March 2010

Sea Brook – Hydraulic Modelling Exercise to define Flood Zones 1, 2, 3a and 3b between former Royal Navy Stores Depot link road and Topsham Road

Introduction

This modelling exercise is for the Sea Brook that flows north to south between the former Royal Navy Stores Deport (RNSD) and Topsham Road. The Sea Brook is then culverted in a 1.6m diameter pipe underneath Topsham Road for approximately 110m before continuing in an open watercourse to its discharge into the tidal River Exe.

The Sea Brook is a small watercourse that drains a natural Greenfield area east of Exeter before discharging directly into the River Exe. A public surface water sewer which drains an area north of the natural catchment centred on the former Digby Hospital site also discharges into the head of the Sea Brook catchment.

The Sea Brook is not classified as a Main River by the Environment Agency (EA), however they will still require an ecological buffer between any development and the top of watercourse bank. This buffer is typically 5m based on recent experience.

The Sea Brook has been modelled using the ISIS software package. The model is made up of a series of cross sections (Nodes) of ground level data that have been created using LIDAR data provided by the EA supplemented with fieldwork surveys to more accurately define the watercourse channel.

Four flow scenarios have been considered being the 25-year, 100-year, climate change, and 1000-year flood events. These flows include the actual amount of urban run-off that can be conveyed from the north through the existing sewer system.

The 25 year flow is deemed to be the equivalent of Flood Zone 3B with climate change influences added. The climate change event has been considered to be the 100-year event with an additional 20% added across the hydrograph. In addition to these flow scenarios, additional scenarios have been tested in the model to take into account of changes to the roughness of the channel (sensitivity test), blockage scenarios of structures and the affects of the sediment that is present in the lower sections of the Sea Brook. These are described later.

There is also the potential of an exceedence event when the public sewer system surcharges and above ground flows could occur. This is discussed in detail later in the report

Hydrology

The design flow rates used in the modelling have been derived from two sources; the "Greenfield" undeveloped catchment area of the Sea Brook bounded by the A379 in the north and the urban area of Digby further to the north that has it's surface water run-off discharging into the head of the Sea Brook via a 1350mm diameter pipe network.

The characteristics of the Sea Brook catchment have been assessed using the Flood Estimation Handbook (FEH) CD. The base catchment area has been modified using local knowledge of drainage networks and topographical survey to more accurately show the catchment data of the area. This increases the FEH catchment area from 0.67km^2 to 0.81km² of Greenfield area south of the A379.

The Greenfield catchment flows have been assessed using the Rainfall-Runoff methodology. This estimates flows within the Sea Brook to be 2.40 cumecs under a 100-year return period storm and 5.10 cumecs under a 1000-year return period storm.

The urban Digby contribution (from outside the Greenfield catchment area) has been assessed by determining the contributing areas into a South West Water (SWW) surface water sewer network that runs between Quarry Lane near Peninsula House and Russell Way immediately to the north of the A379. This contributing area has been calculated to be 0.62km². When the sewers were designed by SWW an average factor of 70% impermeable area was assumed for the pipe designs. This equates to a net contributing area into the SWW surface water sewer of 0.43km². To assess the potential urban run-off from this area the contributing area has been tested in System 1 of the WinDes MicroDrainage software to determine various return period design flows.

System 1 will only provide flows for the 2 year design storm so the higher return periods need to be factored using Regional Growth Factors derived by SWW and the EA based on methodology included in the 1975 Flood Studies Report. This is shown to be 5.8 cumecs for the 2 year, 19.3 cumecs for the 100-year return period event, and 34.9 cumecs for a 1000-year event.

The flows from this urban area connect into the Sea Brook by a SWW surface water sewer network. Between the A379 and the head of the Sea Brook the pipe is either a 1350mm or 1500mm diameter pipe. The 1350mm diameter surface water sewer which is directly downstream of the Digby contributing area has been assessed in System 1 to determine the maximum capacity. This shows that the most restricting part of the pipe network has a capacity of approximately 3.4 cumecs or equivalent to a 1 in 2 year storm, which was the design requirement when the sewer was constructed. This flow has therefore been used as the urban contribution for adding to the various Greenfield flows to determine the design flows for the modelling of the Sea Brook.

When the A379 was constructed it was acknowledged that an existing valley feature would be crossed which had a potential to convey overland flows during periods of heavy rainfall. To mitigate this potential blockage of the flood route a 0.875m diameter culvert was constructed under the link road to allow flows to continue south to Old Rydon Lane where highway drainage would intercept some ponding water flows. Any additional flows would continue south west toward the head of the Sea Brook. The

culvert under the A379 can convey approximately 1.3 cumecs assuming the inlet is clear and the culvert is in good condition For this modelling exercise we have excluded this potential overland flow from the Digby urban area as the peak flow becomes diluted as it spreads out across the open farmland north of Old Rydon Lane or is lost in ponding in Old Rydon Lane.

The following table shows the flows used within the ISIS Models;

	Peak Flows (Cumecs)		
Return Period	Greenfield Catchment Contribution	Urban Contribution	Combined Flows
25-year	1.52	3.4	4.82
100-year	2.40	3.4	5.80
Climate Change	2.88	3.4	6.96
1000-year	5.10	3.4	8.50

The time to peak of the storm differs for the urban and the Greenfield catchment contribution areas. The urban contribution provides a much more rapid time to peak than the Greenfield catchment contribution. It has been calculated that the urban time to peak will be within approximately 0.5 hours whereas the Greenfield catchment time to peak is approximately 2.2 hours. For the purposes of this modelling report the urban contribution of 3.4 cumecs is applied across the whole Greenfield hydrograph.

Appendix A includes drawing Sea/Fig.1 which shows the Greenfield catchment area of the Sea Brook and the Digby urban area. The hydrographs used within the ISIS models are included in Appendix B.

ISIS Model Make-up

The model is made up using a series of nodes obtained from the LIDAR data, and physical on site survey of the watercourse channel. The ISIS model covers the Sea Brook from immediately downstream of the bridge on the new road through the former RNSD that will connect Topsham Road to Old Rydon Lane, to downstream of the Sea Brook Culvert underneath Topsham Road and its outfall.

To take into account the roughness of the banks and bed of the watercourse Manning's values of 0.040 have been used in the floodplain areas and 0.055 for the main channel bed and banks throughout as this zone is heavily vegetated. Manning's values of 0.04 have been included for the three concrete culverts in this reach of the Sea Brook.

From the site survey work it is evident that sediment is an issue in the downstream extents of the Sea Brook and especially around the Sea Brook Culvert underneath Topsham Road. At present the sediment upstream of the Topsham Road culvert is approximately 200mm deep which increases to approximately 500mm deep downstream of the culvert. This sediment obviously reduces the capacity of the culvert, which makes it less hydraulically efficient.

A plan showing the LIDAR data and the location of the ISIS nodes is included in Appendix A as Sea/Fig. 2.

ISIS Model Results

Introduction

10 different scenarios have been simulated for the Sea Brook based upon four different flow scenarios. These standard base flow models without different blockage or sensitivity tests are: The 25-year, the 100-year, climate change, and the 1000-year flow conditions.

Because the larger element of flow is from the Digby urban catchment (3.4 cumecs) this contribution influences every peak flow in the four standard flow scenarios. Therefore the difference between flood levels (stage heights) under the three PPS 25 Flood Zone bands is minimal.

Model Results – Flood Zone Models

All the model results for the sea Brook show a very similar peak flood level and therefore peak flood extents through the course of the model. The catchment has a heavily skewed urban contribution from the sewerage network. The results of the model show the natural Greenfield catchment run-off combined with the peak urban contribution of 3.4 cumecs, under all the scenarios.

The watercourse flows in a well defined channel and once out of bank of the main channel is contained by the topography of the surrounding land which falls towards the brook on both sides.

The defining factor in the peak flood levels down the watercourse comes from the culverts and overland spill paths. There are three culverts within the watercourse, two are for agricultural purposes and the third and most significant culvert conveys the water from the Sea Brook underneath Topsham Road.

At the upstream of the model there is a natural valley feature where a small tributary joins into the Sea Brook. At this location there is a pond feature. During an extreme flow event the water levels will rise up to a level of between 14.0m AOD and 14.3m AOD reflecting a 25 year flow scenario and a 1000 year flow scenario respectively.

The floodwater mainly remains within bank between XS3 and XS7. Between XS7 and XS10 there is a natural low point on the eastern side of the Sea Brook. Floodwaters would be able to follow the natural topography in this area, resulting in a large area of flooding on this side of the Sea Brook as shown by Figure 3.

On the eastern side of the Sea Brook on cross sections XS13, XS13A and XS14 there is a natural depression in the ground. Floodwater would not be able to directly flood this area but during the 100-year and the 1000-year flow event flood water would be able to flow into this depression from a low point just downstream of XS14.

The largest influence on flood levels comes from the culvert under Topsham Road. Floodwater will be able to backup behind the culvert inlet to a level of 7.5m AOD before being able to overtop the bank. This floodwater will be able to extend down Topsham Road to approximately the location of Newport Lodges. Once a level of 7.7m AOD the

floodwater will be able to flow further to the south west over the garden centre to merge back into the Sea Brook downstream of the culvert exit. The water depth over the spill level of 7.7m AOD is predicted to range from approximately 140mm during a 25-year flow event to 275mm during a 1000-year event.

Sedimentation Model

To determine the affect the existing sediment has on the Sea Brook during an extreme flow event the downstream sections have been modified to reflect the sedimentation present. This results in the raising of the bed level between XS14 to XS18 including the culvert underneath Topsham Road.

When incorporating the sediment into the ISIS model the maximum water level upstream of the Sea Brook Culvert (Node XS15) increases by 40mm. The peak flow through the culvert under Topsham Road is reduced by approximately 0.5 cumecs. Due to the overland spill, the water levels are not dramatically affected.

Sensitivity Test

A sensitivity test has been carried out by increasing the global Manning's values throughout the model by 20%. The increase in the Manning's values has made very little difference to the maximum flows down the watercourse. The sensitivity test shows a slight rise in stage heights at certain cross sections, the largest increase being at XS5 where the flood level rises by 0.18m.

Blockage Scenarios

50% Blockage scenarios have been assessed on all three of the culverts within the modelled reach of the Sea Brook under the climate change flow scenario. Each blockage has been tested in a separate model so that each culvert can be tested individually.

With a blockage to the upstream culvert (Nodes ABC1&2) it is predicted that there will be a decrease in flow through the culvert of approximately 2 cumecs. This will cause the maximum stage height to rise by 230mm over the spill unit representing the agricultural track.

The blockage of the culvert immediately downstream of node XS14 has minimal affect on high flows under the climate change scenario. The flows passing through the culvert will reduce by 0.2 cumecs although these flows are affected by the backing up affect from the culvert downstream. Therefore this scenario will have minimum affect on the maximum flood level.

The Topsham Road Culvert blockage scenario predicts a 0.5 cumecs drop in the maximum flow through the culvert. Due to the large spill area available there will be a minimal change in the peak stage height spilling over Topsham Road.

Tidal Influences

The lower reach of the Sea Brook is affected by tidal activity propagating up the River Exe. Tidal data has been obtained from the Report on Regional Extreme Tide Levels, May 2002. This states the Mean High Water Spring (MHWS) to be 2.25m AOD. When considering the affects of climate change over the next 100-years as set out by the guidance in Planning Policy Statement 25 (PPS25) a MHWS level of 3.26m AOD can be expected. The 200-year tide level is stated to be 3.82m AOD, with the affects of climate change over the next 100-years this level is predicted to increase to 4.83m AOD.

These tidal influences have no impact upstream of Topsham Road on any of the fluvial models as natural ground levels are all above 8.0m.

Summary

All the flow scenarios modelled show that the flood extents, although out of bank are confined by the local topography of the area. This prevents a large change in flood zoning under all the scenarios considered.

All the flow models considered incorporate the Greenfield flow element and 3.4 cumecs through the public surface water sewer system.

The maximum results at all the ISIS nodes under all the scenarios considered along with an ISIS node plan are included in Appendix B.

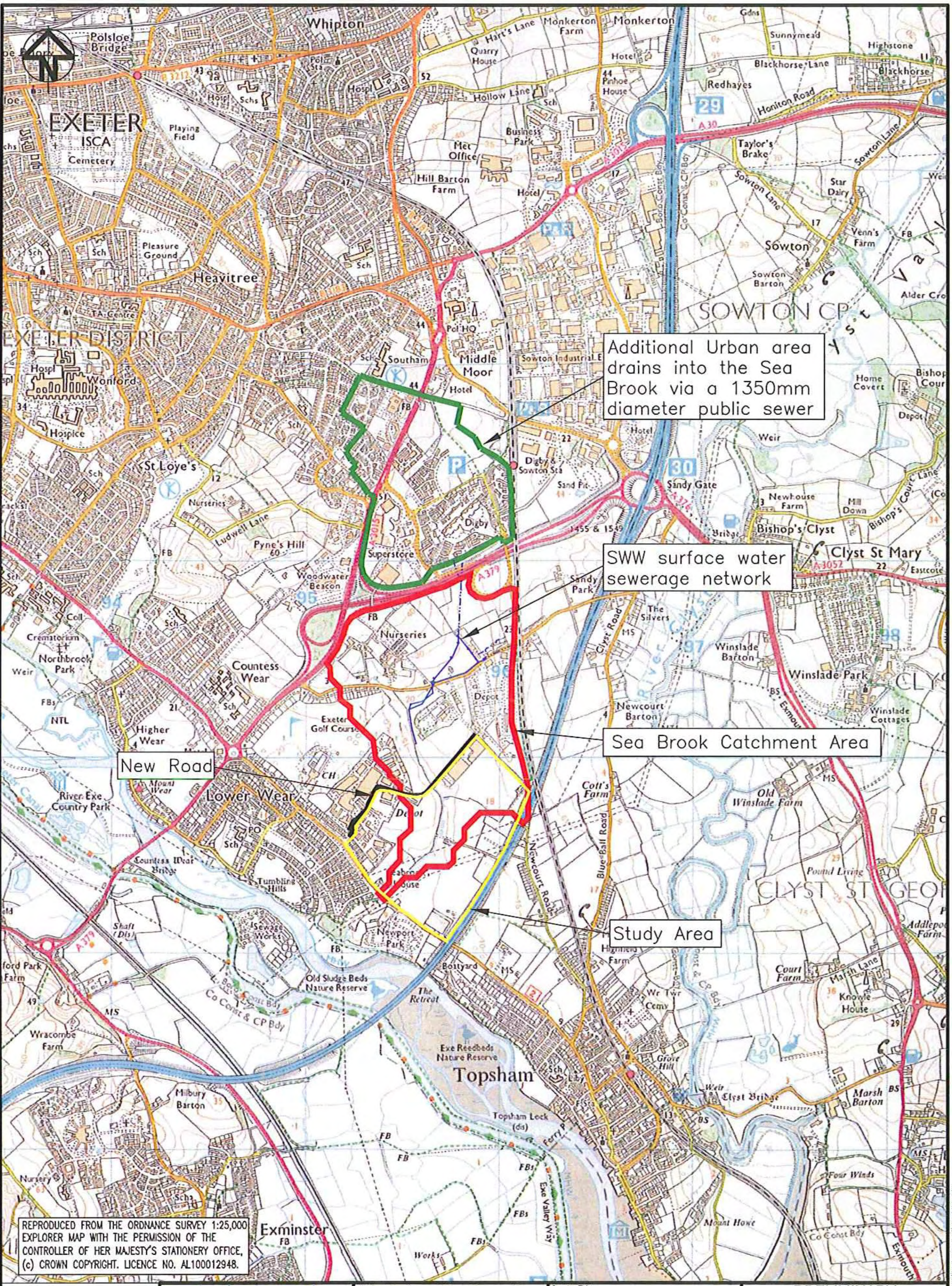
Conclusion

1. The modelling shows the majority of the flood extents can be considered to be within Flood Zone 3b, with only marginal changes in flood extents between the other flood zoning categories when considered against PPS 25 guidance;
2. The Environment Agency has stated that they would accept a general lowering of ground levels in a 10m wide margin beside the brook. This area of land will need to be retained free of all building development.
3. Only ‘water compatible’ development is acceptable in Flood Zone 3b as described within PPS25.
4. This assessment excludes any allowances for further urbanisation of the upstream catchment as all new development schemes will be designed in accordance with PPS25 to mimic existing Greenfield surface water run-off regimes.

Appendix A

Drawings

Sea/Fig. 1	Sea Brook Catchment Plan
Sea/Fig. 2	Sea Brook model – LIDAR topography and Node Locations
Sea/Fig. 3	Flood Extents Plan



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			Drawn AMR / Checked SCS / Approved MKR / Sheet Size A4

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XS1
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XS13A
XS14/BC1
XS14A/BC2
XS15/C1
XS16/C2
XS17
XS18

19.5 16.5 14.0 15.5 13.5 18.0 19.5 17.0 19.0 17.5 15.0 19.5 16.5 18.5 16.0 14.5 12.5 10.5 11.5 12.0 13.0 11.0 9.5 11.0 10.0 10.0 11.0 11.5 8.5 8.0 9.5 10.5 7.5 7.0 7.5 9.0 10.0 9.5 7.5 5.5

Works
Seabrook House
The Barn
Seabrook Cottages
Newport Cottage
Newport Lodge
Newport House
Topsham Road
Pavilion

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REV	DATE	BY	DESCRIPTION	CHK	APD
.	08.08.08	SCS	ORIGINAL ISSUE	NAS	MKR

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CLIENT: Exeter City Council

PRELIMINARY
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PROJECT: Exeter City Council SFRA
Sea Brook

TITLE: Sea Brook Model
LIDAR Topography
and Node Locations

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Key:

- 25-year flood envelope (3b)
- 100 Year flood envelope (3a)
- 1000-year flood envelope (2)

XS1 XS2 XS3 XS4 XS5 XS6/ABC1 XS7/ABC2 XS8 XS9 XS10 XS11 XS12 XS13 XS13A XS14/BC1 XS14A/BC2 XS15/C1 XS16/C2 XS17 XS18

Overland flows will merge back into the sea brook channel.

Works

Seabrook House

The Barn

Seabrook Cottages

Newport Lodge

Topsham Road

Newport House

Shelter

Plotted: 01/1/2010 12:01 PM

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B	13.01.10	AMR	CHANGE TO FLOOD EXTENTS.	SCS	MKR
A	21.10.09	AMR	CHANGE TO FLOOD EXTENTS	SCS	MKR
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CLIENT: Exeter City Council

PRELIMINARY
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PROJECT: Exeter City SFRA
Sea Brook

TITLE: Flood Extents Plan

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SCALE:	CHECKED:	APPROVED:
1:2000 @ A3	SCS	MKR
CAD FILE:	DESIGN-DRAW:	DATE:
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PROJECT NO:	DRAWING NO:	REV:
WE00261	Sea/Fig.3	B

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Appendix B

Hydrology & Modelling

Urban Contribution
Urban Growth Factors
SWW pipe capacity
Hydrographs used with the ISIS Models
ISIS Node Plan
Maximum Result Sheets

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Pipe Size File C:\Program Files\Micro Drainage Ltd\WinDes\STANDARD.PIP
Manhole Size File C:\Program Files\Micro Drainage Ltd\WinDes\STANDARD.MHS

Location - England & Wales

Return Period (years)	2	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	20.900	Min Cover Depth for Optimisation (m)	1.200
Ratio R	0.355	Min Vel for Auto Design Only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Min Slope for Optimisation (1:X)	500
Foul Sewage (l/s/ha)	0.00	Minimum Outfall Invert (m)	0.000
O'flow Setting (*Foul only)	0	Ground Level at Outfall (m)	0.000
Volumetric Runoff Coeff.	0.75	Outfall Manhole Name	
Add Flow / Climate Change (%)	0	Outfall Manhole Dia/Length (mm)	0
Minimum Backdrop Height (m)	0.200	Outfall Manhole Width (mm)	0

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	865.00	16.000	54.1	43.000	4.00	0.0	0.600	o	1275

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	50.0	6.7	0.000	43.000	0.0	0.0	0.0	5.29	6749.6	5822.7

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Time Area Diagram

Time From (mins)	Time To (mins)	Area (ha)
0	4	13.684
4	8	29.316

Total Area Contributing (ha) = 43.000

Total Pipe Volume (m^3) = 1104.400

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Return Periods	Growth factors		
Mean Annual Flood (MAF)	1.00	=	6.6 cumecs
2 yr	0.88	=	5.8 cumecs
5 yr	1.28	=	8.4 cumecs
10 yr	1.58	=	10.4 cumecs
25 yr	2.03	=	13.4 cumecs
30 yr	2.14	=	14.1 cumecs
50 yr	2.45	=	16.1 cumecs
100 yr	2.93	=	19.3 cumecs
Climate Change	100yr+ 20%	=	23.2 cumecs
1000 yr	5.30		34.9

STORM SEWER DESIGN by the Modified Rational Method

Global Variables

Pipe Size File C:\Program Files\Micro Drainage Ltd\WinDes\STANDARD.PIP
Manhole Size File C:\Program Files\Micro Drainage Ltd\WinDes\STANDARD.MHS

Location - England & Wales

Return Period (years)	2	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	20.900	Min Cover Depth for Optimisation (m)	1.200
Ratio R	0.357	Min Vel for Auto Design Only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Min Slope for Optimisation (1:X)	500
Foul Sewage (l/s/ha)	0.00	Minimum Outfall Invert (m)	0.000
O'flow Setting (*Foul only)	0	Ground Level at Outfall (m)	0.000
Volumetric Runoff Coeff.	0.75	Outfall Manhole Name	
Add Flow / Climate Change (%)	0	Outfall Manhole Dia/Length (mm)	0
Minimum Backdrop Height (m)	0.200	Outfall Manhole Width (mm)	0

Designed with Level Soffits

Network Design Table

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	DWF (l/s)	k (mm)	HYD SECT	DIA (mm)
1.000	87.20	0.575	151.7	25.000	4.00	0.0	0.600	o	1350
1.001	96.05	0.341	281.7	0.000	0.00	0.0	0.600	o	1350
1.002	88.77	0.499	177.9	0.000	0.00	0.0	0.600	o	1350

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E.Area (ha)	E.DWF (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	CAP (l/s)	Flow (l/s)
1.000	50.0	4.4	0.000	25.000	0.0	0.0	0.0	3.26	4671.5	3385.3
1.001	50.0	5.1	-0.575	25.000	0.0	0.0	0.0	2.39	3422.8	3385.3
1.002	50.0	5.6	-0.916	25.000	0.0	0.0	0.0	3.01	4311.7	3385.3

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Time Area Diagram

Time From (mins)	Time To (mins)	Area (ha)
0	4	14.963
4	8	10.037

Total Area Contributing (ha) = 25.000

Total Pipe Volume (m^3) = 389.366

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Greenfield Flows

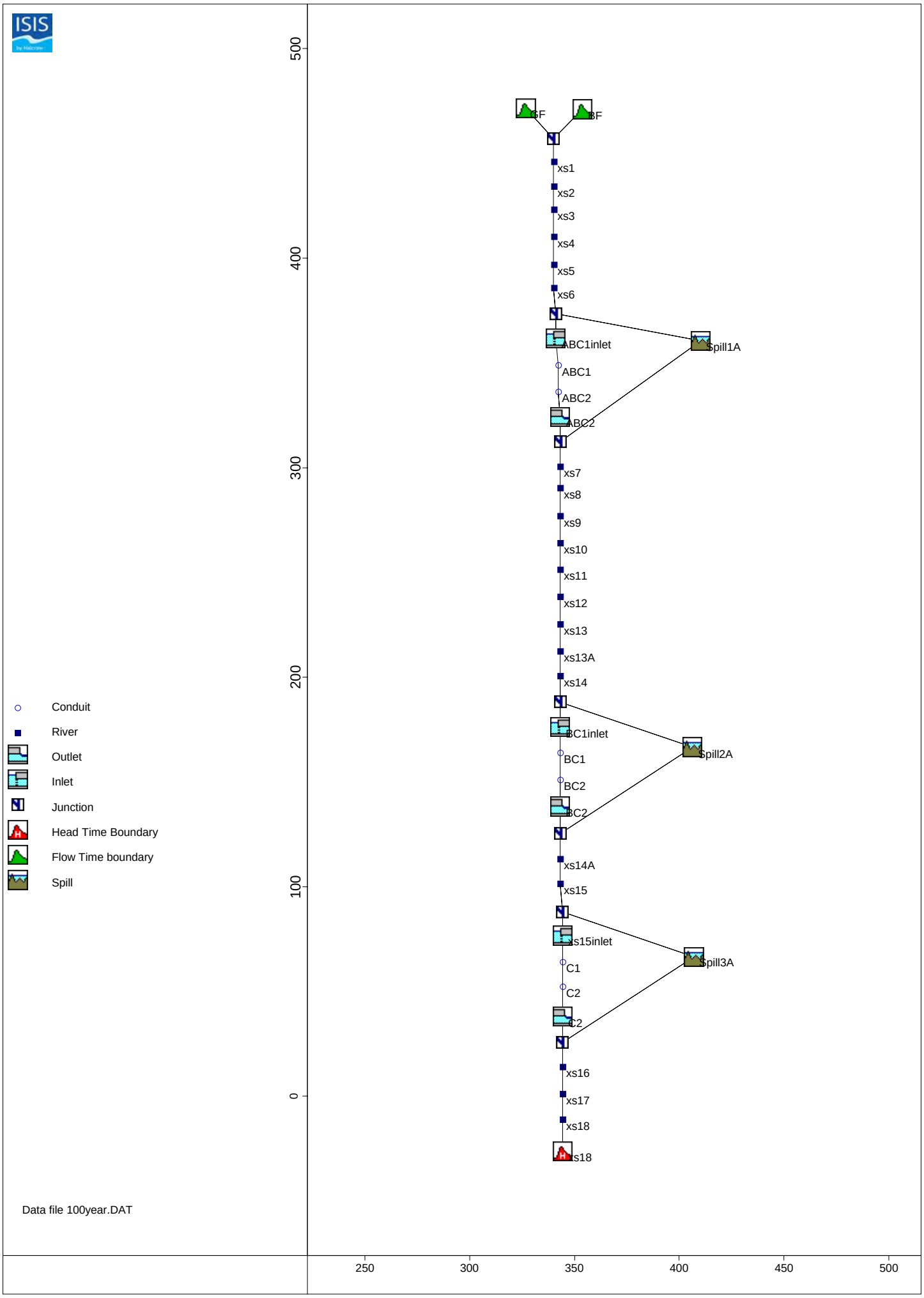
time (hours)	**25-year** flow hydrograph (m3/s)	**100-year** flow hydrograph (m3/s)	**1000-year** flow hydrograph (m3/s)
0	0.02	0.02	0.02
0.2	0.03	0.04	0.05
0.4	0.06	0.07	0.13
0.6	0.10	0.14	0.27
0.8	0.18	0.27	0.54
1	0.32	0.49	1.02
1.2	0.53	0.83	1.75
1.4	0.78	1.23	2.59
1.6	1.03	1.63	3.45
1.8	1.27	2.00	4.24
2	1.45	2.28	4.84
2.2	**1.52**	**2.40**	**5.10**
2.4	1.48	2.34	4.96
2.6	1.36	2.15	4.56
2.8	1.20	1.89	4.01
3	1.01	1.59	3.38
3.2	0.82	1.28	2.70
3.4	0.62	0.96	2.03
3.6	0.43	0.67	1.41
3.8	0.28	0.42	0.88
4	0.16	0.25	0.50
4.2	0.10	0.14	0.27
4.4	0.06	0.08	0.14
4.6	0.04	0.05	0.07
4.8	0.03	0.03	0.04
5	0.02	0.02	0.02

Peak flows including the urban contribution of 3.4 cumecs

25-year	**100-year**	**1000-year**
4.92	5.80	8.50

Sea Brook

ISIS Model Node Plan



	25 Year								100 Year							
Label	Max Flow	Time (hr)mx1	Max Stage	Time (hr)mx2	Max Fr	Time (hr)mx3	Max Velocity	Time (hr)mx4	Max Flow	Time (hr)mx1	Max Stage	Time (hr)mx2	Max Fr	Time (hr)mx3	Max Velocity	Time (hr)mx4
GF	1.51	2.25	14.02	2.42	0.00	0.00	0.00	0.00	2.38	2.25	14.09	2.33	0.00	0.00	0.00	0.00
Spill1A	0.00	2.25	11.47	2.42	0.45	0.00	0.68	0.00	0.51	2.42	11.63	2.42	0.45	0.00	0.68	0.00
Spill1B	0.00	2.25	10.94	2.42	0.29	0.00	0.46	0.00	0.51	2.42	11.02	2.42	0.29	0.00	0.46	0.00
Spill2A	3.81	2.58	7.86	2.58	0.12	0.00	0.32	0.00	4.60	2.50	7.90	2.50	0.12	0.00	0.32	0.00
Spill2B	3.81	2.58	7.84	2.58	0.06	0.00	0.20	0.00	4.60	2.50	7.88	2.50	0.06	0.00	0.20	0.00
Spill3A	1.20	2.58	7.84	2.58	0.05	0.00	0.16	0.00	2.10	2.58	7.88	2.50	0.05	0.00	0.16	0.00
Spill3B	1.20	2.58	5.40	3.00	0.00	0.00	0.28	0.00	2.10	2.58	5.48	3.00	0.00	0.00	0.28	0.00
BF	3.40	0.00	14.02	2.42	0.00	0.00	0.00	0.00	3.40	0.00	14.09	2.33	0.00	0.00	0.00	0.00
xs1	4.91	2.25	14.02	2.42	0.26	0.00	0.79	0.00	5.78	2.25	14.09	2.33	0.29	2.25	0.86	2.17
xs2	4.89	2.25	14.01	2.42	0.06	0.00	0.14	0.00	5.76	2.25	14.08	2.33	0.06	0.00	0.14	0.00
xs3	4.88	2.42	13.98	2.42	0.30	0.00	0.62	0.00	5.75	2.33	14.05	2.33	0.30	0.00	0.62	0.00
xs4	4.88	2.42	13.68	2.42	0.50	2.33	1.53	0.00	5.75	2.33	13.84	2.42	0.50	3.17	1.53	0.00
xs5	4.88	2.42	12.24	2.42	0.74	0.00	2.31	2.33	5.75	2.42	12.40	2.42	0.74	0.00	2.41	2.33
xs6	4.88	2.42	11.47	2.42	0.32	0.00	0.81	0.00	5.75	2.42	11.63	2.42	0.32	0.00	0.81	0.00
ABC1inlet	4.88	2.42	11.47	2.42	1.04	2.42	0.81	0.00	5.24	2.25	11.63	2.42	1.09	2.25	0.81	0.00
ABC1	4.88	2.42	11.42	2.42	0.48	0.00	1.72	2.42	5.24	2.25	11.58	2.42	0.48	0.00	1.85	2.25
ABC2	4.88	2.42	11.07	2.42	0.42	0.00	1.72	2.42	5.24	2.25	11.18	2.42	0.42	0.00	1.85	2.25
ABC2outlet	4.88	2.42	10.94	2.42	0.42	0.00	1.30	0.00	5.24	2.25	11.02	2.42	0.42	0.00	1.30	0.00
xs7	4.88	2.42	10.94	2.42	0.26	0.00	0.65	2.42	5.75	2.42	11.02	2.42	0.26	0.00	0.69	2.33
xs8	4.88	2.42	10.61	2.50	0.67	2.75	1.21	0.00	5.75	2.42	10.63	2.33	0.73	2.42	1.26	2.42
xs9	4.88	2.50	10.00	2.17	1.33	2.50	1.48	0.00	5.75	2.42	10.04	2.42	1.33	1.83	1.48	0.00
xs10	4.89	2.50	9.12	2.50	0.57	2.42	1.70	2.42	5.74	2.50	9.24	2.50	0.57	2.50	1.77	2.50
xs11	4.88	2.58	8.28	2.50	0.68	0.17	1.79	0.75	5.74	2.50	8.37	2.50	0.68	0.17	1.79	0.75
xs12	4.89	2.50	7.92	2.58	0.46	0.33	1.32	0.42	5.74	2.50	7.98	2.50	0.45	0.33	1.29	0.42
xs13	4.88	2.58	7.86	2.58	0.30	0.33	1.03	0.42	5.74	2.50	7.91	2.50	0.30	1.50	0.99	0.42
xs13A	4.87	2.50	7.86	2.58	0.29	0.33	0.66	0.33	5.74	2.50	7.91	2.50	0.22	0.33	0.47	0.33
xs14	4.87	2.58	7.86	2.58	0.29	0.33	0.70	0.33	5.74	2.50	7.90	2.50	0.22	0.33	0.56	0.33
BC1inlet	3.64	1.50	7.86	2.58	0.93	1.50	1.19	0.00	3.61	1.33	7.90	2.50	0.92	1.33	1.19	0.00
BC1	3.64	1.50	7.85	2.58	0.00	0.00	1.27	1.50	3.61	1.33	7.90	2.50	0.00	0.00	1.25	1.33
BC2	3.64	1.50	7.85	2.58	0.00	0.00	1.27	1.50	3.61	1.33	7.89	2.50	0.00	0.00	1.25	1.33
BC2outlet	3.64	1.50	7.84	2.58	0.00	0.00	1.19	0.00	3.61	1.33	7.88	2.50	0.00	0.00	1.19	0.00
xs14A	4.87	2.58	7.84	2.58	0.19	0.33	0.53	0.33	5.74	2.50	7.88	2.50	0.16	0.33	0.46	0.33
xs15	4.87	2.58	7.84	2.58	0.12	0.33	0.36	0.33	5.74	2.58	7.88	2.50	0.10	0.33	0.31	0.33
xs15inlet	3.92	4.50	7.84	2.58	1.45	4.50	0.27	0.00	3.93	4.58	7.88	2.50	1.45	4.58	0.27	0.00
C1	3.92	4.50	7.75	2.58	0.00	0.00	1.95	4.50	3.93	4.58	7.80	2.50	0.00	0.00	1.95	4.58
C2	3.92	4.50	5.56	3.00	0.00	0.00	1.95	4.50	3.93	4.58	5.64	3.00	0.00	0.00	1.95	4.58
C2outlet	3.92	4.50	5.40	3.00	0.00	0.00	1.70	0.00	3.93	4.58	5.48	3.00	0.00	0.00	1.70	0.00
xs16	4.87	2.58	5.40	3.00	0.25	0.08	0.73	0.08	5.74	2.58	5.48	3.00	0.22	0.00	0.67	4.83
xs17	4.86	2.58	5.38	3.00	0.29	0.08	0.82	0.08	5.74	2.58	5.45	3.00	0.23	0.00	0.70	4.83
xs18	4.86	2.58	5.36	3.00	0.30	0.08	0.86	0.08	5.73	2.58	5.43	3.00	0.23	0.00	0.68	4.83

	100 Year + 20%								1000 Year							
Label	Max Flow	Time (hr)mx1	Max Stage	Time (hr)mx2	Max Fr	Time (hr)mx3	Max Velocity	Time (hr)mx4	Max Flow	Time (hr)mx1	Max Stage	Time (hr)mx2	Max Fr	Time (hr)mx3	Max Velocity	Time (hr)mx4
GF	2.86	2.25	14.14	2.42	0.00	0.00	0.00	0.00	5.06	2.25	14.30	2.33	0.00	0.00	0.00	0.00
Spill1A	0.89	2.50	11.68	2.42	0.45	0.00	0.68	0.00	2.77	2.33	11.89	2.33	0.45	0.00	0.68	0.00
Spill1B	0.89	2.50	11.08	3.00	0.29	0.00	0.46	0.00	2.77	2.33	11.18	2.33	0.29	0.00	0.46	0.00
Spill2A	4.98	2.58	7.92	2.58	0.12	0.00	0.32	0.00	6.99	2.50	8.01	2.50	0.12	0.00	0.32	0.00
Spill2B	4.98	2.58	7.90	2.58	0.06	0.00	0.20	0.00	6.99	2.50	7.98	2.50	0.06	0.00	0.20	0.00
Spill3A	2.52	2.58	7.90	2.58	0.05	0.00	0.16	0.00	4.78	2.50	7.98	2.50	0.05	0.00	0.16	0.00
Spill3B	2.52	2.58	5.49	3.00	0.00	0.00	0.28	0.00	4.78	2.50	5.60	2.67	0.00	0.00	0.28	0.00
BF	3.40	0.00	14.14	2.42	0.00	0.00	0.00	0.00	3.40	0.00	14.30	2.33	0.00	0.00	0.00	0.00
xs1	6.26	2.25	14.14	2.42	0.32	2.17	0.89	2.00	8.46	2.25	14.30	2.33	0.38	2.17	0.95	1.75
xs2	6.21	2.25	14.13	2.42	0.06	0.00	0.14	0.00	8.43	2.25	14.30	2.33	0.06	0.00	0.14	0.00
xs3	6.18	2.42	14.10	2.42	0.30	0.00	0.62	0.00	8.42	2.33	14.26	2.33	0.30	0.00	0.62	0.00
xs4	6.17	2.42	13.93	2.42	0.50	3.33	1.53	0.00	8.42	2.33	14.12	2.33	0.50	3.75	1.53	0.00
xs5	6.17	2.42	12.50	2.42	0.74	0.00	2.40	2.00	8.42	2.33	12.81	2.33	0.80	2.33	2.41	1.50
xs6	6.17	2.42	11.68	2.42	0.32	0.00	0.81	0.00	8.42	2.33	11.89	2.33	0.32	0.00	0.81	0.00
ABC1inlet	5.28	2.08	11.68	2.42	1.10	2.08	0.81	0.00	5.64	2.33	11.89	2.33	1.15	2.33	0.81	0.00
ABC1	5.28	2.08	11.63	2.42	0.48	0.00	1.86	2.08	5.64	2.33	11.83	2.33	0.48	0.00	1.99	2.33
ABC2	5.28	2.08	11.23	2.42	0.42	0.00	1.86	2.08	5.64	2.33	11.37	2.33	0.42	0.00	1.99	2.33
ABC2outlet	5.28	2.08	11.08	3.00	0.42	0.00	1.30	0.00	5.64	2.33	11.18	2.33	0.42	0.00	1.30	0.00
xs7	6.17	2.42	11.08	3.00	0.26	0.00	0.70	2.42	8.42	2.33	11.18	2.33	0.28	2.33	0.84	2.33
xs8	6.17	2.50	10.64	2.08	0.83	2.50	1.45	3.00	8.41	2.33	10.70	2.42	0.88	2.17	1.49	2.00
xs9	6.38	2.17	10.11	2.50	1.36	1.67	1.48	0.00	8.39	2.42	10.27	2.42	1.29	3.83	1.48	0.00
xs10	6.17	2.50	9.29	2.50	0.58	2.17	1.80	2.50	8.39	2.42	9.54	2.42	0.58	2.50	1.94	2.42
xs11	6.17	2.50	8.41	2.50	0.68	0.17	1.79	0.75	8.38	2.42	8.57	2.42	0.68	0.25	1.94	2.42
xs12	6.17	2.50	8.00	2.58	0.45	0.33	1.29	0.42	8.38	2.42	8.10	2.50	0.42	0.33	1.24	0.42
xs13	6.16	2.58	7.93	2.58	0.31	1.42	0.99	0.42	8.38	2.50	8.01	2.50	0.30	1.25	0.93	0.42
xs13A	6.17	2.58	7.92	2.58	0.22	0.33	0.49	0.33	8.38	2.50	8.01	2.50	0.18	0.33	0.42	0.00
xs14	6.17	2.58	7.92	2.58	0.22	0.33	0.57	0.33	8.38	2.50	8.01	2.50	0.18	0.33	0.47	0.33
BC1inlet	3.63	1.33	7.92	2.58	0.92	1.33	1.19	0.00	3.59	1.08	8.01	2.50	0.92	1.08	1.19	0.00
BC1	3.63	1.33	7.92	2.58	0.00	0.00	1.26	1.33	3.59	1.08	8.00	2.50	0.00	0.00	1.25	1.08
BC2	3.63	1.33	7.91	2.58	0.00	0.00	1.26	1.33	3.59	1.08	7.99	2.50	0.00	0.00	1.25	1.08
BC2outlet	3.63	1.33	7.90	2.58	0.00	0.00	1.19	0.00	3.59	1.08	7.98	2.50	0.00	0.00	1.19	0.00
xs14A	6.17	2.58	7.90	2.58	0.16	0.33	0.46	0.33	8.38	2.50	7.98	2.50	0.14	0.33	0.40	0.33
xs15	6.17	2.58	7.90	2.58	0.10	0.33	0.32	0.33	8.39	2.50	7.98	2.50	0.09	0.33	0.28	0.33
xs15inlet	3.94	4.58	7.90	2.58	1.45	4.58	0.27	0.00	3.94	4.67	7.98	2.50	1.45	4.67	0.27	0.00
C1	3.94	4.58	7.82	2.58	0.00	0.00	1.96	4.58	3.94	4.67	7.89	2.50	0.00	0.00	1.96	4.67
C2	3.94	4.58	5.65	3.00	0.00	0.00	1.96	4.58	3.94	4.67	5.77	2.67	0.00	0.00	1.96	4.67
C2outlet	3.94	4.58	5.49	3.00	0.00	0.00	1.70	0.00	3.94	4.67	5.60	2.67	0.00	0.00	1.70	0.00
xs16	6.17	2.58	5.49	3.00	0.22	0.00	0.67	4.83	8.39	2.50	5.60	2.67	0.21	5.00	0.69	2.33
xs17	6.16	2.58	5.46	3.00	0.23	0.00	0.70	4.83	8.38	2.50	5.56	3.00	0.22	5.00	0.69	2.33
xs18	6.16	2.58	5.43	3.00	0.23	0.00	0.68	4.83	8.38	2.50	5.53	3.58	0.21	5.00	0.66	2.33

	100-year + 20% Sediment								1000 Sediment							
Label	Max Flow	Time (hr)mx1	Max Stage	Time (hr)mx2	Max Fr	Time (hr)mx3	Max Velocity	Time (hr)mx4	Max Flow	Time (hr)mx1	Max Stage	Time (hr)mx2	Max Fr	Time (hr)mx3	Max Velocity	Time (hr)mx4
GF	2.86	2.25	14.14	2.42	0.00	0.00	0.00	0.00	5.06	2.25	14.30	2.33	0.00	0.00	0.00	0.00
Spill1A	0.89	2.50	11.68	2.42	0.45	0.00	0.68	0.00	2.78	2.33	11.89	2.33	0.45	0.00	0.68	0.00
Spill1B	0.89	2.50	11.08	3.00	0.29	0.00	0.46	0.00	2.78	2.33	11.18	2.33	0.29	0.00	0.46	0.00
Spill2A	5.08	2.58	7.97	2.58	0.12	0.00	0.32	0.00	7.07	2.50	8.04	2.50	0.12	0.00	0.32	0.00
Spill2B	5.08	2.58	7.96	2.58	0.06	0.00	0.20	0.00	7.07	2.50	8.02	2.50	0.06	0.00	0.20	0.00
Spill3A	4.06	2.58	7.95	2.58	0.05	0.00	0.16	0.00	6.32	2.50	8.02	2.50	0.05	0.00	0.16	0.00
Spill3B	4.06	2.58	5.49	3.00	0.00	0.00	0.28	0.00	6.32	2.50	5.61	2.67	0.00	0.00	0.28	0.00
BF	3.40	0.00	14.14	2.42	0.00	0.00	0.00	0.00	3.40	0.00	14.30	2.33	0.00	0.00	0.00	0.00
xs1	6.26	2.25	14.14	2.42	0.32	2.25	0.89	2.00	8.46	2.25	14.30	2.33	0.38	2.17	0.95	1.75
xs2	6.21	2.25	14.13	2.42	0.06	0.00	0.14	0.00	8.43	2.25	14.29	2.33	0.06	0.00	0.14	0.00
xs3	6.18	2.42	14.10	2.42	0.30	0.00	0.62	0.00	8.42	2.33	14.26	2.33	0.30	0.00	0.62	0.00
xs4	6.17	2.42	13.93	2.42	0.50	3.33	1.53	0.00	8.42	2.33	14.12	2.33	0.50	3.75	1.53	0.00
xs5	6.17	2.42	12.50	2.42	0.74	0.00	2.40	2.00	8.42	2.33	12.81	2.33	0.80	2.33	2.41	1.50
xs6	6.17	2.42	11.68	2.42	0.32	0.00	0.81	0.00	8.42	2.33	11.89	2.33	0.32	0.00	0.81	0.00
ABC1inlet	5.28	2.08	11.68	2.42	1.10	2.08	0.81	0.00	5.64	2.33	11.89	2.33	1.15	2.33	0.81	0.00
ABC1	5.28	2.08	11.63	2.42	0.48	0.00	1.86	2.08	5.64	2.33	11.83	2.33	0.48	0.00	1.99	2.33
ABC2	5.28	2.08	11.23	2.42	0.42	0.00	1.86	2.08	5.64	2.33	11.37	2.33	0.42	0.00	1.99	2.33
ABC2outlet	5.28	2.08	11.08	3.00	0.42	0.00	1.30	0.00	5.64	2.33	11.18	2.33	0.42	0.00	1.30	0.00
xs7	6.17	2.42	11.08	3.00	0.26	0.00	0.70	2.42	8.42	2.33	11.18	2.33	0.28	2.33	0.84	2.33
xs8	6.17	2.50	10.64	2.08	0.83	2.50	1.45	3.00	8.42	2.33	10.70	2.42	0.88	2.17	1.49	2.00
xs9	6.17	2.50	10.11	2.50	1.35	1.67	1.48	0.00	8.41	2.42	10.27	2.42	1.32	1.33	1.48	0.00
xs10	6.17	2.50	9.29	2.50	0.57	2.50	1.80	2.50	8.39	2.42	9.53	2.42	0.59	2.42	1.94	2.42
xs11	6.17	2.50	8.42	2.50	0.63	0.08	1.69	2.50	8.39	2.42	8.58	2.42	0.64	2.42	1.93	2.42
xs12	6.17	2.50	8.04	2.58	0.38	0.00	1.17	0.00	8.39	2.42	8.13	2.50	0.41	2.42	1.09	0.00
xs13	6.16	2.58	7.98	2.58	0.23	0.00	0.85	0.00	8.39	2.50	8.05	2.50	0.21	0.25	0.79	0.00
xs13A	6.17	2.58	7.98	2.58	0.16	0.00	0.47	0.00	8.39	2.50	8.05	2.50	0.14	0.00	0.41	0.00
xs14	6.17	2.58	7.97	2.58	0.13	0.00	0.38	0.00	8.39	2.50	8.04	2.50	0.09	2.50	0.24	0.00
BC1inlet	3.42	0.00	7.97	2.58	0.84	0.00	1.19	0.00	3.27	0.00	8.04	2.50	0.86	0.00	1.19	0.00
BC1	3.42	0.00	7.97	2.58	0.00	0.00	1.19	0.00	3.27	0.00	8.04	2.50	0.00	0.00	1.14	0.00
BC2	3.42	0.00	7.96	2.58	0.00	0.00	1.19	0.00	3.27	0.00	8.03	2.50	0.00	0.00	1.14	0.00
BC2outlet	3.42	0.00	7.96	2.58	0.00	0.00	1.19	0.00	3.27	0.00	8.02	2.50	0.00	0.00	1.19	0.00
xs14A	6.17	2.58	7.96	2.58	0.11	0.00	0.35	0.00	8.39	2.50	8.02	2.50	0.08	2.50	0.23	0.00
xs15	6.17	2.58	7.95	2.58	0.08	0.00	0.25	0.00	8.39	2.50	8.02	2.50	0.07	0.00	0.23	0.00
xs15inlet	3.42	0.00	7.95	2.58	1.31	0.00	0.27	0.00	3.42	0.00	8.02	2.50	1.31	0.00	0.27	0.00
C1	2.36	0.58	7.92	2.58	0.00	0.00	1.23	0.58	2.34	5.00	7.99	2.50	0.00	0.00	1.22	5.00
C2	2.36	0.58	5.61	3.00	0.00	0.00	1.64	0.58	2.34	5.00	5.73	2.58	0.00	0.00	1.63	5.00
C2outlet	3.42	0.00	5.49	3.00	0.00	0.00	1.70	0.00	3.42	0.00	5.61	2.67	0.00	0.00	1.70	0.00
xs16	6.17	2.58	5.49	3.00	0.27	5.00	0.74	5.00	8.39	2.50	5.61	2.67	0.25	0.00	0.77	2.33
xs17	6.16	2.58	5.46	3.00	0.26	5.00	0.73	5.00	8.39	2.50	5.56	3.00	0.24	0.00	0.73	2.33
xs18	6.16	2.58	5.43	3.00	0.25	5.00	0.71	5.00	8.38	2.50	5.53	3.58	0.22	0.00	0.69	2.33

	100 Year + 20% Manning Sensitivity							
Label	Max Flow	Time (hr)mx1	Max Stage	Time (hr)mx2	Max Fr	Time (hr)mx3	Max Velocity	Time (hr)mx4
GF	2.86	2.25	14.25	2.42	0.00	0.00	0.00	0.00
Spill1A	1.25	2.42	11.73	2.42	0.45	0.00	0.68	0.00
Spill1B	1.25	2.42	11.19	2.42	0.29	0.00	0.46	0.00
Spill2A	4.99	2.58	7.92	2.58	0.12	0.00	0.32	0.00
Spill2B	4.99	2.58	7.90	2.58	0.06	0.00	0.20	0.00
Spill3A	2.54	2.58	7.90	2.58	0.05	0.00	0.16	0.00
Spill3B	2.54	2.58	5.51	3.00	0.00	0.00	0.28	0.00
BF	3.40	0.00	14.25	2.42	0.00	0.00	0.00	0.00
xs1	6.26	2.25	14.25	2.42	0.30	2.00	0.78	1.83
xs2	6.20	2.33	14.23	2.42	0.05	0.00	0.12	0.00
xs3	6.18	2.42	14.19	2.42	0.23	0.00	0.50	0.00
xs4	6.18	2.42	14.06	2.42	0.42	3.75	1.26	0.00
xs5	6.18	2.42	12.68	2.42	0.66	2.42	2.02	1.50
xs6	6.18	2.42	11.73	2.42	0.30	0.00	0.77	0.00
ABC1inlet	4.92	2.42	11.73	2.42	1.05	2.42	0.81	0.00
ABC1	4.92	2.42	11.69	2.42	0.45	0.00	1.74	2.42
ABC2	4.92	2.42	11.33	2.42	0.38	0.00	1.74	2.42
ABC2outlet	4.92	2.42	11.19	2.42	0.42	0.00	1.30	0.00
xs7	6.18	2.42	11.19	2.42	0.23	0.00	0.61	2.42
xs8	6.17	2.42	10.65	2.42	0.76	2.50	1.30	2.50
xs9	6.17	2.50	10.16	2.50	1.13	1.33	1.27	0.00
xs10	6.17	2.50	9.43	2.50	0.48	2.50	1.57	2.50
xs11	6.17	2.50	8.52	2.50	0.56	0.58	1.51	0.67
xs12	6.17	2.58	8.04	2.58	0.37	0.33	1.13	0.42
xs13	6.17	2.58	7.93	2.58	0.30	1.42	0.94	0.42
xs13A	6.17	2.58	7.93	2.58	0.20	0.33	0.45	0.33
xs14	6.17	2.58	7.92	2.58	0.21	0.33	0.54	0.33
BC1inlet	3.60	1.25	7.92	2.58	0.92	1.25	1.19	0.00
BC1	3.60	1.25	7.92	2.58	0.00	0.00	1.25	1.25
BC2	3.60	1.25	7.91	2.58	0.00	0.00	1.25	1.25
BC2outlet	3.60	1.25	7.90	2.58	0.00	0.00	1.19	0.00
xs14A	6.17	2.58	7.90	2.58	0.15	0.33	0.44	0.33
xs15	6.17	2.58	7.90	2.58	0.10	0.33	0.31	0.33
xs15inlet	3.91	4.58	7.90	2.58	1.45	4.58	0.27	0.00
C1	3.91	4.58	7.82	2.58	0.00	0.00	1.95	4.58
C2	3.91	4.58	5.67	2.92	0.00	0.00	1.95	4.58
C2outlet	3.91	4.58	5.51	3.00	0.00	0.00	1.70	0.00
xs16	6.17	2.58	5.51	3.00	0.21	0.00	0.63	4.83
xs17	6.16	2.58	5.47	3.00	0.22	0.00	0.68	4.83
xs18	6.16	2.58	5.43	3.00	0.23	0.00	0.68	4.83

	100 Year + 50% Blockage - ABC							
Label	Max Flow	Time (hr)mx1	Max Stage	Time (hr)mx2	Max Fr	Time (hr)mx3	Max Velocity	Time (hr)mx4
GF	2.86	2.25	14.13	2.33	0.00	0.00	0.00	0.00
Spill1A	2.96	2.42	11.91	2.33	0.45	0.00	0.68	0.00
Spill1B	2.96	2.42	11.08	2.92	0.29	0.00	0.46	0.00
Spill2A	5.03	2.50	7.92	2.50	0.12	0.00	0.32	0.00
Spill2B	5.03	2.50	7.90	2.50	0.06	0.00	0.20	0.00
Spill3A	2.57	2.50	7.90	2.50	0.05	0.00	0.16	0.00
Spill3B	2.57	2.50	5.48	3.00	0.00	0.00	0.28	0.00
BF	3.40	0.00	14.13	2.33	0.00	0.00	0.00	0.00
xs1	6.26	2.25	14.13	2.33	0.32	2.25	0.89	2.17
xs2	6.24	2.25	14.12	2.33	0.05	0.00	0.12	2.17
xs3	6.22	2.33	14.08	2.33	0.23	0.08	0.50	0.00
xs4	6.22	2.33	13.87	2.33	0.54	1.67	1.38	5.00
xs5	6.22	2.42	12.60	2.33	0.69	2.42	2.19	2.42
xs6	6.22	2.42	11.91	2.33	0.15	2.42	0.50	2.42
blockage	3.30	0.00	11.91	2.33	0.45	0.00	0.68	0.00
ABC1inlet	3.30	0.00	11.31	2.42	0.80	0.58	0.81	0.00
ABC1	3.30	0.00	11.29	2.42	0.44	0.00	1.32	0.00
ABC2	3.30	0.00	11.14	2.92	0.37	0.00	1.18	0.00
ABC2outlet	3.30	0.00	11.08	2.92	0.42	0.00	1.30	0.00
xs7	6.22	2.42	11.08	2.92	0.25	2.08	0.70	2.42
xs8	6.22	2.42	10.64	2.08	0.84	2.42	1.46	2.92
xs9	6.22	2.42	10.11	2.42	1.35	1.67	1.40	0.42
xs10	6.22	2.42	9.30	2.42	0.57	2.42	1.80	2.42
xs11	6.22	2.42	8.41	2.50	0.67	0.50	1.77	0.58
xs12	6.21	2.50	8.00	2.50	0.38	2.42	1.15	0.50
xs13	6.22	2.50	7.93	2.50	0.31	1.42	0.85	0.50
xs13A	6.22	2.50	7.93	2.50	0.15	0.00	0.43	0.00
xs14	6.21	2.50	7.92	2.50	0.13	0.42	0.37	0.42
BC1inlet	3.62	1.25	7.92	2.50	0.92	1.25	1.19	0.00
BC1	3.62	1.25	7.92	2.50	0.00	0.00	1.26	1.25
BC2	3.62	1.25	7.91	2.50	0.00	0.00	1.26	1.25
BC2outlet	3.62	1.25	7.90	2.50	0.00	0.00	1.19	0.00
xs14A	6.21	2.50	7.90	2.50	0.11	0.42	0.34	0.42
xs15	6.21	2.50	7.90	2.50	0.07	0.42	0.25	0.42
xs15inlet	3.95	4.58	7.90	2.50	1.45	4.58	0.27	0.00
C1	3.95	4.58	7.82	2.50	0.00	0.00	1.96	4.58
C2	3.95	4.58	5.65	3.00	0.00	0.00	1.96	4.58
C2outlet	3.95	4.58	5.48	3.00	0.00	0.00	1.70	0.00
xs16	6.21	2.50	5.48	3.00	0.22	0.08	0.67	4.83
xs17	6.21	2.50	5.46	3.00	0.24	0.08	0.70	4.83
xs18	6.21	2.50	5.43	3.00	0.23	0.08	0.69	4.83

	100 Year + 50% Blockage BC1							
Label	Max Flow	Time (hr)mx1	Max Stage	Time (hr)mx2	Max Fr	Time (hr)mx3	Max Velocity	Time (hr)mx4
GF	2.86	2.25	14.14	2.42	0.00	0.00	0.00	0.00
Spill1A	0.89	2.50	11.68	2.42	0.45	0.00	0.68	0.00
Spill1B	0.89	2.50	11.08	3.00	0.29	0.00	0.46	0.00
Spill2A	5.57	2.58	7.93	2.58	0.12	0.00	0.32	0.00
Spill2B	5.57	2.58	7.90	2.58	0.06	0.00	0.20	0.00
Spill3A	2.52	2.58	7.90	2.58	0.05	0.00	0.16	0.00
Spill3B	2.52	2.58	5.49	3.00	0.00	0.00	0.28	0.00
BF	3.40	0.00	14.14	2.42	0.00	0.00	0.00	0.00
xs1	6.26	2.25	14.14	2.42	0.32	2.17	0.89	2.00
xs2	6.21	2.25	14.13	2.42	0.06	0.00	0.14	0.00
xs3	6.18	2.42	14.10	2.42	0.30	0.00	0.62	0.00
xs4	6.17	2.42	13.93	2.42	0.50	3.33	1.53	0.00
xs5	6.17	2.42	12.50	2.42	0.74	0.00	2.40	2.00
xs6	6.17	2.42	11.68	2.42	0.32	0.00	0.81	0.00
ABC1inlet	5.28	2.08	11.68	2.42	1.10	2.08	0.81	0.00
ABC1	5.28	2.08	11.63	2.42	0.48	0.00	1.86	2.08
ABC2	5.28	2.08	11.23	2.42	0.42	0.00	1.86	2.08
ABC2outlet	5.28	2.08	11.08	3.00	0.42	0.00	1.30	0.00
xs7	6.17	2.42	11.08	3.00	0.26	0.00	0.70	2.42
xs8	6.17	2.50	10.64	2.08	0.83	2.50	1.45	3.00
xs9	6.38	2.17	10.11	2.50	1.34	1.67	1.48	0.00
xs10	6.17	2.50	9.29	2.50	0.58	2.17	1.80	2.50
xs11	6.17	2.50	8.41	2.50	0.67	0.25	1.74	0.42
xs12	6.17	2.50	8.01	2.58	0.38	0.00	1.17	0.00
xs13	6.16	2.58	7.93	2.58	0.27	1.08	0.85	0.00
xs13A	6.17	2.58	7.93	2.58	0.16	0.00	0.47	0.00
xs14	6.17	2.58	7.93	2.58	0.13	0.00	0.38	0.00
blockage	3.24	0.83	7.93	2.58	0.12	0.00	0.32	0.00
BC1inlet	3.42	0.00	7.91	2.58	0.86	0.83	1.19	0.00
BC1	3.42	0.00	7.91	2.58	0.00	0.00	1.19	0.00
BC2	3.42	0.00	7.90	2.58	0.00	0.00	1.19	0.00
BC2outlet	3.42	0.00	7.90	2.58	0.00	0.00	1.19	0.00
xs14A	6.17	2.58	7.90	2.58	0.19	0.25	0.53	0.25
xs15	6.17	2.58	7.90	2.58	0.12	0.25	0.36	0.25
xs15inlet	3.92	4.50	7.90	2.58	1.45	4.50	0.27	0.00
C1	3.92	4.50	7.82	2.58	0.00	0.00	1.95	4.50
C2	3.92	4.50	5.65	3.00	0.00	0.00	1.95	4.50
C2outlet	3.92	4.50	5.49	3.00	0.00	0.00	1.70	0.00
xs16	6.17	2.58	5.49	3.00	0.22	0.00	0.66	4.83
xs17	6.16	2.58	5.46	3.00	0.23	0.00	0.69	0.00
xs18	6.16	2.58	5.43	3.00	0.23	0.00	0.67	0.00

	100 Year + 50% Blockage C1							
Label	Max Flow	Time (hr)mx1	Max Stage	Time (hr)mx2	Max Fr	Time (hr)mx3	Max Velocity	Time (hr)mx4
GF	2.86	2.25	14.14	2.42	0.00	0.00	0.00	0.00
Spill1A	0.89	2.50	11.68	2.42	0.45	0.00	0.68	0.00
Spill1B	0.89	2.50	11.08	3.00	0.29	0.00	0.46	0.00
Spill2A	5.04	2.58	7.95	2.58	0.12	0.00	0.32	0.00
Spill2B	5.04	2.58	7.93	2.58	0.06	0.00	0.20	0.00
Spill3A	3.29	2.58	7.93	2.58	0.05	0.00	0.16	0.00
Spill3B	3.29	2.58	5.49	3.00	0.00	0.00	0.28	0.00
BF	3.40	0.00	14.14	2.42	0.00	0.00	0.00	0.00
xs1	6.26	2.25	14.14	2.42	0.32	2.17	0.89	2.00
xs2	6.21	2.25	14.13	2.42	0.06	0.00	0.13	0.00
xs3	6.18	2.42	14.10	2.42	0.32	0.00	0.63	0.00
xs4	6.17	2.42	13.93	2.42	0.50	3.33	1.47	0.00
xs5	6.17	2.42	12.50	2.42	0.74	0.00	2.40	2.00
xs6	6.17	2.42	11.68	2.42	0.32	0.00	0.82	0.00
ABC1inlet	5.28	2.08	11.68	2.42	1.10	2.08	0.81	0.00
ABC1	5.28	2.08	11.63	2.42	0.48	0.00	1.86	2.08
ABC2	5.28	2.08	11.23	2.42	0.42	0.00	1.86	2.08
ABC2outlet	5.28	2.08	11.08	3.00	0.42	0.00	1.30	0.00
xs7	6.17	2.42	11.08	3.00	0.27	0.00	0.70	2.42
xs8	6.17	2.50	10.64	2.08	0.83	2.50	1.45	3.00
xs9	6.35	2.17	10.11	2.50	1.35	1.67	1.49	0.00
xs10	6.17	2.50	9.29	2.50	0.58	2.17	1.80	2.50
xs11	6.17	2.50	8.41	2.50	0.66	0.08	1.70	2.50
xs12	6.17	2.50	8.02	2.58	0.38	0.00	1.18	0.00
xs13	6.17	2.58	7.96	2.58	0.25	0.67	0.84	0.00
xs13A	6.17	2.58	7.95	2.58	0.15	0.00	0.41	0.00
xs14	6.17	2.58	7.95	2.58	0.13	0.00	0.38	0.00
BC1inlet	3.42	0.00	7.95	2.58	0.89	0.00	1.19	0.00
BC1	3.42	0.00	7.95	2.58	0.00	0.00	1.19	0.00
BC2	3.42	0.00	7.94	2.58	0.00	0.00	1.19	0.00
BC2outlet	3.42	0.00	7.93	2.58	0.00	0.00	1.19	0.00
xs14A	6.17	2.58	7.93	2.58	0.11	0.00	0.35	0.00
xs15	6.17	2.58	7.93	2.58	0.07	0.00	0.24	0.00
blockage	3.34	0.00	7.93	2.58	0.05	0.00	0.16	0.00
xs15inlet	3.34	0.00	6.99	2.67	1.32	0.00	0.27	0.00
C1	3.34	0.00	6.94	2.67	0.00	0.00	1.66	0.00
C2	3.34	0.00	5.59	3.00	0.00	0.00	1.66	0.00
C2outlet	3.34	0.00	5.49	3.00	0.00	0.00	1.70	0.00
xs16	6.17	2.58	5.49	3.00	0.22	0.00	0.64	0.00
xs17	6.16	2.58	5.46	3.00	0.24	0.00	0.70	0.00
xs18	6.16	2.58	5.43	3.00	0.22	0.00	0.66	0.00