TECHNICAL NOTE

Project:	Proposed Residential Development, Maes Emlyn, Rhyl	**Scheme No:**	14973
Subject:	Outline Drainage Strategy	**Revision:**	01
Client:	Wales & West Housing	**Date:**	03/02/26
Doc Ref:	14973-260202-Outline Drainage Strategy-01	**Status:**	First Issue
Author:	Adam Caldwell MEng (Hons)		
Checker:	Andrew Russell BEng (Hons) IEng MICE		
Approver:	Aled Williams BSc (Hons) MCIWEM C.WEM		

Introduction

Waterco Datrys have been instructed to prepare a Drainage Strategy in respect of a proposed 23no. plot housing development on the former site of 59 flats, to be demolished as part of the project. The purpose of this document is to support the Pre-application Consultation (PAC) process and subsequent planning application.

Existing Drainage

1. The existing brownfield site is occupied by a number of apartment blocks, associated access roads and parking. The existing drainage system has been proven via investigation to serve a combination of both foul and surface water flows, with rainwater pipes and external gullies discharging to the onsite drainage.
2. A drainage CCTV survey (Appendix C) of the existing drainage system and offsite networks confirmed that all pipework discharges to the 300mm diameter combined sewer at SJ01815601 which lies within the site's eastern boundary. The CCTV survey also investigated the local highway gullies and confirmed that they connect to the combined sewer with no separate highway drain being present.
3. The existing surface water runoff enters the combined sewer unattenuated and brownfield runoff rates (Appendix E) have been determined as 17.79l/s and 70.31l/s for the 1 in 1yr and 1 in 100yr storm events respectively.
4. The adjacent housing estate immediately to the north has a separate surface water sewer that discharges to a separate combined sewer network at SJ01814606. This combined sewer network discharges to the northwest as opposed to north-eastwards from SJ01815601.

Foul

1. An initial PPA application (PPA0007341) was previously made to Dwr Cymru Welsh Water (DCWW) in November 2022 relative to a proposed development of 23 units. An updated PPA application (**PPA0009857**) was submitted to DCWW in December 2025, still relative to a proposal for 23 units but accounting for the time period since original application. The response is attached within Appendix A.
2. The response received 08/01/26 stated that there were no concerns relative to the sewerage network nor treatment works to receive the foul flows from the development, however a preferred connection point was suggested to the northwest at/ downstream of manhole SJ01814602 (see Appendix B). Communications are ongoing with regards the point of connection (Appendix H) with the developer desiring to utilise the existing onsite demarcation chamber SJ01815601.
3. The onsite foul drainage will be subject to s104 adoption by DCWW with exact extents yet to be agreed.

Surface Water

Disposal of surface water is summarised as follows:

1. Infiltration tests have been undertaken as part of the intrusive ground investigation undertaken by GroundSolve Ltd in January 2023 (Appendix D). The tests show that all of the trial pits failed the first cycle, as the water failed to percolate through the underlying superficial deposits. Groundwater was encountered within all of the exploratory hole locations within either the Made Ground or wind-blown sand, at depths between 0.60m.bgl and 1.00m.bgl.
2. The site is generally flat with approximately 500mm difference in elevation between the west and east boundaries. Given the site topography, in conjunction with the tree root protection requirements, the opportunity for above ground storage is hindered.
3. Restriction of discharge rates to the greenfield runoff rate is not considered feasible for this site. An initial review of attenuation storage volumes based on a limited discharge rate of 2 l/s (as close to the greenfield rate as practical) shows that attenuation storage depths would be in excess of 2m and would result in a requirement for a pumped solution. A pumped discharge is not in line with the principles set out in the Statutory standards for SuDS.
4. Communications with DCWW in 2023 (Appendix F) accepted that the hierarchy had been adequately considered and a discharge rate of 5 l/s was offered as acceptable into the combined sewer. This provides a 71.9% & 92.8% betterment on the existing 1 in 1yr and 1 in 100yr brownfield runoff rates respectively.
5. Informal discussions have previously taken place with SAB (Appendix G) which confirmed that, if the hierarchy has been followed and there is no alternative than to discharge to the combined sewer, then they accept the approach, but is subject to agreement of flows with DCWW. A formal SAB pre-app submission will be made early February 2026.
6. As a result of the January 2026 response to an updated DCWW pre-application, communications are currently ongoing with DCWW regards a proposed flow rate into the combined sewer.
7. An initial FLOW model has been prepared to ascertain the required attenuation storage with the results attached within Appendix I. The calculations utilise FEH22 and account for up to the threshold design event (1 in 100yr) including for a 30% allowance for climate change and 10% urban creep.
8. An attenuation basin, in combination with below ground cellular tanks and the reservoir layers associated with porous paving, will provide the required storage volume. The model has initially been set up considering all the contributing area as impermeable thus giving a worse case scenario, whereas in reality there will be a significant portion of permeable or semi-permeable surfaces that will be accounted for in the detailed design, reducing the storage requirement.
9. FFLs have been set to achieve a minimum of 300mm freeboard relative to the peak water storage level.
10. The proposals will look to incorporate various SUDS features in order to meet the water quality, amenity and biodiversity requirements, through use of a mixture of filter strips, roadside raingardens, a swale, an attenuation basin and various raingardens. Porous paving will also be incorporated where possible to parking bays and private access roads with underlying reservoir offering storage capacity. Re-use of rainwater will be promoted through provision of above ground water butts at the base of rainwater pipes to provide the ability to re-use some rainwater.
11. A proposed Drainage Scheme is included in Appendix J.

Supporting Information References

- **APPENDIX A:** PPA0009857 (date received 08.01.26)
- **APPENDIX B:** PPA0009857 Sewer Plan
- **APPENDIX C:** Drainage Investigation
- **APPENDIX D:** Soakaway Testing (by Groundsolve 2023)
- **APPENDIX E:** Brownfield Runoff Assessment and ReFH2 Greenfield Runoff Rates
- **APPENDIX F:** Email Correspondence with DCWW in 2023
- **APPENDIX G:** Former SAB Response to informal pre-application
- **APPENDIX H:** Email correspondence with DCWW in 2026
- **APPENDIX I:** Preliminary Hydraulic Modelling Output
- **APPENDIX J:** Proposed Drainage Scheme

APPENDIX A –

PPA0009857 (date received 08.01.26)

Dŵr Cymru
Welsh Water

Developer Services
PO Box 3146
Cardiff
CF30 0EH

Tel: +44 (0)800 917 2652
Fax: +44 (0)2920 740472
E.mail: developer.services@dwrcymru.com

Gwasanaethau Datblygu
Blwch Post 3146
Caerdydd
CF30 0EH

Ffôn: +44 (0)800 917 2652
Ffacs: +44 (0)2920 740472
E.bost: developer.services@dwrcymru.com

Mr Ivan Ramadhan
Waterco
Block C, Unit 1
Caernarfon
Gwynedd
LL55 1TH

Date: 08/01/2026
Our Ref: PPA0009857

Dear Mr Ramadhan

Grid Ref: 301483 381600
Site Address: Maes Emlyn, Rhyl
Development: Redevelopment of the 'existing 59-unit older persons' accommodation to 23 residential dwellings

I refer to your pre-planning enquiry received relating to the above site, seeking our views on the capacity of our network of assets and infrastructure to accommodate your proposed development. Having reviewed the details submitted I can provide the following comments which should be taken into account within any future planning application for the development.

APPRAISAL

Firstly, we note that the proposal relates to the redevelopment of the '*existing 59-unit older persons*' accommodation to 23 residential dwelling's at Maes Emlyn, Rhyl, Denbighshire. We acknowledge that the site comprises of a potential windfall development with no site-specific allocated status in the Local Development Plan (LDP).

Recent communication with DCCW indicates that a preliminary drainage assessment (2023) has been undertaken by yourselves (Waterco), with the exception of highway surface water sewers, for the site and the public sewerage and watermains system. We offer the following comments as part of our appraisal of this development.

PUBLIC SEWERAGE NETWORK

The proposed development site is located in the immediate vicinity of a mixed sewerage system, comprising combined, foul and surface water public sewers, which drains to Kinmel Bay Wastewater Treatment Works (WwTW).

ASSET PROTECTION

This site is crossed by public watermains with their approximate position being marked on the attached Statutory Public Sewer Record. In accordance with the Water Industry Act 1991, Dwr Cymru Welsh Water requires access to its apparatus at all times in order to carry out maintenance and repairs. No part of any building will be permitted within the protection zone of the public watermains measured 3 metres either side of the centreline of the 100mm public watermain. Our strong recommendation is that your site layout takes into account the location of the assets crossing the site and should be referred to in any master-planning exercises or site layout plans submitted as part of any subsequent planning application.

You are also advised that some public sewers and lateral drains may not be recorded on our maps of public sewers because they were originally privately owned and were transferred into public ownership by nature of the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011. The presence of such assets may affect the proposal. In order to assist you may contact Dwr Cymru Welsh Water on 0800 085 3968 to establish the location and status of the apparatus in and around your site. Please be mindful that under the Water Industry Act 1991 Dwr Cymru Welsh Water has rights of access to its apparatus at all times.

SURFACE WATER DRAINAGE

We note that the enquiry describes surface water disposal via 'DCWW combined sewer network at SJ01815601 as per existing, with attenuation.'

We would advise that the demolition of the existing building would revoke any existing / previous connection of surface water to the combined sewer. Once demolished, the automatic right to connect to the public sewer will be lost and any development proposed will be treated as if it is new development (greenfield). In addition, please note that no surface water, highway or land drainage run-off will be permitted to discharge directly or indirectly into the public sewerage system.

As of 7th January 2019, this proposed development is subject to Schedule 3 of the Flood and Water Management Act 2010. The development therefore requires approval of Sustainable Drainage Systems (SuDS) features, in accordance with the 'Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems'. As highlighted in these standards, the developer is required to explore and fully exhaust all surface water drainage options in accordance with a hierarchy preferring infiltration (PL2) and, where infiltration is not possible, disposal to a surface water body (PL3), in liaison with the Lead Local Flood Authority and/or Natural Resources Wales, or surface water sewer or highway drain (PL4) in liaison with the riparian owner and/or Local Highways Authority.

Please note, DCWW is a statutory consultee to the SAB application process and will provide comments to any SuDS proposals by response to SAB consultation. SAB has recently introduced a new verification form which will include a requirement for thorough assessments including highways surface water sewers.

Please refer to further detailed advice relating to surface water management included in our attached Advice & Guidance note and our Developer Services website at https://developers.dwrcymru.com/en/help-advice/regulation-to-be-aware-of/sustainable-drainage-systems

In progressing towards an accompanying surface water drainage strategy, it is recommended that the developer engage in consultation with Denbighshire County Council, as the determining SuDS Approval Body (SAB), for their proposals for SuDS features. Please be advised that due to capacity constraints with the downstream public sewerage network, under no circumstances would we allow surface water runoff highway run-off from the proposed development to communicate directly or indirectly with the public combined sewerage system. In addition, please note, no amount of land drainage run-off is permitted to discharge directly or indirectly into the public sewerage system.

Furthermore, Planning Policy Wales (PPW) acknowledges that discharge of surface water to foul sewers is prohibited and highlights that any additional surface water from new developments should not be discharged to combined systems because of the risk of pollution when combined systems overflow (Para 6.6.3). Moreover, PPW recognises the challenges faced from rainfall intensity causing surface water flooding and diffuse pollution (Para 6.6.14) along with the importance of well-maintained sewerage networks (Para 6.6.15), particularly as a result of run-off from built surfaces and the sewage discharges from overloaded sewers (Para 6.6.16).

FOUL WATER DRAINAGE – SEWERAGE NETWORK

We note that the enquiry describes foul water disposal via 'DCWW combined sewer network at SJ01815601'.

We have considered the impact of foul flows generated by the proposed development and concluded that flows can be accommodated within the public sewerage system. We advise that the flows should be connected to the existing combined sewer point or at/ downstream of manholes SJ01814602, located to the north west.

Should a planning application be submitted for this development we will seek to control these points of communication via appropriate planning conditions and therefore recommend that any drainage layout or strategy submitted as part of your application takes this into account.
However, should you wish for an alternative connection point to be considered please provide further information to us in the form of an updated drainage strategy, preferably in advance of a planning application being submitted.

You may need to apply to Dwr Cymru Welsh Water for any connection to the public sewer under Section 106 of the Water industry Act 1991. However, if the connection to the public sewer network is either via a lateral drain (i.e. a drain which extends beyond the connecting property boundary) or via a new sewer (i.e. serves more than one property), it is now a mandatory requirement to first enter into a Section 104 Adoption Agreement (Water Industry Act 1991). The design of the sewers and lateral drains must also conform to the Welsh Ministers Standards for Foul Sewers and Lateral Drains, and conform with the publication "Sewers for Adoption"- 7th Edition. Further information can be obtained via the Developer Services pages of www.dwrcymru.com

If the development will give rise to a new discharge (or alter an existing discharge) of trade effluent, directly or indirectly to the public sewerage system, then a Discharge Consent under Section 118 of the Water Industry Act 1991 is required from Dwr Cymru / Welsh Water. Please note that the issuing of a Discharge Consent is independent of the planning process and a consent may be refused although planning permission is granted.

FOUL WATER DRAINAGE – SEWAGE TREATMENT

We have considered the impact of foul flows generated by the proposed development and concluded that flows can be accommodated within the public sewerage system.

POTABLE WATER SUPPLY

Capacity is currently available in the water supply system to accommodate the development. Initial indications are that a connection can be made from the 4" Upvc diameter watermain in 'Grid '301504,381596' location. We reserve the right however to reassess our position as part of the formal application for the provision of new water mains under Section 41 and Section 51 of the Water Industry Act (1991) to ensure there is sufficient capacity available to serve the development without causing detriment to existing customers' supply as demands upon our water systems change continually.

Finally, we highlight that a right to communicate with the public sewerage network is lost upon demolition of the building.

FURTHER CONTACT

If you have any questions about the above response, please contact Shân Wyn Jones who is the Development Planning Officer for the area at developer.services@dwrcymru.com or on 0800 917 2652.They will be happy to assist further.

I trust the above information is helpful and will assist you in forming water and drainage strategies that should accompany any future planning application. I also attach copies of our water and sewer extract plans for the area, and a copy of our Planning Guidance Note which provides further information on our approach to the planning process, making connections to our systems and ensuring any existing public assets or infrastructure located within new development sites are protected.

Please note that our response is based on the information provided in your enquiry and should the information change we reserve the right to make a new representation. Should you have any queries or wish to discuss any aspect of our response please do not hesitate to contact our dedicated team of planning officers, either on 0800 917 2652 or via email at **developer.services@dwrcymru.com**

Please quote our reference number in all communications and correspondence.

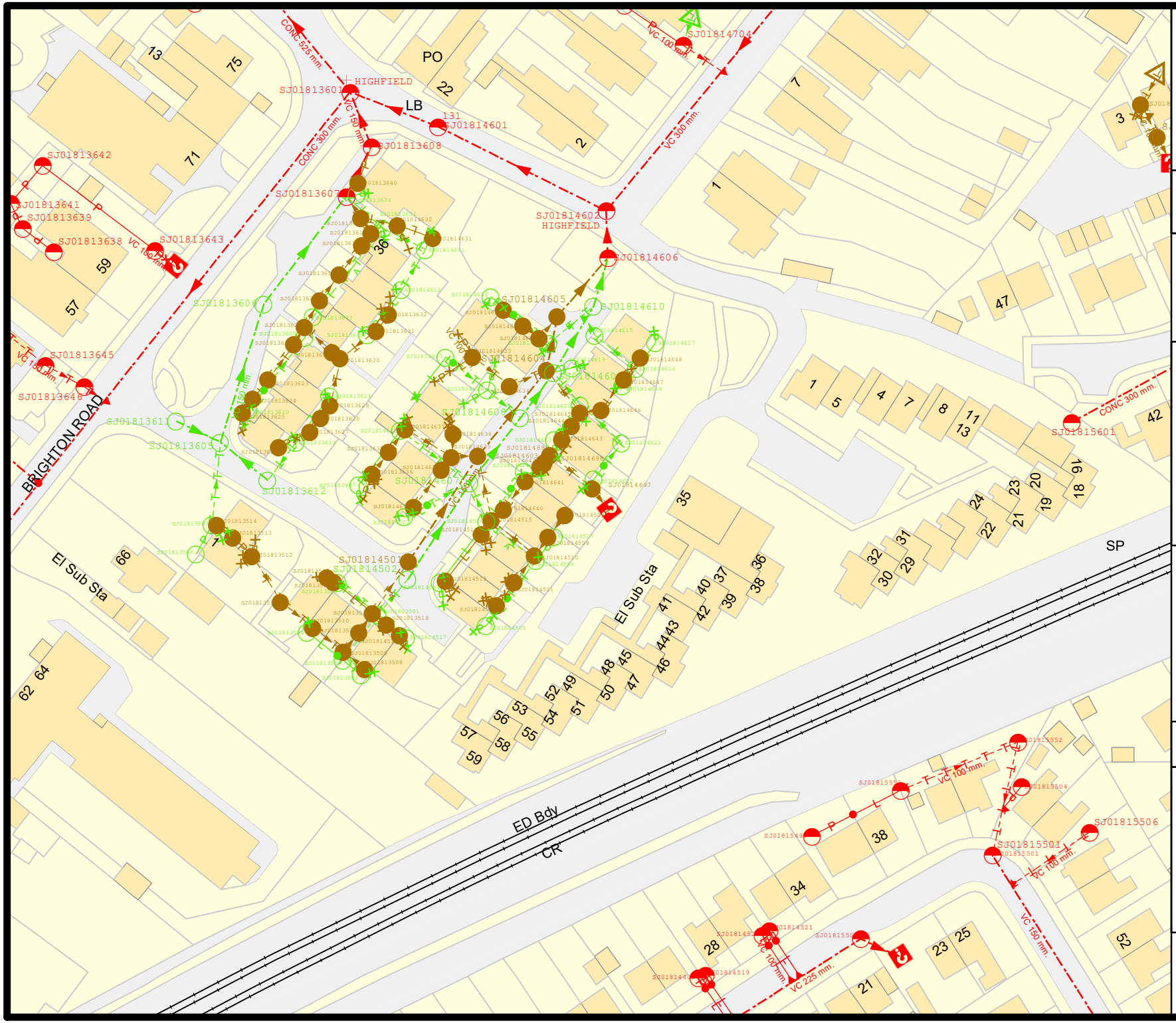
Yours faithfully,

Matthew Lord
Planning Liaison Manager
Developer Services

***Please Note** that demands upon the water and sewerage systems change continually; consequently the information given above should be regarded as reliable for a maximum period of 12 months from the date of this letter.*

APPENDIX B –

PPA0009857 Sewer Plan



Dŵr Cymru
Welsh Water

PPA0009857 Public Sewer Record

N
W E
S

LEGEND(Representative of most common features)

Waste network:

- Foul chamber
- Surface water chamber
- Combined chamber
- Combined sewer overflow
- Special purpose chamber
- Treatment works
- Pumping station
- Outfall
- Lamphole
- Storm Overflow
- Rising main
- Gravity sewer
- Private sewer
- Private sewer subject to Sect. 104 adoption agreement
- Private Sewer Transfer
- Lateral Drain
- Inspection Chamber

NB: Sewer symbol colour indicates the type.
RED - Combined
GREEN - Surface Water
BROWN - Foul
Purple - Former S24 sewers (for indicative purposes only)

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF) . It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

Dŵr Cymru Cyfyngedig ('the Company') gives this information as to the position of its underground apparatus by way of general guidance only and on the strict understanding that it is based on the best information available and no warranty as to its correctness is relied upon in the event of excavations or other works made in the vicinity of the company's apparatus. The onus of locating apparatus before carrying out any excavations rests entirely on you. The information which is supplied by the Company, is done so in accordance with statutory requirements of sections 198 and 199 of the Water Industry Act 1991 which is based upon the best information available and, in particular, but without prejudice to the generality of the foregoing, it should be noted that the records that are available to the Company may not disclose the existence of a water main, service pipe, sewer, lateral drain or disposal main and any associated apparatus laid before 1 September 1989, or, if they do, the particulars thereof including their position underground may not be accurate. It must be understood that the furnishing of this information is entirely without prejudice to the provision of the New Roads and Street Works Act 1991 and the Company's right to be compensated for any damage to its apparatus.

Service pipes are not generally shown but their presence should be anticipated.

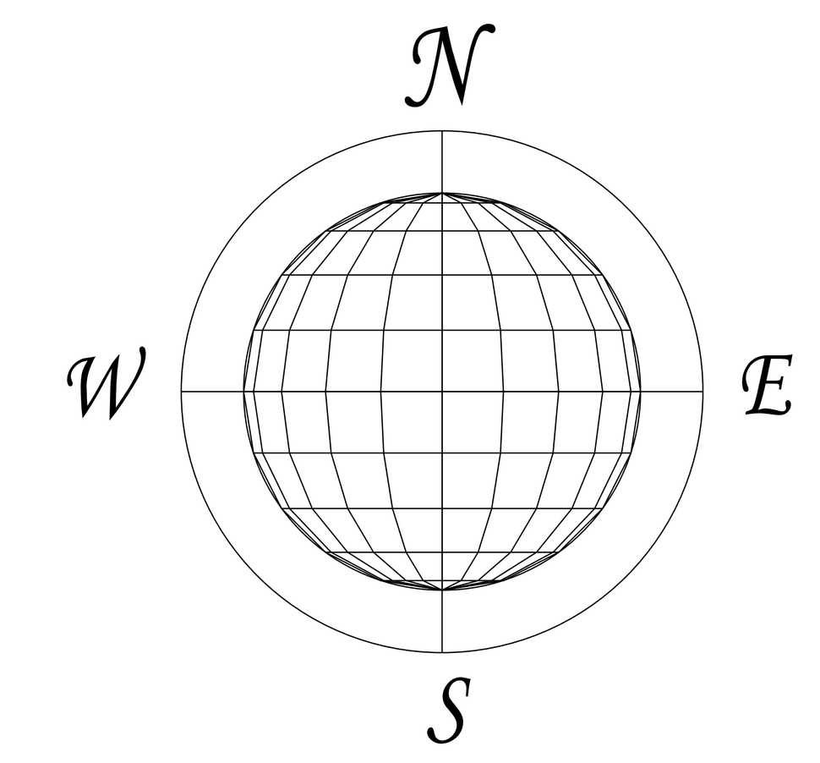
EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

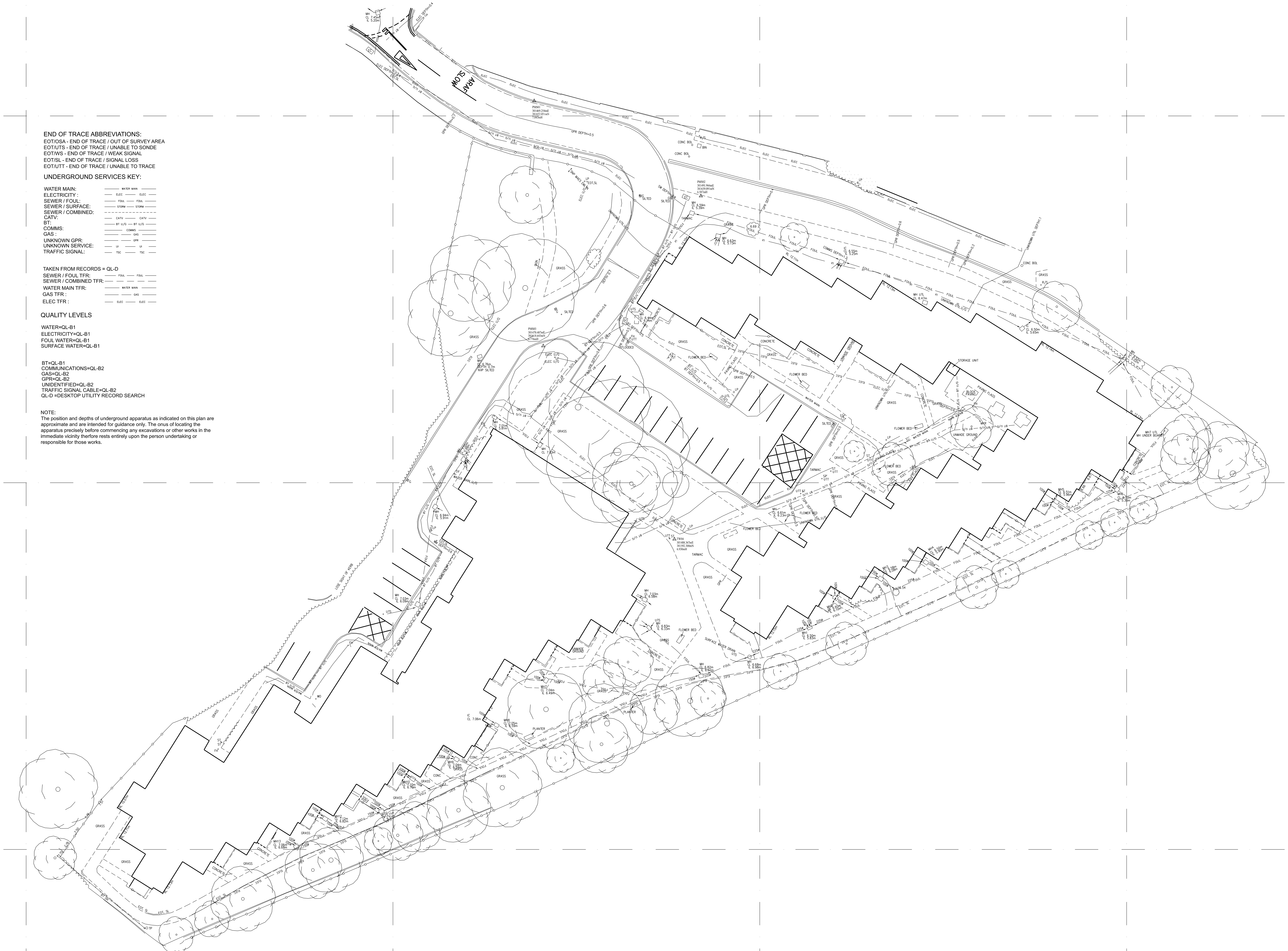
Map Ref:	301442,381600
Map scale:	1:1079
Printed by:	Jeremy Hackman
Printed on:	08 Jan 2026

APPENDIX C –

Drainage Investigation

Site Grid North





END OF TRACE ABBREVIATIONS:

EOT/OSA - END OF TRACE / OUT OF SURVEY AREA
EOT/UTS - END OF TRACE / UNABLE TO SONDE
EOT/WS - END OF TRACE / WEAK SIGNAL
EOT/SL - END OF TRACE / SIGNAL LOSS
EOT/UTT - END OF TRACE / UNABLE TO TRACE

UNDERGROUND SERVICES KEY:

WATER MAIN:	WATER MAIN
ELECTRICITY :	ELEC ELEC
SEWER / FOUL:	FOUL FOUL
SEWER / SURFACE:	STORM STORM
SEWER / COMBINED:	- - - - - -
CATV:	CATV CATV
BT:	BT U/G BT U/G
COMMS:	COMMS
GAS :	GAS
UNKNOWN GPR:	GPR
UNKNOWN SERVICE:	UI UI
TRAFFIC SIGNAL:	TSC TSC

TAKEN FROM RECORDS = QL-D

SEWER / FOUL TFR:	FOUL FOUL
SEWER / COMBINED TFR:	— — — — —
WATER MAIN TFR:	WATER MAIN
GAS TFR :	GAS
ELEC TFR :	ELEC ELEC

QUALITY LEVELS

WATER=QL-B1
ELECTRICITY=QL-B1
FOUL WATER=QL-B1
SURFACE WATER=QL-B1

BT=QL-B1
COMMUNICATIONS=QL-B2
GAS=QL-B2
GPR=QL-B2
UNIDENTIFIED=QL-B2
TRAFFIC SIGNAL CABLE=QL-B2
QL-D =DESKTOP UTILITY RECORD SEARCH

NOTE:
The position and depths of underground apparatus as indicated on this plan are approximate and are intended for guidance only. The onus of locating the apparatus precisely before commencing any excavations or other works in the immediate vicinity therfore rests entirely upon the person undertaking or responsible for those works.

Symbols/Abbreviations (Where Applicable):

AV:	AIR VALVE
BB:	BELISHA BEACON
BH:	BOREHOLE
BM:	BENCHMARK
BOL:	BOLLARD
B/S:	BUS STOP
CAM:	CAMERA
CS:	CABLE STAY
CATV:	C.A.T.V INSPECTION CHAMBER
CBOX:	ELECTRICITY BOX, CABLE BOX, ETC.
CCTV:	C.C.T.V CAMERA
C.PIT:	CATCH PIT
EC:	ELECTRICITY COVER
EP:	ELECTRICITY POLE
ER:	EARTH ROD
FH:	FIRE HYDRANT
FP:	FLAG POLE
G:	GULLY
G:	GULLY (ROUND)
GV:	GAS VALVE
IC:	INSPECTION COVER (SQUARE)
IC:	INSPECTION COVER (ROUND)
IL:	INVERT LEVEL
KO:	KERB OUTLET
LB:	LETTER BOX
LC:	LIGHTING COLUMN
LP:	LAMP POST
LP/BS:	LAMP POST/BUS STOP
MH:	MANHOLE (SQUARE)
MH:	MANHOLE (ROUND)
MKR:	MARKER
P:	POST
RE:	RODDING EYE
R/S:	ROAD SIGN
S/P:	SIGN POST
SNP:	STREET NAME PLATE
ST:	STOP TAP
SV:	STOP VALVE
TCB:	TELEPHONE CALL BOX
TL:	TRAFFIC LIGHT
TP:	TELEGRAPH POLE
TP/EP:	TELEGRAPH POLE/ELECTRIC POLE
T/IC:	TELECOM INSPECTION COVER
WO:	WATER OUTLET
WM:	WATER METER
	GATE
	DEFINED POINT
	CONTROL POINT
	TREE (CONIFEROUS)
	TREE (DECIDUOUS)
	FOLIAGE
	HEDGE
DPC 99.99m	DAMP PROOF COURSE LEVEL
EL 99.99m	EAVES LEVEL
FL 99.99m	FLOOR LEVEL
RL 99.99m	RIDGE LEVEL
SL 99.99m	SOFFIT LEVEL
TL 99.99m	THRESHOLD LEVEL

FENCE DESCRIPTIONS:

B/W:	BARBED WIRE FENCE
C/B:	CLOSE BOARDED FENCE
C/L:	CHAIN LINK FENCE
C/P:	CHESTNUT PALING FENCE
CONC/P:	CONCRETE PANEL FENCE
I/R:	IRON RAILING FENCE
P/R:	POST AND RAIL FENCE
P/W:	POST AND WIRE FENCE
P/C:	POST AND CHAIN FENCE
S/PAL:	STEEL PALISADE FENCE
S/B:	SAFETY BARRIER
T/PAL:	TIMBER PALISADE FENCE

Revision Information

Rev	Date	Description

INFORMATION

1) Ordnance Survey co-ordinates and level are derived from OSTN15 and OSGM15, transformed from WGS84.

2) Only services located during the site survey are shown on this plan. Further investigation may be required to ascertain the full extent of the site services.

NOTES

PM SURVEYS UK

PM Surveys UK Ltd
Unit 3, Queensferry Industrial Estate
Pentre
Flintshire, CH5 2DJ
Tel: 01244 952477
Email: info@pmsurveys.co.uk

Client Info

Denbighshire CC
Caledfryn
Smithfield Road
Denbigh

Tel
Email melvyn.edwards@denbighshire.gov.uk

Project

Maes Emlyn
Rhyl
GPR Survey

Project No PMS22185	Sheet A0 / Scale 1:200	Surveyed By DJ TW HBB / Drawn By JW / Approved By PM
Dwg PMS22185-02		Issued 30/08/22

N

Legend/Notes:

- Combined Sewer
- Foul Sewer
- SW Sewer
- Assumed Sewer (Not Proven)
- Rising Main
- Highway Drainage
- Culvert Sewer
- Open Water Course
- Overflow Line
- Treated Line
- RWD Rain Water Down Pipe
- FDP Foul Down Pipe
- CDP Combined Down Pipe
- GDP Grey Water Down Pipe

INVEK SURVEYS LTD.
Warrington Business Park, Long Lane, Warrington, Cheshire, WA2 8TX
Tel: 01925 244376 Fax: 01925 241517
Email: kevin@invek.com – www.invek.com

Client
Waterco

Drawing Title
Maes Emlyn, Rhyl
Drainage Layout

Scale(s)	N.T.S	Drawn	PW
Date	12.06.23	Checked	RD
Job Number	2109	Approved	KN

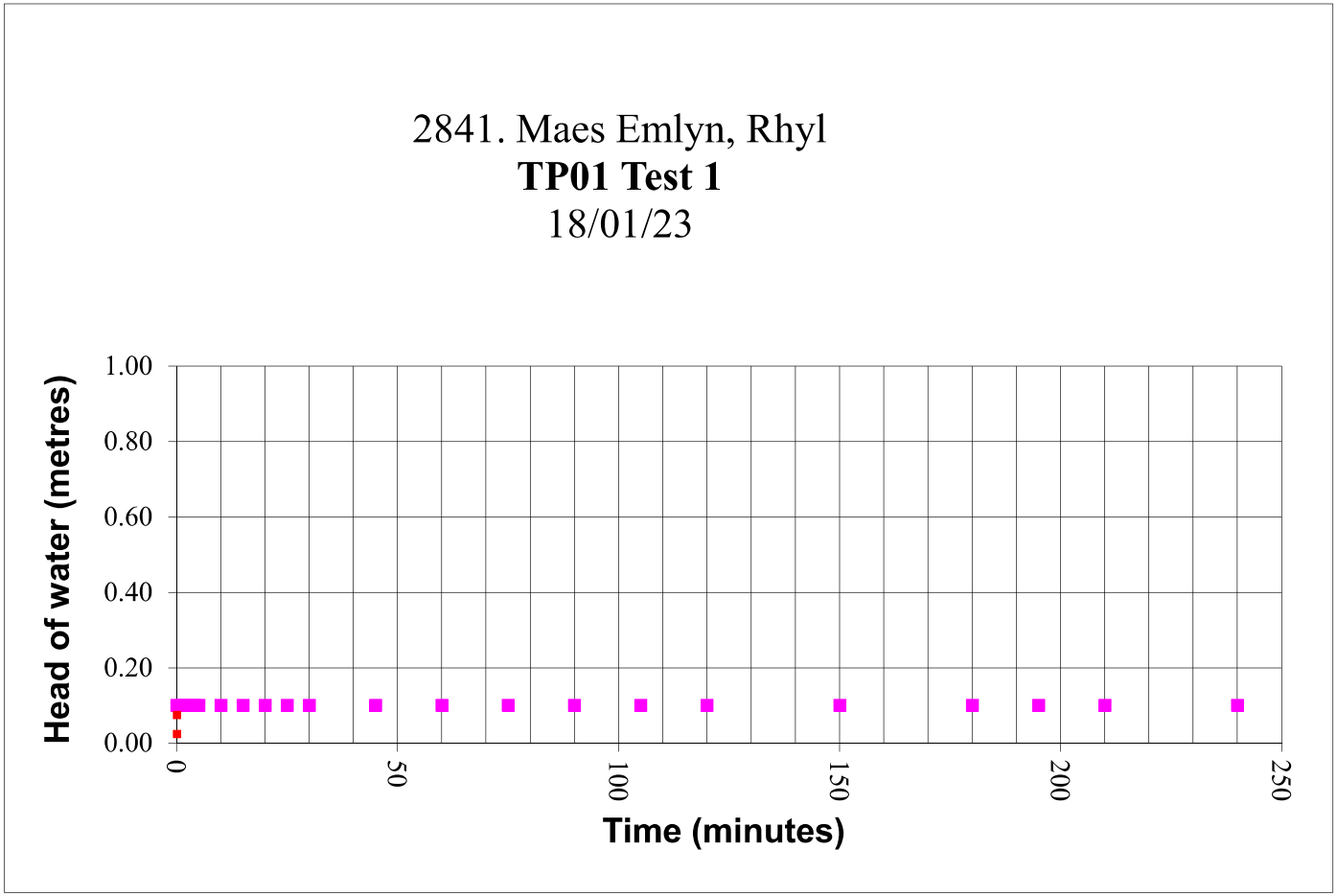
Sheet Size, Drawing Number & Revision
A1_2109/01_Rev_00

APPENDIX D –

Soakaway Testing (by Groundsolve 2023)

GroundSolve Ltd
Consulting Geotechnical Engineers

Time (Mins)	Depth of Water	Head of Water
0	0.90	0.10
1	0.90	0.10
2	0.90	0.10
3	0.90	0.10
4	0.90	0.10
5	0.90	0.10
10	0.90	0.10
15	0.90	0.10
20	0.90	0.10
25	0.90	0.10
30	0.90	0.10
45	0.90	0.10
60	0.90	0.10
75	0.90	0.10
90	0.90	0.10
105	0.90	0.10
120	0.90	0.10
150	0.90	0.10
180	0.90	0.10
195	0.90	0.10
210	0.90	0.10
240	0.90	0.10



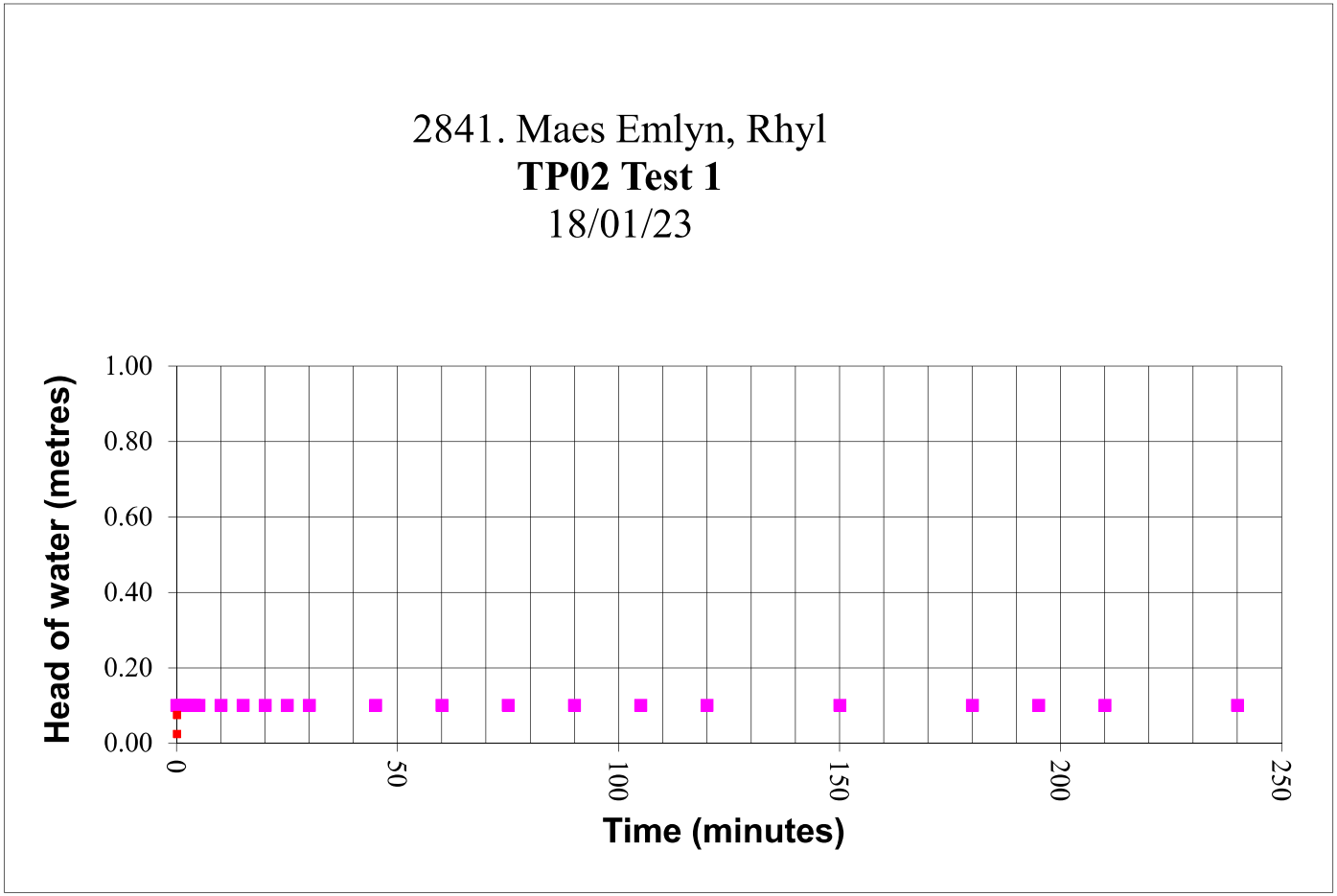
Depth	Length	Width	Head at 75% Vol	Head at 25% Vol	Water depth(t=0)	Effective Area	Vp75-Vp25	Adjustment Factor *	t75	t25	Infiltration
(m)	(m)	(m)	(m)	(m)	(m)	Ap50 m2	Volume of water m3		(mins)	(mins)	rate m/s
1.00	1.70	0.70	0.075	0.03	0.10	1.430	0.060	1.00		0	N/A

* with gravel filter adjustment factor = 0.30, with no filter = 1.0

Note: The test failed to reach the 25% & 75% head

GroundSolve Ltd
Consulting Geotechnical Engineers

Time (Mins)	Depth of Water	Head of Water
0	0.90	0.10
1	0.90	0.10
2	0.90	0.10
3	0.90	0.10
4	0.90	0.10
5	0.90	0.10
10	0.90	0.10
15	0.90	0.10
20	0.90	0.10
25	0.90	0.10
30	0.90	0.10
45	0.90	0.10
60	0.90	0.10
75	0.90	0.10
90	0.90	0.10
105	0.90	0.10
120	0.90	0.10
150	0.90	0.10
180	0.90	0.10
195	0.90	0.10
210	0.90	0.10
240	0.90	0.10



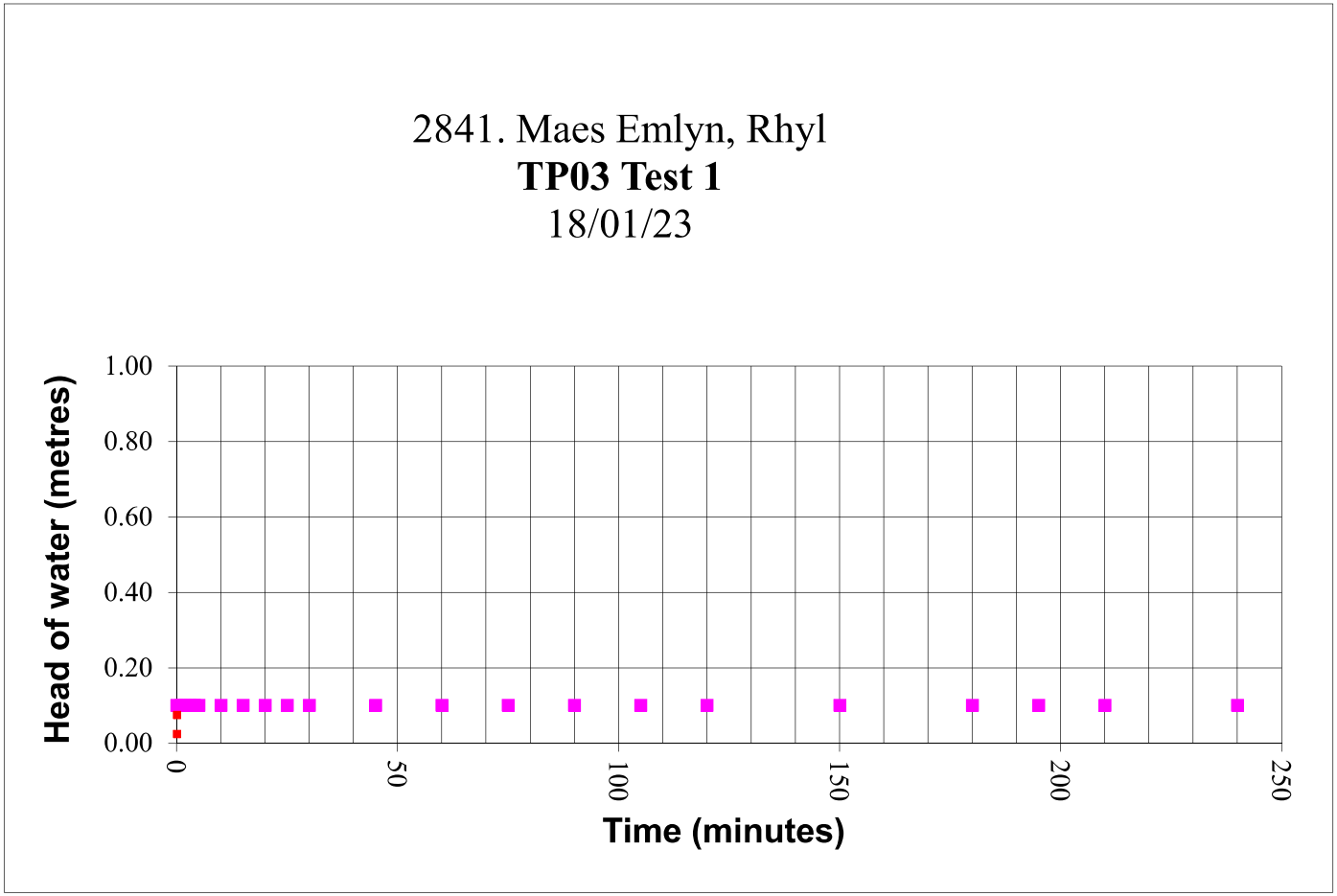
Depth	Length	Width	Head at 75% Vol	Head at 25% Vol	Water depth(t=0)	Effective Area	Vp75-Vp25	Adjustment Factor *	t75	t25	Infiltration
(m)	(m)	(m)	(m)	(m)	(m)	Ap50 m2	Volume of water m3		(mins)	(mins)	rate m/s
1.00	1.65	0.70	0.075	0.03	0.10	1.390	0.058	1.00			N/A

* with gravel filter adjustment factor = 0.30, with no filter = 1.0

Note: The test failed to reach the 25% & 75% head

GroundSolve Ltd
Consulting Geotechnical Engineers

Time (Mins)	Depth of Water	Head of Water
0	0.90	0.10
1	0.90	0.10
2	0.90	0.10
3	0.90	0.10
4	0.90	0.10
5	0.90	0.10
10	0.90	0.10
15	0.90	0.10
20	0.90	0.10
25	0.90	0.10
30	0.90	0.10
45	0.90	0.10
60	0.90	0.10
75	0.90	0.10
90	0.90	0.10
105	0.90	0.10
120	0.90	0.10
150	0.90	0.10
180	0.90	0.10
195	0.90	0.10
210	0.90	0.10
240	0.90	0.10



Depth	Length	Width	Head at 75% Vol	Head at 25% Vol	Water depth(t=0)	Effective Area	Vp75-Vp25	Adjustment Factor *	t75	t25	Infiltration
(m)	(m)	(m)	(m)	(m)	(m)	Ap50 m2	Volume of water m3		(mins)	(mins)	rate m/s
1.00	1.60	0.70	0.075	0.03	0.10	1.350	0.056	1.00			N/A

* with gravel filter adjustment factor = 0.30, with no filter = 1.0

Note: The test failed to reach the 25% & 75% head

APPENDIX E –

Brownfield Runoff Assessment and ReFH2 Greenfield Runoff Rates

Existing Brownfield Runoff Rates

Storm Event (Year)	Rainfall Intensity (mm)	Runoff Rate (l/s)
1	18.67	17.79
30	55.26	52.66
100	73.78	70.31

ReFH2 RUNOFF RATES*	
Return Period (Years)	**As-rural Peak Flow (l/s)**
1	0.58
2	0.67
5	1.00
10	1.27
30	1.84
50	2.19
75	2.51
100	2.76
200	3.43
1000	5.21

*Runoff Rates printed from the ReFH Flood Modelling software package

APPENDIX F –

Email correspondence with DCWW in 2023

2023 DCWW Communications

From: Jake MacMillan
Sent: 24 August 2023 10:49
To: Adam McCulloch
Subject: RE: PPA0007341

Hi Adam,

Apologies for the delayed response and thank you for your patience. In this instance I appreciate that investigations have taken place albeit the historic surveys lack the detail we would expect. We would therefore be amenable to an attenuated rate here, however we generally look to achieve a lower rate of 5 l/s, I would therefore request that you endeavour to achieve an attenuated rate in line with these flows.

Best regards,

Jake MacMillan
Development Planning Officer | Developer Services
Dŵr Cymru Welsh Water

From: Adam McCulloch
Sent: Thursday, June 15, 2023 9:28 AM
To: Jake MacMillan
Subject: RE: PPA0007341

Good morning Jake,

Please see attached a Drainage Layout from Invek surveys regarding the proposed development at Maes Emlyn, Rhyl. The survey shows that all surface water currently drains to the existing DCWW public combined sewer in the site's north-eastern extent.

Please can you advise if a surface water connection to the public combined sewer is acceptable.

Kind Regards,

Adam McCulloch
Environmental Consultant
Waterco
Assessment, Modelling, Design
Main Office: 01824 702220

From: Jake MacMillan
Sent: Tuesday, April 25, 2023 2:53 PM
To: Adam McCulloch
Subject: RE: PPA0007341

Hi Adam,

Thank you for the below email, can you confirm what investigations have been done to confirm that there is an existing connection to the public combined sewer?

Best regards,

Jake MacMillan
Development Planning Officer | Developer Services
Dŵr Cymru Welsh Water

From: Adam McCulloch
Sent: 24 April 2023 09:44
To: Jake MacMillan
Subject: RE: PPA0007341

******** External Mail ********
Hi Jake,

Further to your below email relating to PPA0007341, we have obtained a ground investigation report (see attached) from GroundSolve undertaken in January 2023.

The intrusive ground investigation shows that groundwater was encountered within all of the exploratory hole locations within either the Made Ground or wind-blown sand, at depths between 0.60 metres below ground level (m.bgl) and 1.00m.bgl. Infiltration tests were undertaken as part of the intrusive ground investigation and show that all of the trial pits failed the first cycle, as the water failed to percolate through the underlying superficial deposits.

As infiltration is not suitable, a connection to a watercourse is the next consideration. The nearest watercourse is The Cut which is located approximately 260m east of the site. The site is separated from The Cut by third party, urbanised land including a railways line. A connection to a watercourse is therefore not a feasible option.

There are no surface water sewers in the vicinity of the site (which do not connect into the public combined sewer system). As a result of these findings, we propose to connect to the public combined sewer located within the site's eastern extent per the existing scenario. I attach a GPR survey which demonstrates the existing connection. The 'foul drain' identified on the GPR accommodates rainfall runoff from the roof and is a combined drain.

We propose a surface water discharge rate of 13.7 l/s which provides 30% betterment on the existing 1 in 1 year brownfield runoff rate. Lower discharge rates have been considered however increase the amount and depth of attenuation storage required, which in turn limits the feasibility of a gravity connection.

Please can you advise if a surface water connection to the public combined sewer at 13.7 l/s is acceptable. Please don't hesitate to contact me if you have any questions.

Kind Regards,

Adam McCulloch
Environmental Consultant

Waterco
Assessment, Modelling, Design
Main Office: 01824 702220

From: Adam McCulloch
Sent: 15 November 2022 10:18
To: Jake MacMillan
Subject: RE: PPA0007341

******** External Mail ********
Good morning Jake,

Further to your previous email, please see attached an existing site layout plan. The existing layout comprises 59 no. dwellings in the form of houses and apartments. All existing properties are to be demolished.

The development is currently connected to the public sewer system.

If you require any further information, please don't hesitate to contact me.

Kind Regards,

Adam McCulloch
Environmental Consultant

Waterco
Assessment, Modelling, Design
Main Office: 01824 702220

From: Jake MacMillan
Sent: 14 November 2022 12:11
To: Adam McCulloch
Subject: RE: PPA0007341

Hi Adam,

Thank you for submitting the above pre planning application. It appears that this site comprises a redevelopment, can you advise on the existing housing structure that will be demolished? Can you also advise if this is connected to the public sewerage network?

Best regards,

Jake MacMillan
Development Control Officer | Developer Services
Dŵr Cymru Welsh Water

From: formsubmission@dwrcymru.com <formsubmission@dwrcymru.com>
Sent: 09 November 2022 16:35
To: Services Developer <developer.services@dwrcymru.com>
Cc: DSRevenue <DSRevenue@dwrcymru.com>
Subject: PPA0007341

APPENDIX G –

Former SAB Response to informal pre-application

Former SAB communications 2023

From: Daniel Jones
Sent: 10 January 2023 14:33
To: Adam McCulloch
Cc: Land Drainage Consultations
Subject: RE: 14973-SAB Pre-Application-Maes Emlyn

Good Afternoon Adam,

Thank you for the information below regarding proposals at Maes Emlyn, Rhyl.

We would have no objections in principle to your intention of discharging the surface water from the site into the public combined sewer, providing the following conditions are met:

1. Evidence that the hierarchy has been followed and that you have explored and exhausted alternative surface water drainage options.
2. Confirmation from Welsh Water that they are happy to accepts flows from the site.

Kind regards,

Daniel Jones BSc (Hons)
Swyddog Perygl Llifogydd / Flood Risk Officer
Cyngor Sir Ddinbych / Denbighshire County Council
Priffyrdd a Gwasanaethau Amgylcheddol / Highways & Environmental Services

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From: Adam McCulloch
Sent: 23 December 2022 13:16
To: Land Drainage Consultations <landdrainage.consultations@denbighshire.gov.uk>
Subject: RE: 14973-SAB Pre-Application-Maes Emlyn

Proposed residential development at Maes Emlyn, Rhyl, Denbighshire, LL18 4AB. Grid Reference: 301448, 381587.

Dear Sir/Madam,

We are currently undertaking a Drainage Strategy at the above address. The proposed development is for the demolition of 59No. existing residential dwellings and erection of 38No. residential dwellings with associated access roads and parking. Please find attached the completed SuDS pre-application form and supporting documentation.

If you require any further information to process my request, please do not hesitate to contact me.

Kind Regards,

Adam McCulloch
Environmental Consultant
Waterco DATRYS
Main Office: 01824 702220

APPENDIX H –

Email correspondence with DCWW in 2026

2026 DCWW Communication

From: Adam Caldwell
Sent: 26 January 2026 22:13
To: Shan Wyn Jones
Cc: Matthew Lord; Logan Gibbs
Subject: RE: PPA0009857. Notification - 14973 Maes Emlyn, Rhyl
Attachments: PPA0009857.doc; PPA0009857 Public Sewer Record.pdf; PPA0009857 Water Main Plan.pdf

Hi Shan,
Further to the PPA response, I write to understand this foul situation further.

Watermain: The existing watermain will be removed as part of the proposed redevelopment.

Foul Water: Confirms can accommodate the expected flows but suggests connection to an affsite chamber. We had already proposed an alternate foul connection (onsite) which the response acknowledges but then goes on to say point of connection should be at/ downstream of manhole SJ01814602, located to the north west. Can you advise as to why we cant make use of the existing demarcation chamber already on site that has been proven to serve all the existing apartments on site? Im going to need a reason to advise the Client given the additional cost that will arise in having to seek a connection offsite, that is also going to mean a s104 agreement would be required.

Surface Water: We shall investigate the highway drainage and if confirmed to connect with the combined sewer then we will be in touch to discuss further (once we've run it by SAB and they confirm are in agreement with the disposal destination).

Adam Caldwell MEng (Hons)
Senior Civil Engineer

Waterco DATRYS
Main Office: 01824 702220

-----Original Message-----
From: donotreply@dwrcymru.com <donotreply@dwrcymru.com>
Sent: 08 January 2026 15:18
To: Ivan Ramadhan
Cc: BPMCopies@dwrcymru.com
Subject: Re.PPA0009857. Notification
Dear Customer,

Please find attached important information relating to your application.

Should you wish to contact us for any reason, you must use the contact information shown on the attachment(s).

Please do not reply directly to this message.

Best regards,

Developer Services
Dwr Cymru Welsh Water

APPENDIX I –

Preliminary Hydraulic Modelling Output

Design Settings

Rainfall Methodology	FEH-22	Maximum Time of Concentration (mins)	30.00	Preferred Cover Depth (m)	1.200
Return Period (years)	10	Maximum Rainfall (mm/hr)	50.0	Include Intermediate Ground	✓
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00	Enforce best practice design rules	✓
CV	0.750	Connection Type	Level Soffits		
Time of Entry (mins)	5.00	Minimum Backdrop Height (m)	1.000		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
PS18		5.00	7.157	180	301460.593	381576.829	1.185	5.972
PS19			7.210	180	301456.689	381575.254	1.280	5.930
Attenuation Tank 1		5.00	7.300	1350	301446.024	381576.038	1.570	5.730
Carpark 1		5.00	6.715		301536.766	381623.571	0.565	6.150
S1	0.244	5.00	6.930	1350	301454.003	381581.230	1.248	5.682
S2	0.099	5.00	6.582	1350	301489.186	381596.908	1.093	5.489
PS7		5.00	6.650	180	301507.719	381622.030	0.467	6.183
PS8a			6.650	180	301500.845	381625.073	0.624	6.026
PS9b			6.700	180	301491.540	381629.181	0.791	5.909
PS10			7.060	180	301490.476	381631.252	1.289	5.771
S12		5.00	6.812	1350	301476.694	381633.563	0.700	6.112
S8	0.082	5.00	6.687	1350	301484.331	381626.854	1.067	5.620
S3	0.040	5.00	6.921	1350	301495.147	381610.593	1.510	5.411
S4	0.066	5.00	6.551	1350	301517.203	381614.584	1.253	5.298
Attenuation Tank 2			6.715	1350	301536.440	381618.137	1.517	5.198
S11	0.038	5.00	6.700	1350	301537.181	381617.075	1.522	5.178
S5			6.528	1350	301549.537	381616.776	1.433	5.095
S13	0.064	5.00	6.688	1200	301509.201	381612.042	1.348	5.340
S14	0.046	5.00	6.650	1500	301544.466	381620.071	1.519	5.131
PS9a	0.041	5.00	6.650	180	301492.031	381627.336	0.722	5.928
PS8c			6.650	180	301496.404	381621.324	0.701	5.949
PS8b			6.650	180	301497.611	381620.922	0.677	5.973
Carpark 2		5.00	7.000		301510.441	381604.300	1.300	5.700

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
Attenuation Tank 3		5.00	7.100		301444.429	381584.500	1.367	5.733

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	PS18	PS19	4.210	0.600	5.972	5.930	0.042	100.2	100	5.09	50.0
1.001	PS19	S1	6.552	0.600	5.930	5.861	0.069	95.0	100	5.23	50.0
2.000	Attenuation Tank 1	S1	9.520	0.600	5.730	5.682	0.048	198.3	300	5.14	50.0
5.000_1	Carpark 1	S11	6.509	0.600	6.150	5.178	0.972	6.7	100	5.04	50.0
1.002	S1	S2	38.518	0.600	5.682	5.489	0.193	199.6	300	5.81	50.0
1.003	S2	S3	15.565	0.600	5.489	5.411	0.078	199.6	300	6.04	50.0
4.002	PS7	PS8a	15.684	0.600	6.183	6.026	0.157	99.9	100	5.34	50.0
1.004	S3	S13	14.129	0.600	5.411	5.340	0.071	199.0	300	6.25	50.0
4.004	PS9b	PS10	8.760	0.600	5.909	5.771	0.138	63.5	150	5.15	50.0
4.005	PS10	S8	7.557	0.600	5.771	5.695	0.076	99.4	150	5.27	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	0.768	6.0	0.0	1.085	1.180	0.000	0.0
1.001	0.789	6.2	0.0	1.180	0.969	0.000	0.0
2.000	1.113	78.6	0.0	1.270	0.948	0.000	0.0
5.000_1	3.007	23.6	0.0	0.465	1.422	0.000	0.0
1.002	1.109	78.4	33.0	0.948	0.793	0.244	0.0
1.003	1.109	78.4	46.4	0.793	1.210	0.343	0.0
4.002	0.769	6.0	0.0	0.367	0.524	0.000	0.0
1.004	1.111	78.5	68.6	1.210	1.048	0.506	0.0
4.004	1.264	22.3	5.5	0.641	1.139	0.041	0.0
4.005	1.007	17.8	5.5	1.139	0.842	0.041	0.0

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)
5.000	S12	S8	10.165	0.600	6.112	5.695	0.417	24.4	150	5.08	50.0
4.006	S8	S3	20.070	0.600	5.620	5.486	0.134	149.8	225	5.59	50.0
1.005_1	S13	S4	8.396	0.600	5.340	5.298	0.042	199.9	300	6.38	50.0
1.005	S4	Attenuation Tank 2	17.450	0.600	5.298	5.198	0.100	174.5	300	6.63	50.0
1.006	Attenuation Tank 2	S11	3.140	0.600	5.198	5.178	0.020	157.0	300	6.67	50.0
1.008	S11	S14	7.877	0.600	5.178	5.131	0.047	167.6	225	6.80	50.0
1.009	S14	S5	6.047	0.600	5.131	5.095	0.036	168.0	225	6.90	50.0
6.001	PS8a	PS8b	5.262	0.600	6.026	5.973	0.053	99.3	100	5.45	50.0
6.002	PS8b	PS8c	1.272	0.600	5.974	5.961	0.013	97.8	100	5.48	50.0
3.000	PS9a	PS9b	1.909	0.600	5.928	5.909	0.019	100.5	150	5.03	50.0
5.000_2	Carpark 2	S13	7.841	0.600	5.700	5.340	0.360	21.8	100	5.08	50.0
2.000_1	Attenuation Tank 3	S1	10.117	0.600	5.733	5.682	0.051	198.4	300	5.15	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
5.000	2.048	36.2	0.0	0.550	0.842	0.000	0.0
4.006	1.066	42.4	16.7	0.842	1.210	0.123	0.0
1.005_1	1.108	78.3	77.3	1.048	0.953	0.570	0.0
1.005	1.187	83.9	86.2	0.953	1.217	0.636	0.0
1.006	1.252	88.5	86.2	1.217	1.222	0.636	0.0
1.008	1.007	40.0	91.3	1.297	1.294	0.674	0.0
1.009	1.006	40.0	97.5	1.294	1.208	0.720	0.0
6.001	0.771	6.1	0.0	0.524	0.577	0.000	0.0
6.002	0.777	6.1	0.0	0.576	0.589	0.000	0.0
3.000	1.002	17.7	5.5	0.572	0.641	0.041	0.0
5.000_2	1.661	13.0	0.0	1.200	1.248	0.000	0.0
2.000_1	1.112	78.6	0.0	1.067	0.948	0.000	0.0

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	4.210	100.2	100	Circular	7.157	5.972	1.085	7.210	5.930	1.180
1.001	6.552	95.0	100	Circular	7.210	5.930	1.180	6.930	5.861	0.969
2.000	9.520	198.3	300	Circular	7.300	5.730	1.270	6.930	5.682	0.948
5.000_1	6.509	6.7	100	Circular	6.715	6.150	0.465	6.700	5.178	1.422
1.002	38.518	199.6	300	Circular	6.930	5.682	0.948	6.582	5.489	0.793
1.003	15.565	199.6	300	Circular	6.582	5.489	0.793	6.921	5.411	1.210
4.002	15.684	99.9	100	Circular	6.650	6.183	0.367	6.650	6.026	0.524
1.004	14.129	199.0	300	Circular	6.921	5.411	1.210	6.688	5.340	1.048
4.004	8.760	63.5	150	Circular	6.700	5.909	0.641	7.060	5.771	1.139
4.005	7.557	99.4	150	Circular	7.060	5.771	1.139	6.687	5.695	0.842
5.000	10.165	24.4	150	Circular	6.812	6.112	0.550	6.687	5.695	0.842
4.006	20.070	149.8	225	Circular	6.687	5.620	0.842	6.921	5.486	1.210
1.005_1	8.396	199.9	300	Circular	6.688	5.340	1.048	6.551	5.298	0.953
1.005	17.450	174.5	300	Circular	6.551	5.298	0.953	6.715	5.198	1.217

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	PS18	180	Manhole	Adoptable	PS19	180	Manhole	Adoptable
1.001	PS19	180	Manhole	Adoptable	S1	1350	Manhole	Adoptable
2.000	Attenuation Tank 1	1350	Manhole	Adoptable	S1	1350	Manhole	Adoptable
5.000_1	Carpark 1		Junction		S11	1350	Manhole	Adoptable
1.002	S1	1350	Manhole	Adoptable	S2	1350	Manhole	Adoptable
1.003	S2	1350	Manhole	Adoptable	S3	1350	Manhole	Adoptable
4.002	PS7	180	Manhole	Adoptable	PS8a	180	Manhole	Adoptable
1.004	S3	1350	Manhole	Adoptable	S13	1200	Manhole	Adoptable
4.004	PS9b	180	Manhole	Adoptable	PS10	180	Manhole	Adoptable
4.005	PS10	180	Manhole	Adoptable	S8	1350	Manhole	Adoptable
5.000	S12	1350	Manhole	Adoptable	S8	1350	Manhole	Adoptable
4.006	S8	1350	Manhole	Adoptable	S3	1350	Manhole	Adoptable
1.005_1	S13	1200	Manhole	Adoptable	S4	1350	Manhole	Adoptable
1.005	S4	1350	Manhole	Adoptable	Attenuation Tank 2	1350	Manhole	Adoptable

Pipeline Schedule

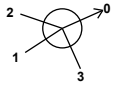
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.006	3.140	157.0	300	Circular	6.715	5.198	1.217	6.700	5.178	1.222
1.008	7.877	167.6	225	Circular	6.700	5.178	1.297	6.650	5.131	1.294
1.009	6.047	168.0	225	Circular	6.650	5.131	1.294	6.528	5.095	1.208
6.001	5.262	99.3	100	Circular	6.650	6.026	0.524	6.650	5.973	0.577
6.002	1.272	97.8	100	Circular	6.650	5.974	0.576	6.650	5.961	0.589
3.000	1.909	100.5	150	Circular	6.650	5.928	0.572	6.700	5.909	0.641
5.000_2	7.841	21.8	100	Circular	7.000	5.700	1.200	6.688	5.340	1.248
2.000_1	10.117	198.4	300	Circular	7.100	5.733	1.067	6.930	5.682	0.948

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.006	Attenuation Tank 2	1350	Manhole	Adoptable	S11	1350	Manhole	Adoptable
1.008	S11	1350	Manhole	Adoptable	S14	1500	Manhole	Adoptable
1.009	S14	1500	Manhole	Adoptable	S5	1350	Manhole	Adoptable
6.001	PS8a	180	Manhole	Adoptable	PS8b	180	Manhole	Adoptable
6.002	PS8b	180	Manhole	Adoptable	PS8c	180	Manhole	Adoptable
3.000	PS9a	180	Manhole	Adoptable	PS9b	180	Manhole	Adoptable
5.000_2	Carpark 2		Junction		S13	1200	Manhole	Adoptable
2.000_1	Attenuation Tank 3		Junction		S1	1350	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
PS18	301460.593	381576.829	7.157	1.185	180	 0	1.000	5.972	100
PS19	301456.689	381575.254	7.210	1.280	180	 1	1.000	5.930	100
						0	1.001	5.930	100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Attenuation Tank 1	301446.024	381576.038	7.300	1.570	1350				
						0	2.000	5.730	300
Carpark 1	301536.766	381623.571	6.715	0.565					
						0	5.000_1	6.150	100
S1	301454.003	381581.230	6.930	1.248	1350		1	2.000	5.682	300
							2	2.000_1	5.682	300
							3	1.001	5.861	100
							0	1.002	5.682	300
S2	301489.186	381596.908	6.582	1.093	1350		1	1.002	5.489	300
						0	1.003	5.489	300
PS7	301507.719	381622.030	6.650	0.467	180				
						0	4.002	6.183	100
PS8a	301500.845	381625.073	6.650	0.624	180		1	4.002	6.026	100
						0	6.001	6.026	100
PS9b	301491.540	381629.181	6.700	0.791	180		1	3.000	5.909	150
						0	4.004	5.909	150
PS10	301490.476	381631.252	7.060	1.289	180		1	4.004	5.771	150
						0	4.005	5.771	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S12	301476.694	381633.563	6.812	0.700	1350				
						0	5.000	6.112	150
S8	301484.331	381626.854	6.687	1.067	1350				
						1	5.000	5.695	150
						2	4.005	5.695	150
						0	4.006	5.620	225
S3	301495.147	381610.593	6.921	1.510	1350				
						1	4.006	5.486	225
						2	1.003	5.411	300
						0	1.004	5.411	300
S4	301517.203	381614.584	6.551	1.253	1350				
						1	1.005_1	5.298	300
						0	1.005	5.298	300
Attenuation Tank 2	301536.440	381618.137	6.715	1.517	1350				
						1	1.005	5.198	300
						0	1.006	5.198	300
S11	301537.181	381617.075	6.700	1.522	1350				
						1	5.000_1	5.178	100
						2	1.006	5.178	300
						0	1.008	5.178	225
S5	301549.537	381616.776	6.528	1.433	1350				
						1	1.009	5.095	225
S13	301509.201	381612.042	6.688	1.348	1200				
						1	5.000_2	5.340	100
						2	1.004	5.340	300
						0	1.005_1	5.340	300

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
S14	301544.466	381620.071	6.650	1.519	1500	1	1.008	5.131	225
						0	1.009	5.131	225
PS9a	301492.031	381627.336	6.650	0.722	180	0	3.000	5.928	150
PS8c	301496.404	381621.324	6.650	0.701	180	1	6.002	5.961	100
PS8b	301497.611	381620.922	6.650	0.677	180	1	6.001	5.973	100
						0	6.002	5.974	100
Carpark 2	301510.441	381604.300	7.000	1.300		0	5.000_2	5.700	100
Attenuation Tank 3	301444.429	381584.500	7.100	1.367		0	2.000_1	5.733	300

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Starting Level (m)		30 year (l/s)	0.0
Rainfall Events	Singular	Skip Steady State	x	Check Discharge Rate(s)	✓	100 year (l/s)	0.0
Summer CV	0.750	Drain Down Time (mins)	240	1 year (l/s)	0.0	Check Discharge Volume	✓
Winter CV	0.840	Additional Storage (m³/ha)	0.0	2 year (l/s)	0.0	100 year 360 minute (m³)	

Storm Durations

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

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	10	0	30	0	10	0
2	0	10	0	100	30	10	0
10	0	10	0				

Pre-development Discharge Rate

Site Makeup	Greenfield	Positively Drained Area (ha)	0.710	Q 30 year (l/s)	
Greenfield Method	ReFH2	Betterment (%)	0	Q 100 year (l/s)	
Region	England, Wales, NI	Q 1 year (l/s)			
Include Baseflow	x	Q 2 year (l/s)			

Pre-development Discharge Volume

Site Makeup	Greenfield	Soil Index	5	Return Period (years)	100	Betterment (%)	0
Greenfield Method	FSR/FEH	SPR	0.53	Climate Change (%)	0	PR	
Positively Drained Area (ha)	0.710	CWI		Storm Duration (mins)	360	Runoff Volume (m³)	

Node S14 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	5.131	Product Number	CTL-SHE-0102-5000-1269-5000
Design Depth (m)	1.269	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node Attenuation Tank 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	5.730
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	122.3	0.0	0.610	122.3	0.0	0.611	0.0	0.0

Node Attenuation Tank 2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	5.198
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	107.5	0.0	0.800	107.5	0.0	0.801	0.0	0.0

Node S12 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	6.112
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	105

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	15.5	0.0	0.200	26.1	0.0	0.400	39.5	0.0	0.600	55.3	0.0
0.100	20.2	0.0	0.300	35.5	0.0	0.500	47.1	0.0	0.700	64.0	0.0

Node Carpark 1 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	20.000	Depth (m)	0.200
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	6.200	Length (m)	21.500	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)	195	Slope (1:X)	1000.0		

Node PS9a Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	6.162
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.928	Main Channel Slope (1:X)	300.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.001

Inlets

PS8c

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	3.0	0.0	1.000	29.5	0.0

Node Carpark 2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	10.000	Depth (m)	0.650
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	5.750	Length (m)	16.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	1000.0		

Node Attenuation Tank 3 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	5.776
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	330.0	0.0	0.610	330.0	0.0	0.611	0.0	0.0

Results for 1 year +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	PS18	1	5.972	0.000	0.0	0.0000	0.0000	OK
15 minute summer	PS19	1	5.930	0.000	0.0	0.0000	0.0000	OK
120 minute winter	Attenuation Tank 1	80	5.736	0.006	0.6	0.6898	0.0000	OK
15 minute summer	Carpark 1	1	6.150	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1	10	5.782	0.100	22.9	0.1434	0.0000	OK
360 minute winter	S2	256	5.680	0.191	6.9	0.2729	0.0000	OK
15 minute summer	PS7	1	6.183	0.000	0.0	0.0000	0.0000	OK
15 minute summer	PS8a	1	6.026	0.000	0.0	0.0000	0.0000	OK
15 minute winter	PS9b	11	5.951	0.042	3.7	0.0011	0.0000	OK
15 minute winter	PS10	11	5.820	0.049	3.7	0.0012	0.0000	OK
15 minute summer	S12	1	6.112	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S8	10	5.700	0.080	11.3	0.1142	0.0000	OK
360 minute winter	S3	256	5.680	0.269	10.2	0.3844	0.0000	OK
360 minute winter	S4	256	5.679	0.381	12.2	0.5456	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	PS18	1.000	PS19	0.0	0.000	0.000	0.0000	
15 minute summer	PS19	1.001	S1	0.0	0.000	0.000	0.0000	
120 minute winter	Attenuation Tank 1	2.000	S1	-0.6	0.127	-0.007	0.0545	
15 minute summer	Carpark 1	5.000_1	S11	0.0	0.000	0.000	0.0255	
15 minute winter	S1	1.002	S2	19.3	0.765	0.246	1.0009	
360 minute winter	S2	1.003	S3	6.9	0.593	0.088	0.8854	
15 minute summer	PS7	4.002	PS8a	0.0	0.000	0.000	0.0000	
15 minute summer	PS8a	6.001	PS8b	0.0	0.000	0.000	0.0001	
15 minute winter	PS9b	4.004	PS10	3.7	0.815	0.164	0.0394	
15 minute winter	PS10	4.005	S8	3.7	0.770	0.207	0.0361	
15 minute summer	S12	5.000	S8	0.0	0.000	0.000	0.0005	
15 minute winter	S8	4.006	S3	11.2	0.776	0.265	0.3113	
360 minute winter	S3	1.004	S13	10.0	0.644	0.127	0.9675	
360 minute winter	S4	1.005	Attenuation Tank 2	11.8	0.805	0.141	1.2288	

Results for 1 year +10% A Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Attenuation Tank 2	256	5.679	0.481	11.8	49.7982	0.0000	SURCHARGED
360 minute winter	S11	256	5.679	0.501	4.9	0.7166	0.0000	SURCHARGED
360 minute winter	S5	200	5.148	0.053	5.0	0.0000	0.0000	OK
360 minute winter	S13	256	5.679	0.339	11.3	0.3839	0.0000	SURCHARGED
360 minute winter	S14	256	5.678	0.547	5.1	0.9661	0.0000	SURCHARGED
15 minute winter	PS9a	11	5.979	0.051	3.8	0.0013	0.0000	OK
15 minute winter	PS8c	11	5.979	0.030	0.2	0.0008	0.0000	OK
15 minute winter	PS8b	12	5.976	0.003	0.0	0.0001	0.0000	OK
15 minute summer	Carpark 2	1	5.700	0.000	0.0	0.0000	0.0000	OK
15 minute winter	Attenuation Tank 3	12	5.777	0.044	2.2	0.3591	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	Attenuation Tank 2	1.006	S11	4.9	0.343	0.055	0.2211	
360 minute winter	S11	1.008	S14	4.9	0.156	0.123	0.3133	
360 minute winter	S13	1.005_1	S4	10.9	0.702	0.139	0.5912	
360 minute winter	S14	1.009	S5	5.0	0.664	0.125	0.0456	124.2
15 minute winter	PS9a	3.000	PS9b	3.7	0.782	0.206	0.0089	
15 minute winter	PS8c	Flow through Pond	PS9a	-0.2	-0.023	0.000	0.1464	
15 minute winter	PS8b	6.002	PS8c	0.0	-0.047	-0.004	0.0007	
15 minute summer	Carpark 2	5.000_2	S13	0.0	0.000	0.000	0.0307	
15 minute winter	Attenuation Tank 3	2.000_1	S1	3.5	0.334	0.045	0.1354	

Results for 2 year +10% A Critical Storm Duration. Lowest mass balance: 99.80%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	PS18	1	5.972	0.000	0.0	0.0000	0.0000	OK
15 minute summer	PS19	1	5.930	0.000	0.0	0.0000	0.0000	OK
360 minute winter	Attenuation Tank 1	272	5.788	0.058	3.3	6.7775	0.0000	OK
15 minute summer	Carpark 1	1	6.150	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S1	10	5.799	0.117	33.2	0.1676	0.0000	OK
360 minute winter	S2	272	5.788	0.299	8.6	0.4272	0.0000	OK
15 minute summer	PS7	1	6.183	0.000	0.0	0.0000	0.0000	OK
15 minute summer	PS8a	1	6.026	0.000	0.0	0.0000	0.0000	OK
15 minute winter	PS9b	11	5.961	0.052	5.3	0.0013	0.0000	OK
15 minute winter	PS10	11	5.831	0.060	5.3	0.0015	0.0000	OK
15 minute summer	S12	1	6.112	0.000	0.0	0.0000	0.0000	OK
360 minute winter	S8	272	5.787	0.167	3.2	0.2396	0.0000	OK
360 minute winter	S3	272	5.787	0.376	12.4	0.5387	0.0000	SURCHARGED
240 minute winter	S4	164	5.787	0.489	18.5	0.7001	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	PS18	1.000	PS19	0.0	0.000	0.000	0.0000	
15 minute summer	PS19	1.001	S1	0.0	0.000	0.000	0.0000	
360 minute winter	Attenuation Tank 1	2.000	S1	-3.3	-0.290	-0.042	0.1503	
15 minute summer	Carpark 1	5.000_1	S11	0.0	0.000	0.000	0.0255	
15 minute winter	S1	1.002	S2	25.8	0.787	0.329	1.3491	
360 minute winter	S2	1.003	S3	8.3	0.599	0.106	1.0955	
15 minute summer	PS7	4.002	PS8a	0.0	0.000	0.000	0.0000	
15 minute summer	PS8a	6.001	PS8b	0.0	0.000	0.000	0.0023	
15 minute winter	PS9b	4.004	PS10	5.3	0.890	0.236	0.0520	
15 minute winter	PS10	4.005	S8	5.3	0.846	0.297	0.0472	
15 minute summer	S12	5.000	S8	0.0	0.000	0.000	0.0059	
360 minute winter	S8	4.006	S3	3.2	0.613	0.075	0.7171	
360 minute winter	S3	1.004	S13	11.6	0.657	0.148	0.9950	
240 minute winter	S4	1.005	Attenuation Tank 2	17.9	0.926	0.214	1.2288	

Results for 2 year +10% A Critical Storm Duration. Lowest mass balance: 99.80%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	Attenuation Tank 2	164	5.787	0.589	17.9	60.9920	0.0000	SURCHARGED
240 minute winter	S11	164	5.787	0.609	4.9	0.8713	0.0000	SURCHARGED
30 minute winter	S5	24	5.148	0.053	5.0	0.0000	0.0000	OK
240 minute winter	S13	164	5.787	0.447	17.0	0.5059	0.0000	SURCHARGED
240 minute winter	S14	164	5.786	0.655	5.3	1.1576	0.0000	SURCHARGED
15 minute winter	PS9a	11	5.991	0.063	5.6	0.0016	0.0000	OK
15 minute winter	PS8c	11	5.991	0.042	0.3	0.0011	0.0000	OK
15 minute winter	PS8b	11	5.992	0.019	0.2	0.0005	0.0000	OK
240 minute winter	Carpark 2	164	5.787	0.087	1.8	1.4165	0.0000	OK
360 minute winter	Attenuation Tank 3	272	5.788	0.055	2.1	3.8326	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	Attenuation Tank 2	1.006	S11	4.9	0.336	0.055	0.2211	
240 minute winter	S11	1.008	S14	4.9	0.149	0.123	0.3133	
240 minute winter	S13	1.005_1	S4	16.3	0.764	0.209	0.5912	
240 minute winter	S14	1.009	S5	5.0	0.664	0.125	0.0456	124.0
15 minute winter	PS9a	3.000	PS9b	5.3	0.854	0.298	0.0118	
15 minute winter	PS8c	Flow through Pond	PS9a	0.4	-0.025	0.000	0.1967	
15 minute winter	PS8b	6.002	PS8c	-0.2	0.161	-0.029	0.0019	
240 minute winter	Carpark 2	5.000_2	S13	-1.8	-0.248	-0.139	0.0591	
360 minute winter	Attenuation Tank 3	2.000_1	S1	-2.1	-0.155	-0.026	0.1563	

Results for 10 year +10% A Critical Storm Duration. Lowest mass balance: 99.59%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	PS18	1	5.972	0.000	0.0	0.0000	0.0000	OK
15 minute summer	PS19	1	5.930	0.000	0.0	0.0000	0.0000	OK
360 minute winter	Attenuation Tank 1	344	5.919	0.189	9.3	22.2457	0.0000	OK
15 minute summer	Carpark 1	1	6.150	0.000	0.0	0.0000	0.0000	OK
360 minute winter	S1	344	5.919	0.237	19.0	0.3393	0.0000	OK
360 minute winter	S2	344	5.919	0.430	12.0	0.6154	0.0000	SURCHARGED
15 minute summer	PS7	1	6.183	0.000	0.0	0.0000	0.0000	OK
15 minute summer	PS8a	1	6.026	0.000	0.0	0.0000	0.0000	OK
15 minute winter	PS9b	11	5.995	0.086	9.9	0.0021	0.0000	OK
15 minute winter	PS10	11	5.974	0.203	9.9	0.0051	0.0000	SURCHARGED
15 minute summer	S12	1	6.112	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S8	10	5.942	0.322	29.3	0.4610	0.0000	SURCHARGED
360 minute winter	S3	344	5.919	0.508	15.9	0.7269	0.0000	SURCHARGED
360 minute winter	S4	344	5.919	0.621	19.8	0.8883	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	PS18	1.000	PS19	0.0	0.000	0.000	0.0000	
15 minute summer	PS19	1.001	S1	0.0	0.000	0.000	0.0021	
360 minute winter	Attenuation Tank 1	2.000	S1	-9.3	-0.455	-0.118	0.5071	
15 minute summer	Carpark 1	5.000_1	S11	0.0	0.000	0.000	0.0255	
360 minute winter	S1	1.002	S2	-9.4	0.599	-0.120	2.5067	
360 minute winter	S2	1.003	S3	10.5	0.608	0.134	1.0961	
15 minute summer	PS7	4.002	PS8a	0.0	0.000	0.000	0.0000	
15 minute summer	PS8a	6.001	PS8b	0.0	0.000	0.000	0.0088	
15 minute winter	PS9b	4.004	PS10	9.9	0.976	0.443	0.1227	
15 minute winter	PS10	4.005	S8	10.5	0.872	0.590	0.1330	
15 minute summer	S12	5.000	S8	0.0	0.000	0.000	0.0895	
15 minute winter	S8	4.006	S3	29.4	0.740	0.695	0.7982	
360 minute winter	S3	1.004	S13	15.4	0.651	0.196	0.9950	
360 minute winter	S4	1.005	Attenuation Tank 2	19.5	0.911	0.233	1.2288	

Results for 10 year +10% A Critical Storm Duration. Lowest mass balance: 99.59%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Attenuation Tank 2	344	5.918	0.720	19.5	74.6059	0.0000	SURCHARGED
360 minute winter	S11	344	5.918	0.740	4.7	1.0594	0.0000	SURCHARGED
30 minute winter	S5	18	5.148	0.053	5.0	0.0000	0.0000	OK
360 minute winter	S13	344	5.919	0.579	17.8	0.6547	0.0000	SURCHARGED
360 minute winter	S14	344	5.918	0.787	5.2	1.3899	0.0000	SURCHARGED
15 minute winter	PS9a	11	6.024	0.096	10.3	0.0024	0.0000	OK
15 minute winter	PS8c	11	6.023	0.075	0.9	0.0019	0.0000	OK
15 minute winter	PS8b	11	6.024	0.051	0.4	0.0013	0.0000	OK
360 minute winter	Carpark 2	344	5.919	0.219	3.0	7.7228	0.0000	SURCHARGED
360 minute winter	Attenuation Tank 3	344	5.919	0.186	12.8	45.0335	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	Attenuation Tank 2	1.006	S11	4.7	0.316	0.053	0.2211	
360 minute winter	S11	1.008	S14	4.7	0.152	0.118	0.3133	
360 minute winter	S13	1.005_1	S4	17.4	0.684	0.222	0.5912	
360 minute winter	S14	1.009	S5	5.0	0.664	0.125	0.0456	149.6
15 minute winter	PS9a	3.000	PS9b	9.9	1.025	0.560	0.0213	
15 minute winter	PS8c	Flow through Pond	PS9a	-0.9	-0.040	0.000	0.3575	
15 minute winter	PS8b	6.002	PS8c	-0.4	-0.220	-0.068	0.0058	
360 minute winter	Carpark 2	5.000_2	S13	-3.0	-0.384	-0.231	0.0614	
360 minute winter	Attenuation Tank 3	2.000_1	S1	-12.8	-0.428	-0.162	0.5345	

Results for 30 year +10% A Critical Storm Duration. Lowest mass balance: 99.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	PS18	352	6.027	0.055	0.0	0.0014	0.0000	OK
360 minute winter	PS19	352	6.027	0.097	0.1	0.0024	0.0000	OK
360 minute winter	Attenuation Tank 1	352	6.027	0.297	11.2	34.9534	0.0000	OK
15 minute summer	Carpark 1	1	6.150	0.000	0.0	0.0000	0.0000	OK
360 minute winter	S1	352	6.027	0.345	25.2	0.4939	0.0000	SURCHARGED
360 minute winter	S2	352	6.027	0.538	13.0	0.7698	0.0000	SURCHARGED
15 minute summer	PS7	1	6.183	0.000	0.0	0.0000	0.0000	OK
15 minute winter	PS8a	12	6.115	0.089	1.2	0.0022	0.0000	OK
15 minute winter	PS9b	12	6.098	0.189	12.6	0.0047	0.0000	SURCHARGED
15 minute winter	PS10	11	6.061	0.290	13.9	0.0073	0.0000	SURCHARGED
15 minute summer	S12	1	6.112	0.000	0.0	0.0000	0.0000	OK
15 minute winter	S8	11	6.036	0.416	34.0	0.5950	0.0000	SURCHARGED
360 minute winter	S3	352	6.027	0.616	16.5	0.8812	0.0000	SURCHARGED
360 minute winter	S4	344	6.027	0.729	20.4	1.0425	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	PS18	1.000	PS19	0.0	-0.019	-0.007	0.0256	
360 minute winter	PS19	1.001	S1	-0.1	-0.009	-0.009	0.0511	
360 minute winter	Attenuation Tank 1	2.000	S1	-11.2	-0.479	-0.143	0.6699	
15 minute summer	Carpark 1	5.000_1	S11	0.0	0.000	0.000	0.0255	
360 minute winter	S1	1.002	S2	-12.9	0.611	-0.164	2.7124	
360 minute winter	S2	1.003	S3	11.0	0.609	0.141	1.0961	
15 minute summer	PS7	4.002	PS8a	0.0	0.000	0.000	0.0454	
15 minute winter	PS8a	6.001	PS8b	-1.2	-0.224	-0.194	0.0400	
15 minute winter	PS9b	4.004	PS10	13.9	0.978	0.621	0.1542	
15 minute winter	PS10	4.005	S8	14.3	0.855	0.805	0.1330	
15 minute summer	S12	5.000	S8	0.0	0.000	0.000	0.0895	
15 minute winter	S8	4.006	S3	34.0	0.855	0.802	0.7982	
360 minute winter	S3	1.004	S13	15.6	0.645	0.198	0.9950	
360 minute winter	S4	1.005	Attenuation Tank 2	20.2	0.951	0.240	1.2288	

Results for 30 year +10% A Critical Storm Duration. Lowest mass balance: 99.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	Attenuation Tank 2	344	6.026	0.828	20.2	82.9363	0.0000	SURCHARGED
360 minute winter	S11	344	6.026	0.848	5.0	1.2137	0.0000	SURCHARGED
180 minute summer	S5	80	5.148	0.053	5.0	0.0000	0.0000	OK
360 minute winter	S13	352	6.027	0.687	18.4	0.7766	0.0000	SURCHARGED
360 minute winter	S14	344	6.025	0.894	5.2	1.5805	0.0000	SURCHARGED
15 minute winter	PS9a	12	6.115	0.187	13.4	0.0047	0.0000	SURCHARGED
15 minute winter	PS8c	12	6.115	0.166	3.6	0.0041	0.0000	OK
15 minute winter	PS8b	12	6.115	0.142	1.8	0.0036	0.0000	SURCHARGED
360 minute winter	Carpark 2	352	6.027	0.327	3.5	12.8983	0.0000	SURCHARGED
360 minute winter	Attenuation Tank 3	352	6.027	0.294	19.4	78.9144	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
360 minute winter	Attenuation Tank 2	1.006	S11	5.0	0.303	0.056	0.2211	
360 minute winter	S11	1.008	S14	4.3	0.154	0.107	0.3133	
360 minute winter	S13	1.005_1	S4	17.8	0.663	0.228	0.5912	
360 minute winter	S14	1.009	S5	5.0	0.664	0.125	0.0455	142.8
15 minute winter	PS9a	3.000	PS9b	12.6	0.970	0.710	0.0336	
15 minute winter	PS8c	Flow through Pond	PS9a	4.3	0.059	0.000	0.9476	
15 minute winter	PS8b	6.002	PS8c	-1.8	0.299	-0.287	0.0100	
360 minute winter	Carpark 2	5.000_2	S13	-3.5	-0.442	-0.265	0.0614	
360 minute winter	Attenuation Tank 3	2.000_1	S1	-19.4	-0.517	-0.246	0.7108	

Results for 100 year +30% CC +10% A Critical Storm Duration. Lowest mass balance: 99.52%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	PS18	585	6.473	0.501	0.1	0.0125	0.0000	SURCHARGED
600 minute winter	PS19	585	6.473	0.543	0.3	0.0136	0.0000	SURCHARGED
600 minute winter	Attenuation Tank 1	585	6.473	0.743	9.0	71.9944	0.0000	SURCHARGED
600 minute winter	Carpark 1	585	6.472	0.322	3.7	24.4467	0.0000	FLOOD RISK
600 minute winter	S1	585	6.473	0.791	32.3	1.1321	0.0000	SURCHARGED
600 minute winter	S2	585	6.473	0.984	18.3	1.4083	0.0000	FLOOD RISK
600 minute winter	PS7	585	6.473	0.290	0.1	0.0073	0.0000	FLOOD RISK
600 minute winter	PS8a	585	6.473	0.447	0.1	0.0112	0.0000	FLOOD RISK
600 minute winter	PS9b	585	6.473	0.564	2.1	0.0141	0.0000	FLOOD RISK
600 minute winter	PS10	585	6.473	0.702	2.1	0.0176	0.0000	SURCHARGED
600 minute winter	S12	585	6.473	0.361	1.4	9.9427	0.0000	SURCHARGED
600 minute winter	S8	585	6.473	0.853	6.5	1.2208	0.0000	FLOOD RISK
600 minute winter	S3	585	6.473	1.062	12.7	1.5197	0.0000	SURCHARGED
600 minute winter	S4	585	6.473	1.175	15.3	1.6808	0.0000	FLOOD RISK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute winter	PS18	1.000	PS19	-0.1	-0.041	-0.023	0.0329	
600 minute winter	PS19	1.001	S1	-0.3	-0.037	-0.043	0.0513	
600 minute winter	Attenuation Tank 1	2.000	S1	-9.0	-0.411	-0.115	0.6704	
600 minute winter	Carpark 1	5.000_1	S11	-3.7	-0.477	-0.158	0.0509	
600 minute winter	S1	1.002	S2	-18.2	0.545	-0.232	2.7124	
600 minute winter	S2	1.003	S3	-12.6	0.531	-0.160	1.0961	
600 minute winter	PS7	4.002	PS8a	-0.1	-0.014	-0.011	0.1227	
600 minute winter	PS8a	6.001	PS8b	-0.1	-0.017	-0.022	0.0412	
600 minute winter	PS9b	4.004	PS10	2.1	0.648	0.093	0.1542	
600 minute winter	PS10	4.005	S8	2.0	0.563	0.114	0.1330	
600 minute winter	S12	5.000	S8	2.3	0.131	0.064	0.1790	
600 minute winter	S8	4.006	S3	6.4	0.544	0.151	0.7982	
600 minute winter	S3	1.004	S13	11.8	0.582	0.150	0.9950	
600 minute winter	S4	1.005	Attenuation Tank 2	15.2	0.933	0.181	1.2288	

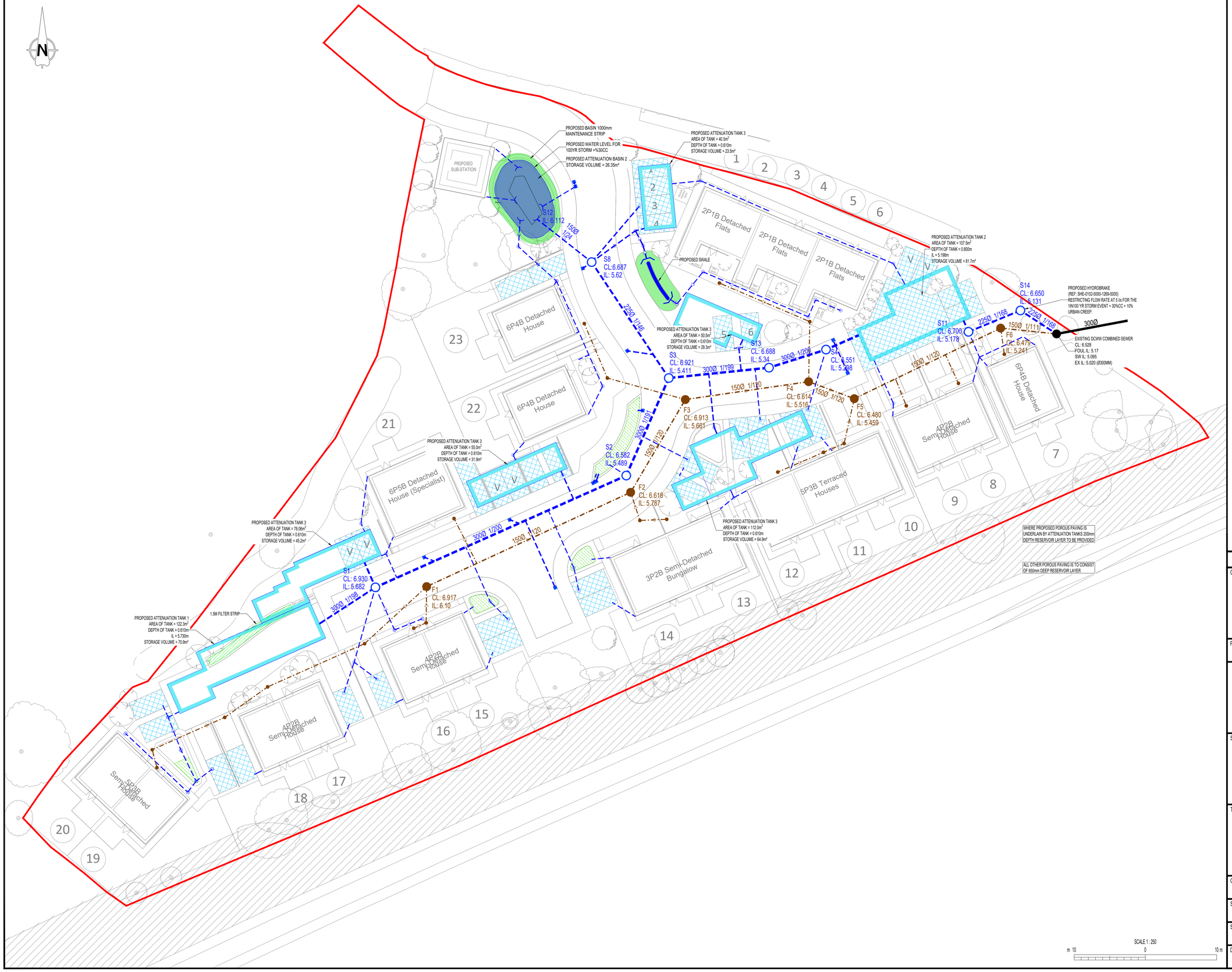
Results for 100 year +30% CC +10% A Critical Storm Duration. Lowest mass balance: 99.52%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	Attenuation Tank 2	585	6.472	1.274	15.2	83.5747	0.0000	FLOOD RISK
600 minute winter	S11	585	6.471	1.293	7.9	1.8501	0.0000	FLOOD RISK
600 minute winter	S5	585	5.148	0.053	5.0	0.0000	0.0000	OK
600 minute winter	S13	585	6.473	1.133	13.6	1.2813	0.0000	FLOOD RISK
600 minute winter	S14	585	6.471	1.340	5.2	2.3671	0.0000	FLOOD RISK
600 minute winter	PS9a	585	6.473	0.545	2.4	0.0136	0.0000	FLOOD RISK
600 minute winter	PS8c	585	6.473	0.524	0.5	0.0131	0.0000	OK
600 minute winter	PS8b	585	6.473	0.500	0.2	0.0125	0.0000	FLOOD RISK
600 minute winter	Carpark 2	585	6.473	0.773	3.8	30.8409	0.0000	SURCHARGED
600 minute winter	Attenuation Tank 3	585	6.473	0.740	23.2	191.5485	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
600 minute winter	Attenuation Tank 2	1.006	S11	7.0	0.281	0.079	0.2211	
600 minute winter	S11	1.008	S14	4.9	0.138	0.121	0.3133	
600 minute winter	S13	1.005_1	S4	13.4	0.628	0.171	0.5912	
600 minute winter	S14	1.009	S5	5.0	0.665	0.126	0.0457	224.3
600 minute winter	PS9a	3.000	PS9b	2.1	0.685	0.121	0.0336	
600 minute winter	PS8c	Flow through Pond	PS9a	0.7	-0.012	0.000	5.4024	
600 minute winter	PS8b	6.002	PS8c	0.2	-0.033	0.031	0.0100	
600 minute winter	Carpark 2	5.000_2	S13	-3.8	-0.487	-0.292	0.0614	
600 minute winter	Attenuation Tank 3	2.000_1	S1	-23.2	-0.468	-0.296	0.7124	

APPENDIX J –

Proposed Drainage Scheme



NOTES

1. ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS SHOWN OTHERWISE.
2. THIS DESIGN IS PROPOSED ON THE BASIS OF CLIENT BRIEF, SPECIFICATIONS, BEST PRACTICE AND RISK REDUCTION / ELIMINATION. THE DESIGNER MUST BE CONSULTED ON ANY PROPOSED CHANGES, BEFORE THEY ARE CONSIDERED FOR IMPLEMENTATION.

KEY

- SITE BOUNDARY
- EXISTING COMBINED CHAMBER AND SEWER
- PROPOSED SURFACE WATER CHAMBER AND PIPE
- PROPOSED FOUL CHAMBER AND PIPE
- PROPOSED INDICATIVE POROUS PAVING
- PROPOSED CELLULAR ATTENUATION TANK
- PROPOSED DETENTION BASIN
- PROPOSED SURFACE WATER HEADWALL
- PROPOSED RAINGARDEN/TREE PIT
- PROPOSED FILTER STRIP

REFERENCE CALCULATIONS

14973-260202-OUTLINE SW DRAINAGE DESIGN

SITE LOCATION

GRID REFERENCE: E301486 , N381597
SITE ADDRESS: MAES EMLYN, RHYL, DENBIGHSHIRE, LL18 4AB

CAUTION: THE MANAGEMENT AND DESIGN OF ANY AND ALL TEMPORARY WORKS REQUIRED TO EXECUTE THIS DESIGN ARE THE RESPONSIBILITY OF THE CONTRACTOR.

REV	DATE	DESCRIPTION	ORG	CHK	APP
P01	02/02/202	FIRST ISSUE	LG	AR	NJ

CLIENT

Tai Wales & West Housing

PRINCIPAL DESIGNER

-

Waterco Ltd., Eden Court,
Lon Parcwr Business Park, Ruthin LL15 1NJ
tel (+44) 1824 702220
www.waterco.co.uk

SCHEME

MAES EMLYN, RHYL

TITLE

PROPOSED DRAINAGE SCHEME

ORIGINATOR	CHECKER	APPROVER
L. GIBBS	A.RUSSELL	N. JONES

STATUS: PRELIMINARY

SCALE / SHEET SIZE	REV
1:250 / A1	P01

DRAWING NUMBER: 14973-1001