4 Smith Street, Rochdale, OL16 1TU

Flood Risk Assessment

For Mr Abrar Hussain

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EXECUTIVE SUMMARY

The Site would be expected to remain dry in all but the most extreme conditions. The consequences of flooding are acceptable, and the development would be in accordance with the requirements of the National Planning Policy Framework (NPPF). The Proposed Development would be operated with minimal risk from flooding, would not increase flood risk elsewhere and is compliant with the requirements of the NPPF.

The Proposed Development should not therefore be precluded on the grounds of flood risk or drainage.

1.0 INTRODUCTION

1.1 Background

This Flood Risk Assessment (FRA) has been prepared by KRS Enviro at the request of Mr Abrar Hussain to support a planning application for the change of use from offices to a residential apartment on the ground floor ("the Proposed Development") at 4 Smith Street, Rochdale, OL16 1TU ("the Site").

This FRA has been carried out in accordance with guidance contained in the National Planning Policy Framework (NPPF)[1], associated Planning Practice Guidance on flood risk and coastal change[2] (PPG) and the PPG 'Site-specific flood risk assessment checklist. This FRA identifies and assesses the risks of all forms of flooding to and from the development and demonstrates how these flood risks will be managed so that the development remains safe throughout the lifetime, taking climate change into account.

It is recognised that developments which are designed without regard to flood risk may endanger lives, damage property, cause disruption to the wider community, damage the environment, be difficult to insure and require additional expense on remedial works. The development design should be such that future users will not have difficulty obtaining insurance or mortgage finance, or in selling all or part of the development, as a result of flood risk issues.

1.2 National Planning Policy Framework (NPPF)

One of the key aims of the NPPF is to ensure that flood risk is taken into account at all stages of the planning process; to avoid inappropriate development in areas at risk of flooding and to direct development away from areas of highest risk.

It advises that where new development is exceptionally necessary in areas of higher risk, this should be safe, without increasing flood risk elsewhere, and where possible, reduce flood risk overall. A risk-based approach is adopted at stages of the planning process, applying a source pathway receptor model to planning and flood risk. To demonstrate this, an FRA is required and should include:

- whether a proposed development is likely to be affected by current or future flooding from all sources;
- whether it will increase flood risk elsewhere;
- whether the measures proposed to deal with these effects and risks are appropriate;
- if necessary, provide the evidence to the Local Planning Authority (LPA) that the Sequential Test can be applied; and
- whether the development will be safe and pass part c) of the Exception Test if this is appropriate.

The report findings are based upon professional judgement and are summarised below with detailed recommendations provided at the end of the report. The report includes rainfall data from

[1] Ministry for Housing, Communities and Local Government (2023) National Planning Policy Framework: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf
[2] Communities and Local Government (2022) Planning Practice Guidance - Flood Risk and Coastal Change: https://www.gov.uk/guidance/flood-risk-and-coastal-change

the Flood Estimation Handbook (FEH) and hydrogeological information from the British Geological Survey (BGS). The assessment will summarise and refer to these datasets in the text.

1.3 Report Structure

This FRA has the following report structure:

- Section 2 describes the location and the existing and Proposed Development;
- Section 3 outlines the flood risk to the existing and Proposed Development;
- Section 4 details the proposed surface water drainage for the Site and assesses the potential impacts of the Proposed Development on surface water drainage;
- Section 5 outlines the mitigation measures used to manage the overall level of flood risk;
- Section 6 details the Sequential and Exception Tests; and
- Section 7 presents a summary and conclusions

2.0 LOCATION & DEVELOPMENT DESCRIPTION

2.1 Site Location

The Site is located at 4 Smith Street, Rochdale, OL16 1TU (see Figure 1). The National Grid Reference (NGR) of the Site is 389794, 413394.

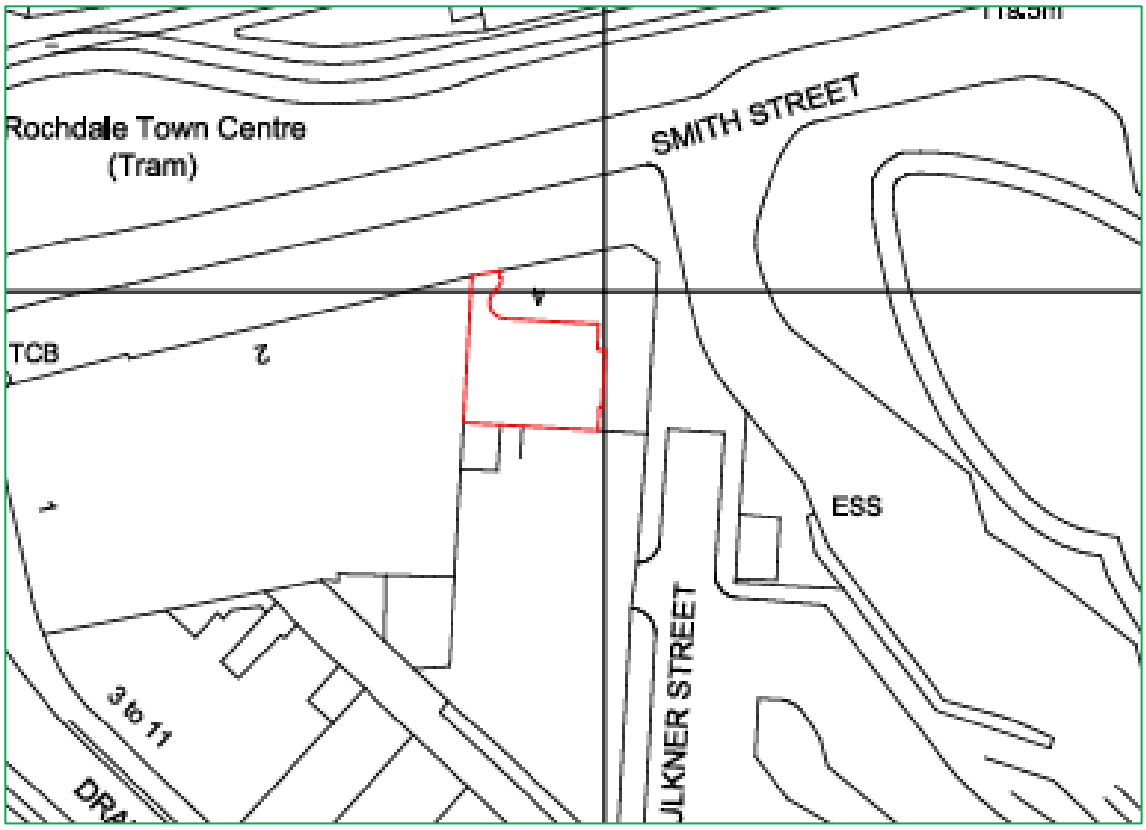

Figure 1 - Site Location

2.2 Existing Development

The existing Site consists of ground floor offices (see Appendix 1).

2.3 Proposed Development

The Proposed Development is for the change of use from the existing offices to a one bedroom residential apartment on the ground floor (see Appendix 1). Further details with regard to the Proposed Development can be found in the accompanying information submitted with the planning application.

2.4 Ground Levels

The Site is relatively flat with ground levels of approximately 121.39 metres Above Ordnance Datum (mAOD).

2.5 Catchment Hydrology

The River Roch is culverted to the north of the Site and is also located approximately 70m to the east of the Site and 120m to the west of the Site. The River Spadden, which is a tributary of the River Roch, discharges into the River Roch approximately 755m to the west of the Site. The Rochdale Canal is located approximately 1.18km to the south of the Site.

2.6 Ground Conditions

The British Geological Survey (BGS) map[3] shows that the bedrock deposits at the Site consist of the Pennine Lower Coal Measures Formation – mudstone, siltstone and sandstone. Sedimentary bedrock formed between 319 and 318 million years ago during the Carboniferous period. The superficial deposits consist of Alluvium – clay, silt, sand and gravel. Sedimentary superficial deposit formed between 11.80 thousand years ago and the present during the Quaternary period.

Information from the National Soil Resources Institute[4] details the Site area as being situated on loamy and clayey floodplain soils with naturally high groundwater.

[3] https://mapapps2.bgs.ac.uk/geoindex/home.html?_ga=2.14476159.932338379.1655890995-1831306757.1655472887
[4] http://www.landis.org.uk/soilscapes/

3.0 FLOOD RISK

3.1 Sources of Flooding

All sources of flooding have been considered, these are; fluvial (river) flooding, tidal (coastal) flooding, groundwater flooding, surface water (pluvial) flooding, sewer flooding and flooding from artificial drainage systems/infrastructure failure.

3.2 Environment Agency

Information regarding the current flood risk at the application Site and local flood defences has been obtained from the Environment Agency (see Appendix 2).

3.3 Climate Change

Projections of future climate change, in the UK, indicate more frequent, short-duration, high intensity rainfall and more frequent periods of long duration rainfall. Guidance included within the NPPF recommends that the effects of climate change are incorporated into FRA's. Recommended precautionary sensitivity ranges for peak rainfall intensities and peak river flows are outlined in the flood risk assessments: climate change allowances guidance[5]. Table 1 shows the peak river flow allowances by river management catchment.

The flood risk assessments: climate change allowances guidance recommends that for 'more vulnerable' uses the central allowances are used to assess climate change throughout the lifetime of the development which is 100 years. Therefore, the fluvial design event for the Site is the 1 in 100 year (+35%) event.

Table 1 - Peak River Flow Allowances by River Catchment

River Catchment	Allowance Category	2020s	2050s	2080s
Irwell Management Catchment	Upper	+24%	+43%	+75%
	Higher	+15%	+26%	+46%
	Central	+12%	+19%	+35%

3.4 Environment Agency Flood Zones

A review of the Environment Agency's Flood Zones indicates that the Site is located within Flood Zone 3 and therefore has a 'high probability' of flooding as shown in Figure 2, with a 1 in 100 or greater annual probability of river flooding (>1%) in any year.

The Site should not be designated as Flood Zone 3b 'Functional Floodplain'. The definition of Flood Zone 3b 'Functional Floodplain' as per the PPG is: *"This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise:*

- *land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or*
- *land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding).*

[5] https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#high-allowances

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."

The Site does not comprise land where water has to flow or be stored in times of flood. The Site does not perform a water conveyance flood route or a flood storage area. The Site does not provide a function of flood conveyance (i.e. free flow) or flood storage, either through natural processes, or by design (e.g. washlands and flood storage areas). The Site is already developed therefore, the Site is located within Flood Zone 3a.

The Flood Zones are the current best information on the extent of the extremes of flooding from rivers or the sea that would occur without the presence of flood defences, because these can be breached, overtopped and may not be in existence for the lifetime of the development. They show the worst case scenario. The Environment Agency Flood Zones and acceptable development types are explained in Table 2. Table 2 shows that some development types are generally acceptable in Flood Zone 3a.

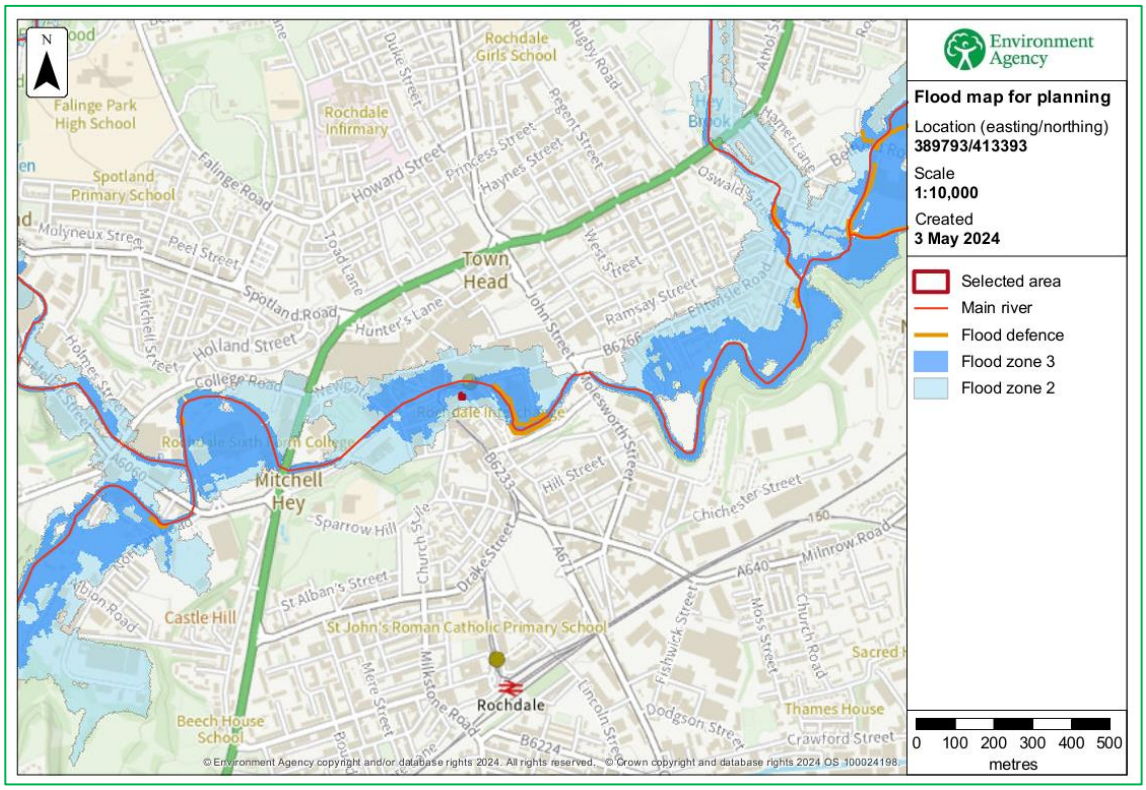

Figure 2 - Environment Agency Flood Zones

Table 2 - Environment Agency Flood Zones and Appropriate Land Use

Flood Zone	Probability	Explanation	Appropriate Land Use
Zone 1	Low	Less than a 1 in 1000 annual probability of river or sea flooding in any year (<0.1%)	All development types generally acceptable
Zone 2	Medium	Between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% 0.1%) in any year	Most development type are generally acceptable

Zone 3a	High	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	Some development types not acceptable
Zone 3b	'Functional Floodplain'	This zone comprises land where water from rivers or the sea has to flow or be stored in times of flood. The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. Functional floodplain will normally comprise: • land having a 3.3% or greater annual probability of flooding, with any existing flood risk management infrastructure operating effectively; or • land that is designed to flood (such as a flood attenuation scheme), even if it would only flood in more extreme events (such as 0.1% annual probability of flooding). 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)	Some development types not acceptable

3.5 Flood Vulnerability

In the PPG appropriate uses have been identified for the Flood Zones. Applying the Flood Risk Vulnerability Classification in the PPG, the proposed use is classified as 'more vulnerable'. Table 3 of this report and the PPG state that 'more vulnerable' uses are appropriate within Flood Zones 3a after the completion of a satisfactory FRA.

Table 3 - Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception test required	✓	✓
Zone 3a	Exception test required	✓	×	Exception test required	✓
Zone 3b 'Functional Floodplain'	Exception test required	✓	×	×	×

Key: *✓: Development is appropriate, ×: Development should not be permitted.*

3.6 Historic Flooding

Environment Agency data shows that the Site has not historically flooded (see Figure 3). There are no other records of anecdotal information of flooding at the Site including within the British Hydrological Society "Chronology of British Hydrological Events". No other historical records of flooding for the Site have been recorded. It can therefore be concluded that the Site has not flooded in the recent past.

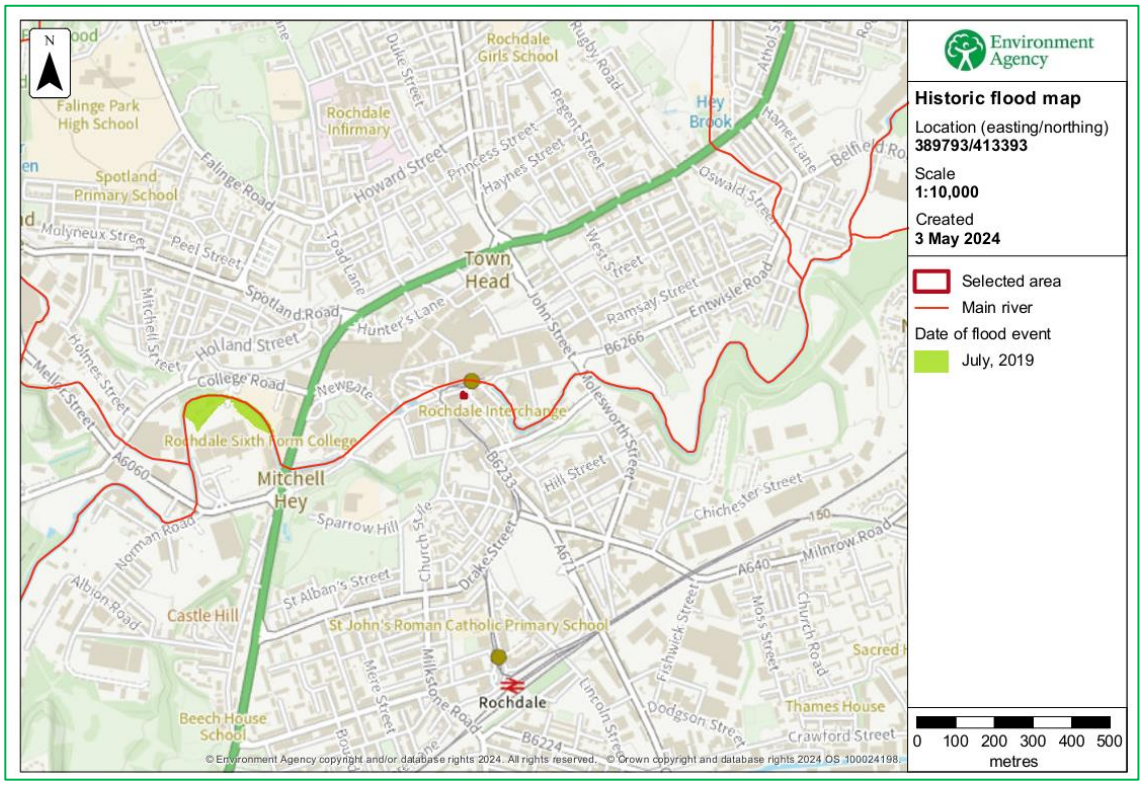

Figure 3 - Environment Agency Historic Flood Outline

3.7 Existing and Planned Flood Defence Measures

The Environment Agency data shows that there are flood defence measures within the vicinity of the Site which have a 1 in 100 year Standard of Protection (SoP) (see Table 4 and Figure 4). Further property level protection measures will be used to protect the Site from flooding these are discussed in Section 5.0.

Table 4 - Flood Defences

Label	Asset ID	Asset Type	Standard of Protection (years)	Current Condition	Downstream actual Crest Level (mAOD)	Upstream actual Crest Level (mAOD)
5	104220	Engineered High Ground	100	Good	119.97	119.60
6	62723	Engineered High Ground	100	Good	118.79	119.55
7	90290	Engineered High Ground	100		120.84	120.79
9	67666	Engineered High Ground	100	Fair	119.61	120.89
10	156206	Engineered High Ground	100	Fair	118.34	118.88

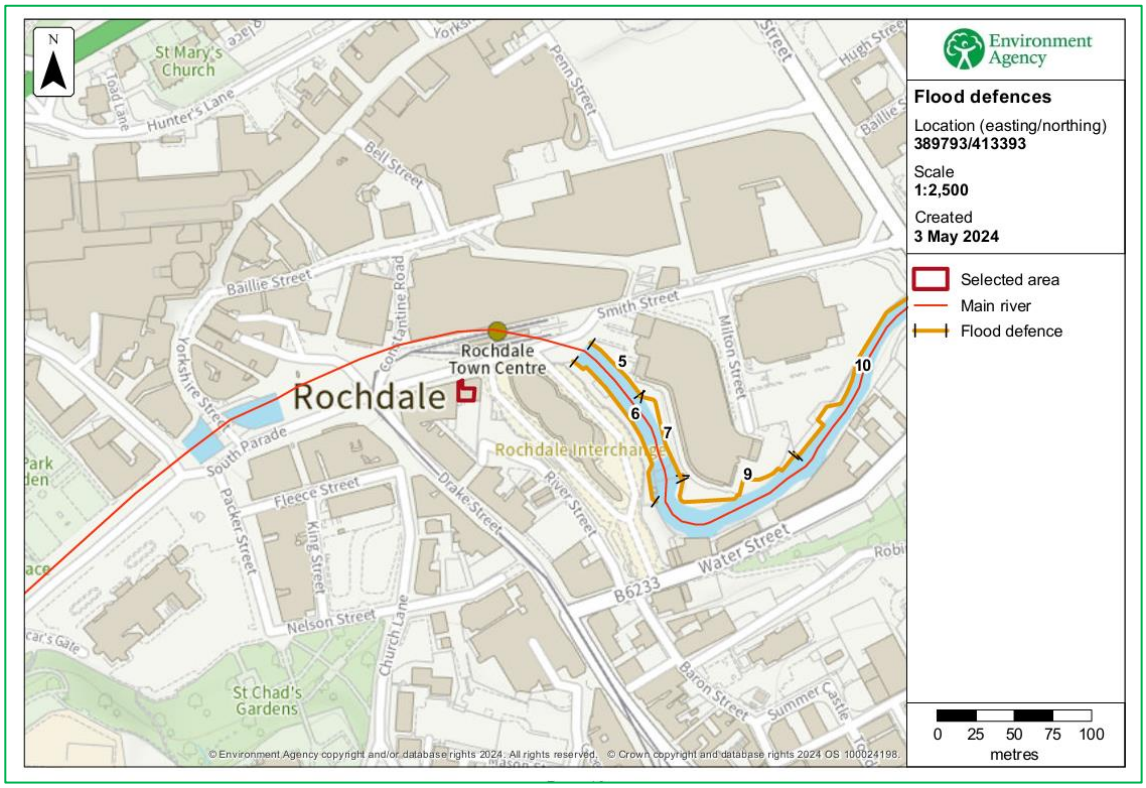

Figure 4 - Environment Agency Flood Defences Map

3.8 Fluvial (River) Flooding

The primary, but unlikely, flood risk posed to the Site is from fluvial flooding from the River Roch.

Actual Defended Scenario

Flood defence measures provide a SoP of 1 in 100 years against fluvial flooding and reduce the flood risk to the Site. Figure 5 shows the model node locations and Table 5 shows the defended Environment Agency floodplain water levels for the Site. The modelled water levels have been compared to the ground level of the Site and areas within the vicinity of the Site to assess the flood risk at the Site in detail. Figures 6 and 7 show the Environment Agency defended modelled flood outlines.

The Environment Agency data shows the Site will not be inundated with floodwater for all events up to and including the defended 1 in 100 year event. The Site will be flood free during the defended 1 in 100 year event.

Water levels have been modelled at 121.64mAOD during the 1 in 100 year (+35%) event and 122.03mAOD during the 1 in 100 year (+70%) event. The Site ground level is approximately 121.39mAOD. Therefore, the Site may be inundated with floodwater during the defended 1 in 100 year (+35%) event, to a depth of 0.25m and during the defended 1 in 100 (+70%) year event, to a depth of 0.64m.

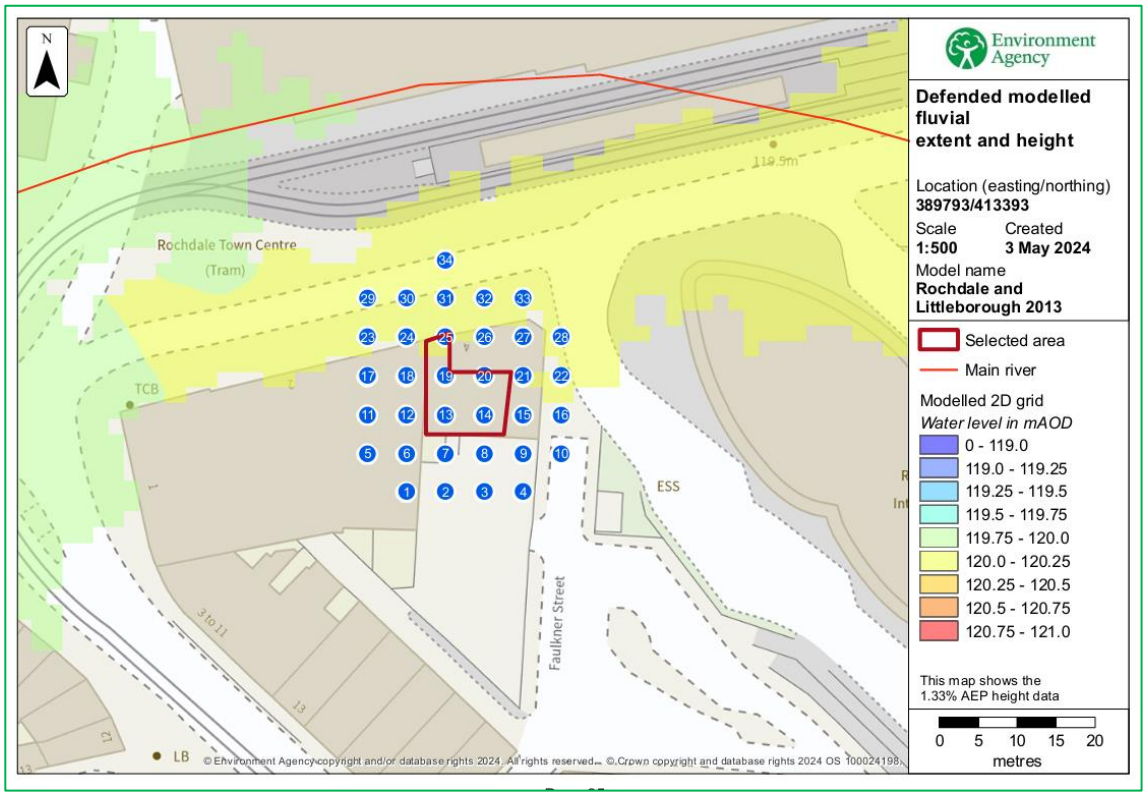

Figure 5 - Environment Agency Modelled Nodes Location Map

Table 5 - Environment Agency Defended Modelled Water Levels (mAOD)

Node Label	Easting	Northing	Return Period (years)							
			20	50	75	100	100 (+35%)	100 (+70%)	200	1000
13	389791	413391	No Data	No Data	No Data	No Data	121.64	122.03	No Data	No Data
14	389796	413391	No Data	No Data	No Data	No Data	121.64	122.04	No Data	No Data
19	389791	413396	No Data	No Data	No Data	No Data	121.64	122.03	No Data	No Data
20	389796	413396	No Data	No Data	No Data	No Data	121.64	122.04	No Data	No Data
25	389791	413401	No Data	No Data	120.03	No Data	121.64	122.03	No Data	No Data

*Cells which contain text 'No Data' for a scenario show that return period has been modelled but there is no flood risk for that return period for that location.

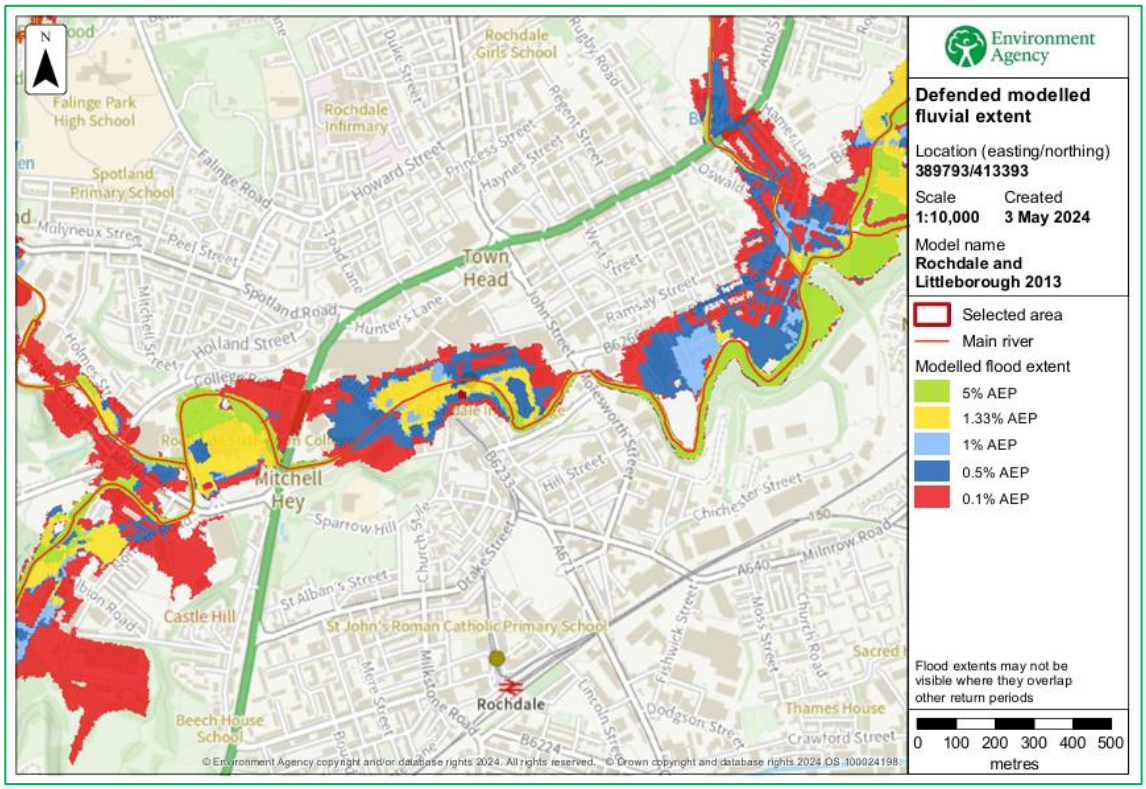

Figure 6 - Environment Agency Defended Modelled Flood Outlines

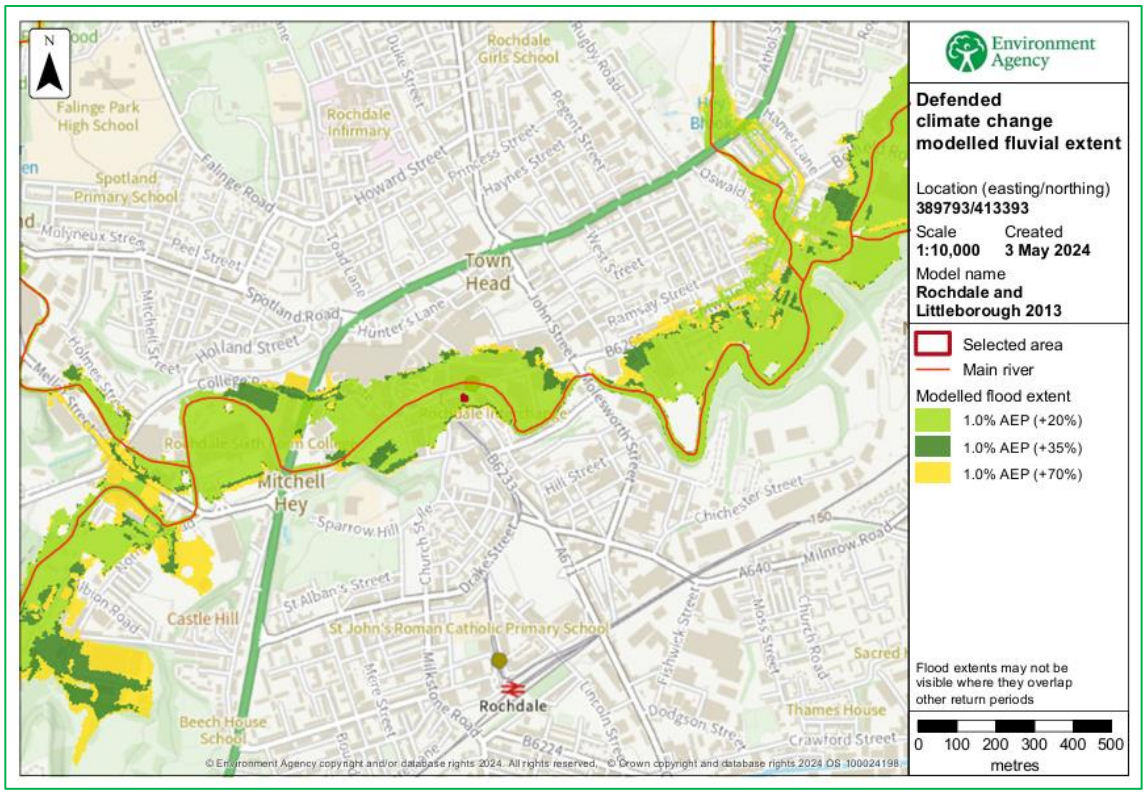

Figure 7 - Environment Agency Defended Climate Change Modelled Flood Outlines

Residual Undefended Scenario

Considerable investment has been made in the provision of the flood defences to protect the Site from fluvial flooding. However, the flood defences can only protect up to a point, they may malfunction, can be breached and have a finite structure life. Therefore, there is a residual risk of fluvial flooding. The condition of the defences is good to fair therefore; it is unlikely that a breach in the flood defences would occur.

If the flood defences were not there, the area would be flooded. However, an area of land may benefit from the presence of flood defences even if the flood defences are overtopped, the presence of the flood defences means that the floodwater does not extend as far as it would if the flood defences were not there.

Table 6 shows the undefended Environment Agency floodplain water levels for the Site. The modelled water levels have been compared to the ground level of the Site and areas within the vicinity of the Site to assess the flood risk at the Site in detail. Figures 8 and 9 show the Environment Agency undefended modelled flood outlines.

The Environment Agency data shows the Site will not be inundated with floodwater for all events up to and including the undefended 1 in 100 year event. The Site will be flood free during the undefended 1 in 100 year event.

Water levels have been modelled at 121.60mAOD during the 1 in 100 year (+35%) event and 121.89mAOD during the 1 in 100 year (+70%) event. The Site ground level is approximately 121.39mAOD. Therefore, the Site may be inundated with floodwater during the defended 1 in 100 year (+35%) event, to a depth of 0.21m and during the defended 1 in 100 (+70%) year event, to a depth of 0.50m.

Table 6 - Environment Agency Undefended Modelled Water Levels (mAOD)

Node Label	Easting	Northing	Return Period (years)							
			20	50	75	100	100 (+35%)	100 (+70%)	200	1000
13	389791	413391	No Data	No Data	No Data	No Data	121.60	121.89	No Data	No Data
14	389796	413391	No Data	No Data	No Data	No Data	121.60	121.89	No Data	No Data
19	389791	413396	No Data	No Data	No Data	No Data	121.60	121.89	No Data	No Data
20	389796	413396	No Data	No Data	No Data	No Data	121.60	121.89	No Data	No Data
25	389791	413401	No Data	No Data	120.08	No Data	121.60	121.89	No Data	No Data

*Cells which contain text 'No Data' for a scenario show that return period has been modelled but there is no flood risk for that return period for that location.

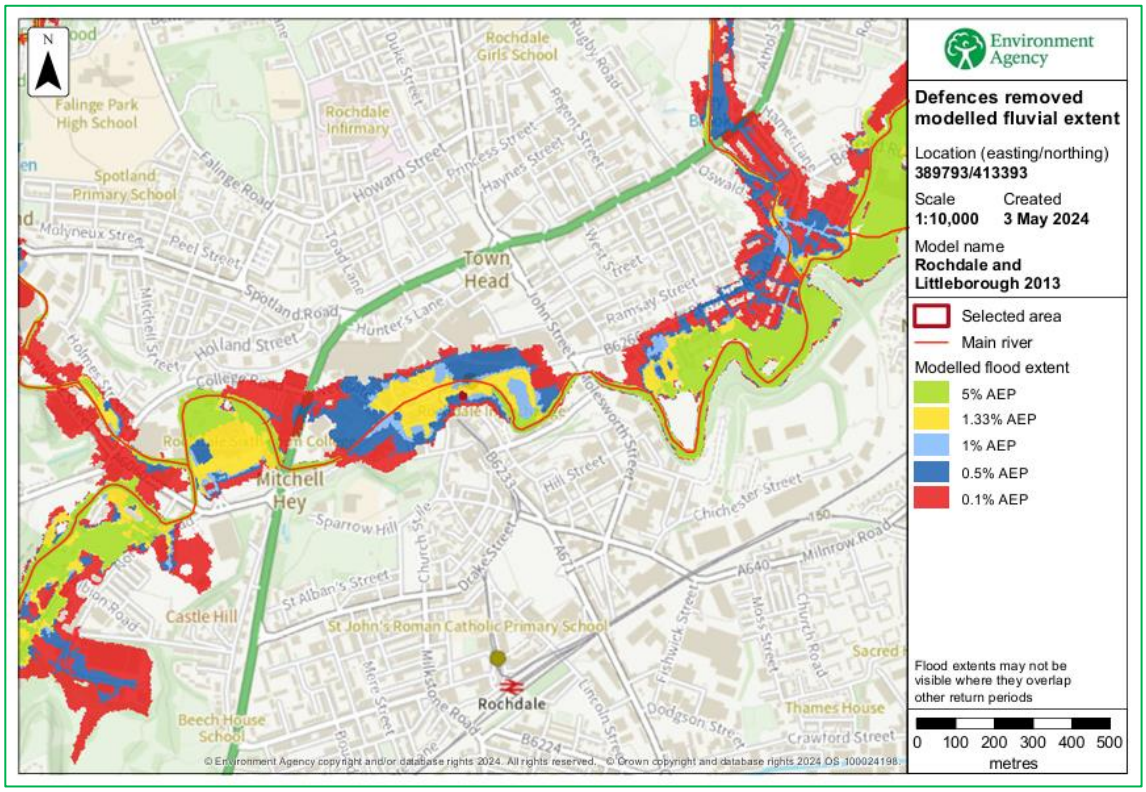

Figure 8 - Environment Agency Undefended Modelled Flood Outlines

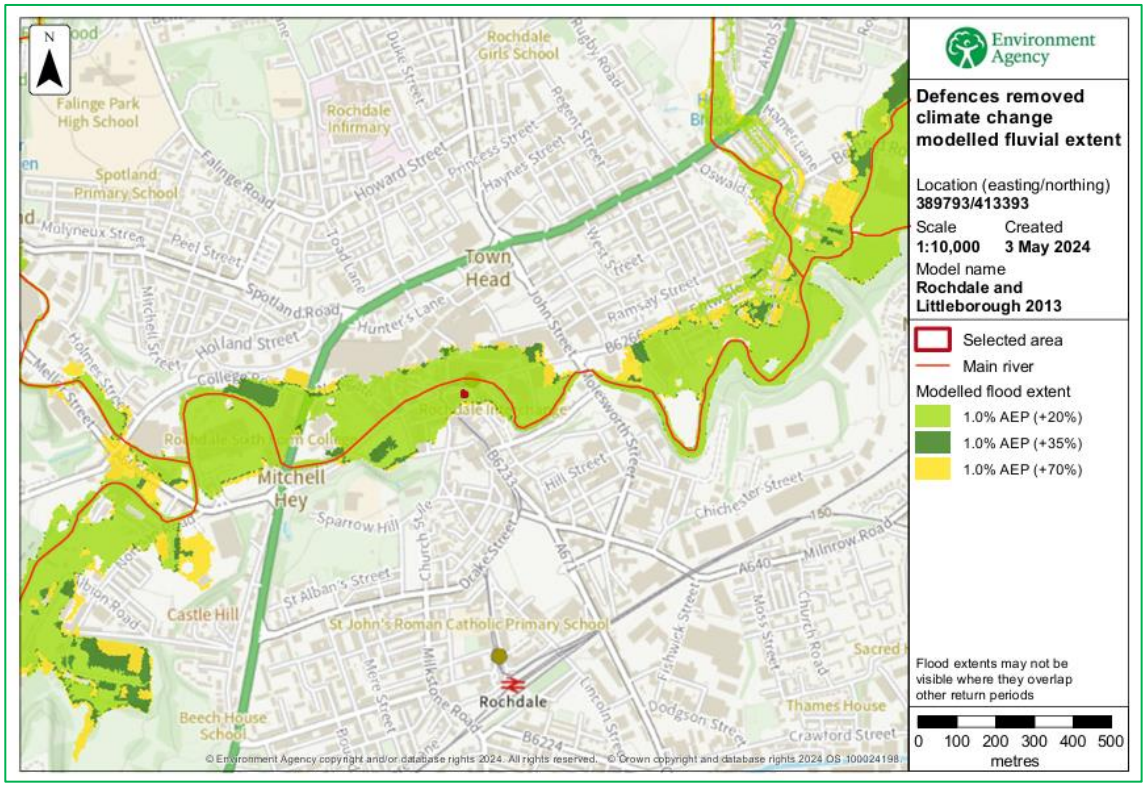

Figure 9 - Environment Agency Undefended Climate Change Modelled Flood Outlines

The flooding will only inundate the Site to a relatively low water depth and water velocity, will only last a short period of time, in very extreme cases. The Site is one of the last places in the area to flood and remains flood free when other areas close by are flooded. The Site is at such a ground level that it would only flood in the most extreme flood events; the Site will remain flood free for the vast majority of flood events during the lifetime of the Proposed Development.

The mechanism for flooding is generally prolonged episodes of rainfall, which affords good time for flood warnings to be issued. The likelihood of a rapid water level rise and possible rapid inundation of urban areas posing a risk to life is considered to be minimal with a forewarning of two (2) days of a pending flood event. The site is located within a low risk area where the onset of flooding is very gradual (many hours) as per Flood Risk Assessment Guidance for New Development Phase 2, R&D Technical Report FD2320/TR2.

Given the scale and nature of the Proposed Development and the size and location of the fluvial flooding sources it has been concluded that fluvial flooding poses a minimal actual and residual flood risk to the site. Therefore, the risk of fluvial flooding is considered to be of medium significance. The risk from this source will be further mitigated by using a number of property level protection measures to manage and reduce the overall flood risk at the Site (see Section 5.0).

3.9 Tidal (Coastal) Flooding

The Site is not located within the vicinity of tidal flooding sources and the risk of tidal flooding is considered to be not significant.

3.10 Groundwater Flooding

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

Groundwater flooding tends to occur sporadically in both location and time. When groundwater flooding does occur, it tends to mostly affect low-lying areas, below surface infrastructure and buildings (for example, tunnels, basements and car parks) underlain by permeable rocks (aquifers). Site ground conditions suggest a low potential for groundwater flooding. Environment Agency data shows that flooding from groundwater is unlikely in this area. The risk of flooding from groundwater flooding is considered to be not significant.

3.11 Surface Water (Pluvial) Flooding

The Site is not situated near to large areas of poor permeability or areas with the geology and/or topography which may result in surface water flooding. The Site surroundings are relatively flat and there are no large catchments that would tend to generate surface water runoff towards the Site. Surface water flow flooding tends to occur sporadically in both location and time such surface water flows would tend to be confined to the streets around the Proposed Development.

The Environment Agency Surface Water flood map shows that the Site has a medium to high risk of surface water flooding (see Figure 10) with a chance of flooding of 1 in 100 (1%) to 1 in 30 (3.3%) years. The depth of water is shown to be less than 300mm during the 1 in 100 year event.

Given the scale and nature of the Proposed Development and the size and location of the surface water flooding sources it has been concluded that surface water flooding poses a low flood risk to the Site and the risk of surface water flooding is considered to be low significance. The risk from this source will be further mitigated by using a number of property level protection measures to manage and reduce the overall flood risk at the Site (see Section 5.0).

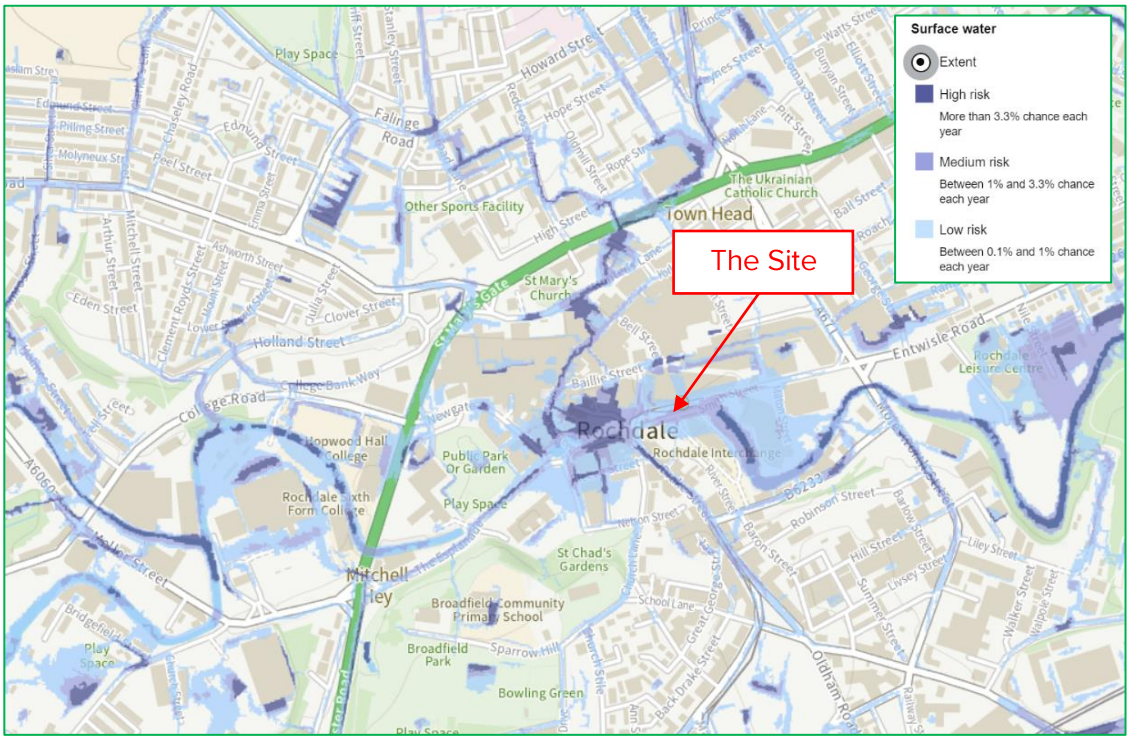

Figure 10 - Environment Agency Surface Water Flood Map

3.12 Sewer Flooding

Sewer flooding occurs when urban drainage networks become overwhelmed and maximum capacity is reached. This can occur if there is a blockage in the network causing water to back up behind it or if the sheer volume of water draining into the system is too great to be handled. Sewer flooding tends to occur sporadically in both location and time such flood flows would tend to be confined to the streets around the development. Flood flows could also be generated by burst water mains, but these would tend to be of a restricted and much lower volume than weather generated events and so can be discounted for the purposes of this assessment.

There are existing sewers located within the vicinity of the Site. The provision of adequate level difference between the ground floors and adjacent ground level would reduce the annual probability of damage to property from this source to 1 in 100 years or less. Therefore, the risk of flooding from sewer flooding is considered to be not significant.

3.13 Flooding from Artificial Drainage Systems/Infrastructure Failure

Reservoirs are located within the vicinity of the Site. The Environment Agency flood map shows that the Site is at risk of reservoir flooding (see Figure 11). This map shows the largest area that might be flooded if a reservoir were to fail and release the water it holds. The Environment Agency Reservoir flood map has been prepared for emergency planning purposes and for this reason they reflect a worst-case scenario. Since this is a prediction of a worst-case scenario, it is unlikely that any actual flood would be this large.

Reservoir flooding is extremely unlikely; reservoirs in the UK have a very good safety record. There has been no loss of life in the UK from reservoir flooding since 1925. Since then reservoir safety legislation has been introduced to make sure reservoirs are well maintained. The hazard is well managed through effective legislation and it is unlikely that the impact zone downstream of these

reservoirs should not allow the Proposed Development. The risk of flooding from artificial drainage systems/infrastructure failure is considered to be not significant.

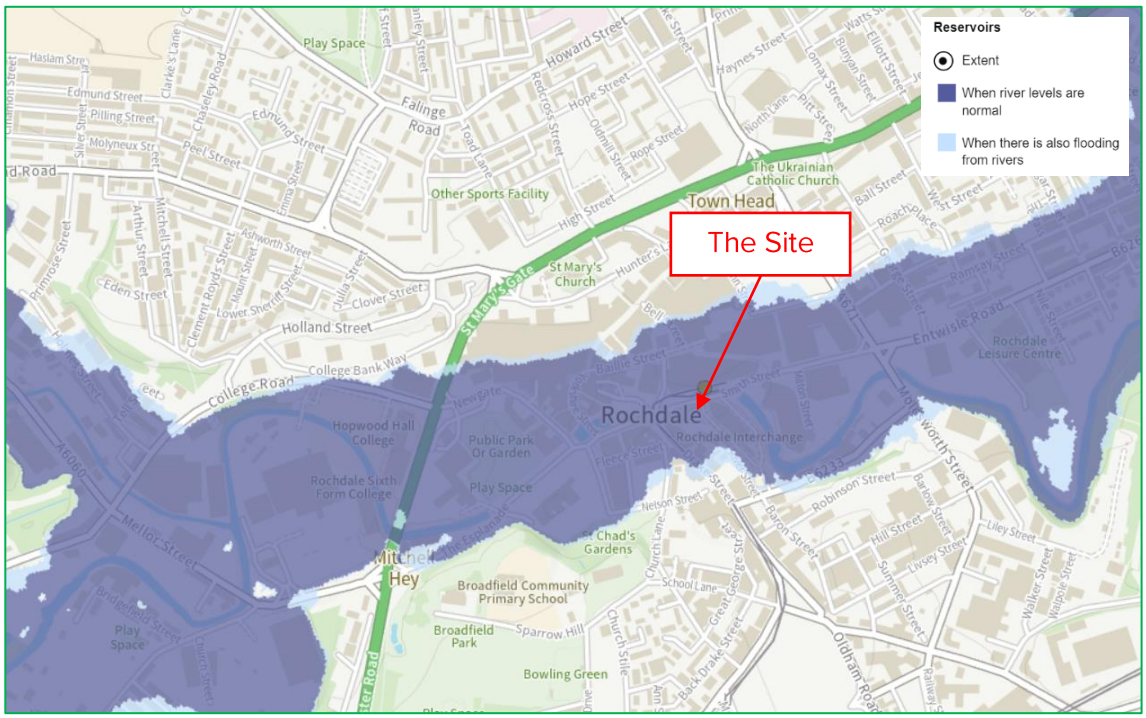

Figure 11 - Environment Agency Reservoir Flood Map

3.14 The Effect of the Development on Flood Risk

The building is existing and no land raising will occur within the Site, therefore the Proposed Development will have no impact on flood risk and the overall direction of the movement of water will be maintained within the developed Site and surrounding area. There will no net loss in flood storage capacity. The conveyance routes (flow paths) will not be blocked or obstructed.

There will be no detriment to the flood storage capacity of the Site. There will be no increase in the flood water levels due to the Proposed Development. There will be no loss in flood storage capacity and no change in the on-site and off-site flood risk.

3.15 Summary of Site Specific Flood Risk

A summary of the sources of flooding and a review of the risk posed by each source at the Site is shown in Table 7.

The Site is unlikely to flood except in extreme conditions. The primary, but unlikely, flood risk to the Site is from fluvial flooding from the River Roch. The Site is located within Flood Zone 3a and therefore has a 'high probability' of flooding, with a 1 in 100 or greater annual probability of river flooding (>1%) in any year. The Environment Agency data shows that there are flood defence measures within the vicinity of the Site which have a 1 in 100 year SoP. Furthermore, the Site has no history of flooding. The proposed use is classified as 'more vulnerable'. 'More vulnerable' uses are appropriate within Flood Zones 3a after the completion of a satisfactory FRA.

Actual Defended Scenario

Flood defence measures provide a SoP of 1 in 100 years against fluvial flooding and reduce the flood risk to the Site. The Environment Agency data shows the Site will not be inundated with

floodwater for all events up to and including the defended 1 in 100 year event. The Site will be flood free during the defended 1 in 100 year event.

Water levels have been modelled at 121.64mAOD during the 1 in 100 year (+35%) event and 122.03mAOD during the 1 in 100 year (+70%) event. The Site ground level is approximately 121.39mAOD. Therefore, the Site may be inundated with floodwater during the defended 1 in 100 year (+35%) event, to a depth of 0.25m and during the defended 1 in 100 (+70%) year event, to a depth of 0.64m.

Residual Undefended Scenario

Considerable investment has been made in the provision of the flood defences to protect the Site from fluvial flooding. However, the flood defences can only protect up to a point, they may malfunction, can be breached and have a finite structure life. Therefore, there is a residual risk of fluvial flooding. The condition of the defences is good to fair therefore; it is unlikely that a breach in the flood defences would occur.

If the flood defences were not there, the area would be flooded. However, an area of land may benefit from the presence of flood defences even if the flood defences are overtopped, the presence of the flood defences means that the floodwater does not extend as far as it would if the flood defences were not there.

The Environment Agency data shows the Site will not be inundated with floodwater for all events up to and including the undefended 1 in 100 year event. The Site will be flood free during the undefended 1 in 100 year event.

Water levels have been modelled at 121.60mAOD during the 1 in 100 year (+35%) event and 121.89mAOD during the 1 in 100 year (+70%) event. The Site ground level is approximately 121.39mAOD. Therefore, the Site may be inundated with floodwater during the defended 1 in 100 year (+35%) event, to a depth of 0.21m and during the defended 1 in 100 (+70%) year event, to a depth of 0.50m.

Given the scale and nature of the Proposed Development and the size and location of the fluvial flooding sources it has been concluded that fluvial flooding poses a minimal actual and residual flood risk to the site. Therefore, the risk of fluvial flooding is considered to be of medium significance. A secondary flooding source has been identified which may pose a low significant risk to the Site. This is:

- Surface Water Flooding

The flood risk at the Site will be further mitigated by using a number of property level protection measures to manage and reduce the overall flood risk at the Site.

The building is existing and no land raising will occur within the Site, therefore the Proposed Development will have no impact on flood risk and the overall direction of the movement of water will be maintained within the developed Site and surrounding area. There will no net loss in flood storage capacity. The conveyance routes (flow paths) will not be blocked or obstructed.

There will be no detriment to the flood storage capacity of the Site. There will be no increase in the flood water levels due to the Proposed Development. There will be no loss in flood storage capacity and no change in the on-site and off-site flood risk.

Table 7 - Risk Posed by Flooding Sources

Sources of Flooding	Potential Flood Risk	Potential Source	Probability/Significance
Fluvial Flooding	Yes	River Roch	Medium
Tidal Flooding	No	None Reported	None
Groundwater Flooding	No	None Reported	None
Surface Water Flooding	Yes	Low Spots/Poor Permeability	Low
Sewer Flooding	No	None Reported	None
Flooding from Artificial Drainage Systems/Infrastructure Failure	Yes	Reservoirs	None

4.0 SURFACE WATER DRAINAGE

4.1 Surface Water Management Overview

It is recognised that consideration of flood issues should not be confined to the floodplain. The alteration of natural surface water flow patterns through developments can lead to problems elsewhere in the catchment, particularly flooding downstream. For example, replacing vegetated areas with roofs, roads and other paved areas can increase both the total and the peak flow of surface water runoff from the Site. Changes of land use on previously developed land can also have significant downstream impacts where the existing drainage system may not have sufficient capacity for the additional drainage.

An assessment of the surface water runoff rates has been undertaken, in order to determine the surface water options and attenuation requirements for the Site. The assessment considers the impact of the proposals compared to current conditions. Therefore, the surface water attenuation requirement for the developed Site can be determined and reviewed against existing arrangements.

The surface water drainage arrangements for any development site should be such that the volumes and peak flow rates of surface water leaving a developed site are no greater than the rates prior to the Proposed Development unless specific off-site arrangements are made and result in the same net effect.

4.2 Surface Water Runoff Rates / Volumes

The Proposed Development will not alter the impermeable areas of the Site. There will be no increase in surface water runoff or exacerbation of off-site risk as a result of the development. It is understood that the existing drainage infrastructure at the Site efficiently and effectively manages surface water runoff generated at the Site.

5.0 RISK MANAGEMENT

5.1 Introduction

The flood risk at this location is considered suitable for the Proposed Development within the NPPF. In this flood 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 use of flood mitigation measures.

The flooding sources will be mitigated on the Site by using a number of techniques, and mitigation strategies to manage and reduce the overall flood risk at the Site. This will ensure the development will be safe and there is:

- Minimal risk to life;
- Minimal disruption to people living and working in the area;
- Minimal potential damage to property;
- Minimal impact of the Proposed Development on flood risk generally; and;
- Minimal disruption to natural heritage.

The flood risk at the Site will be reduced by mitigation measures; these are discussed in more detail below.

5.2 Finished Floor Levels

The finished floor levels will be set at the existing finished floor levels which are raised slightly above the external ground levels. It is recognised however that owing to limited headroom constraints, massing, planning policy and Building Regulations it is considered impractical to raise the finished floor levels further. Therefore, in order to mitigate against this, it is recommended that the occupants of the Site are sign up to receive flood warnings from the Environment Agency and a Flood Plan to a safe area away from the building during times of flood is developed.

A combination of resistance (proofing) and resilience measures will be included to provide further protection. This is discussed below.

5.3 Flood Resilience and Resistance

The development of the layout should always consider that the Site is potentially at risk from an extreme event and as such the implementation of flood resilience and resistance methods should be assessed.

To make the building more resistant to seepage the following measures will be incorporated. Sealant will be used around external doors and windows. All windows are located above the ground levels. All external doors and windows will be constructed from robust materials. The walls of the buildings are thick.

To improve the buildings resilience to flooding the following measures will be incorporated. All electrical wiring, switches, sockets, socket outlets, electrical, and gas meters etc. will be located a minimum of 450mm above the finished floor levels.

5.4 Flood Warning and Evacuation

The Site is located in a flood risk area therefore; the Site will participate in the Environment Agency flood warning telephone service. The Site will register contact details with the Environment Agency' Flood Warnings Service (Floodline 0845 988 1188) in order to receive Flood Warnings. The Environment Agency operate a free flood warning service providing alerts by phone, text or email when flooding is anticipated providing an opportunity for home owners to take necessary precautions, giving enough time for the building to be safely evacuated and mitigation measures to be put in place.

All occupants/visitors of the Site will be made aware of the Environment Agency Floodline telephone number (Call Floodline on 0345 988 1188 or 0845 988 1188 to get more information) and the three Flood Warning Codes and their meaning. The owner of the Site will carry out the role of Flood Warden for the Site and ensure they have an understanding of the flood mechanisms of the Site and will ensure that the safety of the occupants and visitors will not be compromised.

The Environment Agency uses three Flood Warnings Codes. They can be issued in any order, usually ending with an 'all clear'. They are issued by the Environment Agency through their website and Floodline Warning Service. The flood warning will be passed onto the occupier/visitors of the Site verbally, by telephone and/or in person. It will be ensured that everyone receives the flood warnings when required.

5.5 Flood Plan

A Flood Plan outlining the precautions and actions you should take when a flood event is anticipated to help reduce the impact and damage flooding may cause will be developed. Sensible precautions would include raising electrical items, moving valuable items off the ground or where possible moving them to a higher floor, rolling up carpets and rugs and turning off utilities. In addition, consider what actions you would take should the property need to be evacuated including access and egress routes and preparing a flood kit in advance containing warm clothing, medication, a torch, food and wellingtons.

The Flood Plan is a 'living' document and therefore should be periodically reviewed and updated to provide advice and guidance to occupants in the event of an extreme flood. The Flood Plan will therefore reduce the vulnerability of the occupants to flooding and makes them aware of the mechanisms of flooding at the Site.

Residual Risk

If flooding starts to affect the Site without any pre-warning i.e. in real time (e.g. through a failure of the flood warning delivery) the following actions will be taken:

- Occupants and visitors should consider evacuating the Site.
- If flood levels continue to rise, occupants and visitors are advised to evacuate before safe access is lost. Occupants and visitors should monitor the flood progression and evacuate.

The Flood Warden will monitor flood levels and keep occupants and visitors informed and will decide whether to initiate the Flood Plan. If required a 'safe haven' can also be maintained and may be required in very extreme events if a flood warning has not been received.

5.6 Safe Access and Egress Route

The NPPF requires that, where required, safe access and escape is available to/from new developments in flood risk areas. Access routes should be such that occupants can safely access

and exit their houses in design flood conditions. These routes must also provide the emergency services with access to the development during a flood event and enable flood defence authorities to carry out any necessary duties during the period of flood.

The Site is at such a ground level that it would only flood in the most extreme flood event. The Site is located where the onset of flooding is very gradual (many hours) as per Flood Risk Assessment Guidance for New Development Phase 2, R&D Technical Report FD2320/TR2. The ground levels rise to the north west of the Site with the water depths decreasing rapidly Therefore, a safe access and egress route, including emergency access can be maintained for vehicles and/or by foot.

Facilities such as community centres, shops etc. are located to the south of the Site. There may also be large areas than those shown in Figure 2 that are flood free located nearer and within the vicinity of the Site. In the event of a flood warning, vital belongings, including waterproof clothing, necessary medication and essentials for infants and children will be collected. It should be ensured that all occupiers and visitors to the Site are accounted for, and then exit the Site using the routes shown in Figure 12.

The Safe Access and Egress Route shown in Figure 12 indicates the exit routes that all people (i.e. occupants and visitors) on Site should follow once a flood warning has been received. People should make their way to areas outside of the flood zone. Therefore, safe access and egress can be maintained in accordance with the NPPF and Environment Agency guidance.

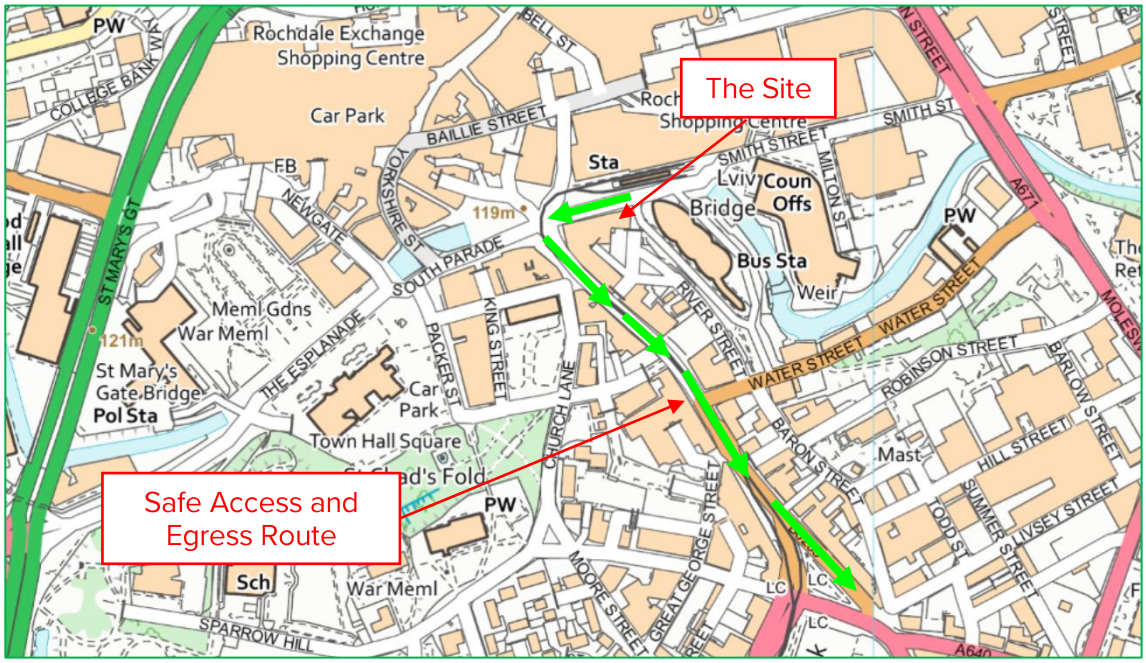

Figure 12 - Safe Access and Egress Route

5.7 Flooding Consequences

The mitigation measures detailed above show that the flood risk can be effectively managed and therefore the consequences of flooding are acceptable. The Site is unlikely to flood except in extreme conditions. This takes into account the property level protection measures.

6.0 SEQUENTIAL APPROACH

6.1 Sequential / Exception Tests

The risk-based Sequential Test in accordance with the NPPF aims to steer new development to areas at the lowest probability of flooding (i.e. Flood Zone 1). However, paragraph 174 of the NPPF confirms that: *'Applications for some minor development and changes of use[6] should not be subject to the Sequential or Exception Tests but should still meet the requirements for site-specific flood risk assessments'.*

The development proposals should therefore be considered by the LPA to satisfy the Sequential and Exception Tests as set out in the NPPF.

[6] This includes householder development, small non-residential extensions (with a footprint of less than 250m^2) and changes of use; except for changes of use to a caravan, camping or chalet site, or to a mobile home or park home site, where the sequential and exception tests should be applied as appropriate.

7.0 SUMMARY AND CONCLUSIONS

7.1 Introduction

This report presents a FRA in accordance with the NPPF for the Proposed Development at 4 Smith Street, Rochdale, OL16 1TU.

This FRA identifies and assesses the risks of all forms of flooding to and from the development and demonstrates how these flood risks will be managed so that the development remains safe throughout the lifetime, taking climate change into account.

7.2 Flood Risk

The Site is unlikely to flood except in extreme conditions. The primary, but unlikely, flood risk to the Site is from fluvial flooding from the River Roch. The Site is located within Flood Zone 3a and therefore has a 'high probability' of flooding, with a 1 in 100 or greater annual probability of river flooding (>1%) in any year. The Environment Agency data shows that there are flood defence measures within the vicinity of the Site which have a 1 in 100 year SoP. Furthermore, the Site has no history of flooding. The proposed use is classified as 'more vulnerable'. 'More vulnerable' uses are appropriate within Flood Zones 3a after the completion of a satisfactory FRA.

Actual Defended Scenario

Flood defence measures provide a SoP of 1 in 100 years against fluvial flooding and reduce the flood risk to the Site. The Environment Agency data shows the Site will not be inundated with floodwater for all events up to and including the defended 1 in 100 year event. The Site will be flood free during the defended 1 in 100 year event.

Water levels have been modelled at 121.64mAOD during the 1 in 100 year (+35%) event and 122.03mAOD during the 1 in 100 year (+70%) event. The Site ground level is approximately 121.39mAOD. Therefore, the Site may be inundated with floodwater during the defended 1 in 100 year (+35%) event, to a depth of 0.25m and during the defended 1 in 100 (+70%) year event, to a depth of 0.64m.

Residual Undefended Scenario

Considerable investment has been made in the provision of the flood defences to protect the Site from fluvial flooding. However, the flood defences can only protect up to a point, they may malfunction, can be breached and have a finite structure life. Therefore, there is a residual risk of fluvial flooding. The condition of the defences is good to fair therefore; it is unlikely that a breach in the flood defences would occur.

If the flood defences were not there, the area would be flooded. However, an area of land may benefit from the presence of flood defences even if the flood defences are overtopped, the presence of the flood defences means that the floodwater does not extend as far as it would if the flood defences were not there.

The Environment Agency data shows the Site will not be inundated with floodwater for all events up to and including the undefended 1 in 100 year event. The Site will be flood free during the undefended 1 in 100 year event.

Water levels have been modelled at 121.60mAOD during the 1 in 100 year (+35%) event and 121.89mAOD during the 1 in 100 year (+70%) event. The Site ground level is approximately 121.39mAOD. Therefore, the Site may be inundated with floodwater during the defended 1 in 100

year (+35%) event, to a depth of 0.21m and during the defended 1 in 100 (+70%) year event, to a depth of 0.50m.

Given the scale and nature of the Proposed Development and the size and location of the fluvial flooding sources it has been concluded that fluvial flooding poses a minimal actual and residual flood risk to the site. Therefore, the risk of fluvial flooding is considered to be of medium significance. A secondary flooding source has been identified which may pose a low significant risk to the Site. This is:

- Surface Water Flooding

The flood risk at the Site will be further mitigated by using a number of property level protection measures to manage and reduce the overall flood risk at the Site.

The building is existing and no land raising will occur within the Site, therefore the Proposed Development will have no impact on flood risk and the overall direction of the movement of water will be maintained within the developed Site and surrounding area. There will no net loss in flood storage capacity. The conveyance routes (flow paths) will not be blocked or obstructed.

There will be no detriment to the flood storage capacity of the Site. There will be no increase in the flood water levels due to the Proposed Development. There will be no loss in flood storage capacity and no change in the on-site and off-site flood risk.

7.3 Risk Management

The flood risk at the Site will be reduced by mitigation measures, discussed below.

Finished Floor Levels: The finished floor levels will be set at the existing finished floor levels which are raised slightly above the external ground levels. It is recognised however that owing to limited headroom constraints, massing, planning policy and Building Regulations it is considered impractical to raise the finished floor levels further. Therefore, in order to mitigate against this, it is recommended that the occupants of the Site are sign up to receive flood warnings from the Environment Agency and a Flood Plan to a safe area away from the building during times of flood is developed.

A combination of resistance (proofing) and resilience measures will be included to provide further protection. This is discussed below.

Flood Resilience and Resistance: To make the building more resistant to seepage the following measures will be incorporated. Sealant will be used around external doors and windows. All windows are located above the ground levels. All external doors and windows will be constructed from robust materials. The walls of the buildings are thick.

To improve the buildings resilience to flooding the following measures will be incorporated. All electrical wiring, switches, sockets, socket outlets, electrical, and gas meters etc. will be located a minimum of 450mm above the finished floor levels.

Flood Warning and Evacuation: The Site is located in a flood risk area therefore; the Site will participate in the Environment Agency flood warning telephone service. The Site will register contact details with the Environment Agency' Flood Warnings Service (Floodline 0845 988 1188) in order to receive Flood Warnings.

Flood Plan: A Flood Plan outlining the precautions and actions you should take when a flood event is anticipated to help reduce the impact and damage flooding may cause will be developed.

Safe Access and Egress Route: The Site is at such a ground level that it would only flood in the most extreme flood event. The Site is located where the onset of flooding is very gradual (many hours) as per Flood Risk Assessment Guidance for New Development Phase 2, R&D Technical Report FD2320/TR2. The ground levels rise to the south of the Site with the water depths decreasing rapidly. Therefore, a safe access and egress route, including emergency access can be maintained for vehicles and/or by foot.

Facilities such as community centres, shops etc. are located to the north west of the Site. The Safe Access and Egress Route indicates the exit routes that all people (i.e. occupants and visitors) on Site should follow once a flood warning has been received. People should make their way to areas outside of the flood zone. Therefore, safe access and egress can be maintained in accordance with the NPPF and Environment Agency guidance.

7.4 Conclusion

In conclusion, the Proposed Development, would be expected to remain dry in all but the most extreme conditions. Providing the recommendations made in this FRA are instigated, flood risk from all sources would be minimised, the consequences of flooding are acceptable and the development would be in accordance with the requirements of the NPPF.

This FRA demonstrates that the Proposed Development would be operated with minimal risk from flooding, would not increase flood risk elsewhere and is compliant with the requirements of the NPPF. The development should not therefore be precluded on the grounds of flood risk.

APPENDICES

APPENDIX 1 – Existing and Proposed Site Layout

DO NOT SCALE EXCEPT FOR PLANNING APPLICATION PURPOSES. USE FIGURED DIMENSIONS.
ANY DISCREPANCIES ARE TO BE REPORTED TO THIS OFFICE PRIOR TO THE CONTINUANCE OF WORKS.
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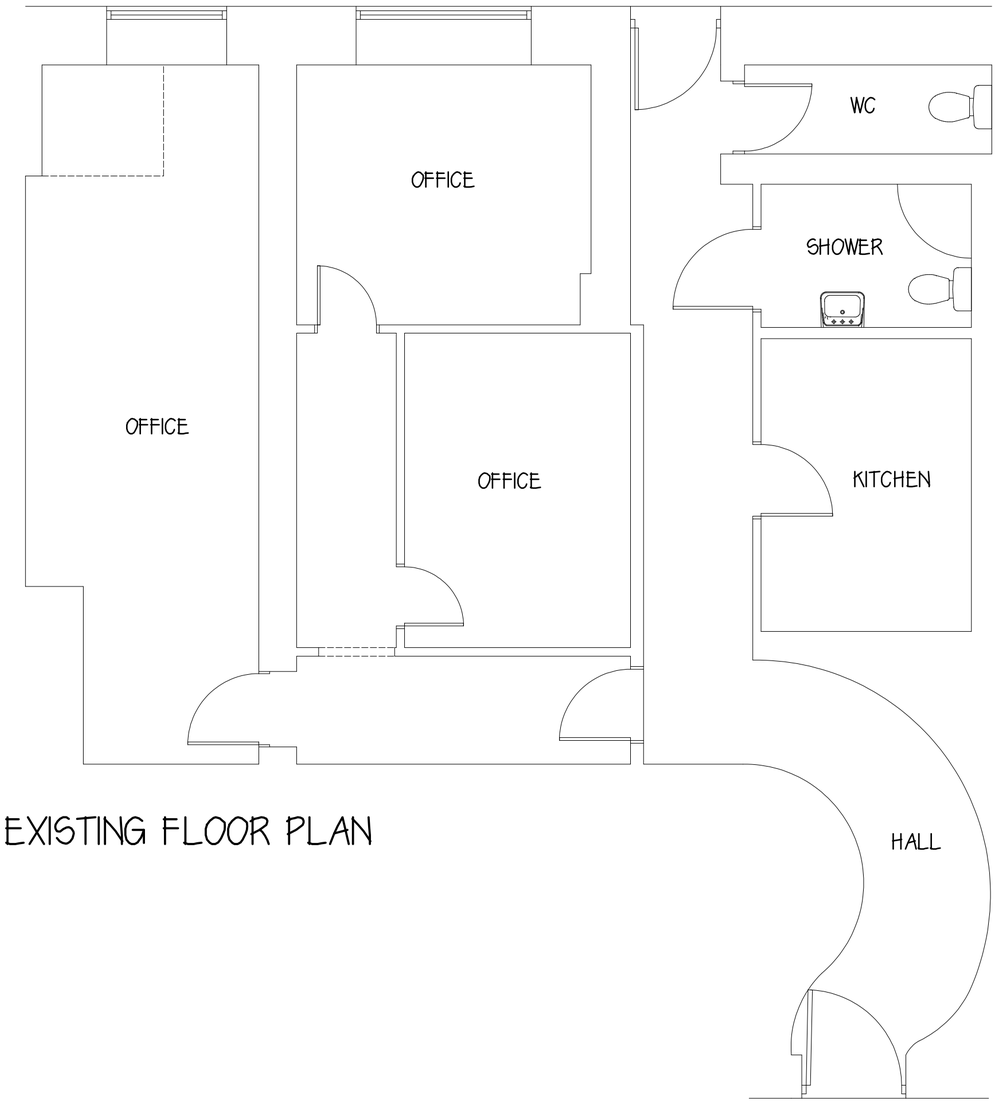
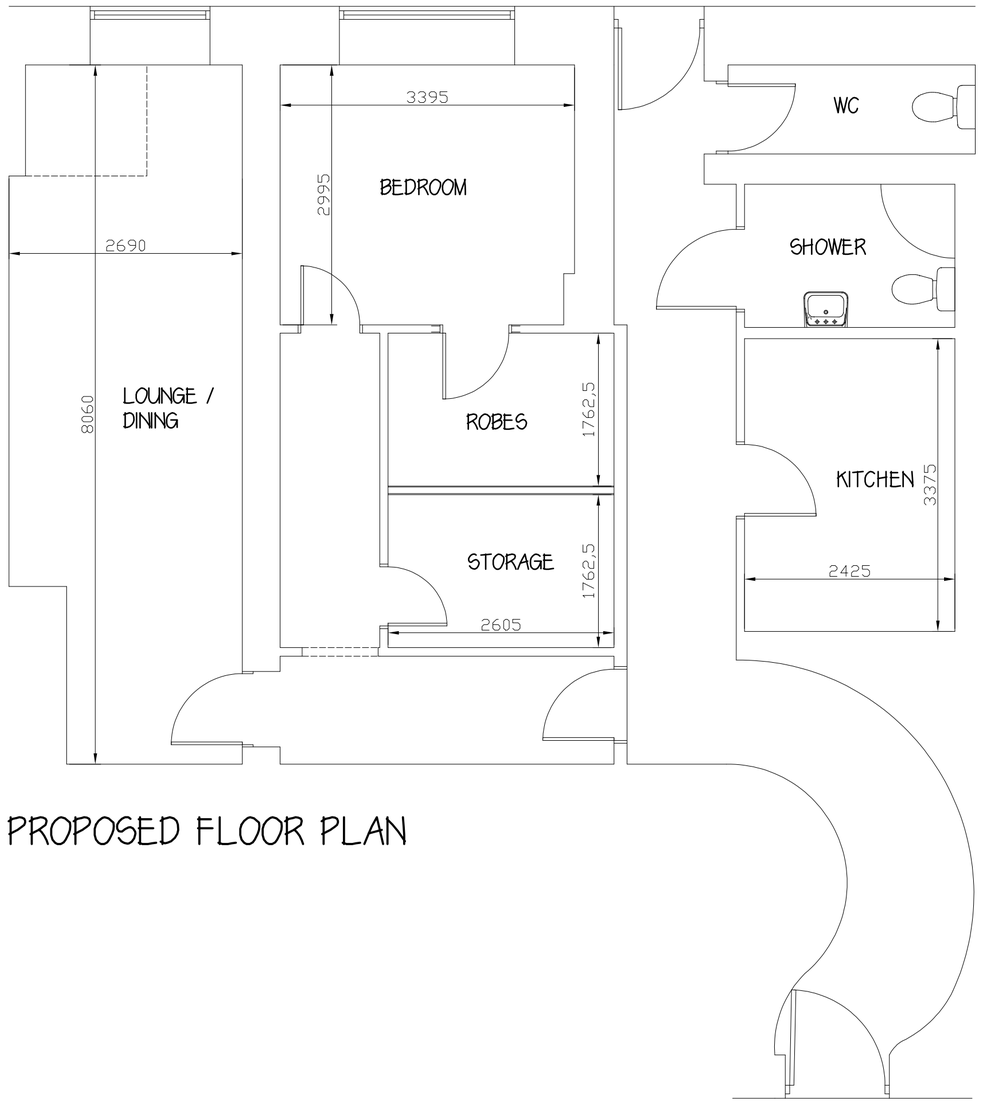
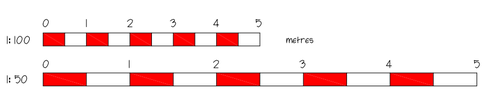


EXISTING FLOOR PLAN



PROPOSED FLOOR PLAN



Malcolm B. J. Percy, 5, Newark Place, Henhull, Nantwich, Cheshire, CW5 6XY.
E-mail : malcolmpercy@hotmail.com
Mobile : 07802 663325

BUILDING DESIGN AND PLANNING Consultancy

PROJECT	CHANGE OF USE OF FORMER OFFICES INTO RESIDENTIAL APARTMENT. FARRIERS CHAMBERS, 4, SMITH STREET, ROCHDALE, OL16 1TU.
CLIENT	MR. A. HUSSAIN.
TITLE	EXISTING & PROPOSED FLOOR PLANS.

DATE	SCALE	DRAWN BY	DRAWING NO.	REVISION
April 2024	1: 50 @ A2	mbjp	2333.01	

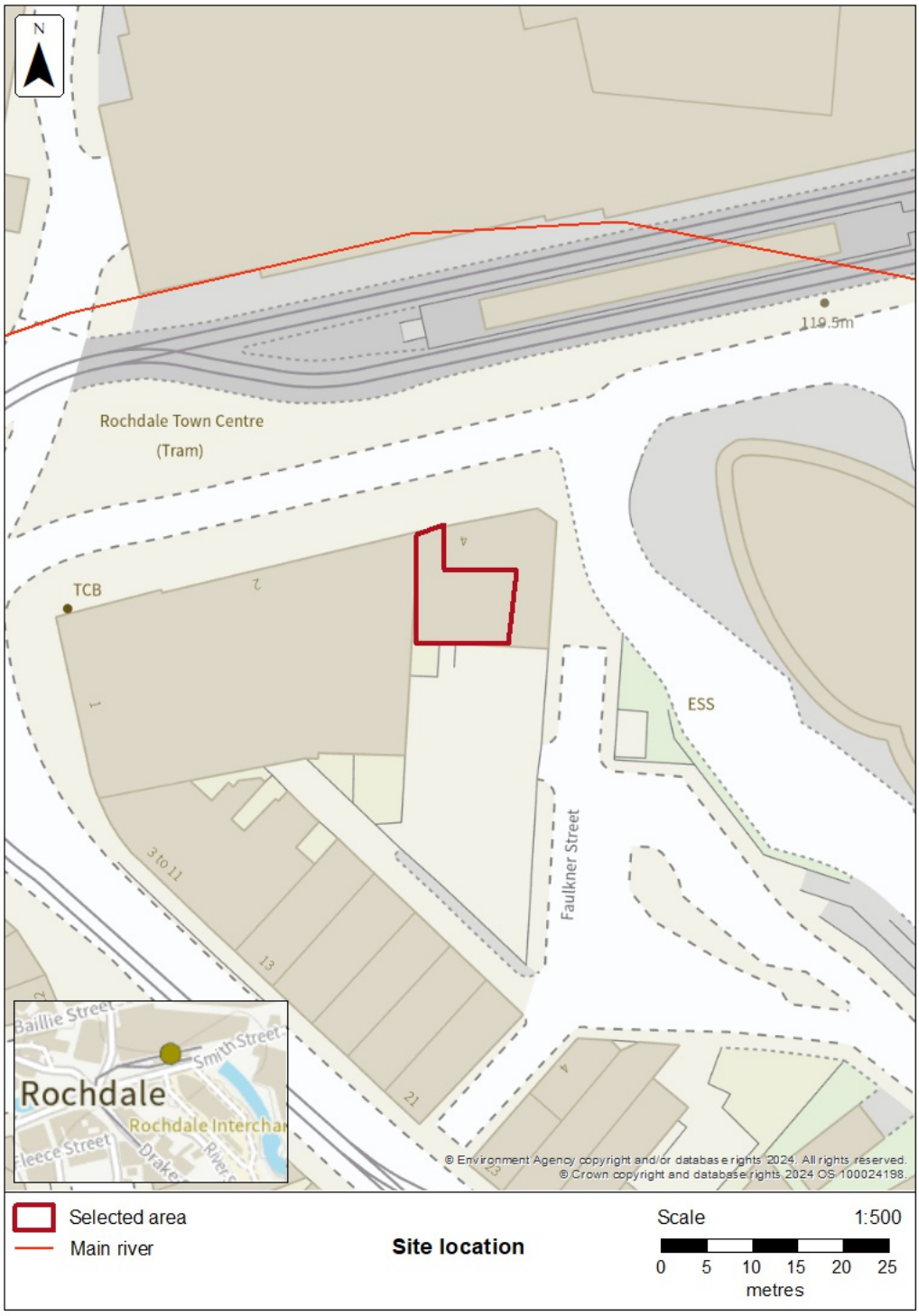
A2

APPENDIX 2 – Environment Agency Data

Flood risk assessment data

Location of site: 389793 / 413393 (shown as easting and northing coordinates)
Document created on: 3 May 2024
This information was previously known as a product 4.
Customer reference number: 4DKCEA6MA1XE

Map showing the location that flood risk assessment data has been requested for.



How to use this information

You can use this information as part of a flood risk assessment for a planning application. To do this, you should include it in the appendix of your flood risk assessment.

We recommend that you work with a flood risk consultant to get your flood risk assessment.

Included in this document

In this document you'll find:

- how to find information about surface water and other sources of flooding
- information on the models used
- definitions for the terminology used throughout
- flood map for planning (rivers and the sea)
- historic flooding
- flood defences and attributes
- information to help you assess if there is a reduced flood risk from rivers and the sea because of defences
- modelled data
- climate change modelled data
- information about strategic flood risk assessments
- information about this data
- information about flood risk activity permits
- help and advice

Surface water and other sources of flooding

Use the long term flood risk service to find out about the risk of flooding from:

- surface water
- ordinary watercourses
- reservoirs

For information about sewer flooding, contact the relevant water company for the area.

About the models used

Model name: Rochdale and Littleborough 2013
Scenario(s): Defended fluvial, defences removed fluvial, defended climate change fluvial, defences removed climate change fluvial
Date: 1 June 2013

These models contain the most relevant data for your area of interest.

Terminology used

Annual exceedance probability (AEP)

This refers to the probability of a flood event occurring in any year. The probability is expressed as a percentage. For example, a large flood which is calculated to have a 1% chance of occuring in any one year, is described as 1% AEP.

Metres above ordnance datum (mAOD)

All flood levels are given in metres above ordnance datum which is defined as the mean sea level at Newlyn, Cornwall.

Flood map for planning (rivers and the sea)

Your selected location is in flood zone 3.

Flood zone 3 shows the area at risk of flooding for an undefended flood event with a:

- 0.5% or greater probability of occurring in any year for flooding from the sea
- 1% or greater probability of occurring in any year for fluvial (river) flooding

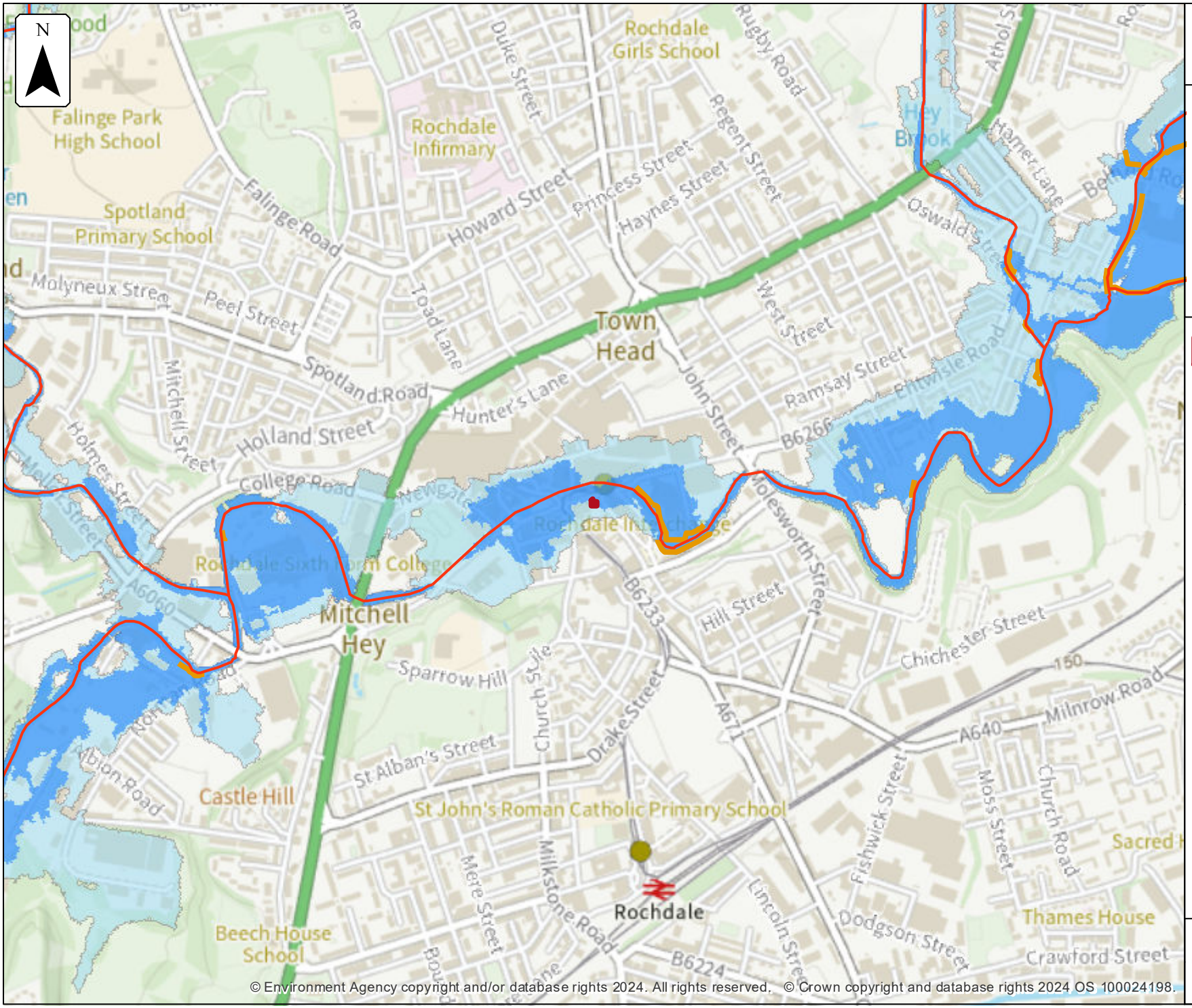
Flood zone 2 shows the area at risk of flooding for an undefended flood event with:

- between a 0.1% and 0.5% probability of occurring in any year for flooding from the sea
- between a 0.1% and 1% probability of occurring in any year for fluvial (river) flooding

It's important to remember that the flood zones on this map:

- refer to the land at risk of flooding and do not refer to individual properties
- refer to the probability of river and sea flooding, ignoring the presence of defences
- do not take into account potential impacts of climate change

The flood zones are not currently being updated. The last update was in November 2023. Some of the flood zones may have changed, however all source data is included in the models below.



Environment Agency

Flood map for planning

Location (easting/northing)
389793/413393

Scale
1:10,000

Created
3 May 2024

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

0 100 200 300 400 500
metres

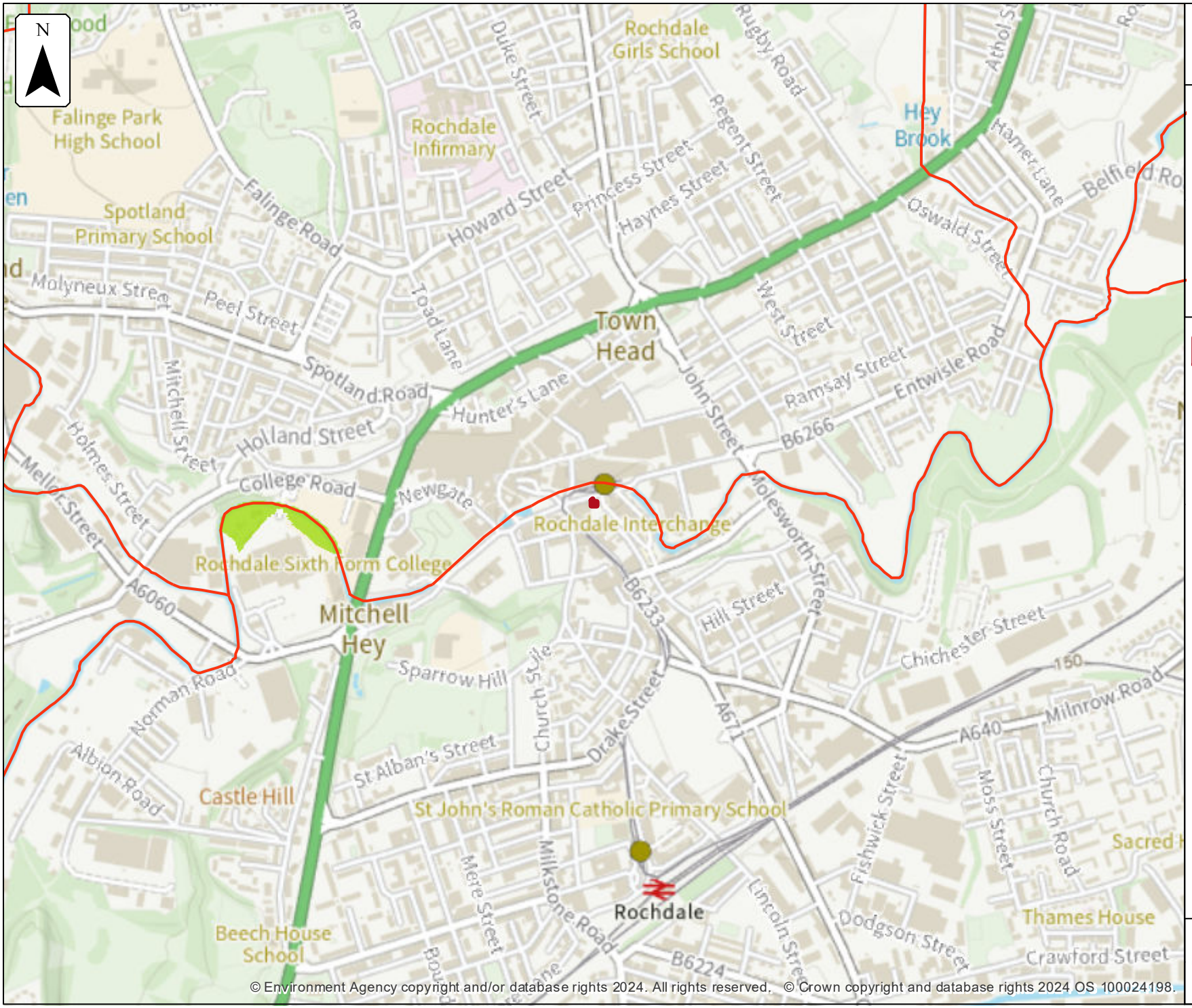
Historic flooding

This map is an indicative outline of areas that have previously flooded. Remember that:

- our records are incomplete, so the information here is based on the best available data
- it is possible not all properties within this area will have flooded
- other flooding may have occurred that we do not have records for
- flooding can come from a range of different sources - we can only supply flood risk data relating to flooding from rivers or the sea

You can also contact your Lead Local Flood Authority or Internal Drainage Board to see if they have other relevant local flood information. Please note that some areas do not have an Internal Drainage Board.

Download recorded flood outlines in GIS format



Environment Agency

Historic flood map

Location (easting/northing)
389793/413393

Scale
1:10,000

Created
3 May 2024

Selected area

Main river

Date of flood event

July, 2019

0 100 200 300 400 500
metres

Historic flood event data

Start date	End date	Source of flood	Cause of flood	Affects location
28 July 2019	31 July 2019	main river	channel capacity exceeded (no raised defences)	No

Flood defences and attributes

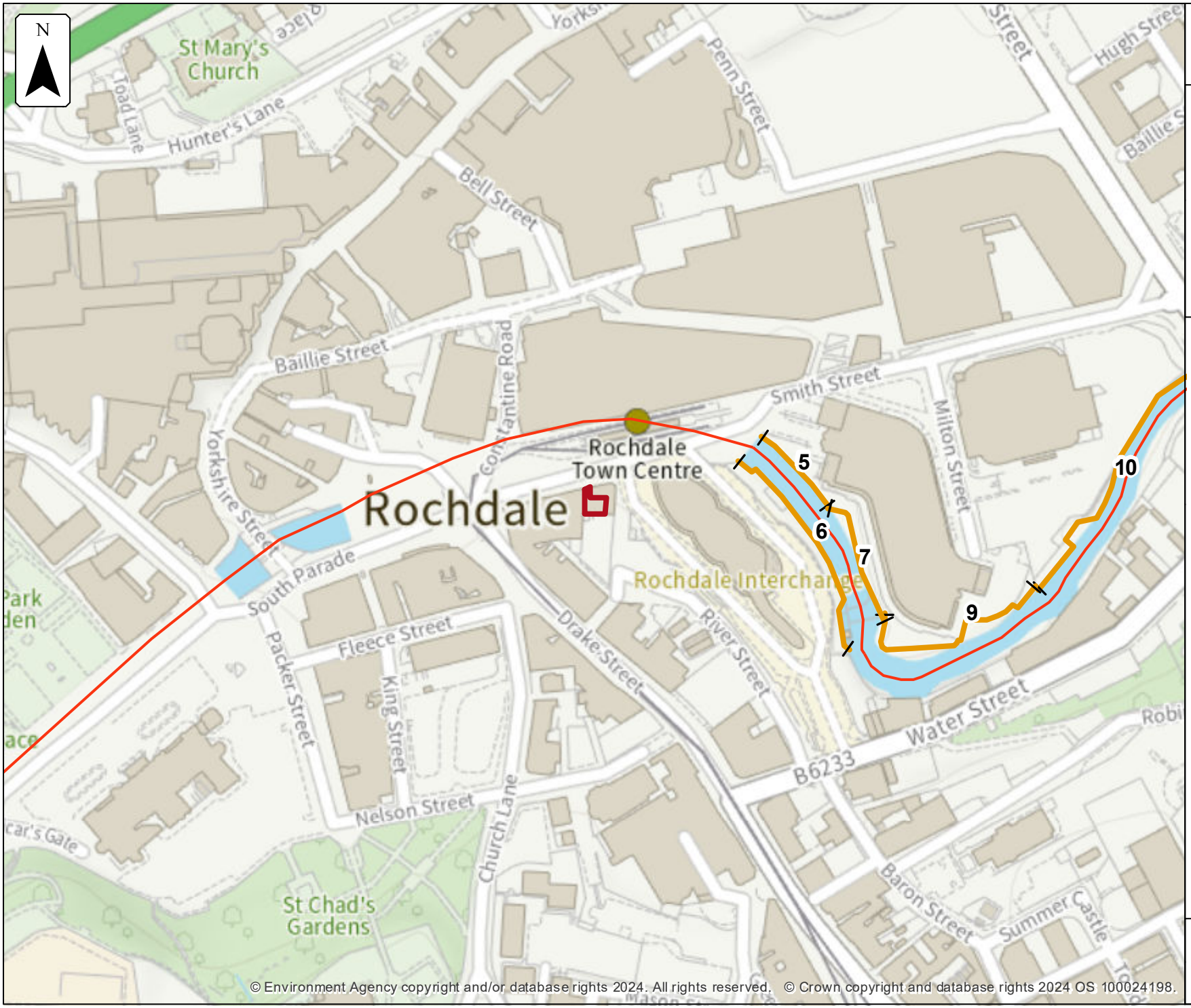
The flood defences map shows the location of the flood defences present.

The flood defences data table shows the type of defences, their condition and the standard of protection. It shows the height above sea level of the top of the flood defence (crest level). The height is In mAOD which is the metres above the mean sea level at Newlyn, Cornwall.

It's important to remember that flood defence data may not be updated on a regular basis. The information here is based on the best available data.

Use this information:

- to help you assess if there is a reduced flood risk for this location because of defences
- with any information in the modelled data section to find out the impact of defences on flood risk



Environment Agency

Flood defences

Location (easting/northing)
389793/413393

Scale
1:2,500

Created
3 May 2024

Selected area
Main river
Flood defence

0 25 50 75 100
metres

Flood defences data

Label	Asset ID	Asset Type	Standard of protection (years)	Current condition	Downstream actual crest level (mAOD)	Upstream actual crest level (mAOD)	Effective crest level (mAOD)
5	104220	Engineered High Ground	100	Good	119.97	119.60	
6	62723	Engineered High Ground	100	Good	118.79	119.55	
7	90290	Engineered High Ground	100		120.84	120.79	
9	67666	Engineered High Ground	100	Fair	119.61	120.89	
10	156206	Engineered High Ground	100	Fair	118.34	118.88	

Any blank cells show where a particular value has not been recorded for an asset.

Modelled data

This section provides details of different scenarios we have modelled and includes the following (where available):

- outline maps showing the area at risk from flooding in different modelled scenarios
- modelled node point map(s) showing the points used to get the data to model the scenarios and table(s) providing details of the flood risk for different return periods
- map(s) showing the approximate water levels for the return period with the largest flood extent for a scenario and table(s) of sample points providing details of the flood risk for different return periods

Climate change

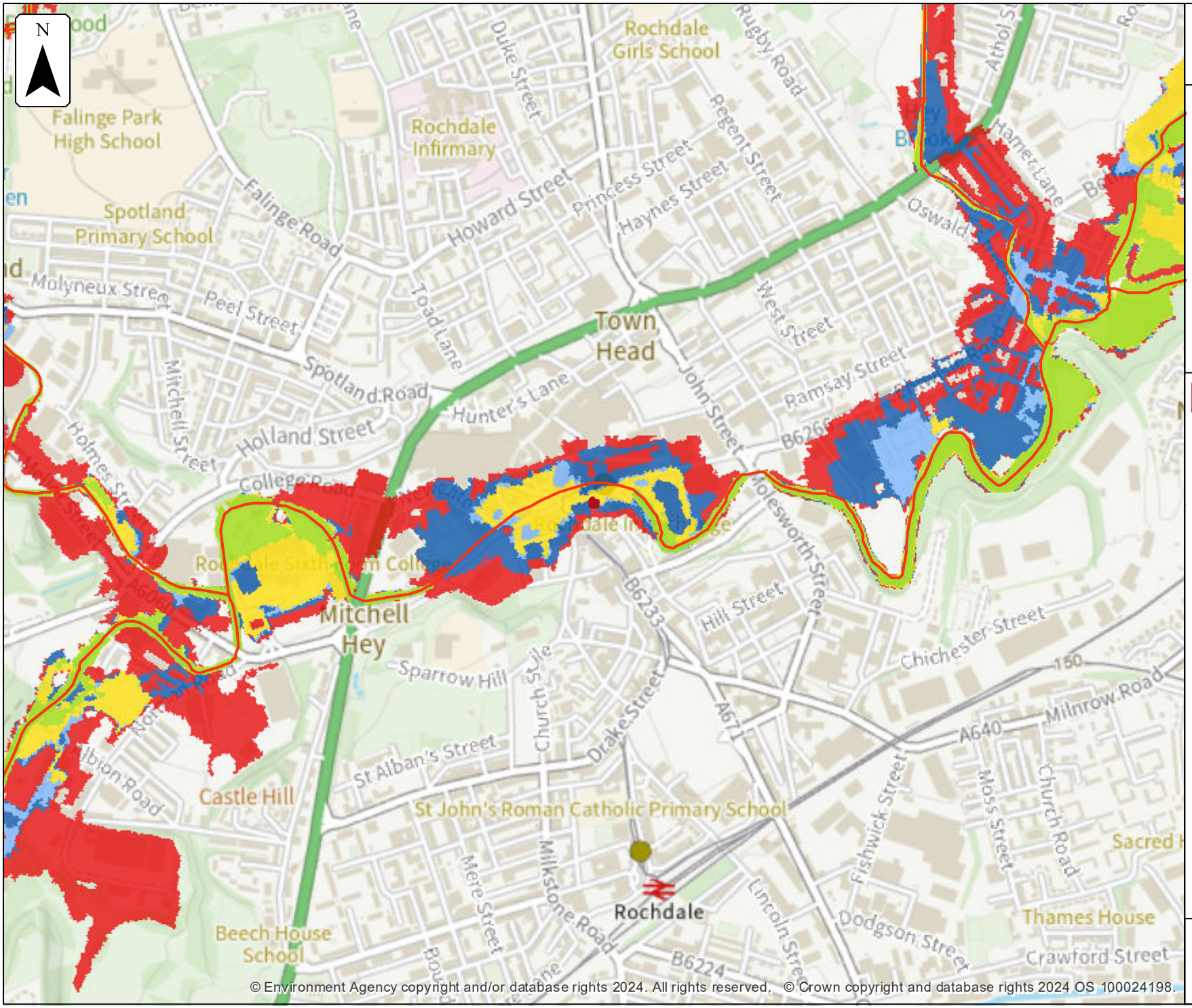
The climate change data included in the models may not include the latest flood risk assessment climate change allowances. Where the new allowances are not available you will need to consider this data and factor in the new allowances to demonstrate the development will be safe from flooding.

The Environment Agency will incorporate the new allowances into future modelling studies. For now, it's your responsibility to demonstrate that new developments will be safe in flood risk terms for their lifetime.

Modelled scenarios

The following scenarios are included:

- Defended modelled fluvial: risk of flooding from rivers where there are flood defences
- Defences removed modelled fluvial: risk of flooding from rivers where flood defences have been removed
- Defended climate change modelled fluvial: risk of flooding from rivers where there are flood defences, including estimated impact of climate change
- Defences removed climate change modelled fluvial: risk of flooding from rivers where flood defences have been removed, including estimated impact of climate change



Environment Agency

Defended modelled fluvial extent

Location (easting/northing)
389793/413393

Scale
1:10,000

Created
3 May 2024

Model name
Rochdale and Littleborough 2013

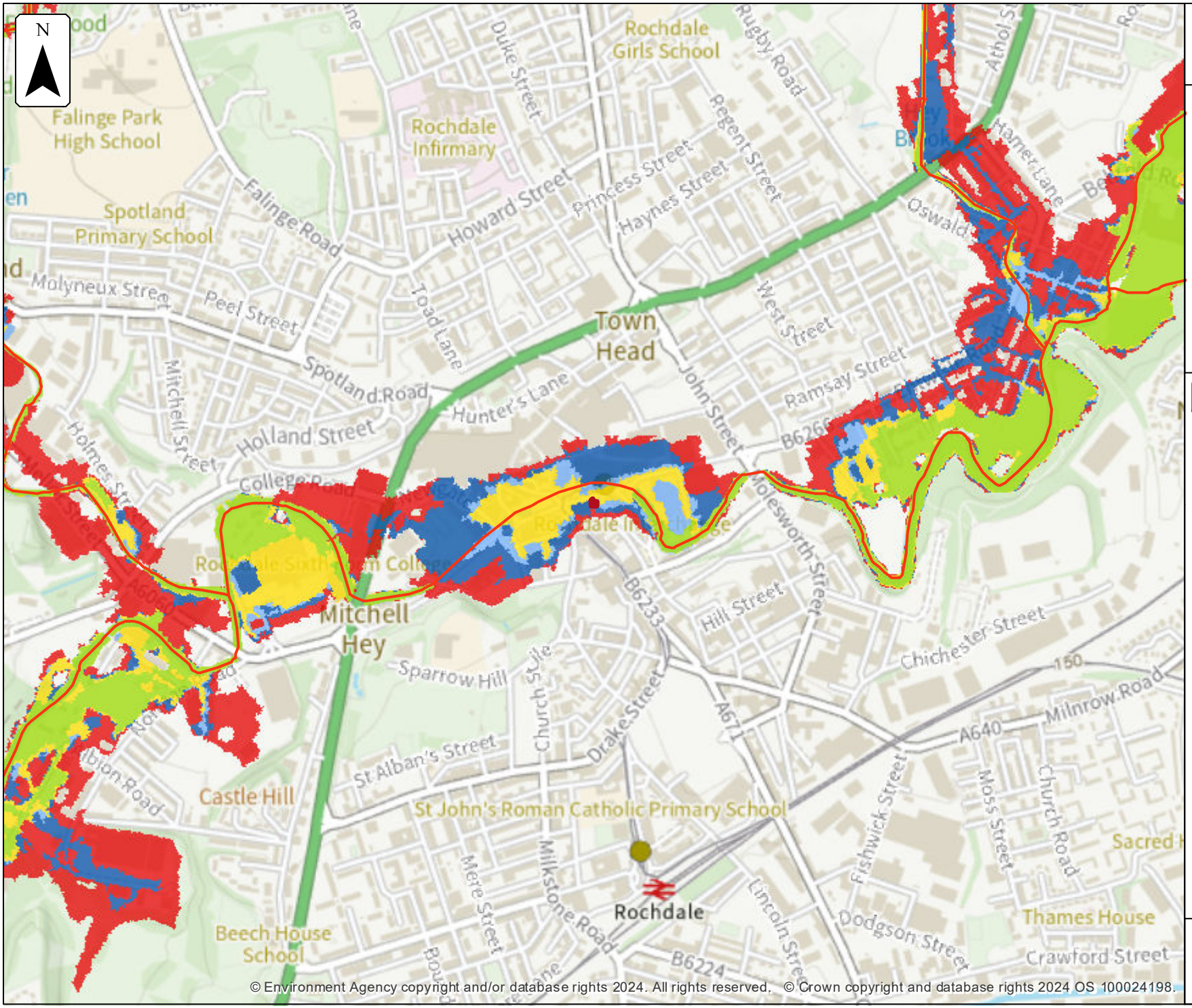
- Selected area
- Main river

Modelled flood extent

- 5% AEP
- 1.33% AEP
- 1% AEP
- 0.5% AEP
- 0.1% AEP

Flood extents may not be visible where they overlap other return periods

0 100 200 300 400 500
metres



Environment Agency

Defences removed modelled fluvial extent

Location (easting/northing)
389793/413393

Scale
1:10,000

Created
3 May 2024

Model name
Rochdale and Littleborough 2013

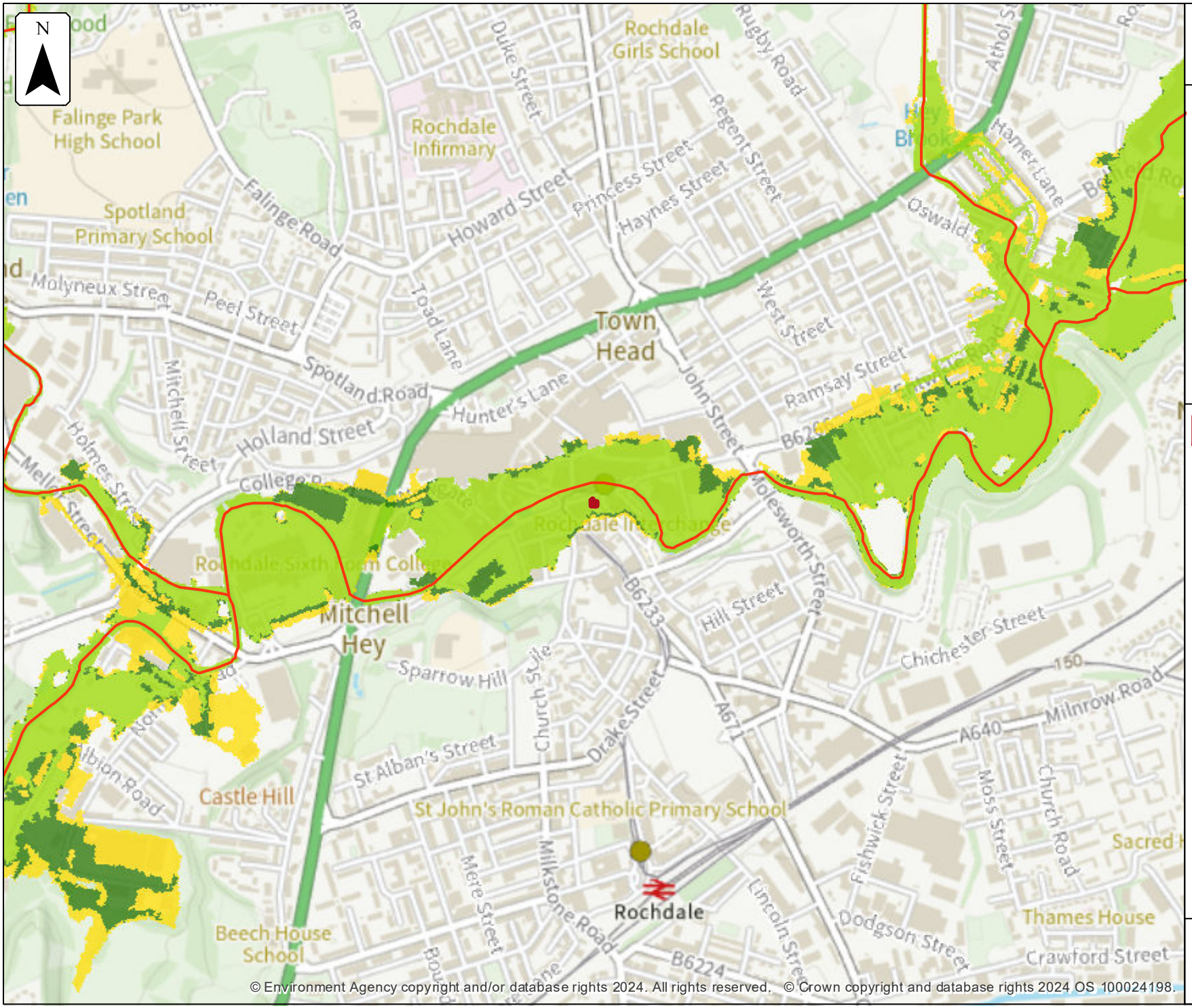
- Selected area
- Main river

Modelled flood extent

- 5% AEP
- 1.33% AEP
- 1% AEP
- 0.5% AEP
- 0.1% AEP

Flood extents may not be visible where they overlap other return periods

0 100 200 300 400 500
metres



Environment Agency

Defended climate change modelled fluvial extent

Location (easting/northing)
389793/413393

Scale
1:10,000

Created
3 May 2024

Model name
Rochdale and Littleborough 2013

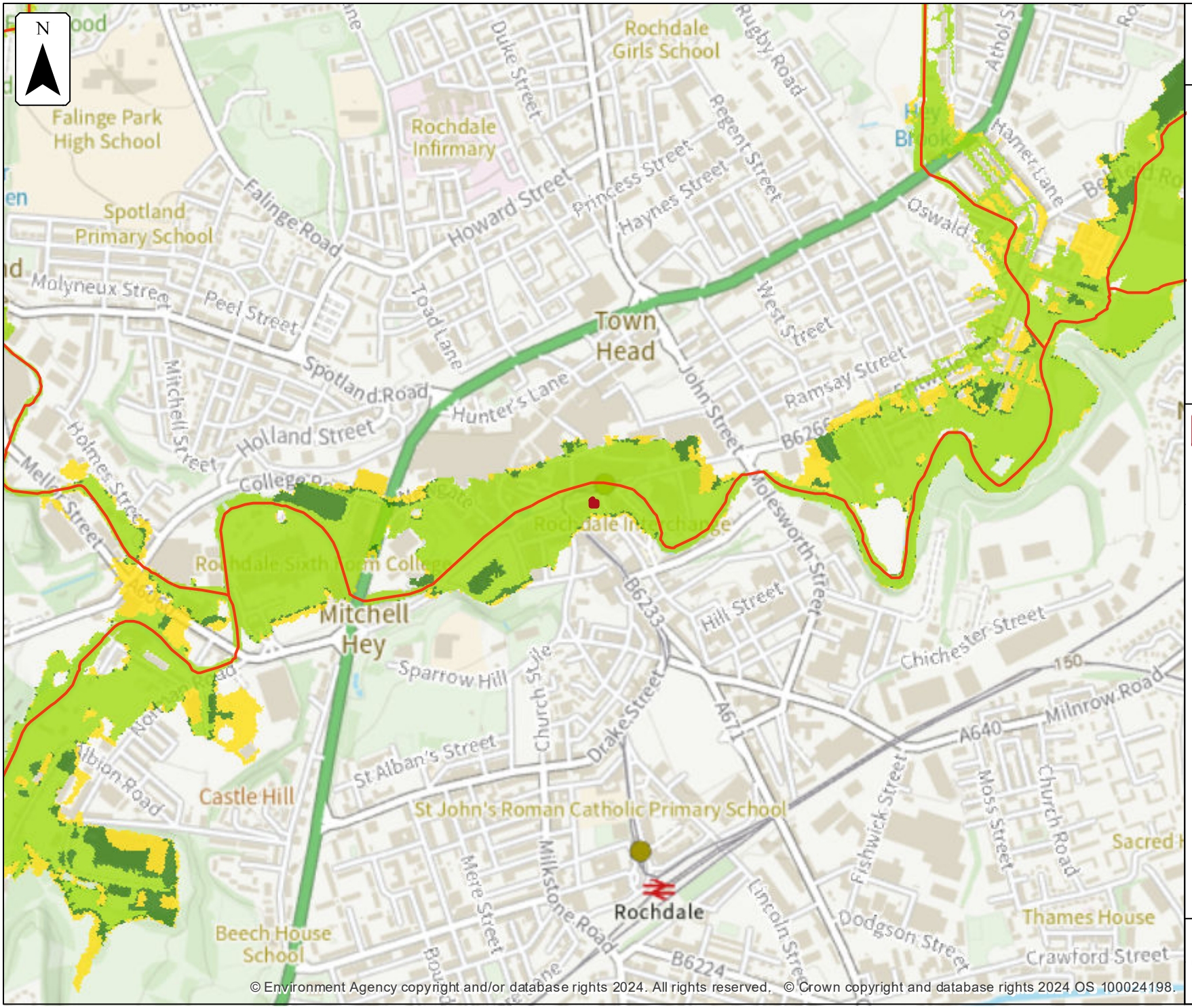
- Selected area
- Main river

Modelled flood extent

- 1.0% AEP (+20%)
- 1.0% AEP (+35%)
- 1.0% AEP (+70%)

Flood extents may not be visible where they overlap other return periods

0 100 200 300 400 500
metres



Environment Agency

Defences removed climate change modelled fluvial extent

Location (easting/northing)
389793/413393

Scale
1:10,000

Created
3 May 2024

Model name
Rochdale and Littleborough 2013

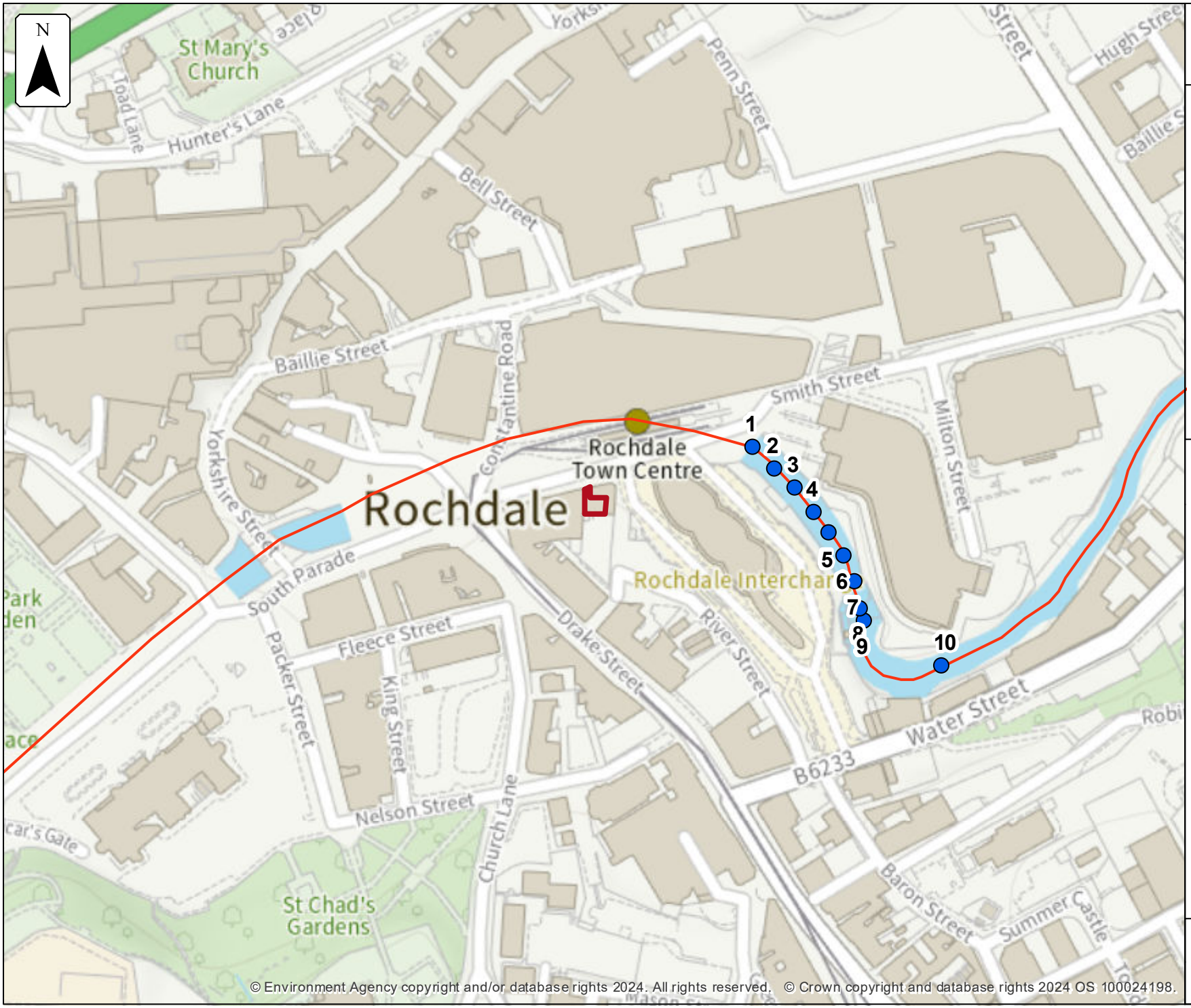
- Selected area
- Main river

Modelled flood extent

- 1.0% AEP (+20%)
- 1.0% AEP (+35%)
- 1.0% AEP (+70%)

Flood extents may not be visible where they overlap other return periods

0 100 200 300 400 500
metres



Environment Agency

Defended modelled fluvial node locations

Location (easting/northing)
389793/413393

Scale
1:2,500

Created
3 May 2024

Model name
Rochdale and Littleborough 2013

- Selected area
- Modelled location
- Main river

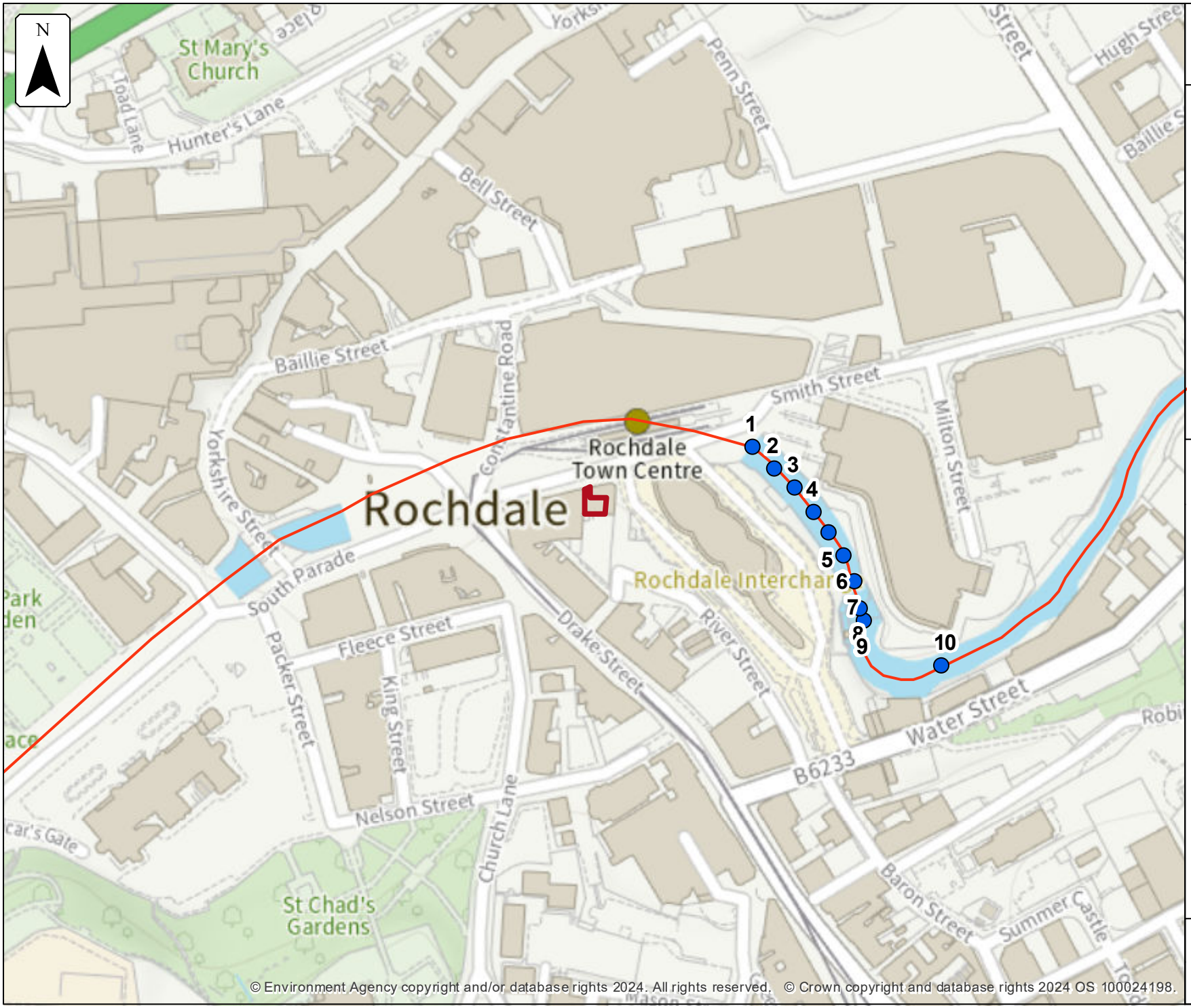
0 25 50 75 100
metres

Modelled node locations data

Defended

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	75472	389871	413421	119.39	58.14			120.04	70.18	120.16	73.66	120.91	87.82	121.84	99.43
2	348519	389881	413410	119.40	58.14			120.05	70.66	120.16	74.20	120.98	77.93	121.88	95.46
3	138966	389891	413401	119.41	58.15			120.06	70.79	120.18	74.17	120.99	78.07	121.91	89.29
4	194352	389900	413389	119.43	58.15			120.08	70.65	120.19	73.53	121.0	76.61	121.93	84.44
5	289728	389908	413379	119.44	58.15			120.09	69.21	120.21	72.18	121.01	76.45	121.94	83.26
6	58316	389915	413368	119.45	58.15			120.10	69.59	120.22	72.52	121.01	76.59	121.94	83.32
7	326819	389920	413356	119.46	57.59			120.11	68.81	120.23	71.66	121.02	75.87	121.95	82.76
8	195841	389923	413342	119.45	57.59			120.10	68.82	120.22	71.63	121.02	75.95	121.95	82.77
9	43396	389925	413336	119.89	57.59			120.27	68.82	120.38	71.63	121.07	75.95	121.97	82.77
10	17645	389963	413315	120.13	57.59			120.45	67.98	120.54	70.30	121.12	73.68	121.71	119.41

Data in this table comes from the Rochdale and Littleborough 2013 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.



Environment Agency

Defences removed modelled fluvial node locations

Location (easting/northing)
389793/413393

Scale
1:2,500

Created
3 May 2024

Model name
Rochdale and Littleborough 2013

Selected area
Modelled location
Main river

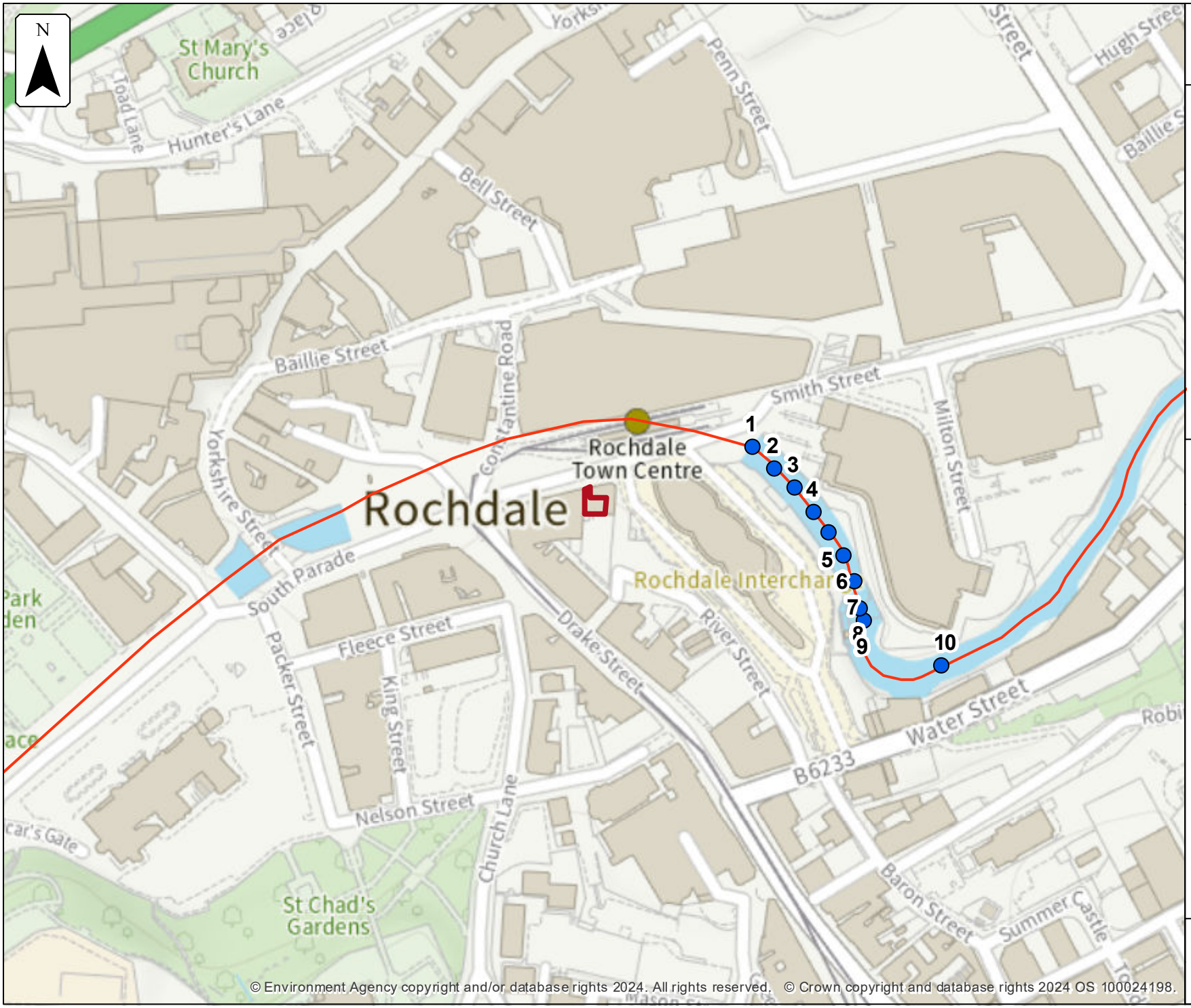
0 25 50 75 100
metres

Modelled node locations data

Defences removed

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	75472	389871	413421	119.35	57.81			120.08	71.66	120.39	77.43	121.08	91.39	121.84	100.49
2	348519	389881	413410	119.36	57.81			120.10	71.45	120.43	74.95	121.16	80.85	121.88	97.57
3	138966	389891	413401	119.38	57.81			120.11	71.55	120.44	74.91	121.16	80.52	121.90	89.49
4	194352	389900	413389	119.39	57.81			120.12	71.64	120.45	74.86	121.17	80.35	121.92	87.61
5	289728	389908	413379	119.40	57.81			120.13	71.73	120.45	75.24	121.18	80.74	121.93	87.24
6	58316	389915	413368	119.41	57.81			120.14	72.03	120.46	75.82	121.18	81.35	121.94	87.78
7	326819	389920	413356	119.42	57.31			120.15	71.41	120.47	75.25	121.19	80.67	121.94	86.61
8	195841	389923	413342	119.41	57.19			120.15	68.66	120.47	71.61	121.20	75.66	121.94	78.86
9	43396	389925	413336	119.88	57.19			120.31	68.66	120.59	71.61	121.24	75.66	121.97	78.86
10	17645	389963	413315	120.13	56.91			120.48	67.44	120.70	70.48	121.25	72.61	121.74	113.91

Data in this table comes from the Rochdale and Littleborough 2013 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.



Environment Agency

Defended climate change modelled fluvial node locations

Location (easting/northing)
389793/413393

Scale
1:2,500

Created
3 May 2024

Model name
Rochdale and Littleborough 2013

- Selected area
- Modelled location
- Main river

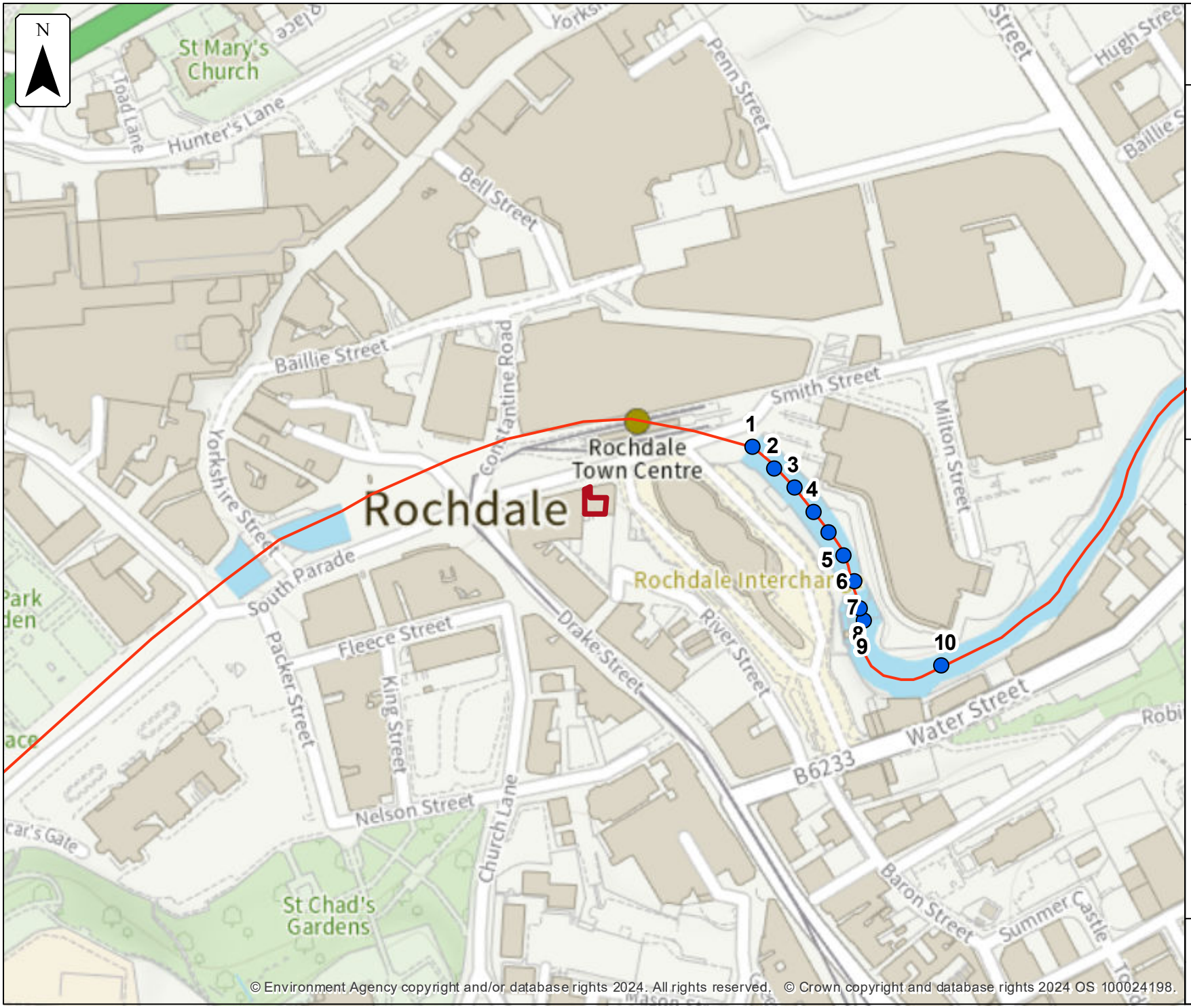
0 25 50 75 100
metres

Modelled node locations data

Defended climate change

Label	Modelled location ID	Easting	Northing	1.0% AEP (+20%)		1.0% AEP (+35%)		1.0% AEP (+70%)	
				Level	Flow	Level	Flow	Level	Flow
1	75472	389871	413421	121.24	93.85	121.56	97.87	122.01	100.32
2	348519	389881	413410	121.33	79.40	121.64	79.67	122.04	89.45
3	138966	389891	413401	121.34	79.41	121.65	79.61	122.06	83.33
4	194352	389900	413389	121.35	77.61	121.66	77.75	122.08	79.94
5	289728	389908	413379	121.35	77.48	121.67	77.62	122.09	79.12
6	58316	389915	413368	121.35	77.61	121.67	77.77	122.10	79.16
7	326819	389920	413356	121.36	76.64	121.68	76.75	122.11	78.24
8	195841	389923	413342	121.36	76.80	121.67	76.88	122.12	78.42
9	43396	389925	413336	121.40	76.80	121.71	76.88	122.13	78.42
10	17645	389963	413315	121.41	74.26	121.58	100.99	121.83	129.28

Data in this table comes from the Rochdale and Littleborough 2013 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.



Environment Agency

Defences removed climate change modelled fluvial node locations

Location (easting/northing)
389793/413393

Scale
1:2,500

Created
3 May 2024

Model name
Rochdale and Littleborough 2013

- Selected area
- Modelled location
- Main river

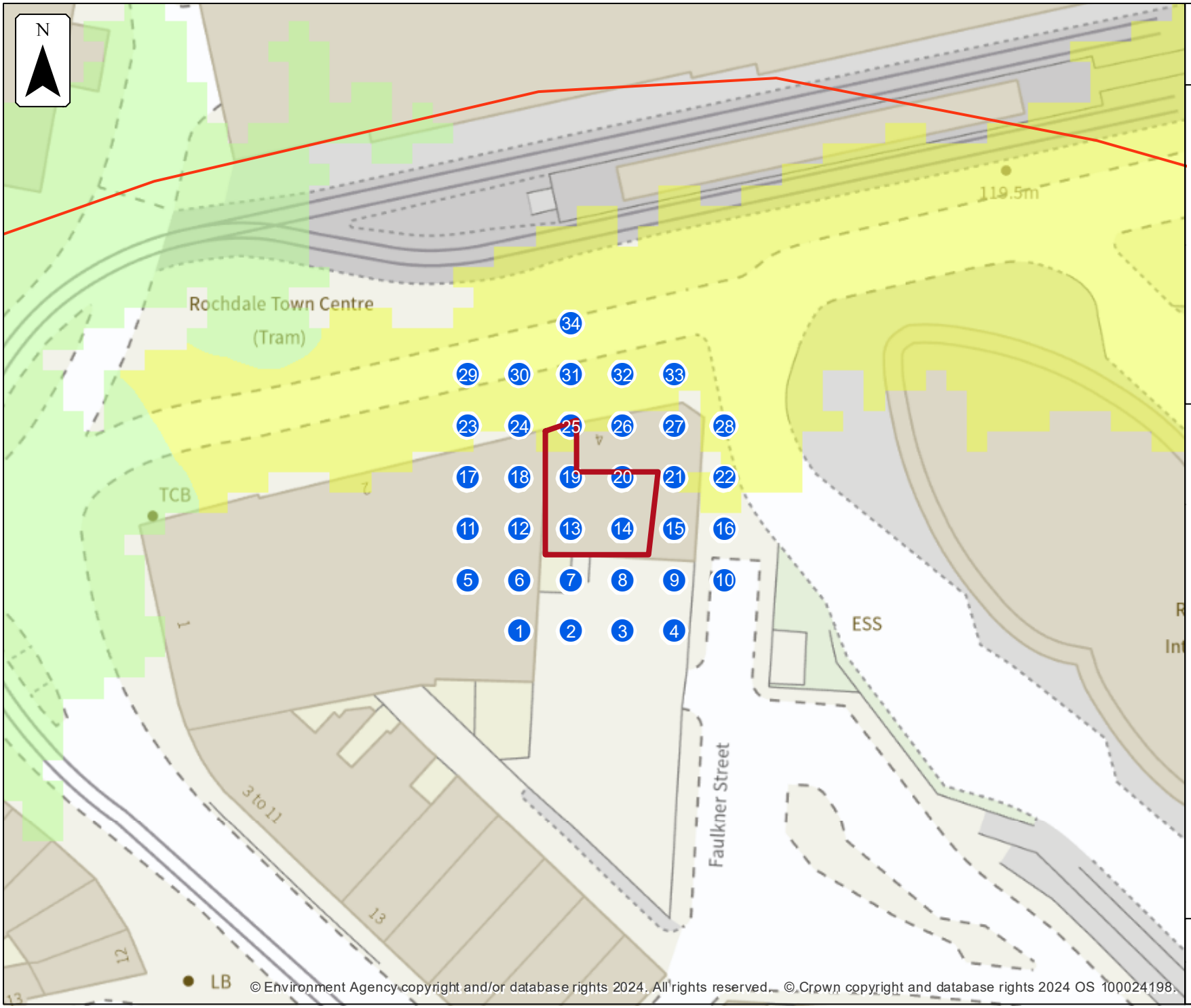
0 25 50 75 100
metres

Modelled node locations data

Defences removed climate change

Label	Modelled location ID	Easting	Northing	1.0% AEP (+20%)		1.0% AEP (+35%)		1.0% AEP (+70%)	
				Level	Flow	Level	Flow	Level	Flow
1	75472	389871	413421	121.32	95.56	121.51	98.0	121.84	100.32
2	348519	389881	413410	121.41	83.05	121.59	85.24	121.89	100.77
3	138966	389891	413401	121.42	82.96	121.61	84.96	121.91	91.29
4	194352	389900	413389	121.43	82.47	121.61	83.91	121.92	88.51
5	289728	389908	413379	121.43	82.57	121.62	83.60	121.93	87.92
6	58316	389915	413368	121.44	83.14	121.63	84.31	121.94	88.43
7	326819	389920	413356	121.44	82.15	121.63	83.22	121.94	86.82
8	195841	389923	413342	121.44	76.62	121.63	77.0	121.95	78.74
9	43396	389925	413336	121.48	76.62	121.66	77.0	121.97	78.74
10	17645	389963	413315	121.47	101.98	121.51	101.95	121.79	108.52

Data in this table comes from the Rochdale and Littleborough 2013 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.



Environment Agency

Defended modelled fluvial extent and height

Location (easting/northing)
389793/413393

Scale
1:500

Created
3 May 2024

Model name
Rochdale and Littleborough 2013

- Selected area
- Main river

Modelled 2D grid
Water level in mAOD

- 0 - 119.0
- 119.0 - 119.25
- 119.25 - 119.5
- 119.5 - 119.75
- 119.75 - 120.0
- 120.0 - 120.25
- 120.25 - 120.5
- 120.5 - 120.75
- 120.75 - 121.0

This map shows the 1.33% AEP height data

0 5 10 15 20
metres

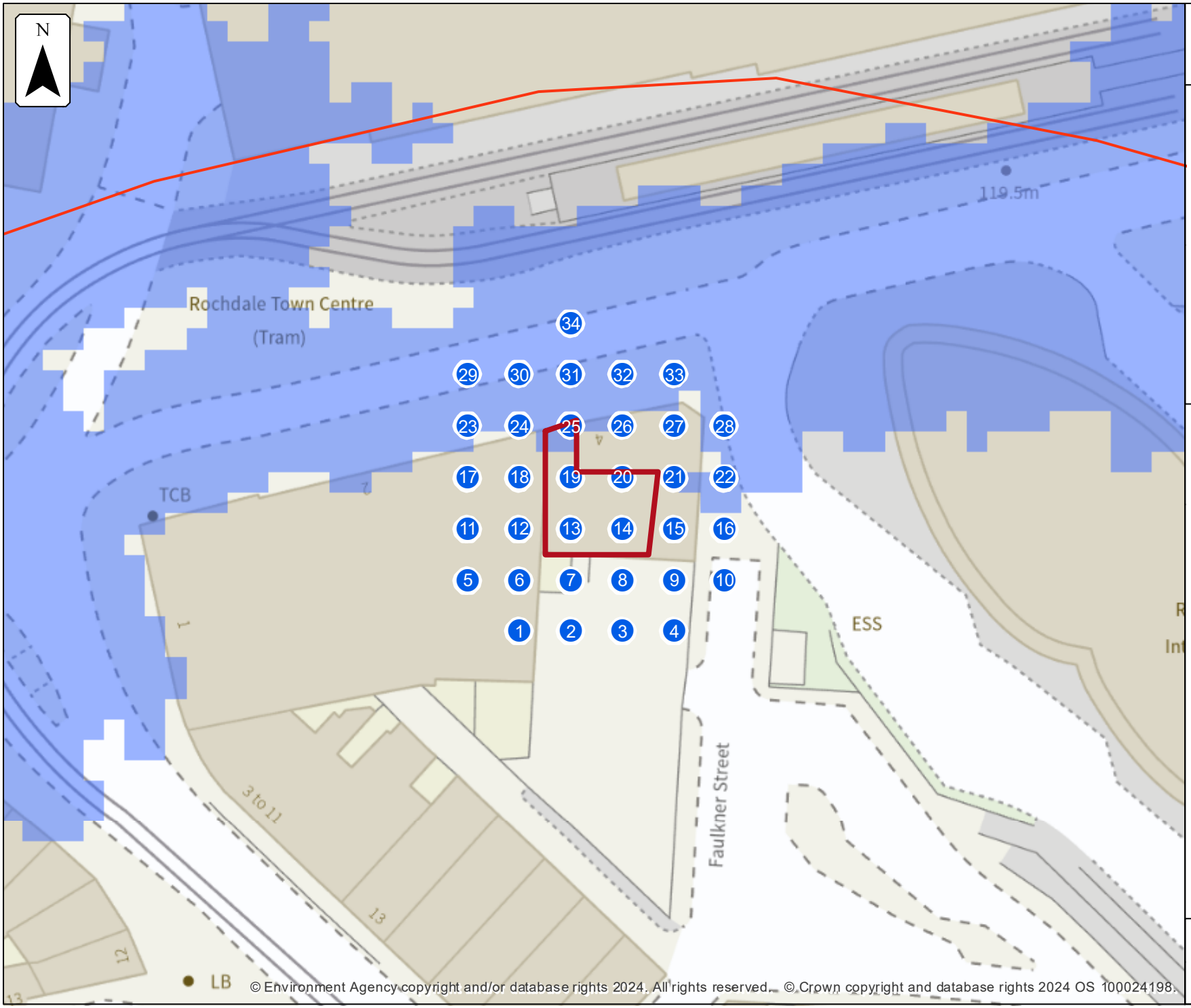
Sample point data

Defended

Label	Easting	Northing	5% AEP		2% AEP		1.33% AEP		1% AEP		0.5% AEP		0.1% AEP	
			Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height
1	389786	413381	NoData	NoData			NoData	NoData						
2	389791	413381	NoData	NoData			NoData	NoData						
3	389796	413381	NoData	NoData			NoData	NoData						
4	389801	413381	NoData	NoData			NoData	NoData						
5	389781	413386	NoData	NoData			NoData	NoData						
6	389786	413386	NoData	NoData			NoData	NoData						
7	389791	413386	NoData	NoData			NoData	NoData						
8	389796	413386	NoData	NoData			NoData	NoData						
9	389801	413386	NoData	NoData			NoData	NoData						
10	389806	413386	NoData	NoData			NoData	NoData						
11	389781	413391	NoData	NoData			NoData	NoData						
12	389786	413391	NoData	NoData			NoData	NoData						
13	389791	413391	NoData	NoData			NoData	NoData						
14	389796	413391	NoData	NoData			NoData	NoData						
15	389801	413391	NoData	NoData			NoData	NoData						
16	389806	413391	NoData	NoData			NoData	NoData						

Label	Easting	Northing	5% AEP		2% AEP		1.33% AEP		1% AEP		0.5% AEP		0.1% AEP	
			Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height
17	389781	413396	NoData	NoData			NoData	NoData						
18	389786	413396	NoData	NoData			NoData	NoData						
19	389791	413396	NoData	NoData			NoData	NoData						
20	389796	413396	NoData	NoData			NoData	NoData						
21	389801	413396	NoData	NoData			NoData	NoData						
22	389806	413396	NoData	NoData			0.12	120.04						
23	389781	413401	NoData	NoData			0.35	120.03						
24	389786	413401	NoData	NoData			0.46	120.03						
25	389791	413401	NoData	NoData			0.26	120.03						
26	389796	413401	NoData	NoData			NoData	NoData						
27	389801	413401	NoData	NoData			NoData	NoData						
28	389806	413401	NoData	NoData			0.29	120.04						
29	389781	413406	NoData	NoData			0.31	120.03						
30	389786	413406	NoData	NoData			0.40	120.03						
31	389791	413406	NoData	NoData			0.44	120.03						
32	389796	413406	NoData	NoData			0.38	120.03						
33	389801	413406	NoData	NoData			0.42	120.03						
34	389791	413411	NoData	NoData			0.38	120.03						

Data in this table comes from the Rochdale and Littleborough 2013 model.
Height values are shown in mAOD, and depth values are shown in metres.
Any blank cells show where a particular scenario has not been modelled for this location.
Cells which contain text 'NoData' for a scenario show that return period has been modelled but there is no flood risk for that return period for that location.



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Environment Agency

Defences removed modelled fluvial extent and height

Location (easting/northing)
389793/413393

Scale
1:500

Created
3 May 2024

Model name
Rochdale and Littleborough 2013

Selected area

Main river

Modelled 2D grid
Water level in mAOD

- 0 - 120.0
- 120.0 - 120.125
- 120.125 - 120.25
- 120.25 - 120.375
- 120.375 - 120.5
- 120.5 - 120.625
- 120.625 - 120.75
- 120.75 - 120.875
- 120.875 - 121.0

This map shows the 1.33% AEP height data

0 5 10 15 20
metres

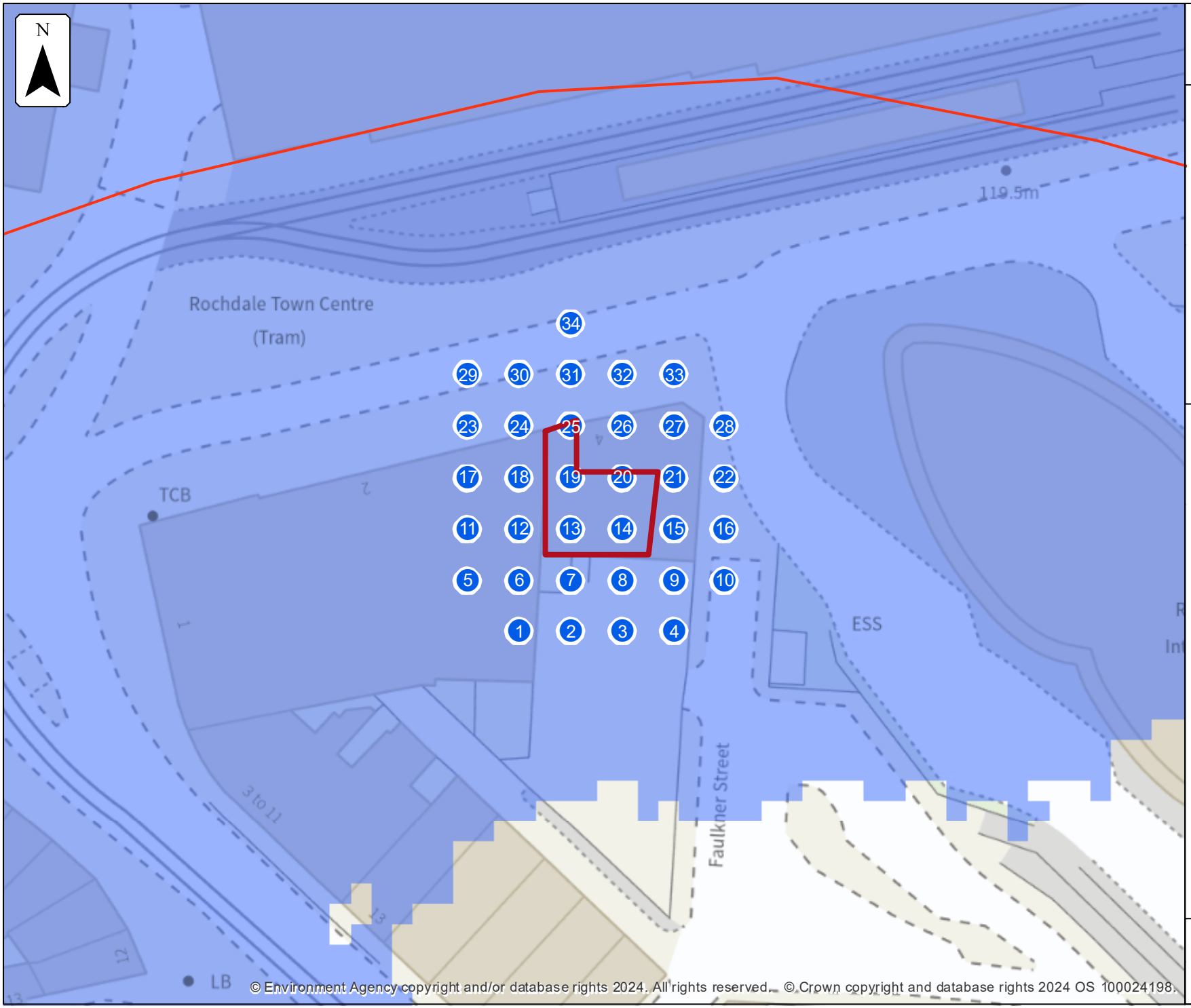
Sample point data

Defences removed

Label	Easting	Northing	5% AEP		2% AEP		1.33% AEP		1% AEP		0.5% AEP		0.1% AEP	
			Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height
1	389786	413381	NoData	NoData			NoData	NoData						
2	389791	413381	NoData	NoData			NoData	NoData						
3	389796	413381	NoData	NoData			NoData	NoData						
4	389801	413381	NoData	NoData			NoData	NoData						
5	389781	413386	NoData	NoData			NoData	NoData						
6	389786	413386	NoData	NoData			NoData	NoData						
7	389791	413386	NoData	NoData			NoData	NoData						
8	389796	413386	NoData	NoData			NoData	NoData						
9	389801	413386	NoData	NoData			NoData	NoData						
10	389806	413386	NoData	NoData			NoData	NoData						
11	389781	413391	NoData	NoData			NoData	NoData						
12	389786	413391	NoData	NoData			NoData	NoData						
13	389791	413391	NoData	NoData			NoData	NoData						
14	389796	413391	NoData	NoData			NoData	NoData						
15	389801	413391	NoData	NoData			NoData	NoData						
16	389806	413391	NoData	NoData			NoData	NoData						

Label	Easting	Northing	5% AEP		2% AEP		1.33% AEP		1% AEP		0.5% AEP		0.1% AEP	
			Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height	Depth	Height
17	389781	413396	NoData	NoData			NoData	NoData						
18	389786	413396	NoData	NoData			NoData	NoData						
19	389791	413396	NoData	NoData			NoData	NoData						
20	389796	413396	NoData	NoData			NoData	NoData						
21	389801	413396	NoData	NoData			NoData	NoData						
22	389806	413396	NoData	NoData			0.16	120.08						
23	389781	413401	NoData	NoData			0.40	120.08						
24	389786	413401	NoData	NoData			0.50	120.08						
25	389791	413401	NoData	NoData			0.29	120.08						
26	389796	413401	NoData	NoData			NoData	NoData						
27	389801	413401	NoData	NoData			NoData	NoData						
28	389806	413401	NoData	NoData			0.33	120.08						
29	389781	413406	NoData	NoData			0.36	120.08						
30	389786	413406	NoData	NoData			0.45	120.08						
31	389791	413406	NoData	NoData			0.48	120.08						
32	389796	413406	NoData	NoData			0.42	120.08						
33	389801	413406	NoData	NoData			0.46	120.08						
34	389791	413411	NoData	NoData			0.42	120.08						

Data in this table comes from the Rochdale and Littleborough 2013 model.
Height values are shown in mAOD, and depth values are shown in metres.
Any blank cells show where a particular scenario has not been modelled for this location.
Cells which contain text 'NoData' for a scenario show that return period has been modelled but there is no flood risk for that return period for that location.



Environment Agency

Defended climate change modelled fluvial extent and height

Location (easting/northing)
389793/413393

Scale
1:500

Created
3 May 2024

Model name
Rochdale and Littleborough 2013

Selected area

Main river

Modelled 2D grid
Water level in mAOD

- 0 - 122.0
- 122.0 - 122.125
- 122.125 - 122.25
- 122.25 - 122.375
- 122.375 - 122.5
- 122.5 - 122.625
- 122.625 - 122.75
- 122.75 - 122.875
- 122.875 - 123.0

This map shows the 1.0% AEP +70% height data

0 5 10 15 20
metres

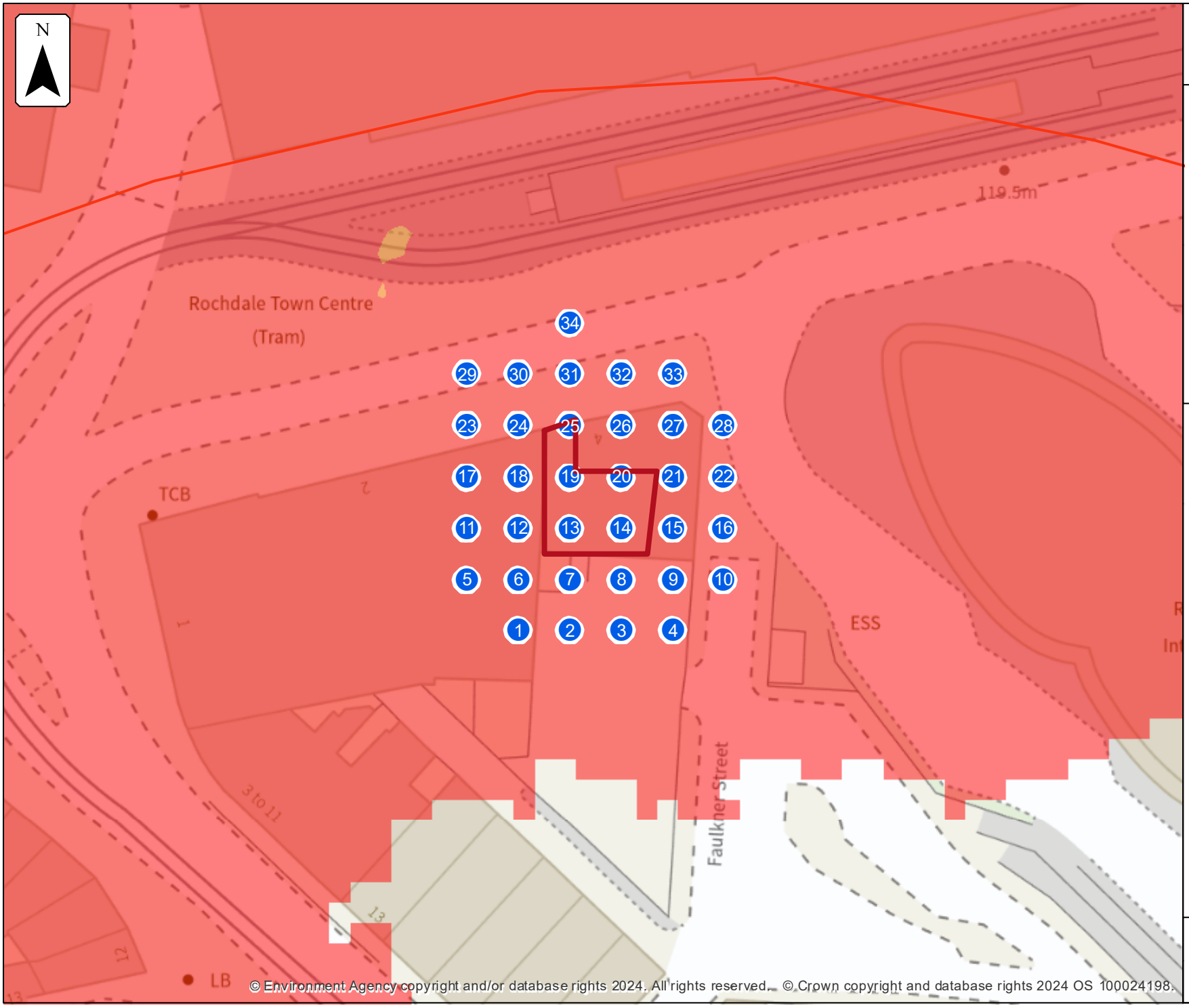
Sample point data

Defended climate change

Label	Easting	Northing	1% AEP (+35%)		1% AEP (+70%)	
			Depth	Height	Depth	Height
1	389786	413381	0.94	121.64	1.33	122.03
2	389791	413381	0.54	121.64	0.93	122.04
3	389796	413381	0.62	121.64	1.02	122.04
4	389801	413381	0.69	121.64	1.08	122.04
5	389781	413386	1.06	121.64	1.44	122.02
6	389786	413386	1.09	121.64	1.48	122.03
7	389791	413386	1.15	121.64	1.54	122.03
8	389796	413386	0.96	121.64	1.35	122.04
9	389801	413386	0.96	121.64	1.35	122.04
10	389806	413386	1.17	121.64	1.56	122.04
11	389781	413391	1.02	121.64	1.40	122.02
12	389786	413391	0.98	121.64	1.36	122.03
13	389791	413391	1.33	121.64	1.72	122.03
14	389796	413391	1.33	121.64	1.72	122.04
15	389801	413391	1.38	121.64	1.78	122.04
16	389806	413391	1.55	121.64	1.95	122.04

Label	Easting	Northing	1% AEP (+35%)		1% AEP (+70%)	
			Depth	Height	Depth	Height
17	389781	413396	1.09	121.64	1.46	122.02
18	389786	413396	1.03	121.64	1.41	122.02
19	389791	413396	1.30	121.64	1.69	122.03
20	389796	413396	1.33	121.64	1.72	122.04
21	389801	413396	1.33	121.64	1.73	122.04
22	389806	413396	1.72	121.64	2.12	122.04
23	389781	413401	1.96	121.64	2.34	122.01
24	389786	413401	2.04	121.64	2.41	122.02
25	389791	413401	1.74	121.64	2.13	122.03
26	389796	413401	1.55	121.64	1.93	122.03
27	389801	413401	1.78	121.64	2.18	122.04
28	389806	413401	1.90	121.64	2.30	122.04
29	389781	413406	1.92	121.64	2.30	122.01
30	389786	413406	2.01	121.64	2.39	122.02
31	389791	413406	2.05	121.64	2.43	122.02
32	389796	413406	1.97	121.64	2.35	122.03
33	389801	413406	2.02	121.64	2.41	122.03
34	389791	413411	1.98	121.64	2.37	122.03

Data in this table comes from the Rochdale and Littleborough 2013 model.
Height values are shown in mAOD, and depth values are shown in metres.
Any blank cells show where a particular scenario has not been modelled for this location.
Cells which contain text 'NoData' for a scenario show that return period has been modelled but there is no flood risk for that return period for that location.



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Environment Agency

Defences removed climate change modelled fluvial extent and height

Location (easting/northing)
389793/413393

Scale
1:500

Created
3 May 2024

Model name
Rochdale and Littleborough 2013

Selected area

Main river

Modelled 2D grid
Water level in mAOD

- 0 - 121.0
- 121.0 - 121.125
- 121.125 - 121.25
- 121.25 - 121.375
- 121.375 - 121.5
- 121.5 - 121.625
- 121.625 - 121.75
- 121.75 - 121.875
- 121.875 - 122.0

This map shows the
1.0% AEP +70% height data

0 5 10 15 20
metres

Sample point data

Defences removed climate change

Label	Easting	Northing	1% AEP (+35%)		1% AEP (+70%)	
			Depth	Height	Depth	Height
1	389786	413381	0.89	121.60	1.19	121.89
2	389791	413381	0.49	121.60	0.79	121.89
3	389796	413381	0.58	121.60	0.87	121.89
4	389801	413381	0.64	121.60	0.94	121.89
5	389781	413386	1.01	121.59	1.31	121.89
6	389786	413386	1.04	121.60	1.34	121.89
7	389791	413386	1.10	121.60	1.40	121.89
8	389796	413386	0.91	121.60	1.21	121.89
9	389801	413386	0.91	121.60	1.21	121.89
10	389806	413386	1.12	121.60	1.42	121.89
11	389781	413391	0.97	121.59	1.26	121.88
12	389786	413391	0.93	121.59	1.22	121.89
13	389791	413391	1.28	121.60	1.58	121.89
14	389796	413391	1.28	121.60	1.58	121.89
15	389801	413391	1.33	121.60	1.63	121.89
16	389806	413391	1.50	121.60	1.80	121.89

Label	Easting	Northing	1% AEP (+35%)		1% AEP (+70%)	
			Depth	Height	Depth	Height
17	389781	413396	1.04	121.59	1.33	121.88
18	389786	413396	0.98	121.59	1.27	121.89
19	389791	413396	1.25	121.60	1.55	121.89
20	389796	413396	1.28	121.60	1.58	121.89
21	389801	413396	1.29	121.60	1.58	121.89
22	389806	413396	1.68	121.60	1.97	121.89
23	389781	413401	1.92	121.59	2.21	121.88
24	389786	413401	1.99	121.59	2.28	121.89
25	389791	413401	1.70	121.60	1.99	121.89
26	389796	413401	1.50	121.60	1.80	121.89
27	389801	413401	1.74	121.60	2.03	121.89
28	389806	413401	1.85	121.60	2.15	121.90
29	389781	413406	1.88	121.59	2.17	121.88
30	389786	413406	1.97	121.59	2.26	121.89
31	389791	413406	2.00	121.60	2.30	121.89
32	389796	413406	1.92	121.60	2.22	121.89
33	389801	413406	1.98	121.60	2.27	121.89
34	389791	413411	1.94	121.60	2.23	121.89

Data in this table comes from the Rochdale and Littleborough 2013 model.
Height values are shown in mAOD, and depth values are shown in metres.
Any blank cells show where a particular scenario has not been modelled for this location.
Cells which contain text 'NoData' for a scenario show that return period has been modelled but there is no flood risk for that return period for that location.

Strategic flood risk assessments

We recommend that you check the relevant local authority's strategic flood risk assessment (SFRA) as part of your work to prepare a site specific flood risk assessment.

This should give you information about:

- the potential impacts of climate change in this catchment
- areas defined as functional floodplain
- flooding from other sources, such as surface water, ground water and reservoirs

About this data

This data has been generated by strategic scale flood models and is not intended for use at the individual property scale. If you're intending to use this data as part of a flood risk assessment, please include an appropriate modelling tolerance as part of your assessment. The Environment Agency regularly updates its modelling. We recommend that you check the data provided is the most recent, before submitting your flood risk assessment.

Flood risk activity permits

Under the Environmental Permitting (England and Wales) Regulations 2016 some developments may require an environmental permit for flood risk activities from the Environment Agency. This includes any permanent or temporary works that are in, over, under, or nearby a designated main river or flood defence structure.

Find out more about flood risk activity permits

Help and advice

Contact the Greater Manchester Merseyside and Cheshire Environment Agency team at inforequests.gmmc@environment-agency.gov.uk for:

- more information about getting a product 5, 6, 7 or 8
- general help and advice about the site you're requesting data for

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