FLOOD RISK ASSESSMENT

Proposed Replacement Dwelling
Carr Farm
Moor Lane
Thorney
NEWARK
NG23 7DQ

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July 2022 Version 1

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FLOOD RISK ASSESSMENT FOR A PROPOSED REPLACEMENT DWELLING, CARR FARM, MOOR LANE, THORNEY, NEWARK. NG23 7DQ

INTRODUCTION

The Government has placed increasing priority on the need to take full account of the risk 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 July 2021, (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.

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APPLICATION SITE

The proposed site is located at Carr Farm, Moor Lane, Thorney, Newark NG23 7DQ, within the administrative area of Newark & Sherwood District Council. The National Grid Reference is SK85040 71415. **Plan 1**

This flood risk assessment has been prepared for a detailed planning application for the demolition of a two-story dwelling and an agricultural building and the construction of a replacement two-storey dwelling. **Plan 1**

The Site would be classed as Non-Major Development applying the National Planning Policy Guidance (NPPG) as the site is to be developed for less than 10 dwellings.

The National Planning Policy Framework Guidance NPPG 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 NPPG.

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.

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.

Site Levels

From Lidar 2m DTM data to OS datum, the existing ground levels around the replacement dwelling building are in the region of 5.93mODN, the existing ground floor level for the existing dwelling is 6.10mODN and the road level at the site entrance is 6.23mODN. **Plan 1**

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

- River Trent
- Trent Valley Internal Drainage Board

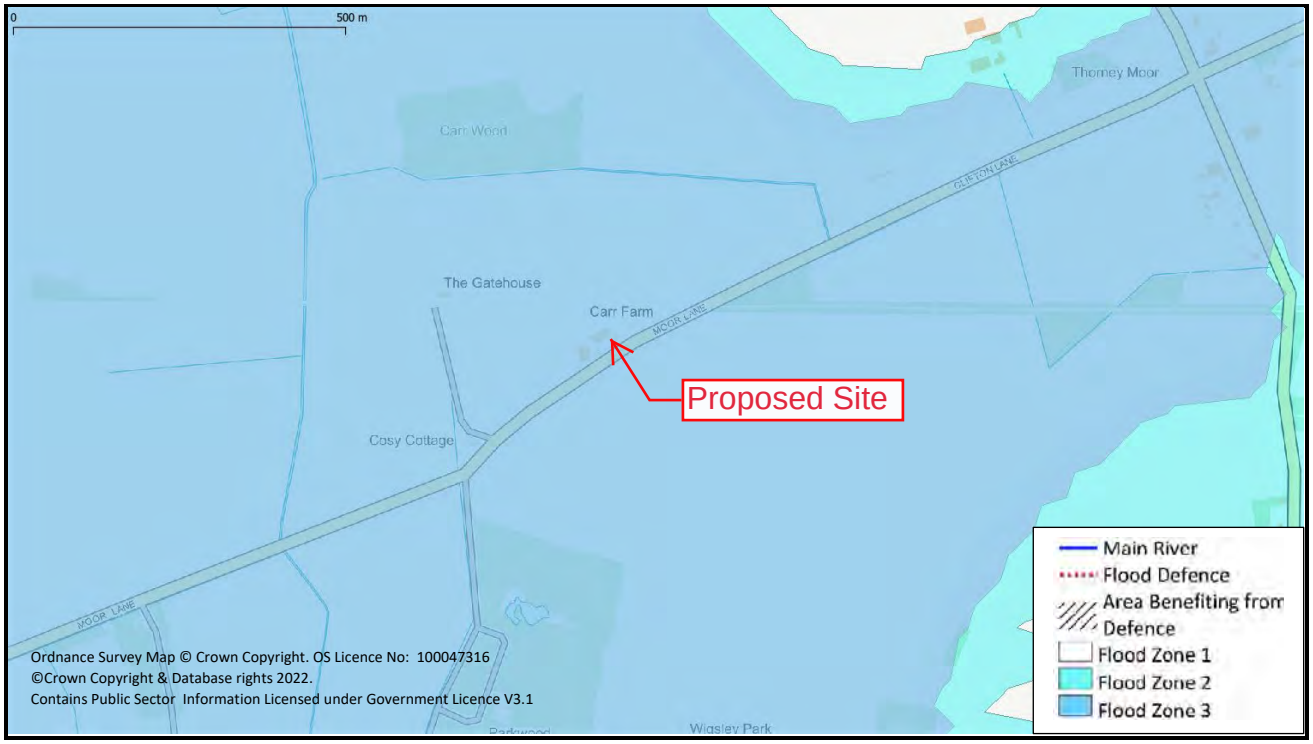
The River Trent is located some 3.55km west of the site.

The Flood Zone 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 0.1% chance of occurring in any year, or the highest recorded historic extent if greater. In some locations, there are many kilometres of raised flood defences. To meet the requirements of the National Planning Policy Framework, these defences are removed in their entirety to produce the Flood Map for Planning (Rivers and Sea). The map therefore shows the full extent of areas that would be at risk of flooding if no defences existed and water could spread out across the floodplain.

In some locations, such as around the fens and the large coastal floodplains, showing the area at risk of flooding assuming no defences may give a slightly misleading picture in that if there were no flood defences, water would spread out across these large floodplains. This flooding could cover large areas of land but to relatively shallow depths and could leave pockets of locally slightly higher land as isolated dry islands. It is important to understand the actual risk of the flooding to these dry islands, particularly in the event of defence failure.

Flood Zones

These maps show that the site is considered at risk from tidal/fluvial flooding as it is all located within an area zoned as Flood Zone 3a.The 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).



Flood Map for Planning (Source EA).

Risk of Flooding from Rivers & Sea

The Risk of flooding from Rivers and Sea map shows the site for the proposed buildings, to be at Low Risk. Low means that each year, this area has a chance of flooding between 0.1% and 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.

Risk of Flooding From River & Sea Map (Source EA).

Fluvial Defence Information

The fluvial defences protecting this site consist of earth embankments. They are in fair condition and reduce the risk of flooding to a 1% (1 in 100) chance of occurring in any year. The standard of the defences is good and regular inspection and maintenance is carried out by the Agency to ensure that any potential defects are identified early. **Map 1**

Defence ID	Asset Reference	Design Standard	D/S Crest Level (mAOD)	U/S Crest Level (mAOD)	Overall Condition Grade
1	22,194	100	8.559	8.568	4
2	101,607	3	6.855	7.06	4
3	22,157	3	6.904	7.473	3
4	24,765	3	7.061	6.907	2

River Trent

The River Trent is located some 3.55Km west of the site, and the flood defences consist largely of earth embankments and sheet piling that are sufficiently high to prevent over-topping during events with a 0.5% (tidal) and 1.0% (fluvial) annual probability of occurrence. The defences are generally in good to fair condition (Grade 3). The risk of flooding to the site is reduced by these raised defences.

The site could be subject to flooding from a breach to the River Trent flood defences. As noted above, the site is some 3.55Km distant from the river.

The 1 in 100-year flood levels have been taken from node data supplied by the Environment Agency from the Trent Model Mott Macdonald 2013 (Includes updated 2014 interim water Levels). **Map 2**

The flows provided represent in channel flow only and do not take into account flow on the floodplain.

Node point reference	Location	50% (1 in 2 year) modelled level (mAOD)	50% (1 in 2 year) modelled flow (m^3/s)	20% (1 in 5 year) modelled level (mAOD)
TRENT_060	SK 81425 70243	N/A	N/A	6.91
TRENT_059	SK 81299 70596	N/A	N/A	6.89
TRENT_058	SK 81379 71007	N/A	N/A	6.87
TRENT_057	SK 81585 71413	N/A	N/A	6.87

Node point reference	Location	20% (1 in 5 year) modelled flow (m^3/s)	10% (1 in 10 year) modelled level (mAOD)	10% (1 in 10 year) modelled flow (m^3/s)
TRENT_060	SK 81425 70243	561.73	6.94	573.72
TRENT_059	SK 81299 70596	561.74	6.92	573.72
TRENT_058	SK 81379 71007	561.60	6.90	573.71
TRENT_057	SK 81585 71413	502.48	6.90	513.20

Node point reference	Location	5% (1 in 20 year) modelled level (mAOD)	5% (1 in 20 year) modelled flow (m^3/s)	4% (1 in 25 year) modelled level (mAOD)
TRENT_060	SK 81425 70243	7.11	597.10	N/A
TRENT_059	SK 81299 70596	7.09	618.46	N/A
TRENT_058	SK 81379 71007	7.07	614.62	N/A
TRENT_057	SK 81585 71413	7.07	540.33	N/A

Node point reference	Location	4% (1 in 25 year) modelled flow (m³/s)	2% (1 in 50 year) modelled level (mAOD)	2% (1 in 50 year) modelled flow (m³/s)
TRENT_060	SK 81425 70243	N/A	7.67	759.69
TRENT_059	SK 81299 70596	N/A	7.64	815.92
TRENT_058	SK 81379 71007	N/A	7.61	793.71
TRENT_057	SK 81585 71413	N/A	7.63	628.44

Node point reference	Location	1.33% (1 in 75 year) modelled level (mAOD)	1.33% (1 in 75 year) modelled flow (m³/s)	1% (1 in 100 year) modelled level (mAOD)
TRENT_060	SK 81425 70243			8.02
TRENT_059	SK 81299 70596			8.00
TRENT_058	SK 81379 71007			7.96
TRENT_057	SK 81585 71413			7.98

Node point reference	Location	1% (1 in 100 year) modelled flow (m³/s)	0.67% (1 in 150 year) modelled level (mAOD)	0.67% (1 in 150 year) modelled flow (m³/s)
TRENT_060	SK 81425 70243	818.70	N/A	N/A
TRENT_059	SK 81299 70596	891.68	N/A	N/A
TRENT_058	SK 81379 71007	862.02	N/A	N/A
TRENT_057	SK 81585 71413	675.51	N/A	N/A

Node point reference	Location	0.5% (1 in 200 year) modelled level (mAOD)	0.5% (1 in 200 year) modelled flow (m³/s)	0.1% (1 in 1000 year) modelled level (mAOD)
TRENT_060	SK 81425 70243	8.34	871.70	8.68
TRENT_059	SK 81299 70596	8.32	954.81	8.67
TRENT_058	SK 81379 71007	8.24	919.90	8.55
TRENT_057	SK 81585 71413	8.31	712.48	8.63

Node point reference	Location	0.1% (1 in 1000 year) modelled flow (m³/s)	1% + 20% flow (1 in 100 year plus climate change) modelled level (mAOD)	1% + 20% flow (1 in 100 year plus climate change) modelled flow (m³/s)
TRENT_060	SK 81425 70243	975.77	8.37	875.66
TRENT_059	SK 81299 70596	1,101.21	8.35	964.87
TRENT_058	SK 81379 71007	1,087.79	8.28	924.56
TRENT_057	SK 81585 71413	791.02	8.34	714.72

The climate change allowance shown above is for a 20% increase in peak flow for the 1 in 100 (1.0%) annual exceedance probability scenario. Whereas the current guidance (July 2022) now indicates that (Central) 27% should be added for residential developments in Humber/ River Idle & Tone Management Catchment.

Given the scale and nature of the proposed development it is considered that additional hydraulic modelling is not appropriate to determine the revised river levels. Therefore, a linear interpolation of the river levels has been used which gives the following.

1.0% (1:100) Node Trent _058	
Increase in level for 20% climate change (8.28 -7.96)	0.38m
Increase in level for 1% increase in climate change	0.019m
Increase in level for 27% climate change	0.513m

This gives the following revised flood levels.

Scenario	Level (mODN)
Central 27%	8.47

1.0% (1:100) Revised Flood Level

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.

HR = d x (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

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.

Map 3 and **Map 4** shows the breach floodplain heights for the present day and for a 20% climate change scenario. The Environment Agency do not currently have the revised climate changes in the model.

The Environment Agency has recently carried out Hazard Mapping for the River Trent following a breach to the defences. The Hazard Map for the 1 in 100-year (including 20% climate change forecast) fluvial flow incorporating a 1 in 5-year tidal flow shows that the site is not within a hazard area. **Map 5**

Finished Floor Levels

It is considered that the ground floor level for the replacement dwelling be set to a minimum of 300mm (Freeboard) above the 1 in 100-year with climate change breach flood heights (6.36mODN) set at 6.66mODN and that with the dwelling being two storey and the first floor providing a safe haven, this would satisfy the revised Central climate change flood level and provide a considerable betterment to that of the existing dwelling.

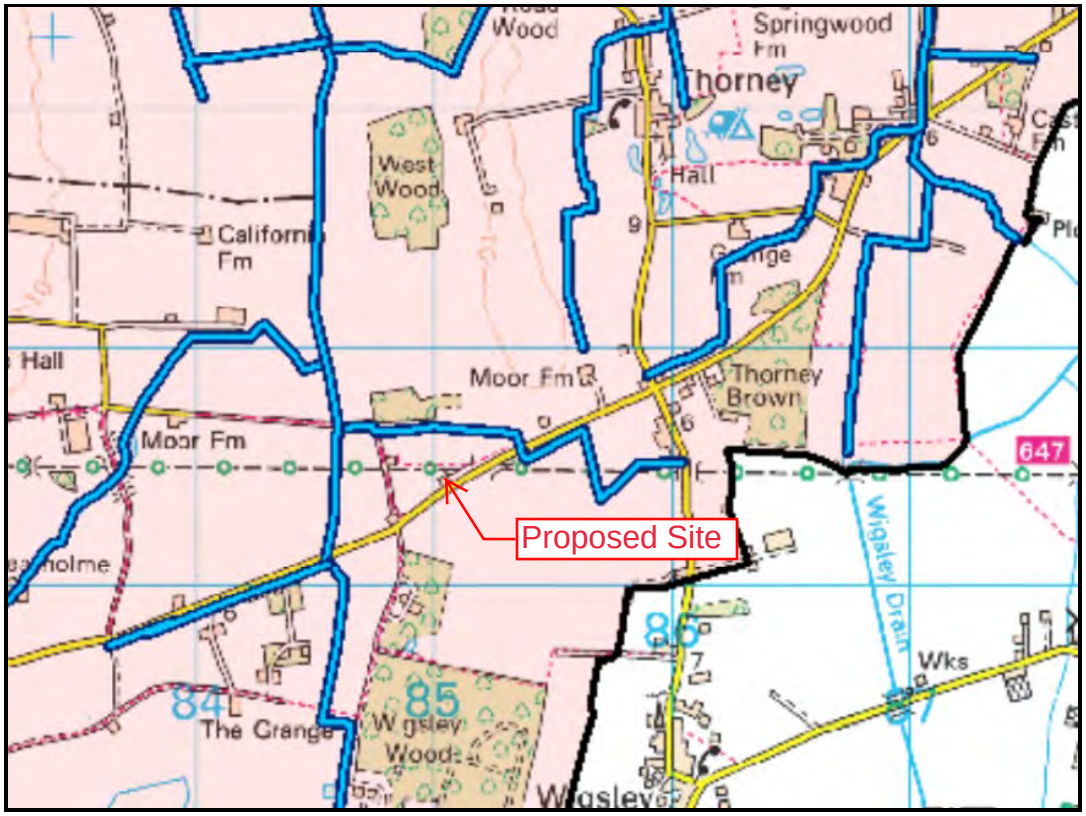
Flood defences are, however, present along the river edge and these do reduce the risk of flooding. Whilst the defences are generally in a good condition there is always a chance, they can be over-topped or fail during extreme floods.

TRENT VALLEY INTERNAL DRAINAGE BOARD

The proposed development site is located within the catchment area of Trent Valley Internal Drainage Board. The Board are therefore responsible to operate and maintain the arterial fluvial system.

The Board have a minimum standard of 1 in year's level of protection for the rural areas. The Board have confirmed that where catchments serve a mixture of rural and urban areas the standard is usually in excess of this level of service and increases to 1 in 50 years level in more urban catchments.

There is a Board's maintained drain just to the north and west of the site, which flows northwards and discharges into the River Trent at Torksey Pumping Station.



Extract from Trent Valley IDB Drainage Map

The Board's prior written consent will be required for any of the following works:

- No person without the previous consent of the Board shall erect any building or structure, whether temporary or permanent, or plant any tree, shrub, willow or other similar growth within 9 metres of the landward toe of the bank where there is an embankment or wall or within 9 metres of the top of the batter where there is no embankment or wall, or where the watercourse is enclosed within 9 metres of the enclosing structure.

- No person shall, without the previous consent of the Board, for any purpose, by means of any channel, siphon, pipeline or sluice or by any other means whatsoever, introduce any water into the District or, whether directly or indirectly, increase the flow or volume of water in any watercourse in the District.

- The erection or alteration of any mill dam, weir or other like obstruction to the flow, or erection or alteration of any culvert within the channel of a riparian watercourse.

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 having no high ground around the site. With the proposed ground floor level being set at 6.66mODN this will not cause any rapid inundation of the site.

- 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. There are no public sewers close to the site.

- 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 known sources within the vicinity of the site.

RESIDUAL RISKS

There is always a possibility of a flood more than that allowed for which might conceivably cause some flooding to the properties. However, such an event would have a very low probability and the risk of flooding to the property would be extremely small. It is therefore considered that the residual risks associated with flooding are not significant.

SURFACE WATER FLOODING

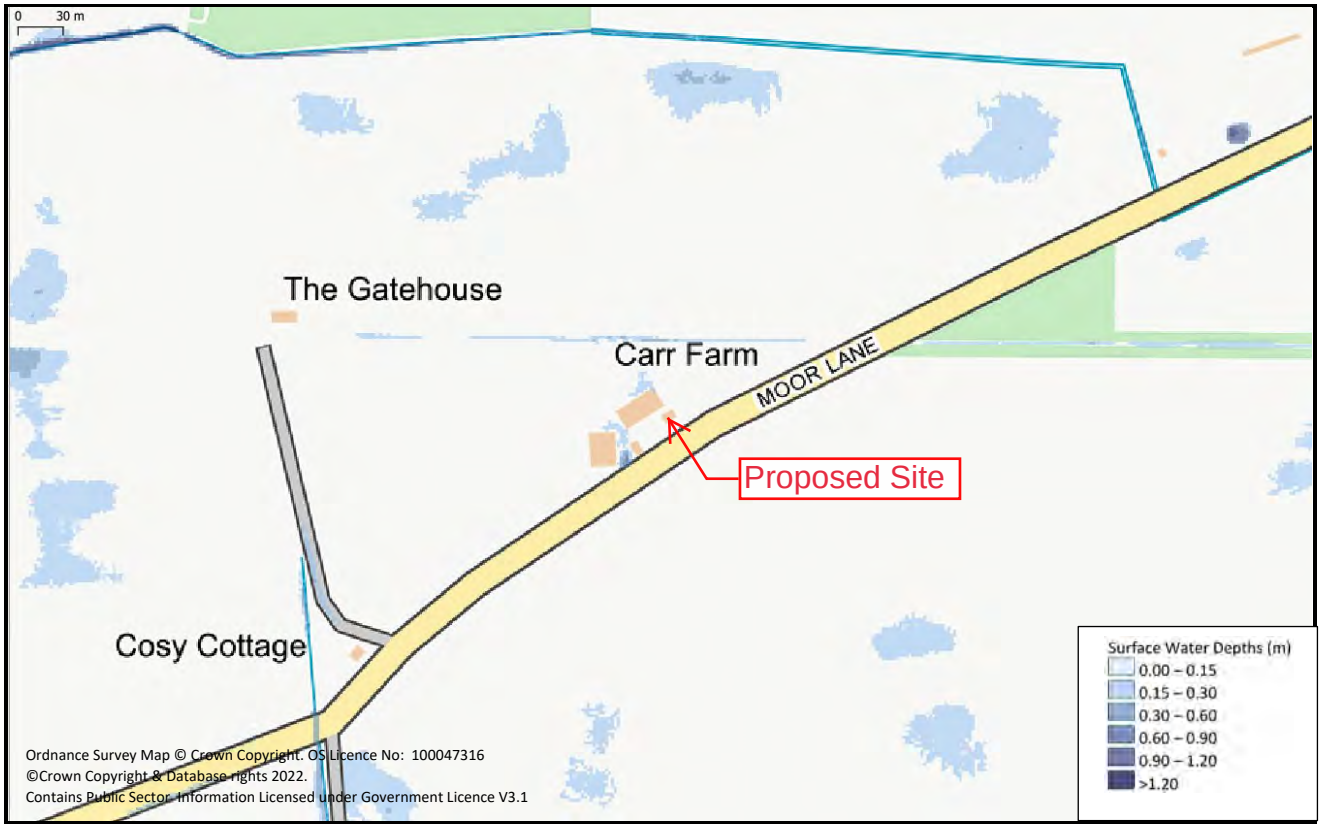
The site for the proposed dwelling is not shown on the Low-Risk scenario Surface Water flood maps, for the 1 in 1000-year event, to be affected from surface water flooding. This type of flooding is usually short lived and associated with heavy downpours of rain, thunderstorms etc.

The maps for surface water and revised maps for river and sea flooding define the risk as High, Medium, Low and Very Low. The chance of flooding for the area defined in any given year is shown below:

- **High:** greater than 1 in 30 (3.3%).
- **Medium:** between 1 in 100 (1%) and 1 in 30 (3.3%).
- **Low:** between 1 in 1000 (0.1%) and 1 in 100 (1%).
- **Very Low:** less than 1 in 1000 (0.1%)

Unlike the fluvial mapping, which is based on a detailed hydraulic model, this mapping is based purely on applying rainfall to a digital terrain model. As such this mapping serves to represent a worst-case scenario which may well overstate the actual probability of flooding in this area.

There is a caveat on the Defra Data website, as to the use of these maps and that they are not to be used to identify that an individual property will flood. Because of the way they have been produced and the fact that they are indicative, these maps are not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.



Risk of Flooding From Surface Water Map (Source EA).

SEQUENTIAL APPROACH

When applying the sequential approach for flood risk in accordance NPPF the site would fall into Flood Zone 3 (High Probability) as shown on the Environment Agency's Flood Map without defences in place.
The Environment Agency categorise land into one of three Flood Zones.

- Flood Zone 1 is Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)

- Flood Zone 2 is Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding: or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)

- Flood Zone 3a is Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)

Applying the Flood Risk Vulnerability Classification in Table 2 of NPPG, the proposed use is classified as, "Less

Vulnerable" use, Table 1 of NPPG states that such uses are appropriate in this zone (as summarised in Table 3 NPPG)

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 & Exception 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.

The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. The NPPF states that development should not be permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. It is important to note that the Sequential Test does not specifically mean that sites such as this cannot be developed, rather that sites at less risk should be developed first. The whole of the surrounding area is shown on the Flood Map for Planning to be in Flood Zone 3 and there are no other sites in a lower flood zone.

Sequential Test

The aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. The NPPF states that development should not be permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. It is important to note that the Sequential Test does not specifically mean that sites such as this cannot be developed, rather that sites at less risk should be developed first.

However, it is considered that as the whole of the site stands within Flood Zone 3 and there is not a less vulnerable area within the site, where the replacement dwelling could be relocated, it is considered that the proposed replacement dwelling complies with polices and with the sequential test as set out in The National Planning Policy Framework.

The Exceptions Test needs to demonstrate that it provides wider community benefit to meet the overall requirements of sustainable development for this site.

NPPF sets out three dimensions and roles of sustainable development ie social, economic and environmental. Paragraph 7 and 8 of the Framework explain that these three roles should not be undertaken in isolation because they are mutually dependent.

In social term the provision of a new dwelling built to modern standards it would be more energy resilient than the existing dwelling and significantly better-flood-resilience measures.

In economic terms, the proposal would provide employment at construction stage and may support local businesses and the local economy both during construction and when the dwellings are occupied.

In socio-economic terms, this development will provide wider sustainability benefits to the local community in helping the existing local and surrounding facilities long term viability.

It is therefore concluded that the development would meet the requirements of the first part of the Exception Test and would be in accordance with the NPPF.

This FRA in support of the development and indicates that the second part of the Exceptions test is satisfied, and that the development would be safe for the lifetime of the development (100 years) and not increase flood risk elsewhere.

This Flood Risk Assessment in terms of making the development safe, would result in finished floor levels being set at 6.66mODN. This would be sufficient to mitigate against flood risk and demonstrates that the development will be safe for its lifetime, and it will not increase flood risk elsewhere.

Given the above, it is concluded that the Sequential and Exceptions Test are satisfied.

In conclusion therefore, it is considered that notwithstanding that the site is located within Flood Zone 3, the development proposed is for a replacement dwelling this being the case there would be no additional vulnerability to flood risk nor any worsening of flood risk elsewhere.

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 21st of July 2021.

Peak River Flow Allowances

For flood risk assessments use the Management Catchment Climate Changes for the peak river flow map. Management catchments are sub-catchments of river basin districts.

The site is located within the River Idle & Tone Management Catchment within the Humber River Basin District,

for sites within Flood Zone 2 or 3a and for “Less Vulnerable” or “Water Compatible” land uses, the Central allowances figures, in the Table below, should be used.

Peak River flow allowances within the Management Catchment Allowances				
River Basin District /Management Catchment	Allowance category	Total potential change anticipated for ‘2020s’ (2015 to2039)	Total potential change anticipated for ‘2050s’ (2040 to2069)	Total potential change anticipated for ‘2080s’ (2070 to2115)
Humber/ River Idle & Tone	Upper End	27%	39%	69%
	Higher Central	14%	19%	37%
	Central	9%	12%	27%

The effect of global warming on peak rainfall allowances is given in Table 1.

Table 1 Peak Rainfall Intensity

Table 1 Peak rainfall intensity allowance in small and urban catchments (1961 to1990 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%
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 2

Table 2 Peak Sea Level Rise

Table 2 Peak Sea level allowance for each epoch in (mm) per year with cumulative sea level rise for each epoch in brackets (use 1981to 2000 baseline)						
Area of England) (Use River Basin	Allowance	2000 to 2035	2036 to 2065	2066 to 2095	2096 to 2125	Cumulative Rise 2000 to 2125 (m)
Hunber	Higher Central	5.8 (203mm)	8.7 (261mm)	11.6 (348mm)	13 (390mm)	1.20m
Humber	Upper End	7 (245mm)	11.3 (339mm)	15.8 (474mm)	18.1 (543mm)	1.6m

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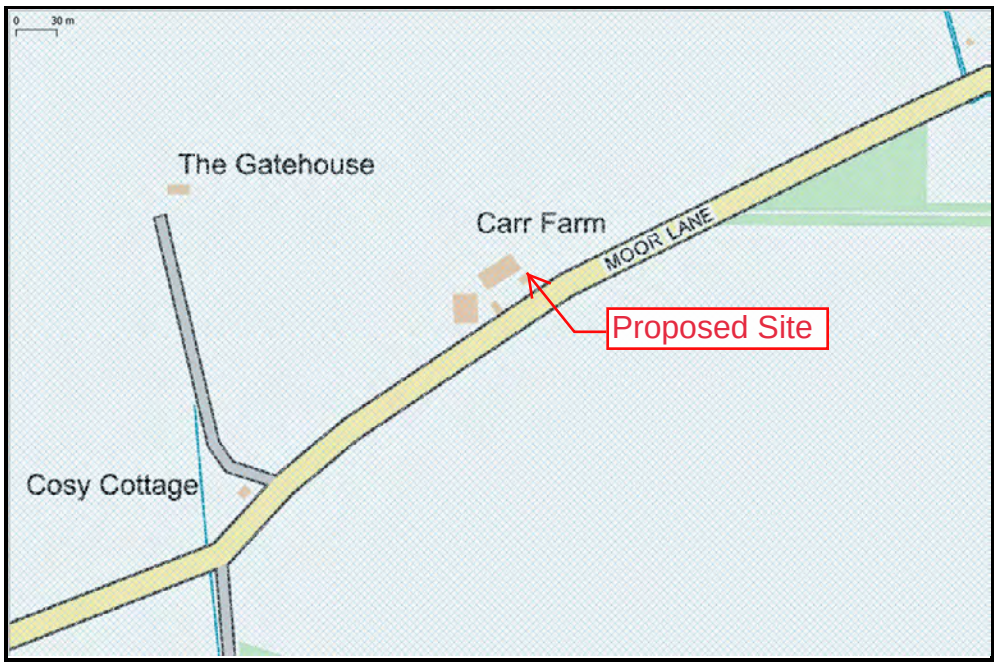
The climate change allowances for Peak River Flows in Table 1 are used in th**is report.**

HISTORIC FLOODING

The Environment Agency historic flood map, shown below, have records of historic fluvial flooding at this location for 1795 and 1947 flood events



Historic Flood Map (Source EA)

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GROUND CONDITIONS

From the British Geology Survey maps, the superficial Deposits are Holme Pierrepont Sand and Gravel Member - Sand and Gravel and the Bedrock to be Mercia Mudstone Group – Mudstone.

DRAINAGE STATEMENT

Surface Water Drainage

Applications for developments where the proposals will result in the increase the amount of surface water run-off require that an appropriate drainage strategy to be undertaken to ensure that the surface water discharge mimics the existing pre-development regime.

Any proposed surface water drainage system will need to be designed to account for the effects of climate change over the lifetime of the development. Based on the recommendations the proposed drainage systems should be sized for the critical 1 in 100-year storm event and to allow for a 40% increase in rainfall intensity for climate change.

In accordance with recognised guidance, Part H of the Building Regulations 2010 and National Planning Policy Framework, 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

From the BGS results the Superficial Deposits are shown to be sand and gravel which will be suitable for infiltration.

The surface water from the roof of the dwelling will be connected into soakaways designed in accordance with BSE Digest 363. A water butt of at least 120L internal capacity shall be installed to intercept rainwater draining from the roof of the building, to reduce the risk of flooding and demand for water by recycling and to increase the level of sustainability of the development

Driveways and parking areas will be constructed from permeable materials.

These arrangements are the same as those which have served the existing dwelling without causing any problems

Watercourses

There are no proposals to discharge any surface water to a watercourse.

Public Sewers

There are no proposals to discharge any surface water to a public sewer.

Foul Water Drainage

There are no public foul sewers within 30m of the site therefore the foul drainage from the new dwelling will be collected in underground pipes designed in accordance with Building Regulations. Document H. and be connected into a package treatment unit, which will replace the existing septic tank..

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

ACCESS AND EGRESS

The 1 in 100-year with climate change hazard map shows that Moor Lane leading away from the site eastwards is not within a hazard rated area therefore a safe access and egress is provided to the east of the site towards Saxilby This safe access and egress route has been highlighted on the map. **Map 7**

If required by the Emergency Officer for Newark and Sherwood Council a Flood Warning and Evacuation plan will be prepared and submitted to the Council before the building is occupied.

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 up to at least a level of 7.70mODN. incorporated in the construction in accordance with "Improving the flood performance of new buildings" CLG (2007).

- The ground floor living accommodation for the two-storey dwelling is to be raised above the existing average ground level, to be set at a level of 6.66mODN.

- Water, electricity, and gas meters: should be located above the predicted flood level. Electrical services: electrical sockets, heating systems: boiler units and ancillary devices should be installed at least 500mm above the ground floor level to minimise damage to electrical services Electric ring mains should be installed at high level with drops to ground floor sockets and switches.

- The ground floor to be constructed with a solid concrete floor with no voids beneath and no low-level wall vents. However, if a beam type floor is to be used, provision should be incorporated for draining the under-floor voids. The wall vents are to be fitted with 'Flood Angel' air bricks which allow air to free pass through as a usual, (complying with BS493:1995) but under flood conditions it shuts down when in contact with water. A removable mesh prevents the passage of debris which may otherwise impinge on the moving part.

- Avoid the use of absorbent cavity insulation to the ground floor level and use the closed cell type.

- Plasterboard to be fixed horizontally to the ground floor area, for ease of replacement.

- Where possible, all service entries should be sealed (e.g., with expanding foam or similar closed cell material). Closed cell insulation should be used for pipes which are below the predicted flood level.

- As this site is in an area that is capable of receiving flood warnings from the Environment Agency Floodline Warning Direct system. It is recommended that the property Owner contact the Environment Agency's Floodline on 0345 988 1188 to register the property to receive advance warning of flooding by telephone, mobile, fax, SMS text, email or pager. The Environment Agency aim to issue a 'severe flood warning' approximately 2 hours before existing defences are overtopped.

CONCLUSION

- The site for the proposed replacement dwelling is shown to be within Flood Zone 3 ‘High Probability' as detailed on the Environment Agency's Flood Zone Maps without defences. However, the site is protected by adequate flood defences which are maintained by the Environment Agency and the site is shown on the Hazard Maps for the River Trent not to be within a hazard area following a breach to the defences for the 1 in 100-year event.

- The residential use falls within "The More Vulnerable" uses of land in Table 2 Flood Risk Vulnerability Classification and Table 3 shows that developments of this nature are appropriate in flood zone 3a subject to passing the Exception Test.

- The proposed development is for the replacement of an existing dwelling with the proposed new two storey development offering a significant betterment on what is currently on site. Finished floor levels (FFL) of the existing dwelling are 6.10mODN with the proposed new dwelling having an FFL of 6.66mODN (560mm betterment provided). A safe refuge is provided at first floor levels, for the occupants to await rescue or wait for flood levels to recede, during times of extreme-flooding events.

- The 1 in 100-year plus climate change hazard map shows a dry access to and from the site along Moor Lane to the east of the site towards Saxilby.

- 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 a stated in the report.

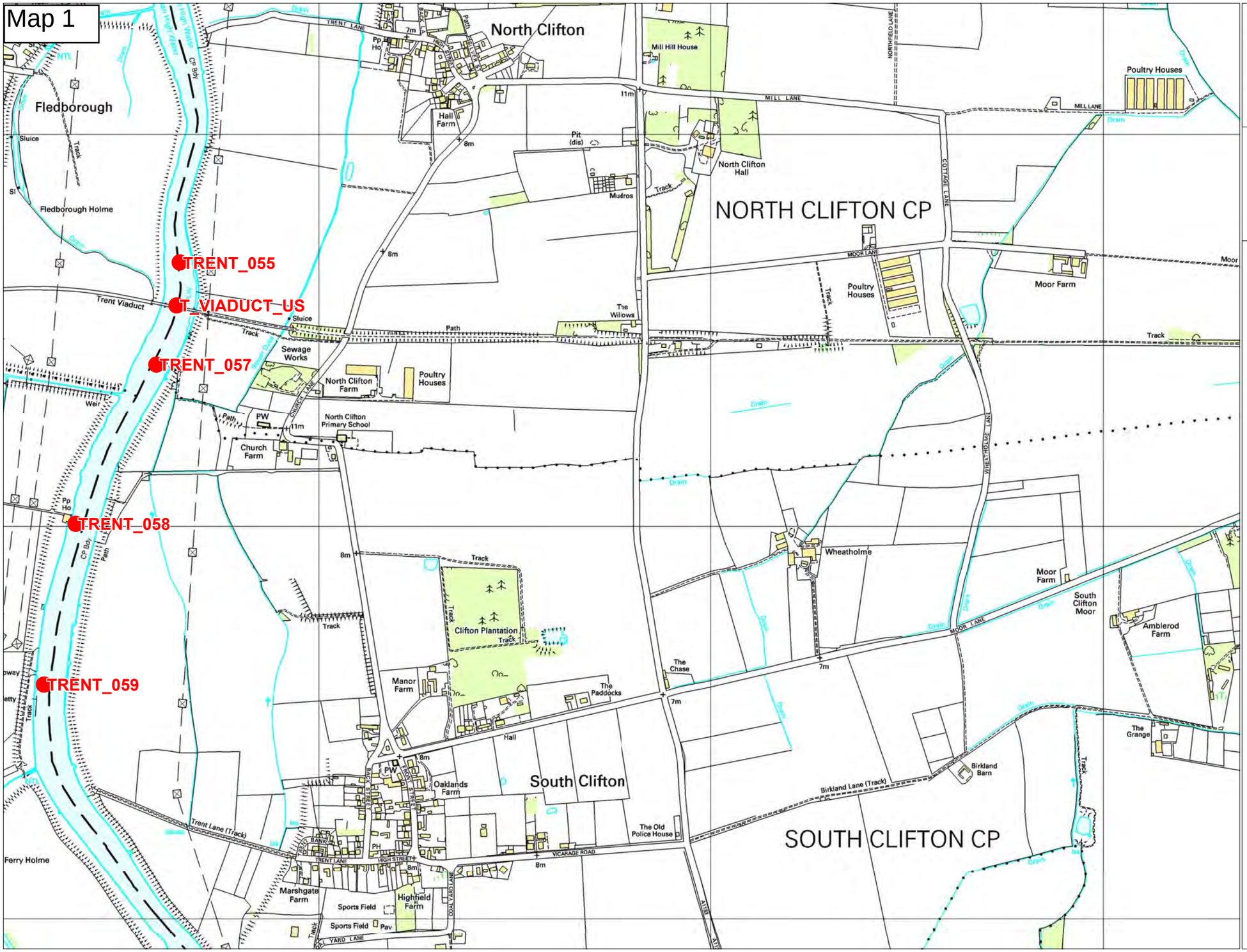
- Flooding from other sources is unlikely to affect the site.

- 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, there is no increase in the flood risk to others. Following the guidelines contained within the NPPF, the proposed development is considered to be suitable assuming appropriate mitigation is maintained for the lifetime of the development.

- It is therefore concluded that the proposed development can be constructed, safely and sustainably, to meet the requirements of NPPF.

Modelled Nodes Map for Moor Lane, Thorney,

Map 1



Environment Agency

Scale 1:10,000

N W E S

Legend

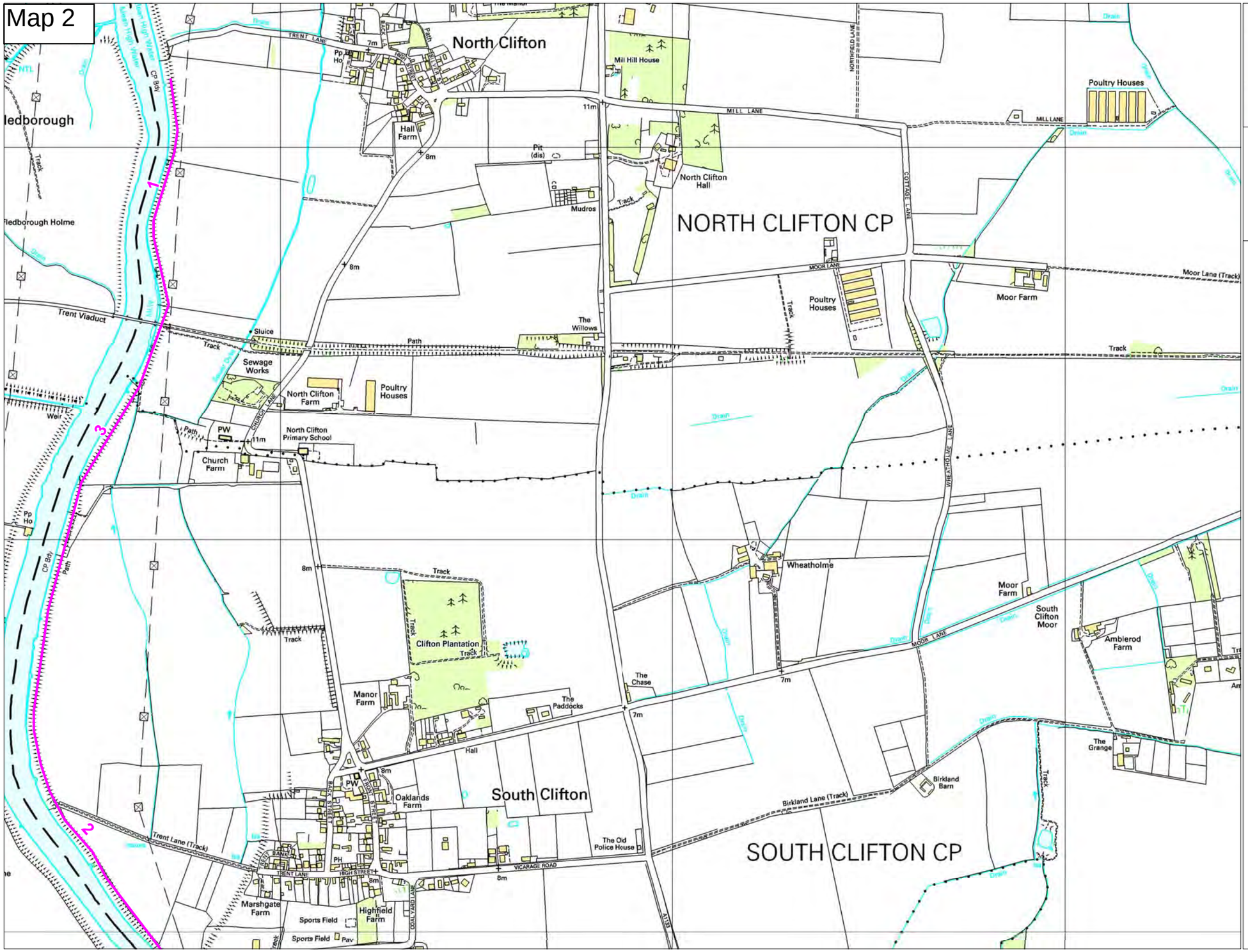
- **Modelled Node Location and Reference**
  Source:
  Tidal Trent SFRM, Mott Macdonald, 2013
  (includes updated 2014 interim water levels)

A Strategic Flood Risk Assessment may be available, providing further information for this site. Please contact your Local Planning Authority to access this information as it will need to be considered within any Flood Risk Assessment submission.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Flood Defence Map for Moor Lane, Thorney,

Map 2



Environment Agency

Scale 1:10,000

N W E S

Legend

Flood Defence Locations

A Strategic Flood Risk Assessment may be available, providing further information for this site. Please contact your Local Planning Authority to access this information as it will need to be considered within any Flood Risk Assessment submission.

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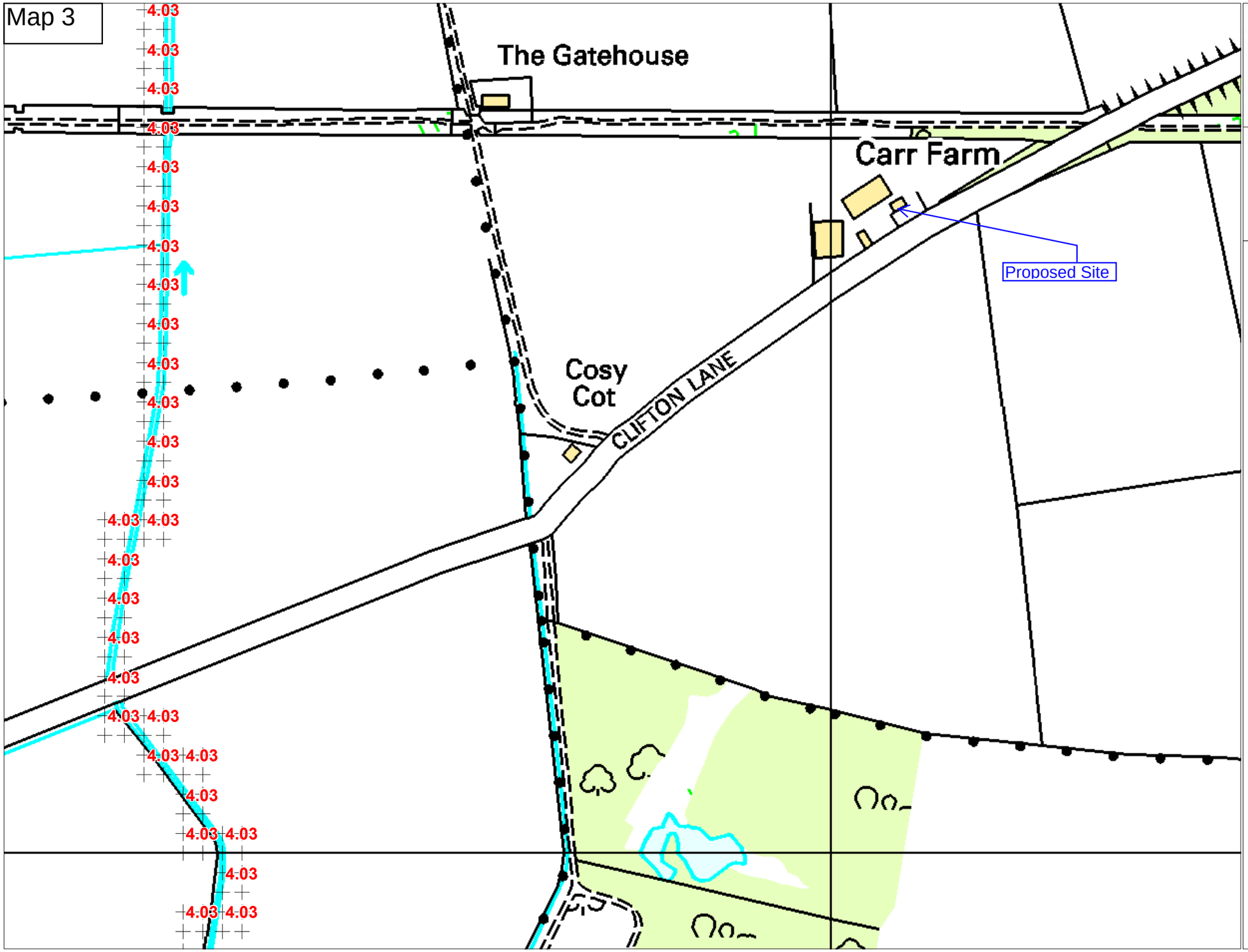
Floodplain Heights Map centred on Moor Lane, Thorney,



Environment Agency

Scale 1:2,500

N
W E
S

Legend

x.xx
1 in 100 year Floodplain Level (mAOD)

Source:
Tidal Trent SFRM, Mott Macdinald, 2013, (including updated 2014 interim water levels)

A Strategic Flood Risk Assessment may be available, providing further information for this site. Please contact your Local Planning Authority to access this information as it will need to be considered within any Flood Risk Assessment submission.

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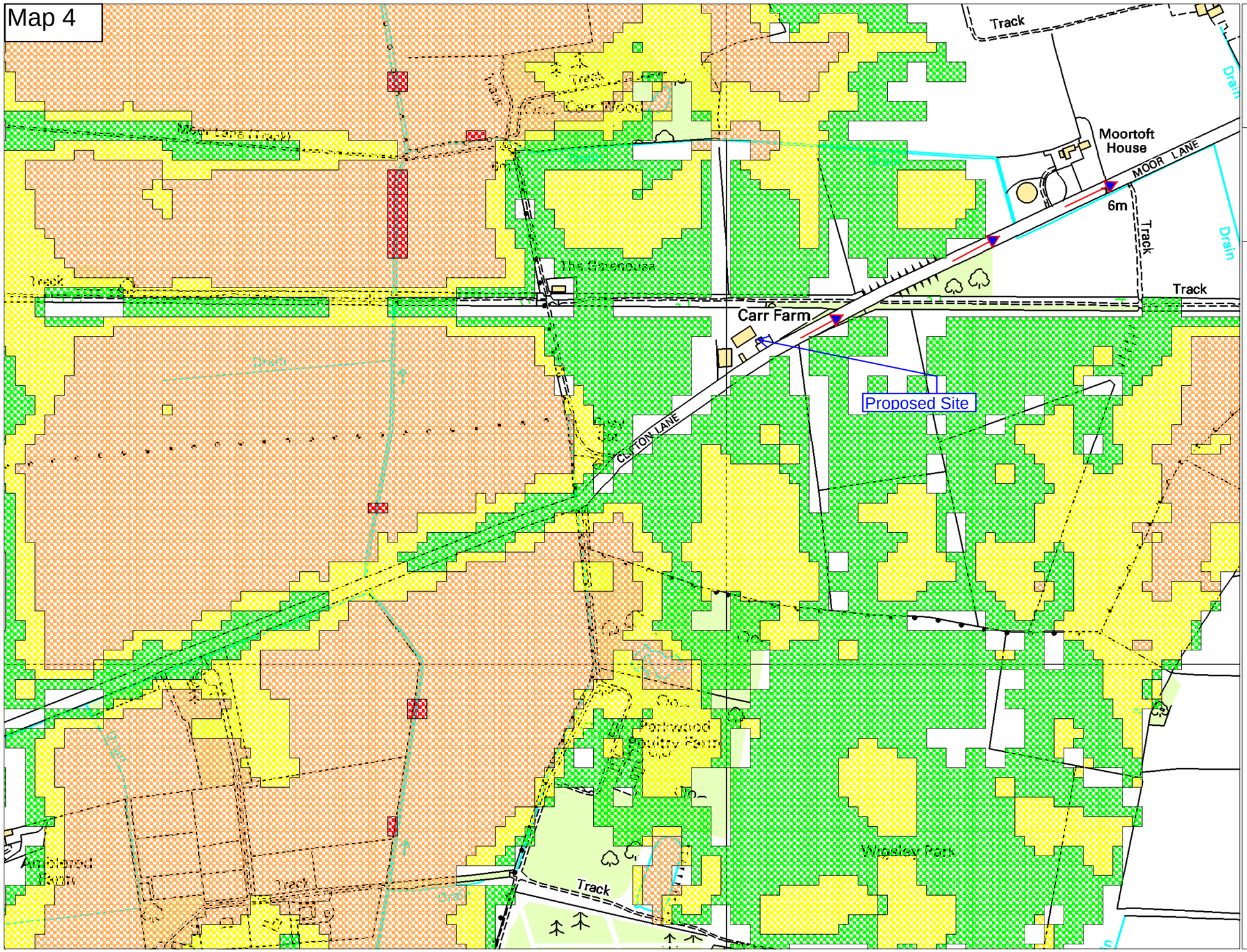
Flood Hazard Map centred on Moor Lane, Thorney,

Map 4



Environment Agency

Scale 1:5,000

N
W E
S

Legend

Hazard Rating (FD2320)
1 in 100 year
(Including Climate Change Forecast)

- Danger for all (greater than 2)
- Danger for most (1.25 - 2)
- Danger for some (0.75 - 1.25)
- Low (less than 0.75)

Source:

Tidal Trent SFRM, Mott Macdonald, 2013 (includes updated 2014 interim water levels)

Safe access and egress route

A Strategic Flood Risk Assessment may be available, providing further information for this site. Please contact your Local Planning Authority to access this information as it will need to be considered within any Flood Risk Assessment submission.

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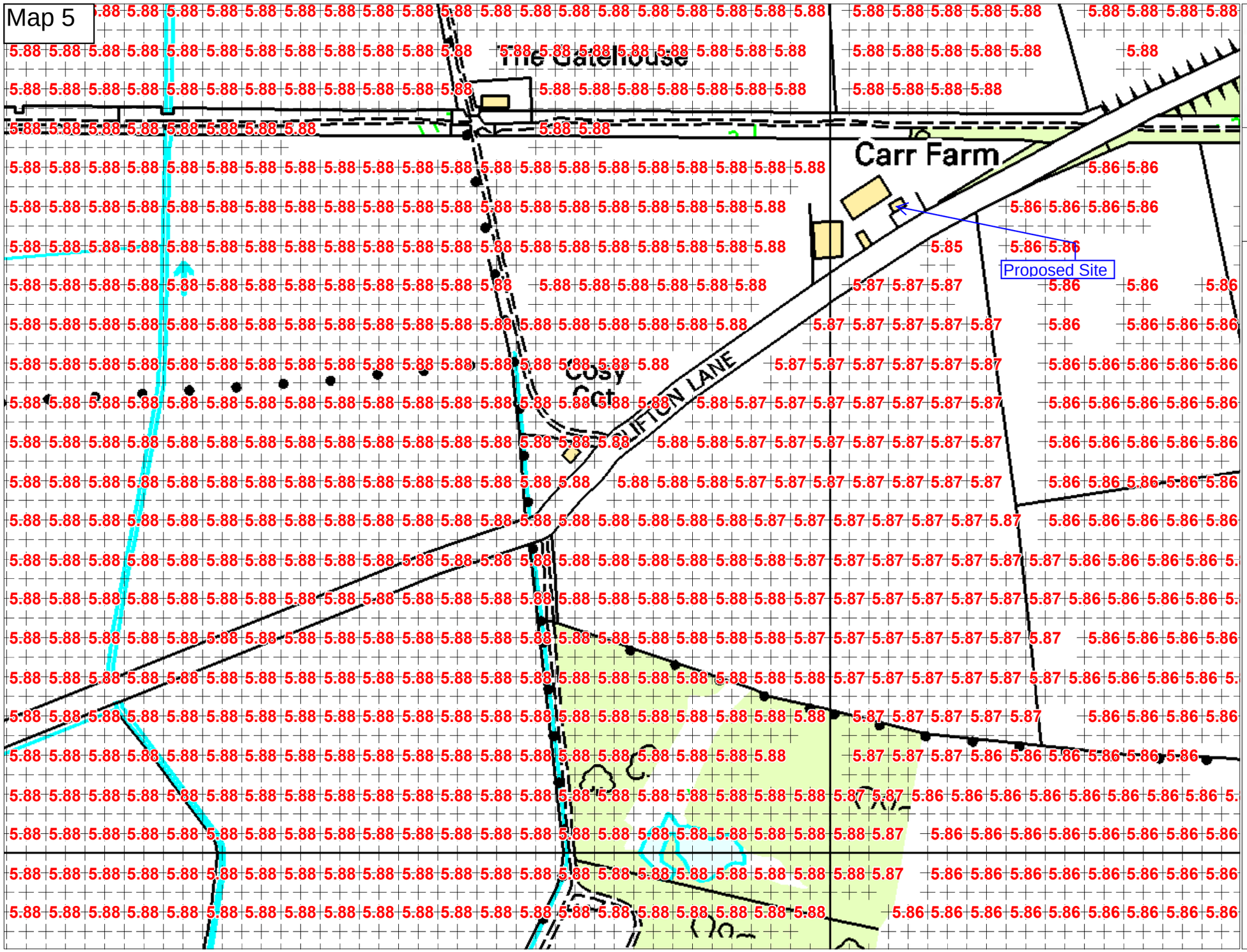
Floodplain Heights Map centred on Moor Lane, Thorney,



Environment Agency

Scale 1:2,500

N
W E
S

Legend

x.xx

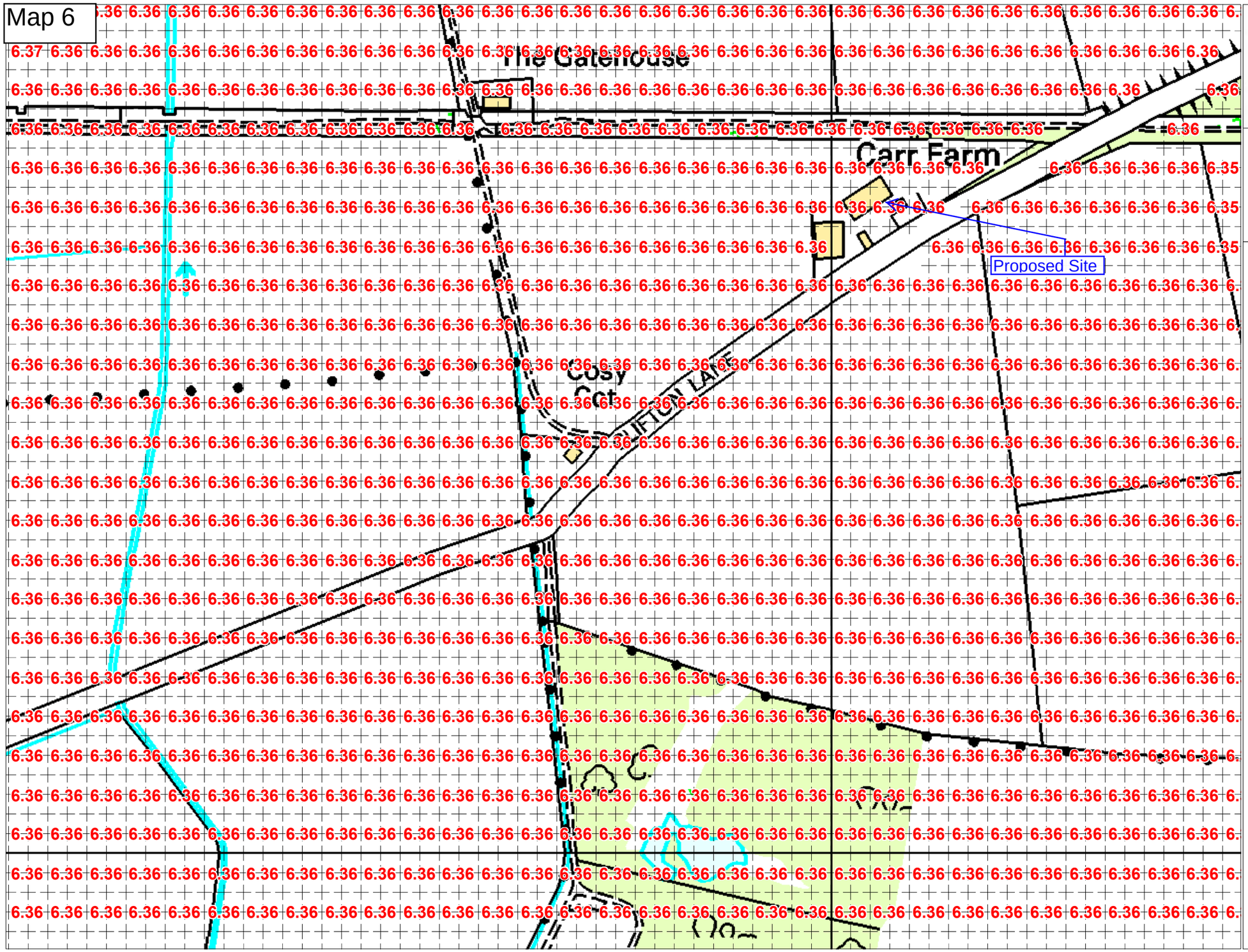
1 in 100 year
(Including Climate Change Forecast)
Floodplain Level (mAOD)

Source:
Tidal Trent SFRM, Mott Macdinald, 2013,
(including updated 2014 interim water levels)

A Strategic Flood Risk Assessment may be available, providing further information for this site. Please contact your Local Planning Authority to access this information as it will need to be considered within any Flood Risk Assessment submission.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Breach Floodplain Heights Map for Moor Lane, Thorney,



Environment Agency

Scale 1:2,500

N
W E
S

Legend

x.xx

1 in 100 year
(including climate change forecast)
Breach Floodplain Level (mAOD)

Source:
Tidal Trent SFRM, Mott Macdonald, 2013
(includes updated 2014 interim water levels)

A Strategic Flood Risk Assessment may be available, providing further information for this site. Please contact your Local Planning Authority to access this information as it will need to be considered within any Flood Risk Assessment submission.

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A1

Plan 1

Existing Building Area's (sqm)

1 - 415
2 - 420
3 - 55
4 - 93

total - 983 sqm

+5.96 Lidar 2n DTM Data Levels to OS Datum

Existing Site Layout Plan (1:500)

Client:	Mr. & Mrs. Kinch
Project Title:	Proposed Replacement Dwelling, Carr Farm, Moor Lane, Thorney
Dwg Title:	Existing Site Layout Plan

Scale:	Date:	Drawn:	Project No.	Drawing No.	Rev No.
as shown	07.22	MC	241/KIN/1407	01	

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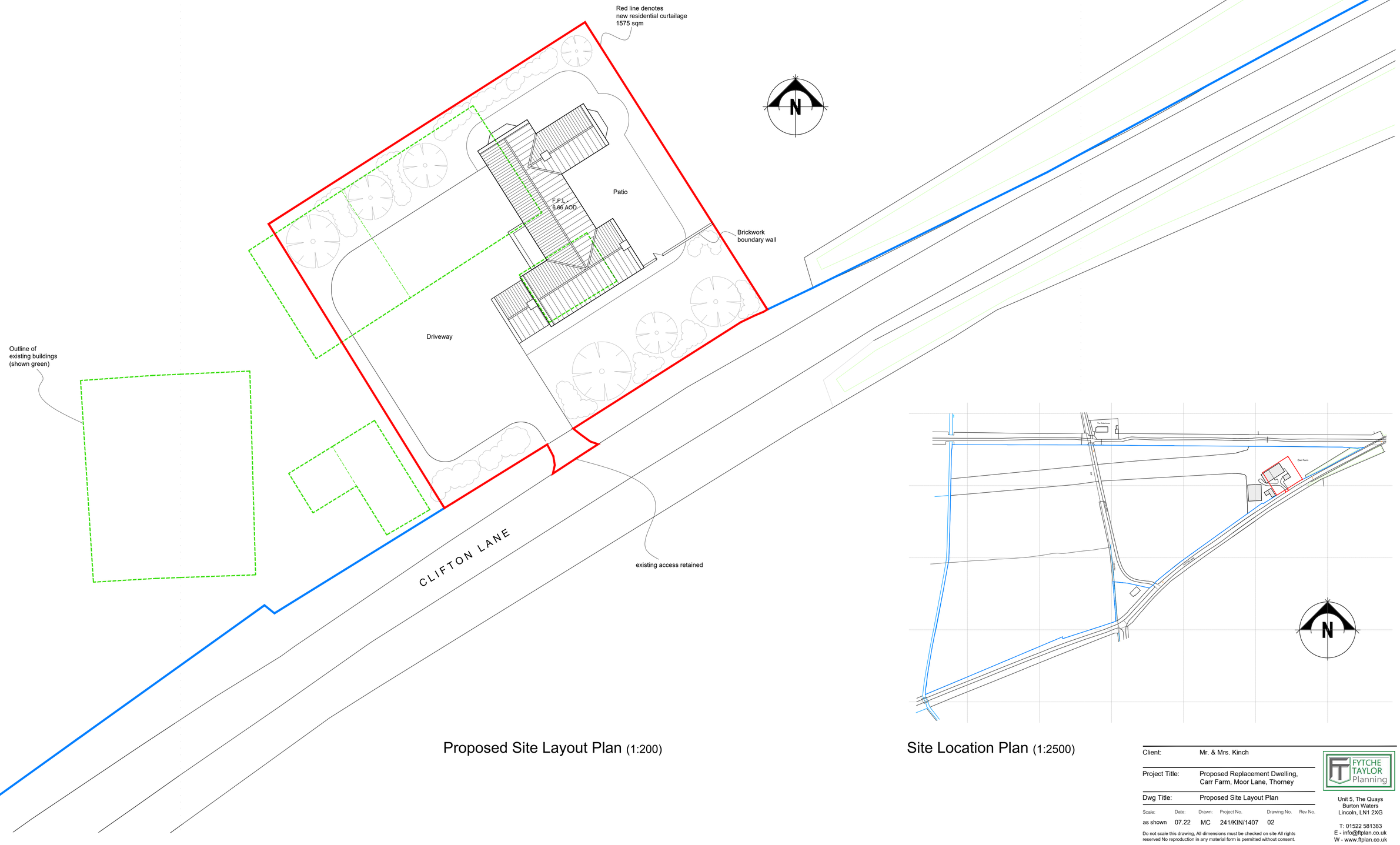
Plan 2



Proposed Site Layout Plan (1:200)

Site Location Plan (1:2500)

Client:	Mr. & Mrs. Kinch
Project Title:	Proposed Replacement Dwelling, Carr Farm, Moor Lane, Thorney
Dwg Title:	Proposed Site Layout Plan

Scale:	Date:	Drawn:	Project No.	Drawing No.	Rev No.
as shown	07.22	MC	241/KIN/1407	02	

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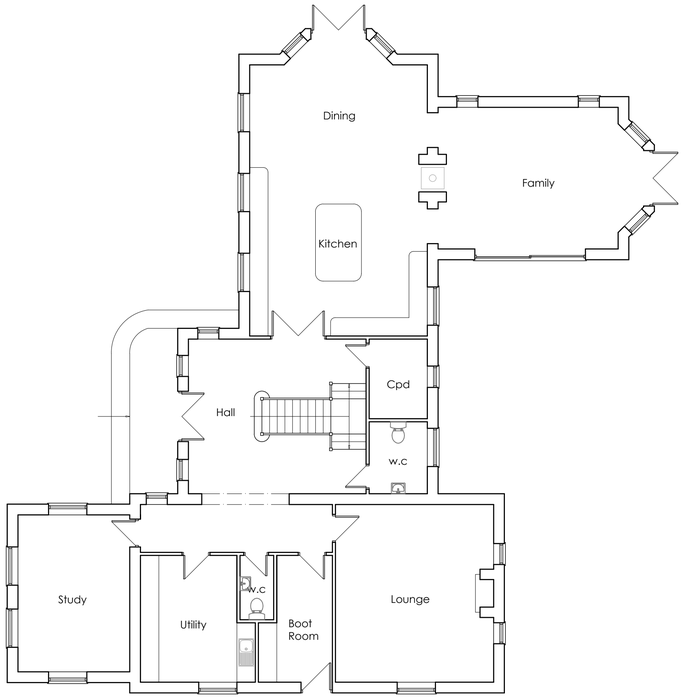
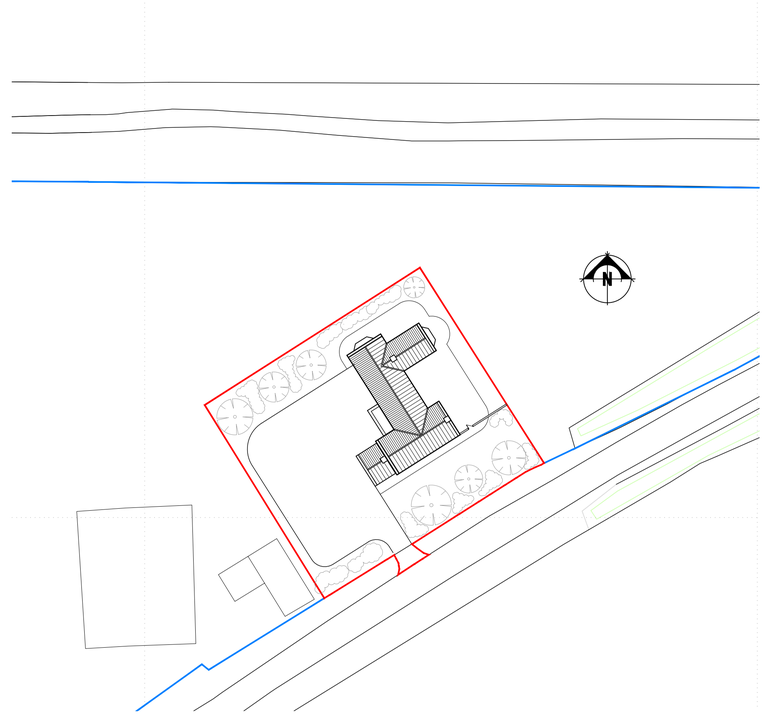
Plan 3



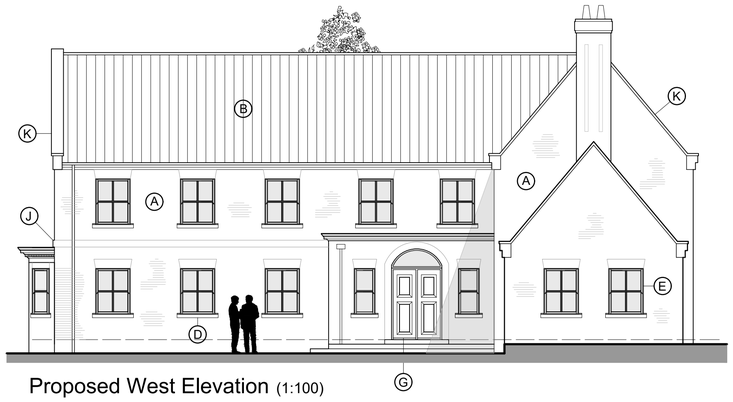
Proposed Ground Floor Layout (1:100)

Proposed First Floor Layout (1:100)



Proposed Site Layout (1:500)

Proposed South Elevation (1:100)



Proposed West Elevation (1:100)

Proposed North Elevation (1:100)

Proposed East Elevation (1:100)

Materials Schedule

- (A) Facing Brickwork
- (B) Spanish slate roof tiles
- (C) Rosemary roof tiles
- (D) Portland stone cills
- (E) Cream woodgrain windows
- (F) Cream woodgrain door
- (G) Timber door
- (H) Black Upvc Rainwater Goods
- (J) Brick corbel detail
- (K) Stone parapets

Spanish slate roof tiles (Main Roof)

Rosemary roof tiles (Lower Roofs)

Woodstock Blend Reserve Facing Brickwork

Sash Windows (Cream)

Old English bond brickwork (every 7th course)

Voussoir brick detail

Dog tooth banding / eaves detail

Client:	Mr. & Mrs. Kinch
Project Title:	Proposed Replacement Dwelling, Carr Farm, Moor Lane, Thorney
Dwg Title:	Scheme Proposals

Scale:	Date:	Drawn:	Project No.	Drawing No.	Rev No.
as shown	07.22	MC	241/KIN/1407	03	

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