FLOOD RISK ASSESSMENT

PROPOSED RESIDENTIAL DEVELOPMENT
WALNUT TREE FIELD
COALBEACH LANE
SURFLEET
PE11 4BY

R.M ASSOCIATES
10 Main Street
Thorpe on the Hill
Lincoln
LN6 9BG
Tel 01522 681728
Mobile 07967 304737
e-mail; ray.rmassociates@gmail.com
Version 1 November 2014

FLOOD RISK ASSESSMENT FOR PROPOSED RESIDENTIAL DEVELOPMENT, WALNUT TREE FIELD, COALBEACH LANE, SURFLEET, PE11 4BY

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 (NPPF) March 2012, which identify how the issue of flooding is dealt with in the drafting of planning policy and the consideration of planning applications.

Inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere. Local Plans should apply 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 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 years flood) for coastal areas under present expectations or the highest known flood. However they do not take into account of the presence of defences or the likelihood that flood return intervals will be reduced by climate change.

This Flood Risk Assessment has been prepared in support of the planning application and considers the risk of flooding from fluvial and tidal sources. 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.

RM Associates accepts no responsibility or liability for any use of this document other than by the client Mrs E Asprey and Mrs S Tunnard, for the purposes, which it was originally commissioned and prepared. If any unauthorised Third Party comes into procession of this report, they rely on it at their own risk and RM Associates owe them no duty of care or skill. All comments contained in this report, including any conclusions are based upon information available at the time of writing the report. RM Associates accepts no liability if additional information exists or becomes available after the time of writing this report.

This document is the copyright of RM Associates The reproduction or transmission of all or part of this document, whether by photocopying or storing in any medium by electronic means or otherwise, without the prior written consent of RM Associates is prohibited.

This report contains Environment Agency information © Environment Agency and database.

APPLICATION SITE

The site is located at Walnut Tree Field, Coalbeach Lane, Surfleet PE11 4BY, within the South Holland District Council's administrative area. **Plan 1**

The Site would be classed as Non Major Development applying the Town & Country Planning (Consultation) (England) Direction 2009 as the site is to be developed for less than 10 dwellings

The National Grid Reference for the site is TF 26272 29007

The Outline Planning Application is for the erection of six two storey dwellings and access road. **Plan 2**

The National Planning Policy Framework Technical Guidance (NPPF TG) defines three levels of flood risk depending upon the annual probability of fluvial flooding occurring.

Zone 1 – Low Probability (<0.1%)
Zone 2 – Medium Probability (0.1 – 1.0%
Zone 3 – High Probability (>1.0%)

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 NPPF TG**.**

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

Zone 3a - high probability

Definition
This zone comprises 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.

Appropriate uses
The water-compatible and less vulnerable uses of land (table 2) are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone.

The more vulnerable uses and essential infrastructure 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 users in times of flood.

Flood risk assessment requirements
All development proposals in this zone should be accompanied by a flood risk assessment.

Policy aims
In this zone, 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 systems;
- relocate existing development to land in zones with a lower probability of flooding; and
- create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.

Applying the Flood Risk Vulnerability Classification in Table 2 of NPPF TG the proposed residential development is classified as More Vulnerable", with Table 1 of NPPF TG stating that such uses are appropriate in this zone subject to the Exceptions Test

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[6].
- Sites used for holiday or short-let caravans and camping, *subject to a specific warning and evacuation plan.*[7]

From the topographical survey the Coalbeach Lane road level at the front of the property is 3.39mODN, with the ground level of the existing site varying from 3.42mODN to 3.82mODN. It is proposed that the ground floor level for the new dwellings will be 300mm above the existing ground level at a minimum of 3.70mODN. **Plan 2**

DRAINAGE AUTHORITIES

Environment Agency

The Environment Agency has permissive powers for reducing the risk of flooding from designated main rivers and from the sea.

The following potential source of flooding affecting the development site has been identified as:

- From the River Glen

The Flood Zone Maps identify river catchments over 3 sq. km. These maps are a theoretical estimate of areas of land that could be inundated by floodwater during a flooding event was it not for the presence of flood defences. 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

These maps indicate that the area would be flooded without flood defences.). The Flood Map indicates the area at risk of flooding, **assuming no flood defences exist**, for a flood event with a 0.5% chance of occurring in any year for flooding from the sea, or a 1% chance of occurring for fluvial (river) flooding. It also shows the extent of the Extreme Flood Outline which represents the extent of a flood event with a 0.5% chance of occurring in any year, or the highest recorded historic extent if greater. **Map 1**

The Environment Agency Risk of flooding from Rivers and Sea map shows that the site is at Medium risk of flooding. Medium means that each year, this area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%). 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 Glen

The site is located 200m to the north of the River Glen. The 1 in 100 year flood level present day in the river

channel is 4.19mODN and including for climate change (2115) is 4.65mODN. The left bank level on Station Road is 5.25mODN. Along this stretch of the River Glen there are no raised defences to the left bank, therefore there would be no breach to the bank due to the natural land levels.

The flood levels in the River Glen are set out below.

Chainage from Tidal Sluice	Peak 1 in 100 year Fluvial Flood Level (mODN)		Design Crest Level (mODN)	Defence Type
	2007	2115		
1.9km	4.17	4.65	4.89	No raised defence road
2.0km	4.17	4.65	4.90	No raised defence road set back
2.1km	4.18	4.65	4.65	No raised defence road set back

These levels are taken from the South Holland Strategic Flood Risk Assessment

From the above figures it has been demonstrated that for flooding events up to 1in 100 year these can be contained within the existing river systems both now and for the 100year lifetime of the development.

The Environment Agency has confirmed that the site is not within a Hazard Zone following a breach to the tidal defences of the River Welland, or affected by overtopping of the defences for both the present day and with climate change 2115 scenarios. The A16 Trunk road forms the boundary of western migration for tidal flooding.

Peak water levels in the River Glen occur when the outfall to the River Welland is tide locked. During this time the incoming river flow cannot discharge so it gradually fills up the river channel until the tidal doors are reopened on the falling tide. The high water levels in the river are only transient lasting only a few hours. Immediately upstream of the tidal doors is the Surfleet Reservoir which will fill when river flows in the River Glen are high.

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

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

It was found that the actual risk from primary sources of flooding (taken as being rivers and the sea) was assessed as being the product of:

- Medium probability (assigned because the standards of the primary defences are variable) and

- Low consequence (assigned because of the District's generally rural nature and because any urban flooding is likely to be shallow with minimal impact).

The findings reflect the considerable protection afforded to the area by coastal and tidal & fluvial flood defences and by the extensive well organised system of lowland IDB fluvial drainage.

The computer modelling used in the SFRA to produce the Hazard, depth and velocity maps simulated the spread of flood waters over the land and allowed for the presence of locally raised features such as road embankments etc. The maps produced by the Environment Agency took a more precautionary approach.

The potential flooding consequences shown on this map relate to flooding from the sea, main rivers and Internal Drainage Board systems taking into account the presence of current flood risk management measures such as flood defences.

The consequences designated as being an Actual Risk arise from direct overtopping of defences, where this would occur, together with assumed breach failure of some defences. Breach failure has been assumed to occur in places where the freeboard between peak sea or river water level and the defence crest level is less than the minimum desirable for structural security of the defence.

From the Actual Peak Depth Spalding - Year 2115 1% Fluvial / 0.5% Tidal Event Probability map from the update of the Strategic Flood Risk Assessment for South Holland District Council the site is not subject to flooding following any breach to the flood defences. **Map 3**

Welland & Deepings Internal Drainage Board

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

The Board's Main Drain is over 400m east of the site and will not affect the proposed site

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 and no high ground around the development this will not cause any rapid inundation of the site and is likely only lead to local ponding of shallow depth and low velocity. The properties are also raised 300mm above the existing ground level. It is 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.

- 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. With the ground floor levels raised 300mm above the existing ground level, it is therefore 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. There are no other known facilities close by which would affect the site.

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 South Holland District Council Strategic Flood Risk Assessment shows that the site is located within a low probability flood zone but the area is reliant on protection by flood defences providing a standard of protection of 1 in 200 years return period. The Actual Peak Depth Spalding - Year 2115 1% Fluvial / 0.5% Tidal Event Probability map from the update of the SHSFRA for shows that the site is not subject to flooding following any breach to the flood defences.

Applying the Flood Risk Vulnerability Classification in Table 2 of NPPF TG, the proposed residential development is classified as "More Vulnerable", with Table 1 of NPPF TG stating that such uses are appropriate in this zone (as summarised in Table 3 NPPF TG).

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

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

The Sequential and Exception Tests are subject to a separate report forming part of the planning application.

The ground floor level for the dwellings has been set at 300mm above the site ground level to ordnance datum at a minimum of 3.70mODN.

CLIMATE CHANGE

It is now recognised that global warming is likely to affect the frequency and severity of extreme events for both tidal and fluvial flooding.

The annual sea rise due to climate change is given in NPPF TG and the recommended contingency allowances are stated in Table 4.

TABLE 4: Recommended contingency allowances for net sea level rises

	Net sea level rise (mm per year) relative to 1990			
	1990 to 2025	**2025 to 2055**	**2055 to 2085**	**2085 to 2115**
East of England, east midlands, London, south-east England (south of Flamborough Head)	4.0	8.5	12.0	15.0
South-west England	3.5	8.0	11.5	14.5
North-west England, north-east England (north of Flamborough Head)	2.5	7.0	10.0	13.0

The site is not affected by tidal flooding for both present day and year 2115 scenarios.

Table 5: Recommended National Precautionary Sensitivity Ranges for Peak Rainfall Intensities. Peak River Flows, Offshore Wind Speeds and Wave Heights.

Parameter	**1990 to 2025**	**2025 to 2055**	**2055 to 2085**	**2085 to 2115**
Peak rainfall intensity	*+5%*	*+10%*	*+20%*	*+30%*
Peak river flow	*+10%*	*+20%*		
Offshore wind speed	*+5%*		*+10%*	
Extreme wave height	*+5%*		*+10%*	

The effect of global warming on fluvial flood peaks is given in Table 5. It is expected that the overall effect up to 2025 will result in an increase of rainfall of 5%, 2025-2055 10%, 2055-2085 20% and 2085-2115 of 30% with Peak River flows increasing by 10% and from 2085-2115 by 20%.

INFRASTRUCTURE

Surface Water Drainage

The roof water from the roofs of the properties will be discharged to soakaways designed to BRE Digest 365 with Rainwater butts provide to the rear elevations for recycling purposes.

All access and parking areas will be constructed using permeable materials.

Foul Water

Foul drainage from the properties will be connected in to a new sewer, designed and laid in accordance with Sewers for adoption 6th edition, adopted by Anglian Water Services Ltd, under Section 104 of the Water

Industry Act 1991, (as amended by the Water Act 2003) and connected into the Anglian Water sewer in Coalbeach Lane.

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

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 actually 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 ground floor level for the dwellings is to be raised 300m above existing average ground level with a lowest level being 3.70mODN.

- Arrange for all service circuits at ground floor level to be routed at high level and where practical socket outlets, boilers etc. to be a minimum of 0.5m above the raised ground floor level.

- The owner of the property will register their property with the Environment Agency to receive automated early warnings of potential flood events.

CONCLUSION

- The site does have the benefit of protection from tidal flooding by the existing defences which are properly maintained to a 1 in 200 year standard of protection from tidal flooding both now and for the lifetime of the development. The River Glen does not have any raised defences along this stretch of river and therefore would not be subject to a breach and the 1 in 100 year flood level with climate change would be contained within the channel.

- The site for the new dwellings is shown to lie within the Flood Zone 3a (High Probability), land assessed as having a less than 1 in 100 annual probability of river or sea flooding in any year (1%), without defences on the Agency's flood maps. There are no local site specific risks that would adversely affect this categorisation.

- The site is protected by adequate flood defences which are maintained by the Environment agency.

- Applying the Flood Risk Vulnerability Classification in Table 2 of NPPF. The proposed use of the land and buildings for residential use falls within the 'More Vulnerable' uses of land shown in Table 2 Flood Risk Vulnerability Classification and buildings used for all purposes are appropriate in Flood Zone 3a subject to passing the exception Test.

- The results of the updated South Holland District Council Strategic Flood Risk Assessment shows that the site is located within a low probability flood zone. The Actual Peak Depth Spalding - Year 2115 1% Fluvial / 0.5% Tidal Event Probability map from the update of the SHSFRA for shows that the site is not subject to flooding following any breach to the flood defences.

- No obvious constraints have been identified that may impact the proposed development and the type of mitigation measures that can be used to reduce the flood risk.

- Floor levels for the dwellings are to be set 300mm above the existing ground level at a minimum of 3.70mODN.

- Flooding from other sources is unlikely to affect the site.

****

APPENDIX

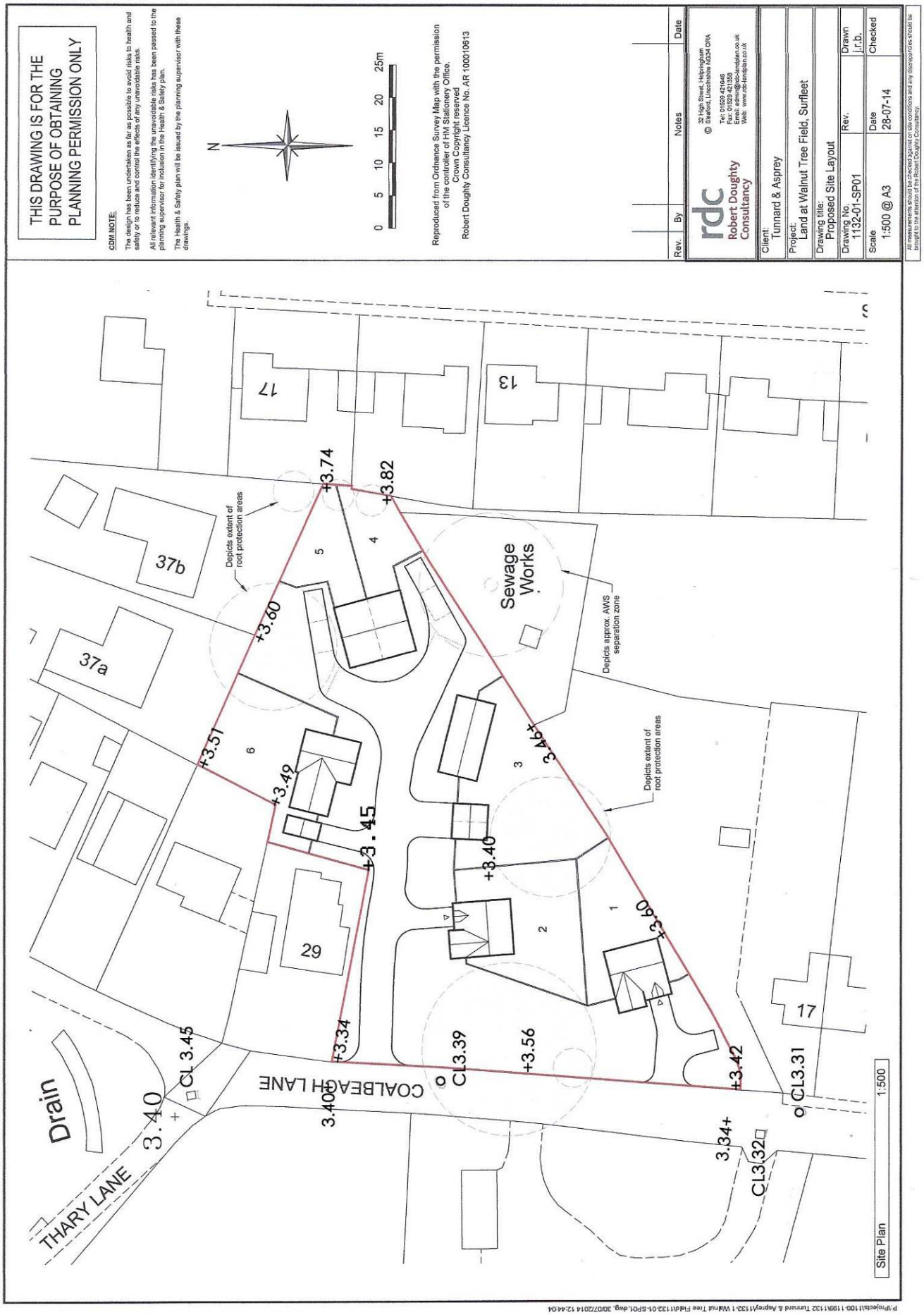
Photo 1	Proposed Development Site
Photo 2	River Glen Side of Station Road
Plan 1	Location Plan
Plan 2	Site Plan with OS Levels
Map 1	Extract from Environment Agency Flood Zone Map
Map 2	Extract from Environment Agency Flooding from Rivers and Sea Map
Map 5	Extract from South Holland SFRA Actual Peak Depth 2115 Map

Photo1 Proposed Development Site

Photo2 River Glen Side of Station Road

© Crown Copyright 2014 RMA Licence No 100047316

PLAN 1


THIS DRAWING IS FOR THE PURPOSE OF OBTAINING PLANNING PERMISSION ONLY
CDM NOTE:
The design has been undertaken as far as possible to avoid risks to health and safety or to reduce and control the effects of any unavoidable risks.
All relevant information identifying the unavoidable risks has been passed to the planning supervisor for inclusion in the Health & Safety plan.
The Health & Safety plan will be issued by the planning supervisor with these drawings.
N
0 5 10 15 20 25m
Reproduced from Ordnance Survey Map with the permission of the controller of HM Stationery Office.
Crown Copyright reserved
Robert Doughty Consultancy Licence No. AR 100010613
Rev. By Notes Date
rdc
Robert Doughty Consultancy
32 High Street, Helpringham
Sleaford, Lincolnshire NG34 0RA
Tel: 01529 421646
Fax: 01529 421359
Email: admin@rdc-landuse.co.uk
Web: www.rdc-lincoln.co.uk
Client: Tunnard & Asprey
Project: Land at Walnut Tree Field, Surfleet
Drawing title: Proposed Site Layout
Drawing No. 1132-01-SP01
Rev.
Drawn J.r.b.
Scale 1:500 @ A3
Date 28-07-14
Checked
All measurements should be checked against on site conditions and any discrepancies should be brought to the attention of the Robert Doughty Consultancy.
Site Plan 1:500
THARY LANE
Drain
3.40
CL 3.45
COALBEAGH LANE
3.40
CL3.39
+3.34
+3.56
+3.42
CL3.31
3.34+
CL3.32
29
37a
37b
17
13
6
5
4
3
2
1
+3.51
+3.49
+3.45
+3.40
+3.60
+3.60
+3.74
+3.82
Depicts extent of root protection areas
Sewage Works
Depicts approx. AWS separation zone
Depicts extent of root protection areas
P:\Projects\1100-1199\1132 Tunnard & Asprey\1132-1 Walnut Tree Field\1132-01-SP01.dwg, 30/07/2014 12:44:04

PLAN 2

EXTRACT FROM ENVIRONMENT AGENCY FLOOD MAP

© Crown Copyright 2014 RMA Licence No 100047316

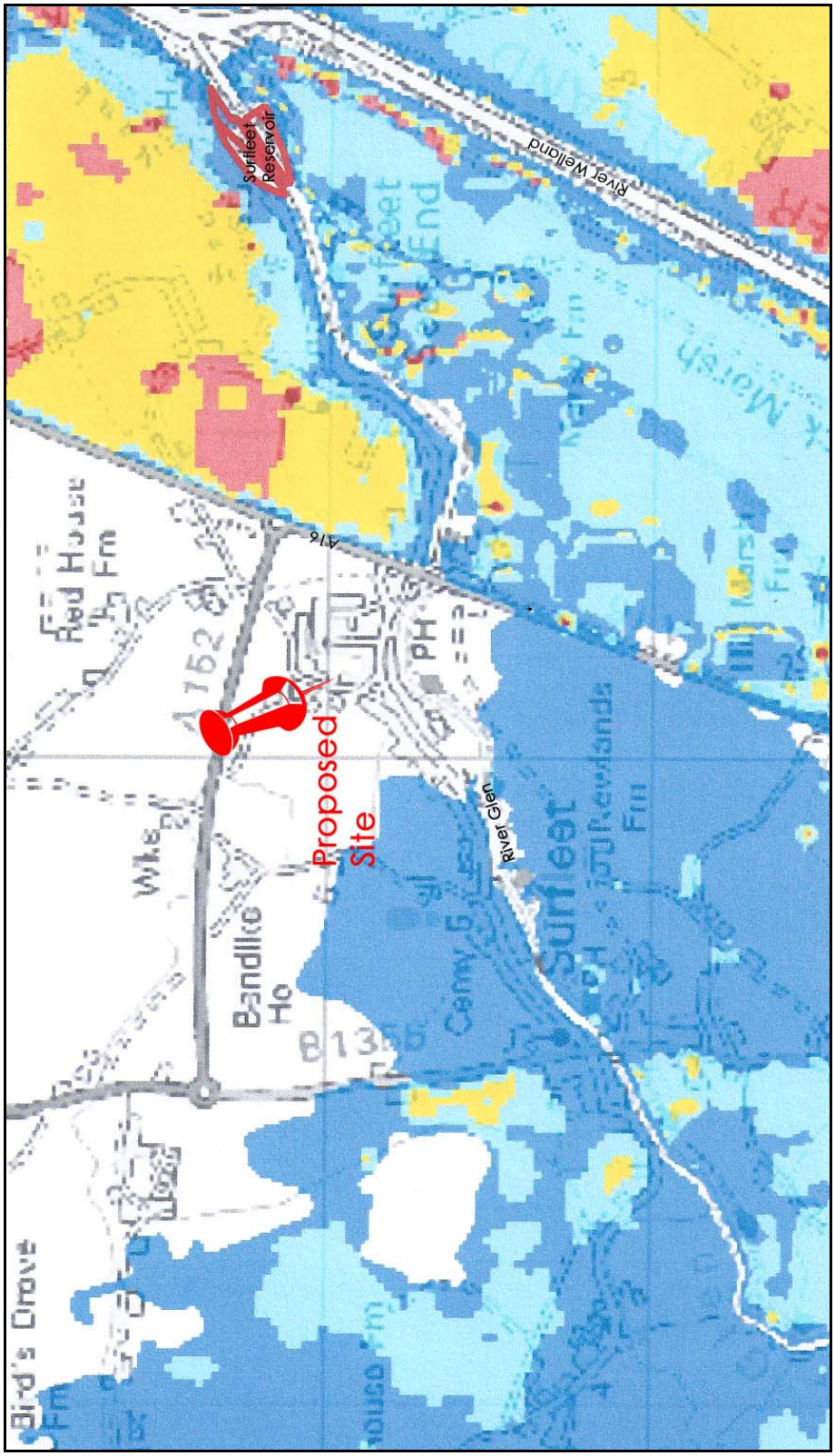
MAP 1

EXTRACT FROM ENVIRONMENT AGENCY FLOODING FROM RIVERS & SEA MAP

© Crown Copyright 2014 RMA Licence No 100047316

MAP 2

Extract from South Holland SFRA Actual Flood Hazard 2115 Map



© Crown Copyright 2014 RMA Licence No 100047316

MAP 3