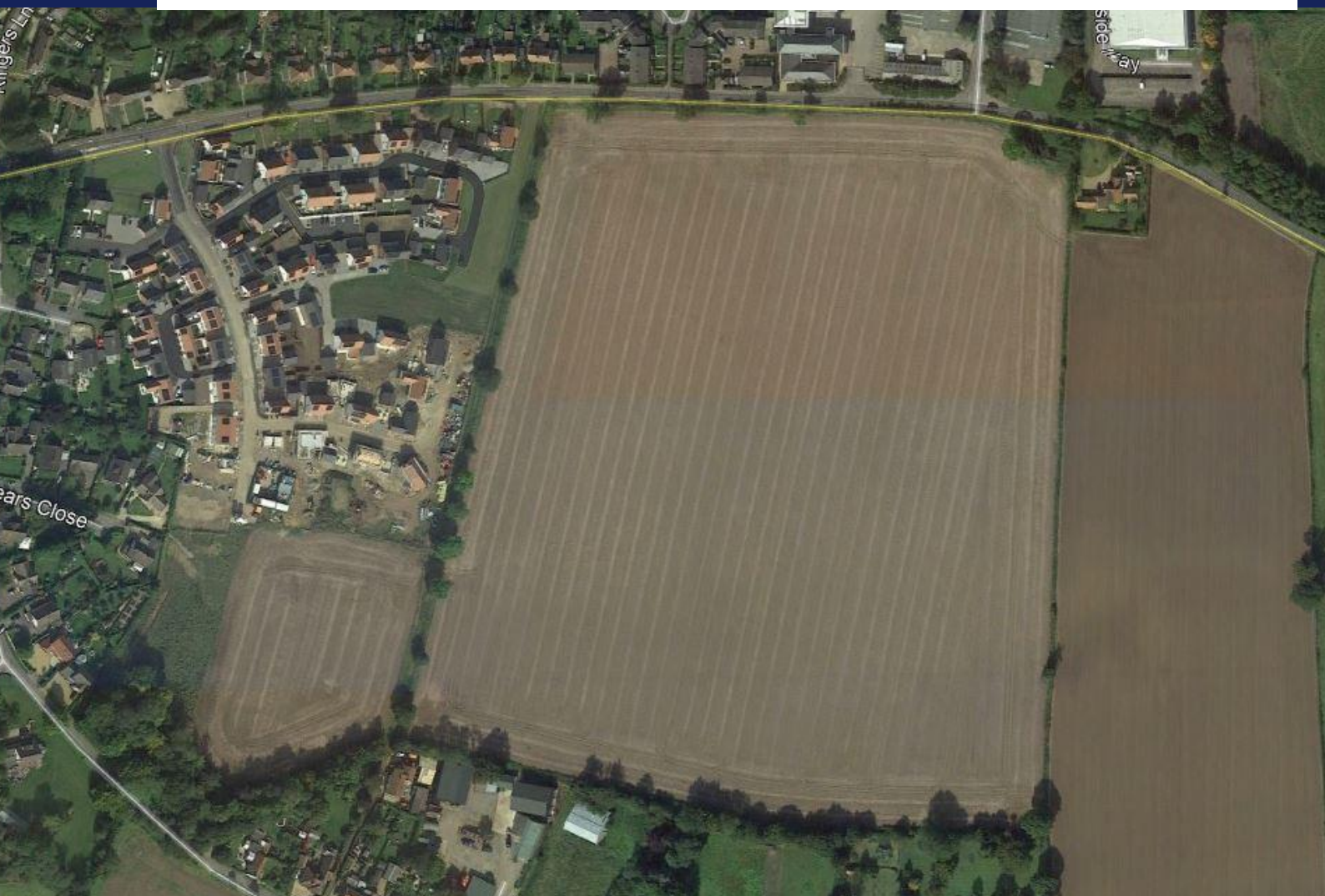
Land South of Norwich Road, Hingham
Abel Homes
Iain Hill
March 2021

BIDWELLS

GREATER NORWICH LOCAL PLAN REGULATION 19 (GNLP0520) REPRESENTATIONS ON BEHALF OF ABEL HOMES



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1.0 Introduction

1.1 On behalf of Abel Homes, we are instructed to submit representations to the draft Greater Norwich Local Plan Regulation 19 consultation. The representation relates to the Sites Plan and specifically Policy GNLP0520, which relates to Hingham

2.0 Reponses to Draft Greater Norwich Local Plan – Part 2 – The Sites

2.1 On behalf of Abel Homes, we strongly support the allocation of GNLP0520, land South of Norwich Road, Hingham. As demonstrated during the various Regulation 18 consultations, the site is entirely deliverable, and capable of making a significant contribution towards satisfying the Councils' housing needs during the period to 2038.

2.2 The continued suitability of the site is detailed below. In considering the suitability of the site regard has been given to the specific requirements of Policy GNLP0520, as well as additional technical work, and discussions with key stakeholders, including the Lead Local Flood Authority and NCC (Highways), that have taken place since the Regulation 18 (c) consultation

2.3 On this basis, the allocation of land to the south of Norwich Road is considered to be sound based on the test of soundness set out in paragraph 35 of the NPPF, subject to minor alterations to the wording of Policy GNLP0520.

Confirmation of Delivery

Suitable

2.4 As detailed at paragraph 5.34 of the Regulation 19 publication, Hingham is identified as a Key Service Centre, as it provides a location which has a good range of services and amenities to support day to day life, whilst also providing access to public transport and employment opportunities. These services include a primary school, Co-op Food store, White Hart Pub, library, a doctor's surgery, alongside a range of employment uses. In relation to employment, the draft Greater Norwich Local Plan recognises that Hingham is well located to benefit from the additional employment opportunities in the Cambridge Norwich Tech Corridor.

2.5 Furthermore, the suitability of Hingham, particularly the eastern part of the village, has been demonstrated through the development of The Hops. The Hops, which lies to the west of the site, comprises 88 dwellings (allocated under Policy HIN 1 of the Adopted Development Plan), and was constructed by Abel Homes. The Hops had a delivery rate of three and a half years (from submission of planning application to end of construction). As a result, the site constitutes a suitable location for development, being adjacent to The Hops, which provides a logical extension to the Settlement Boundary.

2.6 Given the evident suitability of Hingham, the allocation of the site in a sustainable location will help achieve the GNLP's aspirations of focusing growth in locations with access to jobs and services, whilst supporting a vibrant rural economy. Therefore, the site will make a valuable contribution to the 7% housing growth the draft GNLP directs to Key Service Centres (695 new allocations). On this basis, the proposed growth of Hingham by at least 100 new homes and the allocation of land south of Norwich Road, is 'sound' given that it has been positively prepared, justified, effective and consistent with national planning policy.

2.7 The following text provides further commentary on the suitability of the site having regard to technical matters, whilst responding to the points raised in wording of policy GNLP0520.

Density and Quantum of Development

2.8 The preferred allocation identifies the site as being suitable to accommodate approximately 80 homes. However, paragraph 5.36 of the Regulation 19 publication states that at least 100 new homes will be allocated in Hingham. Land to the north west of Hingham (Policy GNLP0503) is the only other site identified in Hingham and is allocated for up to 20 homes, implying that any additional new homes will be accommodated on GNLP0520.

2.9 This is supported by the wording of Policy GNLP0520, which states that more homes may be accommodated on the site, subject to an acceptable design and layout, alongside any infrastructure issues being addressed.

2.10 Based on 80 dwellings and the preferred allocation's site area of 6.92 ha, the density of the development equates to 11.6 dwellings per hectare (13.43 dwellings per net hectare). This figure is considerably lower than the indicative minimum density set out in Policy 2 of the draft GNLP, which seeks a minimum net density of 25 dwellings per hectare, subject to site specific constraints. Due allowance has been made to exclude development from the area identified as accommodating existing overland flow routes and hence any design will be able to take into account the site-specific constraints identified.

2.11 The Hops delivered a density of 23 dwellings per hectare, which is more akin to the aspirations of Policy 2 of the draft GNLP, and considerably higher than that envisaged by draft Policy GNLP0520.

2.12 Based on the foregoing, it is evident that the site can comfortably accommodate the minimum number of homes identified by the proposed allocation, and has the potential, if required, to accommodate in excess of the approximate figure of 80 homes identified in the policy. This is particularly relevant given that we note from comments made to the Regulation 19 consultation that the other site allocated for development in Hingham (Land to the north west of Hingham (Policy GNLP0503)) has been withdrawn by the landowners (Representation ID:23337). Accordingly, the potential for the site to provide in excess of 80 homes, will ensure that the GNLP's objective of providing for at least 100 new homes in Hingham can still be achieved.

2.13 On this basis, it is recommended that the wording of Policy GNLP0520 is revised to state that the site will accommodate at least 80 new homes; an approach that would be consistent with other site allocations in the draft Greater Norwich Local Plan. The proposed amendment would ensure that the policy is positively prepared, justified, and, therefore, sound.

Layout and Design

2.14 An Indicative Masterplan has been prepared by Feilden and Mawson and is submitted in support of this Representation (see Appendix 1). The Indicative Masterplan demonstrates how, in accordance with draft Policy GNLP0520, frontage development along Norwich Road can be successfully achieved through the provision of an internal road network which facilitates development overlooking public open space (without the requirement for individual access points to each dwelling from Norwich Road).

2.15 Draft Policy GNLP0520 requires the proposed design and layout of the site to show regard to the site's gateway role. The current approach into Hingham from the east is along the B1108 Norwich Road with the arrival currently defined by a single dwelling to the south and Hingham Industrial and Business Centre to the north off Ironside Way. The proposed development will enhance this 'gateway' and proposes dwellings set back behind a green space. The green space echoes the small village greens seen in the centre of Hingham and will contribute significantly to the arrival from the east.

2.16 The proposed informal open space along Norwich Road will help to retain the existing trees, which are subject to a Tree Preservation Order (TPO). The dwellings along Norwich Road will be positioned with the front of their dwellings facing north to overlook the open space and will provide good levels of natural surveillance and interest. This approach will help to create a sense of arrival and a gateway feature as requested by the draft policy.

2.17 Significant open space will also be provided to the eastern boundary providing a softer boundary to the development as it is approached from the east. The topography of the land together with house type selection will enable the views of the church to be maintained from the easterly approach.

2.18 The listed Lilac Farmhouse and Blenheim Cottage to the south will be considered in the design proposals to minimise impact on their setting. The listed buildings are approximately 100 metres from the site and currently significantly screened by existing landscaping. However, any future planning application will consider the scale and massing of the proposed dwellings whilst also incorporating landscaping along the southern edge of the development as appropriate. A Heritage Impact Assessment will help to inform the future design proposals at the planning application stage.

2.19 The Indicative Masterplan demonstrates how one point of access can be provided to the site, which preserves the existing TPO to the north of the site, whilst adhering to highway design advice provided by Richard Jackson Engineering Consultants. See Highways and Access Note, prepared by Richard Jackson Engineering Consultants, which is submitted in support of this Representation (see Appendix 2).

2.20 Furthermore, the Indicative Masterplan demonstrates how a high quality development can be achieved on the site, centred around a range of public open spaces. A central swathe of public open space passes through the site, from north to south, including areas of swales. An area of public open space is proposed along the northern boundary of the site, incorporating the existing trees, whilst creating an open and green entrance to the site and along Norwich Road. A large area of public open space is proposed along the western boundary of the site, connecting to the Hingham Public Right of Way (PROW) (Hingham FP9) and the existing open space in The Hops, in accordance with the requirements of draft Policy GNLP0520.

2.21 Accordingly, the Indicative Masterplan demonstrates how, the proposed development is capable of satisfying criteria 1, 2, 5 and 9 of draft Policy GNLP0520,

Access, Transport and Roads

2.22 The access (pedestrian and vehicular) shown on the Indicative Masterplan has been designed by Richard Jackson to serve approximately 100 dwellings (see Appendices 2 and 3). The access accords with the Norfolk Residential Design Guide and includes a Type 2 Road, which is 6m wide, and has an initial straight section of 15m. Initial designs of the access location on Norwich Road confirm that adequate visibility of up to 90m is available in both directions from a 2.4m setback. The visibility splays are in accordance with the Design Manual for Roads and Bridges. The proposed access and visibility splays are depicted on drawing 48851-PP-SK11B. The access design has been informed by a series of discussions with Norfolk County Council Highways. Additional road widening and realignment are proposed, as demonstrated on drawing 48851-PP-SK11B.

2.23 It is recognised that in accordance with the policy in the Regulation 19 consultation off-site highway works will be required to enhance pedestrian access to the town centre.

2.24 These works, which are detailed in the Note and plan prepared by Richard Jackson (Appendix 3), include the provision of a crossing point for pedestrians enabling safe access to the bus stop from the northern side of Norwich Road. Existing footways are proposed to be widened to allow for better pedestrian access to/from the site, whilst avoiding the tree root protection zones.

2.25 An additional pedestrian refuge island is proposed to the east of the access to the site in accordance with the requirements of Policy GNLP0520. This will allow for a suitable crossing point for pedestrians to access employment opportunities located to the north of Norwich Road. Norfolk County Council Highways have confirmed in their response to the various consultations of the GNLP that footpath issues can be addressed.

2.26 The Note prepared by Richard Jackson also confirms that the proposed development is capable of providing a satisfactory pedestrian route to both the Town Centre and to the primary school.

2.27 In terms of sustainability, the Note prepared by Richard Jackson and attached as Appendix 2 confirms that facilities and services are available in the local area, helping to support opportunities for walking and cycling. In addition, frequent bus services are available in close proximity to the site.

2.28 Richard Jackson have assessed vehicle trip generation arising from the development based on similar sites and from TRICS. The trip generation will be approximately 0.46 trips per dwelling in the peak hour, resulting in 46 additional trips. It is assumed that 75% of traffic would flow easterly, away from the centre of Hingham. During the peak hour, there would be 12 additional vehicles travelling into/through the centre of Hingham.

2.29 The Note prepared by Richard Jackson concludes that, in terms of vehicular access, accessibility to services, and other modes of transport, the site meets all the necessary criteria. It is also concluded that with off-site pedestrian improvements any impacts associated with traffic generation can be mitigated.

2.30 However, a minor amendment is proposed to draft Policy GNLP0520 in relation to the requirement for frontage footpaths along the site's entire frontage. The access drawings prepared in support of this representation demonstrate how footpath links can be provided to the north-east and north-west of the site, and to the west, without, crucially, impacting upon the TPO to the north of the site.

2.31 On this basis, whilst it is acknowledged that the location of the footpaths will be explored as the detailed design progresses, the policy should incorporate a degree of flexibility to make it clear that footpaths will not be required to be provided along the site's entire frontage, if it can be demonstrated that their provision is neither, necessary, practical or feasible. This change will ensure that the policy is Justified and, therefore sound.

2.32 On the basis of the foregoing, it is evident that the proposed development can, in principle, satisfy Criterion 3 and 4 of draft Policy GNLP0520.

Flood Risk and Surface Water Drainage

2.33 A Flood Risk and Drainage Strategy has been prepared by Richard Jackson in support of the Regulation 18 (C) consultation (see Appendix 4). An update to the Drainage Assessment, which

was informed by infiltration testing on the site, was undertaken in May 2020 (See Appendix 5) and has been followed by discussions with the Lead Local Flood Authority (LLFA).

2.34 The Assessment confirms that the site falls within Flood Zone 1, and, therefore, the site is not at risk of flooding and the indicative layout can be designed to accommodate surface water overland flow routes.

2.35 The Assessment concludes that based on the indicative ground conditions taken from the ground investigation report produced for the site, that infiltration is likely to be acceptable on part of the site. It goes onto advise that an infiltration strategy that incorporates above ground storage would be in accordance with national and local planning policy, by treating the water for quality and quantity on site, thereby not having a detrimental effect downstream of the site.

2.36 The remainder of the site, which is not suitable for infiltration, would incorporate permeable paving, which would drain into a main sewer system through an infiltration basin, with limited discharge. Based on limited discharge from the site, a preliminary assessment of the capacity of the sewer adjacent the pond has been undertaken and identified as being satisfactory. Accordingly, a surface water drainage strategy, including details of maintenance and management, has been prepared and submitted to the LLFA to inform pre-application discussions.

2.37 A copy of the pre-application response provided by the LLFA is attached as Appendix 6.

2.38 Based on the work undertaken by Richard Jackson, it is evident that the site is not susceptible to surface water flooding and that the proposed development is capable of delivering a surface water drainage strategy that is capable of accommodating surface water on site.

2.39 By adoption the proposed surface water drainage strategy, the flow of surface water from the site will be restricted to the “green field” run-off rate, ensuring that no additional pressure is put onto the off-site drainage network. Accordingly, there will be no heightened flood risk either on-site or off-site as a result of the proposed development.

2.40 Additional highway drainage to Norwich Road as a result of the proposed entranceway will also serve to improve the current drainage position along Norwich Road where surface water currently drains by way of soft verges only and no formal drainage is in place.

2.41 Accordingly, it is evident that the proposed development can satisfy Criterion 6 of draft Policy GNLP0520.

Other

2.42 The site is not known to be contaminated and we are confident that any impacts on the Sea Mere SSSI can be addressed at the planning application stage. These are both issues that were adequately addressed as part of The Hops development.

2.43 Accordingly, it is evident that the proposed development can satisfy Criterion 7 and 8 of draft Policy GNLP0520.

Statement of Common Ground

2.44 A draft Statement of Common Ground (SoCG) has been prepared by Abel Homes. The SoCG confirms that the site is, in principle, compliant with relevant planning considerations and deliverable. In respect of the latter, the SOCG confirms that the site is available, suitable and therefore deliverable.

2.45 A copy of the draft Statement of Common Ground is attached as Appendix 7.

2.46 The Housing Trajectory within the SOCG outlines that the site would be delivered by 2027. This assumes the submission of an application following the adoption of the GNLP (late 2022). Assuming 6-9 months for the determination of the planning application, alongside a further 6 months for construction to commence on site, housing could start to be delivered on site in 2024. It is estimated that, based on the completion rates of The Hops, that the scheme would deliver 35 units per annum, ensuring completion in 2027 and within the first five years of the Local Plan period.

Summary

2.47 Hingham is a highly sustainable location for growth, benefitting from a range of services and amenities, including a primary school, Co-op Food Store, White Hart Pub, library, a doctor's surgery, alongside a range of employment uses. The allocation of at least 100 new homes to Hingham is fully supported and considered sound.

2.48 As has been demonstrated, the proposed allocation is suitable, available, achievable and viable, and is deliverable within the first five years of the plan period. As previously recognised, there are no constraints which would affect the suitability of the site for residential development. The foregoing text demonstrates that this site is a suitable location for development and is capable of meeting the requirements of draft Policy GNLP0250. Accordingly, Abel Homes fully supports, in principle, the allocation of the site under Policy GNLP0250 for residential development. However, as detailed above, to ensure Policy GNLP0250 is sound minor alterations are suggested to the policy. These are detailed below.

Revised Policy Wording

Policy GNLP0520

Land south of Norwich Road, Hingham (approx. 6.92 ha) is allocated for residential development. This will accommodate ~~approximately~~ at least 80 homes.

More homes may be accommodated, subject to an acceptable design and layout being achieved, and any infrastructure issues addressed.

The development will be expected to address the following specific matters:

1. TPO oak trees on south side of Norwich Road to be retained.
2. Design and layout of the site to create an active frontage along Norwich Road and show regard to the site's gateway role.
3. Provision of an adequate visibility splay incorporating footways, to be provided along the whole site frontage, unless it can be demonstrated that the provision of footpaths along the entire frontage is neither required, practical or feasible.
4. Pedestrian refuge in the proximity of Ironside Way, to access local employment opportunities.
5. Connectivity of the site to Public Right of Way (PRoW Hingham F9.
6. Mitigation and further investigation with regards to the site's susceptibility to surface water flooding.
7. Avoid contamination of groundwater.
8. Mitigation of impacts on Sea Mere SSSI.

9. Any development must conserve and enhance the significance of Lilac Farmhouse and Blenheim Cottage to the south of the site, including any contribution made to that significance by setting. This includes but is not limited to landscaping along the southern edge of the site.

Key

Red Text – Proposed Amendments

Strike through – Proposed Text to be Removed

APPENDIX 1
INDICATIVE MASTERPLAN PREPARED BY FEILDEN + MAWSON

REV	DATE	CHK	AMENDMENTS
A01	2018.03.09	MW	Graphical update, annotations ammended.
A02	2020.02.18	EG	Scheme Updated.
A03	2020.02.18	EG	Proposed building parcels updated.

0°

Legend:

- Proposed Building Parcelles
- Swale
- Type 3 Road
- Type 6 Addopted Road
- Driveway
- Foot Path

DO NOT SCALE FROM THIS DRAWING ALL DIMENSIONS TO BE CONFIRMED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION

Feilden+Mawson

21-27 Lamb's Conduit Street London WC1N 3NL tel: 020 7841 1960
1 Ferry Road Norwich NR1 1SU tel: 01603 629571
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DRAWING
Sketch Master Plan

CLIENT
Abel Homes

JOB
Residential Development,
Norwich Road, Hingham

PLEMINARY

SCALE	1:1500 Aprox	PAPER	A3	DATE	2018.03.09
JOB	8716	DWG	SK01	REV	A03

APPENDIX 2
HIGHWAYS & ACCESS NOTE PREPARED BY RICHARD JACKSON

RichardJackson
Engineering Consultants

Our Ref: 48851/LG/MJD
Your Ref:

10 March 2020

Mr D Piper
Abel Homes Ltd
Neaton Business Park
Norwich Road
Watton
Norfolk
IP25 6JB

Dear Mr Piper

RE: Land South of Norwich Road, Hingham – Highways & Access

We refer to our instructions to consider the transport aspects for a potential residential development off Norwich Road, Hingham. The site compromises of greenfield land. The main multi-modal access will be off Norwich Road, with potential pedestrian links to the west into a previous Phase of development referenced "The Hops". Our assessment for an access and the transportation elements for land south of Norwich Road, Hingham has been made on the potential for proposal of approximately 100 dwellings.

This assessment considers current policy with regards to access for the development and accessibility, which are addressed in following matters and we present our views for proposed mitigation for the offsite infrastructure.

1. Access and offsite assessment of highways.
2. Location and accessibility to services.
3. Transportation links including pedestrian, cycle and public transport modes.
4. Development trip generation.
5. Traffic routes towards village.
6. Highway/transportation improvements.

The site is located off Norwich Road in Hingham with a grid reference of 603043, 302031 and an approximate postcode of NR9 4LS. The site is bound by Norwich Road (B1108) to the north and the dwellings of Seamere Road to the south, see **Figure 101** attached. To the west of the site is a Public Right of Way footway linking Norwich Road and Seamere Road with a residential housing estate adjacent and beyond that, the centre of Hingham to the west. Surrounding the site to the east, are agricultural fields and also to the south beyond the existing dwellings.

The civil parish of Hingham resides in rural Norfolk, within the South Norfolk District, with approximately 944 households and a population of 2,367 (taken from the 2011 Census data for the Hingham parish). The village is situated

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along Norwich Road (B1108) which stretches to Norwich in the east and Bodney via Watton to the west. Hingham is approximately 21.7km southwest of Norwich city centre, 10.8km southeast of Dereham and 8.8km west of Wymondham. The main proposed access to the site would be from Norwich Road.

Access and offsite assessment of highways

An access is proposed, which provides for adequate visibility according to the 30mph speed limit, avoiding the existing mature trees. Improved pedestrian and cyclist connections via The Hops into the village centre, are also proposed.

The access parameters for the site have been considered for a development of approximately 100 dwellings. The type of access required to serve the development is dictated by the Norfolk Residential Design Guide and is to be taken as a Type 2 road, which is 6.0m wide and would be taken from Norwich Road. The initial straight length of the road should be minimum of 15m in length.

An initial design of the potential access location on Norwich Road indicates that adequate visibility of up to 90m should be available in both directions from a 2.4m setback. This visibility splay lies in accordance with the Design Manual for Roads and Bridges (DMRB) CD123, where it is stated a 2.4m setback from a simple priority junction is acceptable. These visibility splays are shown on **Drawing 48851-PP-SK11C**.

The northern site boundary is Norwich Road with a width of 6.0m with approximately a 1.2m verge on the southern side and a 1.8m footway on the northern side. There are presently no footways on the southern side along the site boundary of Norwich Road to give the site access to the bus stops or local facilities without crossing the B1108. A new footway would therefore be required to support this development proposal, to connect the site to the bus stop located west of the proposed access. Further to this, it is assumed that a footway connection to the west at the bus stop, will provide a crossing location for pedestrians to the northern side of Norwich Road. The footways are designed to allow for better pedestrian access to the site, local facilities and bus stops, avoiding the tree root protection zone to ensure the trees will not be damaged in the implementation of the footway.

A pedestrian refuge island was implemented as part of The Hops, to allow safer, sufficient access to local facilities and bus stops. This is situated further west along Norwich Road. To access the crossing point from the new development, pedestrians would walk to the north west corner of the development site access and along the proposed west footway linking to a footpath at The Hops development and onto the pedestrian refuge crossing island in the centre of Norwich Road. This will allow pedestrians to safely cross the B1108 to access the local facilities and primary school. Additionally, pedestrian access could be made at the west site boundary, to link the site to the existing public right of way footpath FP9, on the west boundary of the site, and to provide footpath links through to The Hops development footways.

Additionally, road widening and a pedestrian refuge island have been proposed on Norwich Road near to Ironside Way to the east of the proposed access location. This network will allow for a suitable crossing point to access the commercial park, located at the northern side of Norwich Road, from the proposed site. This offsite improvement work is highlighted within **Drawing 48851-PP-SK11C**. A masterplan for the site has been indicated on **Drawing 8716-SK01-A03** produced by Feilden Mawson, showing the proposed access and, the indicated footway connection to the bus stop.

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Location and Accessibility to Services

To assess the ability for potential residents to access services, research has been undertaken to locate the local services and facilities, which are tabulated below.

Facility/Services Table

Facility	Location	Km	Miles
School - Primary	Hardingham Street	1.08	0.67
School - Secondary	Norwich Road, Attleborough	10.14	6.34
Post Office	Market Place	0.97	0.60
Local Shop	Co-op, Norwich Street	0.64	0.40
Doctors	Hardingham Street	0.95	0.58
Public House	Market Place	0.90	0.56
Place of Worship	Market Place	0.94	0.58
Bus Stops	Ironside Way	0.12	0.07
	Ringers Lane	0.32	0.20
Children's Centre	Norwich Road, Attleborough	10.30	6.40

The conclusions that can be drawn from the table are that most of the facilities and services are available in the local area. A key aim of the NPPF is to promote sustainable travel choices and accessibility to shops, jobs and other facilities whilst reducing the need to travel, especially by car.

Walking is identified as the most important form of transport at local level and the walking offers the greatest potential to replace the car for journeys of less than 2.0km. The guidance document (NPPF) also acknowledges that cycling has the potential to replace many car trips of less than 5.0km, which may also form part of longer journeys supported by public transport.

The table above provides an indication of the distances that need to be travelled to the facilities and as a consequence the following list indicates the acceptability of the site in terms of distance, frequency of use and acceptability of need to travel.

Acceptability of Travel/Use Table

Facility	Location	Km	Likely Frequency of Use					
			Daily Km		Weekly Km		Greater than Weekly Km	
			<5.0	>5.0	<5.0	>5.0	<5.0	>5.0
School - Primary	Hardingham Street	1.08	✓					
School - Secondary	Norwich Road	10.14		✓				
Post Office	Market Place	0.97			✓			
Local Shop	Co-op, Norwich Street	0.64			✓			
Doctors	Hardingham Street	0.95					✓	
Public House	Market Place	0.90					✓	
Place of Worship	Church Street	0.94			✓			
Bus Stops	Ironside Way	0.12	✓					
	Ringers Lane	0.32	✓					
Children's Centre	Norwich Road, Attleborough	10.30		✓				

The conclusions of the acceptability table for distance and frequency travelled indicates that most daily activities are within 2.0km of the development.

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Whilst other activities and frequency usage of facilities are likely to be weekly or greater than weekly, the table shows that most are within 5.0km of the site and also less than 2km, indicating that there is a likelihood that walking, and cycling could be used to travel to and from the majority of these locations.

Although the local nearest high school (Attleborough Academy) is outside of the walking and cycling boundaries at 10.14km from the site, Norfolk County Council run a free school bus linking Hingham to Attleborough Academy.

Transportation Links including Pedestrian, Cycle and Public Transport

As stated previously local, regional and national guidance for transportation and residential dwellings advises that proposed development should be readily accessed by all sustainable modes of transport.

Considering the different modes an assessment can be made in respect of the suitability of existing infrastructure.

Pedestrians

The routes for pedestrians are currently served well from the proposed site access to all the facilities recorded in the *'Facility/Services Table'.* All routes consist of road with footways on at least one side of the carriageway. Further, there is a pedestrian refuge in the road to aid pedestrians when crossing the B1108, Norwich Road, to the west of the access for The Hops, if needed.

The new development will offer a footway connection to the northwest corner of the site, at the Ringer's Lane bus stop. From here, pedestrians will have the option to cross Norwich Road, to the northern side of Norwich Road, or walk through the neighbouring residential site, to access the pedestrian refuge crossing point from The Hops site. This will allow sufficient access to the local facilities and bus stops within Hingham, not only encouraging more individuals from the new development to walk to access these facilities, but also making public transport more accessible to individuals.

An initial assessment of the routes to school, shows the route has been confirmed as safe. However, this is subject to further investigation with use of traffic flow data.

Cyclists

The bicycle has become a much more widely used mode of transport in recent years, as promoting the healthier lifestyle and the current economic circumstances that affects the population. From assessing the locations of the facilities locally, many of them are well within the 5.0km cycling parameters that are recognised in the NPPF.

The majority of the roads in Hingham are within a 30mph speed limit and, thus, provide an appropriate network for cycle use in Hingham, to access local facilities. Using the SUSTRANS website, it appears that there are no national or local cycle routes within the vicinity of Hingham, therefore, cycling outside of the village is likely to be for keen cyclists only.

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Public Transport

To establish a criteria for public transport provision, guidance was sought from Norfolk County Council on the necessary bus service frequency. A benchmark guide to bus services can be found in the Norfolk Bus Strategy 2003/4 to 2008/9. Whilst this document is a few years old it has not been updated but does give criteria for 'Target level of service in rural areas (all offering a return journey)'.

The table indicates that for a parish population of between 1500 and 3000 the target service level should provide the following:

- Shopping service, five days a week;
- journey to work service;
- a Saturday service and;
- evening service;

The closest stops to the proposed site are 0.12km and 0.32km from the proposed access from the site.

Operator	Service	Frequency
Konectbus	**3** Watton – Hingham – Norfolk & Norwich University Hospital - Norwich City Centre	Mon – Sat: 0657 – 1717 (departing approximately every hour. Note, Saturday service begins from 0730) Sun: 0945, 1145, 1345, 1545
	3 Norwich City Centre – Norfolk & Norwich University Hospital – Hingham - Watton	Mon - Sat: 0750 – 1838 (departing approximately every hour. Note, Saturday service begins from 0927) Sun: 1107, 1307, 1507, 1707
Konectbus	**6** Watton – Hingham – Wymondham - Norwich City Centre	Mon - Sat: 0637 - 1717 (departing approximately every hour. Note, Saturday service begins from 0726)
	6 Norwich City Centre – Wymondham – Hingham - Watton	Mon - Sat: 0902 - 2000 (departing approximately every hour)
Konectbus	**13** Shipdham – Watton – Easton College	Mon – Fri: 0745 (during term time)
	13 Easton College – Watton – Shipdham	Mon - Fri: 1743 (during term time)
West Norfolk Community Transport	**17** Bradenham – Yaxham - Dereham	Tues and Fri only: 0956
	17 Dereham – Yaxham - Bradenham	Tues and Fri only: 1328

(All main stop details included, data correct as Feb 2020)

The bus company Konectbus use bus stops on Norwich Road for services listed above, with stops including Ironside Way, Ringers Lane and Bears Lane. West Norfolk Community Transport use the Lincoln Avenue Bus Stop, Hingham.

Services are frequent and offer good commuting and social facilities to the residents requiring access to them. The accessibility of the buses may also encourage more individuals to use public transport, rather than their cars.

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Furthermore, there are sufficient footways to reach the bus stops along with a pedestrian refuge in the centre of Norwich Road to aid pedestrian crossing to reach the bus stop on the northern side of the B1108 (Norwich Road) of Ringers Lane.

Overall, accumulatively, the bus timetables meet the Norfolk County Council village requirements for Hingham in terms of public transport availability and frequency.

Development trip generation

The proposed development site vehicle trip generation can be calculated based on similar sites and data taken from a national data base (TRICS). An assessment of the trip generation from the proposed development site could also be taken from the local trips undertaken by the occupants of the dwellings already in the village. In general, the trip generation will be approximately 0.46 trips per dwelling in the peak hour. On this basis, the development is likely to generate approximately 46 additional trips in the peak hour. If it is assumed the key area of employment are Dereham, Wymondham and Norwich, this would amount to approximately 75% of this traffic, which would travel in an easterly direction. Therefore, it is assumed that 75% of the traffic would flow away from Hingham centre.

Based on the information above which is an approximation at this stage, there would be an of increase of 12 vehicles travelling into/through Hingham centre in the peak hour.

Traffic routes towards the village

The route from the site on Norwich Road to Norwich City Centre follows the B1108 through until it becomes Earlham Road and then onto the City Centre. The area of Norwich Road and other roads surrounding the site are 30mph carriageways with footways on at least one side of the road. There is also a 20mph zone in the centre of Hingham.

Along Norwich Road in the vicinity of the site, there have been three slight accidents within the last 5 years (2014-2018), the latest being in February 2018, none of which have involved a pedestrian or a cyclist. Additionally, a serious accident has been reported on Norwich Road, close to the site boundary. It should be noted that this accident did not involve a cyclist or a pedestrian and was recorded in August 2018. Furthermore, the accident data shows there has only been one additional accident to these recorded in the area within the last 10 years (2009-2018) and this was reported as slight. This suggests the site is not a high-risk accident site and the road will not require any additional traffic calming measures to prevent accidents. All information collected from publicly available data (viewable via www.crashmap.co.uk).

Access and Highway/Transportation Improvements Conclusion

With the addition of a pedestrian crossing point to the east of the site and footways to access The Hops development, it is concluded that in terms of vehicular access and accessibility to services, the site meets a satisfactory level to deliver a suitable access and pedestrian links.

Cont'd.../

Conclusions

To collate the issues and highlight the matters that are relevant to transportation for the proposed development at Norwich Road, Hingham, the following table shows the summary of benefits that this scheme includes:

Summary Table

Matters	Comment	Satisfactory	Needs some Upgrade	Not Satisfactory
Site Access	A satisfactory access with necessary visibility can be achieved.			
Local Junction Assessment	Based upon preliminary findings no offsite junction upgrades are required.			
Accessibility to Services	A high proportion of daily and weekly services can be accessed by pedestrian, cyclists or public transport routes at less than 2.0km.			
Pedestrian Links	Good site routes to schools and facilities (upon additional footway implementation within the site and offsite improvement works within Norwich Road to the east of the proposed access location)			
Cycle Facilities	There is no specific route in the village however there is a 20/30mph speed limit between the site and local facilities.			
Public Transport	The current public transport provision does meet the NCC targets.			

It is therefore concluded that in terms of vehicular access, accessibility to services, other modes of transport, the site meets all the necessary criteria. In summary, the development, which will generate a low level of trips in the peak hour towards/through Hingham centre, shows how, with offsite pedestrian improvements the generated traffic can be mitigated. I trust the foregoing is satisfactory, but if we can be of further assistance, please do not hesitate to contact us.

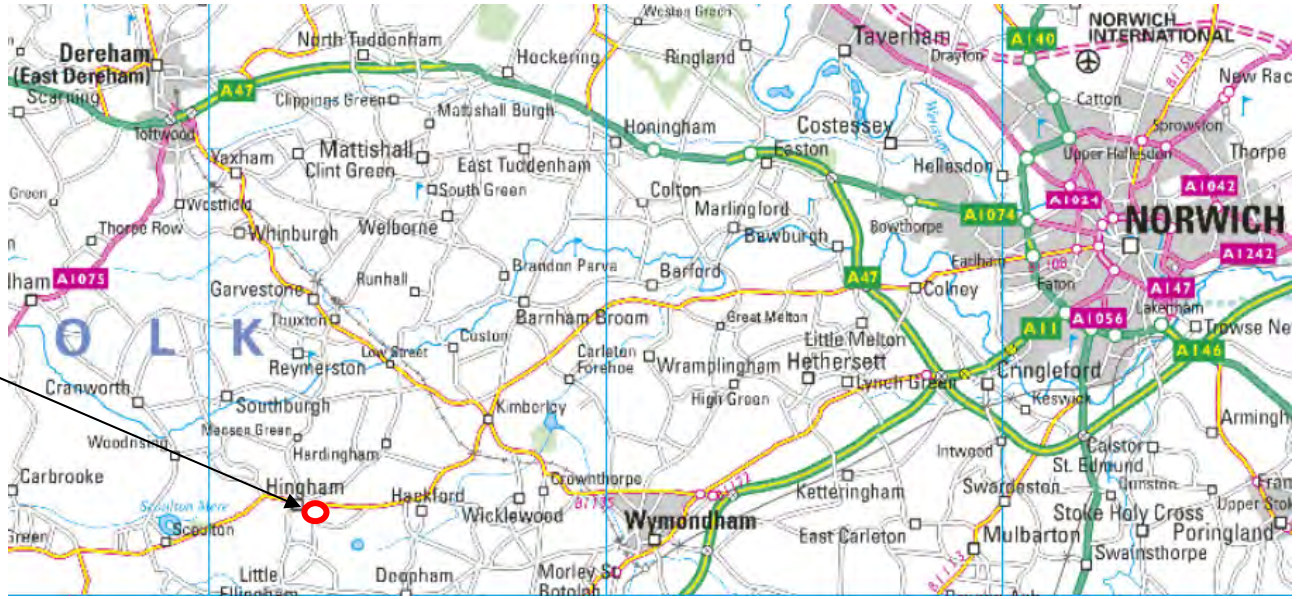
Yours sincerely,

Prepared by Lauren Gray
on behalf of Richard Jackson Ltd

Checked by Martin Doughty (Director) – BEng (Hons), CEng, FICE, FCIHT, MAPM
on behalf of Richard Jackson Limited

Encs – Figure 101
Drawing 8716-SK01-A03
Drawing 48851-PP-SK11C

INDICIATIVE SITE LOCATION



INDICATIVE SITE LOCATION

Site location grid reference 603043, 302031 and postcode NR9 4LS

Client:	Drawing Title:		
Abel Homes Ltd	**Site Location Plan**		
Job Title:	Date:	Job No:	Dwg No:
Land south of Norwich Road, Hingham	**06.03.20**	**48851**	**Fig. 101 (NTS)**

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REV	DATE	CHK	AMENDMENTS
A01	2018.03.09	MW	Graphical update, annotations ammended.
A02	2020.02.18	EG	Scheme Updated.
A03	2020.02.18	EG	Proposed building parcels updated.

0°

Legend:

- Proposed Building Parcelles
- Swale
- Type 3 Road
- Type 6 Addopted Road
- Driveway
- Foot Path

DO NOT SCALE FROM THIS DRAWING ALL DIMENSIONS TO BE CONFIRMED ON SITE BY THE CONTRACTOR PRIOR TO CONSTRUCTION

Feilden+Mawson

21-27 Lamb's Conduit Street London WC1N 3NL tel: 020 7841 1980
1 Ferry Road Norwich NR1 1SU tel: 01603 629571
50 St Andrews Street Cambridge CB2 3AH tel: 01223 350567
email: info@feildenandmawson.com www.feildenandmawson.com

DRAWING
Sketch Master Plan

CLIENT
Abel Homes

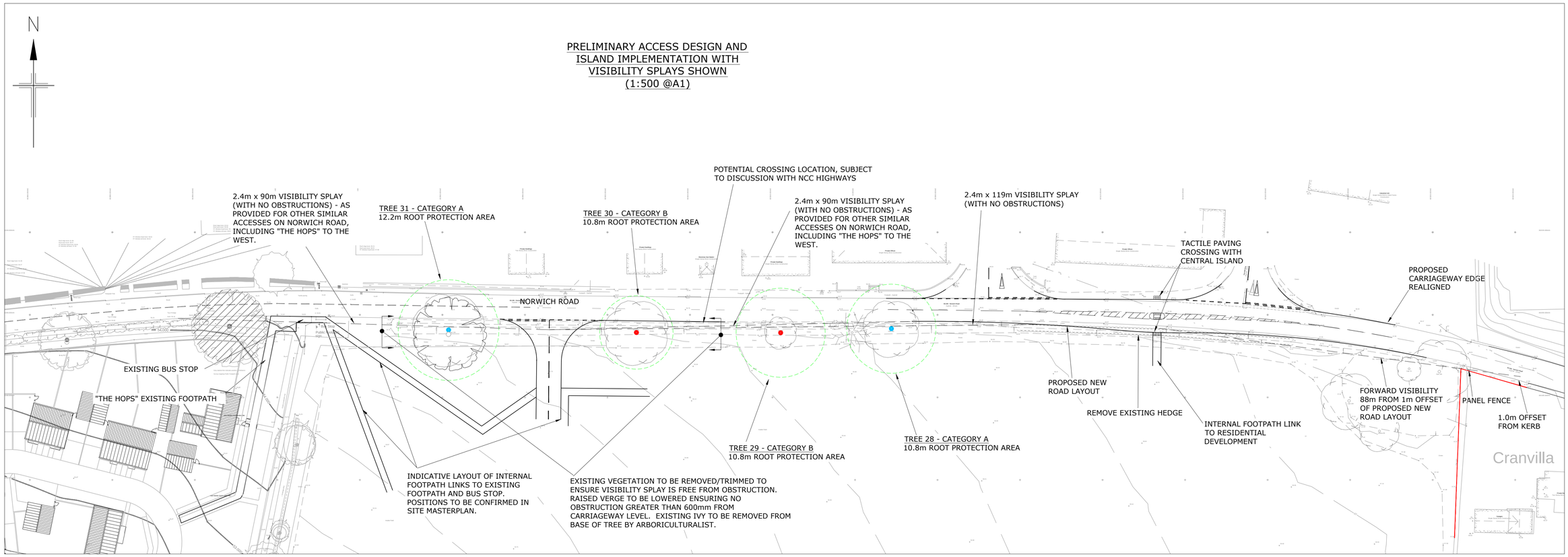
JOB
Residential Development,
Norwich Road, Hingham

PLEMINARY

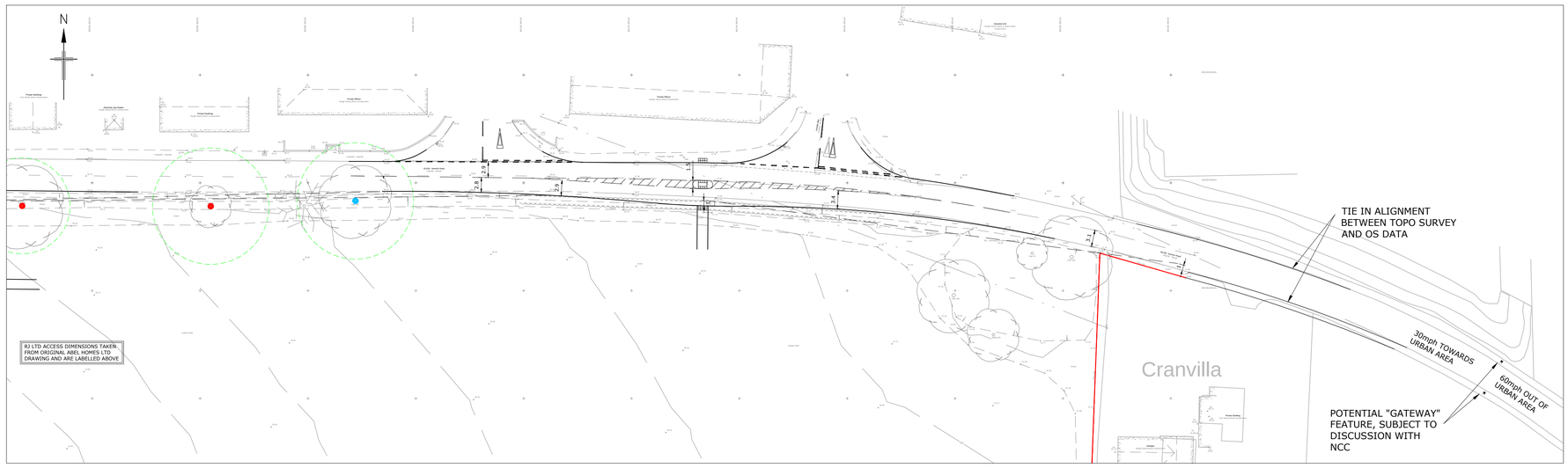
SCALE	1:1500 Aprox	PAPER	A3	DATE	2018.03.09
JOB	8716	DWG	SK01	REV	A03

DO NOT SCALE

PRELIMINARY ACCESS DESIGN AND ISLAND IMPLEMENTATION WITH VISIBILITY SPLAYS SHOWN (1:500 @A1)



PRELIMINARY ISLAND IMPLEMENTATION DIMENSIONS (1:500 @A1)



NOTES:

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
2. ALL LEVELS ARE IN METRES ABOVE ORDNANCE SURVEY DATUM.
3. TOPOGRAPHICAL SURVEY 18731ea01 - 06 DATED NOVEMBER 2016 HAS BEEN SUPPLIED TO RICHARD JACKSON LTD BY SURVEY SOLUTIONS AND RJ LTD ACCEPT NO RESPONSIBILITY FOR ERROR OR OMISSION.
4. ROOT PROTECTION AREAS HAVE BEEN TAKEN FROM A.T. COOMBES ASSOCIATES LTD PRELIMINARY ARBORICULTURAL IMPACT ASSESSMENT. TREE NUMBERS HAVE BEEN TAKEN FROM APPENDIX 3 OF THAT REPORT.
5. VISIBILITY SPLAYS DRAWN IN ACCORDANCE WITH DMRB CD123. FOR A SIMPLE PRIORITY JUNCTION, AS PROPOSED FOR THIS SITE ACCESS, VISIBILITY SPLAYS CAN BE INVESTIGATED USING A 2.4m SETBACK, AS DEMONSTRATED.

KEY:

- ROOT PROTECTION AREA (AS PER A.T. COOMBES REPORT)
- CATEGORY A TREE (AS PER A.T. COOMBES REPORT)
- CATEGORY B TREE (AS PER A.T. COOMBES REPORT)
- TREE NO LONGER EXISTS

REVISIONS

REV	DATE	DESCRIPTION	DRAWN	CHKD
C	02.03.20	PHASE 1 ADDED	MJD	MJD
B	25.02.20	VISIBILITY NOTE ADDED PROPOSED FOOTWAY LAYOUT AMENDED	LLG	MJD
A	5.11.18	VEGETATION NOTE ADDED	MJD	MJD

Project	LAND SOUTH OF HINGHAM ROAD, NORWICH	Title	ACCESS DESIGN WITH PEDESTRIAN ISLAND
Client	ABEL HOMES LTD		
Drawn	L. GRAY	Date	19/07/18
Job Manager	M. DOUGHTY	Checked	M. DOUGHTY
Approved	M. DOUGHTY	Scale	AS SHOWN @A1

This drawing is to be read in conjunction with all other Engineer's drawings and all other project information. Any discrepancy between the Engineer's drawings and other project information is to be reported to the Engineer immediately.

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5 Quern House, Mill Court, Great Shelford, Cambs CB22 5LD — Tel: 01223 314794
4 The Old Church, St. Matthews Road, Norwich, Norfolk NR1 1SP — Tel: 01603 230240
The Wheelhouse, Bonds Mill, Stonehouse, Gloucestershire GL10 3RF — Tel: 01172 020070
Email Address: mail@rj.uk.com — Website: http://www.rj.uk.com

Drawing No.	Revision
48851-PP-SK11	C

Drawing Status

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☐ TENDER ☐ CONSTRUCTION ☐ AS CONSTRUCTED

A1

APPENDIX 3
LOCAL FOOTWAY NETWORK ASSESSMENT PREPARED BY RICHARD JACKSON

RichardJackson
Engineering Consultants

Our Ref: 48851/LG/MJD
Your Ref:

06 March 2020

Mr D Piper
Abel Homes Ltd
Neaton Business Park
Norwich Road
Watton
Norfolk
IP25 6JB

Dear Mr Piper

RE: Land South of Norwich Road, Hingham – Local Footway Network Assessment to Hingham Town Centre

We refer to our instructions to consider the local footway network within Hingham, as an extension from our work at the potential residential development off Norwich Road, Hingham. Our assessment is to outline the suitability of the local footway network in terms of the accessibility of the local facilities for pedestrians from land south of Norwich Road, Hingham.

This assessment considers current policy with regards to pedestrian requirements. This has been developed further through a site visit on 19th February 2020, including use of internet and OS mapping to outline existing highway conditions and we present the offsite infrastructure. This letter should be read in conjunction with **Drawing 48851-PP-SK14C**.

Manual for Streets guidance indicates a 0.9m wide footway is acceptable for a wheelchair to use, with a 1.2m wide footway allowing an adult and a child to walk side by side, and 1.5m wide footway accommodating two adults walk side by side, with one person pushing a pushchair. Throughout our assessment, this guidance has been considered and has aided the development of our proposed improvement works to the local footway network.

Proposed zebra crossing and footway widening

The proposed zebra crossing has been designed to allow a pedestrian crossing point to access the southern side of Norwich Street, just west of Ringers Lane. This aids pedestrian access to the town centre, reducing individuals using the northern footway of Norwich Street, which reduces in width to 0.7m and 1.0m, near Stone Lane.

To accommodate the zebra crossing, the southern footway on Norwich Street has proposed widening from 1.5m to 2.0m. The design and location of the zebra crossing are subject to detail design on a topographical survey and agreement from the local highway authority (Norfolk County Council) approval.

Cont'd.../

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The zebra crossing has been designed in accordance with the following guidance document: Traffic Signs Manual Chapter 6. The width of the crossing is 2.4m, with dropped kerbs and tactile paving located at both the northern and southern sides of the crossing location.

Proposed footway widening to the south of Norwich Street

Additional footway widening is proposed on the southern side of Norwich Street, outside dwelling No.23. At this location, the footway is reduced to a width of 1.1m, and therefore it is proposed this section of footway, as indicated on the attached drawing, should be widened to 1.8m by reducing the width of the current verge located on the southern side of the footway.

Change of layout regarding the island at the Norwich Street / Stone Lane junction

The current layout at the Norwich Street / Stone Lane junction, restricts pedestrians to use a 0.9m width crossing link. It is proposed the existing grass island is removed and surfaced, the existing sign is proposed to be setback to 1.8m from the kerb line, and a white line is proposed to be used to mark around the repositioned objects at the junction. This will increase the area width of the pedestrian crossing location to 1.8m wide.

Removal of some cobbles and proposed dropped kerb, tactile paving crossing at the Norwich Street / Hall Lane junction

The existing cobbles at the western side of the Norwich Street / Hall Lane junction, are to be partly removed and surfaced, providing new dropped kerb locations at the crossing location, with tactile paving to improve pedestrian access to the town centre.

Route to School

An assessment of the route to school from the site has been carried out. The route is accessed from the proposed development site via a footway crossing location at the bus stop location on Norwich Road. The route then travels north along a footpath towards Hardingham Road. Once at Hardingham Road, cross to the northern side and travel west vis Hardingham Street to the primary school. This route is shown on **Drawing 48851-PP-SK14C**. It is considered to be appropriate as a route to school.

Conclusions

In summary, the points highlighted within this letter and annotated on **Drawing 48851-PP-SK14C**, should enhance the pedestrian access within Hingham, and should provide a more suitable route from the proposed site at Norwich Road, into the town centre.

I trust the foregoing is satisfactory, but if we can be of further assistance, please do not hesitate to contact us.

Yours sincerely,

Prepared by Lauren Gray
on behalf of Richard Jackson Ltd

Checked by Martin Doughty
(Director) BEng (Hons), CEng, FICE, FCIHT, MAPM
on behalf of Richard Jackson Limited

Encs – Drawing 48851-PP-SK14C

DO NOT SCALE

N

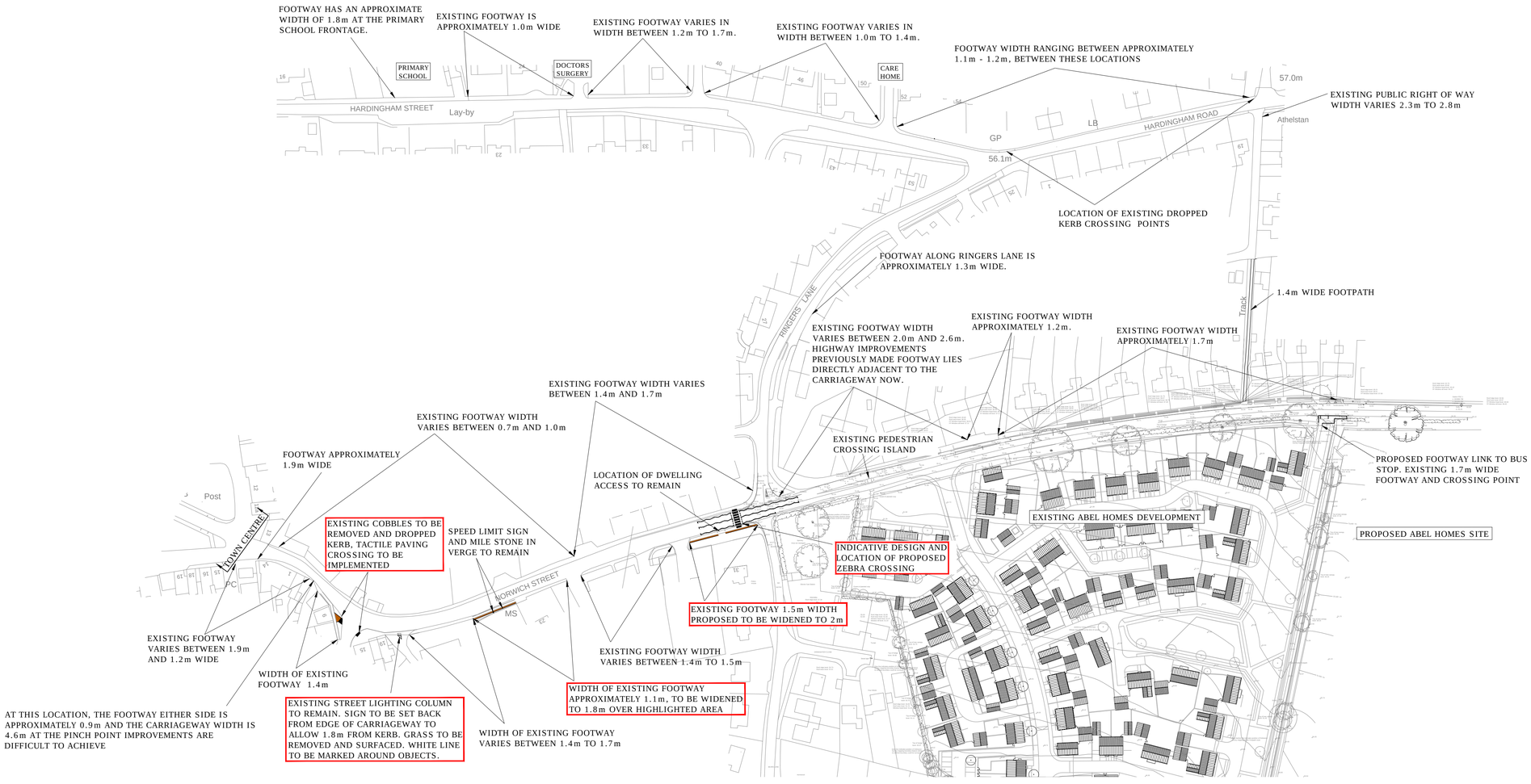
NOTES:

1. DRAWING BASED ON ORDINANCE SURVEY MAPPING WITH MEASUREMENTS SHOWN FROM SITE VISIT 19 FEBRUARY 2020.
2. DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
3. ALL PROPOSED IMPROVEMENTS SUBJECT TO DETAILED DESIGN WITH TOPOGRAPHICAL SURVEY AND AGREEMENT WITH THE HIGHWAY AUTHORITY (NORFOLK COUNTY COUNCIL).
4. ALL HIGHWAY BOUNDARIES TO BE CHECKED.

KEY:

AREAS OF FOOTWAY WIDENING

FOOTWAY IMPROVEMENT — RED SURROUND INDICATES AREAS OF FOOTWAY IMPROVEMENTS



REV	DATE	DESCRIPTION	DRAWN	CHKD
C	6.3.20	REMOVED IMPROVEMENTS LOCATED BEYOND TOWN CENTRE	LLG	MJD
B	2.3.20	PHASE ONE LAYOUT ADDED	MJD	MJD
A	28.2.20	ADDED EXISTING ABEL HOMES DEVELOPMENT ACCESS	LLG	MJD

REVISIONS

Project	LAND SOUTH OF NORWICH ROAD, HINGHAM	Drawn: L. GRAY	Date: 26/02/2020
Title	OFFSITE FOOTWAY ASSESSMENT AND PROPOSED IMPROVEMENTS	Job Manager: M. DOUGHTY	Checked: M. DOUGHTY
Client	ABEL HOMES LTD	Approved: M. DOUGHTY	Scale: 1:1250 @ A1

This drawing is to be read in conjunction with all other Engineer's drawings and all other project information. Any discrepancy between the Engineer's drawings and other project information is to be reported to the Engineer immediately.

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4 The Old Church, St. Matthews Road, Norwich, Norfolk NR1 1SP — Tel: 01603 230240
The Wheelhouse, Bonds Mill, Stonehouse, Gloucestershire GL10 3RF — Tel: 01172 020070
Email Address: mail@rj.uk.com — Website: http://www.rj.uk.com

Drawing No.	Revision
48851-PP-SK14	C

Drawing Status

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A1

APPENDIX 4
FLOOD RISK ASSESSMENT & SURFACE WATER DRAINAGE STRATEGY PREPARED BY RICHARD JACKSON

RichardJackson
Engineering Consultants

Our Ref: 48851/LLG/MJD
Your Ref:

06 March 2020

Mr D Piper
Abel Homes Ltd
Neaton Business Park
Norwich Road
Watton
Norfolk
IP25 6JB

Dear Mr Piper,

Re: Land South of Norwich Road, Hingham – Flood Risk Assessment

I refer to our instructions to assess the preliminary surface water drainage strategy for the above site as indicated on **Figure 101**. The referenced "Phase 1" development relates to the neighbouring Abel Homes development to the west of this site.

The site compromises of greenfield land and is approximately 6.8 Ha in size. The main access will be off Norwich Road, with a potential pedestrian link to the west into Phase 1 and other pedestrian footway connections. Our assessment for a surface water strategy on the land south of Norwich Road, Hingham, has been made on the basis of approximate number of 100 proposed dwellings.

The Flood Risk and Drainage Strategy has been carried out in accordance with the National Planning Policy Framework (NPPF) – Planning Practice Guidance on Flood Risk and Coastal Change, published by the Department for Communities and Local Government (DCLG). Reference is also made to the Norfolk County Council, Lead Local Flood Authority (LLFA) Guidance, dated March 2019.

The topography of the site falls to the low point in the south western corner, which is at approximately 49.50m AOD. The high point is in the north eastern corner which is at the 57.4m AOD.

Proposed Development

The site is proposed for residential development and the total site area is approximately 6.8 Ha. The site has an existing Public Right of Way (PROW) to the west that creates a small south western parcel of approximately 1.6 Ha, and this contains the surface and foul water disposal from the Phase 1 development that forms the western boundary of the site. The drainage is referred to on the **drawing 49455-PP-SK16A**.

Cont'd.../

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For the purposes of establishing the likely drainage parameters for the site, the site area of 6.8 Ha, with a density of impermeable area at 40% to 50%, will be used to provide a range of necessary water attenuation and/or storage. Additionally, an area of 15% of the overall site area will be assumed to be highways.

Existing Flood Sources

When assessing any development site, there are four potential sources of flooding which need to be considered both in terms of their effect on the development itself and its end users and that caused to others. The main sources of flooding that need to be considered are as follows:

- Fluvial and/or tidal flooding;
- Ground water;
- Overloading of the existing drainage network;
- Surface water flooding.

Fluvial and Tidal Sources of Flooding

From investigation of the existing watercourses and the Environment Agency (EA) floodplain maps, there are no identified influences of fluvial or tidal flooding at the site and the site is in Flood Risk Zone 1, see the Environment Agency 'Flood Map for Planning'. Therefore this has not been investigated further. An indication of the associated Government Flood Maps are shown on **Figure 2A**.

Groundwater Vulnerability

The ground investigation from the Phase 1 development produced by Plandescil Consulting Engineers was used for an indicative assessment for the proposed development. There were trial holes undertaken in October 2014 to a maximum depth of 3m, and groundwater was not observed in any of the trial holes.

Additionally, Plandescil Consulting Engineers produced the FRA for the Phase 1 development which included mapping from the British Geological Survey showing the Hydrogeology mapping. The mapping indicates that the groundwater will be between 40 and 50 metres above ordnance survey datum. Using the data from the trial holes located in Phase 1, it is believed that the groundwater will be approximately 5m below ground level at the lowest point in the site.

Groundwater Source Protection Zone around all major groundwater abstraction points are identified on magic.defra.gov.uk mapping. Source Protection Zones (SPZ) are defined to protect areas of groundwater that are used for potable supply, (including mineral and bottled water) or for use in the production of commercial food and drinks. The proposed site is within Groundwater Source Protection Zone 3 (total catchment). This zone is identified as the total area needed to support the abstraction or discharge from the protected groundwater source. For the EA groundwater source protection zones of the site, see **Figure 3A.**

In addition, the Groundwater Vulnerability Zone Maps see **Figure 3A** show that the site is predominantly in the medium risk for groundwater vulnerability. The north east corner of the site is shown to be a 'soluble rock risk', this will require further investigation with trial pits to identify the geology of the site.

Cont'd.../

If soluble rocks, such as chalk, are present within the site then further consideration will be required for distances of any infiltration methods and their proximity to permanent buildings. This does not preclude the use of soakaways, however, further precautions may need to be made during design and construction.

The surface water storage for Phase 1 is in the south western corner of that Phase. Due to the topography of the site, surface water storage will be located to the south west of this additional Phase. Infiltration testing to BRE digest 365 will need to be undertaken to obtain accurate information.

Existing Surface Water System and Ground Conditions

Abel Homes Ltd have provided us with the surface water drainage strategy for the Phase 1 development to the west and it shows that Highway surface water sewers, lead to cellular storage crates before discharging into an existing ditch in the south west corner of the development site. Further, the strategy indicates that private dwelling drainage at the Phase 1 development, is managed by infiltration through the use of permeable paving.

Using the Plandescil report previously mentioned, the infiltration rates based on the Phase 1 report, suggests permeability of soils ranging from 7.7×10^{-6} m/s to 9.47×10^{-6} m/s. A ground investigation of Phase 1 in 2014 provided data indicating no water strike at 3.0m below ground level, thus, soakaways or other infiltration devices could be utilised on the site and is likely that this strategy could be used for the proposed site also.

The existing surface water flooding for the 1 in 100 and 1 in 1000 year events have been investigated and are shown on **Figure 4A** and **Figure 5A** respectively. There is some minor flooding within in the site for the 1 in 100 year event and consideration to this area of the site is to be kept clear of development and for managed for potential exceedance events. The 1 in 1000 year event shows some amounts of surface water flooding, likely due to the topography of the site, the proposed surface water drainage strategy will incorporate attenuation of water and therefore should mitigate this risk within the new development.

Any new systems of drainage should consider the flow from the site and suitable SuDS to accommodate storage before discharging into the ground.

Flood Risk Impact

It has been determined using the Ordnance Survey and topographical survey level information available, that surface water runoff from the site will occur in a south westerly direction.

A proportion of rainfall falling across the existing site will also infiltrate into the soils of the site given the current ground conditions. A proportion of this infiltrating surface water will also contribute to any groundwater recharge. Ground permeability has been checked for the site as mentioned.

To determine the rainfall data for the site when undertaking the detail design, the Flood Estimation Handbook (FEH) data would be used for establishing the critical rainfall scenario, as indicated in LLFA guidance.

Cont'd.../

Soil Types and SuDS Suitability

The NPPF and appropriate guidance indicates that the FRA should identify the risks of flooding and manage those risks to ensure the site remains safe. One way to manage the flood risk is to incorporate Sustainable Drainage Systems (SuDS) within proposals for new sites. There is a general requirement that SuDS be installed where appropriate, in order to limit the amount of surface water runoff entering drainage systems and to return surface water into the ground to follow its natural drainage path. This advice is also replicated in the SuDS Manual C753 (2015).

The details of the ground conditions have yet to be determined through a full ground investigation but advice on the use of SuDS/soakaways is such that they could be used. The permeability of the site has been determined as being between 7.7 x 10^{-6} m/s to 9.47 x 10^{-6} m/s based on the soil type for the neighbouring site.

SuDS Assessment

The suitability of the use of SuDS on the site is based on the criteria as set out in the Ciria document C753 dated November 2015, where in Chapter 26 the appropriateness of SuDS can be established. The table below suggests the potential SuDS selection for Highways and Private Drives and also for Private Roof

Table A – SuDS Selection

Type of SuDS	Highways & Private Drives TSS=0.5 Metal=0.4 Hydrocarbons=0.4	Private Roofs TSS=0.2 Metals=0.2 Hydrocarbons=0.05
Filter Strip		✓
Filter Drain		✓
Swale	✓	✓
Permeable Paving	✓	✓
Detention Basin	✓	✓
Pond	✓	✓
Wetland	✓	✓
Soakaway (surrounded with infiltration materials)		✓
Infiltration Trench		✓

Using the **Table A** above which is derived from **Table 26.3** and **26.4** of Ciria C753 then it can be concluded that the better SuDS' choices for the site are as set out below;

Private Drives – Permeable paving to soakaway

Residential Roofs – To soakaway or permeable paving

Highways – To Swales or Infiltration Basin or Detention Basin

Cont'd.../

A surface water strategy is therefore proposed to utilise the permeable paving and soakaways for the drives and private roof areas and swales and/or infiltration basins for the highway water for events up to the 1 in 100 year storm event, plus climate change at 40%. This strategy is based on the SuDS management train and also the favourable soakage rates as previously indicated.

Flood Risk Management

Having determined that the soils across both sites do possess sufficient infiltration capacity for the use of infiltration devices, the methods of surface water disposal have been investigated, to determine the feasibility of discharging and treating the water prior to it entering the ground.

To determine the appropriate use of the SuDS features, the pollution indices were used to determine the type of SuDS to be used. For the purposes of the design for the site, which has yet to be detailed and is only at masterplan stage, a selection of likely solutions have been prepared for different house types, drive areas and widths of highway.

The private drives will provide permeable paving to act as a pollution treatment and then the water can be collected and drain towards the soakaway proposed for the private dwelling. The permeability rate of 7.77×10^{-6} m/s or 0.02797 m/hr as indicated as the lower permeability rate will be used for a robust assessment. Suggested sizes for the private dwelling drainage are indicated on **Table B** below:

Table B – Indicative SuDS Storage Sizes

Dwelling Type	Dwelling Area (m^2)	Garage Area (m^2)	Private Drive Area (m^2)	Total Area (m^2)	1 in 100 year plus 40% CC Storage (LxWxH)m
A	48	N/A	42	90	2.5 x 3.5 x 0.8 Vol = 6.8m^3
B	56	23	29	106	2.0 x 3.5 x 1.2 Vol = 8.6m^3
C	65	45	19	129	2.5 x 3.5 x 1.2 Vol = 10.3m^3
D	116	45	124	285	5.5 x 3.0 x 1.6 Vol = 25.2m^3

The dwelling, garage and drive areas have been based on the Phase 1 layout, and the dwelling types that are used.

The highway water will be directed towards the swales and/or infiltration basins which are to be positioned south of the site. The size will be determined by the exact dimensions of the roads and footways going to the swales/infiltration basin but an indication of the sizes are given in this Chapter. For purposes of being robust, a permeability rate of 7.77×10^{-6} m/s or 0.02797m/hr will be used.

For an estimated Highways SuDS sizing see **Table C** below which shows swales and **Table D** shows catchments of larger areas in infiltration basins:

Cont'd.../

Table C – Highway Swale/Infiltration Design for smaller areas

Overall Highway Width (m)	Length of Highway (m)	Swale Profile	1 in100 year storm plus 40% CC	
			Depth (m)	Volume (m^3)
4.8 + 1.0 = 5.8m	10m	Side Slope = 1 in 4 Base Width = 1.0m	0.254	3.7
4.8 + 1.5 + 1.5 = 7.8m	10m	Side Slope = 1 in 4 Base Width = 1.0m	0.304	5.2
6.0 + 1.8 + 1.8 = 9.6m	10m	Side Slope = 1 in 4 Base Width = 1.0m	0.349	6.6

For an estimated Highways SuDS sizing see **Table D** below:

Table D – Highway Infiltration Basin Design for Larger areas (if required)

Overall Highway Width (m)	Length of Highway (m)	Basin Profile	1 in100 year storm plus 40% CC	
			Depth (m)	Volume (m^3)
5.8m	250m	Side Slope = 1 in 4 Area = 276m2	0.612	106
7.8m	250m	Side Slope = 1 in 4 Area = 320m2	0.654	151
9.6m	250m	Side Slope = 1 in 4 Area = 430m2	0.544	179

Table E – Highway Infiltration Basins/Detention Basins

Overall Highway Area 15% of the 6.8 Ha	Potential Outflow (2L/s/Ha)	Area of Basin (m2)	1 in100 year storm plus 40% CC	
			Depth (m)	Volume (m^3)
1.02 Ha	2.0 l/s	874 m^2 to 1890m^2	Approx. 0.70m	851m^3

For the scenarios of drainage and areas required for the SuDs as outlined in Tables C & E, an indicative strategy is shown on Drawing **48851-PP-SK16A**.

The alternative options shown on Table D are not indicated on the drawing but could be implemented across the site if required as an alternative.

Cont'd.../

Summary

It can be seen from the indicative ground conditions taken from the ground investigation produced for the site to the west of the proposed that infiltration is likely to be suitable. Further intrusive investigations are required in order to determine infiltration rates for the proposed, and confirm the underlying geology within the site boundary. If chalk is present within the site then, an easement distance from soakaways to buildings will have to be agreed with the LLFA.

An infiltration strategy, with above ground storage, would be in accordance with National and Local planning policy, by treating the water for quality and quantity on site, thus not creating a detrimental effect downstream of the site.

The sizes of the soakaways for the houses might be a little large to fit into back gardens, so if this is the case, then alternative arrangements for the water in line with the areas and volumes indicated for the highways could be introduced for the water from the private dwellings. Sufficient land must be set aside for accommodating the swales / infiltration facilities, which could be accommodated on land immediately to the south, which is within the same ownership.

An indicative area of drainage needed for the highways is shown on drawing **48851-PP-SK16A** showing the infiltration basins and locations, subject to further masterplanning processes.

Matters	Comment	Satisfactory	Needs some Upgrade	Not Satisfactory
Flood Risk Zone	The site is in Flood Risk Zone 1. Suitable for residential development			
High Risk Surface Water Flooding	There are no existing surface water flooding issues of High Risk			
Medium Risk Surface Water Flooding	There are no existing surface water flooding issues of Medium Risk.			
Low Risk Surface Water Flooding	There are no existing surface water flooding issues of Low Risk which can not be accommodated within the development drainage strategy			
Proposed Surface Water Drainage	The proposals are likely to conform to the SuDS Manual and LLFA guidance for use of infiltration devices which are dependant upon a detailed site investigation to determine the permeability rate for the site			

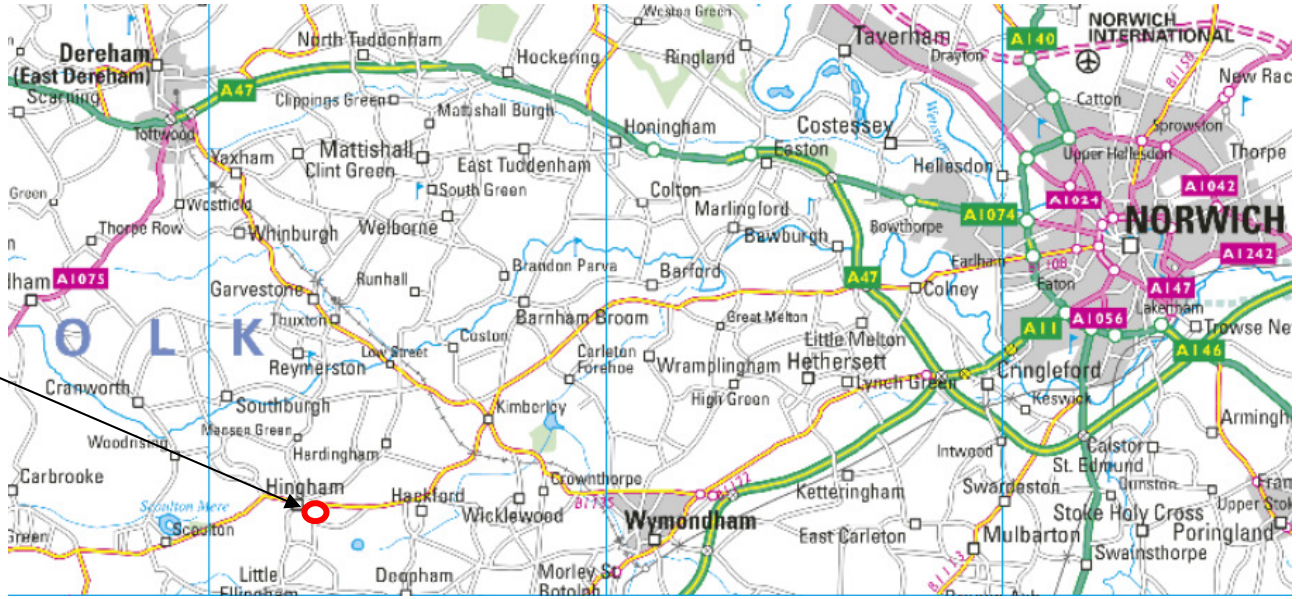
I trust the foregoing is satisfactory but if we can be of any further assistance, please do not hesitate to contact us.

Yours sincerely

Martin Doughty BEng (Hons), CEng, FCIHT, FICE, MAPM
Director on behalf of Richard Jackson Limited

Enc Figures 101, 2A, 3A, 4A & 5A
48851/PP/SK16A – Preliminary Surface Water Drainage Strategy

INDICIATIVE SITE LOCATION



INDICATIVE SITE LOCATION

Site location grid reference 603043, 302031
and postcode NR9 4LS

Client:	Drawing Title:		
Abel Homes Ltd	**Site Location Plan**		
Job Title:	Date:	Job No:	Dwg No:
Land south of Norwich Road, Hingham	**06.03.20**	**48851**	**Fig. 101 (NTS)**

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Flood map for planning

Your reference	Location (easting/northing)	Created
48851	**603050/302081**	**28 Feb 2020 12:07**

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

This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

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

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

Environment Agency

Flood map for planning

Your reference
48851

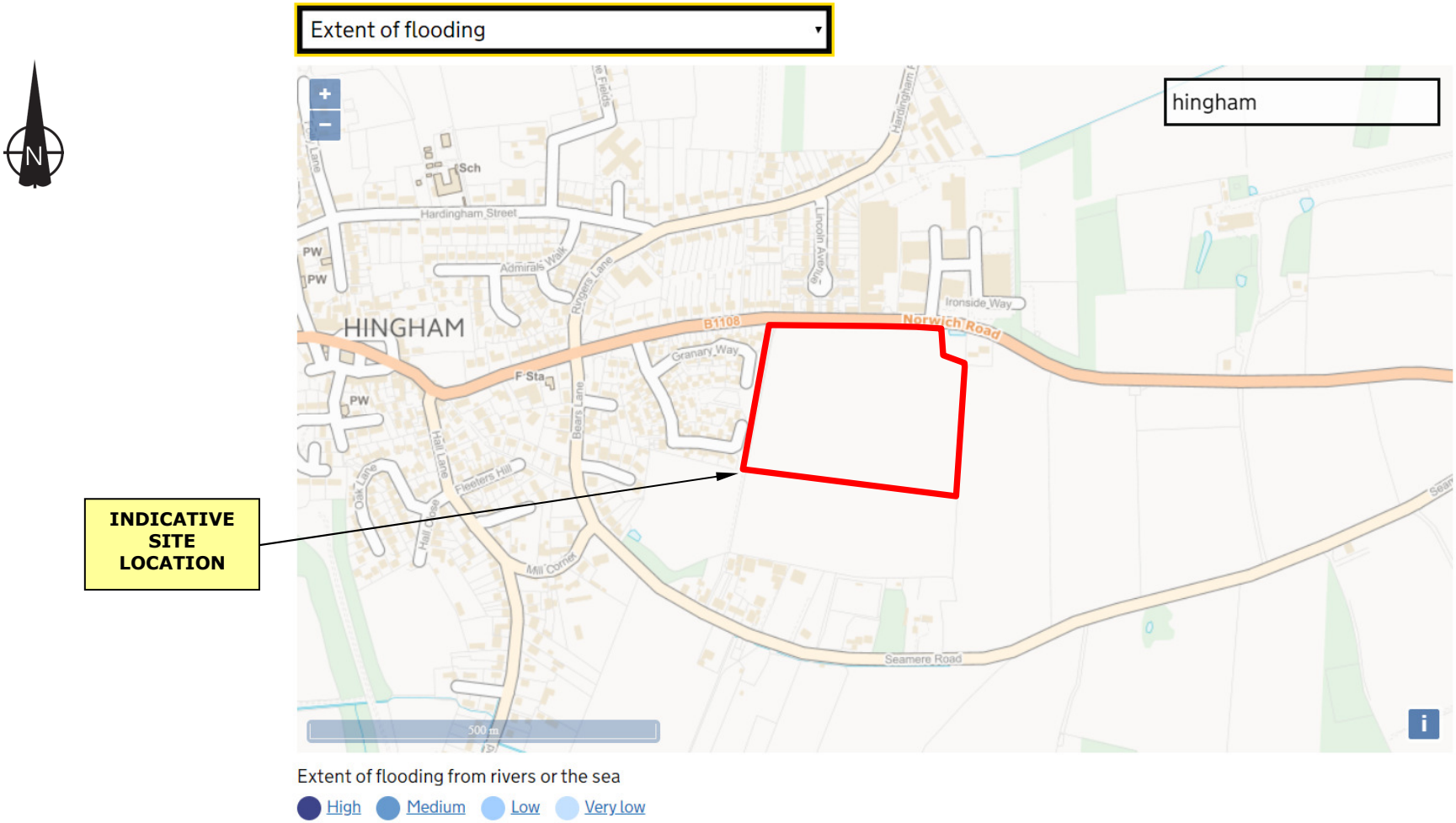
Location (easting/northing)
603050/302081

Scale
1:10000

Created
28 Feb 2020 12:07

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 100 200 300m



Site location grid reference 603043, 302031 and postcode NR9 4LS

Client:	Drawing Title:		
Abel Homes Ltd	**Flood Plan (Rivers and Sea)**		
Job Title:	Date:	Job No:	Dwg No:
Land South of Norwich Road, Hingham	**06.03.20**	**48851**	**Fig. 2A (NTS)**

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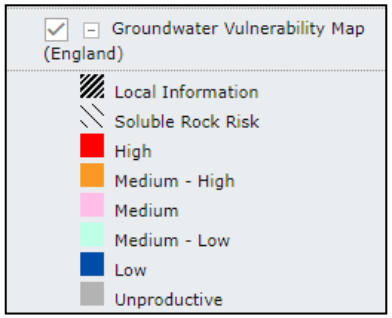
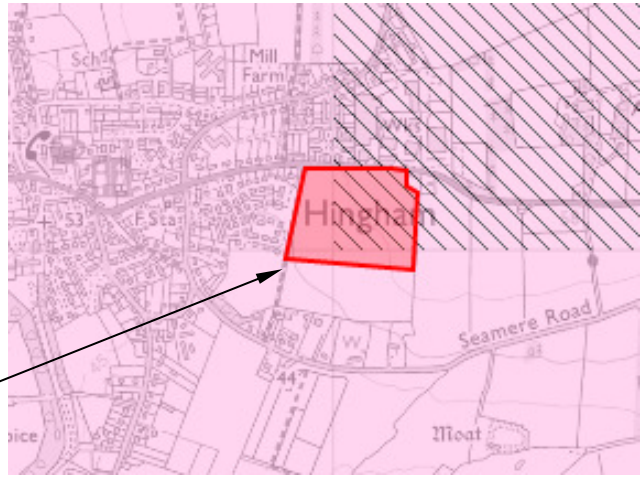
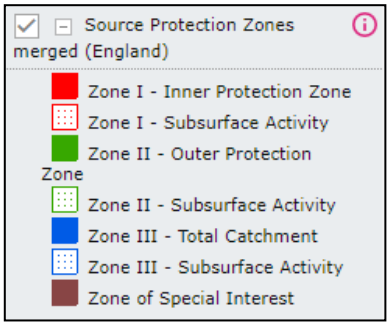
FLOOD PLAN (GROUNDWATER)

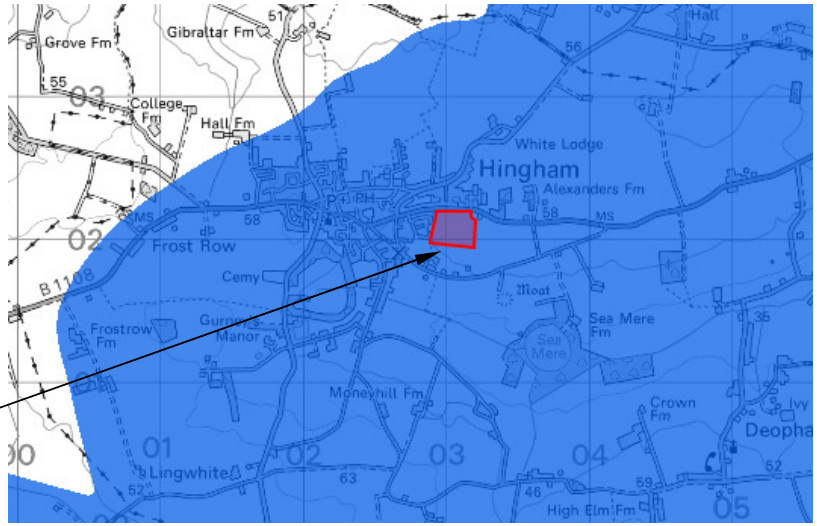




INDICATIVE SITE LOCATION

SOURCE PROTECTION ZONES (GROUNDWATER)





INDICATIVE SITE LOCATION

Site location grid reference 603043, 302031 and postcode NR9 4LS

Client:	Drawing Title:		
Abel Homes Ltd	**Flood Plan (Groundwater) & Source Protection Zones (Groundwater)**		
Job Title:	Date:	Job No:	Dwg No:
Land South of Norwich Road, Hingham	**06.03.20**	**48851**	**Fig. 3A (NTS)**

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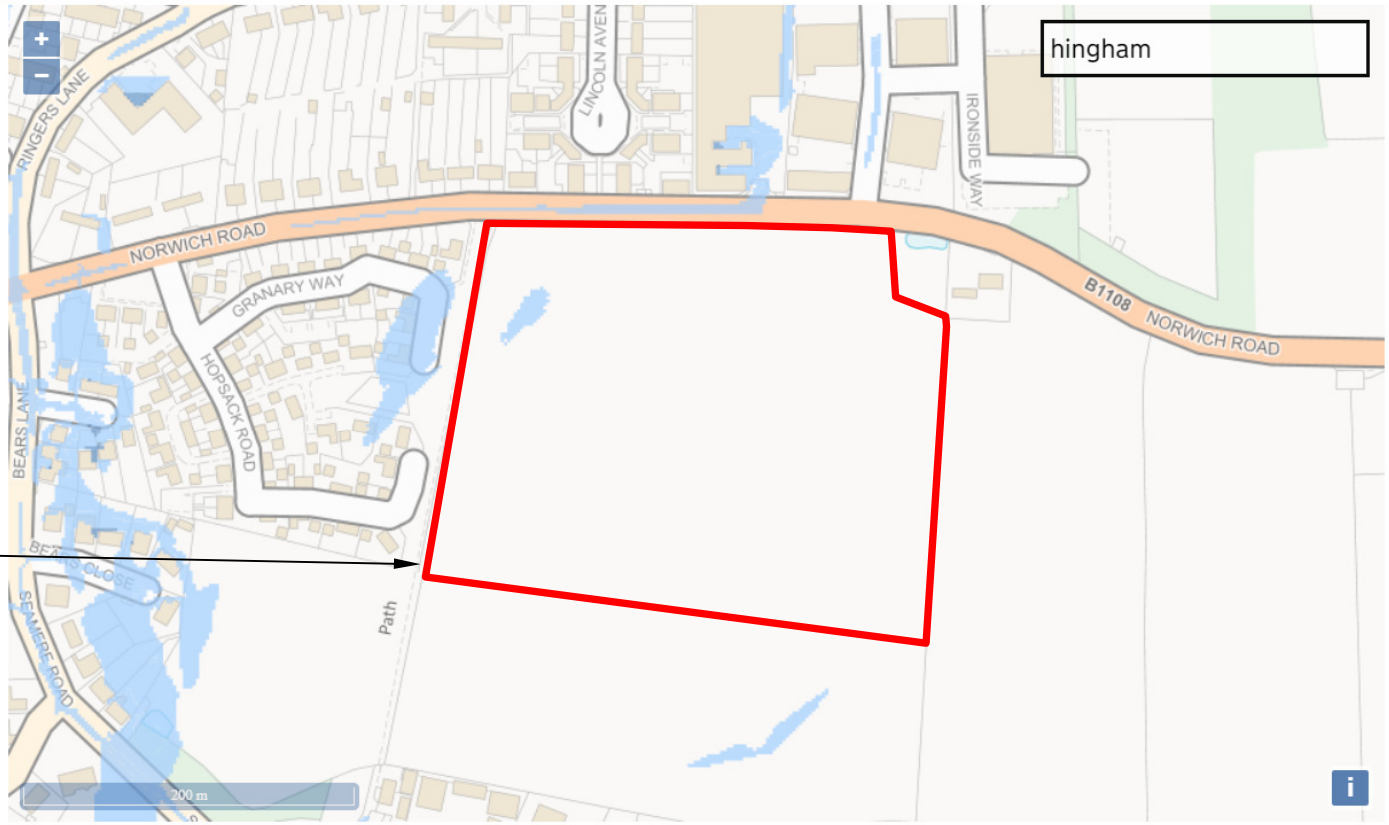
Medium risk: depth



INDICATIVE SITE LOCATION

Surface water flood risk: water depth in a medium risk scenario

Flood depth (millimetres)

Over 900mm | 300 to 900mm | Below 300mm

Site location grid reference 603043, 302031 and postcode NR9 4LS

Client:	Drawing Title:		
Abel Homes Ltd	**Surface Water Flood Mapping (Medium Risk)**		
Job Title:	Date:	Job No:	Dwg No:
Land South of Norwich Road, Hingham	**06.03.20**	**48851**	**Fig. 4A (NTS)**

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Low risk: depth

INDICATIVE SITE LOCATION

Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

Over 900mm | 300 to 900mm | Below 300mm

Site location grid reference 603043, 302031 and postcode NR9 4LS

Client:	Drawing Title:		
Abel Homes Ltd	**Surface Water Flood Mapping (Low Risk)**		
Job Title:	Date:	Job No:	Dwg No:
Land South of Norwich Road, Hingham	**06.03.20**	**48851**	**Fig. 5A (NTS)**

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DO NOT SCALE

N

NORWICH ROAD

PHASE 1 SHOWN INDICATIVELY

3m EASEMENT EITHER SIDE OF THE CENTRELINE OF FOUL SEWERS

LAND DRAIN

EXISTING PUBLIC RIGHT OF WAY LINKING NORWICH ROAD AND SEAMERE ROAD

INDICATIVE SITE BOUNDARY

EXISTING INLET
IL: 43.770

43m x 3.5m x 0.8m ATTENUATION CRATES

OUTFALL
IL: 43.770

SEAMERE ROAD

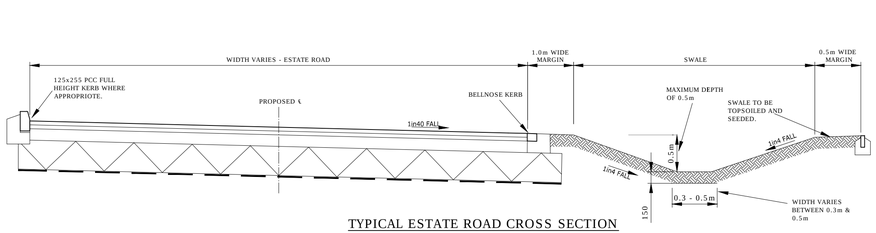
INDICATIVE LOCATION FOR HIGHWAY BASIN FOR PROPOSED DEVELOPMENT TO ACCOMMODATE 15% OF IMPERMEABLE AREA FROM TOTAL SITE (6.8Ha)

KEY:

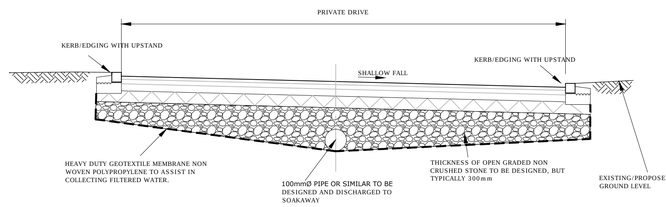
- FOUL WATER
- SURFACE WATER
- SITE BOUNDARY
- EASEMENTS
- ATTENUATION CELL
- PUBLIC RIGHT OF WAY
- LOW RISK FLOOD OUTLINE
- MEDIUM RISK FLOOD OUTLINE
- INDICATIVE SPINE ROAD
- EXCEEDENCE/TOPOGRAPHY FLOW DIRECTION

NOTES:

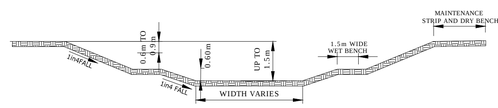
1. ALL LEVELS ARE IN METRES ABOVE ORDNANCE SURVEY DATUM.
2. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
3. TOPOGRAPHICAL SURVEY DRAWING NUMBER 18731ea-01 - 06 DATED NOVEMBER 2016 SUPPLIED TO RICHARD JACKSON LTD BY SURVEY SOLUTIONS AND RJ LTD ACCEPT NO RESPONSIBILITY FOR ERROR OR OMISSION.
4. NOT ALL MANHOLE COVERS HAVE BEEN IDENTIFIED AND THEREFORE SEWER RUNS REMAIN INDICATIVE.
5. NOT ALL UTILITIES ARE SHOWN FOR CLARITY.
6. LOW AND MEDIUM FLOOD OUTLINES TAKEN FROM GOVERNMENT FLOOD RISK WEBSITE.



TYPICAL ESTATE ROAD CROSS SECTION
SCALE NTS



TYPICAL CROSS SECTION OF THE PRIVATE DRIVE AND PERMEABLE PAVING
SCALE NTS



TYPICAL INFILTRATION BASIN CROSS SECTION (VARIES ACROSS THE SITE)
SCALE N.T.S

REV	DATE	DESCRIPTION	DRAWN	CHKD
A	06.03.20	UPDATED SITE LAYOUT PLAN	LLG	MJD

REVISIONS

Project: LAND SOUTH OF NORWICH ROAD, HINGHAM	Title: PRELIMINARY SURFACE WATER DRAINAGE STRATEGY	Client: ABEL HOMES LTD	Drawn: L. GRAY; Date: 28/02/20; Job Manager: M. DOUGHTY; Checked: M. DOUGHTY; Approved: M. DOUGHTY; Scale: 1:1000@A1

This drawing is to be read in conjunction with all other Engineer's drawings and all other project information. Any discrepancy between the Engineer's drawings and other project information is to be reported to the Engineer immediately.

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3rd Floor, Rennie House, 57-60 Aldgate High Street, London EC3N 1AL — Tel: 020 7448 9910
5 Queen House, Mill Court, Great Shelford, Cambs CB22 5LD — Tel: 01223 314794
4 The Old Church, St. Matthews Road, Norwich, Norfolk NR1 1SP — Tel: 01603 230240
The Wheelhouse, Bonds Mill, Stonehouse, Gloucestershire GL10 3RF — Tel: 01172 020070
Email Address: mail@rj.uk.com — Website: http://www.rj.uk.com

Drawing No.: 48851-PP-SK16
Revision: A

Drawing Status:
- [X] INFORMATION
- [ ] APPROVAL
- [ ] COSTING
- [ ] TENDER
- [ ] CONSTRUCTION
- [ ] AS CONSTRUCTED

A1

APPENDIX 5
UPDATED DRAINAGE STRATEGY PREPARED BY RICHARD JACKSON

RichardJackson
Engineering Consultants

Our Ref: 48851/MJD
Your Ref:

18 May 2020

Mr D Piper
Abel Homes Ltd
Neaton Business Park
Norwich Road
Watton
Norfolk
IP25 6JB

Dear Mr Piper,

Re: Land South of Norwich Road, Hingham – Flood Risk Assessment

I refer to our instructions to assess the preliminary surface water drainage strategy for the above site as indicated on **Figure 101**. The referenced "Phase 1" development relates to the neighbouring Abel Homes development to the west of this site.

The site compromises of greenfield land and is approximately 6.8 Ha in size. The main access will be off Norwich Road, with a potential pedestrian link to the west into Phase 1 and other pedestrian footway connections. Our assessment for a surface water strategy on the land south of Norwich Road, Hingham, has been made on the basis of approximate number of 100 proposed dwellings.

The Flood Risk and Drainage Strategy has been carried out in accordance with the National Planning Policy Framework (NPPF) – Planning Practice Guidance on Flood Risk and Coastal Change, published by the Department for Communities and Local Government (DCLG). Reference is also made to the Norfolk County Council (NCC), Lead Local Flood Authority (LLFA) Guidance, dated March 2019.

The topography of the site falls to the low point in the south western corner, which is at approximately 49.50m AOD. The high point is in the north eastern corner which is at the 57.4m AOD.

Proposed Development

The site is proposed for residential development and the total site area is approximately 6.8 Ha. The site has an existing Public Right of Way (PROW) to the west that creates a small south western parcel of approximately 1.6 Ha, and this contains the surface and foul water disposal from the Phase 1 development that forms the western boundary of the site. The drainage is referred to on the **drawing 49455-PP-SK16B**.

Cont'd.../

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Norfolk NR1 1SP

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www.rj.uk.com

For the purposes of establishing the likely drainage parameters for the site, with a density of impermeable area at 40% to 50%, this data will be used to provide a range of necessary water attenuation and/or storage. Where necessary on individual dwellings the drainage design will include Urban Creep of 10% which will be added to the preliminary design. Additionally, an area of the highways will be calculated and appropriate drainage design provided for these areas.

Existing Flood Sources

When assessing any development site, there are four potential sources of flooding which need to be considered both in terms of their effect on the development itself and its end users and that caused to others. The main sources of flooding that need to be considered are as follows:

- Fluvial and/or tidal flooding;
- Ground water;
- Overloading of the existing drainage network;
- Surface water flooding.

Fluvial and Tidal Sources of Flooding

From investigation of the existing watercourses and the GOV.UK and Environment Agency (EA) floodplain maps, there are no identified influences of fluvial or tidal flooding at the site and the site is in Flood Risk Zone 1, see the Environment Agency 'Flood Map for Planning'. Therefore this has not been investigated further. An indication of the associated Government Flood Maps are shown on **Figure 2A**.

Groundwater Vulnerability

Groundwater Source Protection Zone around all major groundwater abstraction points are identified on magic.defra.gov.uk mapping. Source Protection Zones (SPZ) are defined to protect areas of groundwater that are used for potable supply, (including mineral and bottled water) or for use in the production of commercial food and drinks. The proposed site is within Groundwater Source Protection Zone 3 (total catchment). This zone is identified as the total area needed to support the abstraction or discharge from the protected groundwater source. For the EA groundwater source protection zones of the site, see **Figure 3A.**

In addition, the Groundwater Vulnerability Zone Maps see **Figure 3A** show that the site is predominantly in the medium risk for groundwater vulnerability. The north east corner of the site is shown to be a 'soluble rock risk'. The ground investigation showed some chalk at depth but no particular 'soluble rock risk', thus this is not investigated further at this stage.

If soluble rocks, such as chalk, are present within the site then further consideration will be required for distances of any infiltration methods and their proximity to permanent buildings. This does not preclude the use of soakaways, however, further precautions may need to be made during design and construction. In preference, permeable paving would normally be recommended rather than deeper soakaway use in these areas.

Infiltration testing to BRE digest 365 has been completed and is investigated further in this letter report.

Cont'd.../

Existing Surface Water System and Ground Conditions

Abel Homes Ltd have provided us with the surface water drainage strategy for the Phase 1 development to the west and it shows that Highway surface water sewers, lead to cellular storage crates before discharging into an existing ditch in the south west corner of the development site. Further, the strategy indicates that private dwelling drainage at the Phase 1 development, is managed by infiltration through the use of permeable paving.

A ground investigation has been completed for this proposed site, undertaken in September 2018 by NCC, Norfolk Partnership Laboratory (NPL). A copy of the report can be made available if necessary, but the key data is supplied in this report in respect of the drainage issues.

There were trial holes dug across the site and a summary of the infiltration test results are indicated on drawing **48851-PP-SK16B**. These were undertaken to a maximum depth of 1.9m and found that shallow infiltration was better than at depth across much of the site. The shallow testing across the site showed the lower values for infiltration rates at approximately 0.8 to 0.9m depth was $1.1x10^{-6}$ m/s. Better rates were experienced up to $7.2x10^{-6}$ m/s. Upon closer inspection the site was found to have reasonable soakage rates on the western side of the site only and the data is shown on drawing **48851-PP-SK16B**. The drawing indicates the areas that could be used for SuDS successfully and those which have poorer values. For the purposes of the SuDS design in the western part of the site a value of $3.8x10^{-6}$ m/s will be used as this is the lower value from trial pit TP11A and appears to be representative of the western side of the site, see the drawing **48851-PP-SK16B** for details.

At the detail design stage, more accurate and individual plots/area testing could be applied and design formulated accordingly attributed to those results on a localised basis.

Additionally, the NPL report indicated that the groundwater is thought to be at approximately 40m AOD, taken from the British Geological Survey showing the Hydrogeology mapping. Using the data from the trial holes located on the site, it is believed that the groundwater will be approximately 10m to 17m below ground level at the lowest point in the site.

The existing surface water flooding for the 1 in 100 and 1 in 1000 year events have been investigated and are shown on **Figure 4A** and **Figure 5A** respectively. There is some minor flooding within in the site for the 1 in 100 year event and consideration to this area of the site is to be kept clear of development and for managed for potential exceedance events. The 1 in 1000 year event shows some amounts of surface water flooding, likely due to the topography of the site, the proposed surface water drainage strategy will incorporate attenuation of water and therefore should mitigate this risk within the new development.

Any new systems of drainage should consider the flow from the site and suitable SuDS to accommodate storage before discharging into the ground/watercourse.

Cont'd.../

Flood Risk Impact

It has been determined using the Ordnance Survey and topographical survey level information available, that surface water runoff from the site will occur in a south westerly direction. A proportion of rainfall falling across the existing site will also infiltrate into the soils of the site given the current ground conditions. A proportion of this infiltrating surface water will also contribute to any groundwater recharge. Ground permeability has been checked for the site as mentioned.

To determine the rainfall data for the site when undertaking the detail design, the Flood Estimation Handbook (FEH) data would be used for establishing the critical rainfall scenario, as indicated in LLFA guidance.

Soil Types and SuDS Suitability

The NPPF and appropriate guidance indicates that the FRA should identify the risks of flooding and manage those risks to ensure the site remains safe. One way to manage the flood risk is to incorporate Sustainable Drainage Systems (SuDS) within proposals for new sites. The use of SuDS will be installed where appropriate, in order to limit the amount of surface water runoff entering drainage systems and to return surface water into the ground to follow its natural drainage path. This advice is also replicated in the SuDS Manual C753 (2015).

The details of the ground conditions have been determined through a full ground investigation and advice on the use of SuDS/soakaways is such that they could be used. The permeability of the western part of the site has been determined as being $3.8x10^{-6}$ m/s, as a worse case but higher rates to $7.2x10^{-6}$ m/s have been found at shallow depths, suitable for permeable paving.

SuDS Assessment

The suitability of the use of SuDS on the site is based on the criteria as set out in the Ciria document C753 dated November 2015, where in Chapter 26 the appropriateness of SuDS can be established. The table below suggests the potential SuDS selection for Highways and Private Drives/Roofs.

Table A – SuDS Selection

Type of SuDS	Highways & Private Drives TSS=0.5 Metal=0.4 Hydrocarbons=0.4	Private Roofs TSS=0.2 Metals=0.2 Hydrocarbons=0.05
Filter Strip		✓
Filter Drain		✓
Swale	✓	✓
Permeable Paving	✓	✓
Detention Basin	✓	✓
Pond	✓	✓
Wetland	✓	✓
Soakaway (surrounded with infiltration materials)		✓
Infiltration Trench		✓

Cont'd.../

Using the **Table A** above which is derived from **Table 26.3** and **26.4** of Ciria C753 then it can be concluded that the better SuDS' choices for the site are as set out below;

Private Drives and Residential Roofs - Permeable paving where pollution indices are TSS=0.7, Metals=0.6 and Hydrocarbons=0.7, all greater than the required, where possible on the site.

Highways – To Swales or Infiltration Basin or Detention Basin or a combination of these via a piped drainage network where the use of the SuDS as a minimum indicates pollution indices values of TSS=0.5, Metals=0.5 and Hydrocarbons=0.7, all greater than the required.

A surface water strategy is therefore proposed to utilise the permeable paving and soakaways for the drives and private roof areas and swales and/or infiltration basins for the highway water for events up to the 1 in 100 year storm event, plus climate change at 40%.

Flood Risk Management

Having determined that the soils across the site does possess sufficient infiltration capacity for the use of infiltration devices in the western side, the methods of surface water disposal have been investigated, to determine the feasibility of discharging and treating the water prior to it entering the ground.

To determine the appropriate use of the SuDS features, the pollution indices were used to determine the type of SuDS to be used. For the purposes of the design for the site, which has yet to be detailed and is only at masterplan stage, a selection of likely solutions have been prepared for different house types.

The private drives will provide permeable paving to act as a pollution treatment and SuDS feature for the discharge of water from the drives and residential roof areas across the whole site, but only the western side of the site will infiltrate. The permeability rate of $3.8x10^{-6}$ m/s or 0.01368m/hr as indicated as the lower permeability rate will be used for a robust assessment. Suggested sizes for the private dwelling drainage are indicated on **Table B** below, which could be used across the western side of the site, see drawing **48851-PP-SK16B** for details:

Table B – Indicative SuDS Storage Sizes for dwellings

Dwelling Type*	Dwelling Area (m^2)	10% urban creep (m^2)	Garage Area (m^2)	Drive Area (m^2)	Total Area (m^2)	Permeable Paving depth for 1 in 100 year plus 40% CC Storage under private drive (m)
A	48	4.8	N/A	42	95	0.706m
B	56	5.6	21	36	119	0.661m using 0.551m material plus 0.15m x 3m x 12m (Permavoid or similar crate storage)
C	65	6.5	42	54	167	0.775m using 0.625m material plus 0.15m x 3m x 12m (Permavoid or similar crate storage)
D	116	11.6	42	72	242	0.738m using 0.588m material plus 0.15m x 6m x 10m (Permavoid or similar crate storage)

*The dwelling, garage and drive areas have been based on the Phase 1 layout, and the dwelling types that are used.

Cont'd.../

The highway water will be captured by a piped system or swales directed towards an infiltration basin which is to be positioned south of the site. The size will be determined by the dimensions of the roads and footways going to the swales/infiltration basin and an indication of the sizes are given in this Chapter. For purposes of being robust, a permeability rate of 7.2 x 10^{-6} m/s or 0.0259m/hr will be used for the infiltration basin design, as indicated by the soils investigation and taken in the location of the infiltration basin at trial pit TP18A, see drawing **48851-PP-SK16B** for details.

For an estimated contribution of the impermeable land parcels flowing to the infiltration basin see **Table C below;**

Table C – Indicative Contributing Areas to Infiltration Basin from Development Areas

Land Parcel	Land Area (m^2)	Suitable for infiltration / SuDS (Y/N)	SuDS Type	Areas to Infiltration Basin (based on 50% impermea-bility) m2	Total Imp Area (m^2) to Infiltration Basin(50% plus 10% Urban Creep) m2
1	7294	Y	Permeable paving infiltration for dwellings	N/A	0
2	2660	Y	Permeable paving infiltration for dwellings	N/A	0
3	4015	N	Permeable paving to pipes and infiltration basin	2007	2208
4	1747	N	As Area 3	873	960
5	7329	N	As Area 3	3364	4030
6	5046	N	As Area 3	2523	2775
7	1700	N	As Area 3	850	935
8	1107	N	As Area 3	553	608
Total					**11520m2**

Cont'd.../

For an estimated contribution of the impermeable areas from the highways flowing to the infiltration basin see **Table D** below;

Table D – Indicative Contributing Areas to Infiltration Basin from Highways

Highway Area	Highway Length (m)	Suitable for infiltration / SuDS (Y/N)	SuDS Type	Width of Road (m)	Total Imp Area (m^2) to Infiltration Basin (m2)
A	239	Y	Highway to Swale and then to Infiltration basin	10.8	2581
B	265	Possibly	Highway to Swale and then to Infiltration basin	6.6	1749
C	305	N	Highway to piped system and then Infiltration Basin	6.6	2013
D	34	N	As Area C	6.6	224
E	95	N	As Area C	6.6	627
F	134	N	As Area C	6.6	884
G	234	N	As Area C	6.6	1544
H	90	N	As Area C	6.6	594
I	39	N	As Area C	6.6	257
J	69	N	As Area C	6.6	455
Total					**10928m2**

Infiltration / Detention Basin Design

It can be seen from **Tables C & D** that the total contributing areas to the infiltration basin are 1.152Ha and 1.093Ha from the development land and Highways respectively.

To determine the flow rate from the basin, a greenfield runoff rate calculation has been conducted using the UKSUDS.com tool for greenfield runoff calculation. Using the FEH Statistical runoff approach and a site area of 2.245Ha, the same as the contributing area and a BFIHOSt from the FEH data, a greenfield runoff rate of QBar = 6.79L/s. This will be used as the discharge rate from the infiltration basin. The sizing of the infiltration basin has been completed and the summary data is outlined below see **Table E** below;

Table E – Highway/Development Infiltration / Detention Basin

Overall contributing Area	QBar Outflow at GFR Rate (L/s)	Area of Basin (m2)	1 in100 year storm plus 40% CC (Urban Creep has been included in the contributing areas)	
			Depth (m)	Volume (m^3)
2.245 Ha	6.79 L/s	3385 m^2	Approx. 0.730m	1845m^3

The details of the basin and outfall to the existing pond to the southwest of the site are shown on drawing **48851-PP-SK16B**.

Cont'd.../

Existing Capacity check on the Receiving Sewer Network near Pond

The discharge rate to the pond from the new development will be 6.7L/s. The discharge rate from the Phase One development is limited to 5L/s. We have been informed that there is a receiving sewer adjacent to the pond which is 225mm diameter and laid at a 1 in 40 fall, which provides a capacity of 82L/s.

The sewer has an additional contributing pipe from the west which appears to accommodate up to 11 dwellings and Bears Close. The likely contributing area from this area is approximately 0.317Ha, taken from OS data. Using the formula from the SuDS Manual 2015, Eq24.5, the runoff rate from this area can be calculated. Where the flow rate will be Q=2.78xCxixA.

C=runoff coefficient (1.0)

i = rainfall intensity (50mm/hr)

A = area in Ha

Therefore the flow is likely to be, Q=2.78 x 1.0 x 50 x 0.317 = 44.0L/s.

It can be concluded therefore that if the pipe has a capacity of 82L/s and the contributing discharges are 44L/s (Bear Close), 5.0L/s (Phase One) and 6.7L/s (Proposed development) then the pipe has spare capacity of 32.3L/s and is adequate for the discharge from the proposed development through the pond.

Management and Maintenance Plan

SuDS management requires a clear understanding of who is responsible for maintenance, particularly on a self-contained small development. There are distinct areas of SuDS maintenance:

- Maintenance of the first category of feature (for example water butts and permeable driveways) is the responsibility of the land or property owner(s).

- Maintenance of the second category (for example shared permeable pavements/soakaways and highway gullies/swales) in this case will be the land owner, property owner(s) or the highway authority for associated highway drainage.

- The third category (for example detention basins, and flow control structures) links to the main attenuation/infiltration features for the site will be the adopting authority which could be Anglian Water or a Property Management Company.

Anglian Water will be the adopting body for the main foul water sewers in the development where the sewer receives more than one dwelling. Appropriate easements will be applied based on Sewers for Adoption and on the pipe diameter.

The attenuation feature will have a clear 3.0m width around the basin to allow for it to be maintained accordingly, where appropriate.

The maintenance regime will be such that the work to maintain the attenuation basin and adoptable system, regular checks and maintenance will be undertaken as indicated below, with further details of maintenance contained within the SuDS Manual (2015). A detailed management plan for the SuDS features can be a document secured through a planning condition.

Cont'd.../

SuDS Maintenance Plan

Maintenance	***Action***	***Frequency***
Regular Maintenance	Check inlets, outlets, control structures and overflows.	Monthly or annually as required
	Litter removal from site that might block inlets and outlets.	Monthly
	Grass cutting / plant control on / around detention basin as well weed removal from permeable paving.	Monthly or as required
	Gratings, inspection chambers and silt traps – Check for damage and blockages.	Bi-annually
	Regular maintenance and jetting of carrier pipes.	Annually
	Regular maintenance schedule to be updated.	Bi-annually
Occasional Tasks	Jetting and suction where silt has settled.	Bi-annually or as required by manufacturers
	Check of inlets and outlets on Pipe Storage system adopted by the adopting Authority	Annually
	Vacuum sweeping and brushing of pervious pavements – replace jointing material.	Bi-Annually
Remedial Work	Reinstate	As necessary when the function of the permeable paving fails between 10-25 years.

Summary

It can be seen from the indicative ground conditions taken from the ground investigation produced for the site that infiltration is likely to be suitable in part of the site, mainly on the western side. Further intrusive investigations are required in order to determine infiltration rates for the proposed dwellings in more detail at the appropriate stage.

An infiltration strategy, with above ground storage, where possible, would be in accordance with National and Local planning policy, by treating the water for quality and quantity on site, thus not creating a detrimental effect downstream of the site.

The sizes of the permeable paving for the houses have been provided indicatively where infiltration rates allow. A proposal to use permeable paving on the rest of the site, which could drain into a main sewer system and through an infiltration basin with limited discharge, with highways using swales on the main spine road where possible.

Cont'd.../

If, following further infiltration testing, at the detailed design stage, permeability of the soils was not found to be suitable for the western parcels of land, a similar strategy for that of the eastern parcels will be adopted, with under-drained permeable paving and a piped network discharging to the existing pond via the new lagoon

With limited discharge from the site, a preliminary assessment of the capacity of the sewer near the pond has also been undertaken and found to be satisfactory.

An indicative surface water drainage strategy is shown on drawing **48851-PP-SK16B** showing the infiltration basin, subject to further masterplanning processes.

Matters	Comment	Satisfactory	Needs some Upgrade	Not Satisfactory
Flood Risk Zone	The site is in Flood Risk Zone 1. Suitable for residential development			
High Risk Surface Water Flooding	There are no existing surface water flooding issues of High Risk			
Medium Risk Surface Water Flooding	There are no existing surface water flooding issues of Medium Risk. Development has been removed from these areas.			
Low Risk Surface Water Flooding	There are no existing surface water flooding issues of Low Risk which can not be accommodated within the development drainage strategy			
Proposed Surface Water Drainage	The proposals are likely to conform to the SuDS Manual and LLFA guidance for use of infiltration devices where appropriate and an infiltration basin based upon the detailed site investigation already undertaken.			

I trust the foregoing is satisfactory but if we can be of any further assistance, please do not hesitate to contact us.

Yours sincerely

Martin Doughty BEng (Hons), CEng, FCIHT, FICE, MAPM
Director on behalf of Richard Jackson Limited

Enc

Figures and Drawings

Figures 101, 2A, 3A, 4A & 5A

48851/PP/SK16B – Preliminary Surface Water Drainage Strategy

Additional Supporting Data

Flood Map for Planning

FEH Data

Microdrainage - Dwelling Permeable Paving Calcs – Type A to D

Greenfield Runoff UKSUDS.com calculation

Microdrainage - Infiltration basin design

Site location grid reference 603043, 302031
and postcode NR9 4LS

Client:	Drawing Title:		
Abel Homes Ltd	**Site Location Plan**		
Job Title:	Date:	Job No:	Dwg No:
Land south of Norwich Road, Hingham	**26.2.20**	**48851**	**Fig. 101 (NTS)**

RichardJackson Engineering Consultants
4 The Old Church, St Matthews Road, Norwich, NR1 1SP
Tel. 01603 230240
www.richardjackson.uk.com

Extent of flooding

Extent of flooding from rivers or the sea

High Medium Low Very low

Site location grid reference 603043, 302031 and postcode NR9 4LS

Client:	Drawing Title:		
Abel Homes Ltd	**Flood Plan (Rivers and Sea)**		
Job Title:	Date:	Job No:	Dwg No:
Land South of Norwich Road, Hingham	**06.03.20**	**48851**	**Fig. 2A (NTS)**

RichardJackson Engineering Consultants
4 The Old Church, St Matthews Road, Norwich, NR1 1SP
Tel. 01603 230240
www.richardjackson.uk.com

FLOOD PLAN (GROUNDWATER)

SOURCE PROTECTION ZONES (GROUNDWATER)

Site location grid reference 603043, 302031 and postcode NR9 4LS

Client:	Drawing Title:		
Abel Homes Ltd	**Flood Plan (Groundwater) & Source Protection Zones (Groundwater)**		
Job Title:	Date:	Job No:	Dwg No:
Land South of Norwich Road, Hingham	**06.03.20**	**48851**	**Fig. 3A (NTS)**

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Tel. 01603 230240
www.richardjackson.uk.com

Medium risk: depth

INDICATIVE SITE LOCATION

Surface water flood risk: water depth in a medium risk scenario

Flood depth (millimetres)

Over 900mm | 300 to 900mm | Below 300mm

Site location grid reference 603043, 302031 and postcode NR9 4LS

Client:	Drawing Title:		
Abel Homes Ltd	**Surface Water Flood Mapping (Medium Risk)**		
Job Title:	Date:	Job No:	Dwg No:
Land South of Norwich Road, Hingham	**06.03.20**	**48851**	**Fig. 4A (NTS)**

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Low risk: depth

INDICATIVE SITE LOCATION

Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

Over 900mm | 300 to 900mm | Below 300mm

Site location grid reference 603043, 302031 and postcode NR9 4LS

Client:	Drawing Title:		
Abel Homes Ltd	**Surface Water Flood Mapping (Low Risk)**		
Job Title:	Date:	Job No:	Dwg No:
Land South of Norwich Road, Hingham	**06.03.20**	**48851**	**Fig. 5A (NTS)**

RichardJackson Engineering Consultants
4 The Old Church, St Matthews Road, Norwich, NR1 1SP
Tel. 01603 230240
www.richardjackson.uk.com

DO NOT SCALE

KEY:

- FOUL WATER
- SURFACE WATER
- SITE BOUNDARY
- EASEMENTS
- ATTENUATION CELL
- PUBLIC RIGHT OF WAY
- LOW RISK FLOOD OUTLINE
- MEDIUM RISK FLOOD OUTLINE
- INDICATIVE SPINE ROAD
- INDICATIVE SWALE POSITION
- EXCEEDENCE/TOPOGRAPHY FLOW DIRECTION
- LAND WITHOUT SUITABLE INFILTRATION FOR SuDS
- LAND WITH SUITABLE INFILTRATION FOR SuDS

NOTES:

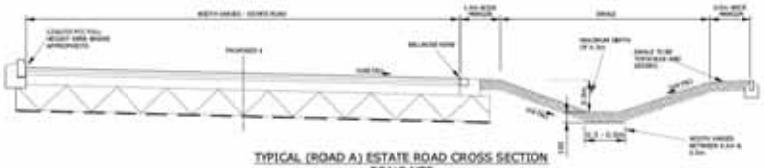
1. ALL LEVELS ARE IN METRES ABOVE ORDNANCE SURVEY DATUM.
2. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE STATED.
3. TIOPOGRAPHICAL SURVEY DRAWING NUMBER 18731se-01 – 06 DATED NOVEMBER 2016 SUPPLIED TO RICHARD JACKSON LTD BY SURVEY SOLUTIONS AND RJ LTD ACCEPT NO RESPONSIBILITY FOR ERROR OR OMISSION.
4. NOT ALL MANHOLE COVERS HAVE BEEN IDENTIFIED AND THEREFORE SEWER RUNS REMAIN INDICATIVE.
5. NOT ALL UTILITIES ARE SHOWN FOR CLARITY.
6. LOW AND MEDIUM FLOOD OUTLINES TAKEN FROM GOVERNMENT FLOOD RISK WEBSITE.
7. SOILS DATA TAKEN FROM NORFOLK COUNTY COUNCIL'S, NORFOLK PARTNERSHIP LABORATORY SITE INVESTIGATION REPORT DATED SEPT 2018.

TABLE A - PERMEABLE PAVING REQUIREMENTS LAND PARCEL 1 AND 2

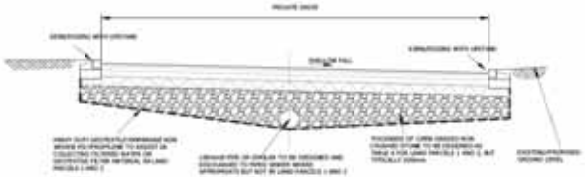
DWELLING TYPE	DWELLING AREA (m²)	URBAN CREEP (m²)	GARAGE AREA (m²)	DRIVE AREA (m²)	TOTAL AREA (m²)	DEPTH OF MATERIAL UNDER PAVING (m) & CELLULAR CRATES AS APPROPRIATE
A	86	4.8	N/A	42	95	0.700
B	98	5.6	21	36	119	0.561m using 0.371m material plus 0.190m x 3m x 12m (Permavoid or similar crate storage)
C	83	4.5	42	94	167	0.775m using 0.425m material plus 0.190 x 3m x 12m (Permavoid or similar crate storage)
D	135	11.6	42	72	260	0.728m using 0.538m material plus 0.190 x 6m x 20m (Permavoid or similar crate storage)

TABLE B - LAND PARCEL DETAILS

LAND PARCEL	LAND PARCEL AREA (m²)	TRIAL PIT REFERENCE	DEPTH OF TRIAL HOLE / PERMEABILITY TEST	INFILTRATION RATE (m/s)
1	7194	TP9A/B TP11A/B	0.8m 0.8m	8.3x10⁻⁶m/s 3.8x10⁻⁶m/s
2	3698	-	N/A	N/A
3	4015	TP3A/B	0.9m	7.2x10⁻⁶m/s
4	1747	TP4A/B	0.9m	1.3x10⁻⁶m/s
5	7329	TP6A/B	0.8m	2.3x10⁻⁶m/s
6	5846	TP14A/B	1.0m	3.3x10⁻⁶m/s
7	1755	-	N/A	N/A
8	1187	-	N/A	N/A
INFILTRATION BASIN	∞	TP16A/B	0.8m	7.2x10⁻⁶m/s



TYPICAL (ROAD A) ESTATE ROAD CROSS SECTION
SCALE NTS



TYPICAL CROSS SECTION OF THE PRIVATE DRIVE AND PERMEABLE PAVING

TYPICAL INFILTRATION BASIN CROSS SECTION (VARIES ACROSS THE BASIN)
SCALE N.T.S

REV	DATE	DESCRIPTION		
B	13.05.20	SITE LAYOUT PLAN & DRAINAGE	RGT	RGT
A	06.03.20	UPDATED SITE LAYOUT PLAN	LLO	RGT

REVISIONS

Project: LAND SOUTH OF NORWICH ROAD, HINGHAM	Title: PRELIMINARY SURFACE WATER DRAINAGE STRATEGY	Client: ABEL HOMES LTD	
Drawn: L. GRAY	Date: 28/02/19		
Job Manager: M. DOUGHTY	Checked: M. DOUGHTY		
Approved: M. DOUGHTY	Scale: 1:1000@A1		

The drawing is to be read in conjunction with all other Engineer's drawings and all other project information. Any discrepancy between the Engineer's drawings and other project information is to be reported to the Engineer immediately.

RichardJackson Engineering Consultants

Drawing No.: 48851-PP-SK16 | Revision: B

Drawing Status: ☒ INFORMATION ☐ APPROVAL ☐ COSTING ☐ TENDER ☐ CONSTRUCTION ☐ AS CONSTRUCTED

A1

Environment Agency

Flood map for planning

Your reference	Location (easting/northing)	Created
48851	**603050/302081**	**28 Feb 2020 12:07**

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

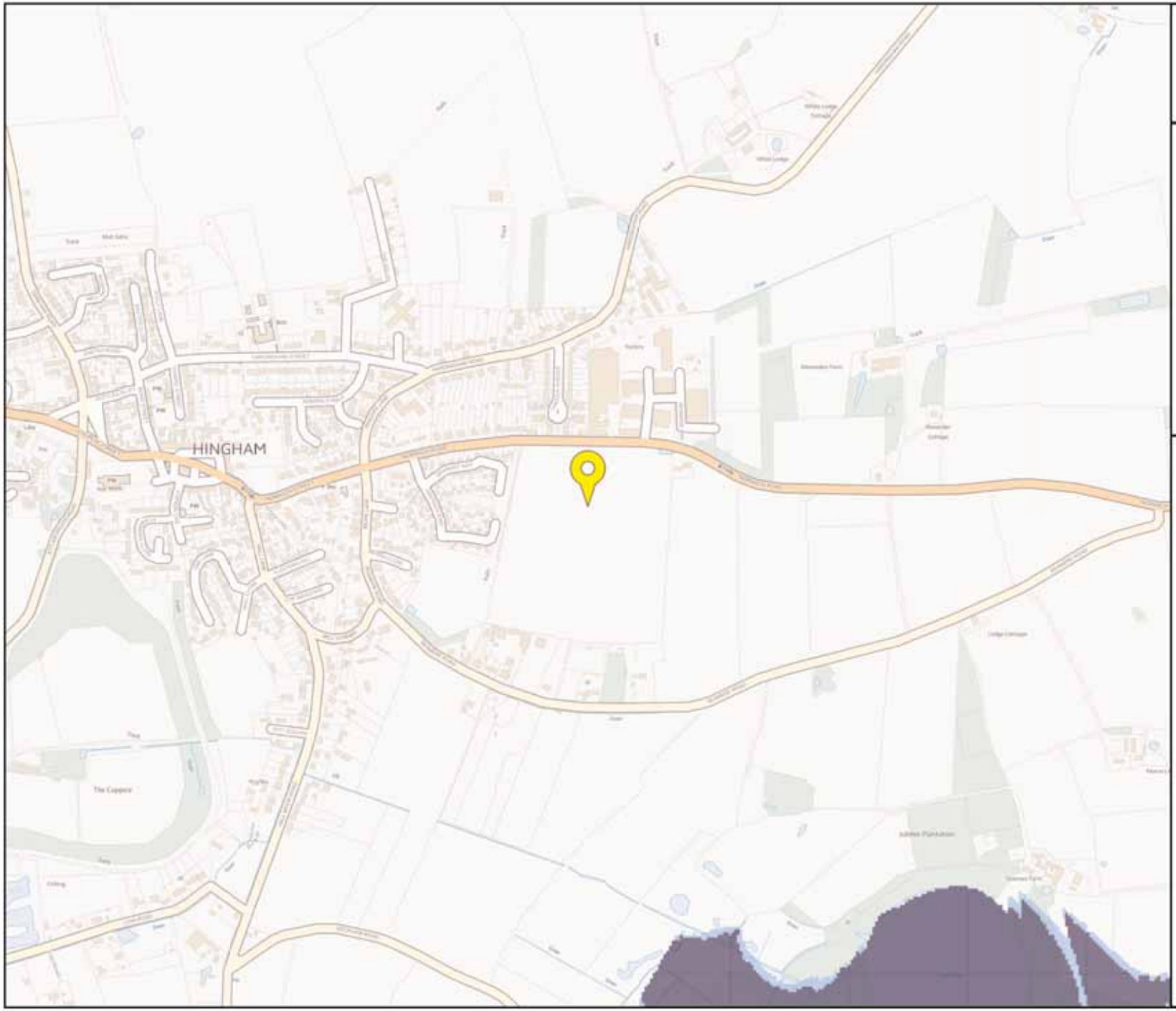
This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

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

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



Environment Agency

Flood map for planning

Your reference
48851

Location (easting/northing)
603050/302081

Scale
1:10000

Created
28 Feb 2020 12:07

- Selected point
- Flood zone 3
- Flood zone 3: areas benefitting from flood defences
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Flood storage area

0 100 200 300m

VERSION	"FEH CD-R	Version		3	exported a	17:04:56	GMT	Mon	19-Feb-18
CATCHMEI	GB		603300	301300	TG 033000	01300			
CENTROID	GB		602396	301584	TG 023960	01584			
AREA	3.4575								
ALTBAR	52								
ASPBAR	112								
ASPVAR	0.35								
BFIHOST	0.43								
DPLBAR	1.39								
DPSBAR	17.5								
FARL	1								
FPEXT	0.1142								
FPDBAR	0.615								
FPLOC	0.686								
LDP	2.96								
PROPWET	0.31								
RMED-1H	11.2								
RMED-1D	30								
RMED-2D	37.6								
SAAR	636								
SAAR4170	704								
SPRHOST	36.49								
URBCONC:	0.747								
URBEXT19	0.0694								
URBLOC19	1.097								
URBCONC2	0.877								
URBEXT20	0.0709								
URBLOC20	1.112								
C	-0.02397								
D1	0.31488								
D2	0.33457								
D3	0.24709								
E	0.31585								
F	2.4709								
C(1 km)	-0.024								
D1(1 km)	0.313								
D2(1 km)	0.339								
D3(1 km)	0.244								
E(1 km)	0.316								
F(1 km)	2.474								

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1224 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	52.387	0.387	0.1	3.8	O K
30 min Summer	52.432	0.432	0.1	4.3	O K
60 min Summer	52.482	0.482	0.1	5.0	O K
120 min Summer	52.533	0.533	0.1	5.6	O K
180 min Summer	52.562	0.562	0.1	6.0	O K
240 min Summer	52.581	0.581	0.1	6.2	O K
360 min Summer	52.604	0.604	0.1	6.5	O K
480 min Summer	52.615	0.615	0.1	6.6	O K
600 min Summer	52.619	0.619	0.1	6.7	O K
720 min Summer	52.620	0.620	0.1	6.7	O K
960 min Summer	52.617	0.617	0.1	6.7	O K
1440 min Summer	52.603	0.603	0.1	6.5	O K
2160 min Summer	52.579	0.579	0.1	6.2	O K
2880 min Summer	52.553	0.553	0.1	5.9	O K
4320 min Summer	52.476	0.476	0.1	4.9	O K
5760 min Summer	52.411	0.411	0.1	4.1	O K
7200 min Summer	52.354	0.354	0.1	3.4	O K
8640 min Summer	52.307	0.307	0.1	2.8	O K
10080 min Summer	52.266	0.266	0.1	2.2	O K
15 min Winter	52.425	0.425	0.1	4.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	214.767	0.0	19
30 min Summer	123.574	0.0	34
60 min Summer	71.102	0.0	64
120 min Summer	40.911	0.0	124
180 min Summer	29.609	0.0	182
240 min Summer	23.540	0.0	242
360 min Summer	17.037	0.0	362
480 min Summer	13.544	0.0	482
600 min Summer	11.337	0.0	602
720 min Summer	9.803	0.0	720
960 min Summer	7.852	0.0	934
1440 min Summer	5.743	0.0	1154
2160 min Summer	4.200	0.0	1536
2880 min Summer	3.364	0.0	1956
4320 min Summer	2.368	0.0	2728
5760 min Summer	1.845	0.0	3520
7200 min Summer	1.521	0.0	4256
8640 min Summer	1.299	0.0	5008
10080 min Summer	1.136	0.0	5656
15 min Winter	214.767	0.0	19

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	52.476	0.476	0.1	4.9	O K
60 min Winter	52.532	0.532	0.1	5.6	O K
120 min Winter	52.591	0.591	0.1	6.3	O K
180 min Winter	52.625	0.625	0.1	6.8	O K
240 min Winter	52.648	0.648	0.1	7.1	O K
360 min Winter	52.676	0.676	0.1	7.4	O K
480 min Winter	52.692	0.692	0.1	7.6	O K
600 min Winter	52.700	0.700	0.1	7.7	O K
720 min Winter	52.703	0.703	0.1	7.8	O K
960 min Winter	52.706	0.706	0.1	7.8	O K
1440 min Winter	52.691	0.691	0.1	7.6	O K
2160 min Winter	52.657	0.657	0.1	7.2	O K
2880 min Winter	52.620	0.620	0.1	6.7	O K
4320 min Winter	52.510	0.510	0.1	5.3	O K
5760 min Winter	52.414	0.414	0.1	4.1	O K
7200 min Winter	52.332	0.332	0.1	3.1	O K
8640 min Winter	52.265	0.265	0.1	2.2	O K
10080 min Winter	52.212	0.212	0.1	1.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	123.574	0.0	33
60 min Winter	71.102	0.0	64
120 min Winter	40.911	0.0	122
180 min Winter	29.609	0.0	180
240 min Winter	23.540	0.0	240
360 min Winter	17.037	0.0	356
480 min Winter	13.544	0.0	472
600 min Winter	11.337	0.0	588
720 min Winter	9.803	0.0	700
960 min Winter	7.852	0.0	924
1440 min Winter	5.743	0.0	1340
2160 min Winter	4.200	0.0	1664
2880 min Winter	3.364	0.0	2128
4320 min Winter	2.368	0.0	2984
5760 min Winter	1.845	0.0	3800
7200 min Winter	1.521	0.0	4536
8640 min Winter	1.299	0.0	5192
10080 min Winter	1.136	0.0	5840

Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.244	Cv (Winter)	0.840
Return Period (years)	100	E (1km)	0.316	Shortest Storm (mins)	15
Site Location		F (1km)	2.474	Longest Storm (mins)	10080
C (1km)	-0.024	Summer Storms	Yes	Climate Change %	+40
D1 (1km)	0.313	Winter Storms	Yes		
D2 (1km)	0.339	Cv (Summer)	0.750		

Time Area Diagram

Total Area (ha) 0.010

Time (mins) From:	To:	Area (ha)
0	4	0.010

Model Details

Storage is Online Cover Level (m) 53.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.01368	Width (m)	3.0
Membrane Percolation (mm/hr)	1000	Length (m)	14.0
Max Percolation (l/s)	11.7	Slope (1:X)	80.0
Safety Factor	3.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	52.000	Cap Volume Depth (m)	0.000

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 638 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	52.134	0.134	0.1	4.6	O K
30 min Summer	52.358	0.358	0.1	5.3	O K
60 min Summer	52.449	0.449	0.1	5.9	O K
120 min Summer	52.508	0.508	0.1	6.6	O K
180 min Summer	52.537	0.537	0.1	6.9	O K
240 min Summer	52.552	0.552	0.1	7.1	O K
360 min Summer	52.560	0.560	0.1	7.1	O K
480 min Summer	52.560	0.560	0.1	7.1	O K
600 min Summer	52.559	0.559	0.1	7.1	O K
720 min Summer	52.556	0.556	0.1	7.1	O K
960 min Summer	52.551	0.551	0.1	7.0	O K
1440 min Summer	52.530	0.530	0.1	6.8	O K
2160 min Summer	52.489	0.489	0.1	6.4	O K
2880 min Summer	52.452	0.452	0.1	6.0	O K
4320 min Summer	52.376	0.376	0.1	5.4	O K
5760 min Summer	52.138	0.138	0.1	4.7	O K
7200 min Summer	52.114	0.114	0.1	3.9	O K
8640 min Summer	52.095	0.095	0.1	3.2	O K
10080 min Summer	52.079	0.079	0.1	2.7	O K
15 min Winter	52.324	0.324	0.1	5.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	214.767	0.0	23
30 min Summer	123.574	0.0	37
60 min Summer	71.102	0.0	66
120 min Summer	40.911	0.0	124
180 min Summer	29.609	0.0	184
240 min Summer	23.540	0.0	242
360 min Summer	17.037	0.0	346
480 min Summer	13.544	0.0	398
600 min Summer	11.337	0.0	458
720 min Summer	9.803	0.0	522
960 min Summer	7.852	0.0	658
1440 min Summer	5.743	0.0	928
2160 min Summer	4.200	0.0	1324
2880 min Summer	3.364	0.0	1704
4320 min Summer	2.368	0.0	2512
5760 min Summer	1.845	0.0	3456
7200 min Summer	1.521	0.0	4176
8640 min Summer	1.299	0.0	4848
10080 min Summer	1.136	0.0	5552
15 min Winter	214.767	0.0	23

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	52.445	0.445	0.1	5.9	O K
60 min Winter	52.517	0.517	0.1	6.7	O K
120 min Winter	52.589	0.589	0.1	7.5	O K
180 min Winter	52.625	0.625	0.1	7.8	O K
240 min Winter	52.645	0.645	0.1	8.1	O K
360 min Winter	52.661	0.661	0.1	8.2	O K
480 min Winter	52.661	0.661	0.1	8.2	O K
600 min Winter	52.653	0.653	0.1	8.1	O K
720 min Winter	52.648	0.648	0.1	8.1	O K
960 min Winter	52.637	0.637	0.1	8.0	O K
1440 min Winter	52.598	0.598	0.1	7.6	O K
2160 min Winter	52.530	0.530	0.1	6.8	O K
2880 min Winter	52.470	0.470	0.1	6.2	O K
4320 min Winter	52.380	0.380	0.1	5.4	O K
5760 min Winter	52.132	0.132	0.1	4.5	O K
7200 min Winter	52.099	0.099	0.1	3.4	O K
8640 min Winter	52.073	0.073	0.1	2.5	O K
10080 min Winter	52.055	0.055	0.1	1.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	123.574	0.0	36
60 min Winter	71.102	0.0	66
120 min Winter	40.911	0.0	122
180 min Winter	29.609	0.0	180
240 min Winter	23.540	0.0	238
360 min Winter	17.037	0.0	348
480 min Winter	13.544	0.0	454
600 min Winter	11.337	0.0	492
720 min Winter	9.803	0.0	562
960 min Winter	7.852	0.0	716
1440 min Winter	5.743	0.0	1012
2160 min Winter	4.200	0.0	1428
2880 min Winter	3.364	0.0	1816
4320 min Winter	2.368	0.0	2640
5760 min Winter	1.845	0.0	3640
7200 min Winter	1.521	0.0	4392
8640 min Winter	1.299	0.0	5016
10080 min Winter	1.136	0.0	5544

Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.244	Cv (Winter)	0.840
Return Period (years)	100	E (1km)	0.316	Shortest Storm (mins)	15
Site Location		F (1km)	2.474	Longest Storm (mins)	10080
C (1km)	-0.024	Summer Storms	Yes	Climate Change %	+40
D1 (1km)	0.313	Winter Storms	Yes		
D2 (1km)	0.339	Cv (Summer)	0.750		

Time Area Diagram

Total Area (ha) 0.012

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.006	4	8	0.006

Model Details

Storage is Online Cover Level (m) 53.000

Complex Structure

Cellular Storage

Invert Level (m)	52.000	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.01368	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.01368		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	36.0	36.0	0.151	0.0	40.5
0.150	36.0	40.5			

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.01368	Width (m)	3.0
Membrane Percolation (mm/hr)	1000	Length (m)	12.0
Max Percolation (l/s)	10.0	Slope (1:X)	80.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	52.300	Cap Volume Depth (m)	0.000

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 584 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m^3)	Status
15 min Summer	52.437	0.437	0.2	6.5	O K
30 min Summer	52.495	0.495	0.2	7.4	O K
60 min Summer	52.557	0.557	0.2	8.4	O K
120 min Summer	52.617	0.617	0.2	9.4	O K
180 min Summer	52.647	0.647	0.2	9.9	O K
240 min Summer	52.664	0.664	0.2	10.1	O K
360 min Summer	52.677	0.677	0.2	10.3	O K
480 min Summer	52.677	0.677	0.2	10.3	O K
600 min Summer	52.675	0.675	0.2	10.3	O K
720 min Summer	52.672	0.672	0.2	10.3	O K
960 min Summer	52.669	0.669	0.2	10.2	O K
1440 min Summer	52.650	0.650	0.2	9.9	O K
2160 min Summer	52.610	0.610	0.2	9.2	O K
2880 min Summer	52.567	0.567	0.2	8.5	O K
4320 min Summer	52.467	0.467	0.2	6.9	O K
5760 min Summer	52.409	0.409	0.2	6.0	O K
7200 min Summer	52.380	0.380	0.2	5.6	O K
8640 min Summer	52.354	0.354	0.1	5.4	O K
10080 min Summer	52.333	0.333	0.1	5.2	O K
15 min Winter	52.488	0.488	0.2	7.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m^3)	Time-Peak (mins)
15 min Summer	214.767	0.0	22
30 min Summer	123.574	0.0	37
60 min Summer	71.102	0.0	66
120 min Summer	40.911	0.0	126
180 min Summer	29.609	0.0	184
240 min Summer	23.540	0.0	242
360 min Summer	17.037	0.0	360
480 min Summer	13.544	0.0	428
600 min Summer	11.337	0.0	486
720 min Summer	9.803	0.0	546
960 min Summer	7.852	0.0	678
1440 min Summer	5.743	0.0	952
2160 min Summer	4.200	0.0	1360
2880 min Summer	3.364	0.0	1736
4320 min Summer	2.368	0.0	2468
5760 min Summer	1.845	0.0	3168
7200 min Summer	1.521	0.0	3896
8640 min Summer	1.299	0.0	4672
10080 min Summer	1.136	0.0	5640
15 min Winter	214.767	0.0	22

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	52.553	0.553	0.2	8.3	O K
60 min Winter	52.623	0.623	0.2	9.5	O K
120 min Winter	52.693	0.693	0.2	10.6	O K
180 min Winter	52.730	0.730	0.2	11.2	O K
240 min Winter	52.752	0.752	0.2	11.5	O K
360 min Winter	52.772	0.772	0.2	11.9	O K
480 min Winter	52.775	0.775	0.2	11.9	O K
600 min Winter	52.770	0.770	0.2	11.8	O K
720 min Winter	52.762	0.762	0.2	11.7	O K
960 min Winter	52.754	0.754	0.2	11.6	O K
1440 min Winter	52.720	0.720	0.2	11.0	O K
2160 min Winter	52.653	0.653	0.2	9.9	O K
2880 min Winter	52.584	0.584	0.2	8.8	O K
4320 min Winter	52.447	0.447	0.2	6.6	O K
5760 min Winter	52.393	0.393	0.2	5.8	O K
7200 min Winter	52.362	0.362	0.1	5.4	O K
8640 min Winter	52.340	0.340	0.1	5.3	O K
10080 min Winter	52.138	0.138	0.1	4.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	123.574	0.0	37
60 min Winter	71.102	0.0	66
120 min Winter	40.911	0.0	124
180 min Winter	29.609	0.0	180
240 min Winter	23.540	0.0	238
360 min Winter	17.037	0.0	352
480 min Winter	13.544	0.0	460
600 min Winter	11.337	0.0	562
720 min Winter	9.803	0.0	586
960 min Winter	7.852	0.0	734
1440 min Winter	5.743	0.0	1040
2160 min Winter	4.200	0.0	1472
2880 min Winter	3.364	0.0	1876
4320 min Winter	2.368	0.0	2552
5760 min Winter	1.845	0.0	3224
7200 min Winter	1.521	0.0	3968
8640 min Winter	1.299	0.0	4928
10080 min Winter	1.136	0.0	6152

Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.244	Cv (Winter)	0.840
Return Period (years)	100	E (1km)	0.316	Shortest Storm (mins)	15
Site Location		F (1km)	2.474	Longest Storm (mins)	10080
C (1km)	-0.024	Summer Storms	Yes	Climate Change %	+40
D1 (1km)	0.313	Winter Storms	Yes		
D2 (1km)	0.339	Cv (Summer)	0.750		

Time Area Diagram

Total Area (ha) 0.017

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.008	4	8	0.009

Model Details

Storage is Online Cover Level (m) 53.000

Complex Structure

Cellular Storage

Invert Level (m)	52.000	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.01368	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.01368		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	36.0	36.0	0.151	0.0	40.5
0.150	36.0	40.5			

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.01368	Width (m)	6.0
Membrane Percolation (mm/hr)	1000	Length (m)	9.0
Max Percolation (l/s)	15.0	Slope (1:X)	80.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	52.300	Cap Volume Depth (m)	0.000

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 744 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	52.379	0.379	0.2	9.2	O K
30 min Summer	52.444	0.444	0.3	10.5	O K
60 min Summer	52.509	0.509	0.3	11.9	O K
120 min Summer	52.572	0.572	0.3	13.2	O K
180 min Summer	52.604	0.604	0.3	13.9	O K
240 min Summer	52.621	0.621	0.3	14.3	O K
360 min Summer	52.634	0.634	0.3	14.6	O K
480 min Summer	52.633	0.633	0.3	14.6	O K
600 min Summer	52.632	0.632	0.3	14.5	O K
720 min Summer	52.629	0.629	0.3	14.5	O K
960 min Summer	52.626	0.626	0.3	14.4	O K
1440 min Summer	52.606	0.606	0.3	14.0	O K
2160 min Summer	52.564	0.564	0.3	13.1	O K
2880 min Summer	52.520	0.520	0.3	12.1	O K
4320 min Summer	52.425	0.425	0.3	10.1	O K
5760 min Summer	52.381	0.381	0.2	9.2	O K
7200 min Summer	52.345	0.345	0.2	8.8	O K
8640 min Summer	52.139	0.139	0.1	8.0	O K
10080 min Summer	52.118	0.118	0.1	6.7	O K
15 min Winter	52.436	0.436	0.3	10.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	214.767	0.0	23
30 min Summer	123.574	0.0	37
60 min Summer	71.102	0.0	66
120 min Summer	40.911	0.0	124
180 min Summer	29.609	0.0	184
240 min Summer	23.540	0.0	242
360 min Summer	17.037	0.0	360
480 min Summer	13.544	0.0	420
600 min Summer	11.337	0.0	480
720 min Summer	9.803	0.0	542
960 min Summer	7.852	0.0	674
1440 min Summer	5.743	0.0	944
2160 min Summer	4.200	0.0	1348
2880 min Summer	3.364	0.0	1736
4320 min Summer	2.368	0.0	2464
5760 min Summer	1.845	0.0	3224
7200 min Summer	1.521	0.0	4040
8640 min Summer	1.299	0.0	5016
10080 min Summer	1.136	0.0	5752
15 min Winter	214.767	0.0	22

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	52.505	0.505	0.3	11.8	O K
60 min Winter	52.579	0.579	0.3	13.4	O K
120 min Winter	52.653	0.653	0.3	15.0	O K
180 min Winter	52.692	0.692	0.3	15.8	O K
240 min Winter	52.714	0.714	0.3	16.3	O K
360 min Winter	52.735	0.735	0.3	16.7	O K
480 min Winter	52.738	0.738	0.3	16.8	O K
600 min Winter	52.732	0.732	0.3	16.7	O K
720 min Winter	52.724	0.724	0.3	16.5	O K
960 min Winter	52.716	0.716	0.3	16.3	O K
1440 min Winter	52.681	0.681	0.3	15.6	O K
2160 min Winter	52.612	0.612	0.3	14.1	O K
2880 min Winter	52.543	0.543	0.3	12.6	O K
4320 min Winter	52.417	0.417	0.3	9.9	O K
5760 min Winter	52.371	0.371	0.2	9.1	O K
7200 min Winter	52.331	0.331	0.1	8.7	O K
8640 min Winter	52.122	0.122	0.1	6.9	O K
10080 min Winter	52.093	0.093	0.1	5.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	123.574	0.0	37
60 min Winter	71.102	0.0	66
120 min Winter	40.911	0.0	122
180 min Winter	29.609	0.0	180
240 min Winter	23.540	0.0	238
360 min Winter	17.037	0.0	350
480 min Winter	13.544	0.0	460
600 min Winter	11.337	0.0	560
720 min Winter	9.803	0.0	580
960 min Winter	7.852	0.0	732
1440 min Winter	5.743	0.0	1032
2160 min Winter	4.200	0.0	1456
2880 min Winter	3.364	0.0	1852
4320 min Winter	2.368	0.0	2516
5760 min Winter	1.845	0.0	3336
7200 min Winter	1.521	0.0	4392
8640 min Winter	1.299	0.0	5280
10080 min Winter	1.136	0.0	5952

Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.244	Cv (Winter)	0.840
Return Period (years)	100	E (1km)	0.316	Shortest Storm (mins)	15
Site Location		F (1km)	2.474	Longest Storm (mins)	10080
C (1km)	-0.024	Summer Storms	Yes	Climate Change %	+40
D1 (1km)	0.313	Winter Storms	Yes		
D2 (1km)	0.339	Cv (Summer)	0.750		

Time Area Diagram

Total Area (ha) 0.024

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.012	4	8	0.012

Model Details

Storage is Online Cover Level (m) 53.000

Complex Structure

Cellular Storage

Invert Level (m)	52.000	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.01368	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.01368		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	60.0	60.0	0.151	0.0	64.8
0.150	60.0	64.8			

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.01368	Width (m)	8.0
Membrane Percolation (mm/hr)	1000	Length (m)	9.0
Max Percolation (l/s)	20.0	Slope (1:X)	80.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	52.300	Cap Volume Depth (m)	0.000

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Martin Doughty
Site name:	Norwich Road
Site location:	Hingham

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

Site Details

Latitude:	52.57849° N
Longitude:	0.99444° E
Reference:	78035866
Date:	May 14 2020 19:47

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha):	2.245

Methodology

Q_{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Specify BFI manually
HOST class:	8
BFI / BFIHOST:	0.43
Q_{MED} (l/s):	4.06
Q_{BAR} / Q_{MED} factor:	1.12

Hydrological characteristics

	Default	Edited
SAAR (mm):	632	632
Hydrological region:	5	5
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	2.45	2.45
Growth curve factor 100 years:	3.56	3.56
Growth curve factor 200 years:	4.21	4.21

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	4.57	6.79
1 in 1 year (l/s):	3.97	5.9
1 in 30 years (l/s):	11.19	16.63
1 in 100 year (l/s):	16.25	24.16
1 in 200 years (l/s):	19.22	28.57

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 1335 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Σ Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	49.389	0.389	4.1	6.5	10.3	890.7	O K
30 min Summer	49.441	0.441	4.3	6.5	10.3	1021.0	O K
60 min Summer	49.497	0.497	4.4	6.5	10.3	1164.7	O K
120 min Summer	49.555	0.555	4.6	6.5	10.4	1316.9	O K
180 min Summer	49.588	0.588	4.7	6.5	10.6	1405.4	O K
240 min Summer	49.609	0.609	5.8	6.5	11.9	1463.5	O K
360 min Summer	49.632	0.632	5.9	6.5	12.1	1533.9	O K
480 min Summer	49.644	0.644	5.9	6.5	12.2	1571.8	O K
600 min Summer	49.650	0.650	6.0	6.5	12.2	1590.9	O K
720 min Summer	49.652	0.652	6.0	6.5	12.2	1597.7	O K
960 min Summer	49.654	0.654	6.0	6.5	12.2	1602.0	O K
1440 min Summer	49.648	0.648	6.0	6.5	12.2	1585.1	O K
2160 min Summer	49.635	0.635	5.9	6.5	12.1	1544.0	O K
2880 min Summer	49.619	0.619	5.9	6.5	12.0	1494.3	O K
4320 min Summer	49.557	0.557	4.6	6.5	10.4	1321.5	O K
5760 min Summer	49.493	0.493	4.4	6.5	10.3	1154.1	O K
7200 min Summer	49.432	0.432	4.2	6.5	10.3	999.9	O K
8640 min Summer	49.380	0.380	4.1	6.5	10.3	867.8	O K
10080 min Summer	49.333	0.333	4.0	6.5	10.3	753.7	O K
15 min Winter	49.432	0.432	4.2	6.5	10.3	999.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	214.767	0.0	790.7	31
30 min Summer	123.574	0.0	848.9	45
60 min Summer	71.102	0.0	1182.4	74
120 min Summer	40.911	0.0	1350.7	134
180 min Summer	29.609	0.0	1455.0	192
240 min Summer	23.540	0.0	1529.6	250
360 min Summer	17.037	0.0	1628.2	368
480 min Summer	13.544	0.0	1682.6	486
600 min Summer	11.337	0.0	1711.9	604
720 min Summer	9.803	0.0	1722.0	722
960 min Summer	7.852	0.0	1715.3	942
1440 min Summer	5.743	0.0	1671.7	1162
2160 min Summer	4.200	0.0	2538.8	1548
2880 min Summer	3.364	0.0	2700.7	1964
4320 min Summer	2.368	0.0	2769.7	2820
5760 min Summer	1.845	0.0	2981.9	3640
7200 min Summer	1.521	0.0	3072.2	4400
8640 min Summer	1.299	0.0	3147.9	5120
10080 min Summer	1.136	0.0	3211.3	5856
15 min Winter	214.767	0.0	841.3	30

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Σ Max Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	49.490	0.490	4.4	6.5	10.3	1145.7	O K
60 min Winter	49.552	0.552	4.6	6.5	10.4	1307.8	O K
120 min Winter	49.614	0.614	5.9	6.5	11.9	1479.7	O K
180 min Winter	49.646	0.646	6.0	6.5	12.2	1579.7	O K
240 min Winter	49.668	0.668	6.0	6.5	12.3	1647.7	O K
360 min Winter	49.696	0.696	6.1	6.5	12.6	1734.1	O K
480 min Winter	49.711	0.711	6.2	6.5	12.7	1783.5	O K
600 min Winter	49.720	0.720	6.2	6.5	12.7	1811.8	O K
720 min Winter	49.724	0.724	6.2	6.6	12.8	1826.3	O K
960 min Winter	49.730	0.730	6.2	6.6	12.8	1845.3	O K
1440 min Winter	49.723	0.723	6.2	6.6	12.8	1821.8	O K
2160 min Winter	49.705	0.705	6.1	6.5	12.6	1764.9	O K
2880 min Winter	49.682	0.682	6.1	6.5	12.5	1691.4	O K
4320 min Winter	49.606	0.606	5.8	6.5	11.9	1453.3	O K
5760 min Winter	49.524	0.524	4.5	6.5	10.3	1233.9	O K
7200 min Winter	49.435	0.435	4.2	6.5	10.3	1006.9	O K
8640 min Winter	49.359	0.359	4.0	6.5	10.3	816.8	O K
10080 min Winter	49.292	0.292	3.8	6.5	10.3	656.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	123.574	0.0	871.9	45
60 min Winter	71.102	0.0	1317.6	74
120 min Winter	40.911	0.0	1498.0	130
180 min Winter	29.609	0.0	1605.3	188
240 min Winter	23.540	0.0	1674.8	246
360 min Winter	17.037	0.0	1751.7	362
480 min Winter	13.544	0.0	1783.0	478
600 min Winter	11.337	0.0	1789.4	592
720 min Winter	9.803	0.0	1788.8	706
960 min Winter	7.852	0.0	1783.1	926
1440 min Winter	5.743	0.0	1750.9	1330
2160 min Winter	4.200	0.0	2838.3	1656
2880 min Winter	3.364	0.0	3011.7	2116
4320 min Winter	2.368	0.0	2993.1	2996
5760 min Winter	1.845	0.0	3339.8	3928
7200 min Winter	1.521	0.0	3440.9	4752
8640 min Winter	1.299	0.0	3525.8	5456
10080 min Winter	1.136	0.0	3597.6	6160

Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.244	Cv (Winter)	0.840
Return Period (years)	100	E (1km)	0.316	Shortest Storm (mins)	15
Site Location		F (1km)	2.474	Longest Storm (mins)	10080
C (1km)	-0.024	Summer Storms	Yes	Climate Change %	+40
D1 (1km)	0.313	Winter Storms	Yes		
D2 (1km)	0.339	Cv (Summer)	0.750		

Time Area Diagram

Total Area (ha) 2.245

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	0.561	4	8	0.561	8	12	0.561	12	16	0.562

Model Details

Storage is Online Cover Level (m) 50.500

Infiltration Basin Structure

Invert Level (m) 49.000 Safety Factor 5.0
Infiltration Coefficient Base (m/hr) 0.02590 Porosity 1.00
Infiltration Coefficient Side (m/hr) 0.02590

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2106.0	0.601	3070.0	1.201	0.0	2.100	0.0
0.100	2201.0	0.700	3174.0	1.300	0.0	2.200	0.0
0.200	2296.0	0.800	3279.0	1.301	0.0	2.300	0.0
0.300	2392.0	0.900	3385.0	1.500	0.0	2.400	0.0
0.400	2490.0	1.000	3493.0	1.501	0.0	2.500	0.0
0.500	2588.0	1.001	0.0	1.900	0.0		
0.600	2688.0	1.200	0.0	2.000	0.0		

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SHE-0124-6700-0700-6700
Design Head (m)	0.700
Design Flow (l/s)	6.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	124
Invert Level (m)	49.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	6.5
Flush-Flo™	0.224	6.5
Kick-Flo®	0.498	5.5
Mean Flow over Head Range	-	5.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.4	1.200	8.3	3.000	12.8	7.000	19.2
0.200	6.5	1.400	8.9	3.500	13.8	7.500	19.8
0.300	6.4	1.600	9.5	4.000	14.7	8.000	20.5
0.400	6.2	1.800	10.1	4.500	15.6	8.500	21.1
0.500	5.5	2.000	10.6	5.000	16.4	9.000	21.7
0.600	6.0	2.200	11.1	5.500	17.1	9.500	22.3
0.800	6.9	2.400	11.5	6.000	17.9		
1.000	7.6	2.600	12.0	6.500	18.6		

APPENDIX 6
LOCAL LEAD FLOOD AUTHORITY PRE-APPLICATION RESPONSE, 20TH MAY 2020

Norfolk County Council

Community and Environmental Services
County Hall
Martineau Lane
Norwich
NR1 2SG
NCC contact number: 0344 800 8020
Textphone: 0344 800 8011

via e-mail
Abel Homes Limited
Neaton Business Park
Norwich Road
Watton
Norfolk
IP25 6JB

Your Ref:
Date: 20 May 2020

My Ref: FW2020_0343
Tel No.: 0344 800 8020
Email: llfa@norfolk.gov.uk

Dear Mr Piper,

Town and County Planning (Development Management Procedure) (England) Order 2015

Pre-app advice: Land South Of Norwich Road, Hingham Norfolk

Thank you for your pre-app enquiry on the above site, received on 18 May 2020.

As part of any submission, we would expect the applicant to provide evidence to demonstrate that the proposals for surface water management are sufficient to prevent an increase in the risk of flooding as a result of increased speed of runoff through the development; and, appropriately integrate within the development layout the ingress, through flow and egress of surface water flow path exceedance routes identified as affecting the development site.

A written response to your previous Pre-app enquiry was sent on 16 April and subsequently discussed at a pre-app meeting carried out remotely on 17 April 2020, (meeting minutes were forwarded to yourselves on 23 April 2020).

We stated would wish to see appropriate information on the following and gave recommendations on the FRA submitted (see Appendix A).

- Appropriate assessment and mitigation of surface water flooding that may affect the development,
- Sustainable Drainage Systems (SuDS) proposals in accordance with appropriate guidance including “Non-statutory technical standards for sustainable drainage systems” March 2015 by Department for Environment, Food and Rural Affairs (DEFRA).
- At least one feasible proposal for the disposal of surface water drainage should be demonstrated and, in many cases, supported by the inclusion of appropriate information.
- It is important that the SuDS principles and hierarchies have been followed in terms of surface water disposal location, prioritised in the following order: disposal of water to

Continued…/

shallow infiltration, to a watercourse, to a surface water sewer, combined sewer / deep infiltration (generally greater than 2m below ground level),

- the SuDS components used within the management train (source, site and regional control) in relation to water quality and quantity, identifying multifunctional benefits including amenity and biodiversity.
- The drainage strategy should also contain a maintenance and management plan detailing the activities required and details of who will adopt and maintain all the surface water drainage features for the lifetime of the development.
- The drainage strategy will include a phasing schedule considering how the SuDS relates to the whole site. In particular, highlighting where different future phases rely on each another for connection to the final discharge location and how this will be implemented, during construction and operation of the development.

The following documents have now been submitted to support this enquiry:

- Sketch Masterplan Ref: SK01 Rev A04 dated 9 March 2018
- FRA letter (Richard Jackson Ref: 48851/MJD dated 18 May 2020).
- A flood map for planning (dated 28 February 2020)
- Drainage calculations dated 13 ay 2020 including Greenfield run-off calculations

The revised Masterplan now show that properties are now not within the flood flow path in the top left of the site. However, the same cannot be said for the south of the site, where it appears properties are still within the flow path (land parcels 2 & 7). The LLFA would prefer that properties within the flood zones are avoided. If this is not possible, then attention should be paid to finished floor levels. In this case, levels may have to be 600mm above predicted flood levels. It is understood that at this stage there is still scope to design the layout around the flow paths. It is welcomed that the infiltration basin has now been moved out of the flood risk area.

Consideration has now been given to the water quality for this site. Also, greenfield run off rates have been included. The submitted documentation now accounts for 10% urban creep.

Infiltration is still proposed as the method of discharge of surface water. The infiltration rates used are now for this site as opposed to the adjacent site. Plan 48851-PP-SK16B show locations of infiltration results. This indicates that infiltration is more viable in the west of the site. At detailed design, infiltration testing should be undertaken in accordance with BRE 365 or equivalent (as in our guidance Section 15 and 16) in areas of the site which has shown that infiltration is initially favourable (better than 1x10-6 m/s). Testing should be completed three times at each proposed infiltration location at **representative depths and locations.** It should also be proven that there is 1.2m between a proposed infiltration structure invert and seasonally high groundwater levels. The evidence supporting this should be submitted. It is noted that at the pre-app meeting, the difference in infiltration rates between the west of this site and the adjacent site at the field line varied considerably. As discussed, the neighbouring phase only had shallow infiltration where a partial infiltration scheme was eventually utilised. It was proposed that there were some areas where it was felt the site need further addressing to evidence/clarify these findings or a strategy re-design may need to be considered.

Continued…/

It is now stated that if, following further infiltration testing, at the detailed design stage, permeability of the soils was not found to be suitable for the western parcels of land, a similar strategy for that of the eastern parcels will be adopted, with under-drained permeable paving and a piped network discharging to the existing pond via the new lagoon. The FRA assesses the existing outfall to the pond and concludes that there is sufficient capacity for the discharge from the proposed development through the pond.

Maintenance and Management of the site has now been considered.

Please note if there are any works proposed as part of this application that are likely to affect flows in an ordinary watercourse, then the applicant is likely to need the approval of the County Council. In line with good practice, the Council seeks to avoid culverting, and its consent for such works will not normally be granted except as a means of access. It should be noted that this approval is separate from planning.

Yours sincerely,

Lucy

Lucy Perry

Flood Risk Engineer

Flood and Water Management Team
Lead Local Flood Authority

Disclaimer
We have relied on the accuracy and completeness of the information supplied to us in providing the above advice and can take no responsibility for incorrect data or interpretation, or omissions, in such information. If we have not referred to a particular issue in our response, it should not be assumed that there is no impact associated with that issue.

Continued…/

Appendix A

An FRA (Richard Jackson Ref: 48851/LLG/MJD dated 29 February 2020) has been provided in support of this pre-app application. We have reviewed the information as submitted and wish to make the following comments.

Recommendations

- The drainage strategy has been developed by referring to the Plandescil report (Ref: 17758 dated October 2014) previously submitted for Phase 1, and has considered permeability of soils ranging from 7.7 x 10-6 m/s to 9.47 x 10-6 m/s. However further investigation was undertaken for Abel homes in June 2015 by A F Howland (Ref: APS/15.114/Add 2). This additional infiltration testing undertaken subsequently resulted in unfavourable soakage rates at depth. For Phase 1 it was therefore proposed to utilise shallow infiltration and discharge from the surface water sewer network on the site to the pond that is adjacent to Woodside on Seamere Road. **Full, up to date ground investigation should be carried out for this phase of the works.**
- Calculations should be provided for the determination of the depths of storage beneath any permeable surfaces as shown in the submitted drainage strategy. The applicant should therefore either: a) provide calculations demonstrating that the storage for the permeable paving will be sufficient should the rate of infiltration be lower than previously assessed; b) increase the depth of sub-base to allow for additional storage within the permeable paving system to prevent surcharging; or c) include positive outfalls from the permeable paving and include such areas in the calculations for the wider drainage network to show there is sufficient storage to prevent flooding of the surface water network.
- Urban creep should be considered to account for increases in impermeable surfaces through the lifetime of the development. If the development is for 100 dwellings, a 10% change allowance of impermeable area should be included (see table 5 of our guidance document).
- When identifying the critical rainfall event, the LLFA guidance has been updated, and that the advice to use FSR rainfall information if the critical storm duration is less than 1 hour has been removed. Only up to date FEH data will be accepted in the future.
- Modelling of the conveyance system should be provided for the 1% AEP plus climate change rainfall event, including plans showing where flood water originating from any flooded components of the drainage system (where appropriate) would be directed. Exceedance flow routes through the site should be considered. We understand that flows from off-site are not the responsibility of a landowner to attenuate. However, it is in the developer's responsibility to manage the risk within the site. The influence of offsite flows and the affect they may have on the ability of the proposed drainage system to provide the required standard of protection should be considered.
- Finished ground floor levels of properties should be a minimum of 300mm above expected flood levels of all sources of flooding (including the ordinary watercourses, SuDS features and within any proposed drainage scheme) or 150mm above ground level, whichever is the more precautionary.
- A maintenance plan for the proposed drainage system should be considered, taking into account the maintenance activities that are likely to be required, their frequency

and responsibilities. Please note that there are long term practicality issues for maintaining soakaways with shared maintenance responsibilities, which potentially could be within the back gardens of properties and not within public open space to allow easy access. They may also wish to consider if permitted development rights are removed to prevent accidental damage to the structures or building over them.

Reason

To prevent flooding in accordance with National Planning Policy Framework paragraph 163,165 and 170 by ensuring the satisfactory management of local sources of flooding surface water flow paths, storage and disposal of surface water from the site in a range of rainfall events and ensuring the SuDS proposed operates as designed for the lifetime of the development.

APPENDIX 7
DRAFT STATEMENT OF COMMON GROUND

Greater Norwich Local Plan (GNLP) Site Allocation Statement of Common Ground (SoCG)

Between
Broadland District Council, South Norfolk Council,
Norwich City Council, Norfolk County Council

And

Abel Homes

Site Reference: GNLP0520
Site Address: Land to the south of Norwich Road, Hingham

Proposed Development:

Residential development for approximately 100 units

Introduction

The Greater Norwich authorities want to ensure sites allocated in the GNLP are achievable, where possible wholly compliant with all relevant planning considerations, and deliverable in a timely way. It is with that purpose in mind that landowners, agents and developers with a site likely to be included in the GNLP are being asked to agree a Site Allocation Statement of Common Ground (SoCG). Each SoCG will be available to the inspector appointed to examine the GNLP so that they can satisfy themselves of the commitment to deliver each site and to meeting local plan requirements.

The GNLP Team wants the process of agreeing a SoCG to be a frank but collaborative process for all parties concerned. In the case of most sites, this process is likely to commence in Autumn 2020 and conclude in 2021 as the Regulation 19 submission draft of the GNLP is finalised. For other sites, for example where development may entail abnormal costs, discussions may continue in to 2022, as the GNLP reaches its examination in public.

This SoCG template has been designed with consideration to the possibility of future planning reforms. It is deliberately straightforward and only asks the questions that any landowner, agent, or developer would naturally ask themselves. The template only requires 700 words of written response to complete, but its importance should not be underestimated.

The GNLP Team regards the viability and timely delivery of development as a high priority. Therefore, the working assumption is without a SoCG a site is unlikely to be allocated.

General Guidance

When completing the SoCG template please be precise. For example, in the description of development proposed, use the appropriate GNLP four-digit reference code, as well as giving a site address (including a postcode or eastings/northings reference).

Signatories to the SoCG should include all relevant parties with a role in bringing forward the proposed development. This should include all landowners, agents, developers, and possibly end-users of the development (if known).

The SoCG template contains a series of free-text questions that are designed to be answered within 100 words. If for whatever reason answering one or more of these questions is not possible or proves difficult site promoters are welcome to seek guidance from the GNLP Team. This may lead to completing the SoCG with a description of what issues remain for resolution at a future date.

Completing this SoCG template should be done with reference to the draft policies associated to the GNLP. Notable examples that will likely affect the form of development on site and its construction costs include:

- Provision of green infrastructure and suitable alternative green space (known as SANGS) under Policy 2 Sustainable Development and Policy 3 Environmental Protection and Enhancement; and,

- Obligations for affordable housing under Policy 5 Homes.

It should also be noted that completing a SoCG is a separate exercise from other data requests made by the Greater Norwich Local Plan Team, or the Greater Norwich authorities. For example, this is a separate exercise to the Five-year Housing Land Supply statements that are requested for the Annual Monitoring Report.

Commercially Sensitive or Other Confidential Information

By submitting a SoCG you are consenting to the details about you and your site/s being published and available for public viewing. Any information that you consider to be confidential or commercially sensitive and would not want published should be excluded from this form.

By signing you are agreeing to the information provided being to the best available knowledge accurate, and that it can be used in preparation of the Greater Norwich Local Plan (GNLP) – and used in evidence at the public examination of the GNLP.

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1. Please provide a commentary on the site's progress in respect to the three tests of being available, suitable, and deliverable.
[Approximately 100 words recommended]

Available
The site is controlled, in its entirety, by Abel Homes by way of an Option Agreement and is leased to a local farmer on a temporary basis, which can be terminated with the agreed notice period at any time.

Suitable
Hingham is identified in both the Joint Core Strategy for Broadland, Norwich and South Norfolk (JCS) (2011) and the draft GNLP, as a Key Service Centre, as it provides a location which has a good range of services and amenities to support day to day life. The suitability of Hingham, particularly the eastern part of the village, has been demonstrated through the development of The Hops by Abel Homes.

Deliverable
Abel Homes have a proven track record of delivering high quality residential schemes in Norfolk. Abel Homes are confident that the delivery of the site is viable having regard to the policy requirements of the draft GNLP and there are no factors that we are aware of, at this moment in time, that could prevent the delivery of the site. This statement is, however, made in the context of the representations to the Greater Norwich Local Plan Regulation 18c consultation.

2. Please provide a commentary on any land ownership constraints that may affect or delay development of the site.
[Approximately 100 words recommended]

As detailed above, the site is controlled, in its entirety, by Abel Homes by way of an Option Agreement and is leased to a local farmer on a temporary basis, which can be terminated with the agreed notice period at any time.

3. Please provide a commentary on progress to making a planning application – such as pre-application advice, or if planning permission exists on all or part of the site.
[Approximately 100 words recommended]

Pre-application discussions have been undertaken with South Norfolk Council with further meetings planned.

Abel have commissioned a project team, including architect, highways consultant and drainage engineer, to prepare a full planing applicaiton.

4. Please provide a commentary on the site's delivery, for example a predicted start-on-site, the annual rate of delivery, and the development's likely completion date. *[Approximately 100 words recommended]*
Abel Homes are currently seeking to submit an application following the adoption of the GNLP (late 2022). Assuming 6-9 months for the determination of the planning application, alongside a further 6 months for construction to commence on site, housing could start to be delivered on site in 2024. It is estimated that, based on the completion rates of other developments by Abel Homes, that the scheme would deliver 35 units per annum, ensuring completion in 2027.

5. Please provide a commentary on engagement held with statutory bodies and if any agreements have been made. *[Approximately 100 words recommended]*
Discussions have been held with Norfolk County Council (NCC) who have confirmed that the proposed access arrangements are acceptable. Discussions have been undertaken with the Lead Local Flood Authority and it has been agreed that, in principle, surface water drainage can be addressed on site. Initial discussions have been held with Hingham Town Council.

6. Please provide a commentary on any known technical constraints about the site – such as but not limited to highways, heritage, or ecology. *[Approximately 100 words recommended]*
A substantial amount of technical work has been undertaken to inform the preparation of Representations to the GNLP, relating to flood risk and surface water drainage, ecology, highways & access, heritage, and ground conditions. Through this work, no technical constraints have been identified, which could not be addressed as part of any development.

7. Please provide a commentary on community benefits the site will offer – such as but not limited to land and/or buildings for education and community provision. *[Approximately 100 words recommended]*
The proposed development will facilitate the provision of: affordable housing, open space, including a (children's play facility), and an enhanced pedestrian crossing of the Norwich Road.

Signed on Behalf of the Greater Norwich Development Partnership	Date

Signed on behalf of Abel Homes	Date

BIDWELLS