Thorn, Steve

From: Crew, Chris
Sent: 13 December 2010 09:13
To: _planningadvice
Subject: FW: Long Sutton SSE Flood Risk Assessment
Attachments: Long Sutton SSE Flood Risk Supplementary note_final submitted 101210.pdf
Additional information re: H11-1253-08

From: Hunt, M G (Matthew) [mailto:m.hunt@royalhaskoning.com]
Sent: 10 December 2010 16:54
To: chris.hayes@environment-agency.gov.uk; emma.kirk@environment-agency.gov.uk
Cc: Crew, Chris; Molearch; Rostaing, B. (Benjamin)
Subject: Long Sutton SSE Flood Risk Assessment

Chris, Emma

Further to emails earlier in the week, I attach a copy of the flood risk assessment supplementary note we have prepared on behalf of SEArch Architects in respect of the proposed sustainable settlement in Long Sutton. I am sending this on behalf of Dr Jerry Harrall (SEArch).

This application is scheduled to be considered at the January planning committee meeting. I would be grateful if you could confirm receipt, consider this as necessary, and pass comments to Chris Crew, Planning Officer at SHDC, copied to Jerry (cc'd to this email).

Thank for for your consideration
kind regards
Matthew

Dr Matthew Hunt
Principal Environmental Scientist

T: +44 (0) 1733 373500 F: +44 (0) 1733 262243

E : m.hunt@royalhaskoning.com
Haskoning UK Ltd., Rightwell House, Bretton, Peterborough, PE3 8DW. United Kingdom. Registered in England 1336844

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PLANNING & DEVELOPMENT
13 DEC 2010

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Supplementary Technical Note

HASKONING UK LTD.
COASTAL & RIVERS

To	:	SEArch Architects
From	:	Benjamin Rostaing
Checked	:	David Worth
Approved	:	Dr Matthew Hunt
Date	:	December 2010
Our reference	:	9W4819/N001/303377/PBor
Subject	:	**Flood Risk Assessment for the Long Sutton Sustainable Settlement Extension, Bridge Road, Long Sutton, Lincolnshire - Supplementary Note**

Background

SEArch Architects are proposing to redevelop a 4.23ha plot of land at Bridge Road, Long Sutton Lincolnshire. The proposed development, known as the Long Sutton Sustainable Settlement Extension (SSE), comprises 49 two-storey houses and 9 single-storey commercial units together with an office in a relatively compact site layout which includes a 'living-street', a wetland area, renewable energy appliances, amenity areas, footpaths and allotments. A plan illustrating development proposals is provided in **Appendix A**. This plan shows that the commercial units would be sited on the western part of the site, with the wetland area to its north. The houses would be located on the eastern part with allotments to the north.

A Flood Risk Assessment (FRA) was prepared by Geoff Beel Consultancy in December 2008 to support the planning application for Long Sutton SSE (included as **Appendix B**). The FRA was prepared in compliance with Planning Policy Statement 25: Development and Flood Risk (PPS25) and made use of information included in the South Holland District Council Strategic Flood Risk Assessment (SFRA) published in December 2002.

An update to the South Holland District Council SFRA was published in January 2010 which supersedes the original SFRA. The updated SFRA in particular includes flood inundation mapping from tidal and fluvial sources for a range of scenarios, both under-present day conditions as well allowances for climate change (i.e. sea level rise and a 20% increase in fluvial flows) in line with PPS25. The flood inundation mapping stems from two-dimensional hydraulic modelling.

A planning application for the proposed development was submitted in July 2010, to which the Environment Agency objected on the grounds that the FRA does not include the findings of the updated SFRA. The purpose of this supplementary note is thus to draw out the implications of the updated SFRA with regard to flood risk for the Long Sutton SSE and to provide recommendations to ensure that the site can be developed and occupied safely throughout its proposed lifetime.

The Environment Agency has recently carried out coastal hazard mapping for the Wash and its adjoining low-lying areas. A data request has been submitted to the Environment Agency to obtain this dataset (10 December 2010). The coastal hazard mapping is acknowledged in this document where relevant, and the development proposals will ensure appropriate flood resilience (which could be provided by eg further increased floor level heights, or additional

measures) is incorporated to accommodate its findings as the scheme is developed. This approach has been agreed through recent discussion with the Environment Agency.

Site location and existing features

The 4.23-ha site is situated to the east of Long Sutton. The site is located approximately 4.7km to the west of the River Nene, approximately 6km south of the Wash and with the River Welland approximately 14.5km to the east. A location plan is provided in **Figure 1**.

A site plan identifying geographical features is presented in **Figure 2**. The site is currently occupied by operating commercial buildings and is bounded by drains to the west, to its north-west corner, to the west as well as to the south where the drain is partly culverted. All of the drains around the existing site other than the drain to the east, which is privately owned and maintained, are maintained by the South Holland Internal Drainage Board (IDB). Access to the site can be gained off Bridge Road. The development proposals will use a site entrance further to the east, but still off Bridge Road.

The site lies within the Environment Agency's Flood Zone 3 (land with an annual probability of flooding of 1.0% or greater from rivers, and 0.5% or greater from the sea).

Sources of flooding the site

The potential sources of flooding to the site are the tidal River Nene, the Wash and from the IDB drainage system. Other potential sources are the tidal River Welland, surface water, overland flow, groundwater and sewer overloading. These other potential sources have been discounted in the South Holland SFRA update as probable sources of flooding. As a result, this note has only looked in further detail at flood risk to the site posed by the Wash, the tidal River Nene and the IDB system.

Both the Wash and the tidal River Nene have associated raised flood defences. The frontage along the Wash also has secondary lines of defences which correspond to the old alignment of the sea defences. Only the primary sea defence is maintained by the Environment Agency.

The IDB drainage system discharges into the River Nene at Guy's Head through a tidal sluice whose operation can de deemed to act as a flood defence

Assessment of flood risk in the updated SFRA

Given the peculiar nature of South Holland District, with raised defences protecting large expanses of low-lying land, the updated SFRA has produced two distinct sets of maps for the District.

The first set of maps, termed 'Actual Risk', has given consideration to the freeboard available for raised defences, using detailed crest level survey of these defences and predicted flood levels Without the minimum freeboard, a raised defence is deemed not secure and therefore liable to breach during the flood event. The 'Actual Risk' modelling and mapping has been found by calculating the combined consequences of overtopping, where this would occur, and of potential breaching where the minimum freeboard is not achieved.

The second set of maps, termed 'Residual Risk', acknowledges that, no matter how good the condition and freeboard provided by the raised defences, there still remains a risk that the defence could fail due to unexpected circumstances, such as an undetected local weakness in

the embankment. With this in mind, the updated SFRA has calculated the consequences arising from a possible breach occurring at any point along the raised defences. Also considered were scenarios in which gates at the various gravity tidal outfalls fail to close as the tide level rises during the storm event, so allowing sea water to flow inland through the outfall openings.

Condition of existing flood defences in the area

The condition grade from NFCDD as reported by the updated SFRA shows that the defences along the Wash are generally in good condition and those along the tidal River Nene are in a good to fair condition.

Flood risk management policies in the area

The Shoreline Management Plan 2 (SMP2) for the Wash has recently been completed (adopted in November 2010). The policy for the frontage relevant to this assessment is to hold the existing seabank alignments in the short term. In the medium and long term, the preferred intent is also to continue to hold the existing defences. However, there is the recognition that due to climate change there may be significant loss of intertidal habitats in front of the seabanks. This would increase pressure on the defences and affect the integrity of the habitats in The Wash. If this occurs, localised landward realignment would need to be considered as an alternative to holding the line. The intent is that any realignment would not increase the flood risk to the communities that the existing defences currently protect. As a result, it is assumed that the defences would continue to be maintained at least to the current standards.

The River Nene Catchment Flood Management Plan (CFMP) has identified Policy P4 "Take further action to sustain the current level of flooding into the future (responding to potential increases in risk from urban development, land use change and climate change)" as the preferred policy for the Fens. Therefore, it is assumed that the defences will continue to be maintained so as to maintain the existing standard.

Flood risk to the site based on the updated SFRA inundation mapping

'Actual Risk' flood inundation mapping from the updated SFRA indicates that both under present-day conditions and allowing for 100 years of climate change the site is not at risk from a tidal breach of the raised flood defences either at the Wash or at the tidal River Nene during a 200-year (0.5% AEP) event.

'Residual Risk' flood inundation mapping from the updated SFRA indicates that under present-day conditions the site is not at risk from a tidal breach of the raised flood defences either at the Wash or at the tidal River Nene during a 200-year (0.5% AEP) event.

'Residual Risk' flood inundation mapping from the updated SFRA indicates that allowing for 100 years of climate change the site is not at risk from a tidal breach of the raised flood defences of the tidal River Nene during a 200-year (0.5% AEP) event.

'Residual Risk' flood inundation mapping from the updated SFRA indicates that allowing for 100 years of climate change the site is at risk from a tidal breach of the sea defences at the Wash during a 200-year (0.5% AEP) event. **Figure 3** shows the maximum flood depth for tidal breaches occurring from the Wash in that event. The associated maximum water velocity from this breach is shown in **Figure 4**. The flood depth across the site would generally range from 0.6m to 0.1m whilst the flow velocity would be uniform at 0.1m/s across the site.

It is worth noting that the flood depth would be slightly less to the eastern part of the site, where the residential dwellings are to be provided (see **Appendix A**), ranging from 0.5m to the north to 0.1m near Bridge Road. Across the western part of the site, where the commercial units are to be provided, would range from 0.5m to 0.3m. Under such a scenario, floodwater would reach the site from the east. It would take a number of hours for floodwater to reach the site though. The main town of Long Sutton, approximately 350m to the west, is shown not to flood and therefore it would be possible to seek refuge onto dry land there. Safety of occupants will be further ensured by the tidal flood warning service provided by the Environment Agency covering the Wash frontage, the tidal River Nene and the tidal River Welland. All occupants to the site should register with the Environment Agency's flood warning service.

It may be that the Environment Agency's coastal hazard mapping results in worse conditions at the site, with an increased flood level. This would have a bearing on further recommendations to be made for the site layout (e.g. building finished floor levels, flood resistance and resilience measure) but the conclusions drawn herein with respect to the availability of flood warning and the lead time available for evacuation of the site in a flood event still remain.

Another potential source of flooding is from failure of the IDB drainage system. If either the tidal sluice blocked or its capacity was exceeded by the flow reaching the sluice, the resultant flooding would occur on the low-lying land near the sluice. As the site is located at the upstream end of the IDB system it is very unlikely to be at risk from such flooding. In addition this type of flooding is characterised by very shallow depths over wide areas and therefore would present very little or no risk to the development.

Proposed flood risk management measures for the site

PPS25 requires a sequential approach to allocating land for development. Development should be steered towards the areas of least flood risk using the Environment Agency's Flood Map. Thus, PPS25 then introduces the Exception Test which is 'only appropriate for use when there are large areas in Flood Zones 2 and 3, where the Sequential Test alone cannot deliver acceptable sites, but where some continuing development is necessary for wider sustainable development reasons, taking into account the need to avoid social or economic blight and the need for essential civil infrastructure to remain operational during floods'. Clearly, the context of South Holland District Council is particular in that most of the District falls within Flood Zone 3 and the Sequential Test cannot deliver acceptable sites.

In order to satisfy the Exception Test:

i. it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a SFRA where one has been prepared;
ii. the development should be on developable previously-developed land or, if it is not on previously-developed land, that there are no reasonable alternative sites on developable previously-developed land; and
iii. a flood risk assessment (FRA) must demonstrate that the development will be safe, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

The SFRA for South Holland is being used to inform the development proposals and the development is on previously-developed land.

Thus, satisfying the Exception Test requires the development to be safe, without increasing flood risk elsewhere, and, where possible, reduce flood risk overall. Flood risk mitigation measures are to help in demonstrating this.

In light of the findings of the SFRA with regards to flood depths at the site, the finished floor level for the new buildings, residential and commercial, should be set so as to achieve a freeboard of 300mm over predicted flood depths.

The Wash Coastal Hazard Mapping undertaken by the Environment Agency may provide a higher flood level than that obtained in the updated SFRA. Appropriate flood resilience will be incorporated to accommodate its findings as the scheme is developed, as agreed through recent discussion with the Environment Agency. Flood mitigation measures may take one of two forms:

- Flood resistance measures: Flood-resistant construction prevents the entry of water or minimises the amount of water that may enter a building where there is flooding outside and therefore relies on the operational deployment of flood defences at the property scale. These measures rely on the availability of a reliable flood forecasting and warning system, and well established mobilisation and closure processes. There is a flood warning system in the area, which occupants of the site should register with, and it would take a few hours for floodwater to reach the site following a breach of the sea defences. This form of construction should however be used with caution and accompanied by resilience measures if possible, as effective flood exclusion may rely on the effective deployment of elements, such as barriers to doorways. Buildings may also be damaged by water pressure or debris being transported by flood water which may breach flood-excluding elements of the building and permit rapid inundation; and
- Flood resilience measures: Flood-resilient buildings are designed to reduce the consequences of flooding and facilitate recovery from the effects of flooding sooner than conventional buildings. Flood resilience may be achieved through the use of water-resistant materials for floors, walls and fixtures or by ensuring electrical controls, cables and appliances are placed at a higher than normal level.

Consideration must be given to ensuring access for those with restricted mobility.

Similarly to the buildings, the services for the site should be designed to ensure they are unaffected by a flood event and there is no disruption to their operation. For example, consideration should thus be given to locating sub-stations as well as water, gas and electricity meters above the flood level, allowing for sufficient freeboard. Where possible, all service entries should be sealed. Non-return valves are also recommended in the drainage system to prevent back-flow of diluted sewage if there is an identified risk of the foul sewer surcharging. This should be confirmed. Maintenance of these valves is important to ensure their continued effectiveness.

Should a breach of the raised flood defences at the Wash occur, it would take a number of hours for floodwater to reach the site. Safe egress from the site would be possible to the west, towards Long Sutton. All occupants should register with the Environment Agency's tidal flood warning service.

On site rainwater from the development will be discharged via a comprehensive sustainable surface water drainage system to attenuate run-off to meet the requirements of the South Holland IDB. Therefore, the site will not result in an increase in fluvial flood risk further

downstream on the IDB drainage system. South Holland IDB has been consulted on the drainage proposals and the applicant awaits final confirmation that all issues have been attended to.

In order to comply with the South Holland IDB Byelaw 10, a 9-metre easement strip has to be provided along the IDB drains on the development site's western, north-western and southern boundaries. In the past, South Holland IDB has raised some concerns about this, but the site layout has since been modified to accommodate the 9-metre easement strip. South Holland IDB has been confirmed their agreement (on 10 December 2010).

Conclusions

South Holland District Council encompasses large areas of Flood Zone 3 and the Sequential Test cannot deliver acceptable sites. The Exception Test is therefore appropriate.

The proposed development site has been assessed for both on and off site flood risk using the findings from the updated South Holland District Council SFRA.

The three relevant sources of flooding are from the Wash, from the tidal River Nene and from the IDB system.

The raised flood defences are generally in a good to fair condition and the current flood risk management policies in the area are to at least maintain the flood defences to their current levels.

'Actual Risk' flood inundation mapping from the updated SFRA indicates that both under present-day conditions and allowing for 100 years of climate change the site is not at risk from a tidal breach of the raised flood defences either at the Wash or at the tidal River Nene during a 200-year (0.5% AEP) event.

'Residual Risk' flood inundation mapping from the updated SFRA indicates that under present-day conditions the site is not at risk from a tidal breach of the raised flood defences either at the Wash or at the tidal River Nene during a 200-year (0.5% AEP) event.

'Residual Risk' flood inundation mapping from the updated SFRA indicates that allowing for 100 years of climate change the site is at risk from a tidal breach of the sea defences at the Wash during a 200-year (0.5% AEP) event. The flood depth across the site would range from 0.5m to 0m whilst the flow velocity would be uniform at 0.1m/s across the site. The flood depth would be slightly less to the eastern part of the site, where the residential dwellings are to be provided, ranging from 0.5m to the north to 0.1m near Bridge Road. Across the western part of the site, where the commercial units are to be provided, would range from 0.5m to 0.3m. It would take a number of hours for floodwater to reach the site and it would be possible to seek refuge onto dry land in Long Sutton. Safety of occupants would be further ensured by the tidal flood warning service provided by the Environment Agency covering the Wash frontage, the tidal River Nene and the tidal River Welland. All occupants to the site should register with the Environment Agency's flood warning service.

The finished floor level for the new buildings, residential and commercial, should be set so as to achieve a freeboard of 300mm over predicted flood depths. Appropriate flood resistance and resilience measures should also be incorporated in the design to ensure buildings and infrastructure remain unaffected by more extreme flood levels.

The current IDB system operates well at present and, as the site is located at the upstream end of the catchment, it is unlikely to be at risk from such flooding. On site rainwater from the development will be discharged via a comprehensive sustainable surface water drainage system to attenuate run-off to meet the requirements of the South Holland IDB. Therefore, the site will not result in an increase in fluvial flood risk further downstream on the IDB drainage system. The design of the drainage system will need to be undertaken to the satisfaction of South Holland IDB.

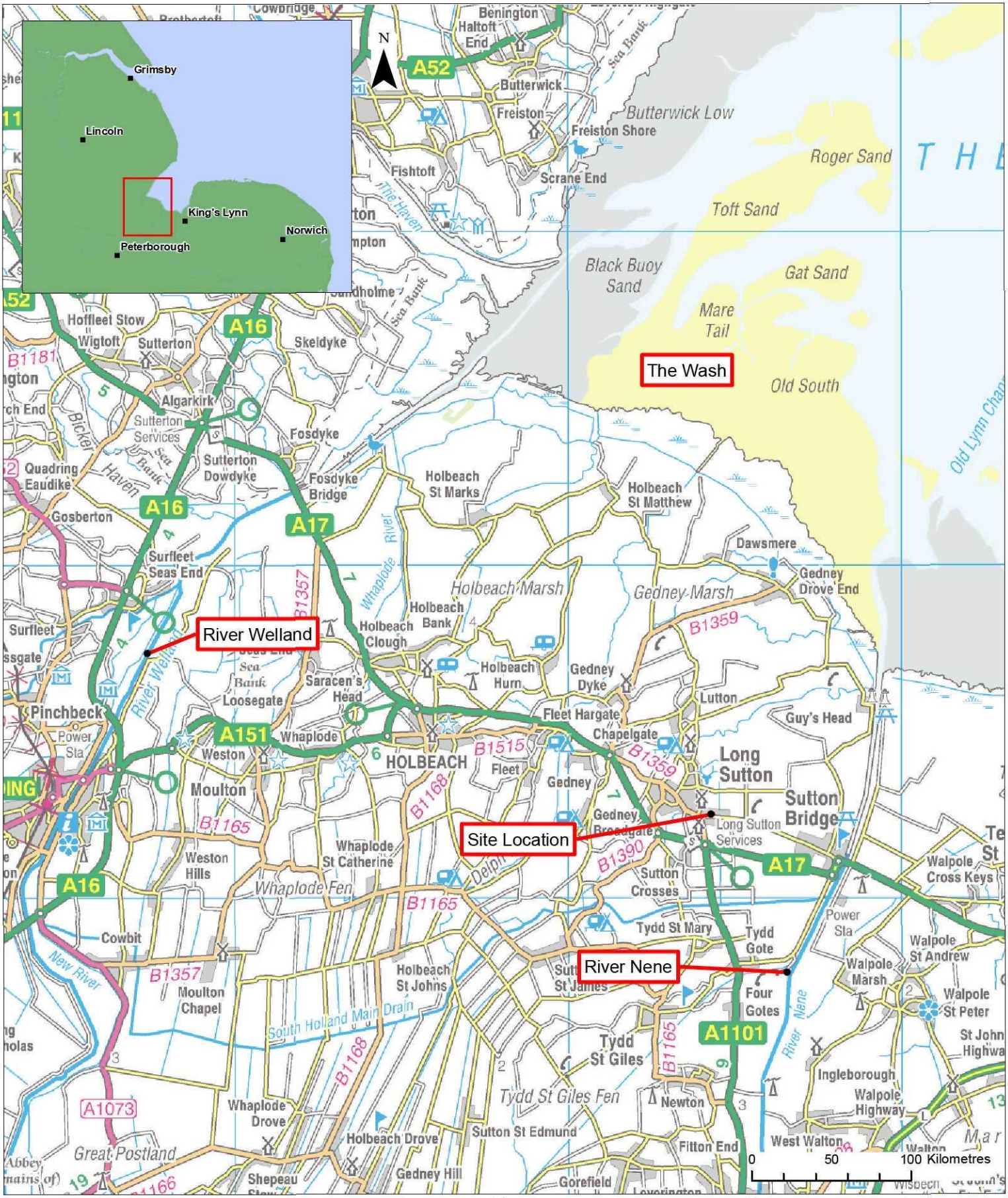
In order to comply with the South Holland IDB Byelaw 10, a 9-metre easement strip is proposed along the IDB drains on the development site's western, north-western and southern boundaries.

Based on the findings of this note and the recommendations proposed, it can be concluded that the development will be safe for its intended use over its lifetime and will not result in an increase in flood risk elsewhere.

FIGURES

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Figure 1: Location Plan
Figure 2: Site Plan
Figure 3: 200-year Tidal Breach Event with Climate Change - Flood Depth (Residual Risk)
Figure 4: 200-year Tidal Breach Event with Climate Change - Flood Velocity (Residual Risk)



Key:

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Title:
Location Plan

Project:
Long Sutton SSE FRA

Client:
SEArch Architects

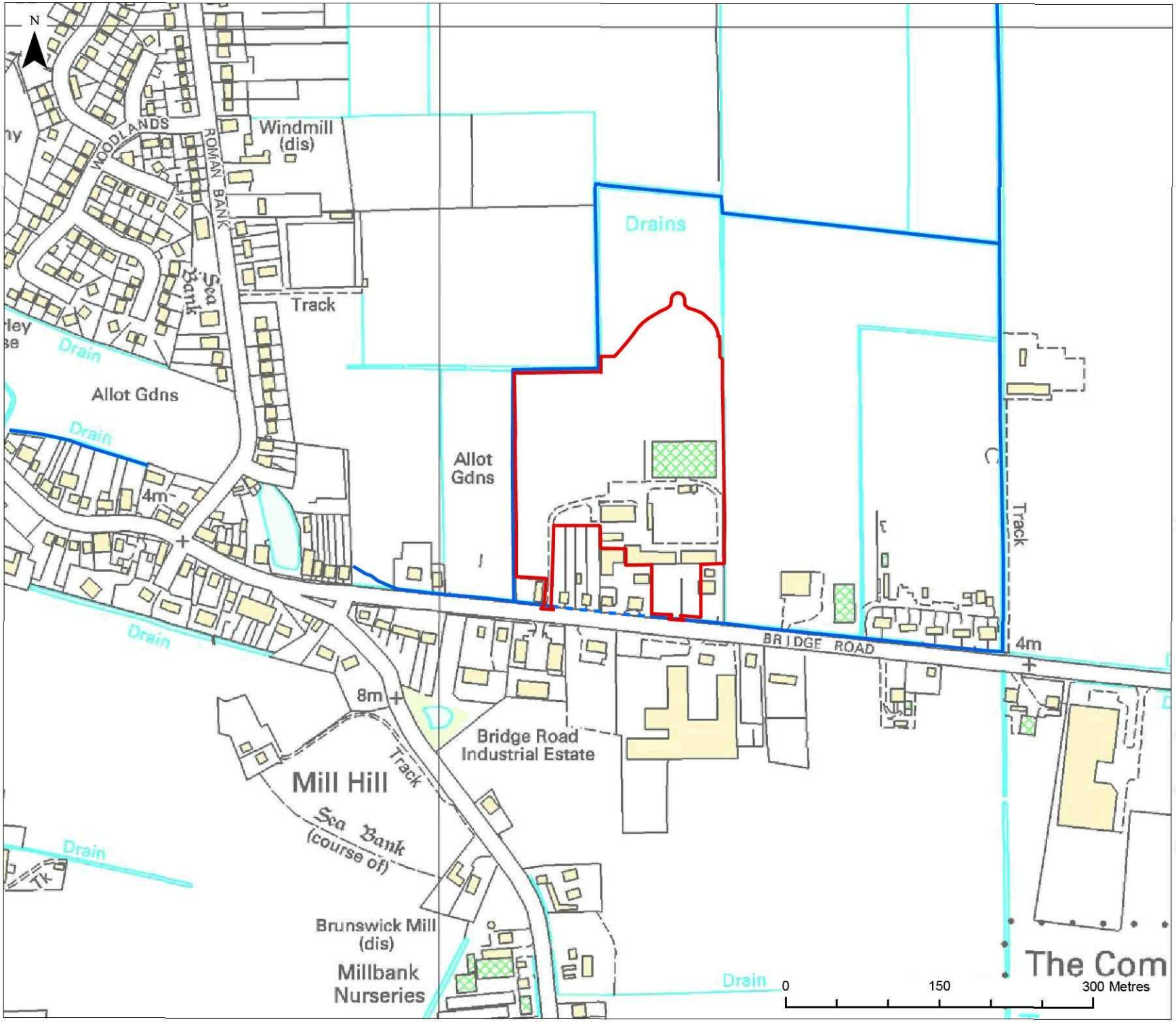
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Date:
December 2010

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ROYAL HASKONING

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Key:

Development Site

South Holland IDB Maintained Drain

Note:
Culverted sections shown as dashed

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Title:
Site Plan

Project:
Long Sutton SSE FRA

Client:
SEArch Architects

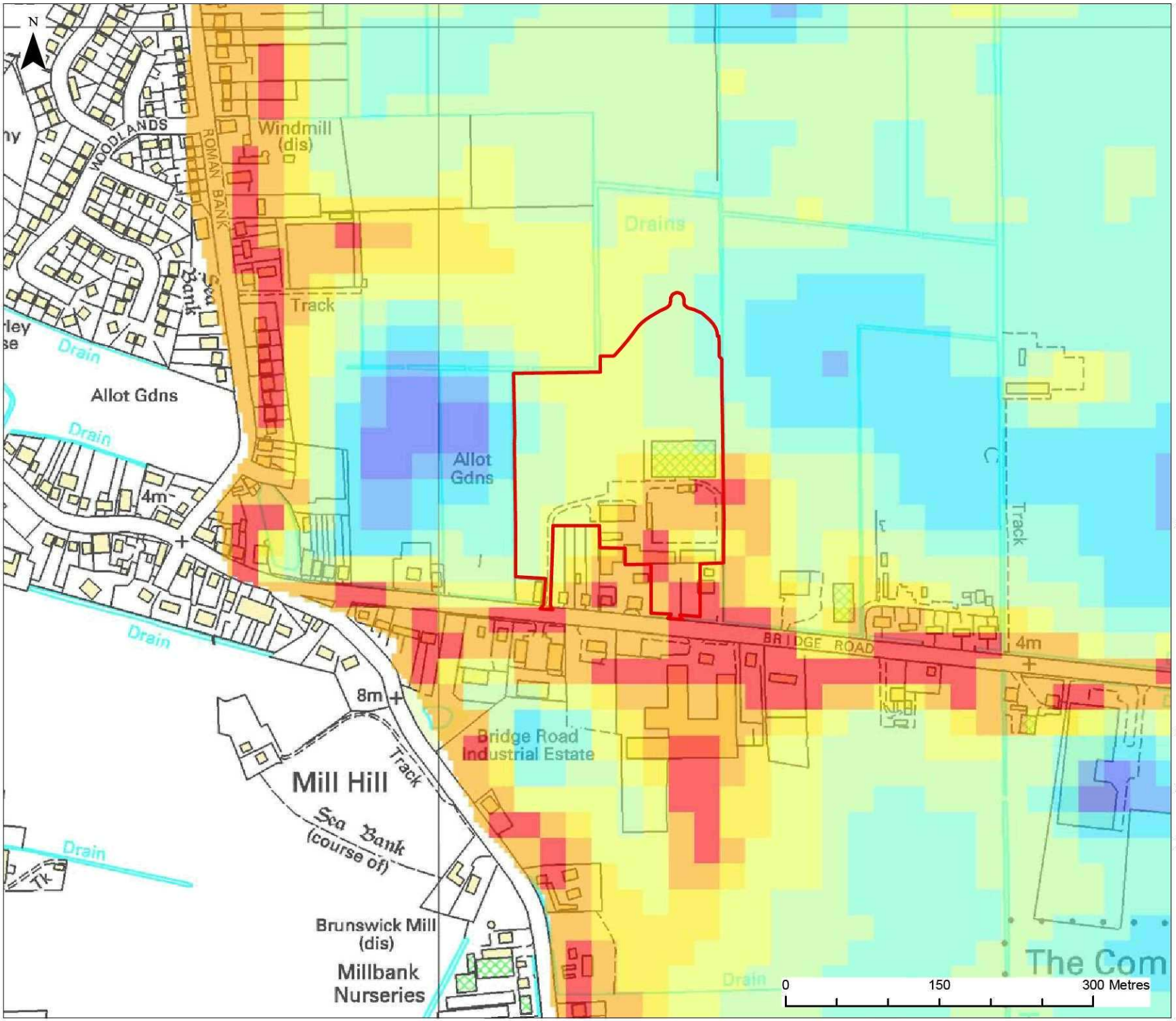
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December 2010

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2

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Key:

- Development Site

Flood Depth (m)

- < 0.0
- 0.0 - 0.1
- 0.1 - 0.2
- 0.2 - 0.3
- 0.3 - 0.4
- 0.4 - 0.5
- 0.5 - 0.6
- 0.6 - 0.7
- 0.7 - 0.8
- 0.8 - 0.9
- 0.9 - 1.0

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Title:
200-year Tidal Breach Event with Climate Change - Flood Depth (Residual Risk)

Project:
Long Sutton SSE FRA

Client:
SEArch Architects

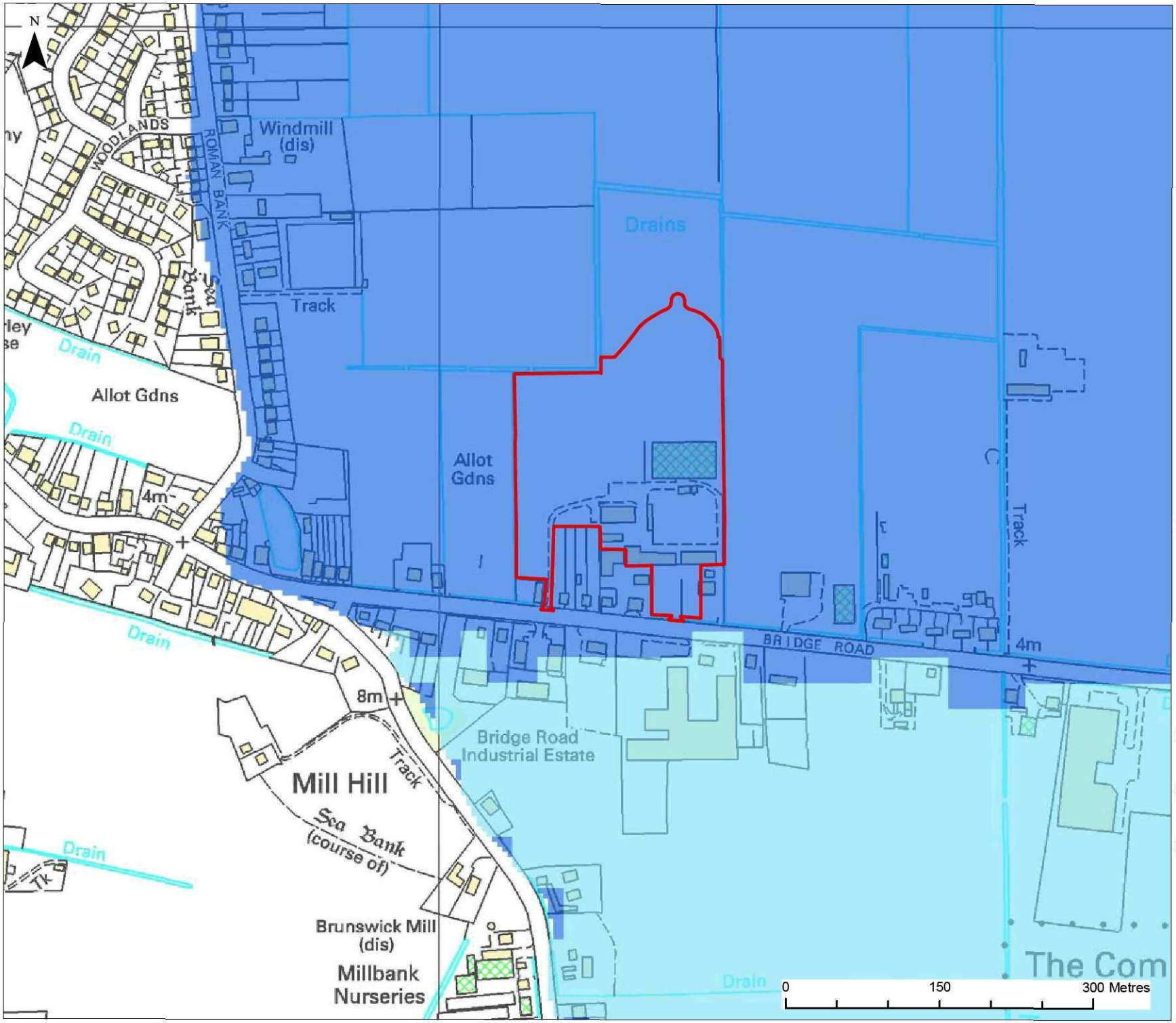
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December 2010

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3

ROYAL HASKONING

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Key:

Development Site

Flood Velocity (m/s)

< 0.1

0.1

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Title:
200-year Tidal Breach Event with Climate Change - Flood Velocity (Residual Risk)

Project:
Long Sutton SSE FRA

Client:
SEArch Architects

Date:
December 2010

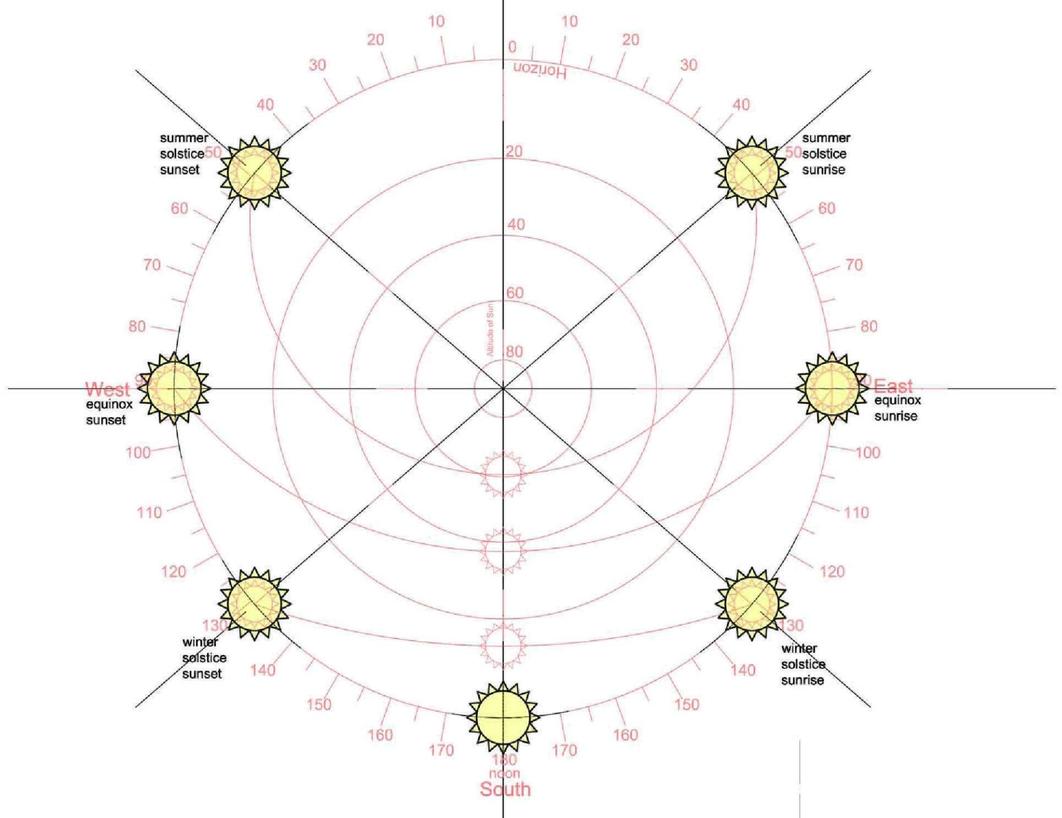
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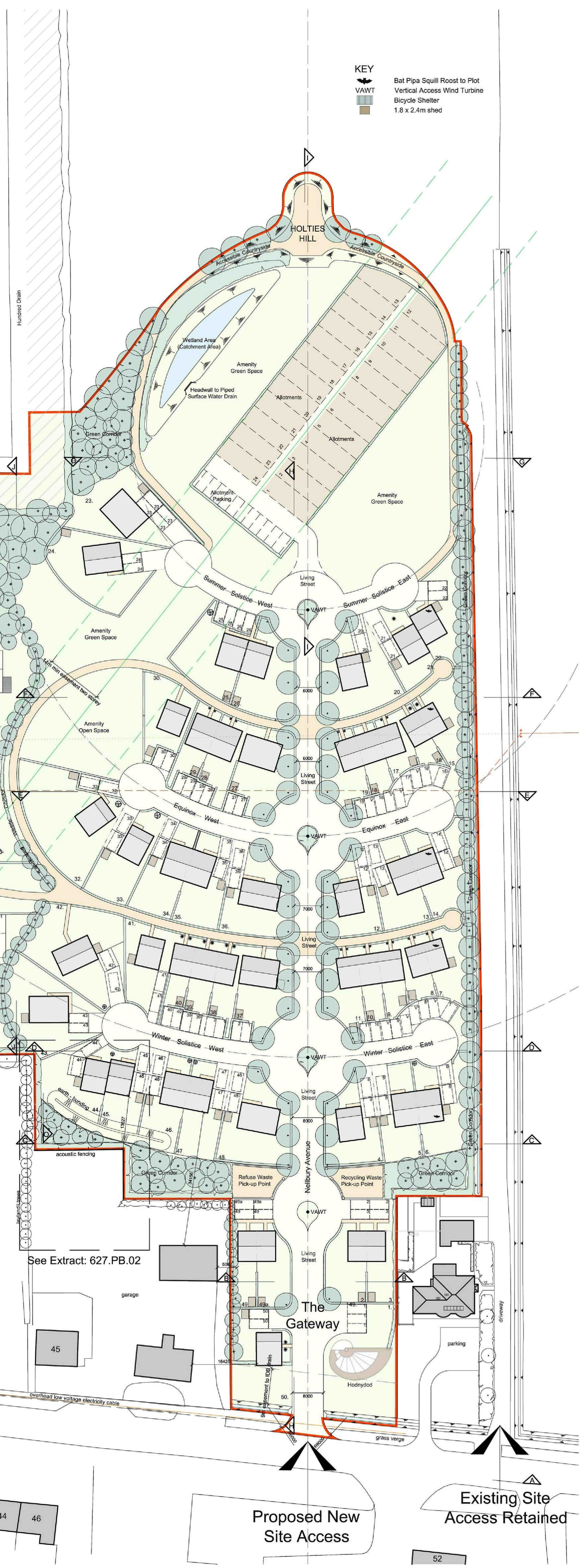
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APPENDIX A - DEVELOPMENT PROPOSALS





Schedule of Accomodation

2 Bedroom, 3 Person - Semi-Detached 62 sq. m / Terrace 75 sq. m 2, 3, 15, 16, 17, 18, 19,38, 39, 40, 49, 49a	12
3 Bedroom, 5 Person - Semi-Detached 86 sq. m 5, 6, 13, 14, 21, 22, 25, 26, 28, 29, 34, 35, 44, 45, 46, 47	16
3 Bedroom, 5 Person - Detached/ Semi-detached/ Terrace 86 sq.m 4, 7, 8, 9, 10, 11,12, 20, 30, 32, 33, 41, 50	13
4 Bedroom, 6 Person - Detached 108 sq. m 24, 27, 37, 42, 43	5
4 Bedroom, 7 Person - Detached 119 sq. m 23, 36, 48	3
Total residential	**49**
Office Unit - 79 sq. m 1	1
Workshop / Office Units - 153sq. m 51, 52, 57, 58, 59	5
Workshop / Office Units - 85sq. m 53, 54, 55, 56	4
Total commercial	**10**

Total commercial floor area	1184sq. m
Total site area	4.23 Hectares, 10.45 Acres

SEARCH ARCHITECTS
SUSTAINABLE ECOLOGICAL ARCHITECTURE LTD
89 Gedney Road, Long Sutton, Spalding, Lincs. PE12 9JU. Tel: (01406) 364646. Fax: (01406) 364471. Email: molearch@searcharchitects.co.uk W: www.searcharchitects.co.uk

Sustainable Settlement Extension to Long Sutton

Land Adjacent No.47 Bridge Road, Long Sutton

Drawing No. 627/20 'B'

Site Layout
1:500 @ A1

APPENDIX B – PREVIOUS FLOOD RISK ASSESSMENT

FLOOD RISK ASSESSMENT FOR PROPOSED RESIDENTIAL AND COMMERICIAL DEVELOPMENT AT BRIDGE ROAD, LONG SUTTON, LINCS

FINAL REPORT

GEOFF BEEL CONSULTANCY

DECEMBER 2008

GCB/SEARCH

DISCLAIMER

This document has been prepared solely as a Flood Risk Assessment in support of a planning application for proposed Residential and Commercial Development at Bridge Road, Long Sutton, Lincolnshire. "Geoff Beel Consultancy" accepts no responsibility or liability whatsoever for any use made of this document other than by the client, "Mr H Myers", for the purposes it was originally commissioned and prepared. All comments and opinions made are based upon information available to "Geoff Beel Consultancy" during the necessary investigate process, and the conclusions and recommendations could therefore, differ in the event of material subsequently being found erroneous, incomplete or misleading. "Geoff Beel Consultancy" therefore, accepts no liability should this prove to be the case.

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7.0 PROBABILITIES AND TRENDS OF FLOODING

8.0 IMPACTS OF FLOODING

9.0 RESIDUAL RISKS – EXTREME EVENTS

10.0 CONCLUSIONS AND RECOMMENDATIONS

Fig 1 - Location Plan – 1:2500
Search Architects Ltd

Fig 2 - Site Survey – 1:500
Search Architects Ltd

Fig 3 - Site Layout – 1:500 Search Architects Ltd

Fig 4 - Strategic Flood Risk Assessment Map
for South Holland District Council

Fig 5 - Location of site in South Holland Internal Drainage
Board district

1.0 INTRODUCTION

1.1 A full planning application is to be submitted by Search Architects Ltd for a proposed residential and commercial development at Bridge Road, Long Sutton, Lincs.

1.2 A Flood Risk Assessment is required to accompany the planning application and meet the requirements of Planning Policy Statement 25 (PPS25) - Development & Flood Risk and for approval by the Environment Agency.

The site, as situated, is located within Flood Zone 3, of the Environment Agency's Flood Zone Maps. The latest Agency Flood Maps have been created as a tool to raise awareness of flood risk with the public and our partner organisations, such as Local Authorities, Emergency Services and Drainage Authorities. The Maps do not take into account any flood defences.

The site is also shown in fluvial Flood Zone 1 of the South Holland District Council's Strategic Flood Risk Assessment Maps.

The site is also located in the South Holland IDB drainage district.

1.3 Geoff Beel Consultancy was appointed on 3rd November 2008 to undertake a Flood Risk Assessment.

A previous Flood Risk Assessment was prepared in April 2008 for an adjoining development under planning application ref. no. H11/0585/08 which received approval from the Environment Agency on 13th May 2008 under file ref. no. AN/2008/105092.

2.0 LOCATION

2.1 The development site is located north of Bridge Road and the Bridge Road Industrial Estate which is on the south side of the road. The National Grid Reference of the central point of the development is TF 44252255.

2.2 The position and extent of the site is shown on Fig 1 – Location Plan at the end of the document.

2.3 The site, located within the South Holland Internal Drainage Board district is shown within Flood Zone 3 as detailed on the Environment Agency Flood Zone Maps and in fluvial Flood Zone 1 of the Council's Strategic Flood Risk Assessment Map as defended by the Internal Drainage Board system.

3.0 THE SITE AND SEQUENTIAL TEST

3.1 The site is currently redundant agricultural land, glasshouses and packing sheds.

3.2 The area of development is approximately 4.18 hectares.

3.3 The proposed site layout consists of 49 residential units with an office and 9 commercial units all accessed from Bridge Road, Long Sutton. A proposed impermeable area of some 0.38 hectare within the total site area of approximately 4.18 hectare whilst the existing impermeable area totals 0.95 hectare.

3.4 The Sequential Test and Exception Test will require to be applied by the Local Planning Authority but the development may be permitted as the site is protected against both the 1 in 200 year return period tidal event and the 1 in 100 year return period fluvial event and located in fluvial Flood Zone 1 of the Council's Strategic Flood Risk assessment Map

4.0 EXISTING FLOOD ALLEVIATION MEASURES

4.1 The site is within a defended floodplain, as defined in Appendix 1 of the Environment Agency's 'Policy for the Protection of Floodplains' and is considered to be passive until such time as a flood greater than that for which the defences were designed occurs. The likelihood of flooding due to overtopping or failure of a flood defence embankment is considered to be small.

The South Holland Internal Drainage Board is protected by a combination of the River Welland tidal defences downstream of Spalding, the River Welland fluvial embankments as well as the River Nene tidal defences downstream of Foul Anchor.

4.2 The site and the surrounding land drains by gravity to Board drains on the immediate south and east boundaries to the Lutton Leam Outfall and hence to the tidal River Nene downstream of the West Lighthouse.

4.3 The existing standard of drainage for the South Holland Internal Drainage Board is 1 in 50 years return period, compatible with the Department of the Environment, Food and Rural Affairs target level of service for rural drainage and flood defence works. Freeboard of 900mm is provided to the lowest land levels. The maximum design flood level of the nearby IDB main drain is 2.26m aOD.

4.4 A length of culverted riparian drain flowing south to north bisects the site and discharges existing surface water run-off.

4.5 Current maintenance standards within the South Holland Internal Drainage Board and of the Environment Agency defences are generally very good.

During the operation and maintenance of its pumping stations, associated structures and channel systems, particularly those that could affect property, the Board seeks to maintain a general standard capable of providing flood protection to its district. A routine maintenance programme is in place to ensure that the Boards assets are commensurate with the standard of protection that is sought. However, bank slips, blocked culverts etc may occur from time to time and these matters are usually dealt with promptly.

5.0 POTENTIAL SOURCES OF FLOODING

5.1 Three potential sources of flooding have been identified as a result of this assessment:

a) local blockages to IDB main drain system.
b) storm return period of 1 in 50 years being exceeded
c) overtopping and breaching of defences of the fluvial River Welland, tidal River Welland and tidal River Nene

5.2 The probability of flooding from source a) is low due to the maintenance standards already achieved and managed by the IDB.

The probability of flooding from b) is also low due to the South Holland IDB main drain design standard incorporating a minimum 900mm freeboard to the lowest land level which provides adequate storage in events greater than 1 in 50 years. Maximum design flood level of nearby IDB main drain is 2.26m as compared with existing land level of varying between 3.40m and 3.96m aOD.

Previous historic rainfall events of 1968 and 1978, estimated to be greater than 1 in 100 year events, caused no flooding to any residential properties at the time and the Boards policy is to provide a standard of drainage which satisfies PPS25 requirements of a 1 in 100 year return period for fluvial protection inclusive of the effects of climate change and developments to the arterial system enables a flexible approach to be adopted and meet the criteria for "sustainable urban drainage".

5.3 The flood embankments to the fluvial River Welland provide a 1 in 100 year return period level of protection in combination with the Crowland and Cowbit Washes. The flood embankments to the tidal River Welland and tidal River Nene provide a 1 in 200 year return period level of protection.

5.4 A sustainable drainage system is to be implemented within the developed site to accommodate the 1 in 100 year rainfall event inclusive of climate change. The South Holland IDB has been involved with pre-planning application discussions to ensure that no increase in surface water run-off is discharged to the IDB main drain system.

The sustainable system will consist of

- rainwater harvesting
- soakaways to BRE365 design requirements
- the existing culverted length of drain will be restored to an open drain for both environmental and drainage benefit
- an attenuation pond will be created at the northern limits of the development site
- a new collector drain excavated to discharge surface water run-off to the attenuation pond on the eastern boundary
- a wetland area with landscaped buffer zone
- allotments and open space either side of the attenuation pond
- permeable access roads

6.0 EXTENT OF KNOWN FLOODING

6.1 During the preparation of this assessment, no evidence was discovered of the site being flooded or of any adjoining properties.

7.0 PROBABILITIES AND TRENDS OF FLOODING

7.1 The probability of this development flooding from localised drainage systems is very low.

7.2 The probability of the site flooding with water from any South Holland IDB main drain is less than 1% because of the standards of the existing flood defence systems, storage within existing drainage channels and the location of the site.

7.3 The probability of the site flooding with fluvial waters from any main river system is less than 1% because of the standards of the existing flood defences and the location of the site.

7.4 If under very extreme events, levels of floodwater from the South Holland IDB main drains or arterial systems rose to such an extent that the site was affected, the situation would not be sudden. It is very probable that sufficient time would be available to take precautionary actions to limit the extent and potential impact of flooding.

7.5 The water levels in the drainage channels will tend to rise as a result of the impacts of climate change. However the existing systems and defences together with the proposed floor levels above existing ground level will be appropriate for the design life of the development (i.e. 100 years).

8.0 IMPACTS OF FLOODING

8.1 No significant impacts of flooding are anticipated.

8.2 Floor levels of the development will be at 4.09m aOD and above existing ground levels which together with the proposed sustainable drainage system will offer additional protection against impacts arising from any extreme short duration, localised events.

8.3 The general location of the site within the catchment is such that if flooding occurred from any of the South Holland IDB main drain systems, then probably 2 to 3 days warning time would be available.

8.4 No displacement of water from the site will affect any adjoining properties. It is intended to provide a sustainable drainage system such that surface water drainage will be attenuated before discharging to the adjoining IDB main drain system at no greater rate than the existing impermeable area run-off.

8.5 Safe and dry access/egress is available to the site from Bridge Road with carriageway level at 4.50m aOD.

9.0 RESIDUAL RISK – EXTREME EVENTS

9.1 The residual risk from extreme events is very low on this site, because of its location, within the South Holland IDB area and its location 4.50 kms from the River Nene tidal defences.

9.2 Although within either fluvial Flood Zone 1 or Flood Zone 3 according to PPS25 classification, the site actually has a very low risk of flooding due to the current standards of drainage and flood defence and land levels. The site is not located within a Functional Flood Plain of any 'main river' or 'main drain' as defined in PPS25. The Environment Agency Flood Zone Maps have been produced irrespective of existing flood defences and standards of protection.

9.3 South Holland District Council in conjunction with the Environment Agency and the local IDB's within the Council area have carried out a Strategic Flood Risk Assessment of the whole District by appointed Consulting Engineers.

The Strategic Flood Risk Assessment has produced more definitive Flood Risk Maps than those published by the Environment Agency and at the same time has analysed flood return periods of all tidal and fluvial defences for years 2002 and 2052 to account for the effects of climate change.

Breach scenarios of embankments failing and/or being overtopped have also been carried out to establish Flood Risk Zones.

9.4 As a result of the Strategic Flood Risk Assessment; the South Holland Main Drain and associated IDB main drains have been determined as providing protection against a 1 in 100 year return period event both in years 2002 and 2052.

9.5 The development site has been identified outside of any Flood Risk Zone from the South Holland Main Drain and associated IDB main drain or the River Welland or the River Nene.

10.0 CONCLUSIONS AND RECOMMENDATIONS

10.1 As a result of the assessment, the following conclusions have been reached:-

- The proposed development is not in a Functional Floodplain as defined by PPS25. It is located in the Passive Floodplain protected by defences to a 1 in 100 year return period, (1.0%)

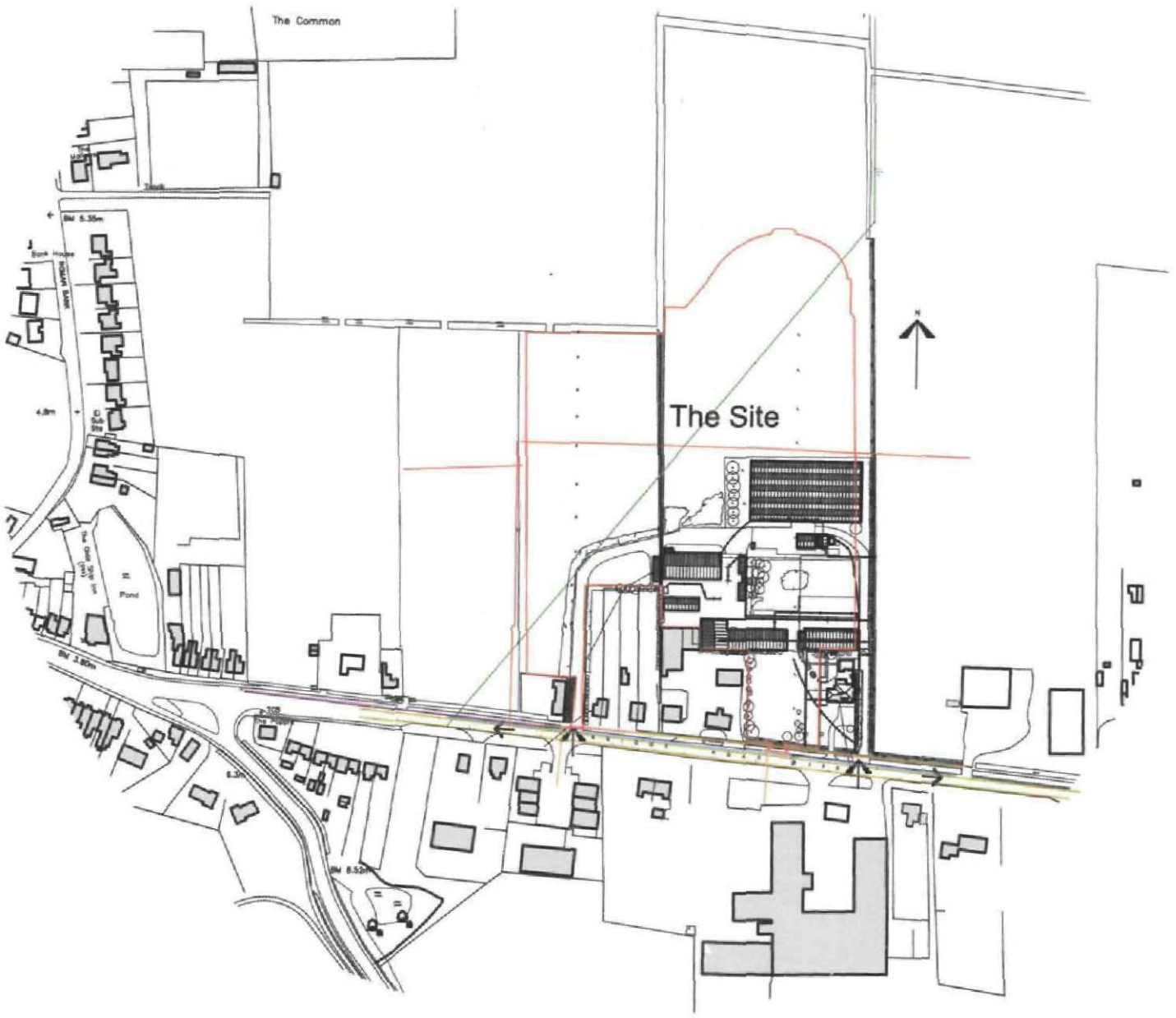
- Although the site is in Flood Zone 3, the actual risk of site flooding from any Environment Agency river system is very low (less than 0.5%). The site has been identified in fluvial Flood Zone 1 of the South Holland District Council's Strategic Flood Risk Assessment Maps.

- Although the site is located within an Internal Drainage District with a minimum standard of drainage of 1 in 50 years, this accords with Defra guidelines for rural development. Freeboard to design water level of 900mm to lowest land level is available for events greater than 1 in 50 years providing further storage within the drainage channels.

- On site rainwater from the development will be discharged via a comprehensive sustainable surface water drainage system to attenuate run-off to meet the requirements of the IDB.

- Land Drainage Byelaw Consent will be required from the South Holland Internal Drainage Board for the proposed site entrance drain culverts and also the 6 metre easement to the drains on the development site western boundary.

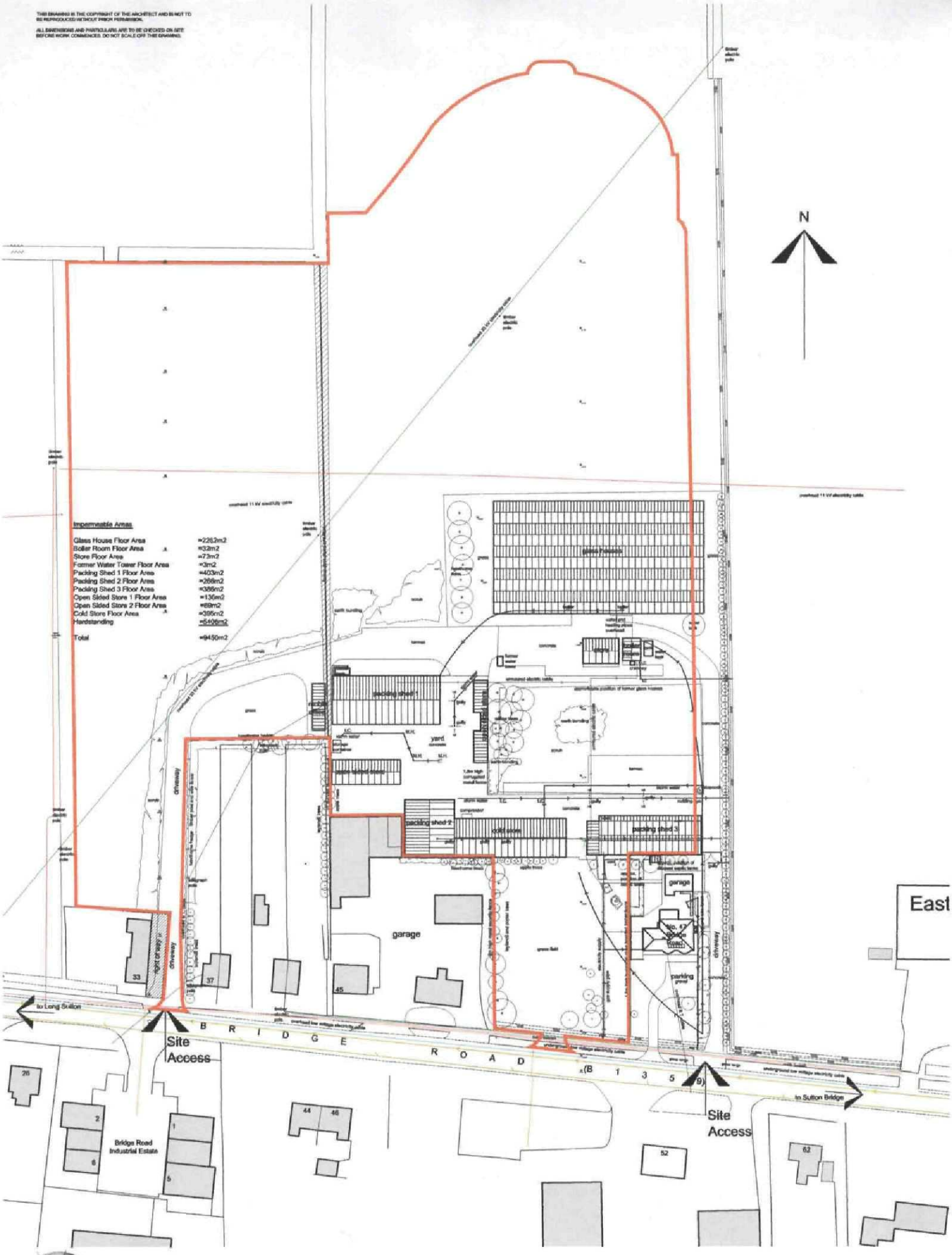
SEARCH ARCHITECTS



LOCATION PLAN 1:2500 @ A3

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SEARCH ARCHITECTS

Sustainable Settlement Extension to Long Sutton

Land Adjacent No.47 Bridge Road, Long Sutton

Site Survey
1:500 @ A1

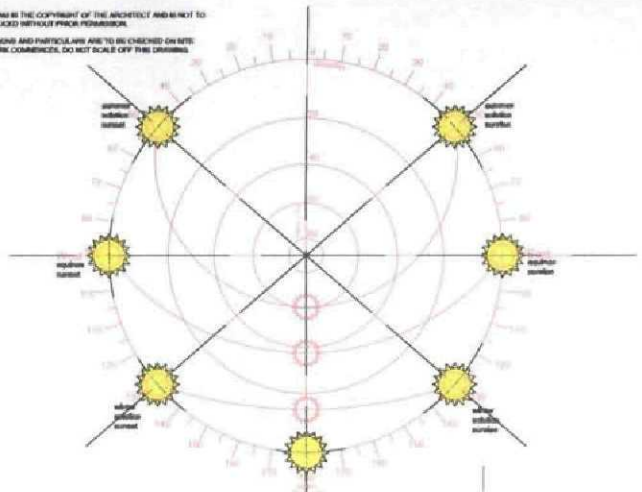
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KEY

Bat Pipe Squill Roost to Plot

VAWT Vertical Access Wind Turbine



Schedule of Accomodation

2 Bedroom, 3 Person - Apartment/Terraced / Terrace, 70 sq. m.
2, 5, 7, 8, 9, 10, 11, 12, 16, 17, 18, 19, 20, 36, 40 — 15

3 Bedroom, 4 Person - Semi-Detached, 90 sq. m.
1, 4, 13, 14, 21, 22, 26, 27, 28, 29, 30, 31, 32, 43, 46, 47 — 14

3 Bedroom, 5 Person - Detached, 100 sq. m.
6, 15, 23, 24, 25, 33, 34, 35, 39, 41, 44 — 11

4 Bedroom, 6 Person - Detached, 135 sq. m.
37, 38, 42, 45, 48 — 5

4 Bedroom, 7 Person - Detached, 150 sq. m.
3, 31, 49 — 3

Total residential — 48

Office Unit - 44 sq. m — 1

Workshop / Office Units - 185sq. m
50, 51, 52, 53, 54 — 5

Workshop / Office Units - 97sq. m
55, 56, 57, 58 — 4

Total commercial — 10

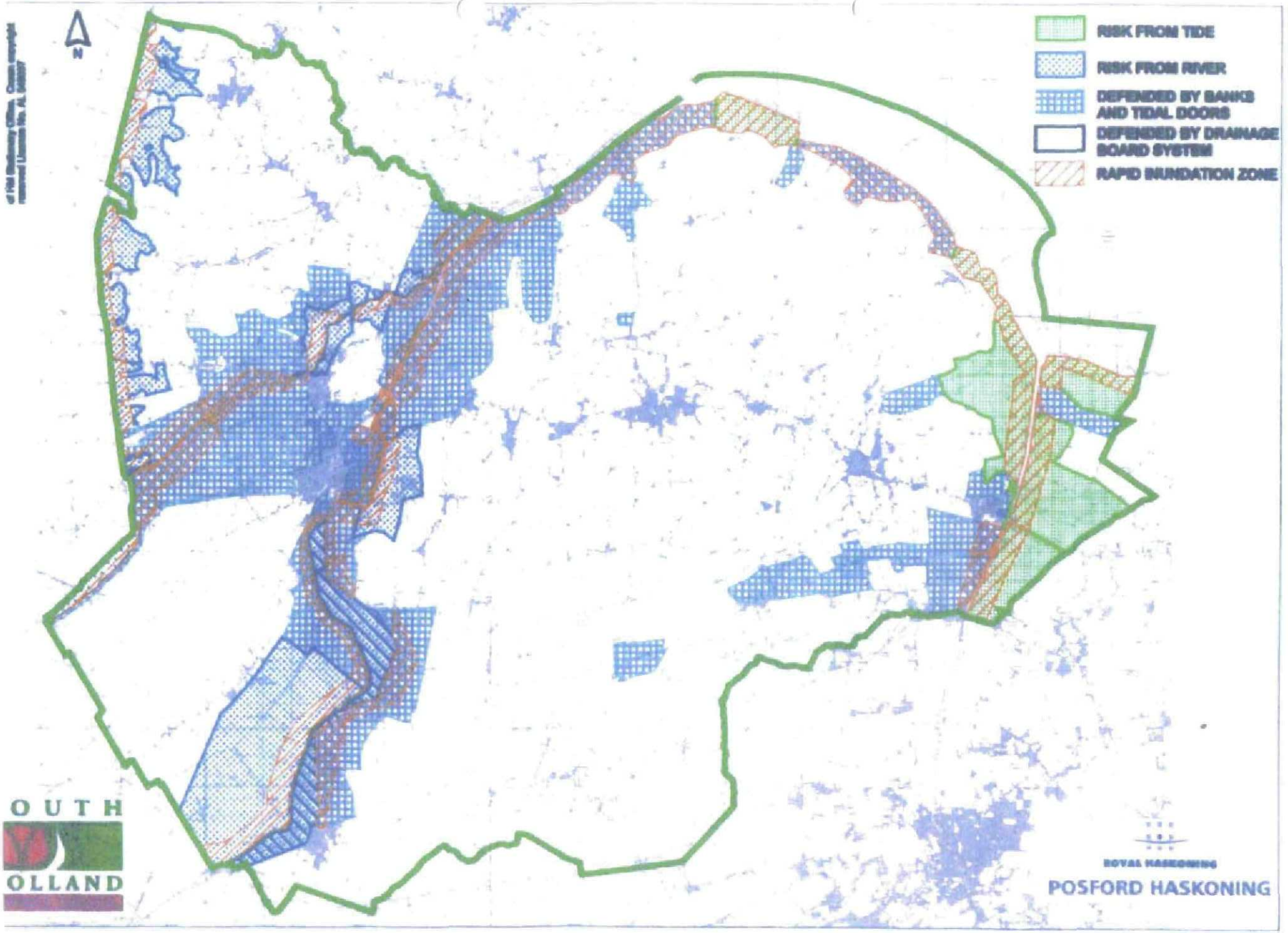
SEARCH ARCHITECTS

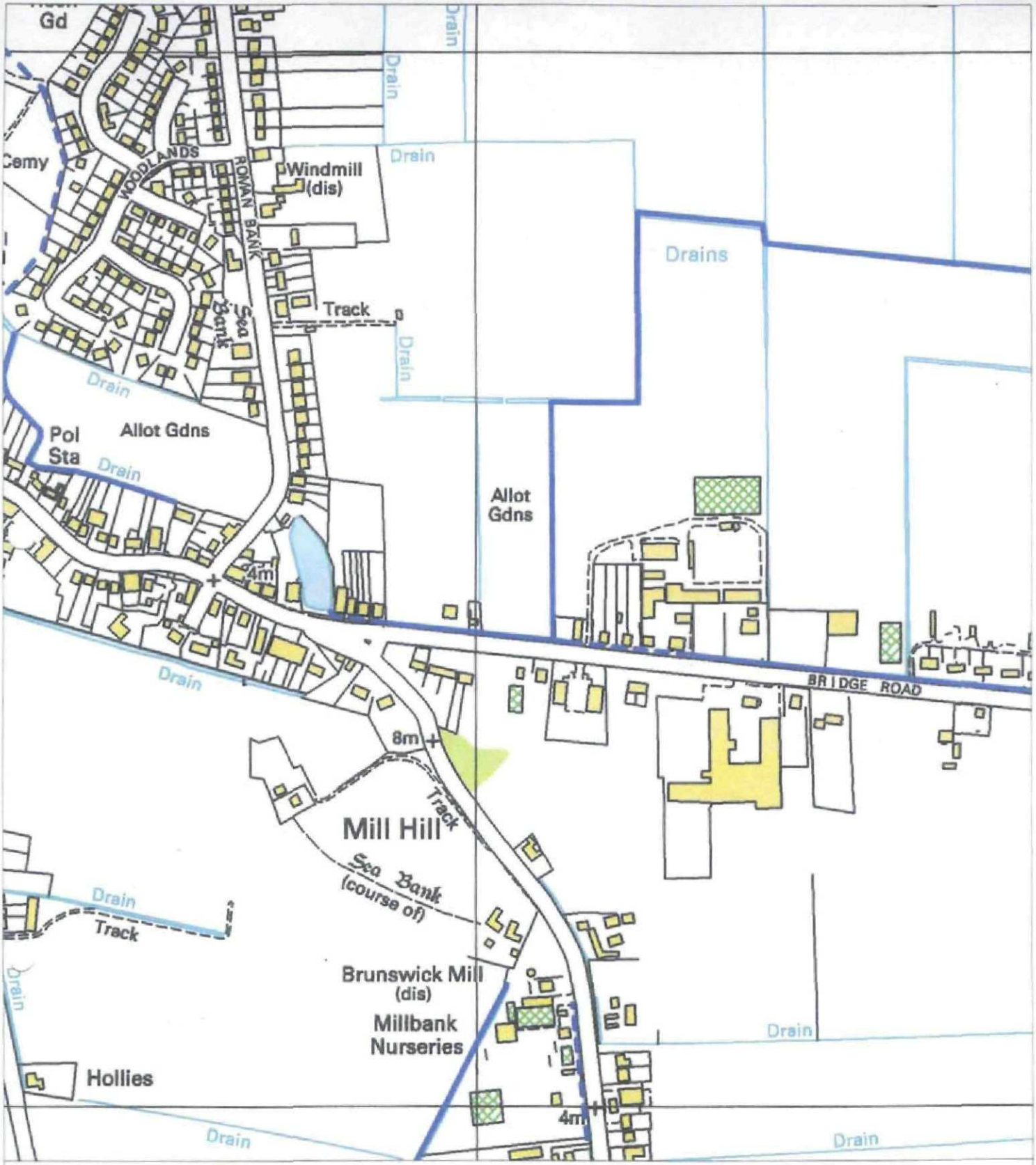
SUSTAINABLE ECOLOGICAL ARCHITECTURE LTD

Sustainable Settlement Extension to Long Sutton

Land Adjacent No.47 Bridge Road, Long Sutton

Site Layout 1:500 @ A1


RISK FROM TIDE
RISK FROM RIVER
DEFENDED BY BANKS AND TIDAL DOORS
DEFENDED BY DRAINAGE BOARD SYSTEM
RAPID INUNDATION ZONE
N
OUTH
OLLAND
ROYAL HASKONING
POSFORD HASKONING



SOUTH HOLLAND INTERNAL DRAINAGE BOARD

Oddfellows, Bridge Road, Long Sutton
Plan showing Board-maintained drains

N
W E
S

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Board-maintained Open Drains

Board-maintained Piped Drains

Date: April 2008
Scale: 1:5000