APPENDIX G

SEPA Simple Index Approach Tool and Greenfield Calculation Sheet

SIMPLE INDEX APPROACH: TOOL

1. The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).

2. The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.

3. Relevant design examples are included in the SuDS Manual Appendix C.

4. Each of the steps below are part of the process set out in the flowchart on Sheet 3.

5. Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

DROP DOWN LIST — RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP

USER ENTRY — USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL

STEP 1: Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index

- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop down lists.

	Runoff Area Land Use Description	*Hazard Level*	*Pollution Hazard Indices* Total Suspended Solids	Metals	Hydrocarbons	*DESIGN CONDITIONS* 1	2
Select land use type from the drop down list (or 'Other' if none applicable): →	Non-residential car parking with frequent change (eg hospitals, retail)	Medium	0.7	0.6	0.7		
If the generic land use types in the drop down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:							
	Landuse Pollution Hazard Index	**Medium**	**0.7**	**0.6**	**0.7**		

STEP 2A: Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required

If the proposed component is bespoke and/or a proprietary treatment product and not generically described by the suggested components, then 'Proprietary treatment system' or 'User defined indices' should be selected and a description of the component and agreed user defined indices should be entered in the rows below the drop down lists

	SuDS Component Description	*Pollution Mitigation Indices* Total Suspended Solids	Metals	Hydrocarbons	*DESIGN CONDITIONS* 1	2	3
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop down list: →	Detention basin	0.5	0.5	0.6	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B		
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop down list: →	Swale	0.5	0.6	0.6	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B		
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop down list: →	None						
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:							
	Aggregated Surface Water Pollution Mitigation Index	**0.75**	**0.8**	**0.9**			

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

Is the runoff now discharged to an infiltration component?

Yes ? Go to Step 2B
No ? Go to Step 2C

STEP 2B: Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and risks to groundwater need not be considered, select 'None'

If the proposed groundwater protection is bespoke and/or a proprietary product and not generically described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop down list

		Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons	*DESIGN CONDITIONS* 1	2	3	4
Select type of groundwater protection from the drop down list: →	None							
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary product' or 'User defined indices' and enter a description of the protection and agreed user defined indices in this row:								
	Groundwater Protection Pollution Mitigation Index	**0**	**0**	**0**				

STEP 2C: Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

	Combined Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons
Combined Pollution Mitigation Indices for the Runoff Area	**0.75**	**0.8**	**0.9**

Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at ">0.95". In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).

STEP 2D: Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (ie over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zone 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator on a site by site basis.

Sufficiency of Pollution Mitigation Indices Total Suspended Solids	Metals	Hydrocarbons	*DESIGN CONDITIONS* 1
Sufficient	**Sufficient**	**Sufficient**	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see *Chapter 7 The SuDS design process*). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England

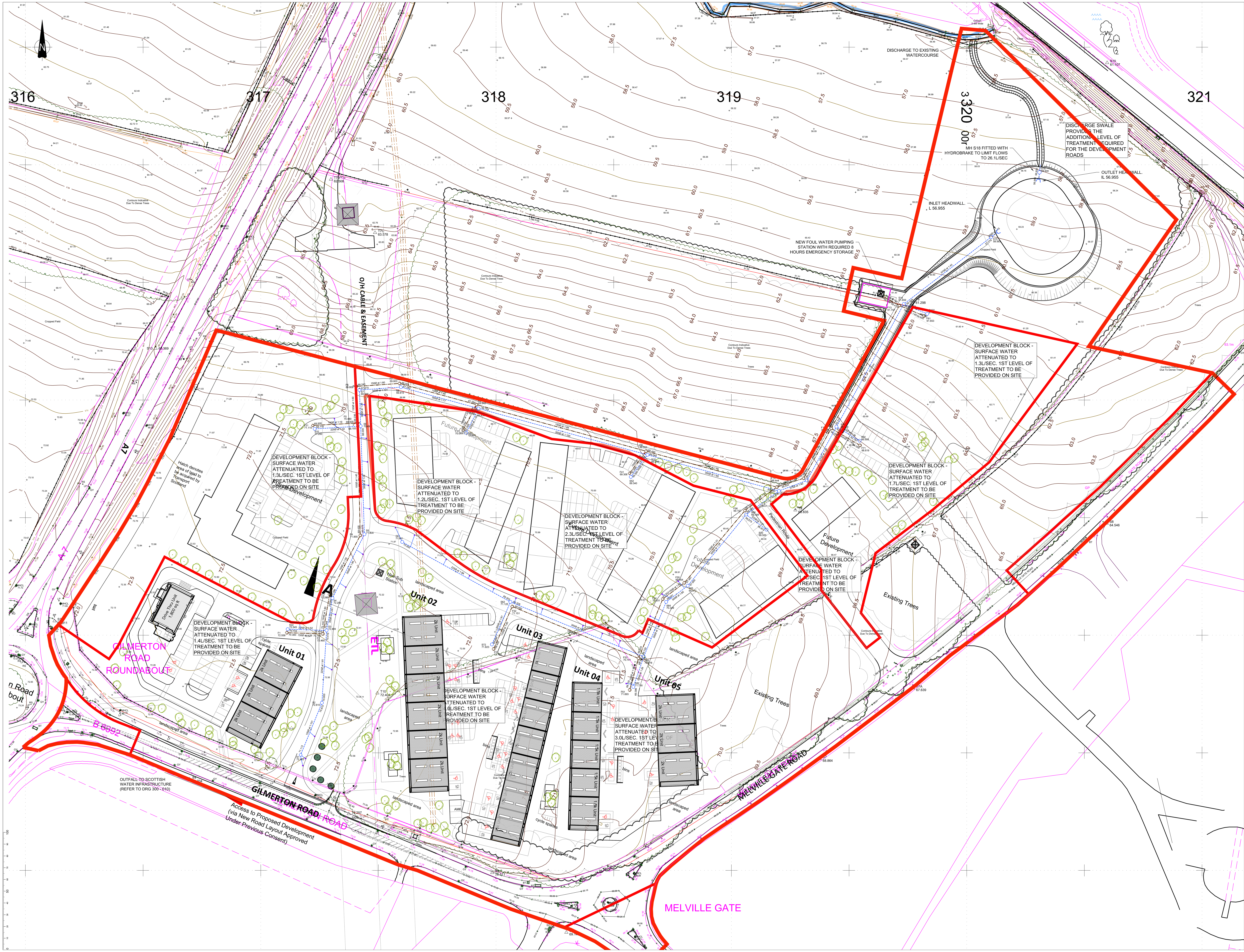
Appendix G – Greenfield Calculation Sheet

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.99
Greenfield Method	IH124	Growth Factor 100 year	2.63
Positively Drained Area (ha)	5.850	Betterment (%)	0
SAAR (mm)	660	QBar	26.4
Soil Index	4	Q 2 year (l/s)	
SPR	0.47	Q 30 year (l/s)	52.5
Region	2	Q 100 year (l/s)	
Growth Factor 2 year	0.91		

APPENDIX H

Proposed Site Drainage Layout (including SUDS)



NOTES

IMPORTANT

HEALTH, SAFETY & ENVIRONMENTAL INFORMATION

IN ADDITION TO THE HAZARDS AND RISKS NORMALLY ASSOCIATED WITH THE TYPE OF WORK DETAILED ON THIS DRAWING, PLEASE NOTE THE FOLLOWING ADDITIONAL RISKS TO HEALTH AND SAFETY:-

CONSTRUCTION PHASE:-

- NO UNUSUAL RISK

IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT.

REV	AMENDMENTS	BY	CHKD	APPD	DATE
S	-	-	-	-	-

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CLIENT
BUCCLEUGH PROPERTY

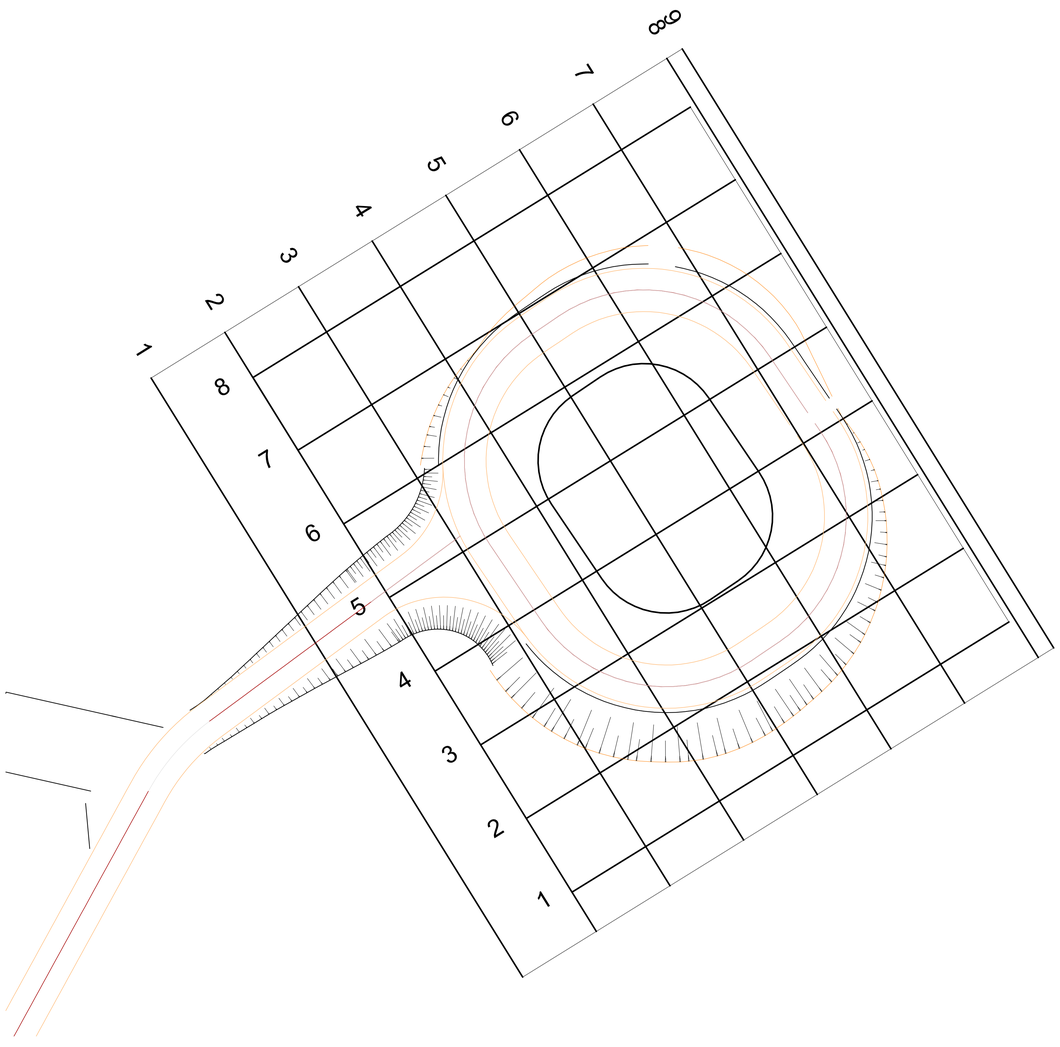
PROJECT
PROPOSED MIXED USE DEVELOPMENT SHERIFFHALL SOUTH

TITLE
PROPOSED SITE DRAINAGE LAYOUT INCLUDING SUDS

STATUS
INFORMATION

DRAWN	CHECKED	APPROVED
RD	MF	-
DATE Nov 2021	DATE Nov 2021	DATE -

DRAWING SCALE 1:500
ORIGINAL DRAWING SIZE 1189 x 841 - A0
DRAWING No 4536 - 300 - 001
REV. 0



1-9

OFFSET	0.0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.9
P TRACKS LEVEL									
EGL LEVEL	56.970	57.102	57.420	57.715	58.104	58.527	58.791	59.056	59.356

1-8

OFFSET	0.0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.9
P TRACKS LEVEL									
EGL LEVEL	56.940	57.171	57.489	57.771	58.164	58.607	58.872	59.135	59.427

2-8

OFFSET	0.0	10.0	20.0	30.0	40.0	50.0	59.3
P TRACKS LEVEL							
EGL LEVEL	56.918	56.964	56.715	57.000	57.656	57.374	57.086

1-7

OFFSET	0.0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.9
P TRACKS LEVEL			57.809	58.517	58.504	58.505	58.550	59.306	
EGL LEVEL	57.149	57.512	57.818	58.098	58.424	58.980	59.256	59.521	59.785

2-7

OFFSET	0.0	10.0	20.0	30.0	40.0	50.0	59.3
P TRACKS LEVEL				58.435	58.550	58.406	57.879
EGL LEVEL	59.368	58.934	58.659	58.313	58.097	57.694	57.386

1-6

OFFSET	0.0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.9
P TRACKS LEVEL			57.979	58.521	57.000	57.000	57.000	58.342	59.118
EGL LEVEL	57.426	57.804	58.147	58.447	58.765	59.128	59.054	59.998	60.195

2-6

OFFSET	0.0	10.0	20.0	30.0	40.0	50.0	59.3
P TRACKS LEVEL		59.294	58.436	57.333	57.647	58.536	57.832
EGL LEVEL	59.650	59.320	58.992	58.670	58.326	57.985	57.681

1-5

OFFSET	0.0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.9
P TRACKS LEVEL			58.273	58.514	57.000	57.000	58.078	59.095	
EGL LEVEL	57.706	58.066	58.479	58.796	59.110	59.436	59.789	60.180	60.552

2-5

OFFSET	0.0	10.0	20.0	30.0	40.0	50.0	59.3
P TRACKS LEVEL	59.624	58.870	57.366	57.000	57.000	58.506	58.085
EGL LEVEL	60.008	59.665	59.317	58.976	58.627	58.282	57.999

1-4

OFFSET	0.0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.9
P TRACKS LEVEL			58.232	57.855	57.427	57.617	58.522	59.489	
EGL LEVEL	58.026	58.387	58.776	59.120	59.454	59.791	60.066	60.451	60.726

2-4

OFFSET	0.0	10.0	20.0	30.0	40.0	50.0	59.3
P TRACKS LEVEL	60.154	58.807	57.479	57.000	57.000	58.502	58.558
EGL LEVEL	60.387	60.002	59.631	59.310	58.974	58.700	58.445

1-3

OFFSET	0.0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.9
P TRACKS LEVEL			59.357	59.974	58.805	58.809	59.999	60.503	
EGL LEVEL	58.374	58.703	59.091	59.459	59.804	60.121	60.417	60.747	61.067

2-3

OFFSET	0.0	10.0	20.0	30.0	40.0	50.0	59.3
P TRACKS LEVEL	60.436	59.360	58.346	57.092	57.446	58.529	58.580
EGL LEVEL	60.662	60.298	59.942	59.634	59.290	59.151	58.796

1-2

OFFSET	0.0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.9
P TRACKS LEVEL				59.910	59.943				
EGL LEVEL	58.738	59.059	59.423	59.800	60.148	60.493	60.814	61.150	61.445

2-2

OFFSET	0.0	10.0	20.0	30.0	40.0	50.0	59.3
P TRACKS LEVEL		60.460	59.102	58.543	58.560	59.003	
EGL LEVEL	61.067	60.813	60.296	60.005	59.790	59.416	59.060

1-1

OFFSET	0.0	10.0	20.0	30.0	40.0	50.0	60.0	70.0	80.9
P TRACKS LEVEL				60.213	60.938				
EGL LEVEL	59.065	59.423	59.754	60.133	60.489	60.877	61.255	61.578	61.878

2-1

OFFSET	0.0	10.0	20.0	30.0	40.0	50.0	59.3
P TRACKS LEVEL							
EGL LEVEL	61.345	60.995	60.671	60.422	60.092	59.876	59.309

NOTES

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REV	AMENDMENTS	BY	CHKD	APR'D	DATE
0	-	-	-	-	-

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CLIENT

BUCCLEUCH PROPERTY

PROJECT

PROPOSED MIXED USE DEVELOPMENT
SHERIFFHALL SOUTH

TITLE

SUDS BASIN

STATUS

INFORMATION

DRAWN	CHECKED	APPROVED
AM	MF	-
DATE	DATE	DATE
Nov 2021	Nov 2021	-

DRAWING SCALE: 1000, 250

ORIGINAL DRAWING SIZE: 1189 x 841 - A0

DRAWING No: 4536 - 300 - 011

REV: 0

APPENDIX I

Drainage Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	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)	14.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	6.00	Enforce best practice design rules	✓

1 STANDARD Manhole Type

Max Width (mm)	Diameter (mm)	Max Width (mm)	Diameter (mm)
374	1200	749	1500
499	1350	900	1800

>900 Link+900 mm

Max Depth (m)	Diameter (mm)	Max Depth (m)	Diameter (mm)
1.500	1050	99.999	1350

Simulation Settings

Rainfall Methodology	FSR	Drain Down Time (mins)	480
FSR Region	Scotland and Ireland	Additional Storage (m³/ha)	5.0
M5-60 (mm)	14.000	Check Discharge Rate(s)	✓
Ratio-R	0.300	2 year (l/s)	26.1
Summer CV	0.750	30 year (l/s)	26.1
Winter CV	0.840	100 year (l/s)	26.1
Analysis Speed	Normal	Check Discharge Volume	✓
Skip Steady State	✓	100 year 360 minute (m³)	

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	30	0	0
200	30	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.99
Greenfield Method	IH124	Growth Factor 100 year	2.63
Positively Drained Area (ha)	5.850	Betterment (%)	0
SAAR (mm)	660	QBar	26.4
Soil Index	4	Q 2 year (l/s)	
SPR	0.47	Q 30 year (l/s)	52.5
Region	2	Q 100 year (l/s)	
Growth Factor 2 year	0.91		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)	5.850	Storm Duration (mins)	360
Soil Index	4	Betterment (%)	0
SPR	0.47	PR	
CWI		Runoff Volume (m³)	

Node 22 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	70.734	Product Number	CTL-SHE-0048-1400-1811-1400
Design Depth (m)	1.811	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.4	Min Node Diameter (mm)	1200

Node 17 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	56.955	Product Number	CTL-SHE-0224-2610-0900-2610
Design Depth (m)	0.900	Min Outlet Diameter (m)	0.300
Design Flow (l/s)	26.1	Min Node Diameter (mm)	1500

Node 32 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	68.715	Product Number	CTL-SHE-0043-1300-2485-1300
Design Depth (m)	2.485	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.3	Min Node Diameter (mm)	1200

Node 42 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	67.500	Product Number	CTL-SHE-0041-1200-2555-1200
Design Depth (m)	2.555	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.2	Min Node Diameter (mm)	1200

Node 52 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	66.560	Product Number	CTL-SHE-0061-2300-1992-2300
Design Depth (m)	1.992	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.3	Min Node Diameter (mm)	1200

Node 72 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	7.001	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0082-4000-1958-4000
Invert Level (m)	69.650	Min Outlet Diameter (m)	0.100
Design Depth (m)	1.958	Min Node Diameter (mm)	1200
Design Flow (l/s)	4.0		

Node 82 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	8.001	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0067-3000-2397-3000
Invert Level (m)	69.321	Min Outlet Diameter (m)	0.100
Design Depth (m)	2.397	Min Node Diameter (mm)	1200
Design Flow (l/s)	3.0		

Node 20 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	9.001_1	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0038-1000-2526-1000
Invert Level (m)	66.974	Min Outlet Diameter (m)	0.075
Design Depth (m)	2.526	Min Node Diameter (mm)	1200
Design Flow (l/s)	1.0		

Node 92 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	10.001	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0049-1700-2741-1700
Invert Level (m)	63.767	Min Outlet Diameter (m)	0.075
Design Depth (m)	2.741	Min Node Diameter (mm)	1200
Design Flow (l/s)	1.7		

Node 102 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	9.001	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0043-1300-2471-1300
Invert Level (m)	59.100	Min Outlet Diameter (m)	0.075
Design Depth (m)	2.471	Min Node Diameter (mm)	1200
Design Flow (l/s)	1.3		

Node 17 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	56.955
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	550.0	0.0	1.500	1175.0	0.0

Node 22 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	70.734
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	200.0	0.0	1.000	200.0	0.0	1.001	0.0	0.0

Node 32 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	68.715
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	200.0	0.0	1.000	200.0	0.0	1.001	0.0	0.0

Node 42 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	67.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	200.0	0.0	1.000	200.0	0.0	1.001	0.0	0.0

Node 52 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	66.560
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	200.0	0.0	1.000	200.0	0.0	1.001	0.0	0.0

Node 72 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	69.650
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	300.0	0.0	1.000	300.0	0.0	1.001	0.0	0.0

Node 82 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	69.321
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	200.0	0.0	1.000	200.0	0.0	1.001	0.0	0.0

Node 92 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	63.767
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	0

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	200.0	0.0	1.000	200.0	0.0	1.001	0.0	0.0

Node 102 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	59.100
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	200.0	0.0	1.000	200.0	0.0	1.001	0.0	0.0

Node 20 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	1.0	Invert Level (m)	66.974
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	480

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	200.0	0.0	1.000	200.0	0.0	1.001	0.0	0.0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Approval Settings

Node Size	✓	Minimum Full Bore Velocity (m/s)	
Node Losses	✓	Maximum Full Bore Velocity (m/s)	3.000
Link Size	✓	Proportional Velocity	✓
Minimum Diameter (mm)	150	Return Period (years)	
Link Length	✓	Minimum Proportional Velocity (m/s)	0.750
Maximum Length (m)	100.000	Maximum Proportional Velocity (m/s)	3.000
Coordinates	✓	Surcharged Depth	✓
Accuracy (m)	1.000	Return Period (years)	
Crossings	✓	Maximum Surcharged Depth (m)	0.100
Cover Depth	✓	Flooding	✓
Minimum Cover Depth (m)		Return Period (years)	30
Maximum Cover Depth (m)	3.000	Time to Half Empty	x
Backdrops	✓	Discharge Rates	✓
Minimum Backdrop Height (m)		Discharge Volume	✓
Maximum Backdrop Height (m)	1.500	100 year 360 minute (m³)	
Full Bore Velocity	✓		

Results for 30 year +30% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	71.242	0.129	17.4	0.1775	0.0000	OK
15 minute winter	2	11	70.920	0.120	30.3	0.1885	0.0000	OK
15 minute winter	21	11	71.345	0.463	71.5	1.0406	0.0000	SURCHARGED
1440 minute winter	22	1350	71.307	0.573	4.8	109.6679	0.0000	SURCHARGED
15 minute winter	3	11	70.501	0.157	34.9	0.2301	0.0000	OK
15 minute winter	4	11	70.425	0.139	43.9	0.2114	0.0000	OK
15 minute winter	5	11	70.081	0.102	56.6	0.1600	0.0000	OK
1440 minute winter	31	1350	69.273	0.479	4.5	0.9078	0.0000	SURCHARGED
1440 minute winter	32	1350	69.273	0.558	4.5	106.7777	0.0000	SURCHARGED
15 minute winter	6	11	68.139	0.109	62.5	0.1601	0.0000	OK
15 minute winter	7	11	67.598	0.183	66.8	0.2692	0.0000	OK
15 minute winter	8	12	67.401	0.161	66.6	0.2298	0.0000	OK
1440 minute winter	41	1380	68.050	0.350	4.3	0.6459	0.0000	SURCHARGED
1440 minute winter	42	1380	68.050	0.550	4.2	105.3373	0.0000	SURCHARGED
15 minute winter	9	12	66.969	0.176	67.7	0.2526	0.0000	OK
720 minute winter	51	690	67.237	0.487	10.5	0.9713	0.0000	SURCHARGED
720 minute winter	52	690	67.237	0.677	10.3	129.5669	0.0000	SURCHARGED
15 minute winter	10	13	66.195	0.146	69.0	0.2094	0.0000	OK
15 minute winter	61	11	70.046	0.046	5.2	0.0688	0.0000	OK
600 minute winter	71	555	70.246	0.396	15.6	0.9764	0.0000	SURCHARGED
600 minute winter	72	555	70.246	0.596	17.4	170.8372	0.0000	SURCHARGED
15 minute winter	62	11	69.433	0.105	27.3	0.1668	0.0000	OK
15 minute winter	81	11	70.097	0.597	97.5	1.4100	0.0000	SURCHARGED
720 minute winter	82	690	69.988	0.667	10.9	127.7402	0.0000	SURCHARGED
15 minute winter	63	11	68.807	0.087	32.8	0.1268	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	17.3	1.117	0.976	0.3751	
15 minute winter	2	1.001	3	30.1	1.442	0.521	0.6447	
15 minute winter	21	2.000	22	72.6	2.274	1.396	0.4837	
1440 minute winter	22	Hydro-Brake®	3	0.9				
15 minute winter	3	1.002	4	34.8	1.007	0.488	0.4830	
15 minute winter	4	1.003	5	43.6	1.654	0.391	0.8050	
15 minute winter	5	1.004	6	56.3	2.556	0.245	1.0143	
1440 minute winter	31	3.000	32	4.5	0.662	0.086	0.3167	
1440 minute winter	32	Hydro-Brake®	6	0.7				
15 minute winter	6	1.005	7	62.1	1.825	0.278	0.5234	
15 minute winter	7	1.006	8	66.6	1.597	0.602	0.7353	
15 minute winter	8	1.007	9	67.1	1.646	0.528	1.3948	
1440 minute winter	41	4.000	42	4.2	0.727	0.073	0.6373	
1440 minute winter	42	Hydro-Brake®	9	0.6				
15 minute winter	9	1.008	10	67.5	1.765	0.608	2.8454	
720 minute winter	51	5.000	52	10.3	0.905	0.083	1.0730	
720 minute winter	52	Hydro-Brake®	10	1.6				
15 minute winter	10	1.009	11	68.5	2.054	0.459	1.9333	
15 minute winter	61	6.000	62	5.1	0.871	0.091	0.3051	
600 minute winter	71	7.000	72	15.4	1.078	0.114	0.9554	
600 minute winter	72	Hydro-Brake®	62	3.2				
15 minute winter	62	6.001	63	27.1	1.404	0.245	1.1861	
15 minute winter	81	8.000	82	97.3	2.447	1.776	0.3668	
720 minute winter	82	Hydro-Brake®	63	2.0				
15 minute winter	63	6.002	64	32.5	1.528	0.184	0.5369	

Results for 30 year +30% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	64	11	68.210	0.119	39.3	0.1765	0.0000	OK
15 minute winter	65	12	67.993	0.093	39.0	0.1331	0.0000	OK
15 minute winter	23	6	67.436	0.386	43.1	0.6977	0.0000	SURCHARGED
1440 minute winter	20	1380	67.343	0.369	3.7	70.6959	0.0000	SURCHARGED
15 minute winter	66	12	66.570	0.070	39.5	0.0999	0.0000	OK
15 minute winter	11	13	65.104	0.171	105.8	0.2452	0.0000	OK
15 minute winter	12	13	64.748	0.134	106.1	0.1925	0.0000	OK
15 minute winter	91	6	64.241	0.361	44.2	0.6429	0.0000	SURCHARGED
720 minute winter	92	660	64.068	0.301	4.9	57.5589	0.0000	SURCHARGED
15 minute winter	13	13	63.420	0.108	107.3	0.1546	0.0000	OK
15 minute winter	101	11	59.816	0.316	70.2	0.6411	0.0000	SURCHARGED
1440 minute winter	102	1380	59.714	0.614	4.8	117.4868	0.0000	SURCHARGED
15 minute winter	14	13	58.509	0.152	108.1	0.2177	0.0000	OK
15 minute winter	15	12	57.720	0.442	107.9	0.6324	0.0000	SURCHARGED
15 minute winter	16	12	57.690	0.675	125.5	1.1919	0.0000	SURCHARGED
360 minute winter	17	240	57.147	0.192	29.4	113.5014	0.0000	OK
15 minute summer	18	1	56.926	0.000	9.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	64	6.003	65	39.0	1.763	0.271	0.2538	
15 minute winter	65	6.004	66	39.1	2.532	0.185	0.6062	
15 minute winter	23	9.000_1	20	43.4	2.068	0.836	0.1604	
1440 minute winter	20	Hydro-Brake®	66	0.5				
15 minute winter	66	6.005	11	39.6	2.899	0.120	0.2735	
15 minute winter	11	1.010	12	106.1	2.515	0.335	0.5388	
15 minute winter	12	1.011	13	106.5	3.458	0.237	0.8037	
15 minute winter	91	10.000	92	44.6	2.053	0.858	0.2450	
720 minute winter	92	Hydro-Brake®	13	0.9				
15 minute winter	13	1.012	14	107.5	3.173	0.185	2.0251	
15 minute winter	101	9.000	102	70.8	2.487	0.965	0.6120	
1440 minute winter	102	Hydro-Brake®	14	0.7				
15 minute winter	14	1.013	15	107.9	2.392	0.354	3.5650	
15 minute winter	15	1.014	16	125.5	1.793	0.241	0.4325	
15 minute winter	16	1.015	17	149.4	2.318	0.465	3.8711	
360 minute winter	17	Hydro-Brake®	18	21.1				551.9

Results for 200 year +30% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	11	71.536	0.423	26.0	0.5832	0.0000	SURCHARGED
15 minute winter	2	11	70.954	0.154	44.1	0.2422	0.0000	OK
15 minute winter	21	11	71.836	0.954	106.9	2.1420	0.0000	SURCHARGED
960 minute winter	22	930	71.623	0.889	9.4	170.1357	0.0000	SURCHARGED
15 minute winter	3	11	70.543	0.199	50.2	0.2927	0.0000	OK
15 minute winter	4	11	70.460	0.174	63.6	0.2641	0.0000	OK
15 minute winter	5	11	70.104	0.125	82.5	0.1959	0.0000	OK
1440 minute winter	31	1380	69.562	0.768	6.4	1.4559	0.0000	SURCHARGED
1440 minute winter	32	1380	69.562	0.847	6.5	162.1095	0.0000	SURCHARGED
15 minute winter	6	11	68.168	0.138	90.9	0.2034	0.0000	OK
15 minute winter	7	12	67.659	0.244	97.3	0.3585	0.0000	OK
15 minute winter	8	12	67.450	0.210	97.3	0.3010	0.0000	OK
15 minute winter	41	11	68.450	0.750	93.3	1.3833	0.0000	SURCHARGED
1440 minute winter	42	1410	68.328	0.828	6.0	158.5054	0.0000	SURCHARGED
15 minute winter	9	12	67.024	0.231	98.5	0.3308	0.0000	OK
960 minute winter	51	765	69.123	2.373	12.4	4.7337	0.0000	SURCHARGED
960 minute winter	52	765	69.123	2.563	12.3	193.7622	0.0000	FLOOD RISK
15 minute winter	10	13	66.234	0.185	99.3	0.2648	0.0000	OK
15 minute winter	61	11	70.057	0.057	7.8	0.0848	0.0000	OK
720 minute winter	71	690	70.635	0.785	19.9	1.9342	0.0000	SURCHARGED
720 minute winter	72	690	70.635	0.985	22.2	282.2283	0.0000	SURCHARGED
15 minute winter	62	11	69.457	0.129	39.7	0.2054	0.0000	OK
600 minute winter	81	555	71.518	2.018	18.1	4.7615	0.0000	FLOOD RISK
600 minute winter	82	555	71.517	2.196	17.9	193.2377	0.0000	FLOOD RISK
15 minute winter	63	11	68.825	0.105	47.4	0.1540	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	24.8	1.407	1.399	0.4143	
15 minute winter	2	1.001	3	43.6	1.562	0.754	0.8628	
15 minute winter	21	2.000	22	107.7	3.009	2.070	0.5873	
960 minute winter	22	Hydro-Brake®	3	1.0				
15 minute winter	3	1.002	4	50.0	1.094	0.701	0.6423	
15 minute winter	4	1.003	5	63.1	1.816	0.565	1.0626	
15 minute winter	5	1.004	6	82.1	2.766	0.357	1.3654	
1440 minute winter	31	3.000	32	6.5	0.726	0.125	0.3167	
1440 minute winter	32	Hydro-Brake®	6	0.8				
15 minute winter	6	1.005	7	90.3	1.912	0.405	0.7135	
15 minute winter	7	1.006	8	97.3	1.700	0.879	1.0071	
15 minute winter	8	1.007	9	97.9	1.765	0.770	1.9008	
15 minute winter	41	4.000	42	94.4	2.746	1.623	0.6189	
1440 minute winter	42	Hydro-Brake®	9	0.7				
15 minute winter	9	1.008	10	97.7	1.890	0.879	3.8279	
960 minute winter	51	5.000	52	12.3	0.896	0.099	1.0730	
960 minute winter	52	Hydro-Brake®	10	2.6				
15 minute winter	10	1.009	11	99.0	2.233	0.664	2.5704	
15 minute winter	61	6.000	62	7.7	0.981	0.138	0.4105	
720 minute winter	71	7.000	72	19.7	1.124	0.146	0.9554	
720 minute winter	72	Hydro-Brake®	62	3.2				
15 minute winter	62	6.001	63	39.6	1.556	0.358	1.5617	
600 minute winter	81	8.000	82	17.9	0.873	0.327	0.3705	
600 minute winter	82	Hydro-Brake®	63	2.9				
15 minute winter	63	6.002	64	47.1	1.667	0.267	0.7131	

Results for 200 year +30% CC Critical Storm Duration. Lowest mass balance: 99.76%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	64	11	68.239	0.148	57.2	0.2207	0.0000	OK
15 minute winter	65	11	68.014	0.114	57.0	0.1635	0.0000	OK
1440 minute winter	23	1380	67.539	0.489	4.2	0.8844	0.0000	SURCHARGED
1440 minute winter	20	1380	67.539	0.565	5.8	108.1369	0.0000	SURCHARGED
15 minute winter	66	12	66.584	0.084	57.1	0.1202	0.0000	OK
15 minute winter	11	12	65.149	0.216	152.6	0.3096	0.0000	OK
15 minute winter	12	13	64.780	0.166	152.5	0.2377	0.0000	OK
15 minute winter	91	6	64.289	0.409	66.1	0.7286	0.0000	SURCHARGED
960 minute winter	92	915	64.265	0.498	5.8	95.3062	0.0000	SURCHARGED
15 minute winter	13	13	63.442	0.130	153.9	0.1865	0.0000	OK
15 minute winter	101	11	60.403	0.903	104.9	1.8295	0.0000	SURCHARGED
1440 minute winter	102	1410	60.025	0.925	6.8	176.9958	0.0000	SURCHARGED
15 minute winter	14	14	58.547	0.190	154.9	0.2722	0.0000	OK
15 minute summer	15	12	57.930	0.652	146.0	0.9336	0.0000	SURCHARGED
15 minute summer	16	12	57.863	0.848	208.5	1.4990	0.0000	SURCHARGED
240 minute winter	17	172	57.198	0.243	47.3	146.3949	0.0000	OK
15 minute summer	18	1	56.926	0.000	10.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	64	6.003	65	57.0	1.924	0.396	0.3396	
15 minute winter	65	6.004	66	56.6	2.797	0.268	0.7954	
1440 minute winter	23	9.000_1	20	5.8	0.667	0.112	0.3027	
1440 minute winter	20	Hydro-Brake®	66	0.5				
15 minute winter	66	6.005	11	57.2	2.948	0.174	0.4190	
15 minute winter	11	1.010	12	152.5	2.706	0.481	0.7193	
15 minute winter	12	1.011	13	153.0	3.781	0.341	1.0561	
15 minute winter	91	10.000	92	67.1	2.168	1.292	0.3474	
960 minute winter	92	Hydro-Brake®	13	0.9				
15 minute winter	13	1.012	14	154.2	3.496	0.266	2.6524	
15 minute winter	101	9.000	102	104.4	2.896	1.422	0.8008	
1440 minute winter	102	Hydro-Brake®	14	0.8				
15 minute winter	14	1.013	15	151.8	2.560	0.499	3.8339	
15 minute summer	15	1.014	16	208.5	1.984	0.401	0.4325	
15 minute summer	16	1.015	17	249.4	2.303	0.776	3.8623	
240 minute winter	17	Hydro-Brake®	18	25.4				555.3