

CLYWEDOG ROAD NORTH, WREXHAM

DRAINAGE STRATEGY

1.0 INTRODUCTION

1.1 Background

1.1.1 A full planning application is being submitted for approval to construct an industrial/warehouse unit with access and associated parking. Caulmert has been appointed to prepare a drainage strategy for surface water and foul drainage from the development, and this report sets out the approach that will be taken.

1.1.2 The site is will be accessed from Clywedog Road North in Wrexham's industrial estate. The post code is LL13 9XN and the grid reference is SJ374494 (337410, 349445). An extract from Google mapping below (Figure 1) shows the site location in the context of the industrial estate.

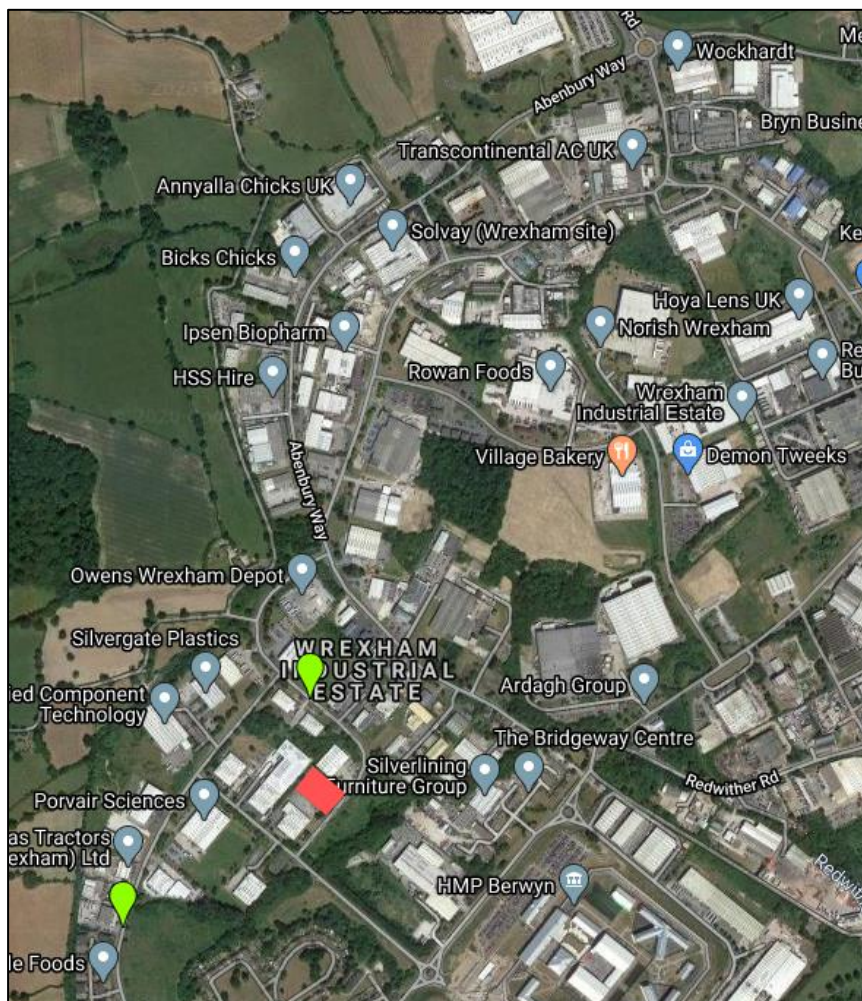


Figure 1 – Site Location (indicated with red rectangle)

1.2 Existing Site Features

- 1.2.1 The western-most part of the site contains a tarmac storage area served by surface water drainage, with the remainder of the site being unused, comprising closely mown grass. There is a bund along the boundary with the highway in the east of the site which is planted with semi mature trees. Beyond the north, south and west boundaries are industrial units. Figure 2 below shows a Google image of the site boundary.



Figure 2 – Site Boundary

- 1.2.2 The site is rectangular in shape with a total site area of approximately 0.54ha. Of this the impermeable area is 0.041ha (410m²).
- 1.2.3 A topographical survey has been undertaken and is provided in Appendix A. At the west boundary the ground levels are 34.3m AOD. A slope from the fence into the site over around 6m sees the ground level reduce to 33.2m AOD (1 in 5). The level at the back of the estate road footway is 33.3m AOD. There is a falls of approximately 0.8m from south to north.
- 1.2.4 The estate road has a footway on one side, which is adjacent to the site.

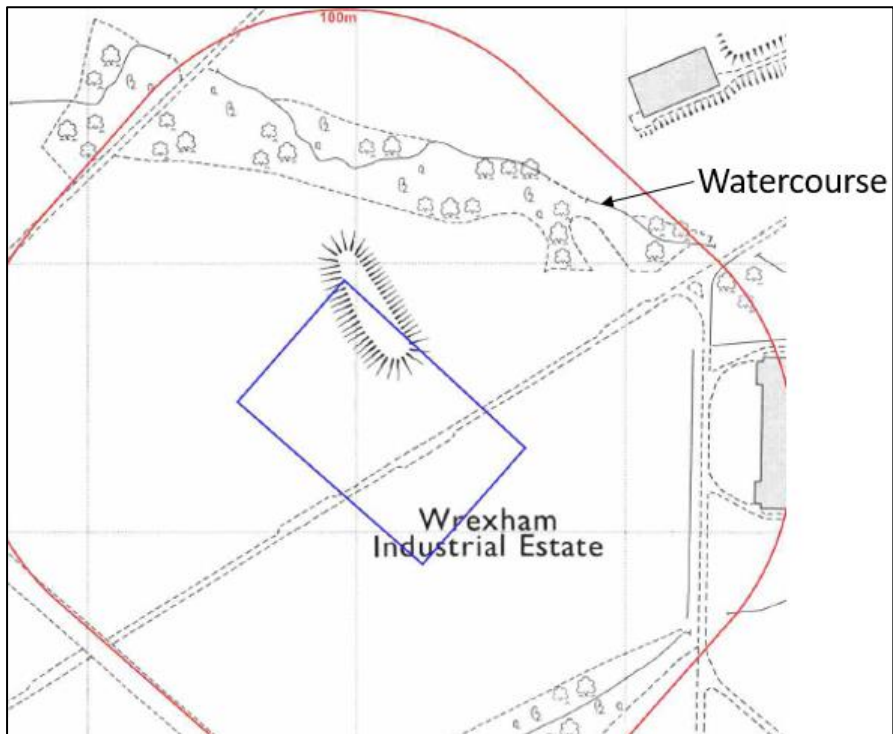


Figure 4 – Watercourse Location

1.3 Topography and Flood Risk

- 1.3.1 The site levels are described in 1.2.3. The site has a cross fall which will allow surface water to flow off. The site is not identified on the Natural Resources Wales flood maps. Refer below to an extract from their on-line web site showing flooding from rivers, reservoirs, sea and surface water. Surface water flood risk is indicated in purple.

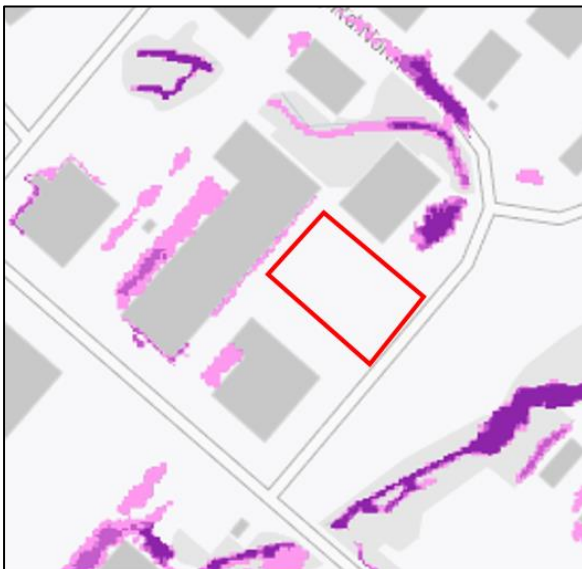


Figure 5 – Flood Risk (Extract from NRW on-line Flood Maps)

1.4 Proposed Development

- 1.4.1 The proposed development will comprise an industrial/warehouse building with adjacent car parking, an area for lorries to turn, and a new access from Clywedog Road North.
- 1.4.2 Internally there will be provision for amenity facilities which will discharge domestic effluent.
- 1.4.3 The table below compares the existing permeability with the proposed:

Table 1: Land Use Comparison

Use	Existing (sq m)	Proposed (sq m)
Building roof area	0	2610
Hard standing (car park/ paved areas)	480	1875
Landscaping	4820	925
Total	5300	5410

2.0 FOUL DRAINAGE

2.1 Connection to Public Sewer Network

- 2.1.1 The location of public sewers is shown in Figure 3 as being on the south side of Clywedog Road North.
- 2.1.2 The development will generate domestic foul effluent but no trade effluent.
- 2.1.3 It is proposed to form a new connection onto the public sewer in Clywedog Road North.

3.0 PROJECT APPROACH TO SUSTAINABLE DRAINAGE

3.1 SuDS Standards

3.1.1 This section summarises the outline design for the disposal of surface water from the site. The approach outlined in the Sustainable Drainage Systems Standards for Wales (SuDS Standards) and the CIRIA SuDS manual seek to manage the quality and quantity of rainwater runoff close to where it falls and to allow its use in a manner which provides amenity benefits to site users and also encourages biodiversity.

3.1.2 The SuDS Standards have standards which need to be addressed. These are:

- S1. Surface water runoff destination
- S2. Surface water runoff hydraulic control
- S3. Water Quality
- S4. Amenity
- S5. Biodiversity

3.1.3 Subsequent paragraphs of this section of the report outline how these objectives can be achieved within the outline drainage design for the development.

3.2 S1. Surface Water Runoff Destination

3.2.1 The Welsh Government standard has five priority levels for surface water runoff. These are:

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

Information has been gathered specific to the proposed phase 4 development and is considered against these priorities below.

Priority 1: Runoff Collected for Use

3.2.2 No rainwater harvesting is proposed for the development, the demand of non-potable water on site is limited to toilet flushing. No stress on the mains water supply has been identified and the provision of rainwater harvesting would not be cost-effective.

3.2.3 Water butts were considered but there is no subsequent use for collected water.

Priority 2: Infiltration to Ground

3.2.4 Ground investigations in the form of trial pits have been carried out on the site in order to advise an assessment of contamination. From these it is evident the ground is consistently

topsoil overlying a Clay, described as firm orange sandy clay. Geotechnical advice confirms that the ground is not suitable for using infiltration as a means of managing significant flow rates of surface water. The image in Plate 1 below shows the clays encountered.



Plate 1 – Trial Pit

- 3.2.5 A review of information on the British Geological Society website indicates trial pit records from the ground investigation for the Wrexham Aluminium Ingot Plant (now Hydro Aluminium) on Clywedog Road, some 130m south east of the site. This confirmed made ground overlying firm to stiff red/brown clay, becoming very stiff below around 1.5m. The trial pits finished at around 3m depth. A ground investigation for a proposed sewer line 175m south west of the site also confirmed red-brown clay to the base of the trial pit at 5m.
- 3.2.6 Notwithstanding this it is proposed that low intensity, frequent and depths of rainfall of up to 5mm will be retained on site by using a drainage system that is, where appropriate “leaky”. This will allow such rainfall to slowly soak into the ground.

Priority 3: Discharge to a Surface Water Body

- 3.2.7 Reference to historical mapping (Figure 4) indicates there are no surface water bodies on or adjacent to the site.

Priority 4: Discharge to a Surface Water Sewer

- 3.2.8 There is a surface water public sewer serving the industrial estate and within Clywedog Road North, as shown on Figure 3. It connects to a watercourse east of the site. It is therefore proposed to connect surface water at controlled rates into this sewer, it being the highest priority option available.

Priority 5: Discharge to a Combined Sewer

3.2.9 Not applicable

3.3 S2. Surface Water Runoff Hydraulic Control

3.3.1 The current runoff from the site is made up of the flow from the paved area drained via traditional gully and pipework, plus the runoff from the grassed area.

3.3.2 The hard standing area of 480m², with a rainfall intensity of 50mm / hr would produce a runoff of 6.7 l/s, using the formula $Q=2.78A_i$.

3.3.3 Using the HR Wallingford Greenfield Runoff Estimation Tool the greenfield Q_{bar} runoff rate from the remainder of the site (0.409ha) is estimated to be 2.3l/s (2.29l/s). A copy of the report is in Appendix B. The soil factor has been adjusted to reflect the impermeable nature of the soils on the site.

3.3.4 The combined existing runoff is approximately 9l/s.

3.3.5 Providing a 50% reduction in runoff from the brownfield impermeable area of the site would equate to approximately 5.6l/s. It is proposed to limit the runoff to 5l/s. This is less than the runoff from the existing impermeable drained area.

3.3.6 Flow will be controlled using a vortex flow control unit within the last chamber before the outfall to the surface water sewer.

3.3.7 Attenuation storage will be provided by a combination of a) stone under the porous paving, b) swale, and c) cellular storage.

3.3.8 The storage on the site will be designed to prevent runoff from the site for rainfall events with a return period of 1 in 100 plus 30% climate change allowance. 100% run-off will be assumed for roof and external hard standing, and 20% run-off for the soft landscaping areas, as they will slope towards SuDS features. The total equivalent drained area is therefore 4560m²

3.3.9 The storage requirement has been estimated using Micro Drainage software. The approximate volumes required for the 1 in 30 year return period and 1 in 100 year return period rainfall with an allowance for climate change are set out in Table 2 below.

Rainfall Period	Return	Approximate volume (m ³)	storage
1 in 30		Between 97 to 152	
1 in 100 + 30%		Between 203 and 298	

3.3.10 Storage for up to 1 in 30 years return period would be stored below ground in porous sub base a, cellular storage and in swales. Beyond this, water would be designed to pond on the surface without affecting the building, in low parts of the car park. A traffic ramp may be provided at the entrance to the car park to further contain such runoff.

3.3.11 Storage could be provided as follows:

- 350mm of Type 3 stone with 30% voids beneath the 580m² of parking would provide 61m³.
- 12m x 12m x 1.2m deep cellular storage would provide 173m³.
- 120mm average depth of standing water in the lower 200m² of the car park would equal 24m³.

3.3.12 The total of these volumes is 258m³, which is mid range of the estimated 1 in 100 year plus climate change storage requirement.

3.4 S3. Water Quality

3.4.1 A summary of the quality of water to be discharged from the site is included in Appendix C. The sources of rainwater to be discharged from the site and their potential for contamination have been assessed using the simple index approach as described in section 26.7.1 of the SuDS manual.

3.4.2 The goods vehicle delivery and manoeuvring area will drain to a bioremediation channel, such as the D-Rainclean bioremediation channel shown in Figure 6

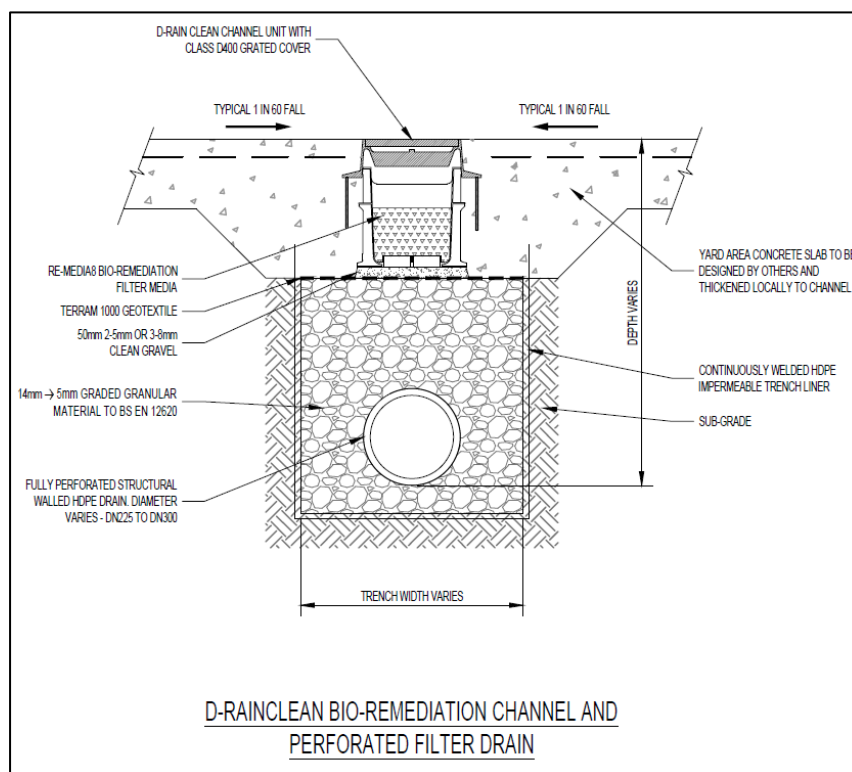


Figure 6 – Bioremediation Channel

- 3.4.3 Car parking areas will drain via porous paving, and, where possible, also into a swale.
- 3.4.4 Due to space limitation only two rainwater pipes can be directed to SuDS planters, where an element of filtration may occur.

3.5 S4. Amenity and S5. Biodiversity

- 3.5.1 These two standards will be met in two ways. Firstly the SuDS planters will provide an opportunity for planting that encourages pollinating insects, but more significantly two areas for shallow swales will be provided. One of these, adjacent to the car park would provide a suitable location for staff to break out to. The swale will receive runoff from the adjacent parking area and will be plated with a species rich seed to also encourage bio diversity. The swales will connect into the below ground system and flow from them will be controlled by the overall site flow control.

3.6 S6. Design of Drainage for Construction, Operation and Maintenance

- 3.6.1 The SuDS proposed for the development is readily manageable and will be retained within the ownership of the developer.
- 3.6.2 The design of the outlets from the swale will mitigate the risk of leaves entering the system and causing blockage.
- 3.6.3 Inspection and maintenance guidance will be prepared for the SuDS system and will be provided to the developer and as part of the full SAB application.

4.0 EXCEEDANCE FLOW PATHS

4.1 Flood Risk Assessment

4.1.1 Section 1.3 refers to existing flood risk. .

4.2 Exceedance Routing

4.2.1 The proposed development slopes towards Clywedog Road North, and the building floor level will be set 150mm above the surrounding ground level. In the event of rainfall exceeding the system design capacity or in the event of a collapse or blockage rainwater would be expected to flow around the building and onto Clywedog Road North.

5.0 CONCLUSION

5.1 Foul Drainage

- 5.1.1 The development will generate domestic foul flows, which will be connected to the public sewer in Clywedog Road North.

5.2 Sustainable Drainage

- 5.2.1 The table below summarises how the drainage strategy for the proposed development will address the standards and priorities contained in the Sustainable Drainage System Standards for Wales.

Standard	Comments
S1 – Destination	
Priority 1 – Re-use	• Limited demand for non-potable water • No stress on supply mains • Rainwater harvesting not cost effective • No requirements for irrigation
Priority 2 – Infiltration	• Unsuitable ground for significant infiltration • Permeable parking areas and swales will allow infiltration of shallow depth rainfall
Priority 3 – Discharge to surface water body	• There is no watercourse close to the site
Priority 4 – Discharge to surface water sewer	• The surface water sewer adjacent to the site connects into a watercourse east of the site and is a suitable destination for site runoff
Priority 5 – Discharge to combined sewer	• Not required
S2 – Runoff Hydraulic Control	
	• The site comprises mainly grassed area, but with a tarmac area drainage to a piped system. • It is proposed to half the runoff from the impermeable area and limit the runoff from the grass area to QBar. • The total runoff would be limited to 5l/s • Attenuation would be swale, porous paving and cellular storage
S3 – Water Quality	
	• Use of rain gardens and porous pavements provides sufficient mitigation for level of potential pollution anticipated for low risk areas • The vehicle turning area would be protected by a bio-remediation channel such as D Rainclean. • Some parking areas will drain into swales.

Standard	Comments
S4 – Amenity & S5 - Biodiversity	
	• SuDS planters will provide some benefit • Swales will be planted with species rich seeds • Opportunities for staff breaks at an area next to a swale will be provided.
S6 – Construction, Operation & Maintenance	
	• Detailed design to be approved by SAB • Development owner and operator to be provided with maintenance guidance document

5.3 Flood Risk

5.3.1 No flood risk has been identified on the site.

5.3.2 An exceedance route exists from the direct to Clywedog Road North.

5.4 Outline Proposals

5.4.1 Drawing 4371-CAU-XX-XX-DR-C-1600 included in Appendix D illustrates the outline drainage layout for the site which addresses all of the above considerations.

Prepared by	Jonathan Sykes	October 2020
Approved by	Howard Jones	October 2020
Document Reference	4371-CAU-XX-XX-RP-D-0300.S4-P1	
Status	Planning Issue	

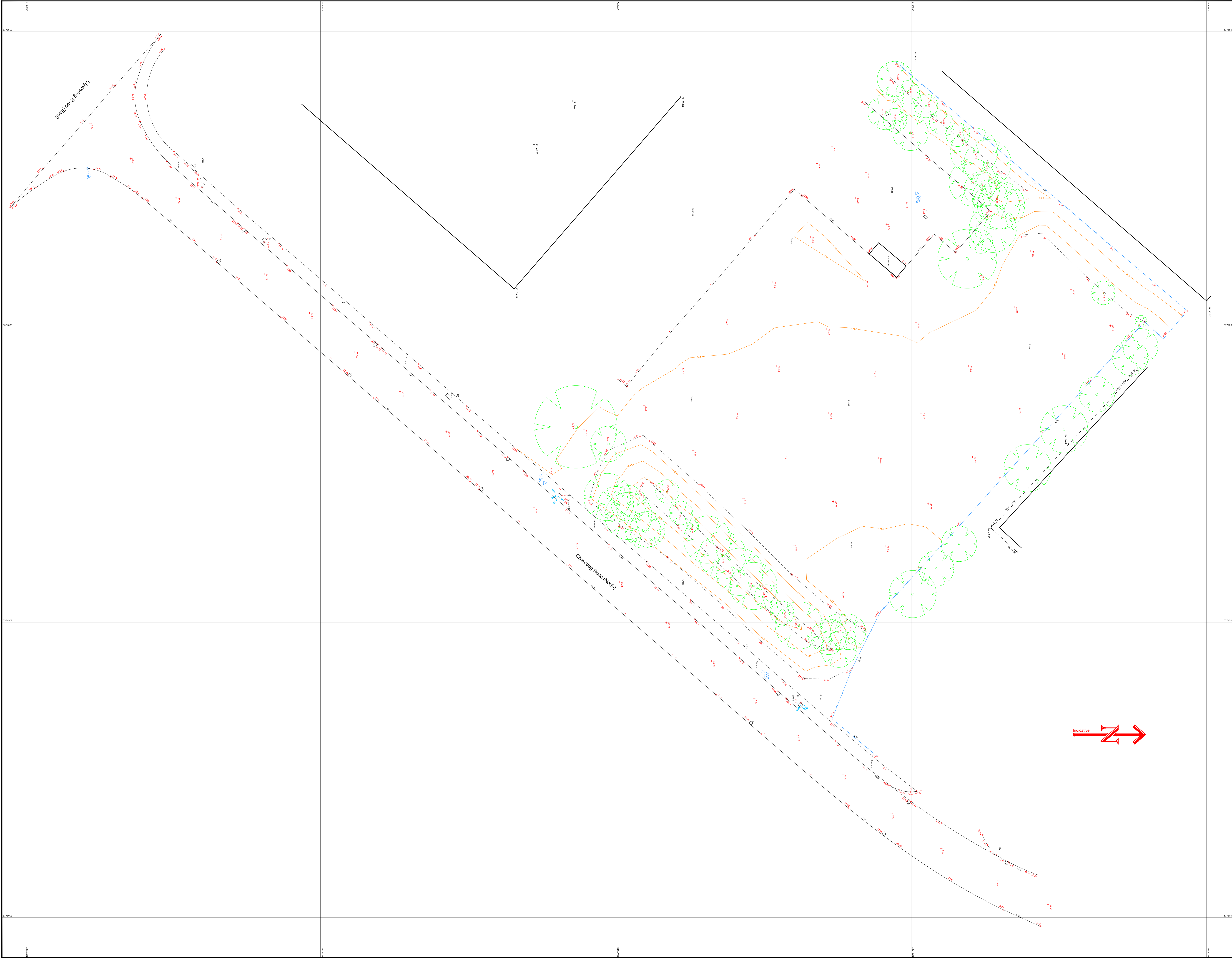
Appendices

- A Topographical Survey
- B Greenfield Runoff Estimate
- C Water Quality Calculation
- D SuDS Layout

REVISION HISTORY

Rev No	Date	Paragraph	Change History
P1			Planning Issue

Appendix A
Topographical Survey



Topographical Survey Legend			
BS	Bolt	h	Height
BS1	Bolt 1	h1	Height 1
BS2	Bolt 2	h2	Height 2
BS3	Bolt 3	h3	Height 3
BS4	Bolt 4	h4	Height 4
BS5	Bolt 5	h5	Height 5
BS6	Bolt 6	h6	Height 6
BS7	Bolt 7	h7	Height 7
BS8	Bolt 8	h8	Height 8
BS9	Bolt 9	h9	Height 9
BS10	Bolt 10	h10	Height 10
BS11	Bolt 11	h11	Height 11
BS12	Bolt 12	h12	Height 12
BS13	Bolt 13	h13	Height 13
BS14	Bolt 14	h14	Height 14
BS15	Bolt 15	h15	Height 15
BS16	Bolt 16	h16	Height 16
BS17	Bolt 17	h17	Height 17
BS18	Bolt 18	h18	Height 18
BS19	Bolt 19	h19	Height 19
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BS21	Bolt 21	h21	Height 21
BS22	Bolt 22	h22	Height 22
BS23	Bolt 23	h23	Height 23
BS24	Bolt 24	h24	Height 24
BS25	Bolt 25	h25	Height 25
BS26	Bolt 26	h26	Height 26
BS27	Bolt 27	h27	Height 27
BS28	Bolt 28	h28	Height 28
BS29	Bolt 29	h29	Height 29
BS30	Bolt 30	h30	Height 30
BS31	Bolt 31	h31	Height 31
BS32	Bolt 32	h32	Height 32
BS33	Bolt 33	h33	Height 33
BS34	Bolt 34	h34	Height 34
BS35	Bolt 35	h35	Height 35
BS36	Bolt 36	h36	Height 36
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BS39	Bolt 39	h39	Height 39
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BS41	Bolt 41	h41	Height 41
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BS94	Bolt 94	h94	Height 94
BS95	Bolt 95	h95	Height 95
BS96	Bolt 96	h96	Height 96
BS97	Bolt 97	h97	Height 97
BS98	Bolt 98	h98	Height 98
BS99	Bolt 99	h99	Height 99
BS100	Bolt 100	h100	Height 100

Survey Station Coordinates			
Stn	Easting	Northing	Level
GPS1	337426.38	349388.02	33.45
GPS2	337458.29	349424.85	33.24
GPS3	337373.17	349310.63	33.85
0004	337377.37	349451.02	33.81

Please note:
Any discrepancy found between an Ordnance Survey benchmark and an OSGB15 computed orthometric height is likely to be due to bench mark subsidence or uplift and, assuming precise GPS survey has been carefully carried out, the orthometric height given by OSGB15 should be considered correct in preference to archive benchmark heights. OSGB15 converts GPS ellipsoid heights to orthometric heights above mean sea level.

Levels are related to OSGB15
Value: n/a

Coordinates are related to National Grid (GPS)

Scale
1:200
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**Topographical Survey
Clywedog Road North
Wrexham Industrial Estate
LL13 9XE**
Surveyed: 05/16/20
Drawn: ME
Date: June 2020
Checked: AG
File Name: 20042
Revision No.:
Sheet Size: A0
Drawing No.: SSL:20042:200:1:1

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SURVEY systems



Appendix B
Greenfield Runoff Calculation

Calculated by:

Site name:

Site location:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:

Longitude:

Reference:

Date:

Runoff estimation approach

Site characteristics

Total site area (ha):

Methodology

Q_{BAR} estimation method:

SPR estimation method:

Soil characteristics

	Default	Edited
SOIL type:	1	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.1	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	692	692
Hydrological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 30 years:	1.78	1.78
Growth curve factor 100 years:	2.18	2.18
Growth curve factor 200 years:	2.46	2.46

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	0.08	2.29
1 in 1 year (l/s):	0.07	2.01
1 in 30 years (l/s):	0.14	4.07
1 in 100 years (l/s):	0.17	4.98
1 in 200 years (l/s):	0.2	5.62

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Appendix C
Water Quality Assessment

CALCULATION SHEET

Client: JCP Investments	Site: Clywedog Rd North	Project: Industrial / Storage Unit	Caulmert 	
Made by: Jonathan Sykes	Date: 06/10/2020	Checked by:	Date:	Sheet no.: 1

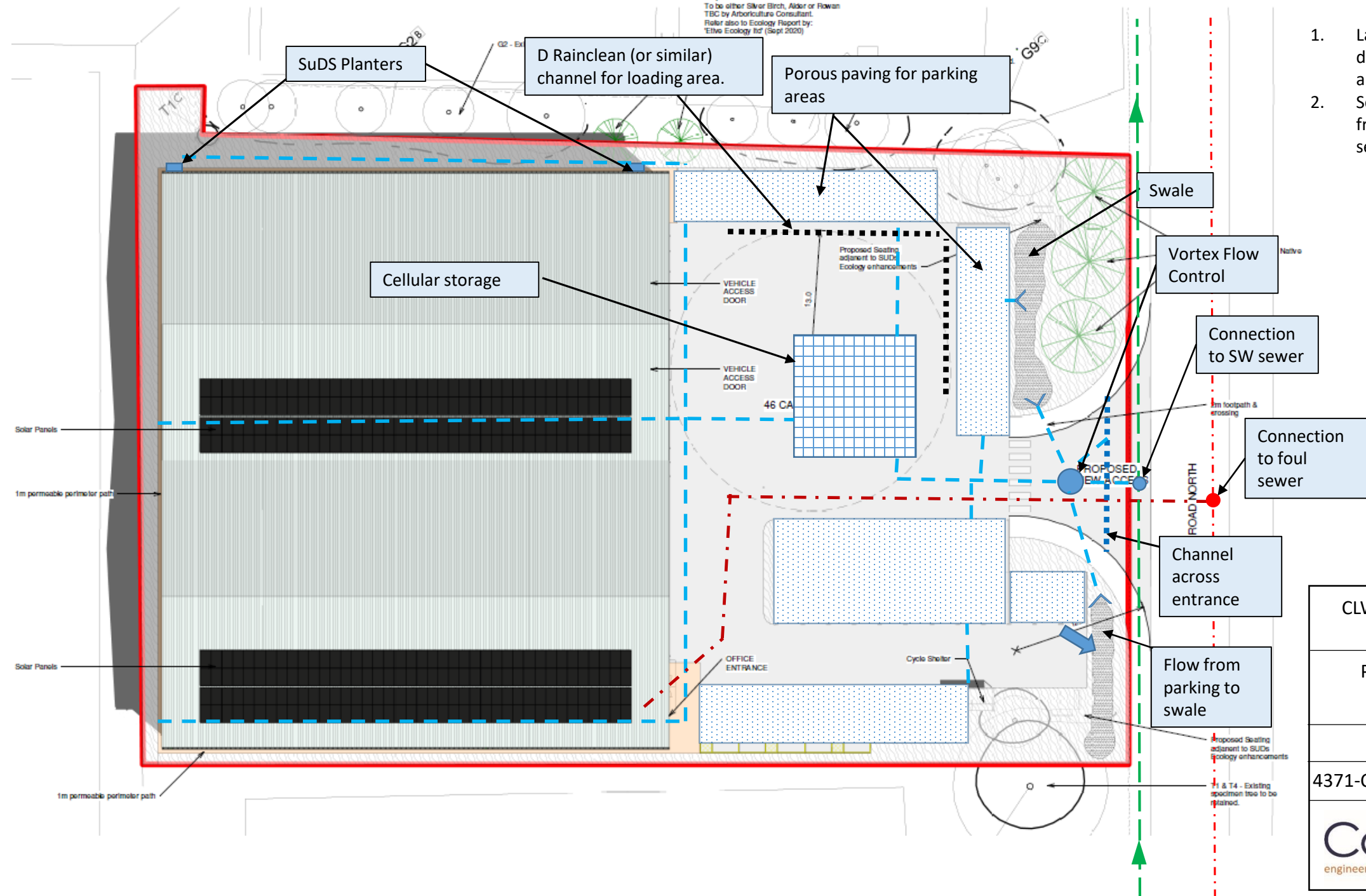
Water Quality Summary

Water quality assessed using Simple Index Approach as described in Section 26.7.1 of the SuDS Manual.

Land Use Type	Car Parking	Standard Commercial Yard or Delivery Area		
Pollution Hazard Level	Low	Medium		
Pollution Hazard Indices				
TSS	0.50	0.70		
Metals	0.40	0.60		
Hydrocarbons	0.40	0.70		
SuDS components proposed				
Component 1	pervious pavement	D Rainclean		
Component 2				
Component 3				
SuDS Pollution Mitigation Indices				
TSS	0.7	0.8		
Metals	0.6	0.8		
Hydrocarbons	0.7	0.8		
Groundwater Protection Type	None	None		
GW protection Pollution Mitigation Indices				
TSS	0	0		
Metals	0	0		
Hydrocarbons	0	0		
Combined Pollution Mitigation Indices				
TSS	0.7	0.8		
Metals	0.6	0.8		
Hydrocarbons	0.7	0.8		
Acceptability of Pollution Mitigation				
TSS	Sufficient	Sufficient		
Metals	Sufficient	Sufficient		
Hydrocarbons	Sufficient	Sufficient		

Appendix D
SuDS Layout

To be either Silver Birch, Alder or Rowan
TBC by Arboriculture Consultant.
Refer also to Ecology Report by:
'Elvie Ecology Ltd' (Sept 2020)



1. Layout to be developed for detailed design and full SAB application
2. Section agreements required from DCWW for connections to sewerage

CLWYDEOG ROAD NORTH, WREXHAM
PROPOSED INDUSTRIAL / WAREHOUSE UNIT
DRAINAGE STRATEGY
4371-CAU-XX-XX-DR-C-1600. S4-P1
 Caulmert engineering environmental planning



Registered Office: InTec, Parc Menai, Bangor, Gwynedd, LL57 4FG

Tel: 01248 672666

Fax: 01248 672601

Email: contact@caulmert.com

Web: www.caulmert.com