INFRASTRUCTURE DESIGN LTD

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FLOOD RISK ASSESSMENT & DRAINAGE STRATEGY REPORT

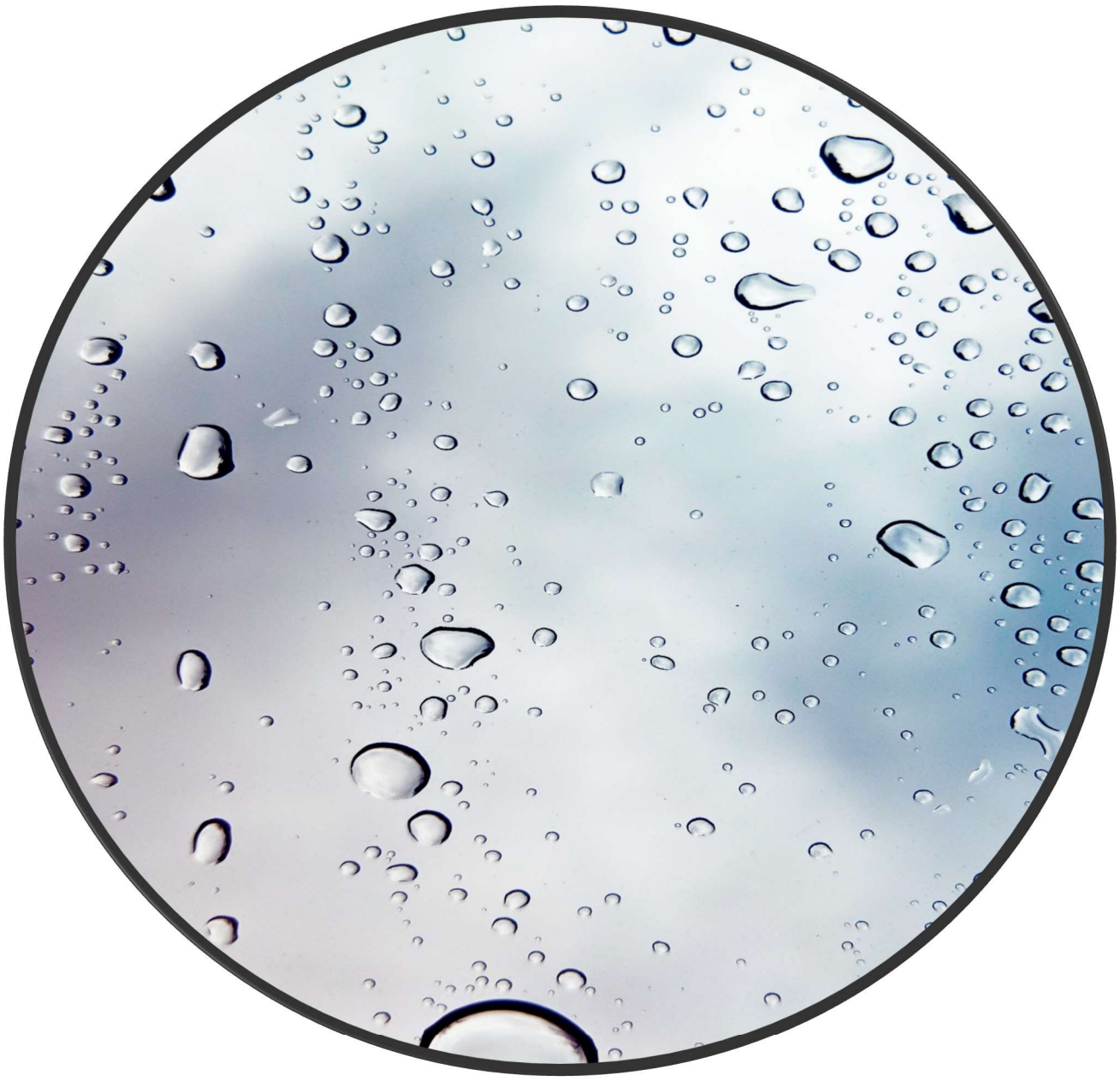
THE BARN HOTEL, WEST END ROAD, RUISLIP

HA4 6JB

ON BEHALF OF CHASE NEW HOMES LIMITED

JULY 2024

IDL/1143/DS/002



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IDL/1143/DS/002

REPORT ISSUE

Revision	Date	Notes
P01	24/07/2024	The site plan amended, and the drainage strategy revised
P02	03/09/2024	The site plan amended, and the drainage strategy revised

PREPARED BY

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Infrastructure Engineer July 2024

REVIEWED BY

Phil Tomes
Director July 2024

CONTENTS

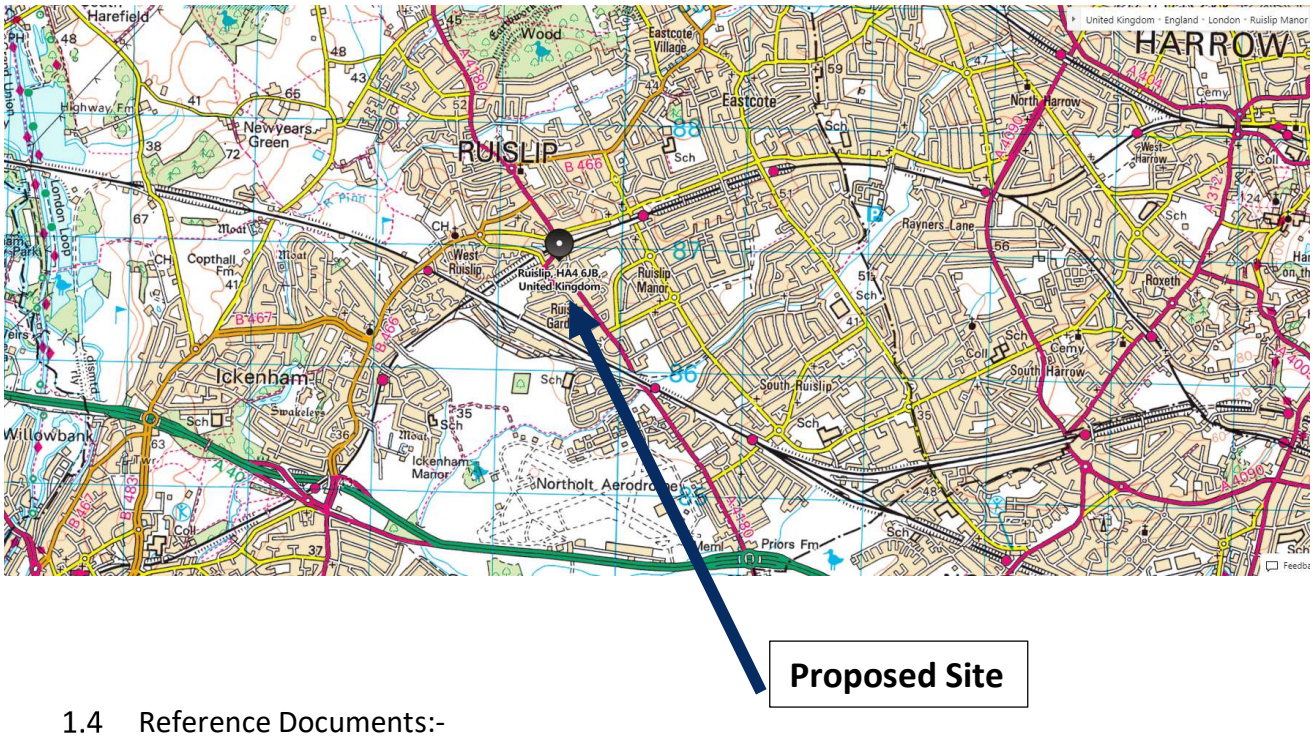
1 INTRODUCTION

1.1 Chase New Homes Limited has appointed infrastructure Design Ltd (IDL) to prepare this Drainage Strategy Summary Report in support of their planning application for their site off West End Road in Ruislip.

1.2 This report has been prepared in accordance with both national and local planning policy and takes guidance from Ciria 753, The SuDS Manual and The Building Regulations, Approved Document Part H.

1.3 The site is located situated off West End Road, Ruislip, in the London Borough of Hillingdon. The site is bounded to the north by Metropolitan and Piccadilly overground rail lines and Ruislip tube station, west by West End Road (A4180), and east & south by Garden Close Road and Residential properties. The National Grid Reference for the site is TQ 09491 86889.

Figure 1 *– Site Location Plan*



1.4 Reference Documents:-

- Desk study, Geotechnical and Geoenvironmental Interpretative report by CGL
- Site Survey carried out by Land Utility Group Ltd drawing no:LUG /9.0
- Thames Water sewer record map.
- Proposed site Layout Plan
- Tree Constraints Plan by Keen Consultant drawing no:2091-KC-XX-YTREE-TCP01Rev0

1.5 The site access is from West End Road. The site currently comprises The Barn Hotel, of which there are a number of existing Grade 2 listed buildings to remain. The site has a relatively steep bank on the western boundary supported by a crib wall—the site slopes from north to south. Refer to Appendix D for a copy of the topographical survey.

1.6 The development comprises partial demolition of 1no. Grade II Listed Building and conversion of both (2no.) listed buildings to provide 3no. dwellings. Demolition and redevelopment of the remainder of the site for residential use with associated infrastructure, public open space and landscaping. Appendix E provides a copy of the proposed site plan.

1.7 The proposed main access to the apartment blocks and existing listed buildings will be from the existing vehicle entrance from West End Road, with access to the two-storey houses taken from Garden Close.

1.8 The planning red line boundary extends to 9600 m2 (0.96 hectares).

1.9 A 375mm diameter Thames Water surface water sewer runs from north to south through the site and connects to the surface water sewer in West End Road at the existing site entrance. 150mm diameter Thames Water foul and surface water sewers are located in the Garden Close and head towards Eversley Crescent. Refer to Appendix C for a copy of the Thames Water sewer record map and Appendix D for a topographical survey showing the location of the surveyed sewers.

1.10 CGL has prepared geotechnical and geoenvironmental interpretative reports. The ground conditions during the investigation comprised made ground overlying Clay soil strata. Infiltration techniques are, therefore, unsuitable for this site, and an alternative surface water outfall has been considered.

1.11 The site is not located within a groundwater source protection zone.

1.12 The existing listed building levels are to be retained. The proposed finish floor level of all buildings is set between 45.75-44.00m AOD. The access road to the site and the car park level have been set between 45.20-44.0m AOD.

2 SOURCES OF FLOODING

2.1 Long Term Flood Risk Mapping has been reviewed from the government web site https://flood-warning-information.service.gov.uk/long-term-flood-risk/map.

2.2 **Fluvial Flooding** – From the EA flood map demonstrates that the site is in flood zone 1. This means the likelihood of flooding from Fluvial sources is less than 1 in 1000 in any one year or 1%AEP (Annual Exceedance Probability).

2.3 **Flooding from Surface Water** - Low to medium risk of surface water flood risk is shown on the map. The minor extent of surface water flooding noted during a low-risk storm event, relates to the existing site where currently there a buildings around a localised low point which prevent natural drainage from occurring.

2.4 **Groundwater Flooding** – Groundwater was identified at depths ranging from 6.14 to 7.12m BGL, with perched water over the cohesive soils at approx. 1.00m BGL. The site is, therefore, at low risk of groundwater flooding.

2.5 **Flooding from Reservoirs** – The site is not in a location shown to be at risk of reservoir flooding.

3 FLOOD RISK VULNERABILITY CLASSIFICATION AND FLOOD ZONE COMPATIBILITY

3.1 The proposed site use is classified as more vulnerable in accordance with National Planning Policy Framework (NPPF, 2021) Annex 3. The site is fully within flood zone 1. An extract from Table 2 of the Planning Practice Guidance (Paragraph:079 Reference ID:7-079-20220825) given below. The red circle indicates the appropriate nature of the site's development's classification.

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

4 FLOOD RISK MANAGEMENT

4.1 **Fluvial Flooding** - The site is in flood zone 1, and therefore, the risk from fluvial flooding is low.

4.2 **Flooding from Surface Water** - The proposed site levels have been designed so that there will be a low risk of surface water collecting on-site. A flow path is shown in the drainage plan.

4.3 **Flooding from Groundwater** - It is considered that groundwater will be sub-surface only and would not be a flood risk to the new development. The proposed site levels have been designed so that there will be a low risk of groundwater flooding.

4.4 **Flooding from Reservoirs** - There is no flood risk from this source.

4.5 **Flood Risk during Construction** – As noted above, the risk is low. At the detailed design stage, methods to prevent flooding due to construction work will be considered part of the surface water management plan.

5 FOUL WATER DRAINAGE

5.1 FW drainage for the proposed buildings will connect via a gravity drain to the existing Thames Water foul sewer manhole located in Garden Close through the eastern site access.

5.2 The drainage strategy layout is included in Appendix E.

6 SURFACE WATER DRAINAGE & SUDS

6.1 The total site area extends to 9600m^2(0.96 hectares).

6.2 The total proposed impermeable area for the site is 3820 m2(0.382Ha). The proposed site's impermeable area is divided into two. Area 1 -1620m2 (0.162ha) serving the apartments, and Area 2-2200m2 (0.220 ha) serving the two-storey private houses. The impermeable area layout is included in Appendix E.

6.3 A hierarchal approach has been taken to the selection of SuDS being considered for the surface water drainage system outfalls. In order of priority, the method of surface water discharge considered are:

6.4 i) via infiltration techniques

6.5 ii) to the nearest watercourse

6.6 iii) and to the nearest sewer.

6.7 As mentioned in section 1.10, infiltration techniques are not a viable option to discharge the proposed surface water run-off from the site. Discharging the proposed surface water run-off to the Thames Water sewer is considered the most feasible option for the site.

6.8 Once developed, the impermeable area will be generated. It is proposed to incorporate flow controls that limit the flow off the site to as close as practicable to the greenfield run-off rates whilst ensuring that the system will endure minimal maintenance. Figure 2a below gives the greenfield discharge rates for the site;

Figure 2 *Greenfield Run-off Rates – Using Proposed Site Impermeable Area*

Pre-development Discharge Rate

Site Makeup	Greenfield	Region	6	QBar	1.7
Greenfield Method	IH124	Growth Factor 1 year	0.85	Q 1 year (l/s)	1.4
Positively Drained Area (ha)	0.382	Growth Factor 2 year	0.88	Q 2 year (l/s)	1.5
SAAR (mm)	644	Growth Factor 30 year	2.40	Q 30 year (l/s)	4.0
Soil Index	4	Growth Factor 100 year	3.19	Q 100 year (l/s)	5.3
SPR	0.47	Betterment (%)	0		

6.9 The proposed residential development will incorporate the use of SuDS techniques selected for their suitability given the site layout, topographical levels and geotechnical constraints. Refer to Appendix A to view the SuDS Hierarchy.

6.10 To summarise, the following SuDs devices will be applied to the scheme;

6.11 **Permeable paving -** To parking areas and access road

Cellular Storage - To accommodate the run-off from all storm events, including peak 1 in 100 years, plus climate change storm events.

Green Roofs – To both apartment blocks. (5mm depression storage only)

Rainwater Harvesting System and Water butts- Below-ground rainwater Harvesting tanks for the Railway Block and water butts proposed for two-storey flats and residential houses. Water collected to be used for irrigation purposes & binstore washdown (Railway Block).

6.8 Permeable paving with a subbase lined in an impermeable membrane will be used in forming the new access roads and parking areas. This will serve to delay run-off into the cellular storage and outfall via perforated pipes surrounded by granular material. Permeable paving serves to improve water quality prior to discharging to the wider SW network.

6.12 A minimum permeable stone layer of 375mm is required where the sub-base is laid level (<1:60).

6.13 All of the building roof areas will be drained through conventional gravity drainage and with cellular storage within the parking areas/access road providing attenuation during periods of heavy or prolonged rainfall.

6.14 Both apartment blocks will incorporate areas of green roof. This will provide depression storage for nominal rainfall events and serve to improve water quality prior to discharding into the below-ground drainage network.

6.15 Appendix E provides the *Flow* software results summary for the 1 in 1, 1 in 30 (3.3%) (plus a 35% allowance for 'upper end' climate change) and 1 in 100 (1%) years (plus a 40% allowance for 'upper end' climate change) return period events for the crate storage. Refer to Appendix F for the surface water calculations and simulation.

6.16 The tables below summarise the greenfield run-off & post-development run-off rates and the storage volumes available within each SuDs feature.

Figure 3 Comparison of pre & post-development run-off rates

Location / Storm Event	Greenfield Rate (l/s)	Proposed Run-off Rate (l/s)
(QBar)	1.7	
1 in 1 year	1.4	Area 1 & 2 (1.8 l/s + 1.1 l/s)=2.9 l/s

1 in 2 year	1.5	Area 1 & 2 (1.9 l/s + 1.1 l/s) =3.0 l/s
1 in 30 year	4.0	Area 1 & 2 (1.9 l/s + 1.2 l/s) =3.1 l/s
1 in 100 year	5.3	Area 1 & 2 (1.9 l/s + 1.3 l/s) =3.2 l/s
1 in 100 year (+40%cc)	-	Area 1 & 2 (2 l/s + 1.5 l/s) =3.5 l/s

Figure 4 *Storage volumes available within each SuDS feature*

LOCATION	**SuDS DEVICE**	**AVAILABLE STORAGE**
Access Road and Parking areas	Granular sub-base /Permeable Paving:1460m2 x 0.375m x 0.33- (Area 1 and Area 2)	**180.675** m3
Crate soakaway storage	Crate system Area 1 (113m2 x 1.05m) Crate Area 2 (112.5m2 x 1.2m)	118.65 m3 + 135 m3 = **253.65** m3 Please note that a 95% void ratio has been used in the calculation.
Green Roof	Green Roof	Negligible However, about 12-15mm (estimated based on 100% retention of rainfall for 1:1 year, 1-hour event in the UK and 72% retention for 1:1 year 24-hour event)

7 CONCLUSION

7.1 The site is in flood zone 1. Sources of flooding and their impacts have been assessed. There will be no increase in flood risk either on-site or offsite.

7.2 The foul water drainage for the proposed buildings will connect via a gravity drain to the existing Thames Water foul sewer manhole located in Garden Close through the eastern site access.

7.3 A hierarchal approach has been considered to the selection of SuDS features for the surface water drainage system and their outfalls.

7.4 The ground conditions are comprised of made-ground overlying Clay soil strata. Infiltration techniques are, therefore, unsuitable for this site. Discharging the proposed surface water run-off to the Thames Water sewer is considered the most appropriate option for the site.

7.5 SuDS features such as rainwater harvesting, water butts, permeable paving and green roof and celllualr storage tanks have been proposed to store/control the surface water run-off for the development.

7.6 The proposed surface water run-off for up to 1 in 100 years storm events plus 40% climate change have been controlled via hydrobrakes as close as possible to the greenfield run-off rate. Refer to Figure 2 for greenfield run-off and proposed run-off.

7.7 A pre-planning enquiry has been made with Thames Water, and it is confirmed that there is sufficient capacity in the foul and surface water networks. Refer to Appendix C for a copy of correspondence with Thames Water.

7.8 A Management and Maintenance has been prepared regime has been set up for the drainage generally and all the SuDS features. The responsibility for maintaining all elements of the development remains with Chase New Homes until it is handed over to the management company. Refer to Appendix H for detailed information.

8 ENCLOSURES

7.1 Appendix A includes the SuDS Hierarchy.

7.2 Appendix B Flood Risk Maps

7.3 Appendix C includes a copy of the Thames Water asset search and a copy of the pre-planning inquiry.

7.4 Appendix D includes a copy of the Topographical Site Survey.

7.5 Appendix E includes a copy of the Drainage Strategy Layouts.

7.6 Appendix F includes the Surface Water / SuDS calculations and simulation results.

7.7 Appendix G includes the SuDS proforma

7.8 Appendix H Management & Maintenance Regime.

APPENDIX A – SUDS HIERARCHY

Most Sustainable	SUDS technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit	Included in the scheme?	Comments
	Living roofs	√	√	√	√	The scheme incorporates green roofs to both apartment blocks.
	Basins and ponds	√	√	√		Given the proposed layout of this site, these SuDS features are not suitable. A small pond is located adjacent to the Listed Building 'Sherley's Farmhouse' however this serves as an amenity feature only (no storage capacity).
	Filter strips and swales	√	√	√		Given the site density and insufficient space exists within the main body of the site for these types of SuDS features.
	Infiltration devices	√	√	√		The presence of London Clay formation which impermeable soil strata and a potential source of soil contamination infiltration techniques, are not suitable for this site. An alternative drainage solution is recommended for the proposed development.
	Permeable surfaces and infiltration blanket	√	√		√	Permeable paving is proposed to be used extensively across the site. This will assist in pollution reduction and the 'delay' of run-off.
Least Sustainable	**Tanked systems-Over size Pipes**	√	√		√	Cellular storage is proposed to store run-off from heavy or prolonged rainfall events.

Appendix A (i) - The London Plan, Policy 5.13 Hierarchy

POLICY 5.13 SUSTAINABLE DRAINAGE

A Development should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

1 store rainwater for later use
The London Plan priority for giving consideration to rainwater harvesting was considered, however, as such facilities would require mains water top up in case of low-rainfall, any non-potable distribution network would require individual metering. Spatially this is impractical, and the risk for cross-contamination with future connections is increased. Furthermore, their use is often over-stated as a SuDS measure, as we have to discount their inclusion when determining the hydraulic capacity of a surface water drainage system (ie. we assume that during a storm event, there is no spare capacity within the harvesting tanks. That said we proposed to include small below-ground rainwater collection tank to serve the Railway Block and water butts to the 2 storey elements. Water collected will be used for irrigation purpose and (in the case of Railway Block) for binstore washdown.

2 use infiltration techniques, such as porous surfaces in non-clay areas
The geology is unsuitable for infiltration techniques.

3 attenuate rainwater in ponds or open water features for gradual
Given the desires of the LPA and viability of the site, density on this development is such that insufficient communal space is available for this larger form of above-ground SuDS feature. However green roofs are being used in railway line apartments, which will store the water and gradually release it to the rest of the drainage system at very low discharge rates.

4 attenuate rainwater by storing in tanks or sealed water features for gradual release
Cellular attenuation crates are proposed, along with a control flow device to limit discharge rates to as close as practicable to greenfield run-off rates.

5 discharge rainwater direct to a watercourse
There are no watercourses within the immediate vicinity of the site.

6 discharge rainwater to a surface water sewer/drain
Discharging the proposed surface water run-off to the Thames Water sewer is considered the most feasible option for the site

7 discharge rainwater to the combined sewer.
Not required.

APPENDIX B– FLOOD RISK MAPS

Environment Agency

Flood map for planning

Your reference
THE BARN HOTEL, WEST END

Location (easting/northing)
509458/186894

Scale
1:2500

Created
1 Mar 2023 11:35

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m

Select the type of flood risk information you're interested in. The map will then update.

Flood risk

Extent of flooding

Location

HA4 6JB

Extent of flooding from rivers or the sea

High Medium Low Very low Location you selected

Flood risk from rivers or the sea is none.

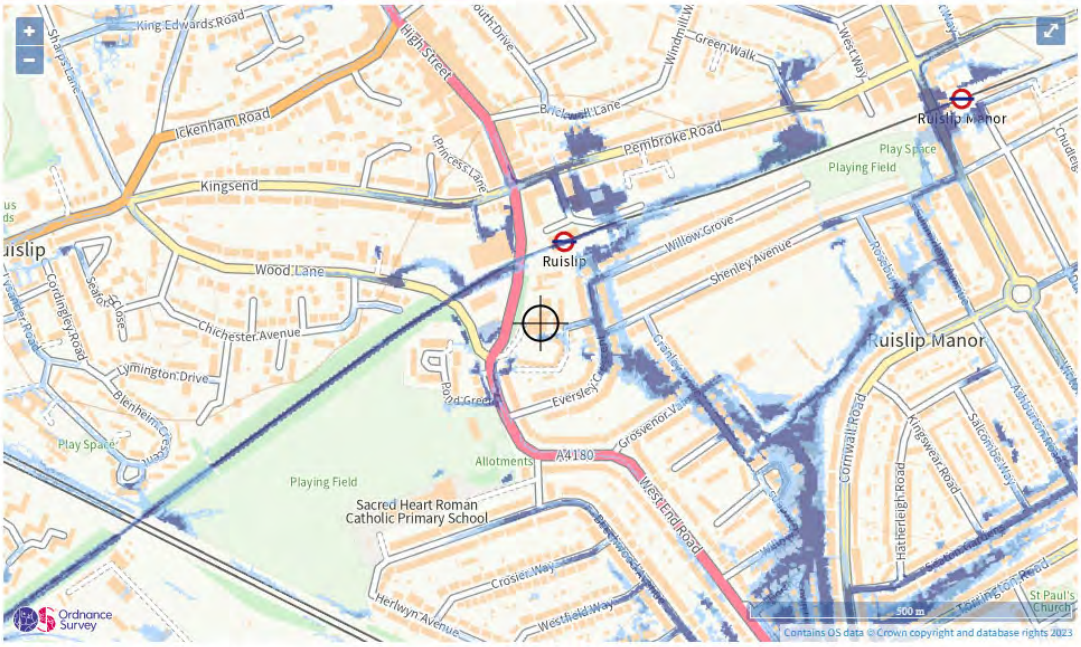
Select the type of flood risk information you're interested in. The map will then update.

Flood risk

Extent of flooding

Location

HA4 6JB



Extent of flooding from surface water

High Medium Low Very low Location you selected

Flood risk from surface water is low to medium.

Select the type of flood risk information you're interested in. The map will then update.

Flood risk

Extent of flooding

Location

HA4 6JB

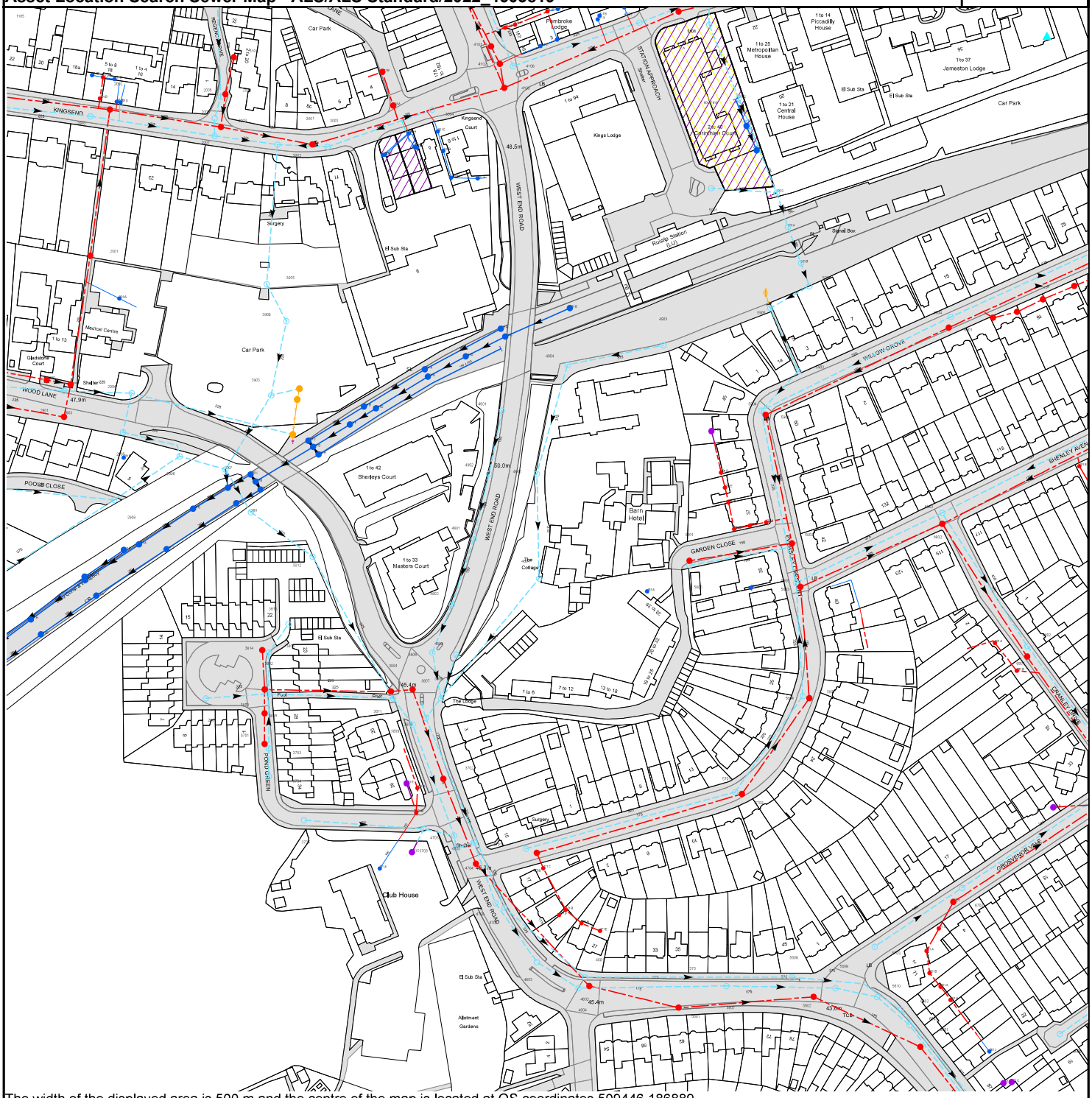
Maximum extent of flooding from reservoirs:

when river levels are normal | when there is also flooding from rivers | Location you selected

Flood risk from reservoirs is none.

APPENDIX C – THAMES WATER ASSET SEARCH AND COPY OF PRE-PLANNING ENQUIRY

Asset Location Search Sewer Map - ALS/ALS Standard/2022_4605819



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 509446,186889

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
201B	n/a	n/a
211A	n/a	n/a
301G	n/a	n/a
301J	n/a	n/a
301H	n/a	n/a
301I	n/a	n/a
301F	n/a	n/a
411G	n/a	n/a
681B	n/a	n/a
6801	41.48	39.63
6802	41.54	40.05
691B	n/a	n/a
6905	n/a	n/a
6002	n/a	n/a
6003	n/a	n/a
661D	n/a	n/a
661C	n/a	n/a
6606	41.94	40.49
671B	n/a	n/a
5804	42.43	40.92
5807	42.44	41.24
681A	n/a	n/a
581A	n/a	n/a
5803	42.62	40.39
5806	42.6	40.85
5802	42.71	40.51
581B	n/a	n/a
581C	n/a	n/a
6902	42.86	39.97
591A	n/a	n/a
6903	42.95	40.47
591B	n/a	n/a
591E	n/a	n/a
591D	n/a	n/a
591C	n/a	n/a
5901	43.05	40.85
5904	43.15	41.18
5903	43.61	41.89
6901	44.86	42.61
6002	n/a	n/a
6904	44.97	43.28
5905	43.96	43.13
5003	n/a	n/a
501B	n/a	n/a
501A	n/a	n/a
5002	46.34	44.3
n/a	n/a	n/a
n/a	n/a	n/a
501C	n/a	n/a
5601	44.78	41.07
5607	44.36	42.19
5702	43.61	41.94
5701	43.56	41.47
5608	44.01	41.72
5602	43.59	40.33
5609	43.63	41.71
5703	43.28	41.8
5610	43.36	41.47
6602	43.07	40.71
6603	42.84	40.95
6601	42.66	39.33
671A	n/a	n/a
661B	n/a	n/a
671C	n/a	n/a
661A	n/a	n/a
661H	n/a	n/a
6701	42.34	40.93
6702	42.22	40.57
661J	n/a	n/a
411D	n/a	n/a
5101	46.83	45.69
481A	n/a	n/a
4804	44.33	42.66
5805	43.54	41.64
5801	43.46	41.47
4905	44.55	42.83
4902	49.36	47.74
4901	50.66	49.31
4904	45.81	42.95
4903	44.42	43.02
491C	n/a	n/a
491A	45.19	44
491B	n/a	n/a
5001	46.34	45.12
401A	n/a	n/a
4103	47.26	45.49
4106	47.09	45.25
4102	47.18	45.37
4101	47.16	45.36
411C	n/a	n/a
411J	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
5104	45.92	44.78
411F	n/a	n/a
4107	46.8	44.16
411A	n/a	n/a
411B	n/a	n/a
411E	n/a	n/a
411I	n/a	n/a
4104	47.66	46.73
411H	n/a	n/a
4105	47.54	46.28
3705	46.47	45.46
371A	n/a	n/a
371C	n/a	n/a
371B	n/a	n/a
371D	n/a	n/a
3706	45.69	44.3
4703	45.63	43.36
4704	45.62	43.29
4705	45.67	43.26
4701	44.78	42.51
4706	45.59	43.11
4707	45.65	42.19
4708	45.88	44.31
4603	45.37	42.95
4702	45.83	43.93
471C	n/a	n/a
471D	n/a	n/a
471B	n/a	n/a
4604	45.31	42.67
471A	n/a	n/a
4602	45.53	42.04
4601	45.16	41.72
471E	n/a	n/a
3802	46.74	45.21
3815	46.71	44.74
3814	46.59	45.01
3704	46.74	45.56
3703	46.82	45.42
3903	46.61	45.74
3813	46.33	45.37
391C	44.66	43.08
3812	46.51	44.25
391G	44.72	43.33
391H	44.6	43.38
391F	n/a	n/a
391B	44.9	43.67
391E	n/a	n/a
3804	45.67	44.36
3811	45.67	43.76
371E	n/a	n/a
3805	45.74	43.35
3809	45.66	43.68
3808	45.52	42.52
391D	n/a	n/a
3806	45.86	43.09
3807	45.51	42.51
3702	45.61	42.92
4802	46.7	44.83
4803	45.79	44.81
4801	48.06	46.52
2001	48.6	46.42
2008	50.09	47
211B	n/a	n/a
2002	49.9	46.08
211C	n/a	n/a
201C	n/a	n/a
201A	n/a	n/a
201D	n/a	n/a
2007	n/a	n/a
2006	n/a	n/a
2005	n/a	n/a
2003	n/a	n/a
2004	n/a	n/a
3101	n/a	n/a
3005	47.84	45.79
3002	48.76	45.94
3906	46.91	45.81
3001	48.53	45.91
3003	48.41	46.18
311B	n/a	n/a
301A	n/a	n/a
391A	45.15	43.87
3004	47.54	46.41
301C	n/a	n/a
301B	n/a	n/a
401B	n/a	n/a
491D	n/a	n/a
291A	n/a	n/a
2903	47.88	46.17
2901	48.28	46.69
2902	47.7	46.48
281G	n/a	n/a
281B	44.23	42.39

Manhole Reference	Manhole Cover Level	Manhole Invert Level
281D	44.06	42.73
2908	47.9	45.51
2905	47.96	45.68
281F	n/a	n/a
291B	n/a	n/a
2904	47.35	46.03
281A	44.31	42.83
281C	44.25	43.05
2906	47.9	45.39
291E	44.37	42.96
2801	47.26	45.88
2907	46.9	44.88
291D	44.65	43.37
391L	44.47	43.53
391K	44.51	43.25
3901	46.6	44.47
391I	44.47	43.33
391J	44.48	43.25
3801	46.6	45.34
3803	46.88	45.33
3701	46.83	45.51
281H	44.01	42.46
281E	43.9	42.63

Asset Location Search - Sewer Key

Public Sewer Types (Operated and maintained by Thames Water)

Foul Sewer: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.

Surface Water Sewer: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

Combined Sewer: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

- Storm Sewer
- Sludge Sewer
- Foul Trunk Sewer
- Surface Trunk Sewer
- Combined Trunk Sewer
- Foul Rising Main
- Surface Water Rising Main
- Combined Rising Main
- Vacuum
- Thames Water Proposed
- Vent Pipe
- Gallery

Other Sewer Types (Not operated and maintained by Thames Water)

- Sewer
- Culverted Watercourse
- Proposed
- Decommissioned Sewer
- Content of this drainage network is currently unknown
- Ownership of this drainage network is currently unknown

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

- Air Valve
- Meter
- Dam Chase
- Vent
- Fitting

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

- Ancillary
- Drop Pipe
- Control Valve
- Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol. Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

- Inlet
- Outfall
- Undefined End

Other Symbols

Symbols used on maps which do not fall under other general categories.

- Change of Characteristic Indicator
- Public / Private Pumping Station
- Invert Level
- Summit

Areas

Lines denoting areas of underground surveys, etc.

- Agreement
- Chamber
- Operational Site

Ducts or Crossings

- Casement — Ducts may contain high voltage cables. Please check with Thames Water.
- Conduit Bridge
- Subway
- Tunnel

Notes:

1) All levels associated with the plans are to Ordnance Datum Newlyn.
2) All measurements on the plan are metric.
3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate the direction of flow.
4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded
5) 'na' or '0' on a manhole indicates that data is unavailable.
6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimeters. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology, please contact Property Searches on 0800 009 4540.

Mr Brijesh Mistry

Infrastructure Design Ltd
33 The Point
Market Harborough

LE16 7QU

Wastewater pre-planning
Our ref DS6103134

22 March 2023

Pre-planning enquiry: Confirmation of sufficient capacity

Site Address: The Barn Hotel, West End Road, Ruislip, Greater London, HA4 6JB

Dear Brijesh,

Thank you for providing information on your development.

Proposed site: residential development comprised of 89 flats and 7 no of houses, re-using listed grade 2 buildings. Proposed foul water drainage connect via existing gravity drain to the existing TW FWMH5801 located on Garden Close through the eastern site access. Proposed surface water connects at 2l/s into SWMH3807 in West End Road and 1.5l/s into SWMH5805 in Garden Close.

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent foul water sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Surface Water

When developing a site, policy 5.13 of the London Plan and Policy 3.4 of the Supplementary Planning Guidance (Sustainable Design And Construction) states that every attempt should be made to use flow attenuation and SuDS/Storage to reduce the surface water discharge from the site as much as possible.

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal

methods have been examined and proven to be impracticable. Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means.

The disposal hierarchy being:

1) rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
2) rainwater infiltration to ground at or close to source
3) rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
4) rainwater discharge direct to a watercourse (unless not appropriate)
5) controlled rainwater discharge to a surface water sewer or drain
6) controlled rainwater discharge to a combined sewer.

Where connection to the public sewerage network is required to manage surface water flows we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

If the above surface water hierarchy has been followed and if the flows are restricted to a total of 3.5 l/s then Thames Water would not have any objections to the proposal.

Please see the attached 'Planning your wastewater' leaflet for additional information.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

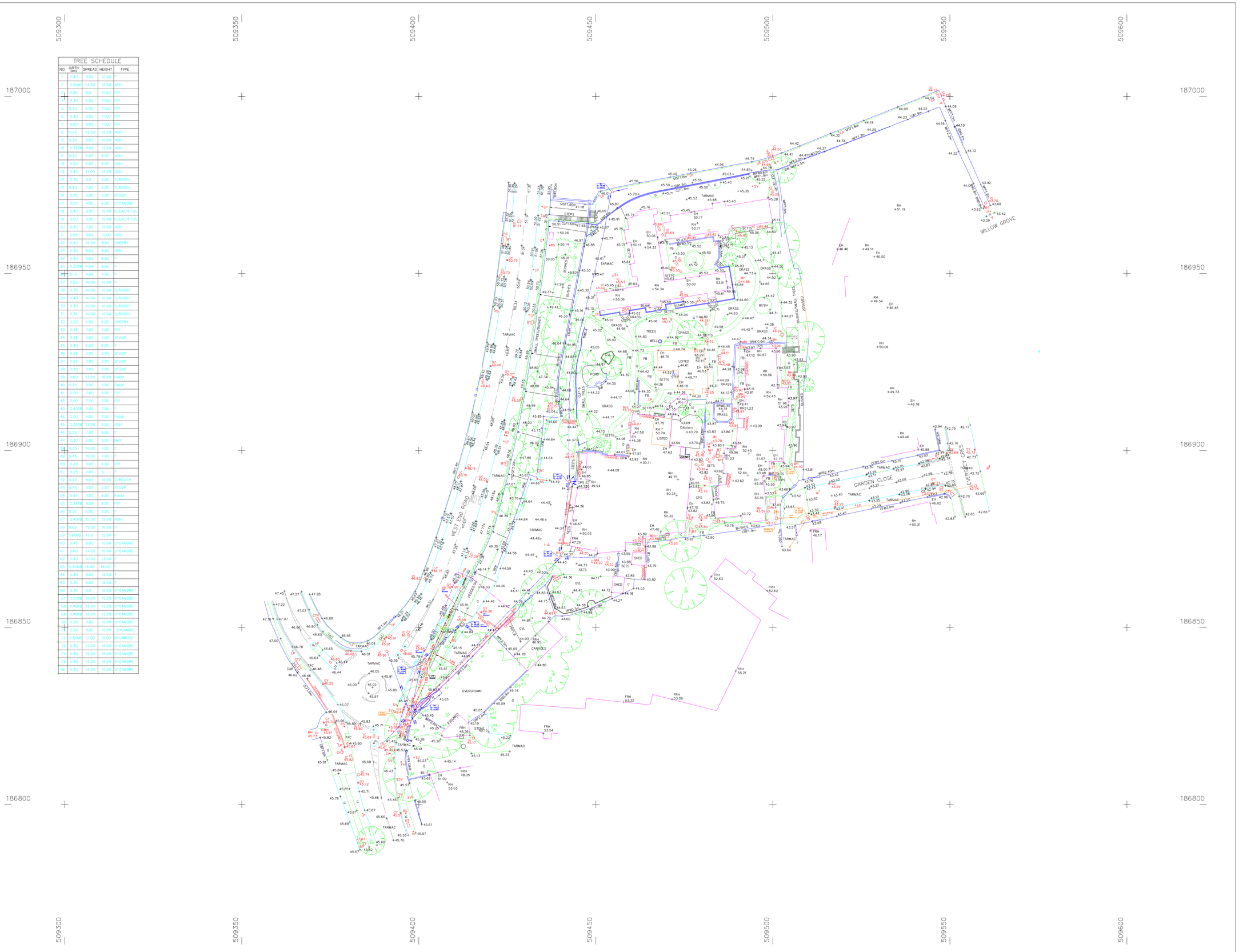
If you've any further questions, please contact me on 07747 641 932.

Yours sincerely

Natalya Bacon
Developer Services – Adoptions Engineer
Mobile: 07747 641 932
Clearwater Court, Vastern Road, Reading, RG1 8DB
Find us online at developers.thameswater.co.uk
Get advice on making your sewer connection correctly at connectright.org.uk

APPENDIX D – TOPOGRAPHICAL SITE SURVEY

TREE SCHEDULE				
NO.	GIRTH (M)	SPREAD	HEIGHT	TYPE
1	0.40	8.00	10.00	T
2	0.50MB	14.00	12.00	ASH
3	0.85	8.0	11.00	FIR
4	0.30	6.00	11.00	FIR
5	0.30	6.00	11.00	FIR
6	0.40	8.00	11.00	FIR
7	0.50	8.00	11.00	FIR
8	0.40	12.00	12.00	ASH
9	0.30	8.00	10.00	ASH
10	0.35TR	8.00	12.00	ASH
11	0.20	6.00	8.00	ASH
12	0.20	6.00	8.00	ASH
13	0.45	11.00	12.00	ASH
14	0.30	8.0	9.00	S/BIRCH
15	0.40	7.00	9.00	S/BIRCH
16	0.35	0.00	0.00	STUMP
17	0.20	4.00	6.00	SYCAMORE
18	0.40	9.00	15.00	EUCALYPTUS
19	0.50	9.00	15.00	EUCALYPTUS
20	0.30	7.00	10.00	ASH
21	0.55	9.00	11.00	ASH
22	0.40	12.00	8.00	CHERRY
23	0.30	8.00	8.00	ASH
24	0.40	5.00	6.00	T
25	0.30TR	6.00	8.00	T
26	0.15	4.00	7.00	T
27	0.60	10.00	10.00	T
28	0.30	10.00	10.00	S/BIRCH
29	0.40	10.00	10.00	S/BIRCH
30	0.30	10.00	10.00	S/BIRCH
31	0.35	10.00	10.00	S/BIRCH
32	0.20	6.00	6.00	CHERRY
33	0.45	7.00	9.00	FIR
34	0.25	0.00	0.00	STUMP
35	0.30	6.00	6.00	T
36	0.25	0.00	0.00	STUMP
37	0.25	0.00	0.00	STUMP
38	0.30	0.00	0.00	STUMP
39	0.60	12.00	16.00	PALM
40	0.25	3.50	5.00	PALM
41	0.30	6.00	8.00	FIR
42	0.50	7.50	9.00	FIR
43	0.40TR	5.00	7.00	T
44	0.30	4.00	7.00	PALM
45	0.35TR	12.00	9.00	ASH
46	0.30	7.00	8.00	T
47	0.30	6.00	5.00	BAY
48	0.35	10.00	7.00	T
49	0.45	10.00	7.00	T
50	0.20	3.00	6.00	FIR
51	0.25	4.00	9.	T
52	0.40	8.00	10.00	C/BEACH
53	0.35	0.00	0.00	STUMP
54	0.45	3.00	4.00	PALM
55	0.35TR	4.00	4.00	FIR
56	0.30	6.00	8.00	T
57	0.40TR	12.00	15.00	ASH
58	0.65	15.00	16.00	T
59	1.60MB	15.0	15.00	T
60	0.45	8.00	10.00	SYCAMORE
61	0.60	14.00	15.00	SYCAMORE
62	0.40	10.00	13.00	T
63	0.50MB	16.00	16.00	T
64	0.30	8.00	12.00	T
65	0.30	8.00	12.00	T
66	0.30	8.0	10.00	SYCAMORE
67	0.50TR	15.00	15.00	SYCAMORE
68	0.40TR	12.00	12.00	SYCAMORE
69	0.40TR	12.00	12.00	SYCAMORE
70	0.20	8.00	10.00	SYCAMORE
71	0.20	8.00	10.00	SYCAMORE
72	0.50MB	12.00	15.00	SYCAMORE
73	0.30	12.00	15.00	SYCAMORE
74	0.30	12.00	15.00	SYCAMORE
75	0.30	12.00	15.00	SYCAMORE
76	0.30	12.00	15.00	SYCAMORE



ABBREVIATIONS

ABH	Arched Beam Height	KO	Kerb Outlet
B	Brick	L	Light
BAL	Balcony	LP	Lamp Post
BB	Belisha Beacon	MH	Manhole
BD	Bollard	MKR	Marker
BH	Beam Height	MSF	Metal Security Fence
BL	Bed Level	N/A	No Access
BP	Brick Pier	OHC	Overhead Cables
BRW	Brick Retaining Wall	P	Post
BS	Bus Stop	PALF	Palisade Fence
BT	British Telecom	PF	Picket Fence
BW	Brick Wall	PIT	Trial Pit
BWF	Barbed Wire Fence	PL	Pavement Light
C	Concrete	PM	Parking Meter
CAB	Cabinet	PRF	Post & Rail Fence
CBF	Close Boarded Fence	PWF	Post & Wire Fence
CBW	Concrete Block Wall	R	Render
CIF	Corrugated Iron Fence	RAD	Radiator
CL	Cover Level	RE	Rodding Eye
CLF	Chain Link Fence	RH	Ridge Height
COL	Column	RS	Road Sign
CPF	Concrete Panel Fence	RWP	Rain Water Pipe
CPS	Concrete Paving Slabs	S	Stone
CRW	Concrete Retaining Wall	SV	Stop Valve
CSU	Ceiling Slopes Up	SL	Skylight
CTV	Cable Television	SP	Soil Pipe
CW	Concrete Wall	SPS	Stone Paving Slabs
CZY	Crazy Paving	SRW	Stone Retaining Wall
D	Door	SW	Stone Wall
DH	Door Height	SWS	Surface Water Sewer
EC	Electricity Cover	TJ	Top of Joist
ESG	Electrical Switch Gear	T	TILE
EH	Eave Height	TI	Timber
EP	Electricity Pole	TRW	Timber Retaining Wall
FB	Flower Bed	UJ	Underside of Joist
FC	False Ceiling	UR	Underside of Ridge Board
F/E	Fire Escape	UWP	Underside of Wall Plate
FH	Fire Hydrant	V	Vent
FL	Floor Level	VP	Vent Pipe
GY	Gully	W	Window
GV	Gas Valve	WL	Water Level
HA	Hatch	WM	Water Meter
IC	Inspection Cover	WMF	Wire Mesh Fence
IL	Invert Level	WPF	Wooden Panel Fence
IRF	Iron Railing Fence	WCL	Window Cill Height
IWF	Interwoven Fence	WHL	Window Head Height
		WRW	Wooden Retaining Wall

Top of Banks / Bottom
Fences
Change in Surface
Edge of Vegetation
OS Data
3.28 Floor to Ceiling Height
Gate
Survey Station
+10.60 Floor Level
Tree

STATION CO-ORDINATE TABLE

Ref.	East	North	Elevation
1	509436.598	186873.332	44.453
2	509387.799	186817.886	45.800
3	509435.348	186966.123	51.238
4	509500.639	186981.226	44.636
5	509547.561	186998.113	44.146
6	509561.328	186966.642	43.575
7	509512.496	186887.962	43.462
8	509560.652	186894.904	42.899

NOTES

UTILITY LINETYPE MENU & KEY

HV - B1	HIGH VOLTAGE CABLE
LV - B1	LOW VOLTAGE CABLE
VM - B1	VIRGIN MEDIA
FO - B1	COMMS
BT - B1	BT CABLE
GPR - B2	RADAR TRACE
G - B1	GAS PIPE
W - B1	WATER MAIN
U - B1	UNIDENTIFIED SERVICE
	SURFACE DRAINAGE
	FOUL DRAINAGE

MEASURED DEPTH BGL TO PIPE/CABLE/DUCT	0.65d
INVERT LEVEL OF PIPE/DUCT/CABLE	IL 12.34
SOFFIT LEVEL OF PIPE/DUCT/CABLE	SL 45.67
COVER LEVEL OF INSPECTION CHAMBER	CL 78.90
DIAMETER OF PIPE/DUCT IN MILLIMETERS	150Ø
NUMBER OF DUCTS	2W

REVISIONS DATE

INDICATIVE ONLY

SCALE: 1:500@A1
DATE: JUNE 2022
DRAWN: SDC

TITLE: SITE SURVEY

JOB: THE BARN HOTEL, W END Rd. RUISLIP, HA4 6JB

CLIENT: CHASE GREEN HOMES

DWG. No: LUG / 9.0

LAND UTILITY GROUP LTD.

MIDLANDS OFFICE
UNIT 10
STRENSHAM BUSINESS PARK
TWYNING ROAD
WORCESTER
WR8 9JZ

T: 0845 602 3966
M: 07979 367282

LONDON OFFICE
BRICKFIELD HOUSE
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CM16 6TH

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M: 07977 112286
M: 07977 111935

APPENDIX E – PROPOSED DRAINAGE STRATEGY LAYOUTS & DRAINAGE AREA PLANS

CONTRACT DOCUMENT

Notes

1 This drawing is to be read in conjunction with the private drainage construction details IDL/1143/07/series and all other relevant contract documents.

West End Road

WEST END ROAD

FFL 45.750

FFL 45.750

Plots 32-72

Sherleys Farm House

FFL 44.700 approx

FFL 44.550 approx

Oak room

FFL Ex. TBC

Leaning barn

FFL Ex. TBC

FFL 44.450

FFL 44.450

Plots 25-28

FFL 44.150

FFL 44.150

Plots 19-22

FFL 44.150

FFL 44.150

FFL 44.150

Plots 15-18

FFL 44.300

Plots 3-14

CS

33 Cycles

FFL 43.650

CS

16 Cycles

Plot 2

FFL 45.450

FFL 45.450

Plot 1

Garden Close

GARDEN CLOSE

1 to 6

7 to 12

13 to 18

19 to 25

26 to 32

33 to 38

37

35

45

3

1

FRH 52.63

Existing Retaining to Remain

Existing Retaining to Remain

Existing Retaining to Remain

Retaining Structure as Retaining Wall

300mm gravel board to boundary fence

600 max R/W

500 max R/W

300 max R/W

300 max R/W

1 in 30

1 in 27

1:18

1:15

1:15

1:12

5 steps R=150 T=300

7 steps R=150 T=300

Key

+ 45.000	Proposed finished levels
+ (44.20)	Interpolated existing spot levels
+ 44.20(Ex)	Existing spot levels to remain
FFL 44.000	Proposed finished floor level
+ 44.20	Existing (pre-demolition) levels
	Exceedance flood flow routing
←	Fall arrow denoting approx. flow direction of sw runoff

Rev	Description	Date
3	Site Layout and levels revised	24.08.24
2	Site Layout and levels revised	19.07.24
1	Preliminary Issue	24.02.23

Status: Preliminary Issue

Scale :	1:200@A0		
Date :	Feb 2023	Checked:	Approved:
Drawn :	IDL	BM	PT

Title : Levels Stategy Layout

Project : The Barn Hotel, Ruislip

Drg. No:	Rev:	File Ref:	1143-05.dwg
1143/CNH05/D3/3051	3	Plot Ref:	1143-05-01.pdf

33 The Point
Rockingham Road
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Leicestershire LE16 7QU
Tel: 01858 411570 Fax: 01858 411571
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iD LTD
INFRASTRUCTURE DESIGN LIMITED
working for

CHASE NEW HOMES

Chase New Homes Limited
Jasmine House
8 Park Way
Welwyn Garden City
Hertfordshire, AL8 6HG

Tel: 01992 766658
Fax: 01992 715406

CONTRACT DOCUMENT

Notes

1. This drawing is to be read in conjunction with the private drainage construction details IDL/1143/07/series and all other relevant contract documents.
2. All private drainage works to be carried out in accordance with the provisions laid down in BS EN 944 & The Building Regulations, Part H.
3. Levels shown in buildings are Finished Floor Level.
4. Before commencing any Sewer or drainage works, the Developer's Groundworker must satisfy themselves, the developer and the Local Authority of actual levels and conditions of existing sewers.
5. Buried concrete to satisfy the requirements of BRE Special Digest 1 as predetermined by the site's Geotechnical Report
6. Depth and Location of existing services to be traced prior to any excavation.
7. All private drainage to be laid to levels shown using flexibly jointed pipes, either uPVC to BS 4660 and BS 5481 or vitrified clayware to BS EN 295.
8. Generally pipes to have granular Bed & Surround in accordance with manufacturers recommendations, ensuring adequate protection with respect to depth and location. Where bedding material is placed at depths susceptible to ground water ingress, it is to be wrapped in a geotextile (Terram 700 or better).
9. Private precast concrete manholes and catchpits to be constructed using conc. box sections or circular rings to BS 5911-200, with 150mm conc. surround, size and construction to comply with Table 12 of Approved Document, Part H.
10. Rodding eyes, etc are to be laid to manufacturers minimum cover and depth to allow adequate fall from adjoining unit.
11. Access panels are to be provided to all rainwater pipes, a max. 600 above finished ground level.
12. All manholes / inspection chambers in hard surfaced areas, to have recessed covers. These are to be orientated such as to minimise cut blocks.
13. All pipework to be 100mmØ unless otherwise stated, 150mm dia from road gullies.
14. All levels in metres (m) unless specified otherwise.
15. Upon completion of all underground drainage works, the groundworker is to provide a written report and CCTV record of the as built foul and surface water drainage systems installed
16. All drain runs from SVP's, stub stacks or FW gullies to be laid at min. 1:40 gradient unless otherwise stated.
17. Svp's, stub stacks & RWP's are shown indicative only. Refer to Architectural dimensioned GA's for accurate locations
18. External drainage to be laid prior to erection of scaffold.
19. All cover and invert levels shown are in metres. All pipe diameters are in millimetres U.N.O.
20. IMPORTANT NOTE: At depths where groundwater ingress is encountered, consider the use of a sump / pump arrangement. Where excavations are >1m deep, consider the use of full perimeter trench support.
21. IMPORTANT NOTE: The new sewer connections are be successfully made prior to commencing any upstream drainage works.
22. IMPORTANT NOTE: Upon completion of all underground drainage works, the groundworker is to provide a written report and CCTV record of the as built foul and surface water drainage systems installed

Rev	Description	Date
4	Site layout revised	24.08.24
3	Site layout revised	17.07.24
2	Rainwater Harvesting tank added	11.09.23
1	Preliminary Issue	01.03.23

Status: Preliminary Issue

Scale : 1:200@A0 | Date : Feb 2023 | Drawn : IDL | Checked: BM | Approved: PT

Title : Private Drainage Layout

Project : The Barn Hotel, Ruislip

Drg. No:	Rev:	File Ref:	1143-07.dwg
1143/CNH007/D3/3700	4	Plot Ref:	1143-07-01.pdf

33 The Point
Rockingham Road
Market Harborough
Leicestershire LE16 7QU
Tel: 01858 411570 Fax: 01858 411571
Email: info@infrades.co.uk URL: www.infrades.co.uk

Key

- FW — Existing foul water sewer
- SW — Existing Surface Water sewer
- Foul Water Drainage
- Surface Water Drainage
- HB — Hydrobrake with 300mm deep sump
- 150Ø — Perforated Pipe at the subbase
- nme — Polypropylene universal inspection chambers 3000mm deep max, Where >1200mm deep, use reduced size access cover.
- R500 / R600 — Denotes 500/600 dia ppic, 3000mm deep max Where >1200mm deep, use reduced size access cover. Wavin Range 500/600 or similar.
- st — Polypropylene silt trap with 300mm sump
- WB — Water Butt (Min 200 liters)
- 1500 RWHT — Rainwater Harvesting tank
- Private access roads and Parking spaces and drives in Permeable Block Paving (tanked)
- Cellular storage system
- Extent to Green Roof to Railway Line Block

INFRASTRUCTURE DESIGN LIMITED
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CHASE NEW HOMES

Chase New Homes Limited
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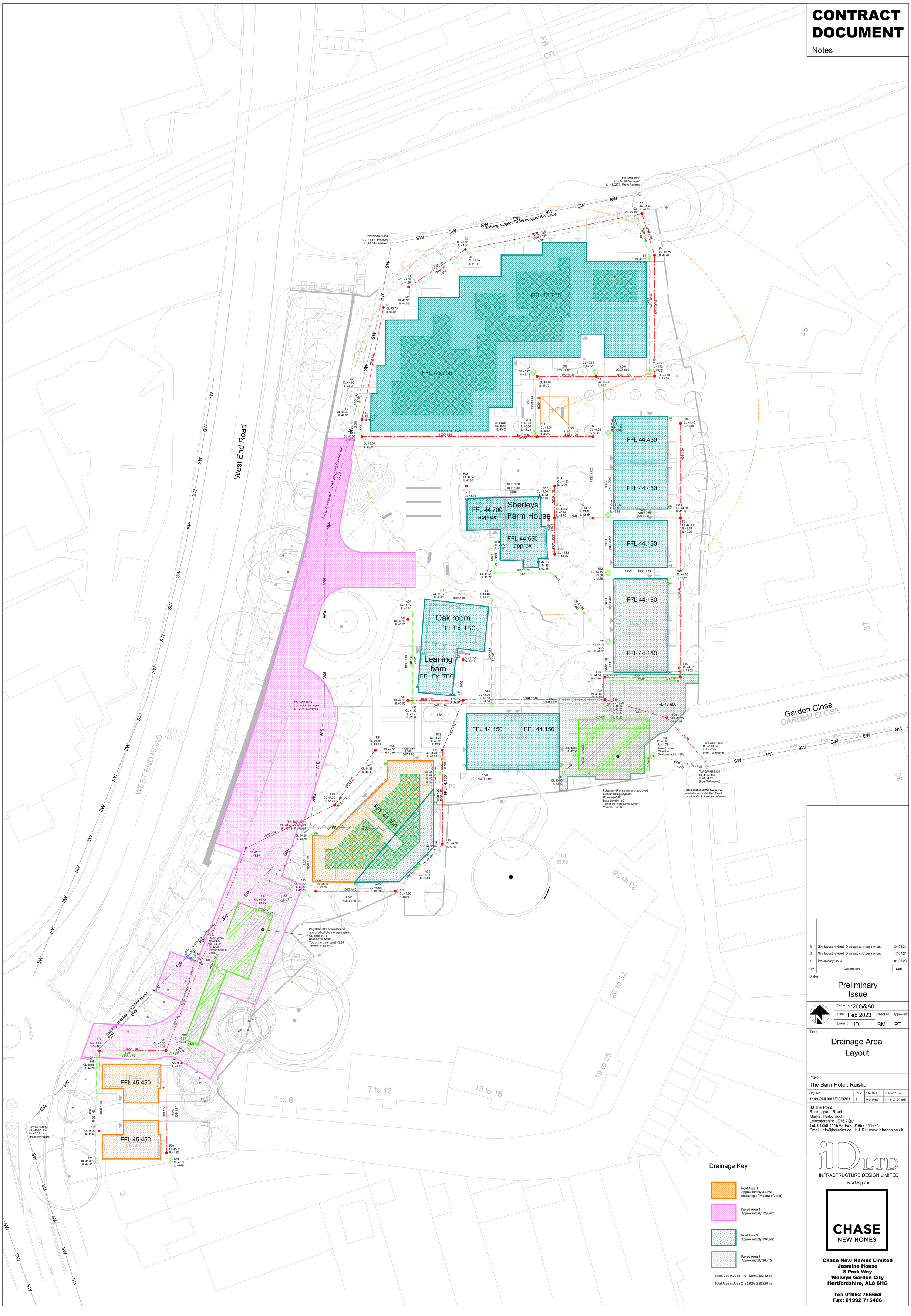
CONTRACT DOCUMENT

Notes



Rev	Description	Date
3	Site layout revised, Drainage strategy revised	24.08.24
2	Site layout revised, Drainage strategy revised	17.07.24
1	Preliminary Issue	01.03.23

Status:

Preliminary Issue

Scale :	1:200@A0		
Date :	Feb 2023	Checked:	Approved:
Drawn :	IDL	BM	PT

Title :

Drainage Area Layout

Project :

The Barn Hotel, Ruislip

Drg. No:	Rev:	File Ref:	1143-07.dwg
1143/CNH007/D3/3701	3	Plot Ref:	1143-07-01.pdf

33 The Point
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Tel: 01858 411570 Fax: 01858 411571
Email: info@infrades.co.uk URL: www.infrades.co.uk

Drainage Key

- Roof Area 1 — Approximately 340m2 (Including 10% Urban Creep)
- Paved Area 1 — Approximately 1280m2
- Roof Area 2 — Approximately 1940m2
- Paved Area 2 — Approximately 260m2

Total Area in Area 1 is 1620m2 (0.162 ha)

Total Area in Area 2 is 2200m2 (0.220 ha)

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working for

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Hertfordshire, AL8 6HG

Tel: 01992 766658
Fax: 01992 715406

APPENDIX F – SURFACE WATER DRAINAGE CALCULATION

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	1.000
CV	0.950	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	4.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	150.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
re51	0.005	5.00	44.250	150	509451.448	186879.814	0.820
S52	0.005	5.00	44.300	500	509440.089	186868.455	1.010
re53	0.005	5.00	44.300	150	509452.528	186857.893	0.800
S53	0.005	5.00	44.300	500	509439.935	186857.888	1.100
S54	0.124		44.700	500	509432.372	186855.706	1.796
S55	0.012	5.00	44.950	1200	509422.910	186846.046	2.060
S56	0.003		45.000	1	509418.866	186847.638	2.150
S57	0.003	5.00	45.300	500	509402.077	186810.651	0.800
S58			45.650	500	509402.263	186829.689	1.450
S59	0.003	5.00	45.300	500	509415.434	186811.213	0.900
S60	0.003	5.00	45.300	600	509415.339	186829.904	1.300
S61			45.200	500	509418.654	186831.094	2.296

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	re51	S52	16.065	0.600	43.430	43.290	0.140	114.8	150	4.00	0.0
1.001	S52	S53	10.569	0.600	43.290	43.200	0.090	117.4	150	4.00	0.0
2.000	re53	S53	12.593	0.600	43.500	43.250	0.250	50.4	150	4.00	0.0
1.002	S53	S54	7.871	0.600	43.200	43.130	0.070	112.4	150	4.00	0.0
1.004	S55	S56	4.347	0.600	42.890	42.850	0.040	108.7	150	4.00	0.0
3.000	S57	S58	19.039	0.600	44.500	44.200	0.300	63.5	150	4.00	0.0
3.001	S58	S60	13.078	0.600	44.200	44.000	0.200	65.4	150	4.00	0.0
4.000	S59	S60	18.691	0.600	44.400	44.000	0.400	46.7	150	4.00	0.0
3.002	S60	S61	3.522	0.600	44.000	43.800	0.200	17.6	150	4.00	0.0

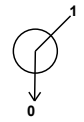
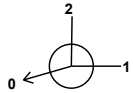
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.937	16.6	0.0	0.670	0.860	0.005	0.0	0	0.000
1.001	0.926	16.4	0.0	0.860	0.950	0.010	0.0	0	0.000
2.000	1.421	25.1	0.0	0.650	0.900	0.005	0.0	0	0.000
1.002	0.947	16.7	0.0	0.950	1.420	0.020	0.0	0	0.000
1.004	0.963	17.0	0.0	1.910	2.000	0.012	0.0	0	0.000
3.000	1.264	22.3	0.0	0.650	1.300	0.003	0.0	0	0.000
3.001	1.245	22.0	0.0	1.300	1.150	0.003	0.0	0	0.000
4.000	1.475	26.1	0.0	0.750	1.150	0.003	0.0	0	0.000
3.002	2.411	42.6	0.0	1.150	1.250	0.009	0.0	0	0.000

Pipeline Schedule

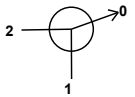
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	16.065	114.8	150	Circular	44.250	43.430	0.670	44.300	43.290	0.860
1.001	10.569	117.4	150	Circular	44.300	43.290	0.860	44.300	43.200	0.950
2.000	12.593	50.4	150	Circular	44.300	43.500	0.650	44.300	43.250	0.900
1.002	7.871	112.4	150	Circular	44.300	43.200	0.950	44.700	43.130	1.420
1.004	4.347	108.7	150	Circular	44.950	42.890	1.910	45.000	42.850	2.000
3.000	19.039	63.5	150	Circular	45.300	44.500	0.650	45.650	44.200	1.300
3.001	13.078	65.4	150	Circular	45.650	44.200	1.300	45.300	44.000	1.150
4.000	18.691	46.7	150	Circular	45.300	44.400	0.750	45.300	44.000	1.150
3.002	3.522	17.6	150	Circular	45.300	44.000	1.150	45.200	43.800	1.250

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	re51	150	Manhole	Adoptable	S52	500	Manhole	Adoptable
1.001	S52	500	Manhole	Adoptable	S53	500	Manhole	Adoptable
2.000	re53	150	Manhole	Adoptable	S53	500	Manhole	Adoptable
1.002	S53	500	Manhole	Adoptable	S54	500	Manhole	Adoptable
1.004	S55	1200	Manhole	Adoptable	S56	1	Manhole	Adoptable
3.000	S57	500	Manhole	Adoptable	S58	500	Manhole	Adoptable
3.001	S58	500	Manhole	Adoptable	S60	600	Manhole	Adoptable
4.000	S59	500	Manhole	Adoptable	S60	600	Manhole	Adoptable
3.002	S60	600	Manhole	Adoptable	S61	500	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
re51	509451.448	186879.814	44.250	0.820	150				
						0	1.000	43.430	150
S52	509440.089	186868.455	44.300	1.010	500	1	1.000	43.290	150
									
						0	1.001	43.290	150
re53	509452.528	186857.893	44.300	0.800	150				
						0	2.000	43.500	150
S53	509439.935	186857.888	44.300	1.100	500	1	2.000	43.250	150
							2	1.001	43.200	150
						0	1.002	43.200	150
S54	509432.372	186855.706	44.700	1.796	500	1	1.002	43.130	150
									
S55	509422.910	186846.046	44.950	2.060	1200				
						0	1.004	42.890	150
S56	509418.866	186847.638	45.000	2.150	1	1	1.004	42.850	150
									

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S57	509402.077	186810.651	45.300	0.800	500				
						0	3.000	44.500	150
S58	509402.263	186829.689	45.650	1.450	500	1	3.000	44.200	150
									
						0	3.001	44.200	150
S59	509415.434	186811.213	45.300	0.900	500				
						0	4.000	44.400	150
S60	509415.339	186829.904	45.300	1.300	600	1	4.000	44.000	150
							2	3.001	44.000	150
						0	3.002	44.000	150
S61	509418.654	186831.094	45.200	2.296	500	1	3.002	43.800	150
									

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Additional Storage (m³/ha)	20.0
Summer CV	0.950	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.950	Drain Down Time (mins)	10080	Check Discharge Volume	x

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 %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	0	0	0
30	0	0	0	100	40	0	0
30	35	0	0				

Node S55 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	42.890	Product Number	CTL-SHE-0066-2000-1050-2000
Design Depth (m)	1.050	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node S55 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	14.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	42.890	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)	696	Main Channel n	0.030

Inlets

S61	S54

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	113.0	0.0	0.420	113.0	0.0	0.840	113.0	0.0	1.051	0.0	0.0
0.210	113.0	0.0	0.630	113.0	0.0	1.050	113.0	0.0			

Node S54 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	10.000	Depth (m)	0.350
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	43.600	Length (m)	13.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	208	Slope (1:X)	1000.0		

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	re51	11	43.452	0.022	0.8	0.0031	0.0000	OK
15 minute summer	S52	11	43.322	0.032	1.6	0.0093	0.0000	OK
15 minute summer	re53	11	43.519	0.019	0.8	0.0027	0.0000	OK
15 minute summer	S53	11	43.246	0.046	3.2	0.0133	0.0000	OK
15 minute summer	S54	10	43.094	0.190	23.5	0.3002	0.0000	OK
240 minute summer	S55	168	43.081	0.191	5.6	0.2382	0.0000	SURCHARGED
15 minute summer	S56	1	42.850	0.000	1.7	0.0000	0.0000	OK
15 minute summer	S57	10	44.516	0.016	0.5	0.0043	0.0000	OK
15 minute summer	S58	11	44.216	0.016	0.5	0.0031	0.0000	OK
15 minute summer	S59	11	44.414	0.014	0.5	0.0038	0.0000	OK
15 minute summer	S60	11	44.020	0.020	1.5	0.0066	0.0000	OK
240 minute summer	S61	168	43.081	0.177	0.6	0.0347	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	re51	1.000	S52	0.8	0.374	0.048	0.0348	
15 minute summer	S52	1.001	S53	1.6	0.439	0.097	0.0387	
15 minute summer	re53	2.000	S53	0.8	0.644	0.032	0.0156	
15 minute summer	S53	1.002	S54	3.2	0.709	0.190	0.0353	
15 minute summer	S54	Flow through pond	S55	14.0	0.072	0.003	10.3299	
240 minute summer	S55	Hydro-Brake®	S56	1.9				34.6
15 minute summer	S57	3.000	S58	0.5	0.540	0.023	0.0185	
15 minute summer	S58	3.001	S60	0.5	0.423	0.022	0.0155	
15 minute summer	S59	4.000	S60	0.5	0.463	0.019	0.0212	
15 minute summer	S60	3.002	S61	1.5	1.093	0.035	0.0048	
15 minute summer	S61	Flow through pond	S55	14.0	0.072	0.003	10.3299	

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	re51	12	43.638	0.208	4.1	0.0291	0.0000	SURCHARGED
15 minute summer	S52	12	43.631	0.341	8.5	0.1005	0.0000	SURCHARGED
15 minute summer	re53	12	43.616	0.116	3.0	0.0166	0.0000	OK
15 minute summer	S53	12	43.615	0.415	12.0	0.1192	0.0000	SURCHARGED
15 minute summer	S54	11	43.594	0.690	61.6	1.0874	0.0000	OK
240 minute summer	S55	240	43.421	0.531	11.6	0.6625	0.0000	SURCHARGED
15 minute summer	S56	1	42.850	0.000	3.2	0.0000	0.0000	OK
15 minute summer	S57	10	44.526	0.026	1.4	0.0070	0.0000	OK
15 minute summer	S58	11	44.226	0.026	1.4	0.0050	0.0000	OK
15 minute summer	S59	11	44.424	0.024	1.4	0.0062	0.0000	OK
15 minute summer	S60	11	44.035	0.035	4.2	0.0114	0.0000	OK
240 minute summer	S61	240	43.421	0.517	1.2	0.1014	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	re51	1.000	S52	3.8	0.477	0.227	0.2760	
15 minute summer	S52	1.001	S53	9.1	0.519	0.558	0.1861	
15 minute summer	re53	2.000	S53	4.8	0.792	0.190	0.2031	
15 minute summer	S53	1.002	S54	14.8	0.842	0.886	0.1386	
15 minute winter	S54	Flow through pond	S55	28.7	0.085	0.006	31.4363	
240 minute summer	S55	Hydro-Brake®	S56	1.9				83.0
15 minute summer	S57	3.000	S58	1.4	0.708	0.063	0.0381	
15 minute summer	S58	3.001	S60	1.4	0.556	0.064	0.0331	
15 minute summer	S59	4.000	S60	1.4	0.597	0.054	0.0452	
15 minute summer	S60	3.002	S61	4.2	1.450	0.098	0.0102	
15 minute winter	S61	Flow through pond	S55	28.7	0.085	0.006	31.4363	

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	re51	12	43.742	0.312	8.0	0.0436	0.0000	SURCHARGED
15 minute summer	S52	12	43.739	0.449	8.6	0.1324	0.0000	SURCHARGED
15 minute summer	re53	12	43.731	0.231	6.5	0.0331	0.0000	SURCHARGED
15 minute summer	S53	12	43.729	0.529	13.2	0.1518	0.0000	SURCHARGED
15 minute summer	S54	12	43.697	0.793	92.5	5.1382	0.0000	OK
240 minute winter	S55	236	43.642	0.752	10.2	0.9379	0.0000	SURCHARGED
15 minute summer	S56	1	42.850	0.000	3.8	0.0000	0.0000	OK
15 minute summer	S57	10	44.530	0.030	1.9	0.0081	0.0000	OK
15 minute summer	S58	11	44.230	0.030	1.9	0.0058	0.0000	OK
15 minute summer	S59	11	44.427	0.027	1.9	0.0072	0.0000	OK
15 minute summer	S60	11	44.041	0.041	5.7	0.0135	0.0000	OK
240 minute winter	S61	236	43.642	0.738	1.1	0.1447	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	re51	1.000	S52	3.8	0.479	0.227	0.2828	
15 minute winter	S52	1.001	S53	8.4	0.522	0.512	0.1861	
15 minute winter	re53	2.000	S53	7.2	0.774	0.287	0.2217	
15 minute winter	S53	1.002	S54	17.4	0.990	1.042	0.1386	
15 minute winter	S54	Flow through pond	S55	32.0	0.092	0.006	42.5049	
240 minute winter	S55	Hydro-Brake®	S56	1.9				112.1
15 minute summer	S57	3.000	S58	1.9	0.772	0.085	0.0473	
15 minute summer	S58	3.001	S60	1.9	0.601	0.086	0.0416	
15 minute summer	S59	4.000	S60	1.9	0.643	0.073	0.0569	
15 minute summer	S60	3.002	S61	5.7	1.567	0.134	0.0128	
15 minute winter	S61	Flow through pond	S55	32.0	0.092	0.006	42.5049	

Results for 100 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	re51	12	43.721	0.291	8.6	0.0407	0.0000	SURCHARGED
15 minute summer	S52	12	43.718	0.428	7.9	0.1262	0.0000	SURCHARGED
15 minute summer	re53	12	43.711	0.211	4.3	0.0302	0.0000	SURCHARGED
15 minute summer	S53	12	43.709	0.509	12.4	0.1460	0.0000	SURCHARGED
15 minute summer	S54	12	43.679	0.775	89.3	4.3355	0.0000	OK
240 minute summer	S55	244	43.618	0.728	14.3	0.9083	0.0000	SURCHARGED
15 minute summer	S56	1	42.850	0.000	3.7	0.0000	0.0000	OK
15 minute summer	S57	10	44.530	0.030	1.9	0.0081	0.0000	OK
15 minute summer	S58	11	44.229	0.029	1.9	0.0058	0.0000	OK
15 minute summer	S59	10	44.427	0.027	1.9	0.0072	0.0000	OK
15 minute summer	S60	11	44.040	0.040	5.6	0.0132	0.0000	OK
240 minute summer	S61	244	43.618	0.714	1.5	0.1400	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute summer	re51	1.000	S52	4.4	0.482	0.268	0.2828	
15 minute summer	S52	1.001	S53	10.1	0.573	0.617	0.1861	
15 minute winter	re53	2.000	S53	4.1	0.774	0.164	0.2217	
15 minute summer	S53	1.002	S54	15.4	0.876	0.922	0.1386	
15 minute winter	S54	Flow through pond	S55	32.5	0.090	0.007	40.6637	
240 minute summer	S55	Hydro-Brake®	S56	1.9				108.2
15 minute summer	S57	3.000	S58	1.9	0.767	0.084	0.0466	
15 minute summer	S58	3.001	S60	1.9	0.599	0.084	0.0407	
15 minute summer	S59	4.000	S60	1.9	0.634	0.072	0.0558	
15 minute summer	S60	3.002	S61	5.5	1.556	0.130	0.0125	
15 minute winter	S61	Flow through pond	S55	32.5	0.090	0.007	40.6637	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	re51	12	43.908	0.478	7.0	0.0670	0.0000	SURCHARGED
15 minute summer	S52	12	43.903	0.613	8.8	0.1810	0.0000	SURCHARGED
15 minute summer	re53	13	43.895	0.395	4.3	0.0565	0.0000	SURCHARGED
15 minute summer	S53	13	43.893	0.693	14.0	0.1988	0.0000	SURCHARGED
360 minute winter	S54	352	43.882	0.978	16.2	13.3830	0.0000	OK
360 minute winter	S55	352	43.882	0.992	9.9	1.2369	0.0000	SURCHARGED
15 minute summer	S56	1	42.850	0.000	4.4	0.0000	0.0000	OK
15 minute summer	S57	10	44.535	0.035	2.6	0.0095	0.0000	OK
15 minute summer	S58	11	44.234	0.034	2.6	0.0068	0.0000	OK
15 minute summer	S59	10	44.432	0.032	2.6	0.0084	0.0000	OK
15 minute summer	S60	11	44.048	0.048	7.7	0.0159	0.0000	OK
360 minute winter	S61	352	43.882	0.978	0.9	0.1917	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	re51	1.000	S52	4.7	0.488	0.283	0.2828	
15 minute winter	S52	1.001	S53	6.6	0.519	0.402	0.1861	
15 minute winter	re53	2.000	S53	3.7	0.758	0.149	0.2217	
15 minute summer	S53	1.002	S54	15.7	0.893	0.940	0.1386	
15 minute winter	S54	Flow through pond	S55	35.2	0.096	0.007	56.7562	
360 minute winter	S55	Hydro-Brake®	S56	2.0				165.0
15 minute summer	S57	3.000	S58	2.6	0.838	0.115	0.0586	
15 minute summer	S58	3.001	S60	2.6	0.646	0.116	0.0520	
15 minute summer	S59	4.000	S60	2.6	0.686	0.099	0.0712	
15 minute summer	S60	3.002	S61	7.6	1.684	0.179	0.0160	
15 minute winter	S61	Flow through pond	S55	35.2	0.096	0.007	56.7562	

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	1.000
CV	0.950	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	4.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	150.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
re51	0.005	5.00	44.250	150	509451.448	186879.814	0.820
S52	0.005	5.00	44.300	500	509440.089	186868.455	1.010
re53	0.005	5.00	44.300	150	509452.528	186857.893	0.800
S53	0.005	5.00	44.300	500	509439.935	186857.888	1.100
S54	0.124		44.700	500	509432.372	186855.706	1.796
S55	0.012	5.00	44.950	1200	509422.910	186846.046	2.060
S56	0.003		45.000	1	509418.866	186847.638	2.150
S57	0.003	5.00	45.300	500	509402.077	186810.651	0.800
S58			45.650	500	509402.263	186829.689	1.450
S59	0.003	5.00	45.300	500	509415.434	186811.213	0.900
S60	0.003	5.00	45.300	600	509415.339	186829.904	1.300
S61			45.200	500	509418.654	186831.094	2.296

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	re51	S52	16.065	0.600	43.430	43.290	0.140	114.8	150	4.00	0.0
1.001	S52	S53	10.569	0.600	43.290	43.200	0.090	117.4	150	4.00	0.0
2.000	re53	S53	12.593	0.600	43.500	43.250	0.250	50.4	150	4.00	0.0
1.002	S53	S54	7.871	0.600	43.200	43.130	0.070	112.4	150	4.00	0.0
1.004	S55	S56	4.347	0.600	42.890	42.850	0.040	108.7	150	4.00	0.0
3.000	S57	S58	19.039	0.600	44.500	44.200	0.300	63.5	150	4.00	0.0
3.001	S58	S60	13.078	0.600	44.200	44.000	0.200	65.4	150	4.00	0.0
4.000	S59	S60	18.691	0.600	44.400	44.000	0.400	46.7	150	4.00	0.0
3.002	S60	S61	3.522	0.600	44.000	43.800	0.200	17.6	150	4.00	0.0

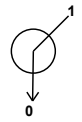
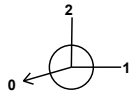
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.937	16.6	0.0	0.670	0.860	0.005	0.0	0	0.000
1.001	0.926	16.4	0.0	0.860	0.950	0.010	0.0	0	0.000
2.000	1.421	25.1	0.0	0.650	0.900	0.005	0.0	0	0.000
1.002	0.947	16.7	0.0	0.950	1.420	0.020	0.0	0	0.000
1.004	0.963	17.0	0.0	1.910	2.000	0.012	0.0	0	0.000
3.000	1.264	22.3	0.0	0.650	1.300	0.003	0.0	0	0.000
3.001	1.245	22.0	0.0	1.300	1.150	0.003	0.0	0	0.000
4.000	1.475	26.1	0.0	0.750	1.150	0.003	0.0	0	0.000
3.002	2.411	42.6	0.0	1.150	1.250	0.009	0.0	0	0.000

Pipeline Schedule

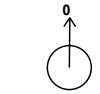
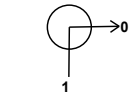
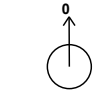
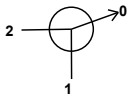
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	16.065	114.8	150	Circular	44.250	43.430	0.670	44.300	43.290	0.860
1.001	10.569	117.4	150	Circular	44.300	43.290	0.860	44.300	43.200	0.950
2.000	12.593	50.4	150	Circular	44.300	43.500	0.650	44.300	43.250	0.900
1.002	7.871	112.4	150	Circular	44.300	43.200	0.950	44.700	43.130	1.420
1.004	4.347	108.7	150	Circular	44.950	42.890	1.910	45.000	42.850	2.000
3.000	19.039	63.5	150	Circular	45.300	44.500	0.650	45.650	44.200	1.300
3.001	13.078	65.4	150	Circular	45.650	44.200	1.300	45.300	44.000	1.150
4.000	18.691	46.7	150	Circular	45.300	44.400	0.750	45.300	44.000	1.150
3.002	3.522	17.6	150	Circular	45.300	44.000	1.150	45.200	43.800	1.250

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	re51	150	Manhole	Adoptable	S52	500	Manhole	Adoptable
1.001	S52	500	Manhole	Adoptable	S53	500	Manhole	Adoptable
2.000	re53	150	Manhole	Adoptable	S53	500	Manhole	Adoptable
1.002	S53	500	Manhole	Adoptable	S54	500	Manhole	Adoptable
1.004	S55	1200	Manhole	Adoptable	S56	1	Manhole	Adoptable
3.000	S57	500	Manhole	Adoptable	S58	500	Manhole	Adoptable
3.001	S58	500	Manhole	Adoptable	S60	600	Manhole	Adoptable
4.000	S59	500	Manhole	Adoptable	S60	600	Manhole	Adoptable
3.002	S60	600	Manhole	Adoptable	S61	500	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
re51	509451.448	186879.814	44.250	0.820	150				
						0	1.000	43.430	150
S52	509440.089	186868.455	44.300	1.010	500	1	1.000	43.290	150
									
						0	1.001	43.290	150
re53	509452.528	186857.893	44.300	0.800	150				
						0	2.000	43.500	150
S53	509439.935	186857.888	44.300	1.100	500	1	2.000	43.250	150
							2	1.001	43.200	150
						0	1.002	43.200	150
S54	509432.372	186855.706	44.700	1.796	500	1	1.002	43.130	150
									
S55	509422.910	186846.046	44.950	2.060	1200				
						0	1.004	42.890	150
S56	509418.866	186847.638	45.000	2.150	1	1	1.004	42.850	150
									

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S57	509402.077	186810.651	45.300	0.800	500				
						0	3.000	44.500	150
S58	509402.263	186829.689	45.650	1.450	500	1	3.000	44.200	150
									
						0	3.001	44.200	150
S59	509415.434	186811.213	45.300	0.900	500				
						0	4.000	44.400	150
S60	509415.339	186829.904	45.300	1.300	600	1	4.000	44.000	150
							2	3.001	44.000	150
						0	3.002	44.000	150
S61	509418.654	186831.094	45.200	2.296	500	1	3.002	43.800	150
									

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Additional Storage (m³/ha)	20.0
Summer CV	0.950	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.950	Drain Down Time (mins)	10080	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	0	0

Node S55 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	42.890	Product Number	CTL-SHE-0066-2000-1050-2000
Design Depth (m)	1.050	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node S55 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	14.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	42.890	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)	696	Main Channel n	0.030

Inlets

S61	S54

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	113.0	0.0	0.420	113.0	0.0	0.840	113.0	0.0	1.051	0.0	0.0
0.210	113.0	0.0	0.630	113.0	0.0	1.050	113.0	0.0			

Node S54 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	10.000	Depth (m)	0.350
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	43.600	Length (m)	13.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	208	Slope (1:X)	1000.0		

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.92%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	re51	12	43.908	0.478	7.0	0.0670	0.0000	SURCHARGED
15 minute summer	S52	12	43.903	0.613	8.8	0.1810	0.0000	SURCHARGED
15 minute summer	re53	13	43.895	0.395	4.3	0.0565	0.0000	SURCHARGED
15 minute summer	S53	13	43.893	0.693	14.0	0.1988	0.0000	SURCHARGED
360 minute winter	S54	352	43.882	0.978	16.2	13.3830	0.0000	OK
360 minute winter	S55	352	43.882	0.992	9.9	1.2369	0.0000	SURCHARGED
15 minute summer	S56	1	42.850	0.000	4.4	0.0000	0.0000	OK
15 minute summer	S57	10	44.535	0.035	2.6	0.0095	0.0000	OK
15 minute summer	S58	11	44.234	0.034	2.6	0.0068	0.0000	OK
15 minute summer	S59	10	44.432	0.032	2.6	0.0084	0.0000	OK
15 minute summer	S60	11	44.048	0.048	7.7	0.0159	0.0000	OK
360 minute winter	S61	352	43.882	0.978	0.9	0.1917	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	re51	1.000	S52	4.7	0.488	0.283	0.2828	
15 minute winter	S52	1.001	S53	6.6	0.519	0.402	0.1861	
15 minute winter	re53	2.000	S53	3.7	0.758	0.149	0.2217	
15 minute summer	S53	1.002	S54	15.7	0.893	0.940	0.1386	
15 minute winter	S54	Flow through pond	S55	35.2	0.096	0.007	56.7562	
360 minute winter	S55	Hydro-Brake®	S56	2.0				165.0
15 minute summer	S57	3.000	S58	2.6	0.838	0.115	0.0586	
15 minute summer	S58	3.001	S60	2.6	0.646	0.116	0.0520	
15 minute summer	S59	4.000	S60	2.6	0.686	0.099	0.0712	
15 minute summer	S60	3.002	S61	7.6	1.684	0.179	0.0160	
15 minute winter	S61	Flow through pond	S55	35.2	0.096	0.007	56.7562	

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	1.000
CV	0.950	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	4.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	150.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
re1	0.010	5.00	45.600	500	509457.279	186964.232	1.250
S2	0.010	5.00	45.600	500	509467.959	186971.304	1.410
S3	0.010	5.00	45.200	500	509497.809	186977.372	1.260
S4	0.010	5.00	45.750	500	509499.898	186970.440	1.870
S5	0.020	5.00	45.750	500	509499.899	186950.266	2.110
S6	0.010	5.00	45.750	500	509490.280	186950.254	2.230
S7	0.010	5.00	45.700	500	509479.449	186950.249	2.270
re8	0.010	5.00	45.600	500	509449.397	186947.896	0.900
S9	0.010	5.00	45.600	500	509448.423	186942.814	1.000
S10	0.010	5.00	45.600	500	509448.424	186939.482	1.650
S11			45.600	500	509475.100	186939.494	2.100
S12			45.280	500	509479.454	186939.496	2.060
S13	0.008	5.00	44.500	500	509492.556	186939.502	1.470
re14	0.008	5.00	44.300	500	509504.645	186925.006	1.120
S15	0.004	5.00	44.300	500	509492.563	186925.001	1.370
re21	0.004	5.00	44.000	500	509504.650	186914.246	0.600
S22	0.016	5.00	44.150	500	509492.568	186914.241	1.290

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
re16	0.003	5.00	44.700	500	509467.031	186929.469	1.000
S17	0.003	5.00	44.700	500	509482.336	186929.476	1.240
re18	0.003	5.00	44.550	500	509472.441	186920.591	0.750
S19	0.003	5.00	44.550	500	509472.444	186914.919	0.820
S20			44.500	500	509482.343	186914.923	1.220
S23			44.150	500	509492.573	186902.629	1.600
re32	0.005	5.00	44.150	500	509458.734	186861.641	0.650
S33	0.005	5.00	44.300	500	509462.790	186865.697	0.900
re30		5.00	44.300	500	509453.333	186882.475	1.330
S31			44.300	500	509462.782	186882.479	1.450
S34			44.150	500	509462.783	186880.272	1.450
S35			43.850	500	509484.725	186880.282	1.330
re24	0.003	5.00	44.100	500	509458.057	186908.076	1.050
S25	0.004	5.00	44.100	500	509458.065	186890.033	1.440
re26	0.003	5.00	44.100	500	509461.771	186910.020	0.850
S27	0.004	5.00	44.400	500	509471.954	186910.025	1.280
S28	0.014	5.00	44.000	500	509471.963	186890.039	1.460
S29			44.000	1200	509492.579	186890.049	2.209
S36	0.020	5.00	43.600	1200	509500.618	186882.456	1.820
existing			43.590	1	509510.098	186880.581	1.900

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	re1	S2	12.809	0.600	44.350	44.190	0.160	80.1	150	4.00	0.0
1.001	S2	S3	30.461	0.600	44.190	43.940	0.250	121.8	150	4.00	0.0
1.002	S3	S4	7.240	0.600	43.940	43.880	0.060	120.7	150	4.00	0.0
1.003	S4	S5	20.174	0.600	43.880	43.720	0.160	126.1	150	4.00	0.0
1.004	S5	S6	9.619	0.600	43.640	43.580	0.060	160.3	225	4.00	0.0
1.005	S6	S7	10.831	0.600	43.520	43.430	0.090	120.3	225	4.00	0.0
1.006	S7	S12	10.753	0.600	43.430	43.300	0.130	82.7	225	4.00	0.0
2.000	re8	S9	5.174	0.600	44.700	44.600	0.100	51.7	150	4.00	0.0
2.001	S9	S10	3.332	0.600	44.600	43.950	0.650	5.1	150	4.00	0.0
2.002	S10	S11	26.676	0.600	43.950	43.500	0.450	59.3	150	4.00	0.0
2.003	S11	S12	4.354	0.600	43.500	43.220	0.280	15.6	150	4.00	0.0
1.007	S12	S13	13.102	0.600	43.220	43.110	0.110	119.1	225	4.00	0.0

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)
1.000	1.124	19.9	0.0	1.100	1.260	0.010	0.0	0	0.000
1.001	0.909	16.1	0.0	1.260	1.110	0.020	0.0	0	0.000
1.002	0.913	16.1	0.0	1.110	1.720	0.030	0.0	0	0.000
1.003	0.893	15.8	0.0	1.720	1.880	0.040	0.0	0	0.000
1.004	1.030	40.9	0.0	1.885	1.945	0.060	0.0	0	0.000
1.005	1.190	47.3	0.0	2.005	2.045	0.070	0.0	0	0.000
1.006	1.439	57.2	0.0	2.045	1.755	0.080	0.0	0	0.000
2.000	1.401	24.8	0.0	0.750	0.850	0.010	0.0	0	0.000
2.001	4.481	79.2	0.0	0.850	1.500	0.020	0.0	0	0.000
2.002	1.309	23.1	0.0	1.500	1.950	0.030	0.0	0	0.000
2.003	2.567	45.4	0.0	1.950	1.910	0.030	0.0	0	0.000
1.007	1.197	47.6	0.0	1.835	1.165	0.110	0.0	0	0.000

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)
1.008	S13	S15	14.501	0.600	43.030	42.930	0.100	145.0	300	4.00	0.0
3.000	re14	S15	12.082	0.600	43.180	43.080	0.100	120.8	150	4.00	0.0
1.009	S15	S22	10.760	0.600	42.930	42.860	0.070	153.7	300	4.00	0.0
4.000	re21	S22	12.082	0.600	43.400	43.060	0.340	35.5	100	4.00	0.0
1.010	S22	S23	11.612	0.600	42.860	42.550	0.310	37.5	300	4.00	0.0
5.000	re16	S17	15.305	0.600	43.700	43.510	0.190	80.6	100	4.00	0.0
5.001	S17	S20	14.553	0.600	43.460	43.280	0.180	80.9	150	4.00	0.0
6.000	re18	S19	5.672	0.600	43.800	43.730	0.070	81.0	100	4.00	0.0
6.001	S19	S20	9.899	0.600	43.730	43.330	0.400	24.7	100	4.00	0.0
5.002	S20	S23	15.994	0.600	43.280	42.700	0.580	27.6	150	4.00	0.0
1.011	S23	S29	12.580	0.600	42.550	42.220	0.330	38.1	300	4.00	0.0
7.000	re32	S33	5.736	0.600	43.500	43.400	0.100	57.4	150	4.00	0.0

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)
1.008	1.303	92.1	0.0	1.170	1.070	0.118	0.0	0	0.000
3.000	0.913	16.1	0.0	0.970	1.070	0.008	0.0	0	0.000
1.009	1.265	89.4	0.0	1.070	0.990	0.130	0.0	0	0.000
4.000	1.298	10.2	0.0	0.500	0.990	0.004	0.0	0	0.000
1.010	2.577	182.1	0.0	0.990	1.300	0.150	0.0	0	0.000
5.000	0.858	6.7	0.0	0.900	1.090	0.003	0.0	0	0.000
5.001	1.119	19.8	0.0	1.090	1.070	0.006	0.0	0	0.000
6.000	0.855	6.7	0.0	0.650	0.720	0.003	0.0	0	0.000
6.001	1.558	12.2	0.0	0.720	1.070	0.006	0.0	0	0.000
5.002	1.925	34.0	0.0	1.070	1.300	0.012	0.0	0	0.000
1.011	2.554	180.5	0.0	1.300	1.480	0.162	0.0	0	0.000
7.000	1.330	23.5	0.0	0.500	0.750	0.005	0.0	0	0.000

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)
7.001	S33	S34	14.575	0.600	43.400	42.750	0.650	22.4	150	4.00	0.0
8.000	re30	S31	9.449	0.600	42.970	42.850	0.120	78.7	100	4.00	0.0
8.001	S31	S34	2.207	0.600	42.850	42.800	0.050	44.1	100	4.00	0.0
7.002	S34	S35	21.942	0.600	42.700	42.520	0.180	121.9	150	4.00	0.0
7.003	S35	S29	12.533	0.600	42.520	42.250	0.270	46.4	150	4.00	0.0
9.000	re24	S25	18.043	0.600	43.050	42.710	0.340	53.1	100	4.00	0.0
9.001	S25	S28	13.898	0.600	42.660	42.540	0.120	115.8	150	4.00	0.0
10.000	re26	S27	10.183	0.600	43.250	43.120	0.130	78.3	100	4.00	0.0
10.001	S27	S28	19.986	0.600	43.120	42.590	0.530	37.7	150	4.00	0.0
9.002	S28	S29	20.616	0.600	42.540	42.370	0.170	121.3	150	4.00	0.0
11.000	S36	existing	9.664	0.600	41.780	41.690	0.090	107.4	150	4.00	0.0

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)
7.001	2.136	37.7	0.0	0.750	1.250	0.010	0.0	0	0.000
8.000	0.868	6.8	0.0	1.230	1.350	0.000	0.0	0	0.000
8.001	1.163	9.1	0.0	1.350	1.250	0.000	0.0	0	0.000
7.002	0.909	16.1	0.0	1.300	1.180	0.010	0.0	0	0.000
7.003	1.480	26.2	0.0	1.180	1.600	0.010	0.0	0	0.000
9.000	1.060	8.3	0.0	0.950	1.290	0.003	0.0	0	0.000
9.001	0.933	16.5	0.0	1.290	1.310	0.007	0.0	0	0.000
10.000	0.870	6.8	0.0	0.750	1.180	0.003	0.0	0	0.000
10.001	1.644	29.0	0.0	1.130	1.260	0.007	0.0	0	0.000
9.002	0.911	16.1	0.0	1.310	1.480	0.028	0.0	0	0.000
11.000	0.969	17.1	0.0	1.670	1.750	0.020	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	12.809	80.1	150	Circular	45.600	44.350	1.100	45.600	44.190	1.260
1.001	30.461	121.8	150	Circular	45.600	44.190	1.260	45.200	43.940	1.110
1.002	7.240	120.7	150	Circular	45.200	43.940	1.110	45.750	43.880	1.720
1.003	20.174	126.1	150	Circular	45.750	43.880	1.720	45.750	43.720	1.880
1.004	9.619	160.3	225	Circular	45.750	43.640	1.885	45.750	43.580	1.945
1.005	10.831	120.3	225	Circular	45.750	43.520	2.005	45.700	43.430	2.045
1.006	10.753	82.7	225	Circular	45.700	43.430	2.045	45.280	43.300	1.755
2.000	5.174	51.7	150	Circular	45.600	44.700	0.750	45.600	44.600	0.850
2.001	3.332	5.1	150	Circular	45.600	44.600	0.850	45.600	43.950	1.500
2.002	26.676	59.3	150	Circular	45.600	43.950	1.500	45.600	43.500	1.950
2.003	4.354	15.6	150	Circular	45.600	43.500	1.950	45.280	43.220	1.910
1.007	13.102	119.1	225	Circular	45.280	43.220	1.835	44.500	43.110	1.165

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	re1	500	Manhole	Adoptable	S2	500	Manhole	Adoptable
1.001	S2	500	Manhole	Adoptable	S3	500	Manhole	Adoptable
1.002	S3	500	Manhole	Adoptable	S4	500	Manhole	Adoptable
1.003	S4	500	Manhole	Adoptable	S5	500	Manhole	Adoptable
1.004	S5	500	Manhole	Adoptable	S6	500	Manhole	Adoptable
1.005	S6	500	Manhole	Adoptable	S7	500	Manhole	Adoptable
1.006	S7	500	Manhole	Adoptable	S12	500	Manhole	Adoptable
2.000	re8	500	Manhole	Adoptable	S9	500	Manhole	Adoptable
2.001	S9	500	Manhole	Adoptable	S10	500	Manhole	Adoptable
2.002	S10	500	Manhole	Adoptable	S11	500	Manhole	Adoptable
2.003	S11	500	Manhole	Adoptable	S12	500	Manhole	Adoptable
1.007	S12	500	Manhole	Adoptable	S13	500	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.008	14.501	145.0	300	Circular	44.500	43.030	1.170	44.300	42.930	1.070
3.000	12.082	120.8	150	Circular	44.300	43.180	0.970	44.300	43.080	1.070
1.009	10.760	153.7	300	Circular	44.300	42.930	1.070	44.150	42.860	0.990
4.000	12.082	35.5	100	Circular	44.000	43.400	0.500	44.150	43.060	0.990
1.010	11.612	37.5	300	Circular	44.150	42.860	0.990	44.150	42.550	1.300
5.000	15.305	80.6	100	Circular	44.700	43.700	0.900	44.700	43.510	1.090
5.001	14.553	80.9	150	Circular	44.700	43.460	1.090	44.500	43.280	1.070
6.000	5.672	81.0	100	Circular	44.550	43.800	0.650	44.550	43.730	0.720
6.001	9.899	24.7	100	Circular	44.550	43.730	0.720	44.500	43.330	1.070
5.002	15.994	27.6	150	Circular	44.500	43.280	1.070	44.150	42.700	1.300
1.011	12.580	38.1	300	Circular	44.150	42.550	1.300	44.000	42.220	1.480
7.000	5.736	57.4	150	Circular	44.150	43.500	0.500	44.300	43.400	0.750

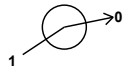
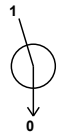
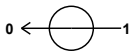
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.008	S13	500	Manhole	Adoptable	S15	500	Manhole	Adoptable
3.000	re14	500	Manhole	Adoptable	S15	500	Manhole	Adoptable
1.009	S15	500	Manhole	Adoptable	S22	500	Manhole	Adoptable
4.000	re21	500	Manhole	Adoptable	S22	500	Manhole	Adoptable
1.010	S22	500	Manhole	Adoptable	S23	500	Manhole	Adoptable
5.000	re16	500	Manhole	Adoptable	S17	500	Manhole	Adoptable
5.001	S17	500	Manhole	Adoptable	S20	500	Manhole	Adoptable
6.000	re18	500	Manhole	Adoptable	S19	500	Manhole	Adoptable
6.001	S19	500	Manhole	Adoptable	S20	500	Manhole	Adoptable
5.002	S20	500	Manhole	Adoptable	S23	500	Manhole	Adoptable
1.011	S23	500	Manhole	Adoptable	S29	1200	Manhole	Adoptable
7.000	re32	500	Manhole	Adoptable	S33	500	Manhole	Adoptable

Pipeline Schedule

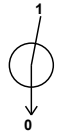
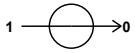
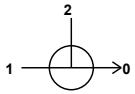
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
7.001	14.575	22.4	150	Circular	44.300	43.400	0.750	44.150	42.750	1.250
8.000	9.449	78.7	100	Circular	44.300	42.970	1.230	44.300	42.850	1.350
8.001	2.207	44.1	100	Circular	44.300	42.850	1.350	44.150	42.800	1.250
7.002	21.942	121.9	150	Circular	44.150	42.700	1.300	43.850	42.520	1.180
7.003	12.533	46.4	150	Circular	43.850	42.520	1.180	44.000	42.250	1.600
9.000	18.043	53.1	100	Circular	44.100	43.050	0.950	44.100	42.710	1.290
9.001	13.898	115.8	150	Circular	44.100	42.660	1.290	44.000	42.540	1.310
10.000	10.183	78.3	100	Circular	44.100	43.250	0.750	44.400	43.120	1.180
10.001	19.986	37.7	150	Circular	44.400	43.120	1.130	44.000	42.590	1.260
9.002	20.616	121.3	150	Circular	44.000	42.540	1.310	44.000	42.370	1.480
11.000	9.664	107.4	150	Circular	43.600	41.780	1.670	43.590	41.690	1.750

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
7.001	S33	500	Manhole	Adoptable	S34	500	Manhole	Adoptable
8.000	re30	500	Manhole	Adoptable	S31	500	Manhole	Adoptable
8.001	S31	500	Manhole	Adoptable	S34	500	Manhole	Adoptable
7.002	S34	500	Manhole	Adoptable	S35	500	Manhole	Adoptable
7.003	S35	500	Manhole	Adoptable	S29	1200	Manhole	Adoptable
9.000	re24	500	Manhole	Adoptable	S25	500	Manhole	Adoptable
9.001	S25	500	Manhole	Adoptable	S28	500	Manhole	Adoptable
10.000	re26	500	Manhole	Adoptable	S27	500	Manhole	Adoptable
10.001	S27	500	Manhole	Adoptable	S28	500	Manhole	Adoptable
9.002	S28	500	Manhole	Adoptable	S29	1200	Manhole	Adoptable
11.000	S36	1200	Manhole	Adoptable	existing	1	Manhole	Adoptable

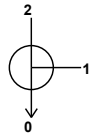
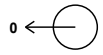
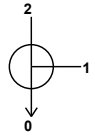
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
re1	509457.279	186964.232	45.600	1.250	500				
						0	1.000	44.350	150
S2	509467.959	186971.304	45.600	1.410	500	1	1.000	44.190	150
									
						0	1.001	44.190	150
S3	509497.809	186977.372	45.200	1.260	500	1	1.001	43.940	150
									
						0	1.002	43.940	150
S4	509499.898	186970.440	45.750	1.870	500		1	1.002	43.880	150
							0	1.003	43.880	150
S5	509499.899	186950.266	45.750	2.110	500		1	1.003	43.720	150
							0	1.004	43.640	225
S6	509490.280	186950.254	45.750	2.230	500	1	1.004	43.580	225
									
						0	1.005	43.520	225
S7	509479.449	186950.249	45.700	2.270	500	1	1.005	43.430	225
									
						0	1.006	43.430	225

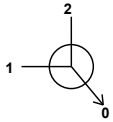
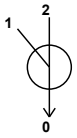
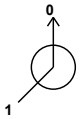
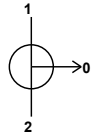
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
re8	509449.397	186947.896	45.600	0.900	500				
						0	2.000	44.700	150
S9	509448.423	186942.814	45.600	1.000	500		1	2.000	44.600	150
							0	2.001	44.600	150
S10	509448.424	186939.482	45.600	1.650	500		1	2.001	43.950	150
							0	2.002	43.950	150
S11	509475.100	186939.494	45.600	2.100	500		1	2.002	43.500	150
							0	2.003	43.500	150
S12	509479.454	186939.496	45.280	2.060	500		1	2.003	43.220	150
							2	1.006	43.300	225
							0	1.007	43.220	225
S13	509492.556	186939.502	44.500	1.470	500		1	1.007	43.110	225
							0	1.008	43.030	300
re14	509504.645	186925.006	44.300	1.120	500				
						0	3.000	43.180	150

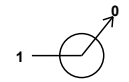
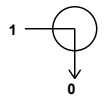
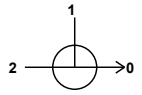
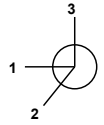
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S15	509492.563	186925.001	44.300	1.370	500		1	3.000	43.080	150
							2	1.008	42.930	300
							0	1.009	42.930	300
re21	509504.650	186914.246	44.000	0.600	500					
							0	4.000	43.400	100
S22	509492.568	186914.241	44.150	1.290	500		1	4.000	43.060	100
							2	1.009	42.860	300
							0	1.010	42.860	300
re16	509467.031	186929.469	44.700	1.000	500					
							0	5.000	43.700	100
S17	509482.336	186929.476	44.700	1.240	500		1	5.000	43.510	100
							0	5.001	43.460	150
re18	509472.441	186920.591	44.550	0.750	500					
							0	6.000	43.800	100
S19	509472.444	186914.919	44.550	0.820	500		1	6.000	43.730	100
							0	6.001	43.730	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S20	509482.343	186914.923	44.500	1.220	500		1	6.001	43.330	100
							2	5.001	43.280	150
							0	5.002	43.280	150
S23	509492.573	186902.629	44.150	1.600	500		1	5.002	42.700	150
							2	1.010	42.550	300
							0	1.011	42.550	300
re32	509458.734	186861.641	44.150	0.650	500					
							0	7.000	43.500	150
S33	509462.790	186865.697	44.300	0.900	500		1	7.000	43.400	150
							0	7.001	43.400	150
re30	509453.333	186882.475	44.300	1.330	500					
							0	8.000	42.970	100
S31	509462.782	186882.479	44.300	1.450	500		1	8.000	42.850	100
							0	8.001	42.850	100
S34	509462.783	186880.272	44.150	1.450	500		1	8.001	42.800	100
							2	7.001	42.750	150
							0	7.002	42.700	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S35	509484.725	186880.282	43.850	1.330	500	 1	7.002	42.520	150
						0	7.003	42.520	150
re24	509458.057	186908.076	44.100	1.050	500	 0	9.000	43.050	100
S25	509458.065	186890.033	44.100	1.440	500	 1	9.000	42.710	100
						0	9.001	42.660	150
re26	509461.771	186910.020	44.100	0.850	500	 0	10.000	43.250	100
S27	509471.954	186910.025	44.400	1.280	500	 1	10.000	43.120	100
						0	10.001	43.120	150
S28	509471.963	186890.039	44.000	1.460	500	 1	10.001	42.590	150
						2	9.001	42.540	150
						0	9.002	42.540	150
S29	509492.579	186890.049	44.000	2.209	1200	 1	9.002	42.370	150
						2	7.003	42.250	150
						3	1.011	42.220	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S36	509500.618	186882.456	43.600	1.820	1200				
						0	11.000	41.780	150
existing	509510.098	186880.581	43.590	1.900	1	1	11.000	41.690	150
									

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Additional Storage (m³/ha)	20.0
Summer CV	0.950	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.950	Drain Down Time (mins)	10080	Check Discharge Volume	x

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 %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	0	0	0
30	0	0	0	100	40	0	0
30	35	0	0				

Node S36 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	41.780	Product Number	CTL-SHE-0052-1500-1500-1500
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.5	Min Node Diameter (mm)	1200

Node S36 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Main Channel Length (m)	11.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	41.780	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)	1688	Main Channel n	0.030

Inlets

S29

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	112.5	0.0	0.400	112.5	0.0	0.800	112.5	0.0	1.200	112.5	0.0	1.201	0.0	0.0

Node S36 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	10.000	Depth (m)	0.350
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	43.000	Length (m)	28.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	352	Slope (1:X)	1000.0		

Results for 2 year Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	re1	10	44.379	0.029	1.7	0.0105	0.0000	OK
15 minute summer	S2	11	44.236	0.046	3.4	0.0155	0.0000	OK
15 minute summer	S3	11	44.001	0.061	4.9	0.0218	0.0000	OK
15 minute summer	S4	11	43.949	0.069	6.5	0.0209	0.0000	OK
15 minute summer	S5	11	43.719	0.079	9.7	0.0304	0.0000	OK
15 minute summer	S6	11	43.599	0.079	11.2	0.0227	0.0000	OK
15 minute summer	S7	11	43.507	0.077	12.8	0.0219	0.0000	OK
15 minute summer	re8	10	44.729	0.029	1.7	0.0120	0.0000	OK
15 minute summer	S9	10	44.621	0.021	3.4	0.0084	0.0000	OK
15 minute summer	S10	10	44.001	0.051	5.1	0.0163	0.0000	OK
15 minute summer	S11	11	43.534	0.034	5.0	0.0066	0.0000	OK
15 minute summer	S12	11	43.321	0.101	17.7	0.0198	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	re1	1.000	S2	1.7	0.488	0.084	0.0444	
15 minute summer	S2	1.001	S3	3.3	0.586	0.204	0.1725	
15 minute summer	S3	1.002	S4	4.9	0.669	0.304	0.0532	
15 minute summer	S4	1.003	S5	6.5	0.837	0.410	0.1561	
15 minute summer	S5	1.004	S6	9.6	0.815	0.235	0.1138	
15 minute summer	S6	1.005	S7	11.2	0.918	0.237	0.1324	
15 minute summer	S7	1.006	S12	12.7	1.116	0.223	0.1229	
15 minute summer	re8	2.000	S9	1.7	0.883	0.068	0.0099	
15 minute summer	S9	2.001	S10	3.4	1.034	0.043	0.0113	
15 minute summer	S10	2.002	S11	5.0	1.225	0.215	0.1096	
15 minute summer	S11	2.003	S12	5.0	0.684	0.109	0.0339	
15 minute summer	S12	1.007	S13	17.6	1.068	0.370	0.2162	

Results for 2 year Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S13	11	43.128	0.098	18.9	0.0300	0.0000	OK
15 minute summer	re14	11	43.209	0.029	1.3	0.0099	0.0000	OK
15 minute summer	S15	11	43.033	0.103	20.7	0.0263	0.0000	OK
15 minute summer	re21	10	43.418	0.018	0.7	0.0058	0.0000	OK
15 minute summer	S22	11	42.937	0.077	23.7	0.0341	0.0000	OK
15 minute summer	re16	11	43.719	0.019	0.5	0.0048	0.0000	OK
15 minute summer	S17	11	43.483	0.023	1.0	0.0056	0.0000	OK
15 minute summer	re18	11	43.819	0.019	0.5	0.0052	0.0000	OK
15 minute summer	S19	11	43.750	0.020	1.0	0.0053	0.0000	OK
15 minute summer	S20	11	43.305	0.025	2.0	0.0049	0.0000	OK
15 minute summer	S23	11	42.631	0.081	25.5	0.0159	0.0000	OK
15 minute summer	re32	10	43.519	0.019	0.8	0.0067	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S13	1.008	S15	18.8	0.908	0.205	0.3008	
15 minute summer	re14	3.000	S15	1.3	0.544	0.081	0.0288	
15 minute summer	S15	1.009	S22	20.5	1.167	0.230	0.1917	
15 minute summer	re21	4.000	S22	0.7	0.722	0.064	0.0110	
15 minute summer	S22	1.010	S23	23.5	1.597	0.129	0.1712	
15 minute summer	re16	5.000	S17	0.5	0.500	0.074	0.0152	
15 minute summer	S17	5.001	S20	1.0	0.550	0.050	0.0262	
15 minute summer	re18	6.000	S19	0.5	0.475	0.074	0.0060	
15 minute summer	S19	6.001	S20	1.0	0.928	0.082	0.0107	
15 minute summer	S20	5.002	S23	2.0	1.041	0.058	0.0304	
15 minute summer	S23	1.011	S29	25.4	1.744	0.141	0.1834	
15 minute summer	re32	7.000	S33	0.8	0.566	0.034	0.0081	

Results for 2 year Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S33	11	43.421	0.021	1.6	0.0066	0.0000	OK
15 minute summer	re30	1	42.970	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S31	1	42.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S34	11	42.734	0.033	1.6	0.0066	0.0000	OK
15 minute summer	S35	11	42.545	0.025	1.6	0.0050	0.0000	OK
15 minute summer	re24	11	43.067	0.017	0.5	0.0042	0.0000	OK
15 minute summer	S25	10	42.687	0.027	1.2	0.0067	0.0000	OK
15 minute summer	re26	11	43.268	0.018	0.5	0.0049	0.0000	OK
15 minute summer	S27	11	43.140	0.020	1.2	0.0053	0.0000	OK
15 minute summer	S28	11	42.595	0.055	4.5	0.0215	0.0000	OK
360 minute winter	S29	328	42.121	0.330	5.8	0.3732	0.0000	OK
360 minute winter	S36	328	42.121	0.341	3.7	0.4607	0.0000	SURCHARGED

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S33	7.001	S34	1.6	1.053	0.042	0.0222	
15 minute summer	re30	8.000	S31	0.0	0.000	0.000	0.0000	
15 minute summer	S31	8.001	S34	0.0	0.000	0.000	0.0000	
15 minute summer	S34	7.002	S35	1.6	0.664	0.100	0.0538	
15 minute summer	S35	7.003	S29	1.6	0.807	0.060	0.0244	
15 minute summer	re24	9.000	S25	0.5	0.580	0.060	0.0154	
15 minute summer	S25	9.001	S28	1.1	0.296	0.068	0.0556	
15 minute summer	re26	10.000	S27	0.5	0.470	0.073	0.0108	
15 minute summer	S27	10.001	S28	1.1	0.794	0.039	0.0285	
15 minute summer	S28	9.002	S29	4.5	0.773	0.279	0.1198	
15 minute winter	S29	Flow through pond	S36	13.8	0.058	0.002	14.2718	
360 minute winter	S36	Hydro-Brake®	existing	1.1				51.9

Results for 2 year Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	existing	1	41.690	0.000	1.0	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)

Results for 30 year Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	re1	10	44.400	0.050	4.8	0.0178	0.0000	OK
15 minute summer	S2	10	44.272	0.082	9.6	0.0277	0.0000	OK
15 minute summer	S3	11	44.109	0.169	14.2	0.0601	0.0000	SURCHARGED
15 minute summer	S4	11	44.052	0.172	17.8	0.0520	0.0000	SURCHARGED
15 minute summer	S5	11	43.783	0.143	26.3	0.0553	0.0000	OK
15 minute summer	S6	11	43.669	0.149	30.9	0.0427	0.0000	OK
15 minute summer	S7	11	43.577	0.147	35.4	0.0417	0.0000	OK
15 minute summer	re8	10	44.749	0.049	4.8	0.0207	0.0000	OK
15 minute summer	S9	10	44.635	0.035	9.6	0.0139	0.0000	OK
15 minute summer	S10	10	44.043	0.093	14.4	0.0297	0.0000	OK
15 minute summer	S11	11	43.565	0.065	14.3	0.0127	0.0000	OK
15 minute summer	S12	11	43.455	0.235	49.3	0.0461	0.0000	SURCHARGED

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	re1	1.000	S2	4.8	0.642	0.240	0.0959	
15 minute summer	S2	1.001	S3	9.4	0.723	0.583	0.4177	
15 minute summer	S3	1.002	S4	13.2	0.793	0.818	0.1275	
30 minute summer	S4	1.003	S5	16.3	1.010	1.035	0.3263	
15 minute summer	S5	1.004	S6	26.3	1.043	0.641	0.2422	
15 minute summer	S6	1.005	S7	30.8	1.126	0.651	0.3001	
30 minute summer	S7	1.006	S12	32.7	1.402	0.572	0.2513	
15 minute summer	re8	2.000	S9	4.8	1.175	0.193	0.0212	
15 minute summer	S9	2.001	S10	9.6	1.327	0.121	0.0244	
15 minute winter	S10	2.002	S11	13.2	1.570	0.572	0.2250	
15 minute summer	S11	2.003	S12	14.1	0.976	0.310	0.0542	
15 minute summer	S12	1.007	S13	49.1	1.304	1.032	0.4888	

Results for 30 year Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S13	11	43.215	0.185	52.8	0.0563	0.0000	OK
15 minute summer	re14	10	43.231	0.051	3.8	0.0173	0.0000	OK
15 minute summer	S15	11	43.116	0.186	58.1	0.0474	0.0000	OK
15 minute summer	re21	10	43.430	0.030	1.9	0.0098	0.0000	OK
15 minute summer	S22	11	43.000	0.140	66.9	0.0623	0.0000	OK
15 minute summer	re16	11	43.732	0.032	1.4	0.0081	0.0000	OK
15 minute summer	S17	11	43.498	0.038	2.8	0.0094	0.0000	OK
15 minute summer	re18	11	43.832	0.032	1.4	0.0089	0.0000	OK
15 minute summer	S19	11	43.764	0.034	2.8	0.0091	0.0000	OK
15 minute summer	S20	11	43.322	0.042	5.6	0.0083	0.0000	OK
15 minute summer	S23	11	42.699	0.149	72.4	0.0292	0.0000	OK
15 minute summer	re32	10	43.533	0.033	2.4	0.0117	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S13	1.008	S15	52.6	1.155	0.571	0.6622	
15 minute summer	re14	3.000	S15	3.8	0.730	0.233	0.0623	
15 minute summer	S15	1.009	S22	57.8	1.490	0.646	0.4204	
15 minute summer	re21	4.000	S22	1.9	0.974	0.183	0.0232	
15 minute summer	S22	1.010	S23	66.8	1.990	0.367	0.3897	
15 minute summer	re16	5.000	S17	1.4	0.671	0.208	0.0319	
15 minute summer	S17	5.001	S20	2.8	0.733	0.142	0.0556	
15 minute summer	re18	6.000	S19	1.4	0.624	0.208	0.0127	
15 minute summer	S19	6.001	S20	2.8	1.236	0.229	0.0224	
15 minute summer	S20	5.002	S23	5.6	1.400	0.164	0.0639	
15 minute summer	S23	1.011	S29	72.2	2.246	0.400	0.4043	
15 minute summer	re32	7.000	S33	2.4	0.759	0.101	0.0180	

Results for 30 year Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S33	10	43.437	0.037	4.8	0.0113	0.0000	OK
15 minute summer	re30	1	42.970	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S31	1	42.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	S34	10	42.758	0.058	4.7	0.0114	0.0000	OK
240 minute winter	S35	240	42.654	0.134	0.8	0.0262	0.0000	OK
15 minute summer	re24	11	43.078	0.028	1.4	0.0071	0.0000	OK
15 minute summer	S25	10	42.705	0.045	3.3	0.0113	0.0000	OK
15 minute summer	re26	10	43.281	0.031	1.4	0.0083	0.0000	OK
15 minute summer	S27	10	43.154	0.034	3.3	0.0088	0.0000	OK
240 minute winter	S28	240	42.654	0.114	2.6	0.0441	0.0000	OK
240 minute winter	S29	240	42.654	0.863	18.0	0.9756	0.0000	OK
240 minute winter	S36	240	42.654	0.874	10.4	1.1802	0.0000	SURCHARGED

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S33	7.001	S34	4.7	1.437	0.126	0.0481	
15 minute summer	re30	8.000	S31	0.0	0.000	0.000	0.0000	
15 minute summer	S31	8.001	S34	0.0	0.000	0.000	0.0000	
15 minute summer	S34	7.002	S35	4.7	0.885	0.294	0.1177	
15 minute summer	S35	7.003	S29	4.7	1.102	0.181	0.0539	
15 minute summer	re24	9.000	S25	1.4	0.782	0.168	0.0323	
15 minute summer	S25	9.001	S28	3.2	0.367	0.197	0.1242	
15 minute summer	re26	10.000	S27	1.4	0.636	0.205	0.0225	
15 minute winter	S27	10.001	S28	3.1	0.943	0.106	0.0822	
15 minute summer	S28	9.002	S29	13.0	0.992	0.806	0.2695	
15 minute winter	S29	Flow through pond	S36	38.6	0.066	0.005	43.1302	
240 minute winter	S36	Hydro-Brake®	existing	1.2				110.4

Results for 30 year Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	existing	1	41.690	0.000	1.1	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	re1	12	44.413	0.063	6.5	0.0224	0.0000	OK
15 minute summer	S2	12	44.403	0.213	13.0	0.0719	0.0000	SURCHARGED
15 minute summer	S3	12	44.270	0.330	17.6	0.1173	0.0000	SURCHARGED
15 minute summer	S4	12	44.184	0.304	22.0	0.0920	0.0000	SURCHARGED
15 minute summer	S5	12	43.821	0.181	33.8	0.0697	0.0000	OK
15 minute summer	S6	12	43.758	0.238	39.2	0.0680	0.0000	SURCHARGED
15 minute summer	S7	11	43.673	0.243	44.9	0.0691	0.0000	SURCHARGED
15 minute summer	re8	10	44.758	0.058	6.5	0.0245	0.0000	OK
15 minute summer	S9	10	44.641	0.041	13.0	0.0162	0.0000	OK
15 minute summer	S10	10	44.061	0.111	19.4	0.0352	0.0000	OK
15 minute summer	S11	11	43.624	0.124	19.4	0.0242	0.0000	OK
15 minute summer	S12	11	43.562	0.342	62.4	0.0670	0.0000	SURCHARGED

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	re1	1.000	S2	6.5	0.688	0.325	0.1575	
15 minute summer	S2	1.001	S3	11.4	0.739	0.708	0.5363	
15 minute summer	S3	1.002	S4	16.2	0.923	1.007	0.1275	
15 minute summer	S4	1.003	S5	21.8	1.238	1.379	0.3444	
15 minute winter	S5	1.004	S6	32.2	1.083	0.786	0.2854	
15 minute winter	S6	1.005	S7	37.7	1.128	0.797	0.3866	
60 minute summer	S7	1.006	S12	32.7	1.402	0.571	0.2507	
15 minute summer	re8	2.000	S9	6.5	1.271	0.261	0.0265	
15 minute summer	S9	2.001	S10	12.9	1.468	0.163	0.0297	
30 minute summer	S10	2.002	S11	17.2	1.584	0.744	0.3208	
15 minute summer	S11	2.003	S12	18.6	1.077	0.411	0.0721	
15 minute summer	S12	1.007	S13	62.2	1.564	1.306	0.5070	

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S13	11	43.251	0.221	66.9	0.0673	0.0000	OK
15 minute summer	re14	10	43.241	0.061	5.2	0.0206	0.0000	OK
15 minute summer	S15	11	43.149	0.219	74.3	0.0559	0.0000	OK
15 minute summer	re21	10	43.435	0.035	2.6	0.0116	0.0000	OK
15 minute summer	S22	11	43.026	0.166	86.6	0.0738	0.0000	OK
15 minute summer	re16	11	43.737	0.037	1.9	0.0095	0.0000	OK
15 minute summer	S17	11	43.505	0.045	3.8	0.0111	0.0000	OK
15 minute summer	re18	11	43.838	0.038	1.9	0.0106	0.0000	OK
15 minute summer	S19	11	43.770	0.040	3.8	0.0108	0.0000	OK
15 minute summer	S20	11	43.330	0.050	7.6	0.0098	0.0000	OK
360 minute winter	S23	360	43.007	0.457	14.2	0.0896	0.0000	SURCHARGED
15 minute summer	re32	10	43.539	0.039	3.2	0.0137	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S13	1.008	S15	66.9	1.217	0.726	0.8029	
15 minute winter	re14	3.000	S15	4.8	0.778	0.298	0.0800	
15 minute summer	S15	1.009	S22	74.1	1.569	0.829	0.5126	
15 minute summer	re21	4.000	S22	2.6	1.062	0.252	0.0293	
15 minute summer	S22	1.010	S23	86.4	2.077	0.474	0.4832	
15 minute summer	re16	5.000	S17	1.9	0.729	0.282	0.0398	
15 minute summer	S17	5.001	S20	3.8	0.794	0.192	0.0697	
15 minute summer	re18	6.000	S19	1.9	0.672	0.283	0.0160	
15 minute summer	S19	6.001	S20	3.8	1.340	0.311	0.0281	
15 minute summer	S20	5.002	S23	7.6	1.521	0.223	0.0799	
15 minute summer	S23	1.011	S29	93.8	2.377	0.520	0.4965	
15 minute summer	re32	7.000	S33	3.2	0.817	0.135	0.0224	

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S33	10	43.443	0.043	6.4	0.0132	0.0000	OK
360 minute winter	re30	360	43.007	0.037	0.0	0.0073	0.0000	OK
360 minute winter	S31	360	43.007	0.157	0.1	0.0308	0.0000	SURCHARGED
360 minute winter	S34	360	43.007	0.307	0.8	0.0602	0.0000	SURCHARGED
360 minute winter	S35	352	43.007	0.487	0.8	0.0955	0.0000	SURCHARGED
15 minute summer	re24	11	43.083	0.033	1.9	0.0084	0.0000	OK
360 minute winter	S25	352	43.007	0.347	0.6	0.0875	0.0000	SURCHARGED
15 minute summer	re26	10	43.287	0.037	1.9	0.0098	0.0000	OK
15 minute summer	S27	10	43.160	0.040	4.5	0.0103	0.0000	OK
360 minute winter	S28	360	43.007	0.467	2.4	0.1813	0.0000	SURCHARGED
360 minute winter	S29	352	43.007	1.216	17.4	1.3757	0.0000	OK
360 minute winter	S36	352	43.007	1.227	9.7	1.7478	0.0000	SURCHARGED

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S33	7.001	S34	6.3	1.559	0.168	0.0593	
360 minute winter	re30	8.000	S31	0.0	-0.006	-0.004	0.0495	
240 minute winter	S31	8.001	S34	-0.1	-0.048	-0.010	0.0173	
15 minute summer	S34	7.002	S35	6.3	0.954	0.393	0.1460	
15 minute summer	S35	7.003	S29	6.3	1.191	0.242	0.0667	
15 minute summer	re24	9.000	S25	1.9	0.851	0.228	0.0403	
15 minute summer	S25	9.001	S28	4.5	0.392	0.270	0.1609	
15 minute summer	re26	10.000	S27	1.9	0.692	0.278	0.0281	
60 minute winter	S27	10.001	S28	2.1	0.935	0.073	0.0476	
15 minute winter	S28	9.002	S29	16.1	1.020	1.002	0.3244	
15 minute winter	S29	Flow through pond	S36	50.8	0.072	0.007	58.4120	
360 minute winter	S36	Hydro-Brake®	existing	1.4				161.8

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	existing	1	41.690	0.000	1.1	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)

Results for 100 year Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	re1	10	44.407	0.057	6.2	0.0204	0.0000	OK
15 minute summer	S2	12	44.353	0.163	12.3	0.0550	0.0000	SURCHARGED
15 minute summer	S3	11	44.235	0.295	17.2	0.1048	0.0000	SURCHARGED
15 minute summer	S4	11	44.157	0.277	21.3	0.0839	0.0000	SURCHARGED
15 minute summer	S5	11	43.810	0.170	32.8	0.0655	0.0000	OK
15 minute summer	S6	11	43.712	0.192	38.7	0.0549	0.0000	OK
15 minute summer	S7	11	43.647	0.217	43.9	0.0615	0.0000	OK
15 minute summer	re8	10	44.757	0.057	6.2	0.0238	0.0000	OK
15 minute summer	S9	10	44.640	0.040	12.4	0.0158	0.0000	OK
15 minute summer	S10	10	44.058	0.108	18.5	0.0342	0.0000	OK
15 minute summer	S11	11	43.610	0.110	18.5	0.0215	0.0000	OK
15 minute summer	S12	11	43.546	0.326	60.6	0.0639	0.0000	SURCHARGED

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	re1	1.000	S2	6.2	0.681	0.310	0.1466	
15 minute summer	S2	1.001	S3	11.0	0.730	0.683	0.5363	
15 minute summer	S3	1.002	S4	15.6	0.887	0.968	0.1275	
15 minute summer	S4	1.003	S5	21.0	1.194	1.329	0.3429	
15 minute summer	S5	1.004	S6	32.8	1.086	0.800	0.2899	
15 minute summer	S6	1.005	S7	38.0	1.128	0.802	0.4081	
30 minute winter	S7	1.006	S12	34.3	1.402	0.600	0.2759	
15 minute summer	re8	2.000	S9	6.2	1.255	0.249	0.0256	
15 minute summer	S9	2.001	S10	12.3	1.450	0.156	0.0288	
30 minute summer	S10	2.002	S11	16.6	1.583	0.718	0.3036	
15 minute summer	S11	2.003	S12	18.1	1.071	0.399	0.0683	
15 minute summer	S12	1.007	S13	60.4	1.520	1.269	0.5053	

Results for 100 year Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S13	11	43.246	0.216	65.1	0.0658	0.0000	OK
15 minute summer	re14	10	43.239	0.059	4.9	0.0199	0.0000	OK
15 minute summer	S15	11	43.145	0.215	72.3	0.0549	0.0000	OK
15 minute summer	re21	10	43.435	0.035	2.5	0.0114	0.0000	OK
15 minute summer	S22	11	43.023	0.163	84.1	0.0724	0.0000	OK
15 minute summer	re16	10	43.737	0.037	1.9	0.0094	0.0000	OK
15 minute summer	S17	10	43.505	0.045	3.7	0.0110	0.0000	OK
15 minute summer	re18	10	43.838	0.038	1.9	0.0105	0.0000	OK
15 minute summer	S19	10	43.769	0.039	3.8	0.0107	0.0000	OK
15 minute summer	S20	11	43.329	0.049	7.4	0.0096	0.0000	OK
480 minute winter	S23	472	42.946	0.396	11.0	0.0775	0.0000	SURCHARGED
15 minute summer	re32	10	43.538	0.038	3.1	0.0134	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S13	1.008	S15	65.1	1.210	0.707	0.7856	
15 minute summer	re14	3.000	S15	4.8	0.770	0.300	0.0821	
15 minute summer	S15	1.009	S22	72.3	1.559	0.808	0.5015	
15 minute summer	re21	4.000	S22	2.5	1.051	0.242	0.0284	
15 minute summer	S22	1.010	S23	84.0	2.067	0.461	0.4721	
15 minute summer	re16	5.000	S17	1.8	0.724	0.274	0.0391	
15 minute summer	S17	5.001	S20	3.7	0.790	0.187	0.0681	
15 minute summer	re18	6.000	S19	1.9	0.670	0.279	0.0159	
15 minute summer	S19	6.001	S20	3.7	1.333	0.305	0.0277	
15 minute summer	S20	5.002	S23	7.4	1.512	0.218	0.0785	
15 minute summer	S23	1.011	S29	91.3	2.364	0.506	0.4860	
15 minute summer	re32	7.000	S33	3.1	0.810	0.131	0.0218	

Results for 100 year Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S33	10	43.442	0.042	6.2	0.0129	0.0000	OK
15 minute summer	re30	1	42.970	0.000	0.0	0.0000	0.0000	OK
480 minute winter	S31	472	42.946	0.096	0.0	0.0187	0.0000	OK
480 minute winter	S34	472	42.946	0.246	0.6	0.0481	0.0000	SURCHARGED
480 minute winter	S35	472	42.946	0.426	0.6	0.0834	0.0000	SURCHARGED
15 minute summer	re24	10	43.083	0.033	1.9	0.0083	0.0000	OK
480 minute winter	S25	472	42.946	0.286	0.5	0.0720	0.0000	SURCHARGED
15 minute summer	re26	10	43.287	0.037	1.9	0.0098	0.0000	OK
15 minute summer	S27	10	43.159	0.039	4.4	0.0101	0.0000	OK
480 minute winter	S28	472	42.946	0.406	1.9	0.1574	0.0000	SURCHARGED
480 minute winter	S29	472	42.946	1.155	13.5	1.3059	0.0000	OK
480 minute winter	S36	472	42.946	1.166	7.7	1.5748	0.0000	SURCHARGED

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S33	7.001	S34	6.1	1.540	0.161	0.0576	
15 minute summer	re30	8.000	S31	0.0	0.000	0.000	0.0000	
480 minute summer	S31	8.001	S34	0.0	-0.025	-0.004	0.0166	
15 minute summer	S34	7.002	S35	6.0	0.942	0.375	0.1410	
15 minute summer	S35	7.003	S29	6.1	1.178	0.232	0.0647	
15 minute summer	re24	9.000	S25	1.9	0.844	0.222	0.0396	
15 minute summer	S25	9.001	S28	4.3	0.390	0.261	0.1578	
15 minute summer	re26	10.000	S27	1.9	0.690	0.274	0.0277	
30 minute winter	S27	10.001	S28	3.1	0.940	0.107	0.0853	
15 minute summer	S28	9.002	S29	16.6	1.025	1.028	0.3328	
15 minute winter	S29	Flow through pond	S36	49.5	0.072	0.006	55.9433	
480 minute winter	S36	Hydro-Brake®	existing	1.3				161.9

Results for 100 year Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	existing	1	41.690	0.000	1.1	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	re1	12	44.850	0.500	8.7	0.1780	0.0000	SURCHARGED
15 minute summer	S2	12	44.831	0.641	16.4	0.2167	0.0000	SURCHARGED
15 minute summer	S3	12	44.669	0.729	19.4	0.2586	0.0000	SURCHARGED
15 minute summer	S4	12	44.558	0.678	25.3	0.2053	0.0000	SURCHARGED
15 minute summer	S5	12	44.080	0.440	39.7	0.1698	0.0000	SURCHARGED
15 minute summer	S6	12	43.999	0.479	46.9	0.1370	0.0000	SURCHARGED
15 minute summer	S7	12	43.875	0.445	54.3	0.1263	0.0000	SURCHARGED
15 minute summer	re8	10	44.769	0.069	8.7	0.0289	0.0000	OK
15 minute summer	S9	11	44.655	0.055	17.4	0.0219	0.0000	OK
15 minute summer	S10	11	44.376	0.426	25.8	0.1355	0.0000	SURCHARGED
15 minute summer	S11	12	43.835	0.335	23.6	0.0657	0.0000	SURCHARGED
15 minute summer	S12	12	43.710	0.490	76.8	0.0961	0.0000	SURCHARGED

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	re1	1.000	S2	8.1	0.718	0.407	0.2255	
15 minute summer	S2	1.001	S3	12.9	0.762	0.801	0.5363	
15 minute summer	S3	1.002	S4	19.2	1.090	1.189	0.1275	
15 minute summer	S4	1.003	S5	25.8	1.465	1.633	0.3552	
15 minute winter	S5	1.004	S6	37.2	1.092	0.909	0.3826	
15 minute summer	S6	1.005	S7	46.3	1.164	0.978	0.4308	
30 minute summer	S7	1.006	S12	51.0	1.407	0.892	0.4277	
15 minute winter	re8	2.000	S9	8.0	1.342	0.325	0.0312	
30 minute winter	S9	2.001	S10	12.6	1.477	0.159	0.0288	
15 minute summer	S10	2.002	S11	23.6	1.591	1.022	0.4696	
15 minute summer	S11	2.003	S12	23.3	1.324	0.514	0.0767	
15 minute summer	S12	1.007	S13	77.0	1.937	1.619	0.5156	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	S13	228	43.359	0.329	18.9	0.1002	0.0000	SURCHARGED
480 minute winter	re14	376	43.354	0.174	0.7	0.0590	0.0000	SURCHARGED
480 minute winter	S15	352	43.356	0.426	11.7	0.1086	0.0000	SURCHARGED
15 minute summer	re21	10	43.442	0.042	3.5	0.0137	0.0000	OK
480 minute winter	S22	352	43.356	0.496	13.6	0.2202	0.0000	SURCHARGED
15 minute summer	re16	10	43.744	0.044	2.6	0.0112	0.0000	OK
15 minute summer	S17	10	43.513	0.053	5.1	0.0130	0.0000	OK
15 minute summer	re18	10	43.846	0.046	2.6	0.0126	0.0000	OK
15 minute summer	S19	10	43.778	0.048	5.2	0.0128	0.0000	OK
240 minute winter	S20	228	43.354	0.074	2.0	0.0144	0.0000	OK
480 minute winter	S23	352	43.355	0.805	14.8	0.1578	0.0000	SURCHARGED
15 minute summer	re32	10	43.546	0.046	4.3	0.0161	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S13	1.008	S15	82.8	1.266	0.899	0.9514	
30 minute summer	re14	3.000	S15	6.3	0.792	0.389	0.1125	
15 minute summer	S15	1.009	S22	91.8	1.637	1.026	0.6080	
15 minute summer	re21	4.000	S22	3.4	1.147	0.338	0.0363	
15 minute summer	S22	1.010	S23	107.4	2.142	0.590	0.5832	
15 minute summer	re16	5.000	S17	2.5	0.787	0.378	0.0496	
15 minute summer	S17	5.001	S20	5.1	0.856	0.258	0.0868	
15 minute summer	re18	6.000	S19	2.6	0.720	0.384	0.0203	
15 minute summer	S19	6.001	S20	5.1	1.444	0.420	0.0352	
15 minute summer	S20	5.002	S23	10.2	1.638	0.301	0.1003	
15 minute summer	S23	1.011	S29	117.1	2.483	0.649	0.5933	
15 minute summer	re32	7.000	S33	4.3	0.877	0.182	0.0279	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S33	10	43.450	0.050	8.6	0.0154	0.0000	OK
240 minute winter	re30	228	43.355	0.385	0.3	0.0754	0.0000	SURCHARGED
240 minute winter	S31	228	43.353	0.503	0.4	0.0985	0.0000	SURCHARGED
360 minute winter	S34	280	43.353	0.653	1.2	0.1280	0.0000	SURCHARGED
480 minute winter	S35	352	43.355	0.835	1.0	0.1636	0.0000	SURCHARGED
240 minute winter	re24	228	43.353	0.303	0.5	0.0767	0.0000	SURCHARGED
480 minute winter	S25	352	43.354	0.694	0.7	0.1748	0.0000	SURCHARGED
480 minute winter	re26	352	43.353	0.103	0.3	0.0276	0.0000	SURCHARGED
480 minute winter	S27	352	43.354	0.234	0.7	0.0606	0.0000	SURCHARGED
480 minute winter	S28	352	43.354	0.814	2.7	0.3157	0.0000	SURCHARGED
360 minute winter	S29	344	43.370	1.579	21.5	1.7863	0.0000	OK
480 minute winter	S36	352	43.372	1.592	25.5	33.2445	0.0000	FLOOD RISK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S33	7.001	S34	8.5	1.685	0.225	0.0735	
240 minute summer	re30	8.000	S31	-0.4	-0.084	-0.065	0.0739	
120 minute winter	S31	8.001	S34	-0.7	-0.148	-0.079	0.0173	
15 minute summer	S34	7.002	S35	8.4	1.023	0.524	0.1811	
15 minute summer	S35	7.003	S29	8.5	1.285	0.324	0.1281	
15 minute summer	re24	9.000	S25	2.6	0.892	0.311	0.0950	
15 minute summer	S25	9.001	S28	6.7	0.400	0.407	0.2447	
15 minute summer	re26	10.000	S27	2.6	0.752	0.377	0.0349	
15 minute summer	S27	10.001	S28	6.0	0.942	0.207	0.2221	
15 minute summer	S28	9.002	S29	21.2	1.208	1.319	0.3510	
15 minute winter	S29	Flow through pond	S36	62.2	0.069	0.008	78.2352	
480 minute winter	S36	Hydro-Brake®	existing	1.5				213.2

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 91.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	existing	1	41.690	0.000	1.1	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	1.000
CV	0.950	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	4.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	150.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
re1	0.010	5.00	45.600	500	509457.279	186964.232	1.250
S2	0.010	5.00	45.600	500	509467.959	186971.304	1.410
S3	0.010	5.00	45.200	500	509497.809	186977.372	1.260
S4	0.010	5.00	45.750	500	509499.898	186970.440	1.870
S5	0.020	5.00	45.750	500	509499.899	186950.266	2.110
S6	0.010	5.00	45.750	500	509490.280	186950.254	2.230
S7	0.010	5.00	45.700	500	509479.449	186950.249	2.270
re8	0.010	5.00	45.600	500	509449.397	186947.896	0.900
S9	0.010	5.00	45.600	500	509448.423	186942.814	1.000
S10	0.010	5.00	45.600	500	509448.424	186939.482	1.650
S11			45.600	500	509475.100	186939.494	2.100
S12			45.280	500	509479.454	186939.496	2.060
S13	0.008	5.00	44.500	500	509492.556	186939.502	1.470
re14	0.008	5.00	44.300	500	509504.645	186925.006	1.120
S15	0.004	5.00	44.300	500	509492.563	186925.001	1.370
re21	0.004	5.00	44.000	500	509504.650	186914.246	0.600
S22	0.016	5.00	44.150	500	509492.568	186914.241	1.290

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
re16	0.003	5.00	44.700	500	509467.031	186929.469	1.000
S17	0.003	5.00	44.700	500	509482.336	186929.476	1.240
re18	0.003	5.00	44.550	500	509472.441	186920.591	0.750
S19	0.003	5.00	44.550	500	509472.444	186914.919	0.820
S20			44.500	500	509482.343	186914.923	1.220
S23			44.150	500	509492.573	186902.629	1.600
re32	0.005	5.00	44.150	500	509458.734	186861.641	0.650
S33	0.005	5.00	44.300	500	509462.790	186865.697	0.900
re30		5.00	44.300	500	509453.333	186882.475	1.330
S31			44.300	500	509462.782	186882.479	1.450
S34			44.150	500	509462.783	186880.272	1.450
S35			43.850	500	509484.725	186880.282	1.330
re24	0.003	5.00	44.100	500	509458.057	186908.076	1.050
S25	0.004	5.00	44.100	500	509458.065	186890.033	1.440
re26	0.003	5.00	44.100	500	509461.771	186910.020	0.850
S27	0.004	5.00	44.400	500	509471.954	186910.025	1.280
S28	0.014	5.00	44.000	500	509471.963	186890.039	1.460
S29			44.000	1200	509492.579	186890.049	2.209
S36	0.020	5.00	43.600	1200	509500.618	186882.456	1.820
existing			43.590	1	509510.098	186880.581	1.900

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	re1	S2	12.809	0.600	44.350	44.190	0.160	80.1	150	4.00	0.0
1.001	S2	S3	30.461	0.600	44.190	43.940	0.250	121.8	150	4.00	0.0
1.002	S3	S4	7.240	0.600	43.940	43.880	0.060	120.7	150	4.00	0.0
1.003	S4	S5	20.174	0.600	43.880	43.720	0.160	126.1	150	4.00	0.0
1.004	S5	S6	9.619	0.600	43.640	43.580	0.060	160.3	225	4.00	0.0
1.005	S6	S7	10.831	0.600	43.520	43.430	0.090	120.3	225	4.00	0.0
1.006	S7	S12	10.753	0.600	43.430	43.300	0.130	82.7	225	4.00	0.0
2.000	re8	S9	5.174	0.600	44.700	44.600	0.100	51.7	150	4.00	0.0
2.001	S9	S10	3.332	0.600	44.600	43.950	0.650	5.1	150	4.00	0.0
2.002	S10	S11	26.676	0.600	43.950	43.500	0.450	59.3	150	4.00	0.0
2.003	S11	S12	4.354	0.600	43.500	43.220	0.280	15.6	150	4.00	0.0
1.007	S12	S13	13.102	0.600	43.220	43.110	0.110	119.1	225	4.00	0.0

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)
1.000	1.124	19.9	0.0	1.100	1.260	0.010	0.0	0	0.000
1.001	0.909	16.1	0.0	1.260	1.110	0.020	0.0	0	0.000
1.002	0.913	16.1	0.0	1.110	1.720	0.030	0.0	0	0.000
1.003	0.893	15.8	0.0	1.720	1.880	0.040	0.0	0	0.000
1.004	1.030	40.9	0.0	1.885	1.945	0.060	0.0	0	0.000
1.005	1.190	47.3	0.0	2.005	2.045	0.070	0.0	0	0.000
1.006	1.439	57.2	0.0	2.045	1.755	0.080	0.0	0	0.000
2.000	1.401	24.8	0.0	0.750	0.850	0.010	0.0	0	0.000
2.001	4.481	79.2	0.0	0.850	1.500	0.020	0.0	0	0.000
2.002	1.309	23.1	0.0	1.500	1.950	0.030	0.0	0	0.000
2.003	2.567	45.4	0.0	1.950	1.910	0.030	0.0	0	0.000
1.007	1.197	47.6	0.0	1.835	1.165	0.110	0.0	0	0.000

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)
1.008	S13	S15	14.501	0.600	43.030	42.930	0.100	145.0	300	4.00	0.0
3.000	re14	S15	12.082	0.600	43.180	43.080	0.100	120.8	150	4.00	0.0
1.009	S15	S22	10.760	0.600	42.930	42.860	0.070	153.7	300	4.00	0.0
4.000	re21	S22	12.082	0.600	43.400	43.060	0.340	35.5	100	4.00	0.0
1.010	S22	S23	11.612	0.600	42.860	42.550	0.310	37.5	300	4.00	0.0
5.000	re16	S17	15.305	0.600	43.700	43.510	0.190	80.6	100	4.00	0.0
5.001	S17	S20	14.553	0.600	43.460	43.280	0.180	80.9	150	4.00	0.0
6.000	re18	S19	5.672	0.600	43.800	43.730	0.070	81.0	100	4.00	0.0
6.001	S19	S20	9.899	0.600	43.730	43.330	0.400	24.7	100	4.00	0.0
5.002	S20	S23	15.994	0.600	43.280	42.700	0.580	27.6	150	4.00	0.0
1.011	S23	S29	12.580	0.600	42.550	42.220	0.330	38.1	300	4.00	0.0
7.000	re32	S33	5.736	0.600	43.500	43.400	0.100	57.4	150	4.00	0.0

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)
1.008	1.303	92.1	0.0	1.170	1.070	0.118	0.0	0	0.000
3.000	0.913	16.1	0.0	0.970	1.070	0.008	0.0	0	0.000
1.009	1.265	89.4	0.0	1.070	0.990	0.130	0.0	0	0.000
4.000	1.298	10.2	0.0	0.500	0.990	0.004	0.0	0	0.000
1.010	2.577	182.1	0.0	0.990	1.300	0.150	0.0	0	0.000
5.000	0.858	6.7	0.0	0.900	1.090	0.003	0.0	0	0.000
5.001	1.119	19.8	0.0	1.090	1.070	0.006	0.0	0	0.000
6.000	0.855	6.7	0.0	0.650	0.720	0.003	0.0	0	0.000
6.001	1.558	12.2	0.0	0.720	1.070	0.006	0.0	0	0.000
5.002	1.925	34.0	0.0	1.070	1.300	0.012	0.0	0	0.000
1.011	2.554	180.5	0.0	1.300	1.480	0.162	0.0	0	0.000
7.000	1.330	23.5	0.0	0.500	0.750	0.005	0.0	0	0.000

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)
7.001	S33	S34	14.575	0.600	43.400	42.750	0.650	22.4	150	4.00	0.0
8.000	re30	S31	9.449	0.600	42.970	42.850	0.120	78.7	100	4.00	0.0
8.001	S31	S34	2.207	0.600	42.850	42.800	0.050	44.1	100	4.00	0.0
7.002	S34	S35	21.942	0.600	42.700	42.520	0.180	121.9	150	4.00	0.0
7.003	S35	S29	12.533	0.600	42.520	42.250	0.270	46.4	150	4.00	0.0
9.000	re24	S25	18.043	0.600	43.050	42.710	0.340	53.1	100	4.00	0.0
9.001	S25	S28	13.898	0.600	42.660	42.540	0.120	115.8	150	4.00	0.0
10.000	re26	S27	10.183	0.600	43.250	43.120	0.130	78.3	100	4.00	0.0
10.001	S27	S28	19.986	0.600	43.120	42.590	0.530	37.7	150	4.00	0.0
9.002	S28	S29	20.616	0.600	42.540	42.370	0.170	121.3	150	4.00	0.0
11.000	S36	existing	9.664	0.600	41.780	41.690	0.090	107.4	150	4.00	0.0

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)
7.001	2.136	37.7	0.0	0.750	1.250	0.010	0.0	0	0.000
8.000	0.868	6.8	0.0	1.230	1.350	0.000	0.0	0	0.000
8.001	1.163	9.1	0.0	1.350	1.250	0.000	0.0	0	0.000
7.002	0.909	16.1	0.0	1.300	1.180	0.010	0.0	0	0.000
7.003	1.480	26.2	0.0	1.180	1.600	0.010	0.0	0	0.000
9.000	1.060	8.3	0.0	0.950	1.290	0.003	0.0	0	0.000
9.001	0.933	16.5	0.0	1.290	1.310	0.007	0.0	0	0.000
10.000	0.870	6.8	0.0	0.750	1.180	0.003	0.0	0	0.000
10.001	1.644	29.0	0.0	1.130	1.260	0.007	0.0	0	0.000
9.002	0.911	16.1	0.0	1.310	1.480	0.028	0.0	0	0.000
11.000	0.969	17.1	0.0	1.670	1.750	0.020	0.0	0	0.000

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	12.809	80.1	150	Circular	45.600	44.350	1.100	45.600	44.190	1.260
1.001	30.461	121.8	150	Circular	45.600	44.190	1.260	45.200	43.940	1.110
1.002	7.240	120.7	150	Circular	45.200	43.940	1.110	45.750	43.880	1.720
1.003	20.174	126.1	150	Circular	45.750	43.880	1.720	45.750	43.720	1.880
1.004	9.619	160.3	225	Circular	45.750	43.640	1.885	45.750	43.580	1.945
1.005	10.831	120.3	225	Circular	45.750	43.520	2.005	45.700	43.430	2.045
1.006	10.753	82.7	225	Circular	45.700	43.430	2.045	45.280	43.300	1.755
2.000	5.174	51.7	150	Circular	45.600	44.700	0.750	45.600	44.600	0.850
2.001	3.332	5.1	150	Circular	45.600	44.600	0.850	45.600	43.950	1.500
2.002	26.676	59.3	150	Circular	45.600	43.950	1.500	45.600	43.500	1.950
2.003	4.354	15.6	150	Circular	45.600	43.500	1.950	45.280	43.220	1.910
1.007	13.102	119.1	225	Circular	45.280	43.220	1.835	44.500	43.110	1.165

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	re1	500	Manhole	Adoptable	S2	500	Manhole	Adoptable
1.001	S2	500	Manhole	Adoptable	S3	500	Manhole	Adoptable
1.002	S3	500	Manhole	Adoptable	S4	500	Manhole	Adoptable
1.003	S4	500	Manhole	Adoptable	S5	500	Manhole	Adoptable
1.004	S5	500	Manhole	Adoptable	S6	500	Manhole	Adoptable
1.005	S6	500	Manhole	Adoptable	S7	500	Manhole	Adoptable
1.006	S7	500	Manhole	Adoptable	S12	500	Manhole	Adoptable
2.000	re8	500	Manhole	Adoptable	S9	500	Manhole	Adoptable
2.001	S9	500	Manhole	Adoptable	S10	500	Manhole	Adoptable
2.002	S10	500	Manhole	Adoptable	S11	500	Manhole	Adoptable
2.003	S11	500	Manhole	Adoptable	S12	500	Manhole	Adoptable
1.007	S12	500	Manhole	Adoptable	S13	500	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.008	14.501	145.0	300	Circular	44.500	43.030	1.170	44.300	42.930	1.070
3.000	12.082	120.8	150	Circular	44.300	43.180	0.970	44.300	43.080	1.070
1.009	10.760	153.7	300	Circular	44.300	42.930	1.070	44.150	42.860	0.990
4.000	12.082	35.5	100	Circular	44.000	43.400	0.500	44.150	43.060	0.990
1.010	11.612	37.5	300	Circular	44.150	42.860	0.990	44.150	42.550	1.300
5.000	15.305	80.6	100	Circular	44.700	43.700	0.900	44.700	43.510	1.090
5.001	14.553	80.9	150	Circular	44.700	43.460	1.090	44.500	43.280	1.070
6.000	5.672	81.0	100	Circular	44.550	43.800	0.650	44.550	43.730	0.720
6.001	9.899	24.7	100	Circular	44.550	43.730	0.720	44.500	43.330	1.070
5.002	15.994	27.6	150	Circular	44.500	43.280	1.070	44.150	42.700	1.300
1.011	12.580	38.1	300	Circular	44.150	42.550	1.300	44.000	42.220	1.480
7.000	5.736	57.4	150	Circular	44.150	43.500	0.500	44.300	43.400	0.750

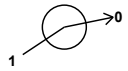
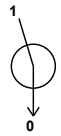
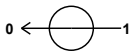
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.008	S13	500	Manhole	Adoptable	S15	500	Manhole	Adoptable
3.000	re14	500	Manhole	Adoptable	S15	500	Manhole	Adoptable
1.009	S15	500	Manhole	Adoptable	S22	500	Manhole	Adoptable
4.000	re21	500	Manhole	Adoptable	S22	500	Manhole	Adoptable
1.010	S22	500	Manhole	Adoptable	S23	500	Manhole	Adoptable
5.000	re16	500	Manhole	Adoptable	S17	500	Manhole	Adoptable
5.001	S17	500	Manhole	Adoptable	S20	500	Manhole	Adoptable
6.000	re18	500	Manhole	Adoptable	S19	500	Manhole	Adoptable
6.001	S19	500	Manhole	Adoptable	S20	500	Manhole	Adoptable
5.002	S20	500	Manhole	Adoptable	S23	500	Manhole	Adoptable
1.011	S23	500	Manhole	Adoptable	S29	1200	Manhole	Adoptable
7.000	re32	500	Manhole	Adoptable	S33	500	Manhole	Adoptable

Pipeline Schedule

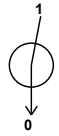
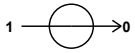
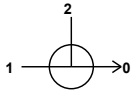
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
7.001	14.575	22.4	150	Circular	44.300	43.400	0.750	44.150	42.750	1.250
8.000	9.449	78.7	100	Circular	44.300	42.970	1.230	44.300	42.850	1.350
8.001	2.207	44.1	100	Circular	44.300	42.850	1.350	44.150	42.800	1.250
7.002	21.942	121.9	150	Circular	44.150	42.700	1.300	43.850	42.520	1.180
7.003	12.533	46.4	150	Circular	43.850	42.520	1.180	44.000	42.250	1.600
9.000	18.043	53.1	100	Circular	44.100	43.050	0.950	44.100	42.710	1.290
9.001	13.898	115.8	150	Circular	44.100	42.660	1.290	44.000	42.540	1.310
10.000	10.183	78.3	100	Circular	44.100	43.250	0.750	44.400	43.120	1.180
10.001	19.986	37.7	150	Circular	44.400	43.120	1.130	44.000	42.590	1.260
9.002	20.616	121.3	150	Circular	44.000	42.540	1.310	44.000	42.370	1.480
11.000	9.664	107.4	150	Circular	43.600	41.780	1.670	43.590	41.690	1.750

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
7.001	S33	500	Manhole	Adoptable	S34	500	Manhole	Adoptable
8.000	re30	500	Manhole	Adoptable	S31	500	Manhole	Adoptable
8.001	S31	500	Manhole	Adoptable	S34	500	Manhole	Adoptable
7.002	S34	500	Manhole	Adoptable	S35	500	Manhole	Adoptable
7.003	S35	500	Manhole	Adoptable	S29	1200	Manhole	Adoptable
9.000	re24	500	Manhole	Adoptable	S25	500	Manhole	Adoptable
9.001	S25	500	Manhole	Adoptable	S28	500	Manhole	Adoptable
10.000	re26	500	Manhole	Adoptable	S27	500	Manhole	Adoptable
10.001	S27	500	Manhole	Adoptable	S28	500	Manhole	Adoptable
9.002	S28	500	Manhole	Adoptable	S29	1200	Manhole	Adoptable
11.000	S36	1200	Manhole	Adoptable	existing	1	Manhole	Adoptable

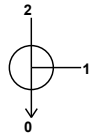
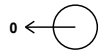
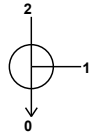
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
re1	509457.279	186964.232	45.600	1.250	500				
						0	1.000	44.350	150
S2	509467.959	186971.304	45.600	1.410	500	1	1.000	44.190	150
									
						0	1.001	44.190	150
S3	509497.809	186977.372	45.200	1.260	500	1	1.001	43.940	150
									
						0	1.002	43.940	150
S4	509499.898	186970.440	45.750	1.870	500		1	1.002	43.880	150
							0	1.003	43.880	150
S5	509499.899	186950.266	45.750	2.110	500		1	1.003	43.720	150
							0	1.004	43.640	225
S6	509490.280	186950.254	45.750	2.230	500	1	1.004	43.580	225
									
						0	1.005	43.520	225
S7	509479.449	186950.249	45.700	2.270	500	1	1.005	43.430	225
									
						0	1.006	43.430	225

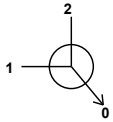
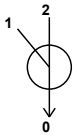
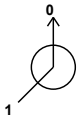
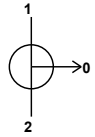
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
re8	509449.397	186947.896	45.600	0.900	500		0	2.000	44.700	150
S9	509448.423	186942.814	45.600	1.000	500		1	2.000	44.600	150
							0	2.001	44.600	150
S10	509448.424	186939.482	45.600	1.650	500		1	2.001	43.950	150
							0	2.002	43.950	150
S11	509475.100	186939.494	45.600	2.100	500		1	2.002	43.500	150
							0	2.003	43.500	150
S12	509479.454	186939.496	45.280	2.060	500		1	2.003	43.220	150
							2	1.006	43.300	225
							0	1.007	43.220	225
S13	509492.556	186939.502	44.500	1.470	500		1	1.007	43.110	225
							0	1.008	43.030	300
re14	509504.645	186925.006	44.300	1.120	500		0	3.000	43.180	150

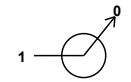
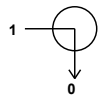
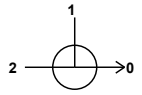
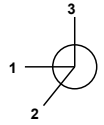
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
S15	509492.563	186925.001	44.300	1.370	500		1	3.000	43.080	150
							2	1.008	42.930	300
							0	1.009	42.930	300
re21	509504.650	186914.246	44.000	0.600	500					
							0	4.000	43.400	100
S22	509492.568	186914.241	44.150	1.290	500		1	4.000	43.060	100
							2	1.009	42.860	300
							0	1.010	42.860	300
re16	509467.031	186929.469	44.700	1.000	500					
							0	5.000	43.700	100
S17	509482.336	186929.476	44.700	1.240	500		1	5.000	43.510	100
							0	5.001	43.460	150
re18	509472.441	186920.591	44.550	0.750	500					
							0	6.000	43.800	100
S19	509472.444	186914.919	44.550	0.820	500		1	6.000	43.730	100
							0	6.001	43.730	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S20	509482.343	186914.923	44.500	1.220	500		1	6.001	43.330	100
							2	5.001	43.280	150
							0	5.002	43.280	150
S23	509492.573	186902.629	44.150	1.600	500		1	5.002	42.700	150
							2	1.010	42.550	300
							0	1.011	42.550	300
re32	509458.734	186861.641	44.150	0.650	500					
							0	7.000	43.500	150
S33	509462.790	186865.697	44.300	0.900	500		1	7.000	43.400	150
							0	7.001	43.400	150
re30	509453.333	186882.475	44.300	1.330	500					
							0	8.000	42.970	100
S31	509462.782	186882.479	44.300	1.450	500		1	8.000	42.850	100
							0	8.001	42.850	100
S34	509462.783	186880.272	44.150	1.450	500		1	8.001	42.800	100
							2	7.001	42.750	150
							0	7.002	42.700	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S35	509484.725	186880.282	43.850	1.330	500	 1	7.002	42.520	150
						0	7.003	42.520	150
re24	509458.057	186908.076	44.100	1.050	500	 0	9.000	43.050	100
S25	509458.065	186890.033	44.100	1.440	500	 1	9.000	42.710	100
						0	9.001	42.660	150
re26	509461.771	186910.020	44.100	0.850	500	 0	10.000	43.250	100
S27	509471.954	186910.025	44.400	1.280	500	 1	10.000	43.120	100
						0	10.001	43.120	150
S28	509471.963	186890.039	44.000	1.460	500	 1	10.001	42.590	150
						2	9.001	42.540	150
						0	9.002	42.540	150
S29	509492.579	186890.049	44.000	2.209	1200	 1	9.002	42.370	150
						2	7.003	42.250	150
						3	1.011	42.220	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S36	509500.618	186882.456	43.600	1.820	1200				
						0	11.000	41.780	150
existing	509510.098	186880.581	43.590	1.900	1		1	11.000	41.690	150
									

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Additional Storage (m³/ha)	20.0
Summer CV	0.950	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.950	Drain Down Time (mins)	10080	Check Discharge Volume	x

Storm Durations

15	30	60	120	180	240	360

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	40	0	0

Node S36 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	41.780	Product Number	CTL-SHE-0052-1500-1500-1500
Design Depth (m)	1.500	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.5	Min Node Diameter (mm)	1200

Node S36 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Main Channel Length (m)	11.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	41.780	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)	1584	Main Channel n	0.030

Inlets

S29

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	112.5	0.0	0.400	112.5	0.0	0.800	112.5	0.0	1.200	112.5	0.0	1.201	0.0	0.0

Node S36 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.33	Width (m)	10.000	Depth (m)	0.350
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	43.000	Length (m)	28.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	236	Slope (1:X)	1000.0		

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 92.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	re1	12	44.850	0.500	8.7	0.1780	0.0000	SURCHARGED
15 minute summer	S2	12	44.831	0.641	16.4	0.2167	0.0000	SURCHARGED
15 minute summer	S3	12	44.669	0.729	19.4	0.2586	0.0000	SURCHARGED
15 minute summer	S4	12	44.558	0.678	25.3	0.2053	0.0000	SURCHARGED
15 minute summer	S5	12	44.080	0.440	39.7	0.1698	0.0000	SURCHARGED
15 minute summer	S6	12	43.999	0.479	46.9	0.1370	0.0000	SURCHARGED
15 minute summer	S7	12	43.875	0.445	54.3	0.1263	0.0000	SURCHARGED
15 minute summer	re8	10	44.769	0.069	8.7	0.0289	0.0000	OK
15 minute summer	S9	11	44.655	0.055	17.4	0.0219	0.0000	OK
15 minute summer	S10	11	44.376	0.426	25.8	0.1355	0.0000	SURCHARGED
15 minute summer	S11	12	43.835	0.335	23.6	0.0657	0.0000	SURCHARGED
15 minute summer	S12	12	43.710	0.490	76.8	0.0961	0.0000	SURCHARGED

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	re1	1.000	S2	8.1	0.718	0.407	0.2255	
15 minute summer	S2	1.001	S3	12.9	0.762	0.801	0.5363	
15 minute summer	S3	1.002	S4	19.2	1.090	1.189	0.1275	
15 minute summer	S4	1.003	S5	25.8	1.465	1.633	0.3552	
15 minute winter	S5	1.004	S6	37.2	1.092	0.909	0.3826	
15 minute summer	S6	1.005	S7	46.3	1.164	0.978	0.4308	
30 minute summer	S7	1.006	S12	51.0	1.407	0.892	0.4277	
15 minute winter	re8	2.000	S9	8.0	1.342	0.325	0.0312	
30 minute winter	S9	2.001	S10	12.6	1.477	0.159	0.0288	
15 minute summer	S10	2.002	S11	23.6	1.591	1.022	0.4696	
15 minute summer	S11	2.003	S12	23.3	1.324	0.514	0.0767	
15 minute summer	S12	1.007	S13	77.0	1.937	1.619	0.5156	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 92.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	S13	228	43.359	0.329	18.9	0.1002	0.0000	SURCHARGED
360 minute winter	re14	280	43.354	0.174	0.9	0.0589	0.0000	SURCHARGED
240 minute winter	S15	228	43.355	0.425	20.8	0.1084	0.0000	SURCHARGED
15 minute summer	re21	10	43.442	0.042	3.5	0.0137	0.0000	OK
360 minute winter	S22	280	43.355	0.495	17.6	0.2199	0.0000	SURCHARGED
15 minute summer	re16	10	43.744	0.044	2.6	0.0112	0.0000	OK
15 minute summer	S17	10	43.513	0.053	5.1	0.0130	0.0000	OK
15 minute summer	re18	10	43.846	0.046	2.6	0.0126	0.0000	OK
15 minute summer	S19	10	43.778	0.048	5.2	0.0128	0.0000	OK
240 minute winter	S20	228	43.354	0.074	2.0	0.0144	0.0000	OK
240 minute winter	S23	232	43.352	0.802	26.0	0.1573	0.0000	SURCHARGED
15 minute summer	re32	10	43.546	0.046	4.3	0.0161	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S13	1.008	S15	82.8	1.266	0.899	0.9514	
30 minute summer	re14	3.000	S15	6.3	0.792	0.389	0.1125	
15 minute summer	S15	1.009	S22	91.8	1.637	1.026	0.6080	
15 minute summer	re21	4.000	S22	3.4	1.147	0.338	0.0363	
15 minute summer	S22	1.010	S23	107.4	2.142	0.590	0.5832	
15 minute summer	re16	5.000	S17	2.5	0.787	0.378	0.0496	
15 minute summer	S17	5.001	S20	5.1	0.856	0.258	0.0868	
15 minute summer	re18	6.000	S19	2.6	0.720	0.384	0.0203	
15 minute summer	S19	6.001	S20	5.1	1.444	0.420	0.0352	
15 minute summer	S20	5.002	S23	10.2	1.638	0.301	0.1003	
15 minute summer	S23	1.011	S29	117.1	2.483	0.649	0.5933	
15 minute summer	re32	7.000	S33	4.3	0.877	0.182	0.0279	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 92.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	S33	10	43.450	0.050	8.6	0.0154	0.0000	OK
240 minute winter	re30	228	43.355	0.385	0.3	0.0754	0.0000	SURCHARGED
240 minute winter	S31	228	43.353	0.503	0.4	0.0985	0.0000	SURCHARGED
360 minute winter	S34	280	43.353	0.653	1.2	0.1280	0.0000	SURCHARGED
240 minute winter	S35	228	43.354	0.834	1.6	0.1635	0.0000	SURCHARGED
240 minute winter	re24	228	43.353	0.303	0.5	0.0767	0.0000	SURCHARGED
240 minute winter	S25	228	43.353	0.693	1.1	0.1746	0.0000	SURCHARGED
240 minute winter	re26	228	43.353	0.103	0.5	0.0276	0.0000	SURCHARGED
240 minute winter	S27	228	43.353	0.233	1.1	0.0604	0.0000	SURCHARGED
360 minute winter	S28	280	43.353	0.813	3.2	0.3155	0.0000	SURCHARGED
360 minute winter	S29	344	43.370	1.579	21.5	1.7863	0.0000	OK
240 minute winter	S36	232	43.355	1.575	23.1	33.2218	0.0000	FLOOD RISK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	S33	7.001	S34	8.5	1.685	0.225	0.0735	
240 minute summer	re30	8.000	S31	-0.4	-0.084	-0.065	0.0739	
120 minute winter	S31	8.001	S34	-0.7	-0.148	-0.079	0.0173	
15 minute summer	S34	7.002	S35	8.4	1.023	0.524	0.1811	
15 minute summer	S35	7.003	S29	8.5	1.285	0.324	0.1281	
15 minute summer	re24	9.000	S25	2.6	0.892	0.311	0.0950	
15 minute summer	S25	9.001	S28	6.7	0.400	0.407	0.2447	
15 minute summer	re26	10.000	S27	2.6	0.752	0.377	0.0349	
15 minute summer	S27	10.001	S28	6.0	0.942	0.207	0.2221	
15 minute summer	S28	9.002	S29	21.2	1.208	1.319	0.3510	
15 minute winter	S29	Flow through pond	S36	62.2	0.069	0.008	78.2352	
240 minute winter	S36	Hydro-Brake®	existing	1.5				196.9

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 92.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	existing	1	41.690	0.000	1.1	0.0000	0.0000	OK

Link Event (Velocity)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)

APPENDIX G –SUDS PROFORMA

BARNET LONDON BOROUGH

GREATERLONDONAUTHORITY

LoDEG

1. Project & Site Details

Project / Site Name (including sub-catchment / stage / phase where appropriate)	The Barn Hotel
Address & post code	The Barn Hotel,West End Road, Ruislip HA4 6JB
OS Grid ref. (Easting, Northing)	E 509491
	N 186889
LPA reference (if applicable)	
Brief description of proposed work	The site will be redeveloped for residential purposes comprising new apartment blocks and low-rise two-storey houses with private gardens at the east of the site.
Total site Area	9600 m^2
Total existing impervious area	2800 m^2
Total proposed impervious area	3820m2 inc existing highway m^2
Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	The site is in flood zone 1
Existing drainage connection type and location	An existing 375mm & 150mm diameter into the Thames Water Sewer.
Designer Name	Phil Tomes
Designer Position	Director
Designer Company	Infrastructure Design Ltd

2. Proposed Discharge Arrangements

2a. Infiltration Feasibility

Superficial geology classification	
Bedrock geology classification	Made Ground and Clay
Site infiltration rate	Not appropriate m/s
Depth to groundwater level	m below ground level
Is infiltration feasible?	No

2b. Drainage Hierarchy

	Feasible (Y/N)	*Proposed (Y/N)*
1 store rainwater for later use	N	N
2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
3 attenuate rainwater in ponds or open water features for gradual release	N	N
4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
5 discharge rainwater direct to a watercourse	N	N
6 discharge rainwater to a surface water sewer/drain	Y	Y
7 discharge rainwater to the combined sewer.	N	N

2c. Proposed Discharge Details

Proposed discharge location	See IDL drainage strategy report
Has the owner/regulator of the discharge location been consulted?	Not Yet

3. Drainage Strategy

3a. Discharge Rates & Required Storage

	Greenfield (GF) runoff rate (l/s)	*Existing discharge rate (l/s)*	*Required storage for GF rate (m^3)*	*Proposed discharge rate (l/s)*
Qbar	1.7			
1 in 1	1.4	unknown		2.9
1 in 30	4	unknown		3.1
1 in 100	5.3	unknown		3.2
1 in 100 + CC			See DS report	3.5
Climate change allowance used		40%		

3b. Principal Method of Flow Control	Hydrobrake manholes

3c. Proposed SuDS Measures

	Catchment area (m^2)	*Plan area (m^2)*	*Storage vol. (m^3)*
Rainwater harvesting	0		0
Infiltration systems	0		0
Green roofs	See DS report	See DS report	
Blue roofs	0	0	0
Filter strips	0	0	0
Filter drains	0	0	0
Bioretention / tree pits	0	0	0
Pervious pavements	1460	1460	180.675
Swales	0	0	0
Basins/ponds	0	0	0
Attenuation tanks	See DS report		253.65
Total	**1460**	**1460**	**434.325**

4. Supporting Information

4a. Discharge & Drainage Strategy	*Page/section of drainage report*
Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	n/a
Drainage hierarchy (2b)	See IDL drainage strategy report
Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	See IDL drainage strategy report
Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	See IDL drainage strategy report
Proposed SuDS measures & specifications (3b)	See IDL drainage strategy report
4b. Other Supporting Details	*Page/section of drainage report*
Detailed Development Layout	See IDL drainage strategy report
Detailed drainage design drawings, including exceedance flow routes	See IDL drainage strategy report
Detailed landscaping plans	See IDL drainage strategy report
Maintenance strategy	See IDL drainage strategy report
Demonstration of how the proposed SuDS measures improve:	See IDL drainage strategy report
a) water quality of the runoff?	See IDL drainage strategy report
b) biodiversity?	See IDL drainage strategy report
c) amenity?	See IDL drainage strategy report

APPENDIX H – MANAGEMENT & MAINTENANCE REGIME

The Management Company

The responsibility for maintenance of all elements of the development remain with Chase New Homes until handed over to the Management Company.

Handover of external works to the Management Company coincides with completion of the final residential unit.

The Management Company employs a specialist Managing Agent to manage the development which includes all aspects of maintenance.

The Management Company BI registered No. ***'tbc'*** *was incorporated in* ***'tbc'*** *and its directors are currently made up of Chase New Homes representatives plus an appointment from the Managing Agent.*

The Managing Agents are ***'tbc'*** *who have over '****tbc'*** *years' experience in the industry.*

At handover the Management Company and Managing Agent receive as built information together with operating and maintenance manuals which detail all maintenance protocols.

Approximately 1 year following completion of the final unit the residents will be invited to elect members to become directors of the Management Company, the Chase New Homes appointed directors at that time resign from the Management Company to be replaced by the elected representatives of the residents.

To ensure continuity and a full understanding of the development and the operation and maintenance of its various components the representative of the Managing Agent remains as a director of the Management Company and the appointment of the Managing Agents is fixed for a minimum period of two years following the date of resignation of the last Chase New Homes director.

After that two year period the Management Company have the right to re-tender the Managing Agent services but it is very rare that a change is made as our original appointments provide an excellent service.

Within the first two years from the final unit completion on the development the residents have two ways in which they can report any defects and problems which would include flooding and that is either to our Aftersales department or to the Managing Agents, the residents are issued with telephone numbers for both which include out of hours emergency response.

After two years our Aftersales contacts are normally replaced by members of the Management Company. The residents therefore have the ability to contact them or the Managing Agents which then remains through the life of the development.

Cellular Storage

The principle means of surface water attenuation/disposal from the development is by way of cellular storage.

The Management Company will ensure that the following measures are undertaken to ensure the longevity of the surface water drainage system;

Inspections to identify any areas not operating correctly, pollution, blocked inlets or outlets, standing water etc.

Collect and remove from site all extraneous rubbish that is detrimental to the operation or detract from the appearance of the site, including paper, bottles, cans and similar debris.

On-site Surface Water Drainage System (generally)

The Management Company will ensure that the following measures are undertaken to ensure the longevity of the surface water drainage system;

Every 6 months: Remove silt build up from ***all*** catchpits and road gullies.

Annually: elect approx. 20% of the development's surface water inspection chambers (situated in accessible non-private areas) and inspect for blockages / silt build up. Remove silt and debris. Rotate on a 5 yearly cycle to cover all such chambers over this period.

Every 2-5 years (depending on outcome of aforementioned inspections)

> Commission a CCTV survey and report on condition of the surface water piped drainage system upstream of the soakaways to check for structural integrity and hydraulic fluidity. Carry out promptly any remedial work as advised by CCTV company.

Permeable Paving

External parking areas and access roads are to be constructed in permeable block paving in order to;

a) Delay the surface water run-off from these areas, and
b) Enhance the quality of the rainwater prior to discharge into the receiving sewer.

The Management Company will ensure that the following measures are undertaken to ensure the longevity of the pervious pavement;

Quarterly

i) Inspect the permeable pavement for signs of ponding and ensure there is no migration of soils from adjacent landscaped areas or other deleterious material that may prematurely clog up the jointing stone situated in the gaps between the blocks. Ideally this type of inspection should be undertaken immediately following a heavy rainfall event.

ii) Commission vacuum sweeping and brushing of the pervious pavement to ensure joints are kept free of silt. Minimum 3 sweeping per year, thus;

a) End of Winter (April) – to collect winter debris
b) Mid-Summer (July/August) – to collect dust, flower and grass-type deposits.
c) After Autumn leaf fall (November)

The company commissioned to carry out this work should ensure that their vacuum equipment is adjusted accordingly to avoid the removal of jointing material.

Any lost material should be replaced promptly to avoid the blocks from being dislodged.

Last Resort Remedial Action

i) Should a portion of the pervious pavement become substantially impervious due to excessive siltation, the following procedure should be followed;

a) Lift block paving and laying course
b) Break out underlying bitmac base layer and replace with similar compacted depth of course aggregate subbase material to BS EN 13242:2002 Type 4/20, lined at base and sides with a 2000 gauge impermeable membrane.
c) Renew laying course, replace blocks and renew jointing material

NB. Material removed from the voids or the layers below the surface may contain heavy metals and hydrocarbons and as such may need to be disposed of as 'controlled waste'. Sediment testing should be carried out before disposal to confirm its classification and appropriate disposal methods.

Renew laying course, replace blocks and renew jointing material.NB. Material removed from the voids or the layers below the surface may contain heavy metals and hydrocarbons and as such may need to be disposed of as 'controlled waste'. Sediment testing should be carried out before disposal to confirm its classification and appropriate disposal methods.

Sedum (Green) Roofs

Springtime Maintenance.

• Removal of unwanted plant material, i.e. grasses, mosses and clover etc.

• If moss is present, recommend lawn fertiliser and moss (eg Mo Bacter moss digester)

• Application of fertiliser. Recommend a 6-month slow release granular fertiliser (eg MiracleGrow Granular) is applied in April and May as the sedum cannot be fertilised after September.

• Inspection of rainwater outlet chambers and surrounding vegetation breaks.

• Replenishment of any areas of settled substrate. Aerate the substrate if needed with a fork, or top up with a general purpose soil.

Summer Maintenance.

• During dry periods watering little and often will help the sedum and prevent it from turning red.

Autumn Maintenance.

• Removal of dead flower heads (shake first to allow seeds to fall). Only a light trim.• Removal of unwanted plant material, i.e. grasses, mosses and clover etc.

• Inspection of rainwater outlet chambers and surrounding vegetation breaks.

• Replenishment of any areas of settled substrate.

Winter Maintenance

• No visit needed after the first frost it will turn red and then become dormant until springtime.

Flow Control Chambers

Flow control chambers are to be maintained. Their maintenance regime shall be as follows:

Following installation of the Flow Controls any extraneous material i.e. Building materials are removed from the unit and the chamber. After the system is made live, the unit is to be inspected monthly for three months and thereafter at six monthly intervals with hose down if required. The Hydrobrake Flow Control is fitted with a pivoting by-pass door, which allows the manhole chamber to be drained down should blockages occur.

Following the drain down and clearance of the blockage the pivoting by-pass door must be returned to the closed position to enable the hydrobrake to function as designed.

The chambers are to be cleared checked for structural integrity at the six monthly interval. Any damage/problems should be made good as per the original design drawings.