

## APPENDIX J: Attenuation Calculations

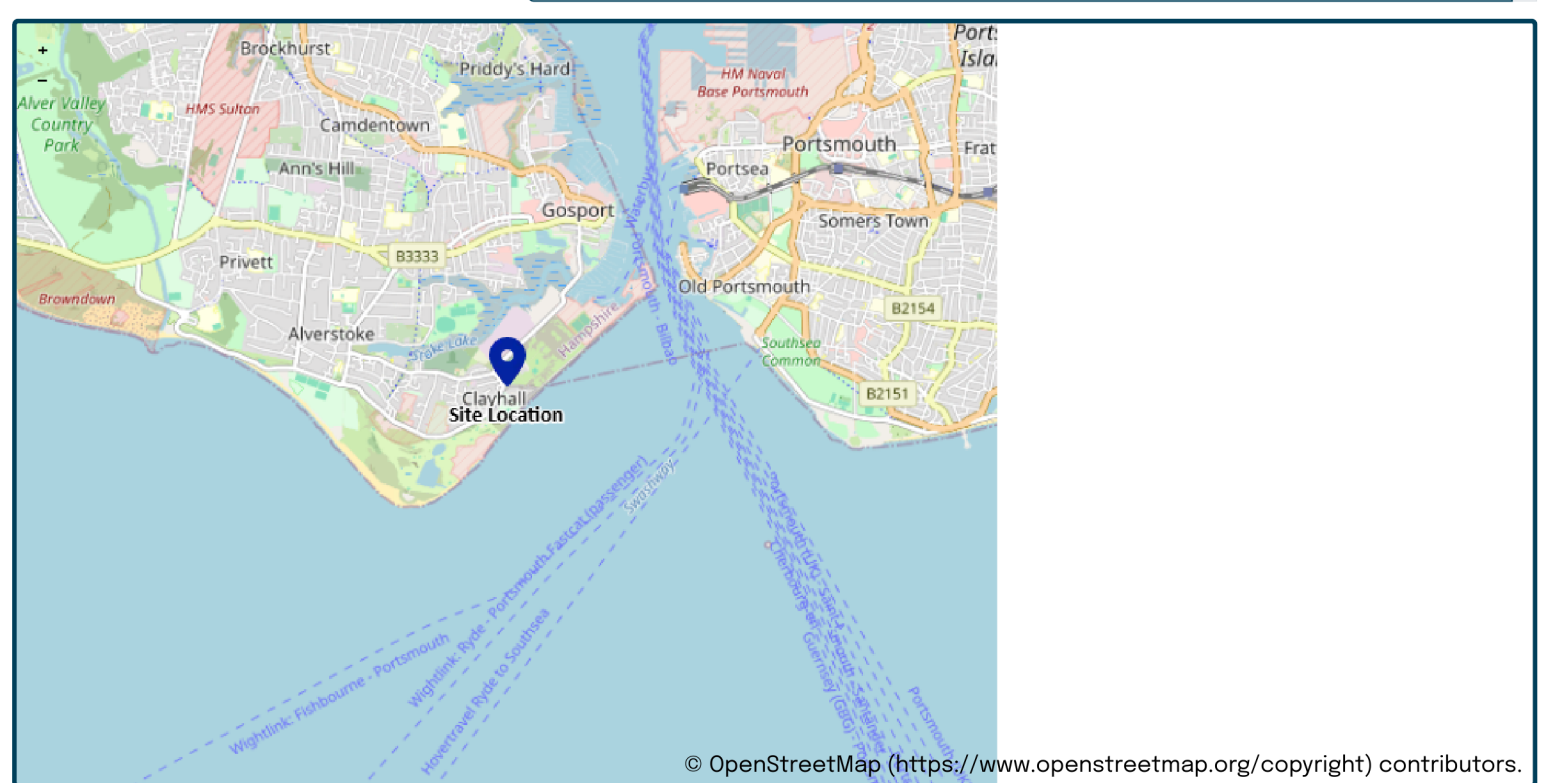
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

## Project details

Date	<input type="text" value="08/12/2025"/>
Calculated by	<input type="text" value=""/>
Reference	<input type="text" value="8607"/>
Model version	<input type="text" value="2.2.2"/>

## Location

Site name	<input type="text" value="Haslar IRC"/>
Site location	<input type="text" value="Gosport"/>



Site easting (British National Grid)	<input type="text" value="461474"/>
Site northing (British National Grid)	<input type="text" value="98249"/>

## Site details

Total site area (ha)	<input type="text" value="4.58"/>	ha
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# Greenfield runoff

## Method

Method

## FEH statistical (2025)

	<u>My value</u>	<u>Map value</u>
SAAR9120 (mm)	<input type="text" value="775"/>	<input type="text" value="mm"/>
BFIHOST19scaled	<input type="text" value="0.686"/>	
QMed-QBar conversion	<input type="text" value="1.136"/>	<input type="text" value="1.136"/>
QMed (l/s)	<input type="text" value="7.4"/>	<input type="text" value="l/s"/>
QBar (FEH statistical 2025) (l/s)	<input type="text" value="8.4"/>	<input type="text" value="l/s"/>

## Growth curve factors

	<u>My value</u>	<u>Map value</u>
Hydrological region	<input type="text" value="7"/>	<input type="text" value="7"/>
1 year growth factor	<input type="text" value="0.85"/>	
2 year growth factor	<input type="text" value="0.88"/>	
10 year growth factor	<input type="text" value="1.62"/>	
30 year growth factor	<input type="text" value="2.3"/>	
100 year growth factor	<input type="text" value="3.19"/>	
200 year growth factor	<input type="text" value="3.74"/>	

## Results

Method	<input type="text" value="FEH statistical (2025)"/>	
Flow rate 1 year (l/s)	<input type="text" value="7.2"/>	<input type="text" value="l/s"/>
Flow rate 2 year (l/s)	<input type="text" value="7.4"/>	<input type="text" value="l/s"/>
Flow rate 10 years (l/s)	<input type="text" value="13.6"/>	<input type="text" value="l/s"/>
Flow rate 30 years (l/s)	<input type="text" value="19.4"/>	<input type="text" value="l/s"/>
Flow rate 100 years (l/s)	<input type="text" value="26.9"/>	<input type="text" value="l/s"/>
Flow rate 200 years (l/s)	<input type="text" value="31.5"/>	<input type="text" value="l/s"/>

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

### Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.2) developed by HR Wallingford and available at [uksuds.com](https://www.uksuds.com/) (<https://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 [uksuds.com/terms-conditions](https://www.uksuds.com/terms-conditions) (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate 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, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

### Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	1	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

### Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.100	5.00	5.314	1500	461320.214	98164.832	1.125
2	0.275	5.00	5.796	1500	461351.808	98133.501	1.869
3	0.216	5.00	6.264	1500	461404.071	98074.042	2.654
11	0.202	5.00	5.735	1500	461355.705	98164.881	1.125
12	0.170	5.00	6.118	1500	461407.390	98137.837	1.851
4	0.054	5.00	6.400	1500	461450.801	98115.123	3.114
5			7.105		461470.864	98125.891	3.890
6			6.457		461510.362	98177.370	3.891
13	0.117	5.00	5.708	1500	461440.063	98284.172	1.125
14	0.312	5.00	5.546	1500	461449.701	98250.157	1.171
7	0.294	5.00	6.635	1500	461524.330	98192.379	4.301
15	0.254	5.00	5.000	1500	461487.427	98252.707	1.125
16	0.226	5.00	4.200	1500	461526.559	98303.205	1.125
8	0.038	5.00	5.075	1800	461580.616	98261.315	3.035
9			5.034	1800	461587.970	98270.322	3.018
10			4.970	1800	461598.280	98283.854	3.054

### Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	44.495	0.600	4.189	3.927	0.262	170.0	450	5.48	33.7
1.001	2	3	79.163	0.600	3.927	3.610	0.317	250.0	450	6.51	31.4
1.002	3	4	62.220	0.600	3.610	3.361	0.249	250.0	450	7.32	29.6
2.000	11	12	58.333	0.600	4.610	4.267	0.343	170.0	525	5.57	33.5
2.001	12	4	48.994	0.600	4.267	3.361	0.906	54.1	525	5.83	32.9
1.003	4	5	22.770	0.600	3.286	3.215	0.071	320.7	525	7.62	29.0
1.004	5	6	64.886	0.030	3.215	2.566	0.649	100.0	900	8.16	27.9
1.005	6	7	20.503	0.030	2.566	2.484	0.082	250.0	525	8.79	26.8

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.556	247.5	12.2	0.675	1.419	0.100	0.0	67	0.822
1.001	1.281	203.7	42.5	1.419	2.204	0.375	0.0	138	1.019
1.002	1.281	203.7	63.2	2.204	2.589	0.591	0.0	172	1.136
2.000	1.715	371.2	24.5	0.600	1.326	0.202	0.0	90	0.986
2.001	3.050	660.3	44.2	1.326	2.514	0.372	0.0	91	1.770
1.003	1.245	269.5	106.5	2.589	3.365	1.017	0.0	229	1.175
1.004	2.001	5762.9	102.7	2.990	2.991	1.017	0.0	151	0.712
1.005	0.544	117.9	98.7	3.366	3.626	1.017	0.0	367	0.610

### Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
3.000	13	14	35.354	0.600	4.583	4.375	0.208	170.0	450	5.38	33.9
3.001	14	7	94.381	0.600	4.375	2.641	1.734	54.4	450	5.95	32.6
1.006	7	8	88.996	0.030	2.334	2.115	0.219	406.4	675	11.73	22.8
4.000	15	16	63.886	0.600	3.875	3.075	0.800	79.9	450	5.47	33.7
4.001	16	8	68.388	0.600	3.075	2.340	0.735	93.0	450	6.01	32.5
1.007	8	9	11.628	0.030	2.040	2.016	0.024	484.5	750	12.12	22.3
1.008	9	10	17.012	0.030	2.016	1.916	0.100	170.0	750	12.46	22.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
3.000	1.556	247.5	14.4	0.675	0.721	0.117	0.0	73	0.860
3.001	2.760	438.9	50.6	0.721	3.544	0.429	0.0	102	1.868
1.006	0.505	180.7	143.1	3.626	2.285	1.740	0.0	453	0.560
4.000	2.276	362.0	31.0	0.675	0.675	0.254	0.0	88	1.415
4.001	2.108	335.2	56.4	0.675	2.285	0.480	0.0	124	1.586
1.007	0.496	219.2	182.1	2.285	2.268	2.258	0.0	522	0.555
1.008	0.838	370.0	179.2	2.268	2.304	2.258	0.0	368	0.831

### Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)	
Rainfall Events	Singular	Skip Steady State	✓	Check Discharge Rate(s)	✓
Summer CV	1.000	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m <sup>3</sup> /ha)	20.0		

### Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	45	0	0

### Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

### Node 6 Online StormBrake™ Control

Flap Valve	x	Design Flow (l/s)	9.0
Replaces Downstream Link	x	Product Code	FPM-SB1-00900-00900-1100
Invert Level (m)	2.566	Min Outlet Diameter (m)	0.225
Design Depth (m)	0.900	Min Node Diameter (mm)	1200

**Node 9 Online StormBrake™ Control**

Flap Valve	x	Design Flow (l/s)	8.4
Replaces Downstream Link	x	Product Code	FPM-SB1-02000-00840-1100
Invert Level (m)	2.016	Min Outlet Diameter (m)	0.150
Design Depth (m)	2.000	Min Node Diameter (mm)	1200

**Node 4 Online Orifice Control**

Flap Valve	x	Design Depth (m)	0.300	Discharge Coefficient	0.600
Replaces Downstream Link	x	Design Flow (l/s)	5.0		
Invert Level (m)	3.286	Diameter (m)	0.068		

**Node 4 Depth/Area Storage Structure**

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	3.286
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	

Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )
0.000	10170.0	0.0	0.300	10170.0	0.0	0.301	0.0	0.0

**Node 9 Depth/Area Storage Structure**

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	2.016
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )	Depth (m)	Area (m <sup>2</sup> )	Inf Area (m <sup>2</sup> )
0.000	459.4	0.0	2.000	459.4	0.0	2.001	0.0	0.0

**Results for 1 year Critical Storm Duration. Lowest mass balance: 98.53%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
15 minute summer	1	11	4.253	0.064	11.3	0.2255	0.0000	OK
15 minute summer	2	11	4.061	0.134	42.0	0.6328	0.0000	OK
15 minute summer	3	12	3.781	0.171	64.3	0.5793	0.0000	OK
15 minute summer	11	10	4.698	0.088	22.9	0.4701	0.0000	OK
15 minute summer	12	11	4.356	0.089	41.5	0.3222	0.0000	OK
10080 minute summer	4	5820	3.377	0.091	4.3	278.8882	0.0000	OK
10080 minute summer	5	5820	3.234	0.019	2.3	0.0000	0.0000	OK
10080 minute summer	6	5880	2.688	0.122	2.3	0.0000	0.0000	OK
15 minute summer	13	10	4.652	0.069	13.2	0.2650	0.0000	OK
15 minute summer	14	11	4.474	0.099	48.2	0.7022	0.0000	OK
30 minute summer	7	20	2.635	0.301	70.3	0.9424	0.0000	OK
15 minute summer	15	10	3.959	0.084	28.7	0.5253	0.0000	OK
15 minute summer	16	11	3.194	0.119	53.6	0.6879	0.0000	OK
15 minute summer	8	11	2.526	0.486	119.7	1.3587	0.0000	OK
720 minute summer	9	480	2.384	0.368	24.5	161.5499	0.0000	OK
720 minute summer	10	480	1.966	0.050	7.7	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
15 minute summer	1	1.000	2	11.0	0.430	0.044	1.1858	
15 minute summer	2	1.001	3	41.0	0.898	0.201	3.7183	
15 minute summer	3	1.002	4	60.6	1.126	0.298	3.3512	
15 minute summer	11	2.000	12	22.4	0.945	0.060	1.3898	
15 minute summer	12	2.001	4	41.0	1.715	0.062	1.1706	
10080 minute summer	4	1.003	5	2.3	0.542	0.008	0.0979	
10080 minute summer	5	1.004	6	2.3	0.045	0.000	3.7729	
30 minute summer	6	1.005	7	-3.3	-0.135	-0.028	0.6877	
15 minute summer	13	3.000	14	12.9	0.651	0.052	0.7236	
15 minute summer	14	3.001	7	46.4	1.822	0.106	2.4053	
15 minute summer	7	1.006	8	67.3	0.500	0.373	16.4885	
15 minute summer	15	4.000	16	28.0	1.085	0.077	1.7105	
15 minute summer	16	4.001	8	52.9	1.521	0.158	3.2604	
15 minute summer	8	1.007	9	205.1	1.916	0.936	1.7736	
720 minute summer	9	1.008	10	7.7	0.374	0.021	0.3615	265.6

**Results for 30 year Critical Storm Duration. Lowest mass balance: 98.53%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
15 minute summer	1	10	4.317	0.128	45.6	0.4523	0.0000	OK
15 minute summer	2	12	4.245	0.318	170.1	1.4974	0.0000	OK
15 minute summer	3	11	4.118	0.508	261.4	1.7234	0.0000	SURCHARGED
15 minute summer	11	10	4.791	0.181	92.1	0.9706	0.0000	OK
15 minute summer	12	11	4.453	0.186	168.5	0.6702	0.0000	OK
4320 minute summer	4	2820	3.454	0.168	12.9	513.7791	0.0000	OK
4320 minute summer	5	2820	3.239	0.024	3.4	0.0000	0.0000	OK
600 minute summer	6	630	3.140	0.574	3.5	0.0000	0.0000	SURCHARGED
15 minute summer	13	10	4.722	0.139	53.3	0.5365	0.0000	OK
15 minute summer	14	10	4.579	0.204	194.8	1.4496	0.0000	OK
15 minute summer	7	11	3.127	0.793	325.4	2.4866	0.0000	SURCHARGED
15 minute summer	15	10	4.046	0.171	115.8	1.0731	0.0000	OK
15 minute summer	16	11	3.346	0.271	217.2	1.5679	0.0000	OK
600 minute summer	8	615	3.071	1.031	67.6	2.8821	0.0000	SURCHARGED
600 minute summer	9	615	3.071	1.055	61.5	463.1915	0.0000	SURCHARGED
30 minute winter	10	231	1.968	0.052	8.4	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
15 minute summer	1	1.000	2	44.9	0.596	0.181	3.4668	
15 minute summer	2	1.001	3	163.0	1.183	0.800	11.0105	
15 minute summer	3	1.002	4	243.4	1.579	1.195	9.0146	
15 minute summer	11	2.000	12	91.0	1.355	0.245	3.9186	
15 minute summer	12	2.001	4	166.5	2.524	0.252	3.2323	
4320 minute summer	4	1.003	5	3.4	0.610	0.013	0.1316	
4320 minute summer	5	1.004	6	3.4	0.057	0.001	14.9354	
15 minute winter	6	1.005	7	-28.8	-0.282	-0.244	4.3769	
15 minute summer	13	3.000	14	52.7	0.947	0.213	1.9749	
15 minute summer	14	3.001	7	191.4	2.251	0.436	10.7538	
15 minute summer	7	1.006	8	288.4	0.848	1.596	28.1379	
15 minute summer	15	4.000	16	114.3	1.526	0.316	4.9315	
15 minute summer	16	4.001	8	214.7	2.199	0.640	6.9782	
15 minute summer	8	1.007	9	514.4	2.452	2.347	3.4254	
30 minute winter	9	1.008	10	8.4	0.384	0.023	0.3817	127.6

**Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 98.53%**

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m <sup>3</sup> )	Flood (m <sup>3</sup> )	Status
15 minute summer	1	10	5.314	1.125	129.0	3.9881	9.2765	FLOOD
30 minute summer	2	18	5.365	1.438	274.0	6.7713	0.0000	SURCHARGED
15 minute winter	3	11	4.867	1.257	402.8	4.2662	0.0000	SURCHARGED
15 minute summer	11	10	4.867	0.257	168.1	1.3781	0.0000	OK
15 minute summer	12	10	4.533	0.266	307.8	0.9580	0.0000	OK
960 minute winter	4	915	4.293	1.007	47.4	918.9539	0.0000	SURCHARGED
1440 minute winter	5	1440	3.887	0.672	6.2	0.0000	0.0000	OK
1440 minute winter	6	1440	3.887	1.321	6.4	0.0000	0.0000	SURCHARGED
15 minute summer	13	12	5.555	0.972	97.3	3.7408	0.0000	FLOOD RISK
15 minute summer	14	12	5.527	1.152	338.0	8.1720	0.0000	FLOOD RISK
15 minute summer	7	12	4.703	2.369	518.0	7.4231	0.0000	SURCHARGED
15 minute summer	15	11	4.156	0.281	211.4	1.7624	0.0000	OK
15 minute summer	16	11	3.964	0.889	394.3	5.1414	0.0000	FLOOD RISK
360 minute winter	8	344	3.823	1.783	116.6	4.9847	0.0000	SURCHARGED
360 minute winter	9	344	3.823	1.807	114.2	793.4004	0.0000	SURCHARGED
10080 minute winter	10	4560	1.968	0.052	8.4	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m <sup>3</sup> )	Discharge Vol (m <sup>3</sup> )
15 minute summer	1	1.000	2	81.1	0.650	0.328	7.0499	
15 minute winter	2	1.001	3	243.9	1.540	1.197	12.5429	
15 minute summer	3	1.002	4	402.8	2.542	1.977	9.7139	
15 minute summer	11	2.000	12	166.3	1.549	0.448	6.2643	
15 minute summer	12	2.001	4	304.0	2.928	0.460	5.0876	
960 minute winter	4	1.003	5	6.6	0.629	0.024	4.9191	
120 minute summer	5	1.004	6	-4.7	0.112	-0.001	114.0469	
15 minute summer	6	1.005	7	-30.9	-0.268	-0.262	4.4293	
15 minute winter	13	3.000	14	103.4	1.005	0.418	5.6016	
15 minute summer	14	3.001	7	290.9	2.248	0.663	14.9541	
15 minute summer	7	1.006	8	468.0	1.311	2.590	31.7696	
15 minute summer	15	4.000	16	206.2	1.624	0.569	8.3795	
15 minute summer	16	4.001	8	353.5	2.232	1.055	10.8356	
15 minute summer	8	1.007	9	838.7	2.568	3.827	5.1177	
10080 minute winter	9	1.008	10	8.4	0.384	0.023	0.3817	3353.7