

Definitions

1. Functional Floodplain: The land where water has to flow or be stored in times of flood.
2. Net zero: The balance between the amount of greenhouse gas produced and the amount removed from the atmosphere.

Return period and AEP conversion.

Years	%AEP	Years	%AEP	Years	%AEP
2	50	30	3.3	200	0.5
5	20	50	2	500	0.2
10	10	75	1.33	1,000	0.1
20	5	100	1		

1 Introduction

1.1 Overview

This Flood Risk Assessment (FRA) has been developed to support the discharge of Planning Conditions and Reserved Matters for the site known as Deal Ground and May Gurney in East Norwich (planning application references: 12/00875/O for Norwich City Council and 2011/0152/O for South Norfolk Council).

This document has been prepared in accordance with latest planning policy, the National Planning Policy Framework (NPPF) and associated Planning Practice Guidance (PPG) and uses site-specific hydraulic modelling and hydrological estimation to assess flood risk at the site.

The site was granted outline planning permission for mixed-use development in 2013. The application was supported by an FRA prepared by Total Flood Solutions Limited and DBR Associates Limited (November 2010). This FRA built on previous work undertaken by JBA in 2008 in terms of hydraulic modelling of the site and wider Norwich area. This (2023) assessment builds upon the previously approved FRA and the associated design principles and assesses the impact of updated development proposals, considering the policy and guidance published since the original outline application.

1.2 Site location and description

The site is located to the east of Norwich adjacent to the confluence of the River Wensum and River Yare. The site lies within 1.5 km of the City Centre and is 1km from Norwich Railway Station. The site is located within two local authority districts (Figure 1-1) Norwich City Council and, South Norfolk Council. The Broads Authority is located immediately downstream of the site.

Table 1-1: Site Description

	Description
Size	12.13ha
North	The River Wensum borders the northern perimeter of the site. Over the river lies a proposed development site known as the 'Utilities Site' which forms part of the East Norwich Strategic Regeneration Area.
South	The site borders on to the public highway known as Bracondale, which provides access over the River Yare from Norwich City to the village of Trowse Newton
East	To the east the site is bordered by the River Yare and County Wildlife Site (primarily fenland). Further is Whitingham Country Park which consists of two large water bodies.

	Description
West	A coated roadstone processing plant is located along the western boundary of the site. An underpass provides possible, future connectivity to the Carrow Works site.
Current land use	The site is currently a mixture of green and brownfield land consisting of demolished warehouses and former construction company headquarters.
Land use history	Previous land uses include timber yard/sawmills, factory printworks, bottle factory and historical mining and infilling. Most recently any buildings within the Deal Ground element of the site have been demolished and the May Gurney component consists of dilapidated buildings.
Access arrangements	Both parts of the site are accessed off Bracondale. May Gurney through the existing highway junction and the remainder of the site is accessed via an access track off Bracondale which travels along the side of the processing plant to the Carrow Yacht Club situated to the north east of the site.

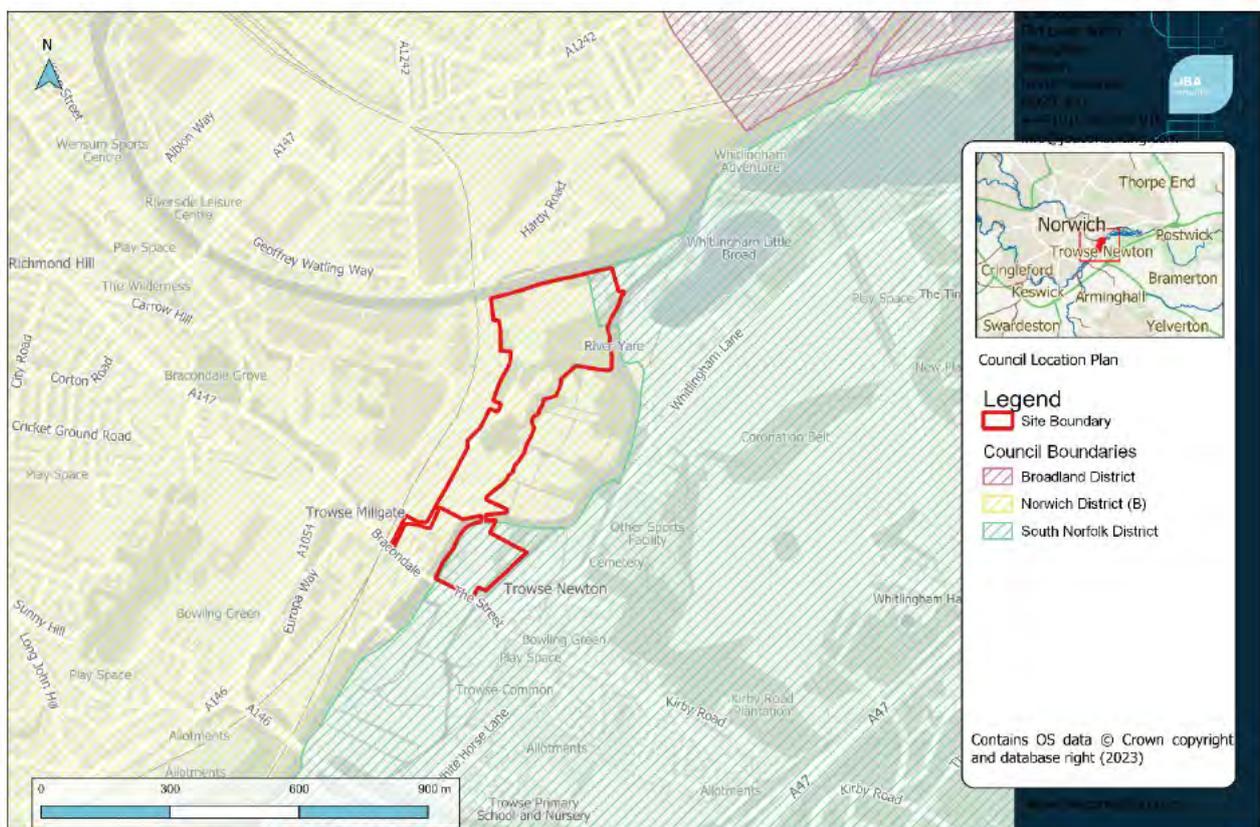


Figure 1-1: Location and administrative boundary plan

1.3 Proposed development

1.3.1 2013 Proposed development

The 2013 proposed development consisted of 317 houses and 365 apartments with shops, restaurant and bars with an access road and associated car parking. The 2013 Application set out the following concepts:

"A landscape led development, in which the conventional boundaries between dwellings and nature are blurred forming a transitional urban area as a soft feathered edge to the City which aims to locate development in the areas of least flood risk and to create a visual buffer to the railway line, extend the marsh between development to create a multi-functional landscape that can provide flood storage, ecological enhancement and semi-public space create a series of new neighborhoods each with its own unique identity and a place where people live and play next door to nature."

A drawing for reference is provided in Appendix A.

1.3.2 2023 Proposed development

The proposed development comprises of three distinct areas. The names of these areas will be used moving forward in this report to aid with clarity of description (Table 1-2).

Detailed plans of the proposed development are provided in Appendix A.

Table 1-2: Proposed development - Description

Area	Description
Overall (Lifespan)	The site is to consist of a mixture of residential and commercial development and therefore it is assumed a lifespan of at least 100-years.
Wensum Edge	Characterised by taller buildings, public spaces and distinct river frontage. The Wensum Edge is the focal point of the development containing a public square complete with commercial units for dining and shopping.
The Views	A village edge, with a mix of dwellings arranged in mews streets and close type streets. The building line is interspersed by nature corridors reducing the visual prominence
Yare Edge	A village character with low buildings in close knit arrangements. A mix of terraces, semi-detached and detached homes providing shared gardens to create a more spacious arrangement.

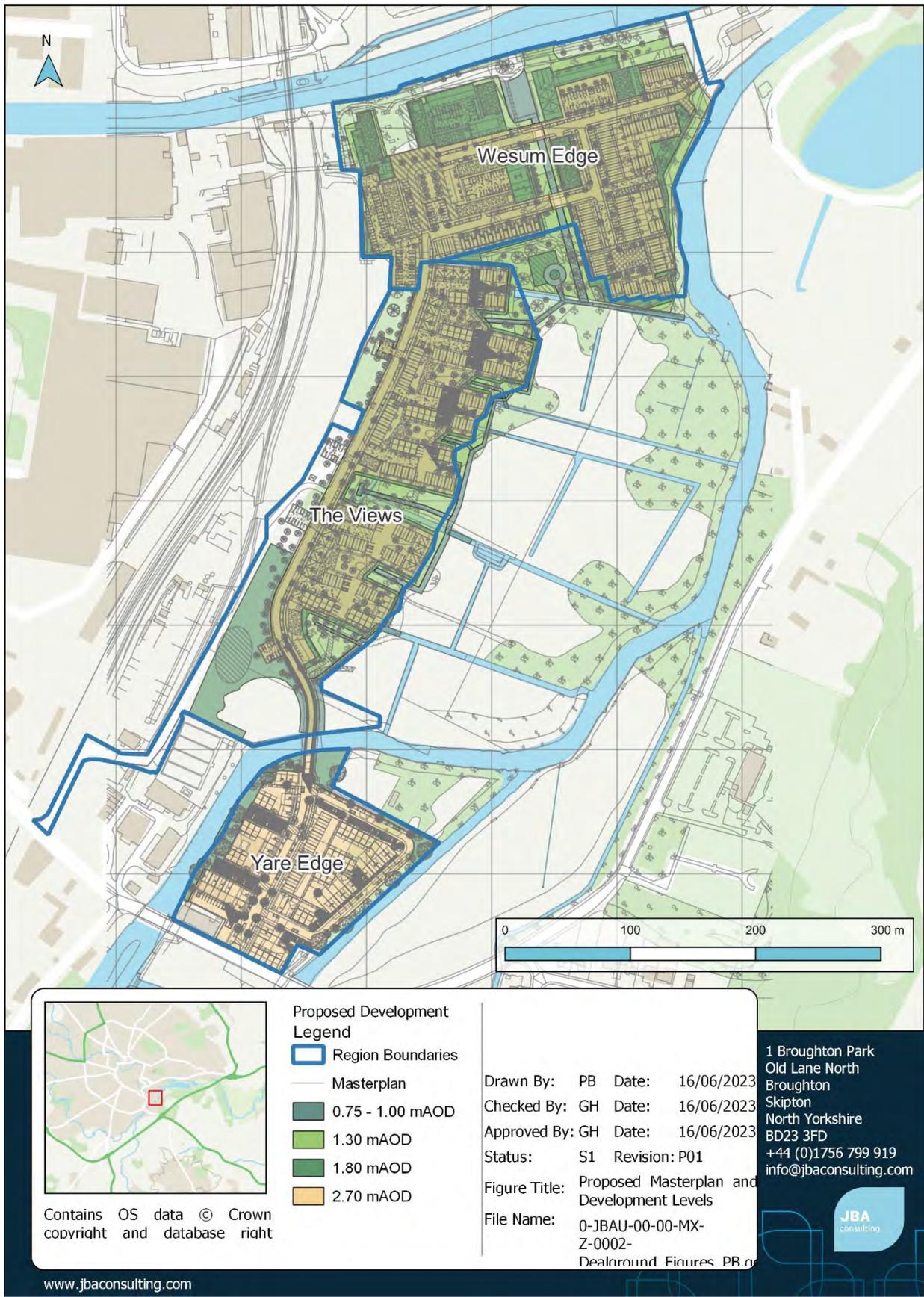


Figure 1-2: 2023 Masterplan

1.4 Flood risk management design principles

As noted above, the site benefits from outline planning permission (2013) for a mixed-use development comprising up to 670 dwellings, commercial uses and associated infrastructure. The application was supported by an FRA prepared by Total Flood Solutions Limited and DBR Associates Limited (November 2010). JBA were involved as Flood Risk advisors on the site, since 2008. The flood risk management design principles set out in the 2010 document included:

1. Maintaining and making space for flood flow pathways (i.e. between the River Yare and River Wensum);
2. Application of the sequential approach to site master planning;
3. Ground raising within Flood Zones 2, 3a and 3b to provide development platforms above the design flood level;
4. Provision of level-for-level floodplain storage compensation to mitigate the impacts of ground raising within the floodplain;
5. Raised floor levels, including a minimum freeboard of 300mm above the design flood level;
6. Elevated building floor slabs (i.e. allowing floodwater to enter the void beneath);
7. Flood resilient construction;
8. Provision of safe access/egress, dry vehicular access and dry refuge within buildings;
9. Car-parking areas elevated above the design flood level, including the use of geo-cellular systems that enable floodwater to pass beneath the finished car-park surface;
10. Vehicles moved off site should an extreme (0.1% probability) flood event be forecast;
11. Implementation of a flood warning and evacuation plan;
12. Incorporation of SuDS to manage the quantity and quality of surface water run-off arising from the development (post-development rate of run-off reduced by 30% compared to the pre-development rate and storage provided using below ground tanks with pumped outflows to the River Yare and River Wensum).

This (2023) assessment builds upon these established flood risk management design principles and, where practicable, sets out an improved design concept.

1.5 Planning conditions - Flood risk

Five conditions relating to flood risk and surface water drainage accompanied the outline consent for the site in 2013. This document aims to provide an evidence base to discharge the conditions set out in the 2013 outline planning permission.

Specifically, conditions 2, 10, 30, 31, 32 and 33 for Norwich City Council and conditions 3, 7, 23, 24 and 25 for South Norfolk Council (full wording is provided in Appendix B). In summary, the conditions are linked to the following:

- Flood risk related to development phasing and associated hydraulic structures such as bridges and culverts
- Off-site impacts and mitigation strategy
- Management of surface water flows
- Finished floor levels and flood resilient design.
- Sustainable drainage systems

2 Planning policy and strategic context

2.1 National Policy

2.1.1 National Planning Policy Framework

The NPPF, as revised 20th July 2021, sets out national planning policy with regards to development and flood risk. The accompanying PPG 'Flood Risk and Coastal Change' (discussed below) provides local planning authorities with guidance on implementation of the planning policy as set out in the NPPF.

The NPPF (Paragraphs 161-163) advocates use of the risk-based, sequential approach (which recognises that risk is a function of probability and consequence), in which new development is preferentially steered towards areas at the lowest probability of flooding. It also requires that new development should be planned to avoid increased vulnerability to the range of impacts arising from climate change. In respect of flood risk, paragraph 159 states that:

“Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere”.

The overall approach of the NPPF to flood risk is summarised in paragraph 167 of the document:

When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:

within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;

the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;

it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;

any residual risk can be safely managed; and

safe access and escape routes are included where appropriate, as part of an agreed emergency plan

2.1.2 Planning Practice Guidance

The PPG (Ministry of Housing, Communities and Local Government, 25th August 2022) defines the Flood Zones that provide the basis for spatial planning. The Flood Zones are defined as follows (PPG Table 1 Paragraph: 078 Reference ID: 7-078-20220825):

- Flood Zone 1: Low probability of flooding - less than 0.1% (1 in 1,000) annual probability of river or sea flooding in any year;
- Flood Zone 2: Medium probability of flooding - between 1% and 0.1% (1 in 100 and 1 in 1,000) annual probability of river flooding and between 0.5% and 0.1% (1 in 200 and 1 in 1,000) annual probability of sea flooding in any year;
- Flood Zone 3a: High probability of flooding - 1% (1 in 100) or greater annual probability of river flooding or 0.5% (1 in 200) or greater annual probability of sea flooding in any year; and
- Flood Zone 3b: The functional floodplain - where water from rivers or the sea has to flow or be stored in times of flood. The functional floodplain will normally comprise land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).

It should be noted that Flood Zones 1, 2 and 3a definitions ignore the presence of flood defences.

The 'Flood Risk and Coastal Change' PPG advocates the use of SuDS to reduce the overall level of flood risk. SuDS can reduce the causes and impacts of flooding, remove pollutants from urban run-off at source and combine water management with green space providing benefits for amenity, recreation and wildlife.

The NPPF (Paragraphs 153 and 154) and the 'Flood Risk and Coastal Change' PPG require that the spatial planning process should consider the possible impacts of climate change and contingency allowances are provided to enable impacts to be considered over the lifetime of the development.

2.1.3 Requirements for a Flood Risk Assessment

The requirements for an FRA are provided in the NPPF and associated PPG. The NPPF outlines that a site-specific FRA should be submitted as part of a planning application for all developments larger than 1 hectare in Flood Zone 1 or any sized development within Flood Zones 2 and 3 on the EA's Flood Map for Planning (FMfP). In this instance, the site lies within Flood Zone 1, 2 and 3 and as such, requires an FRA.

Paragraph 159 of the NPPF states that: "Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk (whether existing or future). Where development is necessary in such areas, the

development should be made safe for its lifetime without increasing flood risk elsewhere”.

FRA should describe and assess all sources of flood risk to, and from, the development and demonstrate how they will be managed, including consideration of the potential impacts of climate change (CC).

2.1.4 Sequential and exception tests

Paragraph 161 of the NPPF requires that the sequential approach is applied to steer new development to areas with the lowest risk of flooding.

Policy R9 of the Norwich Local Plan (adopted December 2014) identifies Deal Ground as a strategic regeneration site in east Norwich and allocates the site for a residential-led, mixed use development.

Paragraph 166 of the NPPF states: ‘Where planning applications come forward on sites allocated in the development plan through the sequential test, applicants need not apply the sequential test again.’

The Local Planning Authority has identified the site as suitable for development, the site selection process was informed by an evidence base comprising a Strategic Flood Risk Assessment and Outline planning permission was granted in 2013. It is not therefore necessary to apply the Sequential Test.

2.2 Local Policy

2.2.1 Joint Core Strategy (JCS) for Broadland, Norwich and South Norfolk

The JCS was prepared by Broadland, Norwich and South Norfolk Councils working with Norfolk County Council as the Greater Norwich Development Partnership. The Strategy was adopted in March 2011 and subsequent amendments adopted in January 2014.

The JCS comprises a 'high level' strategy and provides the framework for the development of each council's Development Plan. By identifying broad locations for growth and defining strategic policies, the Strategy sets out the long-term vision and objectives for the area.

Relevant area-wide policies include:

Policy 1 - addressing climate change and protecting environmental assets

Requires that development (i) is located to minimise flood risk, mitigating any such risk through design and implementing sustainable drainage, and (ii) minimises water use and protects groundwater sources.

Policy 2 - promoting good design

Requires that development is designed to avoid harmful impacts on key environmental assets and, in particular SACs, SPAs and Ramsar sites.

Policy 3 - energy and water

Requires that sufficient water infrastructure is in place to meet the demands of new development and that water quality is protected or improved. This includes improvements at the Whitlingham wastewater treatment works.

2.2.2 Norwich Local Plan

The development plan for Norwich comprises the Site Allocations Plan and the Development Management Policies Plan. The Site Allocations Plan sets out the spatial planning framework for Norwich to 2026. Policy R9 identifies 'The Deal Ground, Trowse', as an allocation for a major residential-led, mixed use development as part of the regeneration of the eastern fringe of Norwich. Policy R9 requires that development will:

be planned as an exemplar development providing for flood resilience including addressing identified risks from fluvial and surface water flooding, providing for sustainable drainage

The Development Management Policies Plan sets out local standards and criteria against which planning applications for the development and use of land and buildings will be assessed. The policies relevant to this FRA are summarised as follows:

Policy DM1 - achieving and delivering sustainable development

Sets out the development principles for Norwich and requires that development proposals combat the effects of climate change.

Policy DM5 - planning effectively for flood resilience

This policy requires that all sources of flooding are considered and that development proposals are supported by an FRA prepared in accordance with the NPPF. It also requires that Sustainable Drainage measures (SuDS) are used to manage surface water run-off arising from development and, where possible and practicable, reduce flood risk within the surrounding area.

Policy DM6 - protecting and enhancing the natural environment

Requires that development proposals take all reasonable opportunities to avoid harm to and protect and enhance the natural environment, taking particular account of the need to avoid harm to the adjoining Broads Authority Area.

Policy DM11 - protecting against environmental hazards

This policy requires that proposals falling within designated groundwater source protection zones incorporate mitigation measures to mitigate the risk of pollution of the water source.

2.2.3 South Norfolk Local Plan

The Local Plan comprises the Site Specific Allocations and Policies Document and Development Management Policies Document. Guided by the Joint Core Strategy, it designates areas of land to deliver housing, employment, recreation, open spaces and community uses. Together with the other documents that make up the Development Plan it is used to assess planning applications and guide development proposals. The documents were formally adopted on 26 October 2015 and cover the period up to 2026.

The Site Specific Allocations and Policies Document identifies the former May Gurney site as a 'committed site' (reference 2011/0152). The Development Management Policies Document is used 'to help determine how the Council carries out its development management responsibilities to promote sustainable development and how it will determine all planning applications'. The policies are framed around three 'dimensions' (economic, social and environmental) and those relevant to this FRA are summarised as follows:

Policy DM 1.3 - the sustainable location of new development

Requires that new development is located so that it contributes to sustainable development and is located on allocated sites or within the development boundaries of settlements.

Policy DM 4.2 - sustainable drainage and water management

Requires that SuDS are incorporated within development proposals, that they contribute to amenity and biodiversity and that measures are included to manage water quality.

Policy DM 4.4 - natural environmental assets - designated and locally important open space

Requires that development contributes to the improvement of natural environmental assets, including opportunities for establishing biodiversity enhancement areas and multi-functional green infrastructure networks.

2.2.4 Greater Norwich Local Plan (GNLP)

Norwich City Council is working with Broadland District Council and South Norfolk Council to develop a joint strategic plan (the GNLP) for the period to 2038. The GNLP identifies the strategy for growth, the sites to deliver growth and will be used to assess

planning applications. When adopted, the GNLP will replace the local plans in each of the three districts.

A pre-submission draft plan was published in February/March 2021 and includes the following:

Policy 2 (sustainable communities), which requires that:

flood risk should be minimised, including avoiding inappropriate development in areas at significant risk of flooding, reducing the causes and impacts of flooding, supporting a catchment approach to water management and using sustainable drainage.

development must protect water quality, both surface and groundwater.

Policy 7 (strategy for areas of growth) identifies the East Norwich Strategic Regeneration Area (ENSRA), which includes Deal Ground and May Gurney, as a key area of future growth and requires that it includes:

flood resilient design which addresses identified risks from river and surface water flooding

As part of the development of the GNLP, a draft Supplementary Planning Document (May 2022) has been prepared to provide planning and design guidance for the ENSRA and provide a framework for the preparation and assessment of future planning applications. This identifies measures to manage flood risk, including raising ground levels above the design flood level and providing floodplain storage compensation to mitigate the impacts of ground raising in the floodplain (this being the design approach set out in the FRA (2010) prepared in support of the outline planning application).

2.3 Flood Risk Evidence Base Studies

2.3.1 Greater Norwich Area Strategic Flood Risk Assessment (SFRA) - Level 1 (November 2017)

The Level 1 SFRA was prepared to support decision-making on local plan site allocations and support the determination of planning applications across the Broadland District, Norwich City and South Norfolk Council areas.

The study was based upon a combination of Environment Agency flood maps (tidal, fluvial, reservoir and surface water), data derived from hydraulic models, the Areas Susceptible to Groundwater Flooding dataset and historic flood data.

The SFRA flood mapping indicates that the County Wildlife Site is located almost entirely within Flood Zone 3 (High Probability). However, that part of Deal Ground identified for development (i.e. outside the CWS) falls largely within Flood Zone 1 (Low Probability) and Flood Zone 2 (Medium Probability), with limited areas within the northern area of Deal Ground adjacent to the River Wensum located in Flood Zone 3.

The former May Gurney site is shown to be unaffected by Flood Zone 3 and comprises areas within Flood Zones 1 and 2.

2.3.2 Greater Norwich Level 2 Strategic Flood Risk Assessment (SFRA) (February 2021)

The Level 2 SFRA was undertaken to support application of the NPPF Exception Test, considered 26 proposed development sites and included flood risk data published following completion of the Level 1 study.

A detailed summary table is presented for each site (including the Deal Ground and May Gurney site - site reference GNLPO360), setting out the nature of risk associated with all sources of flooding, the potential implications of climate change and the opportunities for SuDS measures to manage surface water run-off. A copy of the summary table is included within Appendix C of this FRA and indicates that 38% of the site lies within Flood Zone 1, 62% lies within Flood Zone 2 and 44% lies within Flood Zone 3 (noting that the figure quoted for Flood Zone 2 includes the area within Flood Zone 3).

In terms of surface water flood risk, the summary table indicates that only very limited and localised areas (comprising 4% of the site) are affected by flooding. The study refers to the Areas Susceptible to Groundwater Flooding dataset and notes that:

The majority of the site has a >75% susceptibility to groundwater flood emergence from superficial deposits; and

The southern part of the site has a >50% to <75% susceptibility to groundwater flood emergence from superficial deposits

The SFRA notes that Environment Agency records show the site to have been affected by flooding in 1912.

The SFRA concludes that development of the Deal Ground and May Gurney site is likely to be feasible, subject to, inter alia '...integrated flood resilient and sustainable drainage design...with habitable floor levels above the fluvial design flood event taking into account climate change', consideration of safe access and egress during flood conditions and a flood warning and evacuation plan being prepared.

2.3.3 Greater Norwich Water Cycle Study (March 2021)

The study reviews planned future growth within the context of water supply capacity, wastewater treatment capacity, water quality, flood risk, surface water drainage and aquatic ecology and identifies the water services infrastructure required to support growth.

In respect of flood risk, the study refers to Environment Agency flood mapping at <https://flood-map-for-planning.service.gov.uk/> and <https://check-long-term-flood-risk.service.gov.uk/>. For the Deal Ground and May Gurney site (site reference

GNLP0360), the study notes that 37% of the site lies within Flood Zone 1, 20% within Flood Zone 2 and 43% within Flood Zone 3 and that 4% of the site is at a low risk of surface water flooding.

In terms of surface water management, the study recommends that SuDS are implemented as part of new development to reduce run-off rates to as close to greenfield rates as possible.

2.4 Climate change

This FRA will consider an allowance for climate change to help provide resilience to flooding and minimise the vulnerability of the development now and into the future. All climate change values used in this FRA have been taken from the EA Guidance titled Flood Risk Assessments: Climate Change Allowances (February 2016 updated May 2022) at www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances.

2.4.1 Climate change - Tidal

The tidal climate change allowances for the Anglian Region are provided in Table 2-1. Although the full effect of sea level rise will not be felt at the site due to its inland location, sea level rise will still impact future flood risk in Norwich. Therefore, an assessment of tidal flood risk in isolation and coupled with fluvial flood risk has been undertaken as part of this study.

Table 2-1: Climate Change - Tidal Allowances

Allowance	2000 to 2035 (mm)	2036 to 2065 (mm)	2066 to 2095 (mm)	2096 to 2125 (mm)	Cumulative rise 2000 to 2125 (metres)
Higher central	5.8 (203)	8.7 (261)	11.6 (348)	13 (390)	1.20
Upper end	7 (245)	11.3 (339)	15.8 (474)	18.1 (543)	1.60

2.4.2 Climate change - Fluvial

Table 2-2 indicates the recommended peak river flow uplifts for climate change for the Broadland Rivers Management Catchment. In accordance with current EA guidance on considering climate change in FRAs, the central allowance (11%) should be used for proposed developments classed as More Vulnerable in Flood Zone 3a.

It is worth noting that these values differ to those used in the Greater Norwich SFRA. This difference has arisen because the EA climate change guidance for Flood Risk Assessments was revised following completion of the SFRA. For this assessment the most up to date values have been used.

Table 2-2: Climate Change - Fluvial allowances

Allowance category	Total potential change anticipated for '2020s'	Total potential change anticipated for '2050s'	Total potential change anticipated for '2080s'
Central	8%	3%	11%
Higher	14%	10%	20%
Upper	27%	27%	44%

2.4.3 Climate change - Rainfall

Norwich lies within the Broadland Rivers Management Catchment and the rainfall allowances for the region are shown in Table 2-5. The rainfall allowances, unlike the fluvial allowances, are split into the 3.3% AEP and 1.0% AEP events. The 1% AEP rainfall allowance shows a reduction in the climate change allowance between the 2050s and 2070s epoch, which is caused by rounding in the calculation of the allowances. Despite the lower 2070s allowance, the conservative 45% will be used, as confirmed by the LLFA.

Table 2-3: Climate change - Rainfall Allowances

Epoch	Central	Upper End
3.3%AEP		
2050s	20%	40%
2070s	20%	40%
1%AEP		
2050s	20%	45%
2070s	20%	40%

3 Baseline environmental conditions

3.1 Current land use

The site consists of the following current land uses (Figure 3-1):

- To the north along the River Wensum a series of former warehouses/factory buildings which have now been demolished and the concrete flooring broken up.
- In the centre of the site this area consists of grass and woodland. In this area it forms the edge of the County Wildlife Site (CWS).
- To the south of the River Yare this part of the site is considered fully brownfield and is made up of the former May Gurney headquarters. The majority of this part of the site is covered by impermeable surfaces and served by a drainage system of pipes discharging directly to the river.
- An access track runs through the Deal Ground site providing access to a yacht club located at the confluence of the River Wensum and Yare.

3.2 Topography

The following topographic information is available for the site (Table 3-1)

Table 3-1: Topographic Data Sources

Data Type	Description / Source
LiDAR	National LiDAR programme 1m resolution ¹
Topographic Survey	Survey Solutions - July 2022 - 42887IPLS-01-11.dwg

The site is relatively low lying with average elevations of between 1.84mAOD and 2.20mAOD at Deal Ground and May Gurney respectively. Highest elevations are located along the western boundary of The Views and across through the Wensum Edge. Along the most northern boundary adjacent to the River Wensum, elevations are generally 1.10-1.70mAOD. The lowest elevations in the vicinity of the site are in the CWS lying at approximately 0.51mAOD (Figure 3-2).

The LiDAR data shows good correlation with the site-specific survey. A comparison plot is provided in Appendix D.

¹ DEFRA Data Services - <https://environment.data.gov.uk/DefraDataDownload/?Mode=survey>



Figure 3-1: Current land use (Google Maps)

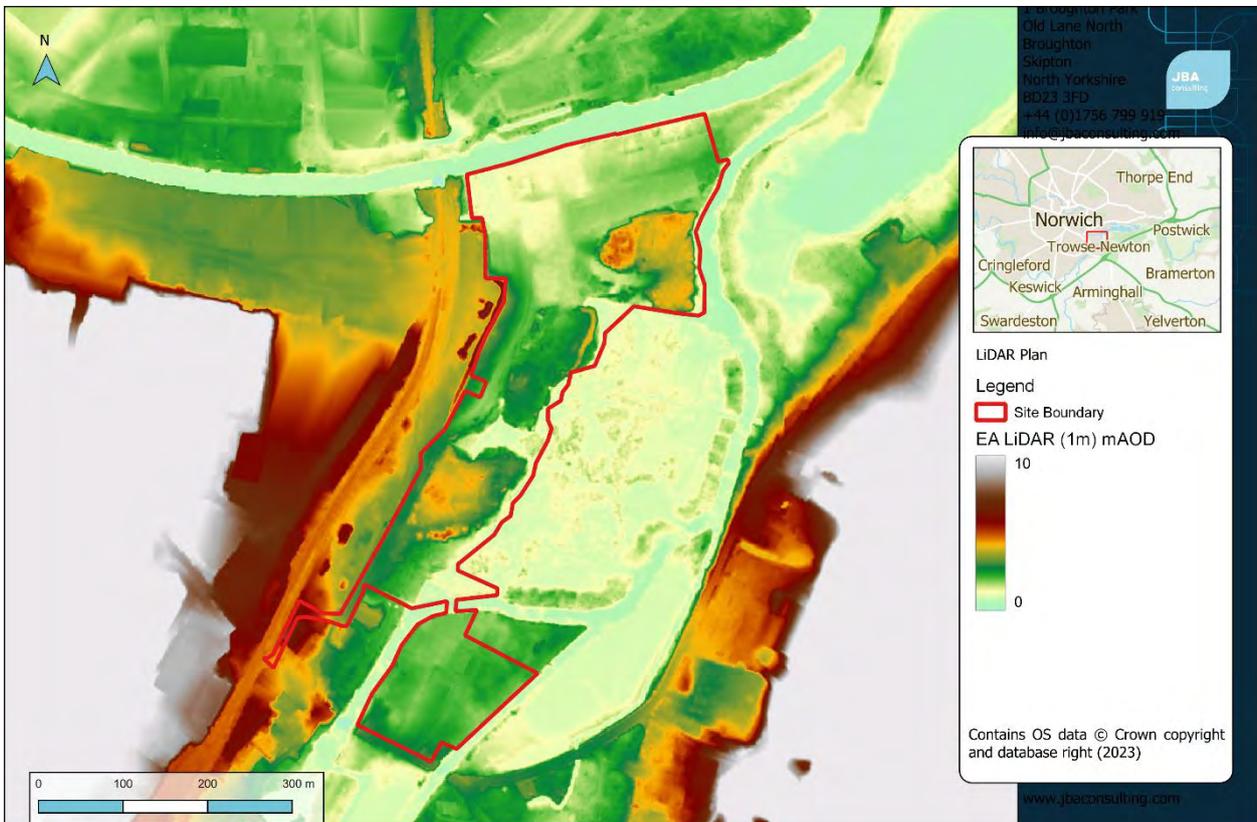


Figure 3-2: Topography (LIDAR 1m Resolution)

3.3 Waterbodies

3.3.1 Wider context

Overall, the Wensum is a low gradient, groundwater dominated river, which has a natural channel with extensive low lying floodplain areas. All surrounding watercourses are shown in Figure 3-3. A network of artificial drainage channels run parallel to the river draining the floodplain and discharging into the river at various locations to allow the land to be operated for farming. A series of mills and water control structures affect water levels upstream and within Norwich.

The underlying geology of the catchment is predominantly chalk. The superficial geology is mainly formed by Till Diamicton, with glacial sand and gravel, and sand and clay from the Crag formation concentrated in the area of Norwich and at the confluence with the River Tas. The distribution of the superficial deposits makes the upper part of the catchment more permeable than downstream areas.

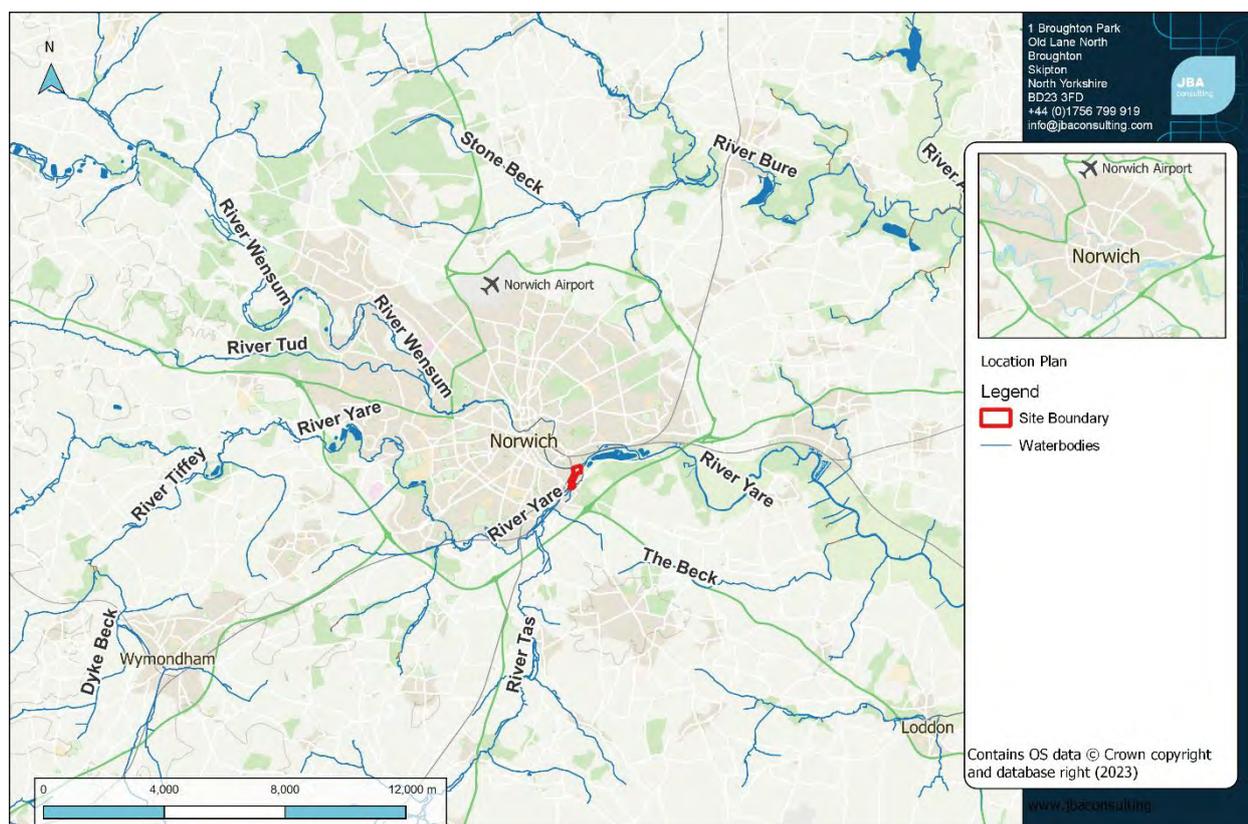


Figure 3-3: Water bodies (Regional)

3.3.2 Local

The site is bounded to the north by the River Wensum and to the South / East by the River Yare. A series of minor ditches exist with the CWS adjacent to the site. To the East of the site lies Whitingham Broads two large waterbodies.

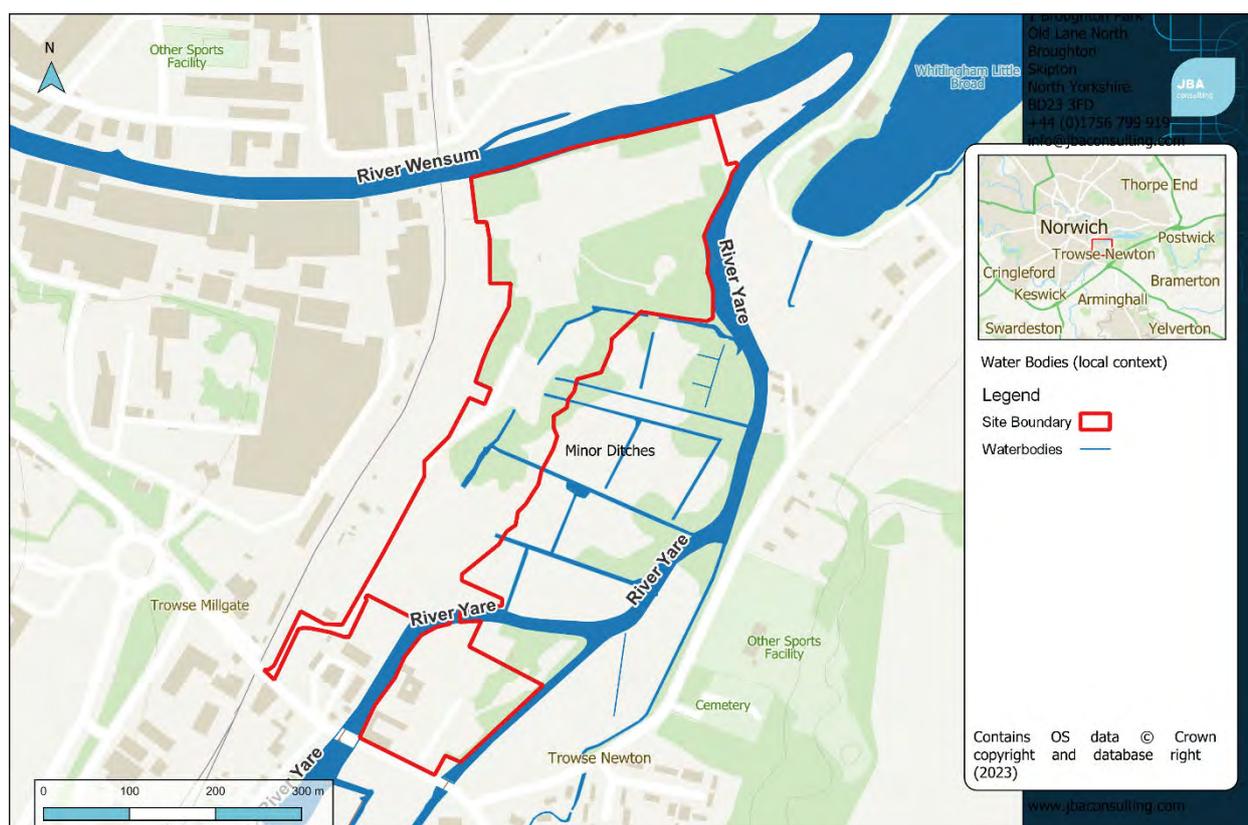


Figure 3-4: Water bodies (local)

3.4 Coastal

Although Norwich is located some 30km inland from the coast, tidal influences are still seen within Norwich. The range of fluctuation in Norwich (Carrow Bridge immediately upstream of the site on the River Wensum) is approximately 600mm due to the tidal influences. When the Mean High Water Springs occurs on the coast (Great Yarmouth) the tide level is in the region of 1.3-1.4mAOD on the coast and this equates to a level of 0.8-0.9mAOD at Norwich.

3.5 Geology and hydrogeology

The British Geological Survey (BGS)² Geology of Britain viewer shows that the site's bedrock derives from various types of chalk from the cretaceous period formed some 72.1 - 93.9million years ago. The types of chalk include; Lewes Nodular Chalk, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk Formations. The viewer also indicates superficial alluvial deposits of clay, silt, sand and gravel formed between 11,000 years ago and the present day (quaternary period). The chalk is classed as a Principal Aquifer and alluvium deposits considered a Secondary A aquifer.

² <https://mapapps.bgs.ac.uk/geologyofbritain/home.html>

Information from Soilscapes³ shows soils in the area are loamy, sandy and contain a high peat content. The soils have a high groundwater with a high-water table leading to typically wet soil conditions.

3.6 Designations

The site lies on the edge of the Broads National park. In addition, there are a number of potentially water sensitive sites in the vicinity of the site. These include Local Nature Reserves, SSSIs and heritage assets such the Bottle Kiln located on site (Figure 3-5).

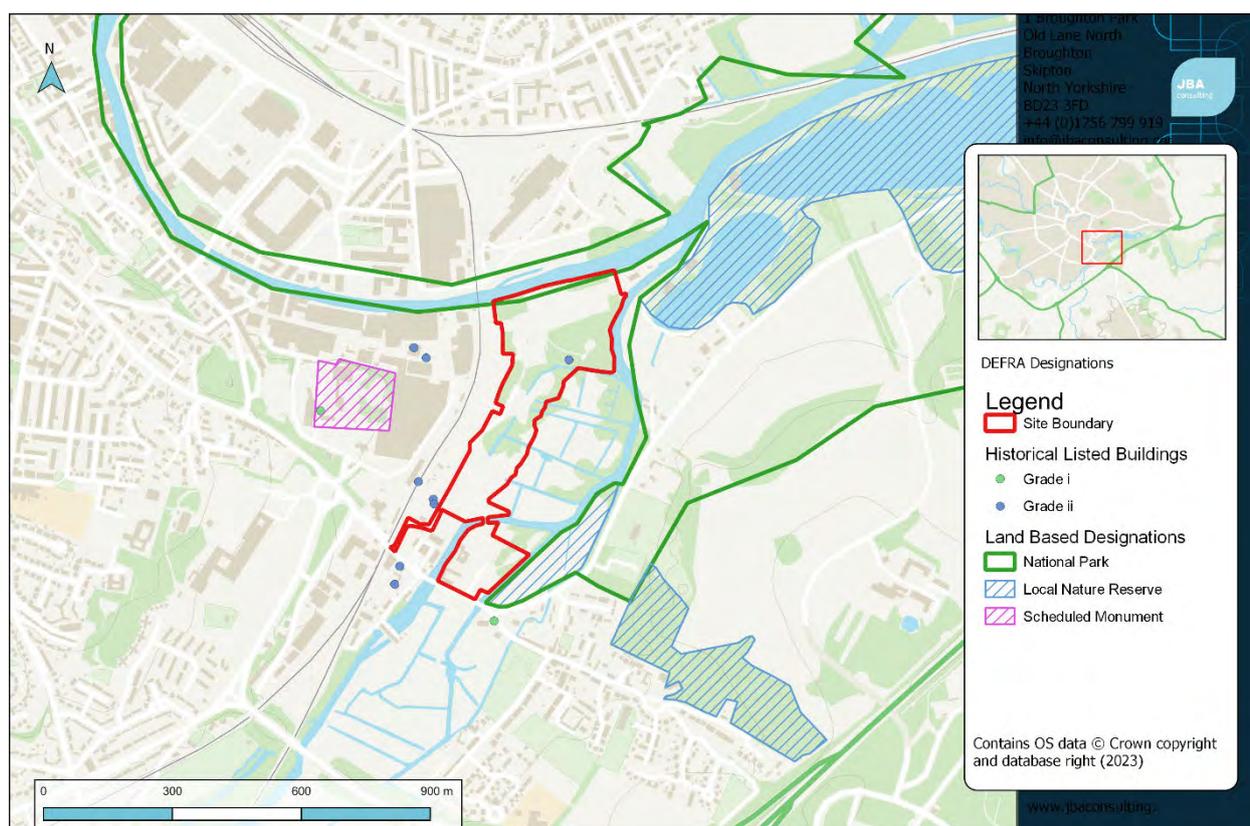


Figure 3-5: Natural England Designations (MAGICmap)

3.6.1 Habitats & Species

The following priority habitats are found at the site:

- Lowland Fens (England)
- Deciduous Woodland (England)

Full ecological and arboricultural assessments have been carried out for the site and should be referred to for further information.

³ <http://www.landis.org.uk/soilscapes/>

4 Consultation and Data Request

4.1 Overview

The following organisations were consulted as part of the FRA process:

- Environment Agency
- Norfolk County Council as Lead Local Flood Authority and Highways Authority
- Internal Drainage Board - Norfolk Rivers Internal Drainage Board

4.2 Environment Agency

A meeting was held on the 12 January 2023 to discuss the latest development proposals and the 2013 application within the context of current flood policy and guidance. Hydraulic modelling requirements were also discussed. The meeting was attended by the following members of the EA:

- Ed Abigail
- Sarah Palmer

At the time of writing, no formal response has been provided by the EA regarding the EIA scoping request of September 2022 (scoping opinions: 22/01225/EIA2 Norwich City Council and 2022/1847 South Norfolk Council).

4.3 Local lead Flood Authority

Norfolk County Council acting as LLFA were consulted as part of the FRA process. The following responses were received from the LLFA and full documentation is provided in Appendix E.

- EIA Scoping opinion (October 2022)
- Updated EIA Scoping opinion (March 2023)
- Response to Design Code (March 2023)

In addition, a meeting was held between the design team and the LLFA on the 11 April 2023 and the accompanying meeting minutes are provided in Appendix E.

5 Preliminary Assessment - Baseline

5.1 Overview

This section provides an overview of baseline flood risk data from all sources including flood history information. This section defines the criteria for detailed analysis undertaken later in the report.

5.2 Flood history

The following flood history information has been collated from various sources (Table 5-1). Based on latest estimation techniques, the flood of 1912 has an estimated rainfall design event more than 1000-years⁴. Table 5-1 provides a summary of the largest flood events experienced in Norwich and the Norfolk area.

Table 5-1: Flood History information⁵

Date	Event description
August 1912	186mm of rainfall in 29 hours. At Hellesdon Mill, located at the Tud Wensum confluence, flood levels reached the soffit of Hellesdon Bridge Road (5.27mAOD). A maximum level between 4.67mAOD (New Mills) and 2.35mAOD at Carrow lifting bridge were recorded in Norwich. Local news reported that about 15,000 people lost property in the disaster and 42 bridges were destroyed. The districts of Heigham and Coslan in the west of the city were the most affected by the flood.
October 1993	This was a combined fluvial/ tidal event which caused flooding all over the North Norfolk area. Flooding was noted along the Wensum and Wendling Beck at several properties between Fakenham and Costessey. Locations affected by the flooding include: Great Ryburgh , Lyng Lenwade, Hellesdon, Wendling
January and February 2007	Combined surface water and fluvial flooding. Flooding at a mobile phone mast near Fakenham Road was reported.
June 2007	Surface water event. Flooding was reported at Fakenham and in the surrounding areas of Colkirk, Stibbard and Kettlestone.

⁴ Calculated using FEH Web Service rainfall event rarity estimator using FEH22 rainfall data.

⁵ Jacobs (2017) Hydraulic Modelling Report

Date	Event description
May and July 2014	A series of rainfall events resulting in flooding to 80 properties within the Norwich urban area, of which two severe events occurred on the 27th of May and the 20th of July 2014, causing the most impact to people, property and infrastructure. These events are most likely attributable to surface water flooding.
December 2020	Largest flow on the River Yare since recording began. However, there was limited flooding experienced.

5.3 Fluvial, surface water, coastal and reservoir flood risk

5.3.1 Environment Agency Flood Map for Planning

The EA FMfP shows the site is located in Flood Zones 1, 2 and 3. Flood Zones are based on the output from the EA's hydraulic model for Norwich which was last updated by CH2M (now Jacobs) in 2017 (Figure 5-1).



Figure 5-1: EA Flood Map for Planning

5.3.2 Flood defences

The EA AIMS (Asset Information Management System) Database was inspected for the presence of flood defences in the vicinity of the site. The database confirmed there are no formal defences that protect the site from fluvial / tidal flooding.

5.3.3 Environment Agency Flood Map for Surface Water

The EA's Risk of flooding from Surface Water map (RoFSW) is shown in Figure 5-2. The mapping shows that most of the Deal Ground and the former May Gurney sites are at 'Very Low' risk of surface water flooding. The map identifies a very limited number of isolated and very localised areas at medium and low risk of surface water flooding. Due to the surrounding topography being relatively flat, there is little opportunity for surface runoff to enter and/or flow through the site.

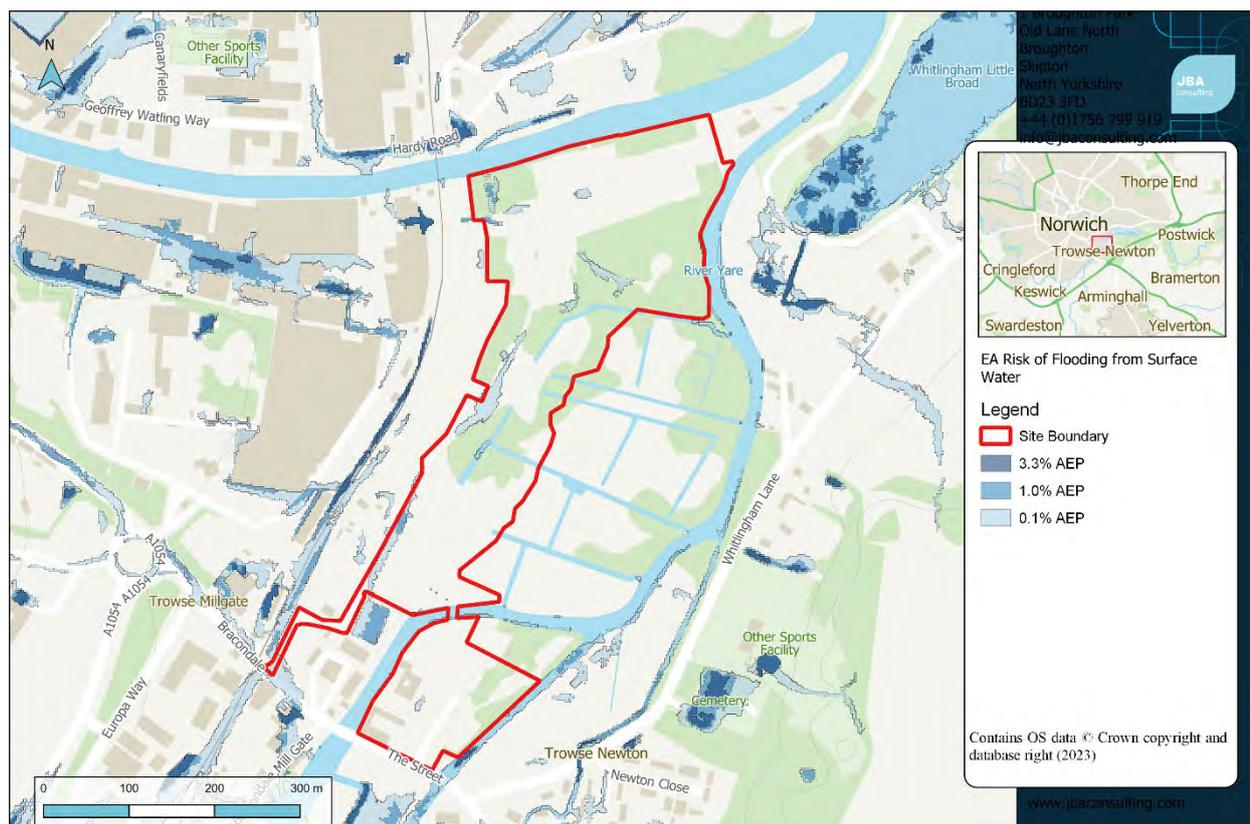


Figure 5-2: EA Risk of Flooding from Surface Water

5.3.4 Environment Agency Reservoir Inundation Map

According to EA records the nearest reservoir is located approximately 16km to the north-west of Deal Ground. The EA's inundation map (Figure 5-3) shows that, when river levels are normal, neither Deal Ground nor the former May Gurney site are affected by reservoir flooding. The mapping shows that under conditions when there is also flooding from rivers, the entirety of the former May Gurney site may be affected by reservoir flooding. Whilst much of the Deal Ground site is also affected by reservoir flooding when there is also flooding from rivers, a corridor along the western edge adjacent to the railway is shown to be unaffected.

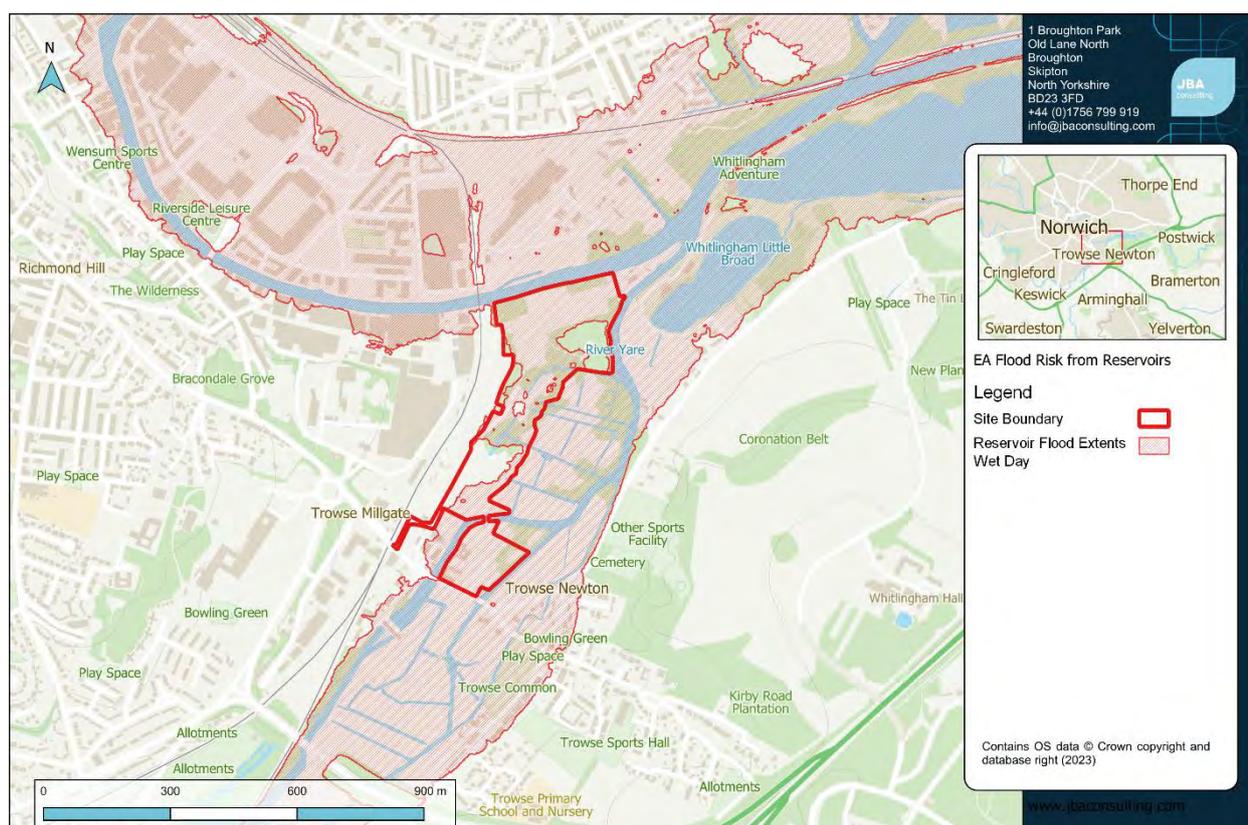


Figure 5-3: EA Risk of Flooding from reservoirs

5.3.5 Groundwater

The EA's Groundwater Vulnerability Map shows the site to be located within a 'high risk' area where solution features may be present. The site is located in Groundwater Source Protection Zone 1.

Following ground investigations and groundwater monitoring in 2021, groundwater was recorded at depths of approximately 1m below the ground surface.

The Greater Norwich Level 2 Strategic Flood Risk Assessment (February 2021) refers to the Areas Susceptible to Groundwater Flooding dataset and notes that (i) the majority of the site has a >75% susceptibility to groundwater flood emergence from superficial deposits and (ii) the southern part of the site has a >50%-<75% susceptibility to groundwater flood emergence from superficial deposits.

Further information can be found in the ground investigation report found in Appendix F.

6 Detailed Assessment - Baseline

6.1 Overview

As set out above, the site was granted outline planning permission for mixed-use development in 2013. The application was supported by an FRA prepared by Total Flood Solutions Limited and DBR Associates Limited (November 2010). For this site specific FRA, in support of discharge of conditions, the flood extents presented in the 2010 FRA have been updated based upon analysis using the latest hydraulic models.

6.2 Definition and Guidance changes

Since the approval of the outline consent there have been the following changes to flood risk definitions and guidance which have been applied to update understanding of baseline flood risk:

1. Flood Zone 3b - In 2013 Flood Zone 3b was delineated using the 5%AEP flood extent. This has subsequently been updated to the 3.3%AEP flood extent.
2. Climate change - There have been several changes to how climate change is assessed. Latest values as stated in chapter 2 have been applied to output presented in this FRA.

6.3 Hydraulic modelling

6.3.1 Overview

A site-specific model was created using the EA's Norwich Hydraulic Model (CH2M, 2017) and the Broadland Environmental Services Limited model (BESL) (Jacobs, 2019). The two models were truncated and merged to best represent the flood mechanisms at the site with the data available. A full description of the model and associated updates is included in the accompanying hydraulic model build and justification document in Appendix G.

6.3.2 Site specific model updates

A full review of the hydraulic model supplied by the EA was conducted as part of the project. The review identified several sources of uncertainty within the modelling analysis. The sources of uncertainty and measures taken to resolve them are included in Table 6-1.

Table 6-1: Model Update Summary

Model Attribute	Review comment	Model update (2023)
Model Instability	Model instability was identified in the upper reaches of the Wensum model.	The reach affected is located a significant distance from the site and the model could therefore be truncated to improve the overall stability of the model.
LiDAR	The LiDAR in the Wensum model is dated 2009/2011 and therefore needed to be updated to represent changes to the ground level.	The model LiDAR was updated to National Plan 2021 1m LiDAR. This dataset is more recent and is of a higher resolution.
Model schematisation	Several aspects of the model schematisation were noted to be incorrect. There were several areas where the 1D-2D connections were not located on the bank top. Some bridge decks had been included in both the 1D and 2D domains.	The 1D-2D connections were updated to match bank tops according to the 2021 LiDAR and the 1D cross-section data. Bridge decks were modified and represented in the 1D domain only.
Roughness	There is widespread use of 0.03 roughness across the 2D domain which did not accurately represent the variety of land uses within the catchment.	The material layer now has 20 unique land use categories. The data is from OS Master Map mapping.
Missing Flow routes	There is no flow route connection between the Whitlingham Little and the Great Broads	Whitlingham Broads now represented in the 2D domain and therefore intrinsically connected.
Boundary Conditions	Downstream boundary was located close to the site.	Downstream boundary now moved 19km downstream of site. BESL model used as an extension.

6.3.3 Climate change allowances

The climate change allowances for the fluvial and tidal inflows are defined in Table 2-2 and Table 2-1. Where fluvial climate change has been applied to the model, all fluvial inflows have been increased by 11% (Central 2080s). Further details of the model inflows are included in Appendix G. The tidal influences have been derived from the Jacobs BESL model. Sea level rise was applied along the open coast and the model run to derive levels further inland to allow for future sea level rise.

6.3.4 Updated approach - Downstream boundary

Initial model runs highlighted the influence of the downstream boundary on flood levels at the site. The downstream boundary is for the model used in this study is calculated using the BESL model. To avoid ambiguity in relation to the downstream boundary the model was extended 19km downstream at Reedham. Updated levels were extracted from the BESL model and applied to the study model. Further information is provided in Appendix G.

6.3.5 Joint probability

Previous studies stated that the equal probability of the same magnitude events on the Wensum and Yare is likely to be conservative. This assumption has been retained for this study.

6.4 Flood Extents

6.4.1 Flood Extents - Present Day

The baseline flood extents for the 3.3%, 1% and 0.1% AEP are shown in Figure 6-1. The results show that parts of the Deal Ground experience flooding during a 3.3% and 1%AEP events. May Gurney site experiences the onset of flooding in the 0.1%AEP event. The lower lying areas of the County Wildlife Site (CWS) are completely inundated in the 50%AEP event. The present-day baseline also shows flow routes that connect the Wensum Edge to the CWS flow route behind an area of raised ground along the western boundary during the 1%AEP as well as 0.1% AEP events.

6.4.2 Flood Extents - Climate change

The baseline climate change flood extents are shown in Figure 6-2. This gives a representation of future flood extent (2100s) for present day site conditions. The area of the site that is most impacted by climate change is the Wensum Edge where the extent of the 3.3% CC event and the 1%AEP + CC11% are increased (Figure 6-2).

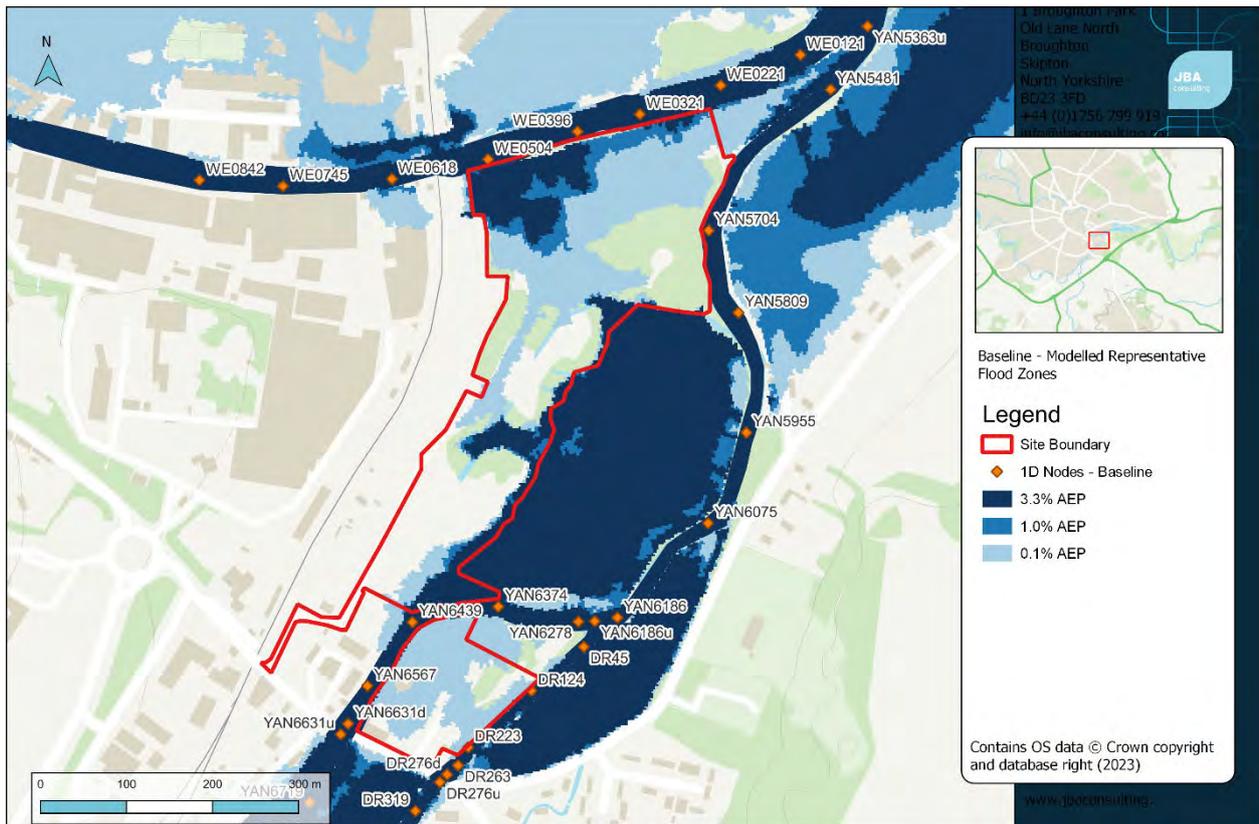


Figure 6-1: Baseline flood extents - Present Day

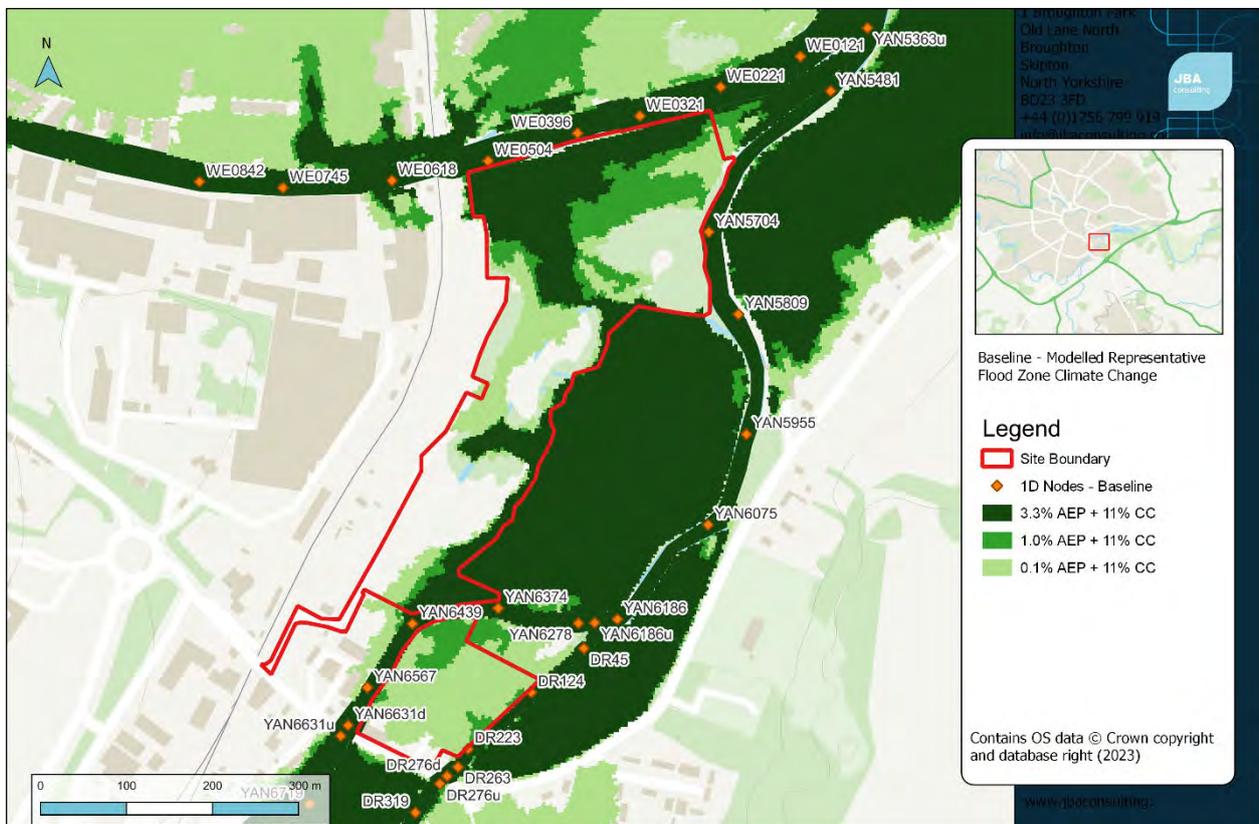


Figure 6-2: Baseline flood extents - Climate Change

6.4.3 Flood Levels

The modelled flood levels are shown in Table 6-3 and Table 6-4 for the present day and climate change events accordingly. A model node plan is shown in Figure 6-1. The average ground elevations within the site vary from 0.51 - 6.85mAOD with lowest elevations found in in the CWS and along the edge of the River Wensum.

The climate change events show an expected increase compared to present-day flood levels with the difference ranging from 0.22m - 0.34m in all events. The difference is greatest along the edge of the River Wensum.

Table 6-2: Maximum Flood Levels (Present Day) (mAOD)

Node	3.3%AEP	1%AEP	0.1%AEP
YAN6567	1.69	1.85	2.30
YAN6439	1.60	1.80	2.26
YAN6186u	1.60	1.78	2.25
YAN5955	1.55	1.74	2.24
YAN5704	1.52	1.68	2.21
YAN5363u	1.44	1.62	2.19
WE0504	1.46	1.65	2.24
WE0221	1.46	1.63	2.19

Table 6-3: Maximum Flood Levels (Climate change) (mAOD)

Node	3.3%AEP CC	1%AEP CC	0.1%AEP CC
YAN6567	1.87	2.06	2.51
YAN6439	1.85	2.03	2.48
YAN6186u	1.84	2.02	2.48
YAN5955	1.82	2.00	2.48
YAN5704	1.79	1.98	2.47
YAN5363u	1.77	1.96	2.43
WE0504	1.78	1.99	2.47
WE0221	1.77	1.96	2.44

Table 6-4: Level increase (m) due to climate change

Node	3.3%AEP / CC	1%AEP / CC	0.1%AEP / CC
YAN6567	0.18	0.21	0.21
YAN6439	0.25	0.22	0.22
YAN6186u	0.24	0.24	0.22
YAN5955	0.27	0.26	0.25
YAN5704	0.27	0.30	0.26
YAN5363u	0.33	0.34	0.24
WE0504	0.32	0.34	0.23
WE0221	0.31	0.34	0.24

6.5 Flood Depths

The flood depths for the 3.3%AEP and 1%AEP climate change events are shown in Figure 6-3 - 6-6 and depth statistics are provided in Table 6-5 and Table 6-6.

The main area of interest regarding depth is within the Wensum Edge, as overland flows are experienced within this area of the site. Elsewhere, depth statistics are skewed by low lying levels with the CWS and river channels.

The tables show that there are large discrepancies between the average and maximum flood depths, this is attributed to local depressions in the floodplain.

Table 6-5: Baseline - Flood Depth Statistics

	Average Depth (m)		Maximum depth (m)	
	3.3%AEP	1%AEP	3.3%AEP	1%AEP
Wensum Edge	0.15	0.27	0.66	0.87

Table 6-6: Baseline - Flood Depth Statistics - Climate Change

	Average Depth (m)		Maximum depth (m)	
	3.3%AEP	1%AEP	3.3%AEP	1%AEP
Wensum Edge	0.32	0.39	0.97	1.15

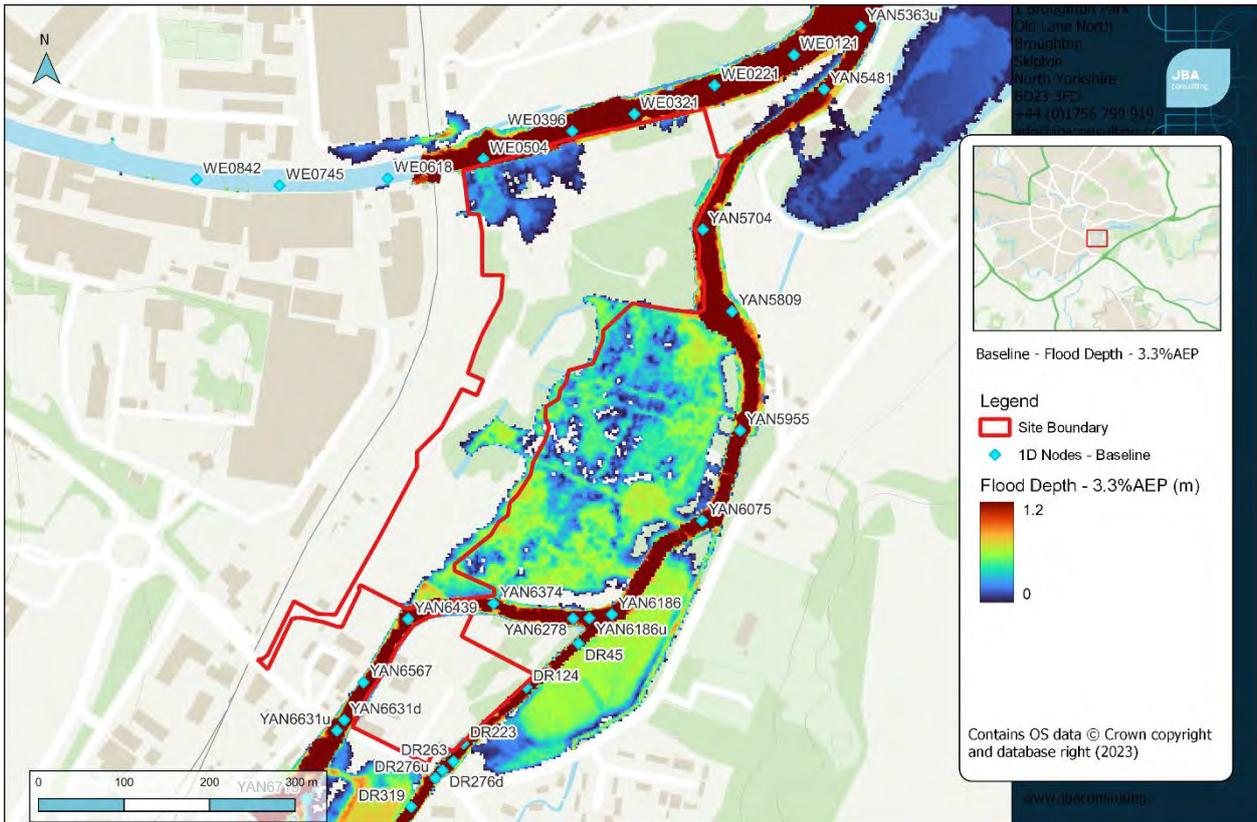


Figure 6-3: Flood Depths - 3.3% AEP

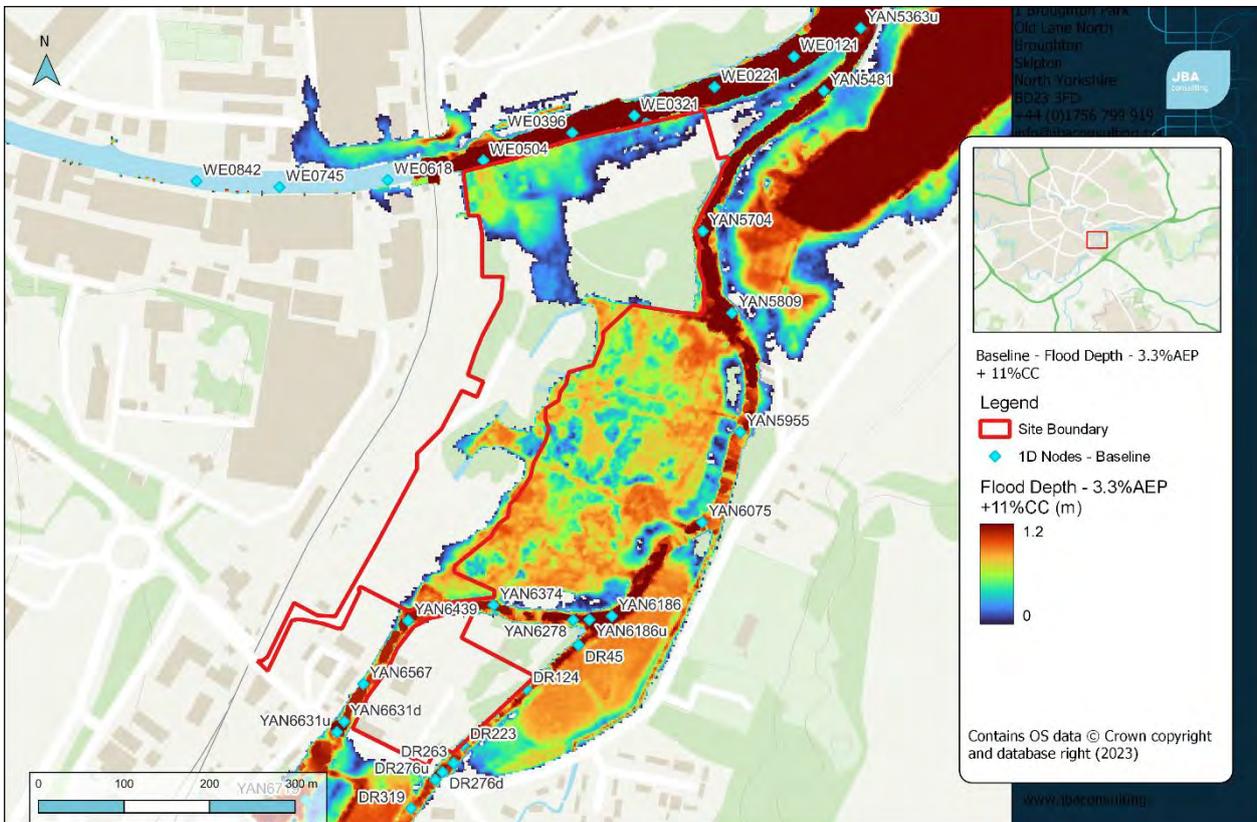


Figure 6-4: Flood Depths - 3.3% AEP + CC11%

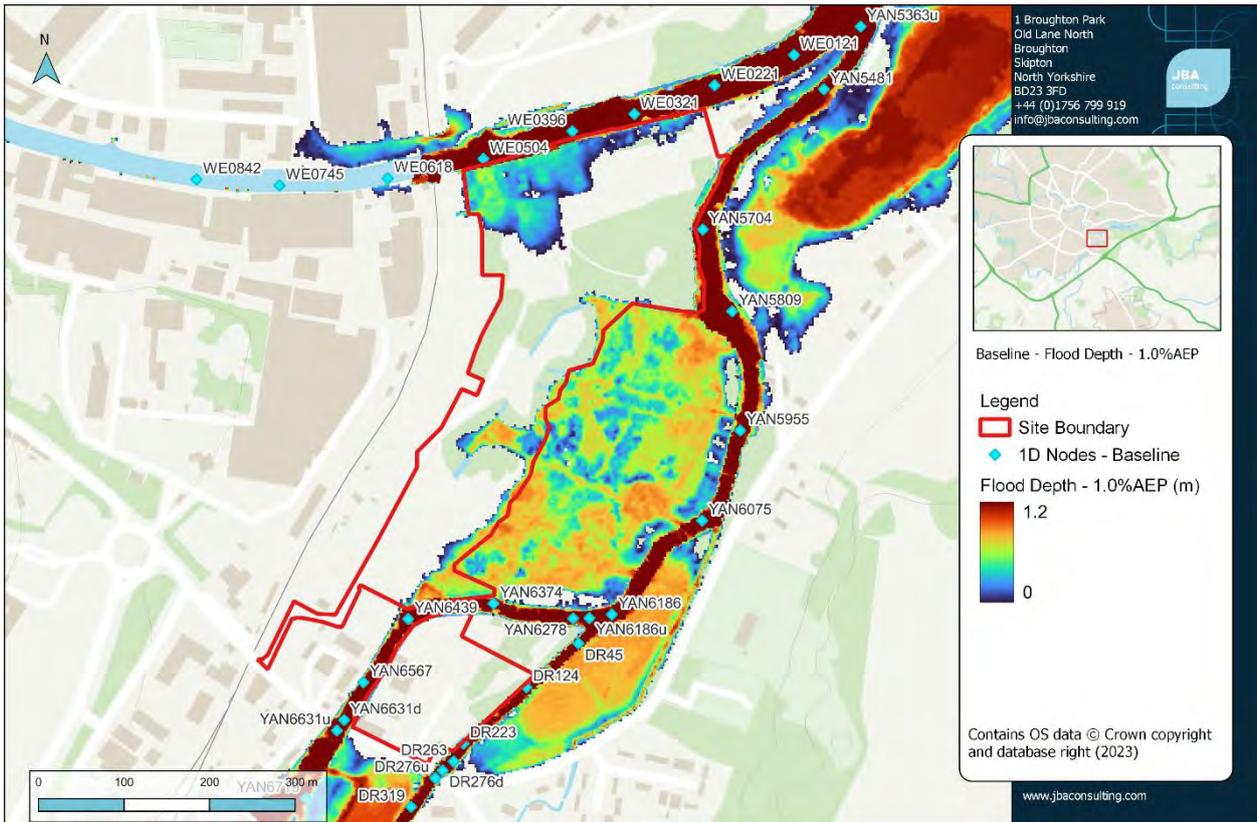


Figure 6-5: Flood Depths - 1% AEP

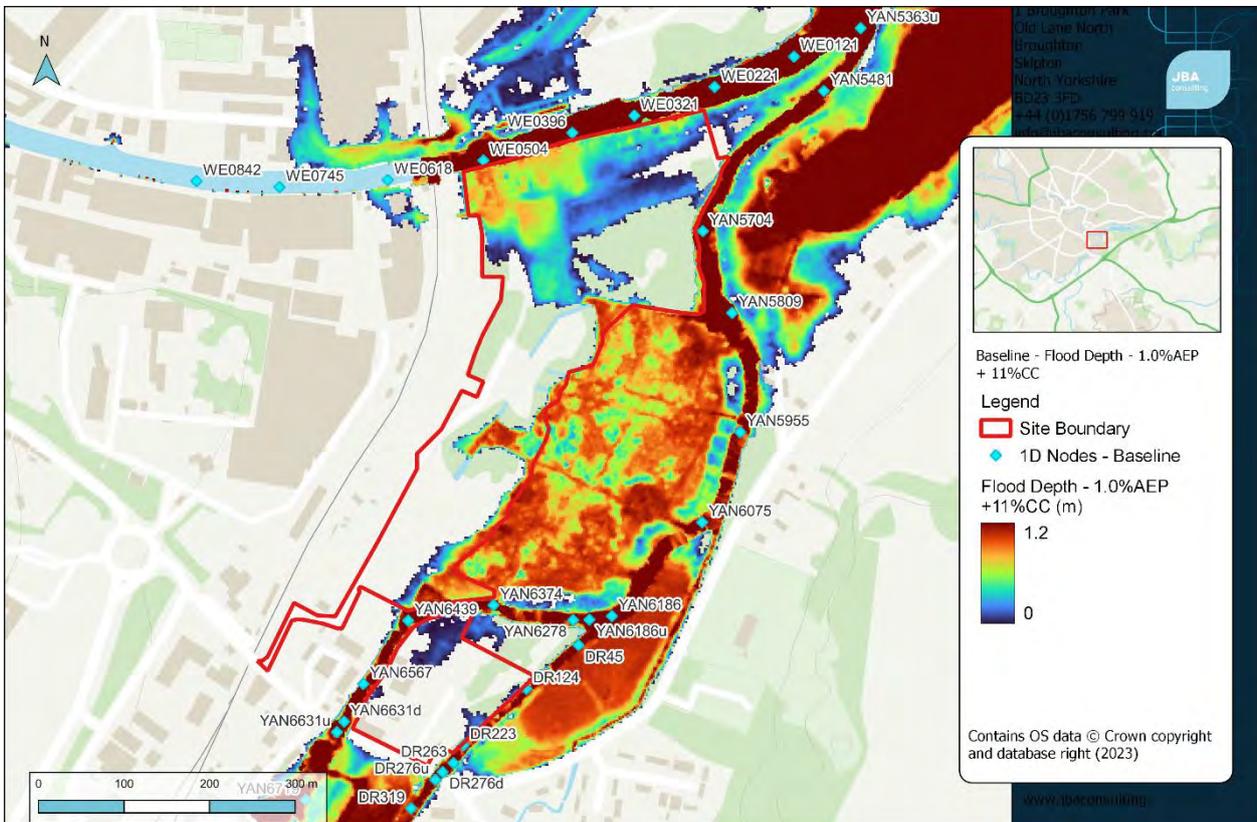


Figure 6-6: Flood Depths - 1% AEP + CC11%

6.6 Extreme Tidal scenario

An extreme tidal event was simulated in order to assess the impact to the site. The 0.5% AEP CC (2100s) tidal levels were applied to the BESL model.

The peak level at the node closest to the site, YA15000d was 1.619m AOD. The water level has been represented as a contour in Figure 6-7. This level is considerably less than the peak fluvial levels.

Analysis from previous Jacobs 2017 study studies suggests it is unlikely that fluvial and tidal events will occur at the same time.

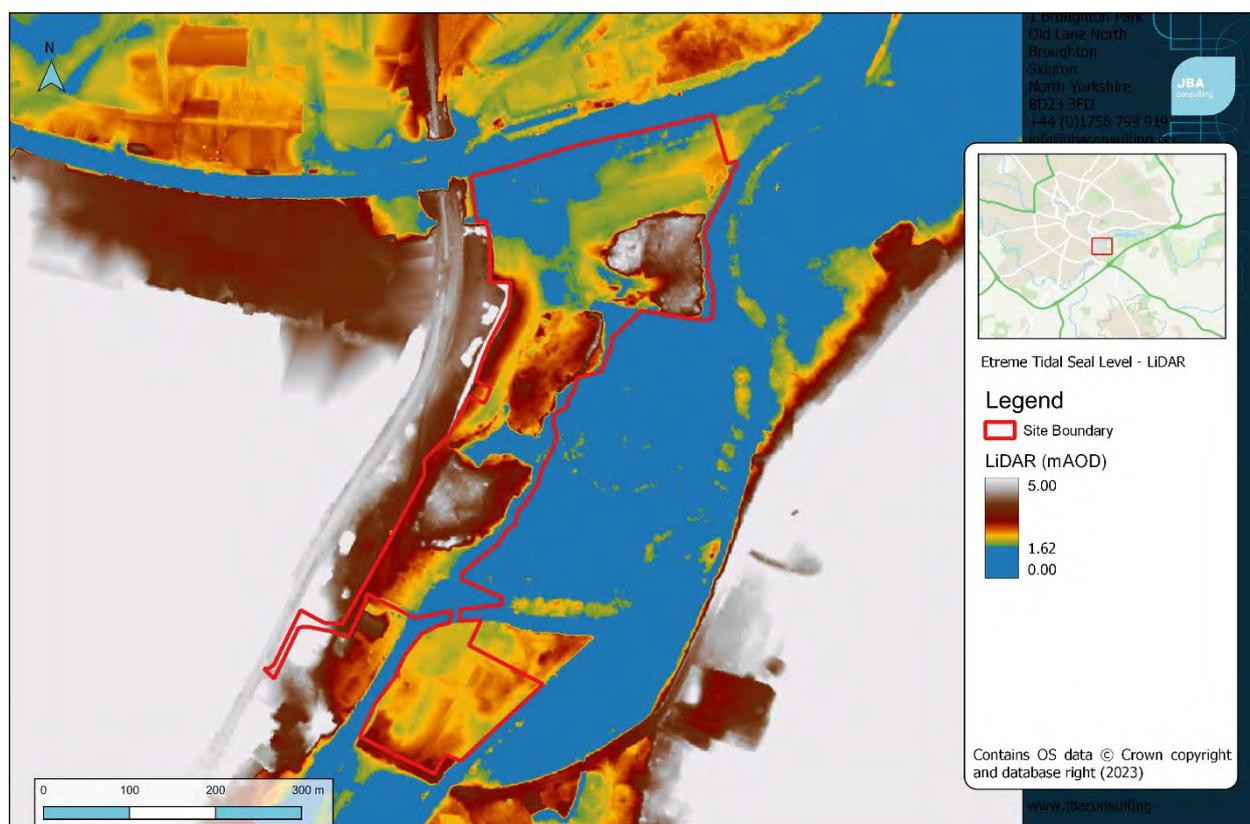


Figure 6-7: Extreme Tidal Sea Level LiDAR Contour

7 Impact Assessment - Site levels and Hydraulic Structures

7.1 Overview

The masterplan has been further developed for the Reserved Matters submission to carefully respond to the updated flood risk constraint present at the site. The following principles were carried through into the masterplan which were approved in the outline application:

- Access and egress not to be impeded by flood water and all access and estate roads are elevated above the 0.1%AEP + CC11% flood level;
- All finished floor levels (FFL) of property to be sited above the 1% AEP + CC11% flood level and allowing for freeboard, which are also above the 0.1%AEP + CC11% flood level;
- All parking to be located above the 1%AEP + CC11% flood level;
- All bridges and culverts have been designed to latest guidance incorporating for freeboard and potential for flow impediment;
- No net loss of floodplain storage due to the proposed development through the provision of compensatory storage;
- No development within the updated footprint of the 3.3%AEP event based on the compensatory storage configuration.

Through the implementation of these principles and application of latest flood risk data this combines to make a suitable flood risk management strategy to reduce flood risk to the proposed development for its intended life span.

7.2 2013 Masterplan review (flooding)

In the 2013 masterplan the minimum finished floor levels were set at 2.4mAOD or higher. The 2013 flood risk management approach included:

1. Land raising and lowering to provide a compensatory storage scheme.
2. Both residential and commercial areas were to be constructed with voids to allow flooding underneath the structure. This was mainly focused along the Wensum frontage and the area in the vicinity of the bottle kiln.
3. Flood resilient construction for all properties with an FFL below the 0.1%AEP_CC flood level (at the time of assessment to be 3.1mAOD) were to be designed to tolerate flood water.
4. An overland flow route between the Wensum and Yare floodplain.
5. Bridges were to be designed to not impede flow.

7.3 Site configuration

7.3.1 Overview

The updated masterplan follows the general principles within the consented scheme with some amendments to meet present day requirements. Additional sensitivity testing has been undertaken to provide further context to the impact of the proposed scheme (i.e. land raising across the whole site without the provision of compensatory storage).

7.3.2 Site levels

Site levels have been based on the latest masterplan. Predominantly the developable area will be elevated above the 1%AEP + CC11% flood level. This applies for Yare Edge and The Views. Within the Wensum Edge ground levels are more variable in order to:

1. Maintain the flow route between the River Wensum and River Yare.
2. Provide sufficient compensation for areas located in within the 3.3%AEP+CC11% extent.

Measures for appropriate design within the Wensum Edge are explored further in Section 7.3.5. Development ground levels used in the model were determined from the water levels calculated in Section 6. The model was therefore configured as shown in Figure 7-1.

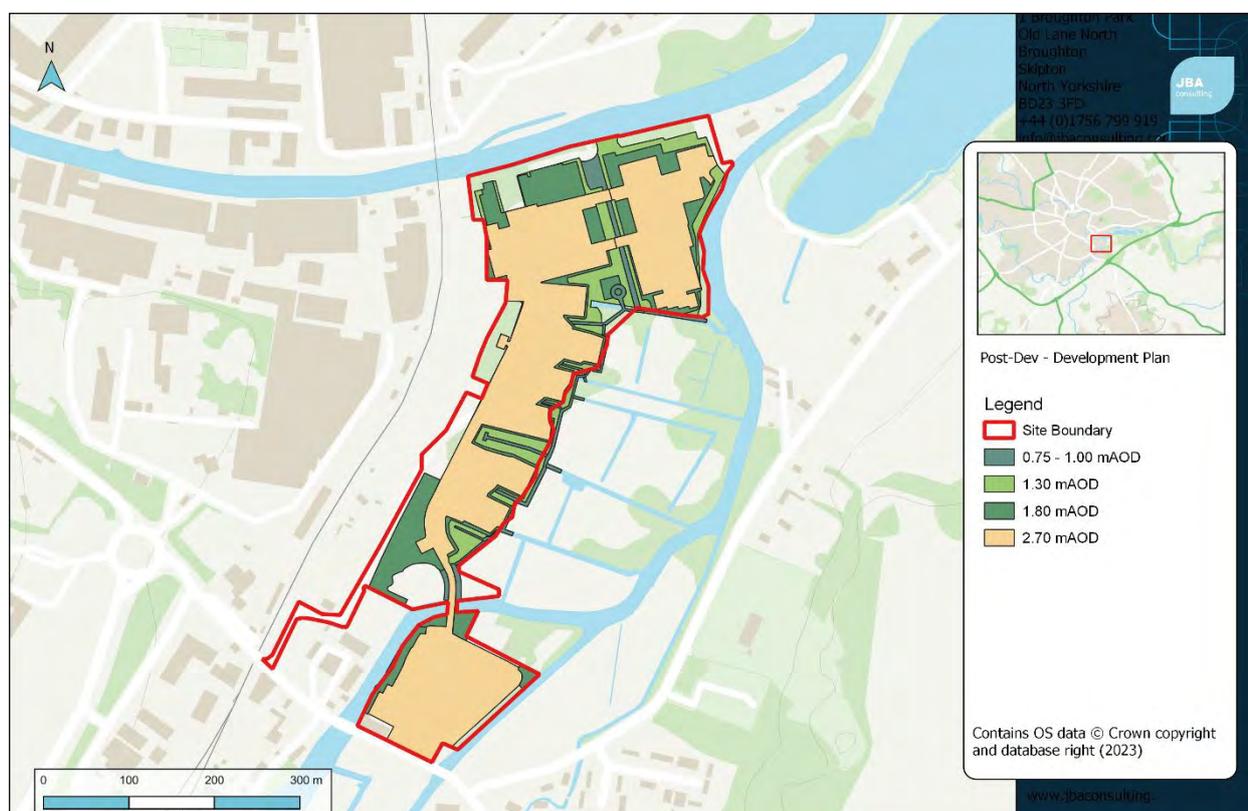


Figure 7-1: Proposed development levels

A volumetric analysis was undertaken to assess any gains/losses due to the development footprint (Table 7-1). The analysis shows there is a post development storage surplus at each measured interval and an overall net increase of over 7,500m³.

Table 7-1: Compensatory Storage - Volumetric Analysis

Existing			Post Development			
Elevation (mAOD)	Cumulative Volume (m ³)	Volume per band (m ³)	Elevation (mAOD)	Cumulative Volume (m ³)	Volume per band (m ³)	Surplus / Deficit (m ³)
0.95	718	-	0.95	619	-	
1.05	2,740	2,022	1.05	2,663	2,045	23
1.15	6,665	3,925	1.15	7,097	4,433	508
1.25	11,842	5,177	1.25	12,994	5,897	720
1.35	18,027	6,186	1.35	20,038	7,045	859
1.45	25,399	7,371	1.45	28,281	8,242	871
1.55	33,579	8,180	1.55	36,986	8,705	525
1.65	42,446	8,867	1.65	46,771	9,786	919
1.75	52,674	10,229	1.75	57,557	10,786	557
1.85	62,865	10,191	1.85	68,454	10,897	706
1.95	72,715	9,850	1.95	79,351	10,897	1,047
2.05	82,565	9,850	2.05	90,102	10,752	902

Note: Calculations in Table 7-1 assume a ground level beneath blocks 2 and 3 of the development are at a level of approximately 1.65mAOD.

7.3.3 Yare Crossing

The proposed bridge consists of a larger opening spanning the river channel and box culverts incorporated to maintain floodplain conveyance. Details of the bridge and culvert implementation in the model are shown in Figure 7-2, Figure 7-3 and Appendix G. The soffit height of the bridges and culverts were designed to be 600mm above the 1%AEP+CC11% flood level.

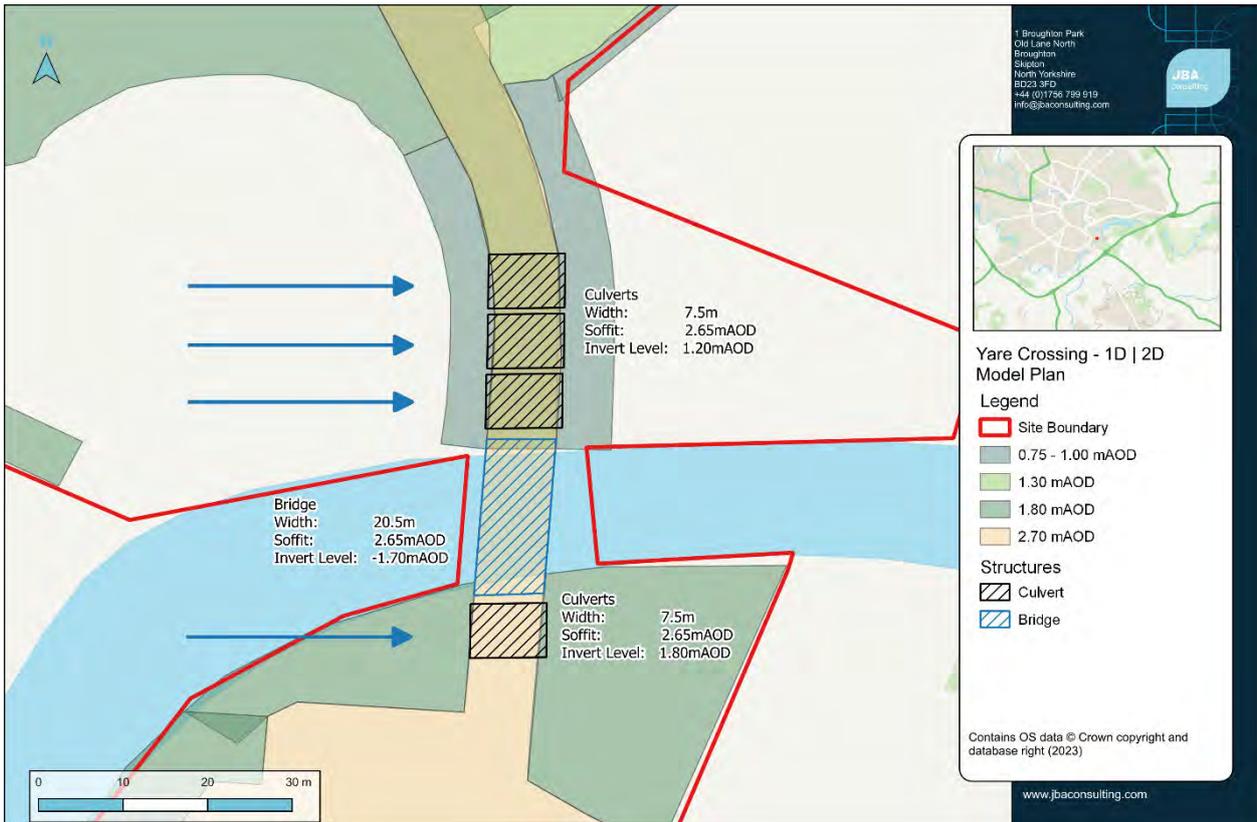


Figure 7-2: Yare Crossing - Model arrangement

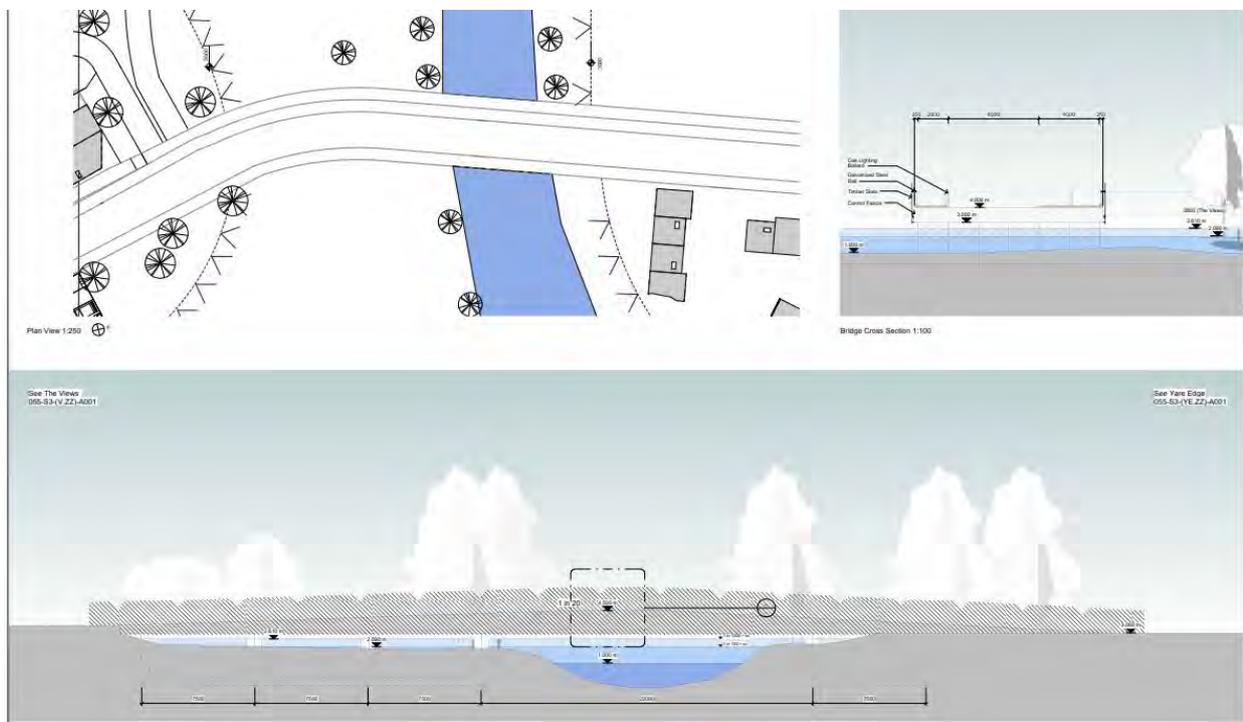


Figure 7-3: Yare Crossing - Proposed Bridge Design

7.3.4 Wensum Crossing

Eventually, a bridge across the Wensum will link the Wensum Edge development to the north bank of the River Wensum. The design for the Wensum bridge has not yet been finalised. Therefore, it has not been represented in the hydraulic modelling. The impact of the bridge is predicted to be negligible due to its height above the river and the proposed use of thin supports that intrude into the channel.

7.3.5 Wensum loop

Baseline modelling showed a flow route present during extreme events connecting the River Yare and River Wensum. To preserve this flow route and provide sufficient compensatory storage, a wet zone has been incorporated through the Wensum Edge to connect to the CWS / River Yare. The location of this flow route was established in the 2013 masterplan. The wet zone will be crossed at two locations by the Wensum Loop highway and culverts will be provided under each section of the carriageway. Figure 7-4 shows the location of the two culverts and initial dimensions.



Figure 7-4: Wensum Loop - Flow route / culvert arrangement

7.4 Impact assessment

7.4.1 Compensatory Storage

A quantitative analysis was undertaken to assess peak flood levels pre and post-development (i.e. following ground raising and the implementation of floodplain storage compensation) to test the impact of the scheme in flood risk terms.

Development levels (Figure 7-1) were applied within the model to assess the impact on water levels. The in-channel water levels are compared in Table 7-2 and Table 7-3 and floodplain water levels are compared in Figure 7-6 and Figure 7-8.

The levels outlined in Table 7-2 show that the proposed development lowers the water level in a 3.3%AEP event. In the 1.0% and 3.3% AEP +CC events there is a negligible increase in channel water levels due to the addition of the development, with the largest increase of 0.008m at model node YAN5704.

However, given that the compensatory scheme design shows a net increase in storage (Table 7-1), the increase in water level can be attributed to model 'tolerance' due to ground level changes. In the 0.1%AEP + CC11% event there is a decrease in 1D water levels caused by the post-development scenario. However, the floodplain water level comparison shows there is little to no change in floodplain water levels. Therefore, it is considered there is no detrimental impacts to offsite receptors. The post-development depth, velocity and hazard grids are shown in Figure 7-5 and Figure 7-7.

Table 7-2: Modelled Water Level Comparison - Present Day

Node	3.3% AEP			1.0% AEP		
	Baseline (mAOD)	Post Dev (mAOD)	Difference (m)	Baseline (mAOD)	Post Dev (mAOD)	Difference (m)
YAN6567	1.69	1.62	-0.072	1.85	1.84	-0.003
YAN6439	1.60	1.59	-0.006	1.80	1.81	0.005
YAN6186u	1.60	1.57	-0.029	1.78	1.79	0.004
YAN5955	1.55	1.52	-0.035	1.74	1.75	0.006
YAN5704	1.52	1.48	-0.042	1.68	1.69	0.008
YAN5363u	1.44	1.41	-0.031	1.62	1.62	0.002
WE0504	1.46	1.43	-0.032	1.65	1.65	0.001
WE0221	1.46	1.41	-0.046	1.63	1.63	0.001

Table 7-3: Modelled Water Level Comparison - Climate Change

Node	3.3% AEP + 11% CC			1.0% AEP + 11% CC		
	Baseline (mAOD)	Post Dev (mAOD)	Difference (m)	Baseline (mAOD)	Post Dev (mAOD)	Difference (m)
YAN6567	1.87	1.88	0.004	2.06	2.06	-0.001
YAN6439	1.85	1.86	0.007	2.03	2.03	0.003
YAN6186u	1.84	1.85	0.006	2.02	2.02	-0.001
YAN5955	1.82	1.83	0.007	2.00	2.00	0.000
YAN5704	1.79	1.80	0.008	1.98	1.98	0.001
YAN5363u	1.77	1.77	0.004	1.96	1.96	0.000
WE0504	1.78	1.79	0.004	1.99	1.99	-0.001
WE0221	1.77	1.77	0.004	1.96	1.96	0.000

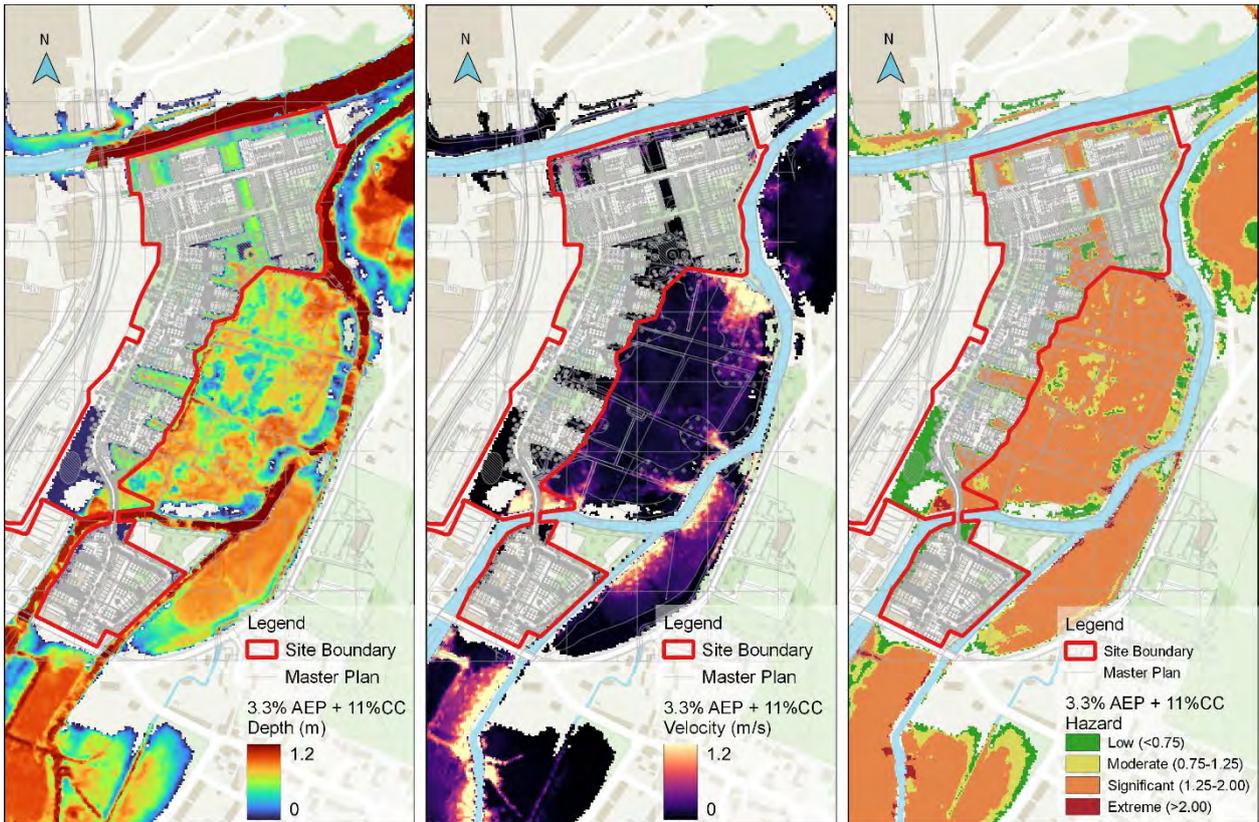


Figure 7-5: Depth, Velocity and Hazard - Post Development- 3.3% AEP + CC11%

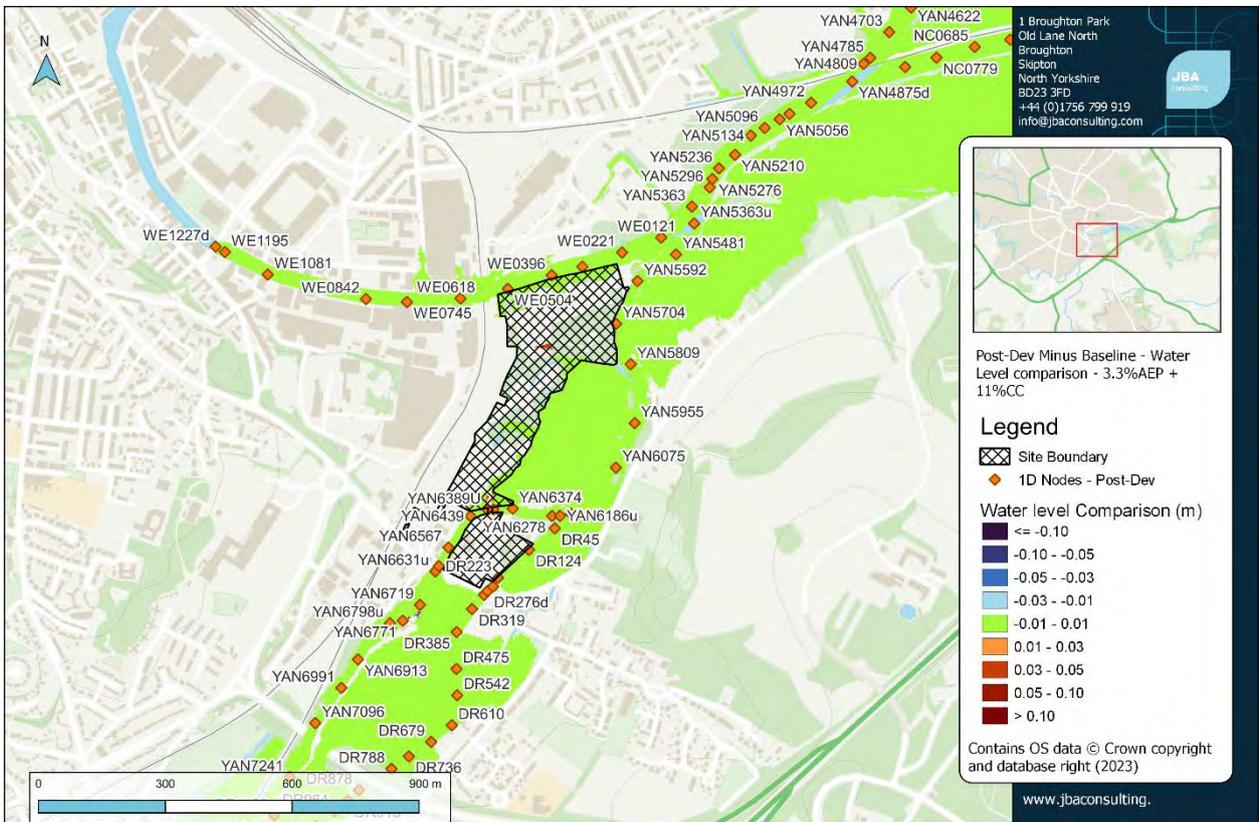


Figure 7-6: Level comparison - Post Development - 3.3% AEP + CC11%

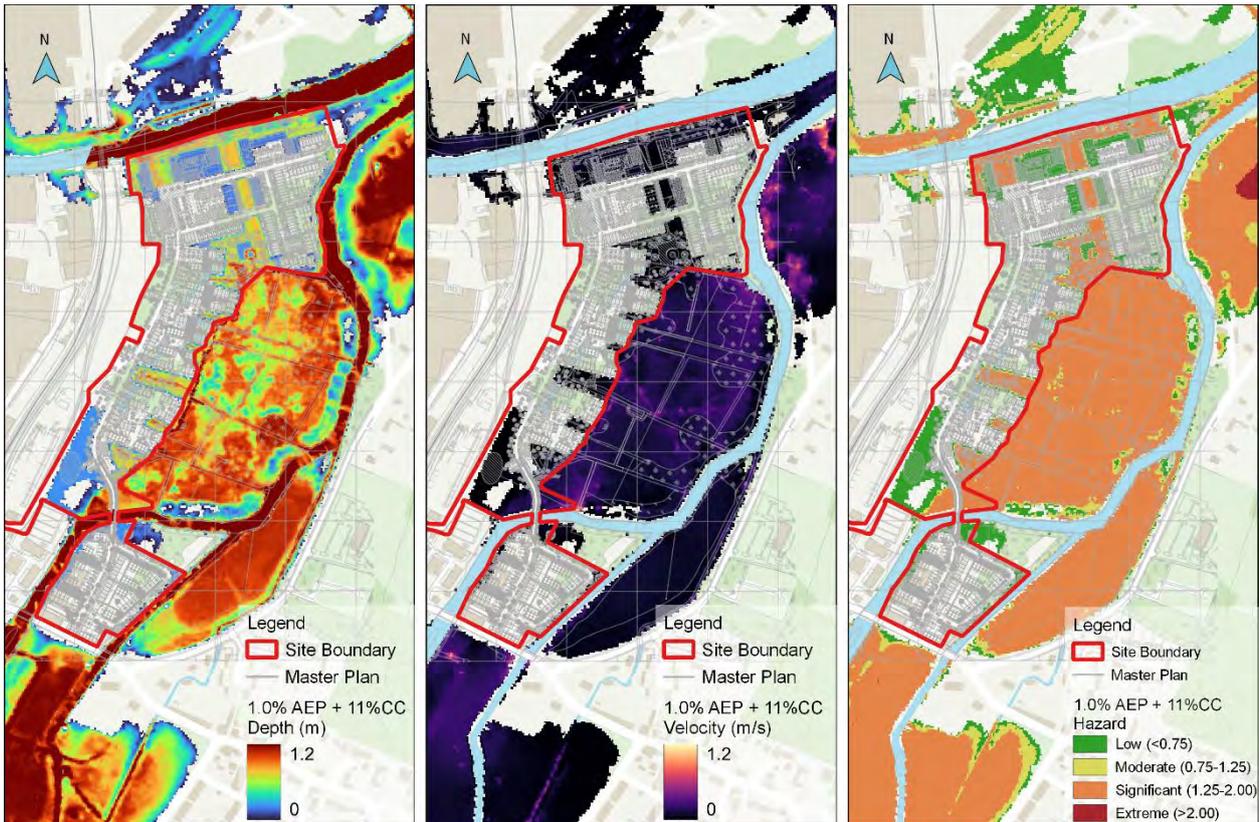


Figure 7-7: Depth, Velocity and Hazard - Post Development -1.0%AEP + CC11%

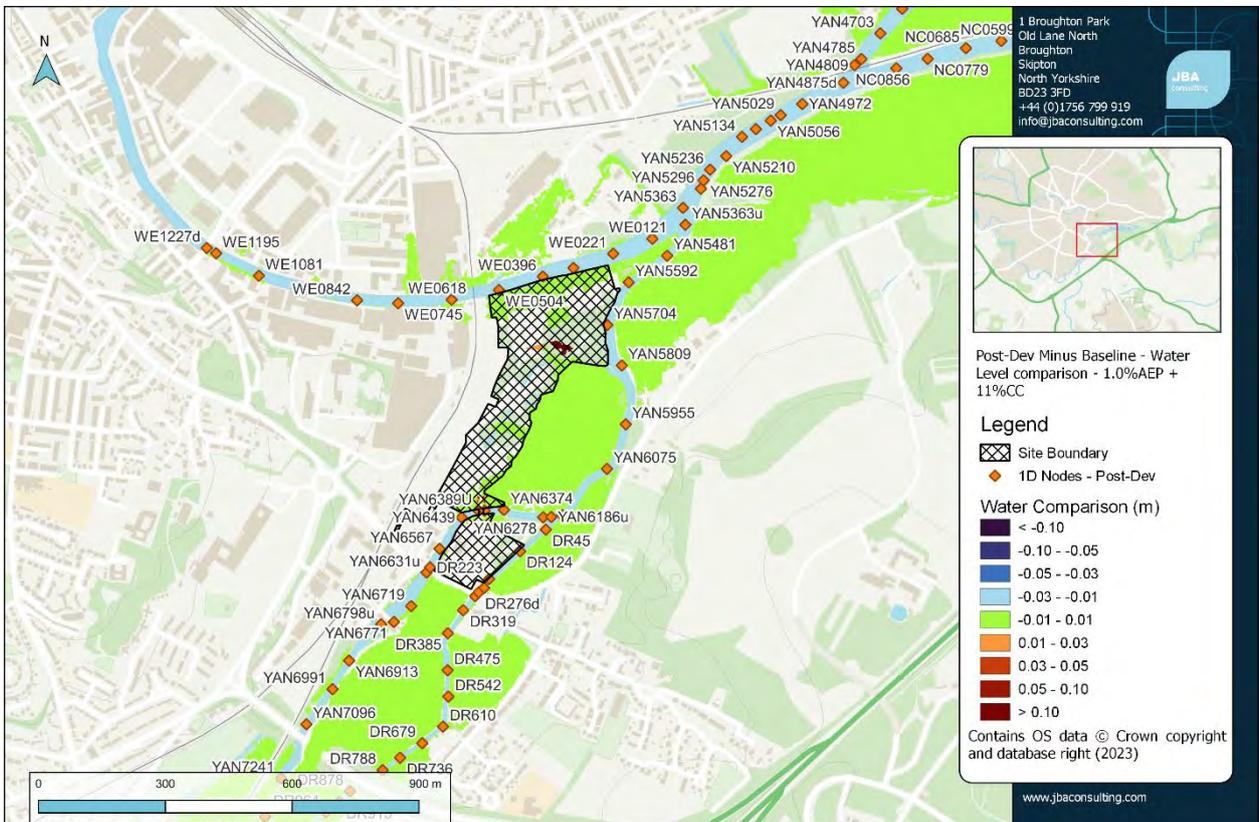


Figure 7-8: Level comparison - Post Development - 1.0%AEP + CC11%

7.4.2 River Yare crossing

The River Yare crossing was implemented in the model as set out in Section 7.3.3. It is located at model node YAN6389. This node is not included in the baseline model. The model demonstrates that there is minimal impact on flood levels with a maximum increase of 3mm upstream of the bridge during the 1%AEP+CC event. This is to be expected due to the losses associated with structures within a hydraulic model and falls within the accepted tolerance range of hydraulic modelling.

Table 7-4: Flood Level Comparison - Yare Crossing (1%AEP + CC)

Node	Baseline	Post Development	Difference (m)
YAN6331d	2.09	2.09	0.002
YAN6567	2.06	2.06	0.002
YAN6439	2.03	2.03	0.003
YAN6374	2.03	2.03	0.001
YAN6278	2.03	2.03	-0.001

7.4.3 River Wensum crossing

The bridge soffit needs to provide 600mm freeboard above the 1.0%AEP + CC11% water level. The 1.0%AEP + CC11% water level at node WE0504 is 1.99mAOD, see Table 7-5. Therefore, the bridge soffit will be a minimum height of 2.59mAOD.

Table 7-5: Wensum Crossing - In channel water levels (mAOD) - 1%AEP+CC11%

Node	Baseline	Post Development (mAOD)	Difference (m)
WE0618	1.99	1.99	0.000
WE0504	1.99	1.99	-0.001
WE0396	1.98	1.98	-0.001
WE0321	1.97	1.97	0.000
WE0221	1.96	1.96	0.000

7.4.4 Wensum Loop flow path

Culverts and channels were created in and around the Wensum Loop, as detailed in Section 7.3.5, to preserve the flow route in this region. Table 7-6 shows the water levels in this area are unchanged. Figure 7-9 shows the velocity vectors at the proposed Wensum Loop. All values near the Wensum Loop (B and C) show little variation, this confirms that the baseline flow route is preserved.

Table 7-6: Wensum Loop Point Analysis (1%AEP + CC11%)

Data Extraction Point	Baseline - Water Level (mAOD)	Post-Development - Water Level (mAOD)
Point A	2.00	2.00
Point B	1.98	1.99
Point C	1.98	1.98



Figure 7-9: Wensum Loop - Flow Direction Vectors

7.4.5 Model sensitivity

To understand the sensitivity of the model to change, a scenario was developed where all land within the site boundary was raised above the 1%AEP+CC11% flood level, with no floodplain storage compensation provided.

In-channel flood levels were compared (Table 7-7) which show the largest increase of 15mm occurred at model node YAN6439.

The negligible increases are due to the large amount of floodplain storage available in the immediate vicinity. Therefore, only minor increases are found due to all the land within the site boundary being raised without any compensatory storage scheme.

Table 7-7: Development Sensitivity (1%AEP + CC11%)

Node	1%AEP + CC		
	Baseline (mAOD)	Raised Site (mAOD)	Difference (m)
YAN6567	2.06	2.07	0.010
YAN6439	2.03	2.04	0.015
YAN6186u	2.02	2.02	-0.002
YAN5955	2.00	2.01	0.002
YAN5704	1.98	1.98	0.001
YAN5363u	1.96	1.96	0.000
WE0504	1.99	1.99	-0.002
WE0221	1.96	1.97	0.000

7.4.6 Summary

The modelling analysis shows that the impact of the proposals upon flood levels is negligible and changes in water levels reported by the model generally fall within the accepted range of modelling tolerance. On this basis, the proposed scheme is considered to be 'nil detriment' in flood risk terms.

8 Development design and flood resilience

8.1 Overview

This section sets out the design principles/parameters to be adopted to make the development and users/occupants safe from flooding.

8.2 Finished Floor Levels

Property thresholds will be set no lower than the 1%AEP + CC11% flood level plus 300mm (2.30-2.35mAOD). In most cases this will be higher due to maintaining existing levels where possible within the site. Figure 8-1 shows indicative FFLs across the whole development. A range is provided at this point as the vertical alignment of the development is to be confirmed.

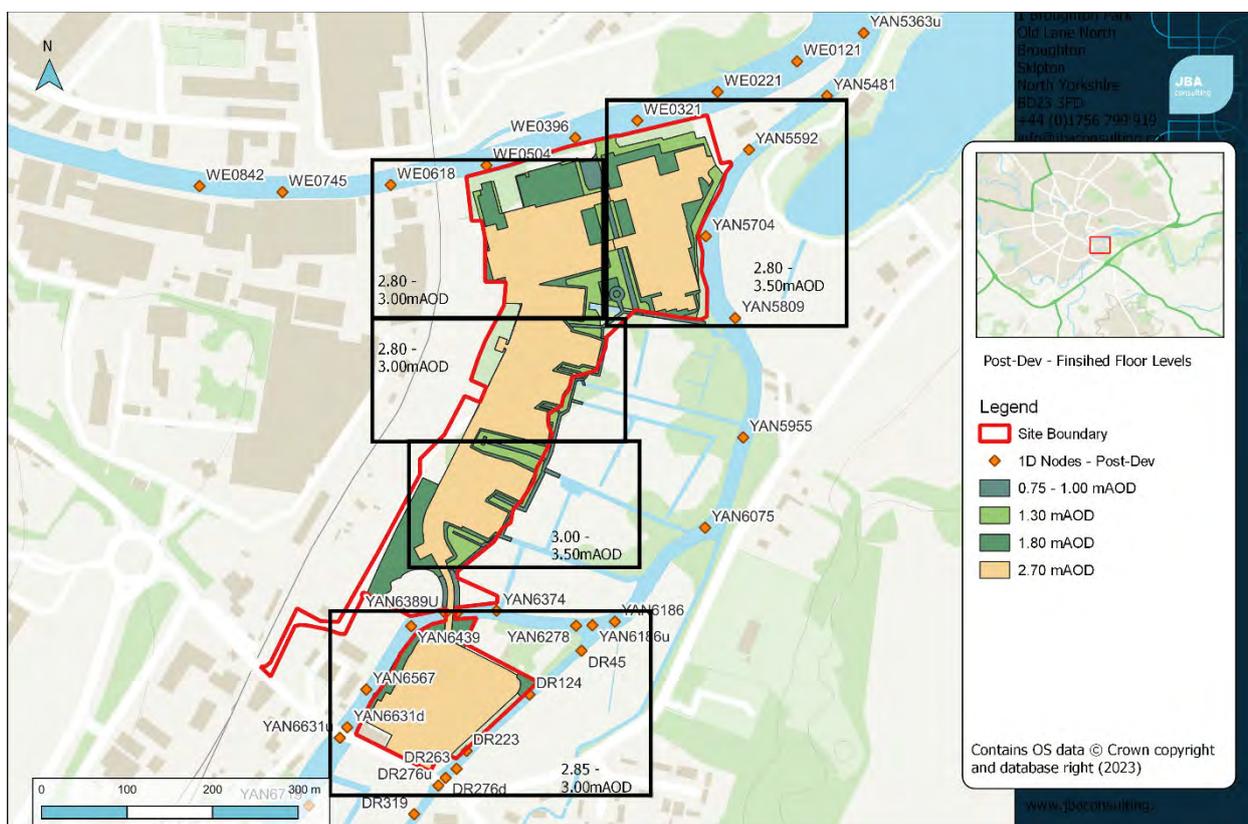


Figure 8-1: Proposed Finished Floor Levels

8.3 Voids

To provide the required FFLs and sufficient floodplain compensatory storage, voids will be provided under blocks 1, 2, 3/4, 6 and 7. This is in line with the previously agreed principles for the consented scheme, which utilised the voids under both larger blocks and smaller residential dwellings. However, the updated masterplan does not include any voids under smaller residential dwellings and so partially addresses the updated requirement that voids should not normally be relied upon for compensatory storage. Therefore, it is considered to comprise an improved design.

Voids will be designed to allow flood flow to freely enter and drain from the space beneath each block. It is envisaged that louvred panels will be used to enclose the void space and to prevent the void being used for storage of residential or commercial property, plant equipment and any future construction that may compromise flood storage.

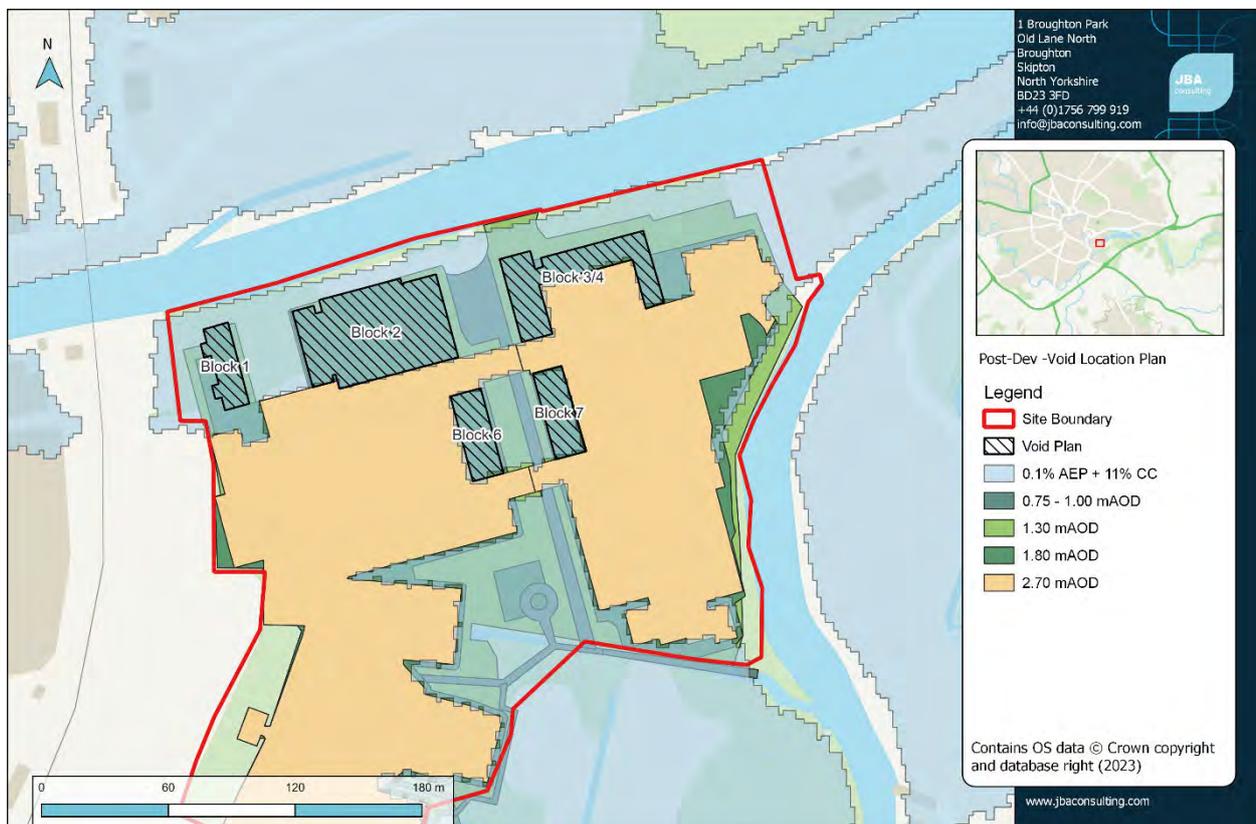


Figure 8-2: Void arrangement plan

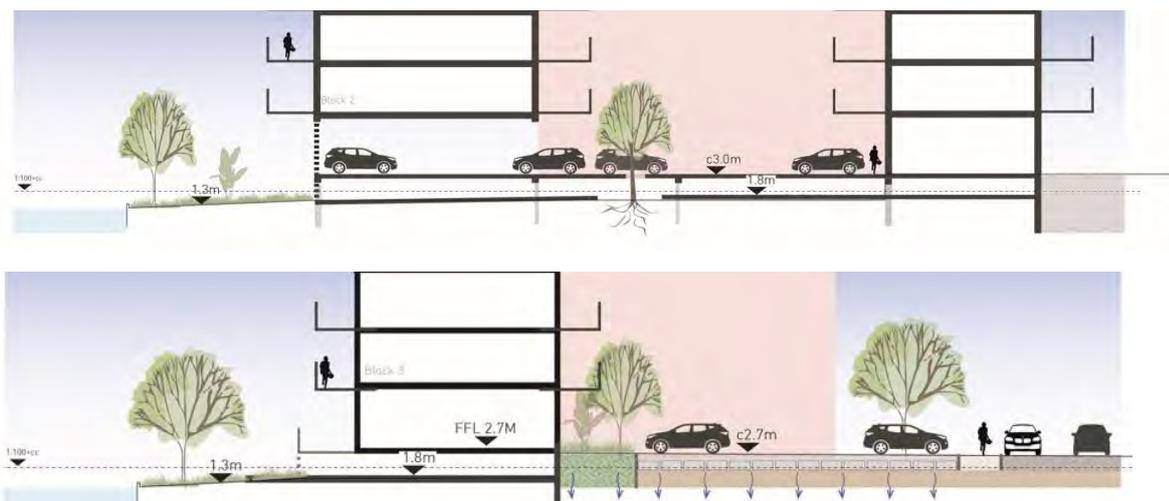


Figure 8-3: Example Void Sections (Top = Block 2 - and Bottom = Block 3)

8.4 Access and Egress

All access roads are elevated above the 0.1%AEP +CC flood level (2.66mAOD or higher). The Wensum loop provides two access routes to the eastern area of the Wensum Edge. Figure 8-4 shows that in a 0.1% AEP + CC event, all access roads are unaffected by flooding. The development will therefore benefit from dry and flood-free access/egress.

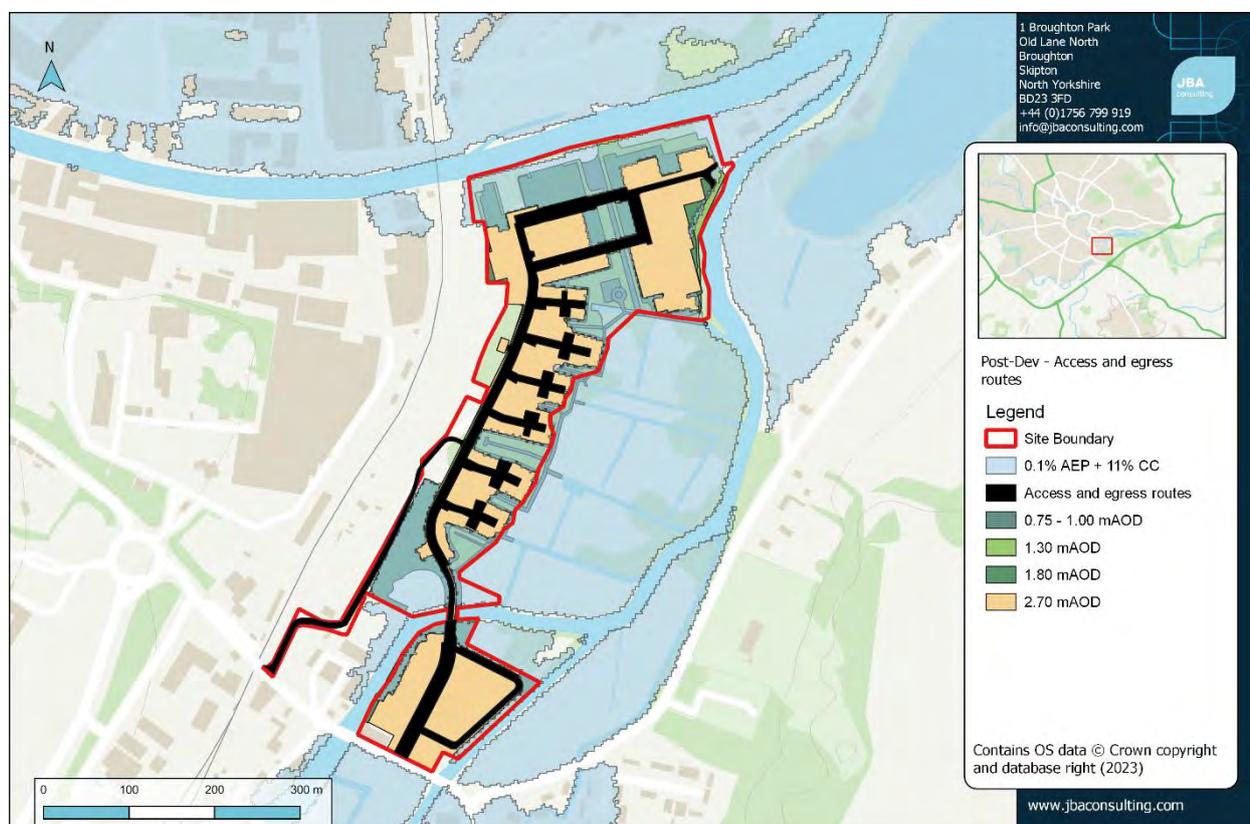


Figure 8-4: Access and egress routes

9 Surface water management plan

9.1 Overview

The following chapter outlines the surface water management strategy for the proposed development. The strategy has been proposed considering latest surface water management techniques, policy and guidance. All aspects of the strategy are housed within this chapter including:

- Review of the 2013 drainage strategy approved as part of the outline application.
- SuDS appraisal and constraint identification for the whole site.
- SuDS Arrangements including run-off rates and storage volumes for:
 - Adoptable Roads
 - Wensum Edge
 - The Views
 - Yare Edge
- Treatment / Water Quality and future maintenance of all proposed options.

9.2 Planning Conditions

Condition 33 for Norwich City Council and condition 26 for South Norfolk Council sets out the requirements for surface water management for the proposed development. The condition sets out the scheme should be based on sustainable drainage principles and contain the following:

- a. details of the proposed location, dimensions and design of each element of the surface water scheme,
- b. Calculations of existing runoff rates for the 1, 30 and 100-year and a range of durations.
- c. Restriction of surface water runoff into rivers to no greater than the existing runoff rates to ensure there is no increase in offsite flood risk.
- d. Calculations to demonstrate the proposed attenuation storage features are sized to contain peak duration 1:100 rainfall event plus CC.
- e. Details of the location and volumes of surface water exceedance flows in extreme rainfall event.
- f. Details of who is responsible for the adoption and maintenance of each aspect of the proposed surface water drainage system.

9.3 2013 Application - Review

The approved outline scheme was reviewed as part of this surface water management plan. The 2013 scheme was set out as follows:

9.3.1 Disposal

The 2013 application did not consider infiltration a viable mechanism of disposal due to the underlying geology (alluvium). The alluvium consists of clay, silt sands and gravels. Also, the 2013 FRA notes there is a high susceptibility to the risk of ground water flooding or high-water table based on the underlying geological conditions particularly in flood conditions. The FRA concluded discharge to a local watercourse was the most appropriate for the site.

9.3.2 Discharge rates

3. Deal ground (The Views and Wensum Edge)
 - a. Assumed total of area is 16.79ha and based on site survey includes 2.85ha of tarmac and concrete hardstanding (this included the site of the former works which have now been demolished). Although no positive drainage system was identified the FRA concluded that surface water runoff would shed off these areas directly into the River Wensum.
 - b. Greenfield runoff rates were calculated using IH124 and a 30% reduction was applied to predevelopment run off rates. But a 30% uplift was applied to represent climate change. Meaning run off rates remained unchanged.
 - c. EA requirement stipulated a further reduction in predevelopment run off rates of 10%.
4. May Gurney (Yare Edge)
 - a. Assumed total site area 2.45ha with existing impermeable area of 1.56ha. Proposed developed area has impermeable area of 1.28ha. A comprehensive drainage system discharging to the river was identified.
 - b. The FRA stated as the developable area is less than the existing impermeable area then storage is not required. However, a reduction by 30% was applied to account for climate change.

9.3.3 Storage

A series of storage tanks were proposed (28 in total) distributed across the site. The proposal was to utilise 2x2m box culvert units to create the sufficient volume required. All further details were deemed subject to detailed design.

9.3.4 Flow control

It was proposed that storage tanks would be drained using pumps. It was envisaged that a multi pump system would be provided in each tank. It was also proposed that where possible a gravity outfall would be provided but was subject to detail design.

The total discharge of the pumps was stated as 520l/s and 1,020l/sec for the 2-year and 100-year storm events.

9.3.5 Review conclusion

The previous application outlined a workable solution for the site. However, there are several elements that are not in line with current guidance and policy. To meet the current requirements of the LLFA the surface water drainage system would need to utilise SuDS and restrict discharge rates to or as close as possible to greenfield runoff. The potential to meet current requirements and improve upon the consented scheme has been assessed in the following section.

9.4 Design standards / requirements

9.4.1 NCC Highways drainage standards

NCC design standards⁶ are set out as follows:

- Minimum diameter of 225mm pipe drains will be provided.
- There will be a free-flowing outfall at 10% AEP (1:10)
- There should be no flooding above ground at the 3.33% (1:30) plus climate change rainfall event (unless in a drainage system designed to convey water (e.g. a swale))
- Flooding at the 1% AEP plus 40% climate change rainfall event be kept within the development boundary and / or within the Highway boundary if works are only within the Highway boundary. Any area of flooding should be kept to areas designed or expected to accommodate it. It may not be appropriate to hold water within the carriageway (*40% value superseded by LLFA and 45% and has been assessed instead*).

⁶ [https://www.norfolk.gov.uk/rubbish-recycling-and-planning/planning-applications/highway-guidance-for-development/drainage#:~:text=Minimum%20diameter%20of%20225mm%20pipe,convey%20water%20\(eg%20a%20swale\)](https://www.norfolk.gov.uk/rubbish-recycling-and-planning/planning-applications/highway-guidance-for-development/drainage#:~:text=Minimum%20diameter%20of%20225mm%20pipe,convey%20water%20(eg%20a%20swale))

9.5 Conceptual strategy - SuDS Appraisal

9.5.1 Overview

Based on the review of the 2013 scheme and in line with Condition 33 (NCC) and Condition 26 (SNC) of the following design principles have been set for the proposed development:

1. System to drain via gravity only to remove the reliance on pumping.
2. Storage where possible to be sited above the 1%AEP + CC11% flood level to provide a free discharge.
3. Drainage outfalls will be sited at or above 10%AEP flood level.
4. Reduced discharge rates towards or as close to greenfield runoff rates.
5. Separate systems to be provided for adoptable highway and private residential / commercial areas.
6. Blending the natural environment with the urban landscape to provide amenity, education, and ecological benefit.

9.6 Surface water disposal

The following runoff disposal hierarchy has been assessed (Table 9-1) and following review it has been deemed that discharge to surface water body is most appropriate for the proposed development.

Table 9-1: Surface water disposal

Disposal method	Description	Outcome
Into the ground	Based on the hydrogeology assessment ground waters may become elevated (within 1m of the surface).	Insufficient freeboard (<1.2m) between the base of infiltration system and ground water levels.
To a surface water body	The site is bounded by the River Wensum and River Yare provided a discharge location immediately adjacent the site.	Preferred option due to proximity of watercourse and with additional environmental enhancements to the county wildlife site through re wetting.
To a surface water sewer, highway drain or another drainage system	No sewer located near the site that could be used.	Deemed not feasible without complex pumping arrangement.

Disposal method	Description	Outcome
To combined sewer	No sewer located near the site that could be used.	Deemed not feasible without complex pumping arrangement.

9.7 Run-Off Rates and existing land cover

Runoff rates have been calculated for the whole site. Alternative approaches have been undertaken to demonstrate the suitability for use in this SuDS strategy (Table 9-2). ReFH2 is now considered to be the method of choice for calculating greenfield runoff for developments and therefore been used in all calculations in this SuDS Strategy. This method utilises most recent rainfall information (FEH). Further information regarding runoff calculations is provided in Appendix H.

Table 9-2: Runoff Rates

Disposal method	Greenfield Runoff Rates (l/s/ha) (QBAR)	Existing conditions (l/s/ha) (QBAR)
Norfolk guidance	2	n/a
ICP SUDS (MicroDrainage)	2.5	n/a
ReFH2	2.6	15

9.8 SuDS Arrangement - Adoptable Highway

9.8.1 Overview

The development is to be served by a spine road off Bracondale and heads north over the River Yare and continues towards the River Wensum. A loop road is provided within the Wensum Edge area of the proposed site. The spine road is also required to provide access to over the River Wensum to the potential future development site known as the 'Utilities Site'.

The spine road and Wensum loop are to be considered for highway adoption therefore a separate drainage system will be provided to facilitate effective surface water management.



Figure 9-1: Adopted highway - SuDS Examples

9.8.2 Drainage arrangement

Drainage for the adoptable highway is to be split into two zones:

- **HIGHWAY-001** - Spine Road south of the River Yare (Yare Edge) including on street parking footpaths and cycle paths.
- **HIGHWAY-002** - Spine Road north of the River Yare and the Wensum loop including on street parking footpaths and cycle paths.

The layout of the scheme is described in Table 9-3. Indicative highway levels are presented and proposed drainage arrangement in Appendix H. Levels are preliminary only subject to change. Drainage calculations and arrangements will be updated on completion of the vertical alignment of the public highway.

Table 9-3: Adoptable highway - Drainage arrangement

Area	Imp area (ha)	Discharge Rate (l/s)	Required Volume (m3)	Description
HIGHWAY-001 (Yare Edge)	0.47	1.22	545	Area to be served by linear engineered swales before discharging into a wetland / pond located immediately downstream of the proposed Yare Bridge.

Area	Imp area (ha)	Discharge Rate (l/s)	Required Volume (m3)	Description
HIGHWAY-002 (Wensum Loop and Spine Road)	0.98	2.56	1275	<p>Spine Road - To be served by a linear swale / pond system which will discharge into the marsh within the Views. Flows to be restricted by a hydrobrake.</p> <p>Wensum Loop - To be served by a high-level drainage system (Beany block, Max-e Channel or equivalent). The system will convey flows towards main spine road and discharge into the Swale / Pond system. In addition, planted zones / tree pits will be provided between parallel parking spaces</p>

9.9 SuDS Arrangement - Wensum Edge

9.9.1 Overview

The Wensum Edge is split into six separate drainage zones with certain zones having the ability to be connected to reduce the number of discharge locations. The SuDS arrangement utilises features within development design such as providing green roofs on flat roofs and locating storage under private roads and parking areas. Within these areas street scene SuDS will be integrated providing a more natural environment to the urban landscape.

Examples of urban SuDS are shown in Figure 9-1 which depict aspects of the overall strategy for the Wensum Edge.



Figure 9-1: Wensum Edge - SuDS Examples

9.9.2 General arrangement

A summary of the SUDS arrangement for The Wensum Edge is summarised in Table 9-4. Further details and drawings are provided in Appendix H.

All permeable paving elements are to be Type C (no infiltration) due to the underlying ground conditions and calculations have been based on an aggregate void ratio of 30% and an operating depth of 1m unless specified.

Table 9-4: Wensum Edge - Drainage Arrangement

Area	Imp area (ha)	Discharge Rate (l/s)	Required Volume (m3)	Description
WEN-001-ABC	0.85	2.21	929	<p>Storage - Green Roof and permeable paving (use of attenuation creates could be considered if sufficient treatment provided). All three Zones to be connected via pipes under adopted highway. Section 50 agreement required.</p> <p>Discharge location - Combined with WEN-002 and WEN-003 and discharge into rain garden / public wetland located between Block 1 and 2</p>
WEN-001-D	0.0853	1	118	<p>Storage - Green roof and street scene swale</p> <p>Discharge location - Discharge into Wensum Flow path or potential to link to WEN-005</p>
WEN-001-E	0.70	1.81	684	<p>Storage - Green Roofs and permeable paving (use of attenuation creates could be considered if sufficient treatment provided).</p> <p>Discharge location - Discharge into the River Yare adjacent to the site boundary</p>
WEN-001-F	0.56	1.46	540	<p>Storage - Green Roofs and permeable paving (use of attenuation creates could be considered if sufficient treatment provided).</p> <p>Discharge location - Discharge into the landscaped area adjacent to the CWS</p>

9.10 SuDS Arrangement - The Views

9.10.1 Overview

The Views is separated into three separate drainage zones. Each zone is to operate under the same principles. Underground storage will be provided in the private highway of each of the development fingers. The fingers will drain into a green open SuDS features within the communal gardens before discharging into the marsh. Therefore, in the area most ecological sensitive at least two forms of treatment are provided. The inclusion of SuDS within communal areas also enhances the amenity value of the areas and creates an opportunity for education benefits to the users of the communal gardens.



Figure 9-2: Wensum Edge - SuDS Examples

9.10.2 General arrangement

A summary of the SUDS arrangement for The Wensum Edge is summarised in Table 9.4. Further details and drawings are provided in Appendix H.

All permeable paving elements are to be Type C (no infiltration) due to the underlying ground conditions and calculations have been based on an aggregate void ratio of 30% and an operating depth of 1m unless specified.

Table 9-5: The Views - Drainage Arrangement

Area	Impermeable area (ha)	Discharge Rate (l/s)	Required Volume (m3)	Description
VIEW-001	0.61	1.6	595	Storage - Green roofs, permeable paving (use of attenuation creates could be considered if sufficient treatment provided) and communal pond / rain garden. Discharge location - Into marsh ditch to connect to CWS
VIEW-002	0.59	1.53	563	Storage - Green roofs, permeable paving (use of attenuation creates could be considered if sufficient treatment provided) and communal pond / rain garden. Discharge location - Into marsh ditch to connect to CWS
VIEW-003	0.75	1.95	719	Storage - Green roofs, permeable paving (use of attenuation creates could be considered if sufficient treatment provided) and communal pond / rain garden. Discharge location - Into marsh ditch to connect to CWS

9.11 SuDS Arrangement - Yare Newton

9.11.1 Overview

Yare Edge is split into two individual drainage zones either side of the Spine Road. Storage is to be provided under private highway and parking areas. Storage components will be linked with engineered swales or conventional pipe system. Street scene SuDS will be provided within landscaped areas to provide green breaks within the landscape.



Figure 9-3: Wensum Edge - SuDS Examples

9.11.2 General arrangement

A summary of the SUDS arrangement for The Yare Edge is summarised in Table 9 4. Further details are provided in Appendix H.

All permeable paving elements are to be Type C (no infiltration) due to the underlying ground conditions and calculations have been based on an aggregate void ratio of 30% and an operating depth of 1m unless specified.

Table 9-6: Yare Edge - Drainage Arrangement (1% AEP+CC45%)

Area	Impermeable area (ha)	Discharge Rate (l/s)	Required Volume (m ³)	Description
YARE-001-A	0.61	1.6	595	Storage - Permeable paving (use of attenuation creates could be considered if sufficient treatment provided) and rain planters/ rain garden. Discharge location - Discharge into the River Yare adjacent to the site boundary.
YARE-001-B	0.59	1.53	563	Storage - Permeable paving (use of attenuation creates could be considered if sufficient treatment provided) and rain planters and communal rain garden. Discharge location - Discharge into the River Yare adjacent to the site boundary.

9.12 Exceedance flow paths

The SuDS scheme for the development is broken down into 13 zones. Therefore, simultaneous failure within each zone is highly unlikely, thus any exceedance zones will be managed within each individual zone.

Exceedance flow paths will be confirmed following the final vertical alignment of the public and private highway systems. Highways will be designed to convey flows away from residential and commercial properties and either into the marsh or river dependant on location within the site.

9.13 SuDS Arrangement - Additional

9.13.1 Small scale SUDS

Several small-scale SUDS features can be applied across the development. This are summarised in Table 9-7.

Table 9-7: Small Scale SuDS Examples

SuDS Component	Description	Example
Green / living roofs	Residential properties to be provided with bin and or bike stores. These are to be flat roofed structures which are compatible with green/living roofs.	
Green walls	Green walls can be fitted to the exterior of building walls to intercept run-off from roof areas.	

9.13.2 Water recycling

In the future as populations increase water resources will become further stretched. The provision of water recycling will aim to reduce demand on mains water and provide an aspect of source control.

The following options are to be considered as part of development proposals:

- Water butts serving residential properties for use for watering gardens and connect green areas.
- Rainwater recycling and collection for communal use (i.e. washing of refuse areas in communal tower blocks and irrigation)
- Rainwater harvesting for using in communal toilet facilities.
- Direct connections of downpipes to green street scene areas to reduce amount of watering.

All calculations have not included these features and is considered as an additional benefit to the proposed development.

9.13.3 Amenity and education provision

The SuDS strategy is closely linked to the landscape plan for the proposed development. Given the proximity to water with the Rivers and Marsh, water plays a prominent role in shaping the development. Elements of SUDS will be present within communal areas and areas of play. Opportunities to enhance educational and amenity aspects have been integrated into the landscape plan including:

- Water related play apparatus and natural play materials.
- Historical features such as old water pumps.
- Educational boards and infographics highlighting the importance of water.

9.14 SuDS Treatment

9.14.1 Simple Index Tool

All treatment calculations have been undertaken using the SIA tool (Appendix H). The SIA tool demonstrates all components of the proposed development provide sufficient treatment for the areas served. Discharge points in water sensitive areas (CWS) provide two stages of treatment before discharging into the CWS.

9.14.2 Nutrient neutrality

The proposed SUDS scheme will act to reduce the sediment, metal and nutrient load within surface run off. It is also envisaged that additional nutrient neutrality mitigation will be provided via the Norfolk Environmental Joint Venture Scheme.

9.15 SuDS Maintenance

For all components included within the SuDS scheme for the proposed development a preliminary maintenance plan is provided in Appendix H.

In all private areas maintenance will be carried out by a management company. SUDS relating to the adopted public highway are to be put forward for adoption and therefore management by the local highway's authority.

A Development Proposals

A.1 Masterplan (Stolon Studio)



Unit Schedule		
Name	Count	Area
Duplex_2B/4P_M4(2)_Lower	4	160.51 m ²
Duplex_3B/4P_M4(2)_Lower	2	42.24 m ²
Duplex_3B/5P_M4(2)_Lower	2	84.48 m ²
Flat_1B/2P	4	239.31 m ²
Flat_1B/2P_M4(2)	2	119.66 m ²
Flat_2B/3P	4	244.02 m ²
Flat_2B/3P_M4(2)	3	191.66 m ²
Flat_2B/4P_M4(2)	1	78.48 m ²
Flat_3B/4P_M4(2)	3	247.88 m ²
House_2B/3P_M4(2)_Grd	28	1056.16 m ²
House_3B/4P_M4(2)_Grd	63	2598.15 m ²
House_3B/5P_M4(2)_Grd	8	336.99 m ²
House_4B/6P_M4(2)_Grd	2	77.35 m ²
House_4B/7P_M4(2)_Grd	23	907.99 m ²
Grand total:	149	6384.88 m²

Parking Schedule		
Type	Family	Count
2500x5000 mm	UK_Standard Parking Space_SSA	117
6100x2000 mm	UK_Standard Parking Space	58
Grand total:		175

1. All Dimensions in mm unless stated otherwise.
 2. Do not scale this drawing. All dimensions to be verified by the contractor before work is commenced.
 3. Architect to be notified immediately if any discrepancies are found.
 4. All shop drawings to be approved by Architect before work commences.
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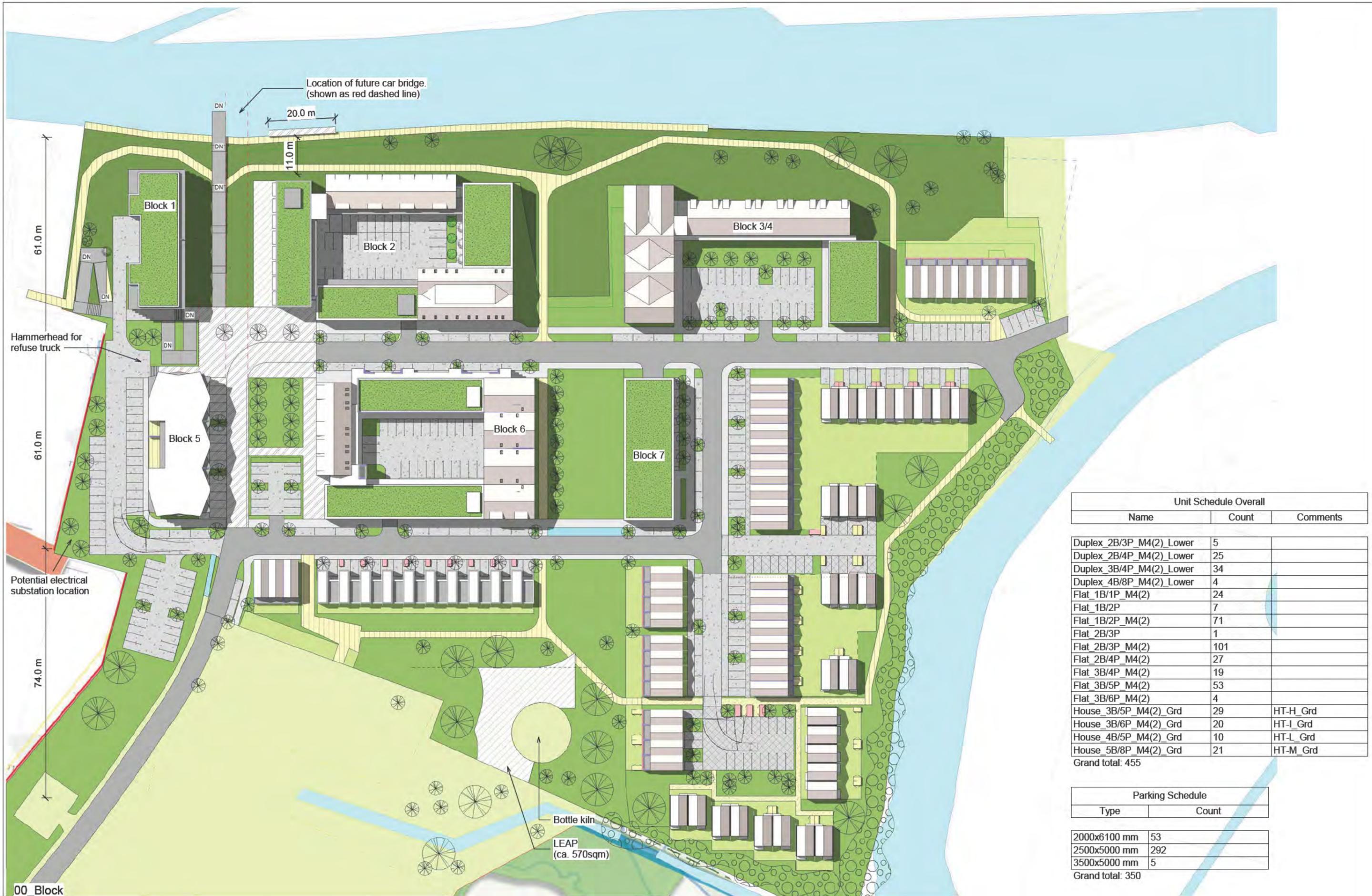
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Rev	Date	Description
C	05/05/23	Amendments to masterplan layout and units
B	24/04/23	Revision
A	19/04/23	First Issue
Rev	Date	Description

Drawing Title:	The Views_Block Plan	Scale:	1 : 500 @ A1
Project No.:	055	First Issue:	19/04/23
Project Name:	Deal Ground and May Gurney Site	Status:	Stage 3
Project Address:	Bracondale, Norwich	Drawing No.:	055-S3-(V.ZZ)-A001
		Rev.:	C

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05/05/2023 12:23:31



Unit Schedule Overall		
Name	Count	Comments
Duplex_2B/3P_M4(2)_Lower	5	
Duplex_2B/4P_M4(2)_Lower	25	
Duplex_3B/4P_M4(2)_Lower	34	
Duplex_4B/8P_M4(2)_Lower	4	
Flat_1B/1P_M4(2)	24	
Flat_1B/2P	7	
Flat_1B/2P_M4(2)	71	
Flat_2B/3P	1	
Flat_2B/3P_M4(2)	101	
Flat_2B/4P_M4(2)	27	
Flat_3B/4P_M4(2)	19	
Flat_3B/5P_M4(2)	53	
Flat_3B/6P_M4(2)	4	
House_3B/5P_M4(2)_Grd	29	HT-H_Grd
House_3B/6P_M4(2)_Grd	20	HT-I_Grd
House_4B/5P_M4(2)_Grd	10	HT-L_Grd
House_5B/8P_M4(2)_Grd	21	HT-M_Grd
Grand total:	455	

Parking Schedule	
Type	Count
2000x6100 mm	53
2500x5000 mm	292
3500x5000 mm	5
Grand total:	350

1:500

1. All dimensions in mm unless stated otherwise.

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Rev	Date	Description
A	05/05/23	Amendments to Masterplan layout and Unit

Drawing Title	Wensum Riverside Block Plan	Scale	1 : 500 @ A1
Project No.	055	First Issue	12/22/22
Project Name	Deal Ground and May Gurney Site	Status	S3-Reserved Matters
Project Address	Dealground, Norwich	Drawings No.	055-S3-(W ZZ)-A001
		Rev.	A



05/05/2023 18:27:17



Parking Schedule			
Type	Family	Count	Comments
2000x6100 mm	UK_Standard Parking Space_SSA	9	
2400x4800 mm	UK_Standard Parking Space	31	
2500x5000 mm	UK_Standard Parking Space_SSA	79	
Grand total: 119			

Area Schedule (Rentable)		
Name	Area	Count
Flat_1B/2P	<varies>	2
Flat_2B/3P	62.26 m ²	1
House_2B/3P_M4(2)_Grd	37.72 m ²	31
House_3B/4P_M4(2)_Grd	41.24 m ²	12
House_3B/5P_M4(2)_Grd	46.04 m ²	16
House_4B/6P_M4(2)_Grd	38.67 m ²	10
Grand total: 72		

1. All Dimensions in mm unless stated otherwise.
 2. Do not scale this drawing. All dimensions to be verified by the contractor before work is commenced.
 3. Architect to be notified immediately if any discrepancies are found.
 4. All shop drawings to be approved by Architect before work commences.
 5. All details to be in accordance with relevant British Standards and manufacturers recommendations and specification.
 6. This drawing is the property of Stolon Studio Ltd. copyright reserved. This drawing is not to be copied, reproduced, retained or disclosed to any unauthorised person either wholly or in part without the specific consent in writing of Stolon Studio.
 7. All work to be carried out by a competent contractor working, where appropriate, to an agreed method statement.
 8. Please note that all details shown on GAs are generated automatically by the computer software, and are not to be used for reference or construction.
 9. For all interface details, please refer to 1:5 drawings.
 10. This drawing is produced based on Survey information by others and Stolon Studio Ltd take no responsibility for the accuracy of this information.

Notes
 Please note that all details shown on GA's are generated automatically by the computer software, and are not to be used for reference or construction. For all interface details, please refer to 1:5 drawings.

Rev	Date	Description
C	05/05/23	Amendments to masterplan layout and units
B	24/04/23	Revisions
A	19/04/23	DRAFT Issue

Drawing Title:	Yare Edge_Block Plan	Scale:	1 : 500 @ A1
Project No.:	055	First Issue:	19/04/23
Project Name:	Deal Ground and May Gurney	Status:	Stage 3
Project Address:	Bracondale, Norwich	Drawing No.:	055-S3-(YE.ZZ)-A001
		Rev.:	C

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05/05/2023 12:34:40

B Planning conditions

Submitted by:

Matt Hill
68 Hanbury Street
London
E1 5JL

On behalf of:

Serruys Property Company Limited
C/o Maddox Planning

TOWN AND COUNTRY PLANNING ACT 1990 SECTION 96A

NON-MATERIAL AMENDMENT

Application Number: 20/00698/NMA

Valid date of application: 22 June 2020

Decision date: 2 September 2020

Location: Deal Ground Bracondale Norwich

Proposal: Amendment to planning application 12/00875/O.

The amendments as detailed within the application received 22 June 2020 and subsequent submissions are considered to be acceptable as non-material amendments to the original outline planning permission 12/00875/O.

Conditions 2, 7, 8, 10, 11, 12, 14, 15, 25, 26, 28, 30, 31, 32, 33, 34, 35, 36, 40, 41, 42, 43, 47 and 48 below have been amended in accordance with section 96A(3)(b) of the Town and Country Planning Act 1990, as amended. For the avoidance of doubt this notice does not grant a new planning consent.

Application Number: 12/00875/O

Location: Deal Ground Bracondale Norwich

Proposal: Outline planning application (full details of access) for a mixed development consisting of a maximum of 670 dwellings; a local centre comprising commercial uses (A1/A2/A3): a restaurant/dining quarter and public house (A3/A4); demolition of buildings on the May Gurney site (excluding the former public house); an access bridge over the River Yare; new access road; car parking; flood risk management measures; landscape measures inc earthworks to form new swales and other biodiversity enhancements including the re-use of the Grade II Listed brick Kiln for use by bats.

Amended conditions:

2. No development shall take place in pursuance of this permission until:
- (a) a phasing plan for the construction and implementation of the access/spine road has been submitted to and approved in writing by the local planning authority;
 - (b) No development of any phase approved under part (a) shall take place until the following additional details for each phase have been submitted to and approved in writing by the local planning authority in consultation with the Highway Authority and where necessary the Environment Agency:
 - (i) full details of the access/ spine road and associated footways and cycle ways;
 - (ii) a flood risk assessment for that phase;
 - (iii) lighting scheme for the route;
 - (iv) foul and surface water strategy;
 - (v) technical drawings of the Yare bridge and any culverts. In the event
 - (vi) of the bridge design and culvert sizes departing from those modelled in the Flood Risk Assessment received by the local planning authority 13 April 2012 the details shall include further modelling to demonstrate no adverse impact on flood flows;
 - (vii) details of the secondary/emergency routes and measures to control access;

The infrastructure shall be implemented in full accordance with the agreed details and implementation plan.

7. No development of any phase agreed under condition 2 shall take place in pursuance of this permission until a Landscape Strategy for the main spine road corridor and a detailed Landscape Scheme for the relevant phase has been submitted to and agreed in writing by the local planning authority. The scheme shall include arboricultural implications assessments, method statements and tree protection plans in line with BS5837:2012 and the following details:
- (a) proposed finished levels or contours;
 - (b) planting plans showing the location, species and numbers of proposed new trees, hedging, shrubs and other planting on the site;
 - (c) planting schedules, noting species, planting sizes (at time of planting) and proposed numbers/densities where appropriate;
 - (d) written specifications (including cultivation and other operations associated with plant and grass establishment);

- (e) an implementation programme clearly indicating a timescale for the completion of all landscaping works;

The development shall be carried out in full accordance with the agreed details and implementation programme.

8. Prior to commencement of the spine road and or submission of reserved matters for any phase as approved under condition 14, a Framework Environmental Action Plan (FEAP) covering the site and the adjacent County Wildlife Site (CWS) shall be submitted to and agreed in writing by the local planning authority. For each phase, a detailed EAP shall include the following:
 - (a) detailed scheme of ecological and protected species mitigation and enhancement, informed by the Ecological Report received by the local planning authority 13 April 2013, up dated ecology surveys and hydrological information;
 - (b) physical measures, in the form of a wet ditch system, to safeguard the long term ecological functioning of the CWS;
 - (c) a phasing plan for the implementation of the ecological and protected species mitigation and enhancement measures;
 - (d) a comprehensive Nature Conservation Management Plan relating to land inside the red line boundary depicted on drawing number 1565/NCMF2 (9.16 chapter 9 Ecology). The Plan shall include details of management responsibilities, plan review arrangements, funding, a schedule of management actions covering all phases of development (construction and long-term operation) and include provisions for any unforeseen cessation in management.

The agreed Framework EAP Plan shall be updated prior to the commencement of each phase. The development shall be undertaken in accordance with the approved EAP and the land shall be managed in accordance with the agreed Nature Conservation Management Plan thereafter. Any subsequent variations to the EAP shall first be approved in writing by the local planning authority

10. With the exception of the access and the main spine road (as detailed under condition 2), no development of any phase agreed under condition 14 shall take place in pursuance of this permission until approval of the reserved matters has been obtained for that phase from the local planning authority. The reserved matters shall relate to the layout, scale, external appearance and landscaping of that phase. Any reserved matters submissions for layout and/or landscaping shall include a flood risk assessment, arboricultural implications assessments, method statements and tree protection plans in line with BS5837:2012.
11. The reserved matters of any phase as agreed under condition 14 shall have regard to the mitigation measures of that phase included in the Environmental Statement received by the local planning authority on 13 April 2012 (as amended by documents dated 19 October 2012, 1 December 2012 and 1 January 2013), the parameters set out on the Proposed Development Areas

plan received 14 February 2013 and the design concept described in the Design and Access Statement (first received 13 April 2012 revised by Addendums D & E) in respect of Vision, the quantum of development, approximate layout of the site, height of blocks (see informative note 1), character areas, access and sustainable transport strategy, landscape/play strategy and integrated design approach.

- (a) Notwithstanding illustrative materials submitted with the application, reserved matters shall exclude the eight storey block previously proposed in the southwest corner of the Marsh Reach character area. For the avoidance of doubt this part of the site is shown on the approved Proposed Development Areas plan received 14 February 2013, as part of the landscaping setting of the development.
 - (b) Reserved matters shall include a scheme to facilitate the water based leisure and recreational use of the river frontage, including the provision of moorings and de-masting facilities.
 - (c) Notwithstanding the illustrative materials submitted with the application, the detailed site layout within the Marsh Reach/Wensum Riverside areas and the appearance, internal room layout, and glazing and ventilation specifications shall be informed by the need to mitigate the impact of noise from adjacent sources, in particular the asphalt plant/rail head, in order to ensure satisfactory levels of amenity for future residents. Mitigation should be informed by the Noise and Vibration Report dated 19 October 2012, updated and revised where necessary.
 - (d) Development within the Wensum Riverside character area shall comply with drawing no. SER001-0014/BZ-DG received by the Local Planning Authority 8 May 2013 regarding the set back of buildings and access roads from the River Yare and River Wensum
 - (e) Notwithstanding the illustrative materials, landscape details shall include a comprehensive landscape scheme that shall seek to mitigate the visual and environmental impacts of the adjacent minerals site and railhead.
12. Reserved matters applications for any phase as agreed under condition 14 shall include a scheme for sustainable construction and renewable or low carbon energy for that phase. The scheme/s shall:
- (a) maximise opportunities for sustainable construction so far as it is viable and practicable to do so;
 - (b) provide for the generation of a minimum of 10% of the predicted energy requirement of the phase from decentralised renewable and/or low carbon sources (as defined in the glossary of Planning Policy Statement: Planning and Climate Change (December 2007) or any subsequent version);
 - (c) demonstrate whether or not there is viable and practicable scope for exceeding 10% of the predicted energy requirement of the phase.

The scheme shall include:

- (d) details of the sustainable construction techniques proposed; and based on d) the estimated annual energy consumption of the phase (expressed in kWh);
 - (e) the type/s of decentralised renewable and/or low carbon energy sources proposed including the number or areas of units proposed;
 - (f) a plan detailing the location of all external equipment associated with the decentralised renewable and/or low carbon source/s and the part of the development it serves;
 - (g) the energy produced per unit or m² for the chosen decentralised renewable and/or low carbon energy source/s (expressed in kWh/unit or kWh/m²);
 - (h) the average annual combined energy production of the renewable and/or low carbon energy sources (expressed in kWh);
 - (i) details of the ongoing operation and management of the decentralised renewable and/or low carbon energy source/s including maintenance responsibilities.
14. Prior to the submission of the first reserved matters a development phasing plan and timetable shall be submitted to and agreed in writing by the local planning authority. The phasing plan shall cover the whole site including all areas of green infrastructure and surface water drainage features/measures. The phasing plan may subsequently be varied subject to the agreement of the local planning authority in writing. The development shall thereafter be constructed in full accordance with the agreed phasing plan.
15. No occupation of any part of the development shall take place until details of a strategy for the provision of equipped children's play space within the development, based on details set out in the Design and Access Statement Addendum A section 2.3 and Addendum B section A.5 received 13 April 2012 and section A. 11 Addendum D received 22 November 2012 have been submitted to the local planning authority and approved in writing. The play spaces should be capable of facilitating the needs of the whole development and should be in line with guidance within the adopted open space and play provision supplementary planning document. The play space shall be provided in full accordance with the approved details for that phase and in accordance with the timetable for the provision of green infrastructure as agreed under condition 14.
25. With the exception of the spine road (as detailed under condition 2), no development of any phase as agreed under condition 14 shall take place in pursuance of this permission until an Interim Travel Plan has been submitted to and approved in writing by the local planning authority, in consultation with the Highway Authority. Such a Travel Plan shall accord with Norfolk County Council document 'Guidance Notes for the Submission of Travel Plans' (or any

approved variation to that document) or be produced using the Workplace Travel Plan Generator Tool, www.worktravelplan.net.

26. No part of the development of any phase as agreed under condition 14 hereby permitted shall be occupied until the approved Interim Travel Plan for that phase referred to in condition 25 above has been implemented. During the first year of occupation a Full Travel Plan, based on the Interim Travel Plan referred to in condition 25 above and including details of proposed implementation and mechanisms for monitoring and review, shall be submitted to the local planning authority for approval, in consultation with the Highway Authority. The Approved Full Travel Plan shall be implemented in accordance with the timetable and targets contained therein and shall continue to be implemented as long as any part of the development is occupied and used for a purpose in accordance with this permission, subject to approved modifications as agreed by the local planning authority, in consultation with the Highway Authority, as part of the annual review.
28. No occupation of any dwelling shall take place until car parking, cycle parking and storage and bin storage and collection facilities for that phase as agreed under condition 14 have been provided in accordance with details to be agreed under condition 10 (reserved matters for layout and landscaping).
30. The development shall be constructed with a minimum finished floor level as detailed in the Flood Risk Assessment approved under condition 10.
31. Prior to the commencement of any phase of development agreed under condition 14, details of a safe exit route based on the Flood Risk Assessment approved under condition 10 and not adversely affecting the flood regime to land outside the 1:100 year floodplain shall be submitted, along with an implementation plan, to be agreed, in writing, with the local planning authority. The route shall be constructed and completed in accordance with the agreed implementation plan
32. Prior to the commencement of the main spine road or development of any phase agreed under condition 14, a scheme for the provision and implementation of compensatory flood storage works for that phase based on the principles set out in the Flood Risk Assessment (Environmental Statement: Section 7 dated November 2010, received 13th April 2012), and as updated in details approved under condition 10, and section 2.6 of the Design and Access Statement (Addendum A, received 13th April 2012) shall be submitted to and approved, in writing by the local planning authority. The approved scheme shall be constructed and completed in accordance with the approved details and implementation timetable.
33. No development of the main spine road (as detailed under condition 2), or any phase agreed under condition 14 shall take place until a surface water drainage scheme for that phase, based on sustainable drainage principles and an assessment of the hydrological and hydro geological context of the development, the principles outlined in the Flood Risk Assessment and section 2.6 of the Design and Access Statement (addendum A) received 13 April 2012

and as updated in details approved under condition 10, has been submitted to and approved in writing by the local planning authority.

The scheme shall also include:

- (a) details of the proposed location, dimensions and design of each element of the surface water scheme;
- (b) calculations of the existing runoff rates from the sites in a range of probability rainfall events including 1 in 1 year, the 1 in 30 year and the 1 in 100 year, and a range of rainfall durations for each probability rainfall event;
- (c) restriction of the surface water runoff into the river to no greater than the existing runoff rates to ensure there is no increase in offsite flood risk. This should include consideration of how the proposed runoff rates compare to the existing runoff events for a range of rainfall events from the 1 in 1 year to the 1 in 100 year events including climate change, with an assessment of a range of rainfall durations for each event;
- (d) calculations to demonstrate that the proposed attenuation storage features are sized to contain the peak duration 1:100 year rainfall event including climate change;
- (e) calculations to demonstrate how the pipe network will perform in the 1 in 30 year and 1 in 100 year rainfall events including climate change, to show that there will be no above ground flooding in the 1 in 30 year rainfall events, and details of the volumes and location of any surcharging water in the 1 in 100 year rainfall event including climate change to demonstrate where it will be stored to ensure no flooding of buildings or offsite flooding;
- (f) details of the location and volumes of surface water exceedance flows in an extreme rainfall event or in the event of pump failure, to demonstrate where the water will flow and be stored to prevent buildings flooding;
- (g) details of who is responsible for the adoption and maintenance of each aspect of the proposed surface water system for the lifetime of the proposed development, and details of the maintenance measures proposed.

The scheme shall subsequently be implemented in accordance with the approved details before the development/phase is completed.

34. With the exception of spine road (as detailed under condition 2), no development of any phase agreed under condition 14 shall take place until a details of Flood Resilient Construction measures for that phase based on the principles outlined within the submitted Flood Risk Assessment 7.66 - 7.71 (Environmental Statement: Section 7 received by the local planning authority on 13th April 2012), and as updated in the details approved under condition 10 has been submitted to and approved in writing by the local planning authority. The

scheme shall be constructed and completed in accordance with the agreed details before occupancy of any part of that phase.

35. Prior to the occupation of any building a Flood Risk Management Plan including arrangements for flood warning and evacuation for any phase as agreed under condition 14 shall be submitted to and approved in writing by the local planning authority. The approved plan, up dated where necessary, shall remain in force for the life time of the development.
36. No development shall take place within any phase as agreed under condition 14 in pursuance of this permission until the following components of a scheme to deal with the risks associated with contamination of that phase have each been submitted to and approved, in writing, by the local planning authority:
 - (a) a preliminary risk assessment which has identified:
 - (i) all previous uses;
 - (ii) potential contaminants associated with those uses;
 - (iii) a conceptual model of the site indicating sources, pathways and receptors;
 - (iv) potentially unacceptable risks arising from contamination at the site;
 - (b) a site investigation scheme, based on the preliminary risk assessment, to provide information for a detailed assessment of the risk to all receptors that may be affected, including those off site;
 - (c) a written report containing the site investigation results and the detailed risk assessment of the risk to all receptors that may be affected and, based on these, if required, an options appraisal and remediation strategy giving full details of the remediation measures required and how they are to be undertaken;
 - (d) a verification plan providing details of the data that will be collected in order to demonstrate that the works set out in the remediation strategy are complete and identifying any requirements for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action.

Phasing of requirements b), c) and d) may be permissible where approved in writing by the local planning authority and provided works would not prevent the adequate investigation, assessment and validation remediation of subsequent phases of the development. Any works on site shall be in accordance with the scheme as approved and any changes to any of the details specified above would require the further express consent of the local planning authority.

40. Prior to the commencement of any development, of any phase as agreed under condition 14, a scheme for the provision and implementation of pollution control shall be submitted to, and agreed in writing by the local planning authority. The works/scheme shall be constructed and completed in accordance with the approved specification for that phase at such times as may be specified in the approved scheme.

41. With the exception of the accesses and spine road (as detailed under condition 2), no development of any phase agreed under condition 14 shall take place until details for the provision of fire hydrants on that phase have been submitted to and agreed in writing by the local planning authority in consultation with Norfolk Fire Service. No occupation of any part of that phase of the development hereby approved shall take place until the hydrant serving that part of the development has been provided in full accordance with the approved details. The hydrants shall be retained as such thereafter.
42. No development shall take place in pursuance of this permission on any phase or the spine road until a Construction Method Statement for the spine road and for each phase of the development as agreed under condition 14, has been submitted to, and approved in writing by the local planning authority. The approved Statement/s shall be adhered to throughout the construction period for the construction of the accesses and spine road and for each phase of development. The Statement shall provide for:
- (a) proposed construction hours;
 - (b) the parking of vehicles of site operatives and visitors;
 - (c) the location of site compounds;
 - (d) construction vehicle access routes;
 - (e) loading and unloading of plant and materials;
 - (f) storage of plant and materials used in constructing the development;
 - (g) storage of fuel/oil and hazardous products or chemicals and measures to prevent pollution of ground water;
 - (h) silt containment;
 - (i) the erection and maintenance of security hoarding, including decorative displays and facilities for public viewing, where appropriate;
 - (j) wheel washing facilities;
 - (k) measures to control the emission of dust and dirt during construction;
 - (l) measures to control light pollution from temporary lighting to areas of retained scrub, hedgerows and trees; and
 - (m) site clearance of any scrub, hedgerows of trees, which are to be removed, to take place outside bird nesting season March - August inclusive, unless otherwise agreed in writing with the local planning authority.

43. No development of any phase as agreed under condition 14 shall take place in pursuance of this permission until a Construction and Environmental Management Plan (CEMP) has been submitted to and approved in writing by the local planning authority.

The approved CEMP shall be adhered to throughout the construction of the accesses and spine road and each phase of development. The Statement shall include:

- (a) details of the project management structure and clearly identify the roles and responsibilities with regard to managing and reporting on the construction phase environmental aspects;
 - (b) an Environmental Risk Assessment identifying all aspects of construction that could have an environmental impact and assesses the potential risk and impact of that activity on the environment;
 - (c) management controls to eliminate and/or minimise identified impacts;
 - (d) a programme of monitoring, reporting and auditing of compliance in accordance with any obligations of the planning consent, licences and approvals should also be contained in the CEMP to ensure that identified and appropriate control measures are effective.
47. No development of any phase as agreed under condition 14 shall commence until a foul water strategy for that phase has been submitted to and approved in writing by the local planning authority. The development of that phase shall be carried out in strict accordance with the approved scheme prior to first occupation of any dwelling on that phase unless otherwise approved in writing by the local planning authority.
48. All imported topsoil and subsoil for use on the site shall either (a) be certified to confirm its source and that it is appropriate for its intended use. No occupation of any phase as approved under condition 14 of the development shall take place until a copy of the certification has been submitted to the local planning authority; or (b) in the absence of suitable certification, analysis of the imported material will be required along with evaluation against the derived assessment criteria for this site.



Mark Brown
Area Development Manager
Planning Services

Appeals to the Secretary of State

- If you are aggrieved by the decision of your local planning authority to refuse permission for the proposed development or to grant it subject to conditions, then you can appeal to the Secretary of State under section 78 of the Town and Country Planning Act 1990.
- If you want to appeal against your local planning authority's decision then you must do so within 6 months of the date of this notice.
- Appeals must be made using a form which you can get from the Secretary of State at Temple Quay House, 2 The Square, Temple Quay, Bristol BS1 6PN (Tel: 0303 444 5000) or online at <https://acp.planninginspectorate.gov.uk>.
- The Secretary of State can allow a longer period for giving notice of an appeal but will not normally be prepared to use this power unless there are special circumstances which excuse the delay in giving notice of appeal.
- The Secretary of State need not consider an appeal if it seems to the Secretary of State that the local planning authority could not have granted planning permission for the proposed development or could not have granted it without the conditions they imposed, having regard to the statutory requirements, to the provisions of any development order and to any directions given under a development order.

Purchase Notices

- If either the local planning authority or the Secretary of State refuses permission to develop land or grants it subject to conditions, the owner may claim that the owner can neither put the land to a reasonably beneficial use in its existing state nor render the land capable of a reasonably beneficial use by the carrying out of any development which has been or would be permitted.
- In these circumstances, the owner may serve a purchase notice on the Council. This notice will require the Council to purchase the owner's interest in the land in accordance with the provisions of Chapter I of Part VI of the Town and Country Planning Act 1990.

Growth & Localism

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APPROVAL OF OUTLINE PLANNING PERMISSION

Ref: 2011/0152/O

Agent

Mr Philip Atkinson
Lanpro Services
4 St Marys House
Duke Street
Norwich
NR3 1QA

Applicant

Serruys Property Company Ltd
C/O Agent

Location: The Deal Ground And Former May Gurney Site, The Street, Trowse

Proposal: Outline planning application (full details of access) for a mixed development consisting of a maximum of 670 dwellings; a local centre comprising commercial uses (A1/A2/A3): a restaurant/dining quarter and public house (A3/A4); demolition of buildings on the May Gurney site (excluding the former public house); an access bridge over the River Yare; new access road; car parking; flood risk management measures; landscape measures inc earthworks to form new swales and other biodiversity enhancements including the re-use of the Grade II Listed brick Kiln for use by bats.

Particulars of decision: The District Council hereby gives notice in pursuance of the Town and Country Planning Act 1990 that outline planning permission **has been granted** for the carrying out of development referred to above in accordance with the application form and plans submitted subject to compliance with the following conditions:

1. Application for the approval of all reserved matters shall be made to the local planning authority not later than the expiration of ten years beginning from the date of this permission. The development hereby permitted shall be begun not later than the expiration of two years from the final approval of the reserved matters, or in the case of approval on different dates, the final approval of the last such matter to be approved.

Reason for condition

As required to be imposed by section 92 of the Town and Country Planning Act 1990 as amended by Section 51 of the Planning and Compulsory Purchase Act 2004.

2. The access/main spine road as detailed on approved drawings; 3009005/B/001 A, 3009005/B/002 A, 3009005/A/015 B, 3009005/AB/016 A, 3009005/A/017 A and 3009005/A/018 A, received by the Local Planning Authority on 17 April 2012 shall be begun before the expiration of ten years from the date of this permission.

Reason for condition

As required to be imposed by section 91 of the Town and Country Planning Act 1990 as amended by Section 51 of the Planning and Compulsory Purchase Act 2004. In this case an extended period of time is allowed given the complexity of this site and the adjacent Utilities site and the lead in period for infrastructure works.

3. With the exception of the access and the main spine road, no development shall take place in pursuance of this permission until approval of the reserved matters has been obtained from the local planning authority. The reserved matters shall relate to the layout, scale, external appearance and landscaping. Any reserved matters submissions for layout and/or landscaping shall include arboricultural implications assessments, method statements and tree protection plans in line with BS5837:2012.

Reason for condition

The application is submitted in outline form only and the details required are pursuant to the provisions of Article 4(1) of the Town and Country Planning (Development Management Procedure) (England) Order 2010. Further arboricultural and ecological surveys have been identified as necessary to comply with the NPPF, and policy 1 of the adopted Joint Core Strategy for Broadland, Norwich and South Norfolk.

4. No development shall take place in pursuance of this permission until the following details have been submitted to and approved in writing by the Local Planning Authority in consultation with the Highway Authority and where necessary the Environment Agency:
 - a) full details of the access/ spine road and associated footways and cycle ways
 - b) lighting scheme for the route
 - c) foul and surface water strategy
 - d) technical drawings of the Yare bridge and any culverts. In the event of the bridge design and culvert sizes departing from those modelled in the Flood Risk Assessment dated July 2010 (received by the Local Planning Authority 13 April 2012) the details shall include further modelling to demonstrate no adverse impact on flood flows
 - e) details of the secondary/emergency routes and measures to control access
 - f) phasing plan for the construction and implementation of infrastructure listed above.

The infrastructure shall be implemented in full accordance with the agreed details and implementation plan.

Reason for condition

To ensure the satisfactory provision of essential infrastructure in accordance with the NPPF and policy 2 of the adopted Joint Core Strategy for Broadland, Norwich and South Norfolk 2011.

5. Notwithstanding the details indicated on the submitted drawings no works shall commence on site until a detailed scheme for the access and off-site highway improvement works on the Street as indicated on drawings numbered 3009005/A/015 Rev B and 3009005/B/002Rev A have been submitted to and approved in writing by the Local Planning Authority in consultation with the Highway Authority. (For the avoidance of doubt the site access/The street junction will not be signalised. Also the footway/cycleway works proposed for Bracondale will not be constructed and will be replaced by an on-carriageway cycle lane scheme.)

Reason for condition

To ensure that the highway improvement works are designed to an appropriate standard in the interest of highway safety and to protect the environment of the local highway corridor in accordance with saved policy IMP8 of the South Norfolk Local Plan 2003.

6. Prior to first occupation of the development hereby permitted the off-site highway improvements referred to above shall be completed to the written satisfaction of the Local Planning Authority in consultation with the Highway Authority unless otherwise agreed in writing.

Reason

To ensure that the highway network is adequate to cater for the development proposed in accordance with saved policy IMP8 of the South Norfolk Local Plan 2003.

7. No development shall take place in pursuance of this permission until a detailed landscaping scheme for the main spine road corridor has been submitted to and agreed in writing with the Local Planning Authority. The scheme shall include arboricultural implications assessments, method statements and tree protection plans in line with BS5837:2012 and the following details:
- a) proposed finished levels or contours;
 - b) planting plans showing the location, species and numbers of proposed new trees, hedging, shrubs and other planting on the site;
 - c) planting schedules, noting species, planting sizes (at time of planting) and proposed numbers/densities where appropriate;
 - d) written specifications (including cultivation and other operations associated with plant and grass establishment).
 - e) an implementation programme clearly indicating a timescale for the completion of all landscaping works;

The development shall be carried out in full accordance with the agreed details and implementation programme.

Reason

In the interests of the satisfactory appearance of the development and to enhance biodiversity in accordance with the NPPF, policy 2 of the adopted Joint Core Strategy for Broadland, Norwich and South Norfolk 2011 and saved policy IMP2 of the South Norfolk Local Plan 2003.

8. The reserved matters shall comply with the mitigation measures included in the Environmental Statement received by the local planning authority on 13 April 2012 (as amended by documents dated 19 October 2012, 1 December 2012 and 1 January 2013), the parameters set out on the Proposed Development Areas plan received 7 February 2013 and the design concept described in the Design and Access Statement (first received 17 April 2012 revised by Addendums D & E) in respect of Vision, the quantum of development, approximate layout of the site, height of blocks (see informative note 1), character areas, access and sustainable transport strategy, landscape/play strategy and integrated design approach.
- a) Notwithstanding illustrative materials submitted with the application, reserved matters shall exclude the eight storey block previously proposed in the south-west corner of the Marsh Reach character area. For the avoidance of doubt this part of the site is shown on the approved Proposed Development Areas plan received 7 February 2013, as part of the landscaping setting of the development.
 - b) Reserved matters shall include a scheme to facilitate the water based leisure and recreational use of the river frontage, including the provision of moorings and de-masting facilities.
 - c) Notwithstanding the illustrative materials submitted with the application, the detailed site layout within the Marsh Reach/Wensum Riverside areas and the appearance, internal room layout, and glazing and ventilation specifications shall be informed by the need to mitigate the impact of noise from adjacent sources, in particular the asphalt plant/rail head, in order to ensure satisfactory levels of amenity for future residents. Mitigation should be informed

by the Noise and Vibration Report dated 19 October 2012, updated and revised where necessary.

d) Development within the Wensum Riverside character area shall comply with drawing no. SER001-0014/BZ-DG received by the Local Planning Authority 8 May 2013 regarding the set back of buildings and access roads from the River Yare and River Wensum

e) Notwithstanding the illustrative materials, landscape details shall include a comprehensive landscape scheme that shall seek to mitigate the visual and environmental impacts of the adjacent minerals site and railhead.

Reason for condition

For the avoidance of doubt and to comply with Article 4 of the Town and Country Planning (Development Management Procedure) (England) Order 2010

9. Reserved matters applications shall include a scheme for sustainable construction and renewable or low carbon energy. The scheme/s shall:
- a) maximise opportunities for sustainable construction so far as it is viable and practicable to do so;
 - b) provide for the generation of a minimum of 10% of the predicted energy requirement of the phase from decentralised renewable and/or low carbon sources (as defined in the glossary of Planning Policy Statement: Planning and Climate Change (December 2007) or any subsequent version);
 - c) demonstrate whether or not there is viable and practicable scope for exceeding 10% of the predicted energy requirement of the phase.
- The scheme shall include:
- d) details of the sustainable construction techniques proposed; and
 - e) based on d) the estimated annual energy consumption of the phase (expressed in kWh);
 - f) the type/s of decentralised renewable and/or low carbon energy sources proposed including the number or areas of units proposed;
 - g) a plan detailing the location of all external equipment associated with the decentralised renewable and/or low carbon source/s and the part of the development it serves;
 - h) the energy produced per unit or m² for the chosen decentralised renewable and/or low carbon energy source/s (expressed in kWh/unit or kWh/m²);
 - i) the average annual combined energy production of the renewable and/or low carbon energy sources (expressed in kWh);
 - j) details of the ongoing operation and management of the decentralised renewable and/or low carbon energy source/s including maintenance responsibilities.

Reason for condition

To ensure sustainable construction is maximised and to secure at least 10% of the site's energy from decentralised and renewable or low carbon sources to accord with policy 3 of the adopted Joint Core Strategy for Broadland, Norwich and South Norfolk 2011.

10. Prior to the submission of any reserved matters application relating to Wensum Riverside character area, a detailed design code for that area shall be submitted to the Local Planning Authority and approved in writing. The design code shall include the following information:
- a) Frontage principles, including the set back of properties from the road, division of public and private space and boundary treatments;
 - b) Building heights and built form including approach to roofscape

- c) Approach to parking location and layout;
 - d) Landscaping strategy for external areas (private / communal gardens; streets; parking areas; public realm and riverside) including palette of materials to be used in the external surfaces.
 - e) Approach to the multi-functional use of the Wensum riverside frontage including the provision of 2m wide (minimum width) pedestrian access for uninhibited public use.
 - f) Palette of materials for buildings
 - g) Architectural treatment (including details of openings and materials) of building elevations at street-level
 - h) Approach to the integration of sustainability measures within the building design.
- The design code shall conform with the parameters approved at outline stage. All reserved matters applications relating to Wensum Riverside shall comply with the approved design code.

Reason for condition

To ensure a consistent approach to the design of the river frontage in the interests of the visual appearance of the site and to accord with the NPPF and Policy 2 of the adopted Joint Core Strategy for Broadland, Norwich and South Norfolk.

11. With the exception of the spine road no development shall take place until a development phasing plan and timetable has been submitted to and agreed by the Local Planning Authority in writing. The phasing plan shall cover the whole site including all areas of green infrastructure and surface water drainage features/measures. The phasing plan may subsequently be varied subject to the agreement of the Local Planning Authority in writing. The development shall thereafter be constructed in full accordance with the agreed phasing plan.

Reason for condition

To ensure that any phasing of the development is satisfactory in terms of the sites operation and visual appearance and to ensure that the delivery of mitigation measures can be co-ordinated across the phased development in accordance with the NPPF and Policy 2 of the Joint Core Strategy for Broadland, Norwich and South Norfolk.

12. With the exception of the spine road no development of any phase as agreed under condition 11 shall take place in pursuance of this permission until precise details of the slab levels of the dwelling/blocks of dwellings have been submitted to and agreed in writing by the local planning authority. Such details shall also provide comparative levels with existing adjoining properties and details of the levels of any ground levels and boundary treatments proposed. The development shall be carried out in accordance with the details as approved.

Reason for condition

To ensure the development of the site results in a high quality design and does not result in detriment to the living conditions of neighbouring residents, in accordance with the NPPF and saved policy IMP9 of the South Norfolk Local Plan 2003.

13. The small local centre hereby permitted shall provide no more than a total of 1,265 sqm gross external floor space as specified in the Environmental Statement Section 10 Table 15 received 17 April 2012 and shall provide no more than 9 individual planning units and no individual planning unit shall exceed 500 sqm gross external floor space. The small local centre shall only be used for uses within use classes A1 (shops), A2 (financial and professional services) or A3 (restaurants and cafes) as defined by the Town and Country Planning (Use Classes) Order 1987 as amended (or in any provision equivalent to that Class in any statutory instrument revoking and re-enacting that Order, with or without

modification) and notwithstanding the provisions of Schedule 2, Part 3 of the Town and Country Planning (General Permitted Development) Order 1995 as amended (or any Order revoking and re-enacting that Order, with or without modification) at least 50% of the gross external floor space of the small local centre shall be in A1 retail use.

Reason for condition

To ensure the floor space is appropriate for the residential location outside of any defined centre and to ensure the vitality and viability of any unit/s provided on site, to accord with the NPPF and saved policy SHO8 of the South Norfolk Local Plan 2003.

14. No development shall take place until a detailed scheme for the undergrounding of the overhead power cables and the removal of existing infrastructure and cables as agreed with the distribution network operator, has been submitted to and agreed in writing by the Local Planning Authority.

Reason for condition

To ensure that the works: minimise and appropriately mitigate impact on the on the flora and fauna on the site and County Wildlife Site; utilise proposed primary service routes and assists in facilitating the regeneration of the east Norwich area in accordance with the NPPF and policies 1 and 11 of the adopted Joint Core Strategy for Broadland, Norwich and South Norfolk 2011.

15. No occupancy of any dwelling within the the May Gurney site shall take place until the approved scheme for the undergrounding of the overhead power cables has been implemented and completed in full.

Reason for condition

In the interests of the amenities of the occupiers of the approved dwellings in accordance with section 6 NPPF.

16. With the exception of the spine road (as detailed under condition 2), unless otherwise agreed in writing by the local planning authority, no development of any phase on the Deal Ground, agreed under condition 11, shall take place until it has been demonstrated and the local planning authority has confirmed in writing, that it is satisfied that relevant consents and full access rights are in place to allow public access for pedestrians and cyclists into perpetuity from The Street over a bridge crossing the River Wensum to either the adopted highway or where it exists to the formal Riverside Walk network, on the northern side of the river.

Reason for condition

To provide improved access to the south-east of the city and ensure that future residents of the development have direct and connected pedestrian and cycle access to routes on the north side of the River Wensum, facilitating modal shift and sustainable travel towards the city centre, in accordance with the approved Transport Strategy (dated July 2010, received 13 April 2013), NPPF, policies 2 and 6 of the adopted Joint Core Strategy for Broadland, Norwich and South Norfolk 2011.

17. Unless otherwise agreed in writing by the local planning authority, no dwelling on the Deal Ground shall be occupied prior to the provision of the Yare bridge (as approved under condition 2) and a bridge providing pedestrian and cycle access over the River Wensum and a route for cyclists and pedestrians being freely available for public use in perpetuity linking either the adopted highway or the formal Riverside Walk network on the northern side of the River Wensum to adopted highway on the Deal Ground.

Reason for condition

To provide improved access to the south-east of the city and ensure that future residents of the development have direct and connected pedestrian and cycle access to the north side of the River Wensum facilitating modal shift and sustainable travel towards the city centre from the start of the development, in accordance with the approved Transport Strategy (dated July 2010, received 17 April 2013) for the development and NPPF, and policies 2 and 6 of the adopted Joint Core Strategy for Broadland, Norwich and South Norfolk 2011. Only in exceptional circumstances will the timing of the bridge be varied, that is where there is evidence that a short term delay would result in the provision of a bridge to serve the needs of the wider east Norwich area. In such cases it would need to be demonstrated that the bridge had all relevant consents, the build contract had been awarded to allow an imminent start and that adequate temporary arrangements were in place to facilitate sustainable travel patterns by residents.

18. With the exception of the spine road no development shall take place in pursuance of this permission until an Interim Travel Plan has been submitted to and approved in writing by the Local Planning Authority, in consultation with the Highway Authority. Such a Travel Plan shall accord with Norfolk County Council document 'Guidance Notes for the Submission of Travel Plans' (or any approved variation to that document) or be produced using the Workplace Travel Plan Generator Tool, www.worktravelplan.net.

Reason for condition

To ensure that the development offers a wide range of travel choices to reduce the impact of travel and transport on the environment in accordance with the NPPF and saved policy IMP8 of the South Norfolk Local Plan 2003.

19. No part of the development hereby permitted shall be occupied until the approved Interim Travel Plan referred to above has been implemented. During the first year of occupation a Full Travel Plan, based on the Interim Travel Plan referred to above and including details of proposed implementation and mechanisms for monitoring and review, shall be submitted to the local planning authority for approval, in consultation with the Highway Authority. The Approved Full Travel Plan shall be implemented in accordance with the timetable and targets contained therein and shall continue to be implemented as long as any part of the development is occupied and used for a purpose in accordance with this permission, subject to approved modifications as agreed by the Local Planning Authority, in consultation with the Highway Authority, as part of the annual review.

Reason for condition

To ensure that the development offers a wide range of travel choices to reduce the impact of travel and transport on the environment in accordance with the NPPF and saved policy IMP8 of the South Norfolk Local Plan 2003.

20. With the exception of the accesses and spine road no development of any phase as agreed under condition 11 shall take place until details of the design, construction and surfacing of roadways, footpaths and cycle ways and an implementation plan for the works have been submitted to and approved in writing by the Local Planning Authority. The roadways, footpaths and cycle ways shall be constructed in full accordance with the approved details and implementation plan.

Reason for condition

To ensure the satisfactory provision of essential infrastructure in accordance with the NPPF, policy 2 of the adopted Joint Core Strategy for Broadland, Norwich and South Norfolk 2011 and saved policy IMP8 of the South Norfolk Local Plan 2003.

21. No occupation of any dwelling shall take place until car parking, cycle parking and storage and bin storage and collection facilities have been provided in accordance with details agreed under the reserved matters for layout and landscaping.

Reason for condition

To ensure a satisfactory development of the site which provides for adequate parking, turning, cycle parking and servicing provision for the development, in accordance with saved policy IMP8 of the South Norfolk Local Plan 2003.

22. With the exception of the access and spine road no occupation of any phase shall take place until appropriate traffic regulations orders have been secured to facilitate the delivery of the Transport Strategy (Environmental Statement - Section 6 dated July 2010, received 17 April 2013) and parking and access arrangements.

Reason for condition

To ensure the effective implementation of the Transport strategy (dated July 2010, received 17 April 2013) and the efficient operation of the highway and in the interests of highway safety in accordance with saved policy IMP8 of the South Norfolk Local Plan 2003.

23. The development shall be constructed with a minimum finished floor level of 2.4 AOD, as detailed in the approved Flood Risk Assessment.

Reason for condition

To minimise and mitigate flood risk in accordance with section 10 of the NPPF and Policy 1 of the adopted Joint Core Strategy for Broadland, Norwich and South Norfolk 2011.

24. Prior to the commencement of development, details of a safe exit route, not adversely affecting the flood regime, to land outside the 1:100 year floodplain shall be submitted to and agreed, in writing, with the Local Planning authority. The route shall be constructed and completed before occupancy of any part of the proposed development.

Reason for condition

To minimise and mitigate flood risk in accordance with section 10 of the NPPF and policy 1 of the adopted Joint Core Strategy for Broadland, Norwich and South Norfolk 2011.

25. Prior to the commencement of the main spine road or development of any phase agreed under condition 11 a scheme for the provision and implementation of compensatory flood storage works for that phase based on the principles set out in the Flood Risk Assessment (Environmental Statement: Section 7 dated November 2010, received 17 April 2012) and section 2.6 of the Design and Access Statement (Addendum A, received 17 April 2012) shall be submitted to and approved, in writing by the Local Planning Authority. The approved scheme shall be constructed and completed in accordance with the approved details and implementation timetable.

Reason for condition

To minimise, mitigate and compensate for flood risk in accordance with section 10 of the NPPF and Policy 1 of the adopted Joint Core Strategy for Broadland, Norwich and South Norfolk 2011.

26. No development of the main spine road or any phase agreed under condition 11 shall take place until a surface water drainage scheme for that development/phase, based on sustainable drainage principles and an assessment of the hydrological and hydro geological context of the development and the principles outlined in the Flood Risk Assessment (Environmental Statement: Section 7 dated November 2010, received 17 April 2012) and

section 2.6 of the Design and Access Statement Addendum A received by the Local Planning Authority on 17 April 2012 has been submitted to and approved in writing by the local planning authority. The scheme shall also include:

- Details of the proposed location, dimensions and design of each element of the surface water scheme
- Calculations of the existing runoff rates from the sites in a range of probability rainfall events including 1 in 1 year, the 1 in 30 year and the 1 in 100 year, and a range of rainfall durations for each probability rainfall event
- Restriction of the surface water runoff into the river to no greater than the existing runoff rates to ensure there is no increase in offsite flood risk. This should include consideration of how the proposed runoff rates compare to the existing runoff events for a range of rainfall events from the 1 in 1 year to the 1 in 100 year events including climate change, with an assessment of a range of rainfall durations for each event
- Calculations to demonstrate that the proposed attenuation storage features are sized to contain the peak duration 1:100 year rainfall event including climate change
- Calculations to demonstrate how the pipe network will perform in the 1 in 30 year and 1 in 100 year rainfall events including climate change, to show that there will be no above ground flooding in the 1 in 30 year rainfall events, and details of the volumes and location of any surcharging water in the 1 in 100 year rainfall event including climate change to demonstrate where it will be stored to ensure no flooding of buildings or offsite flooding
- Details of the location and volumes of surface water exceedence flows in an extreme rainfall event or in the event of pump failure, to demonstrate where the water will flow and be stored to prevent buildings flooding
- Details of who is responsible for the adoption and maintenance of each aspect of the proposed surface water system for the lifetime of the proposed development, and details of the maintenance measures proposed.

The scheme shall subsequently be implemented in accordance with the approved details before the development is completed.

Reason for condition

To ensure that the development makes adequate provision for sustainable urban drainage and does not adversely contribute to surface water flooding, in accordance with section 10 of the NPPF and Policy 1 of the Joint Core Strategy for Broadland, Norwich and South Norfolk 2011.

27. With the exception of spine road no development of any phase agreed under condition 11 shall take place until a details of Flood Resilient Construction measures for that phase based on the the principles outlined within the submitted Flood Risk Assessment 7.66 - 7.71 (Environmental Statement: Section 7 dated November 2010, received by the Local Planning Authority on 17 April 2012), has been submitted to and approved in writing by the local planning authority. The scheme shall be constructed and completed in accordance with the agreed details before occupancy of any part of the proposed development

Reason for condition

To ensure that the development makes adequate provision for sustainable urban drainage and does not adversely contribute to surface water flooding, in accordance with section 10 of the NPPF and Policy 1 of the Joint Core Strategy for Broadland, Norwich and South Norfolk 2011.

28. Prior to the occupation of any building a Flood Risk Management Plan including arrangements for flood warning and evacuation shall be submitted to and approved in

writing by the Local Planning Authority. Approved plan, up dated where necessary, shall remain in force for the life time of the development.

Reason for condition

To minimise and mitigate flood risk in accordance with section 10 of the NPPF and Policy 1 of the adopted Joint Core Strategy for Broadland, Norwich and South Norfolk 2011

29. No development shall take place within the site in pursuance of this permission until the following components of a scheme to deal with the risks associated with contamination of the site have each been submitted to and approved, in writing, by the local planning authority:
- 1) A preliminary risk assessment which has identified:
 - a) all previous uses
 - b) potential contaminants associated with those uses
 - c) a conceptual model of the site indicating sources, pathways and receptors
 - d) potentially unacceptable risks arising from contamination at the site;
 - 2) A site investigation scheme, based on the preliminary risk assessment, to provide information for a detailed assessment of the risk to all receptors that may be affected, including those off site;
 - 3) A written report containing the site investigation results and the detailed risk assessment of the risk to all receptors that may be affected and, based on these, if required, an options appraisal and remediation strategy giving full details of the remediation measures required and how they are to be undertaken.
 - 4) A verification plan providing details of the data that will be collected in order to demonstrate that the works set out in the remediation strategy are complete and identifying any requirements for longer-term monitoring of pollutant linkages, maintenance and arrangements for contingency action.

Phasing of requirements 2), 3) and 4) may be permissible where approved in writing by the Local Planning Authority and provided works would not prevent the adequate investigation, assessment and validation remediation of subsequent phases of the development. Any works on site shall be in accordance with the scheme as approved and any changes to any of the details specified above would require the further express consent of the local planning authority.

Reason for condition

To ensure that risks from land contamination to the future users of the land and neighbouring land are minimised, together with those to controlled waters, property and ecological systems, and to ensure that the development can be carried out safely without unacceptable risks to workers, neighbours and other offsite receptors, in accordance with policy UTL15 of the South Norfolk Local Plan.

Note

This must be conducted in accordance with DEFRA and the Environment Agency's 'Model Procedures for the Management of Land Contamination, CLR 11'.

30. No occupation of the development or where applicable any phase agree under condition 11 and 29 hereby approved shall take place until a verification report demonstrating completion of the works set out in the approved remediation strategy and the effectiveness of the remediation shall be submitted to and approved in writing, by the local planning authority. The report shall include sampling and monitoring carried out in accordance with the approved verification plan to demonstrate that the site remediation criteria have been met. It shall also include any plan (a 'long-term monitoring and maintenance plan') for

longer term monitoring of pollutant linkages, maintenance and arrangements for contingency action, as identified in the verification plan, and for the reporting of this to the local planning authority. The long-term monitoring and maintenance plan shall be implemented as approved.

Reason for condition

To ensure that risks from land contamination to the future users of the land and neighbouring land are minimised, together with those to controlled waters, property and ecological systems, and to ensure that the development can be carried out safely without unacceptable risks to workers, neighbours and other offsite receptors, in accordance with policy UTL15 of the South Norfolk Local Plan.

31. If, during development, contamination not previously identified is found to be present, then no further development (unless otherwise agreed in writing with the local planning authority) shall be carried out until the developer has submitted and obtained written approval from the Local Planning Authority for, a remediation strategy detailing how this unsuspected contamination shall be dealt with. The remediation strategy shall be implemented as approved.

Reason for condition

To ensure that risks from land contamination to the future users of the land and neighbouring land are minimised, together with those to controlled waters, property and ecological systems, and to ensure that the development can be carried out safely without unacceptable risks to workers, neighbours and other offsite receptors, in accordance with policy UTL15 of the South Norfolk Local Plan.

32. Prior to the commencement of any development, a scheme for the provision and implementation of pollution control shall be submitted to, and agreed in writing with the Local Planning Authority. The works/scheme shall be constructed and completed in accordance with the as the approved specification at such times as may be specified in the approved scheme.

Reason for condition

To ensure that risks from land contamination to the future users of the land and neighbouring land are minimised, together with those to controlled waters, property and ecological systems, and to ensure that the development can be carried out safely without unacceptable risks to workers, neighbours and other offsite receptors, in accordance with policy UTL15 of the South Norfolk Local Plan.

33. With the exception of the accesses and spine road (as detailed under condition 2), no development of any phase agreed under condition 15 shall take place until details for the provision of fire hydrants have been submitted to and agreed in writing by the local planning authority in consultation with Norfolk Fire Service. No occupation of any part of the development hereby approved shall take place until the hydrant serving that part of the development has been provided in full accordance with the approved details. The hydrants shall be retained as such thereafter.

Reason for condition

To ensure that adequate provision is made for fire hydrant infrastructure required for health and safety purposes as a direct result of the development hereby approved, in accordance with Policy 20 of the adopted Joint Core Strategy for Broadland, Norwich and South Norfolk 2011.

34. No development shall take place in pursuance of this permission until a Construction Method Statement for the spine road and for each phase of the development as agreed under condition 11 has been submitted to, and approved in writing by the Local Planning Authority. The approved Statement/s shall be adhered to throughout the construction period for the construction of the accesses and spine road and for each phase of development. The Statement shall provide for:
- (a) proposed construction hours;
 - (b) the parking of vehicles of site operatives and visitors;
 - (c) the location of site compounds;
 - (d) construction vehicle access routes;
 - (e) loading and unloading of plant and materials;
 - (f) storage of plant and materials used in constructing the development;
 - (g) storage of fuel/oil and hazardous products or chemicals and measures to prevent pollution of ground water;
 - (h) silt containment;
 - (i) the erection and maintenance of security hoarding, including decorative displays and facilities for public viewing, where appropriate;
 - (j) wheel washing facilities;
 - (k) measures to control the emission of dust and dirt during construction;
 - (l) measures to control light pollution from temporary lighting to areas of retained scrub, hedgerows and trees; and
 - (m) site clearance of any scrub, hedgerows of trees which are to be removed to take place outside bird nesting season March - August inclusive, unless otherwise agreed in writing with the local planning authority.

Reason for condition

To ensure an adequate standard of residential amenity in the nearby area during construction and to limit the ecological impact of the development, in accordance with section 11 of the NPPF and with saved policy IMP9 of the South Norfolk Local Plan 2003.

35. No development shall take place in pursuance of this permission until a Construction and Environmental Management Plan (CEMP) has been submitted to and approved in writing by the Local Planning Authority. The approved CEMP shall be adhered to throughout the construction of the accesses and spine road and each phase of development. The Statement shall include:
- a) details of the project management structure and clearly identify the roles and responsibilities with regard to managing and reporting on the construction phase environmental aspects;
 - b) an Environmental Risk Assessment identifying all aspects of construction that could have an environmental impact and assesses the potential risk and impact of that activity on the environment;
 - c) management controls to eliminate and/or minimise identified impacts;
 - d) a programme of monitoring, reporting and auditing of compliance in accordance with any obligations of the planning consent, licences and approvals should also be contained in the CEMP to ensure that identified and appropriate control measures are effective.

Reason

To ensure the ecological interest of the site, in terms of both wildlife and habitat, is enhanced as part of the development process, in accordance with section 11 of the NPPF and saved policy ENV14 of the South Norfolk Local Plan 2003.

36. With the exception of the accesses and spine road no occupation of any phase agreed under condition 11 shall take place until details of external lighting of roads, green infrastructure and other public space has been submitted to the Local Planning Authority and approved in writing. The details shall include the type, location, numbers and height of the proposed lighting. Lighting on site shall be in full accordance with the approved details and shall be retained thereafter.

Reason

To ensure that lighting does not have a negative effect on biodiversity or the amenity of occupiers of the site and to accord with sections 7 and 11 of the NPPF, and policies 1 and 2 of the adopted Joint Core Strategy for Broadland, Norwich and South Norfolk 2011.

37. No development shall commence until a foul water strategy has been submitted to and approved in writing by the Local Planning Authority. The development shall be carried out in strict accordance with the approved scheme prior to first occupation of any dwelling unless otherwise approved in writing by the Local Planning Authority.

Reason

To ensure sufficient capacity is available and in the interest of avoiding pollution and flooding in accordance with the objectives of section 10 of the NPPF.

38. Prior to commencement of the spine road and or submission of reserved matters, an Environmental Action Plan (EAP) covering the site and the adjacent County Wildlife Site (CWS) shall be submitted to and agreed in writing by the local planning authority. The EAP shall include the following:

- a) Detailed scheme of ecological and protected species mitigation and enhancement, informed by the Ecological Report dated November 2010 (received by the local planning authority 17 April 2013), up dated ecology surveys and hydrological information.
- b) Physical measures, in the form of a wet ditch system, to safeguard the long term ecological functioning of the CWS.
- c) A phasing plan for the implementation of the ecological and protected species mitigation and enhancement measures.
- d) A comprehensive Nature Conservation Management Plan relating to land inside the red line boundary depicted on drawing number 1565/NCMF2 (9.16 chapter 9 Ecology). The Plan shall include details of management responsibilities, plan review arrangements, funding, a schedule of management actions covering all phases of development (construction and long-term operation) and include provisions for any unforeseen cessation in management.

The agreed EAP Plan shall be updated prior to the commencement of each phase. The development shall be undertaken in accordance with the approved EAP and the land shall be managed in accordance with the agreed Nature Conservation Management Plan thereafter. Any subsequent variations to the EAP shall first be approved in writing by the local planning authority

Reason for condition

To ensure the ecological interest of the site, in terms of both wildlife and habitat, is enhanced as part of the development process, in accordance with section 11 of the NPPF.

39. With the exception of the spine road (as detailed under condition 2) and the areas covered by the EAP (as detailed under condition 38) no development of any phase agreed under condition 11 shall take place until an open space management plan has been submitted to the local planning authority and approved in writing for that phase. The open space management plan shall detail management responsibilities and include a schedule of maintenance operations for all areas of green infrastructure within that phase and all other areas of that phase which do not form part of the private curtilage of a property or adopted highway (including, for the avoidance of doubt, both soft and hard landscaped areas and parking areas). The plan shall provide for the replacement of any trees or plants which die, are removed, uprooted, destroyed or become seriously damaged or defective. Management shall commence in full accordance with the approved landscape management plan immediately after completion of landscape works details of which are to be agreed under condition 3 (reserved matters for landscaping).

Reason for condition

To ensure the satisfactory ongoing management and maintenance of all areas of public space on the site in accordance with the NPPF, policies 1 and 2 of the adopted Joint Core Strategy for Broadland, Norwich and South Norfolk.

40. All imported topsoil and subsoil for use on the site shall either (a) be certified to confirm its source and that it is appropriate for its intended use. No occupation of the development shall take place until a copy of the certification has been submitted to the local planning authority; or (b) in the absence of suitable certification, analysis of the imported material will be required along with evaluation against the derived assessment criteria for this site.

Reason for condition

To ensure that risks from land contamination to the future users of the land and neighbouring land are minimised, together with those to controlled waters, property and ecological systems, and to ensure that the development can be carried out safely without unacceptable risks to workers, neighbours and other offsite receptors, in accordance with section 8 of the NPPF.

Reasons for Approval

- 1 The development of this site will bring forward a strategic location identified in JCS Policy 12. The scheme represents sustainable development that is compliant with the NPPF and one that makes a substantial contribution towards general housing provision with the Norwich Policy Area. The development approach successfully mitigates for its environmental impacts, and is considered acceptable in terms of highway safety, impact on existing residential amenity and flood risk, and accords with Local Plan policies IMP8 and IMP9 and Section 10 of the NPPF.

The development is accepted as a departure from JCS Policy 4 in respect of affordable housing provision, and Local Plan policy EMP7 in respect of employment site retention.

1. The Amount, Massing and Accommodation plan received 7 February 2013 and the design concept described in the Design and Access Statement (received 17 April 2012) refers to number of storeys. For the avoidance of doubt a storey has a maximum height of 3.0m and includes ground floor use/s.
2. Anglian Water: The development is within 15 metres of a sewage pumping station. Whilst Anglian Water takes all reasonably practicable steps to prevent any nuisance arising from the site, there should be no development within 15 metres from the boundary of a sewage pumping station of this type if the development is potentially sensitive to noise or other

disturbance or which might give rise to complaint from the occupiers regarding the location of the pumping station.

3. This development involves a Travel Plan to be implemented within the scope of a legal agreement between the applicant and Norfolk County Council. Please note that it is the applicants' responsibility to ensure that, in addition to planning permission, any necessary Agreements under the Town and Country Planning Act 1990 or Highways Act 1980 are also obtained. Advice on this matter can be obtained from the County Council's Highways Development Control Group based at County Hall in Norwich. For residential development, Norfolk County Council offers a fully inclusive package covering the writing, implementation, on-going management and annual monitoring of a Travel Plan for 5 years post completion of the development. Up to date costs can at the time of issue be obtained by contacting Stevie Spencer 01603 223370 or stevie.spencer@norfolk.gov.uk.
4. It is an OFFENCE to carry out any works within the Public Highway without the permission of the Highway Authority. This development involves work to the public highway that can only be undertaken within the scope of a legal agreement between the developer and Norwich City Council. Please note that it is the applicants' responsibility to ensure that, in addition to planning permission, any necessary Agreements under the Highways Act 1980 are also obtained. Advice on this matter can be obtained from the City Council's Transport Team based at City Hall, Norwich. Please contact: transport@norwich.gov.uk
5. This permission is subject to a planning obligation entered into under legal agreement under the provisions of section 106 of the Town and Country Planning Act 1990, as amended.
6. NOTE : The authority can confirm it has worked in a positive and proactive manner, based on seeking solutions to problems arising in relation to dealing with this planning application, in accordance with the National Planning Policy Framework.

This permission refers only to that required under the Town and Country Planning Act 1990 and does not include any consent or approval under any other enactment, bylaw, order or regulation and specifically any consent required under the Building Regulations 1991. The attached notes for applicants are also part of this decision notice.

Where development involves the demolition or part demolition of a listed building, no works can be undertaken (despite the terms of any consent granted by the Council) until notice of the proposal has been given to English Heritage, 62/74 Burleigh Street, Cambridge, CB1 1DJ and they have either been given reasonable access to the building for at least one month following the grant of consent, or have stated that they have completed their record of the building or that they do not wish to record it. A form is enclosed, if appropriate



On behalf of the Council

Date of Application: 3 March 2011

Date of Decision: 12 July 2013

Growth & Localism

Swan Lane Long Stratton Norwich NR15 2XE

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Decision Notice & Notes Attached

Approved Plans:

The Council's approval is only for the details shown on the plans originally submitted or, if amended, as listed on the decision notice. If you wish to change the approved plans in any way, please contact Planning Services quoting the application reference number to check if the changes would be acceptable. In some case/s, a fresh application for approval will be required for the proposed changes. You should not change the approved plans and start work until the proposed changes are approved by the Council.

Conditions of Approval:

If the Council's approval is subject to conditions, you must ensure that any action required, including the need to obtain the Council's further approval for items such as landscaping details or materials to be used, is taken before work commences.

The Council has the power to take action to force compliance with the approved plans and/or the requirements of any conditions attached to the decision notice. Any failure to carry out work strictly in accordance with the approved plans and/or any conditions may result in the work having to be removed or changed.

Notice of Commencement of Work

Before work starts on proposal, please complete and return the notice below to the Council at the address given. This will help us to check that the approved plans and conditions are being complied with. Please note this is not a formal notice of commencement for the purposes of the Building Regulations.

TO: Growth & Localism, South Norfolk Council, Swan Lane, Long Stratton, Norfolk, NR15 2XE

Application Reference Number: 2011/0152

Description of Development: Outline planning application (full details of access) for a mixed development consisting of a maximum of 670 dwellings; a local centre comprising commercial uses (A1/A2/A3): a restaurant/dining quarter and public house (A3/A4); demolition of buildings on the May Gurney site (excluding the former public house); an access bridge over the River Yare; new access road; car parking; flood risk management measures; landscape measures inc earthworks to form new swales and other biodiversity enhancements including the re-use of the Grade II Listed brick Kiln for use by bats.

Location/address of Development: The Deal Ground And Former May Gurney Site The Street Trowse

Contact Name: _____ Phone No: _____

Work on the above proposal is to commence on: Date: _____

If Building Regulation approval has already been obtained please quote Reference no: _____

Signed: _____

**Please ensure that your
expired Site Notice is
removed**



Notes relating to decisions on Applications for Planning Permission or Listed Building Consent under the provisions of the Town and Country Planning Act 1990 and the Planning (Listed Buildings and Conservation Areas) Act 1990

Important

Any permission granted relates only to that required under the relevant Town and Country Planning or Listed Buildings and Conservation Areas Acts and does not include any other consent or approval required under any other enactment, bylaw, order or requisition.

Consent under the Building Regulations may be required for the proposal and work should not proceed until any necessary consent has been obtained. Please contact CNC Building Consultancy on (01603) 430100 for more information.

1. Demolition of Listed Building

Attention is drawn to Section 8(1)-(2) of the Planning (Listed Buildings and Conservation Areas) Act 1990, the effect of which is that demolition either in whole or in part may not be undertaken (despite the terms of any consent granted by the Council) until notice of the proposed demolition has been given to English Heritage, Architectural Investigation Section, Brooklands Avenue, Cambridge CB2 2BU. English Heritage must be given reasonable access to the building for at least one month following the grant of consent, or have stated that they have completed their record of the building or that they do not wish to record it. The relevant form is available on request from the Council.

2. The needs of Disabled People

The Council must draw your attention to certain requirements for the needs of disabled people. Facilities including the means of access, parking, the provision of toilets and notices indicating such facilities, have to be provided in:

- a. any premises to which the public are to be admitted, whether or not on payment;
- b. office, shop, railway or factory premises in which people are employed;
- c. schools, universities and colleges.

Further information can be obtained by contacting the Council's Building Control section.

For detailed guidance you are also recommended to refer to:

- i) *The Chronically Sick and Disabled Persons Act 1970 (as amended by The Disabled Persons Act 1981, Sections 4, 7, 8 and 8a);*
- ii) *The British Standard Code of Practice on access for the disabled to buildings (BS 5810, 1979);*
- iii) *Design Note 18, 'Access for the Physically Disabled to Educational Buildings' published on behalf of the Secretary of State.*
- iv) *BS 5588, Part 8, 1988 Code of Practice for Means of Escape for Disabled People.*

3. Appeals to the Secretary of State

If you are aggrieved by the decision of the Council to refuse consent, permission or approval for the proposed development or works or to grant it subject to conditions, you can appeal to the Secretary of State for the Environment Transport & the Regions under Section 78 of the Town and Country Planning Act 1990 or Section 20 of the Planning (Listed Buildings and Conservation Areas) Act 1990 within six months of the date of this notice. **Appeal forms and information on Appeal procedures can be obtained from The Planning Inspectorate, Customer Support Unit, Temple Quay House, 2 The Square, Temple Quay, Bristol BS1 6PN or online at www.planningportal.gov.uk/pcs.**

The Secretary of State can allow a longer period for giving notice of appeal, but he will not normally be prepared to use this power unless there are special circumstances which excuse the delay in giving notice of appeal. The Secretary of State need not consider an appeal if it seems to him that permission for the proposed development could not have been given by the Council or could not have been given without the conditions imposed having regard to the statutory requirements, to the provisions of the development order and to any directions given under a development order. In practice, the Secretary of State does not refuse to consider appeals solely because the decision of the Council was based on a direction given by him.

4. Purchase Notices

If permission or Listed Building Consent to develop land or carry out works is refused or granted subject to conditions, whether by the Council or by the Secretary of State for the Environment, the owners of the land may claim that the land has become incapable of reasonably beneficial use by the carrying out of any development which has been or would be permitted. In these circumstances, the owner may serve on the Council a purchase notice requiring the Council to purchase his interest in the land in accordance with the provisions of either Part VI of the Town and Country Planning Act 1990 or Section 32 of the Planning (Listed Buildings and Conservation Areas) Act 1990.

5. Compensation

In certain circumstances, a claim may be made against the local planning authority for compensation, where permission is refused or granted subject to conditions by the Secretary of State on appeal or on a reference of the application to him. These are set out in Section 27 of the Planning (Listed Buildings and Conservation Areas) Act 1990.

C SFRA

Greater Norwich Level 2 site table and associated mapping

<p>Greater Norwich Level 2 Strategic Flood Risk Assessment Detailed Site Summary Tables</p>	
<p>Site details</p>	
<p>Site Code</p>	<p>GNLP0360 (East Norwich Regeneration Area)</p>
<p>Address/Grid Ref.</p>	<p>Bracondale, Deal Ground, May Gurney site and Trowse Pumping Station/ 624699,307338</p>
<p>Area</p>	<p>21.35ha</p>
<p>Current land use</p>	<p>Open land, residential and commercial</p>
<p>Proposed land use</p>	<p>Residential led mixed use</p>
<p>Sources of flood risk</p>	
<p>Location of site within catchment</p>	<p>The site is in the catchments of the River Wensum and the River Yare, just upstream of the confluence of the two rivers. The site is situated to the north of the River Yare on predominantly greenfield with some brownfield land use to the west and access from Carrow Bridge. The River Wensum rises between the villages of Colkirk and Whissonsett and flows through Fakenham and the Pensthorpe nature reserve, and on through Swanton Morley, Taverham and Norwich to its confluence with the River Yare. The River Yare rises near Garvestone and flows eastward, around the southern edge of Norwich, towards its confluence with the River Wensum, just downstream of the city centre.</p>
<p>Existing drainage features</p>	<p>The downstream extent of the River Yare flows in a north easterly direction through the southern section of the site (to the north of the commercial buildings off Bracondale), and along the eastern boundary of the site. Two branches of the River Yare approach the site from the south, with the main channel crossing through the southern section of the site and the second skirting the easterly boundary of the site. These channels merge shortly downstream and continue in a northerly direction along the east boundary of the site. The river has not been artificially modified and flows in open channel. The River Wensum flows from west to east along the northern boundary of the site before its confluence with the River Yare. The river has been artificially modified through Norwich and the banks of the river have been enforced with steel and concrete, including along the north edge of the site. Several small drainage channels are present in the centre of the site. These channels are small and flow east into the River Yare.</p>
<p>Fluvial</p>	<p>Proportion of site at risk: FZ3b – 39% FZ3a – 44% FZ2 – 62% FZ1 – 38%</p> <p><i>The % Flood Zones quoted show the % of the site at flood risk from that particular Flood Zone/event, including the percentage of the site at flood risk at a higher risk zone, e.g. FZ2 includes the FZ3 %. FZ1 is the remaining area outside FZ2 (FZ2 + FZ1 = 100%).</i></p> <p>Available data: Modelling exists for the River Wensum and the downstream extent of the River Yare (from Trowse Newton Weir to Kirby Marsh) using TUFLOW. Both defended and undefended scenarios have been modelled and the defended scenarios have been used to assess the risk of flooding to the site. Further modelling was undertaken to apply recent climate change uplifts to the existing fluvial model.</p> <p>The H++ scenario was also run for extreme climate change scenarios due to the site being classed as significant urban development. For fluvial, an 80% increase was applied to existing modelled flows and a 1.9m rise applied to current day sea levels (at the coast).</p>

	<p>Flood characteristics:</p> <p>The site is significantly affected by fluvial flooding and most of the site is within the most extreme event extent .</p> <p>In the 5% AEP flood event, flooding occurs across the south east section of the site adjacent to the River Yare, and to the north of the site. The 5% AEP event shows the extent of the functional floodplain along the banks of the River Wensum in the north of the site Flood depths in this area are between 0.1m and 0.4m and have a flood hazard rating of 'Caution' to 'Dangerous for some'.</p> <p>In the 5% AEP event, the area at risk of flooding adjacent to the River Yare is significantly lower in topography than the rest of the site, resulting in the large extent of flooding. Flood depths in this area range between 0.1m-0.9m and have a flood hazard rating of 'Caution' to 'Dangerous for most'.</p> <p>During the 1% AEP flood event, the extent of flooding in comparison to the 5% AEP flood event is increased in the north of the site, and a marginal increase is seen in the centre of the site. Flood depths in the central part of the site range between 0.1m and 1.1m and have a flood hazard rating of 'Dangerous for most' for the majority of the site, with lower flood hazard ratings around the edge of the floodplain. Flood depths in the north of the site marginally increase and are between 0.1-0.6m in depth, and have a flood hazard rating of 'Caution' to 'Dangerous for most'.</p> <p>In the 0.1% AEP flood event, the extent of flooding in the north of the site is significantly increased. Flood depths in this area are significant and are up to 1.1m in depth. This area has a maximum flood hazard rating of 'Dangerous for most'. In the centre of the site, flood depths are a maximum of 1.5m. The area has a flood hazard rating of 'Dangerous for most' with lower flood hazard ratings around the edge of the floodplain.</p>
<p>Coastal and Tidal</p>	<p>The site is not at risk from coastal or tidal flooding. For the Level 2 SFRA, modelling was undertaken to determine whether a coastal breach would affect sites in the east of Norwich at extreme climate change scenarios, although the 0.1% AEP plus 80+ (H++) scenario does affect these sites.</p>
<p>Surface Water</p>	<p>Proportion of site at risk (RoFfSW):</p> <p>3.3% AEP – 0% Max depth 0m, Max velocity 0m/s</p> <p>1% AEP –1% Max depth 0m Max velocity 0m/s</p> <p>0.1% AEP – 4% Max depth >0.9m Max velocity >0.25m</p> <p><i>The % SW extents quoted show the % of the site at surface water risk from that particular event, including the percentage of the site at flood risk at a higher risk zone (e.g. 1% AEP includes the 3.3% AEP %)</i></p> <p>Description of surface water flow paths:</p> <p>The site is not at risk of surface water flooding during the 3.3% AEP event.</p> <p>In the 1% AEP event, three small areas of surface water ponding are present in the western part of the site. Flood depths during this event could reach 0.15m to 0.9m with a flood hazard rating of 'dangerous for some'.</p> <p>For the 0.1% AEP flood event, additional areas of surface water ponding are located around the site, as well as a minor increase in extent of the areas of ponding in the 1% AEP flood event. Flood depths are up to 0.9m in most of the surface water ponding areas with lower depths in some parts of the site (0.15m-0.6m).</p>
<p>Reservoir</p>	<p>The site is not shown to be at risk of reservoir flooding from the available online maps.</p>
<p>Groundwater</p>	<p>The Environment Agency Areas Susceptible to Groundwater Flooding dataset, provided as 1km grid squares, shows the susceptibility of an area to groundwater flood emergence. The following comments can be made about groundwater flood risk:</p> <ul style="list-style-type: none"> • The majority of the site has a >75% susceptibility to groundwater flood emergence from superficial deposits. • The southern part of the site has a >50%- <75% susceptibility to groundwater flood emergence from superficial deposits. <p>This assessment does not negate the requirement that an appropriate assessment of the groundwater regime should be carried out at the site-specific FRA stage.</p>
<p>Flood history</p>	<p>The Environment Agency's historic flooding and recorded flood outlines dataset has a record of flooding on the site from the great flood of 1912. Given the topography of the site it is likely to have been affected by lower level events more recently.</p>

	Flood history information provided in the Level 1 SFRA identifies one incidence of external historic flooding 300m south-west of the site however the source was not recorded. The site is in a postcode area which has previously experienced 1 incidence of sewer flooding (as identified in the Level 1 SFRA).
Flood risk management infrastructure	
Defences	This site is not protected by any formal flood defences.
Residual risk	There is no residual risk to the site from flood risk management structures.
Emergency planning	
Flood warning	<p>The majority of site is located within the Environment Agency's 'The River Yare from the A11 at Cringleford to Trowse Newton' flood warning area. The northern part of the site is in the 'The River Wensum, through Norwich' flood warning area and the 'Riverside properties on the River Wensum, through Norwich'.</p> <p>The entire site is in the 'The River Yare at Norwich, from Cringleford to Trowse Newton' Environment Agency's flood alert area.</p>
Access and egress	<p>The main area of the site is only accessible from an unnamed access road along the western boundary of the site. The two areas in the south of the site are currently accessible from two small unnamed access roads from Bracondale.</p> <p>In terms of fluvial flood risk, a significant part of the site is at risk of flooding during all flood events and modelling shows that it could experience flood depths of up to 1.1m in some areas of the site during a flood event. The access road along the western boundary of the site remains unaffected during all flood events. The access roads for the two areas in the south of the site also remain unaffected by flood water and access to Bracondale is still possible during a flood event. Flood depths in this area remain shallow (below 0.4m) for all flood events, therefore access is unlikely to be significantly affected.</p> <p>Due to the significant flood extent and depths in the main part of the site, access and egress from the site may not be possible for development in the east of the site during a flood event. A Flood Warning and Evacuation Plan should be prepared for the site, with a policy of shelter in situ on a level above the maximum water level of 3.1m above ground level in a 1 in 0.1% AEP event considering the highest risk climate change scenario.</p> <p>In terms of surface water flood risk, surface water flooding impacts the site and some of the surrounding road network in the 1% AEP and 0.1% AEP modelled events.</p> <p>Neither surface water flooding scenario should impact access and egress from the site. There is very minor surface water pooling modelled in isolated areas around the site and this will not restrict access.</p>
Dry islands	The site is not located on a dry island.
Climate change	
Implications for the site	<ul style="list-style-type: none"> The site is highly sensitive to climate change causing increased fluvial flows in the River Wensum and the River Yare. The future functional floodplain is the 20 year plus the Upper End (65%) climate change event. 60% of the site is in future Functional Floodplain (Flood Zone 3b). Flooding occurs across most of the site, including the south of the site towards Bracondale which was not at risk during the present-day flood risk scenarios. Flood depths in the central part of the site are the most significant and range from 0.1m-1.4m. This area has a flood hazard rating of 'dangerous for most' for the majority of the site. Flood water in the northern and southern parts of the site is shallower and ranges between 0m and 0.4m with a flood hazard rating of 'caution'. This scenario presents a significant increase in risk to the site, as during the present day 5% AEP flood event, the site is not at risk of flooding. For the least severe climate change scenario, the 20 year plus the Central (25%) event results in a significant increase in flooding in the north of the site (in comparison to the current day scenario) with depths of up to 0.7m. This area has a maximum flood hazard rating of 'Dangerous for most'. The future flood zone 3a is the 1% AEP plus the Upper End (65%) climate change event. 73% of the site is in future Flood Zone 3a. Flooding occurs across most of the site with a significant increase in flood extent in the area in the north of the site in comparison to the present day 100 year flood extent. Flood depths in the north and centre of the site are the most significant and range from 0.2m-1.6m with a maximum flood hazard rating of 'dangerous for most'. Flood depths across the rest of the site range between 0.1m-1.3m and have a maximum flood hazard rating of 'dangerous for most'.

	<ul style="list-style-type: none"> 81% of the future Flood Zone 2 is the 0.1% AEP plus the Upper End (65%) climate change event. The 0.1% AEP plus the Upper End (65%) climate change scenario results in flooding across most of the site with depths of up to 2.2m. The highest depth areas are in the centre of the site. During this scenario, the site has a flood hazard rating of 'dangerous for most' for most of the site with an area in the centre of the site rated as 'dangerous for all'. The H++ climate change scenario has been applied to this site as it is considered significant urban development. The 0.1% AEP plus 80% climate change poses the most significant risk to the site. Flood depths from this scenario range between 0.3m-2.3m for most of the site. Applying this extreme scenario results in a flood hazard rating of 'dangerous for most' for most of the site with several areas rated as 'dangerous for all'. The modelled 1% AEP with 40% Climate Change Surface water flooding does not show a significant increase in surface water flooding on the site. <p>Proportions of the site in Future Flood Zones can be found in Table 6-2 of the Greater Norwich Level 2 SFRA Report</p>
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Requirements for drainage control and impact mitigation

<p>Broad scale assessment of possible SuDS</p>	<p>Geology & Soils</p> <ul style="list-style-type: none"> Geology at the site consists of: <ul style="list-style-type: none"> Bedrock – Lewes Nodular Chalk Formation, Seaford Chalk Formation, Newhaven Chalk Formation, Culver Chalk Formation, Portsdown Chalk Formation (undifferentiated) - Chalk. Superficial – Alluvium (Clay, Silt, Sand and Gravel). <p>SuDS</p> <ul style="list-style-type: none"> Most source control techniques are likely to be suitable. Mapping suggests that permeable paving may have to use non-infiltrating systems given the possible risk both to and from groundwater. Mapping suggests that there is a high risk of groundwater flooding at this location, therefore it is likely infiltration techniques will not be suitable. This should be confirmed via site investigations to assess the potential for infiltration. As the site is located within a Source Protection Zone, if infiltration is possible and permitted, it should only be used where there are suitable levels of treatment. Additionally, proposed SuDS should be discussed with relevant stakeholders (LPA, LLFA and EA) at an early stage to understand possible constraints. Detention may be feasible provided site slopes are <5% at the location of the feature. If the site has contamination or groundwater issues, a liner will be required. Filtration is probably suitable provided site slopes are <5% and the depth to the water table is >1m. If the site has contamination or groundwater issues, a liner will be required. An asphalt plant is located alongside the west of the site. When preparing drainage strategy, it will need to be confirmed that surface water flow paths from the asphalt plant do not contaminate surface water on the site. All forms of conveyance are likely to be suitable. Where the slopes are >5% features should follow contours or utilise check dams to slow flows. If the site has contamination issues; a liner will be required. Developers should investigate and consider in full all SuDS options and demonstrate that SuDS are not appropriate where they are not implemented. The site is not designated by the Environment Agency as previously being a landfill site.
<p>Opportunities for wider sustainability benefits and integrated flood risk management</p>	<ul style="list-style-type: none"> Space on the site should be made for green infrastructure, which presents wider opportunities to improve biodiversity and amenity as well as climate change adaptation. It is recommended that areas of green space are retained in areas of higher flood risk to accept surface water flow routes from the site, store water and provide amenity and habitat benefits. It is recommended that areas of hard paving are permeable, and that community level sustainable drainage is considered. A resilient approach to urban design should be taken. Habitable floor levels must be above the 1% AEP flood level considering climate change upper end scenario with an allowance for freeboard. A shelter in situ for an extreme fluvial event must be designed into the building and supported by a flood warning and evacuation plan. Suitable shelter for all occupants of any buildings must be above the 0.1% AEP flood level considering climate change (upper end scenario).

	<ul style="list-style-type: none"> To enable development in the East Norwich Regeneration Area, a carefully considered flood risk and sustainable drainage strategy covering sites GNLP0360, GNLP3053 and R10 must support early master planning and feasibility work. This will involve sacrificing some areas as functional floodplain and increasing flood storage to allow other areas of sites to be defended against fluvial flooding. There should be no overall loss of floodplain storage and the risk of flooding should not be increased up or downstream of the sites. The most suitable site in flood risk terms is GNLP3053.
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NPPF and planning implications

<p>Exception Test requirements</p>	<p>The Local Authority will need to confirm that the sequential test has been carried out. The Sequential Test will need to be passed before the Exception Test is applied.</p> <p>Residential development is classified as 'More Vulnerable' and commercial is classed as 'Less Vulnerable'. As the site is in Flood Zone 3, the Exception Test is required for the site.</p> <p>Given the significant degree of flood risk to this site it must be proved that the site provides significant wider sustainability benefits within the East Norwich Regeneration Area that outweigh the significant costs that would be associated with major reprofiling, flood defences and sustainable drainage work required to bring forward such as high flood risk site.</p>
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<p>Requirements and guidance for site-specific Flood Risk Assessment</p>	<p>Flood Risk Assessment:</p> <ul style="list-style-type: none"> At the planning application stage, a site-specific Flood Risk Assessment will be required as the development is in Flood Zone 3. This should be informed by an overall strategy for flood risk and sustainable drainage for the East Norwich Regeneration Area. All sources of flooding, particularly the risk of fluvial and surface water should be considered as part of a site-specific flood risk assessment. The site-specific FRA should be carried out in line with the National Planning Policy Framework; Flood Risk and Coastal Change Planning Practice Guidance, Norwich City Council's Local Plan policies, and the Norfolk County Council Lead Local Flood Authority's Statutory Consultee for Planning Guidance Document. Consultation with the Local Authority, Lead Local Flood Authority and the Environment Agency should be undertaken at an early stage. The development should be designed to ensure that mitigation measures are in place to ensure the development does not flood, or that ground level space is used for less vulnerable parts of the development. <p>Guidance for site design and making development safe:</p> <ul style="list-style-type: none"> Flood resilient design is essential for this site due to the potential extent and depths of flooding: <ul style="list-style-type: none"> Where possible, more vulnerable development should be located to the outside of the area at risk in the west of the site with the area at risk of flooding used for greenspace. Across the East Norwich Regeneration Area, the most vulnerable development should be located on site GNLP3053. A resilient approach to design should be taken for any development within the floodplain. Habitable floor levels must be above the 1% AEP flood level considering climate change (upper end scenario) with an allowance for freeboard- approximately 2.4m. A shelter in situ for an extreme fluvial event must be designed into any buildings in the fluvial flood plain and supported by a flood warning and evacuation plan. Suitable shelter for all occupants of any buildings must be above the 0.1% AEP flood level considering climate change (upper end scenario)- approximately 3.2m. Major reprofiling, flood defences and sustainable drainage work would be required to bring forward such as high flood risk site. This will involve sacrificing some areas as functional floodplain and increasing flood storage to allow other areas of the site to be defended against fluvial flooding. The residual risk should such work take place must be taken into account so that residents still have a safe place to shelter in an extreme event and so habitable flood levels are above the level that might be reasonably expected should any future flood defences breach. Hence flood resilient urban design will still be essential in any such areas defended against fluvial flooding in future. Compensatory flood storage is required for any land raising and all proposed buildings whenever there is built development on land within the 1% +35% climate change flood extent. This will be challenging given the majority of the site is within Future Flood Zone 3.
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- The developer will need to show, through an FRA, that future users of the development will not be placed in danger from flood hazards throughout its lifetime. It is for the applicant to show that the development meets the objectives of the NPPF's policy on flood risk. For example, how the operation of any mitigation measures can be safeguarded and maintained effectively through the lifetime of the development. (Para 048 Flood Risk and Coastal Change PPG).
- Safe access and egress will need to be demonstrated in the 1 in 0.1% AEP plus climate change fluvial and rainfall events, using the depth, velocity and hazard outputs. Ideally, the access route should be situated 300mm above the designed flood level and waterproofing techniques should be used where necessary. Raising of access routes must not impact on surface water flow routes or contribute to loss of floodplain storage. Consideration should be given to the siting of access points with respect to areas of surface water flood risk or contribute to loss of floodplain storage. Due to the significant fluvial risk posed to the site, a Flood Warning and Evacuation Plan must be prepared based on a policy of shelter in situ, although access should still be available for emergency services.
- Resilience measures will be required if buildings are situated in the flood risk area. Due to the significant depths of flooding on the site and its proximity to the River Wensum and the River Yare, it is suggested that a water entry strategy is used for development within the floodplain (i.e. measures to reduce flood damage once water gets inside rather than trying to keep the water out).
- The risk from surface water flow routes should be quantified as part of a site-specific FRA, including a drainage strategy, to ensure that runoff from the development is not increased by development across any ephemeral surface water flow routes. A drainage strategy should help inform site layout and design to ensure there is no increase in runoff beyond current rates.
- The surface water drainage strategy should also consider any contaminated surface water flows from the west of the site boundary.
- Plans to address both fluvial and surface water flooding should integrate green infrastructure, which presents wider opportunities to improve biodiversity and amenity as well as climate change adaptation. An integrated flood risk management and sustainable drainage scheme for the site is advised.
- It is essential that a detailed model of surface water flooding, using the existing drainage system, topographical and asset survey is constructed at the FRA stage. This will determine the risk from surface water flooding further and to ensure that overland flows do not overwhelm future sustainable drainage features.
- Brownfield sites should discharge surface water at the original pre-development (greenfield) runoff rate. If this is not possible, a significant reduction in the current rate of discharge should be achieved and agreed with the relevant drainage body (LLFA). Development on greenfield land should discharge at rates no greater than the existing greenfield rates for the 100% and the 1% rainfall events.
- Developers should refer to Norfolk County Council's 'Norfolk County Council Lead Local Flood Authority Statutory Consultee for Planning Guidance Document' and the Level 1 SFRA for information on SuDS for guidance on the information required by the LLFA from applicants to enable it to provide responses to planning applications.

Key messages

To enable development in the East Norwich Regeneration Area, a carefully considered flood risk and sustainable drainage strategy covering sites GNL0360, GNL0353 and R10 must support early master planning and feasibility work. This will involve sacrificing some areas as functional floodplain and increasing flood storage to allow other areas of sites to be defended against fluvial flooding. There should be no overall loss of floodplain storage and the risk of flooding should not be increased up or downstream of the sites. The most suitable site in flood risk terms is GNL0353.

Major reprofiling, flood defences and sustainable drainage work would be required to bring forward such as high flood risk site. This will involve sacrificing some areas as functional floodplain and increasing flood storage to allow other areas of the site to be defended against fluvial flooding. This is likely to affect the amount of land available for development.

The development is likely to be able to proceed if:

- A carefully considered and integrated flood resilient and sustainable drainage design is put forward, with habitable floor levels above the fluvial design flood event (1% AEP) taking into account climate change and a facility for all occupants to shelter

above the extreme fluvial flood event (0.1% AEP) taking into account climate change. Residual risk from an extreme flood or breach scenario must be considered if areas of the site are defended in future.

- If flood mitigation measures are implemented then they are tested to ensure that they will not displace water elsewhere (for example, if land is raised to permit development on one area, compensatory flood storage will be required in another)
- Space for surface water to be stored on the site is provided and rainwater harvesting should be considered.
- Brownfield sites should discharge surface water at the original pre-development (greenfield) runoff rate. If this is not possible, a significant reduction in the current rate of discharge should be achieved and agreed with the relevant drainage body (LLFA, IDB or Anglian Water). Development on greenfield land should discharge at rates no greater than the existing greenfield rates for the 100% and the 1% rainfall events.
- Safe access and egress routes must not be in the areas of high surface water risk or the 1% AEP fluvial design flood event (considering climate change).
- The site access points would be from the three unnamed existing access roads that currently serve the site. A Flood Warning and Evacuation Plan should be prepared for the site.
- The most vulnerable development should be located on site GNLP3053.

Mapping Information

The key datasets used to make planning recommendations regarding this site were the broadscale 2D modelling outputs from the Environment Agency's Flood Map for Planning, River Wensum and River Yare Flood Model and the Risk of Flooding from Surface Water map. More details regarding data used for this assessment can be found below.

Flood Zones	Flood Zones 2 and 3 have been taken from the Environment Agency's Flood Map for Planning mapping.
Climate change	Climate change was modelled as part of the Level 2 SFRA strategic 2D modelling for the 2080s. This included Central (+25%), Higher central (+35%) and Upper end (+65%). Level 1 SFRA surface water climate change scenario model results were used to assess the risk of surface water flooding in the future.
Fluvial depth, velocity and hazard mapping	Fluvial depth, velocity and hazard mapping for present day has been taken from the existing River Wensum Model. For the River Yare and for the future River Wensum depth, hazard and velocity, this has been modelled as part of the Level 2 SFRA. This should be explored further at site-specific stage.
Surface Water	The Risk of Flooding from Surface Water map has been used to define areas at risk from surface water flooding.
Surface water depth, velocity and hazard mapping	The surface water depth and hazard mapping for the 1 in 0.1% AEP event is taken from the Environment Agency's Risk of Flooding from Surface Water mapping.



LEGEND

Note: All layers are turned off by default. Click the box next to the layer of interest to turn on.

Authority Information

- Administrative Area
- Study Area

- Main Rivers
- Detailed River Network
- The Broads

Flood Zones

- Flood Zones 3b
- Indicative Flood Zones 3b
- Flood Zones 3a
- Flood Zones 2

Surface Water

- RoFISW 3.3% AEP
- RoFISW 1% AEP
- RoFISW 0.1% AEP

Reservoir Flooding

- Reservoir Flooding

Fluvial Climate Change

- 1% AEP with 35% Climate Change
- 1% AEP with 65% Climate Change
- 0.1% AEP with 25% Climate Change

Tidal Climate Change

- 0.5% AEP Climate Change
- 0.1% AEP Climate Change

Surface Water Climate Change

- 1% AEP with 40% Climate Change

Areas Susceptible to Groundwater Flooding

- >= 75%
- >= 50% <75%
- >= 25% <50%
- < 25%

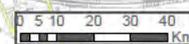
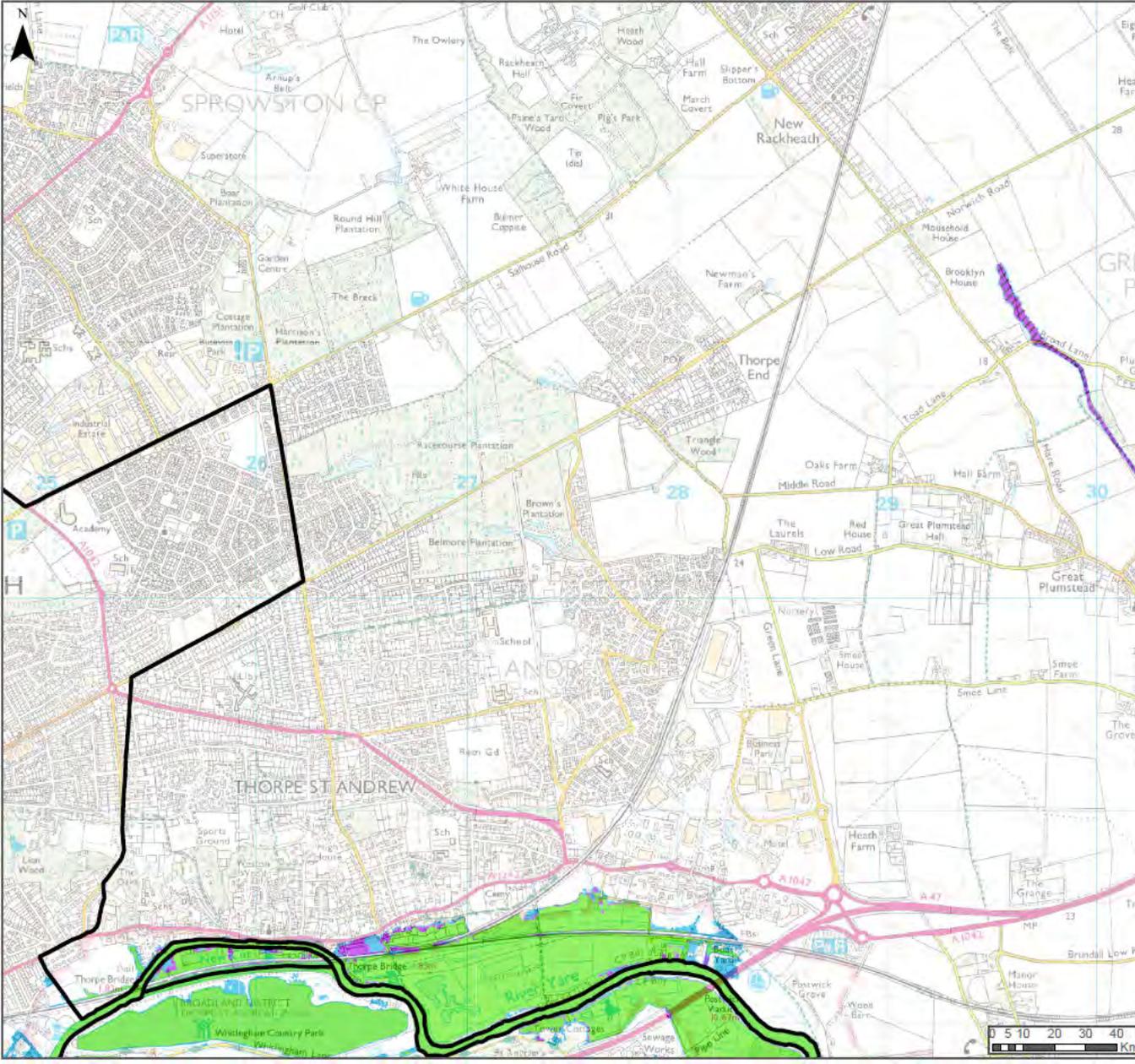
Other

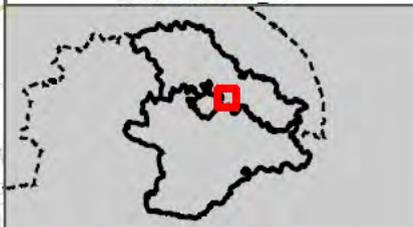
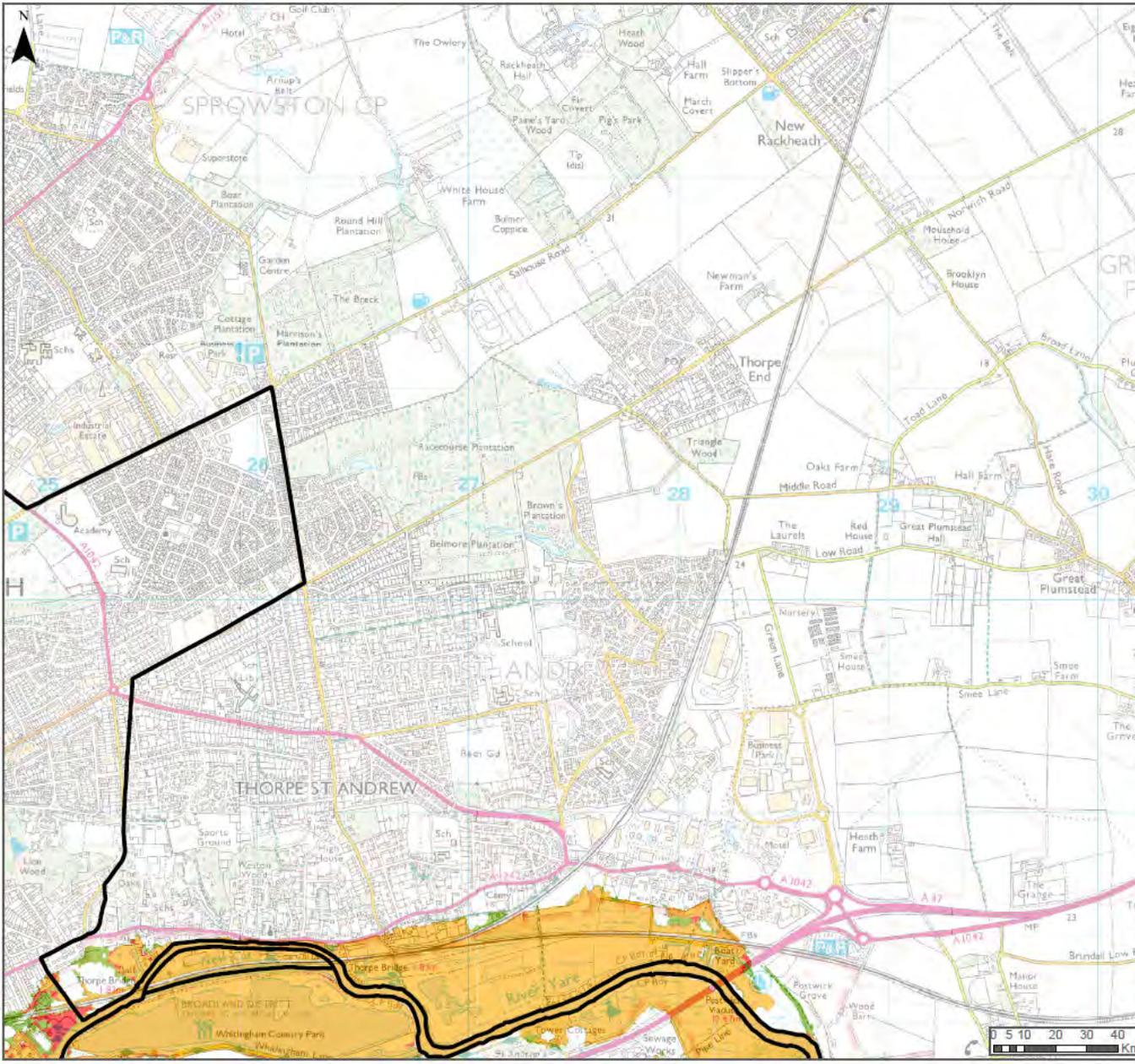
- Dry Islands >0.5Ha

[Return to Index Map](#)

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LEGEND

Note: All layers are turned off by default. Click the box next to the layer of interest to turn on.

- | | | | |
|-------------------------------------|---------------------------|--|----------------------------------|
| Authority Information | | Fluvial Climate Change | |
| <input checked="" type="checkbox"/> | Administrative Area | <input checked="" type="checkbox"/> | 1% AEP with 35% Climate Change |
| <input checked="" type="checkbox"/> | Study Area | <input checked="" type="checkbox"/> | 1% AEP with 65% Climate Change |
| <input type="checkbox"/> | Main Rivers | <input checked="" type="checkbox"/> | 0.1% AEP with 25% Climate Change |
| <input type="checkbox"/> | Detailed River Network | Tidal Climate Change | |
| <input type="checkbox"/> | The Broads | <input type="checkbox"/> | 0.5% AEP Climate Change |
| Flood Zones | | <input type="checkbox"/> | 0.1% AEP Climate Change |
| <input type="checkbox"/> | Flood Zones 3b | Surface Water Climate Change | |
| <input type="checkbox"/> | Indicative Flood Zones 3b | <input type="checkbox"/> | 1% AEP with 40% Climate Change |
| <input type="checkbox"/> | Flood Zones 3a | Areas Susceptible to Groundwater Flooding | |
| <input type="checkbox"/> | Flood Zones 2 | <input type="checkbox"/> | >= 75% |
| Surface Water | | <input type="checkbox"/> | >= 50% <75% |
| <input type="checkbox"/> | RoFSW 3.3% AEP | <input type="checkbox"/> | >= 25% <50% |
| <input type="checkbox"/> | RoFSW 1% AEP | <input type="checkbox"/> | < 25% |
| <input type="checkbox"/> | RoFSW 0.1% AEP | Other | |
| Reservoir Flooding | | <input type="checkbox"/> | Dry Islands >0.5Ha |
| <input type="checkbox"/> | Reservoir Flooding | | |

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LEGEND

Note: All layers are turned off by default. Click the box next to the layer of interest to turn on.

Authority Information

- Administrative Area
- Study Area
- Main Rivers
- Detailed River Network
- The Broads

Flood Zones

- Flood Zones 3b
- Indicative Flood Zones 3b
- Flood Zones 3a
- Flood Zones 2
- RoFSW 3.3% AEP
- RoFSW 1% AEP
- RoFSW 0.1% AEP

Surface Water

- RoFSW 3.3% AEP
- RoFSW 1% AEP
- RoFSW 0.1% AEP

Reservoir Flooding

- Reservoir Flooding

Fluvial Climate Change

- 1% AEP with 35% Climate Change
- 1% AEP with 65% Climate Change
- 0.1% AEP with 25% Climate Change
- 0.1% AEP with 65% Climate Change

Tidal Climate Change

- 0.5% AEP Climate Change
- 0.1% AEP Climate Change

Surface Water Climate Change

- 1% AEP with 40% Climate Change

Areas Susceptible to Groundwater Flooding

- >= 75%
- >= 50% <75%
- >= 25% <50%
- < 25%

Other

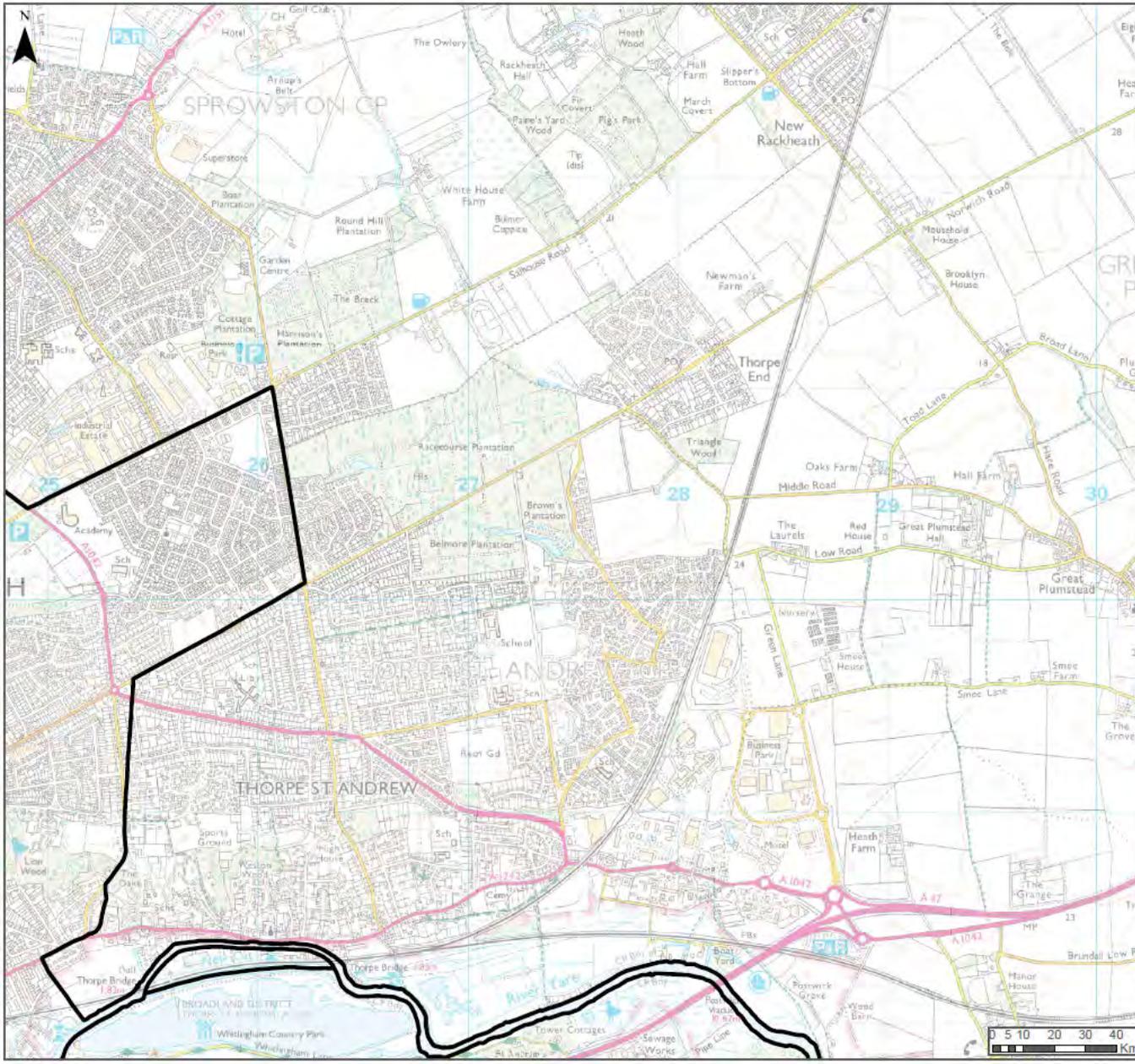
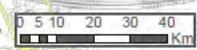
- Dry Islands >0.5Ha

[Return to Index Map](#)

[Mapping Supporting Information](#)

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LEGEND

Note: All layers are turned off by default. Click the box next to the layer of interest to turn on.

Authority Information

- Administrative Area
- Study Area

Fluvial Climate Change

- 1% AEP with 35% Climate Change
- 1% AEP with 65% Climate Change
- 0.1% AEP with 25% Climate Change
- 0.1% AEP with 65% Climate Change

Flood Zones

- Flood Zones 3b
- Indicative Flood Zones 3b
- Flood Zones 3a
- Flood Zones 2

Tidal Climate Change

- 0.5% AEP Climate Change
- 0.1% AEP Climate Change

Surface Water Climate Change

- 1% AEP with 40% Climate Change

Surface Water

- RoFSW 3.3% AEP
- RoFSW 1% AEP
- RoFSW 0.1% AEP

Areas Susceptible to Groundwater Flooding

- >= 75%
- >= 50% <75%
- >= 25% <50%
- < 25%

Reservoir Flooding

- Reservoir Flooding

Other

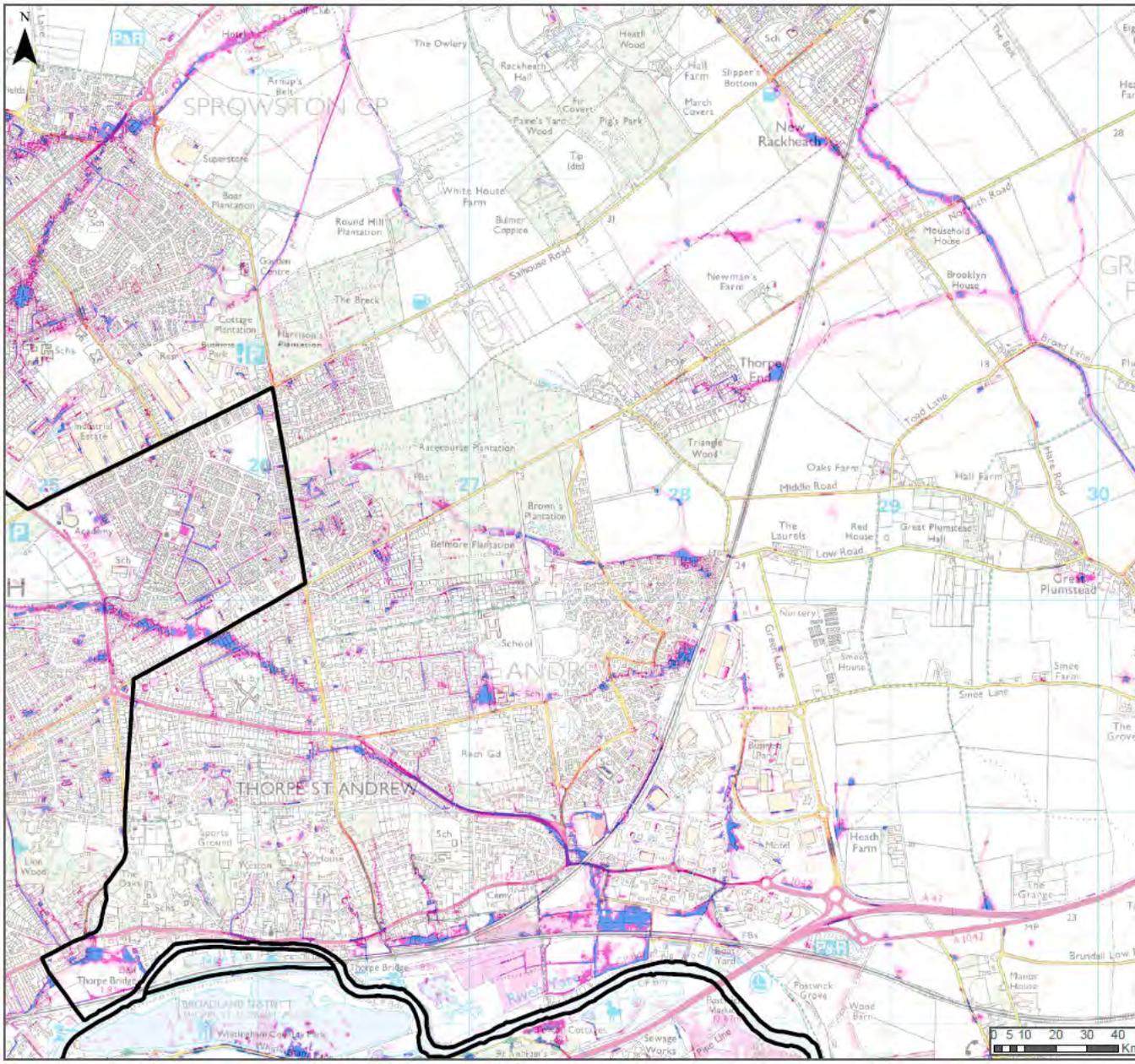
- Dry Islands >0.5Ha

[Return to Index Map](#)

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LEGEND

Note: All layers are turned off by default. Click the box next to the layer of interest to turn on.

Authority Information

- Administrative Area
- Study Area

- Main Rivers
- Detailed River Network
- The Broads

Flood Zones

- Flood Zones 3b
- Indicative Flood Zones 3b
- Flood Zones 3a
- Flood Zones 2

Surface Water

- RoFSW 3.3% AEP
- RoFSW 1% AEP
- RoFSW 0.1% AEP

Reservoir Flooding

- Reservoir Flooding

Fluvial Climate Change

- 1% AEP with 35% Climate Change
- 1% AEP with 65% Climate Change
- 0.1% AEP with 25% Climate Change

Tidal Climate Change

- 0.5% AEP Climate Change
- 0.1% AEP Climate Change

Surface Water Climate Change

- 1% AEP with 40% Climate Change

Areas Susceptible to Groundwater Flooding

- >= 75%
- >= 50% <75%
- >= 25% <50%
- < 25%

Other

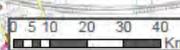
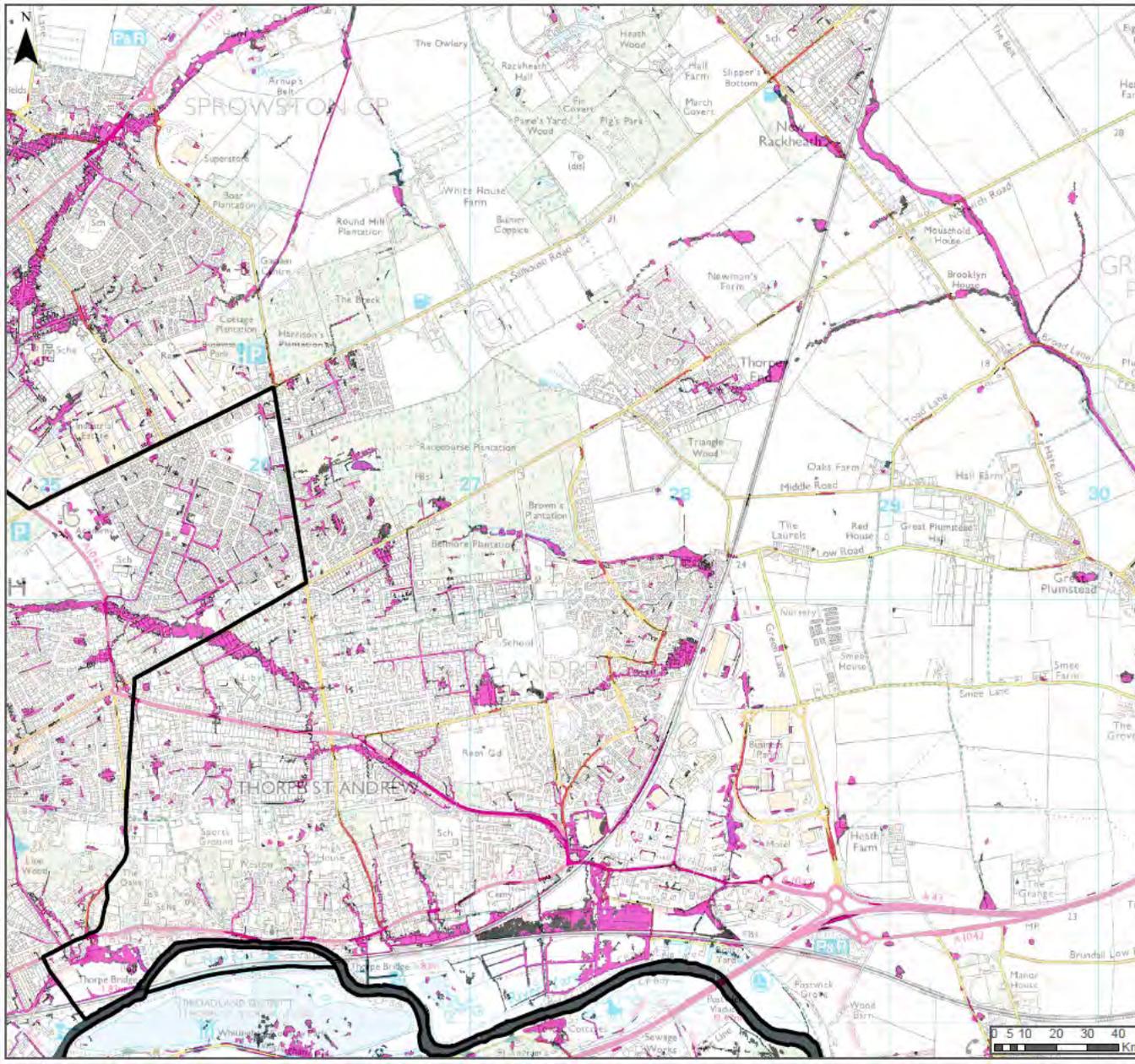
- Dry Islands >0.5Ha

[Return to Index Map](#)

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LEGEND

Note: All layers are turned off by default. Click the box next to the layer of interest to turn on.

Authority Information

- Administrative Area
- Study Area

Fluvial Climate Change

- 1% AEP with 35% Climate Change
- 1% AEP with 65% Climate Change
- 0.1% AEP with 25% Climate Change

Main Rivers

- Main Rivers

Detailed River Network

- Detailed River Network

The Broads

- The Broads

Tidal Climate Change

- 0.5% AEP Climate Change
- 0.1% AEP Climate Change

Flood Zones

- Flood Zones 3b
- Indicative Flood Zones 3b
- Flood Zones 3a
- Flood Zones 2

Surface Water Climate Change

- 1% AEP with 40% Climate Change

Surface Water

- RoFSW 3.3% AEP
- RoFSW 1% AEP
- RoFSW 0.1% AEP

Areas Susceptible to Groundwater Flooding

- >= 75%
- >= 50% <75%
- >= 25% <50%
- < 25%

Other

- Dry Islands >0.5Ha

Reservoir Flooding

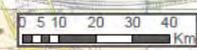
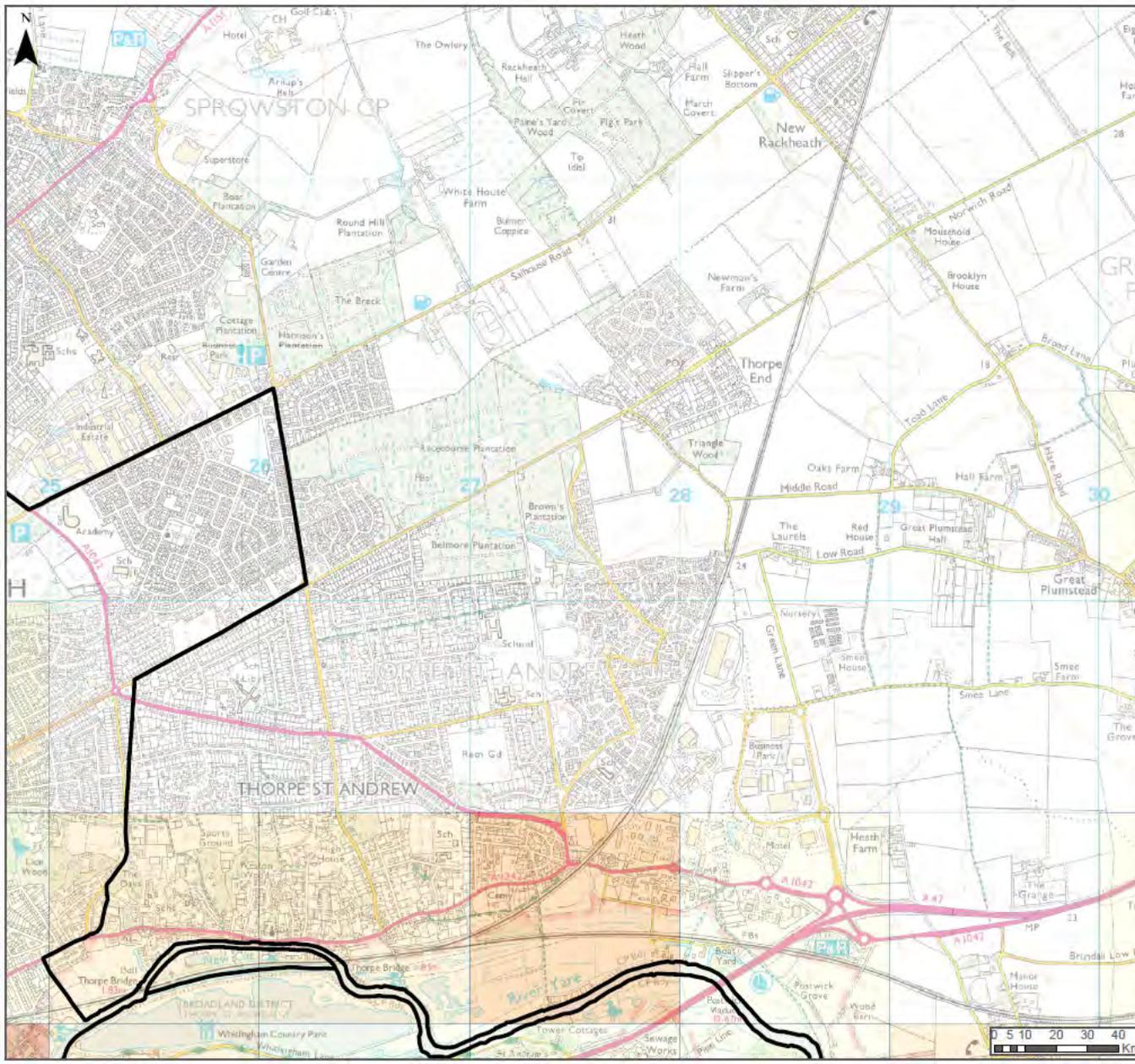
- Reservoir Flooding

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APPENDIX A: FLOOD RISK MAPPING
INDEX GRID: GN 35



LEGEND

Note: All layers are turned off by default. Click the box next to the layer of interest to turn on.

Authority Information

- Administrative Area
- Study Area

Fluvial Climate Change

- 1% AEP with 35% Climate Change
- 1% AEP with 65% Climate Change
- 0.1% AEP with 25% Climate Change

- Main Rivers
- Detailed River Network
- The Broads

Tidal Climate Change

- 0.5% AEP Climate Change
- 0.1% AEP Climate Change

Flood Zones

- Flood Zones 3b
- Indicative Flood Zones 3b
- Flood Zones 3a
- Flood Zones 2

Surface Water Climate Change

- 1% AEP with 40% Climate Change

Surface Water

- RoFSW 3.3% AEP
- RoFSW 1% AEP
- RoFSW 0.1% AEP

Areas Susceptible to Groundwater Flooding

- >= 75%
- >= 60% <75%
- >= 25% <60%
- < 25%

Reservoir Flooding

- Reservoir Flooding

Other

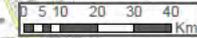
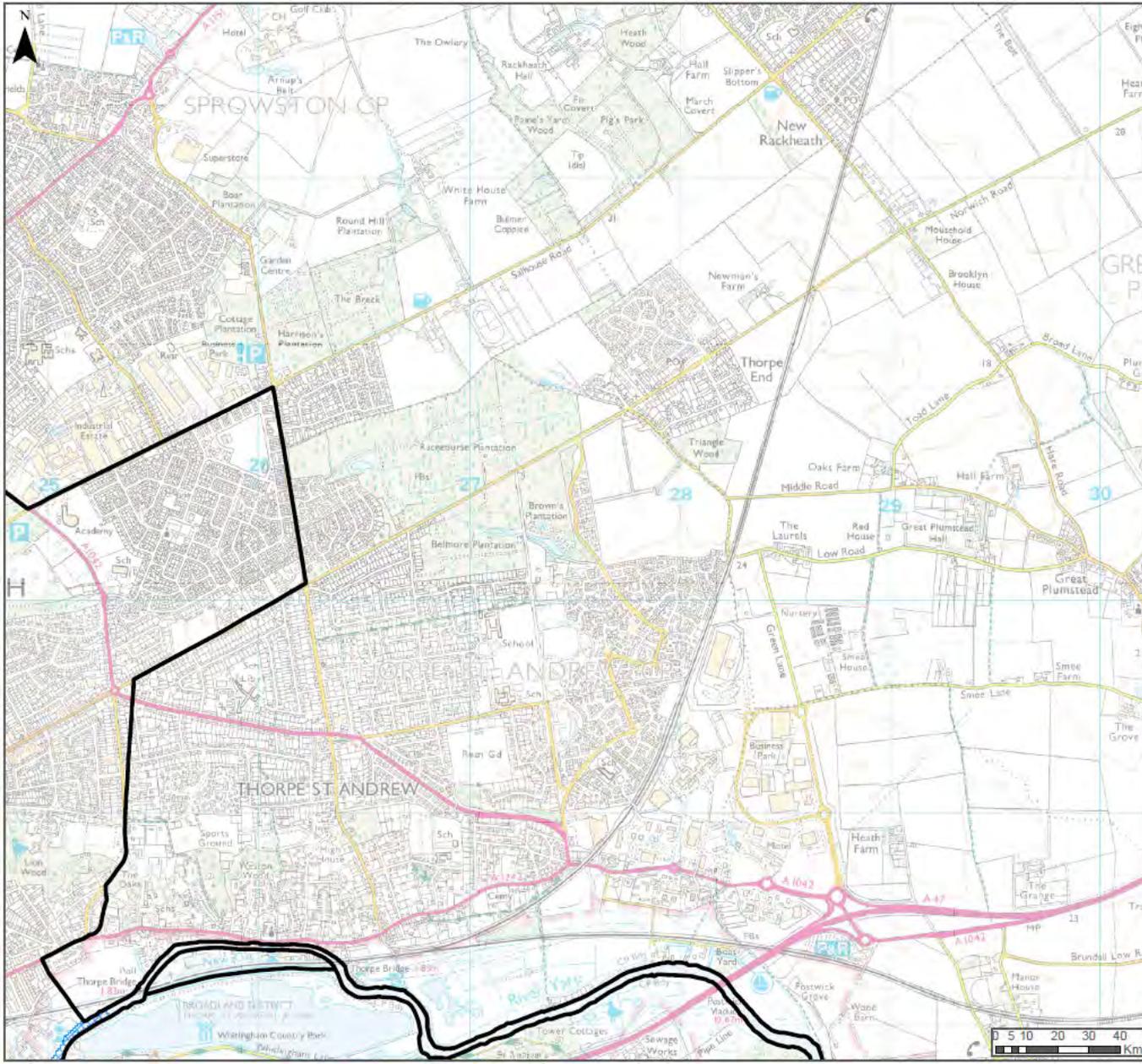
- Dry Islands >0.5Ha

[Return to Index Map](#)

[Mapping Supporting Information](#)

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LEGEND

Note: All layers are turned off by default. Click the box next to the layer of interest to turn on.

Authority Information

- Administrative Area
- Study Area
- Main Rivers
- Detailed River Network
- The Broads

Flood Zones

- Flood Zones 3b
- Indicative Flood Zones 3b
- Flood Zones 3a
- Flood Zones 2

Surface Water

- RoF5W 3.3% AEP
- RoF5W 1% AEP
- RoF5W 0.1% AEP

Reservoir Flooding

- Reservoir Flooding

Fluvial Climate Change

- 1% AEP with 35% Climate Change
- 1% AEP with 65% Climate Change
- 0.1% AEP with 25% Climate Change

Tidal Climate Change

- 0.5% AEP Climate Change
- 0.1% AEP Climate Change

Surface Water Climate Change

- 1% AEP with 40% Climate Change

Areas Susceptible to Groundwater Flooding

- >= 75%
- >= 50% <75%
- >= 25% <50%
- < 25%

Other

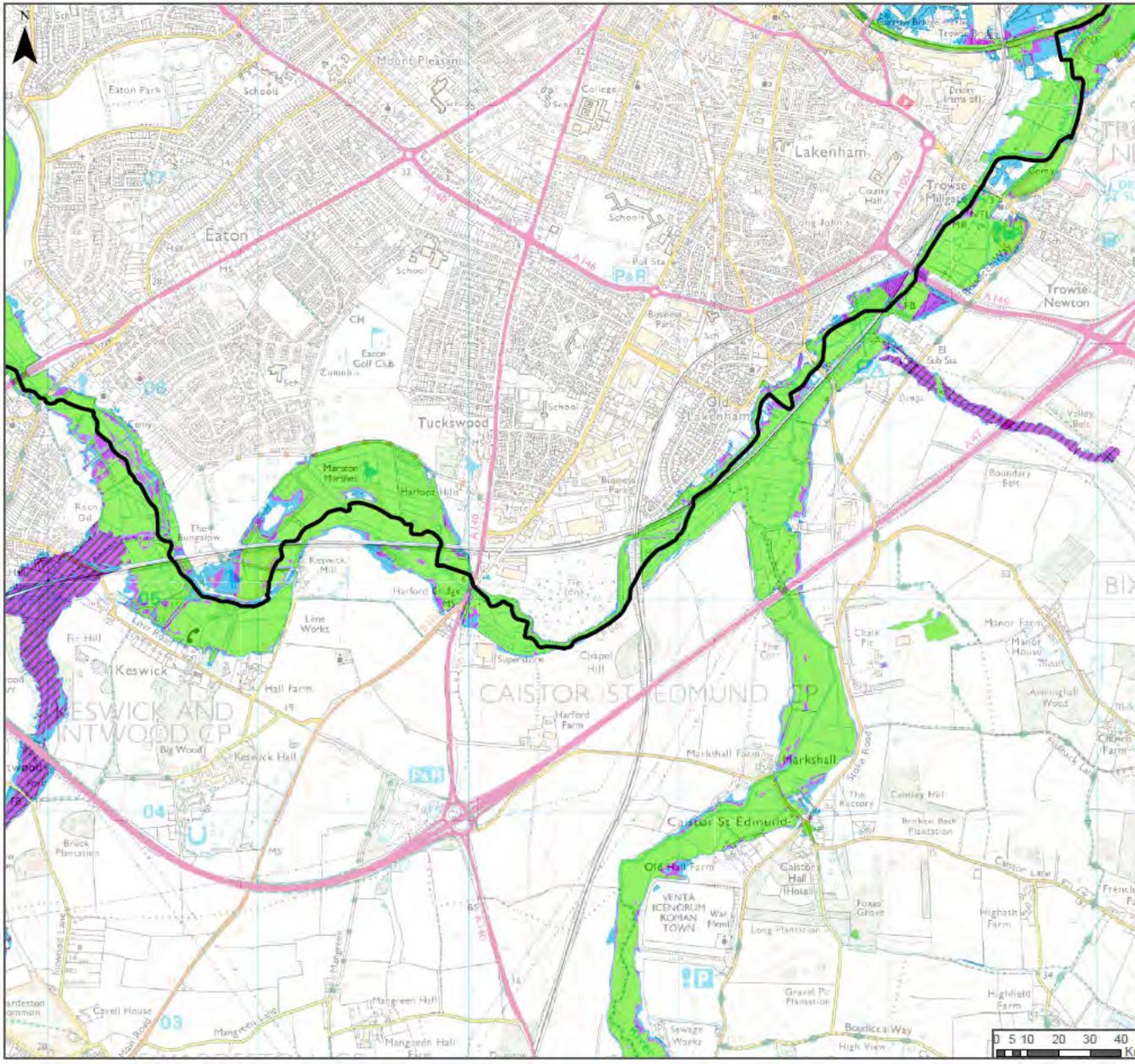
- Dry Islands >0.5Ha

[Return to Index Map](#)

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LEGEND

Note: All layers are turned off by default. Click the box next to the layer of interest to turn on.

Authority Information

- Administrative Area
- Study Area
- Main Rivers
- Detailed River Network
- The Broads

Fluvial Climate Change

- 1% AEP with 35% Climate Change
- 1% AEP with 65% Climate Change
- 0.1% AEP with 25% Climate Change

Tidal Climate Change

- 0.5% AEP Climate Change
- 0.1% AEP Climate Change

Flood Zones

- Flood Zones 3b
- Indicative Flood Zones 3b
- Flood Zones 3a
- Flood Zones 2

Surface Water Climate Change

- 1% AEP with 40% Climate Change

Surface Water

- RoFSW 3.3% AEP
- RoFSW 1% AEP
- RoFSW 0.1% AEP

Areas Susceptible to Groundwater Flooding

- ≥ 75%
- ≥ 50% < 75%
- ≥ 25% < 50%
- < 25%

Other

- Dry Islands > 0.5Ha

Reservoir Flooding

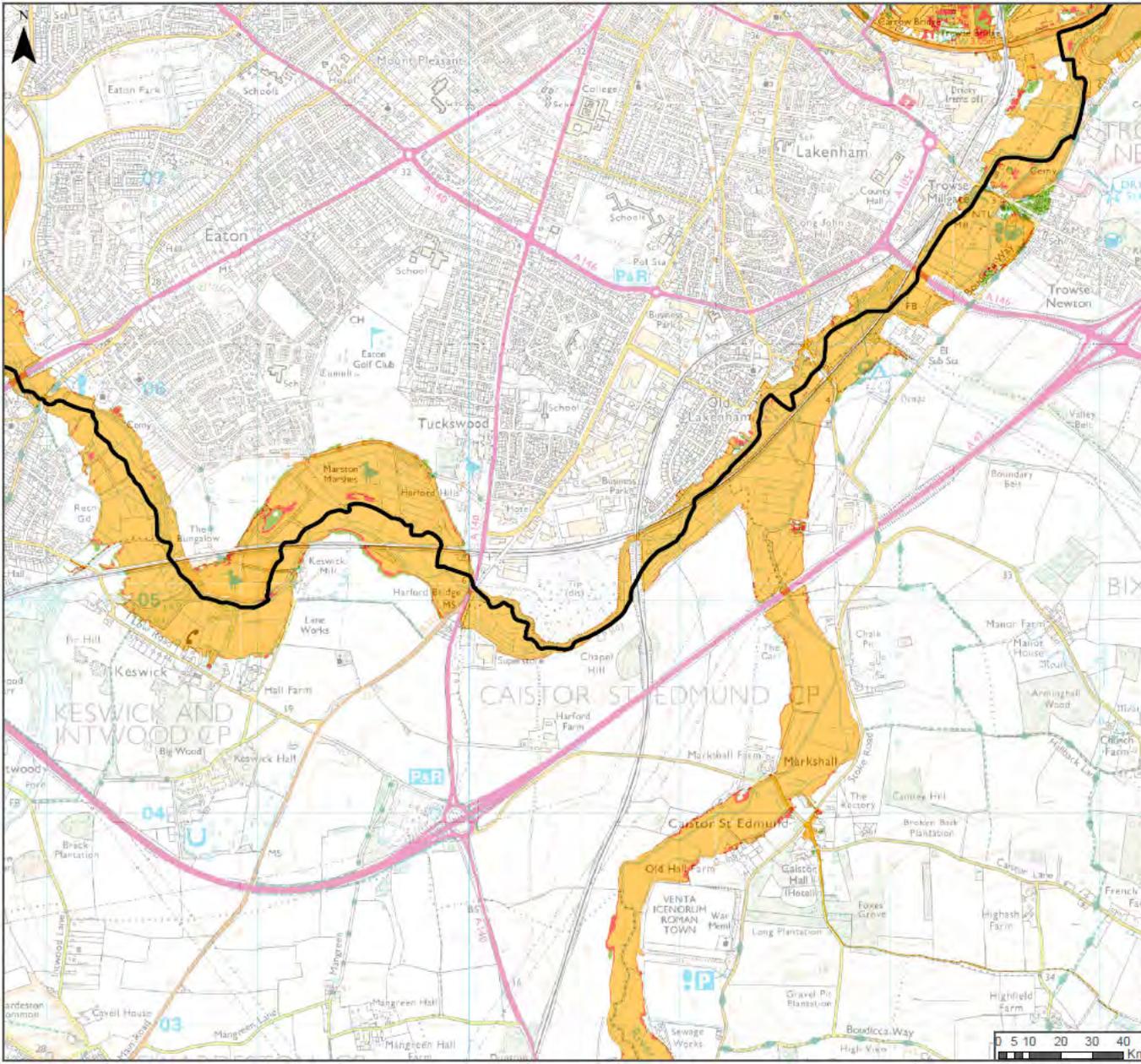
- Reservoir Flooding

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LEGEND

Note: All layers are turned off by default. Click the box next to the layer of interest to turn on.

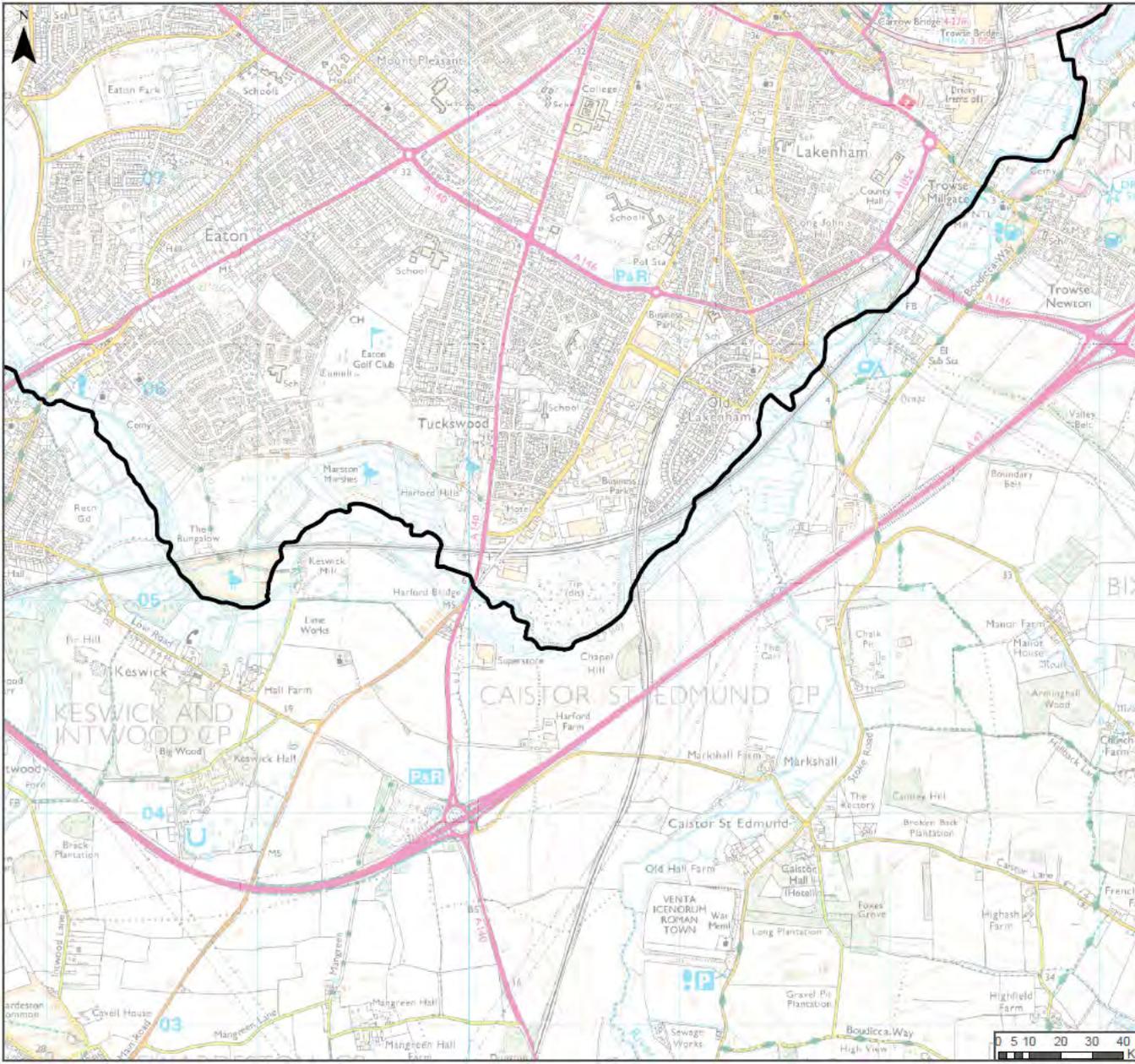
- | | | | |
|-------------------------------------|---------------------------|--|----------------------------------|
| Authority Information | | Fluvial Climate Change | |
| <input checked="" type="checkbox"/> | Administrative Area | <input type="checkbox"/> | 1% AEP with 35% Climate Change |
| <input checked="" type="checkbox"/> | Study Area | <input type="checkbox"/> | 1% AEP with 85% Climate Change |
| <input type="checkbox"/> | Main Rivers | <input type="checkbox"/> | 0.1% AEP with 25% Climate Change |
| <input type="checkbox"/> | Detailed River Network | Tidal Climate Change | |
| <input type="checkbox"/> | The Broads | <input checked="" type="checkbox"/> | 0.5% AEP Climate Change |
| Flood Zones | | <input checked="" type="checkbox"/> | 0.1% AEP Climate Change |
| <input type="checkbox"/> | Flood Zones 3b | Surface Water Climate Change | |
| <input type="checkbox"/> | Indicative Flood Zones 3b | <input type="checkbox"/> | 1% AEP with 40% Climate Change |
| <input type="checkbox"/> | Flood Zones 3a | Areas Susceptible to Groundwater Flooding | |
| <input type="checkbox"/> | Flood Zones 2 | <input type="checkbox"/> | ≥ 75% |
| Surface Water | | <input type="checkbox"/> | ≥ 50% < 75% |
| <input type="checkbox"/> | RoFSW 3.3% AEP | <input type="checkbox"/> | ≥ 25% < 50% |
| <input type="checkbox"/> | RoFSW 1% AEP | <input type="checkbox"/> | < 25% |
| <input type="checkbox"/> | RoFSW 0.1% AEP | Other | |
| <input type="checkbox"/> | Reservoir Flooding | <input type="checkbox"/> | Dry Islands > 0.5Ha |

[Return to Index Map](#)

[Mapping Supporting Information](#)

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LEGEND

Note: All layers are turned off by default. Click the box next to the layer of interest to turn on.

Authority Information

- Administrative Area
- Study Area

- Main Rivers
- Detailed River Network
- The Broads

Flood Zones

- Flood Zones 3b
- Indicative Flood Zones 3b
- Flood Zones 3a
- Flood Zones 2

Surface Water

- RoFSW 3.3% AEP
- RoFSW 1% AEP
- RoFSW 0.1% AEP

Reservoir Flooding

- Reservoir Flooding

Fluvial Climate Change

- 1% AEP with 35% Climate Change
- 1% AEP with 65% Climate Change
- 0.1% AEP with 25% Climate Change

Tidal Climate Change

- 0.5% AEP Climate Change
- 0.1% AEP Climate Change

Surface Water Climate Change

- 1% AEP with 40% Climate Change

Areas Susceptible to Groundwater Flooding

- >= 75%
- >= 50% <75%
- >= 25% <50%
- < 25%

Other

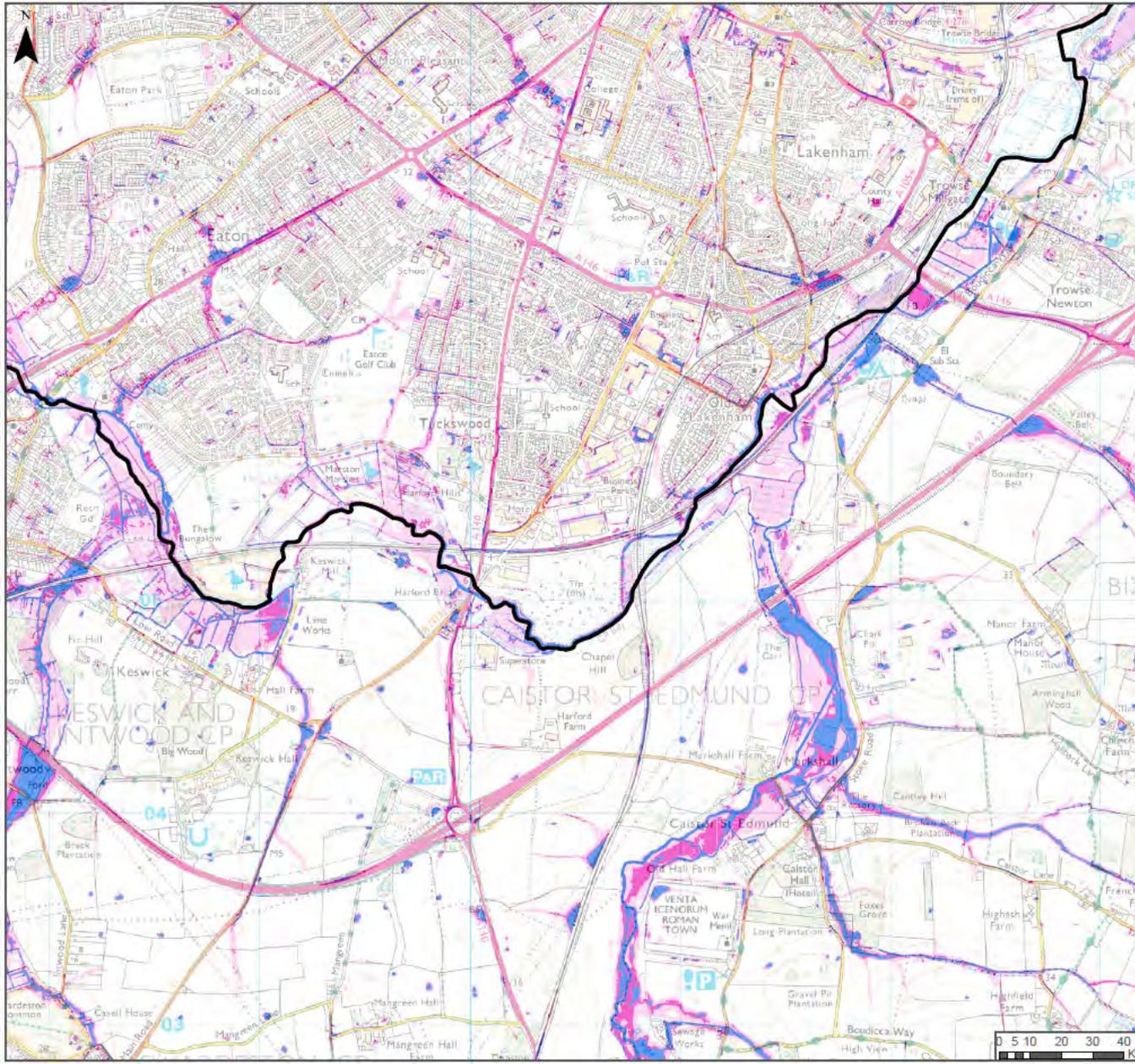
- Dry Islands >0.5Ha

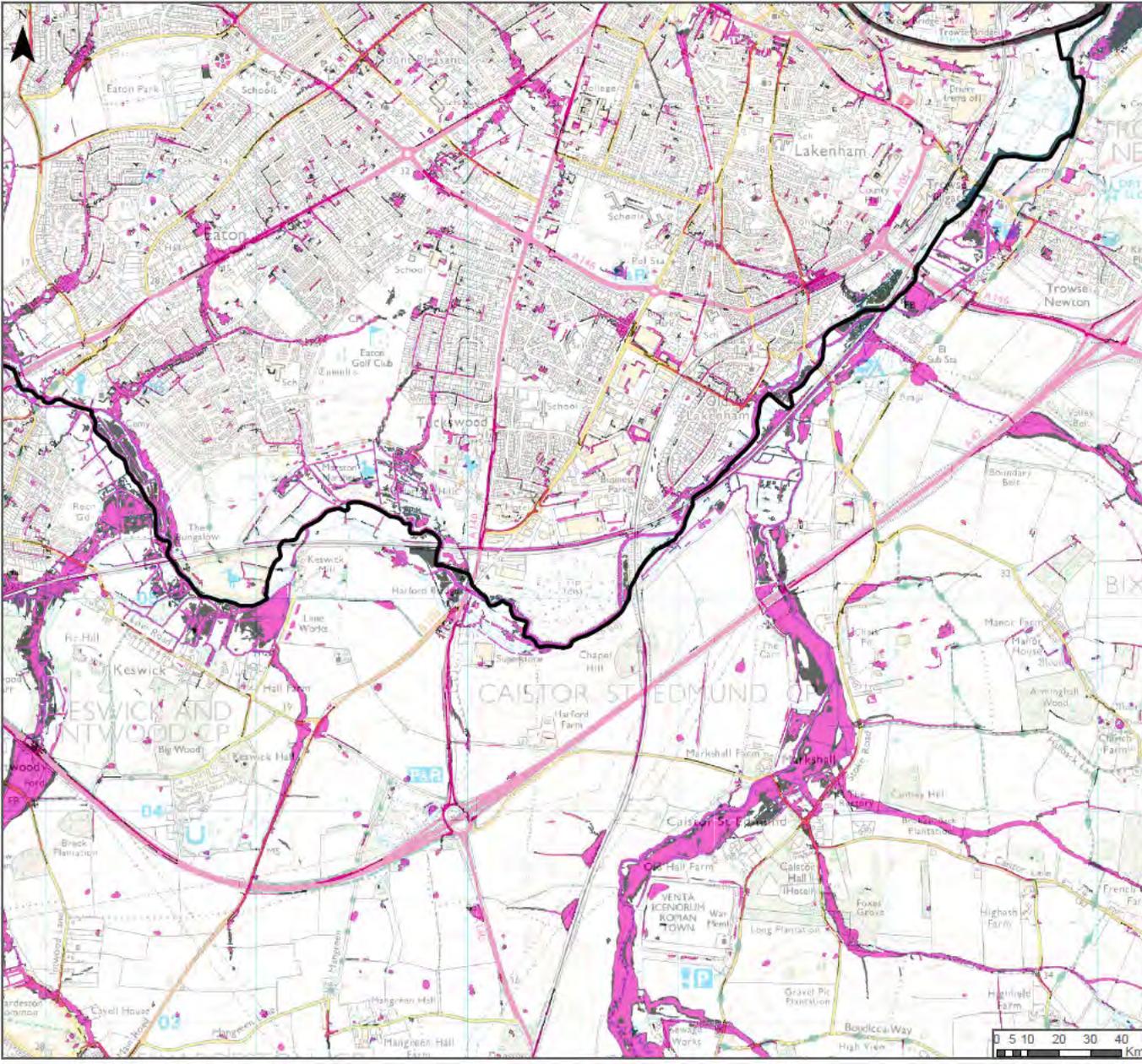
Return to Index Map

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LEGEND

Note: All layers are turned off by default. Click the box next to the layer of interest to turn on.

- | | | | |
|-------------------------------------|---------------------------|--|----------------------------------|
| Authority Information | | Fluvial Climate Change | |
| <input checked="" type="checkbox"/> | Administrative Area | <input type="checkbox"/> | 1% AEP with 35% Climate Change |
| <input checked="" type="checkbox"/> | Study Area | <input type="checkbox"/> | 1% AEP with 65% Climate Change |
| <input type="checkbox"/> | Main Rivers | <input type="checkbox"/> | 0.1% AEP with 25% Climate Change |
| <input type="checkbox"/> | Detailed River Network | Tidal Climate Change | |
| <input type="checkbox"/> | The Broads | <input type="checkbox"/> | 0.5% AEP Climate Change |
| Flood Zones | | <input type="checkbox"/> | 0.1% AEP Climate Change |
| <input type="checkbox"/> | Flood Zones 3b | Surface Water Climate Change | |
| <input type="checkbox"/> | Indicative Flood Zones 3b | <input checked="" type="checkbox"/> | 1% AEP with 40% Climate Change |
| <input type="checkbox"/> | Flood Zones 3a | Areas Susceptible to Groundwater Flooding | |
| <input type="checkbox"/> | Flood Zones 2 | <input type="checkbox"/> | >= 75% |
| Surface Water | | <input type="checkbox"/> | >= 50% <75% |
| <input type="checkbox"/> | RoFISW 3.3% AEP | <input type="checkbox"/> | >= 25% <50% |
| <input checked="" type="checkbox"/> | RoFISW 1% AEP | <input type="checkbox"/> | < 25% |
| <input type="checkbox"/> | RoFISW 0.1% AEP | Other | |
| <input type="checkbox"/> | Reservoir Flooding | <input type="checkbox"/> | Dry Islands >0.5Ha |

[Return to Index Map](#)

[Mapping Supporting Information](#)

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**APPENDIX A: FLOOD RISK MAPPING
INDEX GRID: GN 45**



LEGEND

Note: All layers are turned off by default. Click the box next to the layer of interest to turn on.

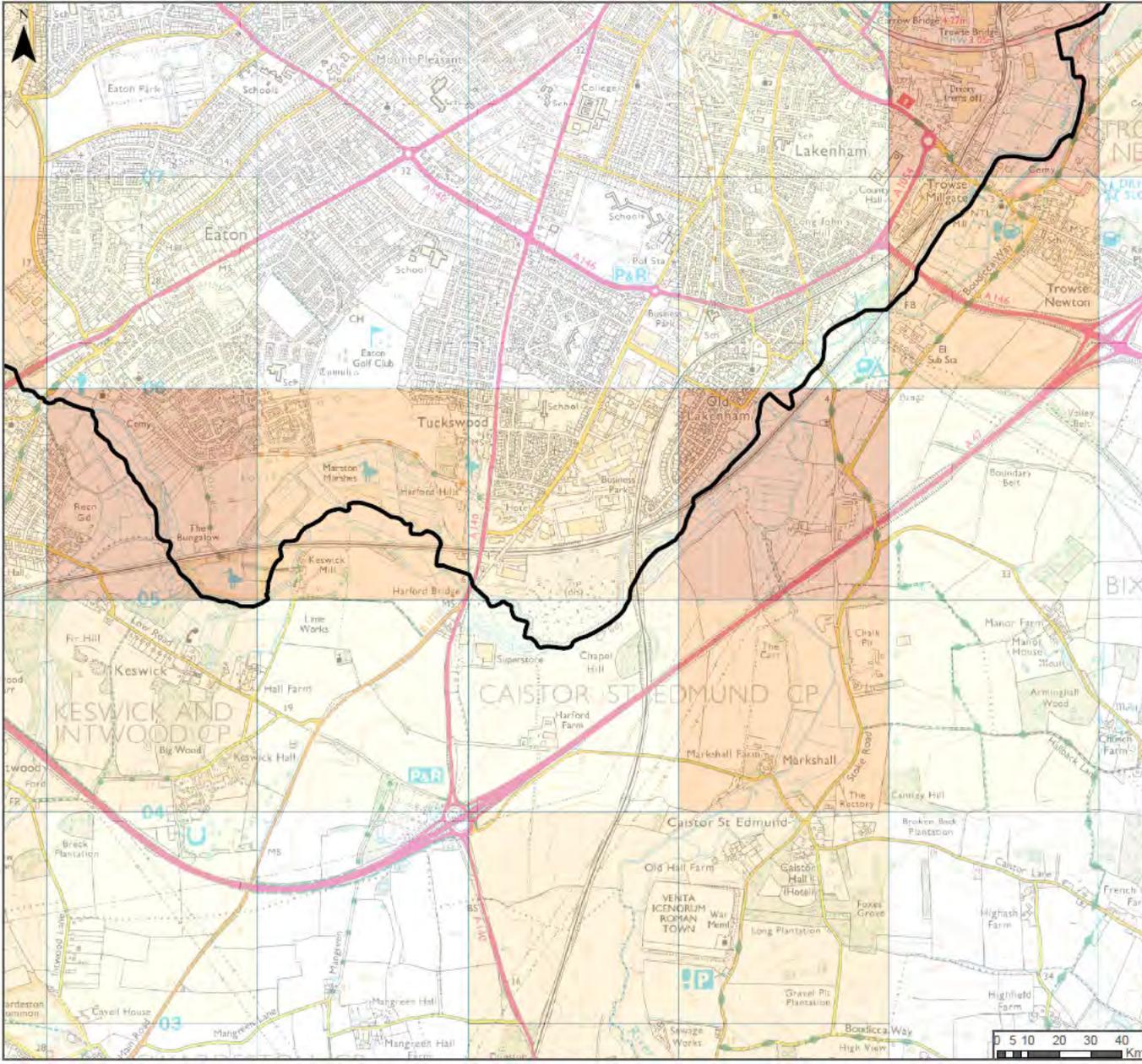
- | | | | |
|-------------------------------------|---------------------------|--|--------------------------------|
| Authority Information | | Fluvial Climate Change | |
| <input checked="" type="checkbox"/> | Administrative Area | 1% AEP with 35% Climate Change | 1% AEP with 65% Climate Change |
| <input checked="" type="checkbox"/> | Study Area | 0.1% AEP with 25% Climate Change | 0.1% AEP Climate Change |
| | Main Rivers | Tidal Climate Change | |
| | Detailed River Network | 0.5% AEP Climate Change | 0.1% AEP Climate Change |
| | The Broads | Surface Water Climate Change | |
| Flood Zones | | 1% AEP with 40% Climate Change | |
| | Flood Zones 3b | Areas Susceptible to Groundwater Flooding | |
| | Indicative Flood Zones 3b | <input checked="" type="checkbox"/> | >= 75% |
| | Flood Zones 3a | | >= 50% <75% |
| | Flood Zones 2 | | >= 25% <50% |
| Surface Water | | | < 25% |
| | RoFSW 3.3% AEP | Other | |
| | RoFSW 1% AEP | | Dry Islands>0.5Ha |
| | RoFSW 0.1% AEP | | |
| Reservoir Flooding | | | |
| | Reservoir Flooding | | |

[Return to Index Map](#)

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**APPENDIX A: FLOOD RISK MAPPING
INDEX GRID: GN 45**



LEGEND

Note: All layers are turned off by default. Click the box next to the layer of interest to turn on.

Authority Information

- Administrative Area
- Study Area
- Main Rivers
- Detailed River Network
- The Broads

Fluvial Climate Change

- 1% AEP with 35% Climate Change
- 1% AEP with 65% Climate Change
- 0.1% AEP with 25% Climate Change
- 0.5% AEP Climate Change
- 0.1% AEP Climate Change

Flood Zones

- Flood Zones 3b
- Indicative Flood Zones 3b
- Flood Zones 3a
- Flood Zones 2

Tidal Climate Change

- 0.5% AEP Climate Change
- 0.1% AEP Climate Change
- 1% AEP with 40% Climate Change

Surface Water

- RoF5W 3.3% AEP
- RoF5W 1% AEP
- RoF5W 0.1% AEP

Surface Water Climate Change

- 1% AEP with 40% Climate Change

Areas Susceptible to Groundwater Flooding

- >= 75%
- >= 50% <75%
- >= 25% <50%
- < 25%

Other

- Dry Islands >0.5Ha

Reservoir Flooding

- Reservoir Flooding

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[Mapping Supporting Information](#)

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