

Central Buildings and Adjoining Land, Brook Street, Wrexham, LL13 7LH

Proposed Residential Redevelopment

Statement of Case - Flood Risk

Project ref:	4183 Central Buildings and Adjoining Land, Brook Street, Wrexham
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Introduction

1. This Flood Risk Statement of Case (SoC) relates to the proposed redevelopment of a circa 0.18 ha site in Wrexham for residential use.
2. The SoC has been prepared by Dr Kevin Tilford, Managing Director of Weetwood Services Ltd, a consultancy firm specialising in flood risk and drainage.
3. Dr Tilford holds a BSc(Hons) in Environmental Science from the University of Lancaster (1986), an MSc(Eng) in Water Resources Technology from the University of Birmingham (1987), a PhD from the University of Salford (1991) and an MBA from Cranfield School of Management (2006).
4. He is a Chartered Water and Environmental Manager, Fellow of the Chartered Institution of Water and Environmental Management and a Chartered Environmentalist. He currently serves as an elected member of the CIWEM Professional Standards Committee, a committee responsible for overseeing the maintenance of professional standards and ethics within the water and environmental management profession.
5. Dr Tilford has worked in the field of hydrology, water engineering and flood risk management since 1988, initially as an academic and thereafter as a consultant with WS Atkins (2000-2005), EC Harris (2006-2010) and Weetwood (2010 on). He has worked on a wide range of development projects including residential developments, mixed use schemes, employment sites and business parks, industrial sites and leisure and recreation schemes.
6. Weetwood has been involved in the proposals for Central Buildings and adjoining land since April 2018 and prepared the Flood Consequences Assessment report (FCA) and FCA Addendum that accompanied the planning application for the proposed development.
7. The evidence and opinions presented in this document are Dr Tilford's true and my professional judgements, based on the scientific evidence and professional experience.

Overview of Proposals

8. The circa 0.18 ha site is located on the corner off Brook Street and Bridge Street, Wrexham. The northern part of the site is currently occupied by an unused three storey building (4 Brook Street, known as and referred in this document as "Central Buildings"). Central Buildings (all floors) was previously used as a nightclub. All floors of the building are believed to be currently unoccupied. The southern part of the site, to the rear of Central Buildings, is currently vacant.
9. The proposal has two main elements:
 - The conversion of the first and second floors of "Central Buildings" to provide ten apartments;
 - The redevelopment of the vacant part of the site to provide a four-storey block of twenty-eight apartments (7 apartments on each floor).

Planning Background

Pre-Application Consultation

10. Natural Resources Wales (NRW) was consulted on the proposals in June 2018. It responded by way of a letter dated (27 June 2018 (NRW reference: CAS-64216-S2V9). The key points in the letter are summarised as follows:

- The proposed development as a whole would form Highly Vulnerable development (HVD) as defined by TAN15.
 - The site is located within Zone C2 and Zone B and immediately adjacent to the culverted section of the River Gwenfro on Brook Street. The site is located within the fluvial flood extents of Flood Zone 2 and within an area at risk from surface water flooding.
 - The proposed change of use to residential, from a Less Vulnerable development nightclub located entirely within C2, would be contrary to Paragraph 6.2 of TAN 15 which states that HVD should not be permitted.
 - The remaining part of the site and the proposal for 32 new residential apartment blocks is partially located in Zone B, which is an area known to have previously flooded. The proposed development would need to be checked against the site levels and extreme flood outline or 0.1% annual exceedance probability (AEP). To assess the need for a flood consequence assessment and the acceptability criteria in section 7 and Appendix 1 of TAN 15. Taking into account the Welsh Government's 2016 climate change guidance CL-03-16 and blockage and breach guidance OGN100.
 - There has been a recent flood risk modelling study (2016) completed for the River Gwenfro.
11. NRW were consulted a second time in August 2018 and responded by way of a letter dated 11 September 2018 (NRW reference: CAS-67398-N6L2). The key points in the letter are summarised as follows:
- The proposal is for HVD (residential), partially located in Zone C2 of the Development Advice Map (DAM) and given that the proposals are contrary to planning policy advice (referencing paragraph 6.2 of TAN15) that the proposals should not be permitted.
 - That should the local planning authority consider that there were overriding reasons to consider granting the application despite its location in Zone C2, NRW would review a submitted FCA.
 - NRW stated, with reference to a 2018 appeal (ref APP/A6835/V/17/3190167; Former Spectrum Garden Centre, Cefn y Bedd, Wrexham) that national planning policy does not allow for mitigation works to be undertaken to reduce the risk of flooding for new HVD to be considered acceptable in Zone C2, and that the justification tests (paragraph 6.2 of TAN15) do not apply to HVD in Zone C2.
12. Pre-application consultation was also undertaken with Dwr Cymru Welsh Water (DCWW). DCWW confirmed by way of a letter dated 24 August 2018, that there was capacity in the public sewerage system to accommodate foul water from the proposed development and indicated a potential point of connection to a public combined sewer on the corner of Brook Street and Bride Street adjacent to Central Buildings.

Planning Application

13. A planning application for *“Residential development comprising conversion of first and second floors of central buildings to provide 10 no. Apartments with related alterations at ground floor level and erection of 28 no. Apartments on adjacent land with associated parking”* was submitted to Wrexham County Borough Council (local planning authority) on 30 October 2018. The application was validated with planning reference P/2018/0915.
14. In respect of flood risk and drainage, the planning application was accompanied by a Flood Consequence Assessment report (FCA) prepared by Weetwood (report ref: 4183/FCA/Final/v1.2/2018-08-22; Issue date 22 August 2018) (refer **Annex A** to this document) and by a report setting out the pre-application consultation undertaken by the applicant (Report on Pre-Application Consultation, The Planning Consultancy, undated, unreferenced).
15. An Addendum to the submitted FCA (“FCA Addendum”) prepared by Weetwood (report ref: 4183/FCAA/Final/v1.0/2019-08-19; Issue date 19 August 2019) (refer **Annex B** to this document) was submitted in August 2019 in response to a consultation response from NRW (see below).
16. The application was reported to Members on 27 July 2020. In respect of flood risk and drainage, the report states the following:
- The majority of the existing building and a small part of the proposed building is located in Zone C2
 - Paragraph 6.2 of TAN15 is “very clear” that HVD should not be permitted in Zone C2, and “*TAN15 makes no exceptions*”.

- Supplementary guidance issued by Welsh Government¹ states that residential development should only be located in an area of flood risk which is developed and served by significant infrastructure, including flood defences, i.e. Zone C1 of the Development Advice Map.
 - Whilst a number of factors weigh heavily in favour of the site [redevelopment], e.g. contribution to housing supply, bringing vacant flood space and previously developed land back into use, these “*very considerable benefits*” do not justify the granting of permission for a development that is at an unacceptable risk of flooding.
 - Whilst there may be scope to develop the vacant plot such that residential building is located entirely out of Zone C2, the current proposals have been considered in their entirety, and on this basis the proposals conflict with TAN15 and Policy EC12.
 - Redevelopment of the site provides the opportunity to reduce the loading on existing surface water drainage infrastructure.
17. The report concludes “*The proposals offer considerable benefits in respect of bringing an under used building and vacant land back into use and contributing to housing supply.... However, the benefits are outweighed by the risk to the development of flooding, which brings the proposals into conflict with policy EC12 and TAN15*”. The recommendation made is that permission is refused.
18. The application was deferred to allow for a meeting with Natural Resources Wales (NRW) to consider the Zone C2 designation of the site and the implications for the wider development of the area.
19. A further Officer Report issued on 4 January 2021 states that NRW declined to meet on the basis that its position on the matter was clear. The report states that NRW confirmed its view that the application should be determined in reference to the extant version of Technical Advice Note 15 (TAN15), and not against an emerging update of TAN15².
20. The report concludes that in the light of the above, the (Council) position on the development remained unchanged and “*Whilst it is acknowledged that the site and wider town centre would benefit from bringing a vacant site and building back into use, the proposals very clearly conflict with TAN15 advice given that the site lies partly in Zone C2*”.
21. The main report is unchanged from the 27 July 2020 report, and the report recommended that permission is refused.
22. **Grant of planning permission was refused by way of a Decision Notice letter dated 4 January 2021. The sole reason for the Council’s decision to refuse permission for the development was as follows:** “*The site lies partially in zone C2 and as a result the development is at unacceptable risk of flooding, thus being in conflict with advice in TAN15: Development and Flood Risk and policy EC12 of the Wrexham Unitary Development Plan*”.

Flood Risk Consultation Responses

23. Following submission of the planning application, NRW provided a consultation response dated 21 November 2018 (NRW reference: CAS-90759-J9H2). The key points in the consultation response letter are summarised as follows:
- The proposals are for HVD (housing) in (partially) Zone C2 of the DAM. Paragraph 6.2 of TAN15 advises that HVD should not be permitted. A planning decision to permit development would therefore be contrary to planning policy advice.

¹ It is presumed that this comment is referring to the “Summary of what TAN15 requires for highly vulnerable development (houses) to be considered acceptable” document published by the Welsh Government in July 2004: <https://gov.wales/sites/default/files/publications/2018-09/tan15-summary-requirements.pdf>

² It is understood that the Welsh Government is currently preparing revised planning guidance in relation to flooding and coastal erosion and aims to replace the development advice map with a new Wales Flood Map; place a greater emphasis on the development plan and the value of strategic flood consequences assessments; integrate guidance on coastal erosion with flood risk issues in TAN 15; and provide guidance for regeneration initiatives affecting communities in flood risk area (reference: <https://gov.wales/technical-advice-note-15-development-flooding-and-coastal-erosion>). Public consultation closed in January 2020. According to Welsh Government, the revised TAN15 will replace TAN14 Coastal Planning (1998) and TAN15 Development and Flood Risk (2004). At the time of writing, the revised TAN15 had not been published.

- Until NRW receives written confirmation [from Wrexham Council] stating that the authority believes that there are overriding reasons to consider granting the application despite its location partially in Zone C2, NRW would not review the submitted FCA.
 - NRW advises [Wrexham Council] that the application should be refused on planning policy grounds.
 - If Wrexham Council proposes to consider the development despite its location in Zone C2, NRW should be re-consulted. In such circumstances, NRW would review the submitted FCA (time permitting).
 - Should a local planning authority be minded to grant permission for a HVD (including residential developments of 10 or more dwellings) in Zone C2, there is a requirement to refer the application to the Welsh Government. It should not be assumed that sites located partially in Zone C2 or less than 10 units are excluded.
24. In a letter dated 14 June 2019 to NRW, Wrexham Council cited “*over-riding reasons*” and requested more detailed advice on the proposals and the submitted FCA. In response, NRW provided a further consultation response dated 15 July 2019 (NRW reference: CAS-67398-N6L2)³. The response is summarised below.
25. NRW stated it had significant concerns with the proposed development as submitted and recommended that planning permission should only be granted if a (revised) FCA demonstrated “*...that the risks and consequences of flooding could be managed to an acceptable level*”. Failing this, NRW stated it would object to proposals.
26. NRW states that the proposals are for HVD (housing) in (partially) Zone C2 of the DAM. Paragraph 6.2 of TAN15 advises that HVD should not be permitted and also that the justification tests within section 6 of TAN 15 should not apply. NRW goes on to state that notwithstanding the Zone C2 policy position and recognising the formal request [from Wrexham Council] for bespoke flood risk advice, it has reviewed the submitted FCA to provide technical advice on the acceptability of flooding consequences in accordance with Appendix 1 of TAN15.
27. NRW summarised its position by stating “*Having reviewed the report, our advice is that the FCA has failed to demonstrate that the risks and consequences of flooding can be managed to an acceptable level in line with TAN15...*” The justification for this position as presented in the NRW letter is summarised as follows:
- The application site lies partially in Zone C2, with the building subject to conversion [Central Buildings] lying almost wholly in Zone C2. The area of new development, i.e. apartment block and car park, shows the car park is located partially in the C2 outline. The development, which is considered to be everything within the red line boundary, constitutes new HVD within Zone C2 and would be contrary to national policy.
 - The submitted FCA has used or modified the latest modelling results from the River Gwenfro flood modelling study 2016. Consideration is given to the effects of climate change (increases in peak river flows) and the effects of blockages within the channel of the River Gwenfro. When climate change and blockages are considered, the flood risks at the site are shown to increase and the extent of flooding on the site is greater than those shown on the published flood map.
 - To comply with TAN15 Table A1.14:
 - The FCA must demonstrate that the proposed new development (including the proposed apartment block and the associated residential car parking area), can be designed to be “flood free” during the 1% annual probability flood event (including allowance for climate change and culvert blockage).
 - Whilst it is acknowledged that the finished floor level (FFL) of the new build apartment block will be set above anticipated flood levels, part of the proposed car parking area will remain at risk of flooding even after other proposed mitigation measures are incorporated into the development.
 - Residential car parking should be treated as new HVD and forms an intrinsic part of the residential development, and therefore should also be designed to remain flood free as per the new residential building. As the FCA shows that the proposed residential parking area will remain at flood risk, we consider that the proposals currently fail to comply with TAN15.
 - The FCA focusses on blockage risks solely from the Island Green Culvert. The FCA should also consider the risk of flooding in the event that the Town Centre culvert and the St. Giles Way culvert become blocked. The FCA needs to properly examine the risks to the development for all 3 blockage locations to fully

³ The date on the letter is stated as 15/07/2018. This is erroneous and should have been 15/07/2019.

demonstrate that the proposed flood risk mitigation measures have been designed using the “worst-case” blockage location.

- Regarding the conversion of Central Buildings: The ground floor level and basement of the property could be subject to internal flooding with flood depths to a depth of up to 0.47 m. Confirmation is required that the basement and ground floor of the building will not be subject to any conversion that could introduce a HV use to those parts of the building.
 - Matters Relating to TAN15 A1.2 (Flood Risk Elsewhere):
 - The site will be reprofiled (with lowering) to facilitate access from Bridge Street, with a minimum ground level of 76.2 m AOD. The FCA indicates: (i) land lowering will increase flood depths within the site boundary and that areas of the proposed car park will experience greater flooding depths when compared with current conditions; (ii) the proposal could result in increased flooding depths off-site, including an area north of the site near the post office off Town Hill, and observes a general increase in depths of approximately 6 mm.
 - TAN15 is clear that new development proposals must not increase flood risk elsewhere. Clarification is required as to the cause of this, and whether it can be attributed to modelling anomalies.
 - The FCA should consider the potential off-site impacts arising from the development in the event of the St. Giles and Town Centre culverts becoming blocked and not solely focus on the Island Green Culvert blockage scenario.
 - Should the proposals be amended to deal with flood risk to the car parking areas, and in the event of further land raising being required, the FCA will need to be updated to assess how those additional operations could affect flood risk elsewhere. Further mitigation is likely to be required to offset any observed adverse flood risk impacts, and this should be fully explored within a revised FCA.
 - Matters Relating to TAN15 Table A1.15 (Emergency Access and Egress)
 - The FCA does not consider the four tests set out in Table A1.15 and there is little information about the potential flood hazards that users of the development could be exposed to.
 - The emergency access and egress issues associated with the proposed conversion of Central Buildings are likely to be particularly challenging if there remains a risk that users of the development could be left marooned within the building in times of flood without appropriate access and egress being available.
 - The views of [Wrexham Council’s] Emergency Planning Team should be sought on this issue and they should advise more on the emergency plans and procedures that may be required to support these proposals.
28. NRW summarises its review of the submitted FCA by stating that: (i) Compliance with A1.14 of TAN15 has not been demonstrated as sections of the site e.g. car parking area are shown to flood during the 1% annual probability (climate change and blockage event). The residential car parking should be treated as HVD and should be designed to remain flood free; (ii) There is some uncertainty as to whether blockage of the Island Green culvert would pose greatest flood risks to the site; (iii) Increase in offsite flood risk could further increase should additional land raising be required on the site; (iv) There is a lack of information on flood hazard.
29. NRW concludes by stating that should Wrexham Council be minded to grant planning permission contrary to C2 policy, the applicant should submit a revised FCA prior to determination of the application as NRW does not believe that Wrexham Council has adequate evidence on which to base a planning decision. If no further information is submitted, or the revised FCA fails to demonstrate that the consequences of flooding can be acceptably managed over the lifetime of the development, then NRW objects to this application and recommends that the application be refused.
30. Weetwood prepared an Addendum to the FCA to respond to the matters raised by NRW in its letter of 15 July 2019 (NRW reference: CAS-67398-N6L2). The addendum was submitted in August 2019. In response, NRW provided a consultation response dated 17 October 2019 (NRW reference: CAS-99194-Q8M5).
31. In summary, NRW maintained its objection to the proposals on the basis that the submitted information “... *failed to demonstrate that the consequences of flooding can be acceptably managed over the development lifetime*”. The letter advises that its response should be read in association with its earlier response letter dated 15 July 2019. The key points made in this letter are summarised as follows:
- Matter relating to TAN15 Table A1.14:

- The development is required to demonstrate that it would remain flood free during the 1% culvert blockage with climate change. We note two blockage locations are detailed and the FCA provides the estimate flood level for the 0.1% annual event probability (AEP) for all three locations in the addendum but not the flood levels for the 1% plus climate change at all three locations.
 - The addendum and revised Appendix F show the flood depths in the car park are around 100-200 mm and so whilst hazard is low, there is flooding within the red line of the application site. The car parking is associated with the new build development and conversion and would form new HVD. The site would not remain entirely dry during the 1% AEP event with an allowance for climate change and therefore fails to satisfy the requirements of A1.14.
 - In relation to Capital Buildings, NRW notes the applicants email confirmation (dated 4 September 2019 to the LPA) confirming that the proposals relate solely to the conversion of first and second floors, that the only ground floor works involve a bin store and new entrance, and no works are proposed at basement level.
 - Matters Relating to TAN15 A1.2 (Flood Risk Elsewhere):
 - There is a lowering of the site and an increase in flood risk off-site in excess of 6 mm near the Post Office, Town Hill. The addendum does not detail what modelling anomalies have been identified or why it is not appropriate to raise site levels, what levels of flood risk are expected to occur in the car park in terms of depths and hazards and why this would be considered acceptable. Appendix F of the FCA shows (i) 5-30 mm increase in flood depth to land immediately north-west of the site boundary during the 1% AEP event; (ii) a greater extent of flooding detriment for the 1 in 1000 AEP event for similar depths to a large part of Brook Street, and (iii) flood depths of 150-300 mm within the site. The increase in flood risk elsewhere is clearly contradictory to the requirements of TAN 15.
 - Matters Relating to TAN15 Table A1.15 (Emergency Access and Egress)
 - Hazard details are provided in the FCA Addendum and it is suggested the new build development would benefit from a safe access and egress from the south and the Central Buildings access and egress arrangements would remain the same, but not in terms of context of new conversion scheme of residential development.
 - NRW advises that it is for the LPA to determine whether the risks and consequences of flooding can be managed in accordance with TAN15 and recommends that other professional advisors are consulted on matters such as emergency plans, procedures and measures to address structural damage that may result from flooding.
32. NRW concludes that the FCA Addendum and revised Appendix F indicates that the site would not remain dry during the 1% AEP design event with an allowance for climate change and would result in significant increased flood risk elsewhere up to the 0.1% AEP event. On this basis, NRW objects to the development as it fails to meet the requirements of TAN15 A1.2 and A1.14.
33. Finally, reference is made to an email exchange between Wrexham Council and NRW. In an email dated 1 November 2019, the Council asks NRW whether the (permitted) use of the upper floors of Central Buildings as a nightclub could be regarded as a HV use, stating that in England, nightclubs and residential dwellings have the same vulnerability to flood risk, and if so, whether this would change NRW's position.
34. In its response dated 13 November 2019, NRW stated *"The proposals would introduce new HVD into a ... Zone C2 area, e.g. small area of new residential car parking, and numerous residential flats on the upper floors of an existing building. The land uses from the NPPF in England are not relevant⁴ and the draft TAN15 land use categories do not list a nightclub as HVD. Therefore, the advice is unchanged in that respect. In relation to the two earlier questions: (i) NRW's advice is based on the scheme in its entirety rather than individual components of it, and the change of use of the upper floor conflicts with TAN15 advice.*

⁴ TAN15 does not specifically classify the vulnerability of nightclubs to flood risk, but does state that public buildings are highly vulnerable. In England, buildings used for dwelling houses, drinking establishments and nightclubs are classified (in the National Planning Policy Framework) as having the same vulnerability category as each other. By extension, it is arguable that the existing nightclub may be regarded as a HV use, and that the proposed use would not result in an increase the vulnerability of the use of the building.

Planning Policy

National Policy

35. Planning Policy Wales (PPW) sets out government planning policy for Wales and how it is expected to be applied. TAN15 provides technical guidance that supplements the policy within PPW and seeks to ensure that flood risk is taken into account at all stages in the planning process and is appropriately addressed.
36. The general approach of TAN15 is to set out a precautionary framework to guide planning decisions in areas at high risk of flooding. The overarching aim of the framework is, in order of preference, to:
 - Direct new development away from those areas which are at a high risk of flooding.
 - Where development has to be considered in high risk areas (i.e. zone C), only those developments which can be justified should be located in such areas.
37. In accordance with paragraph 6 of TAN15, development will only be justified if it can be demonstrated that:
 - i. Its location in zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement; **or**,
 - ii. Its location in zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region;
and,
 - iii. It concurs with the aims of PPW and meets the definition of previously developed land (PPW Figure 2.1);
and,
 - iv. The potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in sections 5 and 7 and appendix 1 found to be acceptable.
38. When considering new development proposals, TAN15 states that it is necessary to take account of the potential impact of climate change over the lifetime of development.
39. The Welsh Government published “Guidance for Flood Consequence Assessments: Climate Change Allowances” in August 2016⁵. The guidance was covered with a letter to local planning authorities and Natural Resources Wales dated 23 August 2016⁶.
40. The guidance presents projected increases in peak river flows and sea levels resulting from climate change over the next century and sets out how the respective allowances should be used in flood consequence assessments that accompany planning applications.
41. The Welsh Government guidance note states that ‘residential development is assumed to have a lifetime of 100 years while a lifetime of 75 years is assumed for non-residential developments. To ensure future development can provide a safe and secure living and /or working environment throughout its lifetime, national planning policy requires proposals in areas of high flood risk to be accompanied by an assessment of flooding consequences to and from the development, taking into account the impacts of climate change’.

Local Policy

42. Policy EC12 Development and Flood Risk of the Wrexham Unitary Development Plan (1996-2011) (adopted February 2005) states:

Development (including the raising of land) within defined flood plains will only be permitted if it: a) would not be subject to an unacceptable risk of flooding on-site; and/or b) does not result in an unacceptable risk of flooding on or off-site; and/or c) does not adversely affect flood management or maintenance schemes.
43. The policy is supported by paragraph 5.16 which states (in part) that “*In exceptional circumstances, where the Council considers a development essential for the economic viability of the area, and it has been confirmed that there are no other sites capable of providing the necessary stimulus, the development will still only be permitted*

⁵ Guidance for Flood Consequence Assessments: Climate Change Allowances, Welsh Government, undated. Available from <https://gov.wales/climate-change-allowances-and-flood-consequence-assessments-cl-03-16>

⁶ Letter from Welsh Government to Local Planning Authorities and Natural Resources Wales, Guidance on Climate Change Allowances for Planning Purposes, Welsh Government, 23 August, 2016 (Ref: CL-03-16). Available from

where the developer can conclusively demonstrate that appropriate and environmentally sympathetic flood protection and mitigation measures can be implemented.”

Summary of Assessment of Flood Risk

44. The Development Advice Map (Figure 2 of the submitted FCA) indicates that the northern portion of the site (i.e. Central Buildings) is located in Zone C2 whilst the southern portion is located in Zone B and Zone A (refer Figure 1a).
45. Figure 1 of TAN15 defines flood zones as follows:
 - Zone A: Considered to be at little or no risk of fluvial or tidal/coastal flooding.
 - Zone B: Areas known to have been flooded in the past evidenced by sedimentary deposits.
 - Zone C: Based on the Low risk event outline (0.1% chance of river, tidal or coastal flooding in any one year) as shown on the Flood Risk Assessment Wales map.
 - Zone C1: Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.
 - Zone C2: Areas of the floodplain without significant flood defence infrastructure.
46. Figure 1b indicates that almost all the car parking and access off Bridge Street and Bridge Street itself (heading south) is in Zone A (circa 3 spaces in Zone B), the proposed new apartment block, cycle store and bin store are in Zone B, and the existing Central Buildings is in Zone C2.

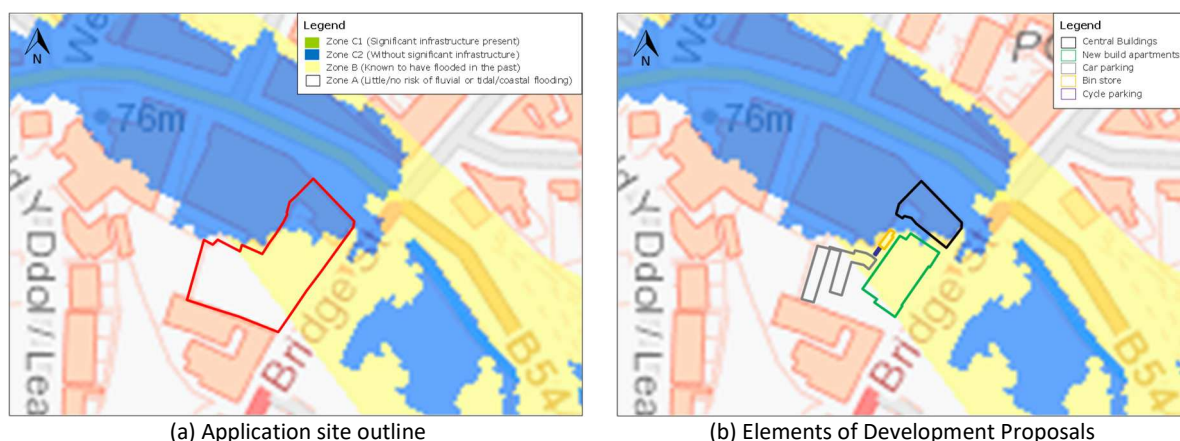


Figure 1: Development Advice Map
Source NRW Website; Accessed 19 May 2021

47. According to NRW historic flood outlines, there are no records of the site being affected by historic flooding.
48. Notwithstanding this, a detailed review of historic flooding in the River Gwenfro catchment was undertaken by JBA Consulting as part of a flood risk study in 2016 (River Gwenfro Model Update, Final Report v0.4, December 2016). The review of historic flooding presented in Figure 1-4 of Appendix F of the study report identifies regular surface water flooding along Brook Street, with properties along the street flooded in 2010, 2012, 2013 and 2015. It is important to note that the reported flooding was due to surface water and not attributable to the River Gwenfro, either due to the capacity of the Island Culvert being exceeded or blocked.
49. The River Gwenfro flows through Wrexham in a broadly south-easterly direction. The river is almost entirely culverted within 675 m upstream (west) of the site, except for a 70 m open channel reach approximately 185 m north-west of the site, and mainly in an open channel downstream (east) of the site (refer FCA Figure 1).
50. The assessment of flood risk presented in the FCA and FCA Addendum was based on a 1D/2D hydraulic model of the River Gwenfro prepared on behalf of Wrexham Council in 2016. The model was amended by Weetwood to more accurately represent flood risk at the site by incorporating topographical survey information. The model outputs for the existing/pre-development situation (the baseline scenario) (FCA Appendix C) indicates:

- Present day 1 in 100 annual exceedance probability event (1% AEP event): *No site flooding*
 - 1 in 100 plus 20% climate change AEP event (1% AEP plus 20%CC): *No site flooding*
 - 1 in 100 plus 45% climate change AEP event (1% AEP plus 45%CC): *No site flooding*
 - Present day 1 in 1,000 AEP event (0.1% AEP event): Flooding to 75.95 m AOD. *Some flooding of northern part of the site i.e. part occupied by Central Buildings but no internal flooding of the building (FFL 76.02 m AOD).*
51. In respect of the residual risk of flooding (as opposed to a direct risk of flooding), modelling was undertaken of a one-third, two-thirds and total blockage⁷ of the inlet of a culvert 185 m upstream of the site (the Island Green culvert) and of the inlet to the culvert under St. Giles Way approximately 30 m downstream of the site (the St Giles culvert).
52. The modelling indicated the site to be more sensitive to a blockage of the Island Green culvert than the closer St Giles culvert (and also a third culvert known as the Tow Centre culvert). On this basis the modelling focussed on the worst case flood risk scenario, i.e. blockage of the Island Green culvert.
53. The modelling indicated that if the Island Green culvert was blocked (for all levels of blockage), the northern half of the site would flood and that the southern part of the site would remain dry. The severity of the flooding, i.e. the extent and depth, was found to be almost identical for the 1% plus 20%CC, 1% AEP plus 45% and present day 0.1% events. For a total blockage during the present day 0.1% AEP event, the northern part of the site was indicated to flood to a level of 76.49 m AOD (1.21 m depth), i.e. 0.47 m above the FFL of the Central Buildings.
54. It is worth noting that the Island Green culvert is a relatively large, arched culvert, 3 m wide and 1.5 m high (maximum height). Whilst the consequences of a culvert blockage are significant, the likelihood of the Island Green culvert being blocked are very small and at the time of writing there is no information available to indicate that there are any such historic records of blockages to this structure.
55. In respect of flood risk mitigation, regarding the development proposals for the southern part of the site, and recognising that the proposed new apartment building, access road (off Bridge Street) and car parking area are not at a direct risk of fluvial flooding from the River Gwenfro, the following measures were proposed to mitigate the residual risk of flooding, i.e. due to culvert blockage:
- New apartment building: FFL to be not lower than 76.73 m AOD. This would provide 300 mm freeboard above the maximum modelled flood level during the 1% AEP plus 20%CC event with a total blockage of the Island Green culvert and is also significantly above the maximum flood level during the total blockage scenarios for the 1% AEP plus 45%CC event and present day 0.1% AEP event.
 - Car park: Given that the car park is shown to remain dry (no flooding) during the present day 0.1% AEP event (no culvert blockage), and that that only a small part of the car park would flood, to a depth less than 100 mm during the total culvert blockage event, with a Very Low flood hazard (FCA Addendum Figure 2), no specific mitigation measures are proposed.
 - Site access and egress: The site could be safely accessed/egressed at all times.
56. Given that the proposals for Central Buildings related solely to a change of use of the first and second floors, and no specific flood risk mitigation measures were proposed. This is because the apartments on the first and second floors by default provide a safe refuge in the event that Brook Street flooded, and that whilst some flooding to the rear of Central Buildings may occur during the present day 0.1% AEP event or due to culvert blockage, it is assessed that the Central Buildings could still be safely accessed/egressed to the rear (south).
57. Although not specified in the FCA report or FCA Addendum, it is recommended that a Flood Warning and Evacuation Plan is prepared and implemented prior to occupation to ensure that all occupants, visitors and users of the development are aware of the risk of flooding, of the procedures to be followed in the event that flooding is forecast or actually occurs, and of the escape evacuation routes.
58. It is concluded that flood risk can be appropriately mitigated and that the proposed development would be safe for its lifetime in accordance with planning policy.

⁷ In accordance with Table 2 of NRW Guidance Note - Flood Risk Management: Modelling Blockage and Breach Scenarios, February 2015, OGN ref: OGN100.

59. In terms of off-site flood risk, given that the new apartment block is located in Zone B and the car park is almost entirely in Zone A, the proposals would not increase flood risk elsewhere for the present day 0.1% event (or during the 1% AEP plus 20%CC and 45%CC events). The modelling demonstrates that there is no significant increase in flood risk elsewhere during the 1% AEP plus 20%CC and present day 0.1% AEP events. The indicated small increase in flood depths to the north-west of the site during the latter event is an isolated area at the extremity of the flood extent which is indicative of a modelling anomaly rather than actual detriment resulting from the proposals.

Compliance of Proposals with Planning Policy

60. The matters raised by NRW in relation to flood risk, and upon which NRW's objection hinges, relate specifically to paragraphs A1.2, A1.14 and A1.15 of TAN15. For convenience, these are provided in **Annex C** of this document (*verbatim*). A separate one page document⁸, referred hereafter as the Summary Guidance, clarifies Section C of Appendix 1 of TAN15 (including paragraphs A1.14 and 1.15).
61. Appendix 1 of TAN15 explains how the potential consequences of a flooding event should be assessed within the context of the technical advice note and provides guidance on the technical requirements for undertaking such an assessment.
62. Paragraph A1.2 of TAN15 relates to the objectives of an assessment and states that the prime objective is to develop a full appreciation of the consequences of flooding on the development and of the development on flood risk elsewhere within the catchment for a range of potential flooding scenarios up to that flood having a probability of 0.1%.
63. Paragraph A1.14 of TAN15 states that residential development should be flood free during the present day 1% AEP event (fluvial), although this advice is stated not to be prescriptive.
64. The Summary Guidance extends this to mean that the development should be designed to be flood free for the lifetime of the development for a 1% AEP fluvial event, i.e. including an allowance for climate change.
65. Paragraph A1.15 of TAN15 states that where mitigation measures are required and in place, it may not be "*sensible*" to allow particular development to take place, e.g. where the velocity and depth of floodwater was such that structural damage was possible or that people could be swept away by floodwater. The (non-prescriptive) table suggests that residential development (habitable rooms) should not flood to a depth of more than 600 mm, that the maximum rise of floodwater should not exceed 100 mm/hr, that the maximum speed of inundation should not be less than 4 hours, and that the velocity of floodwater should not exceed 0.3 m/s.
66. The Summary Guidance clarifies this by stating that in respect to residual risk, e.g. culvert blockage, the development should be designed so that over its lifetime in a 0.1% AEP event, there would be less than 600 mm of water on access roads and within properties, the velocity of any water flowing across the development would be less than 0.3 m/s on access roads and 0.15 m/s in properties, and the maximum rate of rise of floodwater would not exceed 100 mm/hr.
67. All the elements of the proposed development are demonstrated to be flood free (and safe) during the present day 1% AEP event and for the 1% plus 20%CC and 45%CC AEP events, i.e. for its lifetime. The submitted FCA and FCA Addendum confirm that no internal flooding of the proposed residential apartments in Central Buildings or the new apartment building would occur during any modelled flood event (including culvert blockage scenarios), and that there would be less than 600 mm of water on access roads and that all elements of the development would be safe taking flood hazard (depth of flooding and velocity of floodwater) into account. Furthermore, the proposed development is demonstrated to have no significant impact on flood risk elsewhere for the present day 0.1% AEP event (including a total culvert blockage).
68. As such, the proposed development would be safe from flood risk for its lifetime and would not materially increase flood risk elsewhere, in accordance with TAN15 and PPW.

⁸ Welsh Government - "Summary of What TAN15 Requires for Highly Vulnerable Development (Houses) To Be Considered Acceptable" (undated, no reference)

69. With regards whether the conversion of the first and second floors of Central Buildings should be permitted, when the building is located in Zone C2 of the DAM, it must be recognised that all floors of Central Buildings may be lawfully used as a nightclub.
70. According to Figure 2 of TAN15, HVD comprises “*all residential premises (including hotel and caravan parks), public buildings (e.g. schools, libraries, leisure centres), especially vulnerable industrial development (e.g. power stations, chemical plants, incinerators), and waste disposal sites*”. Whilst nightclubs are not explicitly referenced in TAN15, it is reasonable to assume that a nightclub would constitute HV use, in the same way that a leisure centre is.
71. The proposals to change the use of the first and second floors of Central Buildings from nightclub use to residential use, represent a change from one existing HV use to another, different HV use. The vulnerability of the use to flood risk, in planning policy terms, would therefore remain unchanged, and it is not unreasonable to assume that the proposed change of use would represent (in non-policy terms) a reduction in vulnerability to flood risk, particularly as all residential dwellings would be restricted to the first and second floors, unlike the existing permitted use as a nightclub which can be on all floors of the building.
72. The proposed new apartment block is located almost entirely in flood zone B, whilst the car park (Less Vulnerable use) is located in Zones A and, and partly in flood zone B. The proposed uses are appropriate in these flood zones.

Conclusion

73. This Statement of Case relates to the proposed change of use of the first and second storeys of Central Buildings (4 Brook Street, Wrexham) for residential use, and the development of unoccupied, previously developed land to the south of Central Buildings (off Brook Street) for residential use (planning application ref: P/2018/0915).
74. The 2018 planning application was accompanied by a Flood Consequence Assessment report prepared by Weetwood, and, in 2019 an Addendum to the submitted FCA report.
75. It is accepted that Central Building is located in flood zone C2 and that according to planning policy, Highly Vulnerable Development should not be permitted in Zone C2. However, the information presented in the FCA report and Addendum demonstrate that flood risk could be appropriately mitigated and that the risks and consequences of flooding could be managed to an acceptable level, subject to the implementation of the proposed mitigation measures, the proposed development would be safe for its lifetime, and the proposals would not materially increase flood risk elsewhere.
76. It is concluded that in so doing, the proposals comply with the requirements of planning policy.
77. It is relevant to note that all floors of Capital Buildings can be lawfully used as a nightclub. As such, the proposals are to replace an existing Highly Vulnerable use (nightclub) with an alternative Highly Vulnerable Use (residential apartments). The proposals do not therefore create a new Highly Vulnerable Use.
78. Furthermore, all residential use would be located on the first and second floors. As such, the proposals would actually represent (albeit, in non-policy terms) a reduction in vulnerability of the users/occupants of the building to flood risk.
79. Finally, it is concluded that the proposals for the redevelopment of the southern part of the site, being located in flood zone A (car park) and flood zone B (new apartment block) comply with planning policy.
80. It is therefore concluded that there are no grounds for planning permission to be refused on flood risk grounds.

Annex A – Submitted FCA Report

Annex B – Submitted FCA Report Addendum

Annex C – Excerpts from TAN15

A) Objectives of the assessment

A1.2 The prime objective of an assessment is to develop a full appreciation of:

- The consequences of flooding on the development
- The consequences (i.e. the overall impacts) of the development on flood risk elsewhere within the catchment for a range of potential flooding scenarios up to that flood having a probability of 0.1%.
- The assessment can be used to establish whether appropriate mitigation measures can be incorporated within the design of the development to ensure that development minimises risk to life, damage to property and disruption to people living and working on the site or elsewhere in the floodplain.

C) Acceptability criteria for flooding consequences

A1.14 In addition to the above general conditions there are particular flooding consequences which may not be considered acceptable for particular types of development. For instance in view of the traumatic impact of flooding on people's personal lives it is not sensible to allow residential development in areas which flood frequently. Environment Agency advice to planning authorities suggests that development should be designed to be flood free during the 1% fluvial flood (i.e. that fluvial flood with a 100 to 1 chance of occurring in any year) and the 0.5% tidal/coastal flood (i.e. 200 to 1 chance in any year event). There is therefore a frequency threshold of flooding below which flooding of development should not be allowed. The following table, which should not be regarded as prescriptive, provides indicative guidance as to what that frequency threshold could be for different types of development described in terms of annual probability of occurrence.

Type of Development	Threshold Frequency (Years)	
	Fluvial	Tidal
Residential	1%	0.5%
Commercial/Retail	1%	0.5%
Industrial	1%	0.5%
Emergency Services	0.1%	0.1%
General Infrastructure	1%	0.5%

A1.15 Beyond the threshold frequency proposed development would be expected to flood under extreme conditions. However even with adequate mitigation measures in place it may still not be sensible to allow particular development to take place. For instance it would not be sensible for developments to be built in areas where the velocity and depth of floodwaters was such that structural damage was possible or that people could be swept away by the flood. Similarly it would not be sensible for single storey residential development to be sited where the depth of flooding would exceed heights of 0.6metres (ie the height of a bed or a cot). The following table, which should not be regarded as prescriptive provides indicative guidance on what is considered tolerable conditions for different types of developments.

Type of development	Maximum depth of flooding (mm)	Maximum rate of rise of floodwaters (m/hr)	Maximum speed of inundation of flood risk area (hrs)	Maximum velocity of floodwaters (metres/sec)
	Property Access			Property Access
Residential (habitable rooms)	600 600	0.1	4	0.15 0.3
Commercial & Retail	600 600	0.3	2	0.15 0.3
Industrial	1000 1000	0.3	2	0.3 0.45
Emergency Services	450 600	0.1	4	0.15 0.3
General Infrastructure	600 600	0.3	2	0.3 0.3

NOTE. The above figures are indicative and reflect conditions in which, given the presence of adequate warnings and preparation, appropriately equipped personnel could undertake emergency activities. However they are not definitive. Each site must therefore be considered individually and a judgement taken in the context of the particular circumstances which could prevail at that site.

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BRIDGE STREET, WREXHAM

FLOOD CONSEQUENCES ASSESSMENT Final Report v1.2

August 2018

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Report Title: **Bridge Street, Wrexham**
Flood Consequences Assessment
Final Report v1.2

Client: Lingar Group

Date of Issue: 22 August 2018

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This document has been prepared solely as a Flood Consequences Assessment for Lingar Group. This report is confidential to Lingar Group and Weetwood Services Ltd accepts no responsibility or liability for any use that is made of this document other than by Lingar Group for the purposes for which it was originally commissioned and prepared.

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1 INTRODUCTION

1.1 PURPOSE OF REPORT

Weetwood Services Ltd ('Weetwood') has been instructed by Lingar Group to undertake a Flood Consequences Assessment (FCA) in association with the proposed redevelopment of land located off Bridge Street, Wrexham.

A FCA report was produced for the site on 13 August 2018¹; however, this omitted information relating to the proposed scenario flood risk modelling, which was still in progress at that time. The FCA has subsequently been updated to include this, as detailed in **Section 5.2** and **Section 5.3** of this report, and in turn supersedes the previous version (v1.1).

This FCA has been prepared in accordance with the requirements of Technical Advice Note 15 (TAN15): Development and Flood Risk.

1.2 STRUCTURE OF THE REPORT

The report is structured as follows:

- Section 1** Introduction and report structure
- Section 2** Presents national and local flood risk and drainage planning policy
- Section 3** Provides background information relating to the development site, the development proposals, ground conditions and existing site access arrangements
- Section 4** Assesses the potential sources of flooding to the development site
- Section 5** Presents flood risk mitigation measures based on the findings of the assessment
- Section 6** Presents a summary of key findings
- Section 7** Presents the recommendations

¹ Ref: 4183/FCA/Final/v1.1/2018-08-13

2 PLANNING POLICY AND GUIDANCE

2.1 NATIONAL PLANNING POLICY AND GUIDANCE

2.1.1 Technical Advice Note 15; Development and Flood Risk

The general approach of TAN15 is to set out a precautionary framework to guide planning decisions in areas at high risk of flooding. The overarching aim of the framework is, in order of preference, to:

- Direct new development away from those areas which are at a high risk of flooding.
- Where development has to be considered in high risk areas (i.e. Zone C) only those development which can be justified should be located in such areas.

2.1.1.1 Justification Test

In accordance with Paragraph 6 of TAN15 for the Justification Test to be passed it must be demonstrated that:

- i Its location in Zone C is necessary to assist, or be part of, a local authority regeneration initiative or a local authority strategy required to sustain an existing settlement; **or**,
- ii Its location in Zone C is necessary to contribute to key employment objectives supported by the local authority, and other key partners, to sustain an existing settlement or region;

and,

- iii It concurs with the aims of Planning Policy Wales (PPW) and meets the definition of previously developed land (PPW Fig 2.1); and,
- iv The potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in sections 5 and 7 and appendix 1 found to be acceptable.

2.1.2 Welsh Government

2.1.2.1 Climate Change Allowances for Planning, August 2016

A consultation letter² and supporting guidance note³ issued by Welsh Government in August 2016 sets out allowances for climate change for use in FCAs submitted in support of planning applications.

When considering new development proposals, TAN15 states that it is necessary to take account of the potential impact of climate change over the lifetime of development. The Welsh Government guidance note states that 'residential development is assumed to have a lifetime of 100 years while a lifetime of 75 years is assumed for non-residential developments. To ensure future development can provide a safe and secure living and /or working environment throughout its lifetime, national planning policy requires proposals in areas of high flood risk to be accompanied by an assessment of flooding consequences to and from the development, taking into account the impacts of climate change'.

² Welsh Government consultation letter 23 August, 2016 (Ref: CL-03-16)

³ <https://gov.wales/docs/desh/publications/160831guidance-for-flood-consequence-assessments-climate-change-allowances-en.pdf>

The climate change allowances detailed within the Welsh Government guidance note are informed by latest available information on climate change projections and allowances are provided for different epochs (periods) of time over the next century.

The guidance note should be applied to planning applications (full, outline and reserved matters) submitted from 1 December 2016.

2.2 LOCAL PLANNING POLICY AND GUIDANCE

The Wrexham County Borough Council (WCBC) Unitary Development Plan (UDP) 1996 to 2011 expired at the end of 2015; however, this remains the adopted development plan for the county.

The following policy is relevant in respects of flood risk:

Policy EC12 - Development and Flood Risk

Development (including the raising of land) within the defined flood plains will only be permitted if it:-

- a) Would not be subject to an unacceptable risk of flooding on-site; and/or
- b) Does not result in unacceptable risk of flooding on or off-site; and/or
- c) Does not adversely affect flood management or maintenance schemes

WCBC is currently preparing a Local Development Plan (LDP) which will replace the current adopted UDP in spring 2019.

2.3 CONSENTS

An Environmental Permit for Flood Risk Activities may be required from Natural Resources Wales (NRW) for work:

- in, under, over or near a main river (including where the river is in a culvert)
- on or near a flood defence on a main river
- in the flood plain of a main river
- on or near a sea defence

Further information can be found by visiting the NRW website⁴.

If the location of an activity is on any watercourse that lies within an Internal Drainage District (IDD) an application will need to be made to NRW for a Flood Risk Activity Permit.

Ordinary Watercourse Consent may be required from the lead local flood authority for work to an ordinary watercourse.

Undertaking activities controlled by local Byelaws (made under the Water Resources Act 1991) also requires the relevant consent.

2.4 RELEVANT DOCUMENTS

The FCA has been informed by the following documents:

⁴ <https://naturalresources.wales/apply-for-a-permit/flood-risk-activities/flood-risk-activity-permits-information/?lang=en>

- Flood Risk Management Plan (FRMP), WCBC, July 2016
- Local Flood Risk Management Strategy (LFRMS), WCBC, April 2013
- Preliminary Flood Risk Assessment (PFRA), WCBC, November 2017

3 SITE DETAILS AND PROPOSED DEVELOPMENT

3.1 SITE LOCATION

The site is located off Bridge Street, Wrexham, at Ordnance Survey National Grid Reference SJ 333 501 as shown in **Figure 1**. The site is approximately 0.18 hectares (ha) in area.

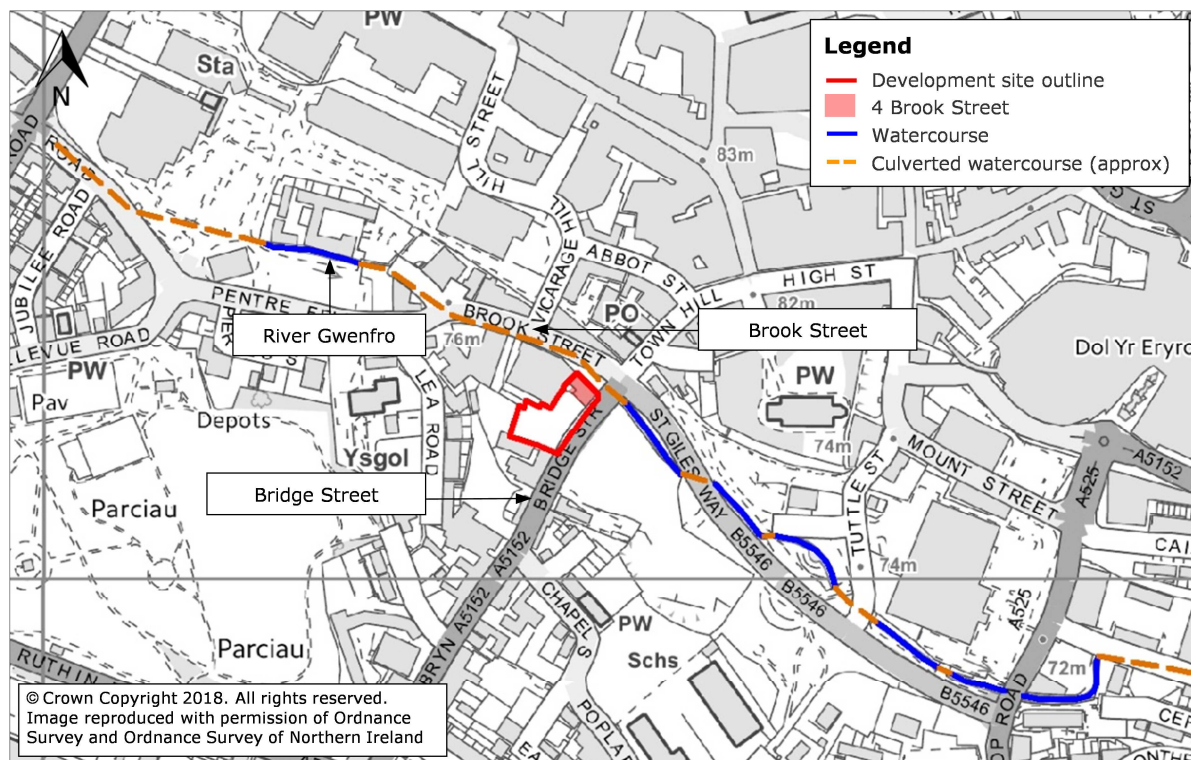


Figure 1: Site Location

3.2 EXISTING AND PROPOSED DEVELOPMENT

The existing site currently comprises an existing building in the north (4 Brook Street), which was previously used as a night club, whilst the southern portion comprises derelict land that was previously subject to a Compulsory Purchase Order by WCBC as this forms part of its regeneration scheme.

Proposals are for the change of use and conversion of the first and second floor of 4 Brook Street into 10 residential apartments, with the existing commercial/retail use retained on the ground floor (it should be noted that the latter does not subsequently form part of the planning application). In addition, it is proposed to construct a new residential block in the southern portion of the site comprising 32 apartments with associated hardstanding and landscaping.

A proposed site layout is provided in **Appendix A**.

TAN15 classifies commercial/retail development as 'less vulnerable' land use and residential development as 'highly vulnerable'⁵.

The previous use of the existing building in the north of the site (4 Brook Street) as a night club may be classified as 'highly vulnerable' development, which includes public buildings. As such the conversion of this building to residential use at and above the first floor should not increase the vulnerability classification.

3.3 WATERBODIES IN THE VICINITY OF THE SITE

The River Gwenfro flows in culvert within Brook Street to the north of the site in a predominately south-easterly direction. Throughout the existing built up area of Wrexham the watercourse flows in both open channel and culvert.

The River Gwenfro is classified as a 'main river'.

3.4 GROUND CONDITIONS

According to the Soilscales maps produced by the National Soils Research Institute⁶, soil conditions at the site and within the surrounding area are described as 'freely draining loamy soils'.

British Geological Survey (BGS) borehole records⁷ located approximately 20.0 m south and 60.0 m south-east of the site show ground conditions to consist of sandy soils, with groundwater encountered at 0.91 m below ground level (bgl).

BGS Surface Geology mapping⁸ indicates the underlying bedrock formation comprises 'Salop Formation – Mudstone, Sandstone and Conglomerate'. This is overlain by 'Glaciofluvial Sheet Deposits, Devensian – Sand and Gravel', with 'Alluvium – Clay, Silt, Sand and Gravel' in the vicinity of the River Gwenfro.

3.5 SITE LEVELS

A topographic survey of the southern portion of the site was undertaken by WCBC in August 2015, with a topographic survey of 4 Brook Street in the north undertaken by Cheshire Surveys Ltd in September 2010. Both surveys are provided in **Appendix B**.

These indicate that site levels in the south of the site are in the region of 76.07 – 77.55 metres Above Ordnance Datum (m AOD) with levels in the north in the region of 75.23 – 75.99 m AOD. The ground floor finished floor level of the existing 4 Brook Street building is shown to be 76.02 m AOD.

3.6 ACCESS AND EGRESS

Vehicular/pedestrian access and egress to the site will be provided via Brook Street to the north and Bridge Street to the east (**Appendix A**).

⁵ TAN15, Figure 2

⁶ Soilscales www.landis.org.uk/soilscales/

⁷ www.bgs.ac.uk/data/boreholescans/home.html, Ref: SJ35SW26, SJ35SW25

⁸ <http://mapapps.bgs.ac.uk/geologyofbritain/home.html>

Levels on Brook Street are shown to be in the region of 74.80 – 75.76 m AOD adjacent to the site, whilst levels on Bridge Street are in the region of 76.30 – 75.90 m AOD, rising to the south.

4 REVIEW OF FLOOD RISK

4.1 FLOOD ZONE DESIGNATION

Flood Zones refer to the probability of river and sea flooding, ignoring the presence of defences. TAN15 defines flood zones as follows⁹:

- **Zone A.** Considered to be at little or no risk of fluvial or tidal/coastal flooding.
- **Zone B.** Areas known to have been flooded in the past evidenced by sedimentary deposits.
- **Zone C.** Based on the Natural Resources Wales extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal). Zone C is subdivided into the following two zones:
 - **Zone C1.** Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.
 - **Zone C2.** Areas of the floodplain without significant flood defence infrastructure.

The Flood Zones are currently shown on the NRW Flood Risk Map and do not take account of the possible impacts of climate change and consequent changes in the future probability of flooding.

4.1.1 Development Advice Map

The Development Advice Map (**Figure 2**) indicates that the northern portion of the site (i.e. 4 Brook Street) is located in Zone C2 whilst the southern portion is located in Zone B and Zone A.

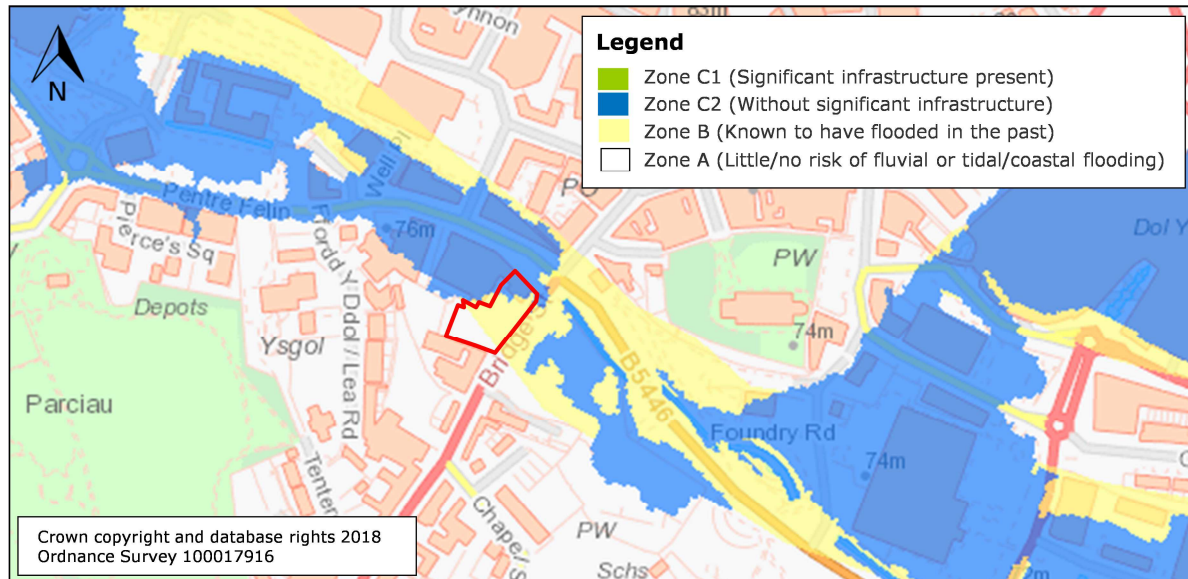


Figure 2: Development Advice Map
(Source: NRW website)

4.1.2 Natural Resources Wales Flood Risk Map

The NRW Flood Risk Map indicates that the northern portion of the site is located in the 1 in 1,000 annual probability flood outline, whilst the southern portion is located outside this flood outline.

⁹ TAN15, Figure 1

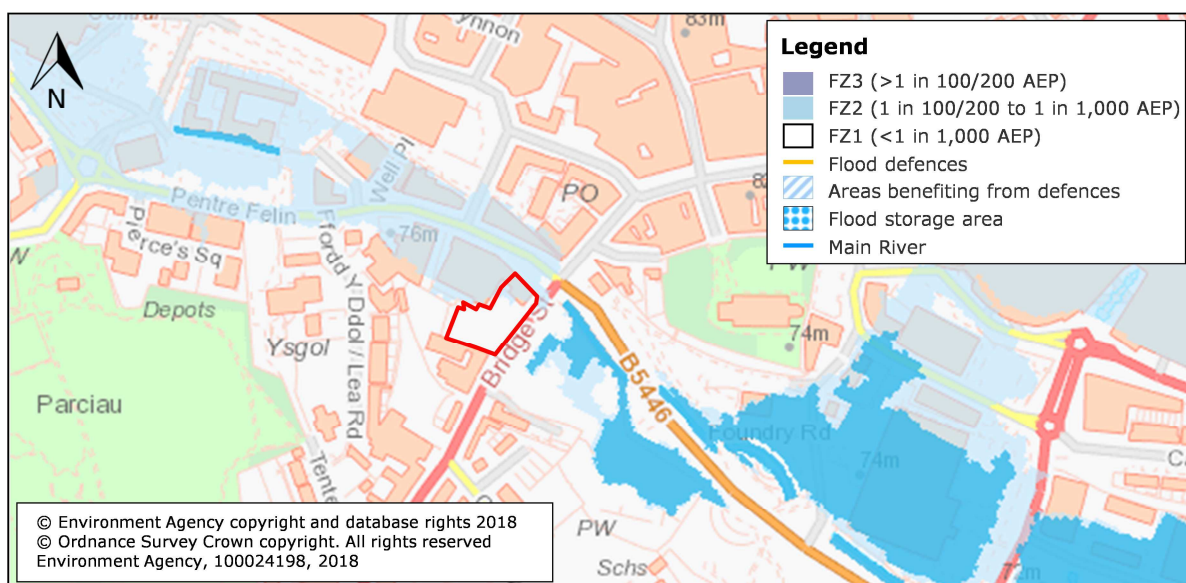


Figure 3: Natural Resources Wales Flood Risk Map
(Source: NRW website)

4.2 JUSTIFICATION TEST

The vast majority of the site (including the area for the proposed new residential apartment block) lies outside Zone C and as such there is no requirement for the Justification Test to be applied.

The land in the north, which is located in Zone C is currently developed. As detailed in **Section 3.2** the proposed conversion of the existing building (4 Brook Street) within this area would not be expected to increase the vulnerability classification. Furthermore, the development of the site is considered to contribute to part of the local authority's regeneration scheme and meets the definition of 'previously developed land'. Part i and iii of the Justification Test are therefore considered to have been addressed.

This report addresses part iv of the Justification Test.

4.3 HISTORICAL RECORDS OF FLOODING

According to NRW historic flood outlines¹⁰, there are no records of the site previously being affected by flooding.

4.4 FLUVIAL FLOOD RISK – RIVER GWENFRO

As outlined in **Section 3.3** the River Gwenfro is located to the north of the site.

The River Gwenfro Model Update was completed by JBA Consulting on behalf of WCBC in December 2016¹¹. This included refinements to the previous flood risk mapping study undertaken by JBA Consulting on behalf of Environment Agency Wales (now NRW) in 2008, which included the development of a 1D-2D ISIS-TUFLOW hydraulic model of the River Gwenfro.

¹⁰ <http://lle.gov.wales/catalogue/item/HistoricFI/?lang=en>

¹¹ River Gwenfro Model Update, Final Report, JBA Consulting/WCBC, December 2016

The primary purpose of the study was to obtain an up-to-date assessment of the flood risk (extents, depths, velocity and hazard), which could be used to inform future development in Wrexham Town Centre.

The 2016 River Gwenfro Model Update report and accompanying hydraulic model have been obtained from WCBC for the purposes of this assessment.

4.4.1 Flood Defences

The River Gwenfro Model Update indicates that there are no formal flood defences along the watercourse within the vicinity of the site; however, several areas in the vicinity of the site are shown to benefit from 'informal' defences, comprising raised walls, which are included within the hydraulic model. Figure 1-5 of the River Gwenfro Model Update report shows the locations of the informal defences.

4.4.2 Modelled Flood Levels and Extents - Baseline

The site topographic survey has been incorporated within the WCBC River Gwenfro 1D-2D ISIS-TUFLOW hydraulic model in order to more accurately represent ground levels; however, no further amendments or refinements have been made to this.

The following events have subsequently been modelled in order to establish the baseline scenario:

- 1 in 100 annual probability
- 1 in 100 climate change (+CC) (20%) annual probability
- 1 in 100 +CC (45%) annual probability
- 1 in 1,000 annual probability

Model output plots are provided in **Appendix C**.

These indicate that no flooding of the site would be expected in up to a 1 in 100 +CC (45%) annual probability event. Whilst some flooding of the site may be expected during a 1 in 1,000 annual probability event this is confined to the northern portion of the site.

Table 1 summarises the flood level, depth and velocity expected on site during the aforementioned events.

Table 1: Flood Information – Baseline

Annual Probability Event	Max Level (m AOD)	Depth (m)		Velocity (m/s)	
		Max	Mean	Max	Mean
1 in 100	-	-	-	-	-
1 in 100 +CC (20%)	-	-	-	-	-
1 in 100 +CC (45%)	-	-	-	-	-
1 in 1,000	75.95	0.69	0.27	0.03	0.00

Based upon the maximum flood level provided within **Table 1**, and with an existing surveyed finished floor level of 76.02 m AOD it may be reasonable to assume that no flooding of the existing building in the north of the site (4 Brook Street) would be expected in a 1 in 1,000 annual probability event. As such, the existing building is not considered to be located in Zone C, contrary to the Development Advice Map.

4.4.3 Structure Blockage

A 30%, 67% and 100% blockage of both the Island Green and St Giles Way culverts have also been modelled as a sensitivity assessment for the 1 in 100 +CC (20%), 1 in 100 +CC (45%) and 1 in 1,000 annual probability events.

The model outputs indicate that the site is more sensitive to a blockage of the Island Green culvert which has therefore been considered further below.

Model output plots for the Island Green culvert blockage scenario are provided in **Appendix D. Table 2** summarises the maximum flood level, depth and velocity expected on site during the respective blockage scenarios for the Island Green culvert.

The results indicate that the southern portion of the site would be expected to remain dry in up to a 1 in 1,000 annual probability 100% culvert blockage scenario. This accounts for approximately 60% of the site area.

Within the northern portion of the site, flood levels are shown to range between 76.23 and 76.49 m AOD depending on the event, equating to maximum flood depths typically between 0.44 and 0.53 m; however, in some lower parts of the site flood depths could reach 1.21 m in the 1 in 1,000 annual probability 100% culvert blockage scenario. The extents of flooding within the site are not shown to significantly vary for all modelled blockage events.

Given the ground floor finished floor level of 76.02 m AOD within the existing building (4 Brook Street), maximum internal flood depths may be between 0.21 and 0.47 m depending on the event in **Table 2**.

Table 2: Maximum Flood Information – Culvert Blockage (Island Green)

Annual Probability Event	Max Level (m AOD)	Depth (m)		Velocity (m/s)	
		Highest	Mean	Highest	Mean
1 in 100 +CC (20%)					
30% blockage	76.23	0.97	0.44	0.20	0.04
67% blockage	76.38	1.11	0.47	0.44	0.11
100% blockage	76.43	1.16	0.51	0.51	0.13
1 in 100 +CC (45%)					
30% blockage	76.30	1.04	0.44	0.36	0.07
67% blockage	76.43	1.16	0.51	0.51	0.13
100% blockage	76.47	1.20	0.52	0.57	0.15
1 in 1,000					
30% blockage	76.34	1.07	0.46	0.37	0.08
67% blockage	76.45	1.18	0.52	0.55	0.14
100% blockage	76.49	1.21	0.53	0.59	0.16

The flood risk to the site from this source will be mitigated though the implementation of the measures proposed in **Section 5** of this report.

4.5 FLOOD RISK FROM RESERVOIRS, CANALS AND OTHER ARTIFICIAL SOURCES

There are no canals located within the immediate vicinity of the site. The NRW Risk of Flooding from Reservoirs map indicates that the site is not at risk of flooding from such sources. The site is therefore not considered to be at risk of flooding from reservoirs, canals or other artificial sources.

4.6 FLOOD RISK FROM GROUNDWATER

As detailed in **Section 3.4** ground conditions at the site and within the surrounding area are described as freely draining soils. There may therefore be the propensity for some groundwater flooding. However, ground levels are shown to fall to the north towards Brook Street and in turn the River Gwenfro. As such any groundwater emerging at the site would be expected to runoff the site before building to any significant depth.

According to the BGS Groundwater Flooding Hazard map (**Figure 4**) the susceptibility to groundwater flooding is moderate to significant.

The risk of flooding from this source will be mitigated through the implementation of the measures proposed in **Section 5** of this report.

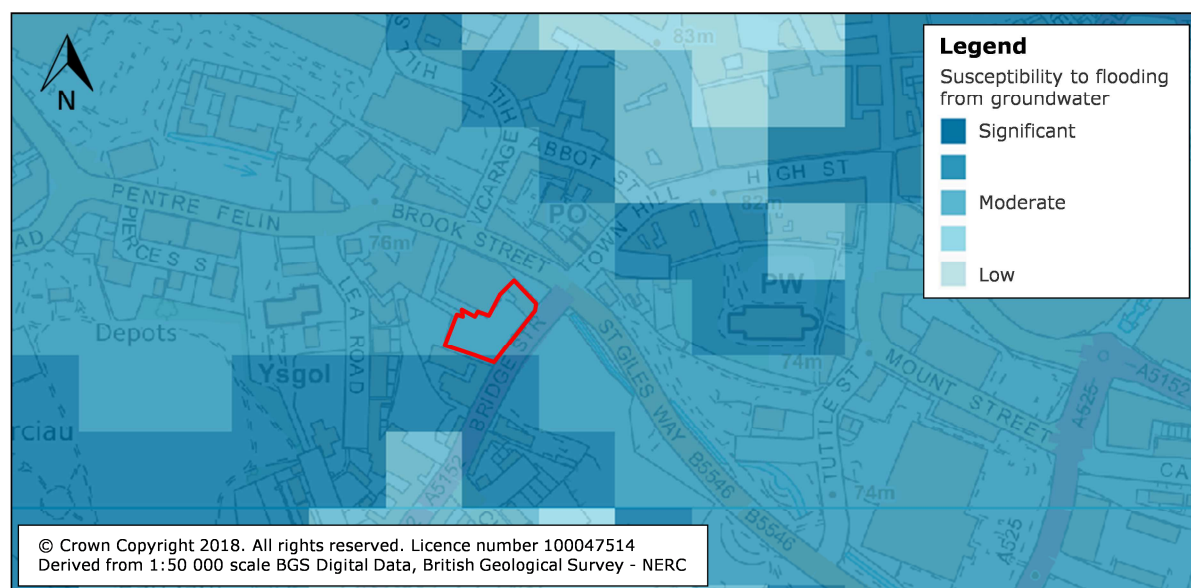


Figure 4: Groundwater Flooding Hazard Map
(Source: Findmaps)

4.7 FLOOD RISK FROM SURFACE WATER

As detailed in **Section 3.4** ground conditions at the site and within the surrounding area are described as freely draining soils. The propensity for surface water flooding may therefore be considered low. Furthermore, ground levels are shown to fall to the north towards Brook Street and in turn the River Gwenfro. As such surface water would not be expected to accumulate to any significant depth at the site itself.

The NRW Risk of Flooding from Surface Water map (**Figure 5**) indicates the majority of the site is at 'very low' risk, with a small area in the north at 'low' risk¹²; however, NRW

¹² Very Low Risk - Chance of flooding of less than 1 in 1000 in each year

data indicates that the flood depths and velocities for the low risk event would be less than 0.15 m and 0.25 m/s respectively.

Any residual flood risk from this source will be addressed through the mitigation measures as detailed in **Section 5**.

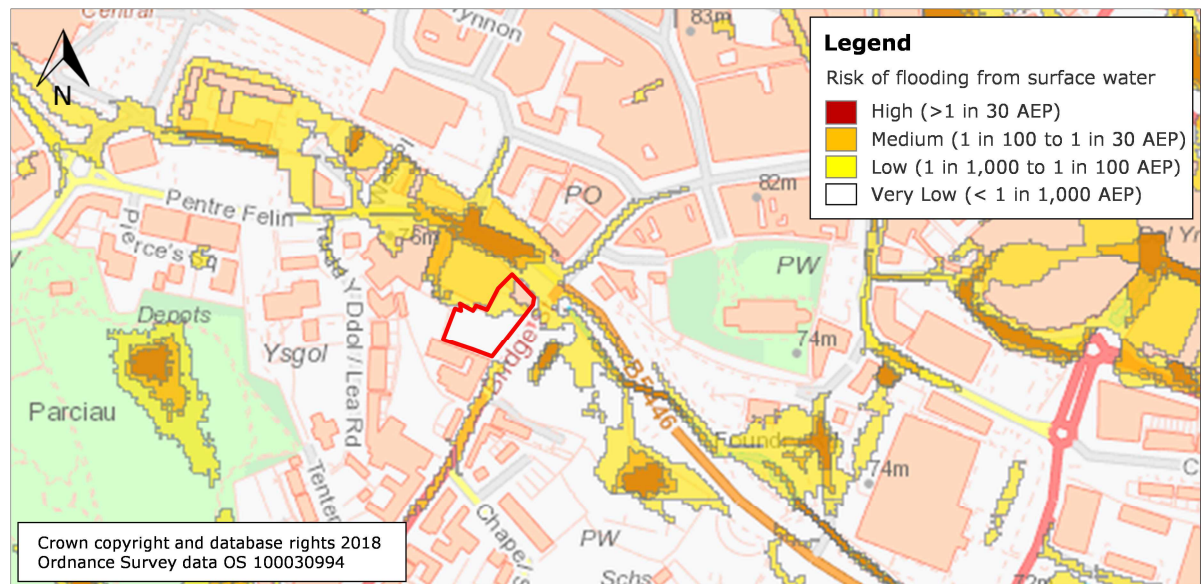


Figure 5: Natural Resources Wales Risk of Flooding from Surface Water
(Source: NRW website)

Low Risk - Chance of flooding of between 1 in 1000 and 1 in 100 in each year
Medium Risk - Chance of flooding of between 1 in 100 and 1 in 30 in each year
High Risk - Chance of flooding is greater than 1 in 30 in each year

5 FLOOD RISK MITIGATION MEASURES

The flood risk to the site from the River Gwenfro and any residual risk of flooding from groundwater and surface will be mitigated through the implementation of the measures proposed within the following section of this report.

5.1 FLOOD MITIGATION

5.1.1 Finished Floor Levels

As detailed in **Section 3.2** the proposals comprise the change of use and conversion of the first and second floor of 4 Brook Street into 10 residential apartments. This will ensure that all 'highly vulnerable' development is located well above the anticipated flood levels expected on site from the River Gwenfro (as indicated in **Table 1** and **Table 2**).

The finished floor level of any new building should be set at a minimum of 76.73 m AOD. This provides a freeboard of 300 mm above the flood level expected at the site during the 1 in 100 +CC (20%) annual probability 100% blockage (Island Green culvert) scenario.

The freeboard allowance is considered appropriate given that this will afford a finished floor level that is also above the 1 in 100 +CC (45%) and 1 in 1,000 annual probability 100% blockage events.

Finished floor levels for new buildings should also be set at a minimum of 0.15 m above adjacent ground levels following reprofiling of the site. This will enable any potential overland flows to be conveyed safely across the site without affecting property in accordance with the approach promoted by government policy¹³.

5.1.2 Car Parking

The proposed new car parking area is shown to be located outside of the 1 in 1,000 annual probability flood outline and would therefore be expected to remain dry during 'free-flowing' flood events.

During a 100% Island Green Culvert blockage scenario the proposed new car parking area is also expected to remain dry based on the baseline model outputs; however, car park levels will be profiled in order to provide a consistent gradient across the area, tying in with the access off Bridge Street. This may afford some shallow flooding of the northern extent of the car park with maximum flood depths expected to be less than 300 mm during a 1 in 1,000 annual probability 100% blockage (Island Green culvert) scenario (refer to **Section 5.2**). It has been assumed that the minimum ground levels within the car parking area will be set to at least 76.20 m AOD.

5.2 PROPOSED SCENARIO FLOOD RISK MODELLING

The proposed flood risk mitigation strategy as outlined in **Section 5.1** has been incorporated within the refined Weetwood hydraulic model of the River Gwenfro. The hydraulic model has subsequently been run for the 1 in 100 +CC (20%), 1 in 100 +CC

¹³ Making Space for Water, Taking forward a new Government strategy for flood and coastal erosion risk management in England, March 2005, Dept for Environment, Food and Rural Affairs

(45%) and 1 in 1,000 annual probability 100% blockage (Island Green culvert) scenarios. It is not considered to be necessary to include 'free-flowing' proposed scenario model outputs given that all new built development will be located outside of the associated flood extents in up to a 1 in 1,000 annual probability event.

Model output plots for the proposed scenario are provided in **Appendix E**.

These indicate that a peak flood level of 76.48 m AOD would be expected within the existing building (4 Brook Street) in the north of the site in a 1 in 1,000 annual probability 100% blockage (Island Green culvert) event. With a ground floor finished floor level of 76.02 m AOD, a maximum internal flood depth of 0.46 m may subsequently be expected; however, all proposed 'highly vulnerable' development will be located at or above the first floor and as such will be significantly raised above the anticipated flood level.

The new proposed building and the majority of the car parking area in the south of the site are shown to remain dry in up to the 1 in 1,000 annual probability 100% blockage (Island Green culvert) event. However, some shallow flooding may be expected in a small area at the northern extent of the car park with maximum flood depths of 0.28 m (but would typically be less).

5.3 FLOOD RISK ELSEWHERE

Any proposal to modify ground levels should demonstrate that there is no increase in flood risk to the development itself, or to any existing buildings which are known to, or are likely to flood.

In accordance with A1.2 of TAN15 the consequences of the development on flood risk elsewhere should be assessed for up to the 1 in 1,000 annual probability event. It is understood that NRW also seek to ensure that blockage scenarios are considered in quantifying flood risk elsewhere.

No inundation of the area of the site to comprise new development is expected in up to the 1 in 1,000 annual probability 'free flowing' event. As such the proposed development would not be expected to increase flood risk elsewhere during this scenario.

Model output plots comparing the baseline and proposed outputs for the 1 in 100 +CC (20%) and 1 in 1,000 annual probability 100% blockage (Island Green culvert) scenarios are provided in **Appendix F**.

This indicates that no significant impact on flood risk elsewhere would be expected as a result of the proposals. Whilst some localised increases in flood risk may be expected to the north-west these are typically in the region of 6 mm during the aforementioned events. This is only slightly greater than the modelling tolerance of +/- 5 mm, which is considered acceptable to NRW.

Furthermore, flood depths within the areas that are shown to be impacted are in the region of 1.09 and 1.14 during the baseline 1 in 100 +CC (20%) and 1 in 1,000 annual probability 100% blockage (Island Green culvert) scenarios respectively. As such an increase of 6 mm is considered to be negligible.

5.4 ACCESS AND EGRESS

The baseline modelled outputs (**Appendix C**) indicate that dry access and egress to the site can be provided via both Brook Street and Bridge Street in up to a 1 in 100 +CC (45%) annual probability event.

In a 1 in 1,000 annual probability event dry access and egress continues to be provided to the site via Bridge Street. Furthermore, the existing external staircase (fire escape) from the first and second floor of 4 Brook Street is to be retained as part of the proposals. This should allow safe access and egress from the building to the southern portion of the site which is shown to be flood free during a 1 in 1,000 annual probability event.

In the event of a blockage of the Island Green culvert dry access and egress to the site is also provided via Bridge Street leading to the south (**Appendix E**). There may be some shallow flooding within a small section of the car parking area in the north with maximum flood depths of 0.27 m (but would typically be less); however, this is shown to remain dry in the south.

6 SUMMARY

This FCA has been prepared on behalf of Lingar Group and relates to the proposed redevelopment of land located off Bridge Street, Wrexham.

According to the NRW Flood Risk Map the northern area of the site is located within the 1 in 1,000 annual probability flood outline. The northern area of the site is subsequently shown to be located within Zone C2, whilst the southern area is classified as Zone B and Zone A.

There is no requirement for the Justification Test to be applied for the area of the site that lies outside Zone C (including the area for the proposed new residential apartment block). The land in the north, which is located in Zone C is currently developed. The proposed conversion of the first and second floor of the existing building (4 Brook Street) within this area would not be expected to increase the vulnerability classification. Furthermore, the development of the site is considered to contribute to part of the local authority's regeneration scheme and meets the definition of 'previously developed land'. Part i and iii of the Justification Test are therefore considered to have been addressed.

The WCBC River Gwenfro 1D-2D ISIS-TUFLOW hydraulic model has been obtained and run for the purposes of this assessment, incorporating the site topographic survey. The model outputs indicate that no flooding of the site would be expected in up to a 1 in 100 +CC (45%) annual probability event. Whilst some flooding of the site may be expected during a 1 in 1,000 annual probability event this is confined to the northern portion of the site.

A 30%, 67% and 100% blockage of the Island Green and St Giles Way culvert has also been modelled as a sensitivity assessment for the 1 in 100 +CC (20%), 1 in 100 +CC (45%) and 1 in 1,000 annual probability events. The model outputs indicate that the site is more sensitive to a blockage of the Island Green culvert. Approximately 60% of the site (within the southern portion of the site) is shown to remain dry in up to a 1 in 1,000 annual probability 100% (Island Green culvert) blockage scenario. Within the northern portion of the site, flood levels are shown to range between 76.23 and 76.49 m AOD depending on the event, equating to maximum flood depths typically between 0.44 and 0.53 m; however, in some lower parts of the site flood depths could reach 1.21 m.

The site is not at risk of flooding from reservoirs, canals or other artificial sources. There may be some susceptibility to groundwater and surface water flooding at the site.

The proposed flood risk mitigation strategy for the site is detailed in **Section 5.1**.

The proposals have been incorporated within the refined Weetwood hydraulic model of the River Gwenfro, which in turn has been run for the 1 in 100 +CC (20%), 1 in 100 +CC (45%) and 1 in 1,000 annual probability 100% blockage (Island Green culvert) scenarios. The model outputs indicate that all proposed 'highly vulnerable' development would remain dry during the modelled events.

The proposals are expected to have a negligible impact on flood risk elsewhere.

Dry access and egress to the site can be provided via both Brook Street and Bridge Street in up to a 1 in 100 +CC (45%) annual probability event, and via Bridge Street in a 1 in 1,000 annual probability event and Island Green culvert blockage scenario.

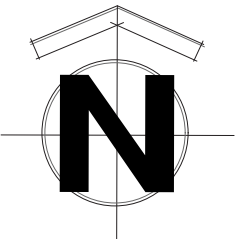
7 RECOMMENDATIONS

This FCA has demonstrated that the proposed development may be completed without conflicting with the requirements of TAN15 subject to the following:

- All 'highly vulnerable' development within the existing building (4 Brook Street) to be provided at or above the first floor
- Finished floor level of the new apartment block to be set at a minimum of 76.73 m AOD
- Finished floor levels to be set 0.15 m above adjacent ground levels
- Minimum ground levels within the car parking area will be set to at least 76.2 m AOD

APPENDIX A:

Development Proposals

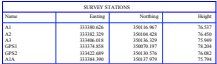
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Checked by:

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APPENDIX B:

Topographic Survey

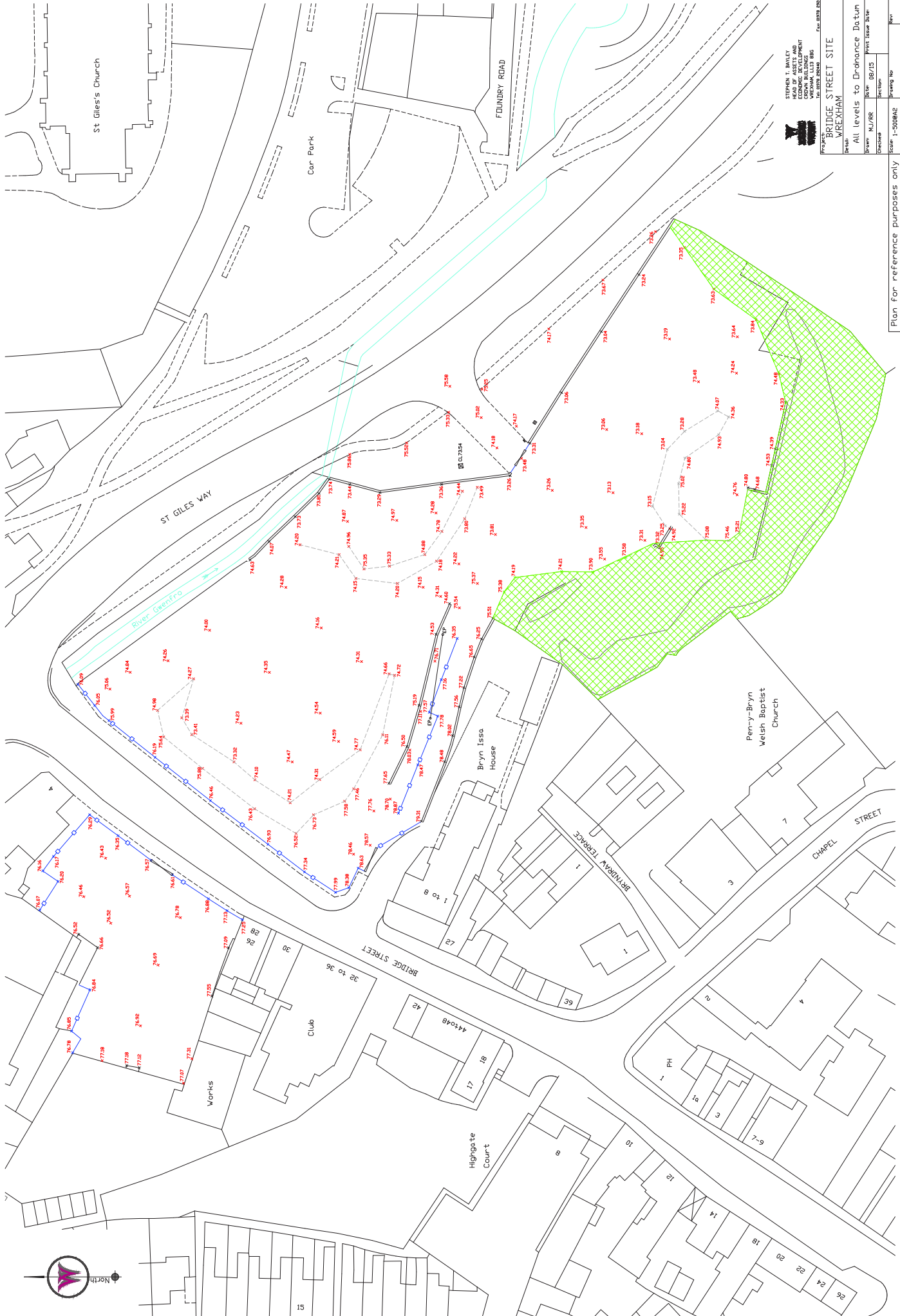


Disclaimer:
All efforts have been made to survey all utility services within the boundary of the survey.
We can not guarantee that we have been able to locate everything and further investigation
will be required to establish full extents of services.

Notes:
Horizontal and vertical control using SmartNet GPS Network and OSGB36(02) coordinate System
This survey has been converted to a local grid orientated to OS grid. Position is only true at one point to OS coordinates


CHESHIRE SURVEYS LTD
 Setting out and Survey Engineers
 Unit 18, Barrowmore Enterprise Estate, Gt Barrow, Chester CH3 7JS
 Email: martin@cheshiresurveys.com Tel/Fax 01829 741859 Mob: 077 9964 1118

Client	Weetwood	
Location	4 Brook St, Wrexham	
Description	Level Survey	
Drg. No.:	2140/1	Surveyed By: GF
Scale: 1:	200/A1	Drawn By: GF
Date:	20/09/10	Amend: *



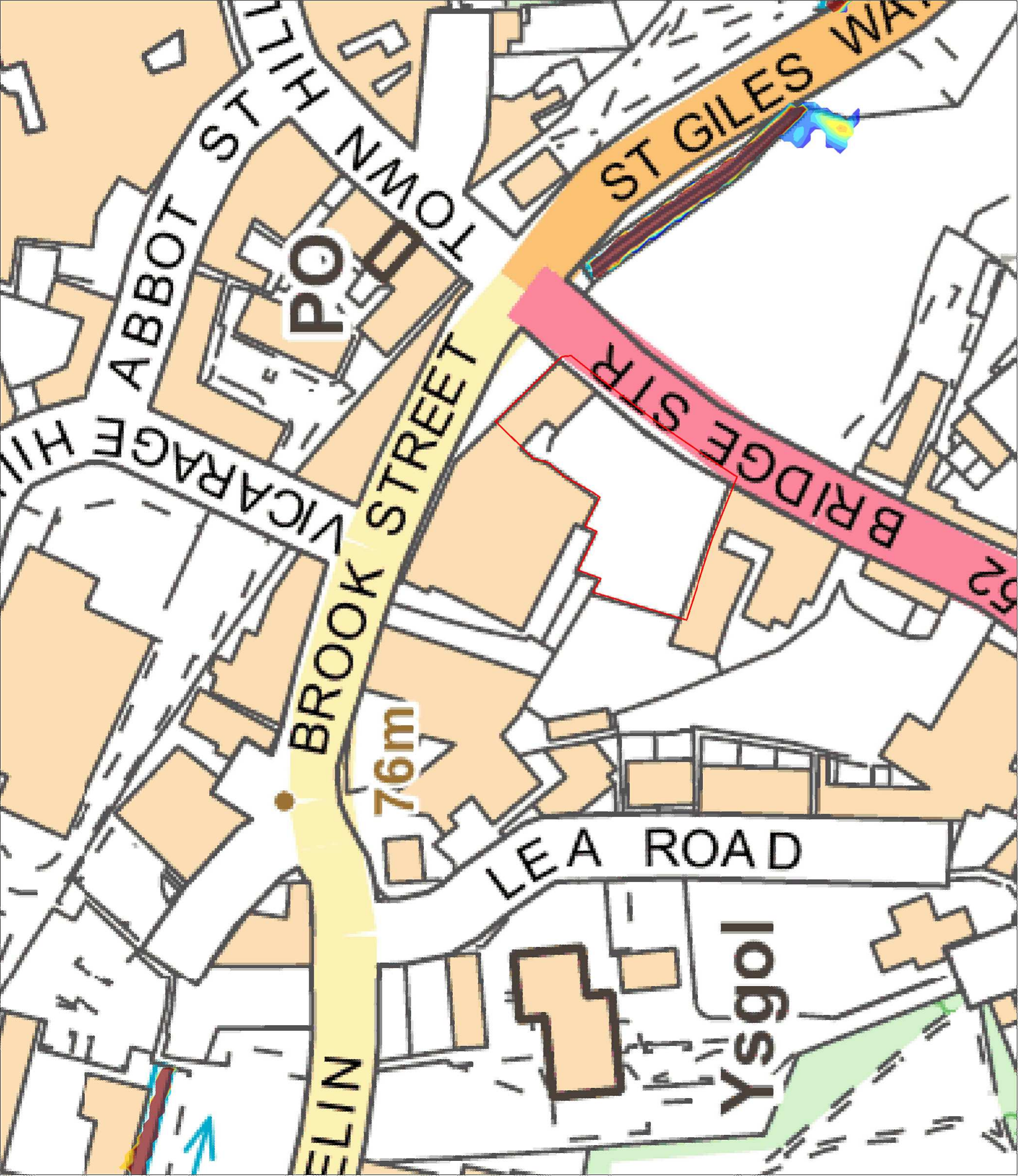
STEPHEN T. BAILEY
LAND SURVEYOR
ECONOMIC DEVELOPMENT
CROWN BUILDINGS
100, BRIDGE STREET
WREXHAM, CHESHIRE, WY6 8JG
TEL: 01978 824448

Project: BRIDGE STREET SITE WREXHAM	
Drawn: MJ/RJR	Check: JB/JS
Section: Part 1 of 2	Scale: 1:500
Issue: 1	Rev: 1

Plan for reference purposes only

APPENDIX C:

Model Output Plots – Baseline Scenario



Notes:

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KEY:

— Site Location

Depth (metres)

- 0.0 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- 0.4 to 0.5
- 0.5 to 0.6
- 0.6 to 0.7
- 0.7 to 0.8
- 0.8 to 0.9
- 0.9 to 1.0
- > 1.0

Weetwood

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T: 01352 700045
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Client:

Lingar Group

Project Title:

Bridge Street, Wrexham

Drawing Title:

Max Flood Depths: 1 in 100
Annual Probability Event - Baseline Scenario

Map Orientation:



Scale:

Drawn:

AE

Checked:

RMu

Date:

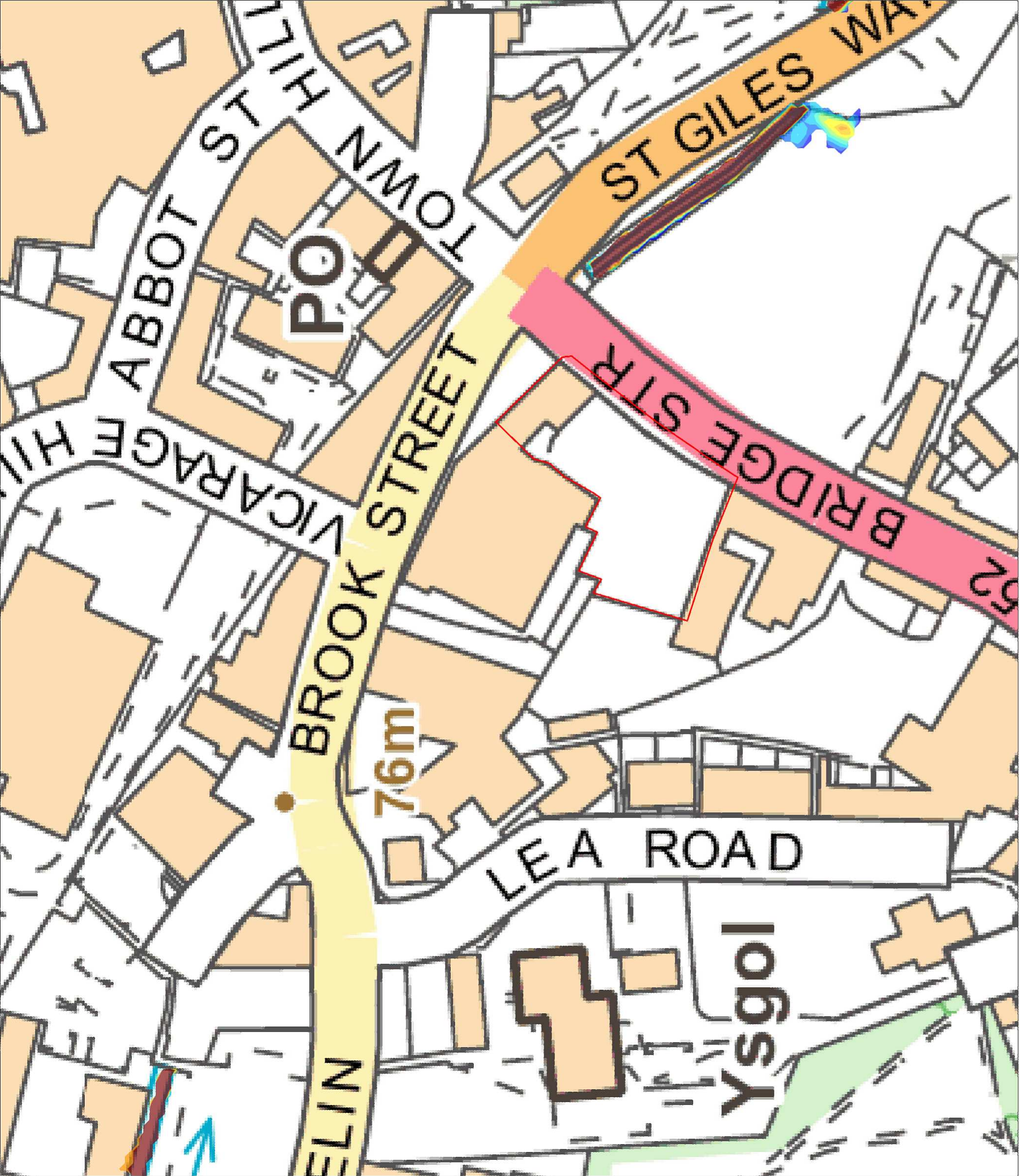
10 August 2018

Drawing No:

Gwen_Design_VS_4183_005_AE_3M_Q100.d

Rev:

A



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KEY:

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Depth (metres)

- 0.0 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- 0.4 to 0.5
- 0.5 to 0.6
- 0.6 to 0.7
- 0.7 to 0.8
- 0.8 to 0.9
- 0.9 to 1.0
- > 1.0

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Client:

Lingar Group

Project Title:

Bridge Street, Wrexham

Drawing Title:

Max Flood Depths: 1 in 100 +CC (20%)
Annual Probability Event - Baseline Scenario

Map Orientation:



Scale:

Drawn:

AE

Checked:

RMu

Date:

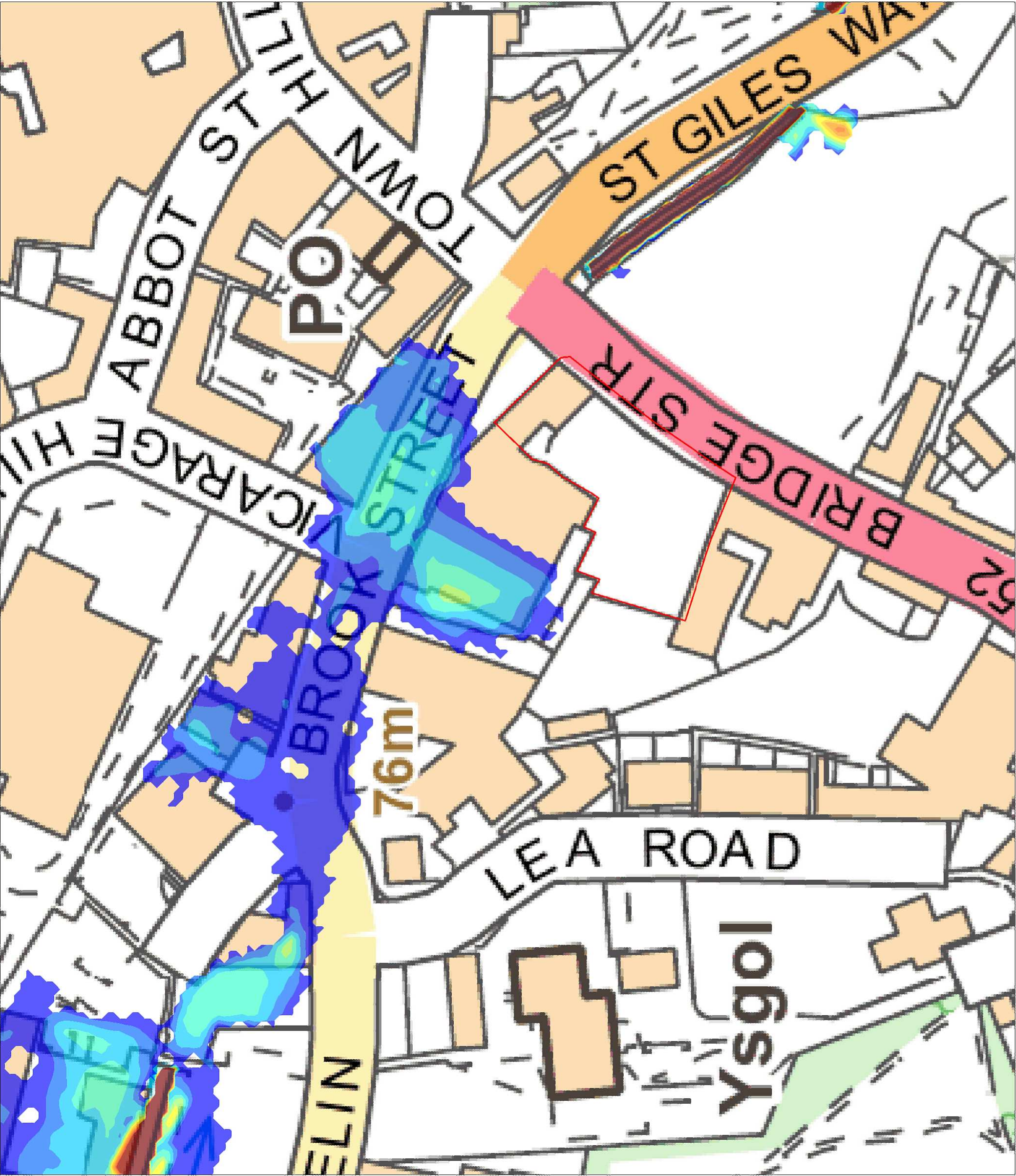
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Drawing No:

Gwen_Design_VS_4183_005_AE_3M_Q100CC20_d

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KEY:

— Site Location

Depth (metres)

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- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- 0.4 to 0.5
- 0.5 to 0.6
- 0.6 to 0.7
- 0.7 to 0.8
- 0.8 to 0.9
- 0.9 to 1.0
- > 1.0

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Client:

Lingar Group

Project Title:

Bridge Street, Wrexham

Drawing Title:

Max Flood Depths: 1 in 100 +CC (45%)
Annual Probability Event - Baseline Scenario

Map Orientation:



Scale:

Drawn:

AE

Checked:

RMu

Date:

10 August 2018

Drawing No:

Gwen_Design_VS_4183_005_AE_3M_Q100CC45_d

Rev:

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KEY:

— Site Location

Depth (metres)

0.0 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.4
0.4 to 0.5
0.5 to 0.6
0.6 to 0.7
0.7 to 0.8
0.8 to 0.9
0.9 to 1.0
> 1.0

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Client: **Lingar Group**

Project Title: **Bridge Street, Wrexham**

Drawing Title: **Max Flood Depths: 1 in 1,000 Annual Probability Event - Baseline Scenario**

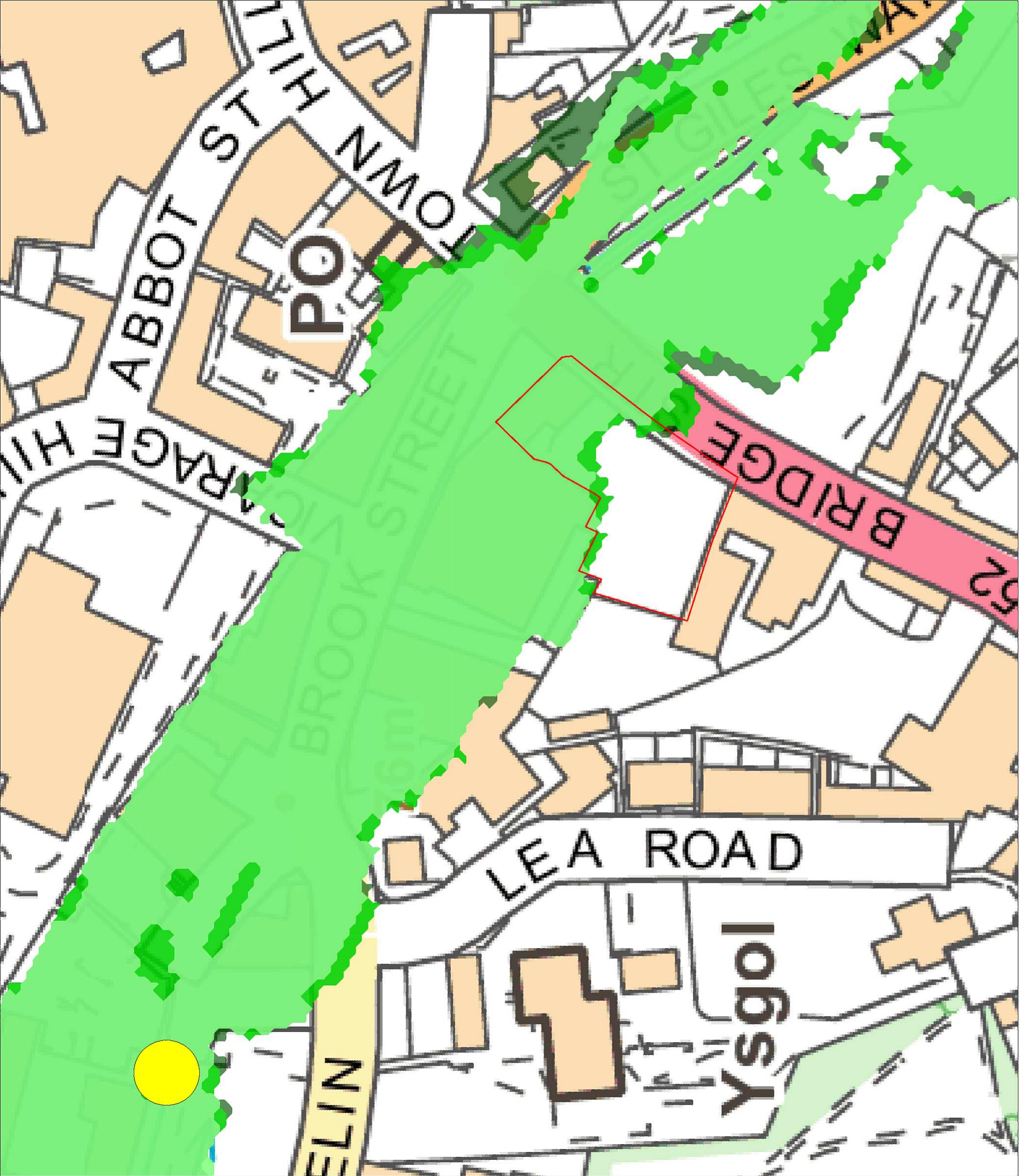
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Drawn: **AE** Checked: **RMu** Date: **10 August 2018**

Drawing No: **Gwen_Design_WS_4183_005_AE_3M_Q1000_d** Rev: **A**

APPENDIX D:

Model Outputs Plots – Baseline Blockage Scenario



Notes:

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KEY:

- Site Location
- Blockage Location
- Blockage Percentage
 - 30%
 - 67%
 - 100%

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Client:	Lingar Group	
Project Title:	Bridge Street, Wrexham	
Drawing Title:	Structure Blockage: 1 in 100 +CC (20%) Annual Probability Event - Baseline Scenario	
Map Orientation:		Scale:
Drawn:	AE	Checked:
		RMu
		Date:
		10 August 2018
Drawing No:	GwenBLK_WS_4183_006_BLK5_Q100CC20	
Rev:	A	

Notes:

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KEY:

—

 Site Location

●

 Blockage Location

Blockage Percentage

30%

67%

100%

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Client: **Lingar Group**

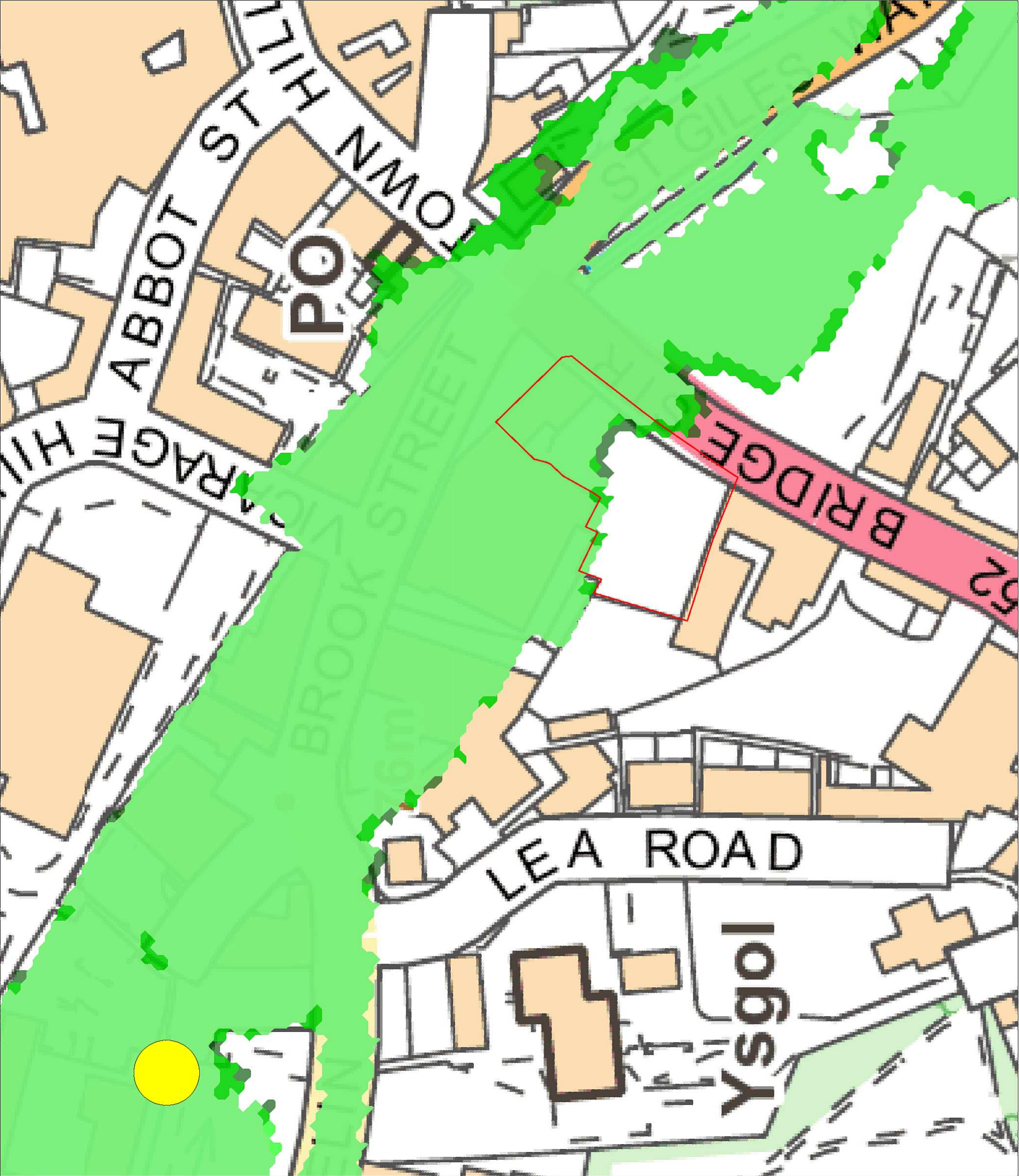
Project Title: **Bridge Street, Wrexham**

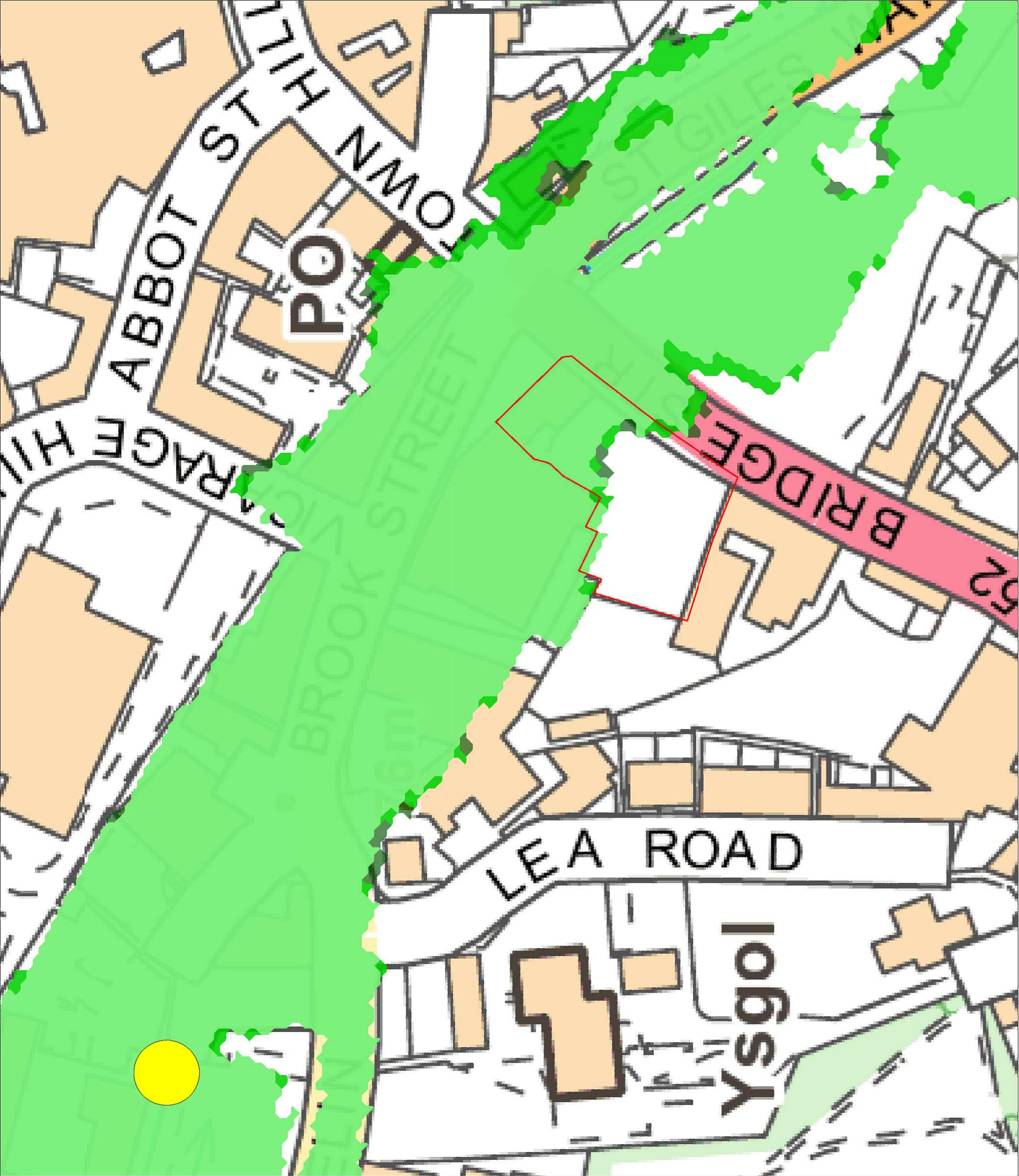
Drawing Title:
**Structure Blockage: 1 in 100 +CC (45%)
Annual Probability Event - Baseline Scenario**

Map Orientation:  Scale:

Drawn: AE Checked: RMu Date: 10 August 2018

Drawing No:
GwenBLK_WS_4183_006_BLK5_Q100CC45
Rev: A





Notes:

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KEY:

- Site Location
- Blockage Location
- Blockage Percentage
 - 30%
 - 67%
 - 100%

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Client:

Lingar Group

Project Title:

Bridge Street, Wrexham

Drawing Title:

Structure Blockage: 1 in 1,000
Annual Probability Event - Baseline Scenario

Map Orientation:

Scale:

Drawn: AE

Checked: RMu

Date: 10 August 2018

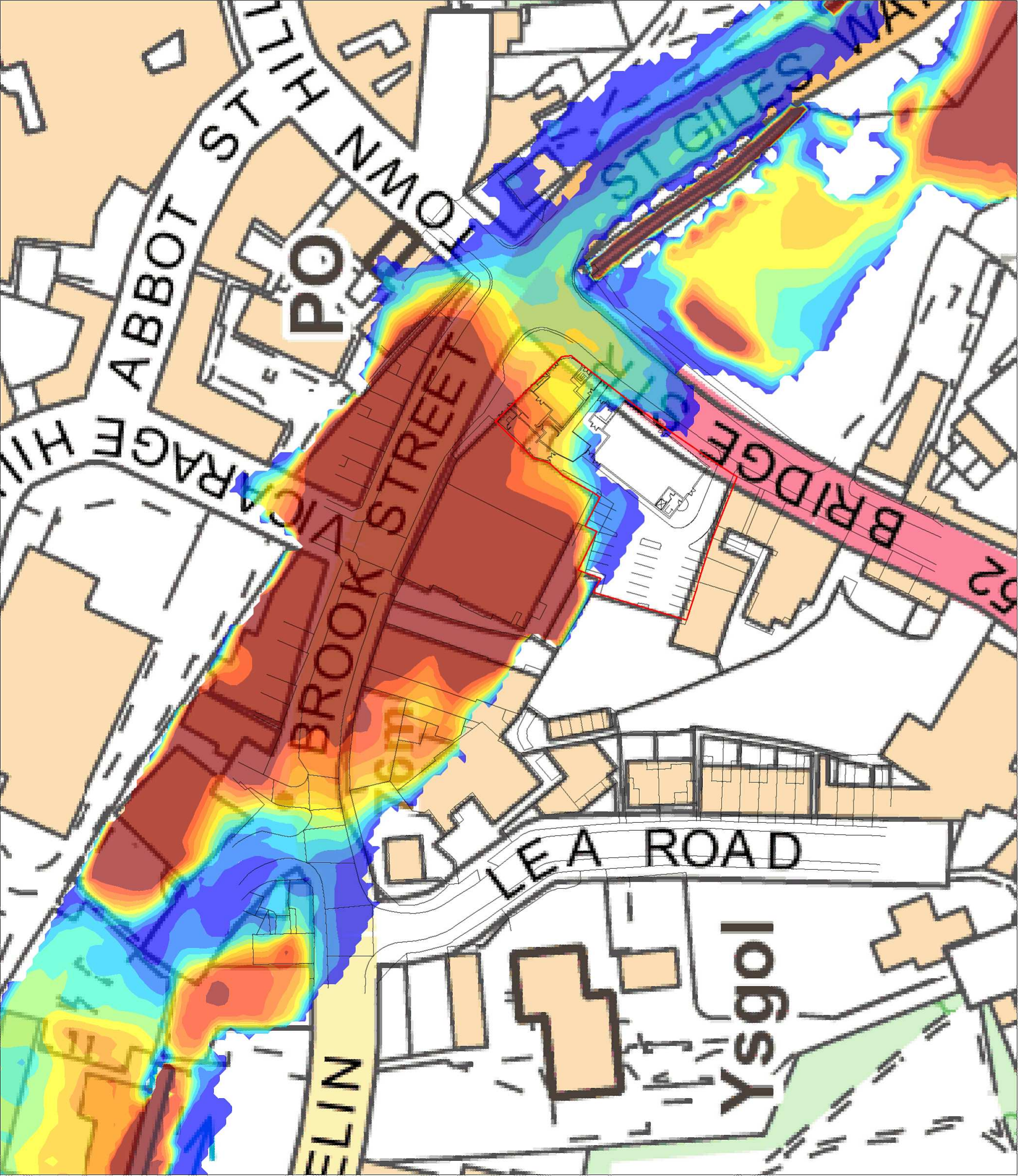
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APPENDIX E:

Model Outputs Plots – Proposed Scenario



Notes:

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KEY:

— Site Location

Depth (metres)

- 0.0 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- 0.4 to 0.5
- 0.5 to 0.6
- 0.6 to 0.7
- 0.7 to 0.8
- 0.8 to 0.9
- 0.9 to 1.0
- > 1.0

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Client:

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Project Title:

Bridge Street, Wrexham

Drawing Title:
Max Flood Depths (Island Green culvert 100% blockage): 1 in 100 + CC (20%) Annual Probability Event - Proposed Scenario

Map Orientation:



Scale:

Drawn:

AE

Checked:

RMu

Date:

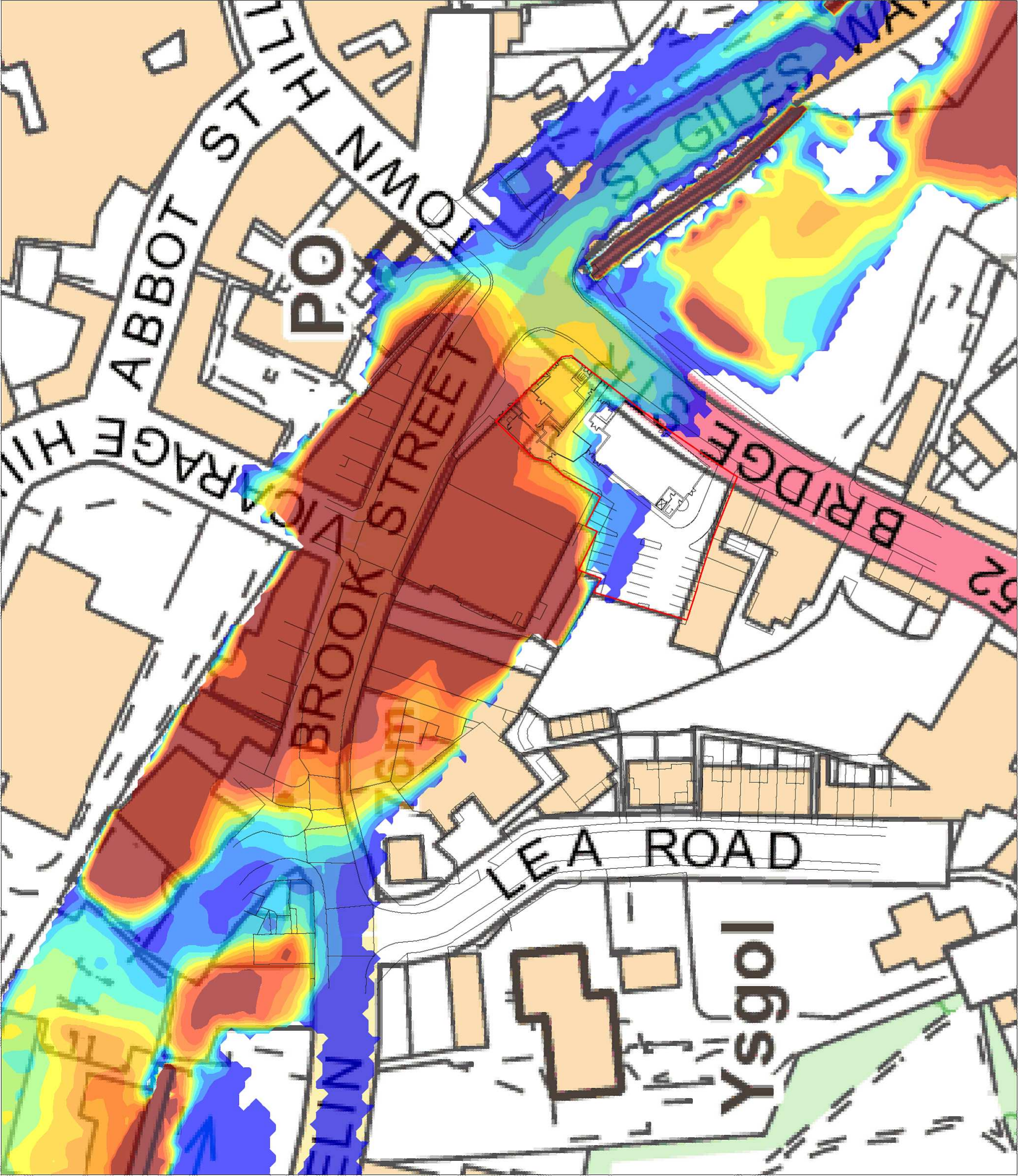
22 August 2018

Drawing No:

GwenBLK_WS_4183_009 BLK5_100%_Q100CC20_d

Rev:

A



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KEY:

— Site Location

Depth (metres)

- 0.0 to 0.1
- 0.1 to 0.2
- 0.2 to 0.3
- 0.3 to 0.4
- 0.4 to 0.5
- 0.5 to 0.6
- 0.6 to 0.7
- 0.7 to 0.8
- 0.8 to 0.9
- 0.9 to 1.0
- > 1.0

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Client:

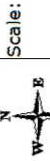
Lingar Group

Project Title:

Bridge Street, Wrexham

Drawing Title:
Max Flood Depths (Island Green culvert 100% blockage): 1 in 100 + CC (45%) Annual Probability Event - Proposed Scenario

Map Orientation:



Scale:

Drawn:

AE

Checked:

RMu

Date:

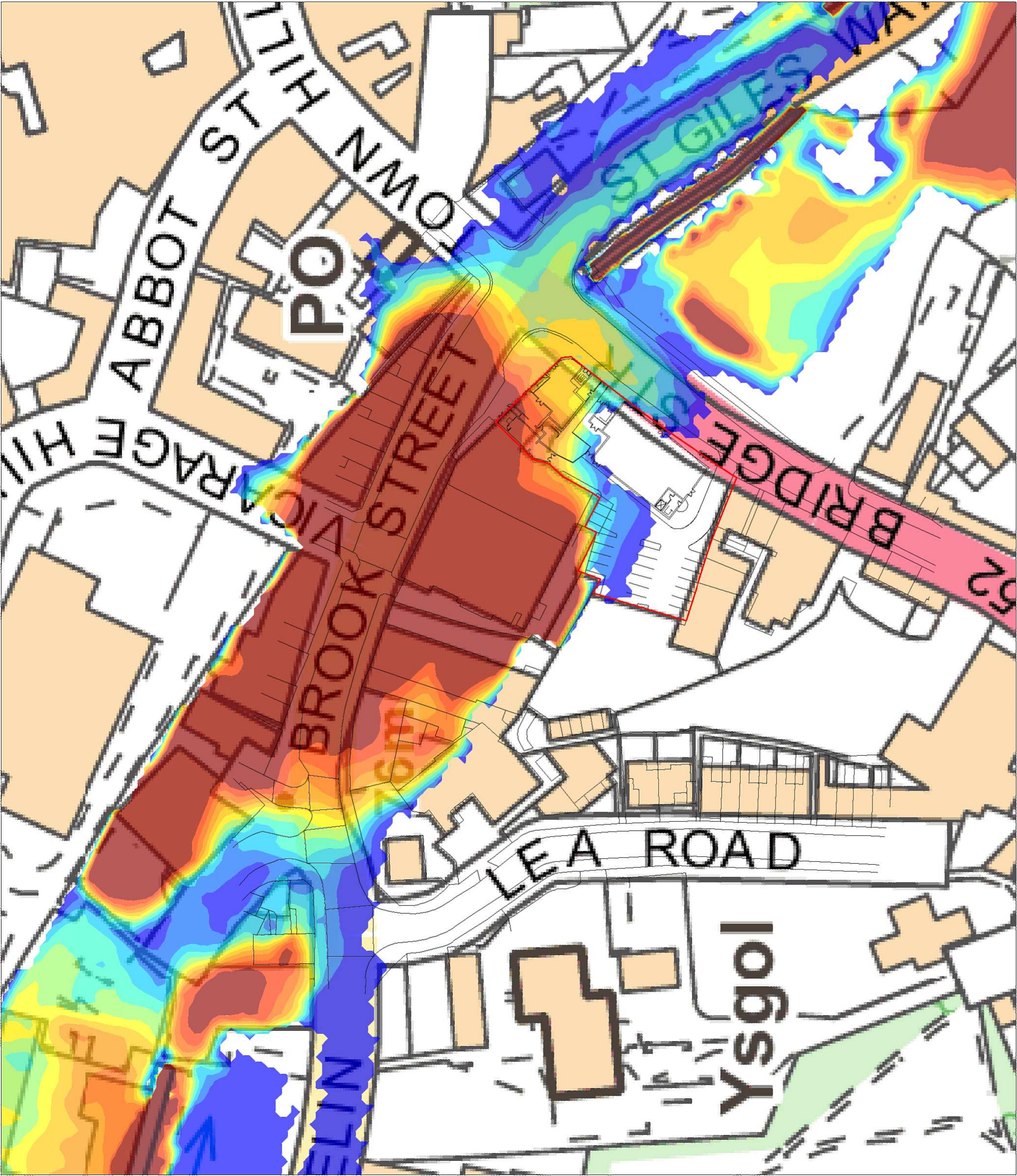
22 August 2018

Drawing No:

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Rev:

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KEY:

— Site Location

Depth (metres)

0.0 to 0.1
0.1 to 0.2
0.2 to 0.3
0.3 to 0.4
0.4 to 0.5
0.5 to 0.6
0.6 to 0.7
0.7 to 0.8
0.8 to 0.9
0.9 to 1.0
> 1.0

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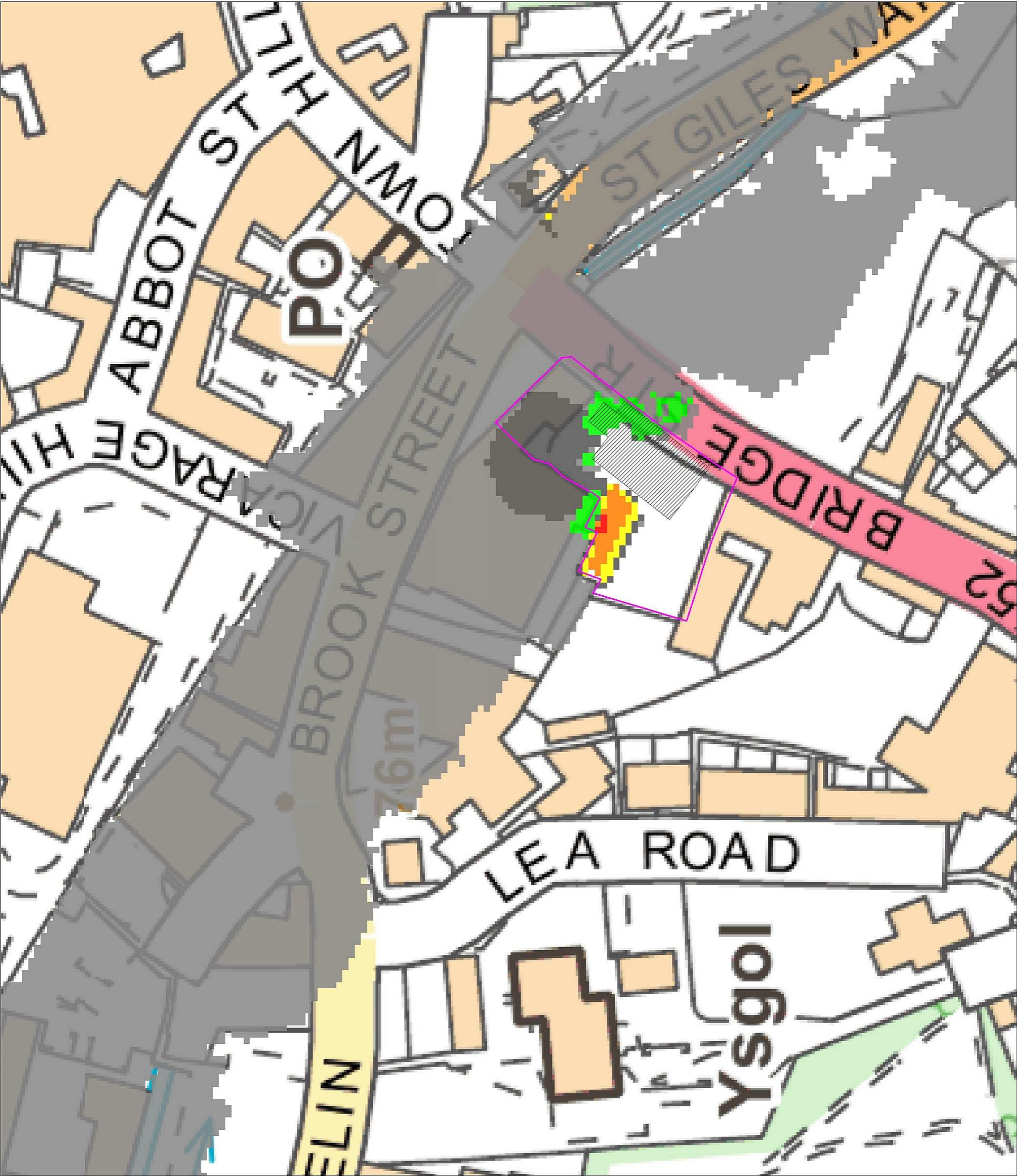
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Client:	Lingar Group		
Project Title:	Bridge Street, Wrexham		
Drawing Title:	Max Flood Depths (Island Green culvert 100% blockage): 1 in 1,000 Annual Probability Event - Proposed Scenario		
Map Orientation:			Scale:
Drawn:	AE	Checked:	RMu
Date:	22 August 2018		
Drawing No:	GwenBLK_WS_4183_009_BLK5_100%_Q1000_d		Rev: A

APPENDIX F:

Model Outputs Plots – Comparison



Notes:

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KEY:

- Site Location
- Proposed Building
- Change in flood depths
 - Decrease
 - Decrease (5 - 30 mm)
 - No change (+/- 5 mm)
 - Increase (5 to 30 mm)
 - Increase (30 to 75 mm)
 - Increase (75 to 150 mm)
 - Increase (150 to 300 mm)
 - Increase (> 300 mm)

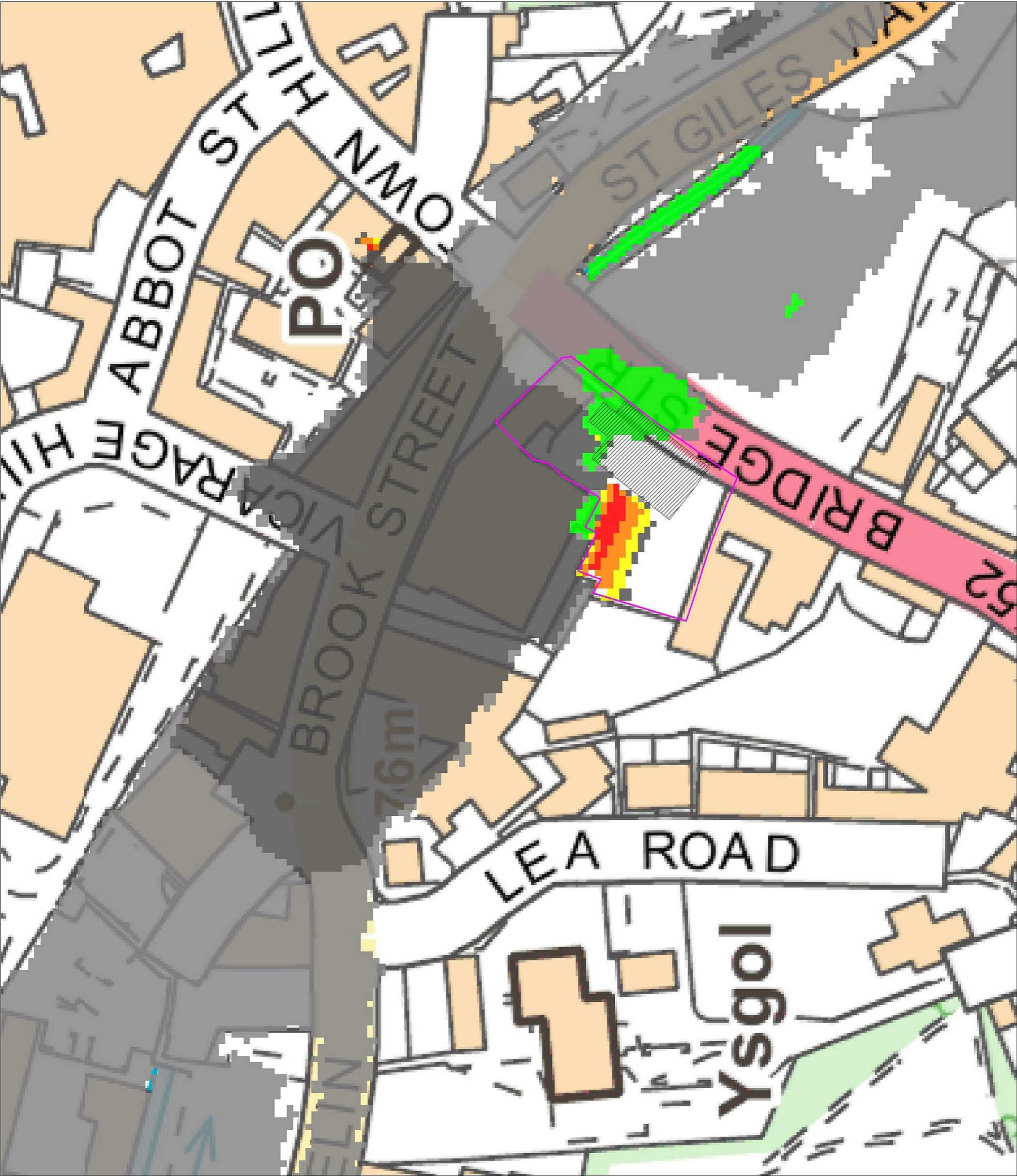
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Client: Lingar Group	
Project Title: Bridge Street, Wrexham	
Drawing Title: Comparison Plot: 1 in 100 +CC (20%) Annual Probability Event - 100% Blockage Scenario	
Map Orientation: 	Scale:  0 10 20 metres
Drawn: AE	Checked: RMu
Date: 20 August 2018	
Drawing No: 4183_009-006_BLK5_100_Q100CC20	Rev: A



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KEY:

- Site Location
- Proposed Building
- Change in flood depths
 - Decrease
 - Decrease (5 - 30 mm)
 - No change (+/- 5 mm)
 - Increase (5 to 30 mm)
 - Increase (30 to 75 mm)
 - Increase (75 to 150 mm)
 - Increase (150 to 300 mm)
 - Increase (> 300 mm)

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Client:	Lingar Group		
Project Title:	Bridge Street, Wrexham		
Drawing Title:	Comparison Plot: 1 in 1,000 Annual Probability Event - 100% Blockage Scenario		
Map Orientation:		Scale:	
Drawn:	AE	Checked:	RMu
		Date:	20 August 2018
Drawing No:	4183_009-006_BLK5_100_Q1000		Rev: A



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Bridge Street, Wrexham

Proposed residential development

Flood Consequences Assessment Addendum

Project ref:	4183 Bridge Street, Wrexham
Prepared by:	Adam Edgerley BSc (Hons) <i>Technical Director, Weetwood Services Ltd.</i>
Approved by:	Andrew Grime BEng MBA CEng C.WEM MICE FCIWEM <i>Director, Weetwood Services Ltd.</i>
Date:	19 August 2019
Version:	Final v1.0

This document has been prepared solely as a Flood Consequences Assessment Addendum for Lingar Group. This report is confidential to Lingar Group and Weetwood Services Ltd accepts no responsibility or liability for any use that is made of this document other than by Lingar Group for the purposes for which it was originally commissioned and prepared.

Background

- 1 This document has been prepared by Weetwood Services Ltd ("Weetwood") on behalf of Lingar Group.
- 2 Weetwood prepared a Flood Consequences Assessment (FCA) v1.2 report dated 22 August 2018 which was submitted to Wrexham County Borough Council (WCBC) in support of a planning application (ref: P/2018/0915).
- 3 A consultation response letter from Natural Resources Wales (NRW) dated 15 July 2019 (**Annex 1**) has raised four concerns. NRW advised that 'if no further information is submitted' then they would object to the application.
- 4 This FCA Addendum provides this information and addresses the concerns raised by NRW. It must be read in conjunction with the FCA v1.2 report.

NRW Concerns

- 5 *Compliance with A1.14 of TAN15 has not been demonstrated as sections of the site (e.g. car parking area) are shown to flood during the 1% annual probability (climate change and blockage event). The residential car parking should be treated as Highly Vulnerable development and should be designed to remain flood free.*
- 6 *There is some uncertainty as to whether blockage of the Island Green culvert would pose greatest flood risks to the site.*
- 7 *Offsite flood risks have been identified within the FCA and these could further increase should additional land raising be required on the site.*
- 8 *There is a lack of information within the FCA as to the flood hazards (flood depths and flood velocities) that future users of the development could be exposed to, so the decision maker does not have the necessary information to make an informed decision.*

Compliance with A1.14 of TAN15 (Refer to Paragraph 5)

- 9 For proposed highly vulnerable development, NRW require the entire development including all residential buildings, garden areas and driveways/parking to be shown to be flood-free during a 1:100 plus climate change (+CC) annual probability event in accordance with their interpretation with A1.14 of TAN15.
- 10 As presented in Appendix C of the FCA v1.2 report, the site is expected to remain entirely dry during the above event. However, whilst not specified in policy A1.14 of TAN15 NRW insists that a culvert blockage should be accounted for.
- 11 When accounting for a 100% blockage of the upstream culvert structure located at Island Green, the car parking area may partially flood to a shallow depth. An extract taken from Appendix E of the FCA v1.2 report is presented in **Figure 1** which also outlines the area of concern that NRW refers to.



Figure 1. Weetwood Modelled 1:100 +CC (20%) AEP Blockage Event; Max Flood Depths

- 12 In terms of the car parking area, in order to prevent this from flooding ground levels would need to be increased within that area of the car park. However, by doing this, increasing flood risk elsewhere is likely to become a more significant issue, which is also a concern raised by NRW (refer to paragraph 7 above). Also, it is not feasible to raise ground levels adjacent to the existing building in the north of the site.
- 13 As shown in **Figure 1**, it is only a small section of the proposed car park that is shown to flood during this scenario, with most of the car park remaining entirely dry. Furthermore, flood depths are relatively shallow being less than 300 mm but generally less than 100 mm which is not expected to pose a significant risk (refer to Hazard Ratings in **Figure 2**). Such flood depths in these circumstances (i.e. a 100% culvert blockage scenario) within a small portion of the car park should, we feel, be considered as acceptable.

Blockage Clarification (Refer to Paragraph 6)

- 14 NRW states that the FCA v1.2 report has focussed on blockage risks solely from the Island Green culvert, and that the FCA should also assess the risks from blockages of the Town Centre culvert and the St. Giles Way culvert.
- 15 However, in Section 4.4.3 of the FCA it is clear that our assessment has considered both the Island Green culvert and the St Giles Way culvert, with the former proving to be a worst-case scenario.
- 16 In terms of the Town Centre culvert, this was not considered within the FCA given its location being way upstream of the site.
- 17 Please note that the hydraulic modelling data provided to Weetwood by Wrexham County Borough Council that was utilised as part of the Weetwood FCA v1.2 report has assessed 8 blockage locations along the River Gwenfro including the 3 aforementioned culverts. In order to select the most appropriate blockage scenario to utilise for the FCA v1.2 report Weetwood assessed the modelled outputs from all 8 blockage locations.
- 18 For the avoidance of doubt the modelled flood levels at the site during the 1:1,000 annual probability event including 100% blockages to culverts at Island Green, St Giles Way and the Town Centre are 76.49, 76.26 and 76.09 m AOD respectively.
- 19 Therefore, the FCA v1.2 report has correctly assessed the impact of a blockage of the Island Green culvert, which is considered to be the worst-case scenario for the site.

Offsite Flood Risks (Refer to Paragraph 7)

- 20 NRW points out within its consultation response letter that there is a small area near the post office located off Town Hill that shows potentially more significant increased flood risk elsewhere; however, a review of the modelled outputs confirms that this is considered to be attributed to modelling anomalies and does not present actual increases expected within that area.
- 21 NRW state that offsite impacts may increase should the car park be raised to satisfy its concern outlined in Paragraph 5 above; however, as explained in Paragraphs 9 to 13 Weetwood do not consider it to be appropriate to raise ground levels.
- 22 Currently, the impact on flood risk elsewhere is considered to be negligible and flood risk in the proposed car park is considered reasonable.

Flood Hazards (Refer to Paragraph 8)

- 23 The Hazard Rating has been calculated using the formula **HR= d x (v + 0.5) + DF** (where d = depth, v = velocity and DF = debris factor), which has been sourced from the DEFRA FD2320/TR2 Technical Report.
- 24 The Hazard Rating for the site has been output directly from the hydraulic model using the 'conservative' land use function; this assumes a debris factor of 0.5 for flood depths between 0 and 0.25 m and 1.0 for flood depths above 0.25 m.
- 25 The results are presented in **Figure 2** below for the 100% culvert blockage scenario (i.e. the worst-case scenario). These show that the proposed car parking area would generally be expected to have a 'very low' Hazard Rating. This is considered an acceptable level of risk given the likelihood of causation i.e. the 1:100 +CC (20%) annual probability event coinciding with a 100% blockage of the Island Green culvert.

- 26 The proposed new residential building is accessed from the south of the site, which is expected to remain flood free. Therefore emergency access and egress should be available in all flood events.
- 27 The Flood Hazard to existing building in the north and its associated access and egress route will remain the same as per the existing situation. However, it should be noted that access to the existing building from the southern portion of the site may improve post development.

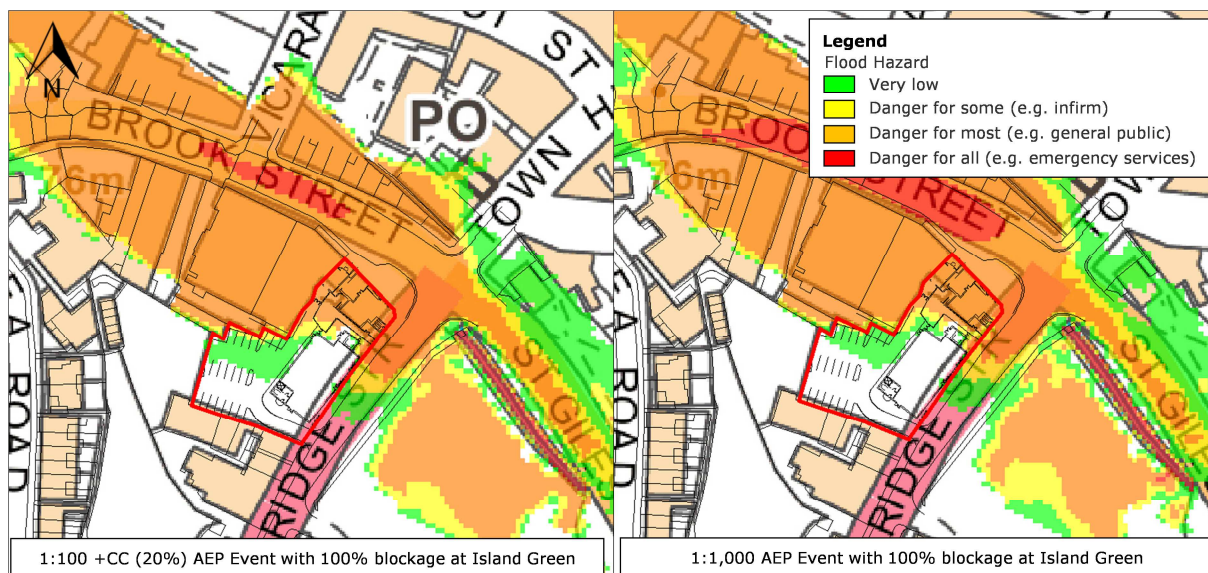


Figure 2. Hazard Ratings; Proposed Scenario

Summary and Conclusions

- 28 It is not considered feasible (see Paragraph 12) to raise the proposed car parking area for it to remain entirely flood free during the 1:100 +CC (20%) annual probability event including a 100% blockage of the Island Green culvert. Whilst this is sought by NRW in accordance with their interpretation of A1.14 of TAN15, the Hazard Rating (see Paragraph 25) for this unlikely combination of events is considered acceptable for a car parking area. Furthermore, most of the car park and access point is shown to remain dry.
- 29 Further information has been provided with respect to calculated Hazard Ratings using a conservative debris factor. Within the car parking area a 'very low' Hazard Rating is expected.
- 30 The off-site impacts on flood risk shown in the FCA v1.2 report are either shown to be negligible or owing to modelling anomalies.



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