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ALDI DEVELOPMENT STRAIGHT MILE LLAY

Drainage Strategy Report

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S2: Suitable for Information

Version: P3

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REVISION HISTORY

VERSION	DATE	SUITABILITY	REVISIONS
P1	08/05/19	S2: Suitable for Information	Issued For Information
P2	28/05/19	S2: Suitable for Information	Report title amended to suit planning team
P3	09/07/19	S2: Suitable for Information	Proposed site plan drawing updated

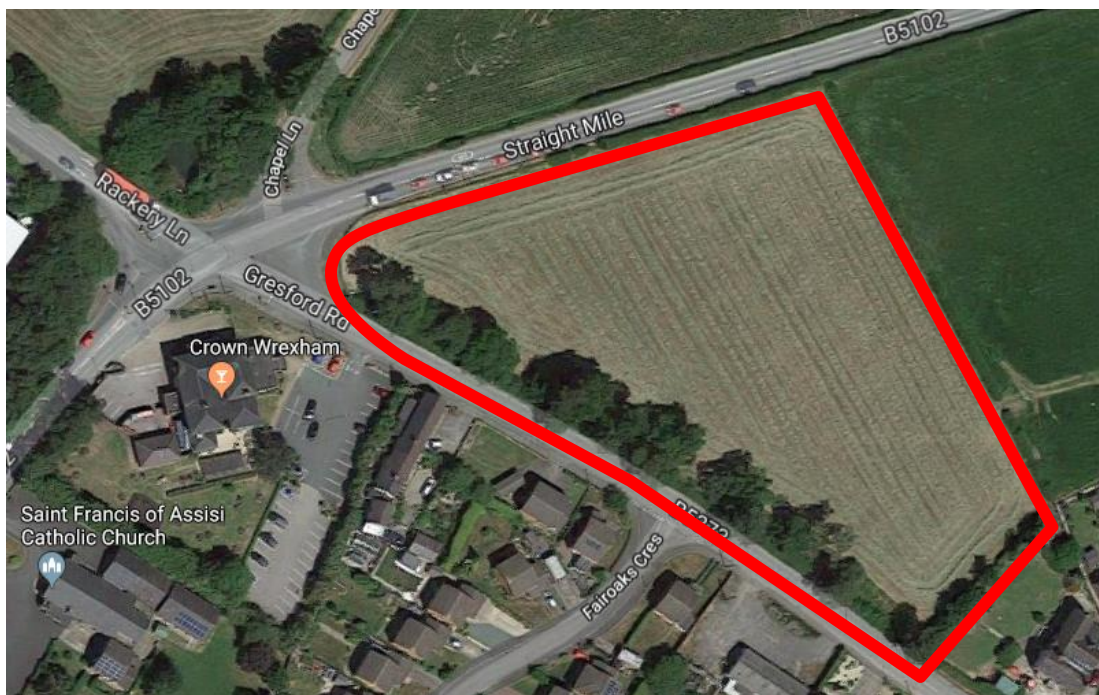
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1. Development Details

The proposed development is to be built on an undeveloped plot of land on the junction of the B5102 (Straight Mile) and the B5373 (Gresford Road).

The site is part of a wider development which includes residential housing. The proposed housing development already has planning permission. The site is indicated on the Google Map extract below.



The proposed plan for the site is shown below:



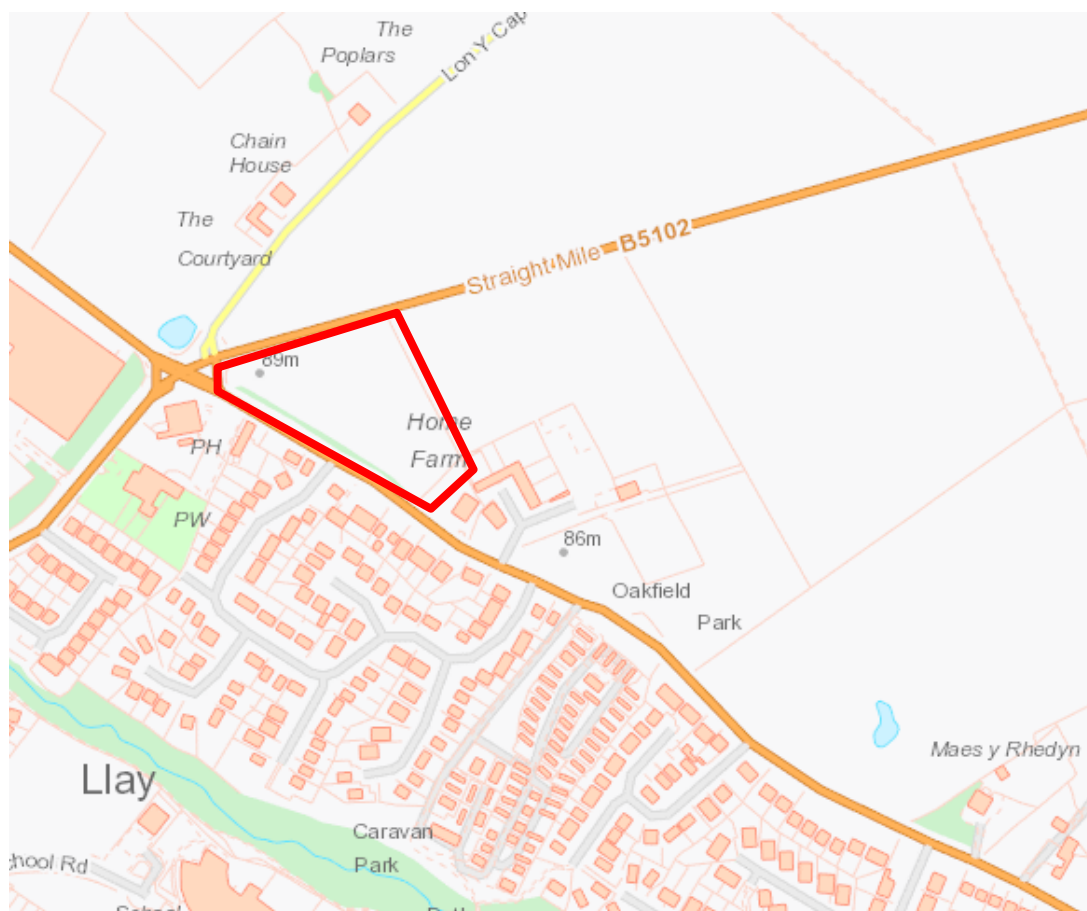
This drainage philosophy document covers the proposals for retail element of the scheme given the housing development has already been granted planning consent.

2. Flood Zone Classification

The Natural Resources Wales maps have been consulted as part of the Flood Consequences Assessment undertaken by WaterCo. This shows that the proposed site is within Flood Zone A and therefore has little or no risk of fluvial or tidal/ coastal flooding.

The FCA has also confirmed that the site:

- has a low risk of flooding from groundwater
- is not affected by canals
- lies outside the zone of influence from reservoir flooding.
- has not suffered from historical flooding



The consequences of the flood zone classification are discussed within the FCA document and it is suggested that this report is read alongside the WaterCo document but, for ease of reference the flood zone map is reproduced above from the Natural Resources Wales development advice maps.

3. Climate Change Allowance

The current guidance indicates that the change in the UK climate could result in significant changes to storm profiles and intensities and therefore an allowance should be made for this within the designs.

The latest industry guidance suggests that a 20% increase for climate change should be allowed for the 100 year storm event and this will be applied to the site.

In addition, the requirements of the Building Regulations will be met in that no surface flooding will be accepted for the 1 in 30 year storm event and no surface water shall escape the site boundary for the 100 year event.

4. Discussion on SuDS measures

Under the Welsh Government requirements the development will be subject to a separate SAB application to Wrexham Council to agree the proposed drainage scheme. This will aim to adhere to the principles of sustainable drainage systems as outlined in the statutory guidance document.

Each particular section of the standard is discussed below which will give the basis of the surface water design to be adopted on the site.

5. Standard S1 - Surface water runoff destination

The priority for any scheme should be for collecting and re-using surface water by way of grey water harvesting, typically for use in toilets where non-potable water can be used. However, given the limited demand for grey water within an Aldi store it is not anticipated that rainwater harvesting will be financially viable for the scheme and therefore rainwater harvesting will not be considered.

Within this standard there is a hierarchical approach to the discharge of the surface water with the first consideration to be discharge via infiltration. The ground investigation report undertaken by REFA Consulting Engineers. is very clear that the use of soakaway systems are not viable due to the impermeable nature of deposits at shallow ground and where more granular areas were encountered these showed little continuity to allow dissipation of the surface water.

5.11 SUDS

5.11.1 Assessment of the ground conditions present within this site in terms of sustainable urban drainage suggests that the majority of the site is effectively impermeable natural deposits at shallow depth will not allow the dissipation of surface water within the site area. Even where granular deposits are more prominent within the eastern half of the site there appears to be no lateral continuity and therefore variable permeability rates are assumed.

It is our opinion based upon the results of these investigations that the ground conditions within this site are not conducive to the adoption of a soakaway or other ground infiltration system of drainage for surface water disposal.

Whilst Aldi Stores have no reliance on this particular report and have commissioned their own investigation, given the factual nature of a ground investigation this advice is unlikely to change.

As a result of this recommendation the next level to consider should be discharge to a surface water body. This option would require the permissions of several land owners given the nearest water body is some 250m south west of the site, across Gresford Road and down through Fair Oaks Crescent. The alternative route would be along adopted highways, most likely Straight Mile.

It is therefore considered that this option is not viable given the distance and inappropriate access.

Level 4 of this section of the standard considers the discharge to a surface water sewer or highway drain.

The proposed site is to be sold to Aldi on the basis that the adjacent development has new sewers constructed and a 'tail' is provided to the site for discharge of the plot surface water. It is therefore the intention that this tail is used for the discharge of the surface water in accordance with the designs for the site.

6. Standard S2 - Surface water runoff hydraulic control

The discharge from the site is limited to 5.4l/s which has been agreed with the adjacent land developer (Anwyl Homes) and Dwr Cymru (Welsh Water) as part of a Section 104 agreement. Appendix A has the Section 104 drawing that shows the proposed points of connection. In order to achieve this limited discharge attenuation measures will be required to the site to control the flows.

It is anticipated that the site will utilise a number of control methods to reduce the flow:

1. Permeable macadam - to be used to the customer car park area with a clean stone sub-base acting as a reservoir. Land drainage will need to be installed to ensure flows are collected and not allowed to enter the clay-based ground.
2. Impermeable macadam - to be used to the main access road and service yard area where permeable macadam is not sufficiently robust for specification in this area. Conventional drainage will be required in this area that may be taken into the stone sub-base by perforated distribution pipes
3. Geo-cellular storage tanks - to be used in attenuating the flow from the roof

It may be necessary to introduce a flow control device, in the form of a HydroBrake (or similar) to ensure that the flows leaving site are no greater than 5.4l/s. Attenuation measures will then need to be sized to ensure that all storm events, up to and including the 100YR storm are contained within the site boundary.

As discussed in Section 3 of the report any flooding will be contained within the site for all storm event up to and including the 100 year event and a 20% increase in flows is to be made for climate change.

7. Standard S3 - Water Quality

The use of a permeable car park will allow the removal of an oil separator from the scheme with the introduction of an appropriate geo-textile within the car park build up. It is expected that the car park construction will be around 150mm of macadam (2 course construction) with 350mm of 4-20mm stone. This will have a Terram Imbitex membrane within the clean stone that naturally removes any oils that may be washed off the surface.

The collecting network of pipes, ensuring the lined car park can be effectively drained will utilise silt trap manholes with a 500mm deep trap to collect any silts that may wash into the system. It is not expected that this will be an issue but the use of the silt trap is a second form of protection.

The service yard area, together with the main access road, will be allowed to filter through stone sub-base, again through the Imbitex membrane to remove any oils that may be present. Given the area will be subject to conventional drainage it is expected that Aco channels or gullies used in these areas will have a silt trap to prevent silts entering the clean stone and reducing the storage capacity of the lined sub-base.

The roof water will be allowed to discharge straight into the drainage network without the need to pass through any filtration methods given the risks of contamination to this particular drained area.

8. Standard S4 - Amenity

There is no public open space associated with the development although a footpath is being developed through the site, along the boundary with Gresford Road and Straight Mile. This will be developed to drain into the soft landscaping that is adjacent the path and provide water to the trees that line the Gresford Road elevation.

The use of the site as a retail development, with customer parking and the store forming the majority of the site, preclude the use of swales and detention basins etc.

9. Standard S5 - Biodiversity

Given the lack of space to improve the biodiversity of the site. Landscaping is to be provided to the site but this will not form part of the surface water drainage scheme.

10. Standard S6 - Design of drainage for Construction, Operation, Maintenance and Structural Integrity

Section 14 of the report discusses the maintenance of the proposed system in more detail however it should be noted that the responsibility for the installed drainage systems on this site will remain with Aldi Stores Ltd. There is no intention for the drainage to be offered for adoption and it will therefore remain private.

The drainage will all be designed in accordance with the latest British Standards for drainage together with the advice contained within the Ciria SUDS Manual 2016 to ensure that the installed drainage is sufficient for use under HGV routes and car park areas.

11. Proposed Drainage Scheme

It has already been discussed in the preceding sections of this report that the car park area will be drainage on the basis of a lined, permeable car park, most likely using permeable macadam given the difficulties Aldi Stores have had using block paved car parks.

It is anticipated that the surface drainage on the service yard will be via ACO channels with silt traps to prevent the build-up of silt within the attenuation tank. It is expected that the ACO channel will be designed for the 100 year storm event to give additional storage within the drainage network when it comes to final design.

The roof area is to drain via conventional gravity fed rain water pipes on the rear elevation with the discharge being collected in oversized pipes or geo-cellular tanks at the rear of the site.

Any geo-cellular attenuation tanks that would be used are likely to be ESS Versavoid tanks which are capable of CCTV camera entry and jet/ vacuum cleaning via inspection points directly over the tanks.

Initial sizing of the attenuation tanks to deal with the roof water is contained within Appendix C at the end of this report.

A schematic drawing showing the proposed drainage for the development can be found in Appendix D at the rear of the report.

12. Foul Drainage

The Dwr Cymru sewer records have been consulted for the area, see Appendix B, and whilst these show foul sewers in the immediate vicinity of the site the proposed point of connection is via a new pipe to be constructed as part of the Section 104 agreement for the proposed residential development.

The nature of the effluent is domestic content with the proposed store having 3 WCs and associated wash hand basins and a small staff kitchen.

In addition to the typical waste water flows from the site there will also be a small amount of condensate drainage, taken into the foul network, that serve the chillers and freezers within the store.

13. Future Maintenance

Given the drainage installation is a gravity fed system the requirements for maintenance are similar to any typical installation.

It is recommended that any road gullies are cleared of silt build up on an annual basis to prevent the build-up of silts within the below ground drainage network. In addition, the roads should be swept of debris, particularly around the autumn months to reduce the ingress of leaf litter.

In a similar manner, the ACO channels to the service yard area should be cleared on an annual basis ensuring that the proprietary silt traps are cleaned as necessary.

The permeable macadam product requires the maintenance to be undertaken by a sweeper fitted with water jetting and vacuuming equipment. It is therefore recommended that the whole car park area is swept twice a year with particular emphasis with one clean in early autumn to prevent the degradation of leaf litter blocking the porous structure.

Land drainage and silt trap manholes associated with the lined car park are able to be cleaned via jetting units with the silt trap manholes to be cleared on a regular basis. It is expected that this can be on a bi-annual basis although this will need to be reviewed once the store is operational.

The storage tank, within the development, is likely to be specified as an ESS Versavoid tank. This product is capable of jet cleaning and vacuuming as with any conventional drainage pipe with access points either directly over the tank or at the upstream end. Immediately upstream of the soakaway storage tanks are silt trap manholes and these need to be emptied, at least annually, to prevent any silts entering the soakaway tanks.

The provision of a flow control device will mean an annual inspection of that manhole as the minimum requirement with an additional requirement to check the device after heavy storms to ensure that no blockage has been caused.

As with any drainage system it is recommended that jet clearing of the system is undertaken on a 5 yearly basis. This should check for defects in the pipework and allow for the removal of any debris

14. Responsible Person

Each Aldi region has designated Property Managers who are based with the distribution centre that serves their store. The drainage maintenance falls under their remit with works sub-contracted as necessary to complete the requirement.

At the time of writing the report Liz Bagnall is the Property Manager for the Neston West region and can be contacted at:

Aldi Distribution Centre
Chester High Road
Neston
CH64 3TS
Tel: 0151 353 2271

The maintenance contractor is David Ratcliff of Calder Construction. Their details are as follows:

Unit 15,
Brearley La
Halifax
West Yorkshire
HX2 6HU
Tel: 01422 886870

APPENDIX A

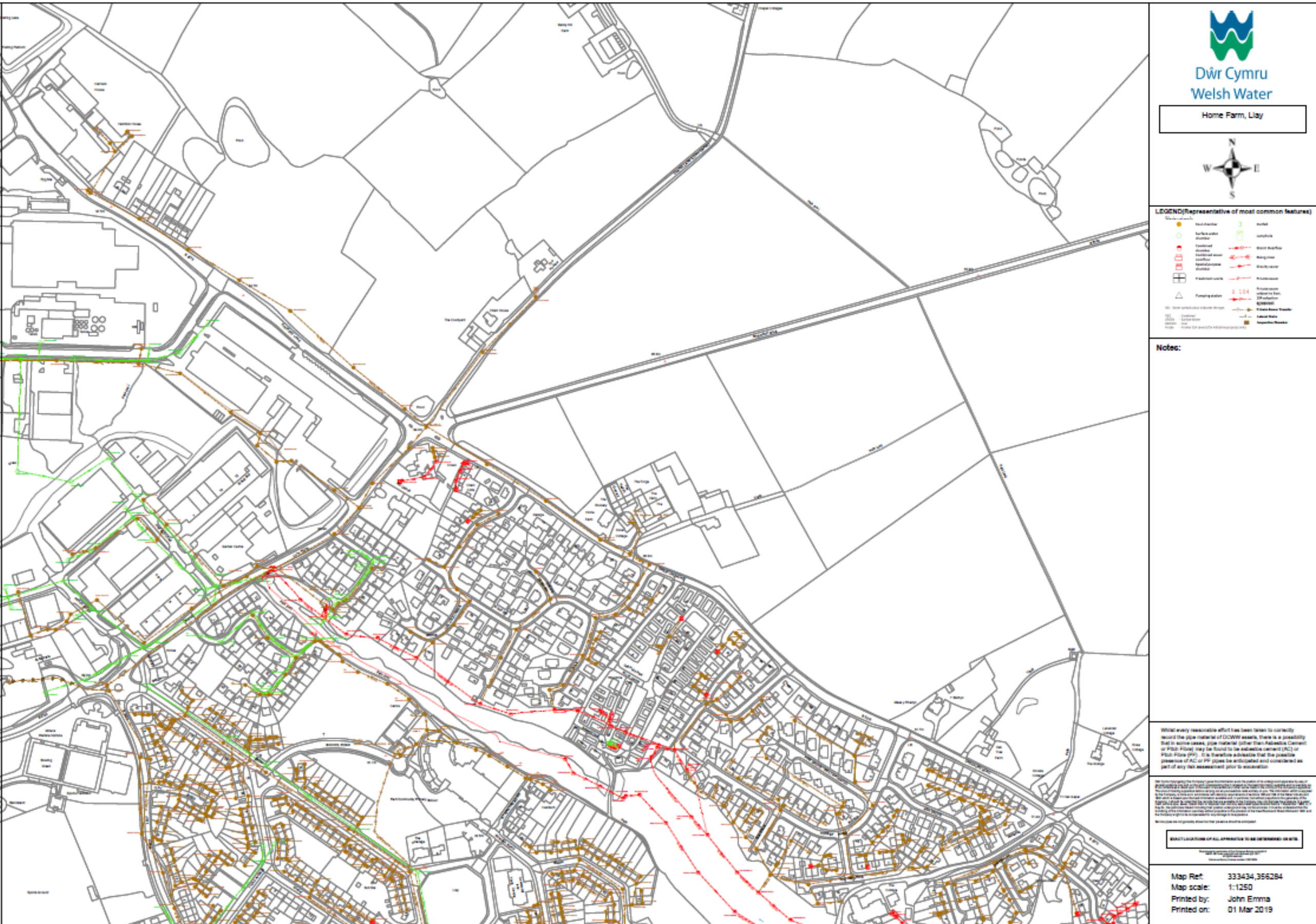
Development Drainage Plan





APPENDIX B

Sewer Record





APPENDIX C

Quick Storage Estimations (Permeable Car Park & Roof Area)

Considering the 100 year storm as the worst case design given the limited discharge



Roof Area:

Micro Drainage		Variables	
Variables Results Design Overview 2D Overview 3D Vt	FSR Rainfall		Cv (Summer) 0.750
	Return Period (years)	100	Cv (Winter) 0.840
	Region	England and Wales	Impervious Area (ha) 0.2086
	Map	M5-60 (mm) 18.000	Maximum Allowable Discharge (l/s) 5.4
		Ratio R 0.314	Infiltration Coefficient (m/hr) 0.00000
			Safety Factor 2.0
		Climate Change (%) 20	

Results

Global Variables require approximate storage of between 60 m³ and 98 m³.

These values are estimates only and should not be used for design purposes.

Service Yard:

Micro Drainage		Variables	
Variables Results Design Overview 2D Overview 3D Vt	FSR Rainfall		Cv (Summer) 0.750
	Return Period (years)	100	Cv (Winter) 0.840
	Region	England and Wales	Impervious Area (ha) 0.122
	Map	M5-60 (mm) 18.000	Maximum Allowable Discharge (l/s) 5.4
		Ratio R 0.314	Infiltration Coefficient (m/hr) 0.00000
			Safety Factor 2.0
		Climate Change (%) 20	

Results

Global Variables require approximate storage of between 26 m³ and 47 m³.

These values are estimates only and should not be used for design purposes.



Car Park:

Micro Drainage		Variables			
Variables Results Design Overview 2D Overview 3D Vt	FSR Rainfall		Cv (Summer)	0.750	
	Return Period (years)		100	Cv (Winter)	0.840
	Region		England and Wales	Impervious Area (ha)	0.439
	Map	M5-60 (mm)	18.000	Maximum Allowable Discharge (l/s)	5.4
	Ratio R		0.314	Infiltration Coefficient (m/hr)	0.00000
			Safety Factor	2.0	
		Climate Change (%)	20		

Results

Global Variables require approximate storage of between 174 m³ and 267 m³.

These values are estimates only and should not be used for design purposes.

Design of car park: (using MicroDrainage Quick Infiltration Design)

Micro Drainage		Variables			
Variables Results 2D Graphs 3D Graphs Structures Pollution	Rainfall and Runoff		Infiltration Structure		
	FSR Rainfall		Porous Car Park		
	Return Period (years)		100	Infiltration Coefficient Base (m/hr)	0.00000
	Region		England and Wales	Safety Factor	2.0
	Map	M5-60 (mm)	18.000	Porosity	0.30
	Ratio R		0.314		
	Cv (Summer)		0.750		
	Cv (Winter)		0.840		
	Impervious Area (ha)		0.439		
	Climate Change (%)		20		
		☒ With Outflow		Maximum Discharge (l/s)	5.4

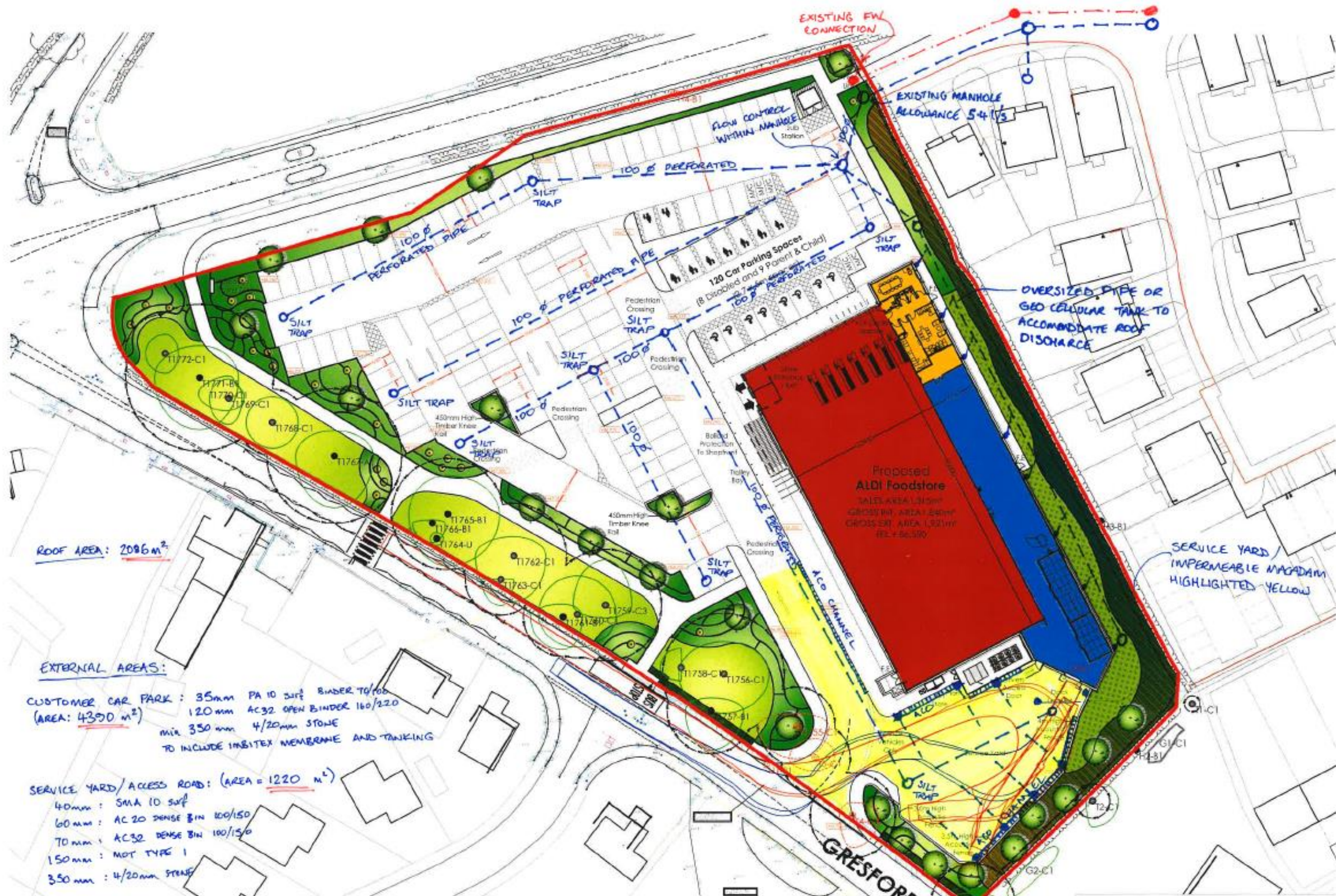


Micro Drainage	Results					
	Results are presented in paired rows. These represent maximum and minimum storage requirements for each size of structure.					
Variables	Depth (m)	Net Vol (m³)	Surface Area (m²)	Capacity Ratio	Ex/Fill Vol (m³)	Half Drain (mins)
	0.2	266.6	4443.2	1.0	888.6	1371
Results		174.1	2901.7	1.5	580.3	269
	0.3	266.6	2962.1	1.5	888.6	1371
2D Graphs		174.1	1934.5	2.3	580.3	269
	0.4	266.6	2221.6	2.0	888.6	1371
		174.1	1450.8	3.0	580.3	269

Note: the area of the permeable car park exceeds the ration of 2:1 of the drained area and therefore the design would comply with Ciria SuDs Manual 2016.

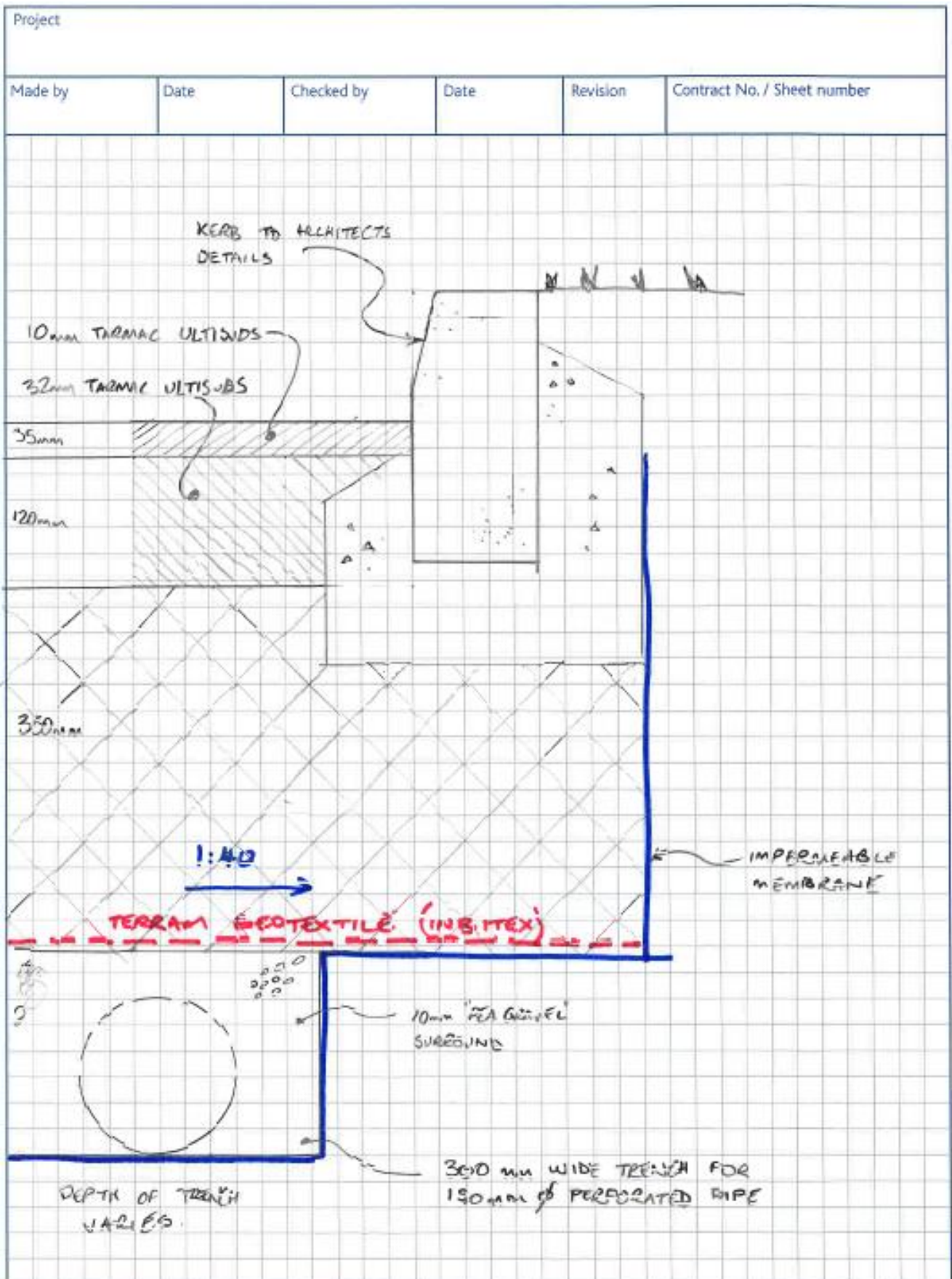
APPENDIX D

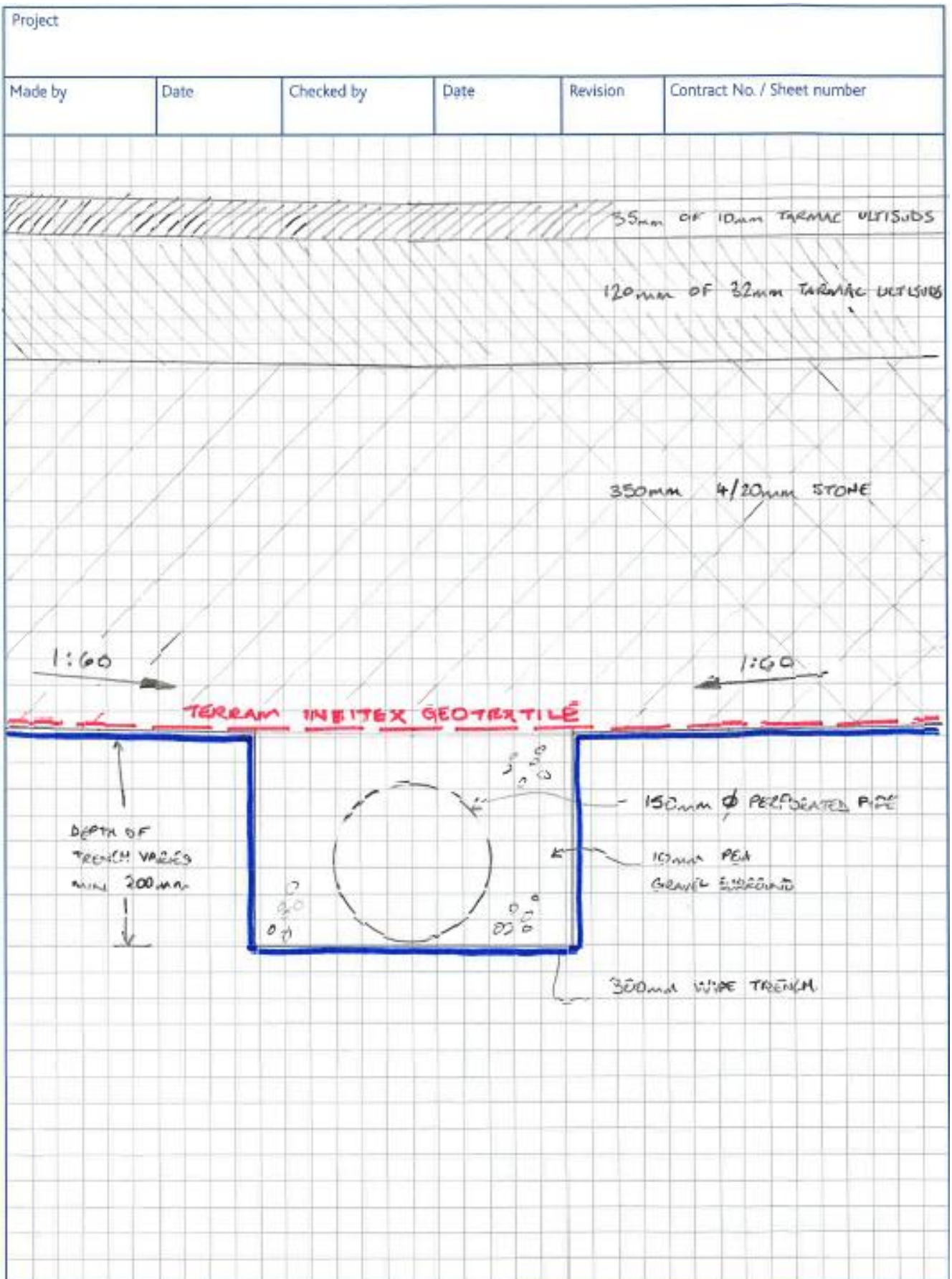
Proposed Drainage Scheme



APPENDIX E

Typical Permeable Pavement Construction

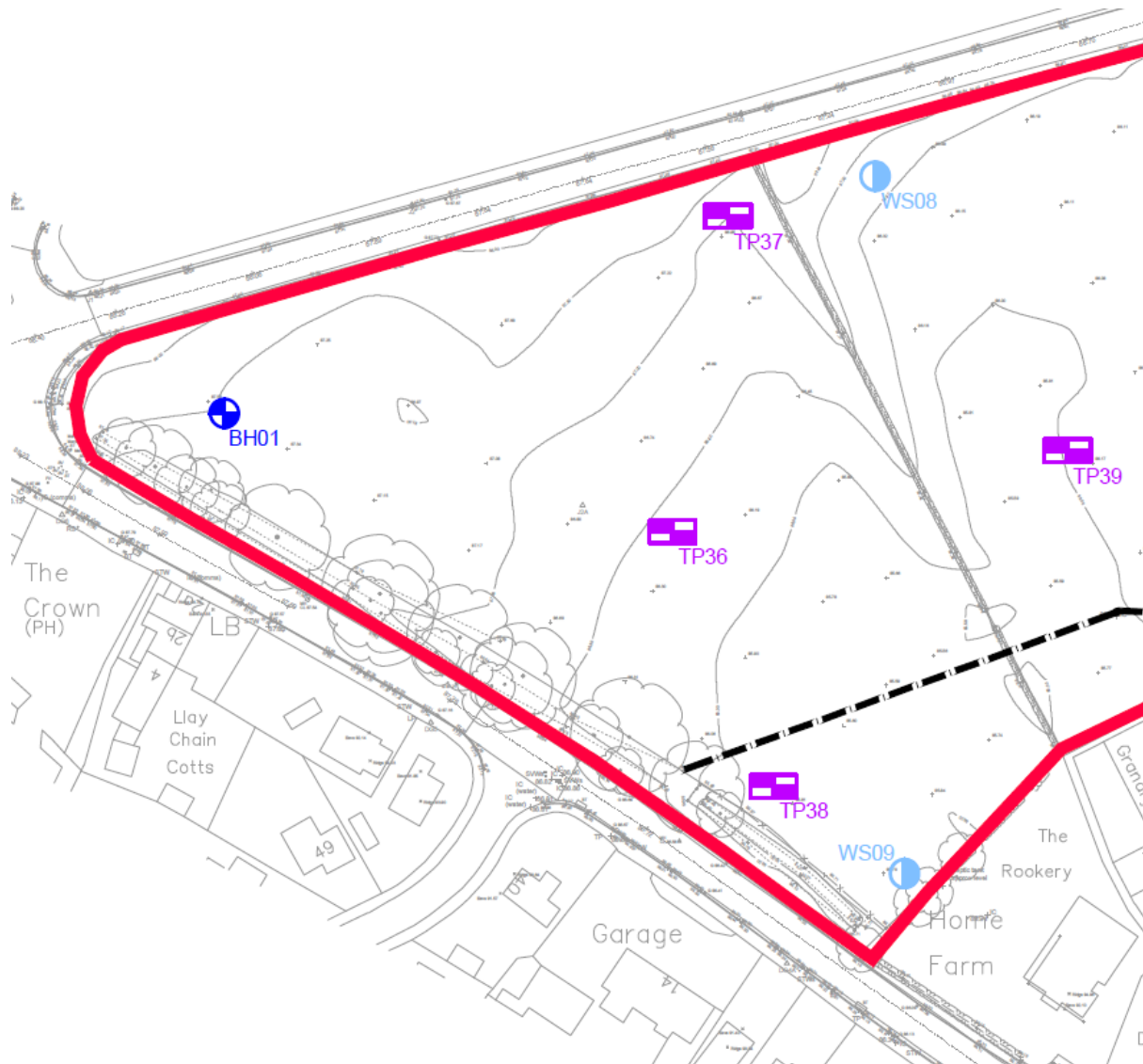




APPENDIX F

Borehole Information

(taken from REFA report)







				Trial Pit Log				Trialpit No TP37 Sheet 1 of 1	
Project Name: Gresford Rd. L Lay				Project No. 17040		Co-ords: 333410.59 - 356350.31 Level: 87.12		Date 15/03/2017	
Location: Gresford Rd, L Lay				Dimensions (m): 2.3		Scale 1:25		Logged MD	
Client: Bellway/Anwyd Construction Ltd				Depth 2.50		0.7			

Water Strike	Samples and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
	Depth	Type	Results					
	0.30	ES		0.40	86.72		TOPSOIL: Brown silty sandy clay and rootlets	
	1.50	D					Stiff to very stiff greyish brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded to rounded and of various lithologies. Low cobble content.	
			HVP=153					1
			HVP=159					
			HVP=153					2
			HVP=187	2.50	84.62			
							End of pit at 2.50 m	3
								4
								5

Remarks: No groundwater encountered.								
Stability: Pit Stable								





Geo-Ventures (UK) Limited <i>Geotechnical and Environmental Services</i>							Site Home Farm, Gresford Road, Llay, Wrexham		Borehole Number BH01
Boring Method Cable Percussion		Casing Diameter 150mm cased to 6.00m		Ground Level (mOD)		Client		Job Number 17-1536	
		Location		Dates 15/03/2017		Engineer Robert E Fry & Associates Limited		Sheet 1/1	
Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Instr
0.20	D					(0.50)	Brown sandy TOPSOIL with rootlets		
0.50	D					0.50	Firm brown CLAY		
						(0.70)			
1.20-1.65 1.20-1.65	SPT(C) N=13 D			2,3/3,3,4,3		1.20	Stiff brown sandy CLAY		
2.00-2.45 2.00-2.45	SPT(C) N=16 D			2,3/4,3,4,5					
3.00-3.45 3.00-3.45	SPT(C) N=24 D			4,4/5,5,5,7		(3.80)			
4.00-4.45 4.00-4.45	SPT(C) N=25 D			4,5/5,5,5,7					
5.00-5.45 5.00-5.45	SPT(C) N=21 D			3,4/4,5,5,6		5.00	Firm / stiff grey brown sandy gravelly CLAY		
6.00-6.45 6.00-6.45	SPT(C) N=22 D			4,4/5,5,5,7		(1.45)			
						6.45	Complete at 6.45m		
Remarks Services pit excavated by hand to 1.20m Water added to borehole to assist drilling							Scale (approx) 1:50	Logged By Dr J Crook	
							Figure No. 17-1536.BH01		