Pendle Level 2 Strategic Flood Risk Assessment - Site P257

Draft

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This report describes work commissioned by Pendle Borough Council by an instruction dated 27 June 2024. The Client's representative for the contract was John Halton of Pendle Borough Council. Laura Thompson of JBA Consulting carried out this work.

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Unless otherwise stated in this Report, the assessments made assume that the sites and facilities will continue to be used for their current purpose without significant changes.

Acknowledgements

We would like to thank the Environment Agency for their assistance with this work

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1 Background

This is a Level 2 Strategic Flood Risk Assessment (SFRA) site screening report for Pendle Borough Council Site P257. The content of this Level 2 SFRA site screening report assumes the reader has already consulted the 'Pendle Level 1 SFRA' (2021) and read the 'Pendle Level 2 SFRA Main Report' (2024) and is therefore familiar with the terminology used in this report.

1.1 Site P257

- Location: Land at Giles Street
- Existing site use: Brownfield, existing roads and grassed areas
- Existing site use vulnerability: Less vulnerable
- Proposed site use: Housing
- Proposed site use vulnerability: More vulnerable
- Site area: 0.8 hectares
- Proposed development impermeable area: 0.7 hectares (assumed 85% of total site area)
- EA model: Hendon Brook 2018
- Watercourse: Hendon Brook
- Summary of requirements from scoping stage:
    - Level 1 SFRA recommendation was for withdrawal from allocation or more detailed assessment through Level 2 SFRA
    - Site subject to the Exception Test
    - Assess modelled fluvial depths and hazards
    - Assess surface water depths and hazards
    - Climate change proxy assessment
    - Potential residual risk from Walverden Water culvert adjacent to site
    - Assess reservoir risk

Figure 1-1: existing site location boundary

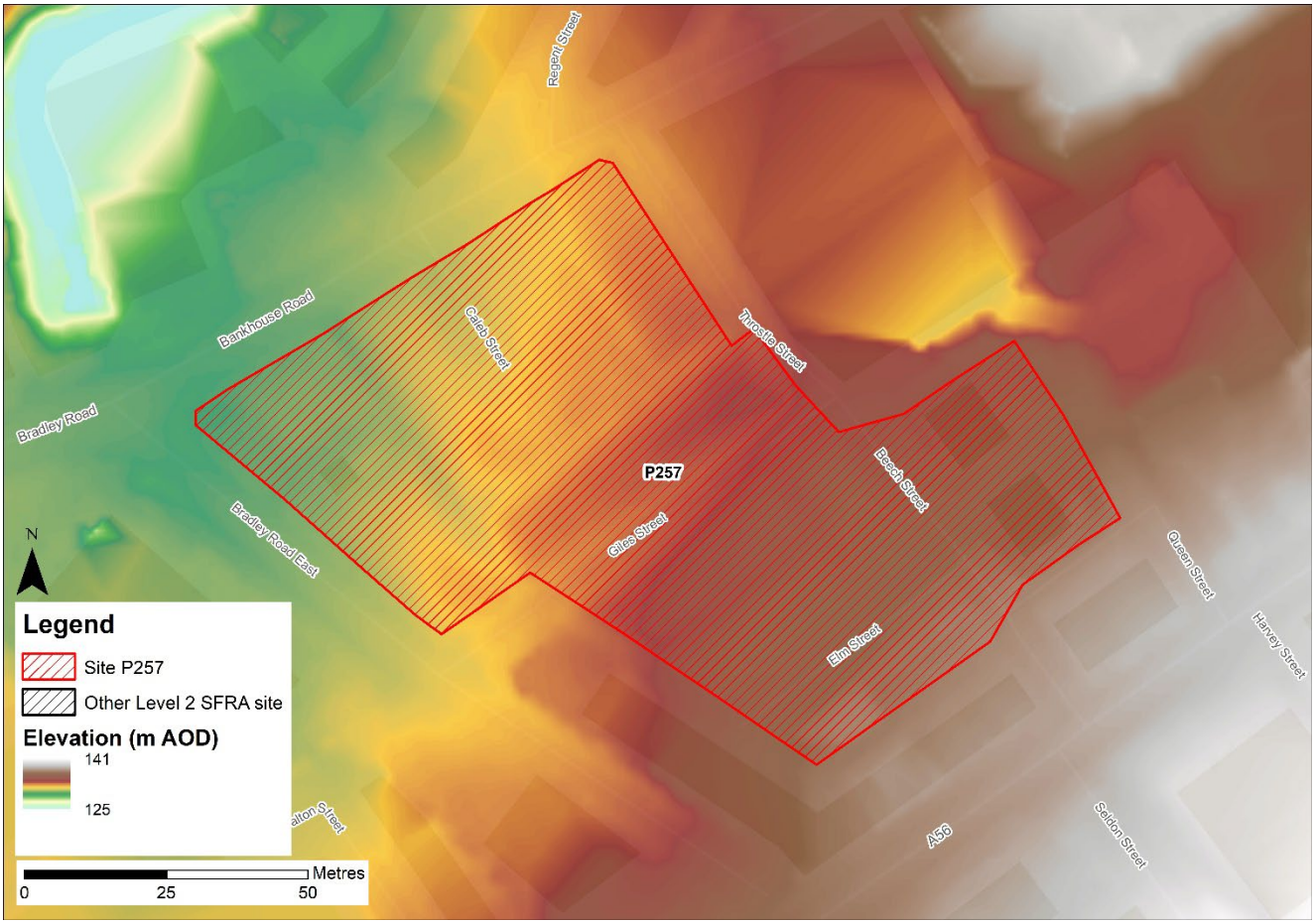

Figure 1-2: topography

2 Flood risk from rivers

2.1 Existing risk

2.1.1 Flood Map for Planning and functional floodplain

Based on the EA's Flood Map for Planning and Flood Zone 3b (functional floodplain) as updated in the Pendle Level 2 SFRA (2024), the percentage areas of the site within each flood zone are stated in Table 2-1 and can be viewed on Figure 2-1. The Flood Map for Planning does not consider flood defence infrastructure (Section 2.3) or the impacts of climate change (Section 2.2).

The main risk area appears to come from where Hendon Brook meets Walverdon Water. Hendon Brook is culverted through the majority of its length before it outfalls into Walverdon Water to the west of the site. Walverdon Water is also culverted for much of its length travelling northwards past the west of the site. Walverdon Water is culverted under the Leeds Liverpool Canal before entering Pendle Water further west beyond the M65.

The area along the northern boundary of the site is located within Flood Zone 3b which should be left free of development. The functional floodplain in this location is based on the 3.3% AEP undefended event from the Hendon Brook 2018 model. A further 20% of the site is within the Flood Zone 3a extent. There is an additional area of fluvial risk within Flood Zone 2. The majority of the site is within Flood Zone 1.

Table 2-1: existing fluvial flood risk

Flood Zone 1 (%)	Flood Zone 2 (%)	Flood Zone 3a (%)	Flood Zone 3b (%)
64	6	20	10

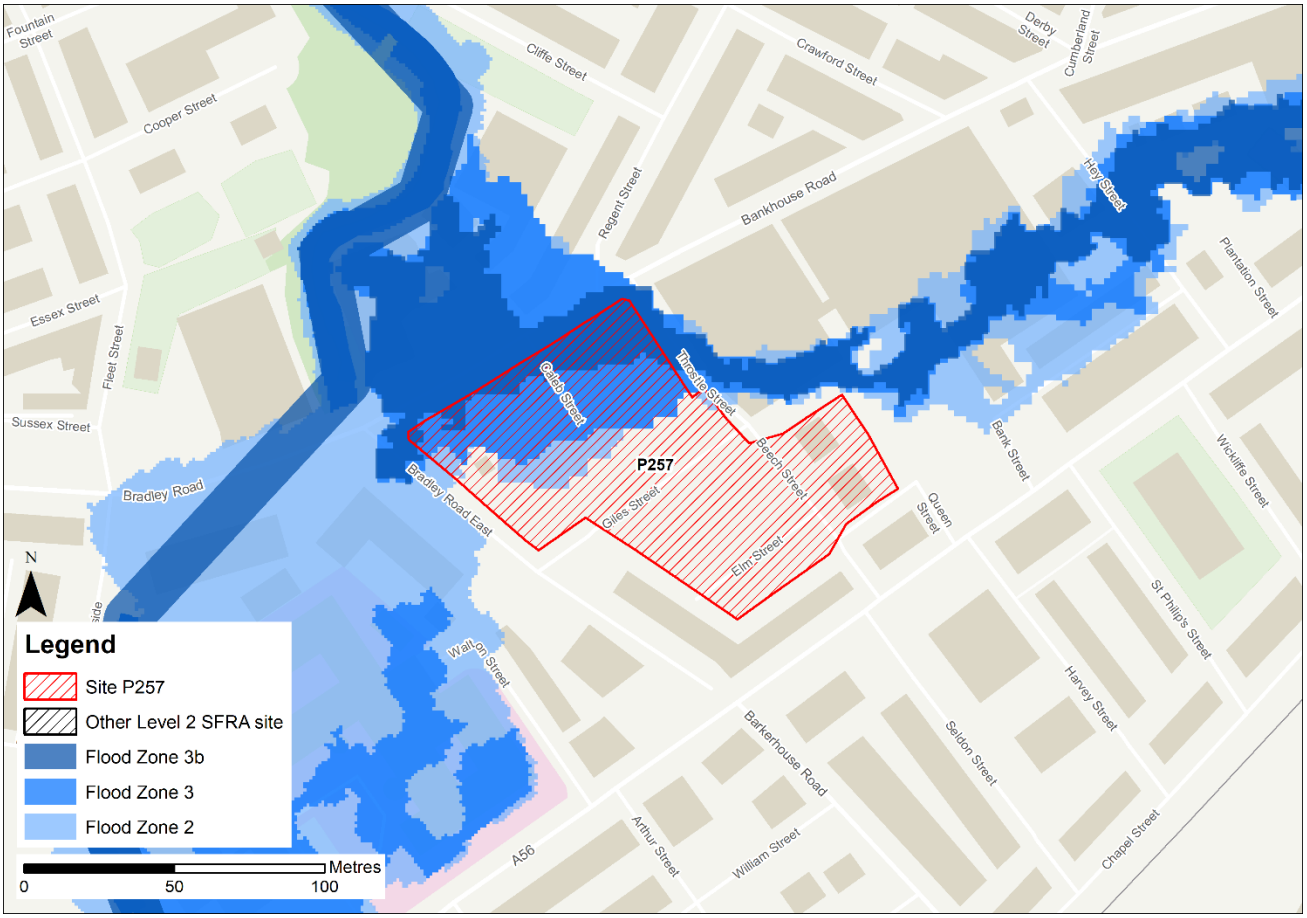

Figure 2-1: existing risk from rivers to the site

2.1.2 Hendon Brook 2018 model outputs

Figure 2-2 shows the modelled flood depths for the 1% AEP undefended event which is the event Flood Zone 3 of the Flood Map for Planning is based on. Modelled risk to the site is similar to Flood Zone 3 in the vicinity of the site, with the area within the north of the site modelled to be at risk. Flood depths are mainly shallow, reflected in the very low hazard rating.

Maximum flood depths within the site are modelled to be between 0.3 and 0.6 m. Figure 2-3 shows the modelled flood hazard ratings for the 1% AEP undefended event. Modelled flood hazard in the area of the site at fluvial risk is largely categorised as 'Very low', with some areas categorised as 'Danger for some'. There is no modelled flood risk to the rest of the site in the 1% AEP undefended event, reflecting Flood Zone 3.

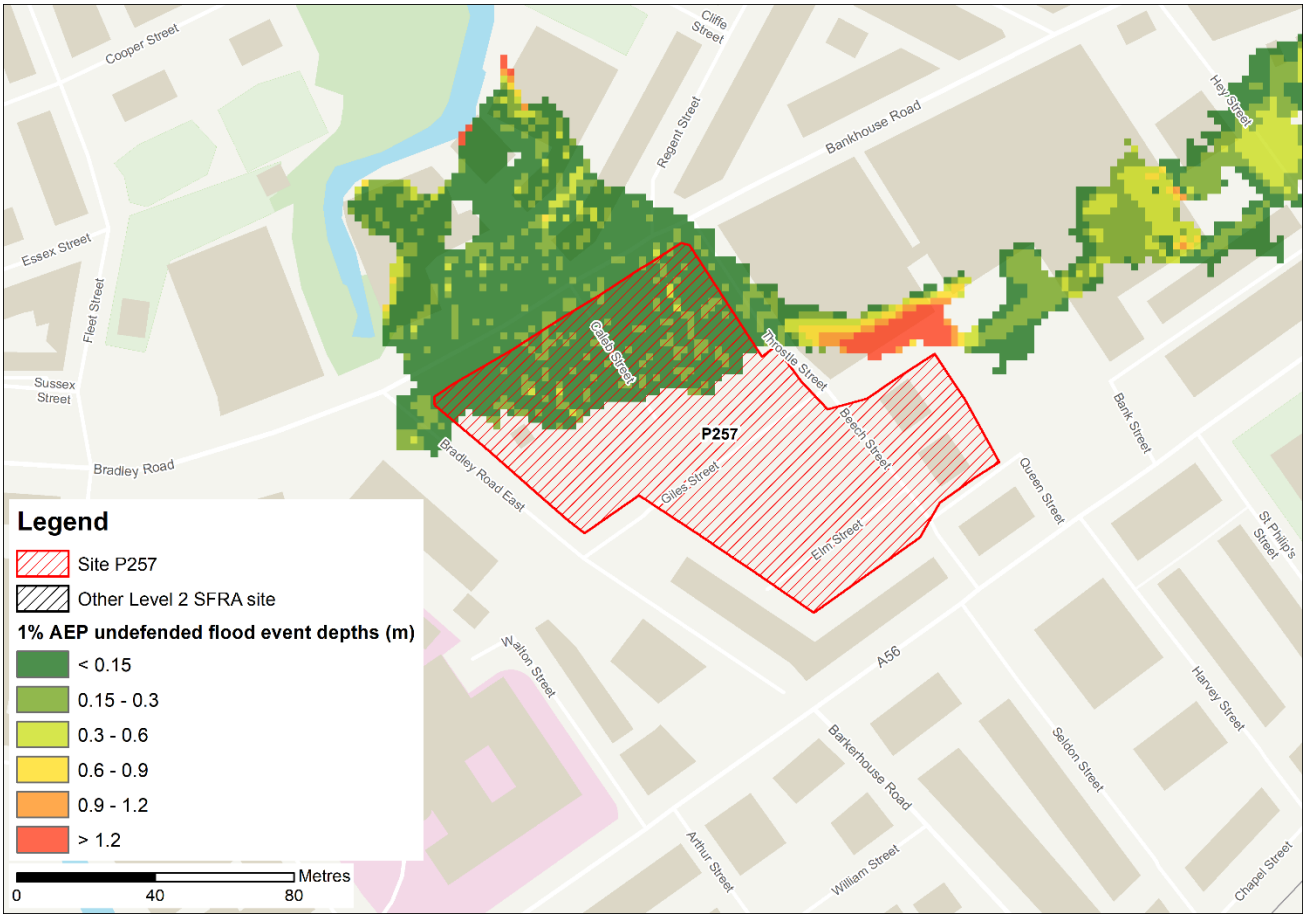

Figure 2-2: flood depths for 1% AEP undefended flood event

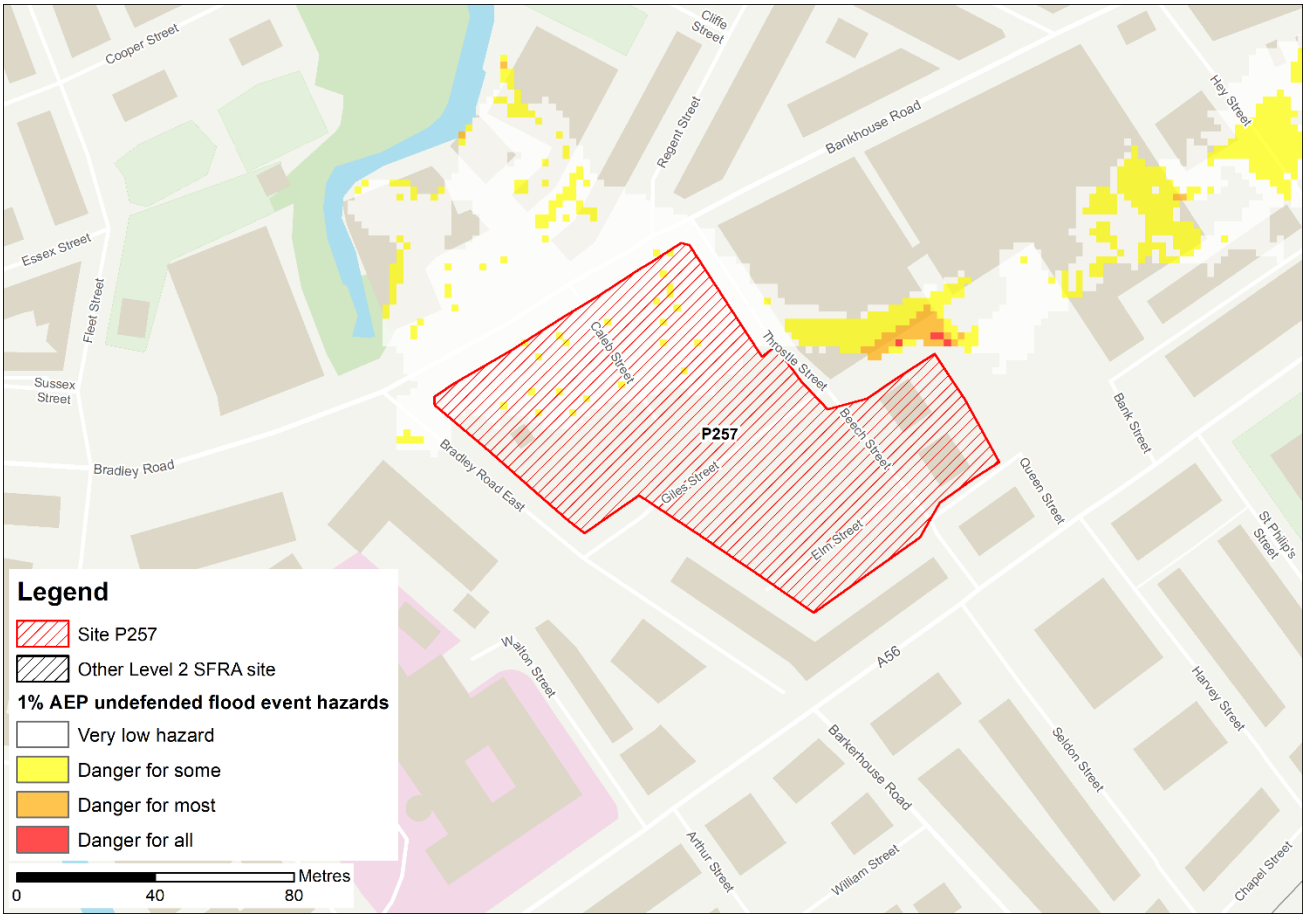

Figure 2-3: flood hazard[1] for 1% AEP undefended flood event

2.2 Impacts from climate change

The impacts of climate change on flood risk from Hendon Brook has not been modelled for this SFRA, as the timescales for the Local Plan would not allow for it. Therefore, in the absence of modelled climate change information, the modelled present day 0.1% AEP undefended event can be used as a conservative proxy for Flood Zone 3 plus climate change. Based on this approach, fluvial risk is modelled to be slightly greater in extent to the present day Flood Zone 3, with some slightly greater depths (Figure 2-4) and hazards (Figure 2-5). Residential development should be directed away from this area.

The impacts of climate change must be modelled using the EA's latest allowances for peak river flows to inform the exception test. Therefore, any updates to this Level 2 SFRA and/or any FRA should include for the most up to date climate change allowances based on a fully up to date flood model.

1 Fluvial hazard ratings based on Table 4 of the SUPPLEMENTARY NOTE ON FLOOD HAZARD RATINGS AND THRESHOLDS FOR DEVELOPMENT PLANNING AND CONTROL PURPOSE – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1. May 2008.

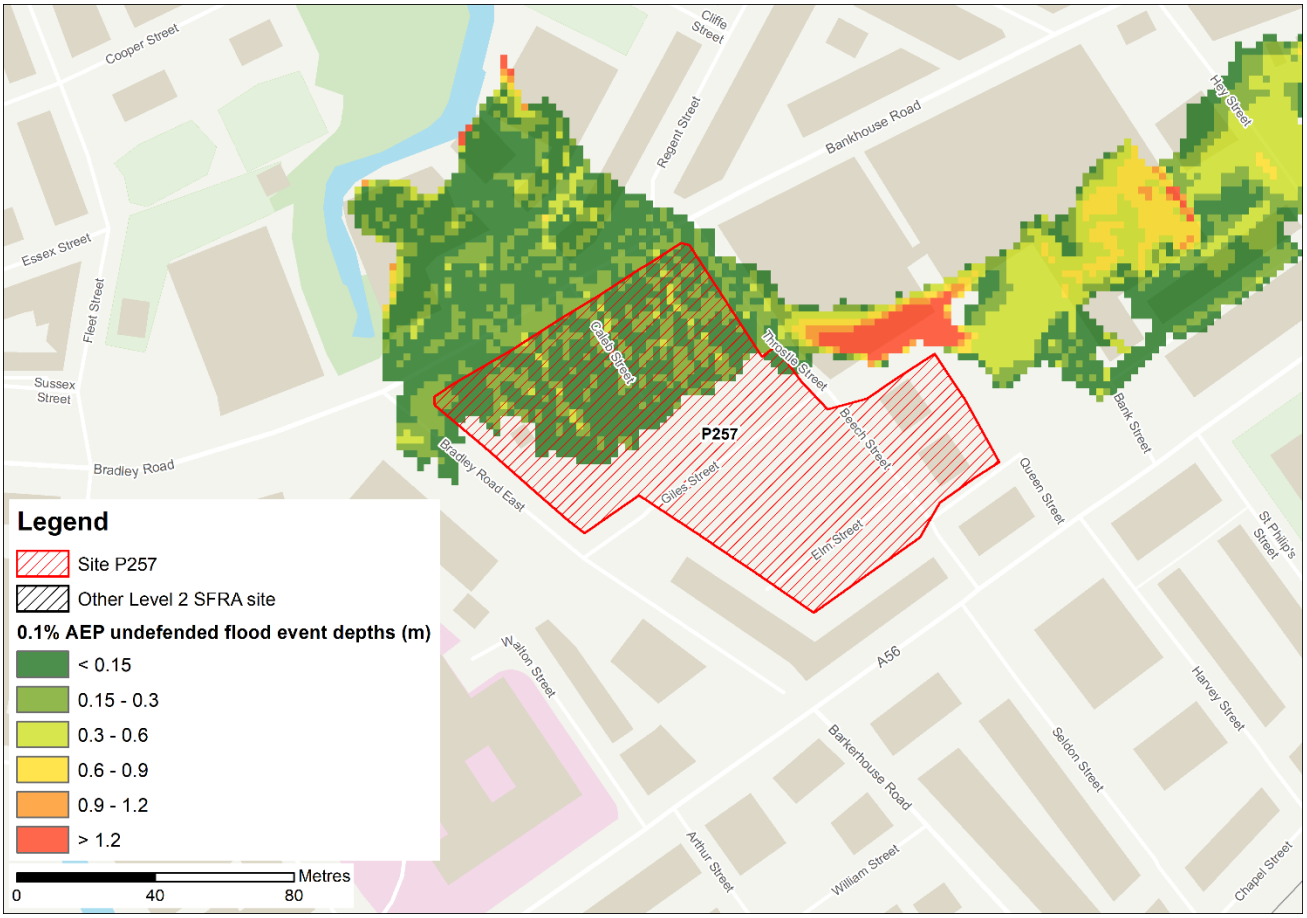

Figure 2-4: flood depths for 0.1% AEP undefended flood event (as a proxy for the 1% AEP undefended event plus climate change)

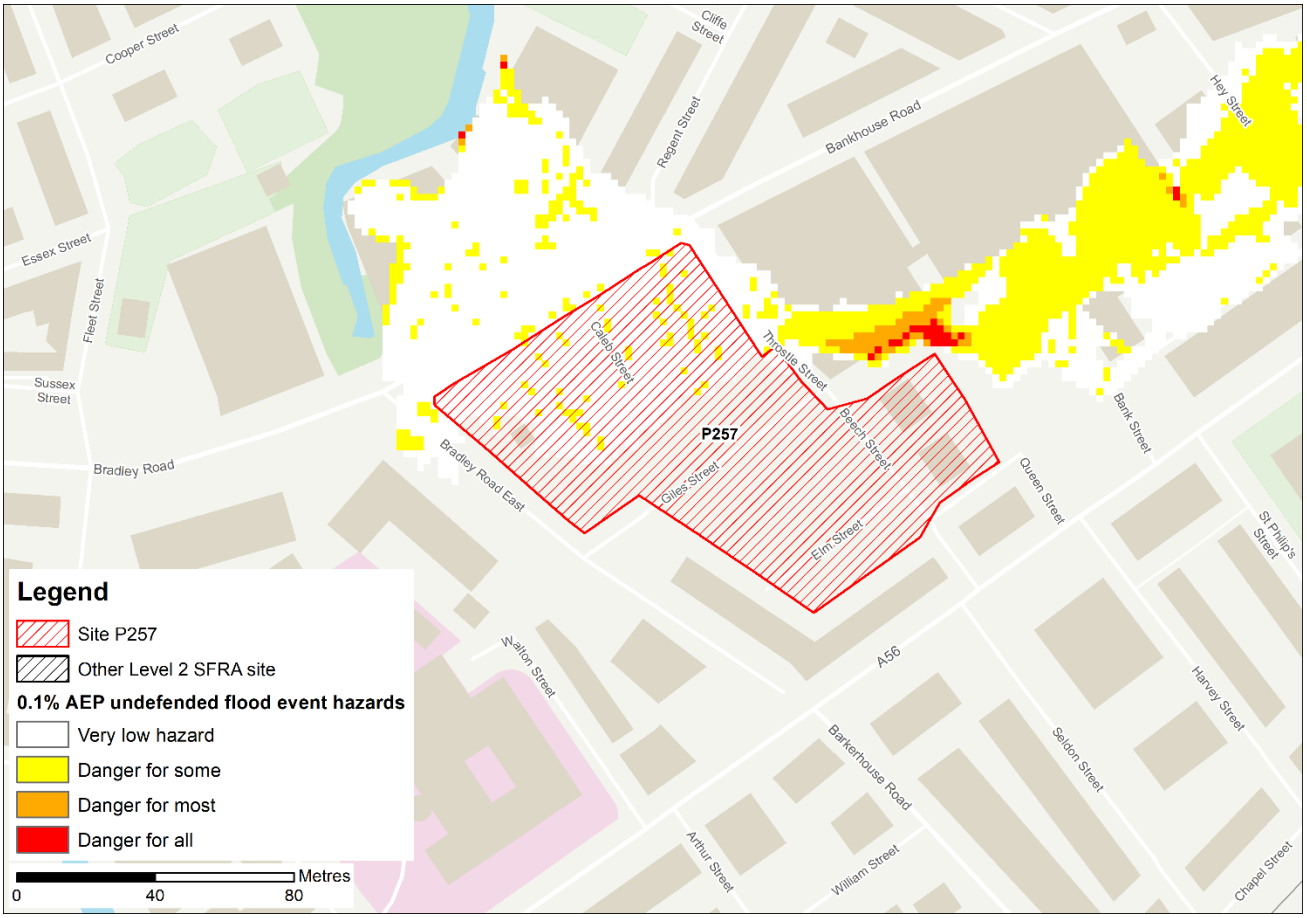

Figure 2-5: flood hazard for 0.1% AEP undefended flood event (as a proxy for the 1% AEP undefended event plus climate change)

2.3 Flood risk management

There are no engineered flood defences within the vicinity of the site that are likely to impact fluvial flood risk. There are however areas of natural high ground along the banks of Walverden Water to the west of the site boundary.

2.3.1 Working with Natural Processes

The EA's Working with Natural Processes (WwNP) dataset has been interrogated to identify opportunities for Natural Flood Management (NFM) to reduce flood risk to the site and surrounding areas. There are no potential areas within the vicinity of the site.

2.4 Residual risk

Although a site may be afforded some protection from defences, there is always a residual risk of flooding from asset failure i.e. breaching / overtopping of flood defences, blockages of culverts or bridge openings.

There is potential residual risk to the site from a possible blockage of Walverden Water which is culverted beneath Bradley Road (Figure 2-6). The impact of a blockage of this structure has not been modelled as part of this Level 2 SFRA, as the timescales for the

Local Plan would not allow for it. It is recommended that the site-specific FRA should consider the impact of a blockage of this culvert on residual flood risk to the site. The Hendon Brook culverted sections should also be investigated for capacity and its spatial course confirmed. Condition surveys should also be carried out by the culvert owners, likely to be the EA given these are main river watercourses.

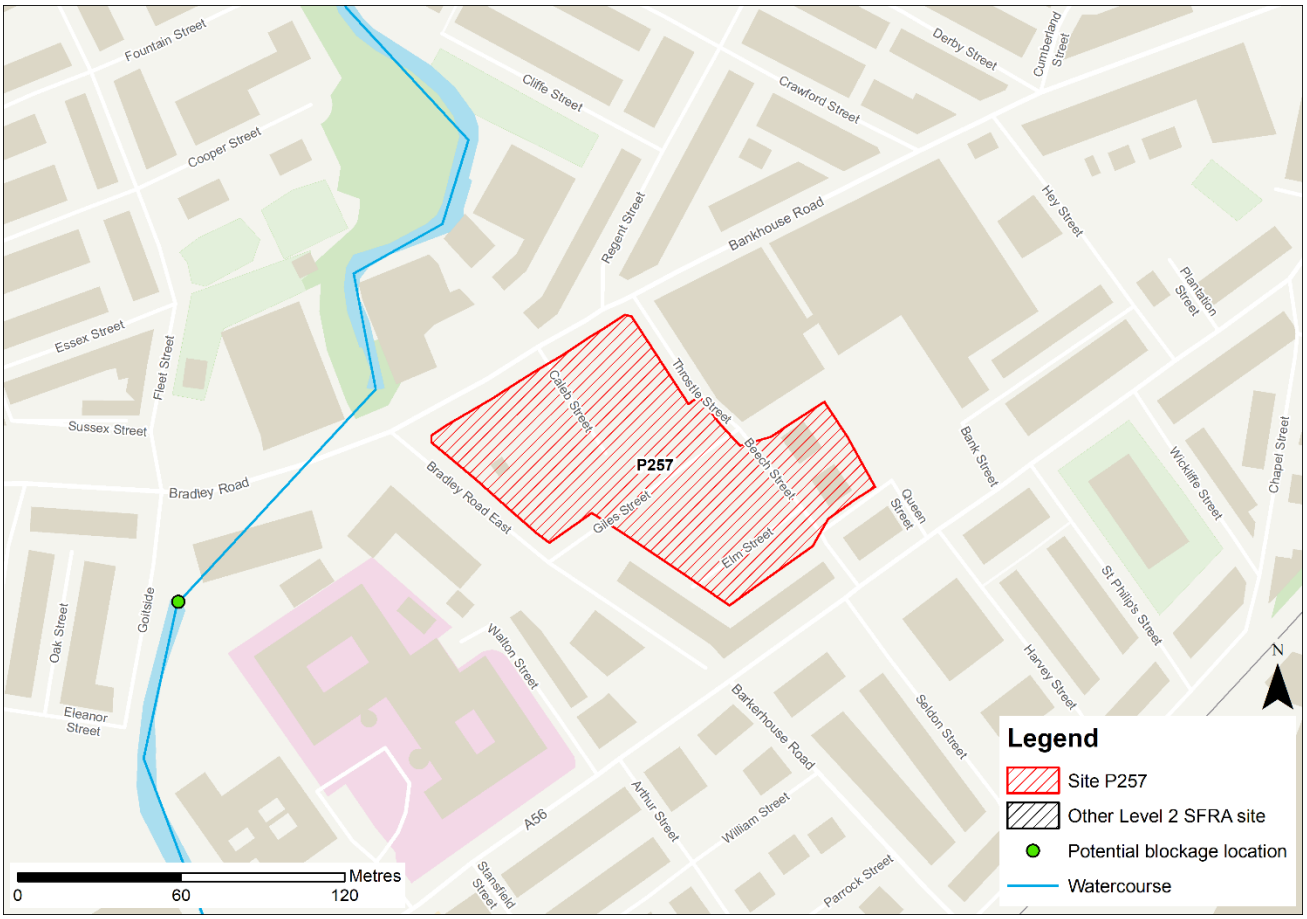

Figure 2-6: Potential culvert blockage location

2.4.1 Flood risk from reservoirs

The EA's Reservoir Flood Maps (RFM) (2021) show where water may go in the unlikely event of a reservoir or dam failure. Figure 2-7 shows the RFM in a "dry day" and "wet day" scenario. A "dry day" scenario assumes that the water level in the reservoir is the same as the spillway level or the underside of the roof for a service reservoir and the watercourses upstream and downstream of the reservoir are at a normal level. A "wet day" scenario assumes a worst-case scenario where a reservoir releases water held on a "wet day" when local rivers have already overflowed their banks.

This site is potentially at risk from three reservoirs, all of which are located either partially or entirely within the Pendle authority area. United Utilities is the undertaker for all three reservoirs.

The EA's SFRA guidance states that where a proposed development site is at flood risk from a reservoir, then an assessment into whether the reservoir design or maintenance

schedule needs improving should be carried out. Expert advice may be required. Refer to the main Level 2 SFRA report for further information.

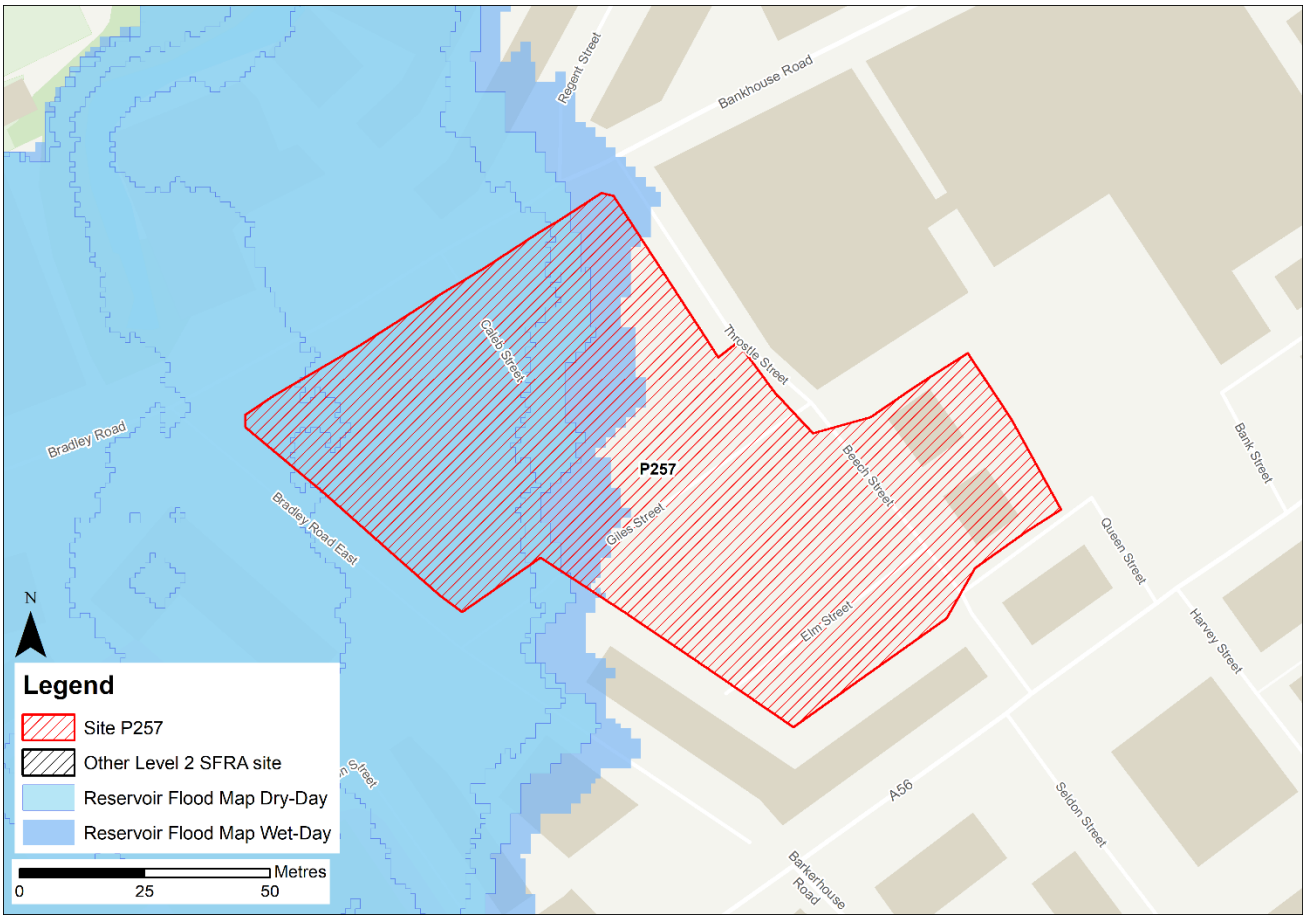

Figure 2-7: Flood risk from reservoirs

2.5 Historic flood incidents

There are no recorded historic flood events within the vicinity of the site.

2.6 Flood warning and access and escape routes

The EA operates a Flood Warning Service for properties located within a Flood Warning Area (FWA) for when a flood event is expected to occur. This site is located within FWA 012FWFL51 - Walverden Water at Nelson, as shown on Figure 2-8.

Flood alerts may be issued ahead of a flood warning for properties located within a Flood Alert Area (FAA) to provide advance notice of the possibility of flooding occurring. A flood alert may be issued when there is less confidence that flooding will occur in a FWA. The site is also located within a FAA, namely 012WAFEL - River Calder in east Lancashire.

Safe access and escape routes should be achievable from the south of the site.

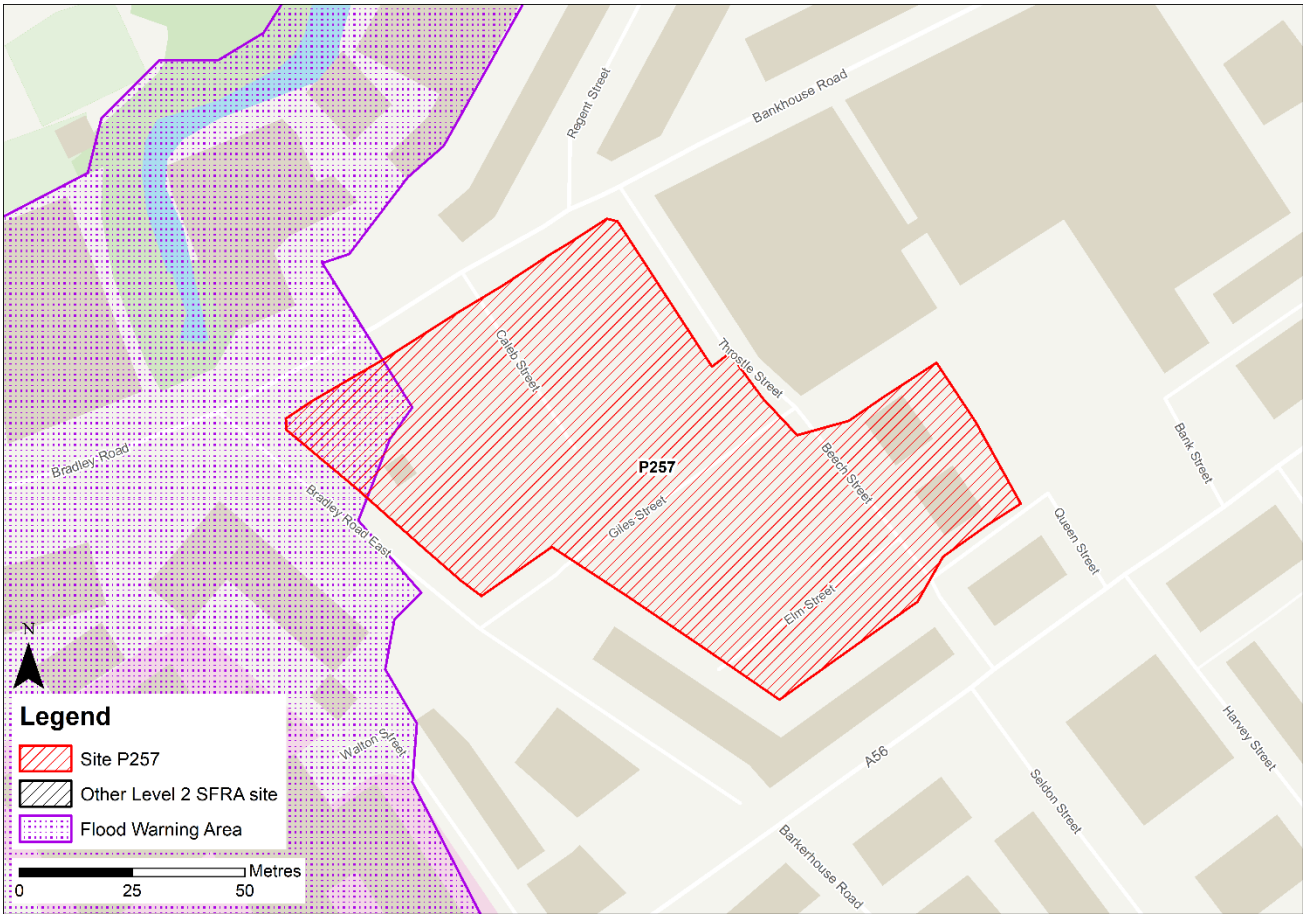

Figure 2-8: EA Flood Warning Areas

2.7 Observations, mitigation options and site suitability - fluvial

- The proposed development of the site would see a change in the risk classification from less vulnerable to more vulnerable, according to the NPPF classification.
- Given the change in use and therefore vulnerability of the site, the site-specific FRA must show that the development can be designed to be safe and that there is adequate emergency planning provision (para 014 FRCC-PPG).
- The site is modelled to be within the functional floodplain along the northern boundary of the site, adjacent to the Hendon Brook culvert. Development is not permitted within the functional floodplain. The whole area at fluvial flood risk within Flood Zone 3a and Flood Zone 2 should not be developed for housing and should be used for amenity open greenspace.
- A flood risk activity permit may be required from the EA if development is planned within 8 metres of the culverted section of Hendon Brook, which is a main river. No development should take place on top of the culvert. EA advice would normally recommend for no development within 8m of a main river or a culvert, to enable access for maintenance activities.

- There is potential residual risk to the site from a blockage or failure of this culvert and also the culvert inlet on Walverden Water. The impacts of any failure or blockage of both culverts should be investigated.
- Options into culvert removal should be investigated whereby the watercourse is opened up and included in site layout and design as blue / green infrastructure.
- The 0.1% AEP undefended event outputs have been used as a proxy to provide a conservative estimate of the 1% AEP undefended event plus climate change. Based on this approach, fluvial risk is modelled to remain largely similar in extent to the present day Flood Zone 3, with some slightly greater depths and hazards. However, climate change must be modelled to inform the exception test for this site.
- The EA flood warnings and alerts should continue to be in place to ensure early evacuation of site users before an extreme flood event occurs. Safe access and escape routes are available from several locations based on current information.

3 Flood risk from surface water

3.1 Existing risk

Based on the EA's national scale Risk of Flooding from Surface Water (RoFSW) map, surface water risk to the site is very low. Approximately 3% of the site is within the high risk surface water flood zone, as shown in Table 3-1. A further 14% of the site is at medium risk and a further 19% of the site is at low risk.

The area at risk in the high risk event is mainly confined to a distinct flow path along the hardstanding area of Giles Street through the centre of the site, and a small area of risk along the western boundary of the site. This is consistent with the medium risk event, however with a few additional flow paths along Caleb Street and another unnamed road. In the low risk event, the same flow paths along hardstanding flow paths remain, although larger in extent, with a greater area of flooding within the west of the site.

Greatest flood depths in the high risk event range between 0.15 and 0.3 m (Figure 3-1) with some areas of moderate hazard (Figure 3-2). Safe access and escape routes should be possible via Bankhouse Road to the north of the site in the high and medium risk events. Safe access and escape routes may be challenging to achieve via this route in the extreme low risk event, however there may be options via the A56 to the south of the site.

Table 3-1: existing surface water flood risk based on the RoFSW map

Very low risk (%)	Low risk (%)	Medium risk (%)	High risk (%)
64	19	14	3

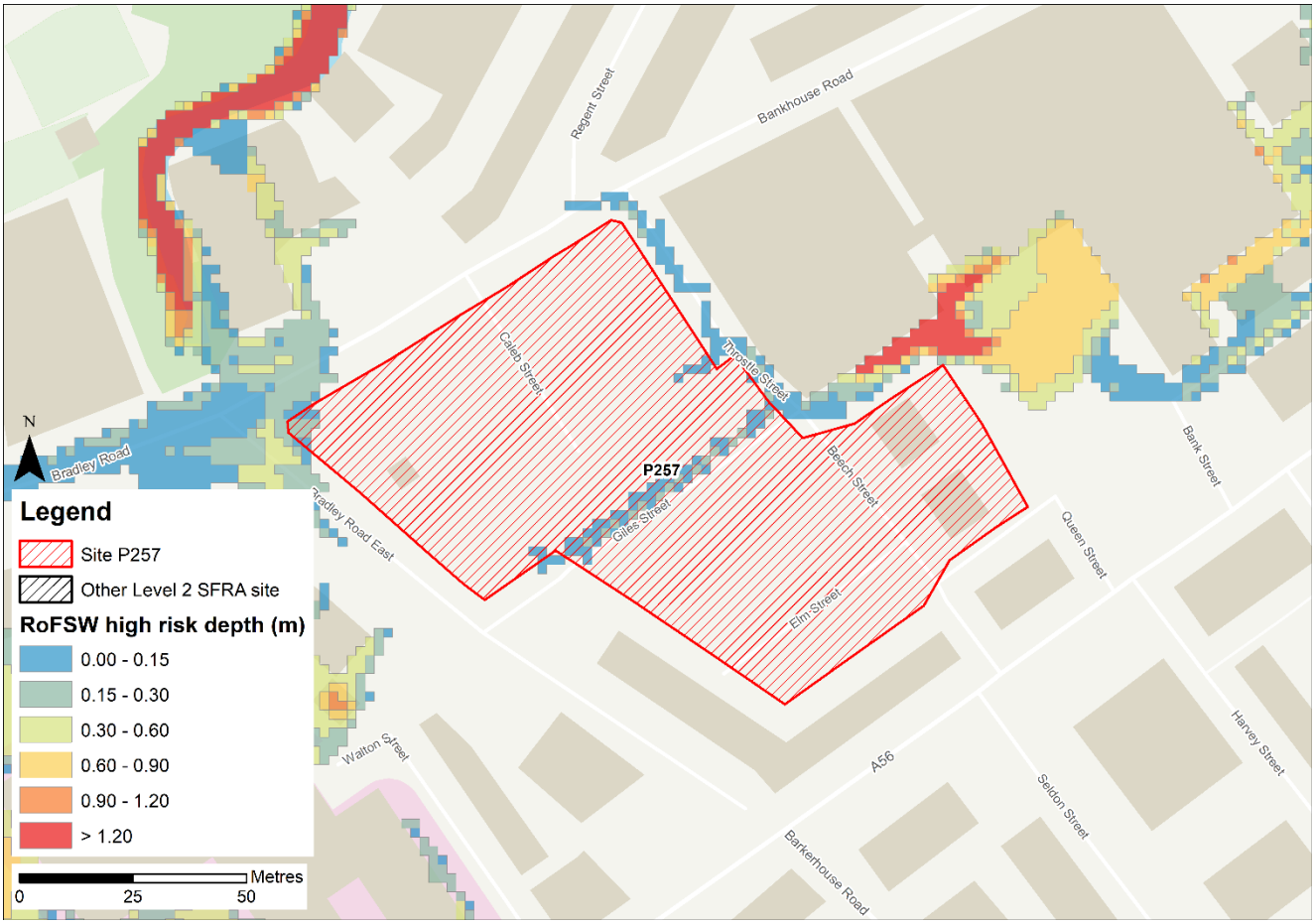

Figure 3-1: high risk event surface water flood depths (Risk of Flooding from Surface Water map)

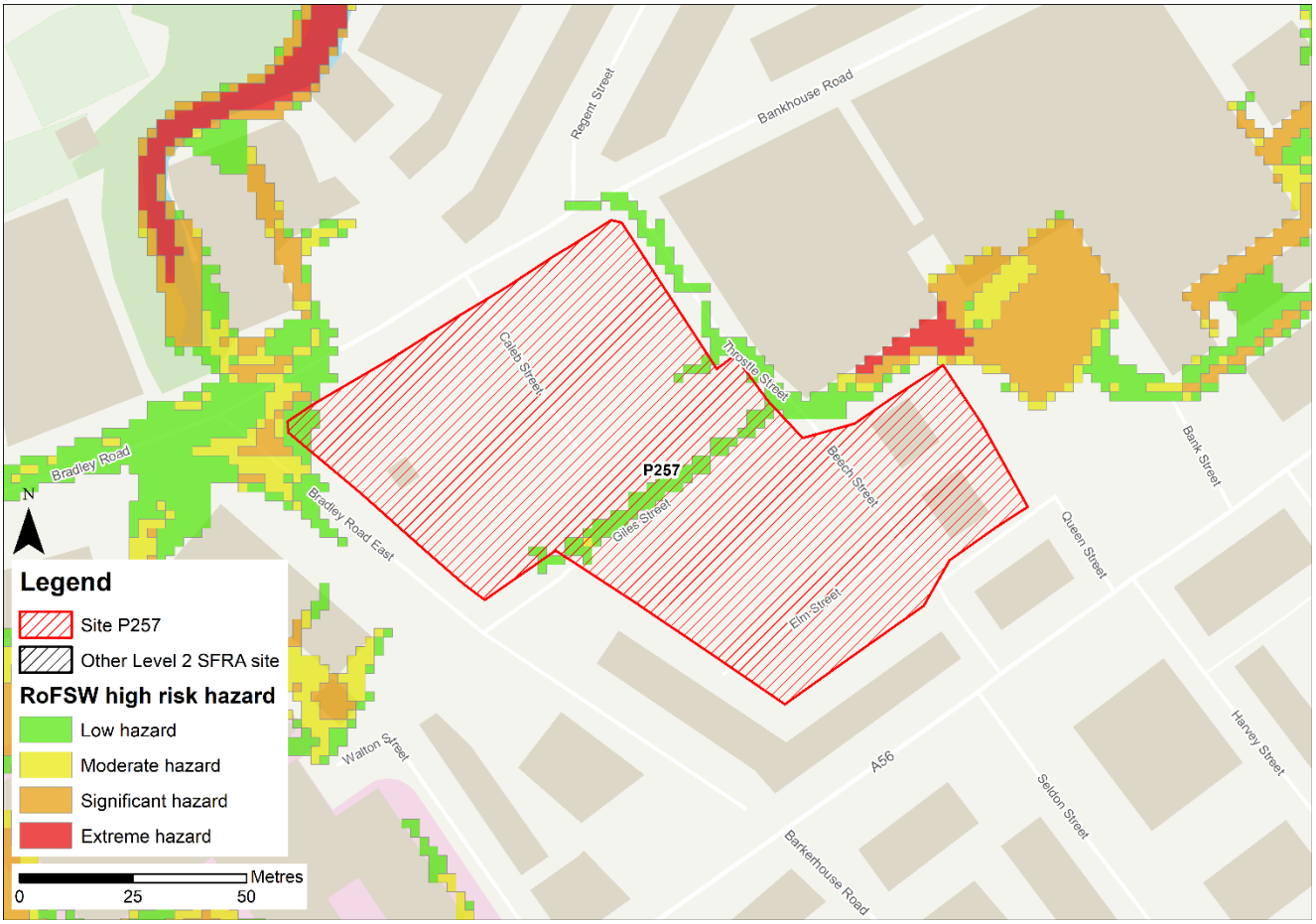

Figure 3-2: high risk event surface water flood hazard[2] (Risk of Flooding from Surface Water map)

3.2 Impacts from climate change

The impact of climate change on surface water flood risk has been modelled. This allows for direct comparison with the RoFSW map. With consideration of the EA's SFRA guidance, the latest climate change allowances have been modelled as shown in Table 3-2.

Table 3-2: modelled climate change allowances for rainfall for the Ribble Management catchment

Return period	Central allowance 2070s	Upper end allowance 2070s
3.3% (high risk)	30%	40%
1% (medium risk)	35%	50%

Figure 3-3 shows the modelled surface water flood depths for the medium risk event +50% climate change. Risk is modelled to be significantly greater than for present day conditions, with the medium risk plus climate change event being similar in extent to the low risk present day event. Greatest flood depths are modelled to be between 0.9 and 1.2 m with

2 Based on Section 7.5 Hazard rating. What is the Risk of Flooding from Surface Water map? Report version 2.0. April 2019. Environment Agency

some areas of extreme hazard (Figure 3-4). Safe access and escape routes may be challenging to achieve.

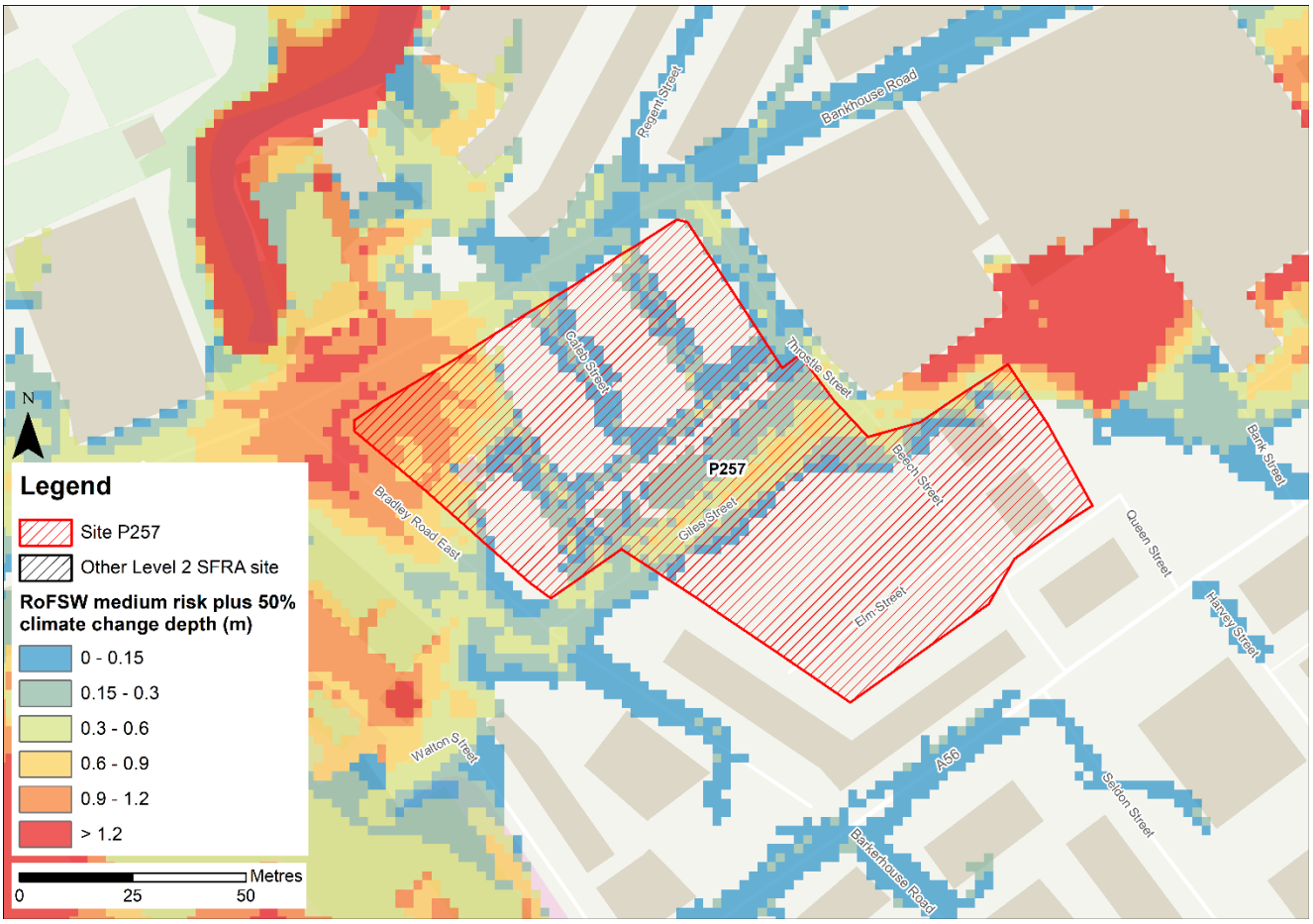

Figure 3-3: medium risk event surface water flood depths plus 50% climate change (based on Risk of Flooding from Surface Water map)

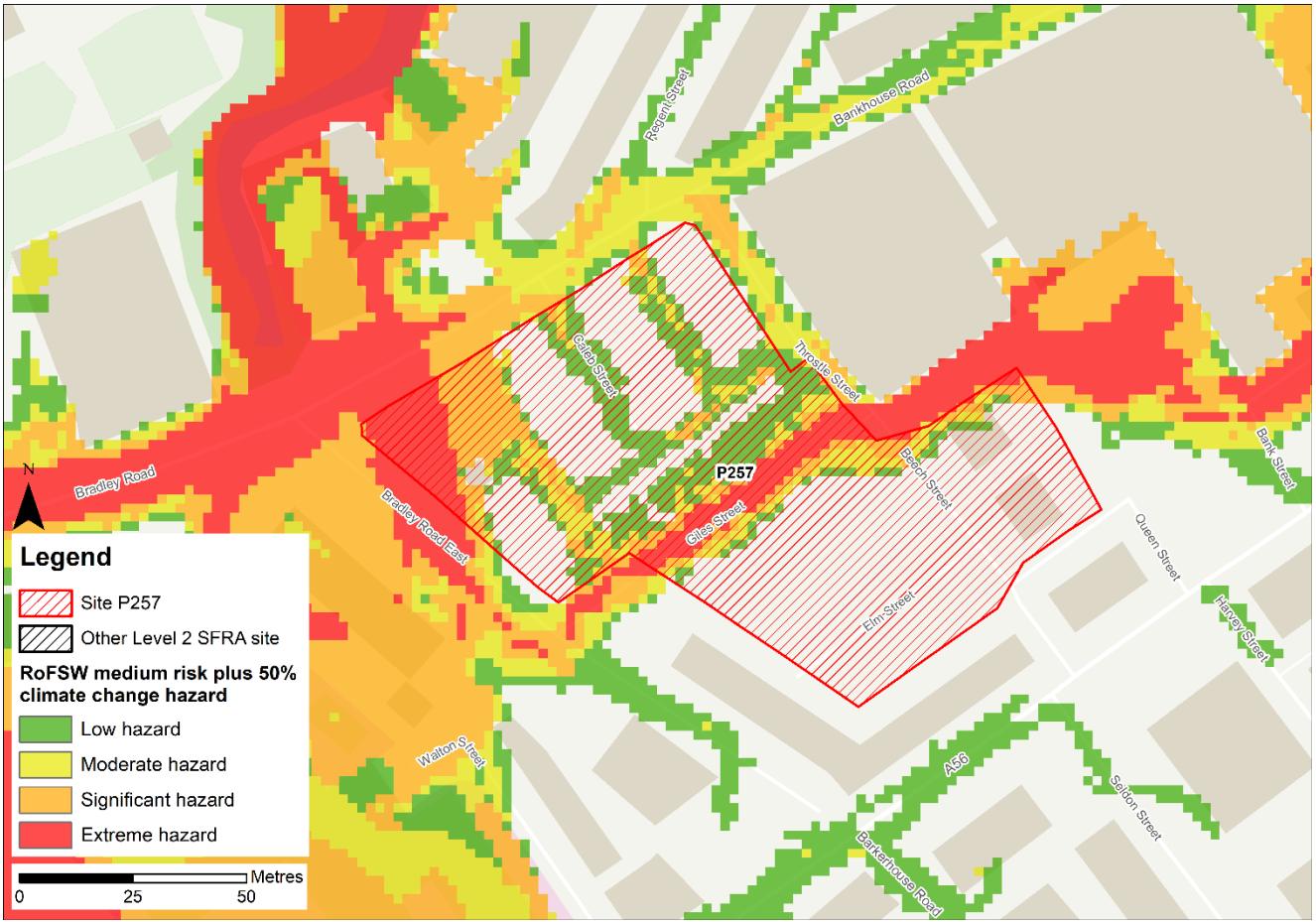

Figure 3-4: medium risk event surface water flood hazards plus 50% climate change (based on Risk of Flooding from Surface Water map)

3.3 Observations, mitigation options and site suitability - surface water

- The site is predominantly at very low surface water flood risk in the present day, with significant flow paths along the hardstanding roads through the site. Safe access and escape routes may be challenging to achieve to the north of the site in the extreme low risk event, however there may be options to achieve this to the south via the A56. Any existing flow paths should be maintained in site design.
- The modelled climate change outputs indicate significantly increased surface water flood risk to the site in the medium risk event. Safe access and escape routes may be achievable via the A56 to the south of the site.
- A detailed drainage strategy will be required for this site and the wider area to ensure there is no increase in surface water flood risk elsewhere as a result of new development. This will require detailed surface water modelling based on layout plans and detailed design and full consultation with the LLFA on required runoff rates.
- The use of appropriate SuDS should be investigated. The groundwater table is likely to be low in this location judging from the Groundwater Flood Map in Figure 4-1 therefore infiltration SuDS may be an option. This will require appropriate ground and infiltration survey.

- The RoFSW map is not suitable for identifying whether an individual property will flood and is therefore indicative. The RoFSW map is not appropriate to act as the sole evidence for any specific planning or regulatory decision or assessment of risk in relation to flooding at any scale without further supporting studies or evidence.

4 Flood risk from groundwater

Flood risk from groundwater sources is assessed in this SFRA using JBA's 5m Groundwater Flood Map. This dataset is recommended for use by the EA in the SFRA Good Practice Guide[3]. Figure 4-1 show the map for the site and the surrounding areas and Table 4-1 explains the risk classifications.

The entire site is in an area of no risk of groundwater emergence. Groundwater conditions should therefore be suited to infiltration SuDS.

Figure 4-1: JBA 5m Groundwater Flood Map

3 Strategic flood risk assessment good practice guide. ADEPT. December 2021.

Table 4-1: Groundwater Flood Hazard Classification

Groundwater head difference (m)*	Class label
0 to 0.025	Groundwater levels are either at very near (within 0.025m of) the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to both surface and subsurface assets. Groundwater may emerge at significant rates and has the capacity to flow overland and/or pond within any topographic low spots.
0.025 to 0.5	Groundwater levels are between 0.025m and 0.5m below the ground surface in the 100-year return period flood event. Within this zone there is a risk of groundwater flooding to surface and subsurface assets. There is the possibility of groundwater emerging at the surface locally.
0.5 to 5	Groundwater levels are between 0.5m and 5m below the ground surface in the 100-year return period flood event There is a risk of flooding to subsurface assets, but surface manifestation of groundwater is unlikely.
>5	Groundwater levels are at least 5m below the ground surface in the 100-year return period flood event. Flooding from groundwater is not likely.
N/A	No risk. This zone is deemed as having a negligible risk from groundwater flooding due to the nature of the local geological deposits.

5 Overall site assessment

5.1 Can part b) of the exception test be passed?

To pass part b) of the exception test[4], it must be proven that the development can be safe for its lifetime, which is 100 years for residential development, taking account of the vulnerability of its users, without increasing risk elsewhere, and, where possible, will reduce flood risk overall.

- Based on current information, the exception test cannot be passed for this site as it cannot, at this stage, be proven that the site can be safe for its lifetime, in the absence of updated modelled climate change information. The lead local flood authority must be consulted on the surface water flood risk.

5.2 Recommendation summary

Based on the evidence presented in the Level 1 SFRA (2021) and this Level 2 SFRA:

- There should be no development within the functional floodplain. There should be no development within 8m of the Hendon Brook culvert.
- Updated climate change modelling along Hendon Brook and Walverden Water should be used to update this Level 2 SFRA or to inform the site-specific FRA to provide a robust assessment of flood risk to this site and the surrounding areas in order to inform the exception test.
- Based on current information, this site could be allocated if development avoids the area at modelled fluvial risk in the modelled 0.1% AEP undefended event, as a conservative proxy for Flood Zone 3 plus climate change.
- A drainage strategy will also be required for any new development, given the significant extent of surface water flooding when considering climate change. The lead local flood authority should be consulted in the first instance. The use of infiltration SuDS should be investigated.
- Residual risk from the culverted watercourses must be accounted for.
- Were this site to be allocated based on current information, the LPA must make it clear that this site cannot be developed until the required information detailed in this SFRA.

5.3 FRA requirements and further work

- Any FRA must further carry out detailed modelling to ascertain the impacts of climate change on fluvial flood risk from Hendon Brook and Walverden Water.
- Any FRA must further consider surface water flood risk including a drainage strategy which should include ground investigation for infiltration SuDS suitability.

4 Para 164 National Planning Policy Framework 2023

- Any FRA should undertake a capacity and condition assessment of the culverts and investigate the impact of a potential blockages.
- Any FRA should be carried out in line with the NPPF; FRCC-PPG; EA guidance; Pendle Local Plan and LLFA policies; and national and local SuDS policy and guidelines.
- Throughout the FRA process, consultation should be carried out with the following, where applicable, the LPA; LLFA; emergency planning officers; EA; UU; the highways authorities; and the emergency services.

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