



TACP

BRYMBO HERITAGE SITE

Drainage Strategy

TACP

BRYMBO HERITAGE SITE

Drainage Strategy

TYPE OF DOCUMENT (VERSION) RESTRICTED

PROJECT NO. 70055167

DATE: NOVEMBER 2019

WSP

Wrexham Office

Opus House

Yale Business Village

Wrexham

LL13 7YL

Phone: +44 1978 368100

WSP.com

QUALITY CONTROL

Issue/revision	First issue	Revision 1	Revision 2	Revision 3
Remarks	Issue 1	Revision 1	Revision 2	
Date	25/02/19	30/04/19	11/11/19	
Prepared by	J. Russell	J. Russell	J. Russell	
Signature	<i>J Russell</i>	<i>J Russell</i>	<i>J Russell</i>	
Checked by	G. Taylor	G. Taylor	G. Taylor	
Signature	<i>G Taylor</i>	<i>G Taylor</i>	<i>G Taylor</i>	
Authorised by				
Signature				
Project number	70055167	70055167	70055167	
Report number	001	001	001	
File reference				

CONTENTS

1.0 INTRODUCTION **2**

1.1	COMMISSION	2
1.2	POLICY CONTENT	3
1.3	LIMITATIONS	3

2.0 EXISTING SITE AND DEVELOPMENT PROPOSALS **4**

2.1	SITE LOCATION	4
2.2	SITE DESCRIPTION	4
2.3	PROPOSED DEVELOPMENT	5
2.4	GEOLOGY AND HYDROGEOLOGY	5
2.5	HYDROLOGY	6
2.6	EXISTING DRAINAGE	7
2.6.1	PUBLIC SEWERS	7
2.6.2	EXISTING SITE DRAINAGE ARRANGEMENTS	7
2.7	CONSULTATION WITH AUTHORITIES	8
2.7.1	CONSULTATION WITH WREXHAM COUNTY BOROUGH COUNCIL (WCBC) LEAD LOCAL FLOOD AUTHORITY (LLFA)	8
2.7.2	CONSULTATION WITH NATURAL RESOURCES WALES (NRW)	8
2.7.3	CONSULTATION WITH DWR CYMRU WELSH WATER (DCWW)	8
2.7.4	CONSULTATION WITH BRYMBO HERITAGE TRUST (BHT)	8

3.0 ASSESSMENT OF FLOOD RISK **9**

3.1	FLOODING HISTORY	9
------------	-------------------------	----------

4.0 DRAINAGE PROPOSALS **10**

4.1	FOUL DRAINAGE	10
4.1.1	CONNECTION TO PUBLIC SEWER	10

4.2	SURFACE WATER DRAINAGE	11
4.2.1	SURFACE WATER DRAINAGE GUIDANCE AND POLICY	11
4.2.2	DISCHARGE TO GROUND	12
4.2.3	DISCHARGE TO SURFACE WATER BODY	12
4.2.4	DISCHARGE TO SURFACE WATER SEWER	12
4.2.5	SUSTAINABLE DRAINAGE FEATURES	13
4.2.6	SCHEME PROPOSALS	13
4.2.7	WATER QUALITY	14
4.2.8	RESIDUAL RISKS AND EXCEEDENCE FLOWS AND RUNOFF IN EXCESS OF DESIGN CRITERIA	15
4.2.9	GENERAL MAINTENANCE REGIMES	15
	5.0 CONCLUSION	16
5.1	CONCLUSION	16
	6.0 APPENDICES	17
6.1	DEVELOPMENT PLAN	17
6.2	TOPOGRAPHICAL SURVEY	17
6.3	PROPOSED AND EXISTING IMPERMEABLE AREAS	17
6.4	DCWW SEWER PLAN	17
6.5	SCOTT WILSON DRAINAGE LAYOUT	17
6.6	DCWW PLANNING CORRESPONDENCE	17
6.7	BHT PRIVATE LAND OWNER PERMISSION	17
6.8	NRW FLOOD MAP	17
6.9	INDICATIVE DRAINAGE LAYOUT	17
6.10	TYPICAL ATTENUATION CALCULATIONS	17

EXECUTIVE SUMMARY

This report was commissioned in late 2018 as a Drainage Strategy document for the redevelopment of the former Brymbo Steelworks Heritage. The report was prepared to inform the development of the project design and scope, and support various future Planning Application's associated with the wide ranging project.

In the preparation of this document, consideration has been given to the whole of the remaining estate against the proposals current at the time of the report as supplied by the client. However, it should be acknowledged that matters regarding land ownership's, responsibilities and maintenance, as well as the final overall design, are to be resolved in due course to support the funding and programme constraints of the project.

1.0 INTRODUCTION

1.1 COMMISSION

WSP were appointed by Brymbo Heritage to undertake a Drainage Strategy to support the proposed development at Brymbo Heritage Site, Brymbo, Wrexham.

The scope of this Drainage Strategy includes the following:

- Consult with relevant body regarding their specific surface water management requirements and allowable discharge rates for surface water drainage.
- Review publicly available documents, local policy documents and geological and hydrogeological mapping;
- Review details of published geology and hydrogeology and review the results of ground investigation tests, if available at time of writing.
- Obtain existing and proposed site development details from the Client in AutoCAD format in order to assess the likely change in impermeable area resulting from the new development.
- Establish approximate surface water attenuation volumes and rates of runoff, taking climate change and local policy into account.
- Develop preliminary proposals for surface and foul water drainage on the site. This will include SuDS features to meet the requirements of the relevant statutory bodies.

1.2 POLICY CONTENT

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

- Building Regulations 2010 (Part H3)
- Sewers for Adoption 7th Edition
- Welsh Ministers Standards for Foul Sewers and Lateral Drains
- The new Sustainable Drainage Systems (SuDS) Manual C753, CIRIA
- Technical Advice Note (TAN) 15: Development and Flood Risk dated October 2004 issued by Welsh Government
- RainScape – Dwr Cymru Welsh Water
- SuDS Wales
- Planning Policy Wales (Edition 9, November 2016) issued by Welsh Government
- Wrexham County Borough Councils local planning guidance note Management of Surface Water Generated from New Development

1.3 LIMITATIONS

The findings and opinions conveyed via 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 or 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 taking into account of the information made available by the Client, as the manpower and resources devoted to it by agreement with the Client.

The findings of this DS have been based on data available at the time of the 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 6.1**. WSP do not warrant that the advice in this report will guarantee the availability of flood insurance either now or in the future.

2.0 EXISTING SITE AND DEVELOPMENT PROPOSALS

2.1 SITE LOCATION

The proposed re-development site is located to the south of the village of Brymbo, Wrexham. The site has an approximate area of 11.51ha, of which 1.43ha is impermeable area and is centred within National Grid Reference 329490E, 353483N.

The site is irregular in shape and is bounded to the north by Brymbo Enterprise Centre / Blast Road / Brake Road / Residential Properties, to the east by Phoenix Drive / Brymbo Link Road and to the south and west by farmland. The existing site location plan is shown in **Figure 1.0** below.



Figure 1.0: Site Location Plan (Source: Ordnance Survey Map

License Number WL100018294)

2.2 SITE DESCRIPTION

A topographical survey provided by the Client has been reviewed as part of this assessment and is included in **Appendix 6.2** of this report. The survey indicates that the site has a high point of 259.900m AOD located in the North West corner of the site. The low point is located in the south east corner of the site at 195.220m AOD, with levels of 247.670m AOD and 206.160m AOD in the south west and north east corners respectively.

The site was formally a steel works although it is undeveloped following its closure, currently there are still numerous large structures on site associated with the former steel works but a large portion of the site is populated with trees and shrubland.

2.3 PROPOSED DEVELOPMENT

The site is to be developed in four Phases.

- Heritage Fund Area
- Duck Pond Site
- Carriages Site
- Solar Park

The first three phases consists of the re-development of existing buildings and construction of additional car parking areas with the final phase being the construction of a new solar park.

Based upon latest development plans the approximate impermeable area generated by the proposals will be within the region of 1.52Ha which represents an increase of 0.085Ha in impermeable area, as shown on the impermeable area plan included on drawing 5167-SK01 in **Appendix 6.3**.

The development proposals & phasing are shown on the Architects plans enclosed within **Appendix 6.1**.

2.4 GEOLOGY AND HYDROGEOLOGY

The geology of the site has been reviewed from the following reports provided by the client:

- Former Brymbo Steelworks Fossil Forrest – Land Contamination Review for Brymbo Heritage September 2019

The information in the reports can be summarised as following:

BGS, historical OS mapping, the previous reports, and site observations indicate the potential ground, conditions to be:

- Made ground: Is not present the area having been excavated to rockhead
- Superficial Deposits: BGS mapping provides no data for superficial deposits beneath the site.
- Bedrock: Is not present the area having been excavated to rockhead
- Faults: - The Brymbo Fault is mapped as running roughly NNW-SSE across the western edge of the site. The fault has been seen in the opencast workings as a narrow well-defined break and throws down the strata by about 140m to the west. On the west side of the fault the Cefn Rock sandstone outcrops whilst to the east are the typical sequences of Coal Measures strata.

Hydrology / Drainage - Surface infiltration through the more permeable weathered rock and via fractures is possible but runoff downslope to the west will diver most drainage arising on the site.

Hydrogeology / Groundwater - The Environment Agency (via the Defra Magic Map web application) shows that the bedrock underlying the site is classed as a Minor Aquifer and the superficial deposit is unproductive. The site is not in an area of aquifer vulnerability and not in any Source Protection Zones.

Mining - The former Brymbo Colliery (Blast Pit) is located adjacent to the northwest of the site and comprised two shafts. The shafts were sunk in the 1840s and closed in 1914. The shafts have been infilled to 60m bgl with water inflows at 30m bgl. Numerous worked coal seams are anticipated below the site and an unworked coal seam is exposed near the northern boundary

Landfill - Natural Resources Wales mapping indicates that the wider site is a historical landfill, referred to as the Works Bank as the Steelworks held a license to tip waste materials anywhere within their boundary. This was surrendered as part of the programmed of remediation works in 2008 when the steelworks wastes were relocated outside of the Fossil Forest boundary

Additionally, The Brymbo Fossil Forest was discovered in 2003 during open cast mining for coal on the site. The fossil trees are circa 300 million years old and have been designated as a Site of Special Scientific Interest and has potential to become a World Heritage Site.

Any infiltration based drainage system would be founded under the compacted mudstone overburden, within the compacted / residual steelworks waste materials and natural ground, however, given the nature of this material, we would suggest that this is not suitable for the means of infiltration and that the excavation of this material for soakaway testing in accordance with BRE365 guidance will increase the potential for contaminants present to be exposed and have an adverse effect on the proposed site.

Based on this information, it has therefore been concluded that a below ground infiltration based drainage system will not be viable for the disposal of surface water run-off generated by the site.

2.5 HYDROLOGY

There are no open watercourses on the site and the nearest adjacent watercourses are the *Afon Cegidog located 1.6km to the north of the site and the Afon Gwenfro located 1.4km to the south. The Gwenfro is fed by the Lodge Stream, which runs down the valley along the eastern boundary of the main site. The stream forms the closest surface watercourse to the site, lying about 400m to the southeast.*

*There are two known drainage systems within the Blast Furnace Area referred to as the Foundry Adit and Furnace Culvert, please refer to the Module Layout plan in **Appendix 6.4** for details. The Foundry Adit drains acidic mine water and emerges within the Foundry. The flow is irregular but increases over winter and wet periods. The water issuing from the adit flows through a concrete lined channel located in the eastern area of the Heritage Module and then into a drain passing along the former road tunnel and Armco Tunnel to the Lodge Stream. Monitoring of the Foundry Adit during the reclamation works indicated that the discharge is typical of acidic mine drainage. The open-air concrete-lined channel has been filled with crushed concrete to provide a temporary treatment method to raise the pH levels of the water, allow oxygenation and the precipitation of hydrated iron oxide (ochre) to minimise the potential impacts on the Lodge Stream.*

The Furnace Culvert is located adjacent to the former blast furnaces. The water flows eastwards into the culvert from the direction of Blast Road, uphill of the North Western Development Module (learning, information and resource centre). The flow from the Furnace Culvert is believed to pass below the western part of the Apartment area (car park) to combine with the No. 1 Gate Drain (flowing to the east of the Heritage Area) and Foundry Adit water, ultimately flowing to the Lodge Stream via a former road tunnel / Armco Tunnel drain.

In addition a series of ponds are located within the Blast Pit area which provide a Great Crested Newt Habitat. These are fed by a drain located at the base of the Supply Well building. A further series of

clay lined ponds / reed beds have been created in the Duck Pond area at the base of the Wonder Bank, to which surface water runoff from the Wonder Bank is directed.

2.6 EXISTING DRAINAGE

2.6.1 PUBLIC SEWERS

A copy of Dwr Cymru Welsh Water's (DCWW) sewer records has been reviewed as part of this assessment and is included in **Appendix 6.5** of this report. DCWW's plan shows a 150mm diameter combined sewer beginning at the site and flowing in a south easterly direction towards New Road to the east of the site. However, this arrangement has been superseded during the construction of the amended layout of Phoenix Drive and the Brymbo Link Road.

A copy of the Scott Wilson Drainage Layout drawings (04-04-07) for the Brymbo Reclamation and Proposed Development has also been reviewed as part of this assessment and is included in **Appendix 6.6** of this report. These plans indicate the surface and foul water drainage that is to be adopted as part of the highway works adjacent to the site. Currently these drains have not been adopted, however, it is proposed that they will be in the near future. These plans show a 150mm diameter foul drain located within the adjacent highway with 150mm diameter foul lateral connections coming from each of the two existing access points to the site from the access road. They also show a 375mm / 450mm / 525mm diameter surface water drain located within the adjacent highway (Brymbo Link Road / Phoenix Drive) with a 300mm diameter surface water lateral connection coming from the middle existing access point to the site (S80) and a 225mm diameter surface water lateral connection coming from the southern existing access point to the site from the access road (S135). The plans indicate that the surface water network has an allowance for a discharge rate of 58 l/s from S80 and 38 l/s from S135.

2.6.2 EXISTING SITE DRAINAGE ARRANGEMENTS

The existing drainage arrangements of the site has been reviewed from the following report provided by the client:

- Former Brymbo Steelworks Fossil Area – Contamination Certificate Report for Brymbo Developments Ltd. May 2010 (covers the eastern area of the site)

The information in the report can be summarised as following:

Drainage on the main site is via direct run-off from the slopes, through man made drains and channels constructed during previous uses of the site or by infiltrating the ground and moving through a saturated zone beneath the site. It is considered likely that the majority of drainage on the main site historically moved via infiltration through the tipped slags and steelworks waste materials which lay beneath the site, however, the presence of compacted mudstones over much of the Fossil Area and adjoining development areas now results in reduced permeability, and surface water sheds to the east onto the now grassed Eastern Slopes during periods of high rainfall.

2.7 CONSULTATION WITH AUTHORITIES

2.7.1 CONSULTATION WITH WREXHAM COUNTY BOROUGH COUNCIL (WCBC) LEAD LOCAL FLOOD AUTHORITY (LLFA)

At the time of writing WSP have been unable to consult with the LLFA regarding the proposals.

2.7.2 CONSULTATION WITH NATURAL RESOURCES WALES (NRW)

At the time of writing WSP have been unable to consult with NRW regarding the proposals.

2.7.3 CONSULTATION WITH DWR CYMRU WELSH WATER (DCWW)

DCWW were consulted as part of the planning application of the Fossil Forest, the following was stated in their response and is included within **Appendix 6.7**:

- Having reviewed the details submitted to support the above application to discharge condition 5 from planning permission P/2018/0557, it is unclear whether a foul connection is required. We would seek clarification on this matter. If a foul connection is required, we would request that a drainage plan is provided indicating the drainage layout and point of connection with the known public sewerage system.
- In relation to surface water, we note it is proposed to discharge surface water runoff from the proposed development into a private surface water sewer.
- Our response is based on the information provided by your application. Should the proposal alter during the course of the application process we kindly request that we are re-consulted and reserve the right to make new representation.

2.7.4 CONSULTATION WITH BRYMBO HERITAGE TRUST (BHT)

Given that it is proposed to discharge surface water flows from the development into the (currently) private surface water system located within the adjacent access road, consultation with the owner of that system was required. Brymbo Heritage Trust are the owners of the surface water drainage system and the following was stated in correspondence with them and is included within **Appendix 6.8**:

- Having It has been confirmed from a search of the sewer records that the drainage associated with fossil forest location remains in the ownership of Parkhill Estates' subsidiary company Brymbo Developments Ltd. On 1st February 2019 BHT received written confirmation via email as quoted below from the Parkhill Estates' director John Thomson.
- 'I have no technical objections to the two discharge points to the east of the Heritage Buildings i.e. S75 (22 l/sec) and S80 (58 l/sec) being used for the drainage of the Heritage Buildings area and the Fossil Forest area'.

3.0 ASSESSMENT OF FLOOD RISK

3.1 FLOODING HISTORY

The assessment of flood risk, in accordance with the requirements of TAN15, is outside the scope of this report. However, in accordance with the Natural Resources Wales (NRW) online Maps (shown in **Appendix 6.9**), the site is located within Flood Zone A – Land having less than 1 in 1000 annual probability of river or sea flooding.

Due to the topography of the area, the risk of flooding from adjoining properties or roads is considered to be minimal and therefore, the management of the surface water run-off generated by the post development site will be the principal flood risk associated with this scheme.

The management of surface water and therefore reduction of any flood risk is discussed in Section 4 of this report.

4.0 DRAINAGE PROPOSALS

4.1 FOUL DRAINAGE

The foul drainage disposal is proposed to be in compliance with 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

4.1.1 CONNECTION TO PUBLIC SEWER

There are no proposed foul drainage connections within the Temporary Fossil Forrest Structure, all welfare facilities are to be provided within the existing machine shop.

The proposed peak foul discharge generated by the development has been calculated based upon an assumed number of 10 WCs with a value of 1.6 discharge units with a frequency (k) factor of 1.0, which generates a peak flow in the region of 4 l/s.

As the existing site has been vacant for some time it is currently not possible to calculate the existing peak foul discharge from the site or when it was previously in use, it is likely that the peak foul flows from the proposed development will be greater than the existing.

In light of the above, we would advocate a separate foul drainage system is designed to serve the welfare facilities in the machine shop, in accordance with all statutory requirements. A gravity outfall should be constructed to the existing foul manhole EX MH F45. Indicative proposals of the foul drainage are shown on drawing 5167-SK02 enclosed within **Appendix 6.10**.

4.2 SURFACE WATER DRAINAGE

4.2.1 SURFACE WATER DRAINAGE GUIDANCE AND POLICY

The **Welsh Government Planning Policy Wales** guidance states the following “*flood risk is a material planning consideration*” and the **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:

- Technical Advice Note (TAN) 15: Development and Flood Risk dated October 2004 issued by Welsh Government
- Wrexham County Borough Council
- Building Regulations 2010 (Part H3)
- Sewers for Adoption 7th Edition
- Planning Policy Wales (Edition 9, November 2016) issued by Welsh Government
- Wrexham County Borough Councils local planning guidance note Management of Surface Water Generated from New Development
- Wrexham County Borough Council Local Flood Risk Management Strategy April 2013
- 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

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. Part H3 of the Building Regulations 2010 guidance recommends that surface water runoff shall discharge to one of the following, listed in order of priority:

- Discharge to the ground
- Discharge to a surface water body
- Discharge to a surface water sewer
- 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.

Further to this, the implementation of Schedule 3 of the Flood and Water Management Act 2010 in Wales has placed greater emphasis on the key objectives of;

- a) Flood Risk Reduction
- b) Improving Water Quality
- c) Protecting and Improving the Environment
- d) Protecting Health & Safety
- e) Ensuring the stability and durability of drainage systems.

The design should therefore 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 whilst ensuring that the key objectives of schedule 3 are satisfied to the consent of the local Sustainable Drainage Approval Body (SAB).

4.2.2 DISCHARGE TO GROUND

As previously referenced in section 2 of this report, the underlying compacted mudstone overburden was excavated from the main site void and comprises overlying compacted / residual steelworks waste materials. Additionally, the Fossil Forest has SSSI and potential World Heritage Site status and we would not wish to undertake any excavations within this area except for scientific exploration. Based on this information, it has therefore been concluded that a below ground infiltration based drainage system will not be viable for the disposal of surface water run-off generated by the site.

4.2.3 DISCHARGE TO SURFACE WATER BODY

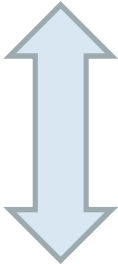
As previously referenced in section 2 of this report, there are no open watercourses on the site and the nearest adjacent watercourse is the Lodge Stream, which runs down the valley along the eastern boundary of the main site approximately 400m to the southeast. Additionally, it would be required to excavate the previously referenced underlying compacted mudstone overburden to gain access to the two mine drainage systems within the Blast Furnace Area the Foundry Adit and Furnace Culvert. On this basis, this option has therefore also been discounted.

4.2.4 DISCHARGE TO SURFACE WATER SEWER

As previously referenced in section 2 of this report, the Scott Wilson Drainage Layout drawings shows that there is a 300mm diameter surface water lateral connection coming from the middle existing access point to the site from the access road (EX MH S80). The plans indicate that the surface water network has an allowance for a discharge rate of 58 l/s from S80 (See Scott Wilson Drainage Layout drawing in **Appendix 6.6**).

4.2.5 SUSTAINABLE DRAINAGE FEATURES

When considering Sustainable drainage features, a Hierarchy of SuDs features can be considered;

	SuDs Technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
Most sustainable  Least Sustainable	Living Roofs	√	√	√
	Basins & Ponds - Wetlands - Detention Basins - Retention Ponds	√	√	√
	Filter Strips and Swales	√	√	√
	Infiltration Devices	√	√	√
	Permeable Surfaces and Filter Drains - Gravelled Areas - Solid Paving Blocks - Porous Paviers	√	√	
	Water Capture & Re-use - Rain Water Harvesting - Irrigation Systems	√		
	Tanked Systems - Over-sized pipes / tanks - Storm Cells	√		

4.2.6 SCHEME PROPOSALS

As previously reference in section, infiltration techniques will not be a viable solution for this site, however, we have looked to incorporate the following features in to the design;

- Swales as a means of conveyance & storage
- Detention basins / underground tanks & oversized pipework as a means of storage
- Rainwater Butts for all buildings
- Inclusion of Porous Paving Systems (subject to agreement) to any new car park

We consider this design to offer a practicable means to positively impact on the existing flood profile whilst improving water quality of the run off in accordance with the philosophy of Schedule 3, whilst acknowledging the site constraints of size, local topography and ground investigation.

In light of the above, we would advocate a piped surface water drainage system, conveyance swales and porous paving will serve the proposed Heritage Fund Site, Duck Pond Site and Carriages Site and will discharge surface water run-off to the existing outfall EX MH S80 at a maximum discharge rate of 58l/s.

It is considered that the creation of the Solar Park will not fundamentally alter the surface water regime within this area and the status quo of impermeable area will remain unchanged, therefore, it is not proposed at this stage to alter or install any additional drainage within this area.

The agreed discharge rate of 58l/s has been divided between the three remaining sites and the required attenuation to accommodate up to and including the 1 in 100 year + CC 30% climate change is shown in Table 1 below.

Table 1 – Attenuation Volumes

SITE	IMPERMEABLE AREA (m ²)	DISCHARGE RATE (l/s)	1 in 100 year + CC STORAGE VOLUME (m ³)
Heritage Fund Site	8,835	48	175 to 330
Duck Pond Site	1,655	5	92 to 147
Carriages Site	2,490	5	50 to 84

It is envisaged that the storage volumes stated above will be accommodated within the porous paving, swales, tanks and oversized pipework and will be subject to detailed design. The design criteria and assumptions are in compliance with the planning criteria of Building Regulations 2010 Part H with indicative proposals shown on drawings 5167-SK02 in **Appendix 6.10** and the calculations shown in **Appendix 6.11**.

4.2.7 WATER QUALITY

The new 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).
- 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 water butts / swales before discharging to EX MH S80.
- Car parking area – surface water discharge to porous paving before discharging to the existing public manholes S80

Table 26.2 of the SuDS Manual C753 assigns pollution hazard indices for different land use classification. The roof water and car parking areas have hazard levels ranging from very low to low, with low levels of contamination. The proposed swales / water butts / porous paving are 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.

4.2.8 RESIDUAL RISKS AND EXCEEDENCE FLOWS AND RUNOFF IN EXCESS OF DESIGN CRITERIA

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 will be minimized.

4.2.9 GENERAL MAINTENANCE REGIMES

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

- Cleaning the water butts to improve the quality of water.
- Cleaning and maintenance of flow control devices and its sump to maintain effective drainage.
- Inspection, cleaning and maintenance of porous paving to remove any silt and debris in accordance with the manufacturer's instructions.
- Inspection, cleaning and maintenance of swales 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 property owner/resident or relevant maintenance team.

5.0 CONCLUSION

5.1 CONCLUSION

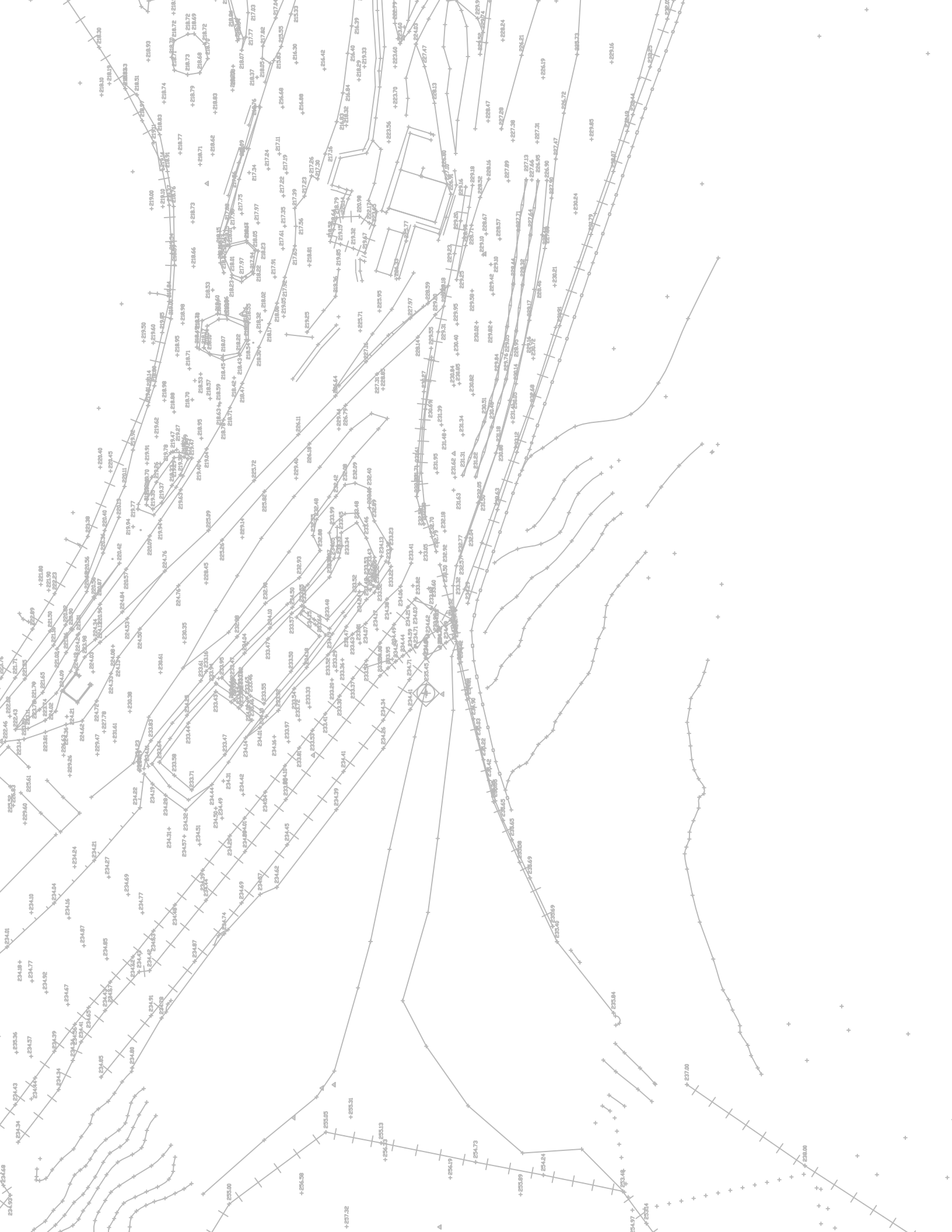
The proposed site was not found to be at fluvial flood risk and is situated on land identified on the TAN15 Development map as Flood Zone A. Due to the location of the site, the risk of flooding from canals, reservoirs and tidal waters is considered to be negligible.

The proposed development is not expected to be affected by general objections in respect to draining the site. There will be suitable conditions imposed to ensure that the drainage proposals are designed and constructed in accordance with relevant statutory requirements, including Building Regulations 2010 and the requirements of WCBC's surface water management guidance.

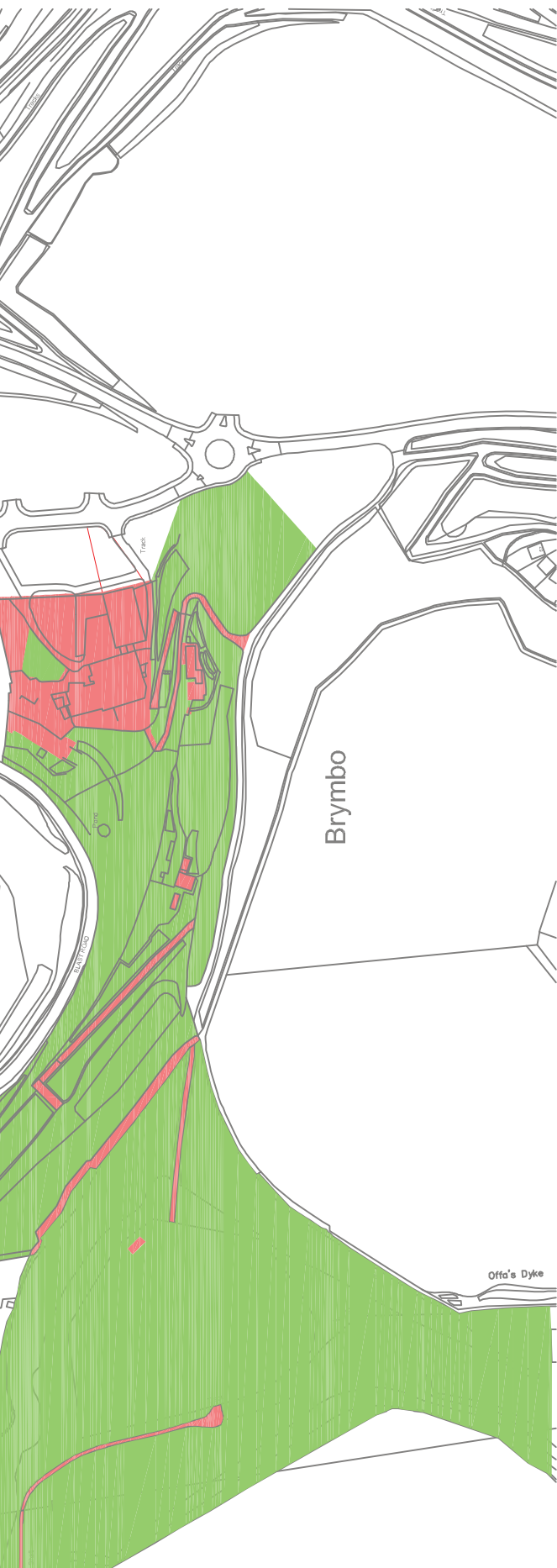
6.0 APPENDICES

- 6.1 DEVELOPMENT PLAN**
- 6.2 TOPOGRAPHICAL SURVEY**
- 6.3 PROPOSED AND EXISTING IMPERMEABLE AREAS**
- 6.4 DCWW SEWER PLAN**
- 6.5 SCOTT WILSON DRAINAGE LAYOUT**
- 6.6 DCWW PLANNING CORRESPONDENCE**
- 6.7 BHT PRIVATE LAND OWNER PERMISSION**
- 6.8 NRW FLOOD MAP**
- 6.9 INDICATIVE DRAINAGE LAYOUT**
- 6.10 TYPICAL ATTENUATION CALCULATIONS**

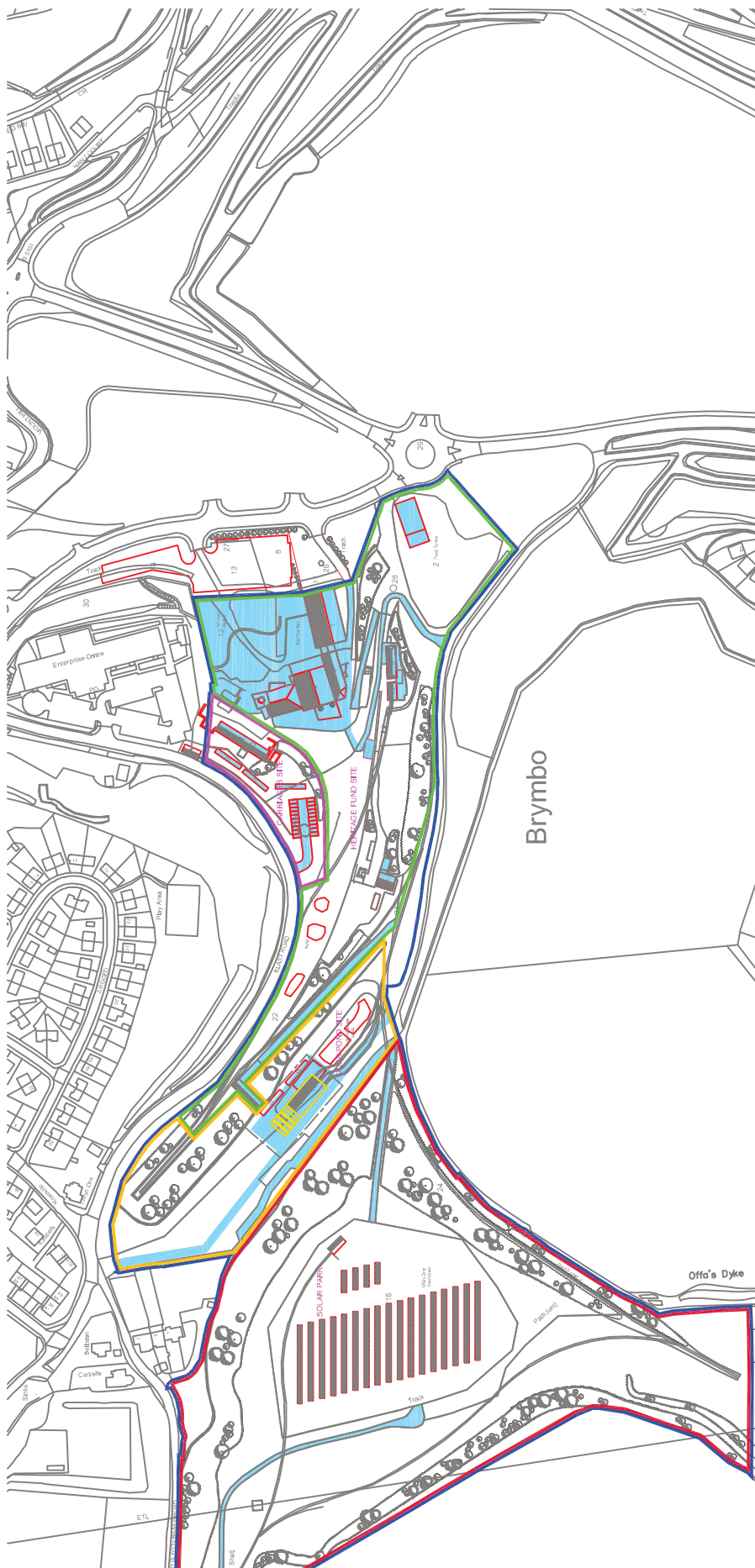




EXISTING SITE
EXISTING SITE
EXISTING SITE



PROPOSED SITE
PROPOSED SITE





Pond

Track

Brymbo

S029535502

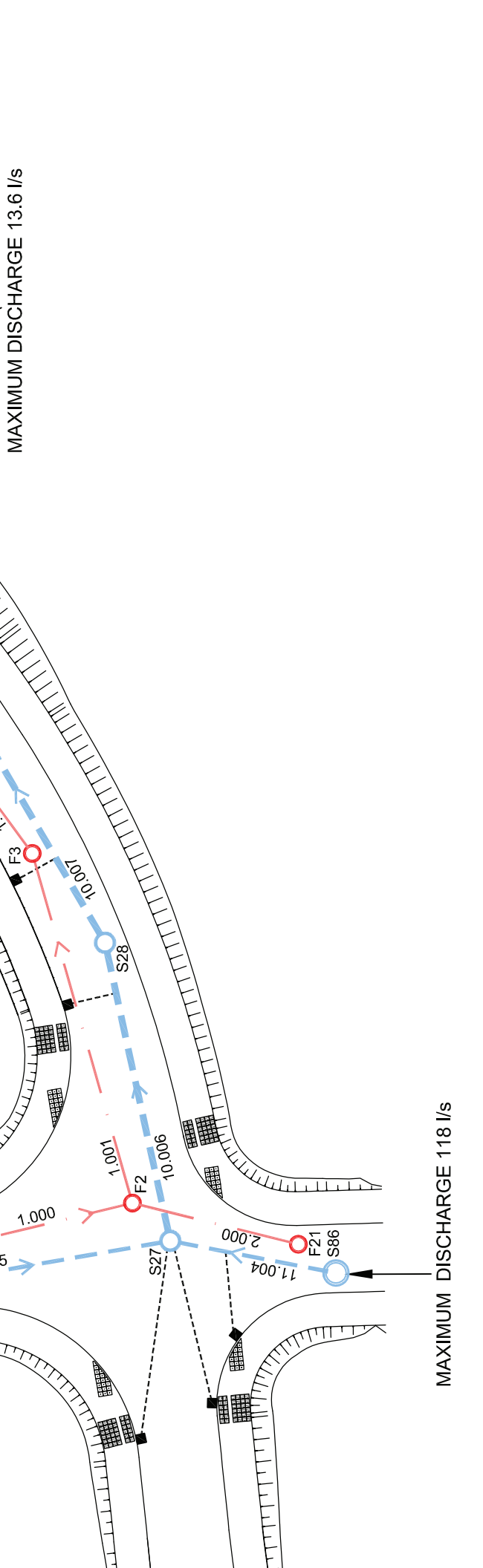
S029535503

S029535501

S029536404

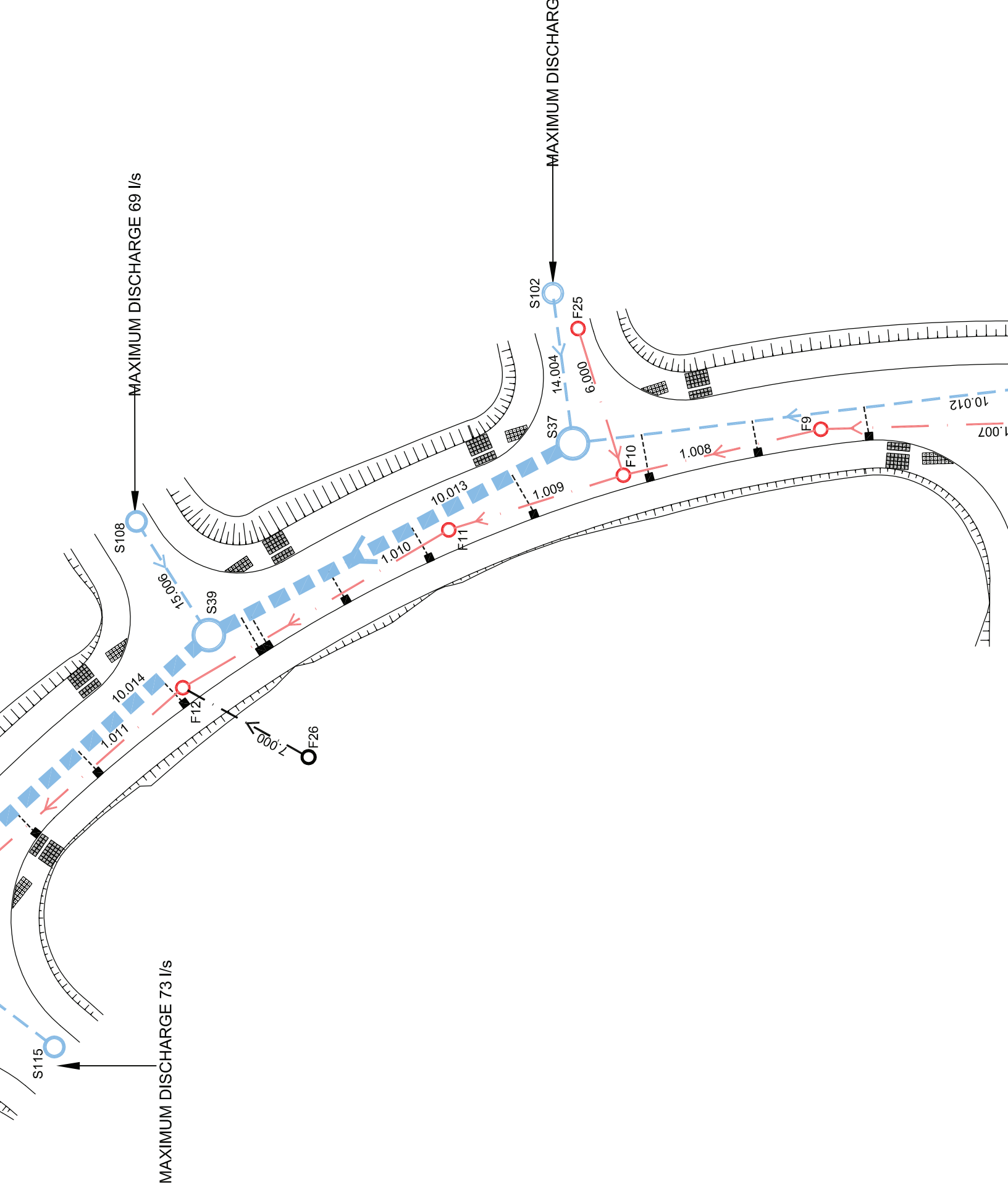
QC 100 mm

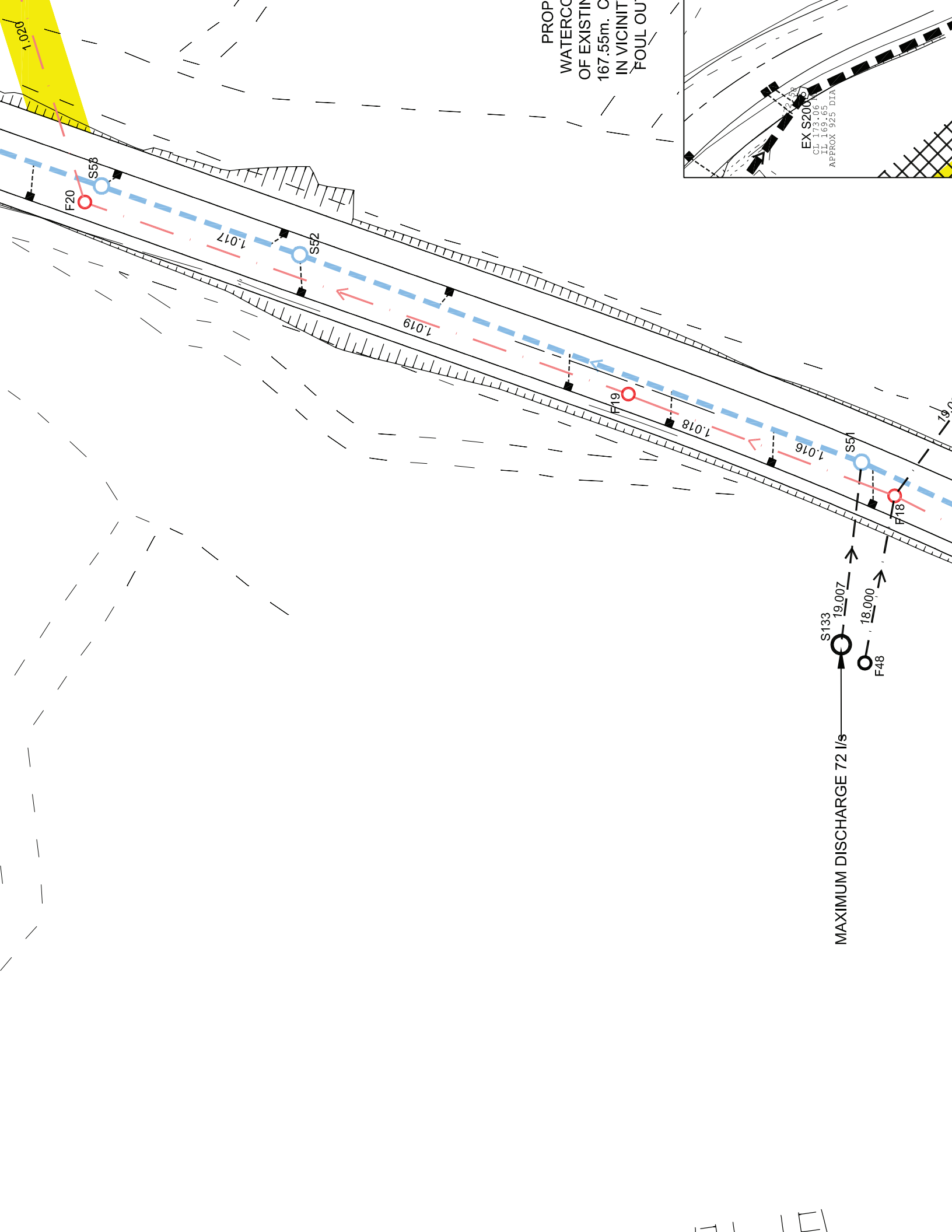
S029536404



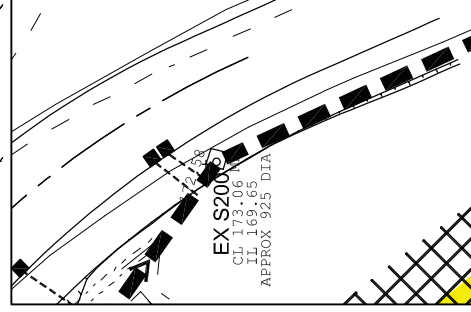
SANITARY SEWER PIPE LINE SCHEDULE									
Pipe Code	Diameter (mm)	Gradient (1:)	Pipe Length	Upstream Manhole			Downstream Manhole		
				Number	Invert	Cover	Number	Invert	Cover
1.000	150	72	20.106	F1	196.95	199.22	F2	196.67	199.66
1.001	150	72	32.400	F2	196.67	199.66	F3	196.22	199.39
1.002	150	72	22.798	F3	196.22	199.39	F4	195.91	199.08
1.003	150	72	21.611	F4	195.91	199.08	F5	195.61	198.81
1.004	150	72	25.520	F5	195.61	198.81	F6	195.25	198.44
1.005	150	150	27.318	F6	195.25	198.44	F7	195.07	198.05
1.006	150	150	59.581	F7	195.07	198.05	F8	194.67	197.21
1.007	150	32	27.130	F8	194.67	197.21	F9	193.82	196.85
1.008	150	18	21.707	F9	193.82	196.85	F10	192.61	196.54
1.009	150	150	19.597	F10	192.61	196.54	F11	192.48	196.30
1.010	150	150	33.121	F11	192.48	196.30	F12	192.26	196.11
1.011	150	150	36.752	F12	192.26	196.11	F13	192.01	196.50
1.012	150	150	52.193	F13	192.01	196.50	F14	191.66	196.20
1.013	150	136	34.962	F14	191.66	196.20	F15	191.41	195.83
1.014	150	132	37.508	F15	191.41	195.83	F16	191.12	195.00
1.015	225	151	13.702	F16	191.05	195.00	F16A	190.96	196.08
1.016	225	44	65.728	F16A	190.96	196.08	F17	189.46	192.24
1.017	225	10	59.744	F17	189.46	192.24	F18	183.53	186.42
1.018	225	10	32.326	F18	183.53	186.42	F19	180.29	183.17
1.019	225	10	65.365	F19	180.29	183.17	F20	174.07	176.92
1.020	225	128	35.611	F20	174.07	176.92	F50	173.79	174.92

SURFACE WATER PIPE LINE SCHEDULE			
Pipe Code	Diameter (mm)	Gradient (1:)	Grade (m)
1.000	225		
1.001	225		
1.002	300		
1.003	300		
1.004	300		
1.005	300		
1.006	525		
1.007	675		
1.008	750		
1.009	750		
1.010	750		
1.011	600		
1.012	600		
1.013	600		
1.014	600		
1.015	600		
1.016	600		
1.017	600		
1.018	600		
1.019	600		
1.020	600		





PROPOSED
WATERCOURSE
OF EXISTING
167.55m. C
IN VICINITY
FOUL OUT



MAXIMUM DISCHARGE 72 l/s

S133 19,007
F48 18,000

Wrexham County Council
16 Lord Street
Wrexham
LL11 1LG

Date: 18/02/2019
Our Ref: PLA0040552
Your Ref: P/2019/0104

Dear Sir

Grid Ref: SJ2955453460 329554 353460

Site: Brymbo Fossil Forest, New High Street, Brymbo, Wrexham

Development: Application for approval of details reserved by conditions under P/2018/0557. Condition 5- scheme for the comprehensive and integrated drainage. 6 submission of written permission of the owner of the private sewer and 7 Reasonable avoidance measures

We refer to your planning consultation relating to the above site, and we can provide the following comments in respect to the proposed development.

Having reviewed the details submitted to support the above application to discharge condition 5 from planning permission P/2018/0557, it is unclear whether a foul connection is required. We would seek clarification on this matter. If a foul connection is required, we would request that a drainage plan is provided indicating the drainage layout and point of connection with the known public sewerage system.

In relation to surface water, we note it is proposed to discharge surface water runoff from the proposed development into a private surface water sewer.

Our response is based on the information provided by your application. Should the proposal alter during the course of the application process we kindly request that we are re-consulted and reserve the right to make new representation.

If you have any queries please contact the undersigned on 0800 917 2652 or via email at developer.services@dwrcymru.com

Please quote our reference number in all communications and correspondence.

Yours faithfully,



Alaw Jones
Development Control Officer
Developer Services



Planning Department
Wrexham County Borough Council
Lord Street
Wrexham

11 February 2019

**PLS0018506 Brymbo Fossil Forest – Condition:
Permission of private landowner to discharge surface water**

It has been confirmed from a search of the sewer records that the drainage associated with the fossil forest location remains in the ownership of Parkhill Estates' subsidiary company Brymbo Developments Ltd. On 1st February 2019 BHT received written confirmation via email as quoted below from the Parkhill Estates' director John Thompson:

'I have no technical objections to the two discharge points to the east of the Heritage Buildings i.e. S75 (22 l/sec) and S80 (58 l/sec) being used for the drainage of the Heritage Buildings area and the Fossil Forest area'.

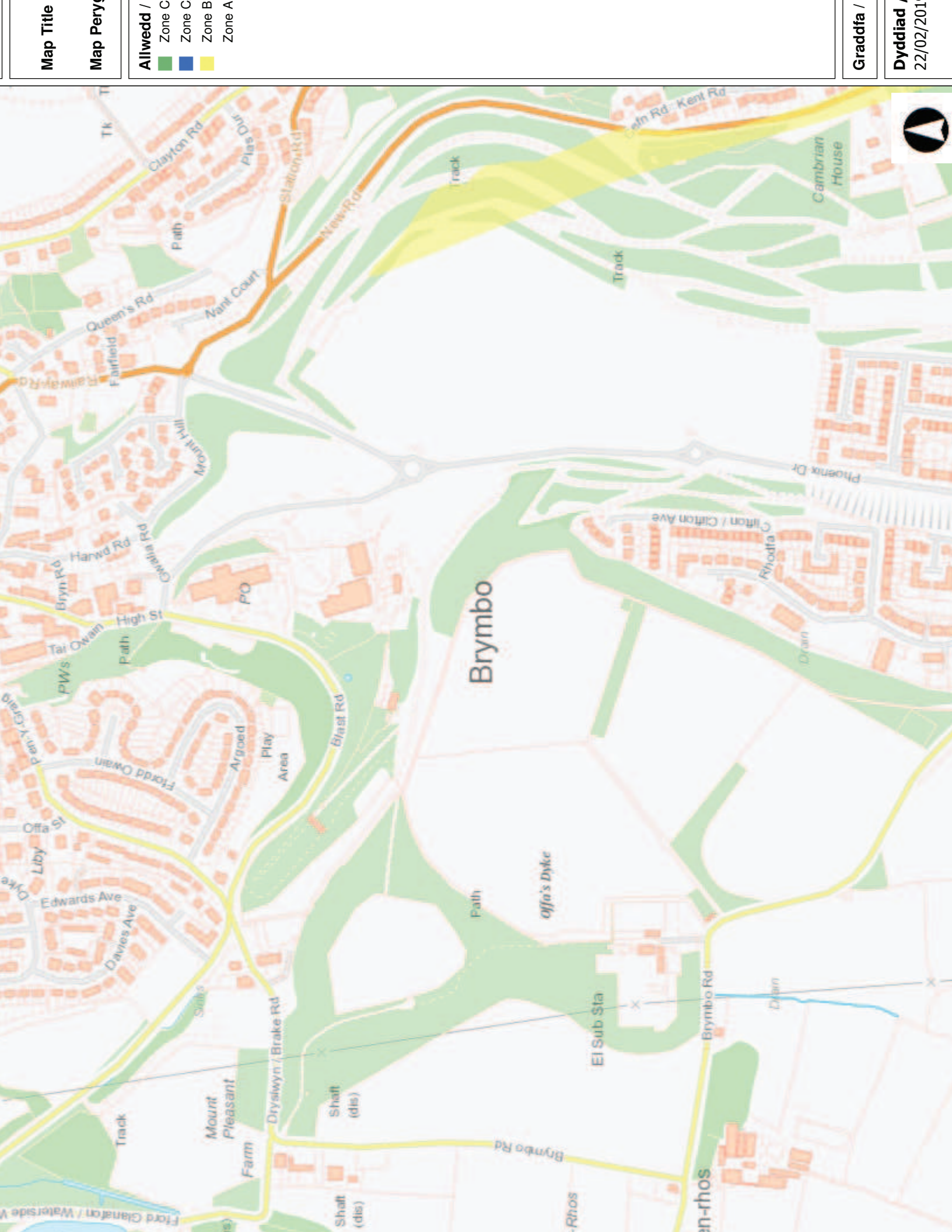
Yours sincerely,

A handwritten signature in black ink, appearing to be 'G. Brown', written in a cursive style.

Gary Brown
Trust Manager

BRYMBO HERITAGE TRUST

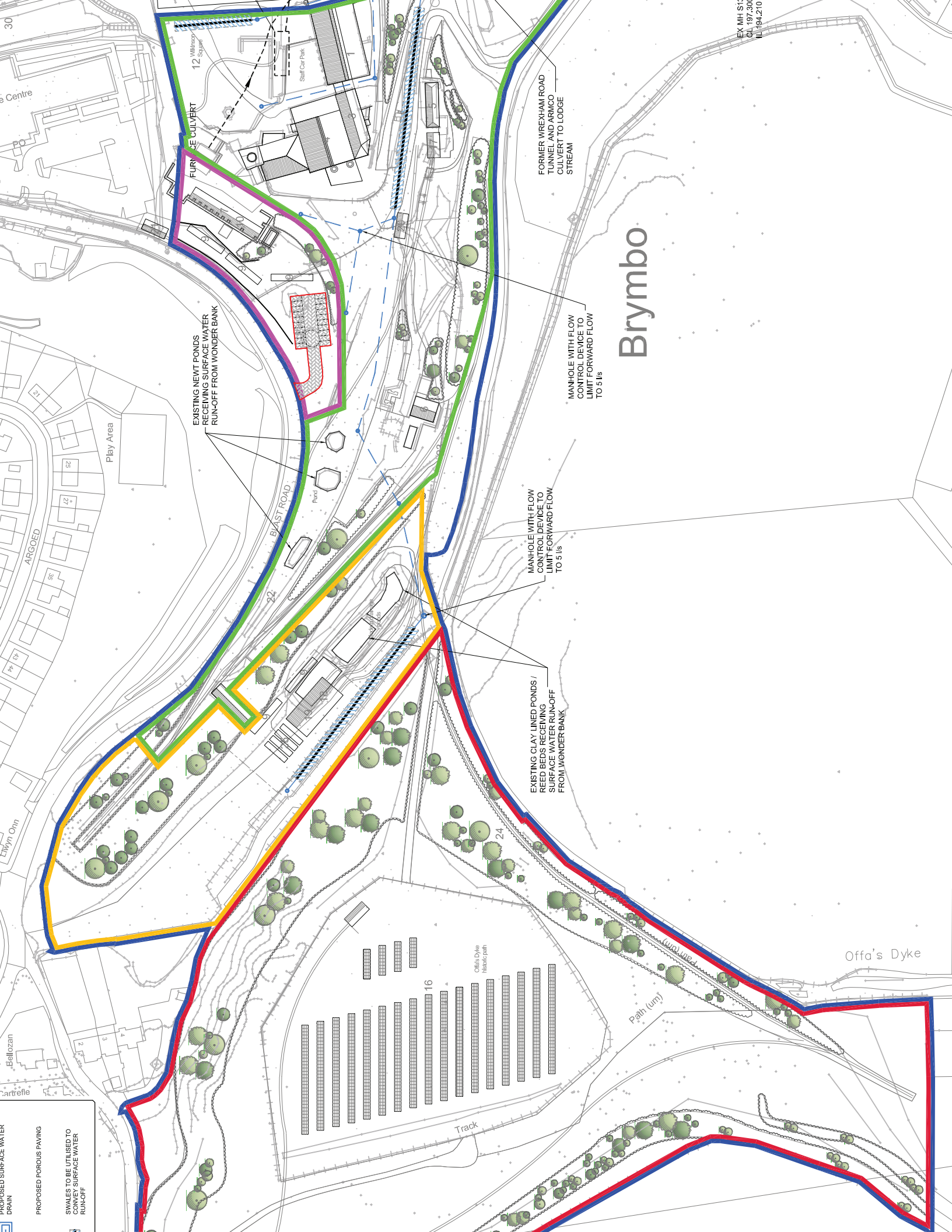
Brymbo Enterprise Centre - Blast Road/Ffordd Blast – Brymbo - Wrexham/Wrecsam - LL11 5BT
0800 772 0981 - www.brymboheritage.co.uk - Registered Charity/ Elusen Gofrestredig 1174269



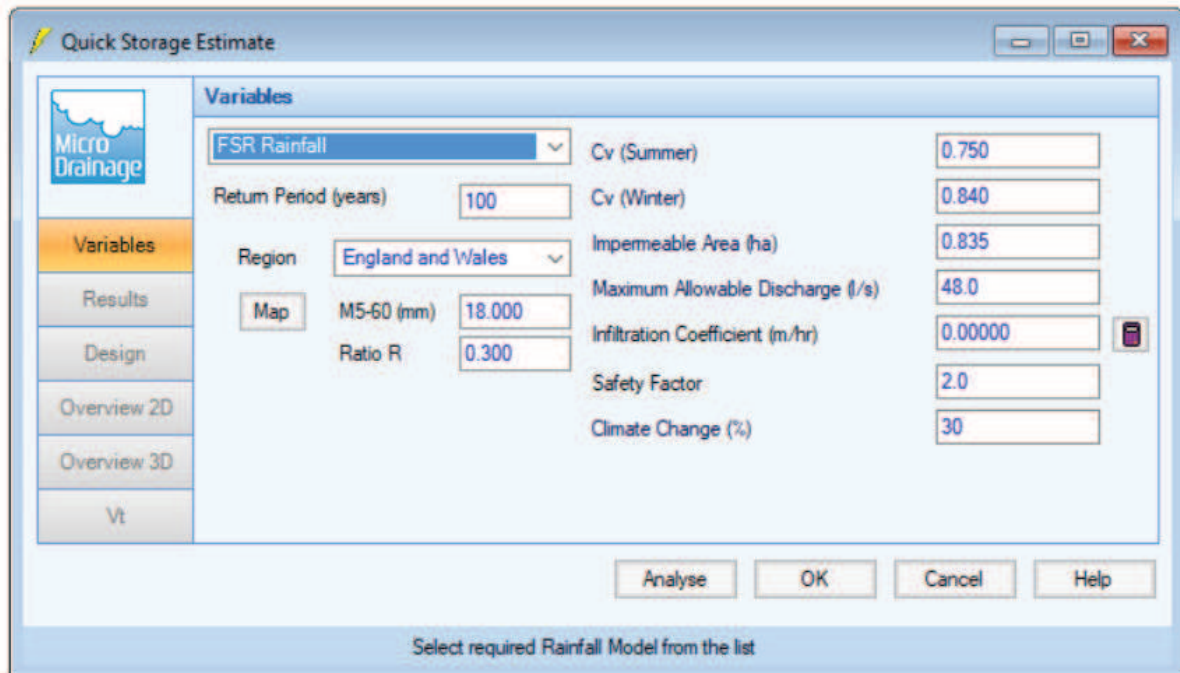
Map Title	Map Pery	Allwedd /
		Zone C
		Zone C
		Zone B
		Zone A

Graddfa /

Dyddiad /
22/02/201



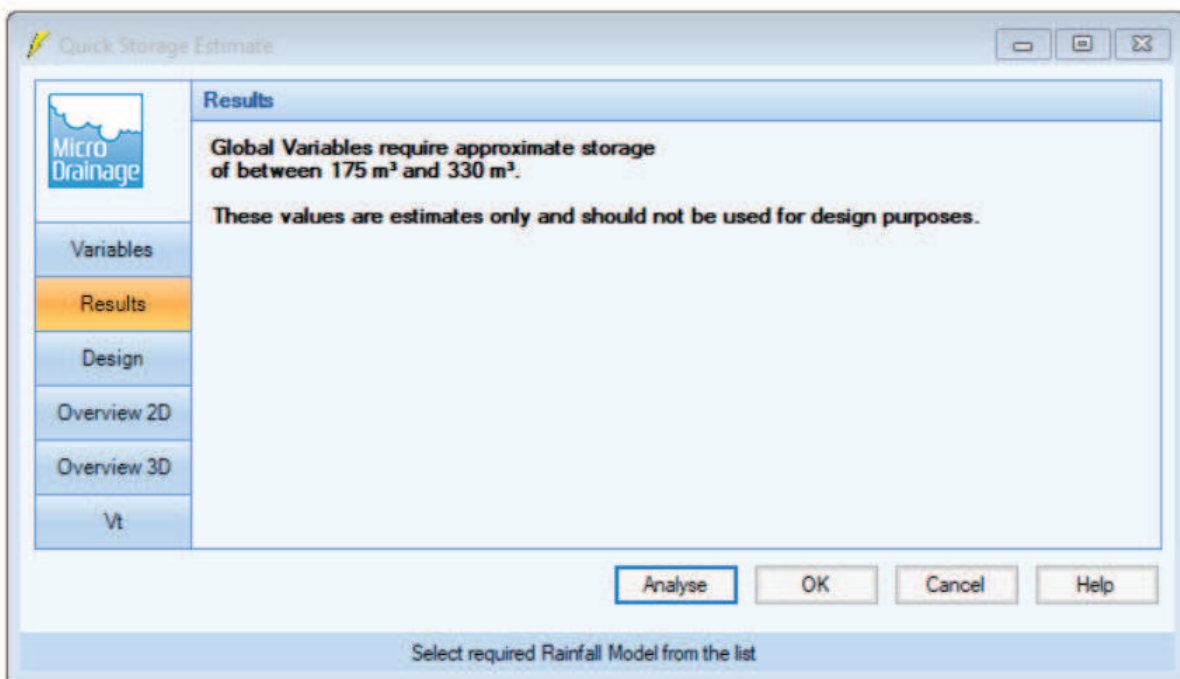
ATTENUATION CALCULATIONS



The screenshot shows the 'Variables' tab of the 'Quick Storage Estimate' software. The interface includes a sidebar with navigation options: Variables (selected), Results, Design, Overview 2D, Overview 3D, and Vt. The main area contains input fields for various parameters. A status bar at the bottom reads 'Select required Rainfall Model from the list'.

Parameter	Value
FSR Rainfall	FSR Rainfall
Return Period (years)	100
Region	England and Wales
Map	M5-60 (mm)
M5-60 (mm)	18.000
Ratio R	0.300
Cv (Summer)	0.750
Cv (Winter)	0.840
Impermeable Area (ha)	0.835
Maximum Allowable Discharge (l/s)	48.0
Infiltration Coefficient (m/hr)	0.00000
Safety Factor	2.0
Climate Change (%)	30

Buttons: Analyse, OK, Cancel, Help



The screenshot shows the 'Results' tab of the 'Quick Storage Estimate' software. The sidebar navigation options are the same as in the previous screen. The main area displays the results of the calculation. A status bar at the bottom reads 'Select required Rainfall Model from the list'.

Global Variables require approximate storage of between 175 m³ and 330 m³.

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

Buttons: Analyse, OK, Cancel, Help

HERITAGE FUND AREA

Quick Storage Estimate

Micro Drainage

Variables

FSR Rainfall Cv (Summer)
 Return Period (years) Cv (Winter)
 Region Impermeable Area (ha)
 Map M5-60 (mm) Maximum Allowable Discharge (l/s)
 Ratio R Infiltration Coefficient (m/hr)
 Safety Factor
 Climate Change (%)

Analyse OK Cancel Help

Enter Area between 0.000 and 999.999

Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 92 m³ and 147 m³.

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

Analyse OK Cancel Help

Enter Area between 0.000 and 999.999

DUCK POND SITE

Quick Storage Estimate

Micro Drainage

Variables

FSR Rainfall

Return Period (years)

Region

Map

Ratio R

Analyse OK Cancel Help

Enter Area between 0.000 and 999.999

Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 50 m³ and 84 m³.

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

Analyse OK Cancel Help

Enter Area between 0.000 and 999.999

CARRIAGES SITE



Wrexham Office
Opus House
Yale Business Village
Wrexham
LL13 7YL

wsp.com