

FLOOD RISK ASSESSMENT & OUTLINE SUSTAINABLE DRAINAGE STRATEGY

**Caravan Park Extension
The Elms, Addlethorpe**

**Mr D Cragg
April 2022**

DOCUMENT ISSUE RECORD

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EXECUTIVE SUMMARY

This Flood Risk Assessment is compliant with the requirements set out in the National Planning Policy Framework, and the associated online Planning Practice Guidance. It has been produced on behalf of Mr D Cragg. This report demonstrates that the proposed development is not at significant flood risk, and will not increase flood risk to others, subject to the recommended flood mitigation strategies being implemented.

Policy

Development Type	Flood Zone	Vulnerability
Caravan and Camping Site	3	More Vulnerable

Climate Change Allowance

Peak River Flow

WITHAM MANAGEMENT CATCHMENT	
Allowance Category	Percentage Increase
Central	8

Peak Rainfall Intensity

Allowance Category	Percentage Increase
Upper End	20
Central	10

Sea Level Rise

Area of England	Allowance	2000-2035 (mm/year)	2036-2065 (mm/year)	2066-2095 (mm/year)	2096-2125 (mm/year)
Anglian	Higher Central	5.8	8.7	11.6	13.0
	Upper End	7.0	11.3	15.8	18.1

Flood Risk and Mitigation

Source	Level of Risk	Proposed Mitigation
Residual	High	Restricted occupancy. Flood response plan.
Fluvial Tidal Groundwater Sewers	Low	
Pluvial Reservoir Canal/Artificial	None	
Development Foul & Surface Water	High	Surface Water to be stored and re-used on site. Foul water to AW sewer.

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1.0 INTRODUCTION

- 1.1 This Flood Risk Assessment, (FRA), is compliant with the requirements set out in the National Planning Policy Framework, (NPPF), and the associated online Planning Practice Guidance.
- 1.2 The FRA has been produced on behalf of Mr D Cragg in respect of a planning application for an extension to the existing caravan park at The Elms, Addlethorpe.

Data Used

- 1.3 This FRA is based on the following information:
 - Topographic Survey
 - Proposed Plans
 - British Geological Survey Drift & Geology Maps
 - Environment Agency Consultation
 - Environment Agency Data
 - British Geological Survey Hydrogeology Data
 - Anglian Water Sewer Records
 - Site visit

Existing Site

- 1.4 The site is located at grid reference TF5422768573 as shown in **Figure 1.1** below.



Figure 1.1 Site Location

- 1.5 The site forms part of a disused golf course and is now predominately grassland.
- 1.6 The site is relatively flat at approximately 2.00m AOD.
- 1.7 The online British Geological Survey maps indicates that the site is located on clay and silt over a bedrock of chalk.

Proposed Development

- 1.8 Change of use of part of former golf course site for siting 56 static caravans with associated access and car parking arrangements, excavation of five fishing ponds and other biodiversity enhancement areas including wild flower area as shown on **Figure 1.2** below.

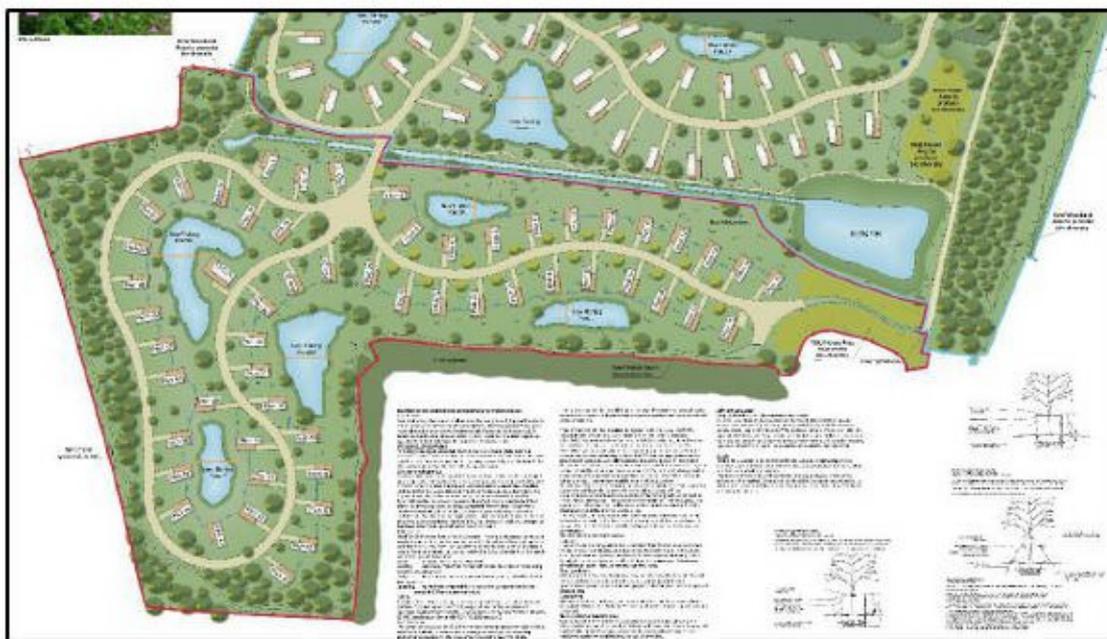


Figure 1.2 Proposed Plan

2.0 FLOOD RISK PLANNING POLICY

National Planning Policy Framework

- 2.1 The NPPF sets out the Government's national policies on different aspects of land use planning in England in relation to flood risk. A supporting web-based Planning Practice Guidance, (PPG), is also available.
- 2.2 The guidance uses four Flood Zones to characterise flood risk which refer to the probability of river and sea flooding, ignoring the presence of defences.

Sequential Test

- 2.3 The NPPF requires the application of a Sequential Test to ensure that new development is in areas with the lowest probability of flooding and the Flood Zones provide the basis for applying the Test.

Flood Zone Definition

Flood Zone 1	Low probability (1 in 1000 annual probability of river or sea flooding (<0.1%)).
Flood Zone 2	Medium probability (between 1 in 100 and 1 in 1000 annual probability of river flooding (1.0%-.0.1%) or between 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5%-.0.1%) in any given year).
Flood Zone 3a	High probability (1 in 100 or great annual probability of river flooding (>1.0%) or 1 in 200 or greater annual probability of sea flooding (>0.5%) in any given year).
Flood Zone 3b	This zone comprises land where water must flow or be stored in times of flood. Land which would flood with an annual probability of 1 in 20 (5.0%), or is designed to flood in an extreme flood (0.1%) should provide a starting point for discussions to identify functional floodplain.

- 2.4 The Flood Zones do not consider the projected effects of climate change and may not represent potential flooding from smaller watercourses.
- 2.5 The aim is to steer new development to Flood Zone 1 and where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should consider the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2, applying the Exception Test if required.
- 2.6 Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 be considered, considering the flood risk vulnerability of land uses and applying the Exception Test if required.
- 2.7 Paragraph 33 of the PPG states, "when applying the Sequential Test, a pragmatic approach on the availability of alternatives should be taken. For example, in considering planning

applications for extensions to existing business premises it might be impractical to suggest that there are more suitable alternative locations for that development elsewhere.”

- 2.8 The guidance also sets out the vulnerability to flooding of different land uses and some of these are detailed below.

Flood Risk Vulnerability Classification

Essential Infrastructure	Transport Infrastructure; Utility Infrastructure; Wind Turbines.
Water Compatible	Flood Control Infrastructure; Water and Sewage Infrastructure; Navigation Facilities.
Highly Vulnerable	Emergency Services (which are required in times of flood); Basement Dwellings; Caravans, Mobile Homes and Park Homes, (intended for permanent residential use); Installations requiring Hazardous Substances Consent.
More Vulnerable	Hospitals and other Health Services; Residential Institutions; Dwelling Houses, Drinking Establishments; Nightclubs; Hotels; Non-residential uses for Health Services; Nurseries; Educational Establishments; Landfill and Hazardous Waste Management Facilities; Sites used for Holiday or short-let Caravan and Camping sites, (subject to a specific warning and evacuation plan).
Less Vulnerable	Commercial Establishments; Emergency Services not required in times of flood; Land and Buildings used for Agriculture and Forestry. Waste Treatment; Minerals Working; Water Treatment Works; Sewage Treatment Works.

Appropriate Development

- 2.9 Based on the vulnerability of a development the guidance states what Flood Zone(s) the development is appropriate within. The flood risk compatibility is summarised below.

Flood Zone 1	Appropriate Development – All.
Flood Zone 2	Exception Test - Highly vulnerable. Appropriate Development - Essential Infrastructure; More vulnerable; Less vulnerable and Water Compatible.
Flood Zone 3a	Should not be permitted – Highly vulnerable. Exception Test – Essential Infrastructure, More vulnerable. Appropriate Development – Less vulnerable; Water compatible.
Flood Zone 3b	Should not be permitted – Highly vulnerable; More vulnerable; Less vulnerable. Exception Test – Essential Infrastructure. Appropriate Development –Water compatible.

- 2.10 The Planning Practice Guidance also states that all sources of flooding should be considered when preparing a FRA.

Exception Test

- 2.11 The Exception Test is a method to demonstrate and help ensure that flood risk to people and property will be managed satisfactorily, while allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available.
- 2.12 The first part of the Exception Test is to show that the proposed development will provide wider sustainability benefits to the community that outweigh flood risk. The second part is the requirement for a FRA to demonstrate that it will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall.

Development Proposals

- 2.13 The proposed development consists of an extension to a long established caravan site.

Flood Zones

- 2.14 The Flood Zones are shown on **Figure 2.1** below which shows the site to be in Flood Zone 3.

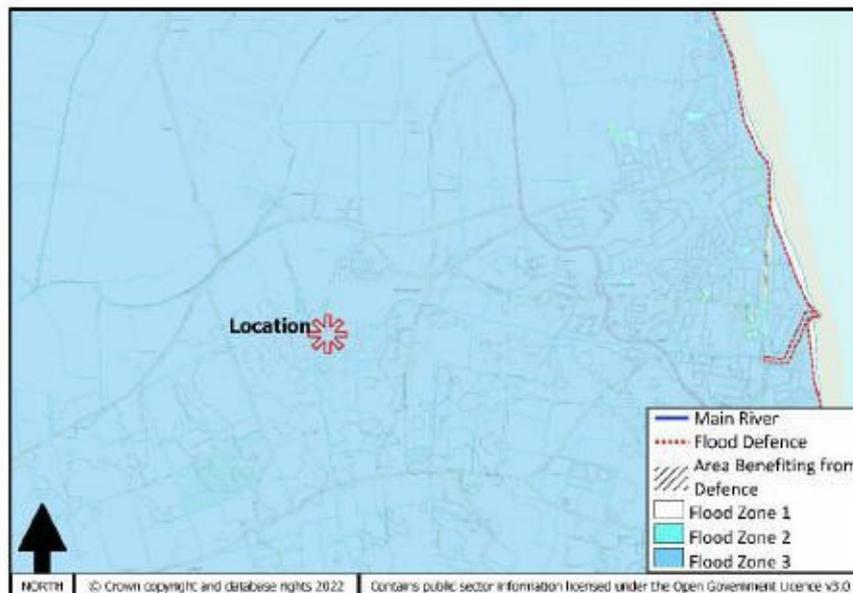


Figure 2.1 Flood Zones

Development Vulnerability

- 2.15 Caravan and camping sites are More Vulnerable.

Site Sequential Test

- 2.16 Paragraph 33 of the PPG states, “when applying the Sequential Test, a pragmatic approach on the availability of alternatives should be taken. For example, in considering planning applications for extensions to existing business premises, **(as is the case here)**, it might be impractical to suggest that there are more suitable alternative locations for that development elsewhere.”.

Exception Test

- 2.17 A FRA is required to ensure the development will remain safe over its lifetime from all sources of flooding and not increase flood risk elsewhere.

3.0 CLIMATE CHANGE

- 3.1 The NPPF sets out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change.
- 3.2 As the Government's expert on flood risk on 19th February 2016 the Environment Agency, (EA), published revised climate change allowances to support the NPPF. The sea level rise allowances were revised on the 17th December 2019 and the peak river flows revised on the 20th July 2021.
- 3.3 The climate change allowances are based on projections and different scenarios of carbon dioxide (CO₂) emissions to the atmosphere and provide predictions of anticipated change for:
- peak river flow by river Management Catchment;
 - peak rainfall intensity;
 - sea level rise;
 - offshore wind speed and extreme wave height.

Peak River Flow Allowances

- 3.4 The peak river flow allowances show the anticipated changes to peak flow by Management Catchment, which are sub-catchments of River Basin Districts, with three allowances; central; higher central and upper end.
- 3.5 This proposed development is in the Witham Management Catchment.
- 3.6 The appropriate allowance depends on the Flood Zone and vulnerability classification of the development and for this proposal it is appropriate to use the Central allowance.
- 3.7 The allowances change over three periods of time over the next century. The appropriate period should be chosen based on the expected lifetime of the development and for commercial that is 50 years.
- 3.8 The following climate change allowances in peak river flows therefore need to be applied:

WITHAM	
Allowance Category	Percentage Increase
Central	8

Table 3.1 Climate Change Allowances for Peak River Flow

Peak Rainfall Intensity Allowance

- 3.9 Increased rainfall affects river levels and land and urban drainage and should be applied to surface water drainage systems.
- 3.10 These allowances are uniform across England and change over three periods of time over the next century. The appropriate period should be chosen based on the expected lifetime of the development and for commercial that is 50 years
- 3.11 Surface water drainage strategies and detailed designs need to assess both the central and upper end allowances to understand the range of impact. The following climate change allowances in peak rainfall intensity therefore need to be applied:

Allowance Category	Percentage Increase
Upper End	20
Central	10

Table 3.2 Climate Change Allowances for Peak Rainfall Intensity

Sea Level Allowances

- 3.12 There is a range of allowances for each region and epoch or time frame for sea level rise as follows:

Area of England	Allowance	2000-2035 (mm/year)	2036-2065 (mm/year)	2066-2095 (mm)/year	2096-2125 (mm/year)
Anglian	Higher Central	5.8	8.7	11.6	13.0
	Upper End	7.0	11.3	15.8	18.1

Table 3.3 Climate Change Allowances for Sea Level Rise

4.0 FLOOD RISK SOURCES

- 4.1 The following flood risk sources have been identified and where mitigation is required to reduce the flood risk this is discussed in **Section 5**.

Fluvial

Main River

- 4.2 The nearest EA Main River to the site is approximately 2.60km to the north.

Ordinary Watercourses

- 4.3 The site lies within the district of the Lindsey Marsh Drainage Board, (IDB), and the Boards maintained watercourse is located on the western, southern and eastern boundaries of the site.

- 4.4 Flood risk from this watercourse is considered low.

Climate Change

- 4.5 As the risk of flooding from fluvial sources is low and is less than the tidal risk, see below, climate change has not been considered further.

Tidal

- 4.6 The site is approximately 3.00km from the east coast.

Actual Risk of Flooding

- 4.7 The EA have produced maps which show the flood risk from rivers or the sea. These maps take into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail. The maps **do not** take into account the potential effect of climate change.

- 4.8 The risk of flooding map is shown below in **Figure 4.1** which shows the majority of the site to be at low risk of flooding.

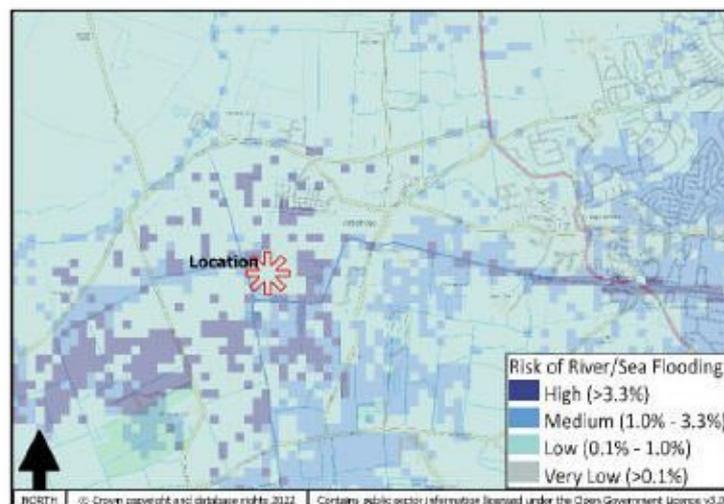


Figure 4.1 Flood Risk Map

Residual Risk

- 4.9 The site is protected from flooding from the East Coast by defences, including a raised defence. Information provided by the EA shows that the defences consist of concrete floodwalls which are supplemented by beach nourishment to maintain foreshore levels. They are in good condition and reduce the risk of flooding to a 0.5 % (1 in 200) chance of occurring in any year. The EA inspect these defences routinely to ensure potential defects are identified. However, if that defence was to be overtopped or fail then flooding could occur .
- 4.10 The EA have produced hazard mapping and **Figure 4.2** below shows the results of a breach for the 0.5% (1:200) 2115 climate change event.

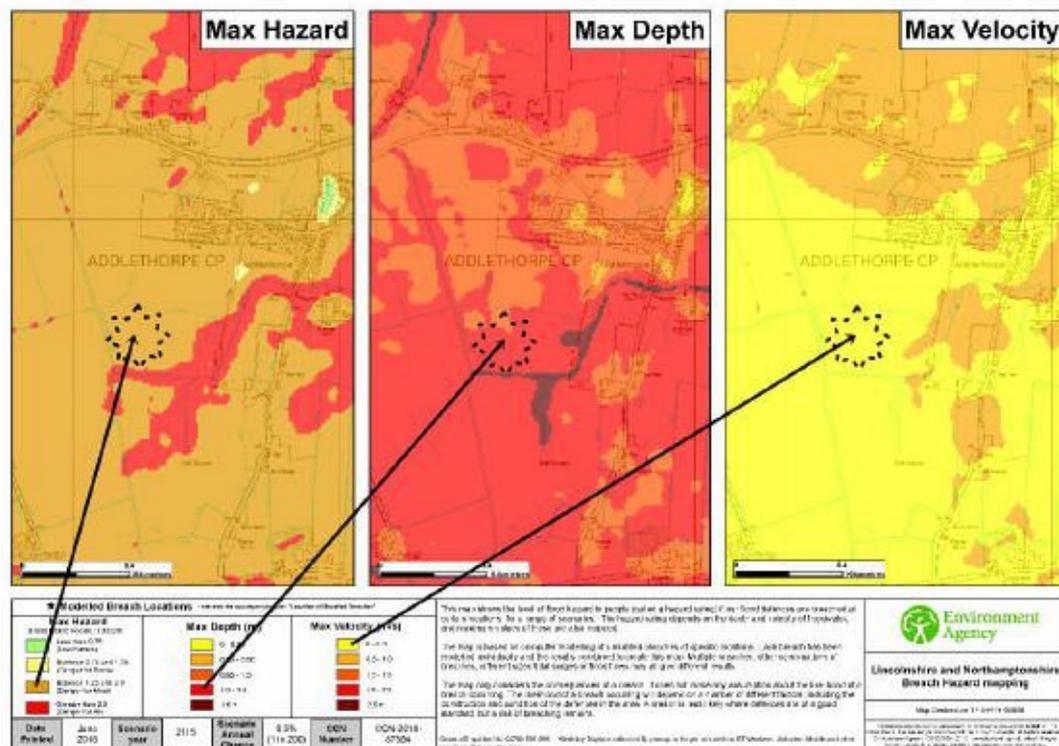


Figure 4.2 Hazard Mapping for 0.5% (1:200) 2115 Climate Change Event

- 4.11 Whilst the flood velocities on the site are low the hazard rating is “Danger for Most” due to the relatively deep flood depths.
- 4.12 Generally, the depth of flooding on the site is between 1.00m to 1.60m.
- 4.13 The residual risk of flooding from tidal sources is high and will require mitigation.

Pluvial

- 4.14 The EA have produced maps showing flooding when rainwater lies or flows over the ground. The surface water flooding extents are shown below in **Figure 4.3**.

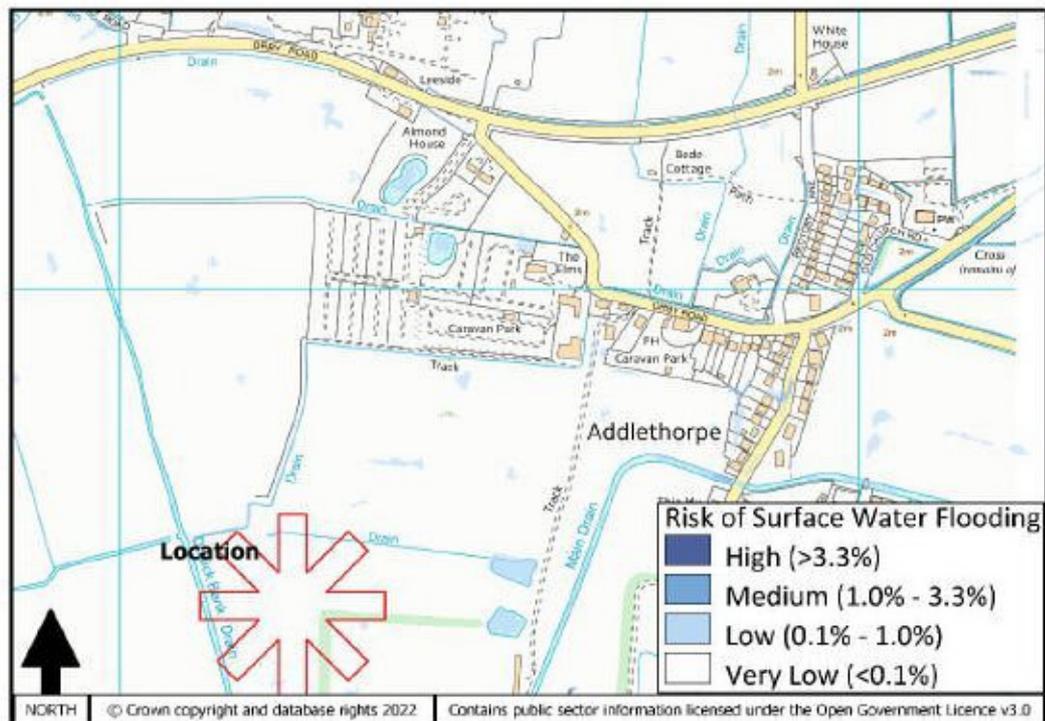


Figure 4.3 Surface Water Flooding Extents

- 4.15 The site is not at risk of flooding from pluvial sources.

Groundwater

- 4.16 The site is located on a high productivity aquifer and there are no known instances of groundwater flooding in the area.
- 4.17 The risk of flooding from groundwater is low.

Sewers

- 4.18 There is an existing Anglian Water foul sewer approximately 150m from the site in Orby Road, but it is unlikely to pose a flood risk to the site as it is well maintained.

Reservoirs

- 4.19 The site is not at risk of flooding from reservoirs.

Canals and Artificial Water Bodies

- 4.20 The site is not at risk of flooding from canals.

Development Foul & Surface Water

- 4.21 The proposed development will require the disposal of foul and surface water which could impact on existing systems and developments.
- 4.22 The risk of flooding to the wider catchment from the proposed development is high and will require mitigation.

5.0 MITIGATION

- 5.1 Section 4.0 has identified the sources of flooding which could potentially pose a risk to the site and the proposed development. This section of the FRA sets out the mitigation measures which are to be incorporated within the proposed development to address and reduce the risk of flooding to within acceptable levels.

Site Layout

- 5.2 The proposed development is at high residual risk of flooding from a breach in the tidal defences and it is therefore proposed that the occupancy be restricted to 15th March to 31st October, (or the following Sunday if half term extends into November).
- 5.3 The caravans will be securely fastened to the ground via chains fixed to in-situ concrete pads.
- 5.4 There is an existing flood warning and evacuation plan in place which will be extended to cover this proposed development.

6.0 OUTLINE SUSTAINABLE DRAINAGE STRATEGY

- 6.1 When rain falls on a natural landscape it soaks into the ground, evaporates, is taken up by plants and some of it eventually finds its way into streams and rivers.
- 6.2 These stages of the water cycle can be impeded when land is developed and there tends to be less permeable ground available for infiltration and less vegetation for evapotranspiration. When rain falls on impermeable surfaces much more of it turns to surface water runoff, which can cause flooding, pollution and erosion problems.
- 6.3 Sustainable drainage systems, (SuDS), are designed to maximise the opportunities and benefits that can be secured from surface water management.

Hierarchy of Surface Water Drainage

- 6.4 The recommended surface water drainage hierarchy is to utilise soakaway, or infiltration as the preferred option, followed by discharging to an appropriate watercourse or if this is not available the final option is to an existing public sewer.
- 6.5 The online British Geological Survey maps indicates that the site is located on clay and silt which is unlikely to support the use of infiltration.
- 6.6 In this instance, it is proposed that the surface water generated from the roof area of the caravans and the access road is stored on the site and re-used for irrigation on the adjoining land with no direct discharge to the adjacent watercourses.

Surface Water Run Off

- 6.7 The total impermeable area is approximately 5,600m². The depth of rainfall in this location for the worst-case event of 100-year event, 6hr duration storm is 55mm. This would result in a volume of water from this one event from the impermeable areas of 5,600m² x 0.055m = 308m³.
- 6.8 The annual average rainfall depth in this location is 0.618m. The total average rainfall volume from the impermeable areas in a year is 5,600m² x 0.618m = 3,460m³.
- 6.9 The five ponds shown on the proposed layout will hold a permanent depth of water and will be of sufficient depth to allow the required storage above the retained water level.
- 6.10 The above storage requirements are indicative only for the purposes of this strategy and will be confirmed at detailed design stage.

Foul Water Drainage

- 6.11 The foul drainage will be connected into the existing system which has a connection into the Anglian Water sewer in the adjacent road as shown on **Figure 6.1** below.



Figure 6.1 Anglian Water Foul Sewer

8.0 CONCLUSIONS

- 8.1 This FRA is compliant with the requirements set out in the NPPF and the associated online Planning Practice Guidance.
- 8.2 The FRA has been produced on behalf of Mr D Cragg.
- 8.3 This report demonstrates that the proposed development is not at significant flood risk, and will not increase flood risk to others, subject to the recommended flood mitigation strategies being implemented.
- 8.4 The identified risks and mitigation measures are summarised below;

Source	Level of Risk	Proposed Mitigation
Residual	High	Restricted occupancy. Flood response plan.
Fluvial Tidal Groundwater Sewers	Low	
Pluvial Reservoir Canal/Artificial	None	
Development Foul & Surface Water	High	Surface Water to be stored and re-used on site. Foul water to AW sewer.

Table 8.1 Summary of Risk and Mitigation

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