



PROPOSED DEVELOPMENT OF 18 DWELLINGS

on land at Blast Road, Brymbo, Wrexham LL11 5BB

Drainage Strategy Rev A

April 2019

BLAST ROAD DEVELOPMENT

Brymbo

Drainage Strategy Rev A

April 2019

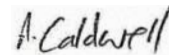
Client: **Brenig Construction**
Parc Busnes Cartrefi Conwy
Business Park,
Station Road,
Mochdre,
LL28 5EF

Report Status: **PLANNING**

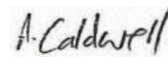
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Date: May 2019

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1. INTRODUCTION

Datrys have been commissioned by Brenig Construction to prepare a drainage strategy in support of a planning application for the proposed housing development on Blast Road, Brymbo located at grid reference SJ 292 536. The existing site is an un-developed, open green space. The site location is shown in Figure 1 below and in **Appendix A**.



Figure 1 - Site Location

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Existing site

The proposal is contained within a site area of approximately 0.435Ha upon a southerly sloping site, which is predominantly grassed. A topographic survey has been undertaken which provides detailed levels across the site.

The site slopes from north to south with values varying from 237.78mAOD to 231.90mAOD. Its southern boundary is formed by an embankment leading downwards to Blast Road at a level of 227.61mAOD at the lowest point. There is an existing multi use games area to the right of the site and development to the north and east.

Maps show no watercourses within the vicinity of the site. River Gwenfro is situated approximately 1.65km from the site.

The public sewer records show no foul or surface water sewers along Blast Road. A 150mm diameter foul sewer is present at the back of the properties along Argoed, which face on to the site. A 150mm diameter surface water sewer also runs at the front of these properties. A 150mm diameter combined sewer is present to the west of the site, along Pen-y-Graid Road.

A CCTV trace of the existing drainage system adjacent to the site was undertaken to determine invert levels and diameter of the existing drainage. During a site walkover, no existing drainage on the site itself was identified and this has been confirmed through plans by the relevant statutory undertakers.

A highway drain is located in Blast Road however it is heavily silted. Investigation therefore awaits attendance of jetting crew.

Proposal

The development comprises of the construction of 18 residential units. The units will consist of three blocks of two 1-bedroom flats, two 2-bedroom bungalows, six 2-bedroom semi-detached dwellings, three 2-bedroom terraced dwellings and one 3-bedroom detached dwelling.

The scheme will also include an adoptable access road and appropriate hard and soft landscaping. The proposed development is shown in Figure 2.



Figure 2 – Proposed site plan

The areas of the proposals are as follows:

Usage	Proposed area (m ²)
Building roofs	801
Roads and associated paths	1516
Car Parking	365
Other hardstanding's	887
Soft landscaping	1248

Table 1 - Proposed surface areas

2. SURFACE WATER DRAINAGE

Sustainable Drainage Philosophy

The surface water design has been undertaken in accordance with the SuDS drainage hierarchy given in the SuDS Manual published by CIRIA and accepted and adopted by the Lead Local Flood Authority (LLFA).

The drainage hierarchy is:

SuDS Priority Level	Design approach
Level 1	Surface water runoff is collected for re-use
Level 2	Surface water runoff is infiltrated to ground
Level 3	Surface water runoff is discharged to a surface water body
Level 4	Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system
Level 5	Surface water runoff is discharged to a combined sewer

Table 2 - SuDS drainage hierarchy

Priority Level 1 is the preferred (highest priority) and that 4 and 5 should only be used in exceptional circumstances.

Application of SuDS hierarchy to proposals

The following considerations are relevant to the application of the above to the proposed development.

Priority Level 1 – Re-use

The re-cycling of rainwater for re-use has had widespread application in particular with respect to the use of Rainwater Harvesting. In this case, a portion of the runoff from building roofs is collected into storage tanks for re-use as grey water in toilets. The key benefit is the reduction in use of potable water for uses other than consumption. The disadvantage is the need for large tanks to provide a buffer storage against periods of low rainfall.

However, with respect to reducing the flood risk from surface water and providing a means of disposal, this approach is limited. It cannot be assumed that the storage tanks would offer any spare capacity for attenuation of surface water run-off during a storm event as the antecedent conditions would be unknown. As such, assuming spare capacity in the tanks during a storm event would be an unsafe assumption that could lead to an unacceptable level of flood risk from the inadequate provision of attenuation storage capacity. The potential re-use of water should therefore be ignored in the design of the storm water system under the design rainfall events.

Priority Level 2 – Infiltration to ground –

Porosity testing was undertaken on 21st January 2019 by Groundsolve. Tests were completed in 3 of the 4 trial pits as impermeable strata was noted to depth, in one of the pits. The remaining trial pits consisted generally of sandstone cobble in a sandy silty matrix. The ground conditions are shown in Table 3. The test locations are illustrated upon drawing 18303/SK02 in **Appendix B** along with the test results.

Material	Thickness (m)
Topsoil	0.2
Silty Clay with gravel and cobble of sandstone	0.9
Silty sandy gravel and cobble, recovered as a very gravelly clay	0.7
Sandstone bedrock	0.4

Table 3 - Summary of ground conditions

Porosity tests were carried out on trial pits 01 – 03. For TP01, the results show that given the cohesive nature of the underlying ground, the strata will be impermeable and possess inadequate values of permeability coefficient as described in BRE 365. Therefore the use of infiltration methods at TP01 would be inappropriate. For TP02 and TP03, the results show that infiltration methods would be suitable at these locations.

It is recommended that further tests are carried out to determine the extent of which infiltration methods could be utilised.

Given that infiltration is not feasible to the west end of the site, another means of discharging surface water will need to be determined.

Priority Level 3 – Discharge to surface water body

The nearest watercourse is approximately 1.6km as the crow flies with developments between the site and the watercourse. Therefore, it can be determined that no nearby watercourses are available to allow a feasible connection of surface water flows.

Priority Level 4 – Surface water or highway sewer

The sewer records (**Appendix H**) indicate the presence of a 150mm diameter storm sewer in the footway along Argoed. However, in order to connect to this, a pumping station would be required due to Argoed being situated at a higher level than the site. Therefore, connecting to the surface water sewer is not considered feasible.

However, two highway drains are present within Blast Road, though any connection will require the agreement of Wrexham Highways. The site discharge will need to be restricted to a suitable level with a minimum recommended value of 5l/s to avoid blockages of the hydraulic control. Sufficient on-site storage would be required to achieve the attenuated flow. Storage for storms of up to 1 in 100-year return period with climate change effects would need to be stored on-site.

Subject to agreement with Wrexham Highways, the above is considered to be a feasible option.

Priority Level 5 – disposal to combined sewer

Any surface water discharging into a combined sewer would be subject to treatment downstream. The flows would therefore increase the load on the Sewage Treatment Works, risk flushing them and be wasteful. As such this option should be avoided unless all others are exhausted.

A combined sewer was noted to be in Pen-Y-Graig Road to the west of the development site, however given the proximity of the highway drain and due to the difference in levels requiring a pumping station, this option is not considered.

3. DESIGN CRITERIA

From the previous page, the most feasible option entails a combination of soakaways and attenuation. Following greenfield run-off calculations (**Appendix D**), the attenuation aspect is to be designed to the following criteria:

Design element	Criterion
Rate of discharge	5l/s
Climate change effects	+ 30%
No surface flooding	Up to 1 in 30 Year Return Period
No off-site run-off	Up to 1 in 100 Year Return Period + Climate Change
Min gradient	1 in 150
Nominal cover	0.9m private; 1.2m highway

Table 4 - Storm water design criteria

The calculation of the storm water run-off is derived from the Wallingford Modified Rational method and in compliance with BS EN 752-4 *Drain and sewer systems outside buildings*.

The rate of discharge has been set to provide the lowest practical flow through the hydraulic control structure to avoid the risk of blockage. The difference between the design storm flow and the outflow is stored temporarily in underground attenuation tanks. Due to site topography, the attenuation tanks have been designed to accommodate the full 1 in 100 flow plus climate change effects below ground.

4. SURFACE WATER DRAINAGE DESIGN

The site consists of tarmacadam highway, concrete pavements around the dwellings and the roofs of the dwellings themselves. Porous tarmac will be utilised for driveways which attempts to imitate existing greenfield thus reducing storage requirements on-site.

The 6 hour duration 1 in 1-year storm event on the existing site has a flow rate of less than 5l/s. Flows will be controlled by a single hydro-break located near the site entrance and restricted to 5l/s.

There may be scope to agree a dual flow control arrangement to allow additional flows in larger storm events such as the 1 in 30-year storm.

The attenuation volume of for the 1 in 30-year storm is 26.3 cubic metres and for the 1 in 100-year storm is 40.1 cubic metres. For full attenuation calculations, refer to **Appendix E**.

The porosity results indicate that soakaways can be utilised at the eastern end of the site. Therefore, it is possible for the surface water to infiltrate into the ground via various soakaways on site; individual soakaways to the rear of plots 7 – 10, infiltration blanket under the driveways of plots 7-10, an enlarged infiltration blanket to plot 11, cellular storage to the front of units 12-17 and precast concrete soakaway rings serving the proposed adopted highway. Agreement with Wrexham Highways would be required for soakaways located within the highway. Individual soakaways in gardens would require approval from Wrexham SuDS Approval Body (SAB's) whilst the domestic runoff from 12-18 would be subject to adoption by the SAB. The surface water flows from plots 1-6 and the highway drainage from ch0-ch95m would be attenuated and discharged at 5l/s (subject to agreement with Wrexham Highways) into the highway drain in Blast Road. The pipework serving plots 1-6 would be adopted by the SAB where the pipe crosses multiple curtilages.

A proposed drainage scheme is illustrated upon drawing 18303/501 (**Appendix C**).

Extreme Event

The site is designed to contain a 1 in 100-year storm event + climate change effects within its boundary. If an extreme flood event occurred (above 1 in 100-year storm event etc.) surcharging the attenuation and onsite gullies the surface water on the lower site (plots 1-6 & ch0-80m) would flow down the proposed access road and enter the highway drainage system and follow the flood routing of the existing highway. The flows from units 7-18 and the remainder of the adoptable highway would surcharge the gullies at ch110m and flow down the

embankment as per the existing overland flows pre-development. Please refer to 18303/510 in **Appendix F**.

Pollution prevention

A pollution risk arises from petrol or oil spillage from vehicles using the development site. The drainage of the car parking and access road form a part of the general site surface water drainage system. The total number of car parking spaces is 34.

The risk of pollution is considered to be low and methods of control suggested in the SuDS Manual, such as the use of porous paving, will be considered in the drainage design. Oil separators are not deemed a requirement.

5. FOUL WATER DRAINAGE

The following design criteria will apply for the surface water runoff and foul discharge design of the site:

- Approved Document H, Building Regulations
- Sewers for Adoption 7th Edition
- BS EN 12056 Part 2.

The sewer records indicate a 150mm diameter combined sewer running northwards on Pen-Y-Graig Road.

The foul drainage will discharge to the combined sewer on Pen-Y-Graig Road, chamber number SJ29531705. This will require an adopted Type 2 pumping station on site.

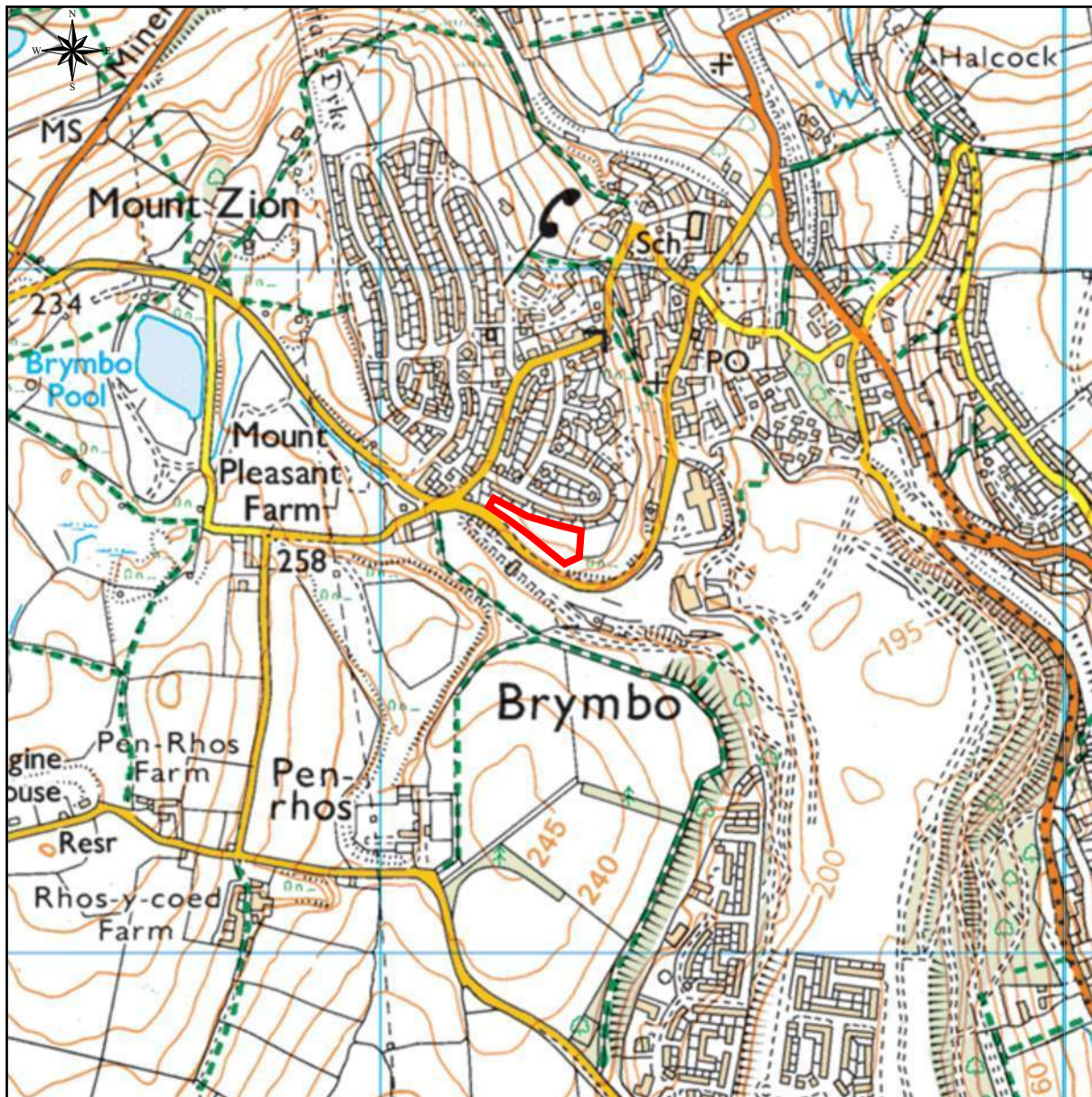
A section 104 adoption agreement of the Water Industries Act 1991 will be sought for the formal adoption of the foul drainage layouts within the site including the connection to the existing foul sewer.

The drainage is illustrated on the enclosed drawing 18303/501 (**Appendix C**). The design calculations are contained within **Appendix G** and indicate an estimate peak flow of 5.6l/s.

In terms of sizing the pumping station, the peak flow based on Sewers for Adoption 7 guidance of 4000l/day/dwelling = 0.83l/s therefore Type 2 pumping station required.

APPENDICES

APPENDIX A – SITE LOCATION PLAN



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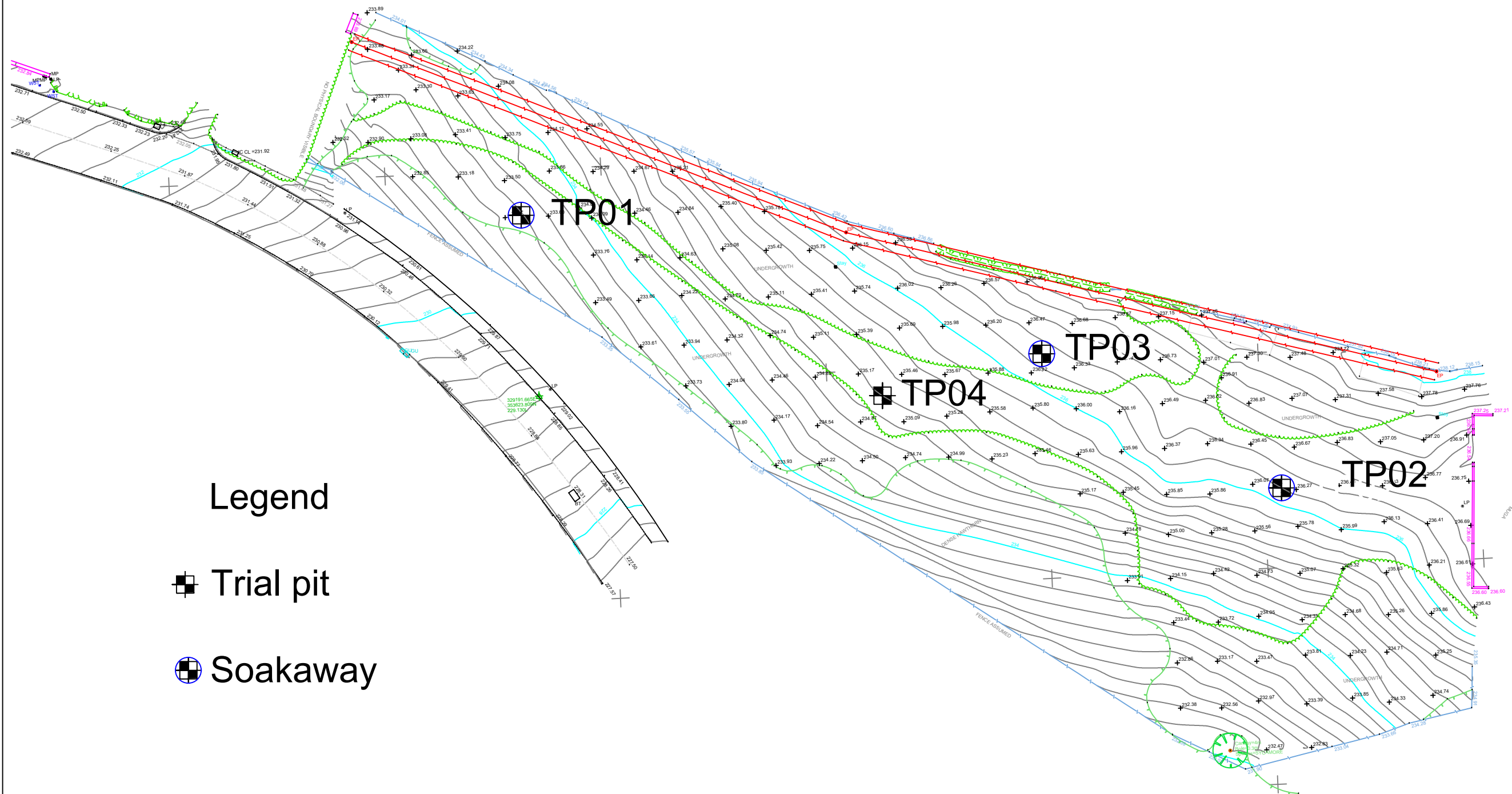
0m 100m 200m 300m 400m 500m 600m 700m 800m

Scale: 1:10000, paper size: A4

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TITLE Site Location Plan	PROJECT Development at Blast Road, Brymbo	 MODELU BYLUNIO FERRIANNEG MODEL DESIGN ENGINEERING	DRAWN TD DATE Mar. 19 DRG No. 18303/SK01	SCALE A.S CHKD AC
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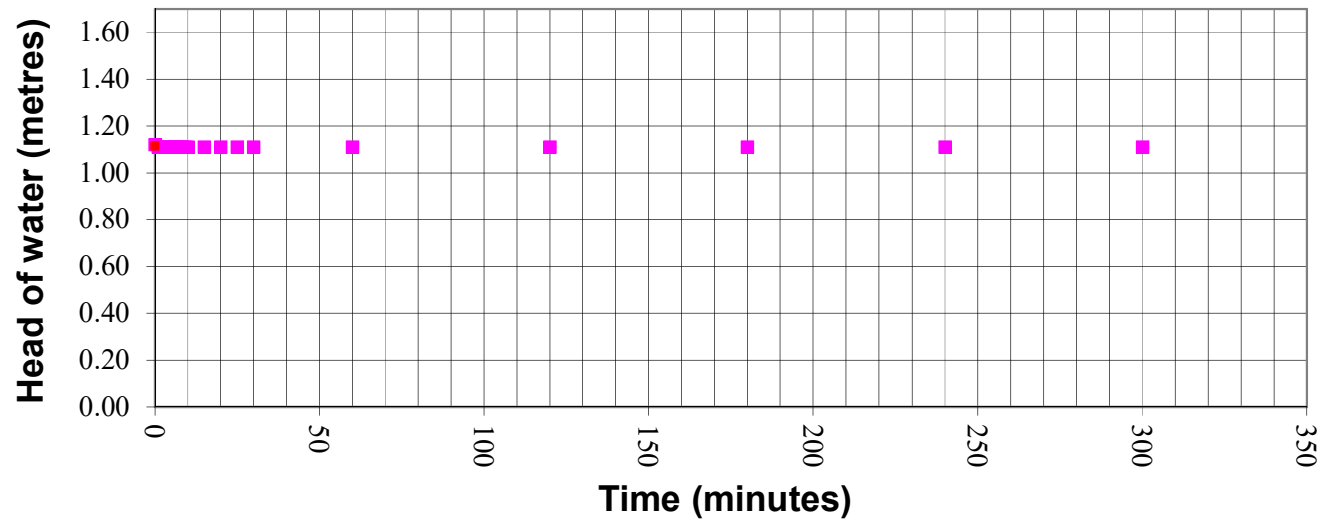
APPENDIX B – POROSITY TESTING LAYOUT & RESULTS



Time (Mins)	Depth of Water	Head of Water
0	1.28	1.12
1	1.29	1.11
2	1.29	1.11
3	1.29	1.11
4	1.29	1.11
5	1.29	1.11
6	1.29	1.11
7	1.29	1.11
8	1.29	1.11
9	1.29	1.11
10	1.29	1.11
15	1.29	1.11
20	1.29	1.11
25	1.29	1.11
30	1.29	1.11
60	1.29	1.11
120	1.29	1.11
180	1.29	1.11
240	1.29	1.11
300	1.29	1.11
360	1.29	1.11

GroundSolve Ltd

2182-Brymbo Blast Road
TP01 Test 1
21/01/19



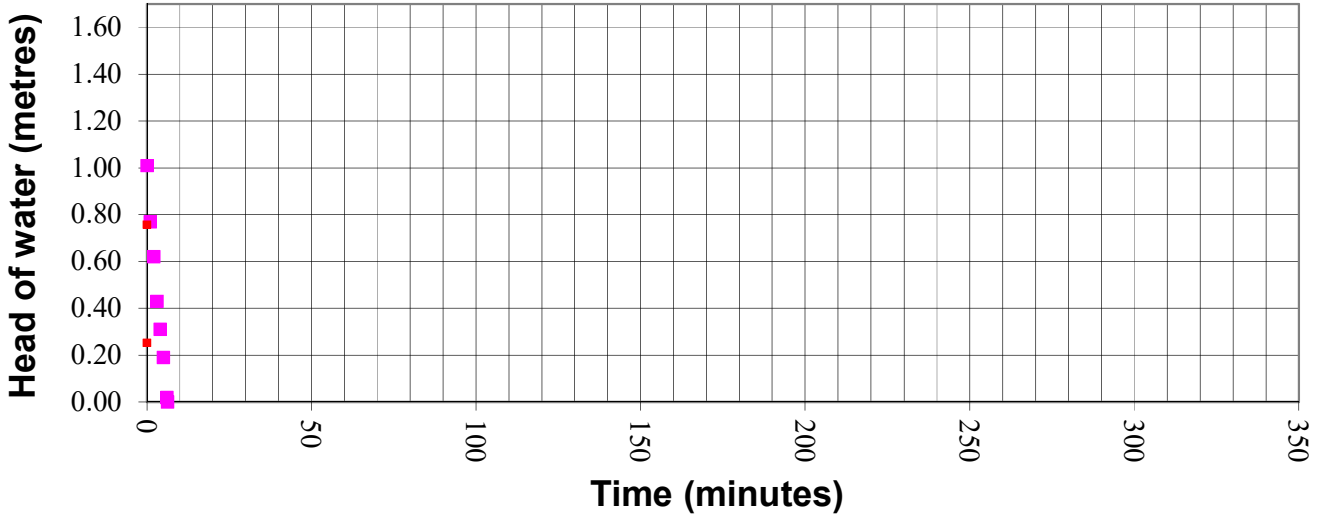
Depth	Length	Width	Head at 75% Vol	Head at 25% Vol	Water depth(t=0)	Effective Area	Vp75-Vp25	Adjustment Factor *	t75	t25	Infiltration
(m)	(m)	(m)	(m)	(m)	(m)	Ap50 m2	Volume of water m3		(mins)	(mins)	rate m/s
2.40	2.10	0.60	0.840	0.28	1.12	4.284	0.706	1.00	-	-	N/A

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

[illegible]

GroundSolve Ltd

2182-Brymbo Blast Road
TP02 Test 1
 21/01/19



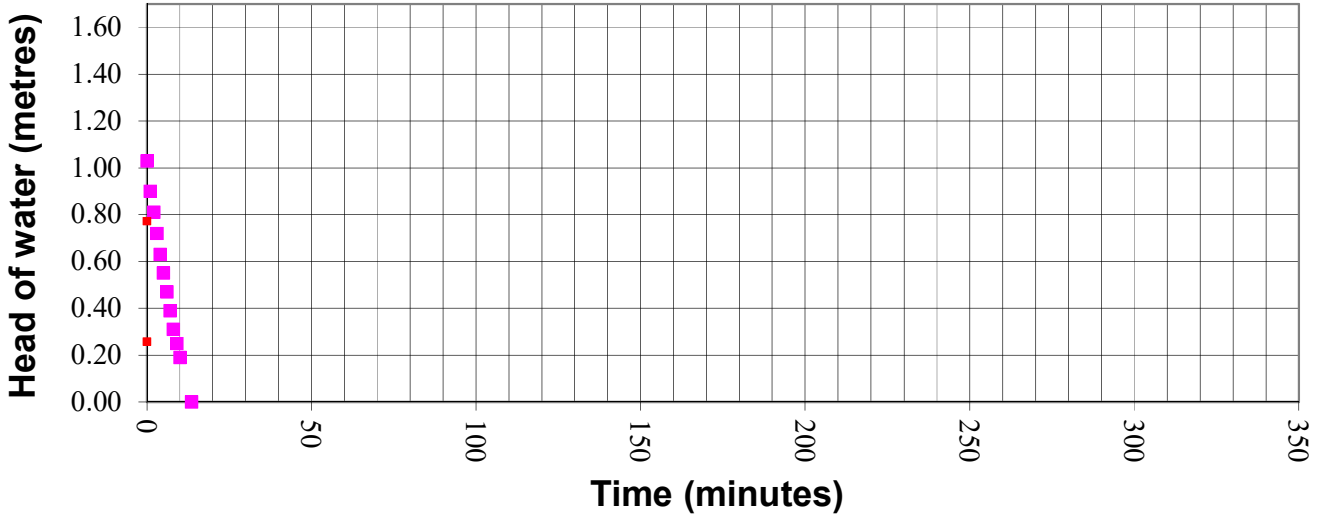
Depth	Length	Width	Head at 75% Vol	Head at 25% Vol	Water depth(t=0)	Effective Area	Vp75-Vp25	Adjustment Factor *	t75	t25	Infiltration
(m)	(m)	(m)	(m)	(m)	(m)	Ap50 m2	Volume of water m3		(mins)	(mins)	rate m/s
2.00	1.90	0.60	0.758	0.25	1.01	3.665	0.576	1.00	1	4.5	7.480E-04

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

[illegible]

GroundSolve Ltd

2182-Brymbo Blast Road
TP02-Test 2
 21/01/19



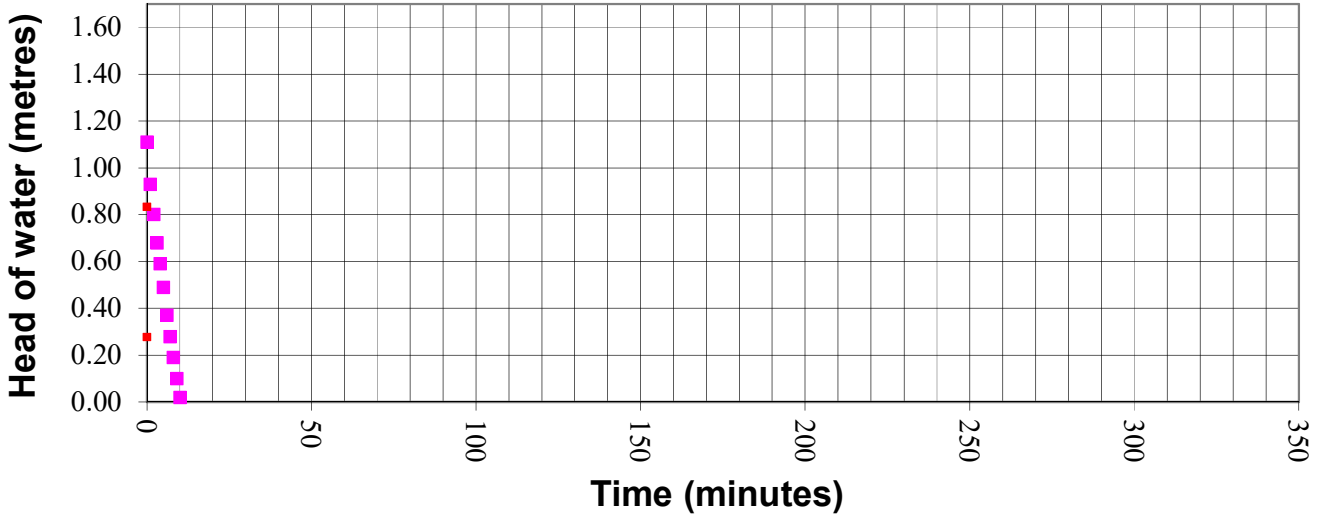
Depth	Length	Width	Head at 75% Vol	Head at 25% Vol	Water depth(t=0)	Effective Area	Vp75-Vp25	Adjustment Factor *	t75	t25	Infiltration
(m)	(m)	(m)	(m)	(m)	(m)	Ap50 m2	Volume of water m3		(mins)	(mins)	rate m/s
2.00	1.90	0.60	0.773	0.26	1.03	3.715	0.587	1.00	3	9	4.390E-04

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

[illegible]

GroundSolve Ltd

2182-Brymbo Blast Road
TP02 Test 3
 21/01/19



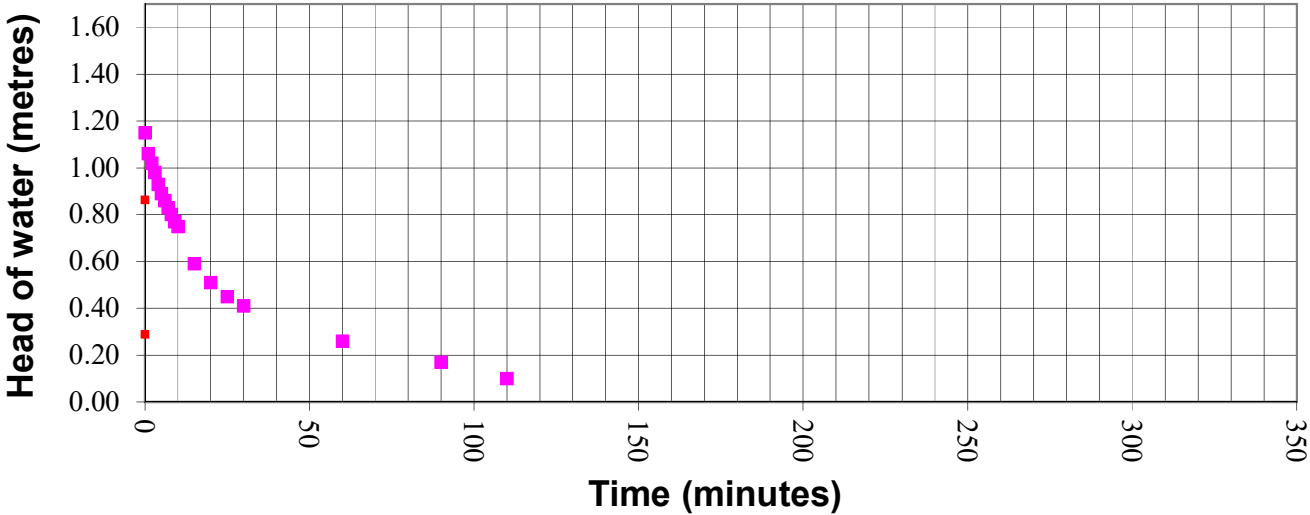
Depth	Length	Width	Head at 75% Vol	Head at 25% Vol	Water depth(t=0)	Effective Area	Vp75-Vp25	Adjustment Factor *	t75	t25	Infiltration
(m)	(m)	(m)	(m)	(m)	(m)	Ap50 m2	Volume of water m3		(mins)	(mins)	rate m/s
2.10	1.90	0.60	0.833	0.28	1.11	3.915	0.633	1.00	2	7	5.387E-04

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

[illegible]

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2182-Brymbo Blast Road
TP03 Test 1
 21/01/19



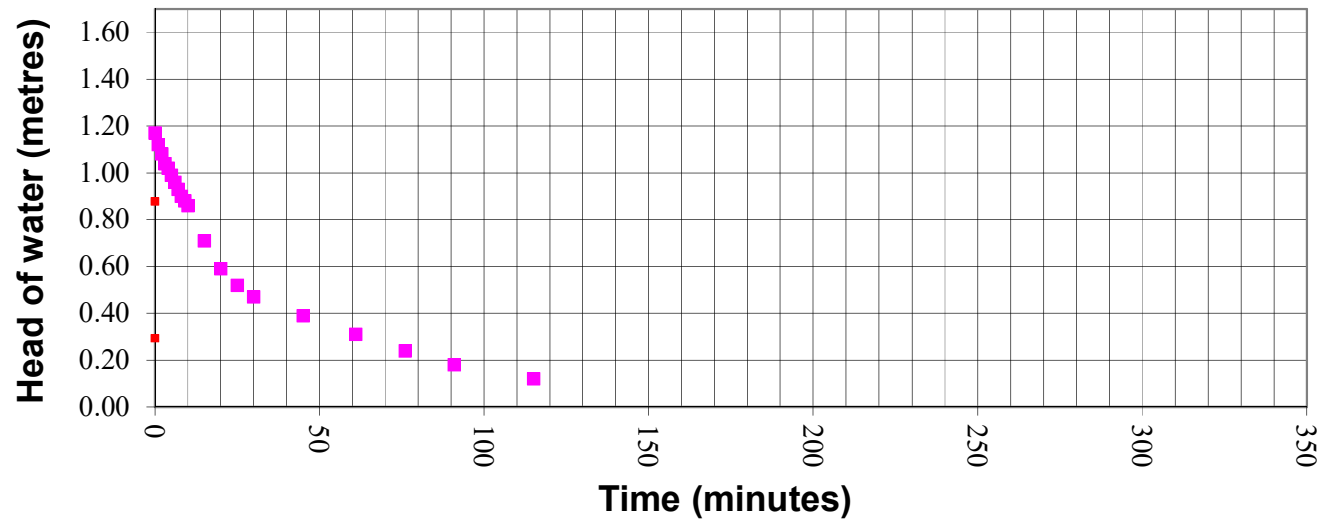
Depth	Length	Width	Head at 75% Vol	Head at 25% Vol	Water depth(t=0)	Effective Area	Vp75-Vp25	Adjustment Factor *	t75	t25	Infiltration
(m)	(m)	(m)	(m)	(m)	(m)	Ap50 m2	Volume of water m3		(mins)	(mins)	rate m/s
2.75	2.15	0.60	0.863	0.29	1.15	4.453	0.742	1.00	6	58	5.339E-05

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

Time (Mins)	Depth of Water	Head of Water
0	1.58	1.17
1	1.63	1.12
2	1.67	1.08
3	1.71	1.04
4	1.73	1.02
5	1.76	0.99
6	1.79	0.96
7	1.82	0.93
8	1.85	0.90
9	1.87	0.88
10	1.89	0.86
15	2.04	0.71
20	2.16	0.59
25	2.23	0.52
30	2.28	0.47
45	2.36	0.39
61	2.44	0.31
76	2.51	0.24
91	2.57	0.18
115	2.63	0.12

GroundSolve Ltd

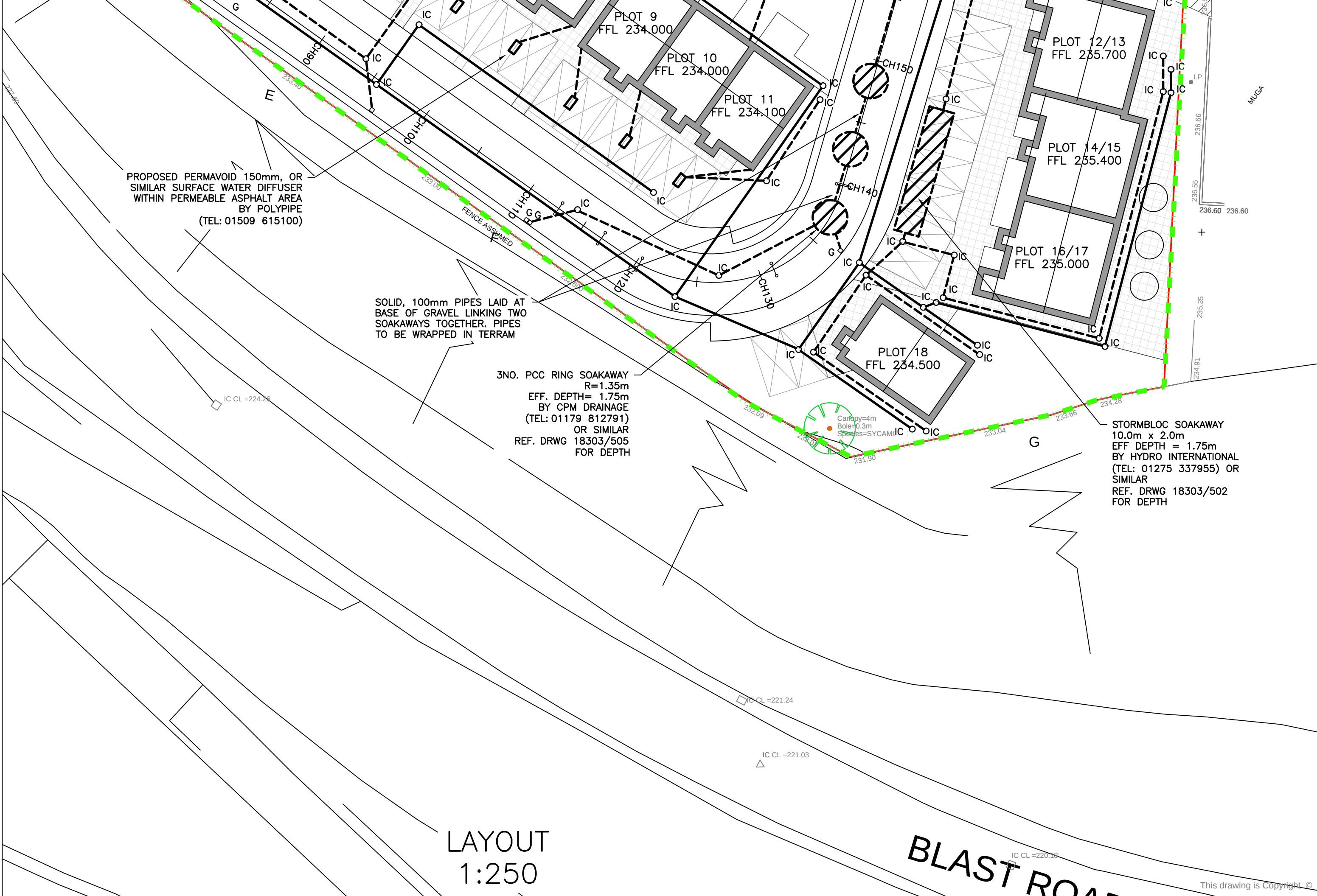
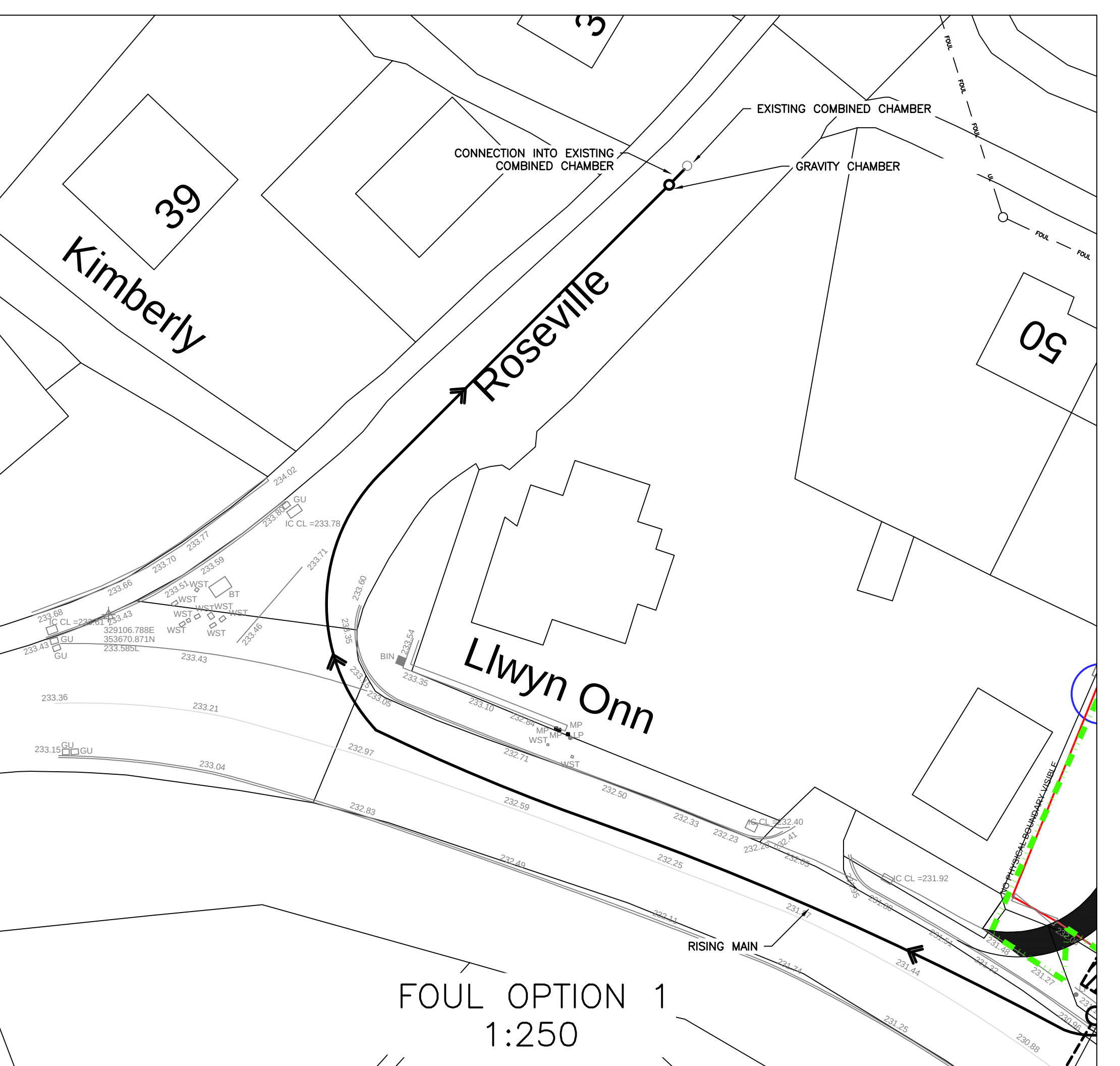
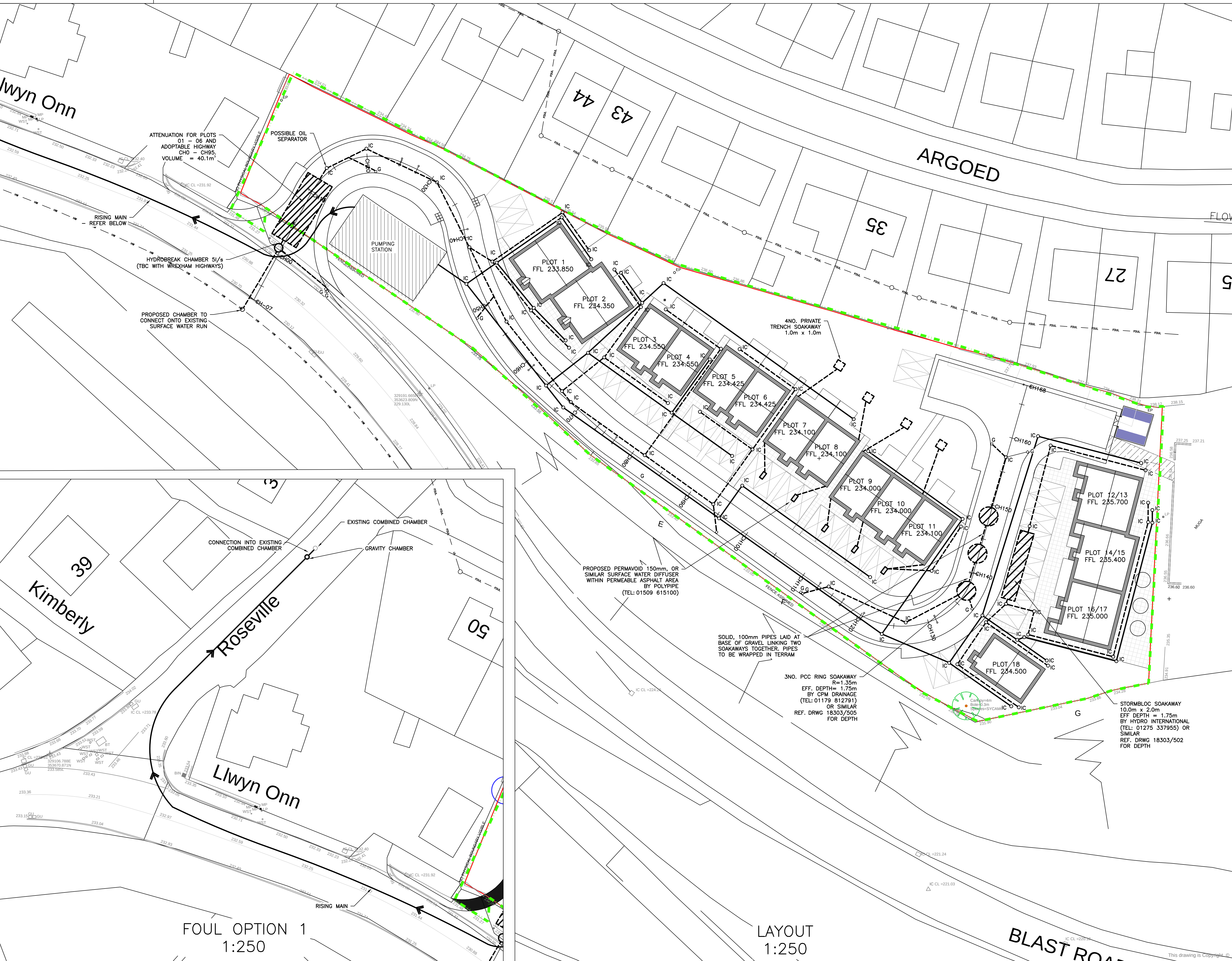
2182-Brymbo Blast Road
TP03 Test 2
21/01/19



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
2.75	2.15	0.60	0.878	0.29	1.17	4.508	0.755	1.00	9	63	5.167E-05

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

APPENDIX C – SURFACE WATER AND FOUL DRAINAGE GENERAL ARRANGEMENT



NOTES

- THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECT'S, ENGINEER'S AND OTHER SPECIALISTS' DRAWINGS.
- PLEASE REFER TO ARCHITECTS DRAWINGS FOR FINAL BUILDING LOCATION
- REFER TO DATRYS DRAWING 18303/502 - 505 FOR DRAINAGE DETAILS.
- ALL DRAINAGE COMPONENTS ARE TO COMPLY WITH CURRENT BRITISH STANDARDS & BUILDING REGULATIONS REQUIREMENTS
- AT ALL OUTFALL POINTS TO AN EXISTING NETWORK, THE POSITION AND INVERT LEVEL OF EXISTING DRAINS MUST BE CONFIRMED WELL IN ADVANCE OF THE PROGRAMMED DATE FOR INSTALLING ANY OF THE UPSTREAM DRAINAGE, OR ORDERING ANY MATERIALS IN ORDER TO ALLOW TIME FOR ANY NECESSARY REVISIONS TO THE HYDRAULIC DESIGN.
- ALL GRAVITY PVC-U PIPEWORK TO BE TO BS 4660:2000 OR BS EN 1401-1:2009 WHERE RELEVANT UNLESS NOTED OTHERWISE
- FINAL LOCATIONS AND DETAILS OF SOIL VENT PIPE, STUB STACKS, RAINWATER DOWN PIPES, GULLYS etc. TO BE CONFIRMED BY REFERENCE TO ARCHITECTS' DRAWINGS
- ALL PIPES INTO MH's TO BE SOFFIT TO SOFFIT LVL U.N.O.
- ALL NON ADOPTABLE DOMESTIC FOUL AND SURFACE WATER PIPE RUNS SHALL CONSIST OF 100mm Ø PIPES LAID AT A MINIMUM FALL OF 1 IN 80 U.N.O
- ALL CONNECTIONS FROM HIGHWAY GULLIES TO BE 150mmØ LAID AT FALLS OF BETWEEN 1:20 & 1:100 WITH TYPE S BED & SURROUND TO ALL CONNECTIONS WHERE MIN 1.2m COVER IS ACHIEVED. TYPE Z' BED & SURROUND TO ALL OTHER CONNECTIONS.
- COVER LEVELS ARE APPROXIMATE AND SHOULD MATCH PROPOSED SURROUNDING LEVELS. CONTRACTOR TO USE OFFICIAL TBM'S FOR SETTING OUT.

KEY

- SITE BOUNDARY
- FOUL --- EXISTING FOUL DRAINAGE
- IC --- PROPOSED FOUL CHAMBER AND PIPE RUN
- IC --- PROPOSED SURFACE WATER CHAMBER AND PIPE RUN
- PROPOSED RISING MAIN
- HW --- EXISTING HIGHWAY DRAIN

A	08.05.19	REMOVED CONNECTION OPTION TO NO.44 ARGOED	TD	AC	AC
REV	DATE	DESCRIPTION	BY	CHK	APP

REVISIONS

STATUS

CLIENT

PROJECT

TITLE

St Andrews Business Centre
Queens Lane
Mold
Flintshire
CH7 1XB
01352 786005
info@datrys.coop
www.datrys.net

Telephone
E-mail
Internet

DRAWN	TD	CHECKED	AC	PASSED	AC
DATE	26.04.19	CLIENT'S REF.			
SCALE AT A1	1:250	AUTOCAD REF.	18303-501		
18303/501				REVISION A	

APPENDIX D – GREENFIELD RUN-OFF CALCULATIONS



CALCULATION SHEET

Project Blast Road, Brymbo
 Project No 18303
 Sheet No 1
 Description Existing flow rates

STORAGE VOLUME 2 Year Return Period

Return Period 2 years
 M5-60min 17 mm
 r 0.3

Permissible outflow unrestricted

EXISTING
 Volumetric run-off coefficient soft roads roofs
 0.35 0.75 1
 Permeable area 4857 sqm
 Road & fpath 0 sqm
 Roofs and Hardstanding 0 sqm

TOTAL EFFECTIVE AREA 1699.95 sqm

Duration min	Z1	M5-D mm	Z2	M100-D mm	Total Vol cu m	Qmax l/s
5	0.34	5.78	0.79	4.57	7.76	25.87
10	0.50	8.42	0.79	6.65	11.30	18.84
15	0.59	10.03	0.79	7.92	13.47	14.97
30	0.78	13.26	0.80	10.56	17.95	9.97
60	1.00	17.00	0.80	13.67	23.23	6.45
120	1.24	21.08	0.81	17.12	29.10	4.04
240	1.55	26.35	0.82	21.68	36.85	2.56
360	1.80	30.60	0.83	25.34	43.08	1.99
600	2.13	36.21	0.84	30.28	51.47	1.43
1440	2.79	47.43	0.85	40.19	68.33	0.79
2880	3.50	59.50	0.86	51.03	86.74	0.50



CALCULATION SHEET

Project Blast Road, Brymbo
 Project No 18303
 Sheet No 2
 Description Existing flow rates

STORAGE VOLUME 30 Year Return Period

10% Climate Change Allowance

Return Period 30 years
 M5-60min 17 mm
 M5-60min 18.7 mm
 r 0.3

Permissible outflow unrestricted

EXISTING
 Volumetric run-off coefficient soft roads roofs
 0.35 0.75 1
 Permeable area 4857 sqm
 Road & fpath 0 sqm
 Roofs and Hardstanding 0 sqm

TOTAL EFFECTIVE AREA 1699.95 sqm

Duration min	Z1	M5-D mm	Z2	M100-D mm	Total Vol cu m	Qmax l/s
5	0.34	6.36	1.44	9.16	15.56	51.88
10	0.50	9.26	1.48	13.70	23.29	38.81
15	0.59	11.03	1.50	16.55	28.13	31.26
30	0.78	14.59	1.52	22.17	37.69	20.94
60	1.00	18.70	1.54	28.80	48.96	13.60
120	1.24	23.19	1.54	35.71	60.70	8.43
240	1.55	28.99	1.52	44.06	74.90	5.20
360	1.80	33.66	1.50	50.49	85.83	3.97
600	2.13	39.83	1.47	58.55	99.53	2.76
1440	2.79	52.17	1.41	73.56	125.06	1.45
2880	3.50	65.45	1.37	89.67	152.43	0.88



CALCULATION SHEET

Project Blast Road, Brymbo
 Project No 18303
 Sheet No 3
 Description Existing flow rates

STORAGE VOLUME 100 Year Return Period

30% Climate Change Allowance

Return Period	100	years
M5-60min	17	mm
M5-60min	22.1	mm
r	0.3	

Permissible outflow unrestricted

EXISTING	soft	roads	roofs
Volumetric run-off coefficient	0.35	0.75	1
Permeable area	4857 sqm		
Road & fpath	0 sqm		
Roofs and Hardstanding	0 sqm		

TOTAL EFFECTIVE AREA 1699.95 sqm

Duration min	Z1	M5-D mm	Z2	M100-D mm	Total Vol cu m	Qmax l/s
5	0.34	7.51	1.85	13.90	23.63	78.77
10	0.495	10.94	1.93	21.11	35.89	59.82
15	0.59	13.04	1.96	25.56	43.44	48.27
30	0.78	17.24	2.01	34.65	58.90	32.72
60	1	22.10	2.02	44.64	75.89	21.08
120	1.24	27.40	1.99	54.53	92.71	12.88
240	1.55	34.26	1.94	66.45	112.97	7.85
360	1.8	39.78	1.89	75.18	127.81	5.92
600	2.13	47.07	1.83	86.14	146.44	4.07
1440	2.79	61.66	1.73	106.67	181.33	2.10
2880	3.5	77.35	1.63	126.08	214.33	1.24

APPENDIX E – SURFACE WATER DESIGN CALCULATIONS



CALCULATION SHEET

Project Blast Road, Brymbo
 Project No 18303
 Sheet No 1
 Description Attenuation

STORAGE VOLUME 30 Year Return Period

30% Climate Change Allowance

Return Period	30	years
M5-60min	17	mm
M5-60min	22.1	mm
r	0.3	

Permissible outflow 5 l/s

PROPOSED NEW DEVELOPMENT

	soft	roads	roofs
Volumetric run-off coefficient	0.35	0.75	1
Permeable area	141 sqm		
Road & fpath	748 sqm		
Roofs and Hardstanding	690 sqm		

TOTAL EFFECTIVE AREA 1300.35 sqm

Duration min	Z1	M5-D mm	Z2	M100-D mm	Total Vol cu m	Total out cu m	Storage cu m
5	0.375	8.29	1.44	11.93	15.52	1.50	14.02
10	0.53	11.71	1.48	17.34	22.54	3.00	19.54
15	0.62	13.70	1.50	20.55	26.73	4.50	22.23
30	0.78	17.24	1.52	26.20	34.07	9.00	25.07
60	1	22.10	1.54	34.03	44.26	18.00	26.26
120	1.2	26.52	1.54	40.84	53.11	36.00	17.11
240	1.44	31.82	1.52	48.37	62.90	72.00	-9.10
360	1.6	35.36	1.50	53.04	68.97	108.00	-39.03
600	1.81	40.00	1.47	58.80	76.46	180.00	-103.54
1440	2.25	49.73	1.41	70.11	91.17	432.00	-340.83
2880	2.73	60.33	1.37	82.66	107.48	864.00	-756.52



CALCULATION SHEET

Project Blast Road, Brymbo
 Project No 18303
 Sheet No 2
 Description Attenuation

STORAGE VOLUME 100 Year Return Period

30% Climate Change Allowance

Return Period	100	years
M5-60min	17	mm
M5-60min	22.1	mm
r	0.3	

Permissible outflow 5 l/s

PROPOSED NEW DEVELOPMENT

	soft	roads	roofs
Volumetric run-off coefficient	0.35	0.75	1
Permeable area	141 sqm		
Road & fpath	748 sqm		
Roofs and Hardstanding	690 sqm		

TOTAL EFFECTIVE AREA 1300.35 sqm

Duration min	Z1	M5-D mm	Z2	M100-D mm	Total Vol cu m	Total out cu m	Storage cu m
5	0.34	7.51	1.85	13.90	18.08	1.50	16.58
10	0.495	10.94	1.93	21.06	27.38	3.00	24.38
15	0.59	13.04	1.96	25.54	33.21	4.50	28.71
30	0.78	17.24	2.01	34.61	45.01	9.00	36.01
60	1	22.10	2.02	44.68	58.10	18.00	40.10
120	1.24	27.40	1.99	54.56	70.94	36.00	34.94
240	1.55	34.26	1.94	66.31	86.23	72.00	14.23
360	1.8	39.78	1.89	75.25	97.86	108.00	-10.14
600	2.13	47.07	1.83	86.31	112.23	180.00	-67.77
1440	2.79	61.66	1.73	106.71	138.77	432.00	-293.23
2880	3.5	77.35	1.63	126.13	164.01	864.00	-699.99



AREAS	
	ROADS & FOOTWAY 748m ²
	ROOFS & HARDSTANDINGS 670m ²
	PERMEABLE 141m ²

REV	DATE	DESCRIPTION	BY	CHK	APP

STATUS	
--------	--



PROJECT	Proposed Development of 18 Dwellings on Land at Blast Road, Brymbo, LL11 5BB
---------	--

TITLE

Sketch showing
areas for attenuation calcs



DRAWN	TD	CHECKED	AC	PASSED	AC
DATE	13.03.19	CLIENT'S REF.			
SCALE AT A1	1:250	AUTOCAD REF.	18303-SK		

18303/SK	REVISION
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Soakaway calculations to BRE Digest 365

Calculation Sheet 01
 Project Blast Road, Brymbo
 Ref 18303
 Description Plot 7-10 Soakaway

1 in 100 year return period design

30% allowance for climate change	M5-60min	17	Volumetric Runoff Coefficient		
	M5-60min	22.1	Roofs and harstanding	1	152.0
	r	0.3	Roads + footways	0.75	0.0
			Permeable	0.35	225.0
Total Effective Area					230.75

Duration (min)	Z1	M5-D (mm)	Z2	M100-D (mm)	I (mm/hr)	Area (sq m)	Inflow (cu m)	Outflow (cu m)	Storage (cu m)
5.0	0.34	7.51	1.88	14.1	169.5	230.8	3.3	1.6	1.68
10.0	0.495	10.94	1.96	21.4	128.6	230.8	4.9	3.2	1.79
15.0	0.59	13.04	1.99	25.9	103.8	230.8	6.0	4.7	1.25
30.0	0.78	17.24	2.03	35.0	70.0	230.8	8.1	9.5	-1.41
60.0	1	22.10	2.00	44.2	44.2	230.8	10.2	19.0	-8.77
120.0	1.24	27.40	1.95	53.4	26.7	230.8	12.3	37.9	-25.60
240.0	1.55	34.26	1.89	64.7	16.2	230.8	14.9	75.9	-60.92
360.0	1.8	39.78	1.84	73.2	12.2	230.8	16.9	113.8	-96.90
600.0	2.13	47.07	1.77	83.3	8.3	230.8	19.2	189.6	-170.42
1440.0	2.79	61.66	1.66	102.4	4.3	230.8	23.6	455.2	-431.54
2880.0	3.5	77.35	1.58	122.2	2.5	230.8	28.2	910.3	-882.11

Percolation factor (m/s) 4.39E-04

Trench: Outflow and storage based on:

No of trenches	(nr)	4.0
Length of soakaway	(m)	1.0
Width of soakaway	(m)	1.0
Effective depth	(m)	1.5
Eff Area of soakaways at 50%	(sq m)	12.0
Storage per soakaway	(cu m)	0.45
Total Storage provided	(cu m)	1.80

Base not included in calc



AREAS

ROOFS & HARDSTANDING
152m²

PERMEABLE
225m²

REV	DATE	DESCRIPTION	BY	CHK	APP
REVISIONS					
STATUS					
CLIENT					
					
PROJECT					
Proposed Development of 18 Dwellings on Land at Blast Road, Brymbo, LL11 5BB					
TITLE					
Sketch showing areas for soakaway to plots 7-10					
 St Andrews Business Centre Queens Lane Mold Flintshire CH7 1XB 01352 798305 info@datrys.coop www.datrys.net Telephone E-mail Internet					
DRAWN	TD	CHECKED	AC	PASSED	AC
DATE	13.03.19	CLIENT'S REF.			
SCALE AT A1	1:250	AUTOCAD REF.	18303-SK		
18303/SK					REVISION



Soakaway calculations to BRE Digest 365

Calculation Sheet 01

1 in 100 year return period design

Project Blast Road, Brymbo

Ref 18303

Description Plot 12 - 18 Soakaway

30% allowance for climate change

M5-60min 20
M5-60min 26
r 0.3

Volumetric Runoff Coefficient
Roofs + harstanding 1 519
Roads + footway 0.75 0
Permeable 0.35 262
Total Effective Area 610.7

Duration (min)	Z1	M5-D (mm)	Z2	M100-D (mm)	I (mm/hr)	Area (sq m)	Inflow (cu m)	Outflow (cu m)	Storage (cu m)
5.0	0.34	8.84	1.88	16.6	199.4	610.7	10.1	0.3	9.82
10.0	0.495	12.87	1.96	25.2	151.4	610.7	15.4	0.7	14.75
15.0	0.59	15.34	1.99	30.5	122.1	610.7	18.6	1.0	17.67
30.0	0.78	20.28	2.03	41.2	82.3	610.7	25.1	2.0	23.19
60.0	1	26.00	2.00	52.0	52.0	610.7	31.8	3.9	27.85
120.0	1.24	32.24	1.95	62.9	31.4	610.7	38.4	7.8	30.58
240.0	1.55	40.30	1.89	76.2	19.0	610.7	46.5	15.6	30.89
360.0	1.8	46.80	1.84	86.1	14.4	610.7	52.6	23.4	29.15
600.0	2.13	55.38	1.77	98.0	9.8	610.7	59.9	39.1	20.80
1440.0	2.79	72.54	1.66	120.4	5.0	610.7	73.5	93.8	-20.21
2880.0	3.5	91.00	1.58	143.8	3.0	610.7	87.8	187.5	-99.69

Percolation factor (m/s) 5.17E-05

Cellular Storage: Outflow and storage based on:

Length of soakaway (m) 10.0
Width of soakaway (m) 2.0
Effective depth (m) 1.75

Eff Area of soakaways at 50% (sq m) 21.0

Storage per soakaway (cu m) 33.25

Base not included for calc



AREAS

	ROOFS & HARDSTANDING 519m ²
	PERMEABLE 262m ²

REV	DATE	DESCRIPTION						BY	CHK	APP
REVISIONS										
STATUS										
CLIENT										
										
PROJECT										
Proposed Development of 18 Dwellings on Land at Blast Road, Brymbo, LL11 5BB										
TITLE										
Sketch showing areas for soakaway to plots 12-18										
 St Andrews Business Centre Queens Lane Mold Flanthorpe CST 13D 01352 796205 info@datrys.com www.datrys.net Telephone E-mail Internet										
DRAWN	TD	CHECKED	AC	PASSED	AC					
DATE 13.03.19		CLIENT'S REF.								
SCALE AT A1 1:250		AUTOCAD REF.		18303-SK						
18303/SK								REVISION		



Soakaway calculations to BRE Digest 365

Calculation Sheet

01

1 in 100 year return period design

Project Blast Road, Brymbo

Ref 18303

Description Highways Ch95 onwards - PCC Chambers

30% allowance for climate change

M5-60min 20
M5-60min 26
r 0.3

Volumetric Runoff Coefficient
Roofs + harstanding 1 0
Roads + footway 0.75 728
Permeable 0.35 0
Total Effective Area 546

Duration (min)	Z1	M5-D (mm)	Z2	M100-D (mm)	I (mm/hr)	Area (sq m)	Inflow (cu m)	Outflow (cu m)	Storage (cu m)
5.0	0.34	8.84	1.88	16.6	199.4	546.0	9.1	0.3	8.73
10.0	0.495	12.87	1.96	25.2	151.4	546.0	13.8	0.7	13.08
15.0	0.59	15.34	1.99	30.5	122.1	546.0	16.7	1.0	15.63
30.0	0.78	20.28	2.03	41.2	82.3	546.0	22.5	2.1	20.41
60.0	1	26.00	2.00	52.0	52.0	546.0	28.4	4.1	24.25
120.0	1.24	32.24	1.95	62.9	31.4	546.0	34.3	8.3	26.05
240.0	1.55	40.30	1.89	76.2	19.0	546.0	41.6	16.6	25.03
360.0	1.8	46.80	1.84	86.1	14.4	546.0	47.0	24.8	22.18
600.0	2.13	55.38	1.77	98.0	9.8	546.0	53.5	41.4	12.12
1440.0	2.79	72.54	1.66	120.4	5.0	546.0	65.7	99.4	-33.60
2880.0	3.5	91.00	1.58	143.8	3.0	546.0	78.5	198.7	-120.20

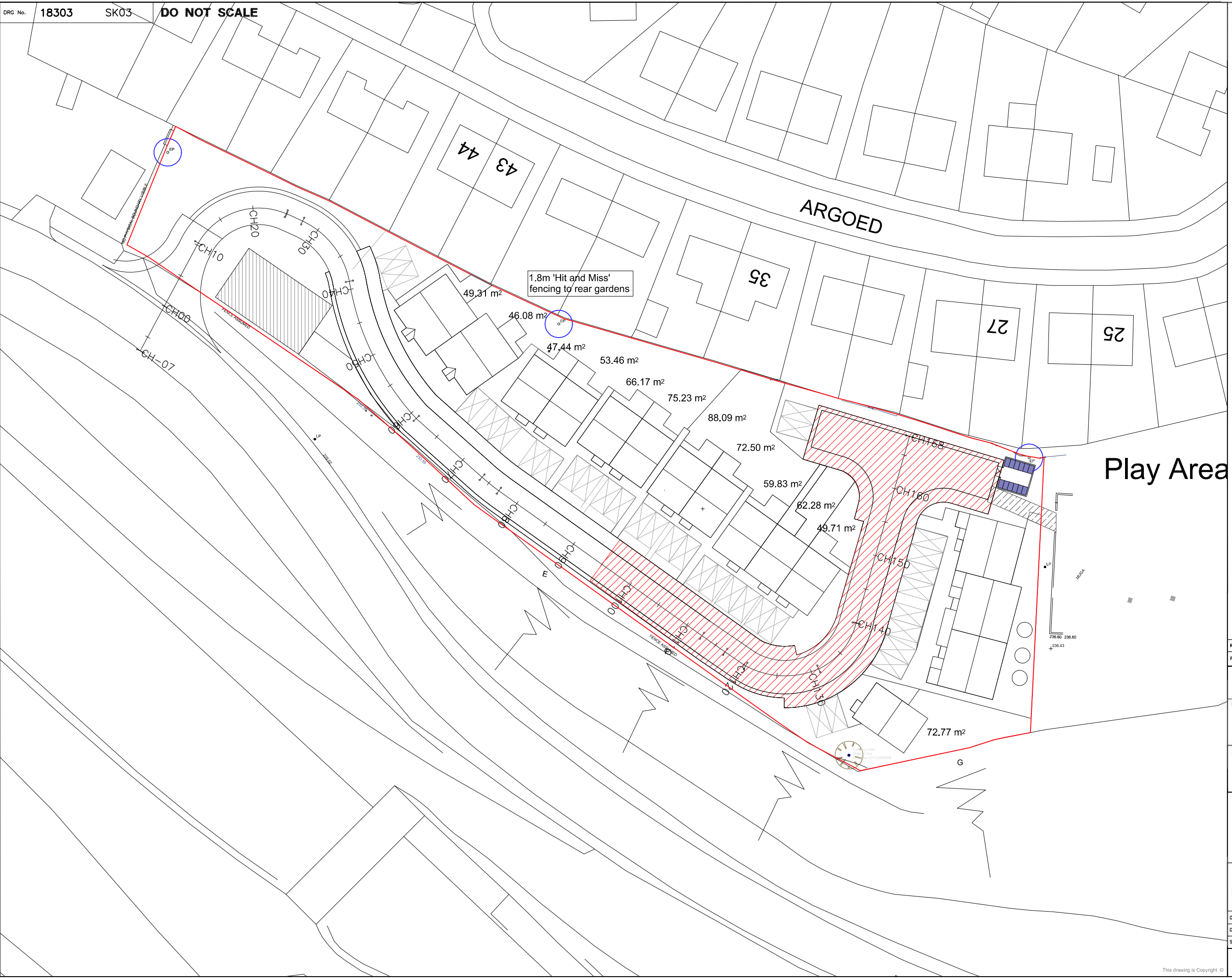
Percolation factor (m/s) 5.17E-05

PCC outflow and storage based on:

No. of chambers (nr)	3.00
Radius (m)	1.35
Effective depth (m)	1.75
Eff Area of soakaways at 50% (sq m)	22.25
Storage per soakaway (cu m)	10.01
Total Storage (cu m)	30.04

Base not included in calcs

Actual chamber depth
2.45 m



REV	DATE	DESCRIPTION	BY	CHK	APP
REVISIONS					

STATUS

CLIENT



PROJECT
Proposed Development of
18 Dwellings on Land at
Blast Road, Brymbo, LL11 5BB

TITLE
Sketch showing
areas for soakaway to
CH95 onwards of carriageway

DATRYS

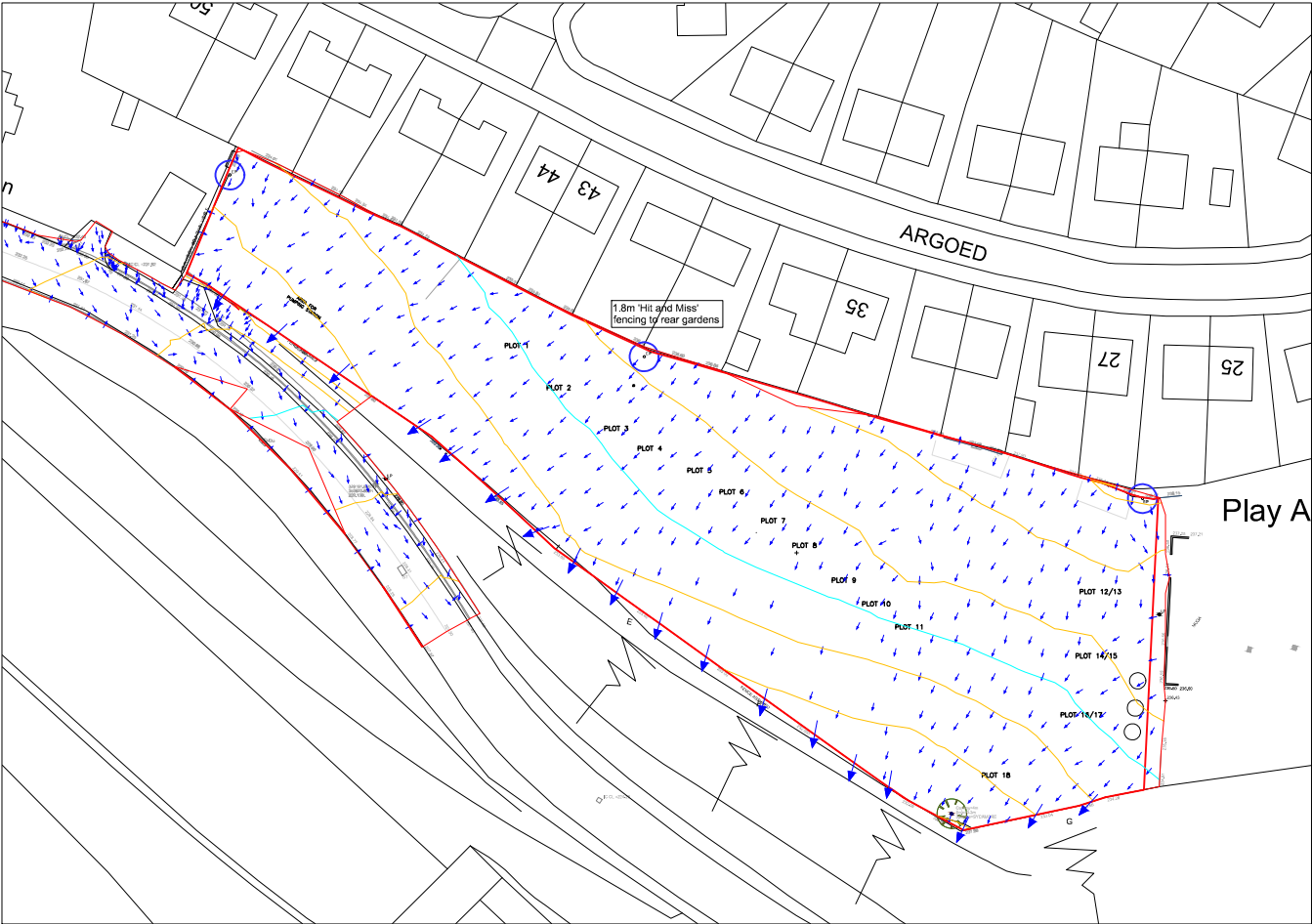
St Andrews Business Centre
Queens Lane
Rhyd
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01352 786505
info@datrys.coop
www.datrys.net

Telephone
E-mail
Internet

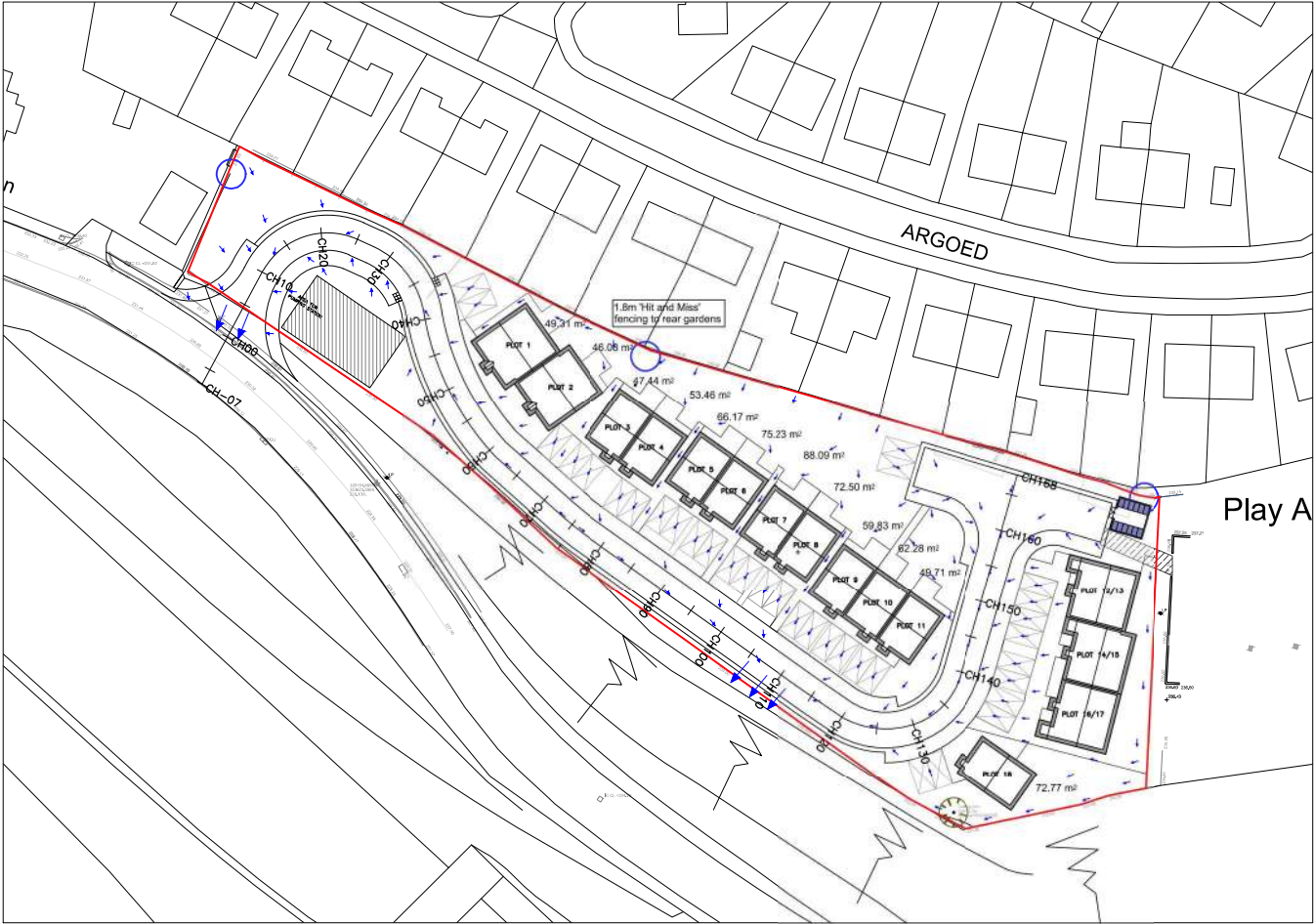
DRAWN	TD	CHECKED	AC	PASSED	AC
DATE	13.03.19	CLIENT'S REF.			
SCALE AT A1	1:250	AUTOCAD REF.	18303-SK	REVISION	

18303/SK

APPENDIX F – FLOOD ROUTING



EXISTING SITE FLOOD ROUTES
1:500



PROPOSED SITE FLOOD ROUTES
1:500



- KEY
- SITE BOUNDARY
 - EXISTING FLOOD ROUTING
 - FLOOD ROUTING
 - EXTREME FLOOD ROUTING OFF-SITE

REV	DATE	DESCRIPTION	BY	CHK	APP
REVISIONS					
STATUS					
PLANNING					
CLIENT					
BRENIG CONSTRUCTION					
PROJECT					
Proposed Development of 18 Dwellings on Land at Blast Road, Brymbo, LL11 5BB					
TITLE					
Existing and Proposed Flood routes					
DRAWN					
TD					
CHECKED					
AC					
PASSED					
AC					
DATE					
26.04.19					
CLIENT'S REF.					
SCALE AT A1					
A.S.					
AUTOCAD REF.					
18303-510					
REVISION					
18303/510					

APPENDIX G – FOUL DRAINAGE DESIGN CALCULATIONS



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☒ Mold: 01352 706205

CALCULATIONS

Job No. 18303

Sheet No.
1

Rev

Project: DEVELOPMENT AT BLAST ROAD, BRYMBO

Subject

FOUL CALCULATIONS

Prepared By

TD

Date

Checked By

Date

THE PROPOSAL INVOLVES THE FOLLOWING:
CONSTRUCTION OF 18 UNIT HOUSING DEVELOPMENT COMPRISING OF:
2NO. 2-BED BUNGALOWS;
6NO. 1-BED FLATS;
6NO. 2-BED SEMI-DETACHED DWELLINGS;
3NO. 2-BED TERRACED DWELLINGS; AND
1NO. 3-BED DETACHED DWELLING

THE FOLLOWING DESIGN CALCULATIONS APPLY TO DOMESTIC FOUL DISCHARGE ONLY

CALCULATIONS ARE COMPILED IN ACCORDANCE WITH BS EN 12056 PART 2 AND ASSUME THAT THE PROPERTY WILL CONTAIN THE FOLLOWING:

26 x TOILET	26 x 1.7 = 44.2
26 x SINK	26 x 0.3 = 7.8
26 x SHOWER	26 x 1.3 = 33.8
18 x KITCHEN SINK	18 x 1.3 = 23.4
18 x DISHWASHER	18 x 0.2 = 3.6
18 x WASHING MACHINE	18 x 0.6 = 10.8
	123.6l/s

THEREFORE TOTAL DISCHARGE UNITS (DU) = 123.6l/s

WASTEWATER FLOWRATER (Q_{ww})

$$Q_{ww} = k\sqrt{\Sigma DU}$$
$$= 0.5\sqrt{123.6}$$

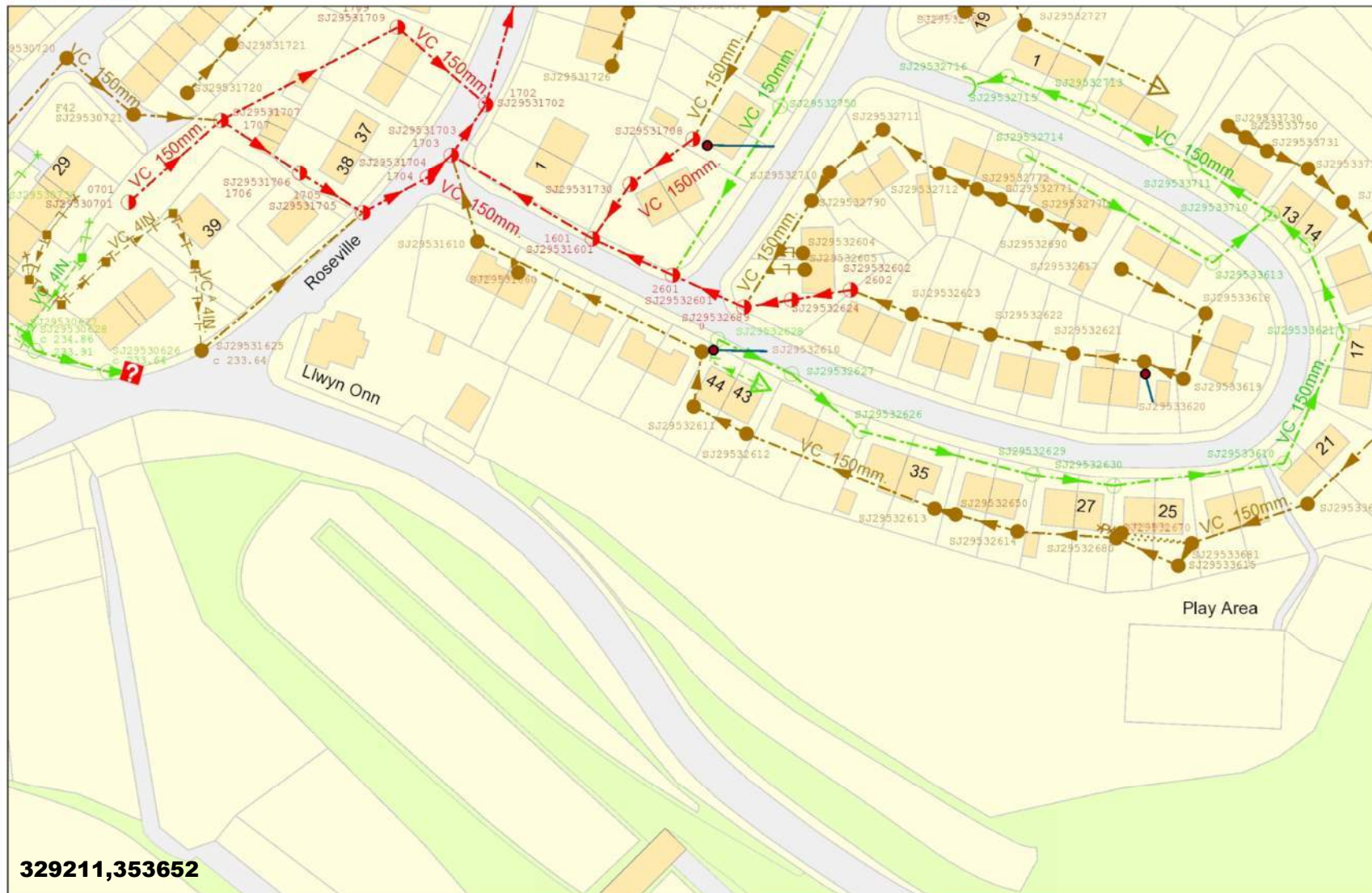
$$Q_{ww} = \underline{5.6l/s}$$

$$k = 0.5 \text{ (INTERMITTENT USE)}$$
$$DU = 123.6$$

APPENDIX H – WELSH WATER UTILITY MAPS



Scale: 1: 1250



329211,353652

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 and any onus of locating the apparatus before carrying out any excavations rests entirely on you. The information which is supplied hereby by the company, is done so in accordance with statutory requirements of sections 198 and 199 of the water industry Act 1991 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 drain sewer or disposal main 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.

**EXACT LOCATION OF
ALL APPARATUS TO
BE DETERMINED ON
SITE**

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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.

