



Transportation Planning : Infrastructure Design

# **Flood Risk Assessment and Drainage Strategy**

***Proposed Haulage Trailer Park at Greendale Business Park***

**Greendale Business Park, EX5 1EW**

**FWS Carter & Sons Ltd**

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## **1.0 EXECUTIVE SUMMARY**

- 1.1 SCP have been commissioned by FWS Carter & Sons Ltd to provide a Flood Risk Assessment (FRA) and Drainage Strategy (DS) in respect of a Planning Application for a proposed haulage trailer park at Greendale Business Park.
  - 1.2 The existing site is currently a greenfield site.
  - 1.3 The Flood Risk Assessment has reviewed all sources of flood risk to both the proposed development and to the adjacent areas as a result of the development proposals and has identified the site as being at low risk of flooding from fluvial and pluvial sources; therefore, the development site is Flood Zone 1.
  - 1.4 The site is in an area with less than 0.1% risk of fluvial flooding (Flood Zone 1) and based on NPPF 2021 the development proposal is wholly suitable in terms of flood risk as it is a more vulnerable development.
  - 1.5 Discharge via infiltration has been eliminated as a suitable choice at planning stage as publicly available information from Magic Maps and BGS suggests that the soils are unsuitable for infiltration. Further infiltration testing will be required to determine this is a viable option. However, for the purpose of this report, discharge via infiltration has currently been discounted due to unconfirmed soil conditions and site constraints.
  - 1.6 Discharge via watercourse has been eliminated as a suitable choice at planning application stage as there are no main river or minor watercourses present within the land ownership or close vicinity of the site and therefore been eliminated as the option for discharging surface water flow.
  - 1.7 Discharge via surface water system has been identified as a suitable choice as there is a private surface water sewer system present in Greendale Business Park which is attenuated in a pond before discharging into the Grindle Brook River therefore been chosen as the option for discharging surface water flow.
  - 1.8 The existing attenuation pond had been designed to accommodate 12ha of development and a 1 in 100-year storm event plus 20% climate change allowance.
  - 1.9 It is projected that the existing private surface water network and attenuation pond can accommodate the new proposed haulage trailer parking facility. However, any further development following the connection of the haulage parking to the existing surface water system would require its own attenuation system.
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- 1.10 Additionally, detailed surface water calculations for the network will need to be completed during the post-planning stage once as built records of the private surface water network and as built records of the pond area available to ensure suitable attenuation volumes are provided.

## **2.0 INTRODUCTION**

### **Appointment**

2.1 SCP have been commissioned by FWS Carter & Sons Ltd to provide a Flood Risk Assessment (FRA) and Drainage Strategy (DS) to support a planning application for a proposed haulage trailer storage facility situated near the existing Greendale Business Park.

2.2 The proposed site is 1.0273 hectares in area, with a proposed impermeable area of 0.6652ha (65%).

### **Objective of Strategy**

#### Scope of the Flood Risk Assessment

2.3 The objective of the strategy is to undertake a site-specific Flood Risk Assessment in accordance with the National Planning Policy Framework 2021 (NPPF).

2.4 The detail and complexity of a Flood Risk Assessment should reflect the level of risk to the site. The NPPF 2021 is the official document that regulates the assessment of flood risks and their appropriate mitigations to the planning process.

2.5 The 'Technical Guidance to the National Planning Policy Framework' was superseded in 2014 and this has been replaced with Planning Practice Guidance 2016 which is available on the [www.gov.uk](http://www.gov.uk) webservice. In developing a site, Developers and applicants need to consider flood risk to and from the development site.

2.6 A site-specific flood risk assessment should:

- Consider whether a proposed development is likely to be affected by current or future flooding from all sources of flooding [NPPF 2021] rivers, groundwater, and sewers.
- Establish whether it will increase flood risk elsewhere;
- Identify whether the measures proposed to deal with these effects and risks are appropriate;
- Review the evidence for the local planning authority to apply (if necessary) the Sequential Test, and;
- Assess whether the development will be safe and pass the Exception Test, if applicable.

2.7 The site-specific flood risk assessment should also be:

- Proportionate to the risk and appropriate to the scale, nature and location of the site;
  - Take the impacts of climate change into account;
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- Consider both the potential adverse and beneficial effects of flood risk management infrastructure including raised defences, flow channels, flood storage areas and other artificial features together with the consequences of their failure;
- Consider the vulnerability of those that could occupy and use the site, taking account of the Sequential and Exception Tests and the vulnerability classification including arrangements for safe access/egress;
- Consider and quantify the different types of flooding (whether from natural and human sources and including joint and cumulative effects) and identify flood risk reduction measures, so that assessments are fit for the purpose of the decisions being made;
- Consider the effects of a range of flooding events including extreme events on people, property, the natural and historic environment and river and coastal processes;
- include the assessment of the remaining (known as 'residual') risks after risk reduction measures have been taken into account and demonstrate that this is acceptable for the particular development or land use;
- Consider how the ability of water to soak into the ground may change with development, along with how the proposed layout of development may affect drainage systems;
- Be supported by appropriate data and information, including historical information on previous events.

2.8 This report therefore assesses flood risk to the site and any impact on flood risk to other land because of the development proposals.

#### Scope of the Drainage Strategy

2.9 The scope of the drainage strategy is to set out the principles of the drainage design for the proposed development and summarise the reasoning behind the chosen design.

2.10 The drainage strategy will utilise the hierarchy for disposal of surface waters generated as runoff on the site to ensure that there is not a potential exacerbation of flood risk elsewhere as a result of undertaking the development. This will be undertaken in accordance with widely accepted best practise principles such as detailed in industry guidance such as the C753 SUDS Manual, Design and Construction Guidance and applicable sections of the PPG.

2.11 The Drainage Strategy aims to provide guarantee that the proposed surface water drainage safely and appropriately conveys all flows derived from the site to appropriate discharge or attenuation locations, so as to ensure sustainable and safe site operation. This should be done in accordance with prescribed best practice, building codes and prioritise the incorporation of sustainable urban

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drainage systems, or SUDS, where appropriate and practicable for the management of surface water.

2.12 Additionally, the drainage strategy will identify potential connection points and discharge rates for surface water generated on the site through the sites occupancy and proposed development type.

### **Limitations**

2.13 This report has been prepared for exclusive use by FWS Carter & Sons Ltd for the purpose of assisting them in evaluating the potential risk of flooding associated with the site and in making a Planning Application.

2.14 SCP accepts no liability for any use of this document other than by its client and only for the purposes, stated in the document, for which it was prepared and provided. No person other than the Client may copy (in whole or in part) use or rely on the contents of this document, without the prior written permission of SCP. Any advice, opinions or recommendations within this document should be read and relied upon only in the context of the document as a whole.

2.15 SCP has endeavoured to assess all information provided to them during this assessment and therefore this report has been compiled from a number of external sources.

2.16 The Flood Risk Assessment addresses the flood risk posed to and from the proposed development, the extent of which is shown on the Proposed Site Plan, see Appendix A.

2.17 This report has been undertaken with the assumption that the site will be developed in accordance with the proposals included within, without significant change. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the site.

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### **3.0 POLICY & GUIDANCE**

3.1 In carrying out our assessment and preparing this report, regard has been taken of the provisions of the development plan and a range of other material considerations. However, it is the Government's National Planning Policy Framework 2021 which provide the most up to date and specific guidance on the Scope of Flood Risk Assessments and drainage requirements.

#### **National Planning Policy Framework**

3.2 The National Planning Policy Framework (NPPF) was published in England in March 2012, re-issued in July 2018 and revised in 2019 and re-issued in September 2021. As a result, the previous NPPF, all previous Planning Policy Guidance Notes (PPGs) and Planning Policy Statements (PPSs) were superseded. This included PPS25: Development and Flood Risk, along with its supplement on Development and Coastal Change. These were replaced with the Planning Practice Guidance for Flood Risk and Coastal Change, available on the gov.uk website. <https://www.gov.uk/guidance/flood-risk-and-coastal-change>

3.3 One of the key aims of the NPPF is to ensure that flood risk is taken into account at all stages of the planning process to avoid inappropriate development in areas at risk of flooding and to direct development away from areas of highest risk.

3.4 It advises that where new development is necessary in areas of higher risk, this should be safe, without increasing flood risk elsewhere, and where possible should reduce flood risk overall.

3.5 The NPPF's flood risk advice is all set out in Chapter 14 of the Framework document, meeting the challenge of climate change, flooding and coastal change.

3.6 This document has been prepared in accordance with the recommendations and the policies contained within the NPPF 2021.

3.7 The National Planning Policy Framework 2021 (NPPF) and accompanying Planning Practice Guidance for Flood Risk and Coastal Change indicate surface water run-off should be controlled as near to its source as possible by making as much use as possible of natural flood management techniques as part of an integrated approach.

3.8 Consideration should therefore incorporate the use of controlling run-off at source combined with using sustainable urban drainage (SUDS) techniques which can include soakaways, infiltration trenches, permeable pavements, grassed swales, ponds and wetlands. This approach can also offer other benefits in terms of promoting groundwater recharge, water quality improvement and amenity enhancements. Approved document Part H of the Building Regulations (2012) sets out

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a hierarchy for the disposal of surface water which encourages a SUDS approach, as detailed above.

### **Planning Policy Guidance**

- 3.9 The current Planning Policy Guidance (PPG) for Flood Risk and Coastal Change is available on the gov.uk website. <https://www.gov.uk/guidance/flood-risk-and-coastal-change>. Planning Policy Guidance was updated and re-issued in August 2022.
- 3.10 The PPG for flood risk and coastal change advises how to take account of and address the risks associated with flooding and coastal change in the planning process.
- 3.11 Proposed developments are required to increase the promotion of Natural Flood Management (NFM) techniques in new developments with specific emphasis on de-culverting and re-naturalisation of watercourses.
- 3.12 More emphasis on SuDS providing the '4 pillars' of SuDS which are: water quantity, water quality, biodiversity and amenity is also required.

### **Flood and Water Management Act 2010**

- 3.13 The Flood and Water Management Act 2010 received Royal Assent on 8th April 2010. This Act provides duties on the Environment Agency, Local Authorities, Developers and other bodies to manage flood risks.

### **LLFA Technical Requirements**

- 3.14 The main areas affecting Developers are:
- Lead Local Flood Authority (LLFA) or regional Water Authority to adopt and maintain sustainable urban drainage systems (SUDS).
  - Approval fees and non-performance bonds to be standardised.
  - DEFRA prepared and issued Non-statutory SuDS technical standards document in 2015, which should be used along with the SuDS Manual (C753); Non-statutory Technical Standards for SuDS: Practice Guidance, LASOO 2016; and LLFA policy and guidance documentation.
  - Changes to the rights to connect to sewers will restrict automatic connection rights to only Section 104 sewer schemes or approved SUDS schemes constructed to a new national sewer or new SUDS standard respectively.
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- Two options for the SUDS approval process. Either directly to the SUDS Approval Body or as a combined application to the Planning Authority as part of the Planning Application.

3.15 East Devon District Council (EDDC) Local Plan contains the following strategy:

**Strategy 3 - Sustainable Development**

The objective of ensuring sustainable development is central to our thinking. We interpret sustainable development in East Devon to mean that the following issues and their inter-relationships are taken fully into account when considering development:

- a) **Conserving and Enhancing the Environment** - which includes ensuring development is undertaken in a way that minimises harm and enhances biodiversity and the quality and character of the landscape. This includes reducing the risk of flooding by incorporating measures such as sustainable drainage systems. Developers should maximise the proportion of their developments that take place on previously developed land
- b) **Prudent natural resource use** - which includes minimising fossil fuel use therefore reducing carbon dioxide emissions. It also includes minimising resource consumption, reusing materials and recycling. Renewable energy development will be encouraged
- c) **Promoting social wellbeing** - which includes providing facilities to meet people's needs such as health care, affordable housing, recreation space and village halls.
- d) **Encouraging sustainable economic development** - which includes securing jobs.
- e) **Taking a long term view of our actions** - Ensuring that future generations live in a high quality environment where jobs, facilities, education and training are readily available.

Figure 1: Extract from East Devon District Council Local Plan 2013-2031 (Source: East Devon District Council Website, 2023)

3.16 Within Strategy 3 extracted from the above-mentioned plan, there is a clear and concise approach to sustainable development and flood risk management throughout the district, however this is not a standalone plan, as it is to be followed in conjunction with the Flood Risk management strategy set out by Devon County Council (DCC).

3.17 The strategy set out by Devon County Council is proposing the following objectives:

- Ensure a clear understanding of the risks of flooding, so that investment in risk management can be prioritised more effectively.
  - Set out a clear strategy for risk management so that communities and businesses can make informed decisions about the management of the residual risk.
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- Encourage innovative management of flood and coastal erosion risks, taking account of the current and future needs of communities and businesses.
- Minimise the negative impacts from flood risk management infrastructure on the natural, built and historic environment, and seek improvements where possible, including the mitigation of climate change through the provision of renewable energy.
- Ensure spatial planning processes refer to the principles and guidance set out in the Strategy and consider the impact of flooding from development.
- Ensure that emergency plans and responses to flood incidents are effective and that communities are able to respond properly to flood warnings, focusing on vulnerable properties and people more vulnerable to flooding, such as the elderly, young children, those living with a disability or those living in areas of deprivation.
- Make the public aware of their risk to flooding and what they can do to help themselves and each other, helping communities recover more quickly and effectively after flood incidents.
- Identify overlaps in flood risk across the various agencies, authorities and the private sector to encourage long term planning and implementation of partnership solutions or mitigation measures.
- Ensure integration of flood risk from all sources of flooding including the public sewerage system.
- To meet the requirements and timescales of the European Union Floods Directive, Flood Risk Regulations and the Flood and Water Management Act.

3.18 All of the aforementioned objectives are to be achieved whilst being consistent with the National

3.19 Devon County Council as a whole encompassing East Devon District Council as a branching entity, implements the Local Flood Risk Management Strategy 2021-2027, setting out how Devon County Council and the surrounding District Councils are to endeavour in managing flood risk across the administrative areas in accordance with the requirements of the Flood and Water Management Act 2010.

3.20 The strategy is a document that explains how the council as an LLFA will coordinate services across the Borough with the primary aim to understand, and where appropriate, manage flood risk from surface water runoff, groundwater, ordinary watercourses, main rivers, the sea, sewers, highway and reservoirs.

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## 4.0 EXISTING SITE CHARACTERISTICS

### Site Location

- 4.1 The site is located off White Cross Road, near Greendale Business Park, EX5 1EW. The area to the north and east of the site form Greendale Business Park which is is predominantly industrial, with various warehouse and distribution centres. The southern and western parcels of land appear to be untouched, greenfield sites,
- 4.2 An approximate postcode for the site is EX5 1EW and OS Co-Ordinates 301989E, 89555N.

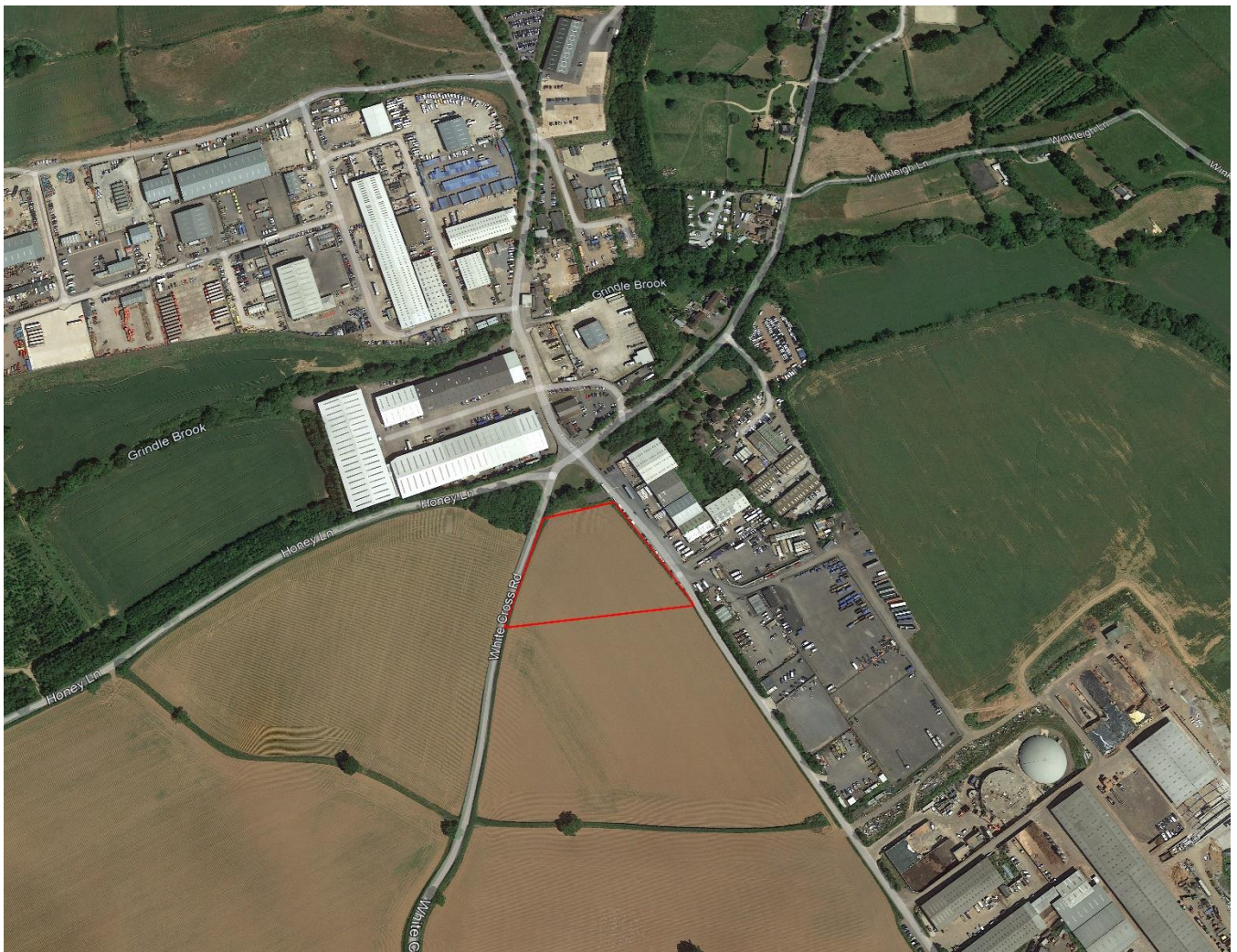


Figure 2: Site Plan (Source: Google Earth Pro, 2023)

**Table 1 – Site Description**

<b>Area</b>	1.0273 hectares or 10273m <sup>2</sup>	
<b>Existing Surfacing</b>	The existing site is a greenfield site.	
<b>General Topography</b>	The general topography of the site falls from south-east to north-west. The levels range from approximately 78.88m AOD in the south-east to 61.04m AOD in the north-west.	
<b>Current Use</b>	The site is currently undeveloped, with agricultural land surrounding the southern and western sectors of the site, and industrial/distribution buildings surrounding the northern and eastern sectors.	
<b>Previous Use</b>	Currently unknown.	
<b>Watercourses</b>	The Grindle Brook River, the most notable and nearest watercourse, is approximately located 180.00 meters north of the site and flows east to west in relation to the northern perimeter of the site.	
<b>Boundaries</b>	<b>North</b>	White Cross Road and Greendale Business Park
	<b>East</b>	Access Road and Greendale Business Park
	<b>South</b>	Vacant / Agricultural land
	<b>West</b>	White Cross Road
<b>Access</b>	<b>Vehicular</b>	Unnamed Road / White Cross Road
	<b>Pedestrian</b>	Unnamed Road / White Cross Road

4.3 The existing site is currently a greenfield site.

4.4 An assessment of the existing greenfield runoff rates has been undertaken using the ICP method on Micro-drainage. Calculations are summarised in Table 2 and can be found in Appendix D.

**Table 2 – Existing Runoff Rates**

<b>Return Period (Yr.)</b>	<b>Existing Runoff Rate (l/s)</b>
1 Year	2.2 l/s
30 Year	5.4 l/s
100 year	6.9 l/s

### **Existing Public Sewers**

- 4.5 Records from South West Water have shown that there are no existing public sewers in the vicinity of the site. Running north of the proposed site is a cast iron distribution main pipe with accompanying communication pipes with subsequent foul/trade manholes located east to northeast of the proposed site.
- 4.6 See Appendix F for South West Water records.

### **Existing Private Sewers**

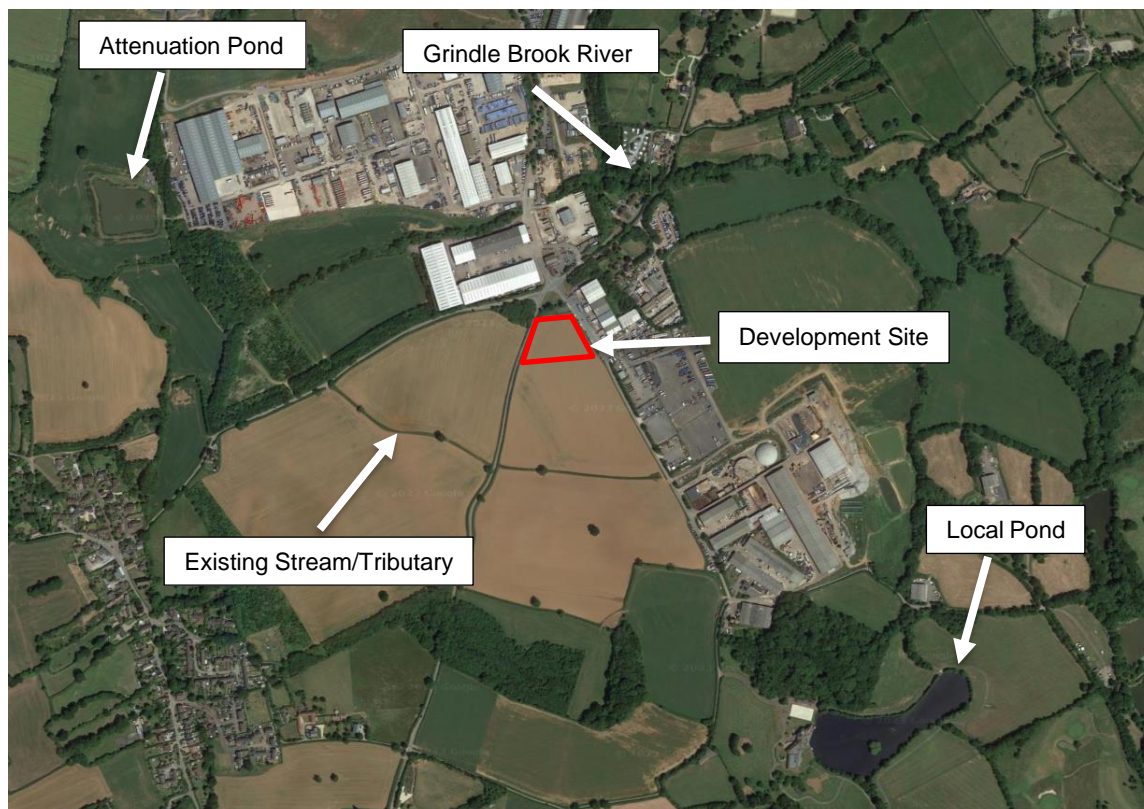
- 4.7 Greendale Business Park has a private surface network which is attenuated in a pond before discharging into the Grindle Brook river.
- 4.8 The topographical survey has indicated that there is a surface water manhole present on White Cross Road near the entrance into the Greendale Business Park.
- 4.9 A flood risk assessment was completed by Atkins in 2009 regarding the expansion of Greendale Barton Business Park, document ref “Greendale Barton BP FRA 2009 R0.doc”, see Appendix I for FRA summary.
- 4.10 As noted in the FRA, a pond was proposed to provide attenuation for the expansion of Greendale Business Park. The new expansion area for Greendale Business Park was estimated at approximately 7.55ha, with there already being 3.25ha of existing development. Therefore, the total area for the development was taken as 10.8ha and the whole of that area was assumed to have 100% impermeable cover.
- 4.11 Additionally, the pond area utilised for the attenuation storage was included in the calculations to provide a conservative estimate of attenuation storage which was assumed to be 1.2ha.
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- 4.12 Therefore, the total area for the preliminary calculations for the attenuation storage for the expansion of the Greendale Business Park, was 12ha.
- 4.13 The pond was designed to store a 1 in 100-year storm event plus a 20% increase in rainfall to allow for possible climate change, with a discharge rate restricted to 5.5ls/ha, based on existing greenfield runoff calculations.

### **Watercourses, Land Drainage and other Waterbodies**

- 4.14 There are no main river or minor watercourses present within the land ownership of the site.
- 4.15 The nearest watercourse to the site is a local tributary running through the land adjacent to the proposed site location and White Cross Road, approximately 165 metres southwest from the development site.
- 4.16 A review of google earth has also indicated that the Grindle Brook River is located approximately 180 metres North of the development site, see Figure 3.
- 4.17 The attenuation pond for Greendale Business Park is approximately 722 metres northwest of the proposed development site.
- 4.18 Additionally, google maps has indicated that there is a local pond located approximately 780 metres southeast from the development site.



### **Existing Flood Defences and Other Structures**

4.19 There are no flood defences recorded on any maps within close proximity to the application site.

### **Historical Land Use**

4.20 The historical land use of the development area is unknown.

### **Geology**

4.21 As Ground Investigation reports have not been provided, the geology information has been based on freely accessible information from Magic Maps and British Geology Survey (BGS).

4.22 Information taken from Magic Maps online service indicates that the site is located within a Bedrock geological area designed by the EA as 'Secondary B' Aquifer. 'Secondary B' are predominantly lower permeability layers which may store and yield limited amounts of groundwater through characteristics like thin cracks and openings or eroded layers.

4.23 The superficial deposits for the development area are classified by the Environment Agency as 'Unproductive'. 'Unproductive' strata are largely unable to provide usable water supplies and are unlikely to have surface water and wetland ecosystems dependent on them.

4.24 The site is located within an area identified as 'Slightly acid loamy and clayey soils with impeded drainage', as provided on Magic Map website.

4.25 Magic Maps identified the development site as having a high groundwater vulnerability.

4.26 Magic maps also identifies the site as being within a high priority of Flood Risk Management Priorities for England for Countryside Stewardship zone.

4.27 The Environment Agency have defined Source Protection Zones (SPZs) for 2000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. These zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. The maps show three main zones (inner, outer and total catchment) and a fourth zone of special interest, which the Environment Agency occasionally applies, to a groundwater source.

4.28 The proposed development site is identified by the Environment Agency as not being located within SPZ.

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- 4.29 Information provided on British Geology Survey (BGS) has stated that the bedrock geology of the development site is 'Littleham Mudstone Formation – Mudstone' a reddish-brown silty mudstone with sporadic thin (< 0.6m) beds of silt and silty sand. BGS does not contain any information regarding the superficial geology of the development area.
- 4.30 See Appendix G for all map extracts from Magic Maps and BGS.
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## 5.0 DEVELOPMENT PROPOSALS

- 5.1 The current proposals are to provide a haulage trailer parking facility to house 40 haulage trailers including associated access road and landscaping.
- 5.2 A new vehicular access is proposed by way of an existing field entrance leading onto the private road between Greendale Business Park and Hogsbrook Farm.
- 5.3 The site area is 1.0273 ha (10273m<sup>2</sup>), with 65% (0.6652ha) proposed to be impermeable.
- 5.4 The most current site plan provided by ARA Architecture can be found within Appendix A, along with the extract below.

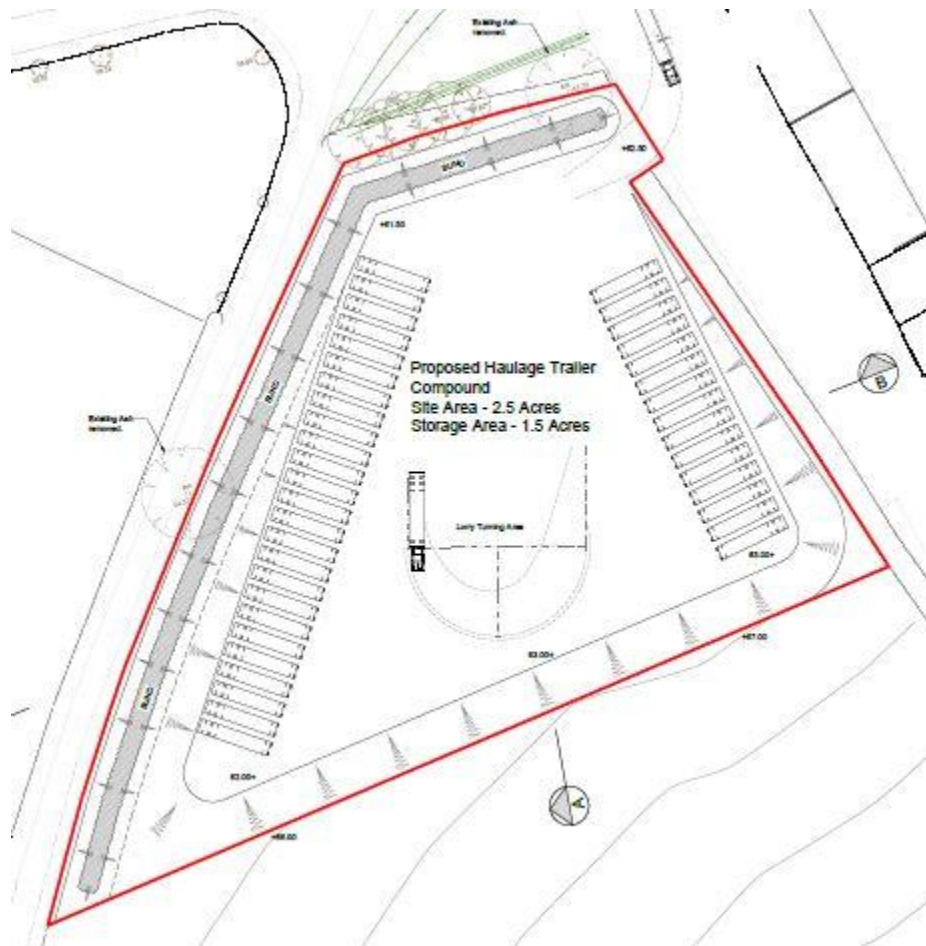


Figure 4: Proposed Site Plan

## 6.0 FLOOD RISK ASSESSMENT

### Sources of Flood Risk

Source	Definition	Likelihood
Fluvial	River Flood	Low
Pluvial	Surface Water Flooding	Low
Coastal - Sea	Tidal Surge	Not Applicable
Coastal - Estuarine	Tidal Surge	Not Applicable
SWS, FWS, CS, CSO	Sewer Flooding	Low / Unknown
Groundwater	Emergence from ground	Low / Unknown

- 6.1 Information relating to flood risk at the site has been obtained via Environment Agency's online flood mapping tool. This information has been presented below.
- 6.2 Additional information has been requested from the Environment Agency, in the form of their Product 4. The information provided in the Product 4 includes flood zones, defences and storage areas, areas benefiting from defences, statutory main river designations, historic flood event outlines and more detailed information from computer river models.

### Fluvial Flood Risk (River Flood)

- 6.3 Examination of flood maps from the Environment Agency shows that the site is located within an area classified as Flood Zone 1 with the risk of flooding as very low and having a 0.1% (1 in 1000) chance of flooding, see Appendix E.
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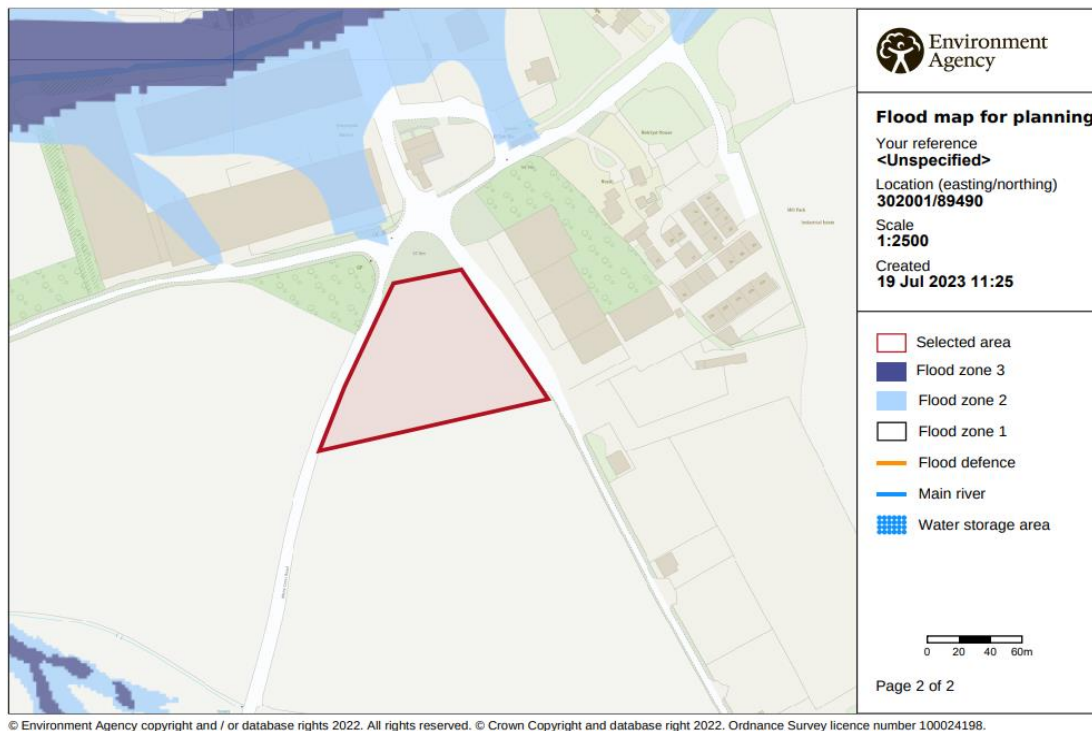


Figure 5: Environment Agency's Flood Map for Planning (Source: EA online maps, 2023)



Extent of flooding from rivers or the sea

Figure 6: Environment Agency's flooding from rivers or the sea (Source: EA online maps, 2023)

### Pluvial Flood Risk (Emergence from Ground Surface Flooding)

- 6.4 Pluvial flooding is defined as flooding resulting from rainfall-generated overland flow before runoff enters any watercourse or sewer.
- 6.5 It is usually associated with high intensity rainfall events but can also occur with low intensity rainfall or melting snow where ground is saturated, frozen, developed or otherwise has low permeability resulting in overland flow and ponding in depressions in the topography. Large catchment areas are particularly prone to this type of flooding.
- 6.6 The Environment Agency Flood Mapping shows that the development site does not indicate pluvial flooding; however, the adjacent road along the eastern boundary is susceptible to low risk surface water flooding, see Figure 7.



Extent of flooding from surface water

Figure 7: Environment Agency's flooding from surface water (Source: EA online maps, 2023)

### Environment Agency Reservoir or Canal Failure Flood Map

- 6.7 The Environment Agency website shows that the development site is not at risk of flooding from reservoirs or canal failures, see Figure 8.



Maximum extent of flooding from reservoirs:

*Figure 8: Environment Agency's flooding from reservoirs (Source: EA online maps, 2023)*

### **Groundwater Flood Risk**

- 6.8 In general terms groundwater flooding can occur from three main sources, raised water tables, seepage and percolation, and groundwater recovery or rebound.
- 6.9 If groundwater levels are naturally close to the surface, then this can present a flood risk during intense rainfall.
- 6.10 As reviewed on the Magic Maps online website, information relating to the groundwater and geology for the UK is available to be reviewed for specific areas. This has been completed for the development. The site is in a high-risk area for groundwater vulnerability.
- 6.11 As there is no access to a site investigation report identifying existing groundwater measurements, it is recommended that a site investigation is undertaken to compile these results and to assess the groundwater flood risk in more depth.
- 6.12 The site is not located within the groundwater source protection zone.



### **Sewer Flood Risk**

- 6.13 Records from South West Water have shown that there are no existing public sewers in the vicinity of the site. Running north of the proposed site on White Cross Road is a cast iron distribution main pipe with accompanying communication pipes with subsequent foul/trade manholes located east to northeast of the proposed site.
- 6.14 The topographical survey has indicated that there is a surface water manhole present on White Cross Road near the entrance into the Greendale Business Park.
- 6.15 It is not known whether there are any existing flood issues with these existing sewers.

### **Historical Flooding Information**

- 6.16 There is no historical flooding available on the DEFRA Spatial Data website.
-

## 7.0 FLOOD RISK VULNERABILITY CLASSIFICATION

7.1 An assessment of the proposed development type (“Building used for dwelling houses” developments are considered “Less Vulnerable” within the NPPF) against the appropriate Environment Agency’s flood zones (site is located in Flood Zone 1) as per *Table 2: Flood Risk Vulnerability Classification* of the NPPF has highlighted that the site is considered to be classified as ‘less vulnerable’.

**Table 2: Flood risk vulnerability and flood zone ‘incompatibility’**

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a †	Exception Test required †	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓ *

Key:

✓ Exception test is not required

X Development should not be permitted

7.2 Therefore, the site location is considered as suitable and flood risk to people, property and the environment is considered low, providing that the proposed fluvial flood risk mitigation measures of providing surface water management techniques, such as the use of SUDS or attenuation controls are identified and correctly implemented to ensure potential localised flooding and contaminated surface water runoff issues are avoided.

## 8.0 SUSTAINABLE URBAN DRAINAGE SYSTEMS

8.1 CIRIA guidance sets out 4 key pillars for SuDS; water quality, water quantity, amenity and biodiversity. These 4 pillars provide guidance on design criteria that should be achieved on a scheme wherever possible.

8.2 As part of the drainage strategy, a SuDS assessment has been completed for the development site, in-line with standard guidance CIRIA SuDS Manual [C753] and the following is summarised:

SuDS	Present	Potential	Reason
Soakaways	No	No	Due to nature of development site
Attenuation underground cellular storage Tank	None	Yes	Control flow off site
Pond	No	No	Site constraints restrict conclusion
Flow Control	No	Yes	Maintain discharge rate
Oil / petrol interceptors	No	Yes	Prevent oil / petrol entering private surface water system
Landscape Relief areas	No	Yes	To be reviewed upon site investigation results
Silt Traps	No	Yes	Prevent silt entering private surface water system
Green Roofs	No	No	No housing units on-site
Water Butts	No	No	No housing units on-site
Rainwater Harvesting	No	No	No housing units on-site
Filter Strips	No	Yes	To be reviewed upon site investigation results
Filter Trenches	No	Yes	To be reviewed upon site investigation results
Tree Pits	No	Yes	To be reviewed upon site investigation results
Swales	No	No	Site constraints restrict conclusion
Permeable Pavement	No	No	Due to nature of development site
Infiltration Basins	No	No	Due to nature of development site
Detention Basin	No	No	Site constraints restrict conclusion

8.3 In summary, SuDS features can be implemented on the development site. However, further discussions and investigations are required to identify the most appropriate feature/features for this site.

## **9.0 DRAINAGE STRATEGY**

### **Introduction**

- 9.1 The National Planning Policy Framework 2021 (NPPF)<sup>1</sup> and accompanying Planning Practice Guidance<sup>2</sup> indicate surface water run-off should be controlled as near to its source as possible through a sustainable drainage approach to surface water management.
- 9.2 Consideration should therefore firstly be given to using sustainable urban drainage (SuDS) techniques including soakaways, infiltration trenches, permeable pavements, grassed swales, ponds and wetlands to reduce flood risk by attenuating the rate and quantity of surface water run-off from a site. This approach can also offer other benefits in terms of promoting groundwater recharge, water quality improvement and amenity enhancements.
- 9.3 Approved document Part H of the Building Regulations (2010)<sup>3</sup> sets out a hierarchy for the disposal of surface water which encourages a SuDS approach, as detailed above.

### **Climate Change**

- 9.4 There are indications that the climate in the UK is changing significantly, and it is widely believed that the nature of climate change will vary greatly by region. Current expert opinion indicates the likelihood that future climate change would produce more frequent short duration and high intensity rainfall events with the addition of more frequent periods of long duration rainfall.
- 9.5 The withdrawn NPPF 2012 Technical Guidance Table 5 states that the recommended national precautionary sensitivity ranges for increase of peak rainfall intensity is 30% until 2115. However, The Environment Agency (EA) issued new advice which updated previous climate change allowances outlined in the NPPF 2012 Technical Guidance.
- 9.6 The updated EA allowances have now been directly linked to River Basin Catchments. The climate change allowance has been reviewed using the Environment Agency's website to locate the River Basin Catchment for the site's location. The site is in the East Devon Management Catchment Basin. The below figure, an extract from the Environment Agency's website, indicates the climate change considerations for this catchment.

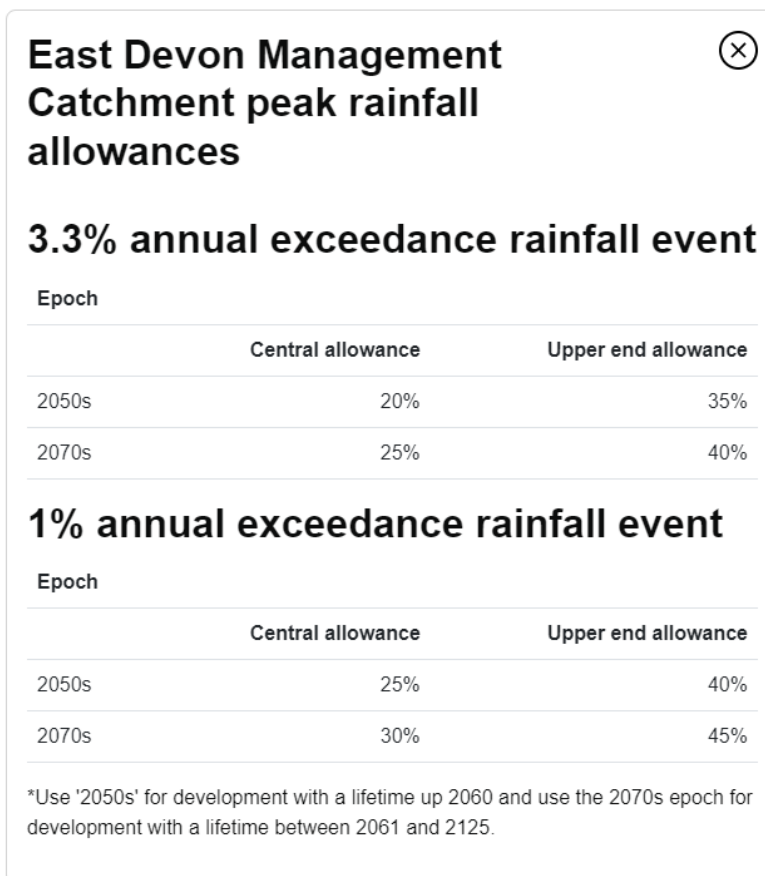
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<sup>1</sup> Department for Communities and Local Government 2021 – National Planning Policy Framework

<sup>2</sup> Department for Communities and Local Government 2016 – Planning Practice Guidance

<sup>3</sup> HM Government Building Regulations 2010 – Approved Document part H

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This map contains information generated by Met Office Hadley Centre (2019): UKCP Local Projections on a 5km grid over the UK for 1980-2080. Centre for Environmental Data Analysis, 2022

Figure 9: Environment Agency's climate change considerations (Source: EA website, 2023)

- 9.7 As recommended by the EA, both the central and upper end allowances have been considered for the purpose of surface water drainage strategy and assessment of exceedance flow pathways.
- 9.8 Therefore, the climate change allowance for the site has been identified at 45%. This is due to the development having a lifetime between 2061 and 2125. Additionally, the 1% annual exceedance rainfall event is utilised as the 3.3% rainfall is not a requirement.

**Existing Site Drainage**

- 9.9 Records from South West Water have shown that there are no existing public sewers in the vicinity of the site. Running north of the proposed site is a cast iron distribution main pipe with accompanying communication pipes with subsequent foul/trade manholes located east to northeast of the proposed site.

- 9.10 The information provided in the Atkins FRA highlights that Greendale Business Park is served by a private surface water network which discharges into an attenuation pond before discharging into the Grindle Brook River at a rate of 5.5ls/ha.
- 9.11 The topographical survey shows a private surface water manhole on White Cross Road near the entrance of Greendale Business Park.
- 9.12 See Appendix F for South West records.

### **Methods of Surface Water Management**

- 9.13 As set out in Part H of the Building Regulations, there are three methods that have been reviewed for the management and discharge of surface water for the site which are detailed below; these may be applied individually or collectively to form a complete strategy. They should be applied in the order of priority as listed:
- Discharge via infiltration;
  - Discharge via watercourse;
  - Discharge via surface water system

### **Proposed Site Drainage**

#### Discharge by Infiltration

- 9.14 The available information on the development site as identified in Section 4, suggests that the soils are not suitable for infiltration. However, no infiltration testing has been completed.
- 9.15 Testing in accordance with BRE365 will be required to determine if this is a viable option.
- 9.16 For the purpose of this report, due to the unconfirmed soil conditions and site constraints, infiltration has been discounted as a suitable option.

#### Discharge by watercourse

- 9.17 There are no main river or minor watercourses present within the land ownership.
- 9.18 The nearest watercourse to the site is a local tributary located approximately 165 metres southwest from the development site. Additionally, the Grindle Brook River is located approximately 180 metres North of the development site.
- 9.19 As there are no suitable options for discharge via watercourse, this option has been discounted as a suitable choice.
-

### Discharge by Surface Water System

- 9.20 South West Asset maps have been obtained, see Appendix F. These plans show that there is no surface water sewer present within the immediate vicinity of the site.
- 9.21 However, Greendale Business Park has its own private surface water system which discharges to the Grindle Brook River. The business park has an attenuation pond for surface water which has been designed to store surface water for up to 12ha of development.
- 9.22 As the haulage trailer park will be utilised by users of the Greendale Business Park, discharge via the private surface water system has been chosen as a suitable option.

### **Surface Water Drainage Strategy**

- 9.23 As noted above in the hierarchy review, discharge via private surface water system is the preferred method for the purpose of this report. However, upon completion of Ground Investigations, infiltration will be considered and applied where appropriate.
- 9.24 The proposed impermeable area for the development site is 0.6652ha which consists of private parking facility, which will generate surface runoff.
- 9.25 The general principle of the surface water drainage strategy for this site, is to collect the surface water runoff and discharge to the existing private surface water system in Greendale Business Park, which is attenuated via a pond, before discharging to the Grindle Brook River at a restricted rate.
- 9.26 As noted in Section 4, the pond for Greendale Business Park has been designed to store surface water for up to 12ha of development and a 1 in 100-year storm event plus 20% climate change with a restricted discharge rate of 5.5l/s/ha, based on existing greenfield calculations.
- 9.27 Currently, the existing impermeable area of Greendale Business Park is approximately 10.8ha and the new impermeable area for the proposed haulage trailer parking facility is 0.6652ha. Therefore, the total impermeable area requiring attenuation is 11.4652ha.
- 9.28 Micro-drainage calculations to review and determine storage estimates have been completed, see Appendix H.
- 9.29 Based on the micro-drainage calculations, the attenuation pond would need to store between 6692m<sup>3</sup> and 9251m<sup>3</sup> for a 12ha development at a 1 in 100-year storm event plus 20% climate change allowance for a discharge rate of 5.5l/s/ha, see Appendix H Point 1.
-

- 9.30 As noted in the FRA by Atkins, the pond was designed with a base area of 9,000m<sup>2</sup> and to provide storage up to 1.05m deep. This provides more storage volume than requirements based on the latest micro-drainage calculations.
- 9.31 However, in the time from when the FRA report was completed and pond had been built, the EA issued new advice which updated previous climate change allowances outlined in the NPPF 2012 Technical Guidance.
- 9.32 The updated EA allowances have now been directly linked to River Basin Catchments, and as noted above, the site is in the East Devon Management Catchment Basin, which now requires a 45% climate change allowance.
- 9.33 As the pond had previously been designed based on 20% climate change allowance, new calculations are required to determine the storage volume needed to accommodate 45% climate change.
- 9.34 Based on a 12ha impermeable development at a 1 in 100-year storm event plus 45% climate change allowance for a discharge rate of 5.5l/s/ha, a total storage volume between 8529m<sup>3</sup> and 11,713m<sup>3</sup> is required, see Appendix H Point 2.
- 9.35 The calculations for the whole (existing and proposed) development network indicate that the existing pond storage volume is within the storage volume range required to meet current climate change requirements in a 'worst case' scenario.
- 9.36 However, for the purpose of this planning application we need to consider the increase in volume for the new haulage site only which has an impermeable area of 0.6652ha as the existing 10.8ha site is already constructed and approved.
- 9.37 Based on a new proposed impermeable area of 0.6652ha, a 1 in 100-year storm event plus 20% climate change allowance with a discharge rate of 5.5l/s, would require a total storage volume between 326m<sup>3</sup> and 450m<sup>3</sup>, see Appendix H Point 3.
- 9.38 However, as the climate change has been updated by the EA, a total storage volume between 417m<sup>3</sup> and 572m<sup>3</sup> would be required to cater for 1 in 100-year storm event plus 45% climate change allowance at a discharge rate of 5.5l/s for the new proposed 0.6652ha impermeable area, see Appendix H Point 4.
- 9.39 Therefore, it is projected that the existing private surface water network and attenuation pond can accommodate the new proposed haulage trailer parking facility. However, any further
-



development following the connection of the haulage parking to the existing surface water system would require its own attenuation system.

- 9.40 Furthermore, detailed surface water hydraulic modelling for the network will need to be completed during the post-planning stage, once as built records for the private surface water network and pond are available to ensure suitable attenuation volumes are provided.
- 9.41 For the purpose of this report, a proposed drainage layout as been produced, see Appendix B.
- 9.42 The drainage layout is subject to proposed levels.
- 9.43 Areas of exceedance will be considered in the detailed design phase once proposed finished levels have been finalised. The development will be designed to ensure all flows from up to and including the 1 in 100 years plus 45% will be attenuated, controlled surface ponding will be acceptable up to the 1 in 100-year event plus 45% climate change and no flooding off site will occur due to the development.
- 9.44 Urban Creep is defined as any increase in the impervious area that is drained to an existing drainage system without planning permission being required, and therefore without any consideration of whether the capacity of the receiving sewerage system can accommodate the increased flow.
- 9.45 Urban Creep has not been considered due to site constraints of the haulage trailer park limiting the ability to further increase impermeable areas.
-

## 10.0 WATER QUALITY MANAGEMENT

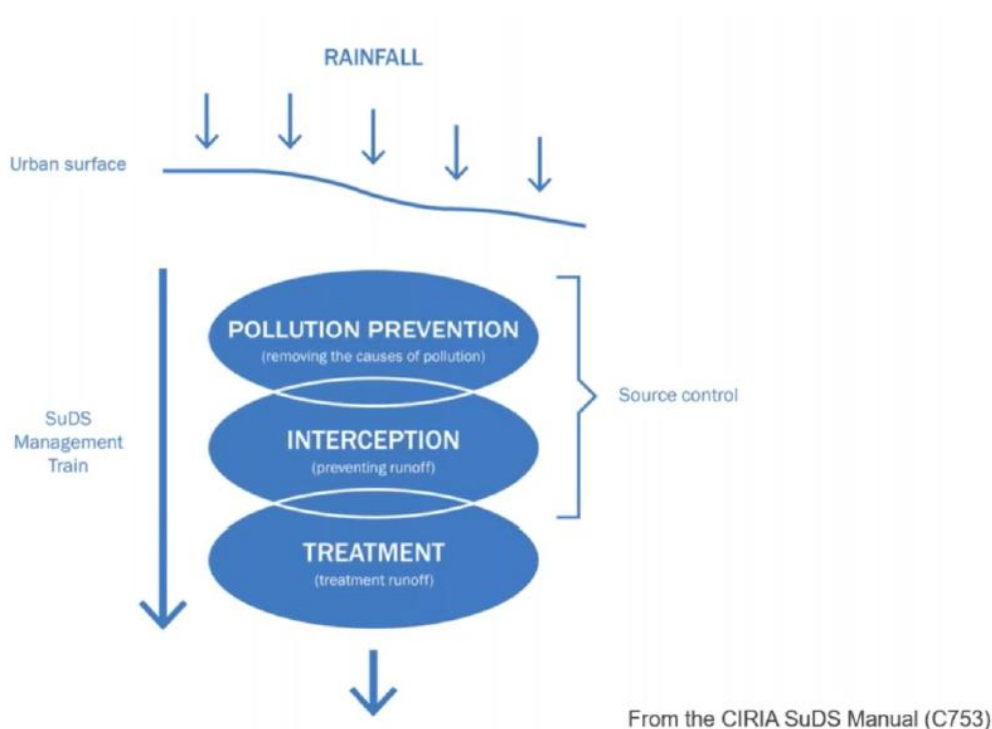
10.1 Water Quality Management options have been reviewed for the development site, in-line with standard guidance CIRIA SuDS Manual [C753] and the following is summarised:

**The following are general notes and identified stages to consider on water quality:**

10.2 The most important rainfall event to manage in terms of water quality is frequent rainfall events – low rainfall / high pollutant % [supposed to when you get high rainfall and diluted pollution %].

- Sunlight [UV light] brakes down pollution.
- Pollution on the surface is easier to identify and remove / maintain.
- Remove sediment / pollution as early as possible.
- Review the state of the receiving [downstream] waterbody.
- Sediment sinks and hydrocarbons / oils float.

### 3 Stages of water quality management



### General Design Summary for this Site:

10.3 All water will be treated on site through a three-stage process which includes sumps in [1] all gullies, [2] catch pits, [3] water storage.

- Gullies provide sediment to sink
- Catchpits enable sediment to sink
- Water storage aids to dilute any pollution in the water

**Pollution Hazard Levels**

10.4 Table 4.3 and 26.2 from the SuDS manual provides pollution hazard levels and values for different elements of a development, the following has been identified:

Element	Pollution hazard level
Car Parks	Low/medium
Other areas	Low

10.5 Based on the above water quality assessment which has identified this site pollution hazard levels and values, the following mitigation measures and the resulting pollution sufficiency have been assessed:

Pollution	Mitigation	Pollution sufficiency summary
Car parks – low/medium pollution hazard level	Gullies with sumps	sufficient
Other areas – low pollution hazard level	Catchpits	sufficient

10.6 The following items that can be implemented on this site:

1. On the surface pollution prevention

- Manage routing activities – silts and sediments, hydrocarbons and oils, metals, micro plastics, and pesticides

1. Interception –

- capture the rainfall for using / tree pits [potential tree pits on this site TBC]

2. Treatment – drainage elements –

- gullies, catchpits, petrol interceptors etc...
-

## **11.0 RECOMMENDATIONS AND MITIGATION MEASURES**

- 11.1 As identified above, the development site lies within Flood Zone 1 and is at a low risk of fluvial flooding.

### **Flood Risk Management Measures**

- 11.2 All drainage features should be located in open areas which are accessible.
- 11.3 Gradients of the hardstanding areas, where possible, should be designed to fall away from buildings such that any overland flow resulting from extreme events would be channelled away.
- 11.4 The proposed levels drain away from the vehicle access and pedestrian access, and therefore is considered that access and egress will not be at an increased risk.

### **Residual Risks**

- 11.1 As with any drainage system, blockages within the surface water system have potential to cause flooding or disruption. It is important that any drainage systems not being offered for adoption to either the Water Company or the Local Authority has an appropriate maintenance regime scheduled which would be advised to prospective property owners where appropriate.
- 11.2 Any overland flows generated by the proposed development must be directed away from any adjacent existing properties surrounding the site and towards the highway network where it can follow natural flow paths.

### **Maintenance**

- 11.1 Requirements for ongoing maintenance of the drainage network will form part of the Operation and Maintenance manual for the site and will be undertaken by the building management. Any specialist or proprietary products that are specified at detailed design will have a manufacturer specific maintenance regime which will be included within the document.
- 11.2 All surface water arrangements outlined above are subject to approval by South West Water.
-

## **12.0 SUMMARY**

- 12.1 SCP have been commissioned by FWS Carter & Sons Ltd to provide a Flood Risk Assessment and Drainage Strategy in respect of a planning application for proposed haulage trailer parking facility including associated landscaping and access road.
- 12.2 The total area for the site is calculated as being 1.0273 ha, with a proposed impermeable area of 0.6652ha (65%).
- 12.3 The existing site is currently a greenfield site.
- 12.4 The Flood Risk Assessment has reviewed all sources of flood risk to both the proposed development and adjacent areas as a result of the development proposals and has identified the site as being at low risk of flooding from fluvial sources; therefore, the development site is Flood Zone 1.
- 12.5 The site is in an area with less than 0.1% risk of fluvial flooding (Flood Zone1) and based on NPPF 2021 the development proposal is wholly suitable in terms of flood risk as it is a more vulnerable development.
- 12.6 Discharge via infiltration has currently been discounted due to unconfirmed soil conditions.
- 12.7 Discharge via watercourse has been discounted as a suitable choice as there are no main river or minor watercourses present within the land ownership or close vicinity of the site.
- 12.8 Discharge via surface water system has been identified as the preferred choice for the purpose of this report as there are private surface water sewers present in Greendale Business Park which are attenuated in a pond before discharging to the Grindle Brook River at a restricted greenfield discharge rate of 5.5l/s/ha.
- 12.9 Micro-drainage calculations for the whole (existing and proposed) development network indicate that the existing pond storage volume is within the storage volume range required to meet the 45% climate change requirements in a 'worst case' scenario.
- 12.10 The proposed impermeable area of the haulage parking facility for a 1 in 100-year storm event plus 20% climate change with a discharge rate of 5.5ls would need a total storage volume of between 326m<sup>3</sup> and 450m<sup>3</sup>.
- 12.11 However, a total storage volume of between 417m<sup>3</sup> and 572m<sup>3</sup> would be required to cater for a 1 in 100-year storm event plus 45% climate change allowance with a discharge rate of 5.5l/s.
-

- 12.12 It is projected that the existing private surface water network and attenuation pond can accommodate the new proposed haulage trailer parking facility. However, any further development following the connection of the haulage parking to the existing surface water system would require its own attenuation system.
- 12.13 However, detailed surface water calculations for the network will need to be completed during the post-planning stage once as built records of the private surface water network and as built records of the pond area available to ensure suitable attenuation volumes are provided.
- 12.14 The development will not be at any greater flood risk.
- 12.15 In accordance with the NPPF 2021 and other relevant guidelines and policies, the development is suitable in this location.
-

## **Appendix A**

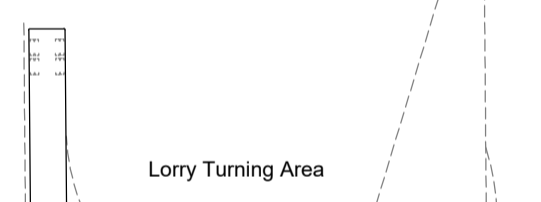
### *Proposed Site Plan*



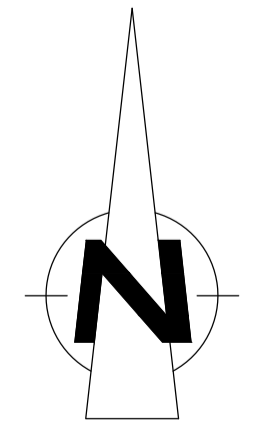
**IMPORTANT NOTES:**  
 Any discrepancies must be reported to ARA Architecture before proceeding.  
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 This drawing remains the copyright of ARA Architecture. This drawing is supplied in order to gain Planning Permission and Building Regulations Approval only and is not to be used as a working drawing unless the Builder or Owner verifies the accuracy of the drawings by checking all dimensions, details, angles and notes on site before work commences or ordering any materials. The Owner is to check his own deeds to verify that no restrictions or covenants exist to prevent building.  
**DO NOT SCALE FOR CONSTRUCTION PURPOSES**



**Proposed Haulage Trailer Compound**  
 Site Area - 2.5 Acres  
 Storage Area - 1.5 Acres



PROPOSED SITE PLAN 1:500



project  
**PROPOSED HAULAGE TRAILER STORAGE FACILITY /COMPOUND AT GREENDALE BUSINESS EX5 1EW**

drawing  
**PROPOSED SITE PLAN**

scale 1:500 @ A1	drawn
date SEPT 2022	checked

drawing no. 8582-02	rev A
---------------------	-------

**ara**  
 architecture

39 Rolle Street, Exmouth, Devon, EX8 2SN  
 tel: (01395) 271619 fax: (01395) 270386  
 e-mail: info@ara-architecture.co.uk

## **Appendix B**

### *Proposed Drainage Layout*



OUTFALL CONNECTION TO BE CONFIRMED ON SITE DURING CONSTRUCTION

- NOTES**
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. ALL LEVELS ARE IN METRES RELATED TO ORDNANCE DATUM NEWLYN (OD) UNLESS NOTED OTHERWISE.
  3. ALL COORDINATES ARE IN METRES RELATED TO ORDNANCE SURVEY NATIONAL GRID.
  4. ALL MATERIALS AND WORKMANSHIP WILL BE AS DEFINED IN THE SPECIFICATION UNLESS NOTED OTHERWISE.
  5. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL DRAWINGS AND DOCUMENTATION ASSOCIATED WITH THE PROJECT.
  6. THIS DRAWING HAS BEEN BASED ON SURVEYORS INFORMATION SUPPLIED BY A THIRD PARTY AND SCP SHALL NOT BE LIABLE FOR ANY INACCURACY OR DEFICIENCIES ARISING FROM IT.
  7. ALL LEVELS, DIMENSIONS AND LOCATIONS ARE TO BE CHECKED BY THE MAIN CONTRACTOR PRIOR TO COMMENCEMENT OF ANY WORK ON SITE.
  8. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH LOCAL AUTHORITY ADOPTABLE RESIDENTIAL ROAD SPECIFICATION AND STANDARD DETAILS.

- KEY**
- PROPOSED PRIVATE SURFACE WATER SEWER
  - G— PROPOSED NEW GULLY AND CONNECTION
  - - - D.C. - - - PROPOSED ACO DRAINAGE CHANNEL
  - SITE BOUNDARY

OUTFALL AND INVERT LEVELS TO BE CONFIRMED FOLLOWING DRAINAGE CCTV SURVEY TO CONFIRM LEVELS

**REVISIONS**

REV	DESCRIPTION	DATE	BY
A	ISSUED FOR INFORMATION	22.08.23	KP



Client Name:  
**F W S CARTER & SONS LIMITED**

Project Title:  
**PROPOSED HAULAGE TRAILER PARK  
GREENDALE BUSINESS PARK**

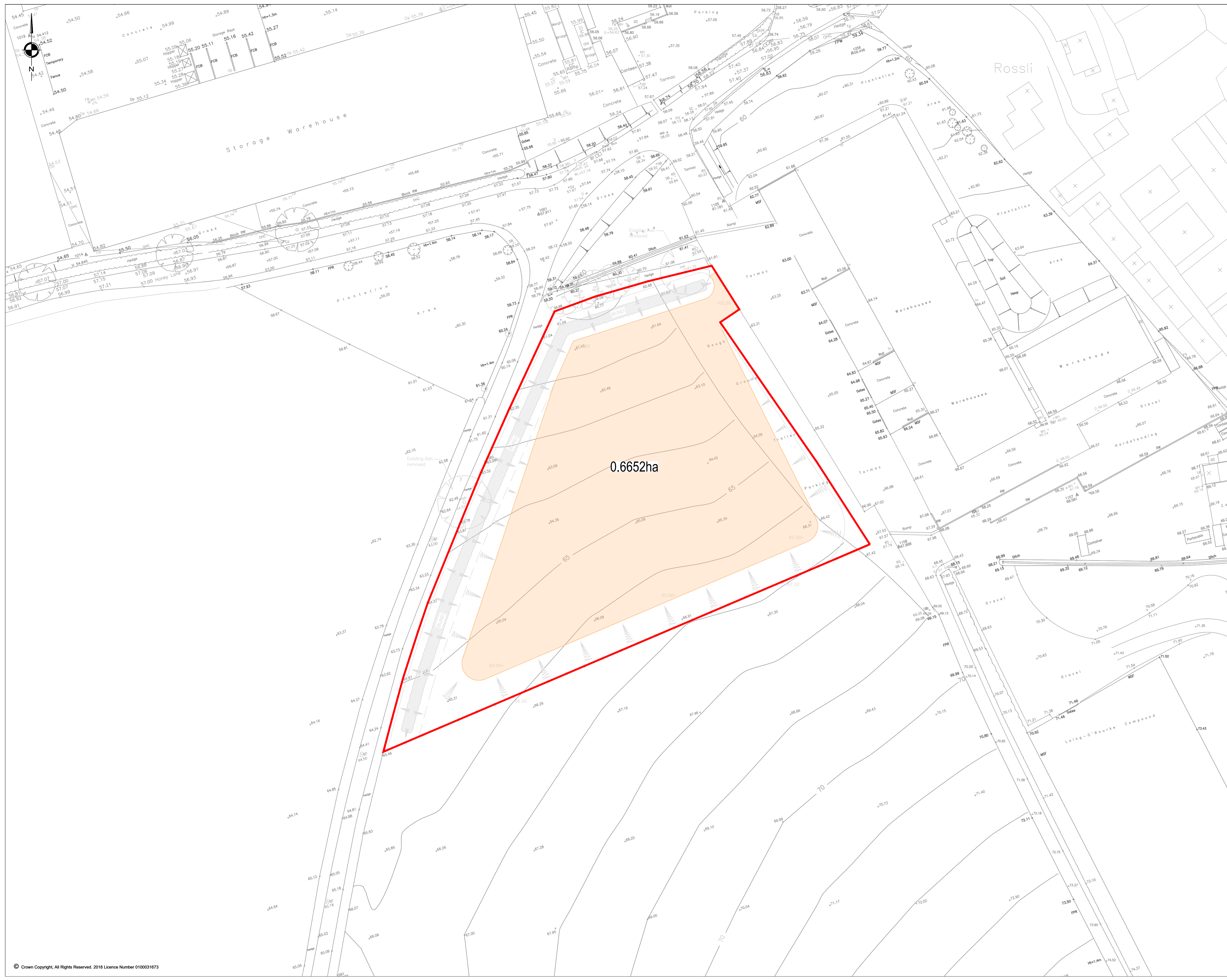
Drawing Title:  
**PROPOSED DRAINAGE STRATEGY**

Date: 22.08.2023	Drawn By: LC
Scale: 1:250 @ A1	Checked: NMc
Status: PLANNING	Approved: NMc

Drawing No: <b>SCP-230527-0000-SK01</b>	Rev: <b>A</b>
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## **Appendix C**

### *Proposed Catchment Plan*



- NOTES**
1. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
  2. ALL LEVELS ARE IN METRES RELATED TO ORDNANCE DATUM NEWLYN (OD) UNLESS NOTED OTHERWISE.
  3. ALL COORDINATES ARE IN METRES RELATED TO ORDNANCE SURVEY NATIONAL GRID.
  4. ALL MATERIALS AND WORKMANSHIP WILL BE AS DEFINED IN THE SPECIFICATION UNLESS NOTED OTHERWISE.
  5. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL DRAWINGS AND DOCUMENTATION ASSOCIATED WITH THE PROJECT.
  6. THIS DRAWING HAS BEEN BASED UPON SURVEYIOS INFORMATION SUPPLIED BY A THIRD PARTY AND SCP SHALL NOT BE LIABLE FOR ANY INACCURACY OR DEFICIENCIES ARISING FROM IT.
  7. ALL LEVELS, DIMENSIONS AND LOCATIONS ARE TO BE CHECKED BY THE MAIN CONTRACTOR PRIOR TO COMMENCEMENT OF ANY WORK ON SITE.
  8. ALL WORKS TO BE CARRIED OUT IN ACCORDANCE WITH LOCAL AUTHORITY ADOPTABLE RESIDENTIAL ROAD SPECIFICATION AND STANDARD DETAILS.

**KEY**

- PROPOSED IMPERMEABLE CATCHMENT
- SITE BOUNDARY

**REVISIONS**

REV	DESCRIPTION	DATE	BY
A	ISSUED FOR INFORMATION	23.08.23	LC

**SCP**  
 Transportation Planning | Infrastructure Design  
Colwyn Chambers, 19 York Street, Manchester, M2 3BA, Tel 0161 832 4400, www.scptransport.co.uk, Email info@scptransport.co.uk

Client Name:  
**F W S CARTER & SONS LIMITED**

Project Title:  
**PROPOSED HAULAGE TRAILER PARK  
 GREENDALE BUSINESS PARK**

Drawing Title:  
**PROPOSED CATCHMENT PLAN**

Date: 23.08.2023	Drawn By: LC
Scale: 1:500 @ A1	Checked: NMc
Status: PRELIMINARY	Approved: NMc

Drawing No: <b>SCP-230527-0000-SK02</b>	Rev: <b>A</b>
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## **Appendix D**

### *Existing Greenfield Runoff Calculations*

Colwyn Chambers  
 19 York St  
 Manchester M2 3BA



Date 19/07/2023 11:42  
 File

Designed by micro.drainage  
 Checked by

XP Solutions

Source Control 2020.1.3

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 1000 Urban 0.000  
 Area (ha) 1.027 Soil 0.300 Region Number Region 8

**Results 1/s**

QBAR Rural 2.8  
 QBAR Urban 2.8  
  
 Q100 years 6.9  
  
 Q1 year 2.2  
 Q30 years 5.4  
 Q100 years 6.9

## **Appendix E**

### *Flood Map for Planning*



# Flood map for planning

Your reference  
<Unspecified>

Location (easting/northing)  
302001/89490

Created  
19 Jul 2023 11:25

**Your selected location is in flood zone 1, an area with a low probability of flooding.**

You will need to do a flood risk assessment if your site is **any of the following**:

- bigger than 1 hectare (ha)
- In an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

## Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

Flood risk data is covered by the Open Government Licence **which** sets out the terms and conditions for using government data. <https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>

## Flood map for planning



Your reference  
**<Unspecified>**

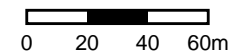
Location (easting/northing)  
**302001/89490**

Scale  
**1:2500**

Created  
**19 Jul 2023 11:25**

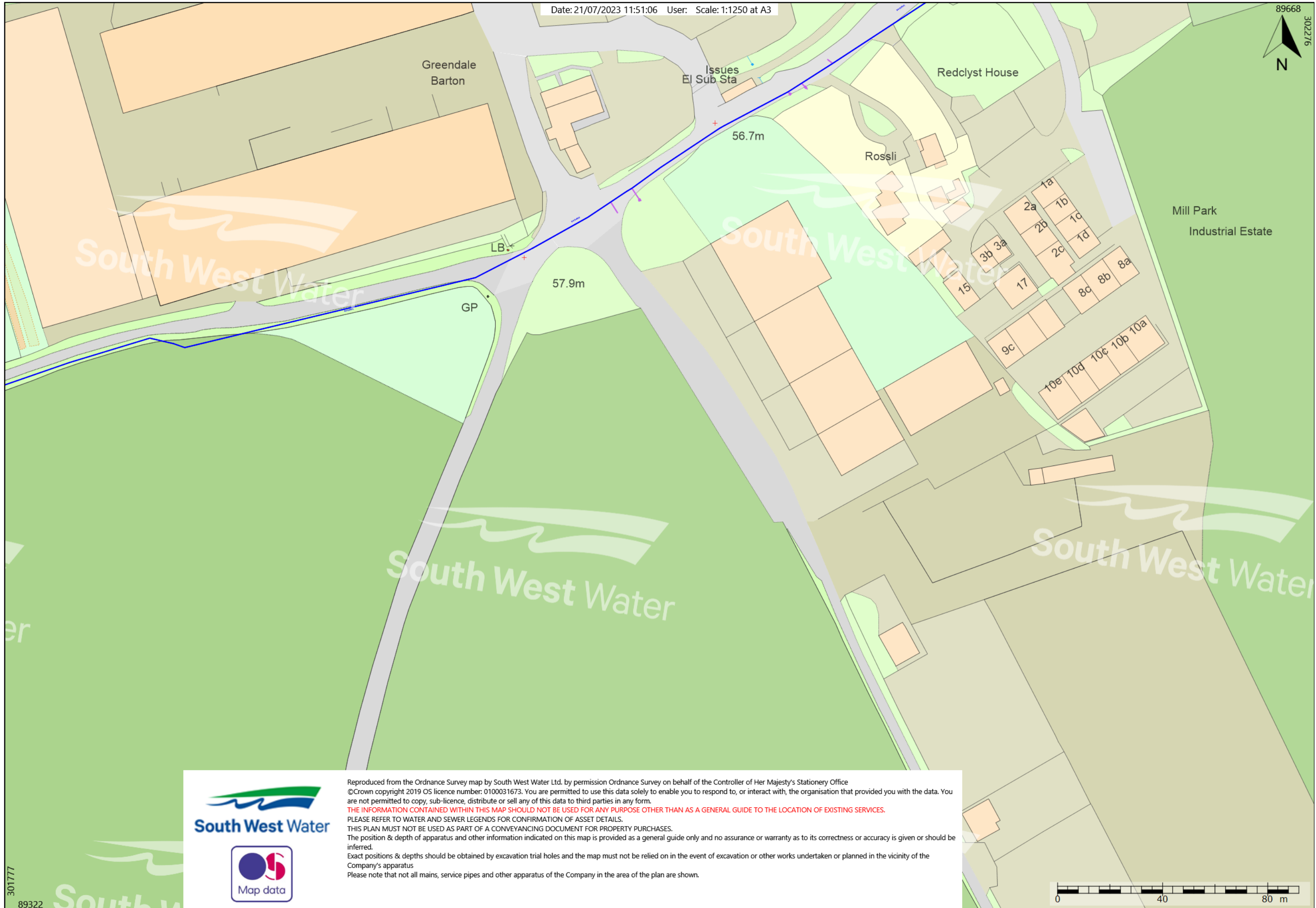


-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area

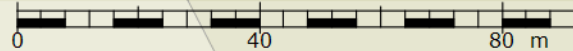


## **Appendix F**

[South West Water Asset Map](#)



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 Exact positions & depths should be obtained by excavation trial holes and the map must not be relied on in the event of excavation or other works undertaken or planned in the vicinity of the Company's apparatus  
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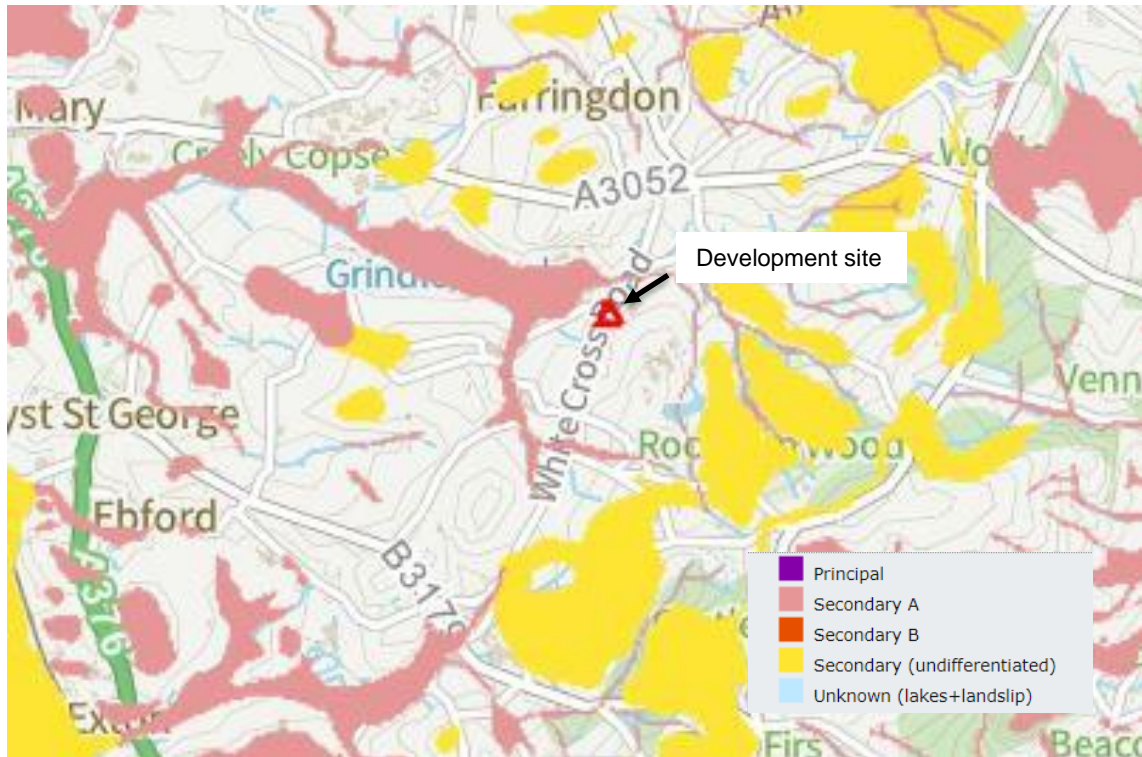
## **Appendix G**

*Magic Maps & BGS Extracts*

Extract 1: Magic Maps Bedrock Classifications



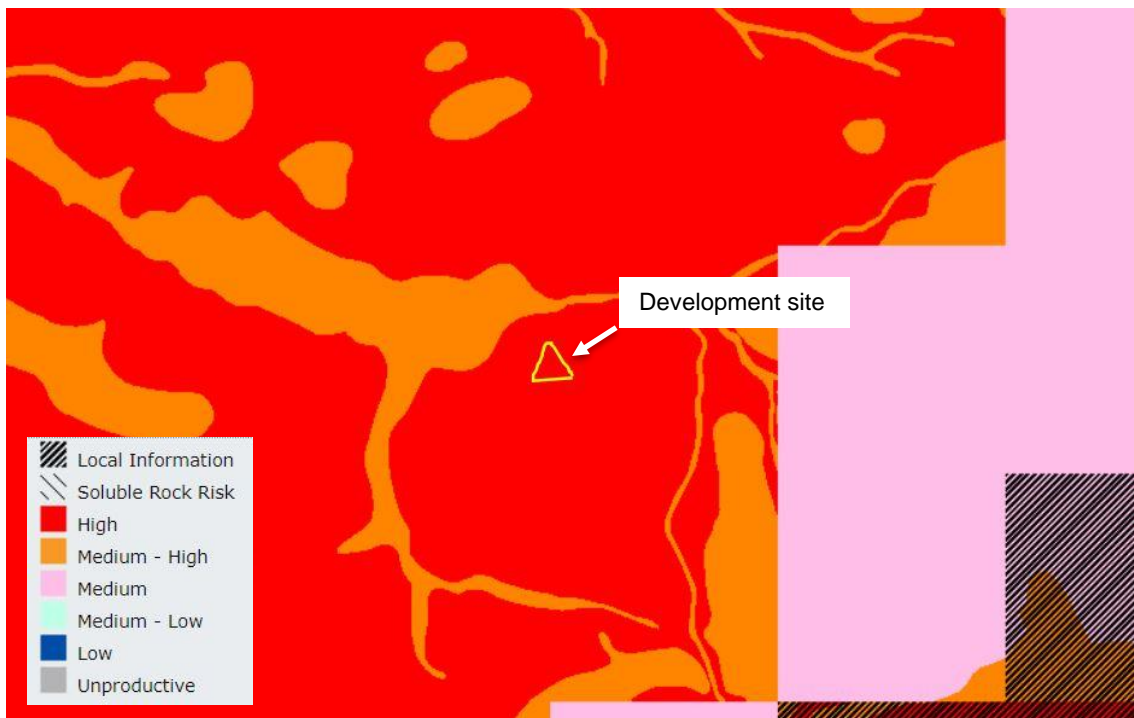
Extract 2: Magic Maps Superficial Drift Classifications



Extract 3: Magic Maps Soil Classifications



Extract 4: Magic Maps Groundwater Vulnerability



Extract 5: Magic Maps Flood Risk Management Priorities

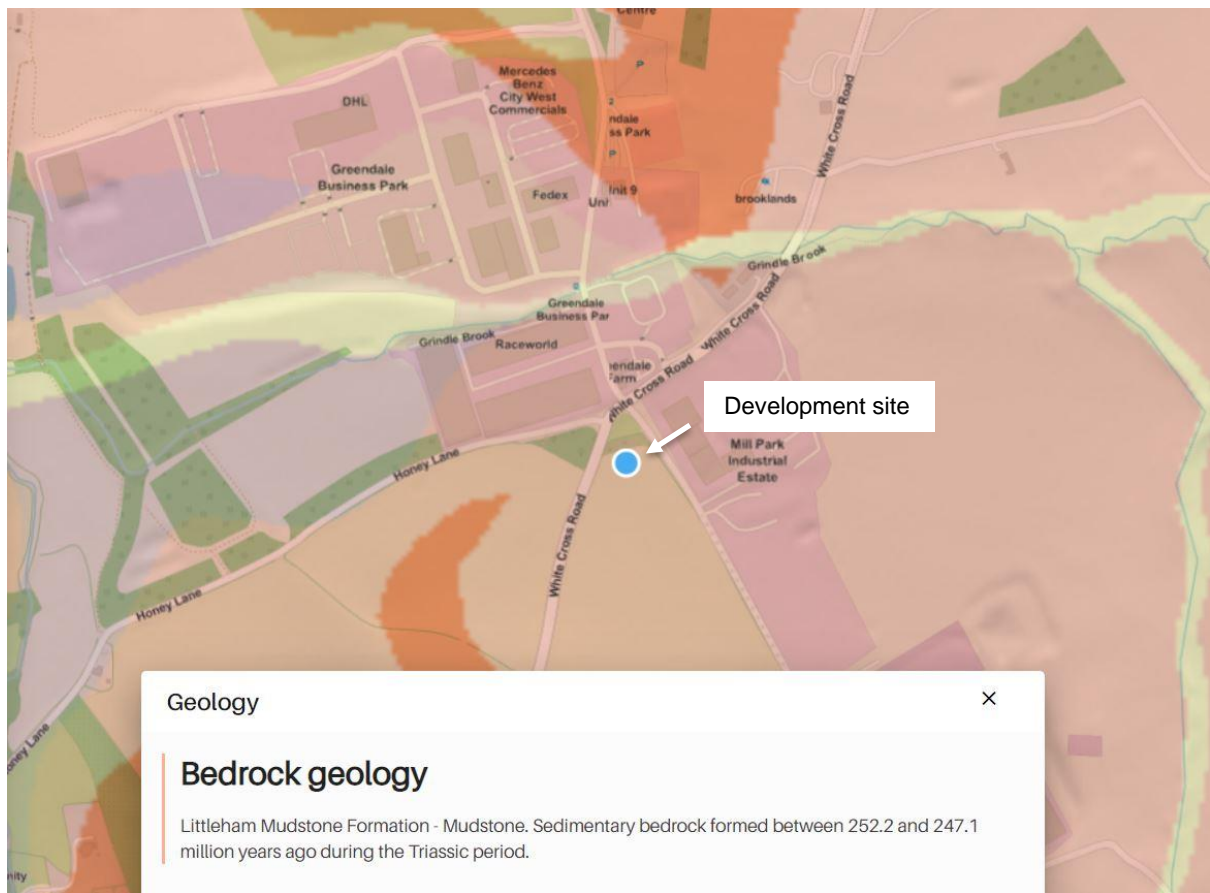


Extract 6: Magic Maps Source Protection Zones





Extract 7: BGS Soil Classification



## **Appendix H**

### *Microdrainage Calculations*

- Point 1:

*Existing 12ha Development with 100 year & 20% Climate Change*

**Quick Storage Estimate**

**Variables**

FSR Rainfall		Cv (Summer)	0.750
Return Period (years)	100	Cv (Winter)	0.840
Region	England and Wales	Impermeable Area (ha)	12.000
Map	M5-60 (mm) 21.000	Maximum Allowable Discharge (l/s)	66.0
	Ratio R 0.388	Infiltration Coefficient (m/hr)	0.00000
		Safety Factor	2.0
		Climate Change (%)	20

Buttons: Analyse, OK, Cancel, Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0

**Quick Storage Estimate**

**Results**

**Global Variables require approximate storage of between 6692 m<sup>3</sup> and 9251 m<sup>3</sup>.**

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

Buttons: Analyse, OK, Cancel, Help

Enter Climate Change between -100 and 600

- Point 2:  
Existing 12ha Development with 100 year & 45% Climate Change

**Quick Storage Estimate**

**Variables**

FSR Rainfall		Cv (Summer)	0.750	
Return Period (years)	100	Cv (Winter)	0.840	
Region	England and Wales	Impermeable Area (ha)	12.000	
Map	M5-60 (mm)	21.000	Maximum Allowable Discharge (l/s)	66.0
	Ratio R	0.388	Infiltration Coefficient (m/hr)	0.00000
			Safety Factor	2.0
			Climate Change (%)	45

Buttons: Analyse, OK, Cancel, Help

Enter Climate Change between -100 and 600

**Quick Storage Estimate**

**Results**

**Global Variables require approximate storage of between 8529 m<sup>3</sup> and 11713 m<sup>3</sup>.**

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

Buttons: Analyse, OK, Cancel, Help

Enter Climate Change between -100 and 600

- Point 3:  
Proposed 0.6652ha Development with 100 year & 20% Climate Change

**Quick Storage Estimate**

Micro Drainage

**Variables**

FSR Rainfall	Return Period (years)	Region	M5-60 (mm)	Ratio R	Cv (Summer)	Cv (Winter)	Impervious Area (ha)	Maximum Allowable Discharge (l/s)	Infiltration Coefficient (m/hr)	Safety Factor	Climate Change (%)
FSR Rainfall	100	England and Wales	21.000	0.388	0.750	0.840	0.665	5.5	0.00000	2.0	20

Buttons: Analyse, OK, Cancel, Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0

**Quick Storage Estimate**

Micro Drainage

**Results**

**Global Variables require approximate storage of between 326 m<sup>3</sup> and 450 m<sup>3</sup>.**

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

Buttons: Analyse, OK, Cancel, Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0

- Point 4:  
Proposed 0.6652ha Development with 100 year & 45% Climate Change

**Quick Storage Estimate**

**Variables**

FSR Rainfall		Cv (Summer)	0.750	
Return Period (years)	100	Cv (Winter)	0.840	
Region	England and Wales	Impemeable Area (ha)	0.665	
Map	M5-60 (mm)	21.000	Maximum Allowable Discharge (l/s)	5.5
	Ratio R	0.388	Infiltration Coefficient (m/hr)	0.00000
			Safety Factor	2.0
			Climate Change (%)	45

Buttons: Analyse, OK, Cancel, Help

Enter Climate Change between -100 and 600

**Quick Storage Estimate**

**Results**

**Global Variables require approximate storage of between 417 m<sup>3</sup> and 572 m<sup>3</sup>.**

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

Buttons: Analyse, OK, Cancel, Help

Enter Climate Change between -100 and 600

## **Appendix I**

[Greendale Barton BP FRA 2009 R0.Doc Summary](#)

## Executive Summary

<b>Site Name &amp; Address</b>	Greendale Barton Business Park, Greendale Barton near Woodbury Salterton, East Devon, EX5 1EW																						
<b>Grid Ref</b>	301701, 89701 (SY017897)	<b>Size</b>	12 ha (7.55 ha new, 3.25 ha existing, 1.2 ha for pond)																				
<b>Current Use</b>	<table border="1"> <tr><td>Greenfield</td><td>✓</td></tr> <tr><td>Brownfield disused</td><td></td></tr> <tr><td>Brownfield operational</td><td>✓</td></tr> <tr><td>Residential</td><td></td></tr> <tr><td>Commercial / Industrial</td><td></td></tr> </table>	Greenfield	✓	Brownfield disused		Brownfield operational	✓	Residential		Commercial / Industrial		<b>Proposed Use</b>	<table border="1"> <tr><td>Residential</td><td></td></tr> <tr><td>Commercial</td><td>✓</td></tr> <tr><td>Industrial</td><td></td></tr> <tr><td>Leisure</td><td></td></tr> <tr><td>Other</td><td></td></tr> </table>	Residential		Commercial	✓	Industrial		Leisure		Other	
Greenfield	✓																						
Brownfield disused																							
Brownfield operational	✓																						
Residential																							
Commercial / Industrial																							
Residential																							
Commercial	✓																						
Industrial																							
Leisure																							
Other																							
<b>Comment</b>	Inert landfill.	<b>Comment</b>	Business Park																				
<b>Flood Zone</b>	Zone 1	<b>Vulnerability</b>	Less Vulnerable																				
<b>Sequential Test</b>	Development is appropriate.	<b>Exception Test</b>	Not required.																				

### Other

Expansion of the Greendale Business Park is proposed which will mainly entailing development on an inert landfill. The proposed area for development is not at risk of fluvial flooding but would increase surface water run off. That run off would mainly need to discharge to the nearby Grindle Brook, hence this study outlines a drainage strategy to ensure flood risk and water quality of the Grindle Brook are not exacerbated.

A pond is proposed to provide attenuation of the increased surface water run off, though with some permanent water to enable greater scope for ecological enhancement of the area in conjunction with the planned landscaping, and which should also aid improving the water quality of the surface water run off. Prior to discharge from the development the surface water run off will have pollution mitigation via catch pits and oil water interception, and overland flow from land to the north which slopes towards the development will be intercepted by french drains.

Calculations are provided of the greenfield run off rate and for the attenuation storage volume in a 1 in 100 year event plus a 20% increase in rainfall to allow for possible climate change, and assuming discharge from the pond at the estimated mean annual peak run off rate of 5.5l/s/ha (a 1 in 2.33 year event). Conservative assumptions have been made regarding the maximum area which may be utilised for development, its proportion of impermeable cover, the area of pond, and minimum discharge rate, in order to indicate the maximum attenuation storage (9,189m<sup>3</sup>) which may be required, though the final pond will be subject to detailed design and will be subject to regulation by the Environment Agency via a consent to discharge under the Water Resources Act 1991 (as amended by the Environment Act 1995).

For up to 12ha of development with impermeable cover, a pond with a base area of 9,000m<sup>2</sup> is proposed to provide attenuation storage of 0-1.05m depth i.e. up to 9,450m<sup>3</sup>, with discharge restricted to 5.5l/s/ha for the predicted 1 in 100 year rainfall event plus a 20% increase for possible climate change. Within the pond area an indicative 3,730m<sup>2</sup> is proposed to provide up to 3,730m<sup>3</sup> of permanent water storage. That storage estimate can be refined dependent on the final area of development, proportion of impermeable cover, and discharge rate agreed. The proposed storage pond will provide a strategic system to which new developments at the Greendale Business Park can discharge, thereby ensuring coherent surface water drainage planning for the business park.