



Wrexham County Borough Council

DERWENT CRESCENT, GARAGE SITE 1, ACTON, WREXHAM

Flood Risk Review and Drainage Strategy





Wrexham County Borough Council

**DERWENT CRESCENT, GARAGE SITE 1,
ACTON, WREXHAM**

Flood Risk Review and Drainage Strategy

TYPE OF DOCUMENT (VERSION) CONFIDENTIAL

PROJECT NO. 70086689

DATE: NOVEMBER 2021



Wrexham County Borough Council

DERWENT CRESCENT, GARAGE SITE 1, ACTON, WREXHAM

Flood Risk Review and Drainage Strategy

WSP

Opus House

Yale Business Village

Wrexham Technology Park

Wrexham

WSP.com

QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	Draft for comment	Final		
Date	09.11.2021	01/12/2021		
Prepared by	R. Potts	R. Potts		
Signature		<i>R. Potts</i>		
Checked by	C. Rowlands	C. Rowlands		
Signature	<i>C. Rowlands</i>	<i>C. Rowlands</i>		
Authorised by	V. Mohun	V. Mohun		
Signature	<i>V. Mohun</i>	<i>V. Mohun</i>		
Project number	70086689	70086689		
Report number	70086689 - Acton - DS - REP - 0001	70086689-Acton- DS-REP-0001		
File reference				

CONTENTS

1.	INTRODUCTION	1
1.1	COMMISSION	1
1.2	POLICY	1
1.3	LIMITATIONS	2
2	EXISTING SITE AND DEVELOPMENT PROPOSALS	3
2.1	SITE LOCATION AND DESCRIPTION	3
2.2	PROPOSED DEVELOPMENT	4
2.3	GEOLOGY AND HYDROGEOLOGY	4
2.4	EXISTING DRAINAGE	5
2.4.1	PUBLIC SEWERS	5
2.4.2	EXISTING SITE DRAINAGE	5
3	CONSULTATIONS	6
3.1	WREXHAM COUNTY BOROUGH COUNCIL (WCBC)	6
3.2	DWR CYMRU WELSH WATER (DCWW)	7
4	FLOOD RISK REVIEW	8
4.1	SUMMARY TABLE	8
5	DRAINAGE PROPOSALS	9
5.1	FOUL DRAINAGE	9
5.1.1	CONNECTION TO A PUBLIC SEWER	9
5.2	SURFACE WATER DRAINAGE	10
5.2.1	SURFACE WATER DRAINAGE POLICY AND GUIDANCE	10
5.2.2	RAINWATER COLLECTED FOR REUSE (SAB S1)	11

5.2.3	DISCHARGE TO THE GROUND (SAB S2)	11
5.2.4	DISCHARGE TO A SURFACE WATER BODY (SAB S3)	11
5.2.5	DISCHARGE TO A SURFACE WATER SEWER (SAB S4)	11
5.2.6	DISCHARGE TO A COMBINED SEWER (SAB S5)	11
5.2.7	SUDS OPTIONS	12
5.2.8	RUN-OFF RATES	12
5.2.9	DISCHARGE RATES AND ATTENUATION REQUIREMENTS	13
5.2.10	WATER QUALITY	13
5.2.11	BIODIVERSITY AND AMENITY	14
5.2.12	RESIDUAL RISKS AND EXCEEDANCE FLOWS AND RUNOFF IN EXCESS OF DESIGN CRITERIA	14
5.2.13	GENERAL MAINTENANCE REQUIREMENTS	15

6 CONCLUSIONS AND RECOMMENDATIONS 16

6.1 RECOMMENDATIONS 16

TABLES

Table 2-1 – Existing and Proposed Impermeable Areas	4
Table 2-2 – Geological Summary	4
Table 4-1 – Flood Risk Summary	8
Table 5-1 – Summary of Existing Greenfield Run-off Rates	12
Table 5-2 – Summary of Indicative Attenuation Volumes	13

FIGURES

Figure 2-1 - Site Location Plan (Source: Ordnance Survey Map, 2021)	3
---	---

APPENDICES

APPENDIX A



TOPOGRAPHIC SURVEY

APPENDIX B

SITE LAYOUT

APPENDIX C

PERMEABLE AND IMPERMEABLE AREA

APPENDIX D

BOREHOLE RECORD

APPENDIX E

INVEK SURVEY

APPENDIX F

DCWW SEWER RECORDS

APPENDIX G

WREXHAM COUNTY BOROUGH COUNCIL CONSULTATION

APPENDIX H

DCWW CONSULTATION

APPENDIX I

PROPOSED DRAINAGE STRATEGY

APPENDIX J

EXISTING GREENFIELD RUNOFF

APPENDIX K

STORAGE CALCULATION VARIABLES

APPENDIX L

STORAGE CALCULATION RESULTS



1

INTRODUCTION



1. INTRODUCTION

1.1 COMMISSION

WSP were appointed by Wrexham County Borough Council (WCBC) to undertake a Flood Risk review (FRR) and Drainage Strategy (DS) to support the proposed redevelopment of a disused garage site off Derwent Crescent, Acton in Wrexham.

This report reviews the published flood risk information at the site and also provides an outline drainage strategy. The following were included in the production of this report:

- Consultations with WCBC and Dwr Cymru Welsh Water (DCWW) to obtain information relating to local flood risk issues for the site.
- Desktop review of all the potential sources of flooding at the site (i.e., fluvial, tidal, highways, groundwater, reservoir, sewers, canal, surface water); and
- Foul drainage and surface water runoff management for the proposed development.

This document has also been prepared in support of a Sustainable Drainage Approval Body (SAB) pre-planning application with WCBC.

1.2 POLICY

This report has been prepared in accordance with the relevant national, regional and local requirements and guidance of the following publications and organisations:

- Technical Advice Note (TAN 15: Development and Flood Risk dated October 2004 issued by Welsh Government).
- Welsh Government Guidance – Statutory standards for sustainable drainage systems (designing, constructing, operating and maintaining surface water drainage systems) – 2018.
- Guidance for Pre-Application Approval and Full Application Approval of SuDS on new developments in accordance with The Sustainable Drainage (Approval and Adoption Procedure (Wales) Regulations 2018.
- Wrexham County Borough Council Flood Risk Management Plans 2016–2021.
- Building Regulations 2010 (Part H3).
- Sewers for Adoption 7th Edition.
- Planning Policy Wales Edition 11 (December 2018) issued by Welsh Government.
- Welsh Ministers Standards for Foul Sewers and Lateral Drains.
- The Sustainable Drainage Systems (SuDS) Manual C753, CIRIA.
- SuDS Wales; and
- Wrexham County Borough Council Management of Surface Water generated from new development (January 2020).

1.3 LIMITATIONS

The findings and opinions conveyed in this report are based on information obtained from a variety of sources, as detailed, which WSP believes are reliable. Nevertheless, WSP cannot and does not guarantee the authenticity or reliability of the information it has relied upon from these sources. This report has been written on behalf of the Client and no responsibility is accepted to any Third Party for all or any part. This report should not be relied upon or transferred to any other parties without the express written authorisation of WSP. If any unauthorised third party comes into possession of this report, they rely on it at their own risk and the authors owe them no duty of care or skill. WSP disclaims any responsibility to the Client and others in respect of any matters outside the scope of the above contract.

This report has been prepared by WSP with all reasonable skill and care within the terms of the Contract with the Client and considering the information made available by the Client, as the manpower and resources devoted to it by agreement with the Client. It should be noted that the insurance market applies different tests to properties in relation to both determining premiums and, more fundamentally, determining the insurability of properties for flood risk. Those undertaking development in areas which may be at risk of flooding are advised to contact their insurers or the Association of British Insurance (ABI) to seek further guidance prior to commencing development. WSP do not warrant that the advice in this report will guarantee the availability of flood insurance either now or in the future.

The findings of this report have been based on data available at the time of study and on the review of available information that has been undertaken to date. They relate to the current development proposals as outlined in Appendix B. Should the proposed end use of the site change after the completion of this assessment, then the findings of this report will need to be reviewed and updated accordingly.

This report does not constitute a Flood Consequences Assessment in line with the requirements of TAN15. It provides a high-level desktop review of potential flood risk at the site.

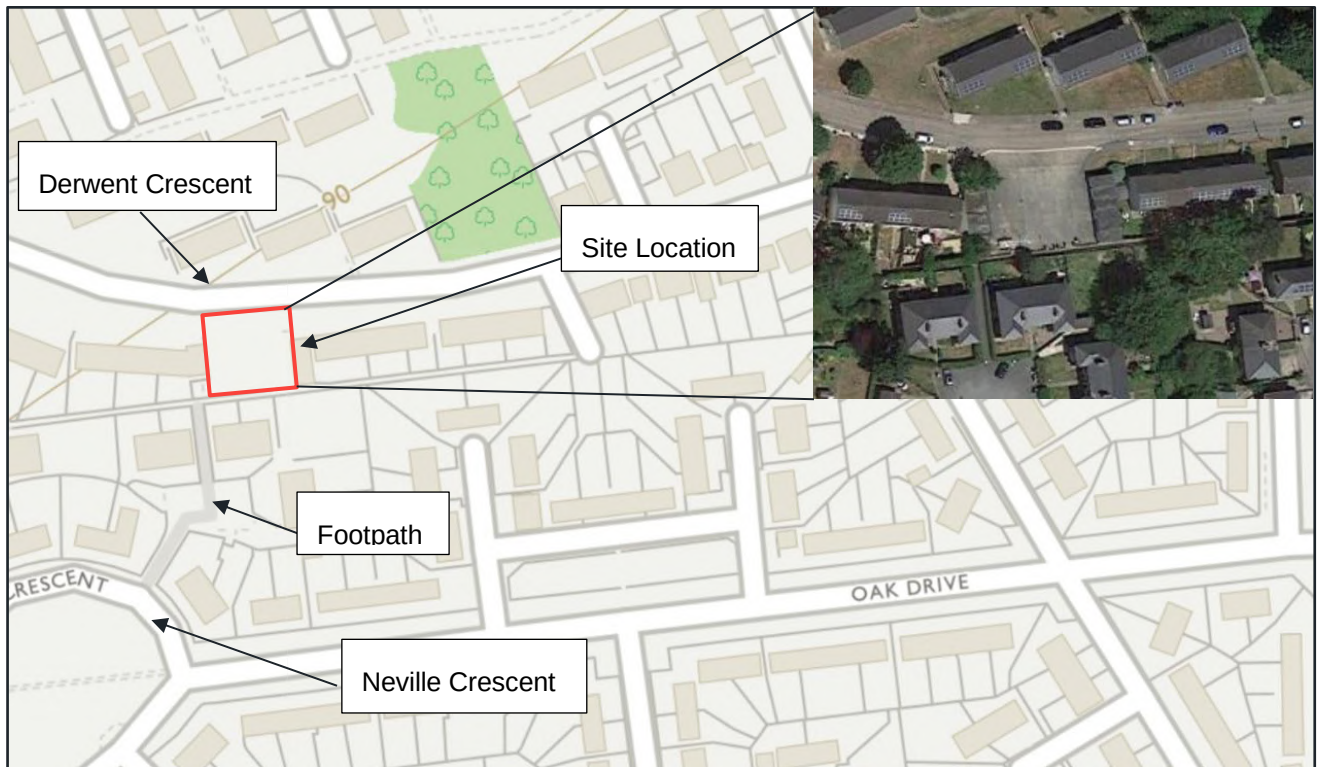
2 EXISTING SITE AND DEVELOPMENT PROPOSALS

2.1 SITE LOCATION AND DESCRIPTION

The proposed development site is located off Derwent Crescent, Acton, Wrexham. The site has an approximate area of 729m² / 0.073ha and is centred at National Grid Reference SJ338515 (E: 333850, N: 351591). The whole site is occupied by hardstanding (impermeable) surfaces.

The site is rectangular in shape and is situated within a residential area. The existing development is currently a disused garage site. The site is bounded to the north by Derwent Crescent, the east, south and west by residential dwellings. There is access to Neville Crescent via a footpath which is located in the south western corner of the existing site. A site location plan is shown below in Figure 2-1:

Figure 2-1 - Site Location Plan (Source: Ordnance Survey Map, 2021)



A topographic survey undertaken by Battlefield Land Surveys (WRE12697 12/07/21) has been reviewed as part of the preparation of this report and is included in Appendix A. The topography of the main site features on site are summarised as followed:

- Site levels – Falls generally from north west to the south east with levels ranging from 90.68mAOD to 88.16mAOD (approximately a 1 in 9 gradient)
- Derwent Crescent road levels – The adjacent road levels fall generally from west to east with levels ranging from 90.69mAOD to 89.70mAOD
- Public footpath – Falls generally west to east with levels ranging from 90.99mAOD to 89.11mAOD

2.2 PROPOSED DEVELOPMENT

The proposed scheme consists of one detached and two semi-detached bungalows with associated off-road parking along the front elevation of Derwent Crescent. There is an area allocated for soft landscaping to the rear (see Appendix B). Based upon the development plans provided by the Client, the approximate impermeable area generated by the development is in the region of 465m² (0.0465ha). The existing and proposed areas are included in Table 2-1 below and in Appendix C.

Table 2-1 – Existing and Proposed Impermeable Areas

Proposal	Permeable (m ²)	Impermeable (m ²)
Existing	0.000	729
Proposed	264	465

2.3 GEOLOGY AND HYDROGEOLOGY

A review of available geological and hydrogeological data on the British Geological Survey (BGS) was undertaken as part of this report in order to establish an understanding of the underlying geology and hydrogeology at the site. The geology present at the site is summarised in Table 2-2 below:

Table 2-2 – Geological Summary

Geology	Geological Description	Source
Bedrock Geology	Salop Formation – Mudstone, Sandstone and Conglomerate. Sedimentary Bedrock formed approximately 272 to 310 million years ago in the Permian and Carboniferous periods. Local environment previously dominated by rivers.	British Geology Survey (online)
Superficial Geology	Till, Devensian - Diamicton. Superficial Deposits formed up to 2 million years ago in the Quaternary Period. Local environment previously dominated by ice age conditions	British Geology Survey (online)
Soil Type	Freely draining slightly acid loamy soils.	Soilscapes (Landis.org.uk)

In the absence of phase 1 and phase 2 ground investigation data, a review of the borehole record SJ35SW/17A, located approximately 316m to the south of the site was carried out (included in Appendix D). This record indicated that the general area to the south of the site comprises of underlying sands and gravels with clay between 0.15m BGL – 10.0m BGL with no recorded standing or seepage of groundwater. However, it should be noted that the depth which the borehole was drilled to was 84mAOD, which is between 4 to 6m lower than the development site. The precise geological conditions should be determined from the undertaking of a ground investigation prior to detailed design.

A review of the data available on Defra's MAGIC Map was also undertaken; the granular deposits are designated as a Secondary A Aquifer within the site and the surrounding area. The bedrock aquifer is classified as unproductive within the site and is not located within a ground water source protection zone.

On the basis of the above, it is indicated that the site may be suitable for the use of an infiltration-based drainage system as a means of disposal of surface water generated by the site. It is however recommended that BRE365 infiltration testing is carried out on the site to establish an appropriate infiltration rate to be used as part of the future detailed SuDS design.

2.4 EXISTING DRAINAGE

2.4.1 PUBLIC SEWERS

A review of the sewer and drainage survey undertaken by Invek Surveys (Appendix E) indicated the presence of a 150mm diameter vitrified clay (VC) combined sewer. This sewer runs from the south western boundary through to the south eastern boundary of the site with unnamed manhole reference Extra 02.

2.4.2 EXISTING SITE DRAINAGE

The DCWW sewer records (Appendix F) and Invek drainage survey plans confirm that there are no stand-alone surface water drainage sewer networks within the vicinity of the site. However, the surface water run-off collected within the existing gullies along Derwent Crescent and within the site are conveyed directly to the DCWW combined water network. This is further confirmed on the Invek drainage survey.

A further review of the Invek Survey indicates that the garage down pipes discharge directly to the hardstanding area of the site before discharging into the gullies located within the site.

It was also noted that beneath the footpath located along the south western boundary, there is a 150mm diameter PVC surface water drain which discharges to a DCWW combined sewer located 60m east on Oak Drive. From a review of imagery provided by Invek it would appear that this drain is inadequate for any surface water connections due to the condition and construction makeup.

3 CONSULTATIONS

3.1 WREXHAM COUNTY BOROUGH COUNCIL (WCBC)

Consultation has been undertaken with WCBC as the SuDS Approval Body (SAB) and Lead Local Flood Authority (LLFA), their response is included within Appendix G. WCBC stated the following in their initial response (*Italics*):

- Any known surface water or foul sewer flooding issues at this area? ***There are no surface water issues recorded in this area. For foul records please redirect this to Welsh Water.***
- Any historical surface water flooding issues at the site? **No**
- Any groundwater flooding or emergence issues and information about local groundwater infiltration potential of the general area **No**
- Any known highway flooding issues **No**
- Does the site lie near or within a Critical Drainage Area? **No**
- Are any known culverted watercourses on site or within its vicinity **No**
- Any known ground contamination issues, which may affect any future surface water drainage design using infiltration techniques. ***We so not hold contaminated land information please contact environmental health for this information***
- Based on recent local development, in this area, could you please advise if soakaways are generally feasible or effective for surface water management. ***There has been on recent development in this area.***
- In the event that discharge to a sewer is the only feasible option at the site, please could you specify a surface water discharge rate and attenuation volume requirements which would be acceptable in this instance. ***If discharge to sewer is the only viable option then approval from welsh water will be required.***
- Is there any specific SuDS features (attenuation and water quality) that WCBC would generally specify for a residential development of this scale? ***Please refer to the SuDS Guidance documents***

3.2 DWR CYMRU WELSH WATER (DCWW)

A DCWW Developers enquiry (included in Appendix H) and consultations with Developer Services were carried out as part of this study. The response can be summarised as follows:

- Any known surface water or foul sewer flooding issues at this area? ***There are no marked public surface water sewers in vicinity of site, our sewer asset plans. There has been no sewer flooding issues in immediate vicinity of site***
- Any historical surface water flooding issues at the site? ***There are no marked public surface water sewers in vicinity of site***
- Any groundwater flooding or emergence issues and information about local groundwater infiltration potential of the general area? - ***We have no information on this***
- Any known highway flooding issues? - ***We have no information on this***
- Does the site lie near or within a Critical Drainage Area? ***Not that I am aware of***
- Are any known culverted watercourses on site or within its vicinity? ***We have no information on this***
- Any known ground contamination issues, which may affect any future surface water drainage design using infiltration techniques? ***We have no information on this***
- Based on recent local development, in this area, could you please advise if soakaways are generally feasible or effective for surface water management. ***We have no information on this and would advise completion of infiltration testing for the site is completed to confirm if soakaways can be utilised***
- In the event that discharge to a sewer is the only feasible option at the site, please could you specify a surface water discharge rate and attenuation volume requirements which would be acceptable in this instance. Is there any specific SuDs features (attenuation and water quality) that Wrexham County Borough Council would generally specify for a residential development of this scale? ***We would request that range of sustainable drainage systems (SuDS) are fully exhausted, and evidence provided to us for review. We would also note that this site may be subject to SAB, if it is there say on approval is final. If we were to accept surface water discharge it would be in region of 2-5 l/s.***

4 FLOOD RISK REVIEW

4.1 SUMMARY TABLE

A desktop review of available flood risk data was carried out as part of this drainage strategy to understand the flood risk to the site from the relevant sources. This is summarised in Table 4-1 below.

Table 4-1 – Flood Risk Summary

Source	Risk	Description and Comments	Information Source
Fluvial	N/A	There are no known culverted or open watercourses within the vicinity of the site that present a fluvial flood risk.	NRW – FRA Wales Map (Aug 2021)
Surface Water	Low Risk	Derwent Crescent appears to be at surface water flooding risk during a 1000yr rainfall event. However, the development site is also at low risk of surface water flooding during a 1000yr rainfall event. Due to the existing site levels, it is possible that run off from the road could encroach onto the site, however this could be mitigated with a sufficiently pavement and drainage system design along the site access off Derwent Crescent.	WCBC SW Flood Map (Aug 2021)
Tidal	N/A	The site is located inland and therefore no tidal flood risk is considered.	NRW – FRA Wales Map (Aug 2021)
Reservoir	N/A	There are no reservoirs located within the surrounding areas of the site, therefore there is no reservoir flood risk.	NRW – FRA Wales Map (Aug 2021)
Groundwater	Low Risk	The WCBC Preliminary Flood Risk Assessment holds no records of past groundwater flooding within the county.	WCBC FRMP (2016-2021)
Sewers	Low	DCWW did not provide any information regarding the risk of flooding from the sewer. As the proposed building will be set 150mm above the external ground levels at the site, the risk of flooding from sewers is considered to be low.	DCWW Sewer Records (2021)
Canal	N/A	There are no canals located within the surrounding areas of the site boundary. Therefore, there is no canal flood risk.	NRW – FRA Wales Map (Aug 2021)

5 DRAINAGE PROPOSALS

5.1 FOUL DRAINAGE

The foul drainage disposal is proposed to follow the requirements of Building Regulations 2010 Part H (2015 Edition), Drainage and Waste Disposal and Sewers for Adoption 7th Edition.

Part H1 of the above document contains the following requirements:

“An adequate system of drainage shall be provided to carry foul water from appliances within the building on to the following, listed in order of priority.”

- a) A public sewer or where that is not reasonably practicable
- b) A private sewer communicating with a public sewer, or where that is not reasonably practicable,
- c) Either a septic tank which has appropriate form of secondary treatment or another wastewater treatment system; or, where that is not reasonably practicable,
- d) A cesspool

5.1.1 CONNECTION TO A PUBLIC SEWER

A review of the DCWW sewer records (Appendix F) confirmed the presence of a 150mm diameter VC combined sewer which runs from the south western boundary through the site, exiting the south eastern boundary before connecting to unnamed manhole reference (Extra 02).

A pre-planning enquiry to DCWW was made by WSP in October 2021 which advised that a foul connection to the existing 150mm diameter combined sewer running through the southern extent of the site would be acceptable. Based on the proposed site layout plan at the time of writing, it appears the most appropriate mode of connection for the foul from the proposed development would be to discharge to the combined public sewer at the rear of the proposed building upstream of manhole ref: Extra 02 as indicated on the Invek drainage survey. This would be subject to a Section 104 adoption and subsequent Section 106 consent to discharge with DCWW ahead of the construction stage.

In addition, the latest site layout plan provided by the Architect indicates that the proposed dwellings will not be situated over the existing combined sewer and will be a minimum of 3m away from the pipe centreline. Therefore, there will be no requirement to submit a Section 185 sewer diversion application under the Water Industry Act 1991. A build over agreement (BOS) could be explored, however, these are predominantly only accepted for extensions to existing dwellings and is therefore unlikely to be accepted by DCWW. We would advise that further consultations are carried out with DCWW prior to detailed design regarding the acceptance of the proposed building given the presence of the combined sewer to the rear of the proposed building.

An indicative foul drainage strategy sketch is included within Appendix I of this report. This shows a gravity connection from the proposed development to the local sewer.

5.2 SURFACE WATER DRAINAGE

5.2.1 SURFACE WATER DRAINAGE POLICY AND GUIDANCE

The Welsh Government Planning Policy Wales guidance states the following “flood risk is a material planning consideration”. Technical Advice Note 15: Development and Flood Risk (TAN15, 2004) also states that “surface water is a material consideration and explains that development should not create additional runoff compared with the undeveloped situation and re-development schemes should also aim to reduce run-off where possible.”

The aim of a surface water drainage strategy is to focus on the capture and management of surface water within the site boundary and ensure compliance with the requirements and guidance of the following publications and organisations:

- Welsh Government Guidance – Statutory standards for sustainable drainage systems (designing, constructing, operating and maintain surface water drainage systems) – 2018;
- Guidance for Pre-Application Approval and Full Application Approval of SuDS on new developments in accordance with The Sustainable Drainage (Approval and Adoption Procedure) (Wales) Regulations 2018;
- Wrexham County Borough Council Flood Risk Management Plan 2016-2021;
- Building Regulations 2010 (Part H3);
- Sewers for Adoption 7th Edition;
- Planning Policy Wales Edition 11 (December 2018) issued by Welsh Government;
- Welsh Ministers Standards for Foul Sewers and Lateral Drains;
- The new Sustainable Drainage Systems (SuDS) Manual C753, CIRIA;
- RainScape – Dwr Cymru Welsh Water;
- SuDS Wales; and
- Wrexham County Borough Council Management of Surface Water generated from new development (January 2020).

In accordance with the above, surface water drainage systems are required to consider quantity, quality, amenity and biodiversity whilst preventing any likelihood of flooding to the site or adjacent sites. WCBC’s SAB guidance recommends that surface water runoff shall discharge to one of the following, listed in order of priority:

1. Surface water runoff is collected for use (rainwater harvesting);
2. Discharge to the ground;
3. Discharge to a surface water body;
4. Discharge to a surface water sewer; and
5. To a combined sewer where there are absolutely no other options and only where agreed in advance with the relevant sewerage undertaker.

It is necessary to identify the most appropriate method of controlling and discharging surface water. The design should seek to improve the local run-off profile by using systems that can either attenuate run-off and reduce peak flow rates or positively impact on the existing flood profile.

5.2.2 RAINWATER COLLECTED FOR REUSE (SAB S1)

The proposed bungalows (one detached, two semi-detached) do not foresee the demand for non-potable water use. The overall site largely comprises of impermeable hard standing surfaces with a small greenspace surrounding the developments, therefore the potential use of collected rainwater is limited. On this basis, the SAB level 1 surface water collection for reuse on the site is discounted. However, it is advised that options for SAB S1 compliance are reviewed by the Client prior to detailed design and subsequent full SAB application and approval.

5.2.3 DISCHARGE TO THE GROUND (SAB S2)

From a review of the BGS borehole record SJ35SW/17A to the south of the site, it appears the underlying geology largely comprises of sand, gravel and clay. Generally, this would be considered suitable for the use of infiltration drainage, however, it is advised that BRE365 soakaway testing is conducted on site to establish a precise infiltration rate and subsequently the feasibility of using a soakaway system to drain the surface water generated by the site. Based on preliminary figures provided by C753 (SuDS Manual), strata of this nature could see an infiltration rate in the region of $1 \times 10^{-7} \text{m/s}$. To cater for 100yr + 40% CC storage volume and an indicative infiltration rate of $1 \times 10^{-7} \text{m/s}$, an infiltration crate system in the order of $4.8 \times 4.8 \times 0.66 \text{m}$ would be sufficient beneath each pair of parking bays at the front of the building. The siting of a system of this size would need to be reviewed against the requirements of The Building Regulations (2010) part H3 during the detailed design of the scheme prior to full SAB application.

On the basis of the above information, the option of drainage discharge into the ground is therefore considered to be potentially suitable but will require further review following BRE 365 tests on site.

5.2.4 DISCHARGE TO A SURFACE WATER BODY (SAB S3)

There are no known ordinary or main river watercourses within the immediate proximity of the site. A review of the NRW mapping also indicates that the closest open surface water body to the site is the Afon Gwenfro approximately 1.6km to the south of the site. This is not suitable as a means of draining the surface water from the site, particularly in a heavily populated residential area, therefore this option is discounted. It should be noted that there are no surface water culverts located within the vicinity of the site, therefore the option to discharge via a surface water culvert is discounted.

5.2.5 DISCHARGE TO A SURFACE WATER SEWER (SAB S4)

A review of the DCWW sewer records indicates that the area is not served by a standalone surface water sewer system. The Invek drainage survey confirmed a surface water drain within the public footway is communicated with the wider combined sewer network. The surface water drain was identified to the south west of the site under the public footway; however, photographic evidence confirmed that these would not be suitable to cater for the surface water flows from the proposed development. It is also likely that the flows from this discharge to the DCWW combined network within Neville Crescent to the south. This option has therefore been discounted.

5.2.6 DISCHARGE TO A COMBINED SEWER (SAB S5)

A review of the Invek drainage survey has identified an existing combined sewer running through the site which connects to an unnamed manhole (extra 02 – Invek). It is proposed that in compliance with SAB 1 (S1), a rainwater garden be placed adjacent to the permeable paving carpark which discharges to attenuation crates beneath the car parking spaces. The controlled surface water

connection to the sewer should be via a hydro-brake chamber within the southern portion of the site which will discharge by gravity. As provisionally proposed by DCWW, the forward flow discharging surface water into the sewer should be restricted to between 2 and 5L/s. This new connection would also be subject to a Section 106 consent to discharge with DCWW which should be in place prior to construction phase.

An indicative surface water drainage strategy drawing is included with Appendix I.

5.2.7 SUDS OPTIONS

Based upon the latest proposed development plans, the following SuDS methods would be suitable for use at the proposed development:

- Permeable paving to the front of the building
- Underground surface water attenuation within the car parking spaces to the front
- Flow control device to limit the forward flow into the DCWW sewer
- Storage crates (possible infiltration if soakaway permits)

As part of the detail drainage design, there are other sustainable drainage methods that will be considered to comply with the requirements of SuDS Manual (CIRIA C753, November 2015). This will also ensure that the treatment train proposed will be appropriate and proportionate with the level of pollution risk prior to the discharge of the surface water runoff from the proposed residential development.

5.2.8 RUN-OFF RATES

The existing greenfield and brownfield run-off rates for the site have been calculated using the ICP SuDS Mean Annual Flood tool on Windes Micro Drainage; these are summarised in Table 5-1 below and also included in Appendix J.

Table 5-1 – Summary of Existing Greenfield Run-off Rates

Return Period	Discharge Rates (L/s)
Qbar (1 in 2.2)	0.02
1 in 1 year	0.03
1 in 30 years	0.04
1 in 100 years	0.0416
1 in 100 years + 40% CC	0.02

As the existing site is developed and the totality of the area within the redline boundary is impermeable, the brownfield discharge rate has been estimated using the Modified Rational Method, this is as follows:

$$Q = C I A$$

Q = Discharge (L/s)

C = Coefficient of Runoff (1.0)

I = Rainfall Per Hour (50mm)

A = Area (0.073ha)

Q = 3.65L/s

5.2.9 DISCHARGE RATES AND ATTENUATION REQUIREMENTS

Acknowledging that the existing brownfield run-off rate for the site using the Modified Rational Method is 3.65L/s, using an agreed in principle discharge rate of 2L/s this provides 45% of betterment compared to the existing surface water regime at the site. This discharge rate is generally recommended to reduce the risk of blockages and build-up of silt. Therefore, a discharge rate of 2L/s has been used for the basis of the drainage strategy storage and discharge calculations. This rate has provisionally been accepted by DCWW in the event that soakaway testing to BRE365 reveal that the site is not appropriate for infiltration.

The attenuation requirements have been determined using Microdrainage Windes for the 100 year + 40% climate change events, using a maximum discharge rate of 2L/s as stipulated by DCWW. It has been estimated that the below ground attenuation providing between 13m³ and 22m³ of storage volume would be required to provide suitable capacity for the proposed development (Table 5-2 below) and included in Appendix L.

Table 5-2 – Summary of Indicative Attenuation Volumes

Discharge Rate (L/s)	Indicative Attenuation Volume (m ³)
2	13 - 22

This could be provided using a permeable paving underground attenuation crate system beneath the car parking spaces parallel to the front elevation of the building. However, this remains subject to detailed design and review against The Building Regulations (2010) Part H3.

It would be possible to reduce the total volume of attenuation required by including rainwater harvesting within the proposed development. Additionally, if BRE365 testing permits, a partial infiltration system could also be provided as part of the overall site attenuation to marginally reduce the total discharge rate to the existing DCWW combined sewer system.

5.2.10 WATER QUALITY

The SuDS Manual (CIRIA C753, November 2015) introduced a slightly different approach compared to the previous version for the water quality management of surface water. The manual describes risks posed by the surface water runoff to the receiving environment as a function of:

- The pollution hazard at a particular site (i.e. the pollution source);
- The effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels (i.e. the pollutant pathway); and
- The sensitivity of the receiving environment (the environment receptor).

The proposed land uses requiring surface water drainage for this site are as follows:

- Roof areas – surface water discharge to roof sump gully's before discharging through the permeable paving car park into an attenuation crate; and
- Car parking area – surface water discharge to permeable paving, catchpits and rain gardens.

Table 26.2 of the SuDS Manual C753 assigns pollution hazard indices for different land use classification. The roof water and car parking areas pollution have hazard levels ranging from “Very Low” to “Low” levels of contamination. Proposed sump gullies are therefore deemed to be sufficient to remove the suspended sediments from the roof and car park surface water for a development of this size and nature. Permeable paving for the car parking areas, if suitable, for this site would also provide additional treatment to the runoff prior to discharge.

5.2.11 BIODIVERSITY AND AMENITY

This section presents general information on potential amenity and biodiversity benefits related to the proposed open SuDS features.

Amenity is one of the four pillars of SuDS design and focuses on the usefulness and aesthetic elements of the SuDS design associated with features at or near the surface. The integration of SuDS with enhanced provision of amenity and biodiversity within the proposed site provides the following benefits:

- Efficient use of space through multi-functionality;
- Usability through the integrated use of landscaping space;
- Visual aesthetics and biodiversity interest as part of the integrated site design;
- Enhancement of wildlife habitats; and
- Management train filtration of silt and sediment providing improvement to water quality.

SuDS provisions should be considered at the early stages of site layout master planning to ensure adequate volumes can be attenuated, treated and conveyed between SuDS features such rainwater gardens and attenuation systems. These are typically located within proposed soft landscaped areas, where possible.

The Garage Site 1 development site layout masterplan has provided space at the southern boundary adjacent to the public footpath where open SuDS could be included. However, given the existing topography of the site in relation to the building positioning, it is unlikely open SuDS storage could be located within the southern portion of the site within the green area.

5.2.12 RESIDUAL RISKS AND EXCEEDANCE FLOWS AND RUNOFF IN EXCESS OF DESIGN CRITERIA

The outline surface water drainage scheme for this development is proposed to comply with the requirements of Sewers for Adoption, i.e. no surcharge in the 1 in 1-year event and no flooding in the 1 in 30-year event.

It is difficult to completely guard against flooding since extreme events greater than the design standard event are always possible. It is practicable to minimise the risk by careful design of the layout of the development such that internal flooding is avoided. Areas of hardstanding can be laid to fall away from buildings with flows directed to areas where damage and disruption to buildings, assets and operations are minimised.

The amenity and landscaped areas could also be used to accommodate residual flows beyond the design 1 in 100 year plus climate change event, without causing flooding elsewhere. This should be investigated during detailed design stages. To minimise risk of internal flooding, the finished floor level should be set at a minimum of 150mm above the external ground levels.

5.2.13 GENERAL MAINTENANCE REQUIREMENTS

The surface water drainage proposals for this site should include the following maintenance measures:

- Cleaning the sump of the gullies, linear drainage channels and roof sump gullies to improve the quality of the water.
- Cleaning and maintenance of flow control device and its sump to maintain effective drainage.
- Inspection, cleaning and maintenance of the below ground attenuation systems to remove any silt and debris in accordance with the manufacturer's instructions.

The frequency of the cleaning and maintenance inspections will be agreed with the site owner/operator's maintenance team. In addition, a drainage maintenance plan needs to be included as part of a full SAB application to accompany the detailed surface water drainage design.

6 CONCLUSIONS AND RECOMMENDATIONS

The flood risk review has identified that the site is at low risk of surface water flooding during a 1 in 1000-year return period event. Flooding from other sources including fluvial, surface water, groundwater, reservoir, canals and sewers is considered to be between “very low” and “low”.

During the pre-development enquiries with DCWW, they confirmed that foul water discharge from the proposed development would be accepted into their sewer system downstream of unnamed manhole Extra 02, this would be subject to a Section 106 agreement for a new connection.

SAB S1 compliance (rainwater for reuse) has not been considered due to the small scale of the proposed development. However, other options for SAB S1 compliance should be explored further at detailed design stage and prior to full SAB application. Geological data near the site indicates that surface water disposal using a soakaway-based drainage system may be possible due to the nature of the underlying geology, however this should be confirmed following the undertaking of ground investigations including infiltration testing to BRE365 guidance. Surface water disposal to a watercourse was discounted due to the absence of open or known culverted surface water bodies within the proximity of the site. Similarly, discharge to a standalone surface water drain/sewer was discounted as there isn't a suitable system within the proximity of the site.

Subject to soakaways being unsuitable, DCWW has provisionally accepted a discharge rate between 2 and 5L/s to the existing combined sewer to the south of the site. Based on a 2L/s discharge rate, to cater for 100yr + 40% CC event, up to 4.8m³ of surface water attenuation would be required. This provides 45% of betterment compared to the existing surface water regime at the site. This could be located within the proposed parking bays to the front of the proposed building. A forward flow restriction device could be located adjacent to the south elevation discharging the water to Extra 02. This would be subject to a Section 106 discharge consent with DCWW prior to construction.

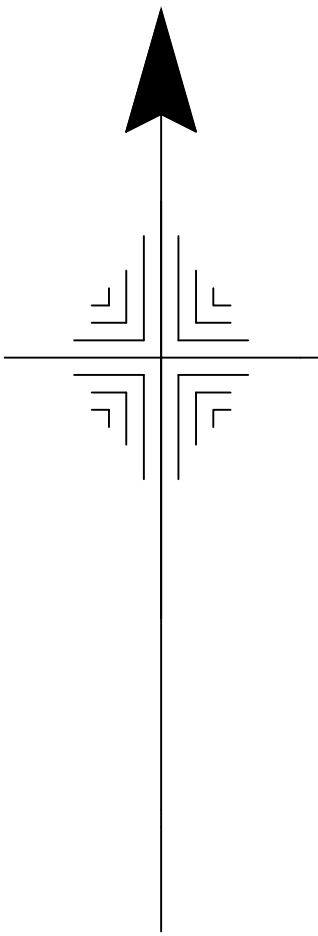
6.1 RECOMMENDATIONS

It is recommended that the proposal presented within this drainage strategy and the appended outline design drainage sketches are taken forward to the pre-SAB applications and subsequent detailed design stages. It is also advised that the applicable adoptions, applications and consents such as the S106 are submitted promptly following the completion of the detailed drainage design at the relevant stages to avoid any delays.

Appendix A

TOPOGRAPHIC SURVEY





- Legend
- BL BOLLARD
 - BS BUS STOP
 - CATV CABLE TV COVER
 - CL COVER LEVEL
 - CPS CONCRETE PAVING SLAB
 - DP DRAIN PIPE
 - DK DROP KERB
 - EL ELECTRICITY COVER
 - EP ELECTRICITY POLE
 - ER EARTH ROD
 - FH FIRE HYDRANT
 - FL FLOOR LEVEL
 - FS FLAG STAFF
 - G GAS COVER
 - GLY GULLY
 - GSV GAS STOP VALVE
 - IC INSPECTION COVER
 - IL INVERT LEVEL
 - LB LITTER BIN
 - LP LAMP POST
 - MKR MARKER
 - NB NOTICE BOARD
 - P POST
 - PH POST HOLE
 - PLP PEDESTRIAN LAMP POST
 - RE RODDING EYE
 - RS ROAD SIGN
 - STN SURVEY STATION
 - STY STAY WIRE
 - T TELECOMMUNICATIONS COVER
 - TL TRAFFIC LIGHT
 - TP TELEGRAPH POLE
 - TWL TOP OF WALL LEVEL
 - UTL UNABLE TO LIFT
 - UTM UNABLE TO MEASURE
 - VP VENT PIPE
 - WL WATER LEVEL
 - WP WASTE PIPE
 - WSV WATER STOP VALVE

- FENCE TYPES
- B/W BARBED WIRE
 - C/B CLOSE BOARD
 - P/W POST AND WIRE
 - P/R POST AND RAIL
 - C/L CHAIN LINK
 - C/P CHESTNUT PALE
 - C/W CHICKEN WIRE
 - M/R METAL RAIL (SECURITY TYPE)
 - P/F PANEL FENCE
 - C/I CORRUGATED IRON
 - I/R IRON RAILING
 - RWL RETAINING WALL

Notes

COPYRIGHT FOR DRAWING REMAINS WITH BLS LTD, AND MAY NOT BE COPIED WITHOUT THEIR WRITTEN CONSENT.

ANY SERVICES SHOWN ARE AS LOCATED BY EITHER GROUND PENETRATING RADAR (GPR) OR BY RADIO DETECTION SCANNER IN EITHER ACTIVE (A) OR PASSIVE MODE (P). DUE TO SUBSOIL CONDITIONS AND OTHER FACTORS THE UNDERGROUND SERVICE INFORMATION SHOWN MAY NOT REPRESENT A COMPREHENSIVE RECORD AND ALL CONTRACTORS SHOULD PROCEED WITH CAUTION BEFORE EXCAVATION

xx --- xx DENOTES OVERHEAD CABLES
* --- * DENOTES UNDERGROUND SERVICES

LEVELS AT ROAD KERBS ARE TAKEN AT CHANNEL LEVELS UNLESS OTHERWISE REQUESTED

STATION CO-ORDINATES				
STN	1	E	333836.810	N 351577.584 H 88.853
STN	2	E	333853.691	N 351609.151 H 90.012
STN	3	E	333762.792	N 351619.352 H 93.517
STN	4	E	333763.644	N 351585.224 H 91.171

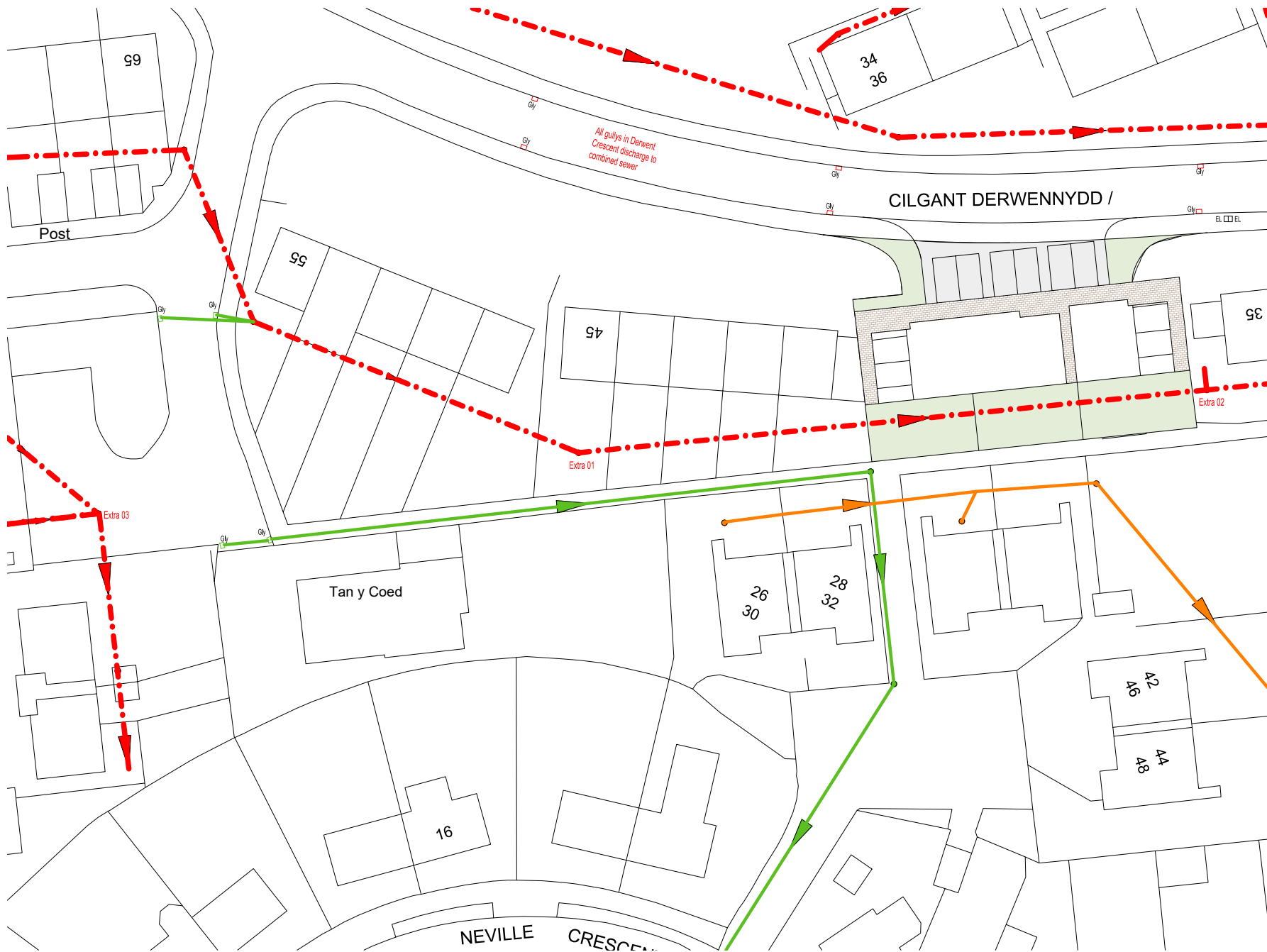
BATTLEFIELD LAND SURVEYS LTD
3 YEOMANRY ROAD
BATTLEFIELD ENTERPRISE PARK
SHREWSBURY
SHROPSHIRE SY1 3EH
TEL/FAX 01743 443388
EMAIL MAILBOX@BLSURVEYS.CO.UK

Client		Title		
WREXHAM COUNTY BOROUGH COUNCIL		DERWENT CRESCENT WREXHAM		
Scale	Date	Job No	Dwg No	Rev.
1 : 200	12/07/21	12697	01	—
Surveyed by		Checked	Scanned	Levels are related to . . .
RDL / JG		RDL	YES	OS DATUM (VRS)

Appendix B

SITE LAYOUT





Drainage Legend:

- Combined Sewer
- Foul Sewer
- SWW Sewer
- Combined Down Pipe
- Foul Down Pipe
- Rain Water Down Pipe

P03	Revised issue (AJ) (KOH) (KOH)	21/08/2021
P02	Revised issue (CH) (KOH) (KOH)	01/08/2021
P01	Initial issue (CH) (CS) (KOH)	30/07/2021
REV	DESCRIPTION / DRAWN BY / CHECKED BY / APPROVED BY	DATE
1	Initial issue (CH) (CS) (KOH)	30/07/2021
2	Revised issue (AJ) (KOH) (KOH)	21/08/2021
3	Revised issue (CH) (KOH) (KOH)	01/08/2021
4	Revised issue (AJ) (KOH) (KOH)	21/08/2021
5	Revised issue (CH) (KOH) (KOH)	01/08/2021
6	Revised issue (AJ) (KOH) (KOH)	21/08/2021
7	Revised issue (CH) (KOH) (KOH)	01/08/2021
8	Revised issue (AJ) (KOH) (KOH)	21/08/2021
9	Revised issue (CH) (KOH) (KOH)	01/08/2021
10	Revised issue (AJ) (KOH) (KOH)	21/08/2021
11	Revised issue (CH) (KOH) (KOH)	01/08/2021
12	Revised issue (AJ) (KOH) (KOH)	21/08/2021
13	Revised issue (CH) (KOH) (KOH)	01/08/2021
14	Revised issue (AJ) (KOH) (KOH)	21/08/2021
15	Revised issue (CH) (KOH) (KOH)	01/08/2021
16	Revised issue (AJ) (KOH) (KOH)	21/08/2021
17	Revised issue (CH) (KOH) (KOH)	01/08/2021
18	Revised issue (AJ) (KOH) (KOH)	21/08/2021
19	Revised issue (CH) (KOH) (KOH)	01/08/2021
20	Revised issue (AJ) (KOH) (KOH)	21/08/2021
21	Revised issue (CH) (KOH) (KOH)	01/08/2021
22	Revised issue (AJ) (KOH) (KOH)	21/08/2021
23	Revised issue (CH) (KOH) (KOH)	01/08/2021
24	Revised issue (AJ) (KOH) (KOH)	21/08/2021
25	Revised issue (CH) (KOH) (KOH)	01/08/2021
26	Revised issue (AJ) (KOH) (KOH)	21/08/2021
27	Revised issue (CH) (KOH) (KOH)	01/08/2021
28	Revised issue (AJ) (KOH) (KOH)	21/08/2021
29	Revised issue (CH) (KOH) (KOH)	01/08/2021
30	Revised issue (AJ) (KOH) (KOH)	21/08/2021
31	Revised issue (CH) (KOH) (KOH)	01/08/2021
32	Revised issue (AJ) (KOH) (KOH)	21/08/2021
33	Revised issue (CH) (KOH) (KOH)	01/08/2021
34	Revised issue (AJ) (KOH) (KOH)	21/08/2021
35	Revised issue (CH) (KOH) (KOH)	01/08/2021
36	Revised issue (AJ) (KOH) (KOH)	21/08/2021
37	Revised issue (CH) (KOH) (KOH)	01/08/2021
38	Revised issue (AJ) (KOH) (KOH)	21/08/2021
39	Revised issue (CH) (KOH) (KOH)	01/08/2021
40	Revised issue (AJ) (KOH) (KOH)	21/08/2021
41	Revised issue (CH) (KOH) (KOH)	01/08/2021
42	Revised issue (AJ) (KOH) (KOH)	21/08/2021
43	Revised issue (CH) (KOH) (KOH)	01/08/2021
44	Revised issue (AJ) (KOH) (KOH)	21/08/2021
45	Revised issue (CH) (KOH) (KOH)	01/08/2021
46	Revised issue (AJ) (KOH) (KOH)	21/08/2021
47	Revised issue (CH) (KOH) (KOH)	01/08/2021
48	Revised issue (AJ) (KOH) (KOH)	21/08/2021
49	Revised issue (CH) (KOH) (KOH)	01/08/2021
50	Revised issue (AJ) (KOH) (KOH)	21/08/2021
51	Revised issue (CH) (KOH) (KOH)	01/08/2021
52	Revised issue (AJ) (KOH) (KOH)	21/08/2021
53	Revised issue (CH) (KOH) (KOH)	01/08/2021
54	Revised issue (AJ) (KOH) (KOH)	21/08/2021
55	Revised issue (CH) (KOH) (KOH)	01/08/2021
56	Revised issue (AJ) (KOH) (KOH)	21/08/2021
57	Revised issue (CH) (KOH) (KOH)	01/08/2021
58	Revised issue (AJ) (KOH) (KOH)	21/08/2021
59	Revised issue (CH) (KOH) (KOH)	01/08/2021
60	Revised issue (AJ) (KOH) (KOH)	21/08/2021
61	Revised issue (CH) (KOH) (KOH)	01/08/2021
62	Revised issue (AJ) (KOH) (KOH)	21/08/2021
63	Revised issue (CH) (KOH) (KOH)	01/08/2021
64	Revised issue (AJ) (KOH) (KOH)	21/08/2021
65	Revised issue (CH) (KOH) (KOH)	01/08/2021
66	Revised issue (AJ) (KOH) (KOH)	21/08/2021
67	Revised issue (CH) (KOH) (KOH)	01/08/2021
68	Revised issue (AJ) (KOH) (KOH)	21/08/2021
69	Revised issue (CH) (KOH) (KOH)	01/08/2021
70	Revised issue (AJ) (KOH) (KOH)	21/08/2021
71	Revised issue (CH) (KOH) (KOH)	01/08/2021
72	Revised issue (AJ) (KOH) (KOH)	21/08/2021
73	Revised issue (CH) (KOH) (KOH)	01/08/2021
74	Revised issue (AJ) (KOH) (KOH)	21/08/2021
75	Revised issue (CH) (KOH) (KOH)	01/08/2021
76	Revised issue (AJ) (KOH) (KOH)	21/08/2021
77	Revised issue (CH) (KOH) (KOH)	01/08/2021
78	Revised issue (AJ) (KOH) (KOH)	21/08/2021
79	Revised issue (CH) (KOH) (KOH)	01/08/2021
80	Revised issue (AJ) (KOH) (KOH)	21/08/2021
81	Revised issue (CH) (KOH) (KOH)	01/08/2021
82	Revised issue (AJ) (KOH) (KOH)	21/08/2021
83	Revised issue (CH) (KOH) (KOH)	01/08/2021
84	Revised issue (AJ) (KOH) (KOH)	21/08/2021
85	Revised issue (CH) (KOH) (KOH)	01/08/2021
86	Revised issue (AJ) (KOH) (KOH)	21/08/2021
87	Revised issue (CH) (KOH) (KOH)	01/08/2021
88	Revised issue (AJ) (KOH) (KOH)	21/08/2021
89	Revised issue (CH) (KOH) (KOH)	01/08/2021
90	Revised issue (AJ) (KOH) (KOH)	21/08/2021
91	Revised issue (CH) (KOH) (KOH)	01/08/2021
92	Revised issue (AJ) (KOH) (KOH)	21/08/2021
93	Revised issue (CH) (KOH) (KOH)	01/08/2021
94	Revised issue (AJ) (KOH) (KOH)	21/08/2021
95	Revised issue (CH) (KOH) (KOH)	01/08/2021
96	Revised issue (AJ) (KOH) (KOH)	21/08/2021
97	Revised issue (CH) (KOH) (KOH)	01/08/2021
98	Revised issue (AJ) (KOH) (KOH)	21/08/2021
99	Revised issue (CH) (KOH) (KOH)	01/08/2021
100	Revised issue (AJ) (KOH) (KOH)	21/08/2021

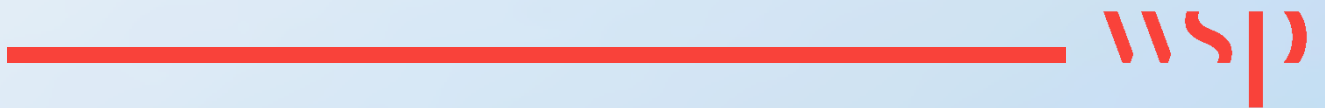
PROPOSED SITE PLAN
1:200



CLIENT	WCBC
PROJECT TITLE	Action Housing WCBC
DRAWING TITLE	Derwent Crescent 1 - Proposed Site Plan
PROJECT No	19545
SCALE @ A1	1:200
DATE	21/08/2021
DESIGNED BY	AHW-LAW-X-X-DR
CHECKED BY	A-069001
APPROVED BY	P03
SCALE	DO NOT SCALE

Appendix C

PERMEABLE AND IMPERMEABLE AREA



File name: I:\UK\NSP\GROUP 2\COMBICENTRAL DATA\PROJECTS\70086693\WSP-DR-01.DWG, printed on 27 October 2021 13:28:00, by James, Adam



DO NOT SCALE

DRAWING BACKGROUND IS BASED UPON © CROWN COPYRIGHT. ALL RIGHTS RESERVED. LICENCE NUMBER 7777

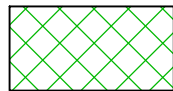


NOTES

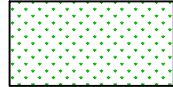
- 1. DO NOT SCALE
- 2. ALL MEASUREMENTS ARE IN METRES UNLESS NOTED OTHERWISE. ALL LEVELS ARE TO METRES ABOVE ORDNANCE DATUM.
- 3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT DRAWINGS, REPORTS AND SPECIFICATION.



IMPERMEABLE AREA (ROOF AND PAVED - 358,4604m² (0.03585ha)



PERMEABLE PAVING - TO BE DRAINED IF SOAKAWAY IS NOT FEASIBLE - 106,4899m² (0.01065ha)



PERMEABLE AREA (SOFT LANDSCAPING - 263,9866m² (0.02640ha)

DRAFT

FOR REVIEW

REV	DATE	BY	DESCRIPTION	CHK	APP
-----	------	----	-------------	-----	-----

DRAWING STATUS: S2 - FOR INFORMATION



Opus House, Yale Business Village, Wrexham Technology Park, Wrexham, LL13 7YL, UK
T+ 44 (0) 1978 368 100
wsp.com

CLIENT:



Wrexham
COUNTY BOROUGH COUNCIL
COUNCIL REPRESENTED BY

SITE/PROJECT: DERWENT CRESCENT, ACTON - WREXHAM

TITLE: IMPERMEABLE AND IMPERMEABLE AREAS
GARAGE 1

SCALE @ A1: 1:100	CHECKED: CR	APPROVED: VM
PROJECT NO: 70086689	DESIGNED: CR	DRAWN: AJ
DATE: SEPTEMBER 2021		

DRAWING No: 70086693-WSP-DR-201	REV: P01
------------------------------------	-------------

© WSP UK Ltd

Appendix D

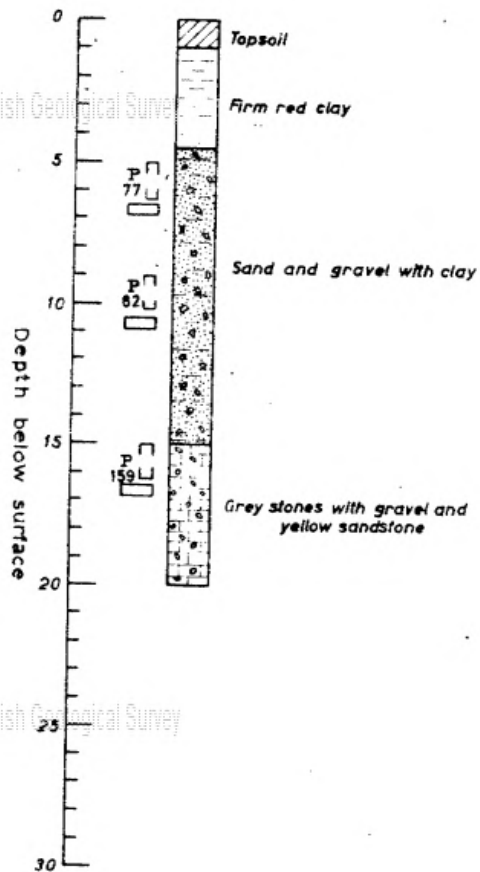
BOREHOLE RECORD





B

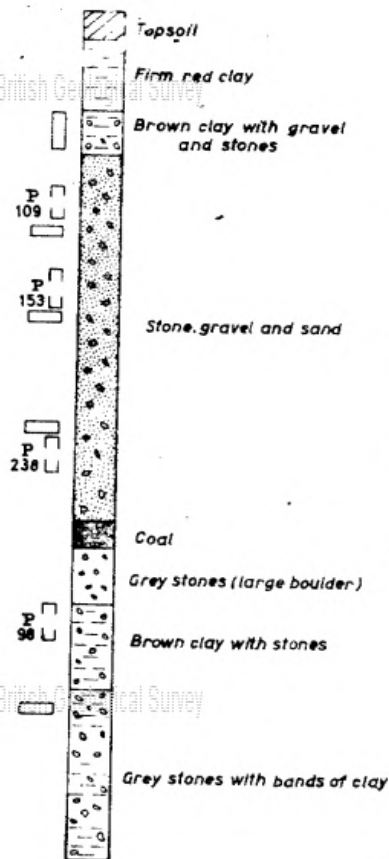
BH2



73

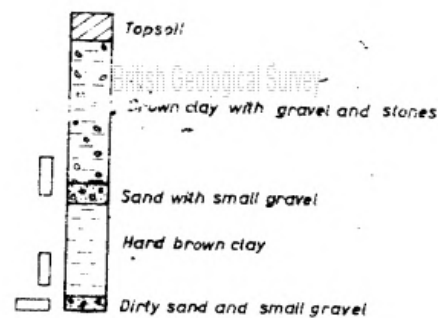
A

BH1



C

BH3



SJ35SW/17A-C

BOREHOLE SECTIONS Scale 1in=5ft

- Legend**
- 4" dia undisturbed core sample
 - P Standard penetration test
 - 98 U (98 blows for 1ft. penetration)
 - = Disturbed bulk sample

GSL

Appendix E

INVEK SURVEY





- smas**  **BUILDER'S PROFILE**
- INVEK**
- SURVEYS LTD.** 
- Spring Business Park, Long Lane, Warrington, Cheshire, WA2 8TX
- Tel: 01925 244376 Fax: 01925 241517
- Email: kevin@invek.com - www.invek.com

Derwent Crescent, Acton Drainage Layout

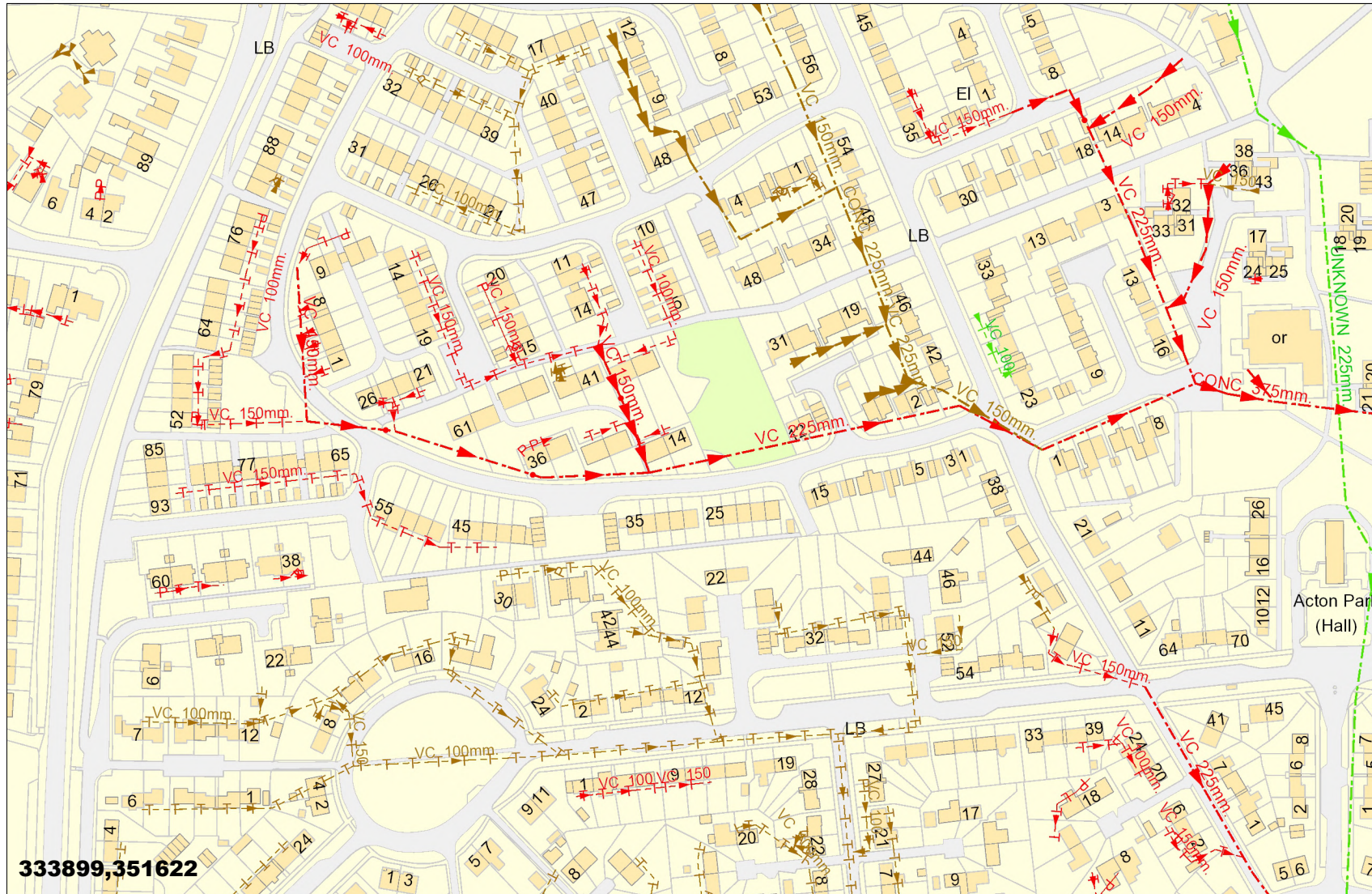
Sheet Size, Drawing Number & Revision

A1_1842/01_Rev_00

Appendix F

DCWW SEWER RECORDS





333899,351622

Dwr 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.

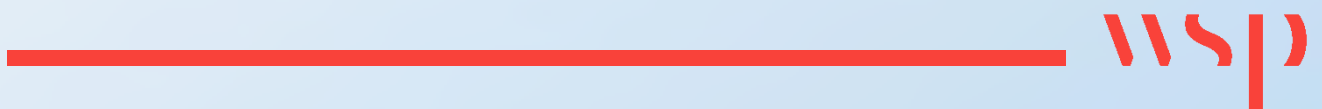
**EXACT LOCATION OF
ALL APPARATUS TO
BE DETERMINED ON
SITE**

Reproduced from the Ordnance Survey's maps with the permission of the Controller of Her Majesty's Stationary Office. Crown Copyright. Licence No: WU298565.

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

Appendix G

WREXHAM COUNTY BOROUGH COUNCIL CONSULTATION



RE: Garage 1 - Derwent Crescent, Acton, Wrexham

 SAB <SAB@wrexham.gov.uk>
To Jones, Adam
Cc Kevin Edwards

Reply Reply All Forward

Wed 18/08/2021 12:45

Follow up. Start by 18 August 2021. Due by 18 August 2021.

Dear Adam

In response to the below questions

- Any known surface water or foul sewer flooding issues at this area? **There are no surface water issues recorded in this area. For foul records please redirect this to Welsh Water.**
- Any historical surface water flooding issues at the site? **No**
- Any groundwater flooding or emergence issues and information about local groundwater infiltration potential of the general area **No**
- Any known highway flooding issues **No**
- Does the site lie near or within a Critical Drainage Area? **No**
- Are any known culverted watercourses on site or within its vicinity **No**
- Any known ground contamination issues, which may affect any future surface water drainage design using infiltration techniques. **We so not hold contaminated land information please contact environmental health for this information**
- Based on recent local development, in this area, could you please advise if soakaways are generally feasible or effective for surface water management. **There has been on recent development in this area.**
- In the event that discharge to a sewer is the only feasible option at the site, please could you specify a surface water discharge rate and attenuation volume requirements which would be acceptable in this instance. **If discharge to sewer is the only viable option then approval from welsh water will be required.**
- Is there any specific SuDs features (attenuation and water quality) that WCBC would generally specify for a residential development of this scale? **Please refer to the SuDS Guidance documents http://old.wrexham.gov.uk/english/planning_portal/sab/sab.htm**

Kind regards

Carole Wright

Carole Wright - BA MBCS

Swyddog Technegol Cefnogi Llifogydd - Technical Flood Support Officer -



01978 729735

Cyngor Bwrdeistref Sirol Wrecsam, Adran Amgylchedd a Thechnegol, De Ffordd yr Abaty, Ystad Ddiwydiannol Wrecsam, Wrecsam LL13 9PW

Wrexham County Borough Council, Environment & Technical Department, Abbey Road South, Wrexham Industrial Estate, Wrexham LL13 9PW

wrecsam.gov.uk | wrexham.gov.uk

twitter.com/cbswrecsam | twitter.com/wrexhamcbc

Appendix H

DCWW CONSULTATION



File

Message

Help

PDF-XChange

Tell me what you want to do

Delete

Archive

Move

Reply

Reply All

Forward

Mark Unread

Categorize

Follow Up

Translate

Find

Search

Read Aloud

Zoom

RE: Derwent Crescent, Acton, Wrexham

RP

Rhodri Perry <Rhodri.Perry@dwrcymru.com>

To

Potts, Rebecca

Reply

Reply All

Forward

Fri 24/09/2021 16:00

Hi Rebecca,

Thank you for patience with reply, please see comments below. If you have any additional queries please let me know.

Any known surface water or foul sewer flooding issues in this area – **We do not have surface water sewers in vicinity of site, there have been no sewer flood incidents within 50 metres of the site. There has been one within 70 but this was not DG5**

Are any properties within this area on the DG5 flooding register – **No**

Are there any plans for the construction of new foul and / or surface water sewers in this area for flood risk management purposes? **Not that I am aware of**

Is there any on-going Section 104 adoptions or Section 185 sewer diversions currently being undertaken in the area? **None within the vicinity of the site**

Is there any capital development sewer upgrading schemes planned in this area in the near future? **Not that I am aware of**

Although it is not indicated on the sewer record that any foul/combined sewers run through the site, are you aware of any unrecorded DCWW assets within the site boundary which may require diversion or relocating as part of the proposed residential development? – **We only mark on our plans assets that are known. We would advise the completion of utility surveys to take place prior to commencement of operational development.**

Thank you,

Rhodri

Rhodri Perry

Development Control Officer | Developer Services

Dŵr Cymru Welsh Water

W: dwrcymru.com

E: developer.services@dwrcymru.com

T: 0800 917 2652 | M: 07557 849514

A: PO Box 3146, Cardiff, CF30 0EH

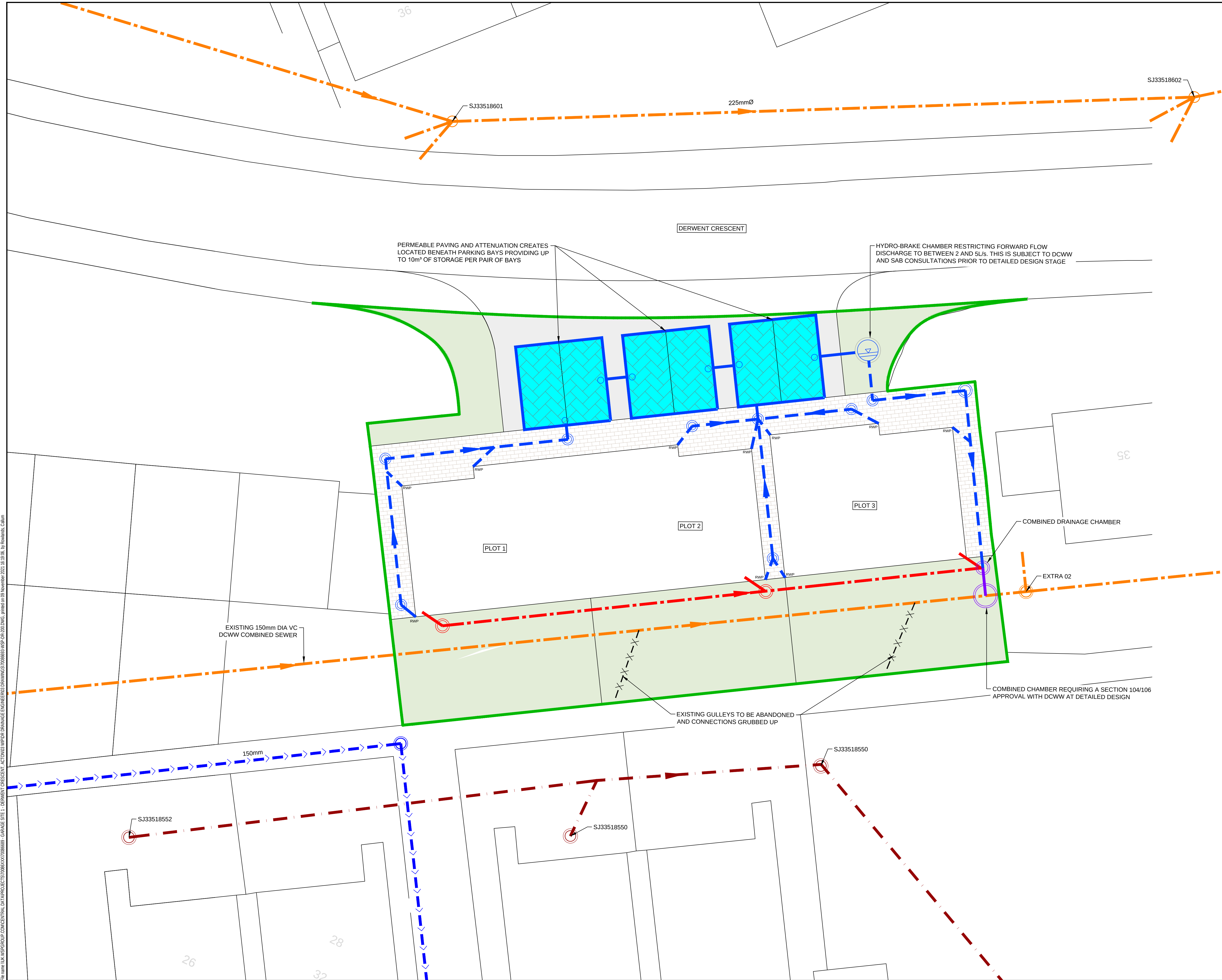
Before you print please think about the ENVIRONMENT

Appendix I

PROPOSED DRAINAGE STRATEGY



File name: W:\KWSGROUP\CONCENTRAL DATA\PROJECTS\70086689-GARAGE SITE 1 - DERWENT CRESCENT - ACTON\WSP\DR-DRAINAGE\ENGINEERING\DRAWINGS\70086689-WSP-DR-001.DWG, printed on 09 November 2021 15:29:08, by Rosemary, Calum



DO NOT SCALE

DRAWING BACKGROUND IS BASED UPON © CROWN COPYRIGHT. ALL RIGHTS RESERVED. LICENCE NUMBER 7777



NOTES

1. DO NOT SCALE.
2. ALL MEASUREMENTS ARE IN METRES UNLESS NOTED OTHERWISE. ALL LEVELS ARE TO METRES ABOVE ORDNANCE DATUM.
3. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL RELEVANT DRAWINGS, REPORTS AND SPECIFICATION.
4. EXISTING SEWER ALIGNMENTS ARE BASED UPON THE INVEK DRAINAGE SURVEY DATED 17.12.20 ALL RIGHTS RESERVED.

- < < — HIGHWAY DRAINAGE
- — — EXISTING FOUL WATER SEWER
- — — PROPOSED SURFACE WATER DRAINAGE
- — — PROPOSED FOUL WATER DRAINAGE
- — — EXISTING COMBINED SEWER
- ATTENUATION CRATES
- — — SITE BOUNDARY
- — — PROPOSED COMBINED DRAINAGE

DRAFT

FOR REVIEW

REV	DATE	BY	DESCRIPTION	CHK	APP
-----	------	----	-------------	-----	-----

DRAWING STATUS: S2 - FOR INFORMATION



Opus House, Yale Business Village, Wrexham Technology Park, Wrexham, LL13 7YL, UK
T+ 44 (0) 1978 368 100
wsp.com



SITE/PROJECT: DERWENT CRESCENT, ACTON - WREXHAM

TITLE: DRAINAGE STRATEGY
GARAGE 1

SCALE @ A1: 1:100	CHECKED: CR	APPROVED: VM
PROJECT NO: 70086689	DESIGNED: AJ	DRAWN: AJ
DATE: OCTOBER 2021		REV: P01

70086689-WSP-DR-201

© WSP UK Ltd

Appendix J

EXISTING GREENFIELD RUNOFF





ICP SUDS

ICP SUDS Input (FSR Method)

Return Period (Years) Area (ha) SAAR (mm) Soil

Map

Growth Curve

Partly Urbanised Catchment (QBAR)

Urban Region

Calculate

Results

QBAR rural (l/s)

QBAR urban (l/s)

Return Period Flood

Region	QBAR (l/s)	Q (100yrs) (l/s)	Q (1 yrs) (l/s)	Q (30 yrs) (l/s)	Q (100 yrs) (l/s)
Region 1	0.2	0.4	0.1	0.3	0.4
Region 2	0.2	0.4	0.1	0.3	0.4
Region 3	0.2	0.4	0.1	0.3	0.4
Region 4	0.2	0.4	0.1	0.3	0.4
Region 5	0.2	0.6	0.1	0.4	0.6
Region 6/Region 7	0.2	0.5	0.1	0.4	0.5
Region 8	0.2	0.4	0.1	0.3	0.4
Region 9	0.2	0.4	0.1	0.3	0.4
Region 10	0.2	0.4	0.1	0.3	0.4

IH 124

ICP SUDS

ADAS 345

FEH

ReFH2

Greenfield Volume

Greenfield Volume (ReFH2)

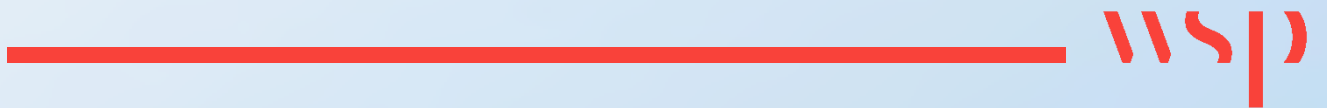
OK

Cancel

Help

Appendix K

STORAGE CALCULATION VARIABLES





Variables

Results

Design

Overview 2D

Overview 3D

Vt

Variables

FSR Rainfall



Return Period (years)

100

Region

England and Wales



Map

M5-60 (mm)

17.000

Ratio R

0.300

Cv (Summer)

0.750

Cv (Winter)

0.840

Impermeable Area (ha)

0.047

Maximum Allowable Discharge (l/s)

2.0

Infiltration Coefficient (m/hr)

0.00000



Safety Factor

2.0

Climate Change (%)

40

Analyse

OK

Cancel

Help

Enter Climate Change between -100 and 600

Appendix L

STORAGE CALCULATION RESULTS





Quick Storage Estimate



Variables

Results

Design

Overview 2D

Overview 3D

Vt

Results

Global Variables require approximate storage of between 13 m³ and 22 m³.

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

Analyse

OK

Cancel

Help

Enter Climate Change between -100 and 600



Opus House
Yale Business Village
Wrexham Technology Park
Wrexham

wsp.com

CONFIDENTIAL