 1.245 0.973 0.856 0.608 1.323 0.250 0.100 0.848 0.000 0.848 0.000	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071 0.024 0.129 0.067 0.118 0.000 0.091 0.302 0.252 0.046 0.106 0.046 0.108 0.046 0.138 0.055 0.028 0.078 0.000	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440 0.0705 0.0899 0.0038 0.0000 0.0102 0.0073 0.0405 0.0130 0.2077 0.0255 0.0319 0.0458 0.0813 0.0186 0.0708	Discharge Vol (m <sup>3</sup> ) 57.7
Link Event (Upstream Depth)) 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 480 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 1 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PP1 PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 4 PRIVATE PERM 5 GR4 GR3 NEW PP	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 8.000 10.000 9.000 2.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI BR MI BR MI BR	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A CTP HS03A CTP HS03B CTP HS03B CTP HS03B CTP HS03B CTP HS03 CTP HS03B CTP HS03B CTP HS03 CTP HS05 CTP HS05 CTP HS05 CTP HS05 CTP HS05 CTP HS05 CTP HS05 CTP HS05 C	Outf (I/ 2	low Y s) -2.1 1.7 0.1 2.8 1.4 0.8 2.3 2.1 2.0 0.0 2.4 2.4 5.0 1.3 2.5 1.0 4.2 1.3 0.5 0.2 0.0 0.0 2.4	Velocity (m/s) 0.381 0.266 0.546 0.528 0.218 0.472 0.463 0.687 1.924 1.027 0.000 1.360 0.652 1.245 0.973 0.856 0.608 1.323 0.250 0.100 0.848 0.000 0.000 0.000	ow/Cap -0.043 -0.044 0.034 0.011 0.065 0.071 0.024 0.129 0.067 0.118 0.000 0.091 0.302 0.252 0.046 0.106 0.106 0.106 0.138 0.055 0.028 0.078 0.000 0.000 0.000	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0129 0.0023 0.0933 0.1440 0.0705 0.0899 0.0038 0.0008 0.0000 0.0102 0.0073 0.0405 0.0102 0.0130 0.2077 0.0255 0.0319 0.0458 0.0319 0.0458 0.0319 0.0458 0.0319	Discharge Vol (m <sup>3</sup> )

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Page 13 Brookfield Storm Network

#### Results for 5 year Critical Storm Duration. Lowest mass balance: 95.68%

Node Event		US Node	Peak (mins)	Le <sup>r</sup> (r	vel n)	Dept (m)	h Inflov (I/s)	v Node Vol (m³)	Flood (m³)	Status
480 minute sumr	ner	BRRG1	336	106	.411	0.11	1 2.0	5 5.5376	0.0000	ОК
15 minute summ	er	PP4	10	106	.424	0.02	4 3.7	0.0207	0.0000	ОК
Link Event (Upstream Depth)	US Nod	6 Lii Ie	nk M	DS Node	Outi (I/	flow ′s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m <sup>3</sup> )
480 minute summer	BRR	G1 1.0	01 N	1HS01	.,	-2.4	0.345	-0.135	0.0973	. ,
15 minute summer	PP4	11.	000 N	1HS03		3.7	0.944	0.053	0.0666	



Page 14 Brookfield Storm Network

## Results for 10 year Critical Storm Duration. Lowest mass balance: 95.68%

Node Event	US Node	P	eak	Level	Depth	Inflow	Vol (m <sup>3</sup> )	Flood	Stat	us
600 minute sum	mer MHS01	(1)	420	106 466	0 591	(1/3)		0,0000	SURCHA	RGED
600 minute sum	mer MHS02		420	106.466	0.351	2.1	0.00000	0.0000	SURCHA	RGED
600 minute sum	mer MHS03		420	106 466	1 095	4 -	3 1 2 3 8 6	0.0000	SURCHA	RGED
600 minute sum	mer MHS04		420	105 386	0.029	1.5	7 0.0000	0.0000	OK	NGLD
960 minute sum	mer GR2		1170	107.508	0.008	0.1	0.4473	0.0000	OK	
600 minute sum	mer MHS03B	-	420	106.466	0.766	2.6	5 0.8668	0.0000	SURCHA	RGFD
600 minute sum	mer MHS03A		420	106.467	0.467	1.7	0.5281	0.0000	SURCHA	RGFD
600 minute sum	mer ICS05		420	106.467	0.337	0.9	0.3811	0.0000	SURCHA	RGED
600 minute sum	mer ICS01		420	106.467	0.067	0.4	4 0.0757	0.0000	OK	
15 minute summ	er private pern	n 2	10	107.289	0.019	2.4	4 0.0193	0.0000	OK	
600 minute sum	mer PrivBRRG2		420	106.467	0.067	0.5	5 0.3804	0.0000	OK	
15 minute summ	er GR1		1	107.500	0.000	0.0	0.0000	0.0000	OK	
15 minute summ	er private pern	n 1	10	107.072	0.022	2.7	7 0.0255	0.0000	OK	
600 minute sum	mer PrivBRRG1		420	106.467	0.067	0.4	1 0.0991	0.0000	OK	
15 minute summ	er PP1		10	106.987	0.037	5.8	3 0.0191	0.0000	OK	
15 minute summ	er PP3		10	106.566	0.016	1.6	5 0.0299	0.0000	OK	
600 minute sum	mer BRTP		420	106.467	0.567	4.1	l 12.8102	0.0000	SURCHA	RGED
15 minute summ	er PRIVATE PEF	RM 3	10	106.665	0.015	1.1	L 0.0114	0.0000	ОК	
15 minute summ	er PP5		10	107.077	0.027	4.8	3 0.0154	0.0000	OK	
15 minute summ	er PRIVATE PEF	RM 4	10	106.967	0.017	1.5	5 0.0140	0.0000	OK	
30 minute summ	er PRIVATE PEF	RM 5	18	107.062	0.012	0.5	5 0.0066	0.0000	OK	
720 minute sum	mer GR4		885	107.510	0.009	0.2	2 1.1958	0.0000	OK	
15 minute summ	er GR3		1	107.500	0.000	0.0	0.0000	0.0000	OK	
15 minute summ	er NEW PP		1	107.500	0.000	0.0	0.0000	0.0000	OK	
600 minute sum	mer BRRG2		420	106.466	0.166	0.8	3 2.1938	0.0000	ОК	
Link Event	US	Link		DS	Outf	low V	elocity Flo	ow/Cap	Link	Discharge
Link Event (Upstream Depth)	US Node	Link		DS Node	Outf (I/:	low V s)	/elocity Flo (m/s)	ow/Cap	Link Vol (m³)	Discharge Vol (m³)
Link Event (Upstream Depth) 600 minute summer	US Node MHS01	Link	МІ	DS Node HS02	Outf (I/:	low V s) -2.4	<b>/elocity Flo</b> (m/s) 0.387	<b>ow/Cap</b> -0.050	Link Vol (m³) 0.6897	Discharge Vol (m³)
Link Event (Upstream Depth) 600 minute summer 600 minute summer	US Node MHS01 MHS02	Link 1 1.003	MI	DS Node HSO2 HSO3	Outf (I/	low V s) -2.4 -2.5	<b>/elocity Flo</b> (m/s) 0.387 0.072	-0.050 -0.051	Link Vol (m <sup>3</sup> ) 0.6897 1.1955	Discharge Vol (m³)
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03	Link 1 1.003 1.004	MI MI MI	<b>DS</b> <b>Node</b> HS02 HS03 HS04	Outf (I/:	low V s) -2.4 -2.5 1.7	<b>/elocity Flo</b> (m/s) 0.387 0.072 0.550	-0.050 -0.051 0.035	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0132	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2	Link 1 1.003 1.004 5.000	MI MI MI	DS Node HS02 HS03 HS04	Outf (I/	low V s) -2.4 -2.5 1.7 0.1	<b>/elocity Fla</b> (m/s) 0.387 0.072 0.550 0.528	-0.050 -0.051 0.035 0.011	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0132	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth) 600 minute summer 600 minute summer 960 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B	Link 1 1.003 1.004 5.000 4.007	MI MI MI pri MI	DS Node HS02 HS03 HS04 ivate perm 1 HS03	Outf (I/	low V s) -2.4 -2.5 1.7 0.1 2.5	<b>Velocity</b> Fla (m/s) 0.387 0.072 0.550 0.528 0.143	-0.050 -0.051 0.035 0.011 0.059	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0132 0.0023 0.0933	Discharge Vol (m³) 69.2
Link Event (Upstream Depth) 600 minute summer 600 minute summer 960 minute summer 600 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A	Link 1 1.003 1.004 5.000 4.007 4.005	MI MI pri MI BR	DS Node HS02 HS03 HS04 ivate perm HS03	Outf (1/:	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6	<b>Velocity</b> Flo (m/s) 0.387 0.072 0.550 0.528 0.143 0.458	-0.050 -0.051 0.035 0.011 0.059 0.080	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05	Link 1 1.003 1.004 5.000 4.007 4.005 4.004	MI MI MI BR MI	DS Node HS02 HS03 HS04 ivate perm 1 HS03 ITP HS03A	Outf (I/	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8	<b>Velocity</b> Fla (m/s) 0.387 0.072 0.550 0.528 0.143 0.458 0.437	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth) 600 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003	MI MI MI BR MI	DS Node HS02 HS03 HS04 ivate perm i HS03 KTP HS03A 505	Outf (I/	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8 0.4	Yelocity Fla (m/s) 0.387 0.072 0.550 0.528 0.143 0.458 0.437 0.359	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023 0.022	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705 0.3377	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001	MI MI MI BR MI ICS Pri	DS Node HS02 HS03 HS04 ivate perm i HS03 KTP HS03A 505 ivBRRG2	<b>Outf</b> (I/ 2	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8 0.4 2.4	Yelocity Fla (m/s) 0.387 0.072 0.550 0.528 0.143 0.458 0.437 0.359 1.994	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023 0.022 0.077	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705 0.3377 0.0042	Discharge Vol (m³) 69.2
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002	MI MI MI BR MI ICS Pri	DS Node HS02 HS03 HS04 ivate perm 1 HS03 TP HS03A 505 ivBRRG2 505	Outf (1/	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8 0.4 2.4 0.5	Yelocity Fla (m/s) 0.387 0.072 0.550 0.528 0.143 0.458 0.437 0.359 1.994 0.668	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023 0.022 0.077 0.029	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705 0.3377 0.0042 0.0227	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000	MI MI MI BR MI ICS Pri ICS pri	DS Node HS02 HS03 HS04 ivate perm HS03A TP HS03A 505 ivBRRG2 505 ivate perm	Outf (1/ 2	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8 0.4 2.4 0.5 0.0	Yelocity Fla (m/s) 0.387 0.072 0.550 0.528 0.143 0.458 0.437 0.359 1.994 0.668 0.000	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023 0.022 0.077 0.029 0.000	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705 0.3377 0.0042 0.0227 0.0000	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001	MI MI MI BR MI ICS Pri ICS Pri Pri	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1	Outf (1/ 2	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8 0.4 2.4 0.5 0.0 2.7	Yelocity (m/s) 0.387 0.072 0.550 0.528 0.143 0.458 0.437 0.359 1.994 0.668 0.000 1.360	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023 0.022 0.077 0.029 0.000 0.102	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705 0.3377 0.0042 0.0227 0.0000 0.0110	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002	MI MI MI BR MI ICS Pri Pri ICS	DS Node HS02 HS03 HS04 ivate perm HS03A S05 ivBRRG2 S05 ivate perm ivBRRG1 S01	Outf (1/ 2	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8 0.4 2.4 0.5 0.0 2.7 0.4	Yelocity (m/s) 0.387 0.072 0.550 0.528 0.143 0.458 0.437 0.359 1.994 0.668 0.000 1.360 0.340	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023 0.022 0.077 0.029 0.000 0.102 0.051	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705 0.3377 0.0042 0.0227 0.0000 0.0110 0.0112	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000	MI MI MI BR MI ICS Pri ICS MI	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A	Outf (1/ 2	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8 0.4 2.4 0.5 0.0 2.7 0.4 5.8	Yelocity (m/s) 0.387 0.072 0.550 0.528 0.143 0.458 0.437 0.359 1.994 0.668 0.000 1.360 0.340 1.260	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023 0.022 0.077 0.029 0.000 0.102 0.051 0.292	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705 0.3377 0.0042 0.0227 0.0000 0.0110 0.0112 0.0441	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000	MI MI MI BR MI ICS Pri ICS MI BR	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A cTP	Outf (1/ 2	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8 0.4 2.4 0.5 0.0 2.7 0.4 5.8 1.6	Yelocity (m/s) 0.387 0.072 0.550 0.528 0.143 0.458 0.437 0.359 1.994 0.668 0.000 1.360 0.340 1.260 1.029	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023 0.022 0.077 0.029 0.000 0.102 0.051 0.292 0.057	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705 0.3377 0.0042 0.0227 0.0000 0.0110 0.0112 0.0441 0.0132	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006	MI MI MI BR MI ICS Pri ICS MI BR MI	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A CTP HS03A	Outf (1/ 2	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8 0.4 2.4 0.5 0.0 2.7 0.4 5.8 1.6 2.6	Yelocity (m/s) 0.387 0.072 0.550 0.528 0.143 0.458 0.437 0.359 1.994 0.668 0.000 1.360 0.340 1.260 1.029 0.832	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023 0.022 0.077 0.029 0.000 0.102 0.051 0.292 0.057 0.111	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705 0.3377 0.0042 0.0227 0.0000 0.0110 0.0112 0.0441 0.0132 0.2077	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PRIVATE PERM 3	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000	MI MI MI BR MI ICS Pri ICS MI BR MI BR	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A tTP HS03A tTP	Outf (I/ 2	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8 0.4 2.4 0.5 0.0 2.7 0.4 5.8 1.6 2.6 1.1	Velocity (m/s)         Flat 0.387           0.387         0.072           0.550         0.528           0.143         0.458           0.437         0.359           1.994         0.668           0.000         1.360           0.340         1.260           1.029         0.832           0.534         0.534	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023 0.022 0.077 0.029 0.000 0.102 0.051 0.292 0.057 0.111 0.051	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705 0.3377 0.0042 0.0227 0.0000 0.0110 0.0112 0.0441 0.0132 0.2077 0.0256	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PP3 BRTP PRIVATE PERM 3 PP5	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A CTP HS03B CTP HS03B	Outf (1/2	low V 5) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8 0.4 2.4 0.5 0.0 2.7 0.4 5.8 1.6 2.6 1.1 4.8	Velocity (m/s)         Flat 0.387           0.387         0.072           0.550         0.550           0.528         0.143           0.458         0.437           0.359         1.994           0.668         0.000           1.360         0.340           1.260         1.029           0.832         0.534           1.253         0.534	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023 0.022 0.077 0.029 0.000 0.102 0.051 0.292 0.057 0.111 0.051 0.158	Link Vol (m³) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705 0.3377 0.0042 0.0227 0.0000 0.0110 0.0112 0.0441 0.0132 0.2077 0.0256 0.0325	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000	MI MI MI BR MI ICS Pri ICS MI BR MI BR MI MI	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A CTP HS03B CTP HS03B CTP HS03 HS03 HS03	Outf (1/ 2	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8 0.4 2.4 0.5 0.0 2.7 0.4 5.8 1.6 2.6 1.1 4.8 1.5	<pre>/elocity (m/s) 0.387 0.072 0.550</pre> 0.528 0.143 0.458 0.437 0.359 1.994 0.668 0.000 1.360 0.340 1.260 1.029 0.832 0.534 1.253 0.335	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023 0.022 0.077 0.029 0.000 0.102 0.051 0.292 0.057 0.111 0.051 0.158 0.064	Link Vol (m³) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705 0.3377 0.0042 0.0227 0.0000 0.0110 0.0112 0.0441 0.0132 0.2077 0.0256 0.0325 0.0463	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth)) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PP1 PP3 BRTP PP1 PP3 PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 8.000 8.000 2.000 8.00	MI MI MI Pri ICS Pri ICS MI BR MI BR MI L MI	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A CTP HS03A CTP HS03B CTP HS03B HS03 HS03 HS03	Outf (I/ 2	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8 0.4 2.4 0.5 0.0 2.7 0.4 5.8 1.6 2.6 1.1 4.8 1.5 0.5	Velocity (m/s)         Flat 0.387           0.387         0.072           0.550         0.550           0.528         0.143           0.437         0.359           1.994         0.668           0.000         1.360           0.340         1.260           1.029         0.832           0.534         1.253           0.335         0.100	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023 0.022 0.077 0.029 0.000 0.102 0.051 0.292 0.057 0.111 0.051 0.158 0.064 0.028	Link Vol (m³) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705 0.3377 0.0042 0.0227 0.0000 0.0110 0.0112 0.0441 0.0132 0.2077 0.0256 0.0325 0.0463 0.0813	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PP1 PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000 8.000_1 1.000	MI MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI BR MI BR MI BR	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A CTP HS03B CTP HS03B CTP HS03B CTP HS03 HS03 HS03 HS03 CRG1	Outf (I/ 2	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8 0.4 2.4 0.5 0.0 2.7 0.4 5.8 1.6 2.6 1.1 4.8 1.5 0.5 0.2	Velocity (m/s)         Flat 0.387           0.387         0.072           0.550         0.550           0.528         0.143           0.437         0.359           1.994         0.668           0.000         1.360           0.340         1.260           1.029         0.832           0.534         1.253           0.335         0.100           0.848	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023 0.022 0.077 0.029 0.000 0.102 0.051 0.292 0.051 0.292 0.057 0.111 0.051 0.158 0.064 0.028 0.078	Link Vol (m³) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705 0.3377 0.0042 0.0227 0.0000 0.0110 0.0112 0.0441 0.0132 0.2077 0.0256 0.0325 0.0463 0.0813 0.0186	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth)) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 4 PRIVATE PERM 4 PRIVATE PERM 4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000 8.000_2 1.000 9.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI BR MI BR MI BR MI	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A TP HS03B TP HS03B TP HS03 HS03 HS03 HS03 HS03 HS03 HS03	Outf (I/ 2	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8 0.4 2.4 0.5 0.0 2.7 0.4 5.8 1.6 2.6 1.1 4.8 1.5 0.2 0.2 0.0	Velocity (m/s)         Flat 0.387           0.387         0.072           0.550         0.528           0.143         0.458           0.437         0.359           1.994         0.668           0.000         1.360           0.340         1.260           1.029         0.832           0.534         1.253           0.335         0.100           0.848         0.000	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023 0.022 0.077 0.029 0.000 0.102 0.051 0.292 0.051 0.292 0.057 0.111 0.292 0.057 0.111 0.292 0.057 0.111 0.292 0.057 0.111 0.292 0.057 0.111 0.292 0.057 0.111 0.292 0.051	Link Vol (m³) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705 0.3377 0.0042 0.0227 0.0000 0.0110 0.0112 0.0441 0.0132 0.2077 0.0256 0.0325 0.0463 0.0813 0.0186 0.0708	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth)) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PP3 BRTP PP1 PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 4 PRIVATE PERM 4 PRIVATE PERM 5 MA	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000 8.000_2 1.000 9.000 2.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI BR MI BR MI BR	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A CTP HS03A CTP HS03B CTP HS03B CTP HS03 HS03 HS03 HS03 HS03 HS03 HS03 HS03	Outf (1/2 2	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8 0.4 2.4 0.5 0.0 2.7 0.4 5.8 1.6 2.6 1.1 4.8 1.5 0.5 0.2 0.0 0.0 0.1 2.5 1.7 0.1 2.5 1.6 0.8 0.4 2.7 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.5 0.2 0.1 0.4 5.8 1.5 0.5 0.4 5.8 1.5 0.5 0.2 0.5 0.4 5.8 1.5 0.5 0.5 0.5 0.4 5.8 1.6 0.5 0.4 5.8 1.6 0.5 0.4 5.8 1.6 0.5 0.4 0.5 0.4 1.5 0.5 0.5 0.5 0.5 0.5 0.5 0.4 1.5 0.5 0.5 0.5 0.5 0.5 0.5 0.5 0	Velocity (m/s)         Flat 0.387           0.387         0.072           0.550         0.550           0.528         0.143           0.458         0.437           0.359         1.994           0.668         0.000           1.360         0.340           1.260         1.029           0.832         0.534           0.253         0.100           0.848         0.000           0.000         0.000	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023 0.022 0.077 0.029 0.000 0.102 0.051 0.292 0.057 0.111 0.292 0.057 0.111 0.051 0.158 0.064 0.028 0.078 0.000 0.000	Link Vol (m³) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705 0.3377 0.0042 0.0227 0.0000 0.0110 0.0112 0.0441 0.0132 0.2077 0.0256 0.0325 0.0463 0.0813 0.0186 0.0708 0.0018	Discharge Vol (m <sup>3</sup> ) 69.2
Link Event (Upstream Depth)) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PrivBRRG1 PP1 PP3 BRTP PP1 PP3 BRTP PP1 PP3 BRTP PP1 PP3 BRTP PP1 PA3 BRTP PP1 PA3 BRTP PP1 PA3 BRTP PP1 PA3 BRTP PP1 PA3 BRTP PP1 PA3 BRTP PP1 PA3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 4 PRIVATE PERM 4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000 8.000_2 1.000 9.000 2.001	MI MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI BR MI BR MI BR MI	DS Node HS02 HS03 HS04 ivate perm HS03A 505 ivBRRG2 505 ivate perm ivBRRG1 501 HS03A CTP HS03A CTP HS03B CTP HS03B CTP HS03B CTP HS03 HS03 HS03 RG1 HS03 RG1 HS03 RG1 HS03 RG2 HS01	Outf (I/ 2	low V s) -2.4 -2.5 1.7 0.1 2.5 1.6 0.8 0.4 2.4 0.5 0.0 2.7 0.4 5.8 1.6 2.6 1.1 4.8 1.5 0.5 0.2 0.0 0.0 0.0 0.5 0.4 5.8 1.6 2.6 1.1 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.0 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.4 5.8 1.6 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	Velocity (m/s)         Flat 0.387           0.387         0.072           0.550         0.528           0.143         0.458           0.437         0.359           1.994         0.668           0.000         1.360           0.340         1.260           1.029         0.832           0.534         1.253           0.335         0.100           0.848         0.000           0.000         0.155	-0.050 -0.051 0.035 0.011 0.059 0.080 0.023 0.022 0.077 0.029 0.000 0.102 0.051 0.292 0.051 0.292 0.057 0.111 0.051 0.158 0.064 0.028 0.078 0.000 0.000 -0.003	Link Vol (m³) 0.6897 1.1955 0.0132 0.0023 0.0933 0.1440 0.0705 0.3377 0.0042 0.0227 0.0000 0.0110 0.0112 0.0441 0.0132 0.2077 0.0256 0.0325 0.0463 0.0325 0.0463 0.0186 0.0708 0.0018	Discharge Vol (m <sup>3</sup> ) 69.2



#### Results for 10 year Critical Storm Duration. Lowest mass balance: 95.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (I/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
600 minute summer	BRRG1	420	106 466	0 166	26	8 3122	0 0000	SURCHARGED
600 minute summer	PP4	420	106.466	0.066	0.7	0.1510	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (I/s)	Velocity (m/s)	Flow/C	ap Lir Vol (	nk Discharge (m³) Vol (m³)
600 minute summer	BRRG1	1.001	MHS01	-2.4	0.347	-0.1	37 0.1	.086
600 minute summer	PP4	11.000	MHS03	0.7	0.065	0.0	10 0.0	862



Page 16 Brookfield Storm Network

## Results for 30 year Critical Storm Duration. Lowest mass balance: 95.68%

Node Event	US	F	Peak	Level	Depth	Infl	ow	Node	Flood	Stat	us
	Node	(r	nins)	(m)	(m)	(1/	s)	Vol (m <sup>3</sup> )	(m³)		
600 minute summ	er MHS01		435	106.569	0.694	4	4.6	0.7853	0.0000	SURCHA	RGED
600 minute summ	er MHS02		435	106.569	0.869		3.8	0.9832	0.0000	SURCHA	RGED
600 minute summ	er MHS03		435	106.569	1.198	:	5.6	1.3553	0.0000	SURCHA	RGED
600 minute summ	er MHS04		435	105.387	0.029		1.8	0.0000	0.0000	OK	
1440 minute sumr	ner GR2		1500	107.508	0.008	(	0.1	0.4473	0.0000	OK	
600 minute summ	er MHS03B		435	106.570	0.870		3.6	0.9835	0.0000	SURCHA	RGED
600 minute summ	er MHSU3A		435	106.570	0.570		2.0	0.6448	0.0000	SURCHA	RGED
600 minute summ	er ICS05		435	106.570	0.440		1.1	0.4978	0.0000	SURCHA	RGED
600 minute summ	er ICS01		435	106.570	0.170	(	0.5	0.1925	0.0000	SURCHA	RGED
15 minute summe	r private peri	nΖ	10	107.291	0.021		3.U	0.0238	0.0000		
500 minute summ	er PrivBRRGZ		435 1	105.570	0.170		0.6	0.9668	0.0000	SURCHA	RGED
15 minute summe	r GRI	m 1	10	107.500	0.000		0.0 2 4	0.0000	0.0000	OK	
10 minute summe	or DrivBBBC1	11 1	135	107.074	0.024		5.4 0 E	0.0510	0.0000		RCED
15 minute summe			435	106.000	0.170		0.5 7 4	0.2519	0.0000		RGED
10 minute summe	or DD2		125	106.592	0.042		7.4 0.2	0.0245	0.0000	OK	
600 minute summ	or PPTD		455	106.570	0.020		0.5 1 0	0.0455	0.0000		PCED
15 minute summe			10	106.570	0.070		ч.э 1 Л	0.01/2	0.0000		
15 minute summe	r DD5		10	100.007	0.017		1.4 6 1	0.0142	0.0000	OK	
15 minute summe	r DDIV/ATE DE		10	107.000	0.030		0.1 1 Ω	0.0195	0.0000	OK	
15 minute summe	r DRIVATE DE		10	100.909	0.019		1.0 0.7	0.0100	0.0000	OK	
720 minute summ	er GR/		225	107.004	0.014		0.7	1 1958	0.0000	OK	
15 minute summe	r GR3		1	107.510	0.000		0.2	0.0000	0.0000	OK	
15 minute summe	r NFW/PP		1	107.500	0.000		0.0	0.0000	0.0000	OK	
600 minute summ	er BRRG2		435	106 569	0.000		1 1	3 5556	0.0000	SURCHA	RGED
	CI DIIIGZ		433	100.505	0.205		1.1	5.5550	0.0000	JUNCHIA	
Link Event	US	Link		DS	Outf	low	Velo	city Flo	ow/Cap	Link	Discharge
Link Event (Upstream Depth)	US Node	Link		DS Node	Outf (I/	low s)	Velo (m,	ocity Flo /s)	ow/Cap	Link Vol (m³)	Discharge Vol (m <sup>3</sup> )
Link Event (Upstream Depth) 600 minute summer	US Node MHS01	Link	MI	DS Node HS02	Outf (I/	<b>low</b> s) -3.7	<b>Velo</b> (m, 0.	<b>city Flo</b> <b>/s)</b> 386	<b>ow/Cap</b> -0.076	Link Vol (m³) 0.6897	Discharge Vol (m³)
Link Event (Upstream Depth) 600 minute summer 600 minute summer	US Node MHS01 MHS02	Link 1 1.003	MI MI	DS Node HS02 HS03	Outf (I/	<b>low</b> s) -3.7 -3.8	<b>Velo</b> (m, 0. -0.	<b>city Flo</b> <b>/s)</b> 386 095	-0.076 -0.078	Link Vol (m³) 0.6897 1.1955	Discharge Vol (m <sup>3</sup> )
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03	Link 1 1.003 1.004	MI MI	DS Node HS02 HS03 HS04	Outf (I/	low s) -3.7 -3.8 1.8	Velo (m) 0. -0. 0.	<b>city Flo</b> <b>/s)</b> 386 095 556	-0.076 -0.078 -0.036	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0136	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2	Link 1 1.003 1.004 5.000	MI MI MI	DS Node HS02 HS03 HS04	Outf (I/ 2	low s) -3.7 -3.8 1.8	Velo (m) 0. -0. 0.	city Flo /s) 386 095 556 528	-0.076 -0.078 0.036 0.011	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0136	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B	Link 1 1.003 1.004 5.000 4.007	MI MI MI pri	DS Node HS02 HS03 HS04 ivate perm 2 HS03	Outf (I/ 2	low s) -3.7 -3.8 1.8 0.1 3.5	Velo (m, 0. -0. 0. 0.	city Flo /s) 386 095 556 528 199	-0.076 -0.078 0.036 0.011 0.082	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0136 0.0023 0.0933	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A	Link 1 1.003 1.004 5.000 4.007 4.005	MI MI MI BR	DS Node HS02 HS03 HS04 Ivate perm 2 HS03 TP	Outf (I/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8	Velo (m, 0. -0. 0. 0. 0.	city Flo /s) 386 095 556 528 199 440	-0.076 -0.078 0.036 0.011 0.082 0.093	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05	Link 1 1.003 1.004 5.000 4.007 4.005 4.004	MI MI pri MI BR MI	DS Node HS02 HS03 HS04 Vate perm 1 HS03 TP HS03A	Outf (1/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8 0.9	Velo (m, 0. -0. 0. 0. 0. 0. 0.	city Flo /s) 386 095 556 528 199 440 438	-0.076 -0.078 0.036 0.011 0.082 0.093 0.027	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440 0.0705	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003	MI MI MI BR MI ICS	DS Node HS02 HS03 HS04 Wate perm 2 HS03 TP HS03A 505	Outf (I/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8 0.9 0.5	Velo (m, 0. -0. 0. 0. 0. 0. 0. 0.	city Flo /s) 386 095 556 528 199 440 438 359	-0.076 -0.078 0.036 0.011 0.082 0.093 0.027 0.027	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440 0.0705 0.4717	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001	MI MI MI BR MI ICS Pri	DS Node HS02 HS03 HS04 ivate perm 1 HS03 TP HS03A 505 ivBRRG2	Outf (I/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8 0.9 0.5 3.0	Velo (m, 0. 0. 0. 0. 0. 0. 0. 2.	city Flo /s) 386 095 556 528 199 440 438 359 099	-0.076 -0.078 0.036 0.011 0.082 0.093 0.027 0.027 0.027 0.096	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440 0.0705 0.4717 0.0050	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002	MI MI MI BR MI ICS Pri	DS Node HS02 HS03 HS04 Vate perm 7 HS03 TP HS03A 505 VBRRG2 505	Outf (I/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8 0.9 0.5 3.0 0.6	Velo (m, 0. -0. 0. 0. 0. 0. 0. 0. 2. 0.	city Flo /s) 386 095 556 528 199 440 438 359 099 668	-0.076 -0.078 0.036 0.011 0.082 0.093 0.027 0.027 0.096 0.034	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440 0.0705 0.4717 0.0050 0.0265	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000	MI MI MI BR MI ICS Pri ICS pri	DS Node HS02 HS03 HS04 Wate perm 2 HS03 TP HS03A S05 WBRRG2 S05 Wate perm 2	<b>Outf</b> (I/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8 0.9 0.5 3.0 0.6 0.0	Velo (m, 0. -0. 0. 0. 0. 0. 0. 2. 0. 0. 0.	city Flo /s) 386 095 556 528 199 440 438 359 099 668 000	-0.076 -0.078 0.036 0.011 0.082 0.093 0.027 0.027 0.027 0.096 0.034 0.000	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440 0.0705 0.4717 0.0050 0.0265 0.0000	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001	MI MI MI BR MI ICS Pri ICS Pri Pri	DS Node HS02 HS03 HS04 Wate perm 2 HS03A S05 WBRRG2 S05 Wate perm 2 Wate perm 2	Outf (l/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8 0.9 0.5 3.0 0.6 0.0 3.4	Velo (m, 0. -0. 0. 0. 0. 0. 2. 0. 0. 1.	city         Flo           386         095           556         556           528         199           440         438           359         099           668         000           494         359	-0.076 -0.078 0.036 0.011 0.082 0.093 0.027 0.027 0.027 0.096 0.034 0.000 0.129	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440 0.0705 0.4717 0.0050 0.0265 0.0000 0.0127	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.001	MI MI MI BR MI ICS Pri ICS Pri ICS	DS Node HS02 HS03 HS04 Wate perm 1 HS03A TP HS03A S05 WBRRG2 S05 Wate perm 1 WBRRG1 S01	<b>Outf</b> (I/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8 0.9 0.5 3.0 0.6 0.0 3.4 0.5	Velo (m, 0. -0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0.	city         Flo           386         095           556         556           528         199           440         438           359         099           668         000           494         374	-0.076 -0.078 0.036 0.011 0.082 0.093 0.027 0.027 0.027 0.096 0.034 0.000 0.129 0.063	Link Vol (m³) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440 0.0705 0.4717 0.0050 0.0265 0.0000 0.0127 0.0157	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI	DS Node HS02 HS03 HS04 ivate perm 1 HS03A G05 ivBRRG2 G05 ivate perm 1 ivBRRG1 G01 HS03A	<b>Outf</b> (I/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8 0.9 0.5 3.0 0.5 3.0 0.6 0.0 3.4 0.5 7.4	Velo (m, 0. -0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 1.	city         Flo           386         095           556         556           528         199           440         438           359         099           668         000           494         374           327         327	-0.076 -0.078 0.036 0.011 0.082 0.093 0.027 0.027 0.096 0.034 0.000 0.129 0.063 0.372	Link Vol (m³) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440 0.0705 0.4717 0.0050 0.0265 0.0000 0.0127 0.0157 0.0493	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000	MI MI MI BR MI ICS Pri ICS MI BR	DS Node HS02 HS03 HS04 Vate perm 7 HS03A 505 VBRRG2 505 VBRRG1 501 HS03A TP	Outf (I/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8 0.9 0.5 3.0 0.6 0.0 3.4 0.5 7.4 0.3	Velo (m, 0. -0. 0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 1. 0. 0.	city         Flo           386         095           556         556           528         199           440         438           359         099           668         000           494         374           327         161	-0.076 -0.078 0.036 0.011 0.082 0.093 0.027 0.096 0.034 0.000 0.129 0.063 0.372 0.011	Link Vol (m³) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440 0.0705 0.4717 0.0050 0.0265 0.0000 0.0127 0.0157 0.0493 0.0137	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI	DS Node HS02 HS03 HS04 Vate perm 7 HS03A 505 VBRRG2 505 Vate perm 7 VBRRG1 501 HS03A TP HS03A TP	<b>Outf</b> (I/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8 0.9 0.5 3.0 0.6 0.0 3.4 0.5 7.4 0.3 3.6	Velo (m, 0. -0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	city         Flo           386         095           5556         528           199         440           438         359           099         668           000         494           374         327           161         832	-0.076 -0.078 0.036 0.011 0.082 0.093 0.027 0.096 0.034 0.000 0.129 0.063 0.372 0.011 0.154	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440 0.0705 0.4717 0.0050 0.0265 0.0000 0.0127 0.0157 0.0493 0.0137 0.2077	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PRIVATE PERM 3	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR	DS Node HS02 HS03 HS04 Wate perm 2 HS03A TP HS03A 505 WBRRG2 S05 WBRRG1 501 HS03A TP HS03A TP HS03B TP	<b>Outf</b> (I/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8 0.9 0.5 3.0 0.6 0.0 3.4 0.5 7.4 0.3 3.6 1.4	Velo (m, 0. -0. 0. 0. 0. 0. 0. 0. 1. 0. 1. 0. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	city         Flo           386         095           5556         528           199         440           438         359           099         668           000         494           374         327           161         832           755         555	-0.076 -0.078 0.036 0.011 0.082 0.093 0.027 0.027 0.027 0.096 0.034 0.000 0.129 0.063 0.372 0.011 0.154 0.065	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440 0.0705 0.4717 0.0050 0.0265 0.0000 0.0127 0.0157 0.0493 0.0137 0.2077 0.0261	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PRIVATE PERM 3 PS	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI	DS Node HS02 HS03 HS04 Wate perm 1 HS03A G05 WBRRG2 G05 WBRRG1 G01 HS03A TP HS03A TP HS03B TP HS03B	Outf (l/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8 0.9 0.5 3.0 0.6 0.0 3.4 0.5 7.4 0.3 3.6 1.4 6.1	Velo (m, 0. -0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 0. 1. 0. 1. 0. 1.	city         Flo           386         095           556         556           528         199           440         438           359         099           668         000           494         374           327         161           832         755           291         291	-0.076 -0.078 0.036 0.011 0.082 0.093 0.027 0.027 0.096 0.034 0.000 0.129 0.063 0.372 0.011 0.154 0.065 0.201	Link Vol (m³) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440 0.0705 0.4717 0.0050 0.0265 0.0000 0.0127 0.0157 0.0493 0.0137 0.2077 0.0261 0.0335	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PP1 PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR	DS Node HS02 HS03 HS04 Vate perm 7 HS03A 505 VBRRG2 505 VBRRG1 501 HS03A TP HS03A TP HS03B TP HS03B TP	Outf (I/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8 0.9 0.5 3.0 0.6 0.0 3.4 0.5 7.4 0.3 3.6 1.4 6.1 1.8	Velo (m, 0. -0. 0. 0. 0. 0. 0. 0. 1. 0. 1. 0. 1. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	city         Flag           386         095           556         556           528         199           440         438           359         099           668         000           494         374           327         161           832         755           291         338	-0.076 -0.078 0.036 0.011 0.082 0.093 0.027 0.027 0.096 0.034 0.000 0.129 0.063 0.372 0.011 0.154 0.065 0.201 0.076	Link Vol (m³) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440 0.0705 0.4717 0.0050 0.0265 0.0000 0.0127 0.0157 0.0493 0.0137 0.2077 0.0261 0.0335 0.0469	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000 8.000_	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI 1 MI	DS Node HS02 HS03 HS04 Vate perm 7 HS03A 505 VBRRG2 505 VBRRG1 501 HS03A TP HS03A TP HS03B TP HS03B TP HS03 HS03 HS03	Outf (I/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8 0.9 0.5 3.0 0.5 3.0 0.6 0.0 3.4 0.5 7.4 0.3 3.6 1.4 6.1 1.8 0.7	Velo (m, 0. -0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 1. 0. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	city         Flo           386         095           5556         556           528         199           440         438           359         099           668         000           494         374           327         161           832         755           291         338           138         138	-0.076 -0.078 0.036 0.011 0.082 0.093 0.027 0.096 0.034 0.000 0.129 0.063 0.372 0.011 0.154 0.065 0.201 0.076 0.039	Link Vol (m³) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440 0.0705 0.4717 0.0050 0.0265 0.0000 0.0127 0.0157 0.0493 0.0137 0.2077 0.0261 0.0335 0.0469 0.0826	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 5 GR4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000 8.000_ 1.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI BR MI 1 MI BR	DS Node HS02 HS03 HS04 Vate perm HS03A 505 VBRRG2 505 Vate perm S05 VBRRG1 501 HS03A TP HS03A TP HS03B TP HS03 HS03 HS03 HS03 HS03 HS03 RG1	Outf (I/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8 0.9 0.5 3.0 0.5 3.0 0.6 0.0 3.4 0.5 7.4 0.3 3.6 1.4 6.1 1.8 0.7 0.2	Velo (m, 0. -0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	city         Flag           386         095           556         556           528         199           440         438           359         099           668         000           494         374           327         161           832         755           291         338           138         848	-0.076 -0.078 0.036 0.011 0.082 0.093 0.027 0.096 0.034 0.000 0.129 0.063 0.372 0.011 0.154 0.065 0.201 0.076 0.039 0.078	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440 0.0705 0.4717 0.0050 0.0265 0.0000 0.0127 0.0157 0.0493 0.0137 0.2077 0.0261 0.0335 0.0469 0.0826 0.0186	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 4 PRIVATE PERM 5 GR4 GR3	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000 8.000_ 1.000 9.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI 1 MI 1 MI 1 MI	DS Node HS02 HS03 HS04 Vate perm 2 HS03A TP HS03A 505 VBRRG2 505 Vate perm 2 VBRRG1 501 HS03A TP HS03A TP HS03B TP HS03 HS03 HS03 HS03 HS03 RG1 HS03	Outf (I/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8 0.9 0.5 3.0 0.6 0.0 3.4 0.5 7.4 0.3 3.6 1.4 6.1 1.8 0.7 0.2 0.0	Velo (m, 0. -0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 0. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	city         Flag           386         095           5556         528           199         440           438         359           099         668           000         494           374         327           161         832           755         291           338         138           848         000	-0.076 -0.078 0.036 0.011 0.082 0.093 0.027 0.027 0.027 0.027 0.096 0.034 0.000 0.129 0.063 0.372 0.011 0.154 0.065 0.201 0.076 0.039 0.078 0.078 0.078	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440 0.0705 0.4717 0.0050 0.0265 0.0000 0.0127 0.0157 0.0493 0.0137 0.2077 0.0261 0.0335 0.0469 0.0826 0.0186 0.0186	Discharge Vol (m <sup>3</sup> ) 74.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 4 PRIVATE PERM 5 GR4 GR3 NEW PP	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000 8.000_ 1.000 9.000 2.000 2.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI BR MI BR MI BR	DS Node HS02 HS03 HS04 Vate perm HS03A 505 VBRRG2 505 VBRRG1 501 HS03A TP HS03A TP HS03B TP HS03B TP HS03 HS03 HS03 HS03 HS03 RG1 HS03 RG2	Outf (I/ 2	low s) -3.7 -3.8 1.8 0.1 3.5 1.8 0.9 0.5 3.0 0.6 0.0 3.4 0.5 7.4 0.3 3.6 1.4 6.1 1.8 0.7 0.2 0.0 0.0	Velo (m, 0. -0. 0. 0. 0. 0. 0. 0. 0. 1. 0. 0. 1. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0. 0.	city         Flag           386         095           556         556           528         199           440         438           359         099           668         000           494         374           327         161           832         755           291         338           138         848           000         000	-0.076 -0.078 0.036 0.011 0.082 0.093 0.027 0.027 0.027 0.027 0.096 0.034 0.000 0.129 0.063 0.372 0.011 0.154 0.065 0.201 0.076 0.039 0.078 0.000 0.000	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0136 0.0023 0.0933 0.1440 0.0705 0.4717 0.0050 0.0265 0.0000 0.0127 0.0265 0.0000 0.0127 0.0265 0.0409 0.0261 0.0335 0.0469 0.0826 0.0186 0.0708 0.0708	Discharge Vol (m <sup>3</sup> ) 74.0



#### Results for 30 year Critical Storm Duration. Lowest mass balance: 95.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (I/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	BRRG1	435	106.569	0.269	4.1	13.4701	0.0000	SURCHARGED
600 minute summer	PP4	435	106.569	0.169	0.8	0.9636	0.0000	SURCHARGED
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (I/s)	Velocity (m/s)	Flow/C	ap Lii Vol	nk Discharge (m <sup>3</sup> ) Vol (m <sup>3</sup> )
600 minute summer	BRRG1	1.001	MHS01	-3.9	-0.341	-0.2	20 0.1	.086
600 minute summer	PP4	11.000	MHS03	0.8	0.074	0.0	12 0.1	.211



Page 18 Brookfield Storm Network

## Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 95.68%

Node Event	US Noda	F	Peak	Level	Depth	Inflo	w Nod	e	Flood	Stat	us
600 minuto summ		U,	105	106 951	0.076	(1/3	5 <b>7 VUI(I</b> 57 110	<b>п</b> 12 л г		SUDCHA	PCED
600 minute summ	or MHS02		495 405	100.001	1 1 5 1		.4 I.IU	12 C	00000		
600 minute summ	or MHS02		495	100.001	1.131	נ. ד	0.2 1.50 7/1 1.67	21 0			
600 minute summ	er MHS04		495	105.222	1.400	7	0.4 1.07	00 0			N SK
1/10 minute summ	ner GR2		1620	105.588	0.031	2		73 0		OK	
600 minute summ	ar MHS03B		1020	107.300	1 1 5 1		5 1 30	17 C			NCK
600 minute summ	er MHS03A		495	106.851	0.851	2	0.0 1.00	30 0			
600 minute summ	er ICS05		495 195	106.852	0.001	- 1	0.50	60 C		SURCHA	RGED
600 minute summ	er ICS01		495	106.852	0.722	<u>د</u>	0.01	.00 C		SURCHA	RGED
15 minute summe	r nrivate ner	m 2	10	100.052	0.452	4	17 0.31			OK	
600 minute summ	er PrivBRRG2		495	106 852	0.020	- ر	1.7 0.03 1.8 2.56	48 C			RGED
15 minute summe	r GR1		1	107 500	0.000	C		00 0	0000	OK	
15 minute summe	r private per	m 1	10	107.081	0.031	5	54 0.05	02 C	0000	OK	
600 minute summ	er PrivBRRG1		495	106 852	0.452	C	0.66	83 0	0000	SURCHA	RGED
30 minute summe	r PP1		18	107.005	0.452	10	0.00	94 (	0000	OK	
600 minute summ	er PP3		495	106 851	0 301	1	3 3 65	95 0	0000	FLOOD	RISK
600 minute summ	er BRTP		495	106.851	0.951	6	5.6 14.70	13 C	0.0000	FLOOD	RISK
600 minute summ	er PRIVATE PE	RM 3	495	106 851	0.201	C	) 4 146	77 C	0000	FLOOD	RISK
15 minute summe	r PP5		10	107.092	0.042	ç	9.5 0.03	55 0	0.0000	OK	
15 minute summe	r PRIVATE PE	RM 4	10	106.974	0.024	2	2.9 0.02	59 0	0.0000	OK	
15 minute summe	r PRIVATE PE	RM 5	10	107.067	0.017	1	L.1 0.01	.33 0	0.0000	OK	
720 minute summ	er GR4		885	107.510	0.009	C	).2 1.19	58 0	0.0000	OK	
15 minute summe	r GR3		1	107.500	0.000	C	0.00	00 0	0.0000	OK	
15 minute summe	r NEW PP		1	107.500	0.000	C	).0 0.00	00 0	0.0000	OK	
600 minute summ	er BRRG2		495	106.851	0.551	1	L.4 7.26	80 C	0.0000	SURCHA	RGED
Link Event	US	Link		DS	Outf	flow	Velocity	Flow	/Cap	Link	Discharge
Link Event (Upstream Depth)	US Node	Link		DS Node	Outf (I/	flow 's)	Velocity (m/s)	Flow	/Cap	Link Vol (m³)	Discharge Vol (m <sup>3</sup> )
Link Event (Upstream Depth) 600 minute summer	US Node MHS01	Link 1	М	DS Node HS02	Outf (I/	f <b>low</b> ' <b>s)</b> -5.1	Velocity (m/s) 0.370	Flow,	<b>/Cap</b> ).105	Link Vol (m <sup>3</sup> ) 0.6897	Discharge Vol (m <sup>3</sup> )
Link Event (Upstream Depth) 600 minute summer 600 minute summer	US Node MHS01 MHS02	Link 1 1.003	MI	<b>DS</b> <b>Node</b> HS02 HS03	Outf (I/	f <b>low</b> /s) -5.1 -5.2	Velocity (m/s) 0.370 -0.132	Flow, -0 -0	<b>/Cap</b> 0.105 0.108	Link Vol (m <sup>3</sup> ) 0.6897 1.1955	Discharge Vol (m³)
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03	Link 1 1.003 1.004	MI MI MI	<b>DS</b> <b>Node</b> HS02 HS03 HS04	Outf (I/	f <b>low</b> / <b>s)</b> -5.1 -5.2 2.0	Velocity (m/s) 0.370 -0.132 0.571	Flow, -0 -0 0	<b>/Cap</b> 0.105 0.108 0.040	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer	US Node MHS01 MHS02 MHS03 GR2	Link 1 1.003 1.004 5.000	MI MI MI	DS Node HS02 HS03 HS04 vate perm 2	Outf (I/	flow /s) -5.1 -5.2 2.0 0.1	Velocity (m/s) 0.370 -0.132 0.571 0.528	Flow, -0 -0 0	/Cap 0.105 0.108 0.040 0.011	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 1440 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B	Link 1 1.003 1.004 5.000 4.007	MI MI MI pri MI	DS Node HS02 HS03 HS04 vate perm 2 HS03	Outf (I/ 2	flow 's) -5.1 -5.2 2.0 0.1 5.4	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307	Flow, -0 -0 0 0	/Cap 0.105 0.108 0.040 0.011 0.011	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146 0.0025 0.0933	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A	Link 1 1.003 1.004 5.000 4.007 4.005	MI MI pri MI BR	DS Node HS02 HS03 HS04 Vate perm 2 HS03 TP	Outf (I/ 2	flow -5.1 -5.2 2.0 0.1 5.4 2.3	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414	Flow, -0 -0 0 0 0 0	/Cap 0.105 0.108 0.040 0.011 0.127 0.115	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05	Link 1 1.003 1.004 5.000 4.007 4.005 4.004	MI MI MI BR MI	DS Node HS02 HS03 HS04 Vate perm 2 HS03 TP HS03A	Out! (I/ 2	flow -5.1 -5.2 2.0 0.1 5.4 2.3 0.8	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414 0.434	Flow, -0 -0 0 0 0 0 0 0 0 0 0	/Cap ).105 ).108 ).040 ).011 ).127 ).115 ).024	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440 0.0705	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003	MI MI MI BR MI	DS Node HS02 HS03 HS04 Vate perm 2 HS03 TP HS03A G05	Outl (I/	flow -5.1 -5.2 2.0 0.1 5.4 2.3 0.8 0.6	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414 0.434 0.341	Flow, -0 -0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	/Cap 0.105 0.108 0.040 0.011 0.127 0.115 0.024 0.032	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440 0.0705 0.4717	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001	MI MI MI BR MI ICS Pri	DS Node HS02 HS03 HS04 Vate perm 2 HS03 TP HS03A 505 VBRRG2	Outf (I/ 2	flow -5.1 -5.2 2.0 0.1 5.4 2.3 0.8 0.6 4.7	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414 0.434 0.341 2.352	Flow, -0 -0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	/Cap 0.105 0.108 0.040 0.011 0.127 0.115 0.024 0.032 0.150	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440 0.0705 0.4717 0.0142	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002	MI MI MI BR MI ICS Pri	DS Node HS02 HS03 HS04 Vate perm 2 HS03 TP HS03A 505 VBRRG2 505	Out! (I/ 2	flow (s) -5.1 -5.2 2.0 0.1 5.4 2.3 0.8 0.6 4.7 0.5	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414 0.434 0.341 2.352 0.674	Flow, -0 -0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	/Cap ).105 ).108 ).040 ).011 ).127 ).115 ).024 ).032 ).150 ).029	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440 0.0705 0.4717 0.0142 0.0265	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000	MI MI MI BR MI ICS Pri ICS pri	DS Node HS02 HS03 HS04 Vate perm 2 HS03 TP HS03A S05 VBRRG2 S05 Vate perm 2	<b>Out!</b> (1/ 2	flow (s) -5.1 -5.2 2.0 0.1 5.4 2.3 0.8 0.6 4.7 0.5 0.0	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414 0.341 2.352 0.674 0.000	Flow, -0 -0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	/Cap 0.105 0.108 0.040 0.011 0.011 0.127 0.115 0.024 0.032 0.032 0.029 0.000	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440 0.0705 0.4717 0.0142 0.0265 0.0000	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001	MI MI MI BR MI ICS Pri ICS Pri Pri	DS Node HS02 HS03 HS04 Vate perm 2 HS03A TP HS03A G05 VBRRG2 G05 Vate perm 2 VBRRG1	Outf (1/ 2	flow (s) -5.1 -5.2 2.0 0.1 5.4 2.3 0.8 0.6 4.7 0.5 0.0 5.4	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414 0.434 0.341 2.352 0.674 0.000 1.464	Flow, -0 -0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	/Cap ).105 ).108 ).040 ).011 ).127 ).115 ).024 ).029 ).000 ).205	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440 0.0705 0.4717 0.0142 0.0265 0.0000 0.0168	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002	MI MI MI BR MI ICS Pri ICS Pri ICS	DS Node HS02 HS03 HS04 Vate perm 2 HS03A TP HS03A 505 VBRRG2 505 Vate perm 2 VBRRG1 501	<b>Outf</b> (I/ 2	flow (s) -5.1 -5.2 2.0 0.1 5.4 2.3 0.8 0.6 4.7 0.5 0.0 5.4 0.7	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414 0.434 0.341 2.352 0.674 0.000 1.464 0.374	Flow, -0 -0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	/Cap ).105 ).108 ).040 ).011 ).127 ).115 ).024 ).024 ).032 ).150 ).029 ).000 ).205 ).085	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440 0.0705 0.4717 0.0142 0.0265 0.0000 0.0168 0.0157	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 30 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000	MI MI MI BR MI ICS Pri ICS MI	DS Node HS02 HS03 HS04 Vate perm 2 HS03A TP HS03A S05 VBRRG2 S05 Vate perm 2 VBRRG1 S01 HS03A	Outf (I/ 2	flow (s) -5.1 -5.2 2.0 0.1 5.4 2.3 0.8 0.6 4.7 0.5 0.0 5.4 0.7 10.4	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414 0.434 0.341 2.352 0.674 0.000 1.464 0.374 1.509	Flow, -0 -0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	/Cap ).105 ).108 ).040 ).040 ).011 ).127 ).127 ).024 ).024 ).029 ).029 ).029 ).000 ).205 ).025 ).085	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440 0.0705 0.4717 0.0142 0.0265 0.0000 0.0168 0.0157 0.0549	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 30 minute summer 600 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000	MI MI MI BR MI ICS Pri ICS MI BR	DS Node HS02 HS03 HS04 Vate perm 2 HS03A TP HS03A 505 VBRRG2 505 VBRRG1 501 HS03A TP	Outf (I/ 2	flow (s) -5.1 -5.2 2.0 0.1 5.4 2.3 0.8 0.6 4.7 0.5 0.0 5.4 0.7 10.4 -0.8	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414 0.434 0.341 2.352 0.674 0.000 1.464 0.374 1.509 0.163	Flow, -0 -0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	/Cap ).105 ).108 ).040 ).040 ).011 ).127 ).115 ).024 ).024 ).032 ).150 ).029 ).000 ).205 ).025 ).085 ).522 ).029	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440 0.0705 0.4717 0.0142 0.0265 0.0000 0.0168 0.0157 0.0549 0.0239	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 30 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006	MI MI MI BR MI ICS Pri ICS MI BR MI	DS Node HS02 HS03 HS04 Vate perm 2 HS03A TP HS03A S05 VBRRG2 S05 Vate perm 2 VBRRG1 S01 HS03A TP HS03A TP HS03B	Outi (1/ 2	flow (s) -5.1 -5.2 2.0 0.1 5.4 2.3 0.8 0.6 4.7 0.5 0.0 5.4 0.7 10.4 -0.8 5.5	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414 0.434 0.341 2.352 0.674 0.000 1.464 0.374 1.509 0.163 0.787	Flow, -0 -0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	/Cap ).105 ).108 ).040 ).040 ).011 ).127 ).115 ).024 ).024 ).029 ).029 ).000 ).205 ).025 ).029 ).085 ).222 ).029 ).238	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440 0.0705 0.4717 0.0142 0.0265 0.0000 0.0168 0.0157 0.0549 0.0239 0.2077	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 600 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PRIVATE PERM 3	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR	DS Node HS02 HS03 HS04 Vate perm 2 HS03A TP HS03A G05 VBRRG2 G05 Vate perm 2 VBRRG1 G01 HS03A TP HS03A TP HS03B TP	Outf (I) 2	flow (s) -5.1 -5.2 2.0 0.1 5.4 2.3 0.8 0.6 4.7 0.5 0.0 5.4 0.7 10.4 -0.8 5.5 0.3	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414 0.434 0.341 2.352 0.674 0.000 1.464 0.374 1.509 0.163 0.787 0.130	Flow, -0 -0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	/Cap ).105 ).108 ).040 ).011 ).127 ).115 ).024 ).029 ).000 ).029 ).000 ).205 ).029 ).021	Link Vol (m³) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440 0.0705 0.4717 0.0142 0.0265 0.0000 0.0168 0.0157 0.0549 0.0239 0.2077 0.0467	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 30 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PRIVATE PERM 3 PP5	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000	MI MI MI BR MI ICS Pri ICS MI BR MI BR MI BR	DS Node HS02 HS03 HS04 Vate perm 2 HS03A 505 VBRRG2 505 VBRRG1 501 HS03A TP HS03A TP HS03B TP HS03B	Outf (I) 2	flow (s) -5.1 -5.2 2.0 0.1 5.4 2.3 0.8 0.6 4.7 0.5 0.0 5.4 0.7 10.4 -0.8 5.5 0.3 9.4	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414 0.434 0.341 2.352 0.674 0.000 1.464 0.374 1.509 0.163 0.787 0.130 1.509	Flow, -0 -0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	/Cap ).105 ).108 ).040 ).011 ).127 ).127 ).024 ).024 ).029 ).029 ).029 ).029 ).029 ).029 ).029 ).029 ).029 ).029 ).029 ).029 ).029 ).028 ).029 ).029 ).028 ).029 ).029 ).028 ).029 ].238	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440 0.0705 0.4717 0.0142 0.0265 0.0000 0.0168 0.0157 0.0549 0.0239 0.2077 0.0467 0.0374	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 30 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000	MI MI MI BR MI ICS Pri ICS MI BR MI BR MI MI	DS Node HS02 HS03 HS04 Vate perm 2 HS03A 505 VBRRG2 505 VBRRG1 501 HS03A TP HS03B TP HS03B TP HS03 HS03	Outf (I/ 2	flow (s) -5.1 -5.2 2.0 0.1 5.4 2.3 0.8 0.6 4.7 0.5 0.0 5.4 0.7 10.4 -0.8 5.5 0.3 9.4 2.9	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414 0.307 0.414 0.341 2.352 0.674 0.000 1.464 0.374 1.509 0.163 0.787 0.130 1.509 0.521	Flow, -0 -0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	/Cap ).105 ).108 ).040 ).011 ).127 ).127 ).125 ).024 ).029 ).029 ).029 ).029 ).025 ).025 ).025 ).025 ).025 ).029 ).029 ).238 ).014 ).238	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440 0.0705 0.4717 0.0142 0.0265 0.0000 0.0168 0.0157 0.0249 0.0239 0.2077 0.0549 0.2077 0.0467 0.0374 0.0374 0.0491	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 600 minute summer 30 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PP1 PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 5	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.001 3.002 6.000 8.000 4.006 7.000 12.000 8.000_ 10.000 8.000_	MI MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI 1 MI	DS Node HS02 HS03 HS04 Vate perm 2 HS03A CO5 VBRRG2 CO5 VBRRG1 CO1 HS03A TP HS03A TP HS03B TP HS03B TP HS03 HS03 HS03 HS03	Outf (I/ 2	flow (s) -5.1 -5.2 2.0 0.1 5.4 2.3 0.8 0.6 4.7 0.5 0.0 5.4 0.7 10.4 -0.8 5.5 0.3 9.4 2.9 1.1	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414 0.307 0.414 0.341 2.352 0.674 0.000 1.464 0.374 1.509 0.163 0.787 0.130 1.509 0.521 0.210	Flow, -0 -0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	/Cap ).105 ).108 ).040 ).011 ).127 ).115 ).024 ).024 ).032 ).150 ).029 ).029 ).000 ).205 ).029 ).025 ).029 ).238 ).014 ).311 ).123 ).061	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440 0.0705 0.4717 0.0142 0.0265 0.0000 0.0168 0.0157 0.0549 0.0239 0.2077 0.0467 0.0374 0.0374 0.0491 0.0850	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 30 minute summer 600 minute summer 500 minute summer 15 minute summer 15 minute summer 600 minute summer 15 minute summer 600 minute summer 15 minute summer 720 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 4 PRIVATE PERM 5 GR4	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000 8.000_ 1.000	MI MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI BR MI BR MI BR	DS Node HS02 HS03 HS04 Vate perm 2 HS03A TP HS03A G05 VBRRG2 G05 Vate perm 2 VBRRG1 G01 HS03A TP HS03A TP HS03B TP HS03 HS03 HS03 RG1	Outi (1/ 2	flow (s) -5.1 -5.2 2.0 0.1 5.4 2.3 0.8 0.6 4.7 0.5 0.0 5.4 0.7 10.4 -0.8 5.5 0.3 9.4 2.9 1.1 0.2	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414 0.434 0.341 2.352 0.674 0.000 1.464 0.374 1.509 0.163 0.787 0.130 1.509 0.521 0.210 0.848	Flow, -0 -0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	/Cap ).105 ).108 ).040 ).011 ).127 ).115 ).024 ).029 ).029 ).029 ).000 ).205 ).205 ).205 ).205 ).205 ).222 ).029 ).238 ).014 ).123 ).011	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440 0.0705 0.4717 0.0142 0.0265 0.0000 0.0168 0.0157 0.0549 0.0239 0.2077 0.0467 0.0374 0.0491 0.0850 0.0186	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 15 minute summer 30 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PP1 PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 4 GR4 GR3	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000 8.000_ 1.000 9.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI 1 MI 1 MI	DS Node HS02 HS03 HS04 Vate perm 2 HS03A TP HS03A G05 VBRRG2 G05 VBRRG2 G05 VBRRG1 HS03A TP HS03A TP HS03B TP HS03 HS03 HS03 HS03 RG1 HS03	Outf (I/ 2	flow (s) -5.1 -5.2 2.0 0.1 5.4 2.3 0.8 0.6 4.7 0.5 0.0 5.4 0.7 10.4 -0.8 5.5 0.3 9.4 2.9 1.1 0.2 0.0	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414 0.434 0.341 2.352 0.674 0.000 1.464 0.374 1.509 0.163 0.787 0.130 1.509 0.521 0.210 0.848 0.000	Flow, -0 -0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	/Cap ).105 ).108 ).040 ).011 ).127 ).115 ).024 ).029 ).000 ).205 ).029 ).029 ).000 ).205 ).029 ).027 ].0	Link Vol (m³) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440 0.0705 0.4717 0.0142 0.0265 0.0000 0.0168 0.0157 0.0239 0.2077 0.0467 0.0239 0.2077 0.0467 0.0374 0.0374 0.0491 0.0850 0.0186 0.0708	Discharge Vol (m <sup>3</sup> ) 84.0
Link Event (Upstream Depth) 600 minute summer 600 minute summer 600 minute summer 1440 minute summer 600 minute summer 600 minute summer 600 minute summer 15 minute summer 15 minute summer 15 minute summer 30 minute summer 600 minute summer 600 minute summer 15 minute summer	US Node MHS01 MHS02 MHS03 GR2 MHS03B MHS03A ICS05 ICS01 private perm 2 PrivBRRG2 GR1 private perm 1 PrivBRRG1 PP1 PP3 BRTP PRIVATE PERM 3 PP5 PRIVATE PERM 4 PRIVATE PERM 4 PRIVATE PERM 4 PRIVATE PERM 4 NEW PP	Link 1 1.003 1.004 5.000 4.007 4.005 4.004 4.003 4.001 4.002 4.000 3.001 3.002 6.000 8.000 4.006 7.000 12.000 10.000 8.000_ 1.000 9.000 2.000	MI MI MI BR MI ICS Pri ICS Pri ICS MI BR MI BR MI BR MI BR MI BR MI BR	DS Node HS02 HS03 HS04 Vate perm 2 HS03A G05 VBRRG2 G05 VBRRG1 G01 HS03A TP HS03A TP HS03B TP HS03 HS03 HS03 HS03 RG1 HS03 RG1 HS03 RG1	Outf (I/ 2	flow (s) -5.1 -5.2 2.0 0.1 5.4 2.3 0.8 0.6 4.7 0.5 0.0 5.4 0.7 10.4 -0.8 5.5 0.3 9.4 2.9 1.1 0.2 0.0 0.0 0.0	Velocity (m/s) 0.370 -0.132 0.571 0.528 0.307 0.414 0.434 0.341 2.352 0.674 0.000 1.464 0.374 1.509 0.163 0.787 0.130 1.509 0.521 0.210 0.848 0.000 0.000	Flow, -0 -0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	/Cap ).105 ).108 ).040 ).011 ).127 ).024 ).024 ).029 ).029 ).029 ).029 ).029 ).0205 ).029 ).020 ].000	Link Vol (m <sup>3</sup> ) 0.6897 1.1955 0.0146 0.0025 0.0933 0.1440 0.0705 0.4717 0.0142 0.0265 0.0000 0.0168 0.0157 0.0549 0.2077 0.0549 0.2077 0.0467 0.0374 0.0374 0.0374 0.0374 0.0491 0.0850 0.0186 0.0708	Discharge Vol (m <sup>3</sup> ) 84.0

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## Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 95.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (I/s)	Node Vol (m³)	Flood (m³)	Status
600 minute summer	BRRG1	495	106.851	0.551	5.5	27.5310	0.0000	SURCHARGED
600 minute summer	PP4	495	106.851	0.451	1.3	6.6083	0.0000	FLOOD RISK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (I/s)	Velocity (m/s)	Flow/C	ap Lii Vol	nk Discharge (m <sup>3</sup> ) Vol (m <sup>3</sup> )
600 minute summer	BRRG1	1.001	MHS01	-5.3	-0.331	-0.2	97 0.1	.086
600 minute summer	PP4	11.000	MHS03	0.8	0.077	0.0	12 0.1	.211

F. Estimated Attenuation Volume – (Causeway FLOW)

Engineering Assessment Report Project Number: 23-044 Document Reference: 23-044r.001

AUSEWA	Y	/aterman M	loylan Co	onsulting	File: Pos Networl Jason Bu 29/11/2	t deve k: Stor urger 023	elopme rm Netv	nt - attenı vork	Page 1 23-044 Bro Post Devel	okfield opment
				Desig	n Settings					
Rainfall N Return P Additio Time of	1ethodology eriod (years) nal Flow (%) FSR Regior M5-60 (mm) Ratio-F CV Entry (mins)	<ul> <li>/ FSR</li> <li>) 5</li> <li>) 0</li> <li>in England</li> <li>) 16.600</li> <li>R 0.270</li> <li>/ 0.750</li> <li>) 4.00</li> </ul>	and Wal	es	1aximum Ti Mir In Enforc	me of Maxii M nimun Prefe nclude ce bes	f Concer mum Ra inimum Co n Backd erred Co Interm t practio	ntration (m ainfall (mm Velocity (r onnection T rop Height over Depth ediate Gro ce design r	ins) 30.00 /hr) 50.0 n/s) 1.00 ype Level (m) 0.200 (m) 1.200 und √ ules x	Soffits
				<u>N</u>	odes					
		Name	<b>Area</b> (ha) 0.220	T of E (mins) 4.00	Cover Level (m) 107.000	Diam (mi	eter   m) 1900	Depth (m) 1.629		
		MHS04			106.850	1	1900	2.105		
				L	<u>inks</u>					
Name US Node 1.000 1	DS Node MHS04	Length k (m) 4.000	s (mm) / n 0.600	US I (m) 105.3	L DS II (m) 71 104.74	- 15 0	Fall (m) 0.626	Slope D (1:X) (m 6.4 10	ia T of C (mins) 000 4.01	Rain (mm/hr) 50.0
Na 1.(	me Vel (m/s)	Cap (I/s) 7 10419.8	Flow (I/s) 29.8	US Depth (m) 0.629	DS Depth (m) 1.105	<b>Σ Are</b> (ha) 0.22	a ΣA Infl (I/	dd Pro ow Dept s) (mm 0.0 3	Pro h Velocity ) (m/s) 8 3.048	
				<u>Pipelin</u>	<u>e Schedule</u>					
Link Leng (m 1.000 4.0	<b>(1:X)</b> (1:X)	Dia (mm) 1000 Ci	Link Type ircular	US CL (m) 107.000	US IL (m) 105.371	US (	Depth (m) 0.629	<b>DS CL</b> (m) 106.850	<b>DS IL</b> (m) 104.745	DS Depth (m) 1.105
Li 1.(	nk US Node	Dia (mm) 1900 N	Node Type /anhole	MH Typ Adopta	e Nod able MHS	6 <b>le (</b> 04	Dia (mm) 1900	Node Type Manhole	MH Type Adoptable	
				Manho	e Schedule	<u>!</u>				
	Node	CL D (m)	epth (m) (	Dia mm)	Connectio	ns	Link	IL (m)	Dia (mm)	
	± .				$\bigcirc$	0	1.000	105.371	1000	
	MHS04 2	106.850 2	2.105	1900	$\bigcirc$	1	1.000	104.745	1000	

CAUSEWAY 🜍	Waterman N	Aoylan Consulting	File: Post develo Network: Storm Jason Burger 29/11/2023	Page 2 23-044 Brookfield Post Development	
		<u>Simulatio</u>	n Settings		
Rainfall	Methodology FSR Region M5-60 (mm) Ratio-R Summer CV Winter CV	FSR England and Wale 16.600 0.270 0.750 0.840	s Sk Drain Do Additional Check Di Check Dis	Normal x 240 20.0 x x	
15 30	60 120	<b>Storm D</b> 180 240	ourations 360 480	600 720	960 1440
1 1	Return Period	Climate Change	Additional Area	Additional Flo	w
	( <b>y</b> ears) 1	0	0	(0(70)	0
	5	0	0		0
	10	0	0		0
	30 100	20	0		0
		Node 1 Online Hy	dro-Brake <sup>®</sup> Contro	ol	
Replaces Downs Inver Design Desigr	Flap Valve x cream Link x : Level (m) 10 Depth (m) 1.5 Flow (l/s) 2.0	5.371 500 Min Ou ) Min Nod	Objective Sump Available Product Number tlet Diameter (m) le Diameter (mm)	(HE) Minimise √ CTL-SHE-0061 0.075 1200	e upstream storage 1-2000-1500-2000
		Node 1 Depth/Are	a Storage Structu	<u>re</u>	
Base Inf Coefficie Side Inf Coefficie	nt (m/hr)  0.00 nt (m/hr)  0.00	0000 Safety Fac 0000 Poro	ctor 2.0 sity 1.00 T	Invert L ime to half emp	.evel (m) 105.371 ty (mins)
Depth	Area Inf Area (m <sup>2</sup> ) (m <sup>2</sup> )	ea Depth Are	ea Inf Area <sup>2</sup> ) (m <sup>2</sup> )	<b>Depth</b> Area (m) (m <sup>2</sup> ) 1.510 0.0	Inf Area (m²)



Page 3 23-044 Brookfield Post Development

#### Results for 1 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	N	US ode	Peak (mins)	Level (m)	Dep (m	th Inflo ) (I/s	w Node ) Vol (m³)	Flood (m³)	Status
360 minute wint	er 1		256	105.650	0.2	79 4	.7 21.0830	0.0000	ОК
240 minute wint	er Mi	HS04	168	104.753	0.0	08 1	.6 0.0000	0.0000	ОК
Link Event (Outflow)	US Node	Link	DS Nod	Outf le (l/	low s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	1	1.000	) MHS	04	1.6	1.296	0.000	0.0048	31.7



Page 4 23-044 Brookfield Post Development

#### Results for 5 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	N	US ode	Peak (mins)	Level (m)	Depth (m)	Inflo (I/s	w Node ) Vol (m³)	Flood (m³)	Status
360 minute win	ter 1		288	105.870	0.499	7	.1 37.6928	0.0000	ОК
30 minute winte	er Ml	HS04	26	104.753	0.008	1	.6 0.0000	0.0000	ОК
Link Event (Outflow)	US Node	Link	DS Node	Outflo	ow Ve	locity n/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m <sup>3</sup> )
30 minute winter	1	1.000	) MHSO	4 1	L.6	1.296	0.000	0.0048	20.5



Page 523-044 BrookfieldPost Development

#### Results for 10 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event		US Node	Peak (mins)	Level (m)	Depth (m)	Inflov (I/s)	w Node ) Vol (m³	Flood ) (m³)	Status
480 minute wint	ter 2	1	384	105.986	0.615	6.	.7 46.4263	3 0.0000	OK
30 minute sumn	ner I	MHS04	24	104.753	0.008	1.	.6 0.000	0.0000	ОК
Link Event (Outflow)	US Node	Link	DS Node	Outflo (I/s)	ow Vel	ocity n/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m <sup>3</sup> )
30 minute winter	1	1.000	) MHSO	4 1	.6 1	L.296	0.000	0.0048	22.6



Page 6 23-044 Brookfield Post Development

#### Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event		U: No	S de	Peak (mins)	L	evel (m)	De (r	pth n)	Inflov (I/s)	N	Node Vol (m³)	Flood (m³)	Status
480 minute winte	er	1		400	10	6.208	0.8	337	8.	5	63.2186	0.0000	ОК
15 minute summ	er	MH	S04	15	10	4.753	0.0	800	1.	6	0.0000	0.0000	ОК
Link Event (Outflow)	U No	S	Link	D: No	S de	Outfl (I/s	ow ;)	Velo (m	city /s)	Flo	w/Cap	Link Vol (m³)	Discharge Vol (m <sup>3</sup> )
15 minute summer	1		1.000	о мня	504		1.6	1.	296		0.000	0.0048	19.2



#### Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins	Level ) (m)	Depth (m)	Inflow (I/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	1	540	0 106.81	.0 1.439	11.1	108.6609	0.0000	FLOOD RISK
600 minute winter	MHS04	540	) 104.75	0.009	2.0	0.0000	0.0000	ОК
Link Event (Outflow)	US Node	Link	DS Node	Outflow (I/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute winter	1	1.000	MHS04	2.0	1.386	0.000	0.0057	79.4

# G. SuDS Volume Calculations

Engineering Assessment Report Project Number: 23-044 Document Reference: 23-044r.001

W wate moy	erman lan		Drainage	Calculations - Ro	ossfield Avenue	ssfield Avenue		
			BY:	L. Mugo	Date: 05.12.2023			
Site Catchment Area =	2487 m <sup>2</sup>							
	Pre	-develop	ment/Curren	t-Brownfield				
			A	Factored				
Hardstanding	C -factor	0.95	Area (m ) 1392	Area (m )	1			
Landscape		0.55	1095	219	)			
	-		2487	1541.4	<b>i</b> 62%	Hardstanding coverage		
		De		t				
		PU	ist-developm	Factored	_			
	C -factor	,	Area (m <sup>2</sup> )	Area (m <sup>2</sup> )				
Hardstanding		0.95	2270	2156.5	5			
Landscape		0.2	217	43.4	1			
			2487	2199.9	88%	Hardstanding coverage		
					26%	Increase in hardstanding		
The proportion	onal area of the post-	develop	ment hardsta	Inding covered	oy SuDS features as	s follows.		
				% of proposed	% of proposed			
		/	Area (m²)	hardstanding	total site area			
Private Permeable Paving (300m	um thick)		200	8.89	<u> </u>			
Public Permeable Paving (450mr	m thick)		200	10.19	6 8.0% 6 9.2%			
Proposed green roof for constru	ction		40	1.89	6 1.6%			
Bioretention tree pit			43	1.9%	6 1.7%			
Private Bioretention tree Pit			22.2	1.0%	6 0.9%			
Rain garden			38	1.79	6 1.5%			
23% Total prop	osed proportion of S	UDS with	nin Post deve	lopment area - o	excluding potential	green roof		
Future Potential green roof for c	onstruction		510	22 59	20.5%			
44% Total proj	posed proportion of S	SUDS wit	hin Post deve	elopment area-i	ncluding potential	green roof		
		9	SuDS Volume	S Death (as		) (aluma (m <sup>3</sup> )		
Private Permeable Paving (200m	m thick)		Area (m)	Depth (m	) Porosity (%)	Volume (m <sup>*</sup> )		
Public Permeable Paving (300m	n thick)		200	0.5	5 40%	20.0 /1 /		
Proposed green roof trial portio	n		40	0.4	<b>,</b> -0/0	71.7		
Soil Comp	oonent			0.2	2 40%	3.2		
Drainage Core	Component			0.04	1 95%	1.5		
Private Bioretention Rain garde	ns		22.2	0.5	5 40%	4.4		
Bioretention tree Pit			43	0.5	5 40%	8.6		
Propopriety Cell	ular Storage		20.5	0.66	5 96%	13.0		
Drainage Core	Component		43	0.1	L 40%	1.7		
Kalli garueli			38	0.0	5 40%	9.1		
	Proposed SUD	S Volum	es - excludin	g Potential Gree	n Roofs			
Total Volume =			111.0	m <sup>3</sup>				
(m3 of runoff stored)/(m2 of dev	velopment)		0.045	m <sup>3</sup>				
(mm depth of runoff stored)/(m	2 of development)		44.63	mm				
	Potential SUP	S Volum	es - Including	Potential Gree	n Roofs			
	Potential SUD	S Volum	es - Including Area (m <sup>2</sup> )	<b>Potential Gree</b> Depth (m	n Roofs )         Porosity (%)	Volume (m <sup>3</sup> )		
Potential Green Roofs	Potential SUD	9S Volum	<b>es - Including</b> Area (m <sup>2</sup> ) 510	<b>; Potential Gree</b> Depth (m	n Roofs )        Porosity (%)	Volume (m <sup>3</sup> )		
Potential Green Roofs Soil Comp	Potential SUD	9S Volum	<b>es - Including</b> Area (m <sup>2</sup> ) 510	<b>; Potential Gree</b> Depth (m 0.2	n Roofs ) Porosity (%) 2 40%	Volume (m <sup>3</sup> ) 40.8		
Potential Green Roofs Soil Comp Drainage Core	<b>Potential SUD</b> ponent Component	9S Volum	<b>es - Including</b> Area (m <sup>2</sup> ) 510	<b>; Potential Gree</b> Depth (m 0.2 0.04	n Roofs ) Porosity (%) 2 40% 4 95%	Volume (m <sup>3</sup> ) 40.8 19.38		
Potential Green Roofs Soil Comp Drainage Core	Potential SUD ponent Component	9S Volum	<b>es - Including</b> Area (m <sup>2</sup> ) 510	<b>Potential Gree</b> Depth (m 0.2	n Roofs ) Porosity (%) 2 40% 4 95%	Volume (m <sup>3</sup> ) 40.8 19.38		
Potential Green Roofs Soil Comp Drainage Core Total Volume =	Potential SUD ponent Component	9S Volum	<b>es - Including</b> Area (m <sup>2</sup> ) 510 171.2	<b>; Potential Gree</b> Depth (m 0.7 0.04	n Roofs ) Porosity (%) 2 40% 4 95%	Volume (m <sup>3</sup> ) 40.8 19.38		
Potential Green Roofs Soil Comp Drainage Core Total Volume = (m3 of runoff stored)/(m2 of dev	Potential SUD ponent Component velopment)	9S Volum	es - Including Area (m <sup>2</sup> ) 510 171.2 0.069	; Potential Gree Depth (m 0.1 0.04 m <sup>3</sup> m <sup>3</sup>	n Roofs ) Porosity (%) 2 40% 4 95%	Volume (m <sup>3</sup> ) 40.8 19.38		

## W waterman moylan

Drainage Calculations - Rossfield Avenue

	Thogan											
			BY:	L. Mugo	Date: 05.12.2023							
			Surface Water Discharge Rate (I/s)									
Retur	n Period	(A) Greenfields *	(B) Current - Brownfields	(C) Post-Development without SuDS	(D) Post-Development with SuDS							
1:	1	0.46	16.7	23.9	1.6							
1:	10	-	32.2	46.1	1.7							
1:	30	1.14	40.4	57.7	1.8							
1:	100+20%	1.4	51.7	88.7**	2.0**							

\*Qbar = 2.17I/s/ha - as per greenfield runoff rate estimation for sites - www.uksuds.com

\*\*100+20%Climate Change

- (A) The catchment area in Greenfields condition
- (B) The current brownfields site as it stands
- (C) The proposed site without consideration for any SUDS measures
- (D) The proposed site with the full compliment of the proposed SUDS and Flow Control (75mm diameter

Notes: In line with GDSDS Clause 6.3.3.1 and the Institute of Hydrology report No 124 "Flood Estimation for Small Catchments", where the Greenfields discharge rates are less than 5l/s, the flow control device has been set to a reasonably practical discharge rate of 2l/s for the 1:100+20% year return period with a minimum orifice size of 75mm diameter.

#### GDSDS

#### 6.3.3.1 Size of Development

To limit discharge to greenfield runoff rates usually requires a pipe or other form of throttle. These throttle sizes theoretically need to be quite small to achieve the required maximum rate of flow, especially for small developments. For operational purposes, it is recommended that the minimum throttle size for a pipe should be 150mm minimum diameter and any other orifice unit other than a pipe should be a minimum of 200mm diameter. This means that flows much below 10 l/s are rarely achievable. Thus small sites, by default, are often allowed a more generous discharge limit than larger developments. This can be partially re-dressed in three ways.

The first is to ensure the development area is planned on a catchment basis so that any development fits within a drainage strategy for a catchment.

Secondly building storage tanks and ponds in series can help in minimising peak flow rates. Thirdly certain SuDS systems can result in significantly greater attenuation than just using a tank and orifice arrangement. Thus small sites should place particular emphasis on the use of unlined pervious pavements and infiltration units. Where the permeability of a soil is low and the use of infiltration is marginal, it should still be used, but systems should be designed with overflows to ensure against a level of service failure.

#### Institute of Hydrology report No 124 "Flood Estimation for Small Catchments"

#### (2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

		Attenuation Volumes (m <sup>3</sup> )								
Retun Period		(A) Current - Brownfield	(B) Estimated required Volume for 21/s disharge	(C) Post-Development excluding potenential green roofs	(D) Post-Development including potenential green roofs					
1:	1	0	21	111.0	171.2					
1:	10	0	46.42	111.0	171.2					
1:	30	0	63.21	111.0	171.2					
1:	100+20%	0	108.66*	111.0	171.2					

\*1:100+20% Critical storm event 600 minute

# UK and Ireland Office Locations



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