john newton & partners
jnpgroup
Consulting Engineers

www.jnpgroup.co.uk

Reg 19 Draft Local Plan Representations
Flooding and Drainage

Project: R03 Officers Meadow, Shenfield

Client: Croudace Developments Ltd

Reference: C86054-R001

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Chesham (HQ)

telephone
01494 771221

email
chesham@jnpgroup.co.uk

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Reg 19 Draft Local Plan Representations
Flooding and Drainage

Prepared by……
Jacob Cronin BSc (Hons), MSc
Graduate Civil Engineer

Approved by……
Alan Brackley BEng CEng FICE FIStructE FCIHT
Founder

FOR AND ON BEHALF OF JNP GROUP

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1 INTRODUCTION

1.1 Terms of Reference

1.1.1 **jnpgroup** was commissioned by Croudace Homes to undertake a Preliminary Flood Risk Assessment and Drainage Strategy and prepare representations for the draft Local Plan for the proposed development of Officers Meadow, Shenfield, Brentwood.

1.1.2 The proposals consist of Officers Meadows circa 510 residential units, within the overall allocation for 825, and represents an area of approximately 22ha. Associated land uses include a care home, vehicular, pedestrian and cycle access, soft landscaped sports and recreation spaces, and integrated sustainable drainage systems.

1.1.3 The site is identified in the Brentwood Strategic Flood Risk Assessment and the Brentwood Draft Local Plan Policy R03 as being in a critical drainage area. A critical drainage is defined as being a location within the extents of Flood Zone 1 (at low risk of fluvial or tidal/ocean flooding) which has known issues relating to drainage and these issues have been notified to the local planning authority by the Environment Agency (EA).

1.1.4 The National Planning Policy Framework (NPPF) states that when determining planning applications, local planning authorities should ensure flood risk is not increased elsewhere and only consider development appropriate in areas at risk of flooding where informed by a site-specific FRA. This assessment is required for: -

"…all development in Flood Zones 2 and 3. In Flood Zone 1, an assessment should accompany all proposals involving: sites of 1 hectare or more; land which has been identified by the Environment Agency as having critical drainage problems; land identified in a strategic flood risk assessment as being at increased flood risk in future; or land that may be subject to other sources of flooding, where its development would introduce a more vulnerable use."

1.1.5 At this early stage no site layout is available, therefore this report considers matters at a high level, identifying constraints and opportunities for development and setting out the principles for enhancement through development and any required mitigation.

1.1.6 In accordance with the March 2014 Planning Practice Guidance (PPG), which supports the NPPF, the objectives of an FRA are to establish:

- Whether a proposed development is likely to be affected by current or future flooding from any source;
- Whether it will increase flood risk elsewhere;
- Whether the measures proposed to deal with these effects and risks are appropriate.

1.1.7 These Representations on the Brentwood Borough Council Reg 19 draft Local Plan have been prepared on behalf of Croudace Homes who are promoting their site (Officers Meadows – site number 034), which falls within the broader allocation of "Land North of Shenfield". The allocation encompasses several land ownerships, including site 158, 235, 087, 263 and 276, as well as the "Officer's Meadow" site (034), all of which make up the allocation R03. It should be noted that Croudace Homes has controlling land interest in site 034 only, therefore whilst development proposals have taken the other sites into account, this document is in respect of the "Officer's Meadow" site.

1.1.8 "Land North of Shenfield" was previously promoted through the Reg 18 Local Plan process (see Site Allocations Map Jan 2016 which supported the Draft Local Plan) historically as one of three separate strategic sites, now shown in the Reg 19 draft Local Plan site allocation as one site, "Officer's Meadow and surrounding land" (ref. Policy R03) allocated for residential development. The "Officer's Meadow"

site is the focus of these Representations to the Reg 19 draft Local Plan and is hereby referred to as "the Site".

1.2 Site Description

1.2.1 The site is approximately 22ha in size and located to the north of Shenfield adjacent the A12. It is bounded by Chelmsford Road (A1023) and existing residential properties to the west and north, the railway to the east, and Alexander Lane to the south.

1.2.2 The site is currently undeveloped greenfield land and may have been previously used for agricultural or the keeping of animals. The site has a number of mature trees along its boundaries, drainage ditches and a stream that flows from east to west across southern end of the site. A site location plan has been provided in Figure 1 below.

Figure 1: Site Location Plan

1.2.3 The site has informal drainage in the form of two ditches running across the site, discharging via culverts under the A1023 and onwards to a tributary of The River Wid.

1.3 Site Topography

1.3.1 1m resolution Digital Terrain Model (DTM) LiDAR was acquired from the EA of the site and surrounding area (where available). Figure 2 below displays the mapped EA LiDAR data.

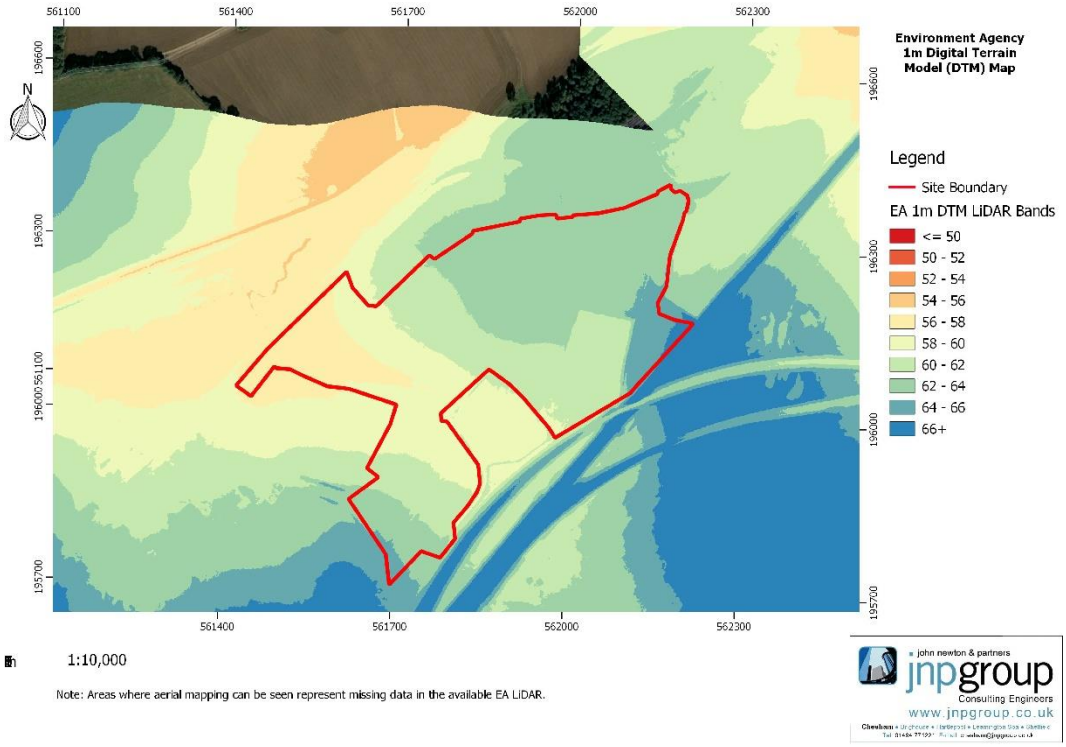

Figure 2: 1m Resolution DTM LiDAR Plan

1.3.2 The LiDAR data shows levels onsite fall south-westwards towards the drainage ditches which run across the southern area of the site. The LiDAR bands suggest that the levels at the far south-western corner of the site are around 54-52m Above Ordnance Datum (m AOD). The highest LiDAR bands onsite are between 62-64m AOD and are located in the northern and south-eastern corner of the site. Levels beyond the sites northern boundary are shown to rapidly fall towards the River Wid, which is approximately 550m away from the site boundary.

1.4 Hydrology

1.4.1 The local hydrology is dominated by upstream flows from the south, which are a combination of piped network and watercourses, passing through an Anglian Water Balancing Pond located immediately to the south-east of the site.

1.4.2 Two drainage ditches convey surface water overland flows across the site, flowing from east to west, before entering a culvert under Chelmsford Road.

1.5 Geology and Hydrogeology

1.5.1 British Geological Survey (BGS) have provided 1:50000 scale geological maps of the area, including the site. These indicate that the site is underlain by bedrock composed of the London Clay and Silt. Superficial deposits composed of Alluvium (Clay, Silt, Sand and Gravel) are shown to be located towards the eastern extremity of the site.

1.5.2 Ground conditions are likely to be impermeable due to the predominately Clay bedrock and superficial deposits, however this will require confirmation via intrusive ground investigation works, before detailed design.

1.5.3 The EA identify the site as underlain by Secondary aquifer in the Bedrock and Superficial deposits and the area is classified as low vulnerability due to the impervious nature of the underlying soils.

2 POLICIES

2.1 Policy NE 06 – Flood Risk

2.1.1 The following policies have been extracted from the February 2019 draft Brentwood Local Plan, Pre-Submission Document for Brentwood Borough Council. The policy statements are included in italics, with our comments following in numbered paragraphs.

"A. Proposed development will be required to avoid where possible flood risk to people and property and manage any residual risk, taking into account the impacts of climate change by: "

"a) Applying the sequential test, directing development away from areas at risk of flooding, including those areas associated with surface water flooding."

"b) If necessary, applying the exception test."

2.1.2 This is in accordance with the NPPF and therefore this requirement is **sound**. Although part of the site lies within the floodplain, the sequential and exception tests will be applied to guide development locations and to assess any residual flood risk.

"c) Safe guarding land from development that is required for current and future flood management."

"d) Using opportunities offered by new development to reduce the causes and impacts of flooding."

2.1.3 This statement is excessive as it suggests that the applicant may be obligated to set aside land to provide flood management to benefit areas outside of the development, therefore this is seen as **unsound** and goes further than the NPPF Practice *Guide which "…requires developers to assess the risk to a development site and demonstrate how flood risk from all sources of flooding to the development itself and flood risk to others will be managed now, and taking climate change into account.".*

2.1.4 In accordance with the NPPF and Technical Guide, a site-specific FRA will be produced to support a planning application, supported by appropriate hydrological and hydraulic assessments of existing flood risk and any mitigation works, in consultation with Anglian Water, the EA and ECC.

2.1.5 Additional storage and surface water management will be introduced to control existing overland flows and pluvial flooding and incorporate these into the total site SuDS drainage strategy, thus controlling and reducing downstream surface water flooding.

"B. In areas designated as functional flood plains, or Critical Drainage Areas, development will only be permitted in accordance with national policy and guidance, and then only if:"

"a) Proposals are located in the lowest appropriate flood risk zone with regard to guidance set in the Brentwood Strategic Flood Risk Assessment as part of the sequential test."

"b) development would not constrain the function of the natural flood plain, either by impeding flow or reducing storage capacity."

2.1.6 The above is in accordance with the NPPF and Technical Guide are therefore **sound** and would be addressed as per our comments in 2.1.4.

"c) development is constructed so as to remain operational even at times of flood through resistant and resilient design."

2.1.7 We would clarify that the entirety of the development area does not need to remain operational at times of flood, such as access roads, if there is an alternate safe means of escape provided. Therefore, we would consider this requirement **unsound**.

"C. Where development is permitted within flood risk areas, it must demonstrate that, where required, it will reduce fluvial and surface water flood risk and manage residual risks through appropriate flood mitigation measures, including emergency planning and response. These measures may include, but are not restricted to:"

"a) land management, landscape and planting measures;"

"b) SuDS, including source control techniques;"

"c) water efficiency measures and, where appropriate, grey water use;"

"d) strategic water storage;"

"e) flow diversion and attenuation; and"

"f) property level protection, which can include appropriate finished floor levels, safe area(s), emergency flood planning and flood resilience measures."

2.1.8 The above is in generally in accordance with the NPPF, Technical Guide and also the April 2015 Ministerial SuDS statement and SuDS Manual (C753). However, the requirement to reduce flood risk is excessive and therefore **unsound**, as per 2.1.3.

2.1.9 However, it is anticipated that there will be potential for improvements via appropriate soft landscaped flood mitigation measures and SuDs to retain convey and attenuate existing surface water flows and surface water run-off from the new developed areas on-site.

2.1.10 Surface water run-off will be stored safely onsite, all surface water storage will be sized to accommodate flows for all storm events up to and including the 1in100+40% Climate Change event.

2.1.11 Property level protection will be utilised where appropriate to ensure that there is no risk to residents from surface water flows. The drainage strategy for the site will also be designed to direct and convey flows away from properties.

"D. Applications will need to demonstrate that the sewerage provider has been contacted to identify whether the sewerage network has adequate capacity both on and off-site to serve the development and to assess the need to contribute to any additional connections for the development to prevent flooding or pollution of land and water courses."

"E. Where sewerage capacity is identities as insufficient, development will only be permitted if it demonstrated that improvements will be completed prior to occupation of the development."

2.1.12 Anglian Water will be contacted via pre-planning enquiry to assess is capacity in the local sewerage network to accommodate flows from the proposed development, and ongoing liaison carried out to ensure that AW are aware of the proposed build-out rate of the site, however Aw are obligated to accept connections from planning approved development, at no additional contribution from the developer, other than new connection charges. Therefore, this requirement is **unsound**.

"F. Where the site is located within a Critical Drainage Area (CDA), development may have the potential to impact on the CDA in respect of surface water flooding. As a result of this, the site will require an individually designed mitigation scheme to address this issue."

2.1.13 This is reasonable as per the above noted requirements within the NPPF and Technical Guide to demonstrate the flood risk is appropriately managed and therefore is **sound**.

2.2 Policy BE08 - Sustainable Drainage

2.2.1 The following policies have been extracted from the February 2019 Brentwood Local Plan, Pre-Submission Document for Brentwood Borough Council.

Table 1: Policy BE08: Sustainable Drainage

Policy BE08: Sustainable Drainage
1. All developments should incorporate appropriate Sustainable Drainage Systems (SuDS) for the disposal of surface water, in order to avoid any increase in flood risk or adverse impact on water quality.
2. Applications must meet the following requirements: 2.1 Quantity: 2.1.1 On brownfield developments, SuDS features will be required to reduce discharge to previous greenfield rates or achieve a 50% minimum reduction of brownfield run-off rates; 2.1.2 Sites over 0.1 hectares in Flood Zone 1 will be required to submit a surface water drainage strategy. Larger sites over 1 hectare in Zone 1 or all schemes in Flood Zone 2 and 3 must be accompanied by a Flood Risk Assessment (FRA). 2.2 Quality: 2.2.1 The design must follow an index-based approach when managing water quality. Implementation in line with the updated CIRIA SuDS Manual is required. Source control techniques such as green roofs, permeable paving and swales should be used so that rainfall run-off in events up to 5mm does not leave the site. 2.3 Amenity and Biodiversity: 2.3.1 SuDS should be sensitively designed and located to promote improved biodiversity, water use efficiency, river water quality enhanced landscape and good quality spaces that benefit public amenities in the area; 2.3.2 Redeveloped brownfield sites should disconnect any surface water drainage from the foul network; 2.3.3 The preferred hierarchy of managing surface water drainage from any development is through infiltration measures, secondly attenuation and discharge to watercourse, and if these cannot be met, through discharge to surface water only sewers: 2.3.4 When discharging surface water to a public sewer, developers will be required to provide evidence that capacity exists in the public sewer network to serve their development.

2.2.2 As per part 1 of Policy BE08 in Table 1 above all SuDS components implemented onsite will be appropriate for the site and will not lead to an increase in flood risk or degradation of water quality both on and offsite.

2.2.3 As per part 2.2.1 of Policy BE08 in Table 1 above a comprehensive FRA and surface water drainage strategy incorporating SuDS will be submitted as part of any application. A Flood Risk Assessment will

be produced which demonstrates that the proposed residential development will not increase the risk of flooding on or off site. The report will also set out the principles of the proposed drainage strategy and any mitigation measures if required.

2.2.4 As per part 2.2.2 of Policy BE08 in Table 1 above SuDS components will be assessed and recommended in line with the SuDS hierarchy from the SuDS Manual C753. Each component will be carefully selected taking into account the site's constraints such as topography, geology, hydrogeology and flood risk.

2.2.5 As per part 2.2.3 of Policy BE08 in Table 1 above SuDS components will be selected and designed in close collaboration with Ecologists and Landscape Architects to provide enhanced and biodiverse wetland areas. The proposed development's drainage system will incorporate multiple SuDS components which will control volume of surface water to acceptable rates and will also treat run-off to mitigate all pollution indices. Discharged water will therefore have negligible hydrological impacts on the water environment.

2.2.6 The index-based approach to assessing and mitigation pollution as per the SuDS Manual will be applied.

2.2.7 In-line with part 2.2.4 of Policy BE08 in Table 1 above the BGS data has been examined for the site, which suggests that the underlying soils are clays and silts of little or no permeability. Infiltration is therefore likely to be impracticable. Surface water drainage is therefore likely to be based around attenuation and discharge to existing watercourses in such a manner that flood risk off site is not increased and that overland flows are controlled, reducing the ongoing effect of surface water flooding.

2.2.8 Therefore, it can be concluded that Policy BE08 is **sound** as it will ensure that the proposed development takes into account all aspects of sustainable drainage and the drainage hierarchy.

2.2.9 The requirement for prevention of runoff for all rainfall events up to 5mm is however in excess of the SuDS manual which states *"… the prevention of runoff from the site for the majority of small (frequent) rainfall events (or for the initial depth of rainfall for larger events) is called Interception, and Interception of about 5 mm is normally achievable."*. The omission an allowance for achieving this where reasonable or achievable is therefore **unsound**.

2.3 Policy BE 18 - Green and Blue Infrastructure

2.3.1 The following policies have been extracted from the February 2019 Brentwood Local Plan, Pre-Submission Document for Brentwood Borough Council.

"A. Brentwood's existing ecological networks, its green and open spaces, as well as green and blue features in the built environment are a part of the borough's network of green and blue infrastructure (GBI) and should be protected, planned, enhanced and manged.

2.3.2 The drainage strategy for the proposed development will implement GBI in the form of SuDS measures. Where applicable existing GBI features such as the existing onsite streams will be enhanced and protected.

"B. Development proposals should:

a. ensure that GBI is integral to the primary decision making at every stage in the planning process;

b. maximise opportunities for the provision, restoration, enhancement, and connection of GBI that integrates with natural and historic environments and systems;

c. direct buildings and construction area to the least sensitive locations;

d. provide appropriate specification and maintenance plans for proposed on site green and blue infrastructure throughout the life of the development, this includes small scale greening interventions such as green roofs, street trees and soft landscaping;

e. protect and enhance Brentwood's rivers, ponds and watercourses, avoid any adverse impacts on existing rivers, the water quality of the rivers and watercourse, and demonstrate that any unavoidable impacts are mitigated;

2.3.3 The drainage strategy for the site will assess the potential to create new GBI, where possible. Furthermore, existing GBI shall be incorporated into the sites proposed drainage strategy and used to integrate proposed drainage features with the natural environment of the area.

2.3.4 The existing onsite stream will be incorporated into the drainage strategy for the site and where possible enhanced to improve its ecological characteristics.

2.3.5 A SuDS maintenance plan for the site will be prepared, this plan will state all required maintenance actions for SuDS and GBI features onsite, as well as, timescales for carrying out the stated actions.

2.3.6 These requirement in relation to drainage and flooding are **sound** and in-line with the NPPF, Technical Guide and the SuDS Manual.

f. seek to improve the water environment and ensure that adequate wastewater infrastructure capacity is provided;

2.3.7 Where possible the existing stream onsite will be protected and enhanced in-line with:

- Environment Agency Water Framework Directive Mitigation Measures Online Manual
- The SuDS Manual (CIRIA report C753, 2015)
- UK River Restoration Centre's Interactive Manual of Techniques for River Restoration
- The New Rivers and Wildlife Handbook (RSPB, 2001).

2.3.8 As per 2.1.12, Anglian Water have an obligation to provide wastewater infrastructure capacity for planning approved development, and whilst the developer would liaise with AW, the requirement to a developer to ensure capacity is excessive and therefore **unsound**.

g. ensure that misconnections between foul and surface water networks are eliminated and not easily created through future building alternations;

2.3.9 The site is greenfield and due to this there are no connections to the existing foul and surface water networks. However, the foul and surface water drainage networks for the site will be set-out to minimise the risk of future misconnections being established.

h. incorporate measures such as smart metering water saving and recycling, including retrofitting and rain/grey water harvesting, to help to achieve lower water consumption rates and to maximise futureproofing;

2.3.10 If possible, water recycling and rain/grey water harvesting measures will be implemented onsite.

i. deliver environmental net gains; if there is a net loss from the development, provide provisions through offsetting."

2.3.11 The proposed development will protect and enhance the natural environment where possible. Areas that cause a loss to the environment will be offset through the implementation of features such as GBI.

"C. where this is not possible, financial contributions to facilitate improvements to the quality and extent of existing GBI in Brentwood Borough will be sought."

"D. The quantity, quality, accessibility and distribution of green and blue infrastructure for proposed allocations, including Dunton Hills Garden Village, will be set out in site specific policies."

2.4 R 03 Land North of Shenfield

2.4.1 The pre-submission Reg 19 Local Plan Policies for the site that were set out in February 2019 state the following policies in relation to flood risk and drainage:

"Policy R03 – C: infrastructure Requirements, sub policy c - the site is located within a Critical Drainage Area. This development may have the potential to impact on the Critical Drainage Area in respect of surface water flooding. As a result of this, the site is likely to require an individually designed mitigation scheme to address this issue."

2.4.2 The policy is addressed within the above, is in accordance with the NPPF and Technical Guide and therefore is **sound**. a site-specific FRA will be produced to support a planning application, supported by appropriate hydrological and hydraulic assessments of existing flood risk and any mitigation works, in consultation with Anglian Water, the EA and ECC.

3 PRELIMINARY FLOOD RISK ASSESSMENT

3.1 Flood Risk Guidance

3.1.1 The following resources have been reviewed to assist with the preparation of the FRA:

- **Strategic Flood Risk Assessment (SFRA)**: An SFRA was prepared by Amec Foster Wheeler for the Borough of Brentwood in 2018. This document provides useful information regarding the specific flood risks associated with the local area.
- **Surface Water Management Plan (SWMP)**: An SWMP was prepared by JBA Consulting for the Borough of Brentwood in January 2015. This document provides a further understanding of flood risk and the local strategy for the management of surface water.

3.2 National Planning Policy Framework 2019

3.2.1 The PPG, which supports NPPF 2019, defines three Flood Zones in relation to river flooding. These are defined as:

- Flood Zone 1 (Low Probability): This zone comprises land assessed as having less than a 1 in 1000 annual probability of river flooding;
- Flood Zone 2 (Medium Probability): This zone comprises land assessed as having between a 1 in 100 and 1 in 1000 annual probability of river flooding; and
- Flood Zone 3 (High Probability): This zone comprises land assessed as having greater than a 1 in 100 annual probability of river flooding.

3.2.2 The EA's Flood Map for Planning shows that the vast majority of the site is located in Flood Zone 1, although a small area from the extreme centre west of the site is identified as Flood Zone 2 and 3.

3.3 Climate Change

3.3.1 In line with PPG, a site-specific FRA must consider the following question:

"How is flood risk at the site likely to be affected by climate change?"

3.3.2 In February 2016, the EA provided guidance on the predicted impacts of climate change on peak river flow and rainfall intensity over the next 100 years. The site is located in the River Wid Catchment, where peak river flow is predicted to increase by 25-65% by 2115. Peak rainfall intensity is predicted to increase by up to 40% by 2115.

3.3.3 Residential development has an expected minimum lifetime of 100 years, so to ensure that the development is safe from the effects of flood risk through this lifetime, climate change must be considered. This assessment takes account of the forecasted effects of climate change on all possible sources of flood risk.

3.4 Sequential Test and Exception Test

3.4.1 In accordance with the NPPF:

"The aim of the sequential test is to steer new development to areas with the lowest risk of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The strategic flood risk assessment will provide the basis for applying this test. The sequential approach should be used in areas known to be at risk now or in the future from any form of flooding."

3.4.2 Where areas of lower risk are not available, the Exception Test, as set out in paragraph 160 of the NPPF can be applied, to ensure flood risk management for people and property meets the required standard.

3.4.3 The SFRA produced by Amec Foster Wheeler for Brentwood Borough Council states that 97% of the site (please note that this includes an additional portion of land to the west) is located within Flood Zone 1 and that a sequential approach should be applied to ensure the most vulnerable aspects of the development are directed to the areas of the lowest flood risk.

3.4.4 The SFRA states that as the development is compatible for housing use within Flood Zone 1. This is conditional to development being steered away from any flood zone areas.

3.5 Fluvial Flood Risk (Rivers)

3.5.1 Examination of the online EA Flood Map for Planning indicates that apart from a very small area on the western extremity of the site, all of the Officers Meadow site is within Flood Zone 1. An extract of the Flood Map for Planning has been provided below in Figure 3.

Figure 3: Flood Map for Planning Extract

3.5.2 All areas of the site which are proposed to be developed will be located within Flood Zone 1.

3.5.3 The proposed main site access off Chelmsford Road is within the extents of Flood Zone 2 and 3, therefore, in a fluvial flood event it may not be possible for resident to escape via this route. However, a safe means of access can be provided at all times via the access onto Alexander Lane, which is entirely within Flood Zone 1.

3.5.4 Although not identified as a main river by the EA the ditches (classed as Ordinary Watercourses) which cross the site are located within Flood Zone 1, apart from their western extremities. The SFRA states these are unmodelled and as such will need to be modelled as part of a planning application.

3.6 Pluvial Flood Risk (Surface Water)

3.6.1 Surface water flooding occurs when the rainwater does not drain away through the normal drainage system or infiltrate to ground, but instead lies on or flows over the ground.

3.6.2 The EA produced a Risk of Flooding from Surface Water Map in December 2013 (updated in 2019). The maps were produced using 'direct rainfall' modelling. Although they take into account local drainage capacity to a degree, mostly drainage features, culverts and detention basins are not considered in detail in the model, also non-surface water influences such as rivers, seas or groundwater are not considered. The map is based on LiDAR data which is not suitable for site specific assessment and therefore, where available, topographic survey data should be used to provide a more accurate understanding of potential flow paths.

3.6.3 The map shows the entire country within four different risk categories, defined below in Table 2. Onsite and local areas of surface water flood risk are displayed below in Figure 4.

Table 2: Environment Agency Surface Water Flood Risk Categories

Risk Category	Definition
High	Each year, there is a chance of flooding of greater than 1 in 30 (3.3%)
Medium	Each year, there is a chance of flooding of between 1 in 30 (3.3%) and 1 in 100 (1%)
Low	Each year, there is a chance of flooding of between 1 in 100 (1%) and 1 in 1000 (0.1%)
Very Low	Each year, there is a chance of flooding of less than 1 in 1000 (0.1%)

Figure 4: Surface Water Flood Risk Plan

3.6.4 The EA's mapping suggests that overland flows can flow at velocities over 0.25m/s and at depths of between 300-900mm (and in some places over 900mm). The depths and velocities of surface water flows is identified to be at risk of, pose a danger to all site users.

3.6.5

3.6.6 The surface water flood risk areas are associated with existing low points within the local topography; valley forms, watercourses, ponds and detention basins. The majority of the surface water flood risk areas crossing the site are associated with the 2No. existing ditches which run from (and appear to receive flows from) the Anglian Water detention basin to the east, and pass across the site to the west, towards Chelmsford Road and the River Wid.

3.6.7 There are also areas of low risk associated with shallow valley forms in the centre and south of the site and the central site, both correlating to existing corridors of trees and hedgerows.

3.6.8 As noted above, the design parameters used by the EA's flood surface water flood mapping are known to be conservative and therefore may show unrepresentative flooding, there is also clearly overlap between the surface water flood risk maps and the fluvial flood risk from the River Wid downstream and the on-site watercourses.

3.6.9 In particular it is expected that the catchment discharging to the east-west surface water flood risk area is less than shown, as it is intercepted by the railway line to the east and culverted, and at least some of this runoff passes through the Anglian Water detention basin.

3.6.10 Flood risk will be investigated in detail in due course, supported by detailed catchment and channel modelling, to determine accurate surface water and fluvial flood extents. Discussion with Essex County Council as LLFA will be carried out, together with liaison with Anglian Water regarding the design of and discharge rates from the nearby detention basin.

3.6.11 In addition to defining the flood risk, this investigation will develop proposals for mitigating areas of surface water flooding. It is demonstrated on the surface water flood maps that that the valley form running east west across the south of the site raises up between the 2 watercourses, and as such there is a clear opportunity for re-profiling of this area to significantly increase flood storage and reduce flood risk on and off-site by creating wetland flood storage areas.

3.6.12 The flood risk and drainage constraints and opportunities plan in Appendix A, illustrates the currently mapped surface water flood risk areas, which will be appropriately assessed and mitigated to enable development.

3.7 Coastal and Tidal Flood Risk

3.7.1 The site is located inland and is not near any tidally influenced watercourses; therefore, there is no risk of flooding from this source.

3.8 Groundwater Flood Risk

3.8.1 Groundwater flooding occurs when the water table rises to the surface and is most likely to occur in low-lying areas underlain by permeable rocks. The underlying bedrock and superficial deposits are classed as a Secondary aquifer by the EA.

3.8.2 The Level 1 SFRA includes scale maps of Areas Susceptible to Groundwater Flooding. The data does not identify areas where groundwater is likely to cause flooding but can be used to identify areas which require further studies. The site is shown to be within the Minor/Low category of susceptibility to groundwater flooding. This is due to the impermeable nature of the underlying soils, as shown on the BGS maps.

3.8.3 Until further testing is carried out the risk of groundwater flooding on site will be considered low as, ground conditions are most likely impermeable due to the presence of clay variable ground conditions.

3.9 Sewer/Drainage Flood Risk

3.9.1 Sewer flooding is often caused by excess surface water entering the drainage system and when there is insufficient sewer capacity to cope with this excess water, but also due to 'one off' events such as blockages.

3.9.2 Asset location plans from Anglian Water, in Appendix B show an existing 225mm foul sewer running parallel with Chelmsford Road, inside the site boundary, to a pump station north of No 165, from here a rising main heads south across the land within the sider allocation designed as School Playing Fields.

3.9.3 The closest surface water sewer to the site is located beyond the sites south-eastern boundary. The sewer outfalls into a stream to the south-east of the site, which flows parallel with the site boundary before connecting into an Anglian Water detention basin located adjacent to the south-eastern boundary of the site.

3.9.4 Flood risk from the detention basin and outfall into the existing watercourse crossing the site is assessed in Section 3.6 above.

3.9.5 The Level 1 SFRA states that there is no indication that the site is at risk of sewer flooding.

3.9.6 Based on the above information, and that the site is considered to have low risk of sewer flooding.

3.10 Reservoir Flood Risk

3.10.1 The EA has produced a Reservoir Flood Map, that shows that the site is at no risk from reservoir flooding.

4 OUTLINE SURFACE WATER MANAGEMENT STRATEGY

4.1 General Principles for Proposed Site Run-Off

4.1.1 The National Standards for Sustainable Drainage Systems (Defra,2011) state that the following options must be considered for disposal of surface water run-off in order of preference:

- Discharge to Ground
- Discharge to Surface Water Body
- Discharge to Surface Water Sewer

4.1.2 Given the underlying soils are likely to be of little or no permeability, the prime method of discharge from the site will be via watercourses.

4.1.3 Run-off from the site will be discharged into the local watercourse at greenfield rate for all storm events up to and including the Q100 storm event plus a 40% climate change allowance in line with updated EA guidance values published in February 2016 for increased rainfall intensities by 2115. This will be achieved via the implementation of surface water attenuation, storage and flow control devices.

4.1.4 The topography of the site lends itself towards a gravity system flowing in a southerly direction towards the stream and ditch flowing east to west just to the north of the existing paying fields.

4.1.5 The proposed drainage strategy for the site will be in line with the 2015 SuDS Manual (C753). The SuDS Manual (C753) outlines the criteria that should be applied to manage the quality of run-off to support and protect the natural environment effectively. Treatment design, wherever practicable, should be based on good practice, comprising of the following principles:

- Manage surface water run-off close to source
- Treat surface water run-off on the surface
- Treat surface water run-off to remove a range of contaminants
- Minimise risk of sediment remobilisation
- Minimise impacts for accidental spills

4.1.6 Managing pollution close to the source can help keep pollutant levels and accumulation rates low, essentially allowing natural treatment processes to be effective. This in turn can help maximise the amenity and biodiversity value of downstream surface SuDS components and keep maintenance activities straightforward and cost-effective.

4.1.7 The anticipated SuDS hierarchy from the new development is suggested as follows:

- Local source control such as tanked permeable paving to private drives and parking courts. This provides local attenuation and runoff polishing.
- A combination of swales and pipe network to transport flows to attenuation ponds/basins, within development parcels and along the low-lying area adjacent to the existing east west flowing streams.
- Hydro brake or similar devices to restrict flows out falling to the stream and hence onwards to The River Wid.

4.1.8 The flood risk and drainage constraints and opportunities plan in Appendix A, illustrates potential locations and sizes of surface water detention basins, directions of flow and outfall locations.

5 OUTLINE FOUL WATER MANAGEMENT STRATEGY

5.1.1 Anglian Water are the sewerage undertakers in the area and their sewer records are included in Appendix B. The existing 225mm foul sewer runs parallel with Chelmsford Road inside the site boundary, to a pump station north of No 165, from here a rising main heads south across the land within the sider allocation designed as School Playing Fields.

5.1.2 Brentwood Borough Council Water Cycle Study (November 2018) states that the future housing growth in the area of Shenfield (the location of the site) is not predicated to cause significant detrimental impacts on water quality in the local watercourses that the Waste water Treatment Works (WwTWs) discharge to. The study also indicates that the WwTWs of Shenfield & Hutton where the proposed development will discharge, has enough capacity within its discharge permit to accommodate the areas future growth.

5.1.3 Anglian Water are obligated to provide capacity to serve the development once it has secured planning approval and will be consulted in due course by pre-application enquiry to assess whether there is existing capacity within their infrastructure to receive foul flows from the development.

5.1.4 As the proposals progress, liaison will continue with liaise with Anglian Water on the anticipated build-out timescales for the site, such that off-site network planning can be carried out.

6 CONCLUSIONS

6.1.1 The vast majority of the site is within Flood Zone 1 and therefore suitable for residential development.

6.1.2 The critical drainage issue highlighted in relation to surface water flooding will be assessed in detail and appropriately mitigated to facilitate development. It is expected these extents will reduce when assessed in detail and that there are significant opportunities to mitigate this risk with the creation of new wetlands and flood storage areas.

6.1.3 Development generated surface water flows can dealt with via variety of SuDS components, and a masterplan developed that maximises the use of green-blue infrastructure to capture, convey, store and treat flows, whilst enhancing local amenity areas and habitat.

Appendix A – Flood Risk and Drainage and Constraints Plan

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Chelmsford Road A1023

+ 63.7m

+ 57m

Main Field

East Field

South Field

School Playing Fields

Shenfield High School

Alexander Lane

stream

Basin Area - 0.102ha
Impermeable Area - 1.06ha
Discharge Rate - 2.0l/s

Basin Area - 0.108ha
Impermeable Area - 1.12ha
Discharge Rate - 2.1l/s

Basin Area - 0.122ha
Impermeable Area - 1.26ha
Discharge Rate - 2.3l/s

Basin Area - 0.286ha
Impermeable Area - 2.96ha
Discharge Rate - 5.5l/s

Basin Area - 0.037ha
Impermeable Area - 0.29ha
Discharge Rate - 1.3l/s

Existing Anglian Water Detention Basin

Potential areas for ground re-profiling to create surface water storage/wetland area. This will aid in reducing/mitigating the existing extents of surface water flooding.

Basin Area - 0.074ha
Impermeable Area - 0.76ha
Discharge Rate - 1.4l/s

Basin Area - 0.05ha
Impermeable Area - 0.54ha
Discharge Rate - 1.3l/s

Route towards Alexander Lane

Areas of existing low surface water flood risk (as per EA mapping) are to be re-profiled along the parcel boundary.

Basin Area - 0.06ha
Impermeable Area - 0.64ha
Discharge Rate - 1.3l/s

Notes:-

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The details on this drawing have been prepared on the assumption that a competent contractor will be carrying out the works. If the contractor(s) considers that there is insufficient Health and Safety information on this drawing, this should immediately be brought to the attention of the designer.

Drawing References:

1. The constraints and opportunities plan was prepared by Barton Willmore. Reference: 18845-001-B, date: 30.09.10
2. Draft concept masterplan information was prepared by Barton Willmore. Reference: 18845-RG-M-01-D, date: 23.05.18
3. Surface water and fluvial flood risk data has been provided by the Environment Agency.
4. OS Mapping for the site has been provided by Barton Willmore under Licence No. 100019279.

Notes

1. The area of low risk shown on the EA surface water flood risk maps is expected to be excessive, given the known conservatism of this mapping and limited data considered in its modeling. This will be assessed in detail and any low risk will be mitigated on-site and/or re-routed within green-blue corridors and storage area, to reduce off-site flood risk and support development on-site.
2. FEH 2013 data was used in sizing the attenuation basins.
3. All attenuation basins have been sized to be 1.5m deep.
4. All attenuation basins have been increased in size by 25% to allow for banking and ground re-profiling.
5. All attenuation basins have been sized to accommodate all storms up to and including the 1in100 year +40% Climate Change event.
6. An allowance for Urban Creep and Soft Landscaped run-off has been included in the Quick Storage Estimate calculations for sizing the attenuation basins.
7. The discharge rate of all basins will be restricted to greenfield Qbar rates.
8. All basins and green-blue infrastructure locations are indicative.

Legend

- Site Boundary
- Existing Woodlands, Copses and Tree Belts
- Existing Watercourses
- Flood Zone 2/3
- Contours (contours at 1.0m intervals)
- Public Rights of Way
- Right of Access, Anglian Water (3m wide)
- Ancient Woodland / County Wildlife Site
- Tree Preservation Order
- Low Surface Water Flood Risk (1in1000 year event)
- Medium Surface Water Flood Risk (1in100 year event)
- High Surface Water Flood Risk (1in30 year event)
- Preliminary Attenuation Basins
- Potential Green-Blue Infrastructure Corridor
- Safe Means of Escape Route
- Proposed Direction of Surface Water Flow
- Existing Anglian Water Foul Sewers and Manholes

Rev.	Date	Amendment	By	Chk.

Status: Preliminary

john newton & partners
jnpgroup
Consulting Engineers
www.jnpgroup.co.uk
Chesham • Brighouse • Hartlepool • Leamington Spa • Sheffield
Tel: 01494 771221 E-mail: chesham@jnpgroup.co.uk

Client	Barton Willmore
Job	Office Meadow, Shenfield
Title	Flood Risk and Drainage, Constraints & Opportunities Plan
Scale	1:1250 @ A1
Date	March 2019
Drawn by	JC
Checked by	
Approved by	

Accredited Contractor

Drawing No.	Rev.
C86054-JNP-00-M2-2001	-

QA Ref: QD019 Rev D

Appendix B – Anglian Water Sewer Asset Location Plan

Date: 08/03/19

Scale: 1:1250

Map Centre: 561779,196147

Data updated: 29/01/19

Our Ref: 301735 - 1

Wastewater Plan A0

Foul Sewer
Surface Sewer
Combined Sewer
Final Effluent
Rising Main*
Private Sewer*
Decommissioned Sewer*

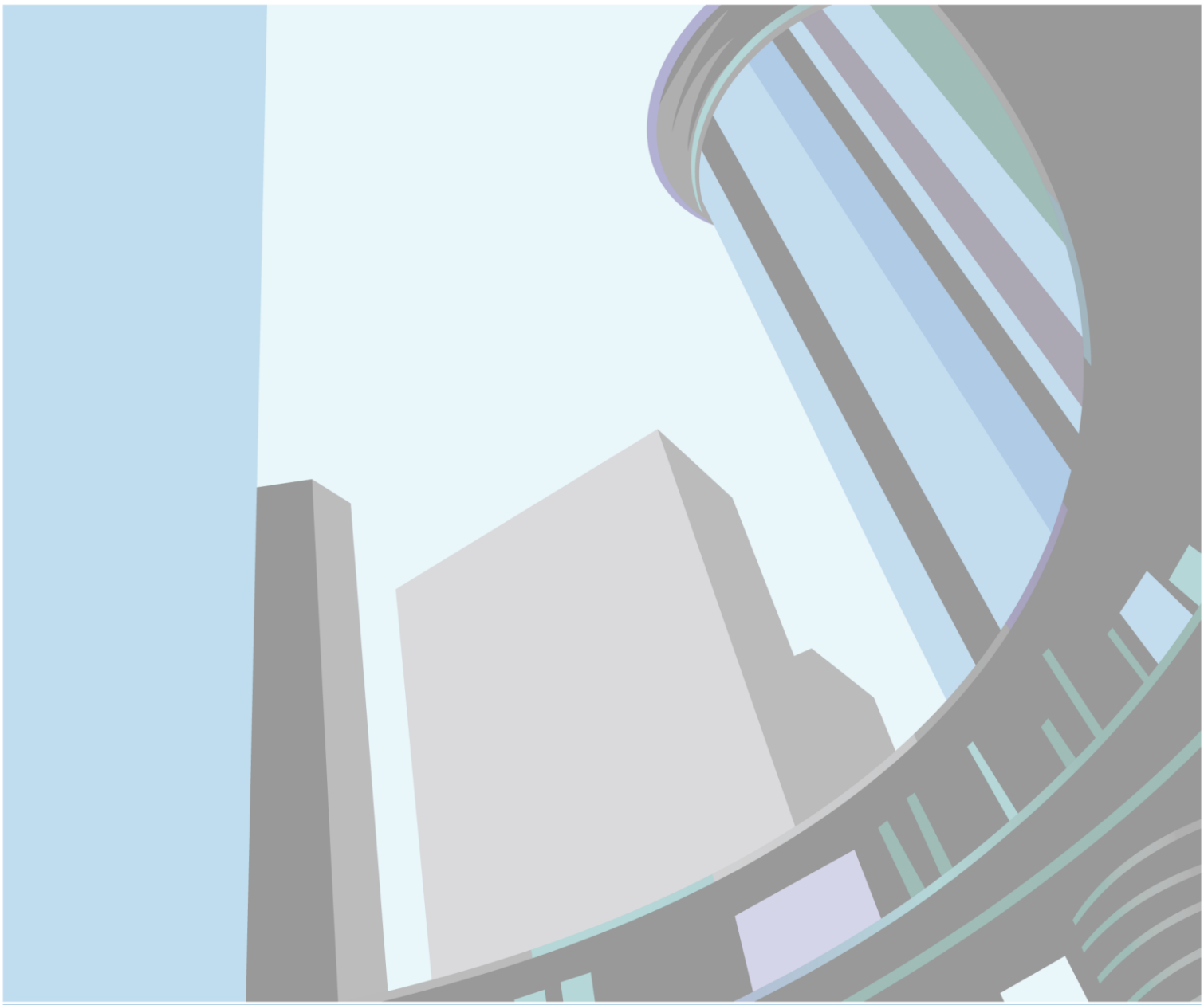
Outfall*
Inlet*
Manhole*

Sewage Treatment Works
Public Pumping Station
Decommissioned Pumping Station

*(Colour denotes effluent type)

jacob.cronin@jnpgroup.co.uk

Shenfield



john newton & partners
jnpgroup
Consulting Engineers

www.jnpgroup.co.uk

Brighouse
Woodvale House
Woodvale Road
Brighouse
West Yorkshire
HD6 4AB

telephone
01484 400691

email
brighouse@jnpgroup.co.uk

Chesham (HQ)
Link House
St Mary's Way
Chesham
Buckinghamshire
HP5 1HR

telephone
01494 771221

email
chesham@jnpgroup.co.uk

Hartlepool
The Innovation Centre
Venture Court
Queens Meadow Business Park
Hartlepool
TS25 5TG

telephone
01429 239539

email
hartlepool@jnpgroup.co.uk

Leamington Spa
Marlborough House
48 Holly Walk
Leamington Spa
Warwickshire
CV32 4XP

telephone
01926 889955

email
leamingtonspa@jnpgroup.co.uk

Sheffield
No.1 Meadowhall Riverside
Meadowhall Road
Sheffield
South Yorkshire
S9 1BW

telephone
0114 244 3500

email
sheffield@jnpgroup.co.uk