



Bonc Wen Residential Site, Wrexham

Flood Consequence Assessment & Drainage Strategy

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Executive Summary

The proposal is for 12 residential units with associated access and landscaping, as well as a revised car park layout on both brownfield and greenfield land at Bonc Wen car park, Wrexham.

The information from the Technical Advice Note 15: Development and Flood Risk (TAN15) and Natural Resources Wales Flood Zones has determined that the site is located within Zone A, i.e. considered to be at little or no risk of fluvial or tidal/coastal flooding.

The site has been assessed against the requirements of Natural Resources Wales flood mapping and TAN15 Flood Risk Vulnerability and Flood Zone Compatibility matrix. Taking into consideration that the application is for a residential development (highly vulnerable development) in Zone A, the TAN15 Flood Risk Vulnerability and Zone Compatibility matrix indicates that this vulnerability would be appropriate within Zone A.

The British Geological Survey information indicates that the underlying geology of the site is Glacial Till, comprised of stiff gravelly clay. The Pennine Lower Coal Measures Formation also underlies the site, comprised of mudstone, siltstone and sandstone. Infiltration testing has been undertaken for the site and confirmed that soakaways are not a viable option for the site. There is an unnamed culverted watercourse approximately 70m to the southwest.

There is an existing Dŵr Cymru Welsh Water Surface Water Sewer in Glanrafon to the west which outfalls into the unnamed culverted watercourse. There is also a Dŵr Cymru Welsh Water Combined Water Sewer in Bonc Wen to the east, which connects into another Combined Water Sewer in Brook Street to the south. Therefore, based on hierarchy of drainage options the site will discharge into the culverted watercourse to the west. Attenuation will take the form of geocellular storage. The discharge rate will be restricted to a minimum of 5l/s to minimise the risk of blockages of the flow control.

There is no residual flood risk from the development site to the surrounding district due to the restriction of surface water runoff prior to discharge. Therefore, the development does not increase the risk of flooding to other adjacent neighbourhoods. Out of chamber or gully flooding for the extreme 100 year plus climate change event may occur within the development site and is classed as exceedance flows. Flood water from this event will be contained within the development site and directed away from the residential dwellings to the external hard and soft landscaped areas.

Foul water generated by the development will be discharged into the Dŵr Cymru Welsh Water Combined Sewer Network in Brook Street to the south. The foul discharge does not present an increased flood risk to the surrounding district.

1.0 Introduction

- 1.1 Scott Hughes Design (SHD) has been appointed by Project Development Workshop Ltd to prepare this Flood Consequence Assessment to support an outline planning submission for the proposed residential development with associated access and hard and soft landscaping and a revised car park layout on land off Bonc Wen, Wrexham. The assessment has been undertaken in line with Technical Advice Note 15: Development and Flood Risk (TAN15) and information from Natural Resources Wales.
- 1.2 This Flood Consequence Assessment (FCA) has been commissioned by Project Development Workshop Ltd and is specific to their interests in the development proposals as described by the Architectural plan in Appendix A. This report may not be assigned.
- 1.3 The report has been commissioned to identify any flood related issues associated with the proposed development and any likely constraints that could be imposed plus to consider the drainage strategy for it. The following issues have been suggested by Natural Resources Wales, Wrexham County Borough Council Preliminary Flood Risk Assessment & Management of Surface Water Guidance Document and subsequently addressed within this report:
- Identify available data relating to flood risk at the site.
 - Determine whether the site is at risk from flooding from all sources, including from breach or overtopping of any existing flood defences, surface water flooding and/or groundwater flooding.
 - Consider the flood risk from all other sources.
 - Determine the current surface water drainage regime and assess any potential increase in surface water runoff as a result of the proposed development.
 - Discuss Sustainable Drainage Systems (SuDS) as an option for reducing surface water flood risk.
 - Devise an appropriate outline surface water drainage strategy (including calculation where appropriate) to deal with any potential increase in surface water runoff and include for climate change.
 - Consider the recommendations of the Wrexham County Borough Council Preliminary Flood Risk Assessment (PFRA) and Wrexham County Borough Council Management of Surface Water Guidance Document.
 - Assess mitigation measures & off-site impacts and define any residual risks.

2.0 Development Description and Location

2.1 Site Location

The site is referenced in Table 1, and a site location map is provided in Appendix A.

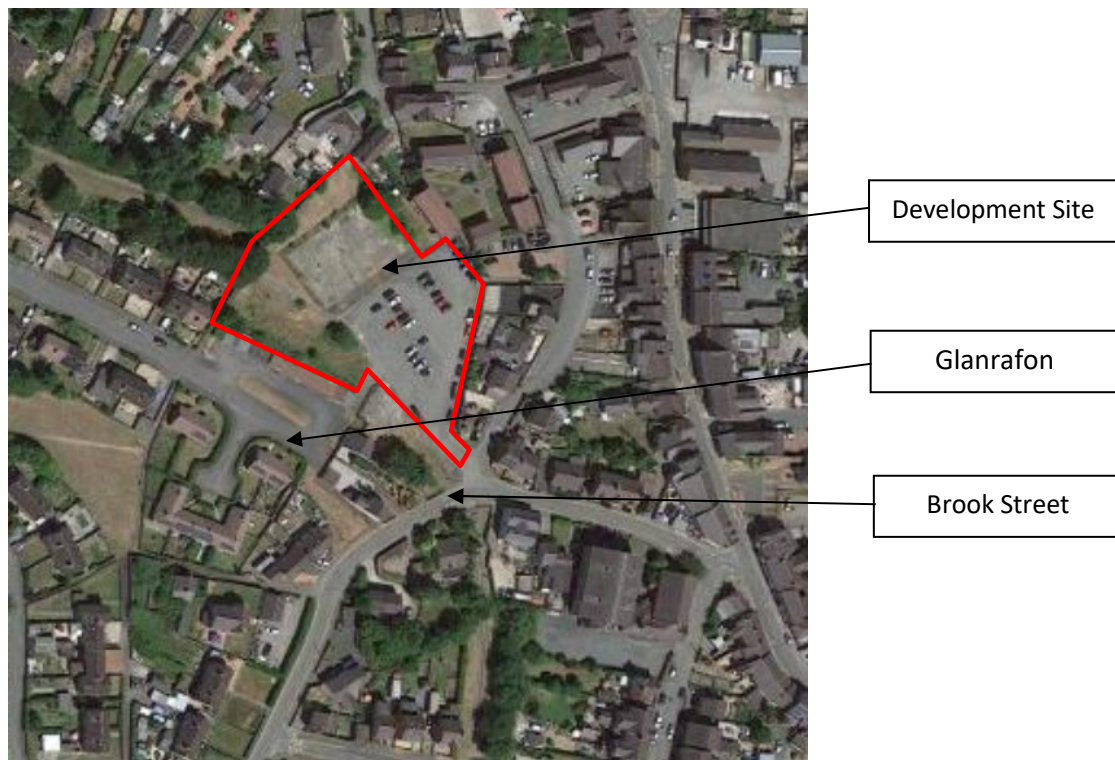
Table 1: Site Referencing Information

Item	Brief Description
Site name	Bonc Wen Residential Site, Wrexham
Site address and location	Bonc Wen Car Park, Rhosllanerchrugog, Wrexham, LL14 2EE
Council Area	Wrexham County Borough Council
Approximate Grid Reference	OS: 328990, 346399
General Locality	The proposed development site is located some 7km to the southwest of Wrexham Town Centre.

2.2 Existing site Description

- 2.2.1 The proposed development site is currently comprised of the existing Bonc Wen Car Park and small grassed areas that surround the car park.
- 2.2.2 The site is bound by residential properties to the north, east and west. Brook Street borders the site to the south.
- 2.2.3 Figure 1 below identifies the overall site location details. Topographical information indicates that the site falls to the south and south east. The highest level of approximately 171.45m AOD is located towards to north of the site and the lowest level of approximately 170.43m AOD is located in the south of the site.

Figure 1: Site Location



2.3 Development Proposals

- 2.3.1 As discussed in the earlier sections, the report is prepared to support a planning application for the proposed residential development with associated access and landscaping, as well as a revised car park layout at Bonc Wen Car Park, Wrexham.
- 2.3.2 The outline Site Layout as indicated in Appendix A provides details of the proposed development intent.

3.0 Planning Policy and Consultation

3.1 Planning Policy Framework

- 3.1.1 The Development Advice Map contained within Technical Advice Note 15: Development and Flood Risk (TAN15) and based on National Resources Wales Flood Zones has determined that the site is located within Zone A, i.e. considered to be at little or no risk of fluvial or tidal/coastal flooding (as shown in table 2 below).

Table 2: National Resources Wales Flood Zones

Natural Resources Wales Flood Zones		
Description	Zone	Notes
Considered to be at little or no risk of fluvial or tidal/coastal flooding	A	Used to indicate that justification test is not applicable and no need to consider flood risk further
Areas known to have been flooded in the past evidenced by sedimentary deposits.	B	Used as part of a precautionary approach to indicate where site levels should be checked against the extreme (0.1%) flood level. If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further
Based on Environment Agency extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal)	C	Used to indicate that flooding issues should be considered as an integral part of decision making by the application of the justification test including assessment of consequences.
Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.	C1	Used to indicate that development can take place subject to application of justification test, including acceptability of consequences.
Areas of the floodplain without significant flood defence infrastructure.	C2	Used to indicate that only less vulnerable development should be considered subject to application of justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered.

Table 3: Natural Resources Wales Flood Zones

- 3.1.2 The proposed residential development is considered a “highly vulnerable development” in terms of flood risk. The TAN15 Flood Risk Vulnerability and Flood Zone Compatibility matrix indicates that a highly vulnerable development in Zone A is appropriate. A justification test is not requested for sites in Flood Zone A.

3.2 Preliminary Flood Risk Assessment (PFRA)

3.2.1 The Lead Local Flood Authority (LLFA) of Wrexham County Borough Council is required by the Flood Risk Regulations (2009) and EU Floods Directive 2007/60/EC to prepare a Preliminary Flood Risk Assessment (PFRA). PFRAs assess the risk associated with all types of flooding and provide the information required to identify the amount of development permitted in an area; how drainage systems in the area should function and also how risks in vulnerable areas can be reduced and/or mitigated. The purpose of the PFRA is to assess and map all known sources of flood risk including fluvial, surface water, sewer, groundwater and all impounded water bodies, taking into account future climate change predictions.

3.2.2 A summary of the main elements from the PFRA are detailed below. The full report can be obtained from the Wrexham County Borough Council website.

- PFRA provides a detailed understanding of flood risks across the borough from all sources.
- Surface Water flooding is the most prominent cause of flooding within the County Borough.
- The report identified no records of past groundwater flooding within the County Borough.
- There are no historic records of canal overtopping or flooding of a canal within the Borough.

3.3 Statutory Authority Correspondence

3.3.1 Wrexham County Borough Council confirmed that:

- Discharge rates and volumes are usually required to be limited to greenfield runoff rate, with on-site attenuation for all events up to the 1 in 100 year rainfall event plus climate change.
- All new development on brownfield sites must improve on existing brownfield runoff rates and should aim to be as close as reasonably practicable to greenfield runoff.
- The practicable minimum limit on the discharge rate from the site is 5l/s, using an appropriate vortex flow control device.
- The minimum size of pipe discharging from an attenuation device should be 150mm laid at a gradient no flatter than 1 in 150.
- An explanation as to how it is proposed to manage and fund the maintenance of the proposed system over the lifetime of the development should be provided. This should consider the requirement to ensure that access is physically possible for such maintenance works.

3.3.2 Owain George, Planning Liaison Manager at Dŵr Cymru Welsh Water confirmed that foul flows should be connected to the 300mm combined sewer in the road to the southwest of the site. No highway or land drainage runoff will be permitted to discharge directly or indirectly into the public sewerage system.

4.0 Definition of Flood Hazard

4.1 Sources of information

TAN15 requires the developer to consider the impact of runoff generated by the proposed development onto the downstream catchment, and to assess the risk of runoff from the surrounding district impacting on the development footprint. Furthermore, the report is to consider flood risk from all other sources. The following section defines the flood risk receptors and anticipated flood risk. Section 5 then discusses in further detail the probability of flooding and the likely impacts.

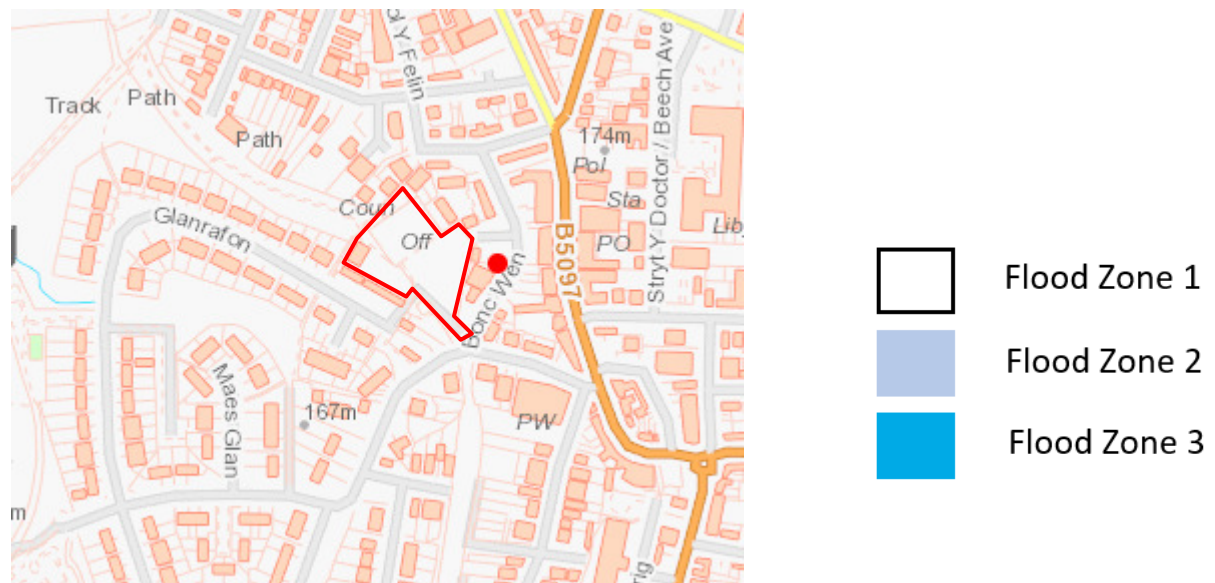
Table 3: Sources of information used in the identification of flood risk

Source of Information	Details
Natural Resources Wales	Flood Risk Map
Dŵr Cymru Welsh Water	Sewer Records
Historic Maps	From various websites

4.2 Flooding from Rivers (Fluvial)

- 4.2.1 There are no Main Rivers in close proximity to the site. The closest watercourse is an unnamed culvert approximately 70m to the southwest of the site which flows to the southeast.
- 4.2.2 Figure 2 below locates the site boundary on the Natural Resources Wales flood risk map. It is clear from this that the red line area sits outside of the influence of flood water from any identified water body or river and is located within Flood Zone 1 i.e. land defined as having an annual probability of fluvial flooding of less than 1 in 1000 in any year (<0.1%).
- 4.2.3 Based on the available information, the site lies within Flood Zone 1 and is classified as Zone A. According to TAN15 Flood Risk Vulnerability and Flood Zone Compatibility Matrix, a justification test is not requested for sites in Flood Zone A. Therefore, there is no need to consider fluvial flood risk any further.

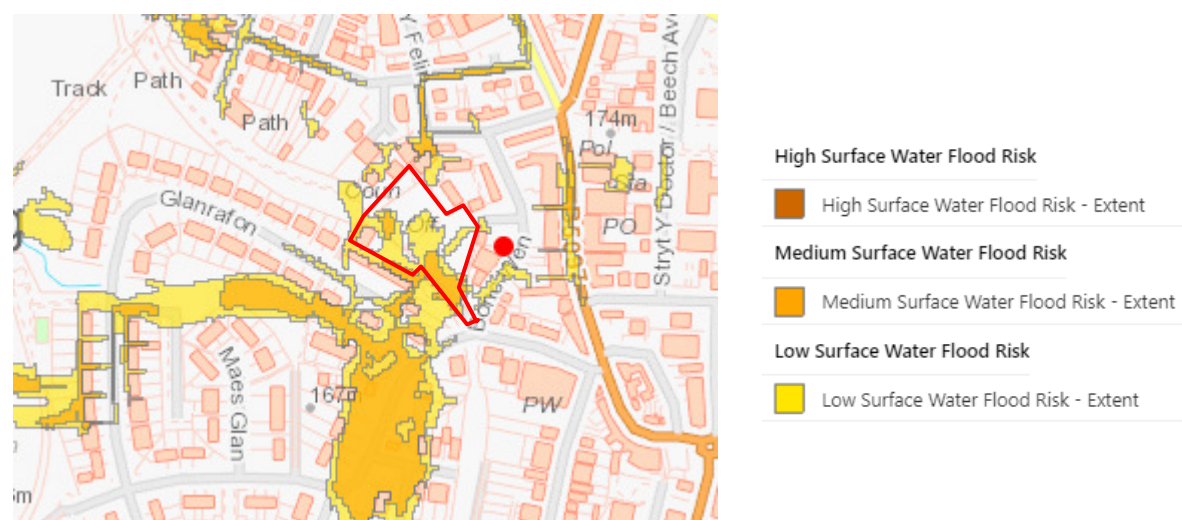
Figure 2 – Natural Resources Wales Risk of Flooding from Rivers & Sea Maps



4.3 Flooding From Land (Overland Flow)

- 4.3.1 The main development site topography slopes towards the south and the south east. Surface water runoff from the surrounding area will be prevented from entering the site by the existing drainage associated with the surrounding residential developments and highways.
- 4.3.2 Furthermore, a review of the Natural Resources Wales Surface Water Flood Risk maps indicates that the site is predominantly at low risk of flooding (see Figure 3 below). However, there are two areas shown as being at medium risk in the south, meaning that the areas have a chance of flooding between 1 in 100 (1%) and 1 in 30 (3.3%). This area is in the north of the site and is associated with a topographical low point. There is larger area at medium risk in the south of the site, this area is situated away from the proposed properties and at a lower level than the properties.

Figure 3 – Natural Resources Wales Surface Water Flood Risk Maps



- 4.3.3 As part of the proposed development the levels across the site will change to ensure that the land falls away from the properties and all low points are located away from the proposed properties, thus posing a low risk.

4.4 Flooding from Sewers and Private Drainage

- 4.4.1 The Dŵr Cymru Welsh Water sewer records have been reviewed and confirm that is a 150mm diameter Surface Water Sewer in Glanrafon to the west. There is also a 300mm diameter Combined Sewer in Bonc Wen to the east, which connects into another 300mm diameter Combined Sewer in Brook Street to the south (See figure 4 below).
- 4.4.2 The extensive Dŵr Cymru Welsh Water adopted drainage network serving the surrounding urban district ensures that the development footprint is protected from the impact of both upstream and downstream runoff. It is speculated that complete protection may well exist beyond a storm event equivalent to the 30-year statistical event. Beyond this projection, there may be a small degree of peripheral 'Exceedance' flooding within the highway areas above the sewers. However, this is expected to be localised and restricted to the location of specific manhole covers located away from the development footprint. Thus flood risk to the site from sewers is diminished to acceptable levels.

Figure 4 – Dŵr Cymru Welsh Water Sewer Records Extract



4.5 Flooding from Groundwater

- 4.5.1 The British Geological Survey mapping indicates that the superficial geology of the site is Glacial Till. The bedrock geology of the site is comprised of the Pennine Lower Coal Measures Formation. According to the Environment Agencies Aquifer Designation Map, the bedrock geology is classified as a Secondary A Aquifer, comprised of permeable layers capable of supporting water supplies at a

local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

4.5.2 Groundwater was not encountered in the excavations during the geotechnical investigations and the PFRA identified no records of past groundwater flooding within the County Borough.

4.5.3 Based on the available information the risk of flooding from groundwater is considered to be low.

4.6 Flooding from Artificial Sources

4.6.1 There are no canals or reservoirs in close proximity to the red line area. Therefore the risk of flooding from artificial sources is low.

5.0 Assessment of Flood Risk on the Development Site (Probability)

5.1 Summary

Section 4 has defined the anticipated flood risks from all sources. Table 4 below considers each of the sources and defines in tabular format the Probability of Flood Risk associated to each and the likely impacts.

Below is a table summary of the flood risks associated with the development site.

Table 4 – Flood Risk Summary

Source	Flood Risk	Likely Impacts	Remarks
Tidal	Low	Low	The site is not tidally influenced.
Fluvial (Watercourse)	Low	Low	The site is in Zone A.
Surface (Overland Flood Flow)	Low/Medium	Low	The Natural Resources Wales flood maps show the majority of the site is at low risk of surface water flooding with an area at medium risk. Mitigation measures to be included within the design are discussed in Section 4.3.
Sewers	Low	Low	There are no Welsh Water sewers shown as crossing the development site.
Groundwater	Low	Low	The site is at low risk of groundwater flooding.
Artificial Sources	Low	Low	There are no artificial sources in close proximity.

6.0 Outline Drainage Strategy

6.1 Existing Surface Water Runoff

- 6.1.1 The existing site is both greenfield and brownfield. In accordance with Wrexham County Borough Council Guidance, greenfield runoff rates will apply as calculated in Table 5 below.

Table 5 – Greenfield Runoff Rates

	Site Area (ha)	1 Year (l/s)	Qbar (l/s)	30 Year (l/s)	100 year (l/s)
Car Park	0.442	3.3	3.7	6.5	8.1

6.2 Geology

- 6.2.1 The superficial geology of the site is Glacial Till comprised of stiff gravelly clay. The bedrock geology is the Pennine Lower Coal Measures Formation comprised of mudstone, siltstone and sandstone.
- 6.2.2 The unsuitability of soakaways has been confirmed by infiltration tests, undertaken in accordance with BRE 365, during which no infiltration was observed (See Appendix F for further details).

6.3 Watercourses

- 6.3.1 There is an unnamed culverted watercourse approximately 70m to the southwest of the site, located within third party land.

6.4 Dŵr Cymru Welsh Water Sewers

- 6.4.1 There is a Dŵr Cymru Welsh Water Surface Water Sewer in Glanrafon to the southwest which outfalls directly into the unnamed culverted watercourse.

6.5 Sustainable Drainage Systems

6.5.1 SuDS Objectives:

Sustainable drainage developed in line with the ideals of sustainable development is collectively referred to as Sustainable Drainage Systems (SuDS). At a particular site, these systems are designed both to manage the environmental risks resulting from the urban runoff and to contribute wherever possible to environmental enhancement. SuDS objectives are therefore to minimise the impacts from the development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities (CIRIA C753, 2015).

6.5.2 SuDS's Design Themes

A strong design theme is essential if the maximum aesthetic benefits are to be gained from the SuDS approach. At a more local scale the SuDS should link with the individuals plot structure, planting, public open space requirements and amenity areas, gaining multiple benefits from a limited area.

6.5.3 The SuDS Management Train

The 'Management Train Approach' should be central to the surface water drainage strategy of the proposed site. The main objective is treatment and control of runoff as near to the source as possible protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of storm water discharge from the site, and is as follows:

1. **Prevention** – The use of good site design and housekeeping measures to prevent runoff and pollution and includes the use of rainwater reuse / harvesting.
2. **Source Controls** – Control of runoff at source or as close to source as possible (e.g. soakaways, green roofs, pervious pavements).
3. **Site Control** – Management of water in a local area and can include below ground storage / attenuation, detention basins, large infiltration devices.
4. **Regional Control** – Management of water from a site or various sites and can include wetlands and balancing ponds.

6.5.4 SuDS Site Constraints

SuDS techniques are suitable for all sites; therefore, an assessment of the existing site is required so that SuDS limitations can be determined.

- Land Use Characteristics: The size and type of the development plot allows a range of source control and site control SuDS devices to be considered both above and below ground.
- Site Characteristics: Infiltration tests have confirmed that soakaways are not viable for use on the site.
- Catchment Characteristics: The site is currently greenfield and brownfield.
- Environmental and Amenity Performance: Safety to all future users is paramount when including SuDS within the overall development and so best practice guidance will be incorporated so that these devices blend into the surrounding without the need for significant safety precautions. Maintenance plans will be prepared for all SuDS devices that are included.

6.5.5 SuDS Methods

Tables 6 and 7, below, provide an assessment of various above and below ground SuDS methods that can provide water quality treatment and management of flows to reduce runoff rates and volumes and whether they can be suitably incorporated at this development site. The purpose of this assessment is to set out options to be considered at the planning stage with consideration to time constraints, viability and lifetime maintenance of the development.

Table 6: Surface SuDS Methods

Method	Comment	Suitability for Development
Green Roofs	Can be used on suitable low-rise buildings to provide retention, attenuation and treatment of rainwater, and promotes evaporation and local biodiversity.	<u>Not suitable:</u> - Architectural proposals and maintenance issues deem this unsuitable. - Additional costs of installation would have severe effect on viability of the development.
Water Butts	Plastic tanks placed at the base of rainwater down pipes to collect runoff from the roof.	<u>Suitable:</u> To be located at the base of downspouts. Subject to client approval.
Rainwater Harvesting	Rainwater harvesting reduces the total runoff volume from the developed site, and reduces treated water consumption.	<u>Not Suitable:</u> - Costs of installation would have severe effect on viability of the development. - The ability to restrict peak flow rates and short-term peak volumes is non-existent where a critical storm event occurs. - Running and maintenance costs would not be acceptable to future residents.
Infiltration Options	Reduces total run off volume from the development.	<u>Not Suitable:</u> Infiltration tests confirmed soakaways are not a viable option for the site.
Permeable Surfacing (Infiltration)	- Reduces total run off volume from the development. - Can be used to enhance water quality.	<u>Not Suitable:</u> Infiltration tests confirmed soakaways are not a viable option for the site.
Permeable Surfacing (Standard)	- Can be used to enhance quality of runoff water. - Sub-base provides 'source' storage and reduces the volume of storage downstream. - The storage can be created with selection of the stone fill or use of plastic box stems. - Impermeable membrane at base of construction to prevent impact on pavement stability.	<u>Suitable:</u> Permeable surfacing which connects into attenuation prior to discharge is suitable for use in the car parking areas.

Method	Comment	Suitability for Development
Swales, basins and ponds	- Provide areas for above ground surface runoff storage. - Swales also allow filtering of particulate matter, improving water quality	<u>Not Suitable:</u> - The size of the development does not allow for large above ground areas for surface water storage. - Dependent upon final development layout.
Bio-Retention	Collect and retain run-off to help improve water quality, prior to discharge in piped system on infiltration.	<u>Not Suitable:</u> - The size of the development does not allow for large above ground areas for surface water storage. - Dependent upon final development layout.

Table 7: Sub-Surface SuDS Methods

Method	Comment	Suitability for Development
Geocellular Storage	- Suitable for sites with insufficient space for basins etc. - Suitable for sites where topography prevents the use of open basins etc. - Can be very effective infiltration devices subject to ground conditions.	<u>Suitable:</u> - The use of geocellular attenuation may be possible to retain excess storm water. - Cannot be used in Public Highways or adopted by WW.
Large Diameter Pipes, Culverts or Tanks	- Suitable for sites with insufficient space for basins etc. - Provide a volume of below ground storage with a high void ratio and good man entry provision to allow for future maintenance and cleaning. - Generally be suitable for adoption by the statutory water company (e.g. Dŵr Cymru Welsh Water).	<u>Suitable:</u> - The use of oversized pipes may be possible to retain excess storm water. - Used primarily on adopted drainage networks.

6.5.6 SuDS Hierarchal Approach

Based on the SuDS assessment in Tables 6 and 7, plus an assessment of the local site conditions, the SuDS hierarchal approach for discharge of surface water at the development site is considered in greater detail below.

Table 8: SuDS Hierarchal Approach

Method	Suitability	Suitability for Development
Infiltration to Ground	No	Infiltration testing confirmed that soakaways are not a viable option for the site.
Connection to Watercourse	Yes	There is an unnamed watercourse approximately 70m to the southwest.
Connection to Surface Water Sewer	No	There are other suitable options that would take precedence.
Connection to a Combined Sewer	No	There are other suitable options that would take precedence.

6.5.7 SuDS Design Philosophy

The SuDS assessment and hierarchal approach discussed in Tables 6, 7 and 8 above has defined the overall SuDS strategy. Thus, the SuDS philosophy for the main development site is the promotion of Source Control and Site Control techniques, to reduce the risk of both site and downstream flooding.

The following design philosophy is proposed:

- Surface water treatment using the 'Management Train' approach to remove and isolate contamination at all SuDS facilities prior to conveyance.
- Site control in the form of a geocellular storage in the south of the site with restricted discharge rate.
- Discharge into the unnamed watercourse to the southwest.
- Aim to limit where possible the impermeable fraction of development.

6.6 **Outline Surface Water Drainage Strategy**

- 6.6.1 The outline strategy is to collect runoff from the roof and external areas and direct it to new below ground surface water drainage networks that will connect into the culverted watercourse to the southwest. The surface water discharge rate will be restricted to 5l/s to minimise the risk of blockage of the flow control, with attenuation provided in the form of geocellular storage.
- 6.6.2 The proposed drainage layout for the new development site will be designed in accordance with BS EN 752: 2008 and Building Regulations Part H guidance and Sewers for Adoption, i.e. up to the 30-year storm return period criterion and tested for the 1 in 100 year return period including a 40% increase to account for climate change to confirm that there is no flood risk to the properties.

- 6.6.3 Flooding can occur on a local scale beyond the 30-year criterion due to runoff exceeding the capacity of the minor system during extreme events and it can only be addressed on a site-specific basis. Sewers for Adoption (SfA) 7th Edition (WRc, 2006) states that developments should be protected against flooding from extreme events (1 in 30 year) and that flood pathways are identified when the drainage system is exceeded.
- 6.6.4 In the case of this development, exceedance flows will be all those over and above the 30-year design criterion set by Sewers for Adoption guidance. Using storage within the external areas would be achievable and would direct flood water away from the residential buildings, with flows directed back into the surface water drainage network as water levels in the sewers receded. The exceedance flows and volumes can be calculated for the new development drainage layout. In the case of this development and due to the fall across the site, consideration will be given to make sure all water is controlled so that it does not impact on any adjoining properties.
- 6.6.5 Table 8 below defined the post development attenuation volumes associated with the site and the method of attenuating (further details can be found on drawing BWW-SHD-00-ZZ-DR-C-0100 in Appendix D). The volumes identified below are preliminary for this outline assessment and are likely to alter at detailed design stage. The outline attenuation volumes in Table 8 have been derived using Microdrainage Source Control Software.

Table 8: Outline Attenuation Volumes

	Impermeable Area (ha)	Allowable Discharge Rate (l/s)	1 in 30 year attenuation (m ³)	1 in 100 year attenuation + 40% Climate Change Allowance (m ³) (extra over from 30yr retained on the surface where possible)
Residential Development	0.3	5.0	70.0	160.0

- 6.6.6 Any future drainage calculations carried out as part of a site-wide drainage strategy or for the development layouts themselves must include the appropriate increase in rainfall to satisfy the future Climate Change allowances.

6.7 Pollution Control

- 6.7.1 Silt is to be prevented from entering the drainage system by the use of trapped gullies, channels with silt traps, French drains with silt traps or by the use of Sustainable Drainage techniques. If appropriate, oil separators in line with Pollution Prevention Guidance 3 (PPG 3) criteria will be provided (it is acknowledged that PPG 3 has been withdrawn, however as no replacement has been released it is still best practice guidance).

6.8 Foul Water Strategy

- 6.8.1 The outline foul water drainage strategy is to connect into the combined sewer network in Brook Street to the south as agreed with Dŵr Cymru Welsh Water. There would be very limited increase in the foul water discharge rates generated by the new development.

7.0 Management Measures, Off Site Impacts and Residual Risk

7.1 Flood Risk Management Measures

- 7.1.1 The report has found the main development site to be at low risk of flooding from all sources.
- 7.1.2 The surface water drainage strategy for the new development site will be to discharge to the unnamed watercourse to the southwest at a restricted rate. The new surface water networks will be designed in line with current British Standard and Sewers for Adoption Guidance up to the 100-year storm return period including an allowance for climate change. Beyond the 30-year criterion out of chamber flooding may occur and flood water will be directed away from the residential buildings to the external areas and car parking, where it will then be directed back into the drainage network as pipe water levels recede.
- 7.1.3 The use of SuDS in the form of Prevention and Site Control measures, with controlled (restricted) outflow, in line with the required reduction in runoff rates, will help to minimise the flood risk impact to the surrounding sewer networks.
- 7.1.4 There will be a site management health and safety document prepared in respect of the final development. This will include the required maintenance regime for the on-site drains and drainage facilities such as the channels, gullies, pipes, manholes and all SUDS facilities.
- 7.1.5 A new Management Company, the local Highway Authority and Dŵr Cymru Welsh Water will be responsible for site cleanliness, gully emptying and drain cleansing to ensure that the surface water drainage system will always operate at its maximum efficiency.
- 7.1.6 Should any flooding occur from the new sewers and drains it will be directed away from the residential buildings to external areas and soft landscaping areas.

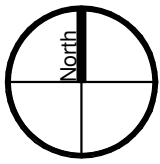
7.2 Off Site Impacts

- 7.2.1 Up to and including the 100-year plus increase in rainfall allowance due to climate change (CC) event, the report has justified that there is no risk of flooding.
- 7.2.2 The development footprint does not cross or cover any existing or declared future catchment flood defences. Consequently, the Applicant does not propose to augment or compromise any existing catchment defences.
- 7.2.3 By reducing the pre-development peak runoff by the inclusion of SuDS, this will reduce surface water flooding impact onto the downstream sewer network and satisfy site constraints.
- 7.2.4 As there is no flood displacement or increased rate of runoff as part of this proposal into the adjacent sewers, the proposed development will therefore not increase flood risk in its locality.

7.3 Residual Risk

- 7.3.1 With careful design of the drainage elements as described above there will be no residual flood-related risks that will remain after the development has been completed.
- 7.3.2 Flood risk to people and property can be managed but it can never be completely removed; a residual risk remains after flood management or mitigation measures have been put in place. The only known flood related risk that will remain will be the risk of out of manhole flooding within both the existing private and public sewer network beyond the 30 year design criterion. Should exceedance occur, out of chamber flood water will be directed to the external hard standing areas and roads but will not be a flood risk generator.

Appendix A – Architectural Site Layout



Notes
The Contractor is to check all dimensions and conditions on site before commencing. Do not scale from this drawing.
This drawing remains the copyright of POZZONI Architecture Ltd.

Scale Bars		TO BE USED ONLY AS GUIDANCE			
1:100	mm	0	1000	2000	3000
1:200	mm	0	1000	2000	3000
1:500	m	0	10	20	30
1:1000	m	0	10	20	30

- Trees Retained
- Trees Removed
- Mine Shaft Location
- Red Line Boundary

P7	Site Plan updated reflecting client changes; bin store positions + pedestrian ramped access	JG	09.10.2020
P6	Proposed levels and notes added	JG	09.09.2020
P5	Updates to site plan following DTM	JG	14.08.2020
P4	Updated inline with client requirements	JG	07.08.2020
P3	Red Line Updated	JG	22.07.2020
P2	Updated inline with design development	JG	10.07.2020
P1	Updated inline with design development	JG	03.07.2020

Rev	Description	By	Date
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PDW

Bonc Wen, Rhos

Site Layout Plan

5525_SK8000 Rev P7

SK8000

Date: 25/06/20 Scale: As indicated @ A1

Prepared: JG As Issued: EM

Planning: Tender: Construction: Design: Contract: As Built:

pozzoni

10-12 Emerald Street
London
WC1N 3QA

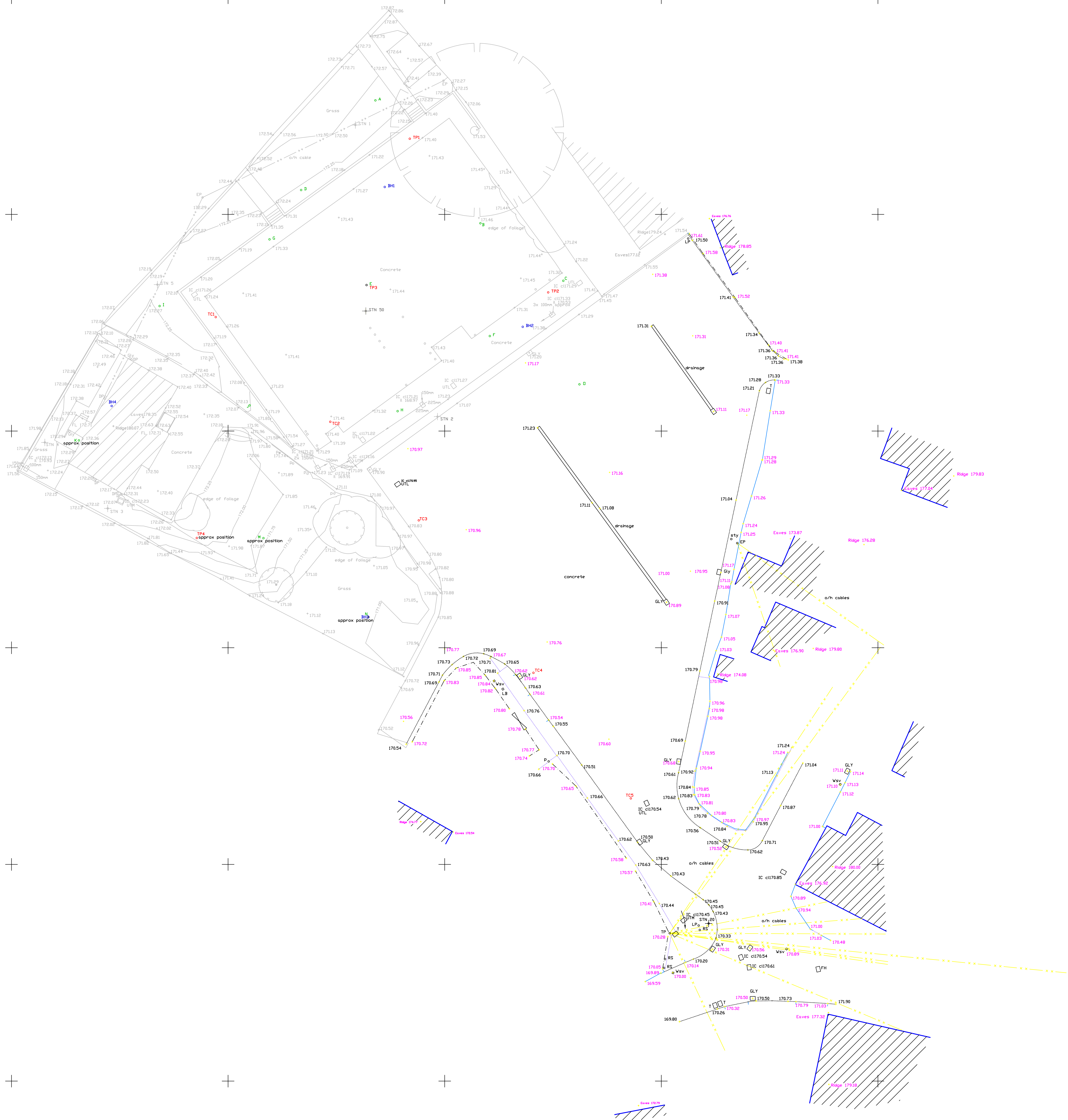
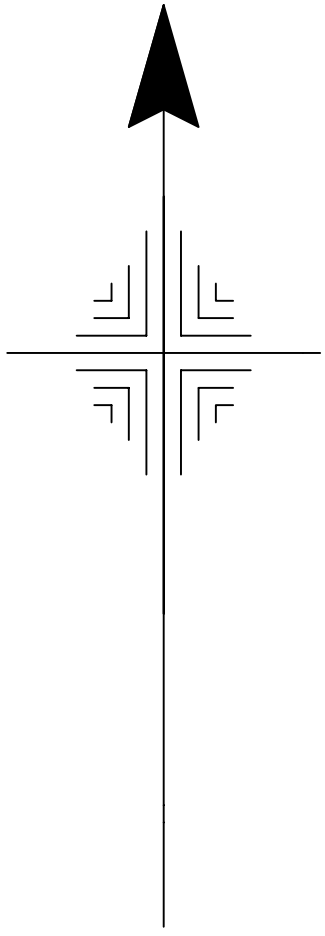
Woodville House
2 Woodville Road
Altrincham
WA14 2FH

+44 20 7078 0079
architects@pozzoni.co.uk

+44 161 928 7848
www.pozzoni.co.uk

Proposed Site Layout Plan
1 : 200

Appendix B – Topographical Survey



Legend

- BL BOLLARD
- BS BUS STOP
- CATV CABLE TV COVER
- CL COVER LEVEL
- CPS CONCRETE PAVING SLAB
- DP DRAIN PIPE
- DS DOOR STOP
- EL ELECTRICITY COVER
- EP ELECTRICITY POLE
- ER EARTH ROD
- PH 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 RECORDING EYE
- RS ROAD SIGN
- STN SURVEY STATION
- STY STAY WIRE
- T TELECOMMUNICATIONS COVER
- TL TRAFFIC LIGHT
- TP TELEGRAPH POLE
- 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

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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

--- DENOTES OVERHEAD CABLES

--- DENOTES UNDERGROUND SERVICES

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

STATION CO-ORDINATES

STN	1	E 328989.690	N 346410.316	H 172.451
STN	2	E 328999.168	N 346376.669	H 171.166
STN	3	E 328961.105	N 346366.077	H 172.075
STN	4	E 328953.848	N 346373.693	H 172.221
STN	5	E 328966.844	N 346381.983	H 172.317
STN	20	E 329030.462	N 346318.188	H 170.494
STN	50	E 328990.892	N 346388.853	H 171.455

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3 YEOMANRY ROAD
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SHREWSBURY
SHROPSHIRE SY1 3EH
TEL/FAX 01743 443388

Client BOWEN CONSULTANTS LTD Title BOND WDN RHOS, WREXHAM

Scale	Date	Job No	Dwg No	Rev.
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1 : 200	24/02/15	9774	01	—
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Surveyed by	Checked	Scanned	Levels are related to	...
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LD/MB	DE	NO	OS DATUM (GPS)	
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Appendix C – Statutory Authority Correspondence

Ms Kiera Sayers
Project Development Workshop Ltd
Warrington
Cheshire
WA4 1JH

Date: 22/07/2020
Our Ref: PPA0004985

Dear Ms Sayers,

Grid Ref: 328986 346383
Site Address: Bonc Wen, Wrexham
Development: Residential development – 12 units

I refer to your pre-planning enquiry received relating to the above site, seeking our views on the capacity of our network of assets and infrastructure to accommodate your proposed development. Having reviewed the details submitted I can provide the following comments which should be taken into account within any future planning application for the development.

SEWERAGE

We have considered the impact of foul flows generated by the proposed development and concluded that flows can be accommodated within the public sewerage system. We advise that the flows should be connected to the 300mm combined sewer between manholes SJ28469399 and SJ28469301 located in road to the south west of the site.

Should a planning application be submitted for this development we will seek to control these points of communication via appropriate planning conditions and therefore recommend that any drainage layout or strategy submitted as part of your application takes this into account.

However, should you wish for an alternative connection point to be considered please provide further information to us in the form of a drainage strategy, preferably in advance of a planning application being submitted.

Advisory Notes

You may need to apply to Dwr Cymru / Welsh Water for any connection to the public sewer under S106 of the Water industry Act 1991. If the connection to the public sewer network is either via a lateral drain (i.e. a drain which extends beyond the connecting property boundary) or via a new sewer (i.e. serves more than one property), it is now a mandatory requirement to first enter into a Section 104 Adoption Agreement (Water Industry Act 1991). The design of the sewers and lateral drains must also conform to

the Welsh Ministers Standards for Gravity Foul Sewers and Lateral Drains and conform with the publication "Sewers for Adoption"- 7th Edition. Further information can be obtained via the Developer Services pages of www.dwrcymru.com

You are also advised that some public sewers and lateral drains may not be recorded on our maps of public sewers because they were originally privately owned and were transferred into public ownership by nature of the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011. Under the Water Industry Act 1991 Dwr Cymru Welsh Water has rights of access to its apparatus at all times.

SURFACE WATER

As of 7th January 2019, this proposed development is subject to Schedule 3 of the Flood and Water Management Act 2010. The development therefore requires approval of Sustainable Drainage Systems (SuDS) features, in accordance with the 'Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems'. As highlighted in these standards, the developer is required to explore and fully exhaust all surface water drainage options in accordance with a hierarchy which states that discharge to a combined sewer shall only be made as a last resort. Disposal should be made through the hierarchical approach, preferring infiltration and, where infiltration is not possible, disposal to a surface water drainage body in liaison with the Land Drainage Authority and/or Natural Resources Wales.

It is therefore recommended that the developer consult with Wrexham County Borough Council, as the determining SuDS Approval Body (SAB), in relation to their proposals for SuDS features. Please note, DCWW is a statutory consultee to the SAB application process and will provide comments to any SuDS proposals by response to SAB consultation. Please refer to further detailed advice relating to surface water management included in our attached Advice & Guidance note.

Due to capacity constraints with the public combined sewerage system we wouldn't allow any surface water run-off from the proposed development to be discharged into the public combined sewer.

In addition, please note that no highway or land drainage run-off will be permitted to discharge directly or indirectly into the public sewerage system.

SEWAGE TREATMENT

No problems are envisaged with the Waste Water Treatment Works for the treatment of domestic discharges from this site.

I trust the above information is helpful and will assist you in forming water and drainage strategies that should accompany any future planning application. I also attach copies of our water and sewer extract plans for the area, and a copy of our Planning Guidance Note which provides further information on our approach to the planning process, making connections to our systems and ensuring any existing public assets or infrastructure located within new development sites are protected.



Welsh Water is owned by Glas Cymru – a 'not-for-profit' company.
Mae Dwr Cymru yn eiddo i Glas Cymru – cwmni 'nid-er-elw'.

We welcome correspondence in
Welsh and English

Dŵr Cymru Cyf, a limited company registered in
Wales no 2366777. Registered office: Pentwyn Road,
Nelson, Treharris, Mid Glamorgan CF46 6LY

Rydym yn croesawu gohebiaeth yn y
Gymraeg neu yn Saesneg

Dŵr Cymru Cyf, cwmni cyfyngedig wedi'i gofrestru yng
Nghymru rhif 2366777. Swyddfa gofrestredig: Heol Pentwyn
Nelson, Treharris, Morgannwg Ganol CF46 6LY.

Please note that our response is based on the information provided in your enquiry and should the information change we reserve the right to make a new representation. Should you have any queries or wish to discuss any aspect of our response please do not hesitate to contact our dedicated team of planning officers, either on 0800 917 2652 or via email at developer.services@dwrcymru.com

Please quote our reference number in all communications and correspondence.

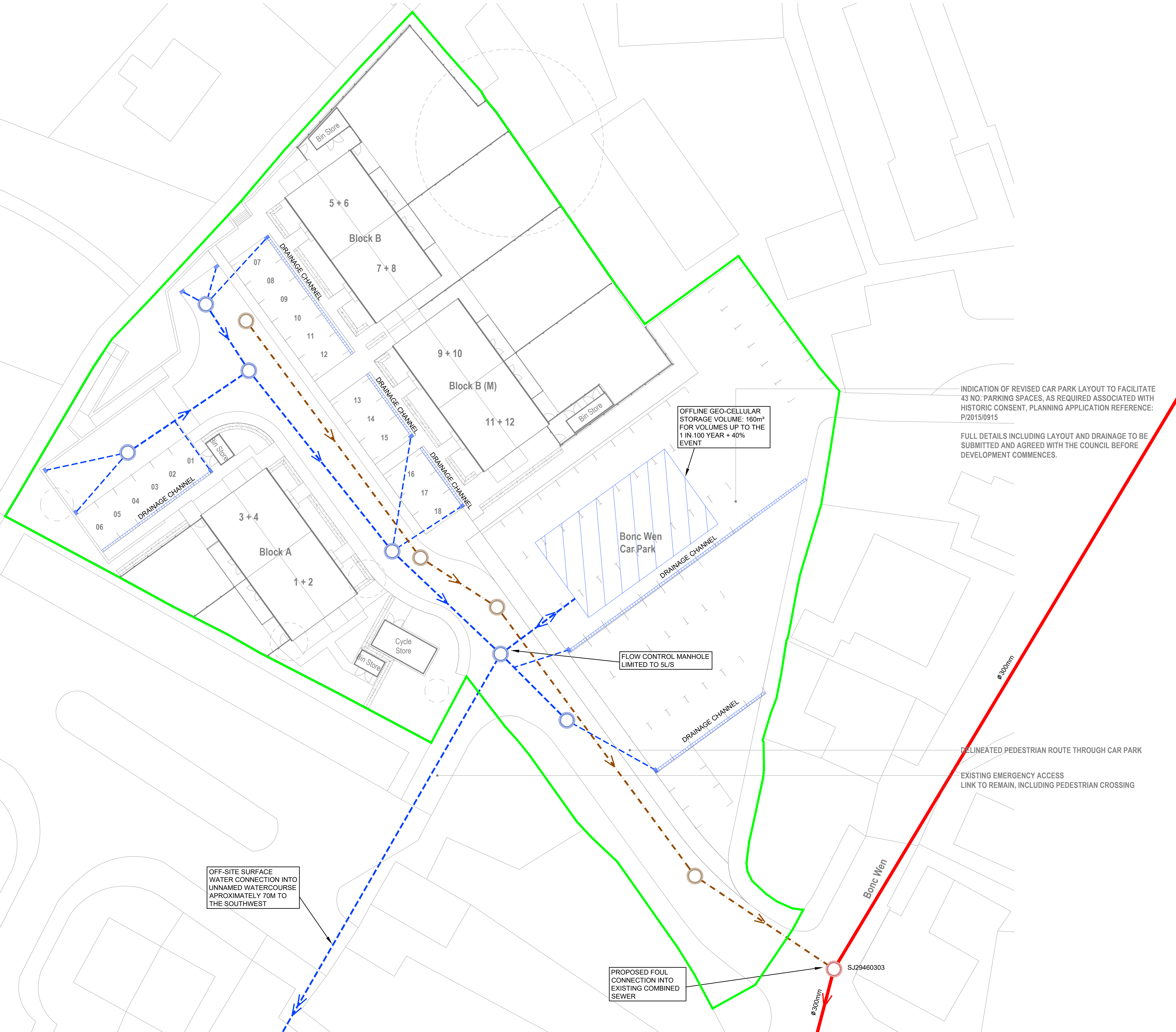
Yours faithfully,



Owain George
Planning Liaison Manager
Developer Services

Please Note that demands upon the water and sewerage systems change continually; consequently the information given above should be regarded as reliable for a maximum period of 12 months from the date of this letter.

Appendix D – Scott Hughes Design Drawings



GENERAL NOTES

1. DRAWINGS ARE TO BE READ IN CONJUNCTION WITH ALL RELEVANT SPECIFICATIONS, ENGINEERS, ARCHITECTS & SERVICES DRAWINGS, INCLUDING APPROVED BUILDERS WORK DRAWINGS. CONTRACTOR TO NOTIFY ENGINEER OF DISCREPANCIES BETWEEN STRUCTURAL DRAWINGS AND SPECIFICATIONS OR OTHER DRAWINGS.
2. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
3. DO NOT SCALE FROM THIS DRAWING, WORK TO DIMENSIONS OR CO-ORDINATES PROVIDED. ALL LEVELS ARE IN METRES AND ALL DIMENSIONS ARE IN MILLIMETRES, UNLESS OTHERWISE NOTED. ANY AMBIGUITIES, OMISSIONS AND ERRORS ON DRAWINGS, SHALL BE BROUGHT TO THE ENGINEERS ATTENTION IMMEDIATELY.
4. INFORMATION CONTAINED ON THIS DRAWING IS SCHEME DESIGN ONLY AND REQUIRES FURTHER DETAILED DESIGN AND CO-ORDINATION WITH THE CONTRACTOR, DESIGN TEAM AND APPROPRIATE SUB-CONTRACTORS.

DRAINAGE KEY

- EXISTING WELSH WATER COMBINED SEWER
- PROPOSED SURFACE WATER DRAIN
- PROPOSED FOUL WATER DRAIN
- SITE BOUNDARY

P3	26.10.20	EJD	PG	UPDATED SITE LAYOUT
P2	25.08.20	EJD	PG	UPDATED SITE LAYOUT
P1	27.07.20	EJD	PG	PRELIMINARY ISSUE
No	DATE	DRAWN	REV'D ENG.	AMENDMENT

STATUS	PURPOSE OF ISSUE
S2	FOR INFORMATION

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Manchester M4 6JW
t. 0161 605 0831
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e.mail@scotthughesdesign.co.uk
Reg No. 4899745

CLIENT	PDW LTD		
PROJECT	BONC WEN, WREXHAM		
DRAFTER	AS	ENGINEER	EJD
TITLE	PROJECT REFERENCE: 3697 DRAINAGE STRATEGY PLAN		
SCALE	SHEET	DRAWING No	REV
1-250	A1	BWW-SHD-00-ZZ-DR-C-0100	P3

Appendix E – Hydraulic Calculations

Scott Hughes Design Ltd		Page 1
The Flint Glass Works 64 Jersey Street Manchester M4 6JW	Bonc Wen Car Park Wrexham	
Date 25/08/2020 File 100yr + CC.SRCX	Designed by EJD Checked by PG	
Micro Drainage Source Control 2018.1		
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 1 Soil 0.500 Area (ha) 0.442 Urban 0.000 SAAR (mm) 1000 Region Number Region 9 Results 1/s QBAR Rural 3.7 QBAR Urban 3.7 Q1 year 3.3 Q1 year 3.3 Q30 years 6.5 Q100 years 8.1		
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