

FLOOD RISK & DRAINAGE ASSESSMENT

PROPOSED RESIDENTIAL DEVELOPMENT

**PLATTING LANE
ROCHDALE
OL11 2JT**

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Doc Ref: rep-tjba-B&L-platting lane-FRA_DSR-080724.docx

Revision	Date	Reason
0	July 2024	Original to support planning application.

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1 FRA Introduction.

Purpose of Flood Risk Assessment:

The purpose of the assessment is to inform & accompany a planning application for a residential development of 3No. dwellings, associated driveways & gardens.

The primary purpose of this report is to identify flood risk to/from the proposed development, and also to assess drainage proposals.

Reference:

Flood Risk Assessments are required for the following Sites:

- *Sites in areas at risk of flooding*
- *Sites of 1 hectare (Ha) or more.*

The Application Site is approximately 450sqm (0.045Ha), but Sudden Brook forms the east boundary. While flood zone 3 remains within the banks of the river, the Application Site is covered by flood zone 2, and thus triggers the requirement for a Flood Risk Assessment under the Town & Country Planning system.

Flood Risk:

National Planning Policy Framework and the Planning Practice Guidance (flood risk & coastal change notes).

Flood zone 2 is defined as land assessed as having between a 1:100 & 1:1000 or greater annual probability of river flooding (0.1-1%) in any year (land shown in light blue on the EA flood map). Flood zone 3 is defined as land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%) in any year (land shown in dark blue on the EA flood map). Flood zone 1 comprises all areas outside of flood zones 2 & 3.

The Planning Practice Guidance indicates the flood risk vulnerability classification (Table 2) for the Application Site end use to be 'more vulnerable'. The flood risk 'vulnerability' and flood zone 'compatibility' matrix (Table 3) indicates that 'more vulnerable' development is acceptable in flood zone 2.

Drainage:

The Site will be assessed in accordance with the national drainage hierarchy for surface water disposal & exceedance characteristics, also considering the proposed end adopters and their requirements.

Regarding Site assessment, this report will appraise the existing and local drainage infrastructure, assess the suitability of the proposed development, giving recommendations for drainage design & management, specifically for approval of the LLFA/EA/sewerage undertakers, as applicable.

Drainage from new developments is to be designed to follow the national drainage hierarchy for surface water discharge to the following networks in order of preference:

- infiltration.
- Watercourse.
- surface water sewer.
- combined sewer.

Flow rates (existing & proposed) are to be estimated for approval using the following methodology:

- Development should aim to deliver greenfield runoff on greenfield sites up to a 100yr rainfall event, considering climate change.

- Development should aim for a minimum reduction in surface water runoff rates of 50% for Brownfield sites on a 1yr rainfall event.
- Development should be designed so that there is no flooding to the development in a 30yr event, and so that there is no property flooding in a 100yr event considering climate change.

Preliminary or Full Flood Risk Assessment:

Full to support planning application.

1.1 Plans.

1.1.1 Location plan.

See Location Plan in Appendix showing the area features.

The Application Site is located to the east of Platting Lane in a mixed residential/commercial area.

It is bound by Sudden Brook to the east side.

1.1.2 Site plan.

Refer to Existing & Proposed Plans in the appendix.

The Application Site comprises a former garage site which is now primarily a vacant plot of land. Some existing hardstanding remain from the former use, such as a macadam driveway to a dilapidated garage, and a former garage slab to the site centre.

Existing Site areas are as follows:

Ex hardstandings	65 sqm.
Soft landscaping	385 sqm.
Total area	450 sqm.

The Proposed Plan indicates 3No. terraced residential dwellings.

Each of the properties has a private driveway for a 2 cars, and associated soft landscaping to form garden areas.

Proposed Site areas are as follows:

Roof/dwelling area	150 sqm.
Driveways	125 sqm.
Soft landscaping/lawns	175 sqm.
Total area	450 sqm.

1.2 Derivation of Data, Surveys and Models.

1.2.1 Existing and proposed topography.

No topographic survey had been undertaken at the time of writing.

A lidar dtm model was downloaded for the Site and contours created which indicated levels of around 135.60m aOD to the north boundary, and 136.00m aOD to the south boundary.

Manhole cover levels at road level central to the Site given by United Utilities are around 135.50m aOD.

The river bed is approximately 133.70m aOD central to the Site.

1.2.2 Geology.

BGS Maps record the superficial cover to be hummocky (moundy) glacial deposits, Devensian - Diamicton.

HR Wallingford hydraulic records indicate the soil type as being Class 1.

1.2.3 Drainage Surveys.

N/A – not yet undertaken.

1.2.4 Sewer Undertaker Records.

United Utilities drainage records for the local area indicate a 525mm combined sewer & a 225mm surface water sewer flowing north in Platting Lane.

There is also a surface water sewer & a combined sewer to the south boundary. The surface water sewer appears to have an outlet to the watercourse within the south boundary.

1.2.5 BGS Borehole Records.

The closest boreholes to the Site are approximately 175m south. Geology recorded was as follows:

0-1250 MADE GROUND.
 1250-2900 Med dense silty SAND & GRAVEL.
 2900-4950 Med dense silty medium SAND.
 4950-6300 Soft silty CLAY.

1.2.6 Landmark Records.

Not obtained.

1.3 Drainage Strategy

1.3.1 Existing Site rainfall & drainage systems.

There is no known Site drainage apart from the United Utilities services.

Local rainfall characteristics are as follows:

SAAR (mm) 	1137
M5-60 rainfall depth (mm) 	20
'r' ratio M5-60 / M5-2day 	0.3
FEH/FSR conversion factor 	1.12
Hydrological region 	10
Specify SOIL type 	1
SPR 	0.1

DESIGN RAINFALL 1YR (THE WALLINGFORD PROCEDURE)

Design rainfall in accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment area	Other
Storm duration	D = 30 min
Return period	Period = 1 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.300
5-year return period rainfall of 60 minutes duration	M5_60min = 20.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 0 %
Factor Z1 (Wallingford procedure)	Z1 = 0.77
Rainfall for 30min storm with 5 year return period	M5_30min _i = Z1 ' M5_60min = 15.4 mm
Factor Z2 (Wallingford procedure)	Z2 = 0.62
Rainfall for 30min storm with 1 year return period	M1_30min = Z2 ' M5_30min _i = 9.6 mm
Design rainfall intensity	I _{max} = M1_30min / D = 19.1 mm/hr

DESIGN RAINFALL 30YR (THE WALLINGFORD PROCEDURE)

Design rainfall in accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment area	Other
Storm duration	D = 30 min
Return period	Period = 30 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.300

5-year return period rainfall of 60 minutes duration
 Increase of rainfall intensity due to global warming
 Factor Z1 (Wallingford procedure)
 Rainfall for 30min storm with 5 year return period
 Factor Z2 (Wallingford procedure)
 Rainfall for 30min storm with 30 year return period
 Design rainfall intensity

M5_60min = **20.0** mm
 $p_{climate} = 0\%$
 $Z1 = 0.77$
 $M5_{30min_i} = Z1 \cdot M5_{60min} = 15.4$ mm
 $Z2 = 1.53$
 $M30_{30min} = Z2 \cdot M5_{30min_i} = 23.5$ mm
 $I_{max} = M30_{30min} / D = 47.1$ mm/hr

DESIGN RAINFALL 100YR (THE WALLINGFORD PROCEDURE)

Design rainfall in accordance with the Wallingford Procedure

Tedds calculation version 2.0.02

Design rainfall intensity

Location of catchment area
 Storm duration
 Return period
 Ratio 60 min to 2 day rainfall of 5 yr return period
 5-year return period rainfall of 60 minutes duration
 Increase of rainfall intensity due to global warming
 Factor Z1 (Wallingford procedure)
 Rainfall for 30min storm with 5 year return period
 Factor Z2 (Wallingford procedure)
 Rainfall for 30min storm with 100 year return period
 Design rainfall intensity

Other
 $D = 30$ min
 Period = **100** yr
 $r = 0.300$
 $M5_{60min} = 20.0$ mm
 $p_{climate} = 0\%$
 $Z1 = 0.77$
 $M5_{30min_i} = Z1 \cdot M5_{60min} = 15.4$ mm
 $Z2 = 1.99$
 $M100_{30min} = Z2 \cdot M5_{30min_i} = 30.7$ mm
 $I_{max} = M100_{30min} / D = 61.4$ mm/hr

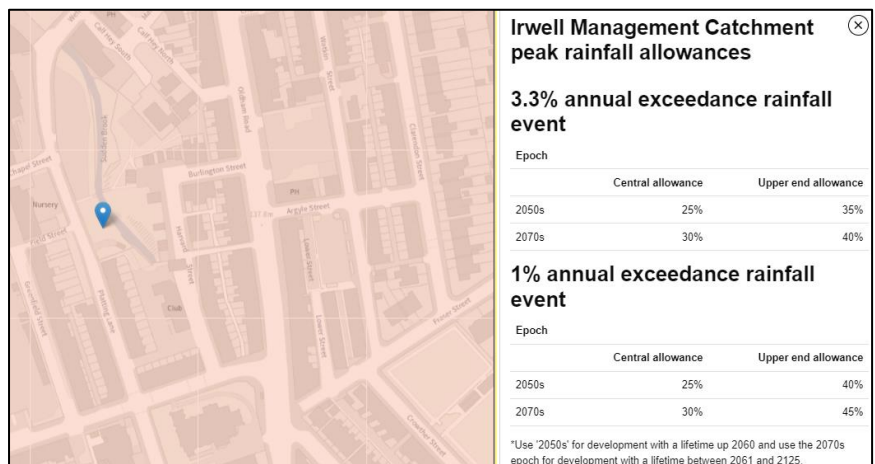
1.3.2 Rainfall Climate change impacts on the proposed development.

Climate change allowances to peak rainfall intensity are given nationally across the whole of England, based upon river management catchment areas. Refer to graphic inset:

Given the proposed residential Site end use, the 2070s epoch is considered suitable for climate change allowance estimation which suggests the following allowance to be used:

30yr rainfalls +40% climate change allowance.

100yr rainfalls +45% climate change allowance.



1.3.3 Proposed Site rainfall & drainage systems.

Following the guidance of hierarchy for disposal of surface water (SUDS):

- **INFILTRATION:** BGS maps suggest the Application Site is underlain by hummocky glacial deposits which usually comprise clay in the local area. However, local borehole records suggest there are sand and gravel/sand deposits beneath the area.

All garden areas and soft landscaping will drain via natural infiltration (ie greenfield).

Regardless of the permeability of site soils; areas such as driveways, pathways and patios, may be of permeable construction with shallow subbase storage to mimic the greenfield runoff of local Soils more naturally.

Soakaways are not considered suitable for the Site. There is little room around the development, there will not be a 5m separation from foundations, nor 2.5m from boundaries as required by building regulations. There is also a potential risk of damage to the river banks.

Surface water discharge from the proposed dwellings/roof areas should discharge to the river as per the below section.

- **WATERCOURSE:** The roof areas of the proposed development should discharge to the watercourse. Due to the low areas involved, it won't be necessary to restrict the flow rate and thus attenuation will not be required. Refer to calculation of flows below, estimating a max 3.7l/s discharge on the 100yr+45% pluvial event.

MODIFIED RATIONAL METHOD					
Client:		B&L Homes Ltd			
Site:		Platting Lane, Rochdale			
PEAK RUNOFF RATE ESTIMATION					
in accordance with CIRIA C753, pgs 519-520, EQ. 24.5					
modified rational method		$Q = 2.78 C I A$		return period (Tr)	rainfall mintensity (mm/hr)
site area:		150	sqm	2yr	19.10
		0.015	Ha	30yr	47.10
volumetric runoff coefficient Cv:		1		100yr	61.40
dimensionless routing coefficient Cr:		1		30yr+40%	65.94
runoff coefficient C (Cv x Cr):		1		100yr+45%	89.03
rainfall intensity assumptions:					
1yr rainfall		19.1	mm/hr	synthetic 2yr TEDDS calculation	
30yr rainfall		47.1	mm/hr	constant lower intensity estimation, CIRIA C753	
100yr rainfall		61.4	mm/hr	constant upper intensity estimation, CIRIA C753	
development type		residential	enter commercial or residential		
30yr rainfall climate change allowance		40	%	0.4	ratio
100yr rainfall climate change allowance		45	%	0.45	ratio

- **SW SEWER:** Not required for surface water discharge.
- **COMBINED SEWER:** Foul water connections only.

1.3.4 Proposed Site foul water system.

The Site should have a new connection to the United Utilities combined system. There is a combined sewer to the south boundary, and it would be more cost effective to connect to this sewer than the main in Platting Lane.

All foul and surface water should be kept separate.

1.3.5 Adoption

The drainage systems drainage will remain private.

1.3.6 Maintenance

Maintenance of suds will be private.

1.4 Flood Risk Assessment

1.4.1 Existing fluvial & surface water system.

In the wider area, land elevation falls to the north, ultimately towards the River Roch of which Sudden Brook is a tributary.

Sudden Brook is culverted through much of the local area, but remains as an open watercourse from the south Site boundary to approximately 75m north where it re-enters a culvert beneath Platting Lane.

In exceedance level events, when the river becomes inundated with flood waters, eventually the banks are overtopped and the resulting flood water moves onto the Site and northwards.

1.4.2 Proposed fluvial & surface water system.

Site infiltration & SUDS will ensure the proposed construction will not have a negative effect on the fluvial system.

1.4.3 Climate change impacts.

As identified in Section 1, the vulnerability of the development is 'more vulnerable'.

The Planning Flood Maps designate the Site as being within flood zone 2. EA guidance specifies climate change allowances by management catchment areas specific to the catchment the

		Irwell Management Catchment peak river flow allowances		
		Central	Higher	Upper
2020s		12%	15%	24%
2050s		19%	26%	43%
2080s		35%	46%	75%

Application Site is within. Peak flow river maps have been produced which specify the climate change allowances to be used in a flood risk assessment:

EA guidance indicates the peak flow rates that should be used for the vulnerability classification:

- essential infrastructure – use the higher central allowance.
- highly vulnerable – use central allowance (development should not be permitted in flood zone 3a).
- more vulnerable – use the central allowance.
- less vulnerable – use the central allowance.
- water compatible – use the central allowance.

Given the more vulnerable development risk category, the central allowance climate change multiplier should be used as the basis for assessment.

As the Application Site is to be used for a residential end use, maximum development lifetimes apply, and the '2080s' timeline is appropriate.

Comparing the '2080s' timeline with the central allowance from the peak river flow allowances above, suggests a 35% climate change allowance on the 100yr flood event, which will form the design flood level.

1.4.4 Fluvial morphological impacts.

The proposed development will not impact fluvial morphology.

1.4.5 Potential sources of flooding.

- a. Fluvial flooding from main rivers.

Environment Agency Product 4 data has been obtained for the local area.

The Site lies in close proximity to Node 7 on the EA flood map with Node 6 approx 75m north of the Site on re-entrance to the culvert beneath Platting Lane. Below are flood levels tabulated for Nodes 6 & 7 for critical flood events:

Sudden Brook Unflooded flood model			
Node	100yr level	100yr+35% level	1000yr level
6	134.79m aOD	135.89m aOD	137.34m aOD
7	134.88m aOD	135.88m aOD	137.34m aOD

The flood levels show the 100yr flood event is still within bank, however, the 100yr+35% design flood level is approximately 100mm above existing average ground level.

- b. Surface water flood maps.

The Environment Agency surface water flood maps are currently in the process of being replaced.

In some areas, the maps give a similar but less specific account of flooding as the Product 4 river models with a wider band of potential flood depths, which appears to be the case in the local area.

The flood outlines appear to be approximately consistent with the river flood models, with flood depth outlines following local watercourses and subsequent overtopping events.

Given the similarity & reduced accuracy of the surface water flood maps compared to the official Product 4 flood data, it is suggested the surface water maps should not be used.

- c. Artificial Watercourse/Canals.

None noted in the local area.

- d. Springs and high groundwater levels.

None noted.

- e. Surcharging of local drainage & sewerage systems.

No evidence of sewer surcharging in the local area.

- f. Reservoirs.

No flood risk from reservoirs in the local area.

1.5 Design.

Environment Agency guidelines indicate a 300mm freeboard will be acceptable on the 100yr+climate change flood level provided there is a high level of certainty around the proposed level. Given the flood levels have been obtained from the Environment Agency Product 4 flood models, the certainty of the flood levels is considered to be high.

Therefore, with a 100yr+35% design flood level having been identified for the Site, the finish floor levels should be set at no less than 136.18m aOD.

2 Emergency Evacuation Plan

3 Emergency Plan

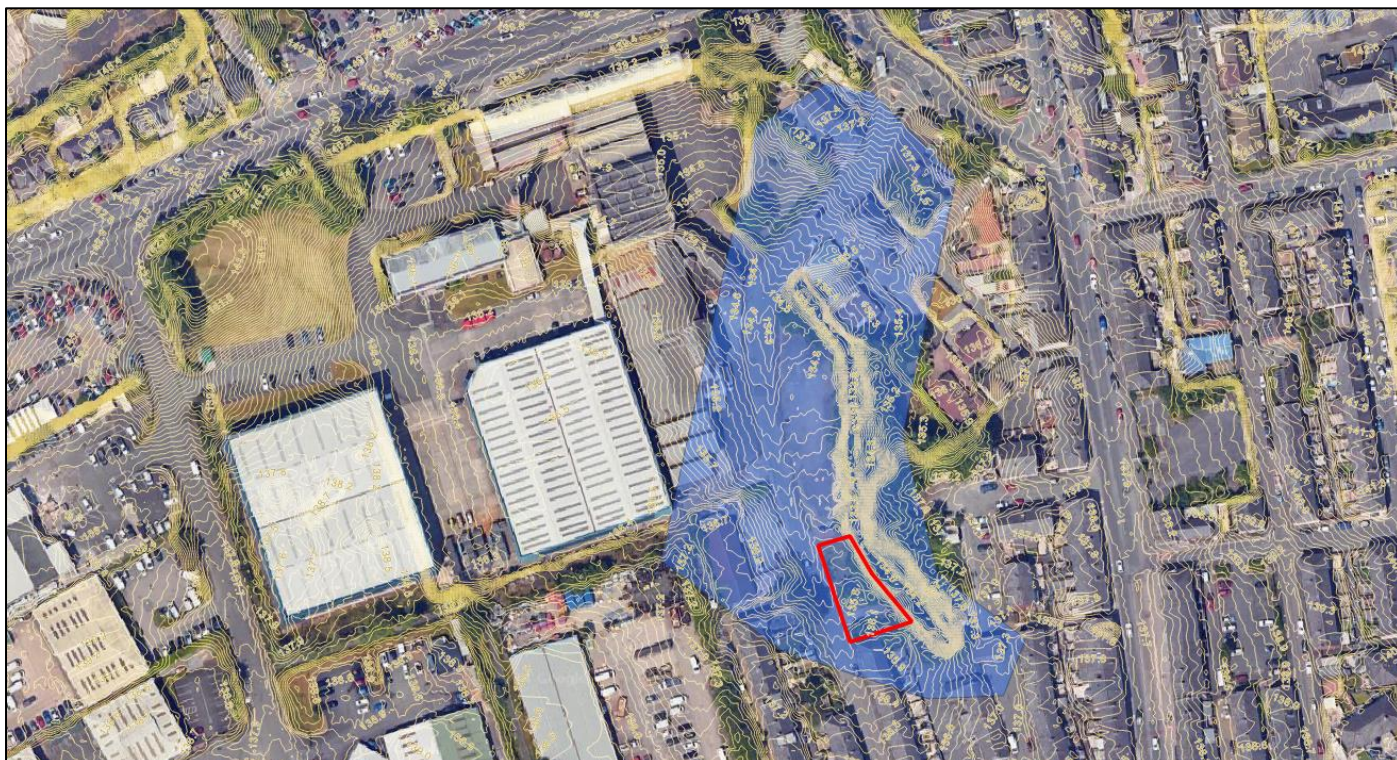
The Adept/Environment Agency guidelines indicate the requirements for flood risk emergency plans (EP) for new development. An EP would generally contain the following sub-sections:

- Section 1. Scope, Objectives and Background.
- Section 2. Location and Proposal.
- Section 3. Risk Summary.
- Section 4. Mitigation Measures.
- Section 5. Flood Warnings and Associated Actions.
- Section 6. Safe Access and Escape.
- Section 7. Temporary Refuge.
- Section 8. After the Flood.
- Section 9. List of Roles.
- Section 10. Plan Upkeep and Awareness.

As the FRA has already discussed Sections 1-4, the Emergency Plan will start at Section 5.

3.1 Section 5. Flood Warnings and Associated Actions

The Site is within a flood warning area, and residents will be able to sign up and get advanced warning of potential fluvial flood events, refer to associated Flood Warning Map below:



FLOOD INFORMATION SERVICE

Dwellings or businesses in England can sign up for the Environment Agency free flood alert service by phone, email or text message, if either homes or businesses are at risk of flooding.

The Site is within the Environment Agency Flood Warning Area and it is strongly advised that the Owner must sign up to receive flood warnings via the Environment Agency Flood Information Service.

The current & simple flood alert/warnings guidance used by the Environment Agency, including an easy-to-understand statement of the following:

- PREPARE.
- ACT.
- SURVIVE.

The Flood Information Service can be found on the internet using the following URL: <https://flood-warning-information.service.gov.uk/warnings>.

See inset graphic below for additional general details what is required for each warning stage.

Flood alert - Prepare



- prepare a bag that includes medicines and insurance documents
- check flood warnings

Flood warning - Act



- turn off gas, water and electricity
- move things upstairs or to safety
- move family, pets and car to safety

Severe flood warning - Survive



- call 999 if in immediate danger
- follow advice from emergency services
- keep yourself and your family safe

FLOODLINE

Alternatively, people at risk from flooding and without access to the internet can register for flood alert warnings & get in touch by calling Floodline on telephone: 0345 988 1188 OR Type talk: 0345 602 6340 (for the hard of hearing), which is a 24hr service.

For flood alerts/warnings, people will need to provide the following information:

- the address to be registered.
- a phone number for the person or people requesting the service can be contacted on 24hrs a day.
- an email address for the person or people requesting the service.

FLOOD WARDENS

Flood Wardens operate in some areas to provide alerts to the local community when flood warnings are issued. Contact Floodline on 0845 988 1188 to find out if this service is available in the area.

SIRENS/LOUDHAILERS

Sirens/loudhailers operate in some areas at risk from extreme flooding to alert residents that a flood warning is in force. Contact Floodline on 0845 988 1188 to find out if this service is available in the area.

GENERAL MEDIA

Media such as the Flood Information Service website details maps and current (up-to-date) area specific advice for all areas of England, including the type of flooding and flood alert/warning level in force for those areas. Other websites such as the Met Office have their own flood alert service. TV & radio news channels give warnings.

3.2 Section 6. Safe Access and Escape

In flood risk areas, safe access and egress from new developments should be in accordance with the Adept EP guidance, and that of the referenced background documentation Defra/EA R&D Technical Report FD2320/TR2 and should be in the following order of preference:

- Safe dry route for people and vehicles.
- Safe dry route for people.
- If a dry route for people is not possible, a route for people where the flood hazard (in terms of depth and velocity of flooding) is low and should not cause a risk to people.
- If a dry route for vehicles is not possible, a route for vehicles where the flood hazard (in terms of depth and velocity of flooding) is low to permit access for emergency vehicles. However, the public should not drive vehicles in floodwater.

The Application Site is within flood zone 2, and access to flood zone 1 is accessible by foot nominally 25m south of the Site along Platting Lane.



The Environment Agency guidance is clear: when a flood alert to PREPARE is issued, preparations should be enacted in case a further flood warning to ACT is given, and business owners should be ready for this scenario.

When a flood warning to ACT is issued, people should follow instructions to evacuate as per the above Emergency Evacuation Route Plan - assuming a flood event could be imminent.

DRIVING OR PEDESTRIAN MOVEMENTS SHOULD NOT BE ATTEMPTED THOROUGH FLOOD WATERS.

3.3 Section 7. Temporary Refuge

All finished floor levels are specified above the design flood level, so temporary refuge is not required.

If flood advice is required in an emergency, the Environment Agency has specially trained Flood Support Officers who provide information and advice during and after floods. Call Floodline (24-hour service) on 0345 988 1188 or type-talk (for the hard of hearing) on 0345 602 6340 to find out if they are active in the local area.

3.4 Section 8. After the Flood

Clean-up information & procedures if required following an extreme storm event are as follows:

- Contact your insurance company.

- Cleaning and repairing the property.
- Specialist advice will likely be required and may need to be undertaken in accordance with insurance company requirements.
- Photographs to document damage and record the flood water height.
- Flood water can be hazardous and contain sewage, chemicals, and animal waste. Care should be taken with personal protective equipment.
- Contact the local council about disposing of large flood damaged items.
- Stay healthy – ensure services are running properly and potable water does not have a change in colour, taste or smell. Ensure food touched by flood water is disposed of.
- Get help via Floodline if required.
- Get emotional support if required from family, friends, GP, or charity organisations.
- Apply for financial aid if required. Apply to the local council for eligibility.

3.5 Section 9. List of Roles

It is the owner's responsibility to follow this EP and keep up to date with current flood warning advice.

3.6 Section 10. Plan Upkeep and Awareness

The owner should ensure they are familiar with the Evacuation Plan and procedures, and keep up to date with latest Environment Agency Guidance.

4 Conclusion & Residual risks.

The Application Site & buildings are safe from fluvial flooding up to and including a 100+35% design flood event.

Access & egress routes are available to proposed Site users.

A minimum floor level of 136.18m aOD should apply to all Site buildings which is 300mm above the 100yr+35% flood level.

As long as this guidance is followed, no other residual risks remain.

Initial assessment of drainage proposals has been put forward for preliminary approval, and detailed design can be sought by Planning by way of condition if required.

Signed.....  .

D.S. Slattery BSc (Hons).

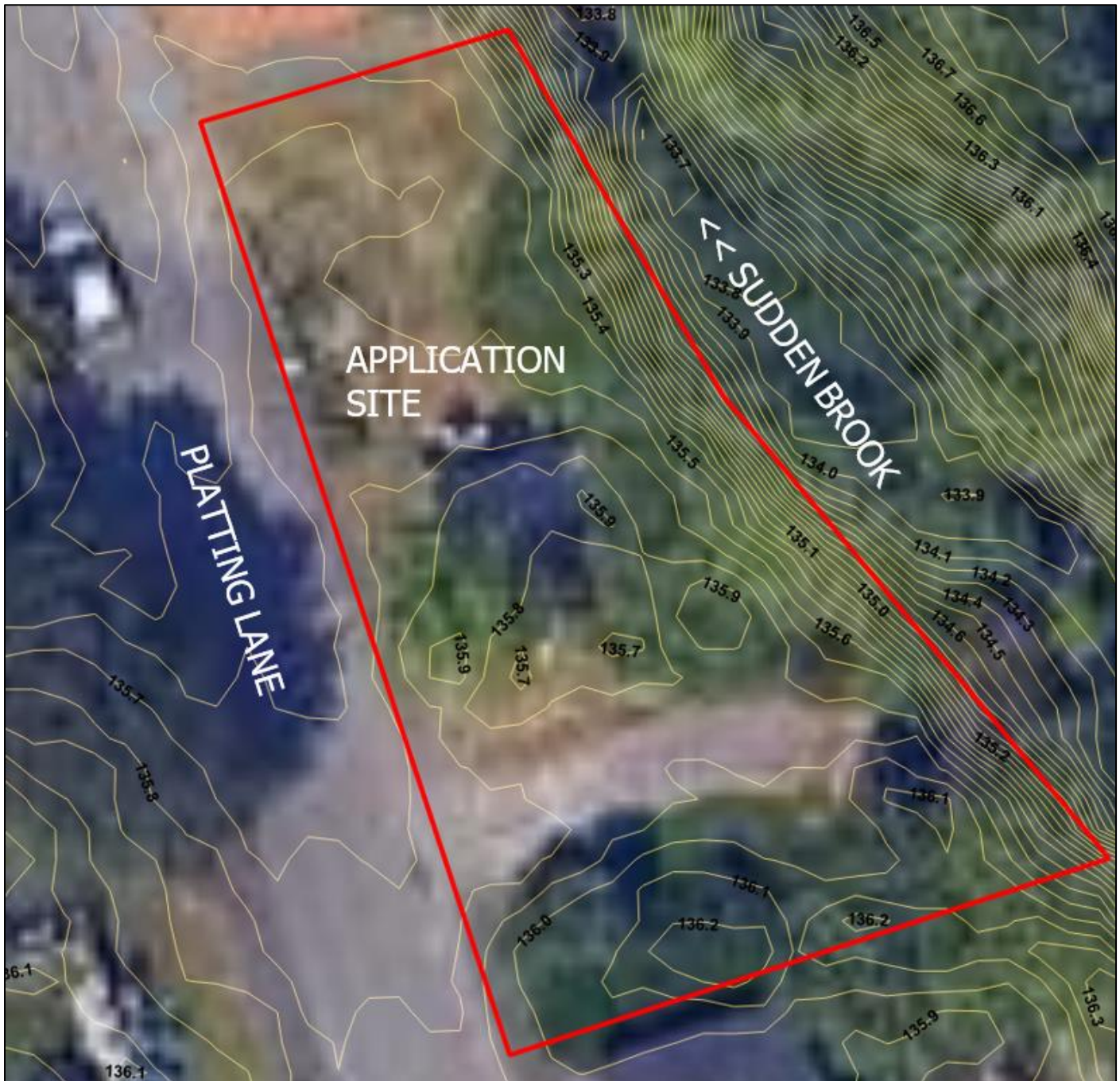
T J Booth Associates.

Authorised...  .

T J Booth BSc (Hons), C. Eng. C. Env. MICE.

T J Booth Associates.

5 Appendix.**5.1 Location Plan.**

5.2 Existing Plans/Topographic Survey.

PROPOSED SITE PLAN

LEGEND:

- DWELLING BLOCK A
- DRIVEWAYS / PARKING / PATHS
- PATIO AREAS
- LANDSCAPING / GARDEN AREAS

TITLE BLOCK:

DRAWING TITLE: PROPOSED SITE PLAN

JCA JAMES CAMPBELL ASSOCIATES LTD
RESIDENTIAL ARCHITECTURAL DESIGN

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Completed House: 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, 60, 65, 70, 75, 80, 85, 90, 95, 100, 105, 110, 115, 120, 125, 130, 135, 140, 145, 150, 155, 160, 165, 170, 175, 180, 185, 190, 195, 200, 205, 210, 215, 220, 225, 230, 235, 240, 245, 250, 255, 260, 265, 270, 275, 280, 285, 290, 295, 300, 305, 310, 315, 320, 325, 330, 335, 340, 345, 350, 355, 360, 365, 370, 375, 380, 385, 390, 395, 400, 405, 410, 415, 420, 425, 430, 435, 440, 445, 450, 455, 460, 465, 470, 475, 480, 485, 490, 495, 500, 505, 510, 515, 520, 525, 530, 535, 540, 545, 550, 555, 560, 565, 570, 575, 580, 585, 590, 595, 600, 605, 610, 615, 620, 625, 630, 635, 640, 645, 650, 655, 660, 665, 670, 675, 680, 685, 690, 695, 700, 705, 710, 715, 720, 725, 730, 735, 740, 745, 750, 755, 760, 765, 770, 775, 780, 785, 790, 795, 800, 805, 810, 815, 820, 825, 830, 835, 840, 845, 850, 855, 860, 865, 870, 875, 880, 885, 890, 895, 900, 905, 910, 915, 920, 925, 930, 935, 940, 945, 950, 955, 960, 965, 970, 975, 980, 985, 990, 995, 1000, 1005, 1010, 1015, 1020, 1025, 1030, 1035, 1040, 1045, 1050, 1055, 1060, 1065, 1070, 1075, 1080, 1085, 1090, 1095, 1100, 1105, 1110, 1115, 1120, 1125, 1130, 1135, 1140, 1145, 1150, 1155, 1160, 1165, 1170, 1175, 1180, 1185, 1190, 1195, 1200, 1205, 1210, 1215, 1220, 1225, 1230, 1235, 1240, 1245, 1250, 1255, 1260, 1265, 1270, 1275, 1280, 1285, 1290, 1295, 1300, 1305, 1310, 1315, 1320, 1325, 1330, 1335, 1340, 1345, 1350, 1355, 1360, 1365, 1370, 1375, 1380, 1385, 1390, 1395, 1400, 1405, 1410, 1415, 1420, 1425, 1430, 1435, 1440, 1445, 1450, 1455, 1460, 1465, 1470, 1475, 1480, 1485, 1490, 1495, 1500, 1505, 1510, 1515, 1520, 1525, 1530, 1535, 1540, 1545, 1550, 1555, 1560, 1565, 1570, 1575, 1580, 1585, 1590, 1595, 1600, 1605, 1610, 1615, 1620, 1625, 1630, 1635, 1640, 1645, 1650, 1655, 1660, 1665, 1670, 1675, 1680, 1685, 1690, 1695, 1700, 1705, 1710, 1715, 1720, 1725, 1730, 1735, 1740, 1745, 1750, 1755, 1760, 1765, 1770, 1775, 1780, 1785, 1790, 1795, 1800, 1805, 1810, 1815, 1820, 1825, 1830, 1835, 1840, 1845, 1850, 1855, 1860, 1865, 1870, 1875, 1880, 1885, 1890, 1895, 1900, 1905, 1910, 1915, 1920, 1925, 1930, 1935, 1940, 1945, 1950, 1955, 1960, 1965, 1970, 1975, 1980, 1985, 1990, 1995, 2000, 2005, 2010, 2015, 2020, 2025, 2030, 2035, 2040, 2045, 2050, 2055, 2060, 2065, 2070, 2075, 2080, 2085, 2090, 2095, 2100, 2105, 2110, 2115, 2120, 2125, 2130, 2135, 2140, 2145, 2150, 2155, 2160, 2165, 2170, 2175, 2180, 2185, 2190, 2195, 2200, 2205, 2210, 2215, 2220, 2225, 2230, 2235, 2240, 2245, 2250, 2255, 2260, 2265, 2270, 2275, 2280, 2285, 2290, 2295, 2300, 2305, 2310, 2315, 2320, 2325, 2330, 2335, 2340, 2345, 2350, 2355, 2360, 2365, 2370, 2375, 2380, 2385, 2390, 2395, 2400, 2405, 2410, 2415, 2420, 2425, 2430, 2435, 2440, 2445, 2450, 2455, 2460, 2465, 2470, 2475, 2480, 2485, 2490, 2495, 2500, 2505, 2510, 2515, 2520, 2525, 2530, 2535, 2540, 2545, 2550, 2555, 2560, 2565, 2570, 2575, 2580, 2585, 2590, 2595, 2600, 2605, 2610, 2615, 2620, 2625, 2630, 2635, 2640, 2645, 2650, 2655, 2660, 2665, 2670, 2675, 2680, 2685, 2690, 2695, 2700, 2705, 2710, 2715, 2720, 2725, 2730, 2735, 2740, 2745, 2750, 2755, 2760, 2765, 2770, 2775, 2780, 2785, 2790, 2795, 2800, 2805, 2810, 2815, 2820, 2825, 2830, 2835, 2840, 2845, 2850, 2855, 2860, 2865, 2870, 2875, 2880, 2885, 2890, 2895, 2900, 2905, 2910, 2915, 2920, 2925, 2930, 2935, 2940, 2945, 2950, 2955, 2960, 2965, 2970, 2975, 2980, 2985, 2990, 2995, 3000, 3005, 3010, 3015, 3020, 3025, 3030, 3035, 3040, 3045, 3050, 3055, 3060, 3065, 3070, 3075, 3080, 3085, 3090, 3095, 3100, 3105, 3110, 3115, 3120, 3125, 3130, 3135, 3140, 3145, 3150, 3155, 3160, 3165, 3170, 3175, 3180, 3185, 3190, 3195, 3200, 3205, 3210, 3215, 3220, 3225, 3230, 3235, 3240, 3245, 3250, 3255, 3260, 3265, 3270, 3275, 3280, 3285, 3290, 3295, 3300, 3305, 3310, 3315, 3320, 3325, 3330, 3335, 3340

Environment Agency

Flood map for planning

Location (easting/northing)
390354/411711

Scale
1:10,000

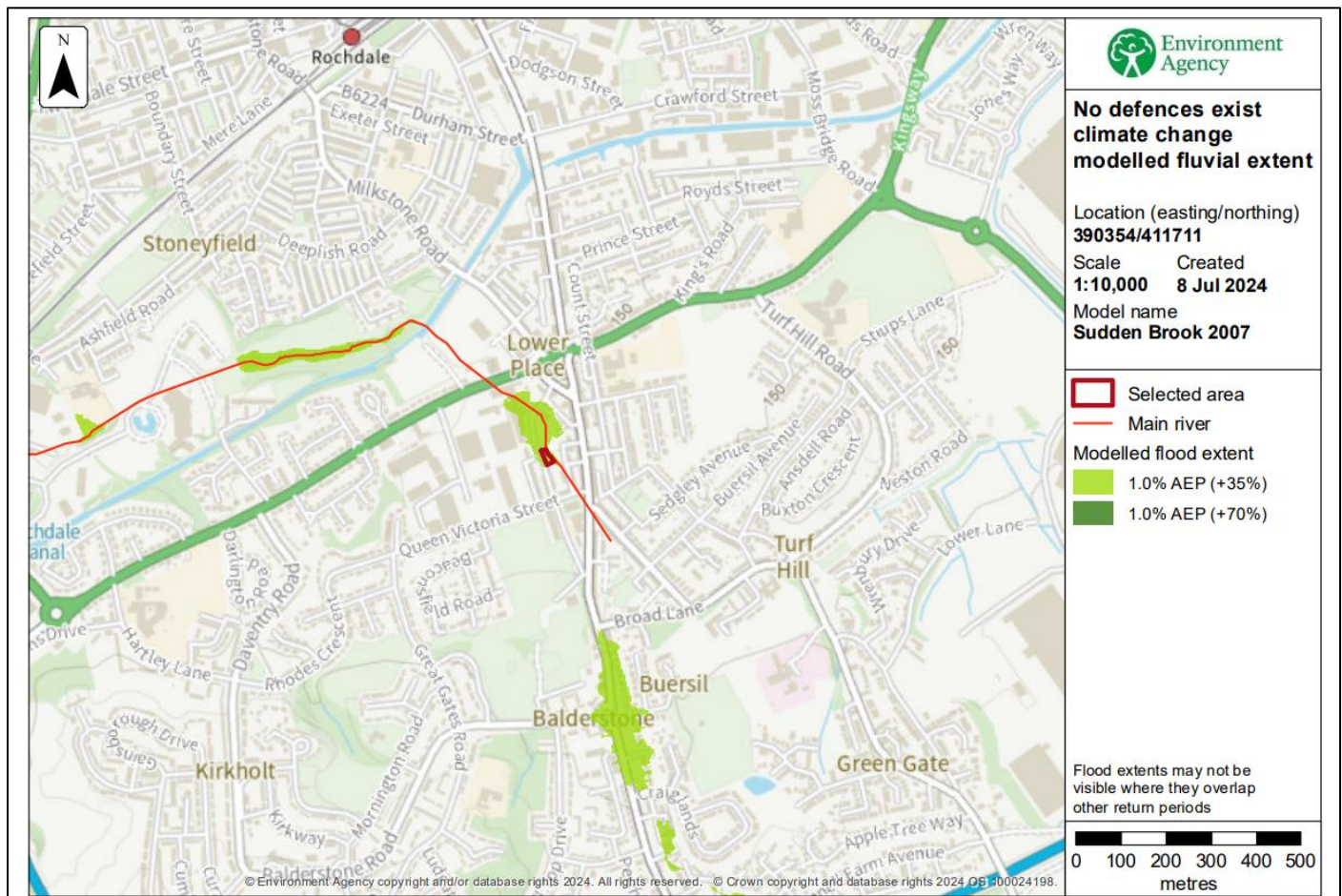
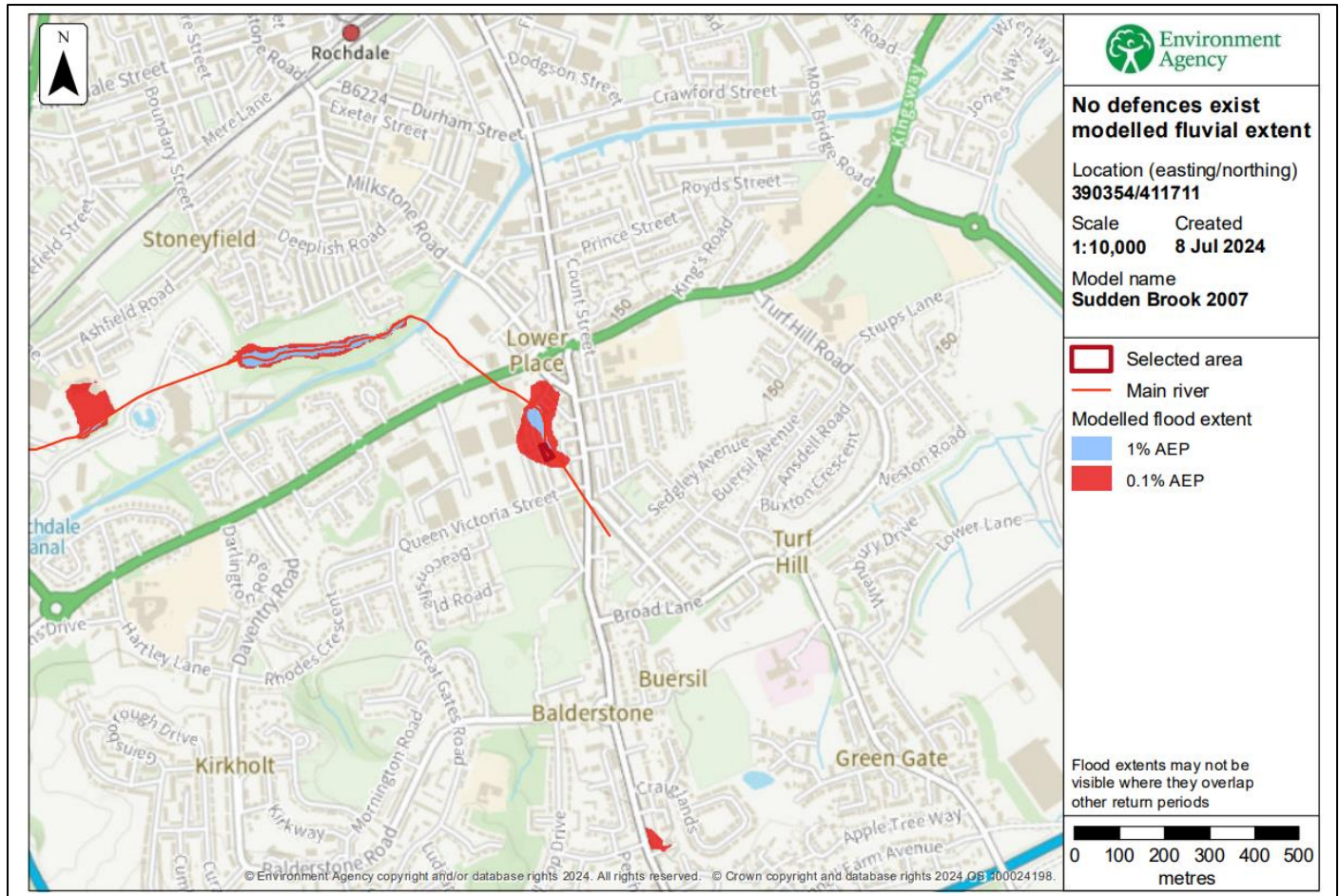
Created
8 Jul 2024

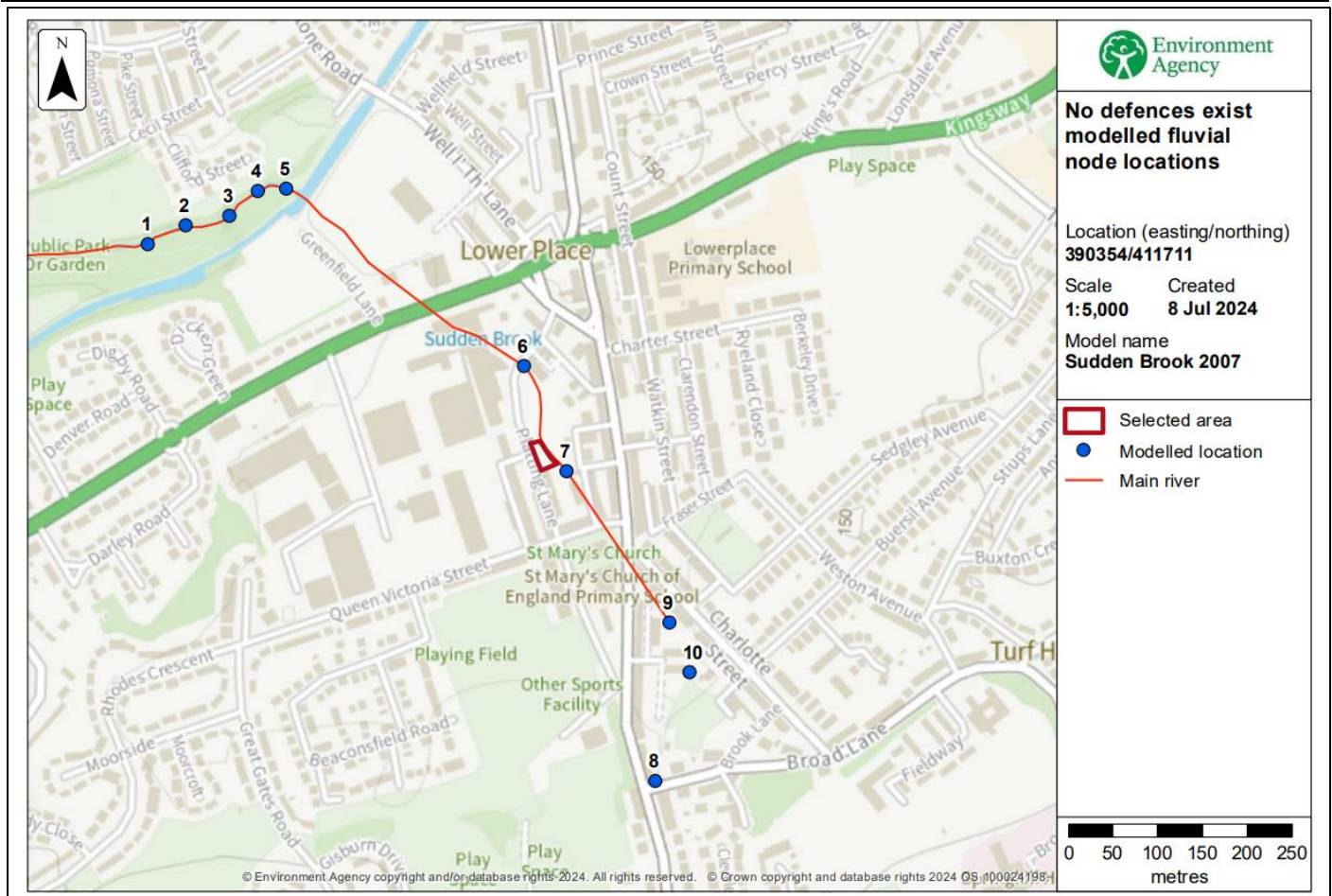
Legend:

- Selected area
- Main river
- Flood zone 3
- Flood zone 2

Scale: 0 100 200 300 400 500 metres

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Modelled node locations data

No defences exist

Label	Modelled location ID	Easting	Northing	5% AEP		2% AEP		1.33% AEP		1% AEP		0.5% AEP		0.1% AEP	
				Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow	Level	Flow
1	1502051	389913	411948							130.45	7.85			131.0	10.73
2	1502077	389955	411968							130.51	7.87			131.02	10.70
3	1502047	390005	411979							130.60	7.89			131.04	10.68
4	1502081	390037	412007							130.86	7.90			131.11	10.68
5	1502088	390068	412010							131.27	7.90			131.51	10.68
6	1502070	390334	411811							134.79	7.06			137.34	9.84
7	1502053	390382	411694							134.88	4.77			137.34	9.04
8	1502044	390481	411347							140.06	4.78			140.55	9.25
9	1502084	390497	411524							136.38	4.79			138.57	9.12
10	1502043	390519	411468							138.04	4.78			138.71	9.22

Data in this table comes from the Sudden Brook 2007 model.

Level values are shown in mAOD, and flow values are shown in cubic metres per second.

Any blank cells show where a particular scenario has not been modelled for this location.

Modelled node locations data

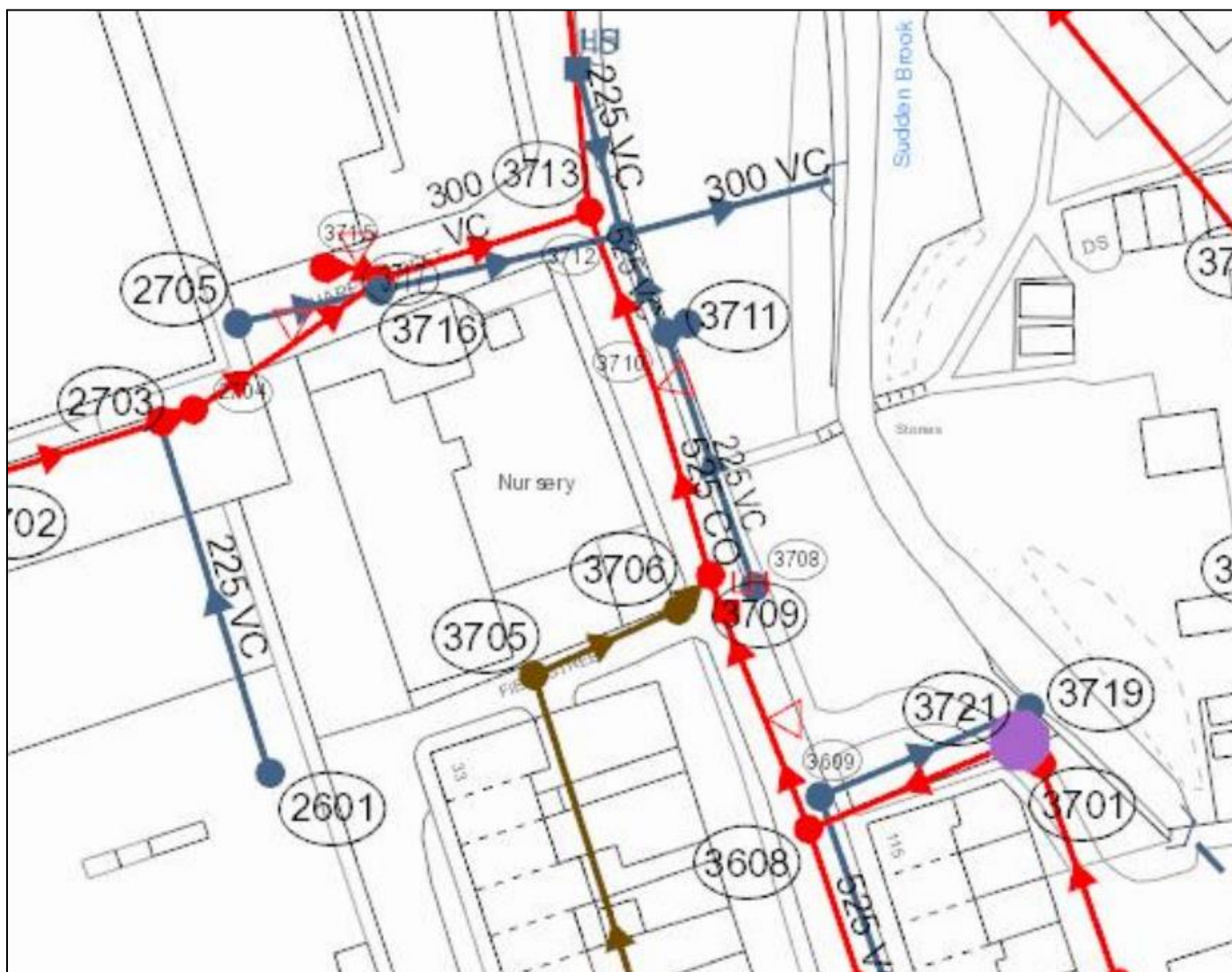
No defences exist climate change

Label	Modelled location ID	Easting	Northing	1.0% AEP (+35%)		1.0% AEP (+70%)	
				Level	Flow	Level	Flow
1	1502051	389913	411948	130.72	9.25	130.91	10.22
2	1502077	389955	411968	130.75	9.26	130.93	10.20
3	1502047	390005	411979	130.80	9.27	130.97	10.19
4	1502081	390037	412007	130.97	9.27	131.06	10.19
5	1502088	390068	412010	131.38	9.27	131.45	10.19
6	1502070	390334	411811	135.89	8.43	136.81	9.35
7	1502053	390382	411694	135.88	6.33	136.81	7.89
8	1502044	390481	411347	140.28	6.45	140.47	8.11
9	1502084	390497	411524	136.75	6.44	137.76	8.08
10	1502043	390519	411468	138.23	6.45	138.41	8.11

Data in this table comes from the Sudden Brook 2007 model.

Level values are shown in mAOD, and flow values are shown in cubic metres per second.

Any blank cells show where a particular scenario has not been modelled for this location.

5.5 United Utilities Sewer Plans.

5.6 NPPF Planning Practice Guidance Table 1.

Table 1: Flood Zones

These Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. They are shown on the Environment Agency's [Flood Map for Planning \(Rivers and Sea\)](#), available on the Environment Agency's web site, as indicated in the table below.

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency. (Not separately distinguished from Zone 3a on the Flood Map)

5.7 NPPF Planning Practice Guidance Table 2.

More vulnerable

- Hospitals
- Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non-residential uses for health services, nurseries and educational establishments.
- Landfill* and sites used for waste management facilities for hazardous waste.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan.

5.8 NPPF Planning Practice Guidance Table 3.

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 †	Exception Test required †	✗	Exception Test required	✓	✓
Zone 3b *	Exception Test required *	✗	✗	✗	✓*

Key:

✓ Development is appropriate

✗ Development should not be permitted.

Notes to table 3:

- This table does not show the application of the **Sequential Test** which should be applied first to guide development to Flood Zone 1, then Zone 2, and then Zone 3; nor does it reflect the need to avoid flood risk from sources other than rivers and the sea;
- The Sequential and **Exception Tests** do not need to be applied to **minor developments** and changes of use, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site;
- Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

† In Flood Zone 3a essential infrastructure should be designed and constructed to remain operational and safe in times of flood.

* In Flood Zone 3b (functional floodplain) essential infrastructure that has to be there and has passed the Exception Test, and water-compatible uses, should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows and not increase flood risk elsewhere.

5.9 Environment Agency Climate Change Allowances.**Table 1 peak river flow allowances by river basin district (use 1961 to 1990 baseline)**

River basin district	Allowance category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
North West	Upper end	20%	35%	70%
	Higher central	20%	30%	35%
	Central	15%	25%	30%

In flood zone 2

- essential infrastructure – use the higher central and upper end to assess a range of allowances
- highly vulnerable – use the higher central and upper end to assess a range of allowances
- more vulnerable – use the central and higher central to assess a range of allowances
- less vulnerable – use the central allowance
- water compatible – use none of the allowances

In flood zone 3a

- essential infrastructure – use the upper end allowance
- highly vulnerable – development should not be permitted
- more vulnerable – use the higher central and upper end to assess a range of allowances
- less vulnerable – use the central and higher central to assess a range of allowances
- water compatible – use the central allowance