FLOOD RISK ASSESSMENT

PROPOSED AGRICULTURAL RESEARCH
& TRAINING CENTRE
LANGARY GATE ROAD,
GEDNEY HILL,
SPALDING,
LINCOLNSHIRE.



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June 2020 Version 1

RMA

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FLOOD RISK ASSESSMENT FOR PROPOSED AGRICULTURAL RESEARCH & TRAINING CENTRE, LANGARY GATE ROAD, GEDNEY HILL, SPALDING.

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 Feb 2019, (NPPF), which identifies how the issue of flooding is dealt with in the drafting of planning policy and the consideration of planning applications by avoiding inappropriate development in areas at risk from flooding and to direct development away from areas at highest risk.

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

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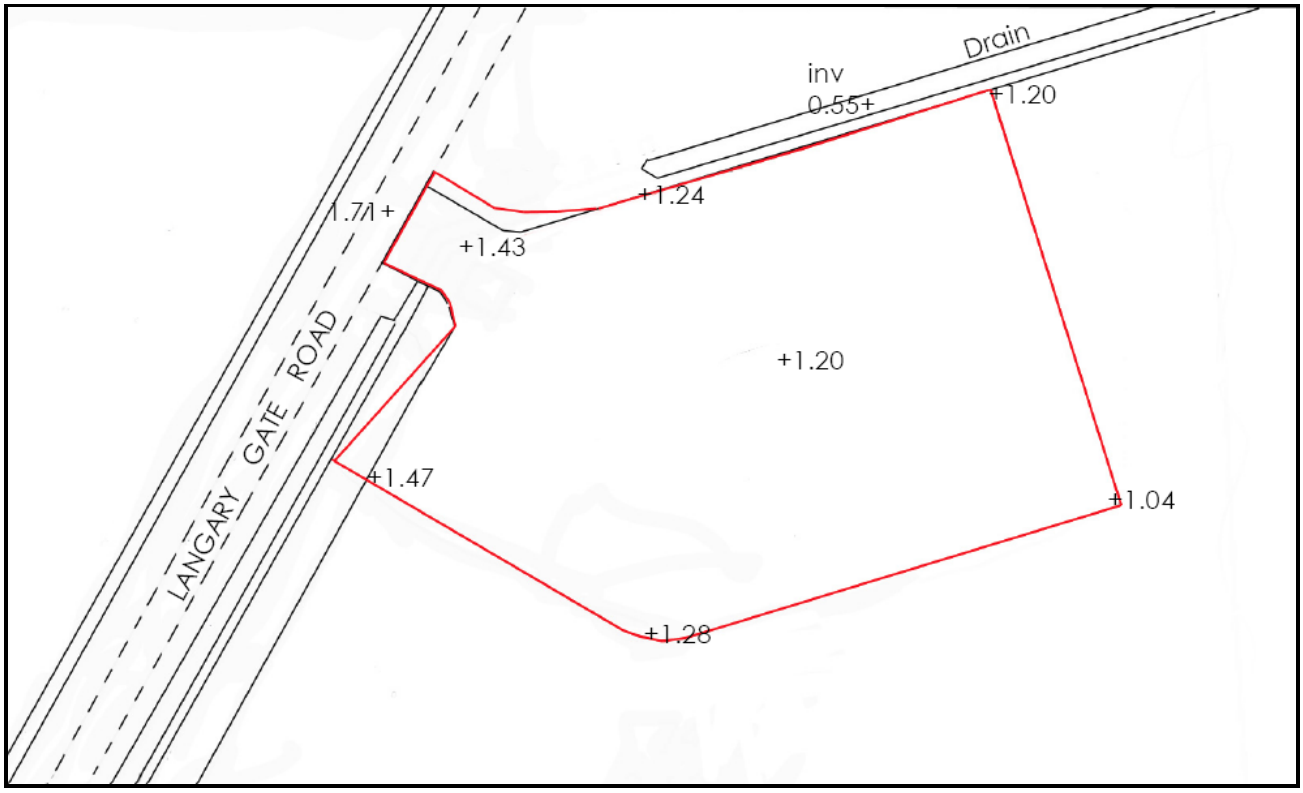
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APPLICATION SITE

The site is located on land off Langary Gate Road, Gedney Hill, Spalding, within the South Holland District Council's administrative area. The National Grid Reference is TF 34857 14981**. Plan 1**

The flood risk assessment has been prepared to accompany a full planning application for a multi-purpose two storey building (40m x 20m) with some ensuite bedrooms for visitors, with associated parking, for an agricultural research and training centre. **Plan 2**

From Lidar 2mDTM the site is reasonably level, the levels vary from1.47mODN adjacent to Langary Gate Road to 1.04mODN on the western boundary averaging 1.20m ODN. The road level at the site entrance, is 1.71mODN.



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 agricultural development is classified as "Less Vulnerable", with Table 1 of NPPG stating that such uses are appropriate in this zone.

Table 2: Flood Risk Vulnerability Classification

Less Vulnerable
• Police ambulance and fire stations that are not required to be operational during flooding • Buildings used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non- residential institutions not included in "more vulnerable" and assembly and leisure. • Land and buildings used for agricultural and forestry. • Waste treatment (except land fill and hazardous waste facilities). • Minerals working and processing (except for sand and gravel working). • Water treatment works that do not need to remain operational during times of flood. • Sewage treatment works (if adequate measures to control pollution and manage sewage during flood events are in place).

DRAINAGE AUTHORITIES

Environment Agency

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

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

- From the River Nene (Tidal)
- The River Welland
- The Wash
- South Holland Internal Drainage Board system

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

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

The Risk of Flooding from Rivers and Sea Map shows that the site is at Very Low risk of flooding. Very low means that each year, this area has a chance of flooding of less than 1 in 1000 (0.1%). This takes into account the effect of any flood defences that may be in this area. Flood defences reduce, but do not completely stop the chance of flooding as they can be overtopped or fail. **Map 2**

River Nene, The Wash & River Welland.

With the River Nene lying some 11.0Km to the east of the site, the Wash being some 19.5Km to the north and the River Welland some 9.0Km to the west, these flooding sources have been discounted as they are too distant

to affect the site.

In locations such as this, within 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. However, the site is protected by defences to the three major sources of flooding and the site would only be affected by these defences failing.

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.

The 2017 Update to SHDC, SFRA has carried out a Tidal & Fluvial Hazard Mapping, for the district, following a breach to the defences. The present-day Residual Flood Hazard, Depth and Velocity District – present day 1% fluvial and 0.5%Tidal Event Probability Maps show that the site where the proposed development is to be located is within an area of no hazard The Hazard, Velocity and Depth Maps, for year 2115, also shows that the site is still within an area of no hazard. **Maps 3, 4 & 5.**

The Environment Agency standing advice recommends that for “Less Vulnerable” developments in Flood Zone 3a, the floor level of buildings should be raised as high as practicable (minimum of 300mm above existing ground level).

The multi-purpose building floor level will be set 300mm above the existing ground level.

South Holland District Council

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

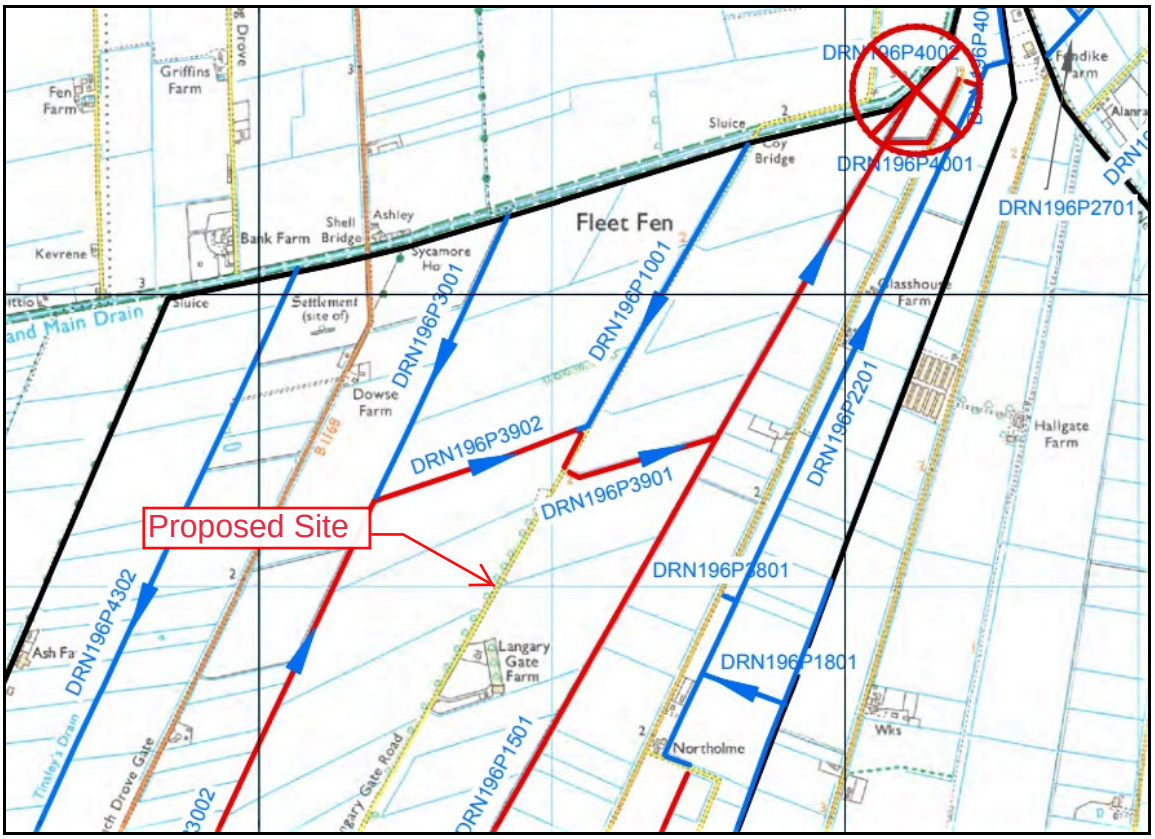
This Flood Risk Assessment has taken the results of the (2017) updated South Holland Strategic Flood Risk Assessment (SHSFRA) into account in its findings.

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

South Holland Internal Drainage Board

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

The site is within Board's catchment Fleet Fen (N) and the nearest watercourse to the site is Drain No DRN196P1501, located 300m to the east of the site. This drain outfalls to Fleet Fen Pumping Station which discharges into the Boards Main Drain.



South Holland IDB Drainage Map

SURFACE WATER FLOODING

Most the site is shown to be at no risk from surface water. The site is, there considered to be at very low risk. Very low risk means that each year this area has a chance of flooding of less than 0.1%. Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. **Map 6**

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. Because of the way these maps 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 in relation to flooding.

FLOODING FROM OTHER SOURCES

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

- Flooding from land can occur from intense rainfall, often over short duration of time that is unable to soak into the ground or enter the drainage system. However, with the natural topographic nature of the ground being flat, with no high ground around the site this will not cause any rapid inundation of the site and is likely only lead to local ponding of shallow depth and low velocity following the natural land contours. The updated SFRA concluded that flooding from this source is limited to minor isolated cases and is not of strategic significance as regards to flood risk.

- The area is not known to suffer from any groundwater problems and therefore is taken as having no strategic significance as regards to flood risk.

- Flooding from sewers can occur from overloading 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.

SEQUENTIAL APPROACH

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

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.

Planning Practice Guidance 2014 states: - When applying the Sequential Test, a pragmatic approach on the availability of alternatives should be taken. For example, in considering planning applications for extensions to existing business premises it might be impractical to suggest that there are more suitable alternative locations for that development elsewhere.
The proposal needs a dedicated base and cannot operate on a disaggregated basis, which would result in multiple trips across the district to access various elements of the project. There will be positive economic impacts for the area. The proposal requires a rural location and one where there is ready access to dedicated areas for agricultural field trials. It is therefore considered that the Sequential Test has been satisfied.

With the application being for a Less Vulnerable use, the Exception Test is not required.

DRAINAGE STATEMENT

Surface Water Drainage

This drainage statement, for the site, proposes to utilise infiltration techniques to reduce the storm water discharge from the proposed development and to minimise the impact of the development on the surrounding area and to comply with guidelines, which require at least one workable solution for managing surface water.

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

1) Infiltration
2) Watercourse
3) Public sewer

Infiltration

The car park and access road and footways will have an informal layout and will be constructed with permeable construction such as 300mm hardcore with a granite chipping surface rolled into the top surface. The roof water from the amenity building will discharge to soakaways designed in accordance with BRE digest 365.

Watercourse

As an alternative if percolation tests are negative the surface water will be attenuated in the pond area and discharged into the dyke on the northern boundary at Greenfield rates of discharge.

Foul Water Drainage

As the site is not located within an area served by public sewers an appropriate sized package treatment plant will be provided for the proposed development. The maintenance of this will be the owners of the properties.

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

CLIMATE CHANGE

Global warming is now recognised that it is likely to affect the frequency and severity of extreme events as both tidal and fluvial flooding. The Climate change allowances in the NPPF Guidance was updated on the 19th February 2016 and again on the 17th December 2019.

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

Table 1 Peak river flow allowances by river basin district (1961 to 1990 baseline)

River basin District	Allowance category	Total potential change anticipated for ‘2020s’ (2015 to2039)	Total potential change anticipated for ‘2050s’ (2040 to2069)	Total potential change anticipated for ‘2080s’ (2070 to2115)
Anglian	Upper End	25%	35%	65%
	Higher Central	15%	20%	35%
	Central	10%	15%	25%

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

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

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

Table 3 Peak sea level allowance for each epoch in (mm) per year with cumulative sea level rise for each epoch in brackets (use 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)
Anglian	Higher Central	5.8 (203mm)	8.7 (261mm)	11.6 (348mm)	13 (390mm)	1.20m
Anglian	Upper End	7 (245mm)	11.3 (339mm)	15.8 (474mm)	18.1 (543mm)	1.6m

The tidal flood defences consist of earth embankments are, they are in good condition and are well maintained by the Environment Agency.

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 amenity building 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 multipurpose building is to be raised 300m above the existing average ground level.

- All sleeping accommodation, for the short stays, will be located at first floor level as shown on the floor plans.

- Arrange for all service circuits to be routed at high level and where practical socket outlets and

switchgear. to be a minimum of 0.5m above the raised ground floor level.

- The construction of the building will be a traditional brick and block walls up to DPC level.
- As this site is in an area that can receive flood warnings from the Environment Agency Floodline Warning Direct system. It is recommended that the property Owner contact the Environment Agency's Floodline on 0845 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 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.
- The site does have the protection of both tidal and fluvial flood defences which are well maintained by the Environment Agency.
- Whilst the site is within Flood Zone 3 according to the Environment Agency maps without defences the 2017 Update to SHDC, SFRA Tidal & Fluvial Hazard Mapping, for District following a breach to the defences, show that the site where the proposed development is to be located is within an area of no hazard, for both the present day and for year 2115.
- The Flood Risk Vulnerability Classification in Table 2 of NPPG the proposed research and training centre is classified as "Less Vulnerable", with Table 1 of NPPG stating that such uses are appropriate in this zone.
- The ground floor level for the multi-purpose building is to be raised 300m above the existing average ground level.
- Any impact of damage to the property can be foreseen and mitigated against by relatively simple design and construction techniques. They will be constructed using materials which are flood resilient construction as outlined in the report.
- Flooding from other sources is unlikely to affect the site.

Flood map for planning

Your reference	Location (easting/northing)	Created
Gedney Hill	**534852/314986**	**3 Jun 2020 18:17**

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

This means:

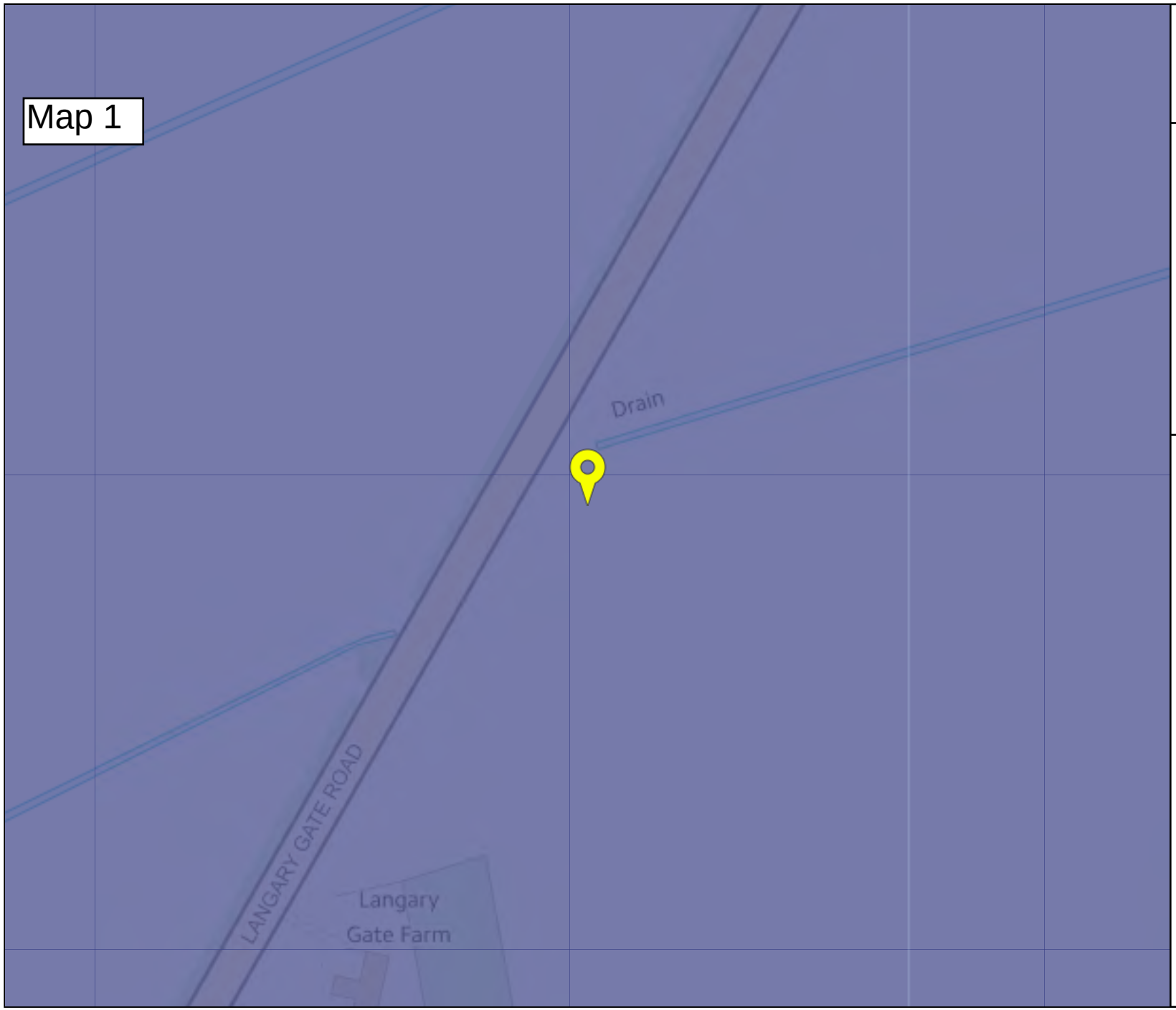
- you must complete a flood risk assessment for development in this area
- you should follow the Environment Agency's standing advice for carrying out a flood risk assessment (see www.gov.uk/guidance/flood-risk-assessment-standing-advice)

Notes

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

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

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Environment Agency

Flood map for planning

Your reference
Gedney Hill

Location (easting/northing)
534852/314986

Scale
1:2500

Created
3 Jun 2020 18:17

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

0 20 40 60m

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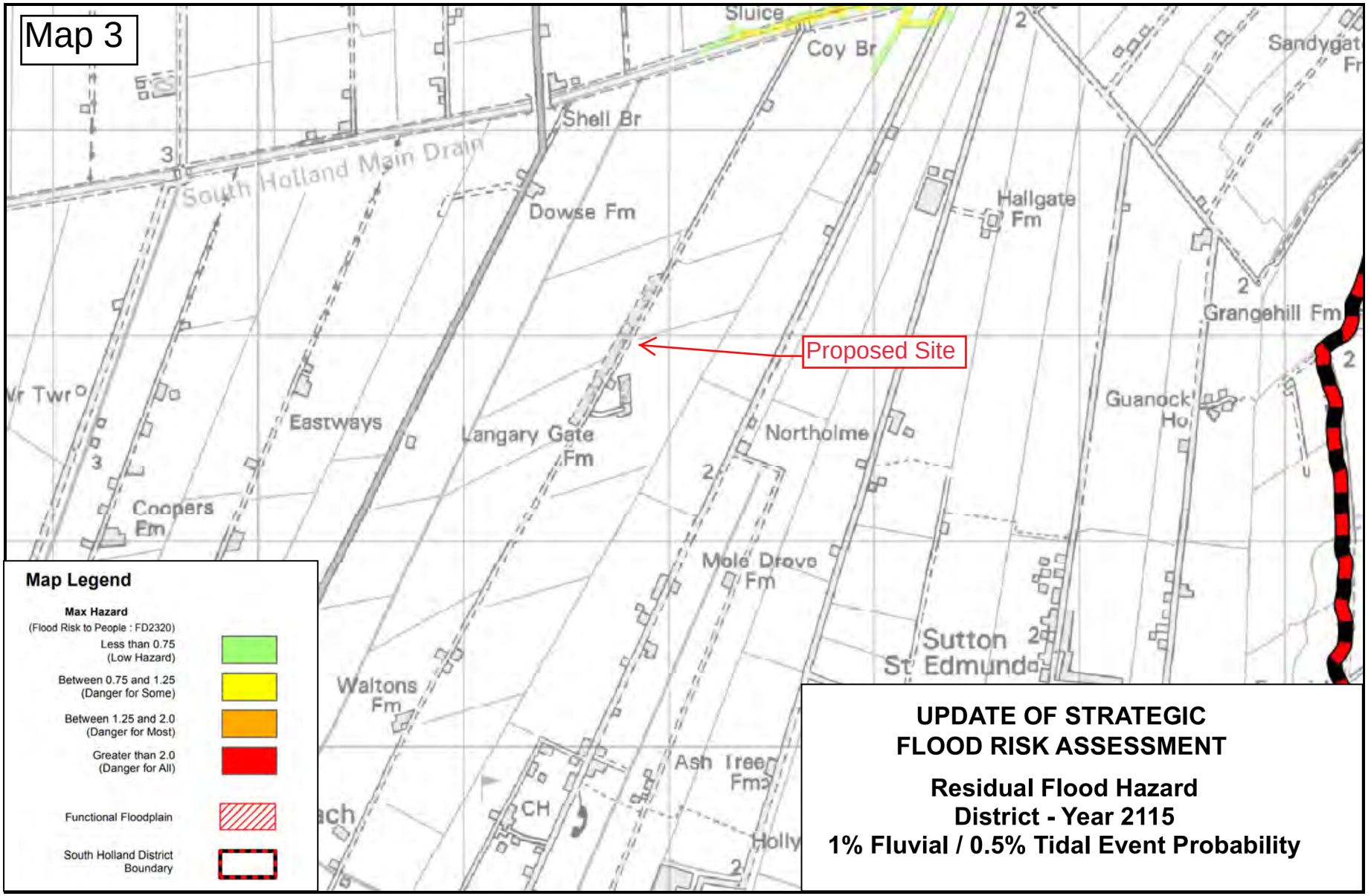
Extent of flooding

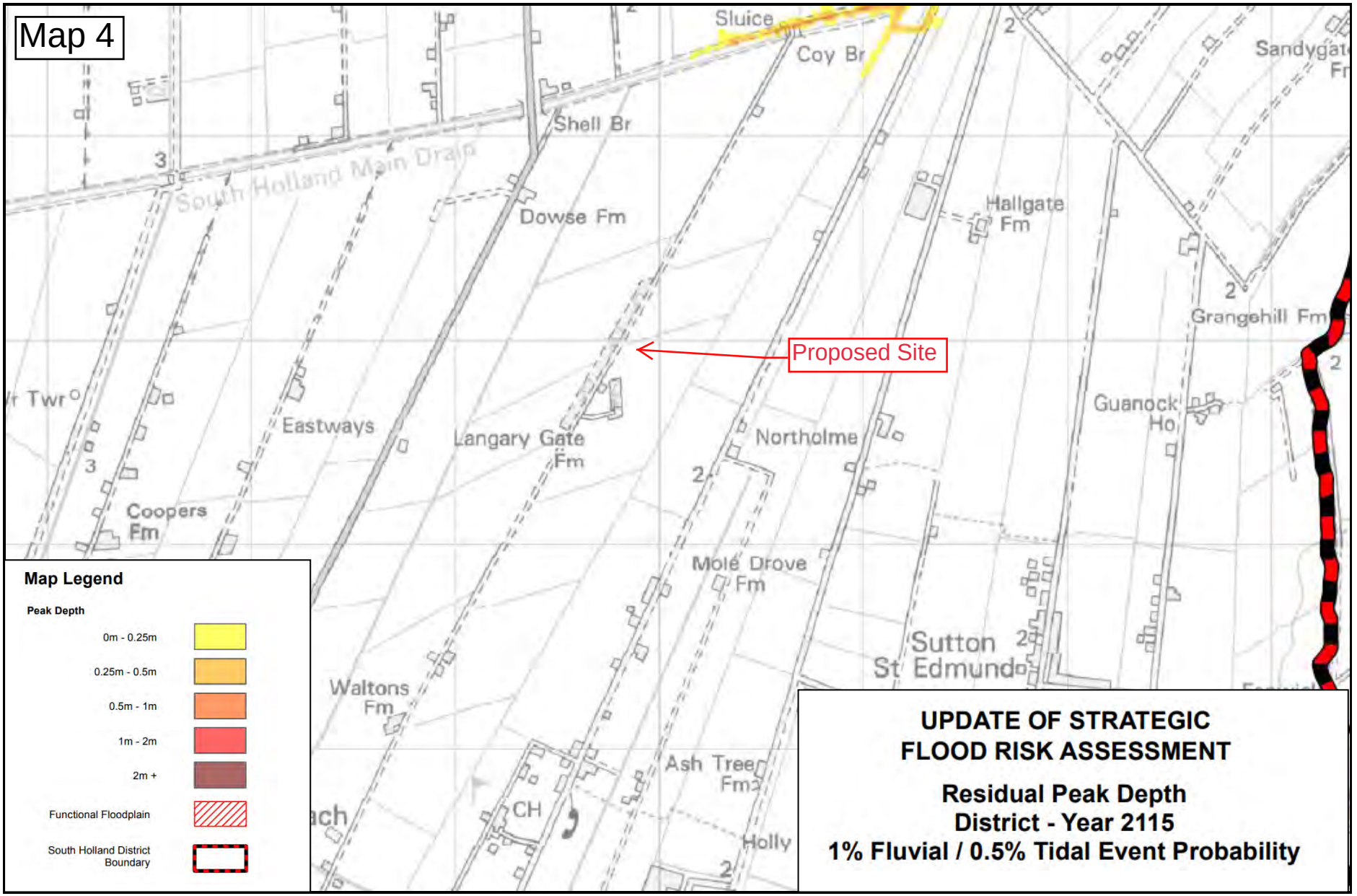
Gedney Hill

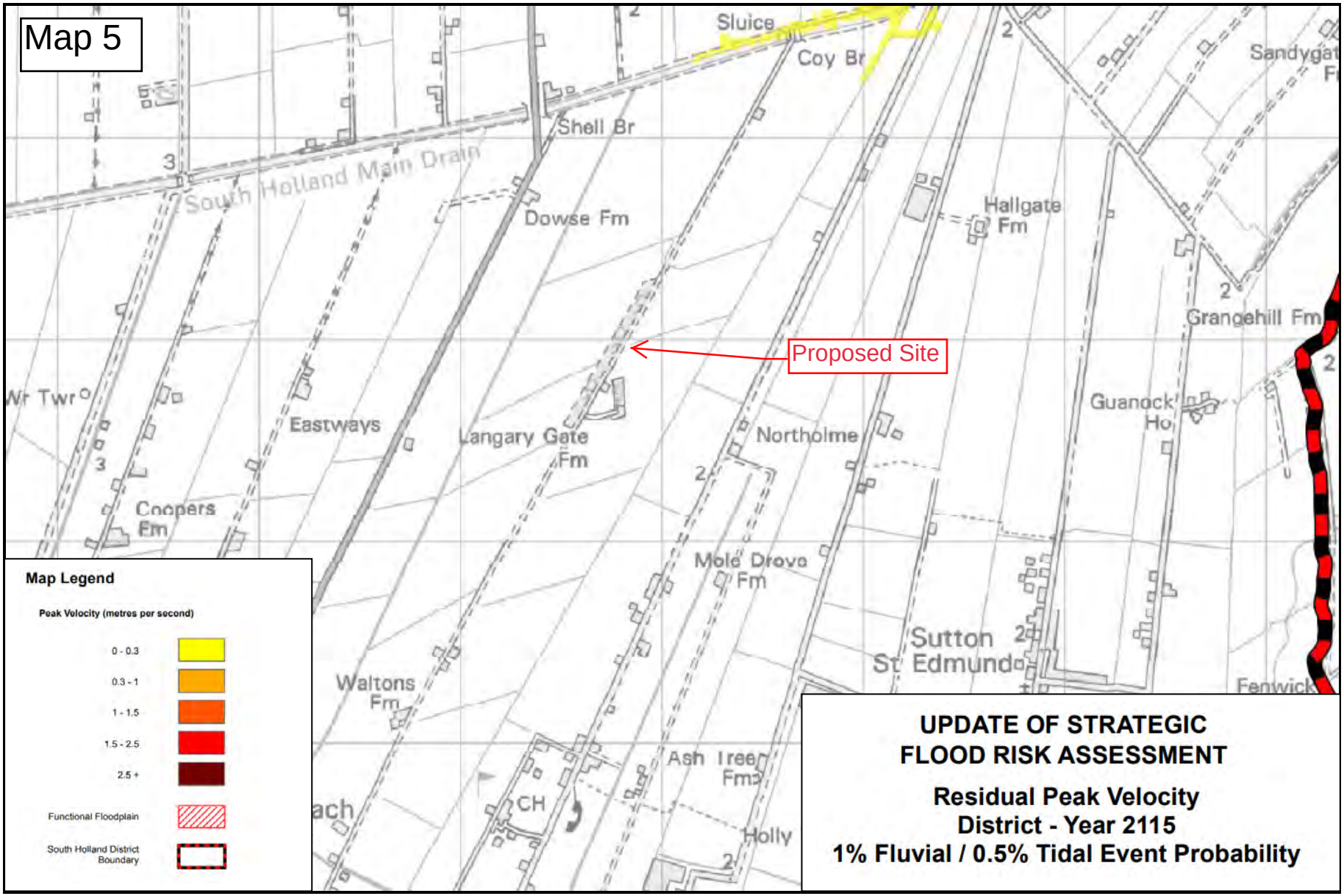


Extent of flooding from rivers or the sea

High Medium Low Very low


Map 3
Sluice
Coy Br
Shell Br
South Holland Main Drain
Dowse Fm
Hallgate Fm
Sandygat Fr
Grangehill Fm
Proposed Site
Eastways
Langary Gate Fm
Northolme
Guanock Ho
Coopers Fm
Mole Drove Fm
Sutton St Edmund
Waltons Fm
Ash Tree Fm
CH
Holly
Map Legend
Max Hazard
(Flood Risk to People : FD2320)
Less than 0.75 (Low Hazard)
Between 0.75 and 1.25 (Danger for Some)
Between 1.25 and 2.0 (Danger for Most)
Greater than 2.0 (Danger for All)
Functional Floodplain
South Holland District Boundary
UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT
Residual Flood Hazard
District - Year 2115
1% Fluvial / 0.5% Tidal Event Probability


Map 4
Sluice
Coy Br
Shell Br
South Holland Main Drain
Dowse Fm
Hallgate Fm
Sandygate Fm
Grangehill Fm
Proposed Site
Guanock Ho
Eastways
Langary Gate Fm
Northolme
Coopers Fm
Mole Drove Fm
Sutton St Edmund
Waltons Fm
Ash Tree Fm
CH
Holly
Map Legend
Peak Depth
0m - 0.25m
0.25m - 0.5m
0.5m - 1m
1m - 2m
2m +
Functional Floodplain
South Holland District Boundary
UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT
Residual Peak Depth
District - Year 2115
1% Fluvial / 0.5% Tidal Event Probability


Map 5
Sluice
Coy Br
Shell Br
South Holland Main Drain
Dowse Fm
Hallgate Fm
Grangehill Fm
Proposed Site
Eastways
Langary Gate Fm
Northolme
Guanock Ho
Coopers Fm
Mole Drove Fm
Sutton St Edmund
Waltons Fm
Ash Tree Fm
CH
Holly
Fenwick
Map Legend
Peak Velocity (metres per second)
0 - 0.3
0.3 - 1
1 - 1.5
1.5 - 2.5
2.5 +
Functional Floodplain
South Holland District Boundary
UPDATE OF STRATEGIC FLOOD RISK ASSESSMENT
Residual Peak Velocity
District - Year 2115
1% Fluvial / 0.5% Tidal Event Probability

Low risk: depth

Gedney Hill

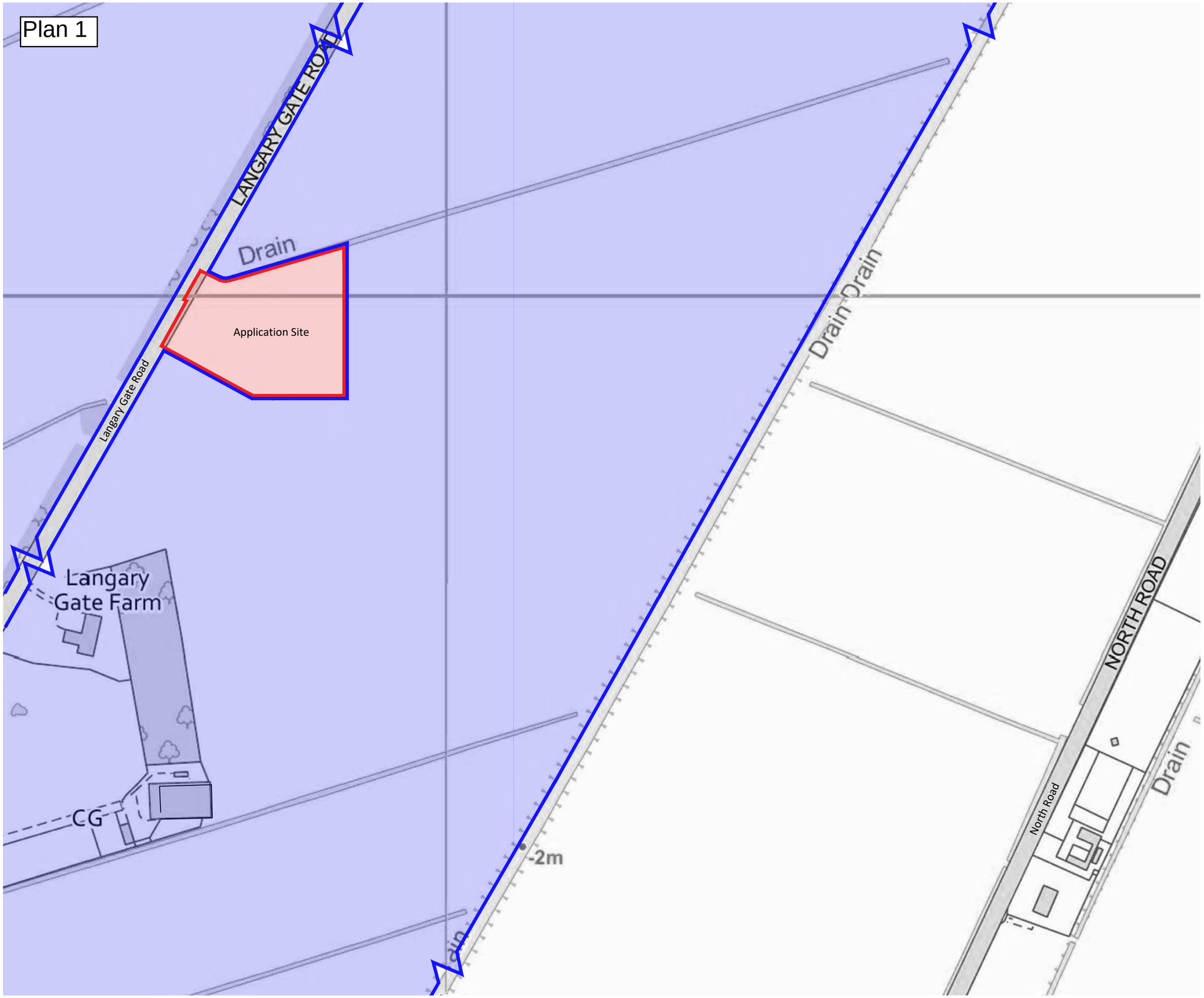


Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

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

Plan 1



Notes

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Rev	Description	Date
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Client
H Sly & Sons

Project
Agriculture Research and Training Centre
Langary Gate Road, Gedney Hill

Drawing
Location Plan

Scale @ A3	Date
1: 2500	09/06/20

Drawn By	Checked By
WW	LMS

Job Number	Status	Purpose of Issue
1411-1	PL	Planning

Drawing No.	Rev
1411-1_PL_LP01	-

Plan 2



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N

0 5 10 15 20 25m

Rev	Description	Date
-	-	-

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Client
H Sly & Sons

Project
Agriculture Research and Training Centre
Langary Gate Road, Gedney Hill

Drawing
Existing Site Plan

Scale @ A3	Date
1: 500	09/06/20

Drawn By	Checked By
WW	LMS

Job Number	Status	Purpose of Issue
1411-1	PL	Planning

Drawing No.	Rev
1411-1_PL_SP01	-

Plan 3



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N

0 5 10 15 20 25m

Rev	Description	Date
-	-	-

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Client
H Sly & Sons

Project
Agriculture Research and Training Centre
Langary Gate Road, Gedney Hill

Drawing
Proposed Site Plan

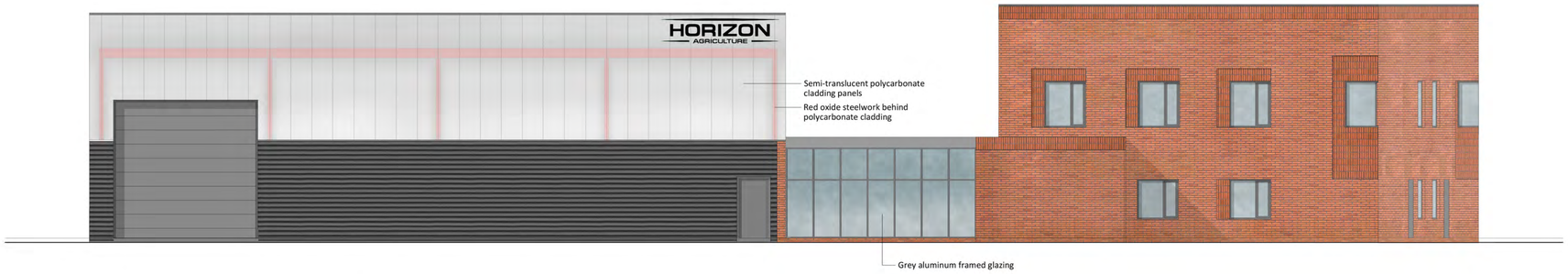
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WW	LMS

Job Number	Status	Purpose of Issue
1411-1	PL	Planning

Drawing No.	Rev
1411-1_PL_SP02	-

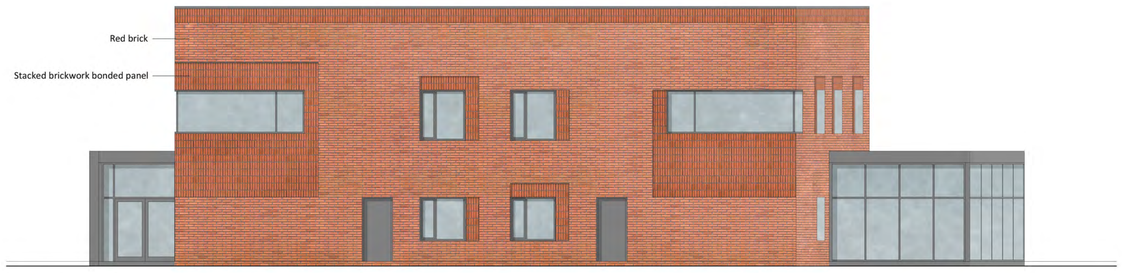
Plan 4



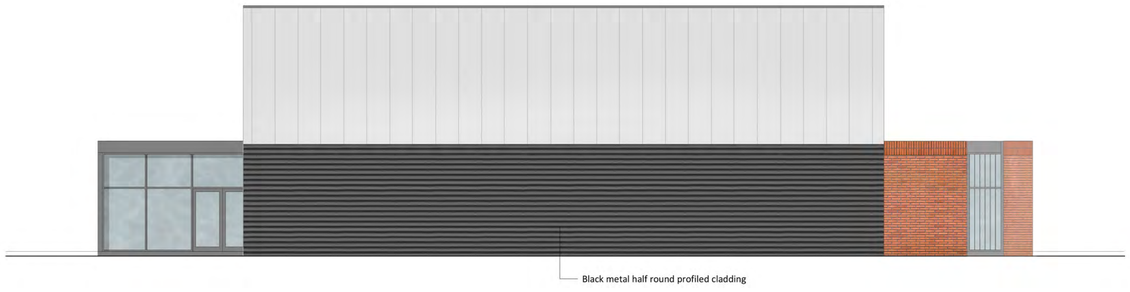
Proposed North Elevation



Proposed South Elevation



Proposed West Elevation



Proposed East Elevation

0 1 2 3 4 5m

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Project
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Drawing
Proposed Elevations

Scale @ A1	Date
1: 100	10/06/20
Drawn By	**Checked By**
PSS/WW	LMS

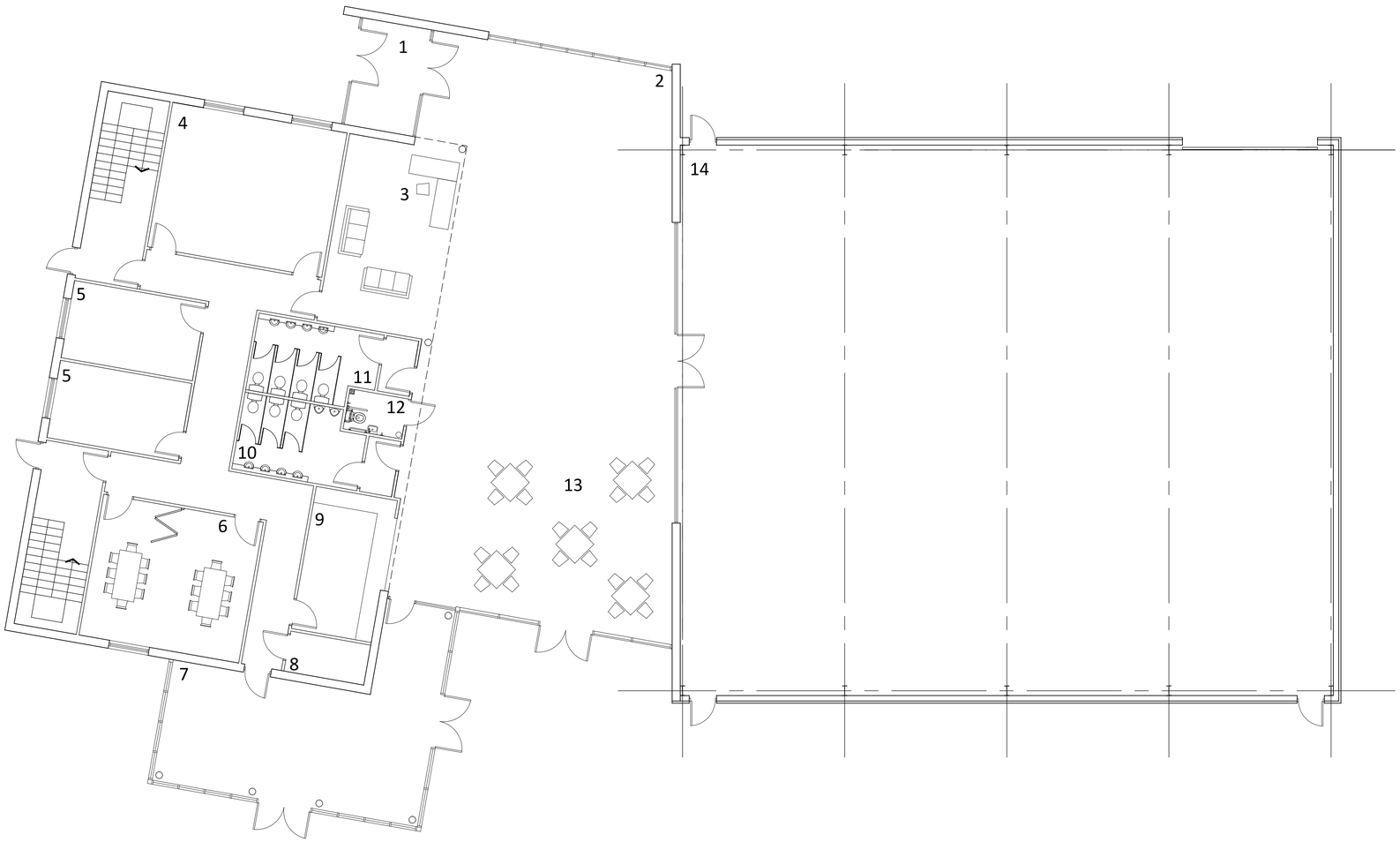
Job Number	Status	Purpose of Issue
1411-1	PL	Planning

Drawing No. 1411-1_PL_EL01 **Rev** -

Plan 5

Key

1. Entrance Lobby
2. Foyer / Display
3. Visitor waiting area
4. Multi-purpose office
5. Office
6. Meeting room with flexible partition
7. Crop R&D/ Viewing area
8. Store
9. Kitchen / Servery
10. Male WC
11. Female WC
12. Access WC
13. Breakout / Informal meeting area
14. Machinery display area



Proposed Ground Floor Plan

0 1 2 3 4 5m

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Client
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Project
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Langary Gate Road, Gedney Hill

Drawing
Proposed Ground Floor Plan

Scale @ A1	Date
1: 100	10/06/20
Drawn By	**Checked By**
PSS	LMS

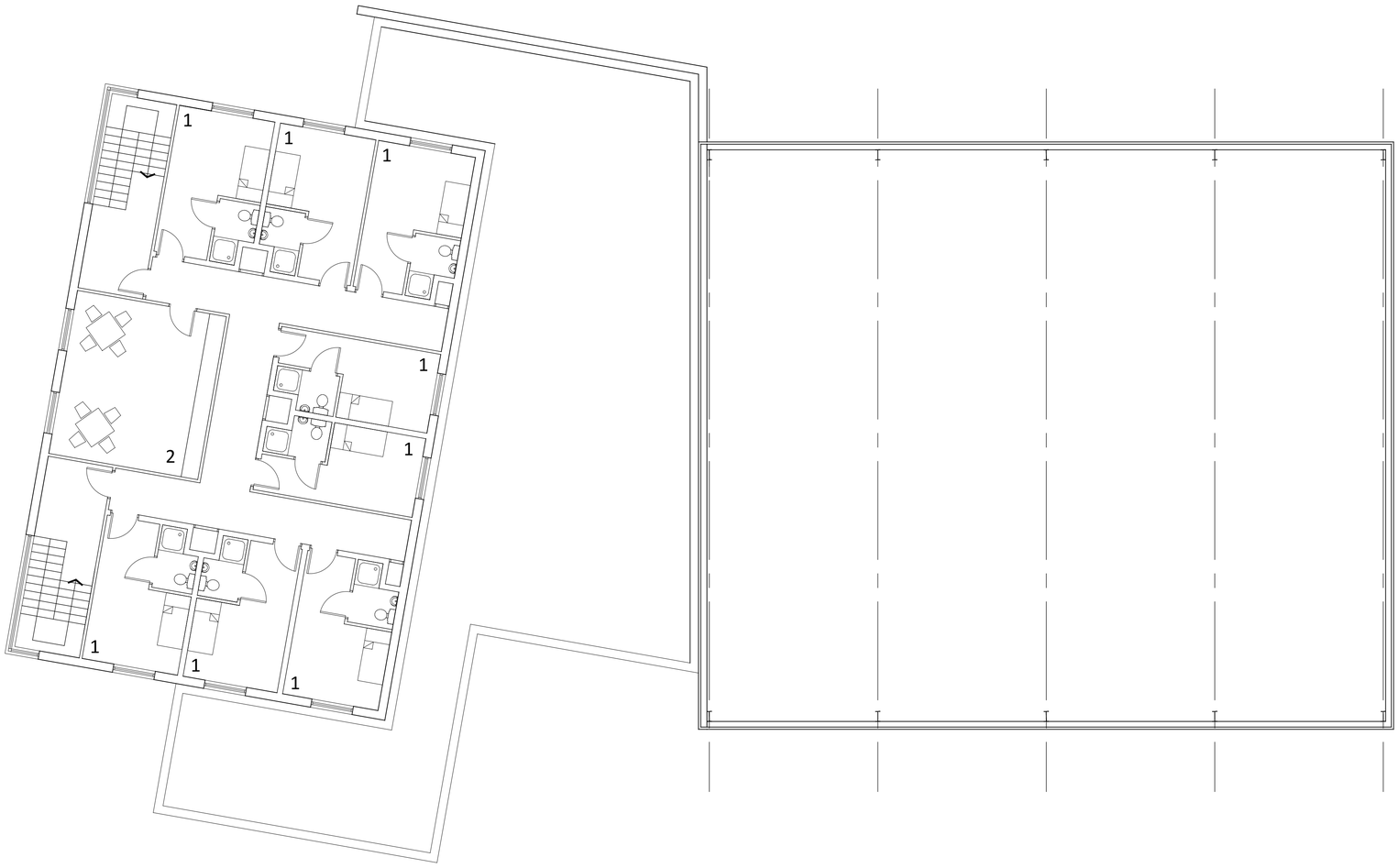
Job Number	Status	Purpose of Issue
1411-1	PL	Planning

Drawing No. 1411-1_PL_PL01 **Rev** -

Plan 6

Key

1. Visitor accommodation
2. Communal kitchen area



Proposed First Floor Plan

0 1 2 3 4 5m

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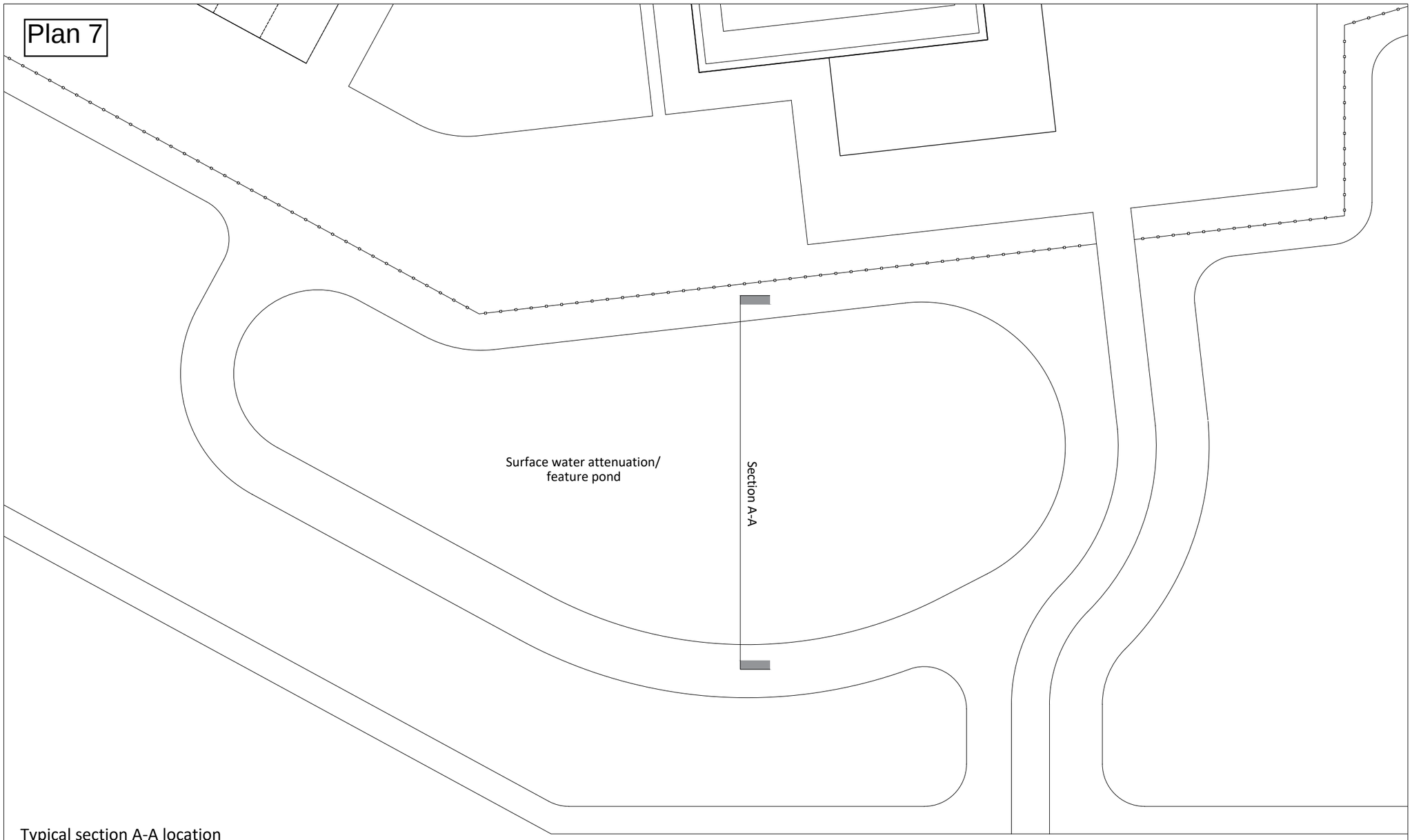
Drawing
Proposed First Floor Plan

Scale @ A1	Date
1: 100	10/06/20
Drawn By	**Checked By**
PSS	LMS

Job Number	Status	Purpose of Issue
1411-1	PL	Planning

Drawing No.	Rev
1411-1_PL_PL02	-

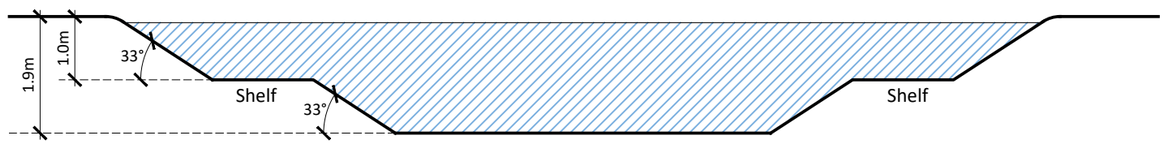
Plan 7



Typical section A-A location

0 2 4 6 8 10m

1.200



Typical section A-A

0 1 2 3 4 5m

1.100

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Drawing
Typical Pond Section

Scale @ A3	Date
As shown	10/06/20

Drawn By	Checked By
WW	LMS

Job Number	Status	Purpose of Issue
1411-1	PL	Planning

Drawing No.	Rev
1411-1_PL_SE01	-