

FLOOD RISK ASSESSMENT

PROPOSED WORKSHOP AND DWELLING,
MILL GREEN ROAD,
PINCHBECK,
SPALDING,
LINCOLNSHIRE.
PE11 3PU



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FLOOD RISK ASSESSMENT FOR PROPOSED RELOCATION OF & AN EXTENDED WORKSHOP & REPLACEMENT DWELLING, MILL GREEN ROAD, PINCHBECK, SPALDING, LINCOLNSHIRE. PE11 3PU

INTRODUCTION

The Government has placed increasing priority on the need to take full account of the risks associated with flooding at all stages of the planning and development process. This seeks to reduce the future damage to property and the risk to life from incidents of flooding. Their expectations relating to flooding are contained in the National Planning Policy Framework February 2019, (NPPF), which identifies how the issue of flooding is dealt with in the drafting of planning policy and the consideration of planning applications by avoiding inappropriate development in areas at risk from flooding and to direct development away from areas at highest risk.

The NPPF provides that development in areas at risk of flooding should be avoided and seeks to direct development away from areas at highest risk. There is a sequential, risk-based approach to the location of development avoiding where possible, flood risk to people and property managing any residual risk and taking account of the impacts of climate change.

The Environment Agency's flood maps show areas that are at risk, from fluvial and tidal flooding. These maps show the limits of the flood plain of the area which could be affected by flood events, over topping or breaching of flood defences. They are based on the approximate extent of floods with a 1% annual probability of exceedance (1 in 100-year flood) for rivers and 0.5% annual probability of exceedance (1 in 200-year flood) for coastal areas under present expectations or the highest known flood. However, they do not consider of the presence of defences or the likelihood that flood return intervals will be reduced by climate change.

This Flood Risk Assessment and Drainage Statement has been prepared in support of a planning application and considers the risk of flooding from fluvial and tidal sources in accordance with National Planning Policy Framework (NPPF). It also considers the risks of localised flooding due to inadequate Foul and Surface Water Sewers, Failure of Reservoirs, Water Main pipe bursts, Sewer Blockages, Pump Failures or High Ground Water Table etc.

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APPLICATION SITE

The site is located at The Anglian Business Centre, Mill Green Road, Pinchbeck, Spalding, PE11 3PU within the South Holland District Council's administrative area. The National Grid Reference is TF 23402 24661. **Plan 1**

Anglia UK Ltd is a highly specialist company that has grown from relatively humble beginnings and now provides services to multi-national clients in the fields of vehicle and asset repossession, vehicle logistics (transportation of vehicles nationwide), The specialist nature of the business, especially that of vehicle logistics and recovery, has necessitated the need to essentially operate a site 24/7. For insurance purposes, vehicles must be brought back to the site and stored under lock and key and this also applies to other items that are recovered for clients.

The current planning application is for the following: -

- A - Storage building to be relocated
- B - Existing building to be extended by 2 bays (12m)
- C - Containers to be removed
- D – Proposed replacement dwelling
- E - Existing building to be removed
- F - Vehicle storage area

Plans 2, 3, 4, 5, 6, & 7



The proposed development site is shown to be within Flood Zone 3a 'High Probability' as detailed on the Environment Agency's Flood Zone Maps without defences, and as defined in Table 1 of NPPG. Map1

Table 1: Flood Zones Definition (Ignoring the presence of defences)

Flood Zone 3- High Probability
Definition Land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year. The water-compatible and less vulnerable uses of land are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone. The more vulnerable and essential infrastructure uses should only be permitted in this zone if the Exception Test is passed. Essential Infrastructure permitted in this zone should be designed and constructed to remain operational and safe for uses in times of flood Flood Risk Assessments requirements All proposals in this zone should be accompanied by a Flood Risk Assessment. Policy aims Developers and local authorities should seek opportunities to: • reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage techniques; • relocate existing development to land with a lower probability of flooding; • create space for flooding to occur by allocating and safeguarding open space for flood storage.

Applying the Flood Risk Vulnerability Classification in Table 2 of NPPG the proposed residential development is classified as "More Vulnerable", with Table 1 of NPPG stating that such uses are appropriate in this zone subject to the Exception Test. All other uses are classified as "Less Vulnerable" with Table 1 of NPPG stating that such uses are appropriate in this zone.

Table 2: Flood Risk Vulnerability Classification

More Vulnerable
• Hospitals • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for: dwelling houses; student halls of residence; drinking establishments; nightclubs; and hotels • Non-residential uses for health services, nurseries and educational establishments • Landfill and sites used for waste management facilities for hazardous waste. • Sites used for holiday or short-let caravan and camping, subject to a specific warning and Evacuation Plan.
Less Vulnerable
• Police ambulance and fire stations that are not required to be operational during flooding • Buildings used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in "more vulnerable" and assembly and leisure. • Land and buildings used for agricultural and forestry. • Waste treatment (except land fill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works that do not need to remain operational during times of flood. • Sewage treatment works (if adequate measures to control pollution and manage sewage during flood events are in place).

From the topographical survey the site is reasonably level, the levels vary from 3.19mODN to 2.78mODN averaging 3.00m ODN. The road level at the site entrance, is 3.28mODN. The ground level at the existing workshop building to be resited is 3.11ODN with a floor level of 3.22mODN the ground level at the new location is 3.00mODN and the proposed floor level is to be 3.17mODN. The ground level at the existing managers accommodation is 3.00mODN with a floor level 3.40mODN, it is proposed that with the ground level for the new replacement bungalow, being 2.98mODN, the floor level is to be raised to 3.30mODN. **Plan 8**

DRAINAGE AUTHORITIES

Environment Agency

The Environment Agency is responsible for reducing the risk of flooding from designated main rivers and from the sea.

The following potential sources of flooding affecting the development site have been identified as:

- From the River Welland (Tidal)
- The River Glen (Fluvial)
- Welland & Deepings Internal Drainage Board system

The Flood Zone Maps identify river catchments over 3 sq. km. These maps are a theoretical estimate of areas that could be inundated should no defence exist. In practice, current standards of protection would result in flood envelopes substantially less than shown by these maps. The maps make no allowance for local, site specific features.

The flood zone maps show that the site of the proposed development is considered at risk from flooding. These maps indicate that the area would be flooded without flood defences, which are in place, (with an annual probability of more than 0.5% i.e. return frequency of less than 1 in 200 years for tidal flooding or more than 1.33% return frequency of less than 1 in 100 years for fluvial flooding). **Map 1**

The National Flood Risk Assessment Map shows that the site is at Medium risk of flooding. Medium means that each year, this area has a chance of flooding of less than 1 in 30 (3.3%) but greater or equal to 1 in 100 (1%). This takes into account the effect of any flood defences that may be in this area. Flood defences reduce, but do not completely stop the chance of flooding as they can be overtopped or fail. **Map 2**

River Welland

The River Welland lies some 2.55Km to the south-east of the site and is tidal down stream of Marsh Lane Sluice, the present day 1 in 200-year tide flood level is 5.98mODN. The tidal flood defences of the tidal River Welland consist of earth embankments which are in good condition and the crest heights are circa 7.00mODN.

From Lincolnshire & Northamptonshire Area, Tidal Modal Analysis (June 2006) **Map 3**

Peak tide levels Present Day (2006) at Marsh Road (Tidal River) 0.5% (1 in 200) = 5.98mODN
Peak tide levels (2116) at Marsh Road (Tidal River) 0.5% (1 in 200) = 5.98mODN plus climate change allowances from Table 3 of 1.21mm = 7.11mODN

Taking the precautionary approach, the Hazard Rating following a breach which in Flood Risk Assessment (FD 2320) Guidance for New Development Phase 2 R& D Technical Report these are classified as low <0.75, moderate 0.75-1.25, significant 1.25-2.50 and extreme >2.50 based upon an empirical measure of velocity and depth.

Flood Hazard			Description
	<0.75	Low	Caution – Flood Zone with shallow flowing water or deep standing water.
	0.75 – 1.25	Moderate	Danger for Some - (i.e. children) Danger Flood Zone with deep or fast flowing water.
	1.25 – 2.0	Significant	Danger for Most – Danger Flood Zone with deep fast flowing water.
	>2.0	Extreme	Danger for All – Extreme Danger Flood Zone with deep fast flowing water.

$$HR = d \times (v + 0.5) + DF$$

Where V = Flood flow velocity (m/sec)

D = Flood depth (m)

DF = A debris factor included to represent the greater damage, or risk of injury to people, that can occur if debris is swept along with the water. = 0.5 for depths <0.25 or 1.0 for depths.

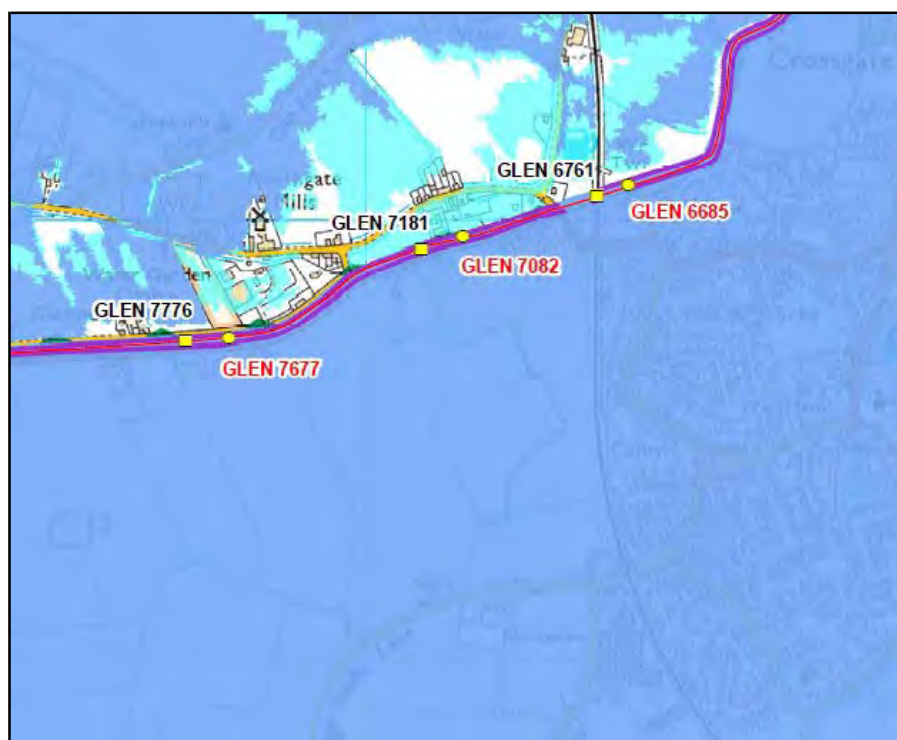
For the degree of Flood Hazard to be classified as low HR must be <0.75

The 2017 Update to SHDC, SFRA has carried out a Tidal & Fluvial Hazard Mapping, for Spalding following a breach to the defences. The Hazard, Velocity and Depth Maps, year 2115, for the 1 in 1000-year event, shows that the site where the proposed dwelling and industrial units are to be located are not within an area affected by flooding from a breach to the flood defences. **Maps 4, 5 & 6.**

River Glen

The River Glen lies some 1.3km to the north of the site and the present day 1 in 100-year flood level with 20% climate change is 4.87mODN. The flood defences of the River Glen between Herring Bridge and the A151 bridge consist of the B1180 Road which are in good condition and the crest heights for the right bank along this stretch of river are circa 5.90mODN. (SHDC SFRA).

The fluvial flood data for the model nodes shown on the map are set out in the tables below.



Node Map

Fluvial Flood Levels (mODN)

The fluvial flood levels for the model nodes shown on the attached map are set out in the table below. They are measured in metres above Ordnance Datum Newlyn (mODN).

Node Label	Easting	Northing	Annual Exceedance Probability - Maximum Water Levels (mODN)										
			50% (1 in 2)	20% (1 in 5)	10% (1 in 10)	5% (1 in 20)	2% (1 in 50)	1.33% (1 in 75)	1% (1 in 100)	1% (1 in 100) inc 20% Climate Change	0.5% (1 in 200)	0.1% (1 in 1000)	0.1% (1 in 1000) inc 20% Climate Change
GLEN 6685	523603	326081	4.01	4.16	4.23	4.31	4.34	4.35	4.38	4.84	4.44	4.60	4.94
GLEN 7082	523224	325963	4.04	4.17	4.25	4.32	4.36	4.39	4.41	4.87	4.49	4.70	5.01
GLEN 7677	522687	325733	4.06	4.20	4.28	4.35	4.41	4.43	4.45	4.91	4.54	4.79	5.07

Fluvial Flood Flows (m³/s)

The fluvial flood flows for the model nodes shown on the attached map are set out in the table below. They are measured in metres cubed per second (m³/s).

Node Label	Easting	Northing	Annual Exceedance Probability - Maximum Flows (m³/s)										
			50% (1 in 2)	20% (1 in 5)	10% (1 in 10)	5% (1 in 20)	2% (1 in 50)	1.33% (1 in 75)	1% (1 in 100)	1% (1 in 100) inc 20% Climate Change	0.5% (1 in 200)	0.1% (1 in 1000)	0.1% (1 in 1000) inc 20% Climate Change
GLEN 6761	523531	326057	25.95	29.44	31.06	33.13	34.59	35.32	35.84	43.56	38.87	48.22	56.95
GLEN 7181	523130	325934	25.69	29.20	30.85	32.93	34.37	35.09	35.60	43.18	38.62	48.05	56.90
GLEN 7776	522589	325726	25.40	29.03	30.65	32.71	34.14	34.86	35.37	42.73	38.33	48.07	56.87

This data is taken from the Welland Model (2016) and are the most up-to date currently available. The Environment Agency aim to review the models on a regular basis.

These levels are “in-channel” levels and therefore may not represent the flood level on the floodplain, particularly where the channel is embanked or has raised defences.

The site lies within the Anglian River Basin District, Peak River flows should be adjusted to reflect the latest climate change allowances. It must also be assumed, to provide a worst-case scenario, that flood defences have been raised during this period to cater for the rise in river level.

Using the Peak River Flows from the NPPG Climate change allowances shown in Table 1 in the spread sheet.

The graph and data show a prediction for the increase in river levels for the 35% and 65% increase in river level. **Document 1**

EXTRAPOLATED WATER LEVEL OUTPUTS AT NODE Glen 7082		
Upper End Scenario	5.05	mODN
Higher Central Scenario	4.80	mODN
Central Scenario	4.71	mODN

With the crest level of the B1180 road being circa 5.90mODN the climate change river levels for the Higher Central (35%) and Upper End (65%) would remain in channel. Based upon the crest heights of the flood defence the proposed site is protected with a freeboard of over 750mm.

The greatest risk of flooding of the site would therefore be from a breach to the tide earth embankments for the River Welland.

The minimum mitigation measures required for developments that do have any ground floor sleeping shall be determined by the flood depths arising from the 2115 0.1% breach scenario. The finished floor Level FFL of any new dwellings shall be informed by the flood depths. For flood depths between 0 – 0.25m deep the FFL shall be set at a minimum of 300mm above the ground level.

With the main risk to flooding of the site being tidal flooding following a breach to the tidal defences, any flooding from fluvial flooding sources has been mitigated against.

With the average site ground level at the site for the replacement dwelling being 3.00mODN, the minimum floor level will be set at 3.30mODN. which is considered to be above the tidal breach level to the River Welland for 2115.

South Holland District Council

In order to inform the process of risk assessment and site selection the District Council commissioned Haskoning UK Ltd Consultants to prepare a Strategic Flood Risk Assessment in December 2002. They have carried out an update of this report and this report was published in January 2010 and this was further updated in February 2017.

This Flood Risk Assessment has taken the results of the (2017) updated South Holland Strategic Flood Risk Assessment (SHSFRA) into account in its findings.

The whole of the tidal flooding information has been replaced by the mapping from the latest Environment Agency Tidal Hazard mapping. Where the mapping for an area contains both fluvial and tidal components, the more severe of the two has been presented.

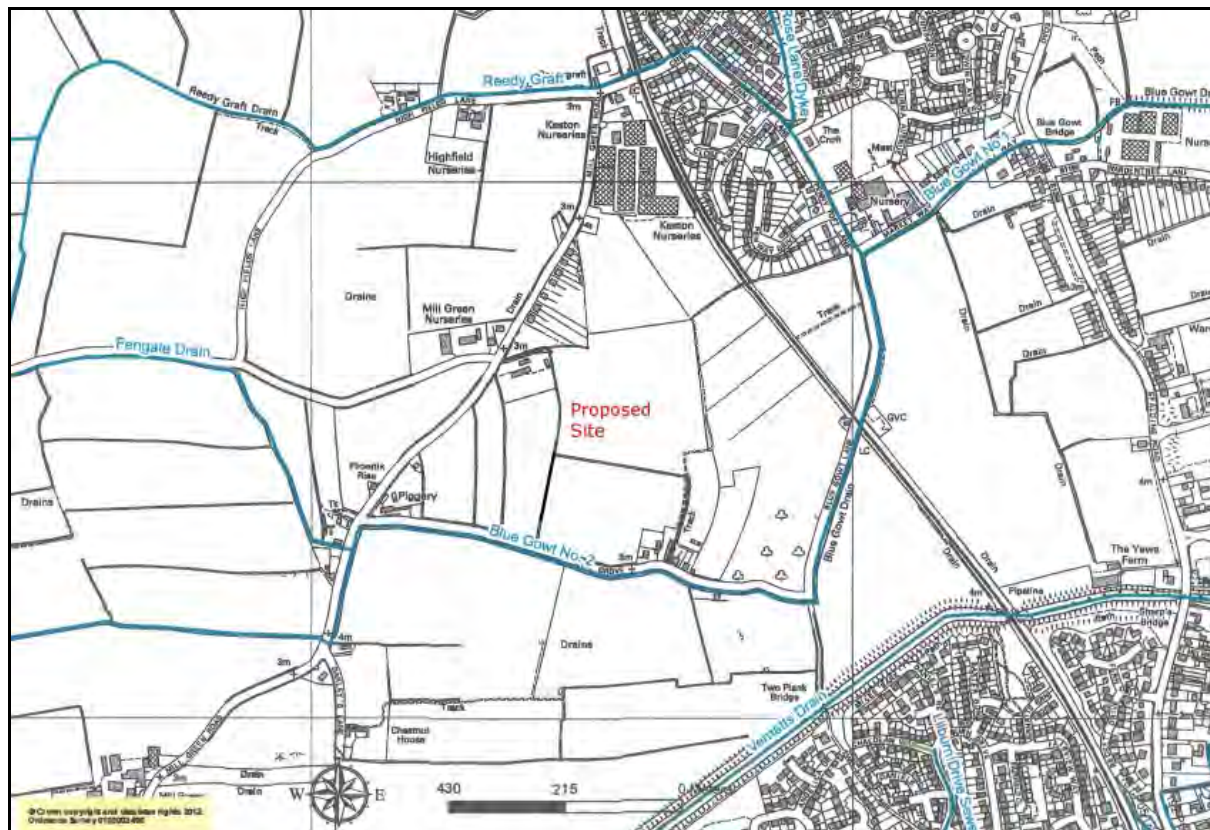
From the Residual Flood Hazard, Depth and Velocity Spalding - Year 2115 0.1% Tidal Event Probability maps,

from the update of strategic flood risk assessment for South Holland District Council, the site is not affected from a breach to the flood defences and has been used in the findings of this assessment.

Welland & Deepings Internal Drainage Board

The proposed development site is located within Catchment area of Welland & Deepings Internal Drainage Board. The Board is responsible to operate and maintain the arterial fluvial system.

The Board's nearest watercourse to the site is the Blue Gowt No 2 some 500m south of the site.



Welland & Deepings Drainage Map

Surface Water Flooding

Most the site is shown to be at no risk from surface water with isolated small areas at risk up to 300mm deep. The site is, there considered to be at low risk. Low risk means that each year this area has a chance of flooding of between 0.1% and 1%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. **Map 7**

FLOODING FROM OTHER SOURCES

Flooding is a natural process and can happen at any time from sources other than watercourses and the sea.

- Flooding from land can occur from intense rainfall, often over short duration of time that is unable to soak into the ground or enter the drainage system. However, with the natural topographic nature of the ground being flat, with no high ground around the site this will not cause any rapid inundation of the site

and is likely only lead to local ponding of shallow depth and low velocity following the natural land contours. The properties are also raised 500mm above the average ground level. The updated SFRA concluded that flooding from this source is limited to minor isolated cases and is not of strategic significance as regards to flood risk.

- The area is not known to suffer from any groundwater problems and therefore is taken as having no strategic significance as regards to flood risk.
- Flooding from sewers can occur from over loading from heavy rainfall caused by blockages or having inadequate capacity. The resulting back pressure could cause foul sewage to flow from manholes which would flow over areas of the carriageway at a lower level and be contained within the confines of the kerb lines following the natural land contour to the south-west. The Updated SFRA concluded that flooding from sewers is limited to minor isolated cases and is not of strategic significance as regards to flood risk.
- Non-natural or artificial sources of flooding such as reservoirs, lakes or canals where water is stored above natural ground level could cause flooding if the structure fails or is over topped.

SEQUENTIAL APPROACH

When applying the sequential approach for flood risk in accordance NPPF the site would fall into Zone 3a (High Probability) as the site is shown to be within the tidal flood plain as shown on the Environment Agency's Flood Map without defences in place.

However, the results of the updated SHSFRA shows that the site is located within a low/medium probability flood zone, but the area is reliant on protection by flood defences providing a standard of protection of 1 in 100 years return period.

TABLE 3: Flood risk vulnerability and flood zones 'compatibility'

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Flood Zone 1	✓	✓	✓	✓	✓
	Flood Zone 2	✓	✓	Exception Test Required	✓	✓
	Flood Zone 3a	Exception Test Required	✓	✗	Exception Test Required	✓
	Flood Zone 3b Functional Floodplain	Exception Test Required	✓	✗	✗	✗

Sequential Test

NPPF Guidance Paragraphs 155 - 165 requires development within high areas of flood risk be determined using a sequential risk-based approach to the location of development to avoid where possible flood risk to

people and property and manage any residual risk, taking account the impacts of climate change.

With the proposal being for a replacement dwelling, having regard to all relevant policies in the Local Plan, the sequential and exception test are not applicable as this site could not be located elsewhere.

As the proposal for the 'Less Vulnerable' uses are for industrial purposes on the site of the existing business, it would be unreasonable to consider sites elsewhere within the District as this facility is to sustain the established business and provide employment opportunities. In this particular case the business is centered on the land owned and operated by Anglia UK Ltd and to consider areas outside the holding would not be practical. Consequentially the Sequential Test is met, with the development being "Less Vulnerable" the Exception Test is not required.

DRAINAGE STATEMENT

This drainage statement, for the site, is a preliminary overview and will be subject to the detailed design being undertaken when planning permission and final layout has been determined. It is proposed to utilise attenuation techniques to reduce the storm water discharge from the proposed development and to minimise the impact of the development on the surrounding area and to comply with EA guidelines, which require at least one workable solution for managing surface water.

In accordance with recognised guidance, National Planning Policy Framework 2012, there is a hierarchy of where surface water should discharge. This hierarchy should be followed where practicable, and is as follows:

- 1) Infiltration
- 2) Watercourse
- 3) Public sewer

Infiltration

No infiltration methods are to be utilised for the disposal of surface water from the new and altered buildings as the infiltration tests were negative. The proposed vehicle storage area will be constructed with a hardcore sub-base topped with gravel so would mimic the existing ground conditions. **Document 2**

Watercourse

A surface water connection to a watercourse will be used as the method of disposal of surface water from the proposed and extended roof areas of the buildings, after attenuation at a maximum discharge rate of 5 litres/sec. (default Greenfield rate)

Approximate Roof areas as follows:

- Existing workshop: 437m²,
- Proposed extension: 228m²

- Shed: 162m²
- Bungalow: 115.75m²
- Garage: 19.25m²
- Total 962.00m²

Surface water runoff and storage calculations have been undertaken using a software tool developed by HR Wallingford and a summary is included below. **Document 3**

SOIL types (1 to 5) are defined in the Flood Studies Report and broadly describes the maximum runoff potential. SOIL type 1 is sandy highly permeable material with permeability reducing as the SOIL value increases. SOIL type 4 is heavy clay and 5 (which is rarely applied) is exposed rock.

The existing site is greenfield and whilst the software considers the site to be located on SOIL type 2 this is not the case and therefore a SOIL type 4 has been used.

The IH124 (1994) approach has been used to assess the greenfield run off rate.

For this Site the flow control has been limited to the default minimum discharge of 5 l/sec to utilise lower discharge rates, as the available capacity in the receiving system is not known. The on-line surface water balancing pond will provide storage at the flow control location. A Hydrobrake Optimum flow control device could attenuate flows down to the permitted discharge rates for 1 year, 30-year and up to the 1:100 year plus 40% climate change standard (default value 5 litres/sec). Flows more than these figures would be stored in the attenuation pond, where the flow would be detained, for a period of time, before draining back down.

The storage volume has been calculated for 40% increase in peak rainfall allowance = 37m³

The surface water from the above buildings will be collected into underground pipes to convey the flows to the attenuation pond approximately 4.1m x 9.0m x 1.00m, (or similar) attenuation pond with 1:2 side slopes will provide 37m³ of storage with 0.30m of freeboard. The pond will be located in the adjacent field and the discharged limited to 5 l/sec to the adjacent watercourse shown on the drainage plan.

As there is a positive drainage system capable of receiving flows from the development there is no likely impact on neighbouring property.

Any drainage routes through the Site will be maintained both during the works on Site and after completion of the works. The upstream and downstream riparian owners and any areas that are presently served by any drainage routes passing through or adjacent to the Site, will not be adversely affected by the development, as there are no changes to these, proposed by the development.

The management of Anglia UK Ltd will be responsible for the maintenance of the entire surface water drainage system.

CLIMATE CHANGE

Global warming is now recognised that it is likely to affect the frequency and severity of extreme events as both tidal and fluvial flooding. The Climate change allowances in the NPPF Guidance was updated on the 19th February 2016.

The site is located within the Anglian River Basin, for sites within Flood Zone 3a and for “More Vulnerable” land uses the Higher Central and Upper End river flow allowances figures in Table 1 should be used.

Table 1 Peak river flow allowances by river basin district (1961 to 1990 baseline)				
River basin District	Allowance category	Total potential change anticipated for '2020s' (2015 to 2039)	Total potential change anticipated for '2050s' (2040 to 2069)	Total potential change anticipated for '2080s' (2070 to 2115)
Anglian	Upper End	25%	35%	65%
	Higher Central	15%	20%	35%
	Central	10%	15%	25%

The effect of global warming on peak rainfall allowances is given in Table 2.

Table 2 Peak rainfall intensity allowance in small and urban catchments (1961 to 1990 baseline)			
Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper End	10%	20%	40%
Higher Central	5%	10%	20%

The annual sea rise due to climate change is given in NPPF and the recommended contingency allowances are stated in Table 3

Table 3 Peak sea level allowance for each epoch in (mm) per year with cumulative sea level rise for each epoch in brackets (use 1990 baseline)					
Area of England) (Use River Basin maps	1990 to 2025	2026 to 2050	2051 to 2080	2081 to 2115	Cumulative Rise 1990 to 2115 (m)
East, Midlands, London, South East	4 (140mm)	8.5 (212.5mm)	12 (360mm)	15 (525mm)	1.24m

From Information requested from the Environment Agency the Main risk of flooding of the site is from the tidal River Welland which is located some 2.55 Km east of the site and is tidal down stream of Marsh Lane Sluice, the 1 in 200-year tide flood level for year Present Day (2006) at Marsh Road (Tidal River) 0.5% (1 in 200) = 5.98mODN. Peak tide levels (2116) at Marsh Road (Tidal River) 0.5% (1 in 200) = 5.98mODN plus climate change allowances from Table 3 of 1.21mm = 7.11mODN

The tidal flood defences of the tidal River Welland consist of earth embankments which are provided with a soak dyke on the landward toe, they are in good condition and the minimum crest heights are 7.57mODN, this provides a protected freeboard of 360mm.

With the floor level being decided from the breach tidal flood depths, any flooding from fluvial sources is considered to be less.

FLOOD PROTECTION

Any impact of damage to the properties can be foreseen and mitigated against by relatively simple design and construction techniques. There are two forms of flood protection works: -

- **Flood-resistance or proofing works:** - these try to reduce the amount of water entering a building.
- **Flood-resilient works:** - these reduce the amount of damage caused by water entering the building.

The proposed property will have the following resilient measures incorporated in the construction in accordance with "Improving the flood performance of new buildings" CLG (2007).

- The lowest ground floor level for the replacement dwelling is to be raised 300mm above existing average ground level with the proposed level being 3.30mODN.
- Arrange for all service circuits at ground floor level to be routed at first floor level and where practical socket outlets, boilers etc. to be a minimum of 0.5m above the raised ground floor level.

CONCLUSION

- o The proposed development site is shown to be within Flood Zone 3a 'High Probability' as detailed on the Environment Agency's Flood Zone Maps without defences.
- o The site does have the protection of both tidal and fluvial flood defences which are well maintained by the Environment Agency.
- o The 2017 Update to SHDC, SFRA has carried out a Tidal Hazard Mapping, River Welland upstream of Welland Bridge, following a breach to the defences. The Tidal Hazard, Velocity and Depth Maps, year 2115, for the 1 in 1000-year event, shows that the site where the proposed dwelling and industrial units are to be located are not within an area affected by flooding from a breach to the flood defences.
- o The lowest ground floor level for the replacement dwelling is to be raised 300mm above the existing average ground level with the proposed level being 3.30mODN, which is considered to be above the 2115 climate change breach level at the site. For operational needs the floor level for the industrial buildings will be raised 150mm above the ground level.
- o The Flood Risk Vulnerability Classification in Table 2 of NPPG the proposed residential development is classified as "More Vulnerable", with Table 1 of NPPG stating that such uses are appropriate in this zone

subject to the Exception Test. All other uses are classified as “Less Vulnerable” with Table 1 of NPPG stating that such uses are appropriate in this zone.

- o The drainage strategy for the development is the utilisation of on- site Suds attenuation methods with attenuated flows discharged to a watercourse.
- o Any impact of damage to the properties can be foreseen and mitigated against by relatively simple design and construction techniques. They will be constructed using materials which are flood resilient construction as outlined in the report
- o Flooding from other sources is unlikely to affect the site.

APPENDIX

Document 1	Climate Spreadsheet & Graphs.
Document 2	Soakaway Testing Report
Document 3	Surface Water Runoff and Storage Calculations
Map 1	Environment Agency Flood Zone Map
Map 2	Flooding from Rivers and Sea Map.
Map 3	Tidal Model Analysis 2006 Map.
Map 4	South Holland SFRA Residual Flood Hazard Spalding year 2115 0.1% Event Probability
Map 5	South Holland SFRA Residual Peak Depth Spalding year 2115 0.1% Event Probability
Map 6	South Holland SFRA Residual Peak Velocity Spalding year 2115 0.1% Event Probability
Map 7	Surface Water Flood Map
Plan 1	Location Plan
Plan 2	Existing Layout Plan
Plan 3	Proposed Layout and Drainage Plan
Plan 4	Proposed Dwelling Details
Plan 5	Proposed Workshop
Plan 6	Proposed Extension
Plan 7	Proposed Storage Shed
Plan 8	Topographical Survey

Site Name
Date
Comments:
Environment Agency CCN
Number

Anglia UK Pinchbeck
Mar-19
FRA
CCN-2017-58571

**INPUT DATA
TO BLUE CELLS
ONLY**

Model Information

Model Name
Date of Model
Model Node
Modelled Results

Welland Model
Jul-16
Glen 7082

**OUTPUTS IN
YELLOW CELLS**

Re-order based on Flow	FLOW	LEVEL
2	25.69	4.04
5	29.2	4.17
10	30.85	4.25
20	32.93	4.32
50	34.37	4.36
75	35.09	4.39
100	35.6	4.41
200	38.62	4.49
100+20	43.12	4.87
1000	48.05	4.70
1000+20	56.9	5.01

Attenuation Factor

-0.93 % FOR 1:100

1.34 % FOR 1:1000

Note: Higher attenuation factors mean results through extrapolation will be over estimated

River Basin
Time Horizon
AEP Scenario

Anglian
Up to 2115
100 AEP

MAKE SURE YOU COPY THE FORMULA VARIABLES AND R² ON THE GRAPHS TAB 1

EXTRAPOLATED WATER LEVEL OUTPUTS AT NODE Glen 7082

Upper End Scenario	5.05	mODN
Higher Central Scenario	4.80	mODN
Central Scenario	4.71	mODN

Log Interpolation

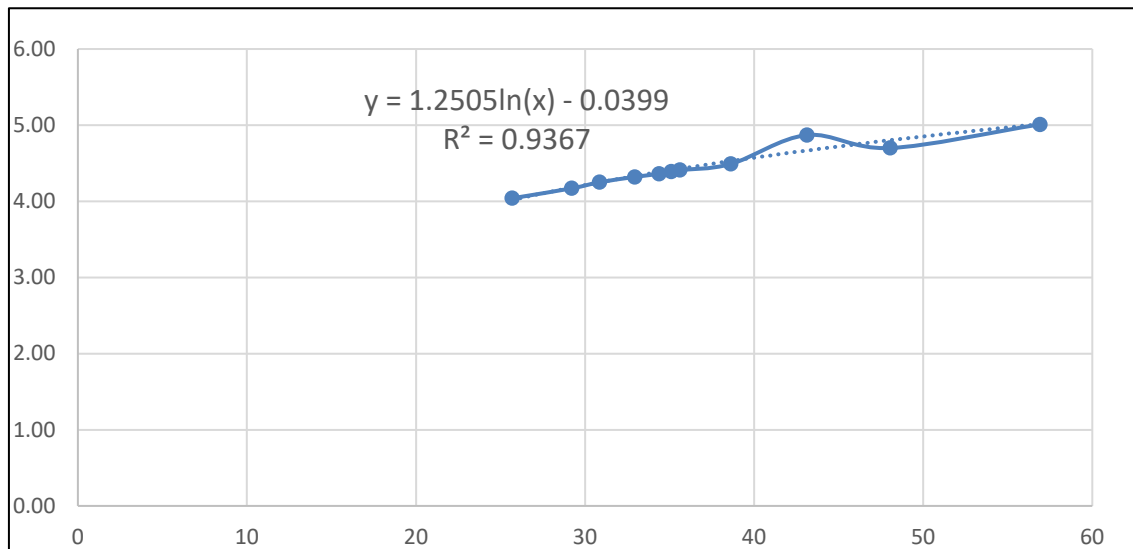
EQUATION >

1.2505

-0.0399

<
include
sign ie
+/-

	1 in 100		1 in 1000	
	FLOW	LEVEL	FLOW	LEVEL
65%	58.74	5.05	79.28	5.43
35%	48.06	4.80	64.87	5.18
25%	44.50	4.71	60.06	5.08



R² value

0.9367

Calculated by:

Site name:

Anglia UK

Site location:

Pinchbeck

Site coordinates

Latitude:

52.80535° N

Longitude:

0.17113° W

This is an estimation of the storage volume requirements that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). It is not to be used for detailed design of drainage systems. It is recommended that hydraulic modelling software is used to calculate volume requirements and design details before finalising the drainage scheme.

Reference:

Date:

2019-03-21 13:43

Methodology	IH124
-------------	-------

Site characteristics

Total site area (ha)	0.0962
Significant public open space (ha)	0
Area positively drained (ha)	0.0962
Pervious area contribution (%)	30
Impermeable area (ha)	0.0962
Percentage of drained area that is impermeable (%)	100
Impervious area drained via infiltration (ha)	0
Return period for infiltration system design (year)	10
Impervious area drained to rainwater harvesting systems (ha)	0
Return period for rainwater harvesting system design (year)	10
Compliance factor for rainwater harvesting system design (%)	66
Net site area for storage volume design (ha)	0.1
Net impermeable area for storage volume design (ha)	0.1

* Where rainwater harvesting or infiltration has been used for managing surface water runoff such that the effective impermeable area is less than 50 % of the 'area positively drained', the 'net site area' and the estimates of Qbar and other flow rates will have been reduced accordingly.

Design criteria

Volume control approach	Use long term storage	
	Default	Edited
Climate change allowance factor	1.4	1.4
Urban creep allowance factor	1.1	1.1
Interception rainfall depth (mm)	5	5
Minimum flow rate (l/s)	5	5
Qbar estimation method	Calculate from SPR and SAAR	
SPR estimation method	Calculate from SOIL type	
	Default	Edited
Qbar total site area (l/s)	0.14	--
SOIL type	2	4
HOST class	N/A	N/A
SPR	0.3	0.47

Hydrology	Default	Edited
SAAR (mm)	560	560
M5-60 Rainfall Depth (mm)	20	20
'r' Ratio M5-60/M5-2 day	0.4	0.4
Rainfall 100 yrs 6 hrs	63	
Rainfall 100 yrs 12 hrs	97.79	
FEH/FSR conversion factor	1.27	1.27
Hydrological region	5	
Growth curve factor: 1 year	0.87	0.87
Growth curve factor: 10 year	1.65	1.65
Growth curve factor: 30 year	2.45	2.45
Growth curve factor: 100 year	3.56	3.56

Site discharge rates	Default	Edited
Qbar total site area (l/s)	0.14	0.36
Qbar net site area (l/s)	0.14	0.36
1 in 1 year (l/s)	5	5
1 in 30 years (l/s)	5	5
1 in 100 years (l/s)	5	5

Estimated storage volumes	Default	Edited
Interception storage (m³)	4	4
Attenuation storage (m³)	33	33
Long term storage (m³)	0	0
Treatment storage (m³)	12	12
Total storage (excluding treatment) (m³)	37	37

SOAKAWAY TEST RESULTS**BRE DIGEST 365 - SOIL INFILTRATION RATE**

Project: Anglia (UK) Limited, Mill Green Road, Pinchbeck
 Client: Anglia (UK) Limited

Project No: C14686
 Sheet No: 1/1

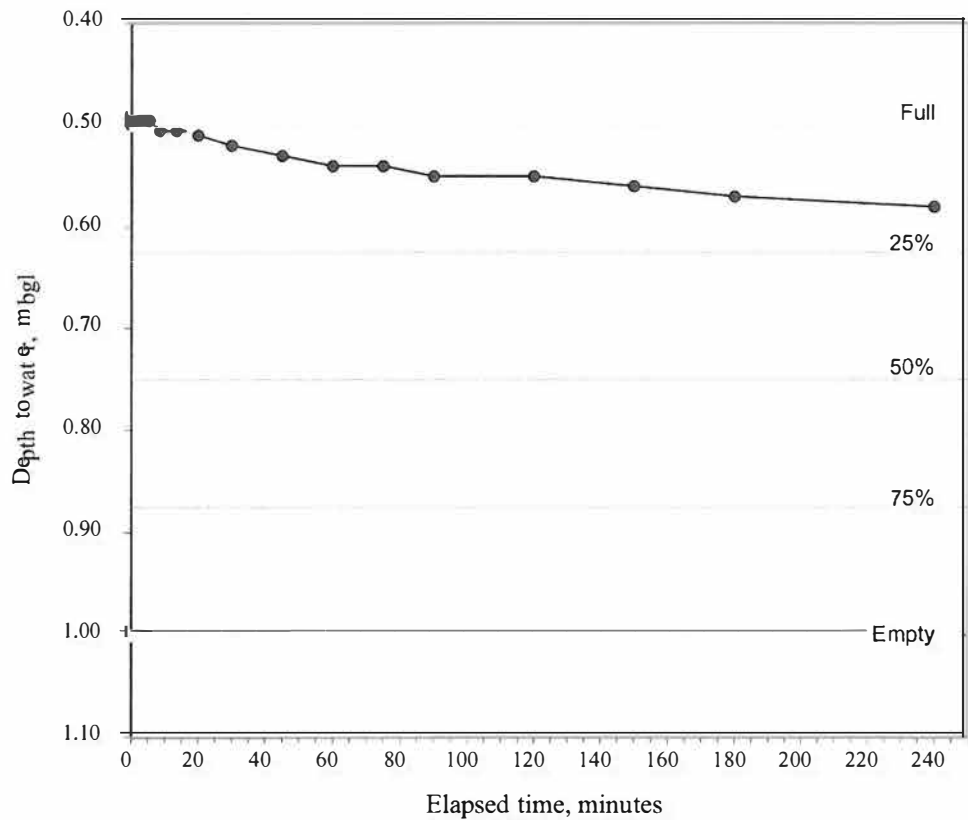
Trial Pit: TP1 FIRST FILLING
 Depth: 1.00
 Length: 1.00
 Width: 0.30

Description of Stratum under test: Firm, brown and orange brown, slightly sandy, silty CLAY

Depth to water prior to test: dry
 (below ground level)

DEPTH TO WATER vs ELAPSED TIME

Elapsed Time min	Depth to Water m
0	0.50
1	0.50
2	0.50
3	0.50
4	0.50
5	0.50
7	0.50
10	0.51
15	0.51
20	0.51
30	0.52
45	0.53
60	0.54
75	0.54
90	0.55
120	0.55
150	0.56
180	0.57
240	0.58



All dimensions given in metres

$$f = (V75 - V25) / A50(T75 - T25)$$

$$V75 - V25 = 0.075$$

$$A50 = 0.950$$

$$T75 - T25 = 2340$$

$$\text{Soil Infiltration Rate } f = \underline{5.62E-07} \text{ m/s}$$

Flood map for planning

Your reference
Pinchbeck

Location (easting/northing)
523399/324655

Created
11 Mar 2019 4:49

Your selected location is in flood zone 3, an area with a high probability of flooding.

This means:

- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

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.

The Open Government Licence sets out the terms and conditions for using government data.
<https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>

Map 1



Flood map for planning

Your reference

Pinchbeck

Location (easting/northing)

523399/324655

Scale

1:2500

Created

11 Mar 2019 4:49

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

0 20 40 60m

Page 2 of 2

 Flood risk from rivers or the sea

- ☒ Extent of flooding
- ☐ Depth and flow estimates at monitoring stations

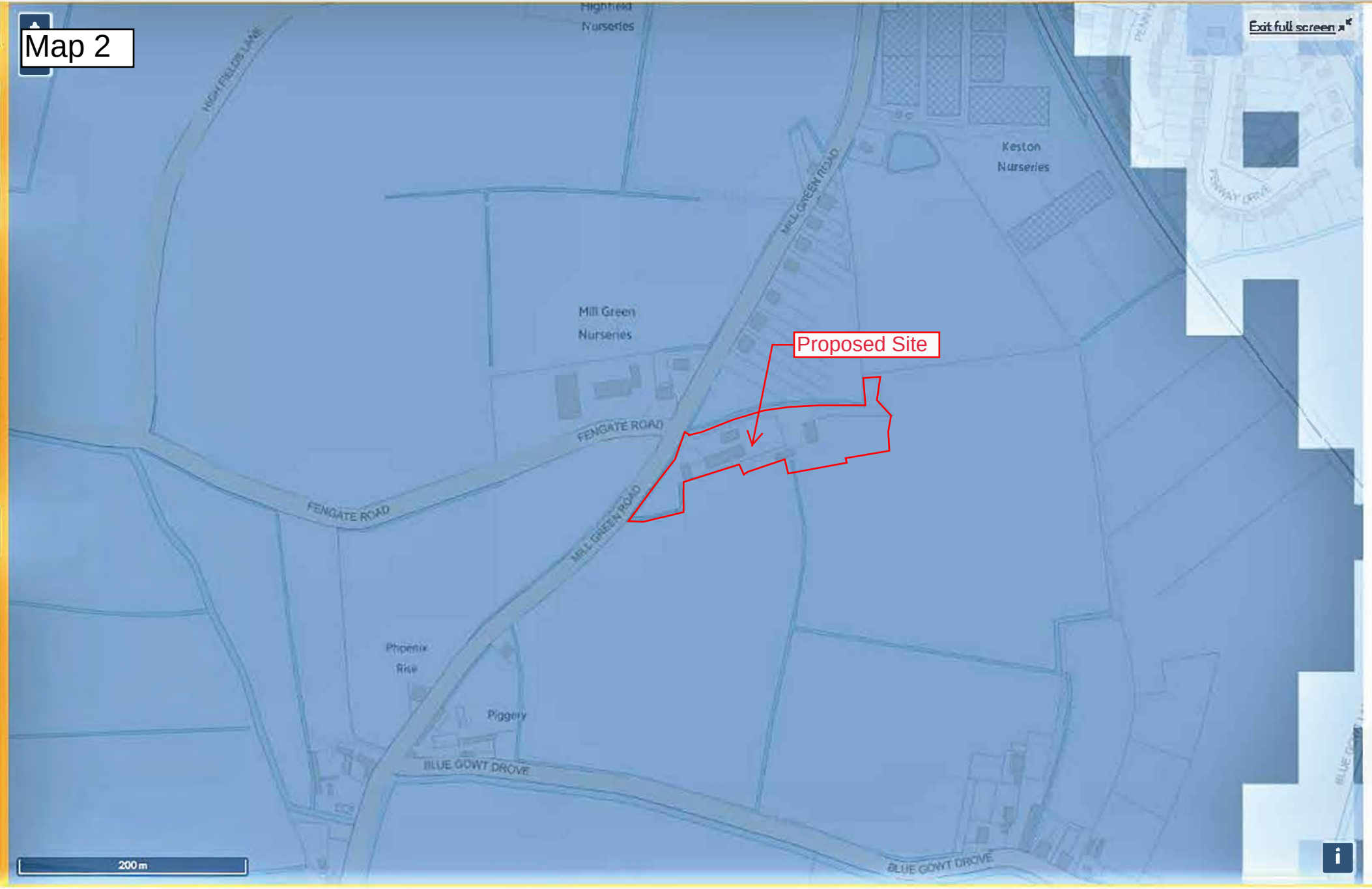
 Flood risk from surface water

- ☐ Extent of flooding
- ☐ High risk: depth
- ☐ High risk: velocity
- ☐ Medium risk: depth
- ☐ Medium risk: velocity
- ☐ Low risk: depth
- ☐ Low risk: velocity

 Flood risk from reservoirs

- ☐ Extent of flooding
- ☐ Flood depth
- ☐ Flood speed

Map 2



Flood risk



High



Medium



Low



Very low



Location you selected



Map 3



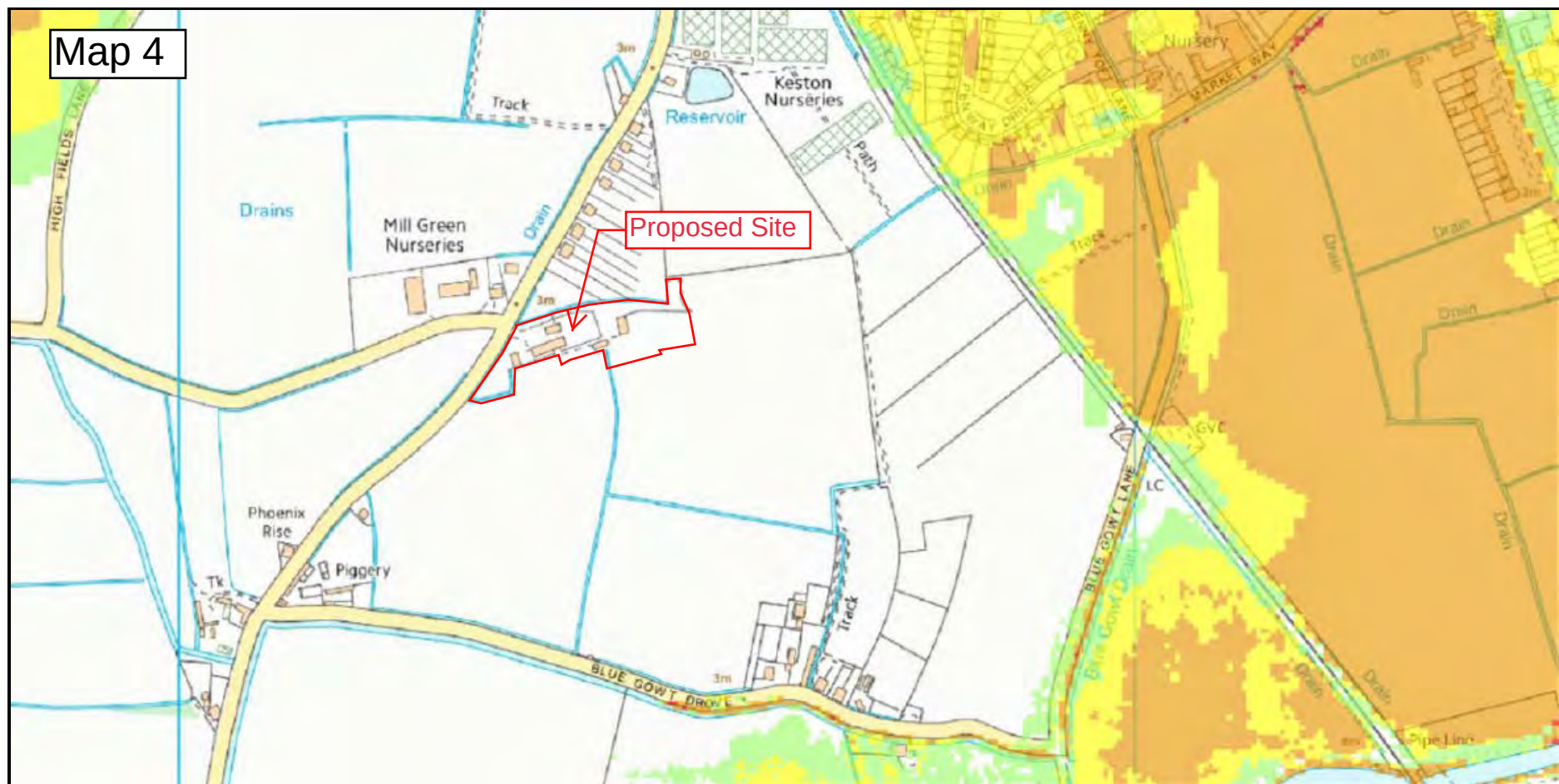
Tidal Water Levels for the South Humber, East Coast and The Wash

The table below shows still water levels for locations, from the above location map, around the South Humber Estuary, East Coast and The Wash. It is important to note the following:

- The base date for the data is 2014 for the South Humber and 2006 for the East Coast and The Wash.
- The data are still water levels. Depending on the use of the data it may be necessary to consider wave heights and / or joint probability analysis of water level and other variables.
- The water level quoted is the ‘Best Estimate’ water level. Depending on the use of the data it may be necessary to carry out sensitivity testing. Upper and Lower 95% confidence bandings are available upon request.
- Levels for other annual chance scenarios are available if required.

Ref	Location	Easting	Northing	Annual Chance (1 in x) of Tide Level					
				metres ODN					
				1	10	50	100	200	1000
HUMBER									
H030	Tetney	535420	403180	3.94	4.29	4.56	4.69	4.82	5.15
H050	Buck Beck	532700	406580	4.03	4.36	4.62	4.74	4.87	5.18
H060	Grimsby	527878	411346	4.10	4.43	4.70	4.82	4.95	5.27
H080	Haborough Marsh	520790	415740	4.26	4.61	4.88	5.01	5.14	5.47
H090	Immingham	519141	417449	4.26	4.61	4.88	5.01	5.14	5.47
H100	South Killingholme	518700	417120	4.41	4.77	5.05	5.18	5.32	5.66
H130	North Killingholme	516530	420000	4.51	4.87	5.15	5.28	5.42	5.77
H150	East Halton	514450	422870	4.59	4.96	5.25	5.39	5.53	5.89
H170	Goxhill	511970	425440	4.67	5.04	5.34	5.47	5.61	5.95
H200	New Holland	508020	424330	4.87	5.26	5.55	5.68	5.81	6.12
H210	Barrow Haven	506380	422620	4.92	5.31	5.60	5.73	5.86	6.17
H220	Ferriby	497550	421150	5.04	5.42	5.67	5.77	5.86	6.04
H230	Winterton	493420	422830	5.14	5.51	5.74	5.83	5.90	6.02
H250	Blacktoft	484247	424190	5.25	5.62	5.83	5.90	5.96	6.04
H270	Goole	474857	422960	5.46	5.85	6.07	6.15	6.21	6.29
East Coast									
~	Great Eau	545500	393800	3.80	4.19	4.46	4.57	4.69	4.96
~	Boygrift	553300	379800	3.84	4.24	4.53	4.65	4.77	5.05
~	Burgh Sluice	555190	358620	4.26	4.45	4.76	4.90	5.03	5.34
Wash									
~	Hobhole	536610	339940	4.82	5.30	5.64	5.78	5.93	6.27
~	Lawyers Sluice	540750	334550	4.84	5.32	5.66	5.80	5.95	6.29
~	West Lighthouse	549150	325750	4.88	5.37	5.71	5.86	6.01	6.35
~	Grand Sluice	532400	344500	4.88	5.33	5.65	5.78	5.93	~
~	Fosdyke Bridge	531700	332200	4.91	5.38	5.71	5.85	5.99	~
~	Marsh Road	526000	324000	5.04	5.44	5.73	5.85	5.98	~
~	Wisbech	546100	310000	4.83	5.25	5.53	5.66	5.78	~
~	Dog In Doublet	527300	299300	3.67	4.00	4.22	4.32	4.42	~

Map 4



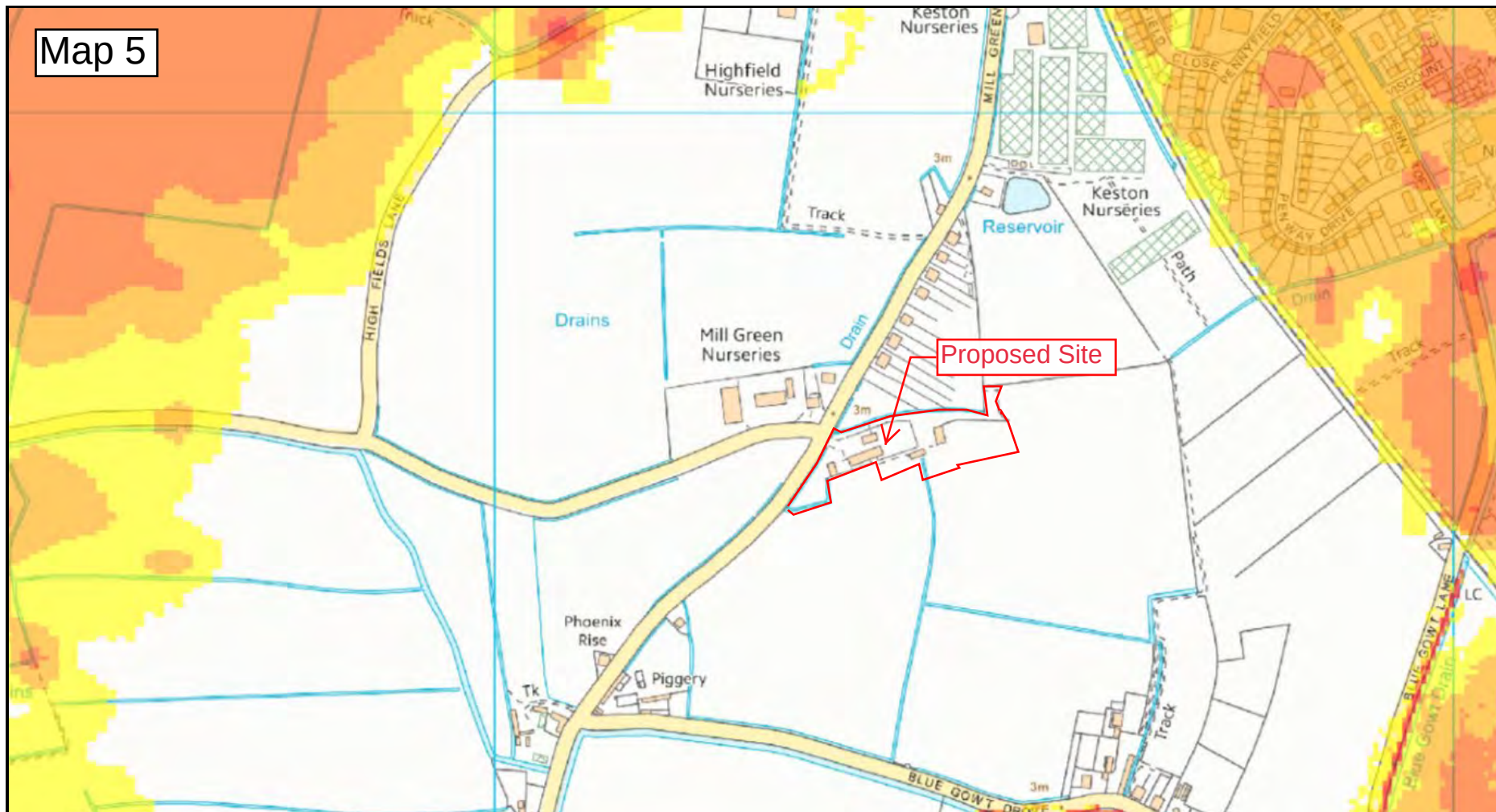
Map Legend

Max Hazard: (Flood Risk to People: FD2320)	
Less than 0.75 (Low Hazard)	
Between 0.75 and 1.25 (Danger for Some)	
Between 1.25 and 2.0 (Danger for Most)	
Greater than 2.0 (Danger for All)	
Functional Floodplain:	
South Holland District Boundary	

UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT

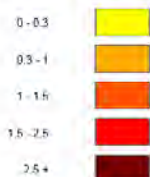
**Residual Flood Hazard
Spalding - Year 2115
0.1% Event Probability**

Map 5



Map Legend

Peak Velocity (metres per second)



Functional Floodplain



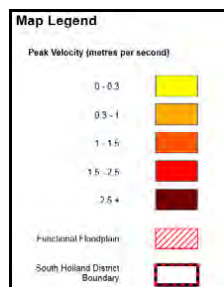
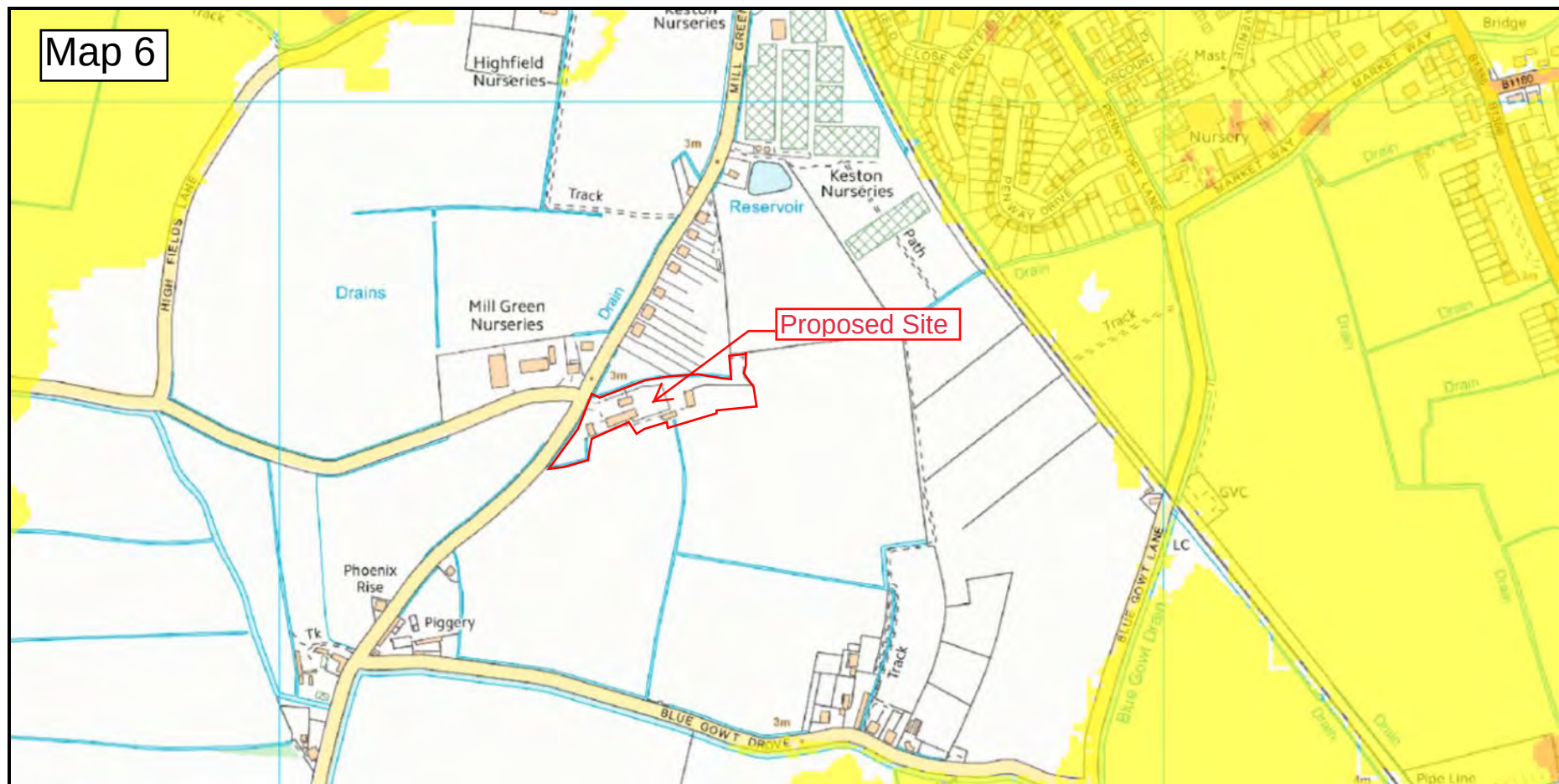
South Holland District Boundary



UPDATE OF STRATEGIC
FLOOD RISK ASSESSMENT

Residual Peak Depth
Spalding - Year 2115
0.1% Event Probability

Map 6



UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT

**Residual Peak Velocity
Spalding - Year 2115
0.1% Event Probability**

 Flood risk from rivers or the sea

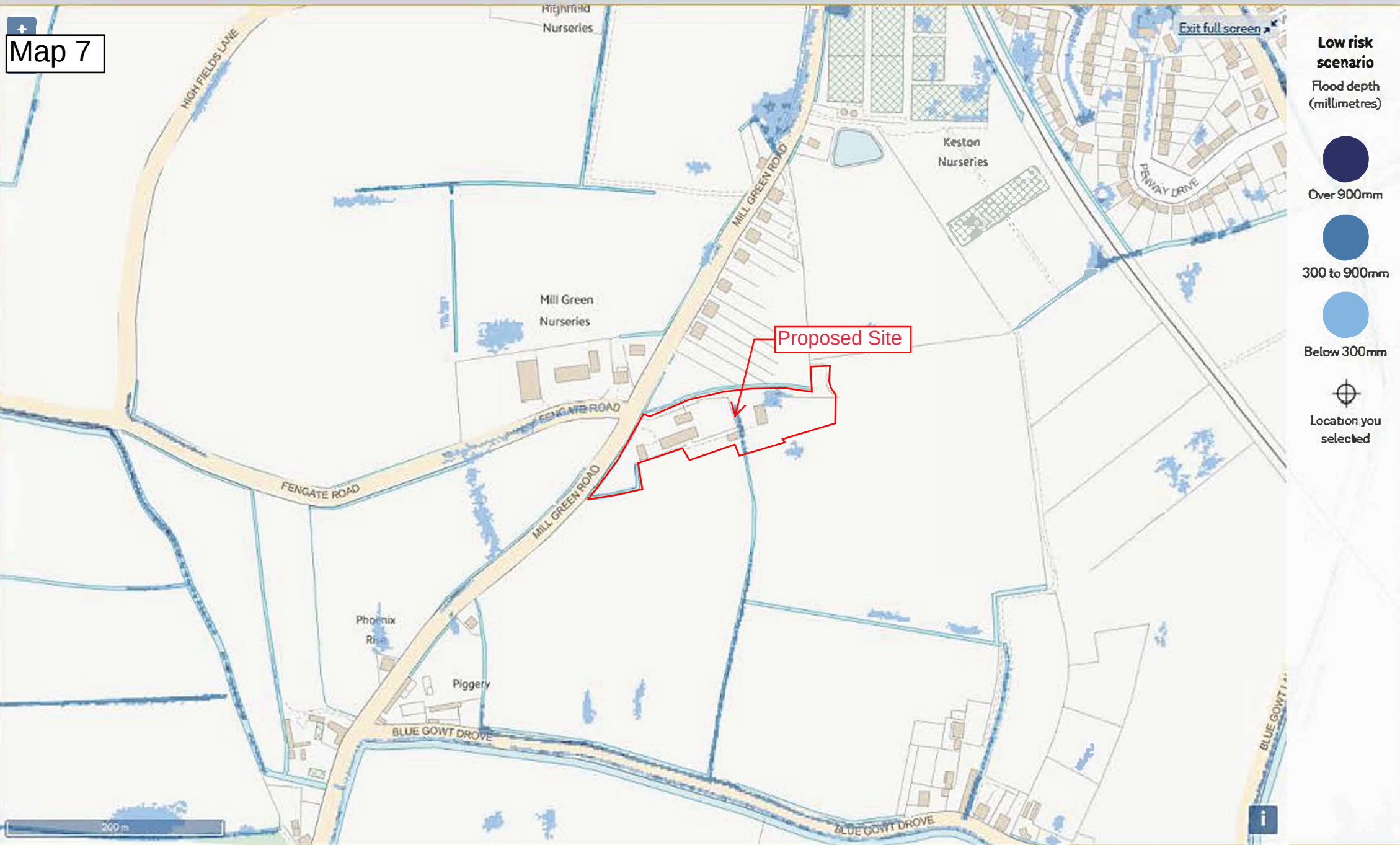
- ☐ Extent of flooding
- ☐ Depth and flow estimates at monitoring stations

 Flood risk from surface water

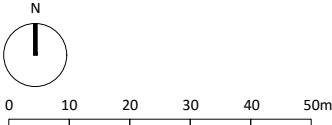
- ☐ Extent of flooding
- ☐ High risk: depth
- ☐ High risk: velocity
- ☐ Medium risk: depth
- ☐ Medium risk: velocity
- ☒ Low risk: depth
- ☐ Low risk: velocity

 Flood risk from reservoirs

- ☐ Extent of flooding
- ☐ Flood depth
- ☐ Flood speed



Plan 1



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B	Red/ blue lines revised	04.06.19
A	Red/ blue lines revised	01.05.19

Rev	Description	Date

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32 High Street, Helpringham
Sleaford, Lincolnshire, NG34 0RA

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Email: admin@rdc-landplan.co.uk
Web: www.rdc-landplan.co.uk

Client
Anglia UK Ltd

Project
Proposed workshop extension and dwelling
Mill Green Road, Pinchbeck

Drawing
Location Plan

Scale @ A3 1: 1250	Date 15/03/19
------------------------------	-------------------------

Drawn By MD/ WW	Checked By LMS
---------------------------	--------------------------

Job Number 823-21	Status PL	Purpose of Issue Planning
-----------------------------	---------------------	-------------------------------------

Drawing No. 823-21_PL_LP01	Rev B
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Plan 2



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B	Red/ blue lines revised	04.06.19
A	Red/ blue lines revised	01.05.19

Rev	Description	Date
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Client
Anglia UK Ltd

Project
Proposed workshop extension and dwelling
Mill Green Road, Pinchbeck

Drawing
Existing Block Plan

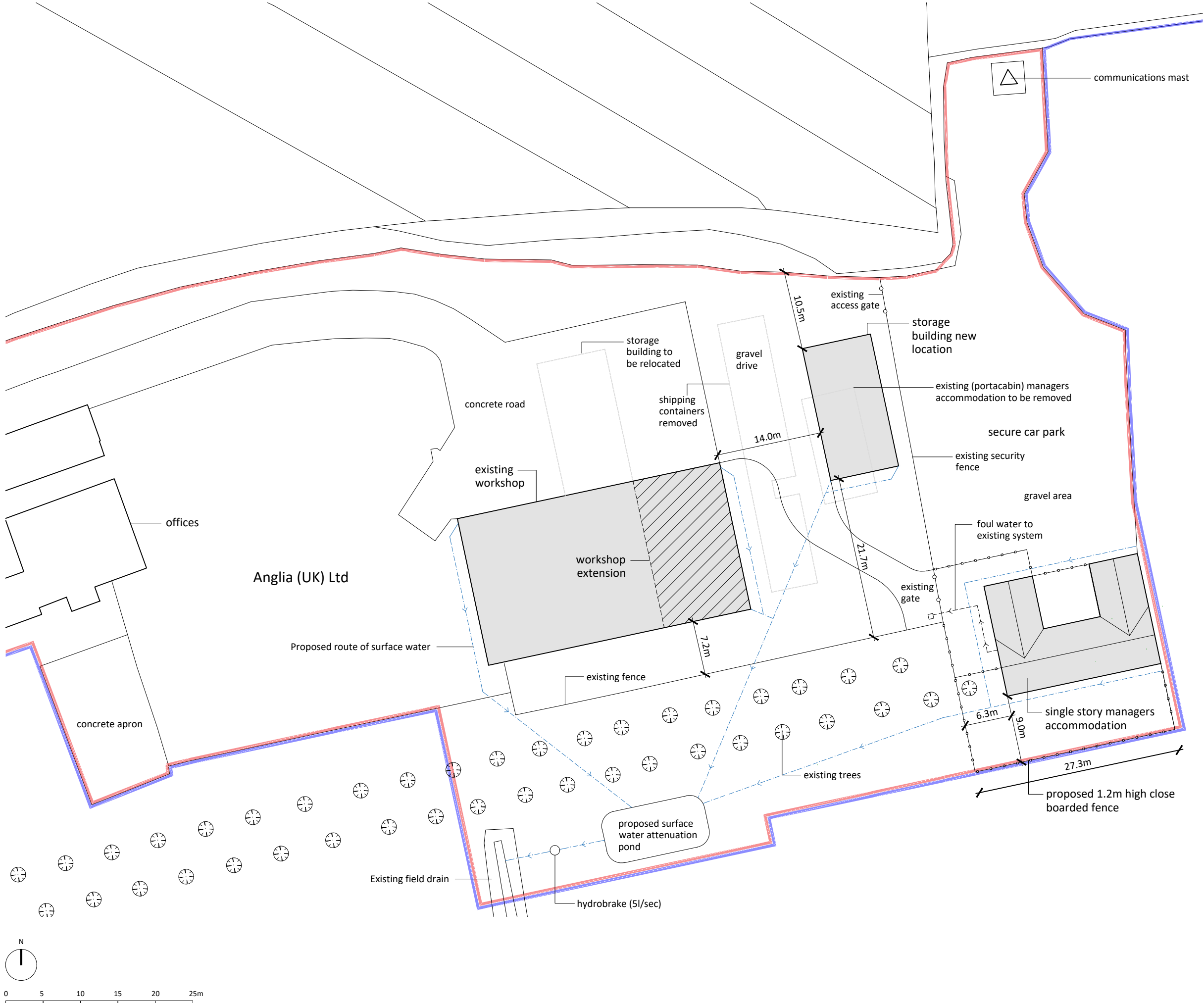
Scale @ A3 1: 500	Date 15/03/19
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Drawn By MD	Checked By LMS
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Job Number 823-21	Status PL	Purpose of Issue Planning
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Drawing No. 823-21_PL_BP01	Rev B
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Plan 3



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B	Communication mast shown	04.06.19
	Red line revised	
A	Dwelling design/ location revised	01.05.19

Rev	Description	Date
-----	-------------	------

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Client
Anglia UK Ltd

Project
Proposed workshop extension and dwelling
Mill Green Road, Pinchbeck

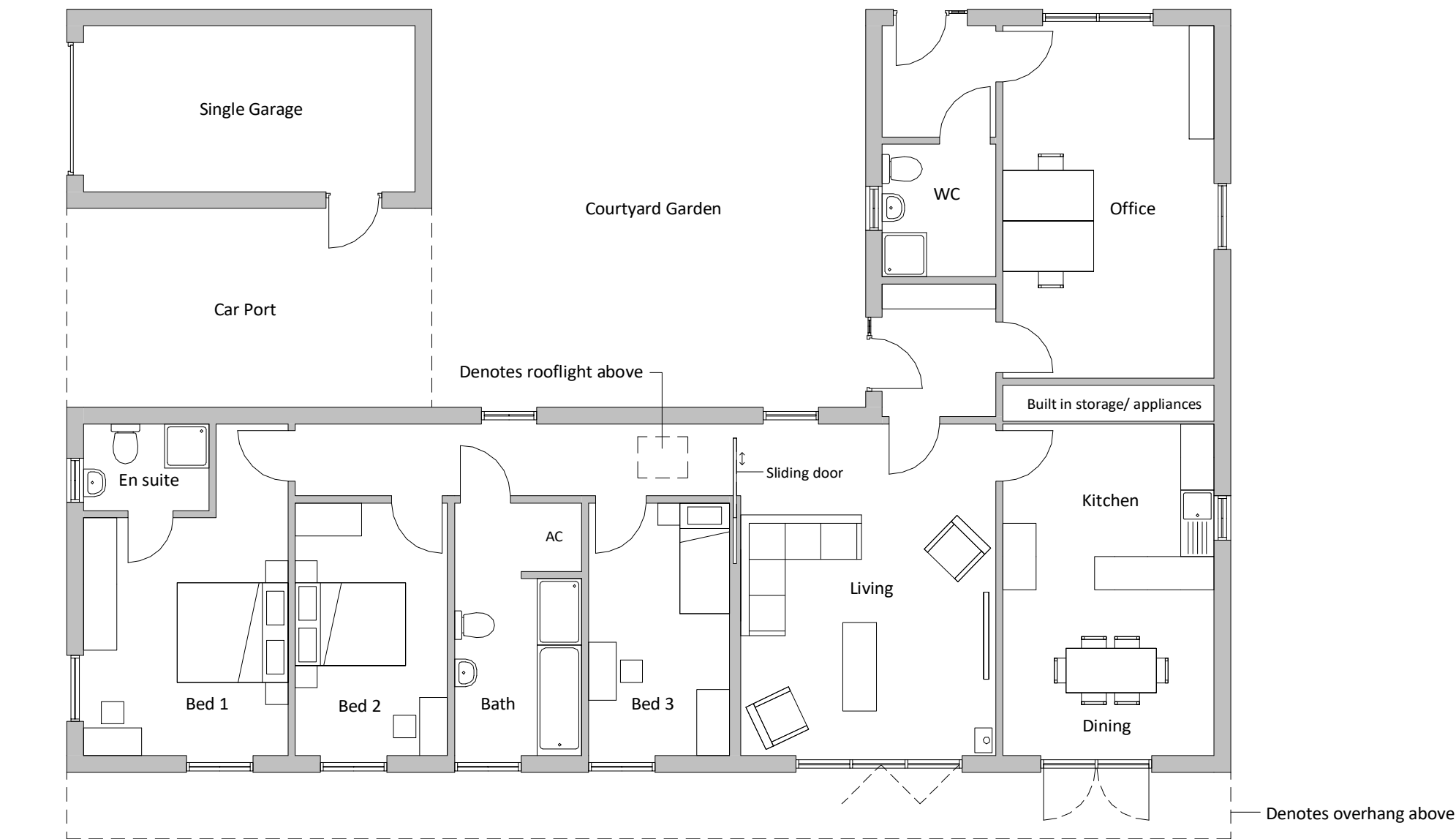
Drawing
Proposed Block Plan

Scale @ A3	Date
1: 500	14/03/19

Drawn By	Checked By
MD/ WW	LMS

Job Number	Status	Purpose of Issue
823-21	PL	Planning

Drawing No.	Rev
823-21_PL_BP02	B



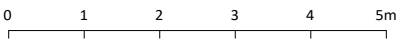
Floor plan



North elevation



South elevation



East elevation



West elevation

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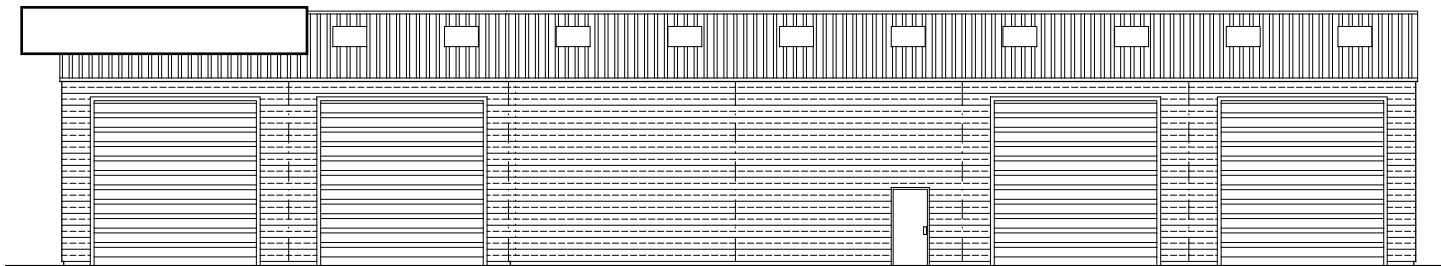
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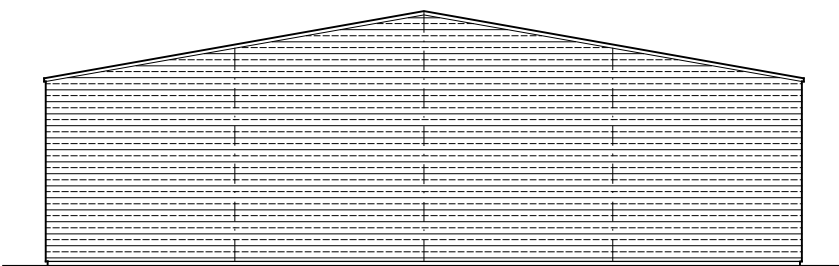
Tel: 01529 421646
Email: admin@rdc-landplan.co.uk
Web: www.rdc-landplan.co.uk

Client Anglia UK Ltd			
Project Proposed workshop extension & dwelling Mill Green Road, Pinchbeck			
Drawing Dwelling plan & elevations			
Scale @ A2 1 : 100		Date 01/05/19	
Drawn By WW		Checked By LMS	
Job Number 823-21	Status PL	Purpose of Issue Discussion	
Drawing No. 823-21-PL_GA06			Rev

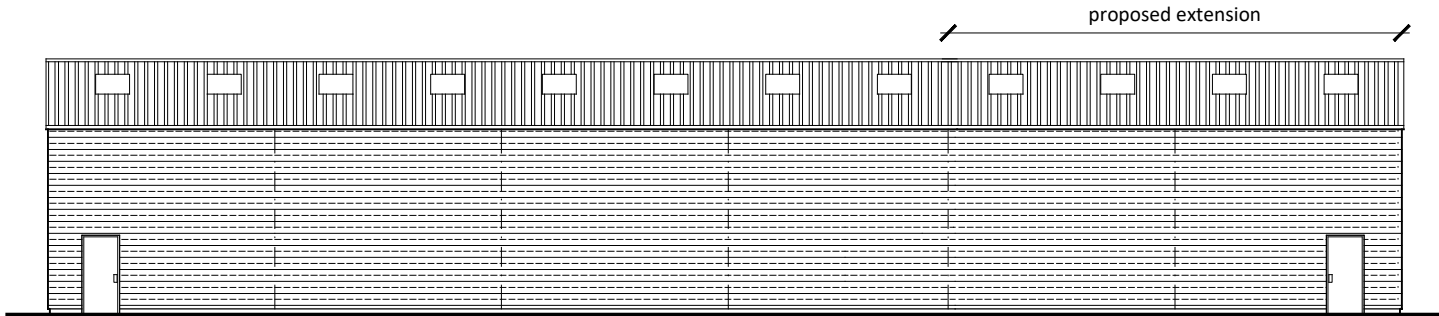
proposed extension



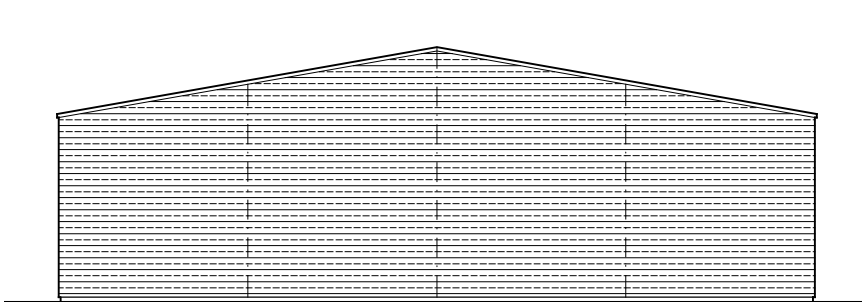
North Elevation - front



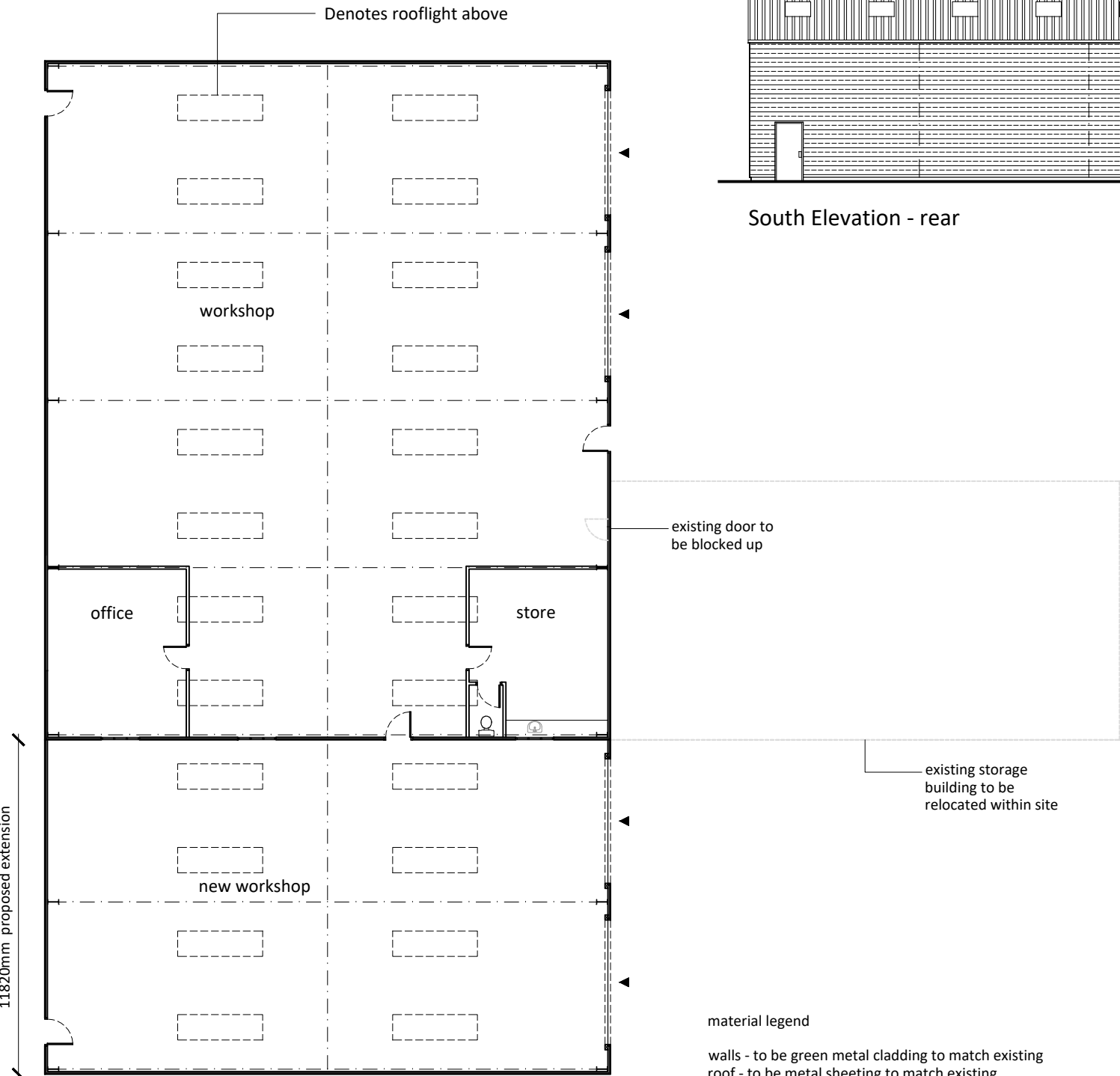
East Elevation - side



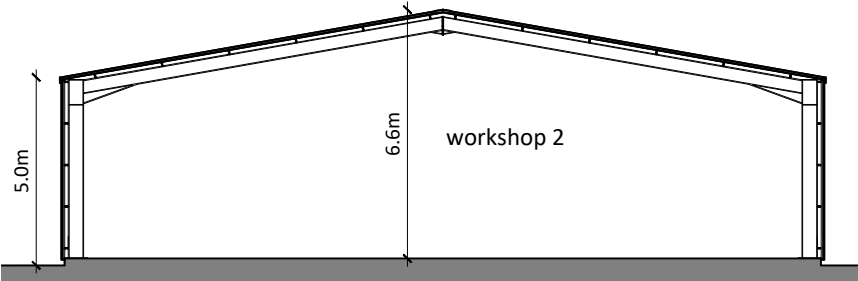
South Elevation - rear



West Elevation - side



Floor Plan



Section



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Rev	Description	Date
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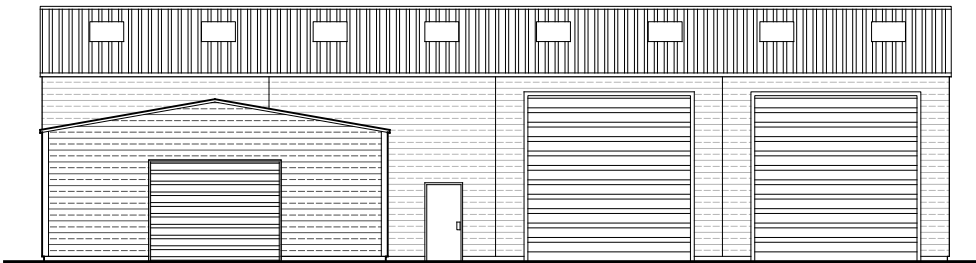
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Sleaford, Lincolnshire, NG34 0RA

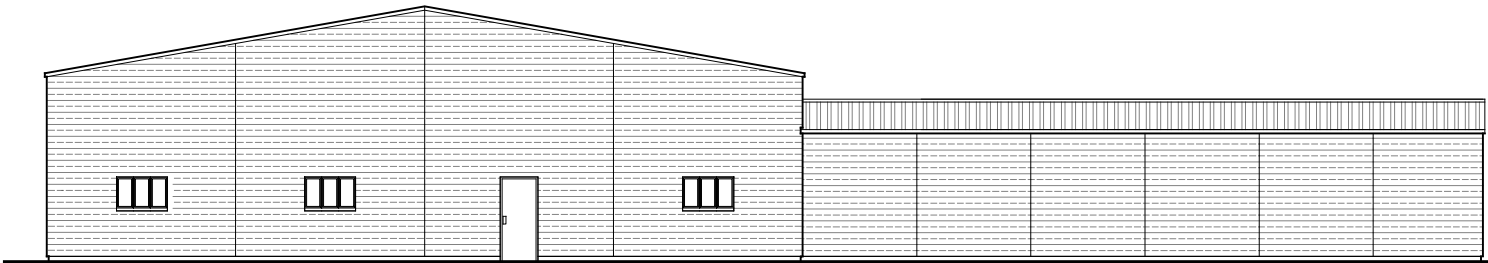
Tel: 01529 421646
Email: admin@rdc-landplan.co.uk
Web: www.rdc-landplan.co.uk

Client Anglia UK Ltd		
Project Proposed workshop extension and dwelling Mill Green Road, Pinchbeck		
Drawing Proposed Workshop Floor Plan, Elevations & Section		
Scale @ A3 1: 200	Date 15.03.19	
Drawn By MD	Checked By LMS	
Job Number 823-21	Status PL	Purpose of Issue Planning
Drawing No. 823-21_PL_GA02		Rev -

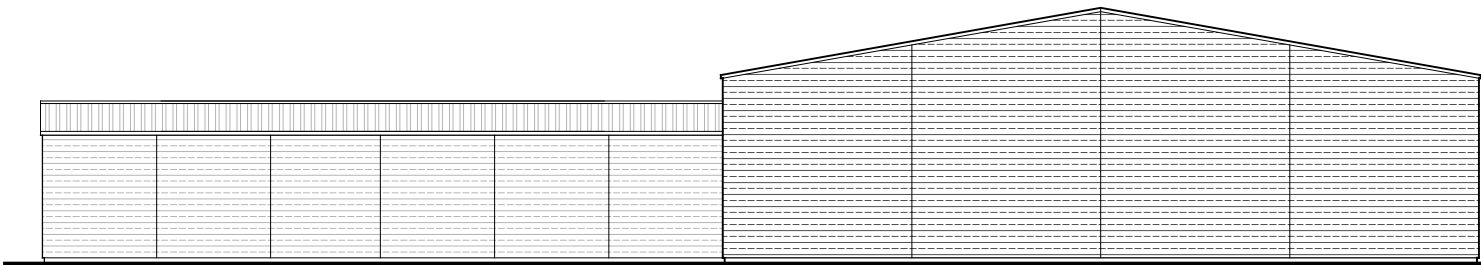
Plan 6



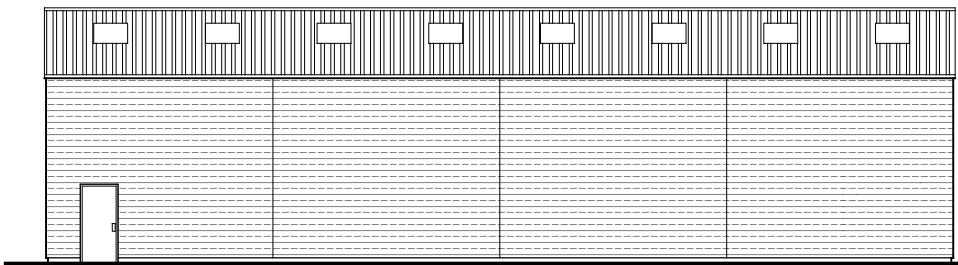
North Elevation - front



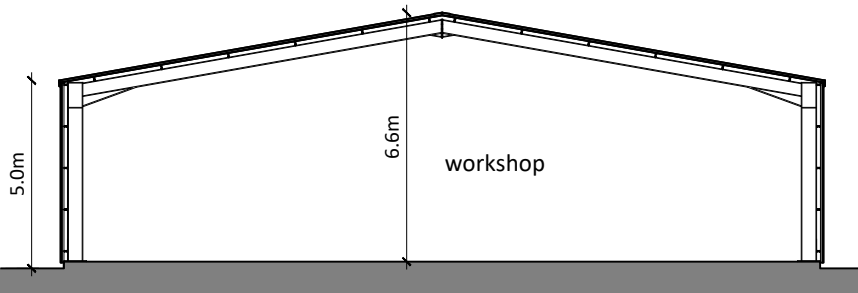
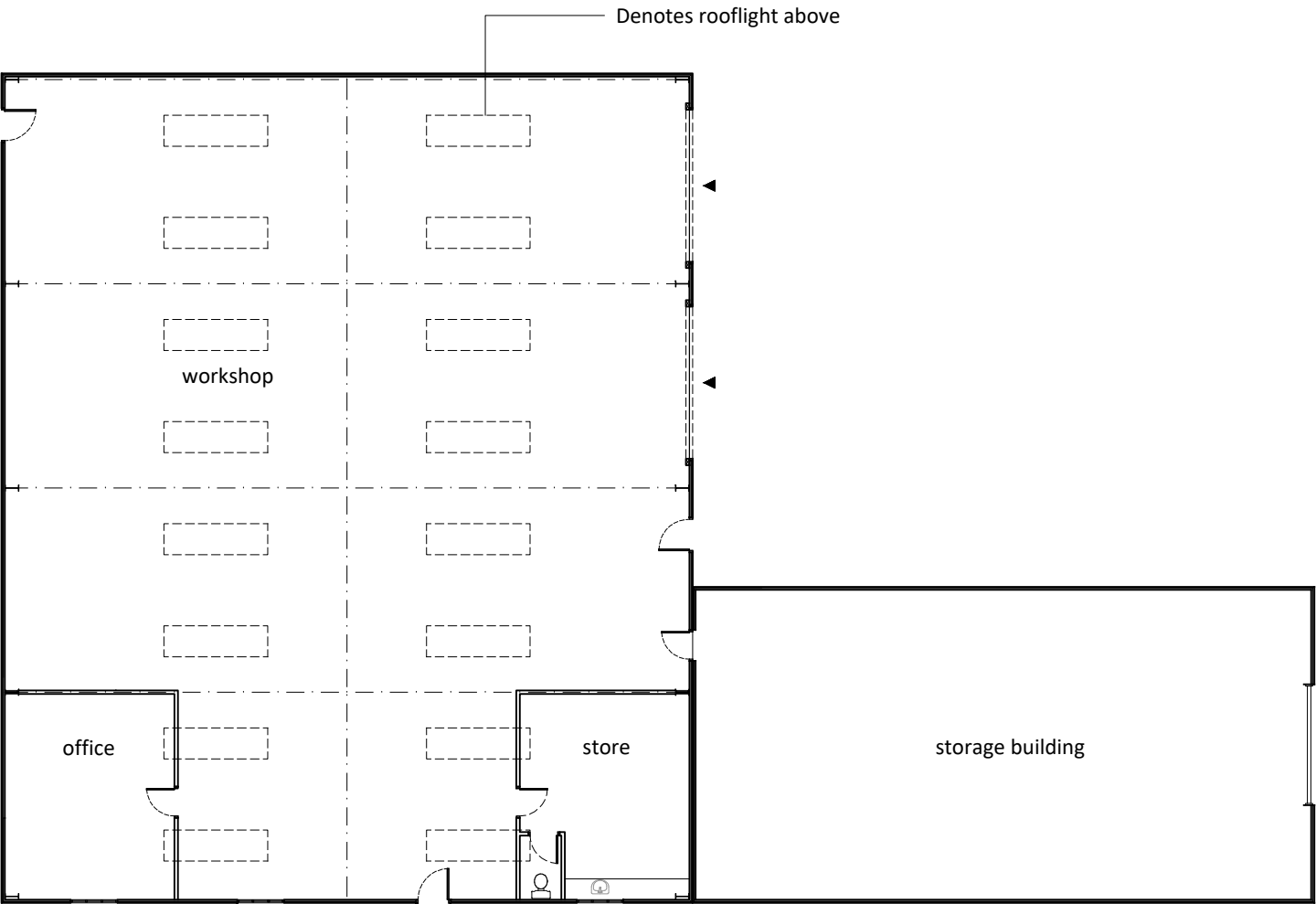
East Elevation - side



West Elevation - side



South Elevation - rear



Section



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Rev	Description	Date
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rdc

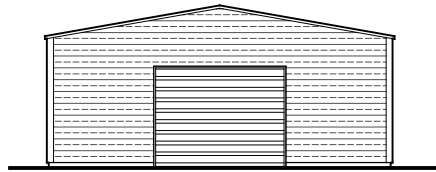
Robert Doughty Consultancy

32 High Street, Helpringham
Sleaford, Lincolnshire, NG34 0RA

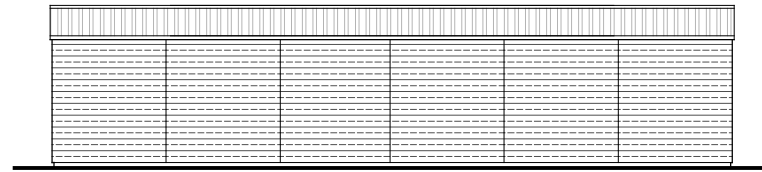
Tel: 01529 421646
Email: admin@rdc-landplan.co.uk
Web: www.rdc-landplan.co.uk

Client Anglia UK Ltd		
Project Proposed workshop extension and dwelling Mill Green Road, Pinchbeck		
Drawing Existing Workshop Floor Plan, Elevations & Section		
Scale @ A3 1: 200	Date 29/11/18	
Drawn By MD	Checked By LMS	
Job Number 823-21	Status PL	Purpose of Issue Planning
Drawing No. 823-21_PL_GA01		Rev -

Plan 7



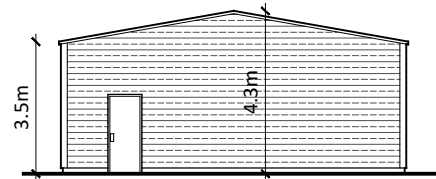
North Elevation - front



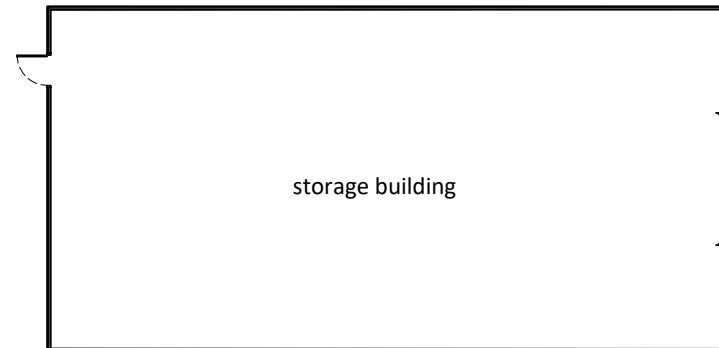
East Elevation - side



West Elevation - side



South Elevation - rear



storage building



Floor Plan

Notes

Dimensions

Use figured dimensions only. All dimensions should be checked against on site conditions and any discrepancies should be brought to the attention of Robert Doughty Consultancy Limited.

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CDM 2015

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Building Survey

The existing survey information used to prepare this drawing has being carried out by others. Its accuracy cannot be guaranteed by The Robert Doughty Consultancy and as such, the practice cannot be held responsible for any discrepancies which may exist between the survey and the as-built information.



Rev	Description	Date
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Client

Anglia UK Ltd

Project

Proposed workshop extension and dwelling
Mill Green Road, Pinchbeck

Drawing

Proposed Shed Floor Plan, Elevations & Section

Scale @ A4

1: 200

Date

15/03/19

Drawn By

MD

Checked By

LMS

Job Number

823-21

Status

PL

Purpose of Issue

Planning

Drawing No.

823-21_PL_GA03

Rev

-



Rev	Description	Date
rdc Robert Doughty Consultancy 32 High Street, Hellingringham Sleaford, Lincolnshire, NG34 0RA Email: 01529 421646 Email: admin@rdc-landplan.co.uk Web: www.rdc-landplan.co.uk		
Client		
Anglia UK Ltd		
Project		
Use of Land for Storage Yardage Mill Green Road, Pinchbeck		
Drawing		
Existing site survey		
Scale @ A1		Date
1: 500		12/03/19
Drawn By		Checked By
WW		LMS
Job Number	Status	Purpose of Issue
823-21	SK	Client comments
Drawing No.		
823-21_SK_SP04		
		Rev
		-