



J ROBERTS DESIGN LTD
STRUCTURAL AND CIVIL ENGINEERING CONSULTANTS

Saria Baggage Storage Facility

Stoke Lane

Nottingham

NG14 5GJ

FLOOD RISK ASSESMENT

Client – John Hill Associates Ltd

3925 / May 2023

COPYRIGHT

THIS DOCUMENT MUST NOT BE COPIED OR REPRODUCED WITHOUT THE PRIOR PERMISSION OF J ROBERTS DESIGN LIMITED

www.jrobertsdesignltd.com

CONTENTS

APPENDICES	2
1 Introduction	3
2 Development and Site Location	4
2.1 Site Location	4
2.2 Site Description.....	4
2.3 Classification of Vulnerability	5
2.4 Flood Zone Classification.....	5
3 Sequential and Exceptions Test.....	6
4 Definition of the Flood Hazard	7
4.1 The River Trent	7
4.2 Ouse Dyke	8
4.3 Unnamed Drains.....	9
4.4 Flooding from Land.....	9
4.5 Flooding from Sewers	10
4.6 Flooding from Ground Water	11
4.7 Flooding from Reservoirs	11
5 The Probability of Flooding.....	13
5.1 Probability of Flooding.....	13
5.2 Surface and Foul Water Discharge.....	14
6 Climate Change Effect.....	14
7 Flood Risk Measures.....	15
8 Off Site Impacts.....	15
8.1 Increase of Flood Risk Elsewhere	15
8.2 Management of Remaining Risks Over Lifetime of Development	16
9 Residual Risks.....	16
9.1 Remaining Flood Risks After Implementation of Protection measures	16
9.2 Management of Remaining Risks Over the Lifetime of Development	16

APPENDICES

- Appendix A – Site Location + Plan
- Appendix B – Site Levels
- Appendix C – Environment Agency Data + Maps
- Appendix D – SFRA Information Data + Maps
- Appendix E – Services Plan
- Appendix F – Evacuation Plan
- Appendix G – Glossary of Terms

1 Introduction

The assessment has been undertaken in accordance with the National Planning Policy Framework (NPPF). It uses information of the existing topography, existing surface water drainage systems, historical flood records and simulated flood maps.

This Flood Risk Assessment has been prepared to support retrospective planning permission for a storage/bagging facility, The development is located on an existing site off Stoke lane, Nottingham, NG14 5HJ, grid reference – 463901E, 341691N – fled.found.spend.

Relevant information was sought from the Environment Agency (EA), the Nottinghamshire County Council (NCC) and the Gedling Borough Council (GBC). The site is also reported to be within the Trent Valley Internal Drainage (IDB) area. The Possible sources of flooding will be evaluated to determine the risk they pose to the development site. The effect of climate change will also be considered, and any off-site impacts caused, by the development.

Should the risk of flooding prove to be significant, the report will endeavour to minimise the impact on the development and the local area throughout its design life to protect against the threat to life. In summary, this report confirms the proposal can be developed safely, with negligible impact on flood risk off-site.

In summary the minimum finished floor level (FFL) of the bagging facility is 20.71mAOD. The building should use flood resilient construction so that should flooding occur the building can quickly be returned to operational status. This FFL will be reviewed when data is provided by the EA.

The opening into the building is required to be level when operational as (forklift) vehicles require access. A 150mm wide drainage channels will be used in front of entrances to direct any water away from the openings. There will be a short 1:20 fall into the drain local to the drain to direct water into it, with the surrounding landscape falling away from the building at a 1:12 fall.

In combination with flood resilient and resistant construction the office should be safe for its intended design life. It is recommended to sign up to the Environment Agencies Flood Warning Scheme. The EA flood warning area covers the site and warnings are available.

2 Development and Site Location

2.1 Site Location

The site is on the edge of Gedling, a village 4 miles northeast of Nottingham city centre. Gedling has become contiguous with the town of Carlton. The closest watercourse is an unnamed water course circa 200m south of the development.

The site address is SARIA, Stoke Lane, Nottingham, NG14 5HJ – grid reference (463899E, 341691N).

The Ouse Dyke is the closest EA watercourse which flows southeast and then loops to head northwest and discharge into the River Trent. The nearest main watercourse is the River Trent, circa 935m east/northeast. There is a Severn Trent Sewerage Works on the north and east side of the site. A new housing/commercial development is southwest of the site. Agricultural fields are around the rest of the site. Refer to Appendix A for the site location.

2.2 Site Description

The development is an additional bagging/storage unit, ancillary to the current on-site works. The unit is operationally linked to the site. The site was previously an area of hard standing. There is little to no impact on the surrounding area. The wider site is private and around the site are Severn Trent facilities that are also private. The commercial/infrastructure buildings are largely separated from any residential areas.

The site is currently accessed via Stoke Lane. A site plan is attached in Appendix A. The development is very small compared to recent housing and commercial developments within the same flood zone and of lower risk. The impermeable area is not increased by the development. The concrete plinth the unit is built upon is approximately 462m².

The general levels of the building range from 20.71 to 21.03 metres Above Ordnance Datum (mAOD). The wider site varies little, 20.45mAOD at the lowest point to 21.20mAOD to the rear of the building (Appendix A).

From BGS data the bedrock geology is noted as Triassic rocks (undifferentiated) - mudstone, siltstone and sandstone with superficial deposits of Alluvium (clay, silt, sand and gravel) and river terrace deposits.

BGS borehole data shows slightly clayey, silty, gravelly sand and gravel, with river gravel starting around 20mAOD down, continuing down beyond 5m depth.

2.3 Classification of Vulnerability

According to NPPF Annex 3, the classification of the proposed development is in the 'Less Vulnerable' category (see Figure 1). Less vulnerable development is considered appropriate in Flood Zone 2 (see Figure 2).

Less vulnerable

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

Figure 1 - NPPF Annex 3

Table 2: Flood risk vulnerability and flood zone 'incompatibility'

Flood Zones	Flood Risk Vulnerability Classification				
	Essential infrastructure	Highly vulnerable	More vulnerable	Less vulnerable	Water compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test required	✓	✓	✓
Zone 3a f	Exception Test required f	X	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	X	X	X	✓*

Key:

✓ Exception test is not required

X Development should not be permitted

Figure 2 - NPPF PPG Table 2

2.4 Flood Zone Classification

The Environment Agency's flood map shows that the development site is located within a Flood Zone 2. This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year (Appendix C).

Concurrently, the Nottinghamshire County Council (NDC) Strategic Flood Risk Assessment (SFRA) locates the development within Flood Zone 2 (Appendix D).

3 Sequential and Exceptions Test

The Environment Agency categorise the site as being within Flood Zone 2 and as per the NPPF the Sequential Test and Exceptions Tests are usually required. As set out in the NPPF, the aim of the Sequential Test is to steer new development to areas of the lowest probability of flooding. Where a site of a lower flood risk is not available the development must pass the Exceptions Test if appropriate. For the Exceptions test to be passed it must: -

- Demonstrate that the development provides wider sustainability benefits to the community to outweigh flood risk.
- Demonstrate that the development will be safe for its lifetime taking into account the vulnerability of its users, without increasing flood risk elsewhere, and where possible will reduce flood risk overall.

Sequential and Exceptions Test

The development cannot be located elsewhere in an area of lower flood risk as it is operationally linked to the existing business. The purpose of the development is for the bagging and temporary storage of materials that are to be moved by forklifts. As movement of the materials via forklift is required the proximity to the existing operation is a requirement as forklifts cannot go elsewhere to retrieve the bagged materials.

As per table 3 of the Planning Policy Guidance (PPG), a less vulnerable development is considered appropriate within FZ2 and therefore the exceptions test is not required.

4 Definition of the Flood Hazard

The sources of flooding that could potentially affect the site are the following: -

- Flooding from water courses
 - River Trent
 - Ouse Dyke
 - Unnamed Drains and ditches
- Flooding from land
- Flooding from sewers
- Flooding from ground water

A Main River Map is attached in Appendix C.

4.1 The River Trent

The site is within the River Trent catchment Area. The River Trent is circa 940m east/northeast. In the case of the River Trent, it is considered that fluvial flooding represents the worst-case scenario rather than tidal flooding, and therefore fluvial flooding is considered over tidal flooding. The River Trent has raised flood defences which protect a large area of low-lying land. Were the River Trent to breach it would cause flooding over a wide area.

Excessive amounts of rainfall could cause the levels to rise. The rivers embankments are lower than the site level and are not raised above the surrounding landscape, thus the most likely method of flooding would be overtopping. There are large areas of agricultural land at a lower level than the site which will accept flood water and help to prevent the site from flooding. The Nottingham SFRA has modelled flood scenarios for a 100-year event with a 20%, 30% and 50% inclusion for climate change. The site is free from flooding during all scenarios.

A breach is unlikely as the banks along the section of the river near the site are not raised. The SFRA models breaches along the course of the River Trent for a 1 in 100-year +30% scenarios. The flooding shown occurs from upstream, the extent of which does not affect the site.

The site is modelled as not affected by overtopping or breach of the River Trent.

Modelled data from the EA has been requested and is in the process of being produced. The data and models, upon arrival, shall be reviewed against the SFRA models. The EA Risk of Flooding from Rivers and the Sea mapping indicates the site is at a low risk of flooding (Appendix C).

There is a large development consisting of housing and commercial buildings 150m – 800m south east of the proposed development, started in 2019 the construction appears to be on going. The entrance to the site is on Stoke Lane which runs adjacent to the northeast border of the housing/commercial development. The site features hundreds of residential dwellings which are of a higher flood risk, many of which are in a higher risk zone; flood zone 3. As part of planning a minimum FFL of 20.65mAOD is permitted. The proposed development is 20.71 – 20.75mAOD, higher than the permitted FFL. A majority of the building is higher still, around 20.83mAOD+. It is considered that the that the existing FFL, 20.71mAOD+ is appropriate as a minimum finished floor level.

It is proposed to mitigate the residual risk of flooding by running a 150mm wide drainage channel in front of the building. The channel will divert any water away from the building entrances. Although surface water is not an issue to the development the risk of such will be effectively mitigated.

In conjunction with flood resilient construction the building should be safe for its intended design life. Flood resilient construction measures allow the building to be quickly cleaned and returned to operational condition. Any materials that are considered higher value should ideally be stored off the floor by a minimum of 900mm. The site occupants may consider that certain lower value materials to be sacrificial, the loss of which is of little detriment to the company. Such items are viable for storage at floor level, the decision to do so is the purview of SARIA.



Figure 3 – View of River Trent East of Site

4.2 Ouse Dyke

The Ouse Dyke is the closest EA watercourse which flows southeast and then loops around to head northwest and discharge into the River Trent. The dyke is circa 830m away at the closest point to the site.

Given the distance to the site any ensuing flood water is unlikely to affect the site. Although unlikely to flood, any flooding from the Ouse Dyke would be over agricultural fields and towards the River Trent, which represents a natural low point in the landscape. The dyke has raised embankments and natural high ground along its length. The north/west embankments are higher than the south/east side defences/high ground, hence the south/east would overtop before the north/west side, directing any flood water away from the site.



Figure 4 - Ouse Dyke

Without prior flooding occurring from the River Trent the Ouse Dyke represents a low risk of flooding to the site.

4.3 Unnamed Drains

The closest watercourse is an unnamed water course circa 200m south of the development. There is a pond which is likely to be a balancing pond that offsets the development that took place around 2019, a large housing/commercial development off the Colwick Loop Road (A612). A desktop study shows the pond to appear as development started, according to Google Earth imagery. The development is in Flood Zone 2/3.

The unnamed drain flows northeast away from the pond and discharges into the River Trent. The water level in the pond itself appears to vary. Flooding is unlikely to occur from the pond as it likely designed for at least a 1 in 100-year event with a 30% or 40% inclusion for climate change, depending on the design standards when development began. The outflow from the pond should be restricted to greenfield run-off rate, thus it is considered that the drain is very unlikely to flood.

Should the drain leading from the pond become blocked flooding would likely be restricted to adjacent fields. Overall the risk of flooding from the pond or the drain is very low. The drain is likely to have spare capacity and would likely be a betterment to the site during periods of high rainfall, drawing water away from the site.

There is another drain circa 270m north of the site, which runs from the Severn Trent and Water Treatment Company in a direct line east/northeast to the River Trent. The drain carries treated water from the facility to discharge into the River Trent. The flow is controlled by Severn Trent and thus flooding is very unlikely.

The site is very unlikely to be at risk of flooding from unnamed watercourses.

4.4 Flooding from Land

Surface water (pluvial) flooding is defined as flooding caused by rainfall-generated overland flow before the runoff enters a watercourse or sewer. In such events, sewerage and drainage systems and surface watercourses may be entirely overwhelmed. Pluvial flooding will usually be the result of extreme rainfall events, though may also occur when lesser amounts of rain falls on land which has a low permeability and/or is already saturated, frozen or developed. In such cases overland flow and 'ponding' in topographical depressions may occur.

The topography indicates a gentle decline towards the northwest of the site. Surface water flooding is likely to be contained within the highways and channelled into the local sewer network.

The EAs surface water flood risk map indicates there is no risk of flooding from surface during an any-year storm event (Figure 5 below). It is proposed to mitigate the residual risk of flooding by running a 150mm wide drainage channel in front of the building. The channel will divert any water away from the building entrances. Although surface water is not an issue to the development the risk of such will be effectively mitigated.

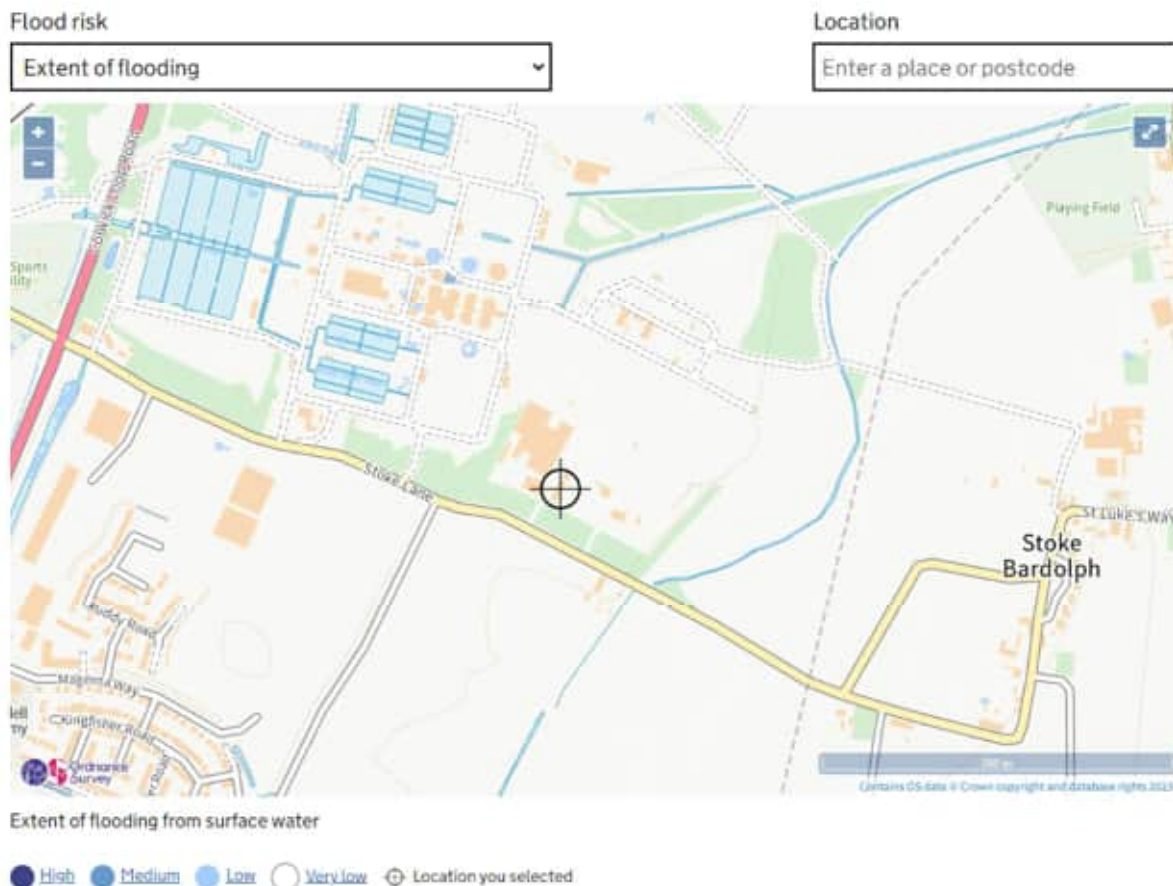


Figure 5 - Surface Water Flood Extent

Low Risk (0.1% (1 in 1000yr) - 1% (1 in 100yr) chance of flooding): - No flooding noted.

Medium Risk (1% (1 in 100yr) – 3.3% (1 in 30yr) chance of flooding): - No flooding noted.

High Risk (greater than 3.3% (1 in 30yr) chance of flooding): - No flooding noted.

It is considered that the recommended FFL is suitable and that there is low to no risk of surface water flooding.

4.5 Flooding from Sewers

There is a 100mm pressurised foul sewer running from east to west across the site to the sewerage treatment works northwest of the site. A 90mm pressure main runs northwest between the southwest border of the site and Stoke Lane. A private pressurised pipe runs from a manhole (7602) on the wider site outside the main

building, which may be foul or combined. The private and foul sewer go to a manhole (7601) and then all the sewers amalgamate at a pumping station which pumps to the sewerage works.

The mains and services maps and associated documentation can be seen in Appendix E.

Sewers coming into a sewerage treatment facility are the final sewers in a much larger network, and as such, tend to be wider and have faster flows. The risk of blockage is, therefore, reduced. Any issues with the sewer network within the vicinity will be repaired as a priority. There is no history of flooding in the vicinity of the site.

Should any blockages occur or the sewers suffer from exceedance flood water would likely be contained within the road channel network. There is no history of flooding from sewers and the risk of sewer flooding is considered low. Any private on-site drainage has the potential to cause local flooding but it is not likely to do so.

4.6 Flooding from Ground Water

Groundwater flooding is the emergence of water from beneath the ground, either at a specific point or at different locations. The effect is usually local and does not usually pose a significant risk to life. Groundwater flooding can, however, cause significant property damage and lead to ground instability.

There are several factors that can lead to groundwater flooding including prolonged rainfall, high in bank river levels, artificial structures, groundwater rebound and mine water rebound. Developments that are in areas susceptible to groundwater will not always be suited to SuDS, dependent on a detailed site investigation and risk assessment. The SFRA groundwater susceptibility is only an indicator of where water might emerge, not the chance that it will emerge.

The site is in an area where the susceptibility to groundwater flooding is >50%. Normally a screenshot of the SFRA would be provided but the SFRA interactive map completely covers the basemap in solid colours without opaquing the layer.

There are no known records of ground water flooding in the vicinity of the site.

From BGS data the bedrock geology is noted as Triassic rocks (undifferentiated) - mudstone, siltstone and sandstone with superficial deposits of Alluvium (clay, silt, sand and gravel) and river terrace deposits. BGS borehole data shows slightly clayey, silty, gravelly sand and gravel, with river gravel starting around 20mAOD down, continuing down beyond 5m deep.

The risk of groundwater flooding is considered to be low.

4.7 Flooding from Reservoirs

There is some flooding indicated from reservoirs if flooding from rivers is also occurring (Figure 6). It is extremely unlikely that a reservoir would fail as they are extensively monitored and maintained. There has been no loss of life from reservoir flooding in the UK since 1925. As the enforcement authority for the Reservoirs Act 1975 in England, the Environment Agency are responsible for ensuring that reservoirs are

inspected regularly and essential safety work is carried out. The risk of flooding occurring from reservoirs is very low.



Figure 6 - Reservoir Flood Map

5 The Probability of Flooding

5.1 Probability of Flooding

According to the Environment Agency the site is located within Flood Zone 2: land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year – land shown in lighter blue on the Flood Map. (Refer to Appendix C). The GDC SFRA also shows the site to be in Flood Zone 2 (Appendix D).

The site is not known to have previously flooded. The SFRA flood maps indicate the site is will not flood during an any-year scenario, including a breach scenario with 30% inclusion for climate change. The EA data will be assessed when available and compared to the SFRA models.

It is recommended that the minimum FFL is 20.71mAOD. Combined with flood resilient construction the building should be safe for the lifetime of the development. An almost adjacent housing/commercial development has an approved FFL of 20.65mAOD, which includes 'more vulnerable' dwellings in a higher risk Flood Zone 3. The recommended FFL (20.71mAOD) is 60mm above the previously approved FFL. The area where the building is situated is entirely permeable, hence there is no increased risk of flooding elsewhere.

Surface water ponding may occur in the vicinity of the site for a short period and is not seen to be a significant risk to the development.

Any high value material should be stored off the ground by a minimum of 900mm. If SARIA deem lesser value materials are, to a degree, financially sacrificial then they may be kept at ground level.

It is proposed to mitigate the residual risk of flooding by running a 150mm wide drainage channel in front of the building. The channel will divert any flood water away from the building entrances. Although surface water is not an issue to the development the risk of such will be effectively mitigated.

The site should be signed up to receive flood warnings from the EA. If a flood warning is received then the site should be evacuated during an extreme weather event. As an ancillary building to a larger operation in the event of a flood warning being issued operations should cease and the entrances to the proposal building should be shut. In this instance the wider operation should have an evacuation plan in place. For completeness an evacuation route has been given in section 9.2.

The water level in the River Trent will increase due to climate change. The SFRA model considers flooding based on the increase due to climate change and no flooding is predicted to affect the site (see Appendix D). There is a residual risk that culverted sections or trash screens may become blocked but flooding should be localised.

The site is not considered to be at significant risk of flooding from local watercourses or from local drains and sewers.

5.2 Surface and Foul Water Discharge

There is no foul waste being produced. The site is wholly impermeable and as such there is no increase in the surface water run-off and no increased risk of flooding elsewhere. The location of the sewers can be seen in Severn Trent sewer map (Appendix E).

6 Climate Change Effect

National Planning Policy Framework (Technical Guidance) (NPPF-TG) Table 5 suggests that a 20% increase in peak river flows will result from climate change in the period to 2115. The design model data provided is beyond the 1 in 200-year event which estimates flooding to 2190, thus takes into account climate change beyond the required 2115 period. The rise in water levels represents a marginally increased risk of the occurrence of a breach or overtopping but the risk to the site is considered low.

The water level in the River Trent will increase due to climate change. The SFRA models flooding based on the increase due to climate change (based on EA data according to the SFRA). It should be noted there is no flooding predicted to occur (Appendix D). There is a residual risk that the Ouse Dyke or local drains may become blocked but flooding will be localised and unlikely to affect the site. The risk of blockage does increase with the effects of climate change.

NPPF-TG suggests that a 20% increase in rainfall intensity will result from climate change in the period to 2115. Levels should be fixed so surfaces fall away from buildings or dwellings and any temporary surface water ponding does not pose a risk of flooding adjacent to the other nearby buildings. It is likely the Lead Local Flood Team, Environment Agency, Local IDB and the Water Authority will continue to monitor the Surface Water drainage networks and Rivers to mitigate any surface water flooding that may occur as a result.

In conjunction with flood resilient construction the development should be safe for its intended design life.

7 Flood Risk Measures

The proposed development is deemed to be in the 'Less Vulnerable' category of NPPF Table 2. Therefore, flood resilient construction in the lower parts of any permanent buildings should be considered where appropriate, in accordance with the document "Improving the Flood Performance of New Buildings – Flood Resilient Construction" (ISBN 9781 85946 2874).

Such measures may include: -

- a) All services to be routed in the ceiling (or higher up) and brought down walls to terminate at least 0.6m above floor level.
- b) Water sensitive apparatus such as boilers, water heaters and their controllers to be mounted at least 1.2m above ground floor level if possible.
- c) Ground floor construction to be solid concrete slab with any floor insulation to be water resistant.
- d) IF used, wall insulation to be of a closed cell water resistant material up to at least 900mm above ground floor level.
- e) Where possible chipboard and Medium Density Fibreboard should be avoided within 900mm of ground floor level.
- f) Openings in walls are to be minimised below 900mm above floor level.
- g) The building should be registered on the Environment Agency's Flood Warning scheme.
- h) The minimum finished floor level (FFL) of the proposed dwellings is to be 20.71mAOD. A 150mm wide drainage channel is proposed across the front of the building to mitigate the residual risk of flooding and stop water entering the building via the entrances.
- i) More valuable materials and products to be raised by a minimum of 900mm from the floor when stored. SARIA may keep materials at ground floor level if they deem the potential loss acceptable should a flood occur.
- j) Use of vent covers.
- k) Meter boxes can be mounted higher on walls but must remain accessible. Waterproof flood cabinets can be used to cover meter boxes.

The above minimum floor level will ensure that flood risk at the site arising from the identified sources of flooding is minimized during the lifetime of the building.

8 Off Site Impacts

8.1 Increase of Flood Risk Elsewhere

The development proposal will not increase the impermeable area of the site as it is all hard standing. Designed correctly, any increase in surface water run-off will have negligible impact off-site.

8.2 Management of Remaining Risks Over Lifetime of Development

The proposal building does not increase surface water run-off, hence there is no increased risk of flooding occurring elsewhere.

9 Residual Risks

9.1 Remaining Flood Risks After Implementation of Protection measures

It is possible that rare and extreme rainfall events will involve volumes of water that exceed the design standard of the surface water drainage which will lead to temporary surface ponding around the site. The final site levels of the proposed dwelling will be fixed so that in extreme conditions surface water flows away from them towards low lying landscaping. This will ensure to reduce the flood risk to the development during extreme rainfall events.

In an extreme event it is possible that the River Trent. The River Trent does not have raised embankments along the section of river relevant to the site which means a breach is not possible. Should a breach occur upstream the effects of such are modelled as not affecting the site, according to the SFRA. Should the River Trent overtop or breach its banks then floodwater is unlikely to affect the site. Any flood water will both spread and rise slowly, thus allowing for warnings to be received and necessary action taken. It is proposed that the minimum FFL is 20.71mAOD. A 150mm wide drainage channel will be installed across the entrance to mitigate the residual risk of flooding. Combined with flood resilient construction the residual risk will be managed for the lifetime of the development.

The development should be registered for automated flood warnings from the Environment Agency as soon as the development is in use. See section 9.2 for an evacuation route.

9.2 Management of Remaining Risks Over the Lifetime of Development

The residual risk should be managed by the designers and the construction team for the development, who should ensure that its design and construction incorporate the points and recommendations contained within this assessment.

The development should be registered for automated flood warnings from the Environment Agency.

Access and egress to higher ground for the proposed development will be northwest along Stoke Lane. At the intersection with Colwick Loop Road.

Continuing along Stoke Lane and then turning right onto Burton Road will allow complete escape from flood zone areas. Evacuees can then head northwest along Burton Road and then northwest along Colliery Way (A6211).

See Figure 7 for evacuation route. Also refer to Appendix F for the Evacuation Plan

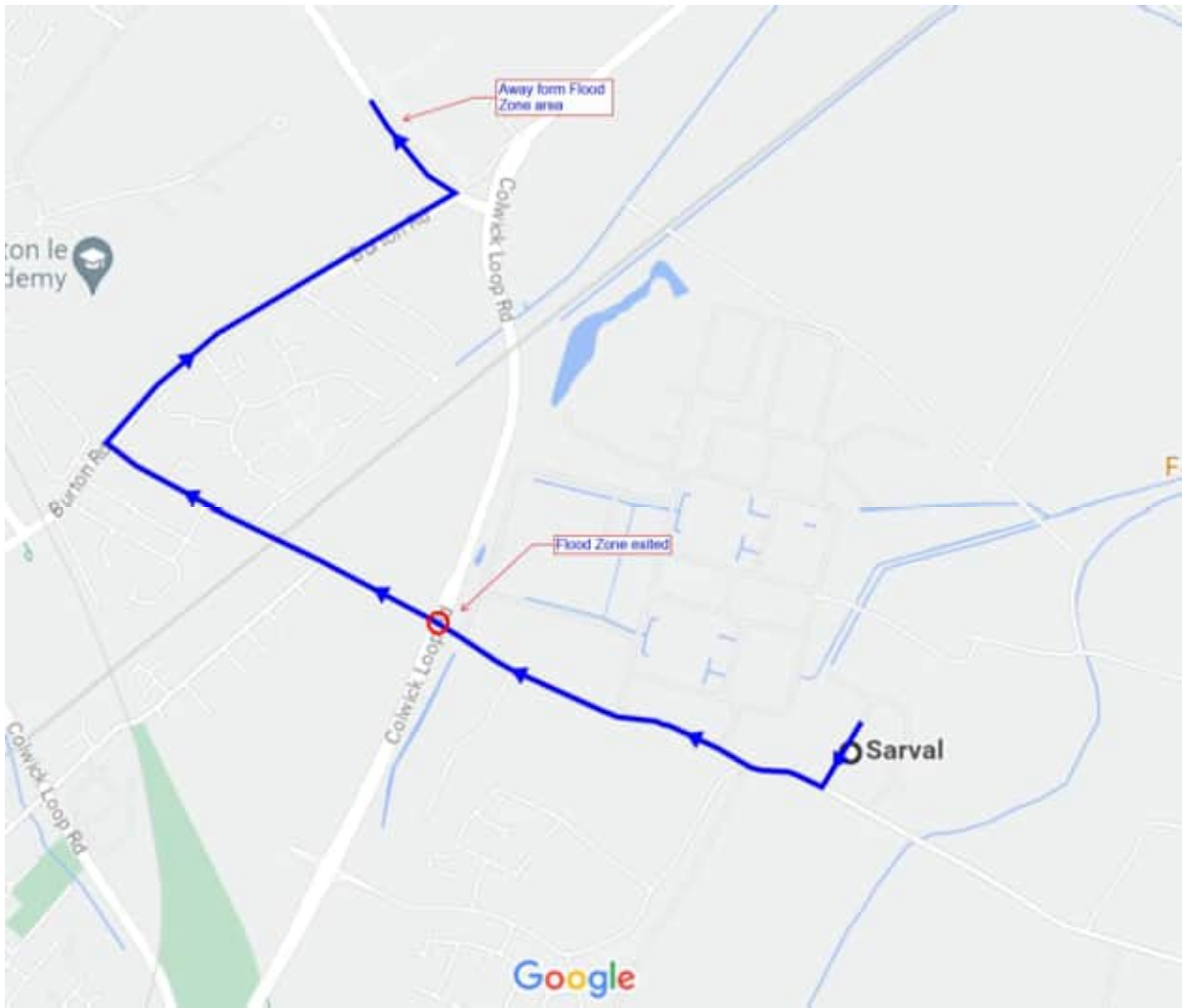


Figure 7 - Evacuation Route

APPENDIX A – Site Location

Severn Trent Green Power Stoke Bardolph

Site Location



Sarval

Stoke Ln

Stoke Ln

Image IBCAO

Google Earth

APPENDIX B – Site Plan & Levels



- Notes:
- DENOTES BOUNDARY LINE
 - CLIENT OWNED SITE

A	22.12.21	Location Amendment.	EB
Ref	Date	Revision	Initial

Project / Client:
**NEW BAGGING STORE
 FOR
 SARIA GROUP, NOTTINGHAM.**

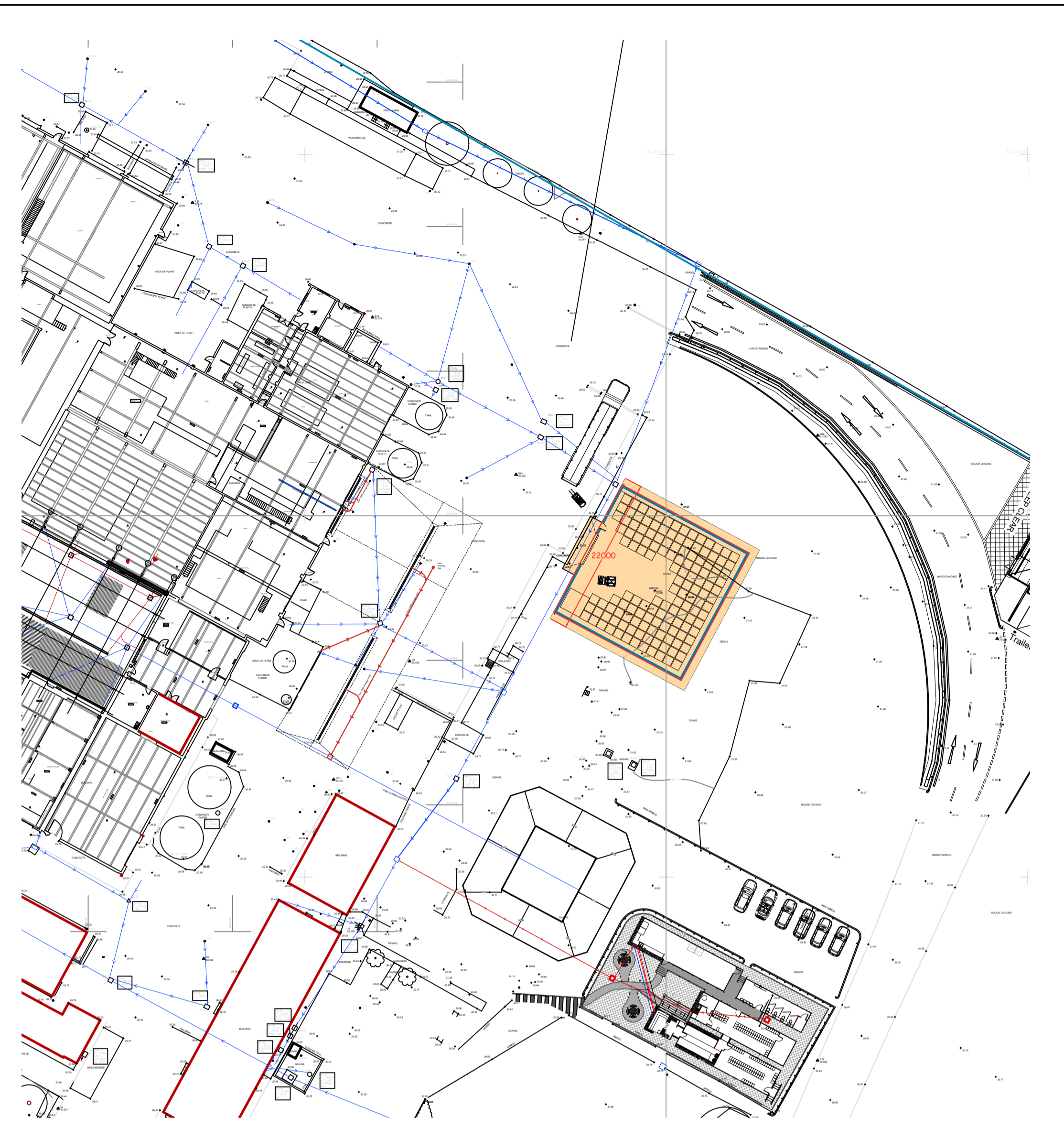
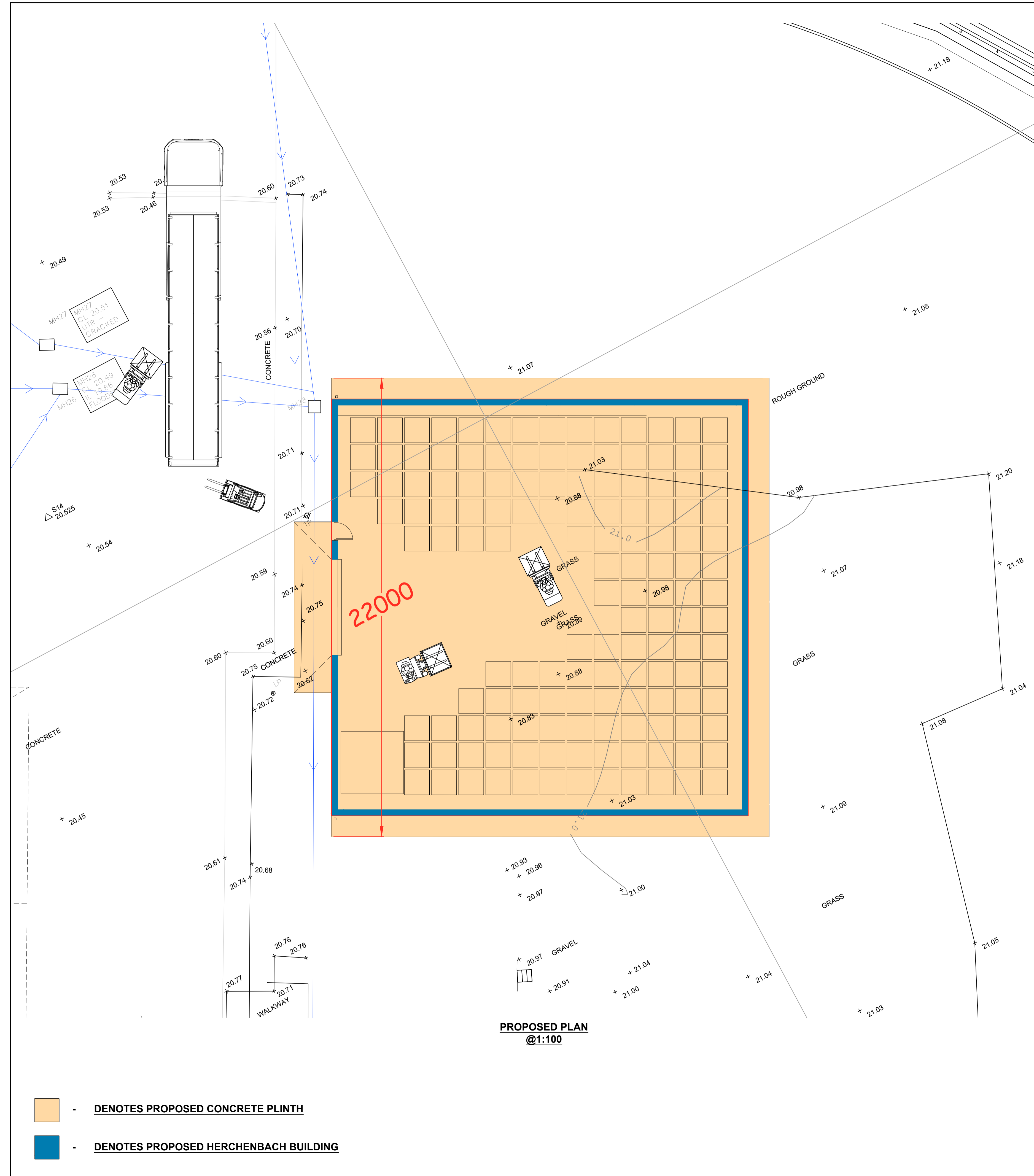
Drawing Title:
PROPOSED OS LOCATION PLAN

	John Hill Associates Ltd, 6 Shaw Wood Way, Shaw Wood Business Park, Doncaster, DN2 5TB
	01302 364565 enquiries@j-h-a.co.uk www.j-h-a.co.uk

Scale:	1:1250	Date:	December 2021
Drawn By:	EB	Checked By:	

Drawing No:	2020/025/01A	Sheet Size:	A3
-------------	--------------	-------------	----

© This drawing is the copyright of John Hill Associates Ltd and shall not be reproduced without permission



Ref	Date	Revision	Initial
G	12.01.22	Telephone Pole Location Amendment	JOH
F	21.12.21	Amended building location.	EB
E	19.04.21	Amended building size.	BF
D	10.02.21	Amended as per structural engineers comments.	BF
C	10.02.21	Site Moved	JOH
B	29.01.21	Herchenbach Building	JOH
A	18.01.21	Revised location.	BF

Project / Client:
NEW BAGGING STORE FOR SARIA GROUP, NOTTINGHAM.

Drawing Title:
PROPOSED PLAN

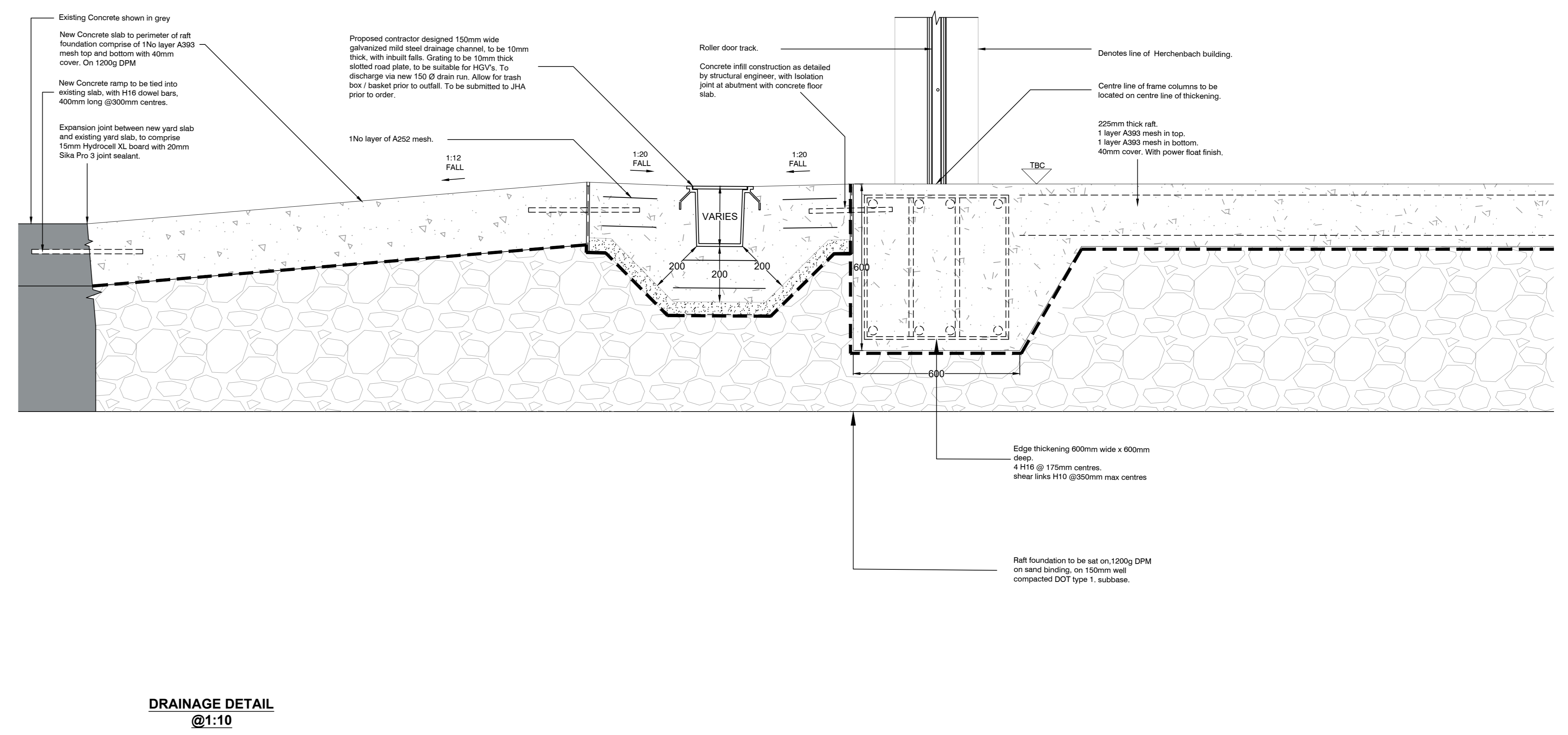
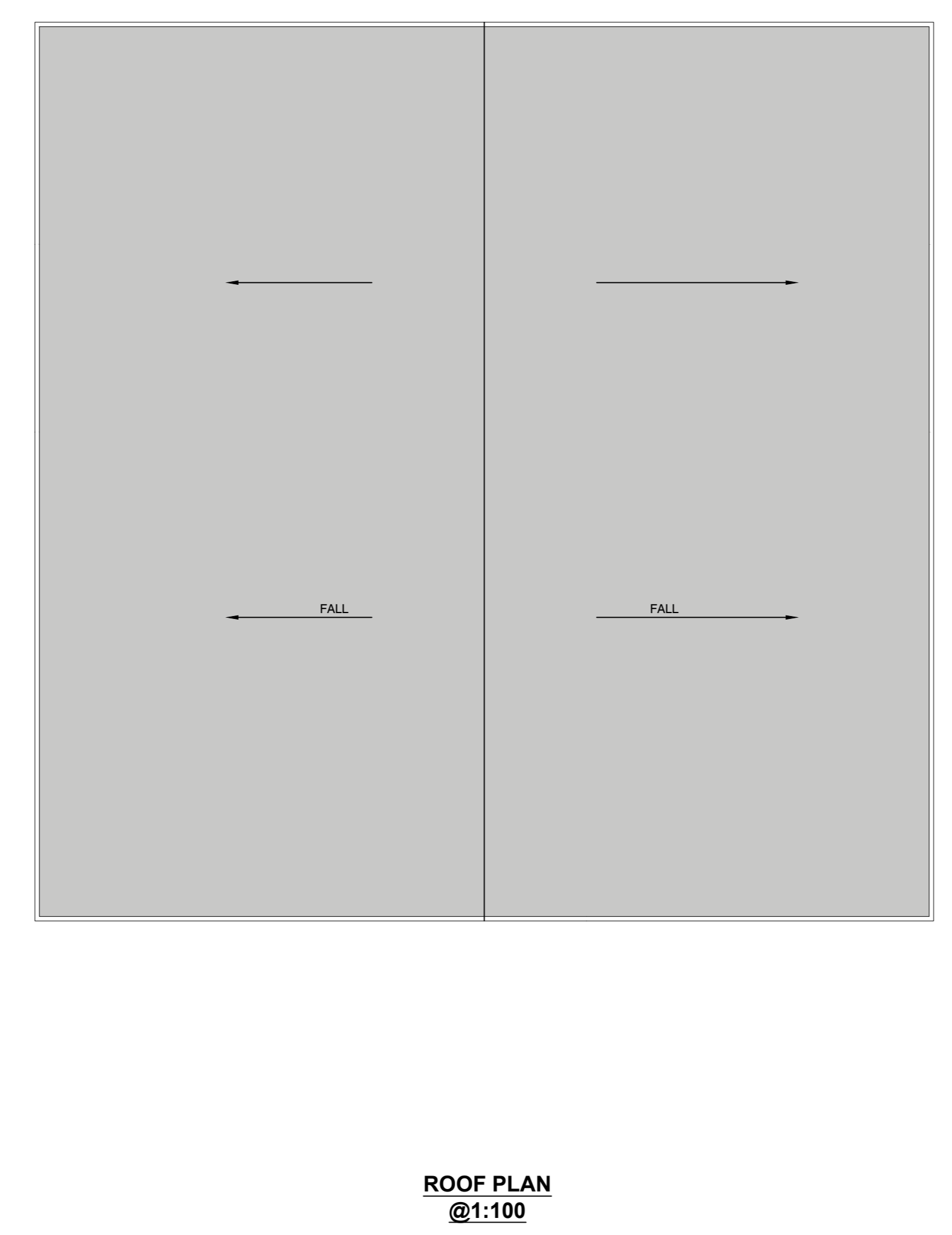
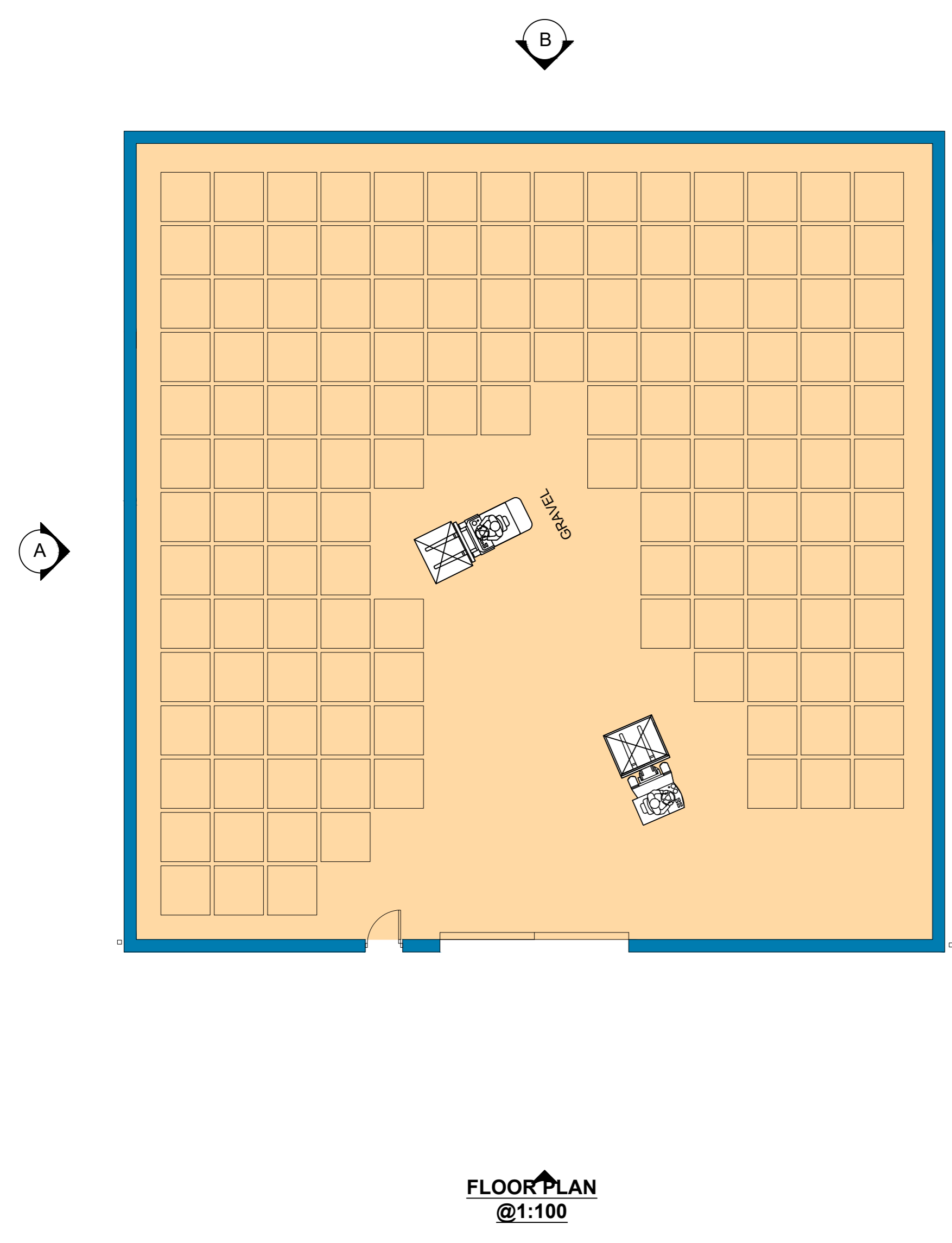
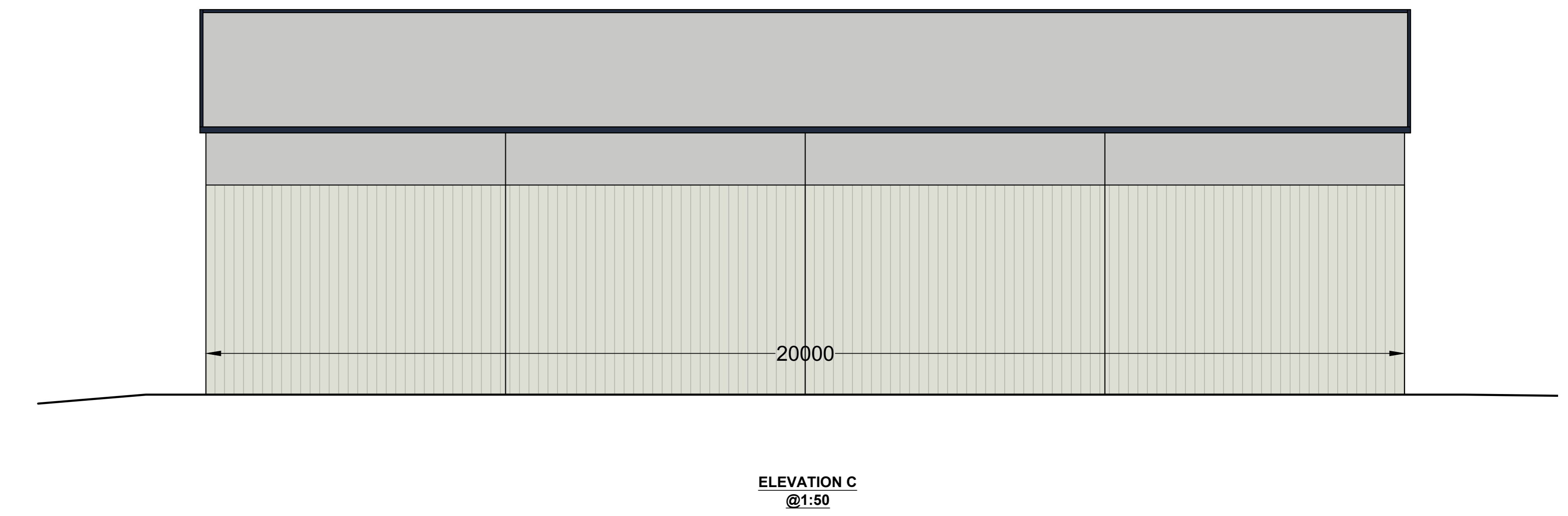
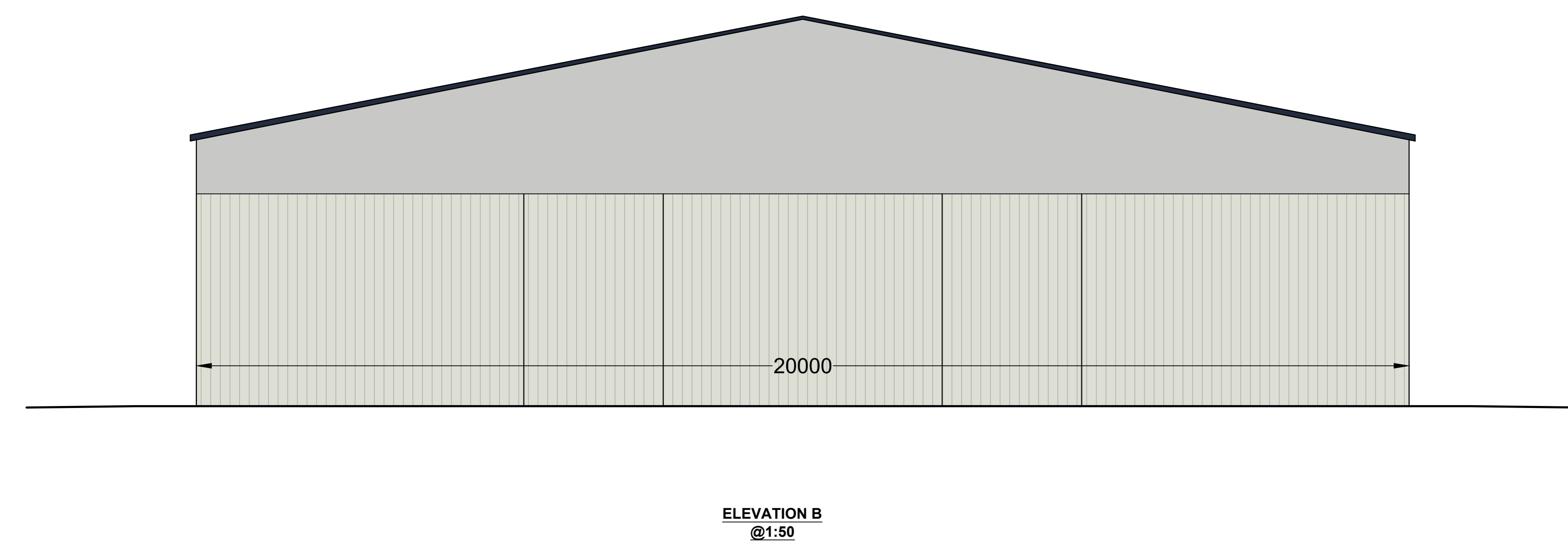
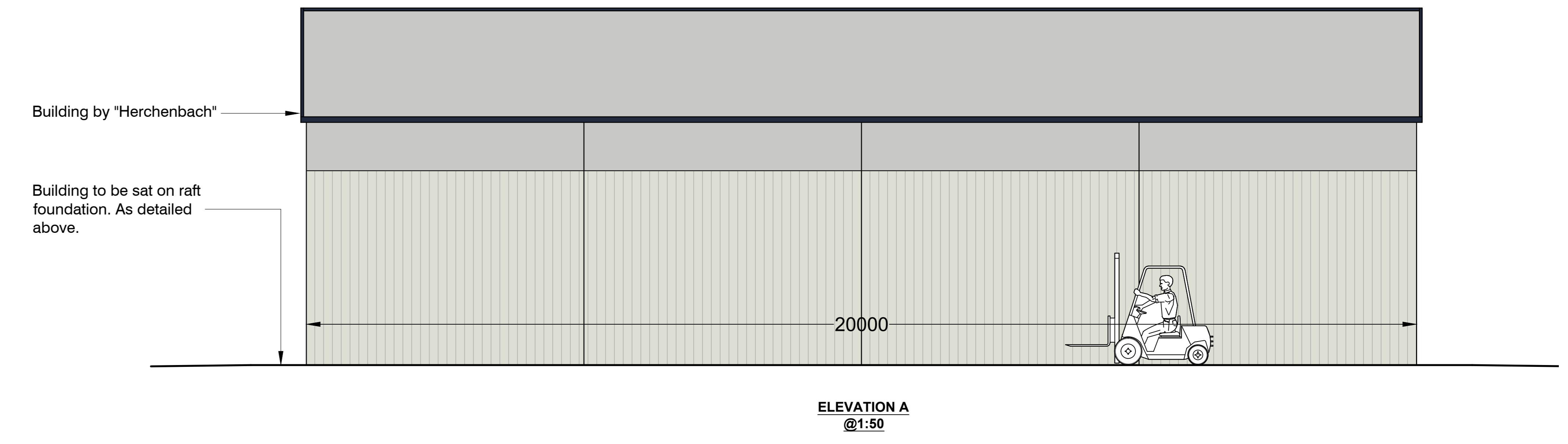
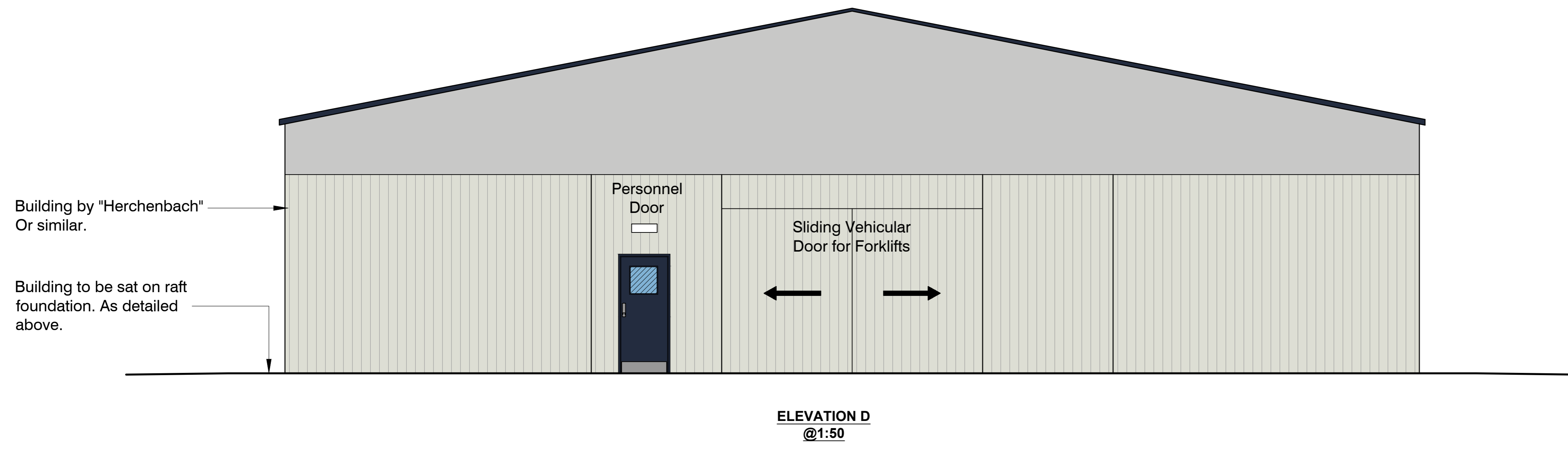
jha LIMITED

John Hill Associates Ltd,
6 Shaw Wood Way,
Shaw Wood Business Park,
Doncaster, DN2 5TB

T 01302 364565
E enquiries@j-h-a.co.uk
W www.j-h-a.co.uk

Scale: As Shown Date: December 2021
Drawn By: EB Checked By:

Drawing No: **2020/025/02G** Sheet Size: **A1**



APPENDIX C – EA Data + Maps

Main River Map



A512

Site Location

River Trent

Stoke Ferry

Stoke La

Top Row Cottages

Stoke Bardolph

Magenta Way

Branbling Rd

Ouse Dyke

Top Close

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
463918/341685

Created
12 May 2023 16:36

Your selected location is in flood zone 2, an area with a medium 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.

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

Use of the address and mapping data is subject to Ordnance Survey public viewing terms under Crown copyright and database rights 2022 OS 100024198. <https://flood-map-for-planning.service.gov.uk/os-terms>

Flood map for planning

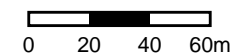
Your reference
<Unspecified>

Location (easting/northing)
463918/341685

Scale
1:2500

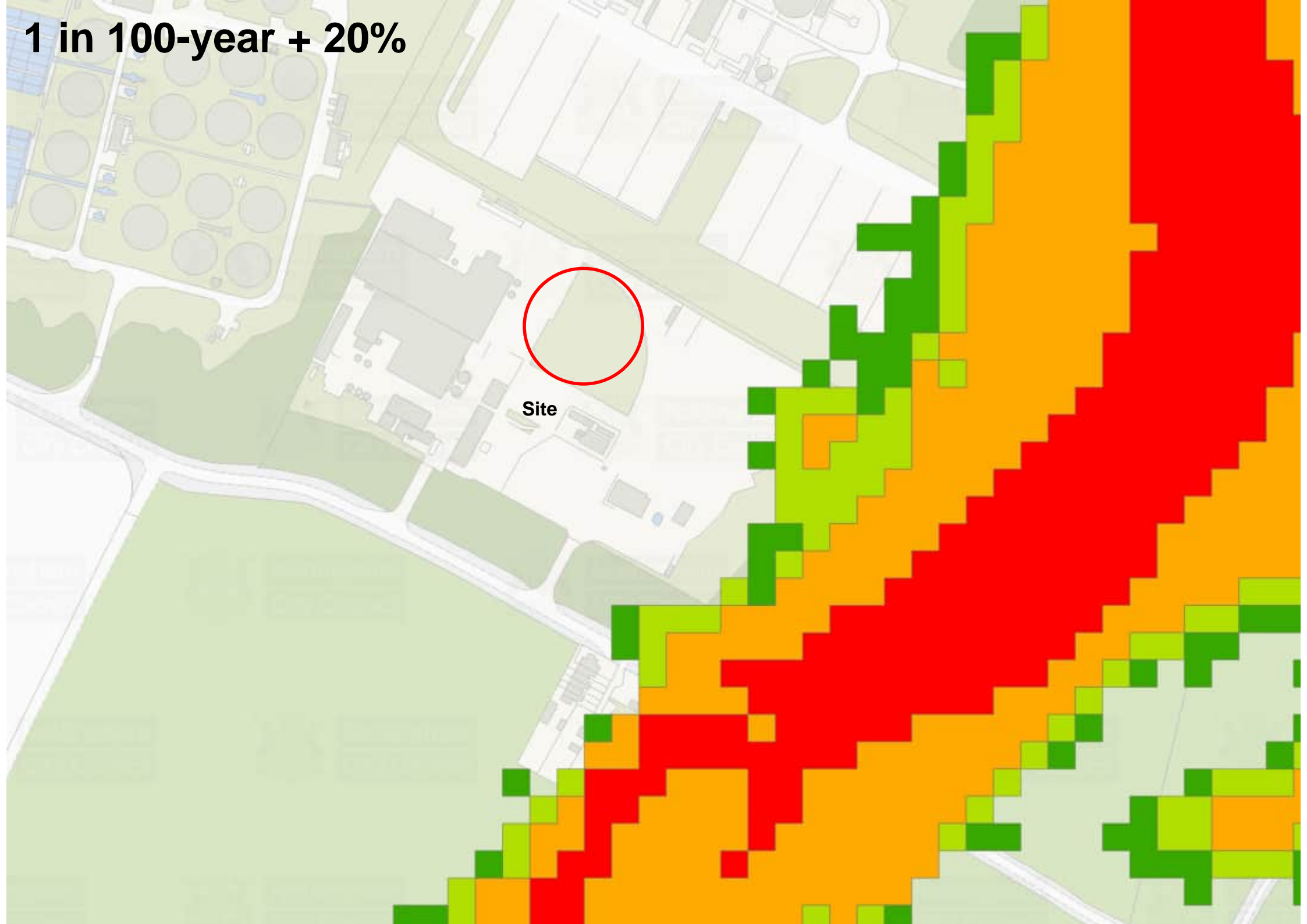
Created
12 May 2023 16:36

-  Selected area
-  Flood zone 3
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Water storage area



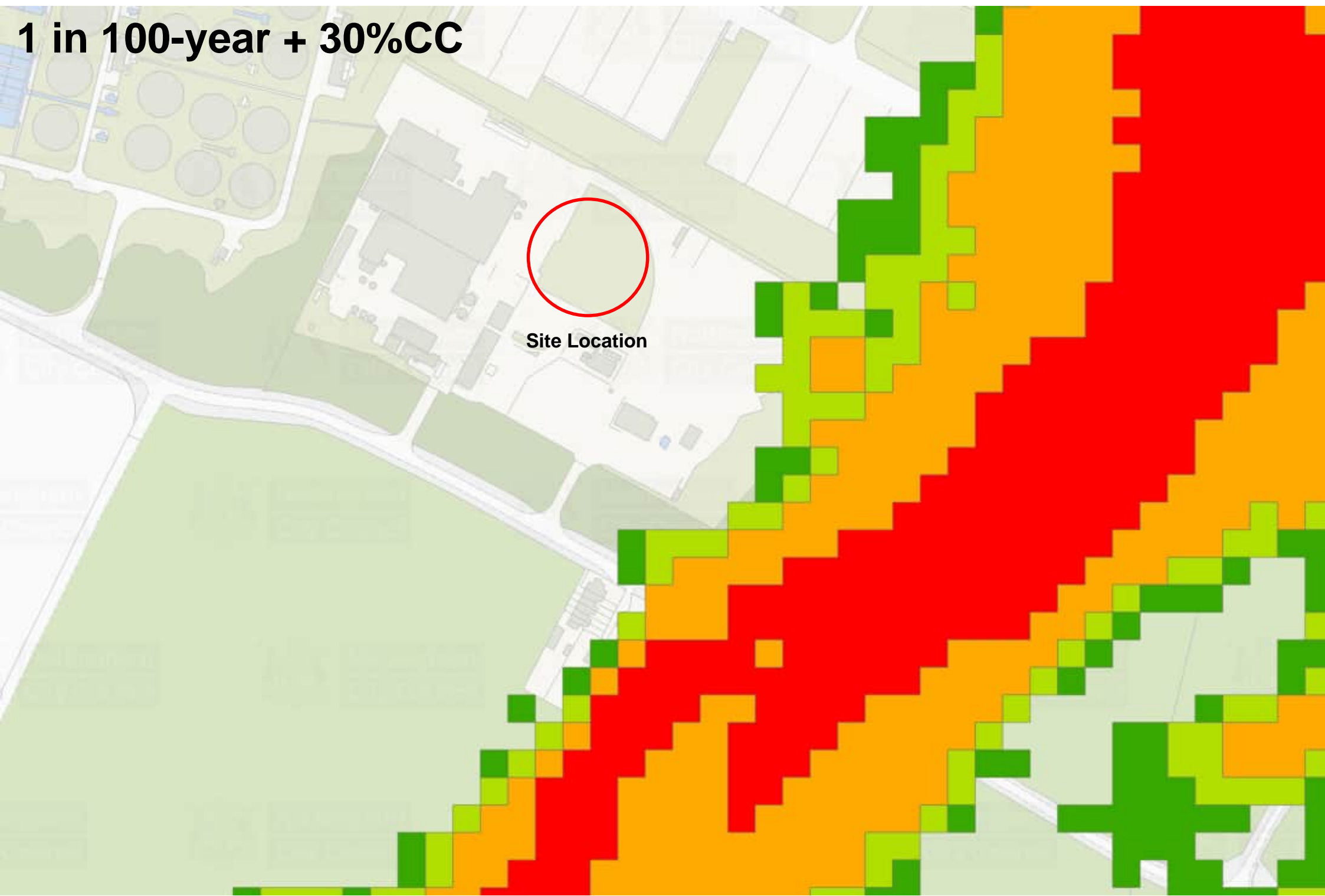
APPENDIX D – DMBC SFRA Data + Maps

1 in 100-year + 20%



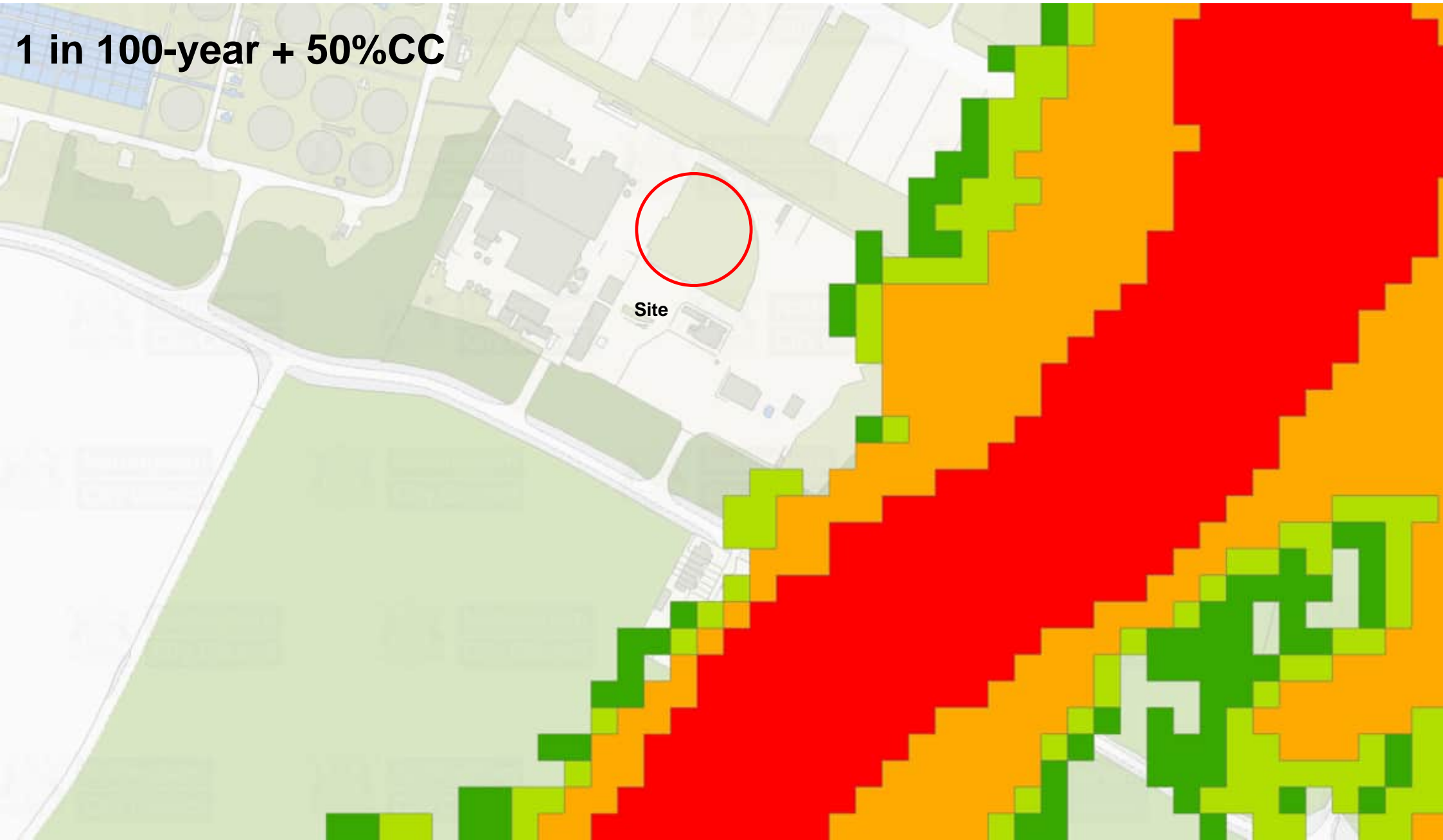
Site

1 in 100-year + 30%CC

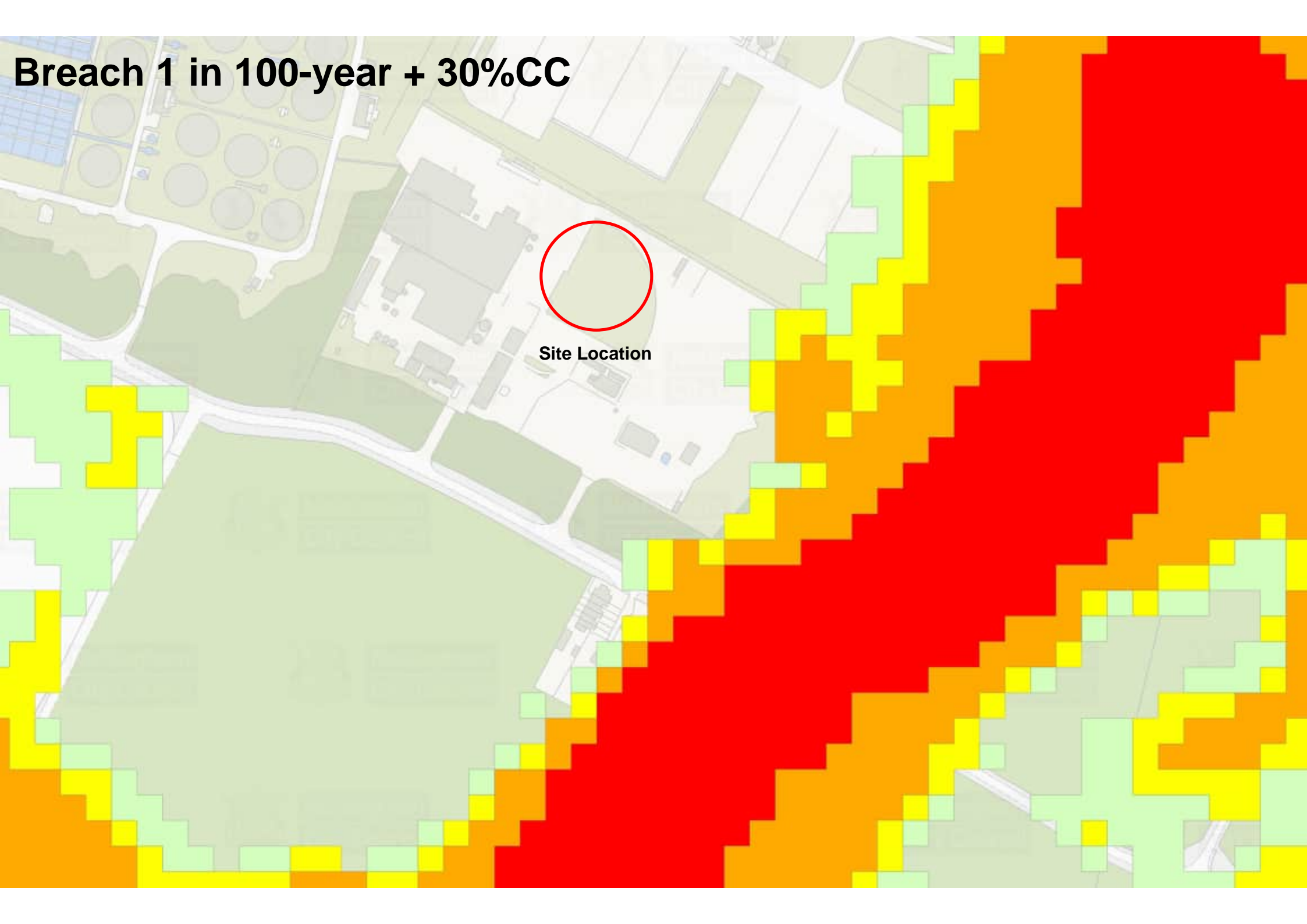


Site Location

1 in 100-year + 50%CC



Breach 1 in 100-year + 30%CC



Site Location

EA Flood Warning Area



Stokell Lane

Stokell Lane

Stokell Lane

Nottinghamshire SFRA - Flood Zone Map



Nottinghamshire SFRA - Groundwater



APPENDIX E – Services



(c) Crown copyright and database rights 2023 Ordnance Survey 100031673 Date: 16/05/23 Scale: 1:1250 Map Centre: 463797,341652 Data updated: 14/05/23 Our Ref: 1178302 - 1 Wastewater Plan A1

Do not scale off this map. The plan and any information supplied with it is furnished as a general guide, is only valid at the date of issue and no warranty as to its correctness is given or implied. In particular this plan and any information shown on it must not be relied upon in the event of any development or works (including but not limited to excavations) in the vicinity of SEVERN TRENT WATER assets or for the purposes of determining the suitability of a point of connection to the sewerage or distribution systems. Reproduction by permission of Ordnance Survey on behalf of HMSO. © Crown Copyright and database rights 2023. All rights reserved. Ordnance Survey licence number 100031673. Document users other than SEVERN TRENT WATER business users are advised that this document is provided for reference purpose only and is subject to copyright, therefore, no further copies should be made from it.

Public Foot Gully/Lateral Drain	Highway Drain	Manhole Full	Manhole Surface
Public Combined Gully/Lateral Drain	Overflow Pipe	Manhole Surface	Abandoned Pipe
Public Surface Water Gully/Lateral Drain	Disposal Pipe	Manhole Surface	Chamber
Pressure Full	Covered Water Course	Manhole Surface	Chamber
Pressure Combined	Pumping Station	Manhole Surface	Chamber
Pressure Surface Water	Filling	Manhole Surface	Chamber

lewism@robtsdesignltd.com

3925 - SARIA

SEVERN TRENT

SEVERN TRENT

GENERAL CONDITIONS AND PRECAUTIONS TO BE TAKEN WHEN CARRYING OUT WORK ADJACENT TO SEVERN TRENT WATER'S APPARATUS

Please ensure that a copy of these conditions is passed to your representative and/or your contractor on site. If any damage is caused to Severn Trent Water Limited (STW) apparatus (defined below), the person, contractor or subcontractor responsible must inform STW immediately on: **0800 783 4444 (24 hours)**

- a) These general conditions and precautions apply to the public sewerage, water distribution and cables in ducts including (but not limited to) sewers which are the subject of an Agreement under Section 104 of the Water Industry Act 1991 (a legal agreement between a developer and STW, where a developer agrees to build sewers to an agreed standard, which STW will then adopt); mains installed in accordance with an agreement for the self-construction of water mains entered into with STW and the assets described at condition b) of these general conditions and precautions. Such apparatus is referred to as "STW Apparatus" in these general conditions and precautions.
- b) Please be aware that due to The Private Sewers Transfer Regulations June 2011, the number of public sewers has increased, but many of these are not shown on the public sewer record. However, some idea of their positions may be obtained from the position of inspection covers and their existence must be anticipated.
- c) On request, STW will issue a copy of the plan showing the approximate locations of STW Apparatus although in certain instances a charge will be made. The position of private drains, private sewers and water service pipes to properties are not normally shown but their presence must be anticipated. This plan and the information supplied with it is furnished as a general guide only and STW does not guarantee its accuracy.
- d) STW does not update these plans on a regular basis. Therefore the position and depth of STW Apparatus may change and this plan is issued subject to any such change. Before any works are carried out, you should confirm whether any changes to the plan have been made since it was issued.
- e) The plan must not be relied upon in the event of excavations or other works in the vicinity of STW Apparatus. It is your responsibility to ascertain the precise location of any STW Apparatus prior to undertaking any development or other works (including but not limited to excavations).
- f) No person or company shall be relieved from liability for loss and/or damage caused to STW Apparatus by reason of the actual position and/or depths of STW Apparatus being different from those shown on the plan.

In order to achieve safe working conditions adjacent to any STW Apparatus the following should be observed:

1. All STW Apparatus should be located by hand digging prior to the use of mechanical excavators.
2. All information set out in any plans received from us, or given by our staff at the site of the works, about the position and depth of the mains, is approximate. Every possible precaution should be taken to avoid damage to STW Apparatus. You or your contractor must ensure the safety of STW Apparatus and will be responsible for the cost of repairing any loss and/or damage caused (including without limitation replacement parts).
3. Water mains are normally laid at a depth of 900mm. No records are kept of customer service pipes which are normally laid at a depth of 750mm; but some idea of their positions may be obtained from the position of stop tap covers and their existence must be anticipated.
4. During construction work, where heavy plant will cross the line of STW Apparatus, specific crossing points must be agreed with STW and suitably reinforced where required. These crossing points should be clearly marked and crossing of the line of STW Apparatus at other locations must be prevented.
5. Where it is proposed to carry out piling or boring within 20 metres of any STW Apparatus, STW should be consulted to enable any affected STW Apparatus to be surveyed prior to the works commencing.
6. Where excavation of trenches adjacent to any STW Apparatus affects its support, the STW Apparatus must be supported to the satisfaction of STW. Water mains and some sewers are pressurised and can fail if excavation removes support to thrust blocks to bends and other fittings.
7. Where a trench is excavated crossing or parallel to the line of any STW Apparatus, the backfill should be adequately compacted to prevent any settlement which could subsequently cause damage to the STW Apparatus. In special cases, it may be necessary to provide permanent support to STW Apparatus which has been exposed over a length of the excavation before backfilling and reinstatement is carried out. There should be no concrete backfill in contact with the STW Apparatus.
8. No other apparatus should be laid along the line of STW Apparatus irrespective of clearance. Above ground apparatus must not be located within a minimum of 3 metres either side of the centre line of STW Apparatus for smaller sized pipes and 6 metres either side for larger sized pipes without prior approval. No manhole or chamber shall be built over or around any STW Apparatus.
9. A minimum radial clearance of 300 millimetres should be allowed between any plant or equipment being installed and existing STW Apparatus. We reserve the right to increase this distance where strategic assets are affected.
10. Where any STW Apparatus coated with a special wrapping is damaged, even to a minor extent, STW must be notified and the trench left open until the damage has been inspected and the necessary repairs have been carried out. In the case of any material damage to any STW Apparatus causing leakage, weakening of the mechanical strength of the pipe or corrosion-protection damage, the necessary remedial work will be recharged to you.
11. It may be necessary to adjust the finished level of any surface boxes which may fall within your proposed construction. Please ensure that these are not damaged, buried or otherwise rendered inaccessible as a result of the works and that all stop taps, valves, hydrants, etc. remain accessible and operable. Minor reduction in existing levels may result in conflict with STW Apparatus such as valve spindles or tops of hydrants housed under the surface boxes. Checks should be made during site investigations to ascertain the level of such STW Apparatus in order to determine any necessary alterations in advance of the works.
12. With regard to any proposed resurfacing works, you are required to contact STW on the number given above to arrange a site inspection to establish the condition of any STW Apparatus in the nature of surface boxes or manhole covers and frames affected by the works. STW will then advise on any measures to be taken, in the event of this a proportionate charge will be made.
13. You are advised that STW will not agree to either the erection of posts, directly over or within 1.0 metre of valves and hydrants,
14. No explosives are to be used in the vicinity of any STW Apparatus without prior consultation with STW.

TREE PLANTING RESTRICTIONS

There are many problems with the location of trees adjacent to sewers, water mains and other STW Apparatus and these can lead to the loss of trees and hence amenity to the area which many people may have become used to. It is best if the problem is not created in the first place. Set out below are the recommendations for tree planting in close proximity to public sewers, water mains and other STW Apparatus.

15. Please ensure that, in relation to STW Apparatus, the mature root systems and canopies of any tree planted do not and will not encroach within the recommended distances specified in the notes below.
16. Both Poplar and Willow trees have extensive root systems and should not be planted within 12 metres of a sewer, water main or other STW Apparatus.
17. The following trees and those of similar size, be they deciduous or evergreen, should not be planted within 6 metres of a sewer, water main or other STW Apparatus. E.g. Ash, Beech, Birch, most Conifers, Elm, Horse Chestnut, Lime, Oak, Sycamore, Apple and Pear. Asset Protection Statements Updated May 2014
18. STW personnel require a clear path to conduct surveys etc. No shrubs or bushes should be planted within 2 metre of the centre line of a sewer, water main or other STW Apparatus.
19. In certain circumstances, both STW and landowners may wish to plant shrubs/bushes in close proximity to a sewer, water main of other STW Apparatus for screening purposes. The following are shallow rooting and are suitable for this purpose: Blackthorn, Broom, Cotoneaster, Elder, Hazel, Laurel, Privet, Quickthorn, Snowberry, and most ornamental flowering shrubs.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
7600	C	20.31	18.83	1.48
7601	C	20.74	18.67	2.07
9400	C	19.29	18.32	0.96
	F	0	0	
	F	0	0	
	F	0	0	
	F	0	0	
3401	F	0	0	
4312	F	0	0	
4313	F	0	0	
4314	F	0	0	
4413	F	0	0	
4414	F	0	0	
4415	F	0	0	
4416	F	0	0	
4417	F	0	0	
4505	F	0	0	
5511	F	0	0	
6701	F	0	0	
7602	F	0	0	
3306	S	0	0	
4308	S	0	0	
4309	S	0	0	
4310	S	0	0	
4409	S	0	0	
4410	S	0	0	
4411	S	0	0	
4412	S	0	0	
4503	S	0	0	
4504	S	0	0	
5302	S	0	0	
5403	S	0	0	
5404	S	0	0	
5506	S	0	0	
5507	S	0	0	
5508	S	0	0	
5509	S	0	0	
5510	S	0	0	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
-------------------	-------------	-------------	--------------	-----------------

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
-------------------	-------------	-------------	--------------	-----------------

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
-------------------	-------------	-------------	--------------	-----------------

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
-------------------	-------------	-------------	--------------	-----------------

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
-------------------	-------------	-------------	--------------	-----------------

--	--	--	--	--

--	--	--	--	--

--	--	--	--	--

--	--	--	--	--

--	--	--	--	--

--	--	--	--	--

APPENDIX F – Flood Evacuation Plan

1. Objectives

This Flood Evacuation Plan details the measures and procedures that are considered necessary to ensure the safety of the users. The following are the main objectives of the plan:

- To safely evacuate users from the site when a flood warning has been indicated by the Environment Agency.
- To implement a flood risk induction for all new users to the site. A copy of this evacuation plan is to be handed to each new user.
- To establish responsibility for procedures and implementation of the evacuation plan.




2. Flood Risk

As indicated in the main body of the report the site lies within Flood Zone 2.

3. Registration of the Site for Flood Warnings

The site will be registered to receive the Environment Agency's flood warning service. Should flooding be forecast for the area, the EA will issue a flood warning.

4. Environment Agency Flood Warning Codes:

Flood Warning Code	What it Means	What To Do
	<p>Flooding is possible.</p> <p>Be prepared.</p> <p>When it's used</p> <p>Two hours to two days in advance of flooding.</p>	<ul style="list-style-type: none"> • Be prepared to act on your flood plan. • Prepare a flood kit of essential items. • Monitor local water levels and the flood forecast on our website.
	<p>Flooding is expected. Immediate action required.</p> <p>When it's used</p> <p>Half an hour to one day in advance of flooding.</p>	<ul style="list-style-type: none"> • Move family, pets and valuables to a safe place. • Turn off gas, electricity and water supplies if safe to do so. • Put flood protection equipment in place if applicable.
	<p>Severe flooding. Danger to life.</p> <p>When it's used</p> <p>When flooding poses a significant threat to life.</p>	<ul style="list-style-type: none"> • Stay in a safe place with a means of escape. • Be ready should you need to evacuate from your home. • Co-operate with the emergency services.

		<ul style="list-style-type: none"> • Call 999 if you are in immediate danger.
Warnings no longer in force	<p>No further flooding is currently expected in your area.</p> <p>When it's used</p> <p>When river or sea conditions begin to return to normal.</p>	<ul style="list-style-type: none"> • Be careful. Flood water may still be around for several days. • If you've been flooded, ring your insurance company as soon as possible.

5. Floodline Warning Direct

5.1 Site Owner must sign up to register for this service to receive Flood Alerts/Warnings via telephone, fax, SMS & email. Registration is essential to ensure the success of this evacuation plan.

5.2 The site owner is responsible for updating the flood evacuation plan annually and issuing to the building occupants.

5.2 Registration for Flood Warnings:

5.2.1 Via the internet (Gov.uk Website):
<https://www.gov.uk/sign-up-for-flood-warnings>

5.2.2 Telephone:
EA Floodline Number 0345 988 1188

5.3 Emergency Contacts

- | | | |
|-------|------------------------------------|---------------|
| 5.3.1 | Emergency Services | 999 |
| 5.3.2 | Trentcaster Council – Flood Advice | 01302 735688 |
| 5.3.3 | EA Floodline Number | 0345 988 1188 |
| 5.3.3 | Insurance Company | |

6. Flood Evacuation Procedure

Flood Warning Received	Monitor Weather
	Monitor flood warning status
	Inform all users of the site

Severe Flood Warning Received	Access and egress to higher ground for the proposed development will be northwest along Stoke Lane. At the intersection with Colwick Loop Road.
-------------------------------	---

Continuing along Stoke Lane and then turning right onto Burton Road will allow complete escape from flood zone areas. Evacuees can then head northwest along Burton Road and then northwest along Colliery Way (A6211).

Secure Site

Inform emergency services of evacuation and maintain contact.
Monitor situation and update flood status from Floodline.

Warning no Longer in Force

On downgrade instruct users to return to site.

Other sources of information

Local Radio Stations

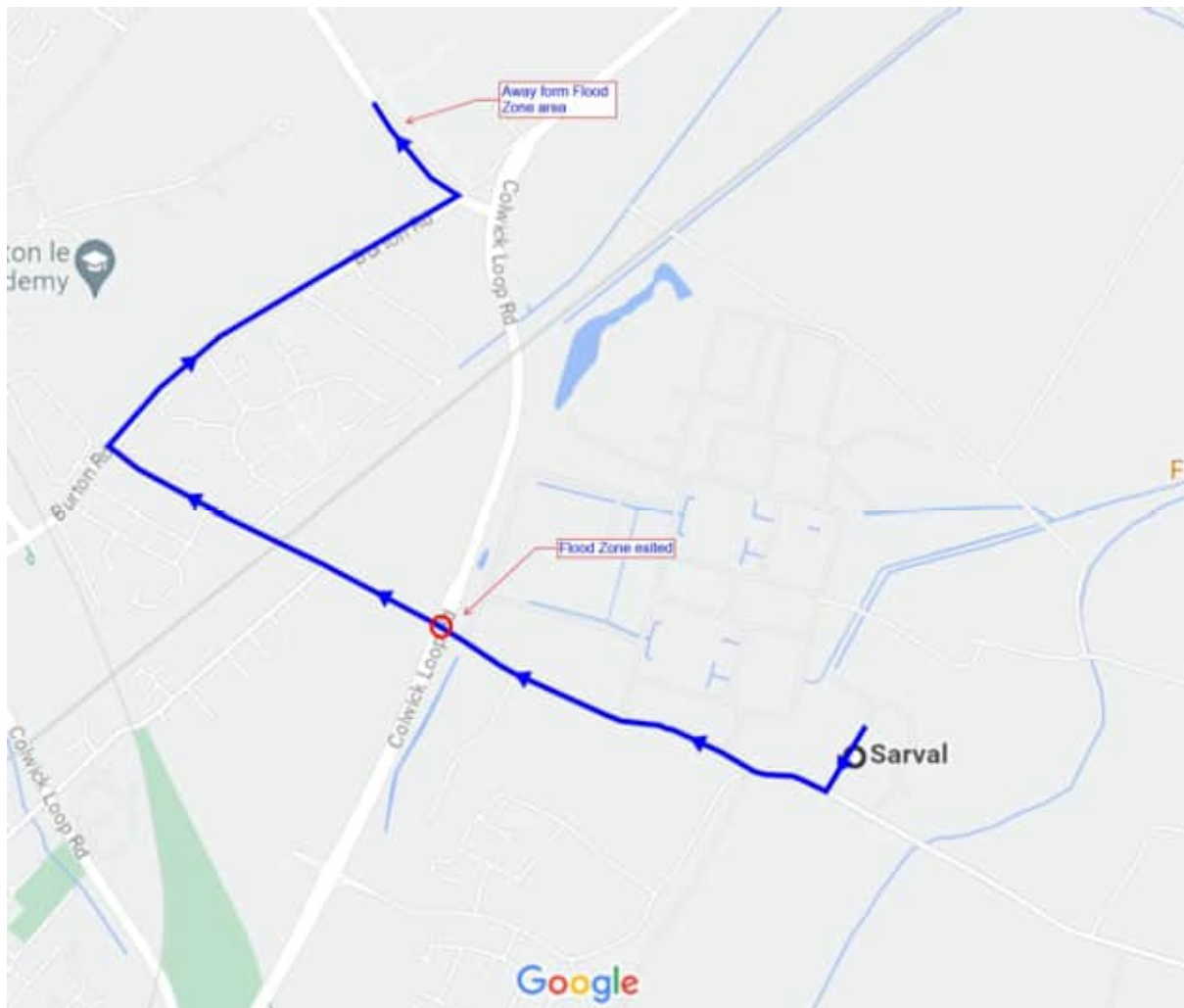
EA Flood Warning

<https://flood-warning-information.service.gov.uk/>

It should be noted the emergency services have the power to overrule the timing of evacuation and routes specified by this Plan.

7. Conclusions

Implementation of this flood evacuation plan will ensure the safe evacuation of the site in a severe flood event.



APPENDIX G – Glossary of Terms

Attenuation	Slowing down the rate of flow to prevent flooding and erosion, with a consequent increase in the duration of flow.
Balancing Pond	A pond designed to attenuate flows by storing runoff during peak periods and releasing the water after the flood peak has passed. The pond always contained water. Storage periods may not be long enough to improve water quality.
Catchment	A river catchment is the whole area which drains either naturally or with artificial assistance to a river. It includes the drainage channels, tributaries, floodplains and washlands associated with a river and an estuary where one is present.
Climate Change	Flood risk may increase due to environmental changes, and one of the key uncertainties in assessing flood risk at present is the extent to which climate is changing and may change in the future. NPPF Table 5 advocates a precautionary approach to deal with uncertainties of how climate change may affect sea levels, river flows and flood risk. Current best practice recommends allowing for a 10% increase in peak rainfall intensity and a 20% increase in peak river flow to 2055. Recommended allowances for net sea level rise in the East of England are 4mm/year to 2025 and then 8.5mm/year onwards to 2055.
Critical Ordinary Watercourse	Ordinary watercourses which the Environment Agency and other operating authorities agree are critical because they have the potential to put large numbers of people and property at risk from flooding.
Design flood level	The flood level to which defences or mitigation measures are designed. This is typically the 1% (1 in 100 year) flood level. More extensive flooding and higher levels due to more extreme conditions than the design event or as a result of obstructions of the watercourse may occur at any time.
Development	In accordance with the definitions given in Section 55 of Town and Country Planning Act 1990, with certain exceptions development means the carrying out of building, engineering, mining or other operations, in on over or under land or the making of any material change in use of any buildings or other land.
Drainage (land drainage)	<p>The Water Resources Act 1991 (as amended by the Environment Act 1995) defines drainage as including:</p> <ul style="list-style-type: none">a) defence against water, including sea water;b) irrigation other than spray irrigation;

- c) warping
- d) the carrying on, for any purpose, of any other practice which involves management of the level of water in a watercourse.

Exception Test	If, following application of the Sequential Test (see below), it is not possible for proposed development to be located in zones of lower probability of flooding, the Exception Test can be applied as detailed in the NPPF. For the Exception Test to be passed the Flood Risk Assessment must demonstrate the proposed development provides wider sustainability benefits to the community that outweigh the estimated flood risk.
Flood Defence	Flood defence means the drainage of land (as defined above), and the provision of flood warning systems.
Flood Estimation Handbook (FEH)	The primary national guide to flood probability estimation in the UK, developed by CEH Wallingford. The use of the FEH ensures national consistency in estimating the probability of flooding, although users must be aware of the need to exercise good judgment and recognise the uncertainty inherent in flood estimation. Prediction of flood flows is not an exact science and therefore the results of estimation cannot be guaranteed, and the users make use of them at their own risk.
Flood return period/risk	The risk of flooding to floodplain areas and property is often described in terms of a return period. Statistical return periods relate to the long-term average time interval between events of a particular magnitude. The 1 in 100year return period flood has a one percent chance of occurring in any one year. i.e. the odds of it happening are one hundred to one. It does <u>not</u> mean that flooding of this magnitude will only occur once every 100 years.
Flood Zone Maps	These were produced by the Environment Agency after the 1998 and 2000 floods to improve public awareness of flood risk and updated in 2004 alongside the release of the new FRA guidance. The floodplain envelopes indicate where flooding from rivers, streams, watercourses or the sea is possible or has occurred, but ignore the presence of all flood defences such as embankments, pumping stations and walls, although the locations of flood defence structures are indicated. The maps therefore only give a general indication of potential areas at risk of flooding, generally based on either 1% probability assessments or historic flood levels. (www.environment-agency.gov.uk/subjects/flood/?lang=e)
Flooding	Inundation by river or sea water whether caused by inadequate or slow drainage, or by breaches or overtopping of banks or defences.

Floodplain	All land adjacent to a watercourse over which water flows in times of flood.
Fluvial Flooding	Is the process of flooding arising from a watercourse
Greenfield	Land which has not been developed.
Greenfield rate of run off	Rate of water flow which would occur over the ground surface of undeveloped land to the drainage system.
Hydrology	The study of water resources.
Main River	Watercourses shown as such on the statutory main river maps held by the Department for Environment, Flood and Rural Affairs. Main rivers are maintained by the Environment Agency and are generally larger arterial watercourses.
NPPF	National Planning Policy Framework and Technical Guidance published by Communities and Local Government in March 2012. Technical Guidance explains how flood risk should be considered at all stages of the planning and development process in order to reduce future damage to property and loss of life.
Ordinary Watercourses	Any watercourse that does not form part of Main River. Internal Drainage Boards maintain certain designated common watercourses within Internal Drainage Districts. Local Authorities maintain certain 'awarded' common watercourses and highway ditches outside Internal Drainage Districts. Generally, other common watercourses are the responsibility of riparian owners.
PAGN/FCDPAG	The DEFRA Flood Coastal Defence Project Appraisal Guidance (FCDPAG) documents provide advice on best practice for the appraisal of flood and coastal defence projects. A brief summary of these documents and the applicable standards (tables 6.1 & 6.2) are appended to this glossary.
Pluvial Flooding	Is the process of flooding arising from rainfall and associated surface water runoff.
Riparian	Relating to/or situated on the banks of a river or watercourse.
Runoff	Water flow over the ground surface to the drainage system. This occurs if the ground is impermeable or if permeable ground is saturated.
Sequential test	NPPF advocates that planners use a sequential test when considering land allocations for development to avoid flood risk where possible. Details of this test are summarised in the NPPF.
Soakaway	A subsurface structure into which surface water is conveyed, designed to promote infiltration.

Source Control	The control of runoff at or near to its source.
Storage Compensation	Due to the cumulative impacts of developments on the extent and function of the floodplain, the EA may require compensation storage to be provided at a site where a loss of storage in the floodplain occurs, irrespective of the negligible impacts of individual developments. In other words, an area of ground above the floodplain level must be found that can be excavated to compensate for the floodplain storage volume lost by the developing building area. In addition, the EA may insist that compensation is provided on a 'level-for-level' basis, i.e. providing compensation areas at the same level as where storage has been lost, so that there is a minimal impact on the flood patterns in the area.
SuDS	Sustainable Drainage Systems: A strategy, supported by a range of techniques, for dealing with surface water drainage that seeks to promote sustainable and environmentally beneficial or least damaging solutions. Developing a 'greenfield' site can significantly alter the way rainfall runs off the site. Impermeable areas such as tarmac mean that rainwater cannot infiltrate into the ground, and is instead channelled directly into rivers via drains and sewers. Flood risk may therefore be increased by the rapid flow of surface water run-off from developed areas into the watercourse. SuDS were developed initially with urban drainage in mind but the approach has broad application over all development drainage. SuDS techniques include Source Control.
Swale	A grass-lined channel designed to drain water from a site as well as controlling the flow and quality of the surface water.
Watercourse	Any natural or artificial channel which conveys surface water.
Wetland	A pond that has a high proportion of emergent vegetation in relation to open water that provides a variety of habitats.

NPPF Technical Guidance - The Sequential and Exception Tests

As set out in the National Planning Policy Framework, the aim of the Sequential Test is to steer new development to areas with the lowest probability of flooding. The flood zones (see table 1) are the starting point for this sequential approach. Zones 2 and 3 are shown on the flood map¹ with Flood Zone 1 being all the land falling outside Zones 2 and 3. These flood zones refer to the probability of sea and river flooding only, ignoring the presence of existing defences.

Strategic Flood Risk Assessments refine information on the probability of flooding, taking other sources of flooding and the impacts of climate change into account. They provide the basis for applying the Sequential Test, on the basis of the flood zones in table 1. Where Table 1 indicates the need to apply the Exception Test (as set out in the National Planning Policy Framework), the scope of a Strategic Flood Risk Assessment will be widened to consider the impact of the flood risk management infrastructure on the frequency, impact, speed of onset, depth and velocity of flooding within the flood zones considering a range of flood risk management maintenance scenarios. Where a Strategic Flood Risk Assessment is not available, the Sequential Test will be based on the Environment Agency flood zones.

The overall aim should be to steer new development to Flood Zone 1. Where there are no reasonably available sites in Flood Zone 1, local planning authorities allocating land in local plans or determining planning applications for development at any particular location should take into account the flood risk vulnerability of land uses (see table 2) and consider reasonably available sites in Flood Zone 2, applying the Exception Test if required (see table 3). Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required.

¹ To access the flood map, see the Environment Agency's website at:

<http://www.environment-agency.gov.uk/homeandleisure/floods/default.aspx>

Table 1: Flood zones

(Note: These flood zones refer to the probability of river and sea flooding, ignoring the presence of defences)

<p>Zone 1 - low probability</p> <p>Definition</p> <p>This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).</p> <p>Appropriate uses</p> <p>All uses of land are appropriate in this zone.</p> <p>Flood risk assessment requirements</p> <p>For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a flood risk assessment. This need only be brief unless the factors above or other local considerations require particular attention.</p> <p>Policy aims</p> <p>In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems².</p> <p>² Sustainable drainage systems cover the whole range of sustainable approaches to surface drainage management. They are designed to control surface water run off close to where it falls and mimic natural drainage as closely as possible.</p>
<p>Zone 2 - medium probability</p> <p>Definition</p> <p>This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.</p> <p>Appropriate uses</p> <p>Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses, as set out in table</p>

2, are appropriate in this zone. The highly vulnerable uses are *only* appropriate in this zone if the Exception Test is passed.

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.

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.

Table 2: Flood risk vulnerability classification

<p>Essential infrastructure</p> <ul style="list-style-type: none"> • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
<p>Highly vulnerable</p> <ul style="list-style-type: none"> • Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use³. • Installations requiring hazardous substances consent⁴. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as “essential infrastructure”)⁵.
<p>More vulnerable</p> <ul style="list-style-type: none"> • 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 waste⁶. • Sites used for holiday or short-let caravans and camping, <i>subject to a specific warning and evacuation plan</i>.⁷
<p>Less vulnerable</p> <ul style="list-style-type: none"> • Police, ambulance and fire stations which are <i>not</i> 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 agriculture and forestry.
- Waste treatment (except landfill and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do *not* need to remain operational during times of flood.
- Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).

Water-compatible development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, *subject to a specific warning and evacuation plan.*

³ For any proposal involving a change of use of land to a caravan, camping or chalet site, or to a mobile home site or park home site, the Sequential and Exception Tests should be applied.

⁴ See Circular 04/00: *Planning controls for hazardous substances* (paragraph 18) at:

www.communities.gov.uk/publications/planningandbuilding/circularplanningcontrols

⁵ In considering any development proposal for such an installation, local planning authorities should have regard to planning policy on pollution in the National Planning Policy Framework.

⁶ For definition, see *Planning for Sustainable Waste Management: Companion Guide to Planning Policy Statement 10* at www.communities.gov.uk/publications/planningandbuilding/planningsustainable

⁷ See footnote 3.

⁸ See website for further details.

www.defra.gov.uk/science/ProjectData/DocumentLibrary/FD23203364TRP.pdf

Notes to table 2:

- a. This classification is based partly on Department for Environment, Food and Rural Affairs and Environment Agency research on *Flood Risks to People (FD2321/TR2)*⁸ and also on the need of some uses to keep functioning during flooding.
- b. Buildings that combine a mixture of uses should be placed into the higher of the relevant classes of flood risk sensitivity. Developments that allow uses to be distributed over the site may fall within several classes of flood risk sensitivity.
- c. The impact of a flood on the particular uses identified within this flood risk vulnerability classification will vary within each vulnerability class. Therefore, the flood risk management infrastructure and other risk mitigation measures needed to ensure the development is safe may differ between uses within a particular vulnerability classification.

FCDPAG INDICATIVE STANDARDS OF PROTECTION

The DEFRA Flood and Coastal Defence Project Appraisal Guidance (FCDPAG) documents provide advice on best practice for the appraisal of flood and coastal defence projects. Volume 3: Economic Appraisal gives indicative standards for flood and coastal defence in England and Wales. The tables below are provided “as an aid to authorities to help in establishing the range of options to be considered, though they should not constrain the need to consider a full range of alternatives. They do not represent any entitlement to protection or minimum level to be achieved”. Please refer to the FCDPAG documents at <http://www.defra.gov.uk/environ/fcd/pubs/pagn/default.htm> for further information.

Table 6.1 Indicative standards of protection

Land use band	Indicative standards of protection			
	Fluvial		Coastal	
	Return period	Annual probability of	Return period	Annual probability of
A	50-200	0.005-0.02	100-300	0.003-0.01
B	25-100	0.01-0.04	50-200	0.005-0.02
C	5-50	0.02-0.20	10-100	0.01-0.10

The standards shown in Table 6.1 are determined by land use bands, as defined in Table 6.2 below.

Table 6.2 Description of Land Use Bands

<i>Land use band</i>	<i>Indicative range of housing units (or equivalent) per km of coastline or single river bank</i>	<i>Description</i>
A	>=50	Typically intensively developed urban areas at risk from flooding and/or erosion
B	>=25 to <50	Typically less intensive urban areas with some high-grade agricultural land and/or environmental assets of international importance requiring protection.
C	>=5 to <25	Typically large areas of high-grade agricultural land and/or environmental assets of national significance
D	>=1.25 to <5	Typically mixed agricultural land with occasional, often agriculturally related, properties at risk. Agricultural land may be prone to flooding, water logging or coastal erosion. May also apply to environmental assets of local significance.
E	>0 to <1.25	Typically low-grade agricultural land, often grass, at risk from flooding, impeded land drainage or coastal erosion, with isolated agricultural or seasonally occupied properties at risk, or environmental assets at little risk from frequent inundation.