FLOOD RISK AND DRAINAGE SOLUTIONS LTD

NPPF Flood Risk Assessment

Land Adjacent to Southport House, Sawley Road

Report No: 2022-053

Client: Zara Moon Architects

Date: 15/12/2022

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Contract

This report describes work commissioned by Zara Moon Architects dated 17th November 2022. Chris Vose BSc of Flood Risk and Drainage Solutions Ltd carried out the work.

Disclaimer

This document has been prepared solely as a Flood Risk Assessment for Zara Moon Architects. Flood Risk and Drainage Solutions Ltd accepts no responsibility or liability for any use that is made of this document other than by the Client for the purposes for which it was originally commissioned and prepared.

Executive Summary

Flood Risk and Drainage Solutions have been appointed by Zara Moon Architects, to provide a Flood Risk Assessment in support of a planning application for the erection of 2No properties on land associate with Southport House, Sawley Road, Sawley, Lancashire.

The proposed development site is located within Flood Zone 1 and therefore has a low risk of fluvial flooding.

An initial assessment indicates that the primary flood risk at the proposed development is from an increase in surface water runoff resulting from the new development and pluvial runoff entering the watercourse named Hollins Syke, located north of the site.

The application site currently comprises of dilapidated agricultural buildings and existing trees. Access is provided via an unnamed road which links Sawley Road to the west and the A59 bypass to the south east.

The topographical survey provided identifies that the site falls from east to west, ranging from 76.800m AOD at the east boundary down to 73.200m AOD at the west of the site.

The nearest watercourse to the application site is Hollins Syke located approximately 6m to the north within the adjacent field. The watercourse flows in a westerly direction before discharging into the River Ribble approximately 135m west of the site.

Hollins Syke is considered to be an 'Ordinary Watercourse' and therefore is the responsibility of the riparian owner.

There are currently 4 dilapidated agricultural buildings on the site with existing trees. The proposal is to demolish the existing buildings and construct 2 detached dwellings.

Pluvial/Overland Flow

In conclusion, the Environment Agency Surface Water Flood Map identifies that the application site is considered to remain unaffected during all events up to and including the low-risk event. Flooding within the road to the north is considered to be less than 0.25m/s and less than 300mm in depth.

Due to the flood depth being considered less than 300mm, it is recommended that the finished floor levels of the properties are elevated no less than 300mm above the road level to the north.

Surface Water and Foul Drainage

It is understood that the application site would have at one time been formally drained, engineering judgment suggests that surface water flows would have been directed into Hollins Syke at the north of the site, however this is not verified.

United Utilities sewer records were not available at the time of writing; however it is likely that public sewers are located within Sawley Road approximately 35m west of the site, this is to be verified during the detailed design phase.

The hierarchy for disposal of surface water from new developments is outlined within the Building Regulations Approved Document H and specifies the following methods in order of preference:

- Infiltration via soakaway or other suitable infiltration device
- Discharge to watercourse
- Discharge to public surface water sewer
- Discharge to public combined sewer

Infiltration

Soilscape maps identifies the site to be located on land which is considered to be *'Freely draining floodplain soils'.*

A review of local borehole logs taken from the BGS online service identifies that there are no records within close proximity to the proposed development.

Taking the above into consideration the use of soakaways at the proposed development is considered to be potentially suitable for surface water disposal following on-site Percolation Testing in accordance with BRE Digest 365.

Watercourse

In the event that infiltration methods are found to be unsuitable following on-site Percolation Testing, surface water flows from the site should discharge into Hollins Syke at the north of the site.

Sewer

If it is found that infiltration methods and direct discharge to watercourse are not considered to be feasible, it is recommended that surface water flows from the proposed development are directed to public sewer.

Flows from the proposed development site should be restricted to no more than existing Qbar i.e. 7.32l/s during all events including the 100 year + 50% climate change event.

- Restricted discharge rate = 7.32l/s

Infiltration

Indicative attenuation volumes for disposal via infiltration methods cannot be estimated until onsite percolation testing has been undertaken.

Watercourse

Indicative attenuation volumes have been calculated for the total proposed impermeable area of each property respectively, with flows split in half i.e. 3.66l/s per property during the 1 in 100 year + 50% climate change event.

West Property (0.061Ha, 3.66l/s)

- 1 in 100 Year + 50% Climate Change Event = $27m^3 – 52m^3$

East Property (0.07Ha, 3.66l/s)

- 1 in 100 Year + 50% Climate Change Event = $34m^3 – 63m^3$

In accordance with Building Regulations Document H Hierarchy of Surface Water Disposal, on-site percolation testing is required to determine if infiltration methods are suitable for disposal. If it is found in favour of soakaway a mixture of permeable paving and soakaway tanks could be used to attenuate and dispose of surface water resulting from the development.

In the event that soakaways are not considered viable it is recommended that surface water discharges into Hollins Syke located north of the site, reusing the existing outfall where possible.

Flows will be restricted via flow control chambers to no more than a total of 7.32l/s (Qbar) up to and including the 100 year + 50% climate change event. Flows in excess of this could be attenuated within a geo-cellular storage tanks and/or permeable paving located within car parking areas.

It is proposed that foul from the proposed development should firstly discharge into the public sewer, failing that the suitability of Package Treatment Plants should be explored.

Flood Mitigation Measures

Due to surface water flooding within the road to the north expected to be less than 300mm during the worst-case event, it is therefore recommended that finished floor levels are elevated 300mm above road level to the north.

- Proposed finished floor levels = 300mm above road level to the north

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1.0 Introduction

1.1 Terms of Reference

Flood Risk and Drainage Solutions have been appointed by Zara Moon Architects, to provide a Flood Risk Assessment in support of a planning application for the erection of 2No properties on land associate with Southport House, Sawley Road, Sawley, Lancashire.

The proposed development site is located within Flood Zone 1 and therefore has a low risk of fluvial flooding.

It is usual for the Environment Agency to raise an objection to development applications within the floodplain, or Zones 2 and 3 of the flood map, until the issue of flood risk has been properly evaluated. The Agency will also object to developments where the total site area is in excess of 1 Hectare until suitable consideration has been given to the management of surface water runoff.

1.2 Objectives

The objective of this assessment is to evaluate the following issues in regard to flood risk at the application site.

- Suitability of the proposed development in accordance with current planning policy.
- Identify the risk to both the proposed development and people from all forms of flooding.
- Provide a preliminary assessment of foul and surface water management.
- Increasing the risk of flooding elsewhere e.g. surface water flows and flood routing.
- Recommendation of appropriate measures to mitigate against flooding both within the proposed development, and neighbouring land and property.

1.3 Data Sources

This assessment is based on desk-top study of information from the following sources:

- National Planning Policy Framework (updated July 2021)
- Planning Practice Guidance at www.gov.uk
- Building Regulations Approved Document H
- Environment Agency Flood Mapping
- Ribble Valley Strategic Flood Risk Assessment May 2010
- Ribble Valley Strategic Flood Risk Assessment Revised April 2017
- Lancashire Area Preliminary Assessment Report May 2011
- British Geological Society – Historic Borehole Logs
- Cranfield University's Soilscape Viewer
- CIRIA C697 The SUDS Manual
- Chronology of British Hydrological Events (Dundee University)
- R&D Technical Report FD2320/TR2 (2005)

2.0 Planning Policy Context

2.1 Approach to the Assessment

An initial assessment indicates that the primary flood risk at the proposed development is from an increase in surface water runoff resulting from the new development and pluvial runoff entering the watercourse named Hollins Syke, located north of the site.

Consideration has also been given to the site flooding from secondary sources such as groundwater; artificial water bodies; infrastructure failure and ponding.

The requirements for flood risk assessments are generally as set out in the 'Technical Guidance to the National Planning Policy Framework', updated in February 2019; and in more detail from the Environment Agency's 'Standing Advice on Flood Risk' available from https://www.gov.uk/government/publications/national-planning-policy-framework--3.

2.2 National Planning Policy Framework (NPPF)

The information provided in the flood risk assessment should be credible and fit for purpose.

Site-specific flood risk assessments should always be proportionate to the degree of flood risk and make optimum use of information already available, including information in a Strategic Flood Risk Assessment for the area, and the interactive flood risk maps available on the Environment Agency's website.

A flood risk assessment should also be appropriate to the scale, nature and location of the development.

2.2.1 Site Specific Flood Risk Assessment Checklist

The following checklist has been extracted from Flood Risk & Coastal Change Section available from www.gov.uk , updated in February 2019.

1. Development site and location

Provide a description of the site you are proposing to develop, including, or making reference to, a location map which clearly indicates the development site.

A. Where is the development site located? (e.g. postal address or national grid reference)
B. What is the current use of the site? (e.g. undeveloped land, housing, shops, offices)
C. Which Flood Zone (for river or sea flooding) is the site within? (i.e. Flood Zone 1, Flood Zone 2, Flood Zone 3).

Check the Flood Map for Planning (Rivers and Sea) and the Strategic Flood Risk Assessment for the area available from the local planning authority.

2. Development proposals

Provide a general summary of the development proposals, including, or making reference to, an existing block plan and a proposed block plan, where appropriate.

A. What are the development proposal(s) for this site? Will this involve a change of use of the site and, if so, what will that change be?
B. In terms of vulnerability to flooding, what is the vulnerability classification of the proposed development?
C. What is the expected or estimated lifetime of the proposed development likely to be? (E.g. less than 20 years, 20-50 years, 50-100 years?).

3. Sequential test

For developments in flood zones 2 or 3 only.
(If the development site is wholly within flood zone 1, this section can be skipped - go to section 4).

Describe how the sequential test has been applied to the development (if required, and as set out in paragraphs 101-104 of the National Planning Policy Framework); and provide the evidence to demonstrate how the requirements of the test have been met.

See paragraph 033 of the NPPF guidance for further information. (It is recommended that the Developer or Agent contacts the LPA to confirm whether the sequential test should be applied and to ensure the appropriate level of information is provided).

A. What other locations with a lower risk of flooding have you considered for the proposed development?
B. If you have not considered any other locations, what are the reasons for this?

C. Explain why you consider the development cannot reasonably be located within an area with the lowest probability of flooding (flood zone 1); and, if your chosen site is within flood zone 3, explain why you consider the development cannot reasonably be located in flood zone 2.
D. As well as flood risk from rivers or the sea, have you taken account of the risk from any other sources of flooding in selecting the location for the development?

Exception test

Provide the evidence to support certain development proposals in flood zones 2 or 3 if, following application of the sequential test, it is appropriate to apply the exception test, as set out in paragraphs 102-104 of the National Planning Policy Framework.

It is advisable to contact the local planning authority to confirm whether the exception test needs to be applied and to ensure the appropriate level of information is provided.

A. Would the proposed development provide wider sustainability benefits to the community? If so, could these benefits be considered to outweigh the flood risk to and from the proposed development?

B. How can it be demonstrated that the proposed development will remain safe over its lifetime without increasing flood risk elsewhere?
C. Will it be possible to for the development to reduce flood risk overall (e.g. through the provision of improved drainage)?

4. Climate Change

How is flood risk at the site likely to be affected by climate change? (The local planning authority's Strategic Flood Risk Assessment should have taken this into account). Further advice on how to take account of the impacts of climate change in flood risk assessments is available from the Environment Agency.

5. Site specific flood risk

Describe the risk of flooding to and from the proposed development over its expected lifetime, including appropriate allowances for the impacts of climate change. It would be helpful to include any evidence, such as maps and level surveys of the site, flood datasets (e.g. flood levels, depths and/or velocities) and any other relevant data, which can be acquired through consultation with the Environment Agency, the lead local flood authority for the area, or any other relevant flood risk management authority. Alternatively, you may consider undertaking or commissioning your own assessment of flood risk, using methods such as computer flood modelling.

A. What is/ are the main source(s) of flood risk to the site? (E.g. tidal/sea, fluvial or rivers, surface water, groundwater, other?). You should consider the flood mapping available from the Environment Agency, the Strategic Flood Risk Assessment for the area, historic flooding records and any other relevant and available information.

B. What is the probability of the site flooding, taking account of the maps of flood risk available from the Environment Agency, the local planning authority's Strategic Flood Risk Assessment and any further flood risk information?
C. Are you aware of any other sources of flooding that may affect the site?
D. What is the expected depth and level for the design flood? See paragraph 055 of the NPPF guidance for information on what is meant by a "design flood". If possible, flood levels should be presented in metres above Ordnance Datum (i.e., the height above average sea level).
E. Are properties expected to flood internally in the design flood and to what depth? Internal flood depths should be provided in metres.
F. How will the development be made safe from flooding and the impacts of climate change, for its lifetime? Further information can be found in paragraphs 054 and 059 (including on the use of flood resilience and resistance measures) of the NPPF guidance.
G. How will you ensure that the development and any measures to protect the site from flooding will not cause any increase in flood risk off-site and elsewhere? Have you taken into account the impacts of climate change, over the expected lifetime of the development? (e.g. providing compensatory flood storage which has been agreed with the Environment Agency).
H. Are there any opportunities offered by the development to reduce the causes and impacts of flooding?

6. Surface water management*

Describe the existing and proposed surface water management arrangements at the site using sustainable drainage systems wherever appropriate, to ensure there is no increase in flood risk to others off-site.

A. What are the existing surface water drainage arrangements for the site?
B. If known, what (approximately) are the existing rates and volumes of surface water run-off generated by the site?
C. What are the proposals for managing and discharging surface water from the site, including any measures for restricting discharge rates? For major developments (e.g. of ten or more homes or major commercial developments), and for all developments in areas at risk of flooding, sustainable drainage systems should be used, unless demonstrated to be inappropriate.
D. How will you prevent run-off from the completed development causing an impact elsewhere?
E. Where applicable, what are the plans for the ongoing operation and/or maintenance of the surface water drainage systems?

7. Occupants and users of the development

Provide a summary of the numbers of future occupants and users of the new development; the likely future pattern of occupancy and use; and proposed measures for protecting more vulnerable people from flooding.

A. Will the development proposals increase the overall number of occupants and/or people using the building or land, compared with the current use? If this is the case, by approximately how many will the number(s) increase?
B. Will the proposals change the nature or times of occupation or use, such that it may affect the degree of flood risk to these people? If this is the case, describe the extent of the change.
C. Where appropriate, are you able to demonstrate how the occupants and users that may be more vulnerable to the impact of flooding (e.g., residents who will sleep in the building; people with health or mobility issues; etc.,) will be located primarily in the parts of the building and site that are at lowest risk of flooding? If not, are there any overriding reasons why this approach is not being followed?

8. Residual risk

Describe any residual risks that remain after the flood risk management and mitigation measures are implemented, and to explain how these risks can be managed to keep the users of the development safe over its lifetime.

A. What flood related risks will remain after the flood risk management and mitigation measures have been implemented?
B. How, and by whom, will these risks be managed over the lifetime of the development? (e.g., putting in place flood warning and evacuation plans).

9. Flood risk assessment credentials

Provide details of the author and date of the flood risk assessment.

A. Who has undertaken the flood risk assessment?
B. When was the flood risk assessment completed?

Other considerations

* Managing surface water

The site-specific flood risk assessment will need to show how surface water runoff generated by the developed site will be managed. In some cases, it may be advisable to detail the surface water management for the proposed development in a separate drainage strategy or plan. You may like to discuss this approach with the lead local flood authority.

Surface water drainage elements of major planning applications (e.g., of ten or more homes) are reviewed by the lead local flood authority for the area. As a result, there may be specific issues or local policies, for example the Local Flood Risk Management Strategy or Surface Water Management Plan, that will need to be considered when assessing and managing surface water matters.

It is advisable to contact the appropriate lead local flood authority prior to completing the surface water drainage section of the flood risk assessment, to ensure that the relevant matters are covered in sufficient detail.
Proximity to Main Rivers

If the development of the site involves any activity within specified distances of main rivers, a flood risk activity permit may be required in addition to planning permission.

For non-tidal main rivers, a flood risk activity permit may be required if the development of the site is within 8 metres of a river, flood defence structure or culvert.

For tidal main rivers, a flood risk activity permit may be required if the development of the site is within 16 metres of a river, flood defence structure or culvert.

Details on obtaining a Flood Risk Activity Permit are available from the Environment Agency.

2.2.2 Sources of Flooding

- Rivers (fluvial): Flooding occurs when flow within river channels exceeds capacity; and the type of flood event experienced e.g. flash flooding; depends upon the characteristics of the river catchment.
- The Sea (tidal): Flooding at low lying coastline and tidal estuaries is caused by storm surges and high tides; with overtopping and breach failure of sea defences possible during extreme storm events.
- Pluvial (surface flooding or overland flows): Heavy rainfall, which is unable to soak away via infiltration or enter drainage systems can flow overland, resulting in localised flooding. Topography generally influences the direction and depth of flooding caused by this mechanism.
- Groundwater: Caused when ground water levels rise to the surface; and is most likely to occur in low lying areas underlain by aquifers.
- Sewers and drains: Generally occurs in more urban areas; where sewers and drains are overwhelmed by heavy rainfall or blocked pipes and gullies.
- Artificial Sources (reservoirs, canals, lakes and ponds): Reservoir and canal flooding may occur as a result of capacity exceedance or structural failure.

Figure 2.1: The Environment Agency Flood Map

Source: www.gov.uk

2.2.3 Flood Zones

- Flood Zone 1: Low probability (less than 1 in 1000 year (<0.1% AEP) annual probability of river or sea flooding in any year.
- Flood Zone 2: Medium probability (between 1 in 100 year (1.0% AEP) and 1 in 1000 year (0.1% AEP) annual probability of river flooding; or between 1 in 200 year (0.2% AEP) and 1 in 1000 year (0.1% AEP) annual probability of sea flooding in any year).
- Flood Zone 3a: High probability (1 in 100 year (1.0% AEP) or greater annual probability of river flooding in any year or 1 in 200 year (0.5% AEP) or greater annual probability of sea flooding in any year).
- Flood Zone 3b: This zone comprises land where water has to flow or be stored in times of flood. Land which would flood with an annual probability of 1 in 20 (5% AEP), or is designed to flood in an extreme flood (0.1%) should provide a starting point for discussions to identify functional floodplain.

2.2.4 Vulnerability of Different Development Types

- Essential Infrastructure: Transport infrastructure (railways and motorways etc...); utility infrastructure (primary sub-stations, water treatment facilities; power stations; and wind turbines).
- Water Compatible Development: Flood control infrastructure; water and sewage infrastructure; navigation facilities.
- Highly Vulnerable: Emergency services; basement dwellings; mobile home parks; industrial or other facilities requiring hazardous substance consent.
- More Vulnerable: Hospitals; residential dwellings; educational facilities; landfill sites caravan and camping sites.
- Less Vulnerable: Commercial premises; emergency services not required during a flood; agricultural land.

2.2.5 Climate Change

The NPPF requires the application of climate change over the lifetime of a development. As of 06th October 2021, the Technical Guidance for NPPF has updated the climate change allowances based on river basin catchments. The climate change allowance for the Ribble Management Catchment is tabulated below:

Table 1: Peak Rainfall Intensity Allowance [1]

Applied Across All of England	2050's	2070's
Upper End	40%	50%
Central	25%	35%

Due to the development having a proposed life span in excess of 50 years, 50% should be applied to rainfall intensity when developing the drainage strategy, to account for climate change over the lifetime of the development,

3.0 Details of the Site

3.1 Site Details

Table 2: Development Location

Site Name:	Land Adjacent to Southport House
Purpose of Development:	Residential
Existing Land Use:	Agricultural
OS NGR:	SD7772546178
Country:	England
County:	Lancashire
Local Planning Authority:	Ribble Valley Borough Council
Lead Local Flood Authority	Lancashire County Council
Internal Drainage Board:	Not Applicable
Other Authority (e.g. British Waterways/ Harbour Authority)	Not Applicable

Location Plan:

Source: Google

3.2 Site Description

The application site currently comprises of dilapidated agricultural buildings and existing trees. Access is provided via an unnamed road which links Sawley Road to the west and the A59 bypass to the south east.

The topographical survey provided identifies that the site falls from east to west, ranging from 76.800m AOD at the east boundary down to 73.200m AOD at the west of the site.

The nearest watercourse to the application site is Hollins Syke located approximately 6m to the north within the adjacent field. The watercourse flows in a westerly direction before discharging into the River Ribble approximately 135m west of the site.

Hollins Syke is considered to be an 'Ordinary Watercourse' and therefore is the responsibility of the riparian owner.

3.3 Proposed Development Details

There are currently 4 dilapidated agricultural buildings on the site with existing trees. The proposal is to demolish the existing buildings and construct 2 detached dwellings.

4.0 Historic Flooding

4.1 Internet Search

An internet search for historic flooding within the vicinity of Sawley Road came back with no results.

4.2 Ribble Valley Borough Council SFRA May 2010

The Ribble Valley Borough Council Strategic Flood Risk Assessment was undertaken by themselves and completed in May 2010. Section 4.4 Historic Flooding does not specifically identify Sawley as having suffered from flooding in the past.

5.0 Initial Evaluation of Flood Risk

5.1 The Environment Agency Flood Map

The Environment Agency Flood Map illustrated within Figure 2.1, confirms that proposed development is located within Flood Zone 1.

The definition for each of the flood zones highlighted above is provided for reference within Section 2.2.3 of this report.

5.2 Sources of Flooding

Table 3: Possible Flooding Mechanisms

Source/Pathway	Significant?	Comment/Reason
Fluvial	No	Flood Zones 1
Canal	No	Not Applicable
Tidal/Coastal	No	Not Applicable
Reservoir	No	EA Map shows that the site will not be affected by reservoir flooding.
Pluvial (urban drainage)	Yes	Site will require a new drainage strategy
Groundwater	No	Groundwater is not considered by the Environment Agency to be a significant flood risk factor in the RVBC area.
Surface Water Flooding	No	Site is located within an area that very low and low risk of flooding
Overland Flow	No	Site is located within an area that very low and low risk of flooding
Blockage	No	Not Applicable
Infrastructure failure	No	Not Applicable
Rainfall Ponding	No	No areas of ponding identified within the boundary of the site.

From the initial assessment it is concluded that the primary source of flood risk is considered be from an increase in surface water as a result of the development and potential for pluvial flooding migrating into the site.

Fluvial

Due to the proposed development site being located within Flood Zone 1, the risk of fluvial flooding is considered to be low.

Taking the above into consideration flooding from this mechanism does not require any further evaluation.

Surface Water Flooding / Overland Flow

The Environment Agency's Surface Water Flood Map identifies that the proposed development and surrounding area are considered to have a very low and low risk of surface water flooding/overland flow.

- Very low risk means that this area has a chance of flooding of less than 0.1% each year. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

- Low risk means that this area has a chance of flooding of between 0.1% and 1% each year. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

Figure 5.1: Environment Agency Surface Water Flood Map

Source: www.gov.uk

Due to the proximity of the surface water flow route, flooding from this mechanism has been evaluated further within Section 6.

Pluvial: Exceedance and Local System Failure (Sewer Flooding)

The following text has been extracted from CIRIA 2906 'Managing Extreme Events by Designing for Exceedance January 2013':

'Climate change and urbanisation is already contributing to increased surface water flooding, where the capacity of the existing drainage systems are overwhelmed (or exceeded).

The traditional approach to fixing the problem is to build bigger pipes or provide underground storage. Ofwat, the Environment Agency and others believe that this approach is unsustainable and unaffordable and are encouraging sewerage undertakers, Lead Local Flood Authorities and highway authorities to look at different approaches to managing sewer and surface water flooding.
One approach being promoted is "designing for exceedance".

Designing for exceedance is an approach to manage flood risk (particularly from extreme events) by planning, designing and retrofitting drainage schemes that can safely accommodate rainfall and flooding that exceeds their design capacity (normally a 1 in 30 rainfall event). This is often achieved by considering flood pathways (such as managing runoff on highways) or providing additional storage (preferably on the surface through car parks, or multifunctional detention basins).

In England and Wales Sewers for Adoption and the National Planning Policy Framework encourage the consideration of drainage exceedance, it is a flexible approach to manage extreme events that can be used to reduce the need for more traditional, expensive underground approaches to manage surface water and often complement sustainable drainage and other local urban design initiatives.'

The impact of extreme rainfall events and/or local system failure will therefore need to be assessed as part of the overall surface water management strategy for the proposed development.

6.0 Quantitative Flood Risk Assessment

6.1 Pluvial / Overland Flow

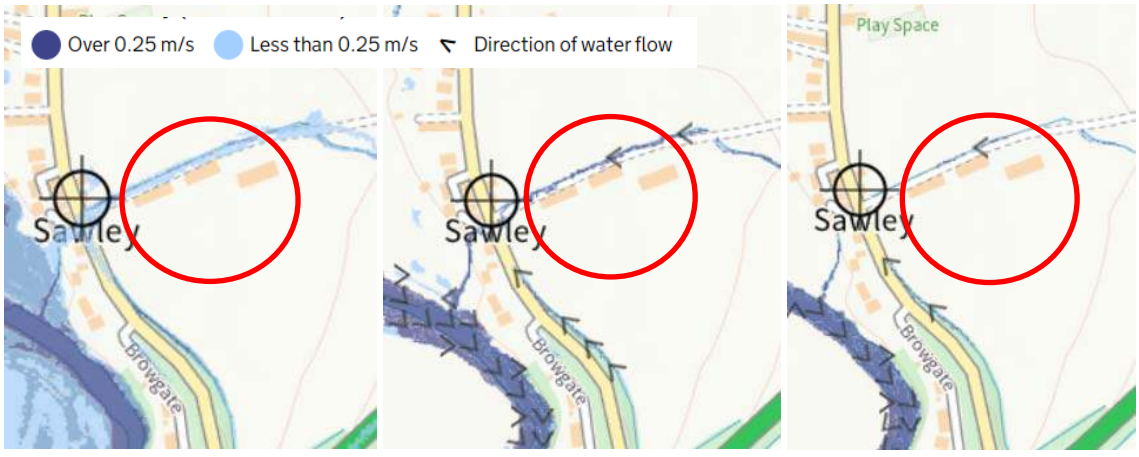
6.1.1 General

A review of the Environment Agency's Surface Water Flood Map has been undertaken to determine the depth and velocity of the surface water flow route associated with the proposed development site.

Figure 6.1: Environment Agency Surface Water Flood Depth

Source: www.gov.uk

Figure 6.2: Environment Agency Surface Water Flood Velocity



Source: www.gov.uk

Evaluation has been undertaken to determine flood depths and velocities within the curtilage of the redline boundary of the proposed development, this is shown below for a range of events.

6.1.2 Low Risk Event

A review of the EA Surface Water Flood Map during the low-risk event shows that the main flow route following the route of the watercourse and is contained within the road to the north and does not encroach the site. Flows within the road are less than 0.25m/s and below 300mm.

During the low-risk event (1:1000 year) the depths and velocities at the site are identified below:

- Depth = N/A
- Velocity = N/A

6.1.3 Medium Risk Event

During the medium risk event (1:100 year) the magnitude of flooding has reduced compared to the low risk event and is contained within the watercourse, the depths and velocities are identified below:

- Depth = N/A
- Velocity = N/A

6.1.4 High Risk Event

During the high-risk event (1:30 year) the depths and velocities are identified below:

- Depth = N/A
- Velocity = N/A

6.1.5 Pluvial: Conclusion

In conclusion, the EA surface water flood map identifies that the application site is considered to remain unaffected during all events up to and including the low-risk event. Flooding within the road to the north is considered to be less than 0.25m/s and less than 300mm in depth.

Due to the flood depth being considered less than 300mm, it is recommended that the finished floor levels of the properties are elevated no less than 300mm above the road level to the north.

6.2 Surface Water Runoff

6.2.1 General

The application site currently comprises of 4No dilapidated buildings and a number of trees, the majority of the site comprises of vegetated areas with very little hardstanding.

6.2.2 Existing On-site Drainage Regime

It is understood that the application site would have at one time been formally drained, engineering judgment suggests that surface water flows would have been directed into Hollins Syke at the north of the site, however this is not verified.

6.2.3 Existing Sewers/Watercourses

United Utilities sewer records where not available at the time of writing, however it is likely that public sewers are located within Sawley Road approximately 35m west of the site, this is to be verified during the detailed design phase.

6.2.4 Surface Water Drainage Hierarchy

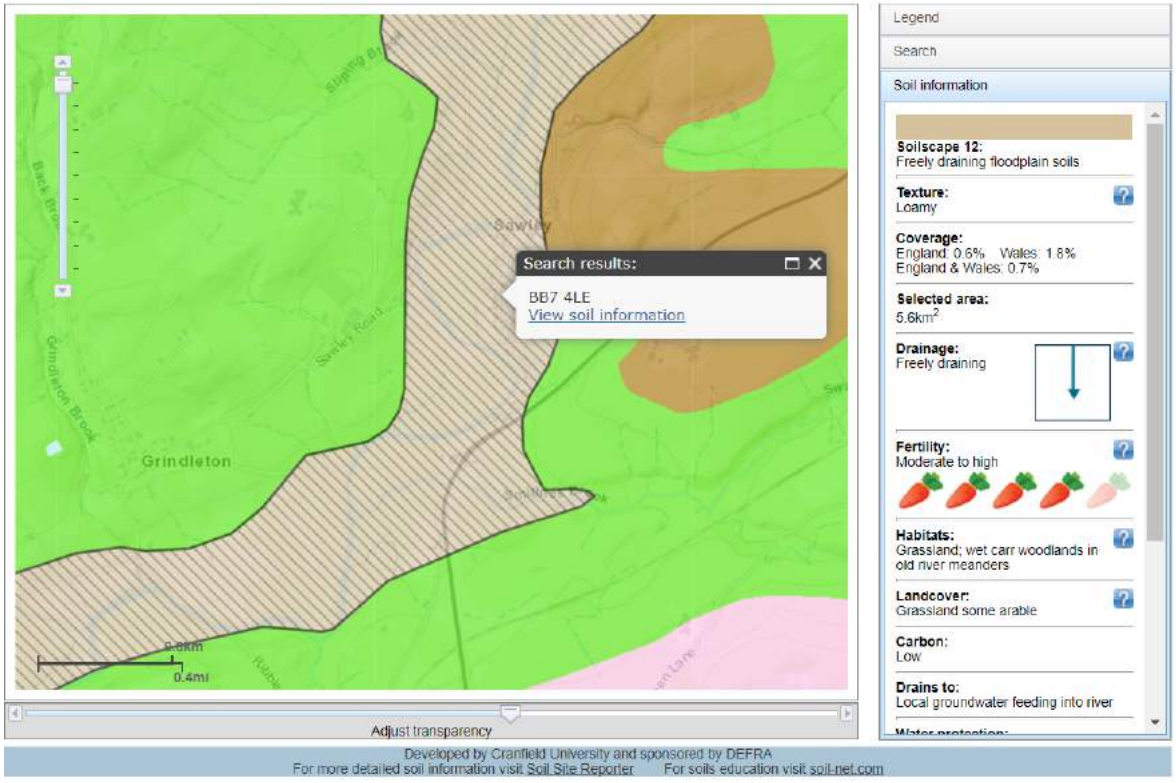
The hierarchy for disposal of surface water from new developments is outlined within the Building Regulations Approved Document H and specifies the following methods in order of preference:

- Infiltration via soakaway or other suitable infiltration device
- Discharge to watercourse
- Discharge to public surface water sewer
- Discharge to public combined sewer

Infiltration

Soilscape maps identifies the site to be located on land which is considered to be *'Freely draining floodplain soils'.*

Figure 6.3: Soilscape Maps



Source: www.gov.uk

A review of local borehole logs taken from the BGS online service identifies that there are no records within close proximity to the proposed development.

Taking the above into consideration the use of soakaways at the proposed development is considered to be potentially suitable for surface water disposal following on-site Percolation Testing in accordance with BRE Digest 365.

Watercourse

In the event that infiltration methods are found to be unsuitable following on-site Percolation Testing, surface water flows from the site should discharge into Hollins Syke at the north of the site.

Sewer

If it is found that infiltration methods and direct discharge to watercourse are not considered to be feasible, it is recommended that surface water flows from the proposed development are directed to public sewer.

6.2.5 Greenfield Runoff Rates

Greenfield runoff rates have been calculated for the total redline boundary of the site i.e., 0.773Ha, using the IH124 methods for a range of return periods.

Table 4: Greenfield Runoff (Greenfield 0.773Ha)

Return Period	Discharge Rate l/s
QBar	7.32
1 Year	6.37
30 Year	12.44
100 Year	15.23

6.2.6 Sustainable Urban Drainage Systems (SUDS)

SUDS act to reduce the impact of surface water runoff from the development by limiting runoff volumes and rates from leaving the site.

Undertaking an assessment using the SUDS Planner a number of different methods could be used within the development. A summary of the results is tabulated below:

Table 5: SUDS Planner

SUDS Criteria	Rank 1	Rank 2	Rank 3
Hydrological	Permeable Pavements	On/offline Storage	Green Roof
Land Use	Infiltration Trench/Soakaway	Bioretention Area	Green Roof
Site Features	Permeable Pavements	Green Roofs	Filtration Techniques
Community & Environment	Bioretention Area	Infiltration Trench/Soakaway	Stormwater Wetlands
Economics & Maintenance	Wet Ponds	On/offline Storage	Dry Detention
Total	Permeable Paving	On/offline Storage	Green Roof

1. Source Control

The inclusion of source control in SUDS schemes is one of the more important principles of SUDS design, and source control components should be upstream of any pond, wetland or other SUDS component.

Source control can help provide interception storage which can handle and treat some of the more frequent but smaller, polluting events (at least 5mm).

Most source control components will be located within the private properties or highway areas. Their purpose is to manage rainfall close to where it falls, not allowing it to become a problem elsewhere.

The main types of source control include:

- Green roofs
- Rainwater harvesting

- Permeable paving
- Other permeable surfaces

Source control methods look to maximize permeability within a site to promote attenuation, treatment and infiltration, thereby reducing the need for off-site conveyance.

a) Green Roofs

Green roof solutions generally comprise of a multi-layered system that covers the roof of a building with vegetation cover, and/or landscaping over a drainage layer, designed to intercept and retain rainfall.
The incorporation of green roofs is to be decided by the architect/developers during the final design stage and is largely dependent on the final building design.

The likelihood of green roofs being utilised is considered to be low due to the increase in structural cost of the development.

b) Rainwater Harvesting

Rainwater harvesting provides a source of non-potable water, for purposes such as car washing; and landscaped area irrigation etc... and can be used for some industrial processes to reduce consumption of water from conventional supplies.

This SUDS solution, like green roof technology, is also designed to provide interception storage i.e. acts to reduce the volume of surface water leaving the proposed development; thereby helping to alleviate the current pressures on the receiving watercourse.

Rainwater harvesting can be installed at relatively low costs dependant on the chosen structure providing that the development site has scope.

c) Permeable Paving

Pervious surfaces can be either porous or permeable. The important distinction between the two is:

Porous surfacing is a surface that infiltrates water across the entire surface. Permeable surfacing is formed of material that is itself impervious to water but, by virtue of voids formed through the surface, allows infiltration through the pattern of voids.

Pervious surfaces provide a surface suitable for pedestrian and/or vehicular traffic, while allowing rainwater to infiltrate through the surface and into underlying layers.

The water can be temporarily stored before infiltration to the ground, reused, or discharged to a watercourse or other drainage system. Surfaces with an aggregate sub-base can provide good water quality treatment.

On/Offline Storage

This is a traditional form of surface water attenuation and may be provided via online or offline structures such as oversized pipes; or shallow attenuation structures such as geo-cellular crate systems e.g., Hydro-International's Stormcell System or similar. These structures may be easily placed within either hardstanding or landscaped areas to provide ease of access for maintenance purposes.

6.2.7 Restricted Discharge Rate

Flows from the proposed development site should be restricted to no more than existing Qbar i.e. 7.32l/s during all events including the 100 year + 50% climate change event.

- Restricted discharge rate = 7.32l/s

6.2.8 Indicative Attenuation Volumes

Infiltration

Indicative attenuation volumes for disposal via infiltration methods cannot be estimated until onsite percolation testing has been undertaken.

Watercourse

Indicative attenuation volumes have been calculated for the total proposed impermeable area of each property respectively, with flows split in half i.e. 3.66l/s per property during the 1 in 100 year + 50% climate change event.

West Property (0.061Ha, 3.66l/s)

- 1 in 100 Year + 50% Climate Change Event = **27m³ – 52m³**

East Property (0.07Ha, 3.66l/s)

- 1 in 100 Year + 50% Climate Change Event = **34m³ – 63m³**

6.2.9 Preliminary Drainage Strategy

In accordance with Building Regulations Document H Hierarchy of Surface Water Disposal, on-site percolation testing is required to determine if infiltration methods are suitable for disposal. If it is found in favour of soakaway a mixture of permeable paving and soakaway tanks could be used to attenuate and dispose of surface water resulting from the development.

In the event that soakaways are not considered viable it is recommended that surface water discharges into Hollins Syke located north of the site, reusing the existing outfall where possible.

Flows will be restricted via flow control chambers to no more than a total of 7.32l/s (Qbar) up to and including the 100 year + 50% climate change event. Flows in excess of this could be attenuated within a geo-cellular storage tanks and/or permeable paving located within car parking areas.

6.2.10 Maintenance

Following development, the drainage network serving the site will remain private, upon request from the LPA the developer is to provide evidence of the funding mechanism for the management and maintenance of the drainage system.

6.3 Foul

It is proposed that foul from the proposed development should firstly discharge into the public sewer, failing that the suitability of Package Treatment Plants should be explored.

7.0 Mitigation Measures

7.1 Finished Development Levels

Due to surface water flooding within the road to the north expected to be less than 300mm during the worst-case event, it is therefore recommended that finished floor levels are elevated 300mm above road level to the north.

- Proposed finished floor levels = 300mm above road level to the north

8.0 Conclusions & Recommendations

Pluvial/Overland Flow

In conclusion, the Environment Agency Surface Water Flood Map identifies that the application site is considered to remain unaffected during all events up to and including the low-risk event. Flooding within the road to the north is considered to be less than 0.25m/s and less than 300mm in depth.

Due to the flood depth being considered less than 300mm, it is recommended that the finished floor levels of the properties are elevated no less than 300mm above the road level to the north.

Surface Water and Foul Drainage

It is understood that the application site would have at one time been formally drained, engineering judgment suggests that surface water flows would have been directed into Hollins Syke at the north of the site, however this is not verified.

United Utilities sewer records were not available at the time of writing; however it is likely that public sewers are located within Sawley Road approximately 35m west of the site, this is to be verified during the detailed design phase.

The hierarchy for disposal of surface water from new developments is outlined within the Building Regulations Approved Document H and specifies the following methods in order of preference:

- Infiltration via soakaway or other suitable infiltration device
- Discharge to watercourse
- Discharge to public surface water sewer
- Discharge to public combined sewer

Infiltration

Soilscape maps identifies the site to be located on land which is considered to be *'Freely draining floodplain soils'.*

A review of local borehole logs taken from the BGS online service identifies that there are no records within close proximity to the proposed development.

Taking the above into consideration the use of soakaways at the proposed development is considered to be potentially suitable for surface water disposal following on-site Percolation Testing in accordance with BRE Digest 365.

Watercourse

In the event that infiltration methods are found to be unsuitable following on-site Percolation Testing, surface water flows from the site should discharge into Hollins Syke at the north of the site.

Sewer

If it is found that infiltration methods and direct discharge to watercourse are not considered to be feasible, it is recommended that surface water flows from the proposed development are directed to public sewer.

Flows from the proposed development site should be restricted to no more than existing Qbar i.e. 7.32l/s during all events including the 100 year + 50% climate change event.

- Restricted discharge rate = 7.32l/s

Infiltration

Indicative attenuation volumes for disposal via infiltration methods cannot be estimated until onsite percolation testing has been undertaken.

Watercourse

Indicative attenuation volumes have been calculated for the total proposed impermeable area of each property respectively, with flows split in half i.e. 3.66l/s per property during the 1 in 100 year + 50% climate change event.

West Property (0.061Ha, 3.66l/s)

- 1 in 100 Year + 50% Climate Change Event = $27m^3 – 52m^3$

East Property (0.07Ha, 3.66l/s)

- 1 in 100 Year + 50% Climate Change Event = $34m^3 – 63m^3$

In accordance with Building Regulations Document H Hierarchy of Surface Water Disposal, on-site percolation testing is required to determine if infiltration methods are suitable for disposal. If it is found in favour of soakaway a mixture of permeable paving and soakaway tanks could be used to attenuate and dispose of surface water resulting from the development.

In the event that soakaways are not considered viable it is recommended that surface water discharges into Hollins Syke located north of the site, reusing the existing outfall where possible.

Flows will be restricted via flow control chambers to no more than a total of 7.32l/s (Qbar) up to and including the 100 year + 50% climate change event. Flows in excess of this could be attenuated within a geo-cellular storage tanks and/or permeable paving located within car parking areas.

It is proposed that foul from the proposed development should firstly discharge into the public sewer, failing that the suitability of Package Treatment Plants should be explored.

Flood Mitigation Measures

Due to surface water flooding within the road to the north expected to be less than 300mm during the worst-case event, it is therefore recommended that finished floor levels are elevated 300mm above road level to the north.

- Proposed finished floor levels = 300mm above road level to the north

APPENDICES

Appendix A: - Development Proposals

Notes

This drawing, together with the design it illustrated, is copyright, and may not be reproduced in any form, without the written consent of Zara Moon Architects.

Do not scale off this drawing except for determination of basic layout - only figured dimensions to be used; All dimensions to be checked on site

N

Key

- Application Boundary
- Domestic Curtilage
- Root Protection Area
- Demolished
- Existing Trees
- Proposed Trees / Planting

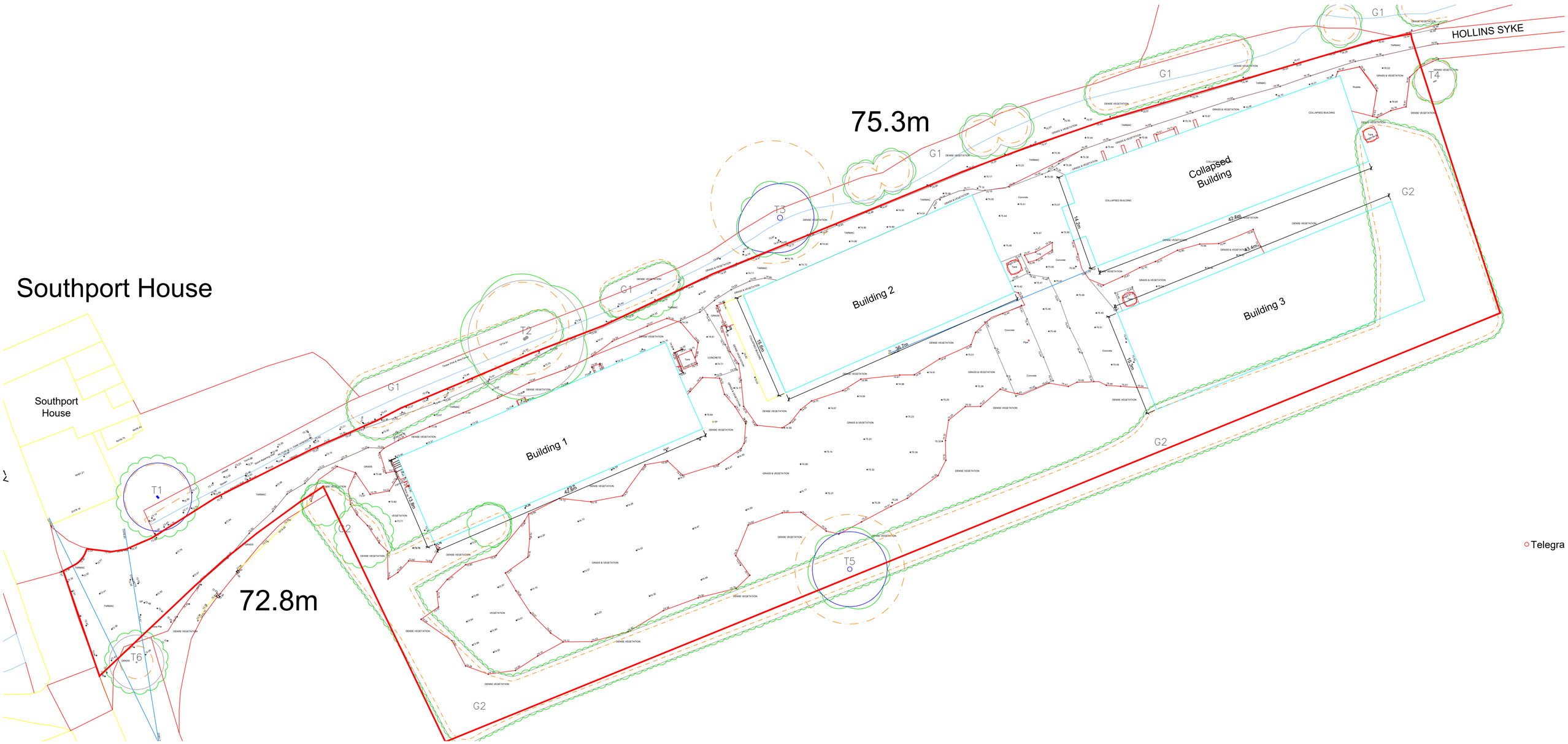
ZMA ZARA MOON ARCHITECTS

RIBA Chartered Practice

Project Name	Abbey Gardens
Project No.	130.21
Stage	Planning Submission
Proposed Site Plan	P01.01
Scale	1:500 @ A1
Date	January 2022
Rev	--
Drawn	RH

Appendix B: - Topographical Survey

Southport House



Appendix C: - Greenfield Runoff Rates

Print | Close Report

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Christian vose
Site name:	Southport House
Site location:	Sawley

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

Site Details

Latitude:	53.91140° N
Longitude:	2.34014° W
Reference:	2813503150
Date:	Dec 14 2022 16:20

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.773

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics	Default	Edited
SAAR (mm):	1245	1245
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	7.32	7.32
1 in 1 year (l/s):	6.37	6.37
1 in 30 years (l/s):	12.44	12.44
1 in 100 year (l/s):	15.23	15.23
1 in 200 years (l/s):	17.35	17.35

Appendix D: - Indicative Attenuation Volumes

INDICATIVE ATTENUATION VOLUMES DISCHARGE TO WATERCOURSE

West Property

Storage Estimate

Return Period (years)	100		OK
Climate Change (%)	50		Cancel
Impermeable Area (ha)	0.061	Update	
Peak Discharge (l/s)	3.660		
Infiltration Coefficient (m/hr) (leave blank if no infiltration)		Calc	
Required Storage (m³)	Calc		
from	27		
to	52		
With infiltration (m³)			
from			
to			

East Property

Storage Estimate

Return Period (years)	100		OK
Climate Change (%)	50		Cancel
Impermeable Area (ha)	0.070	Update	
Peak Discharge (l/s)	3.660		
Infiltration Coefficient (m/hr) (leave blank if no infiltration)		Calc	
Required Storage (m³)	Calc		
from	34		
to	64		
With infiltration (m³)			
from			
to			