



JACQUES WAY, WREXHAM

FLOOD CONSEQUENCES ASSESSMENT Final Report v1.1

March 2019

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Report Title: **Jacques Way, Wrexham**
Flood Consequences Assessment
Final Report v1.1

Client: Castlemead Group Limited

Date of Issue: 11 March 2019

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Contents

	Page
Signature Sheet	i
Contents	ii
List of Tables, Figures & Appendices	iii
1 INTRODUCTION	1
1.1 Purpose of Report	1
1.2 Structure of the Report.....	1
2 PLANNING POLICY AND GUIDANCE	2
2.1 NATIONAL Planning Policy and Guidance.....	2
2.2 Local Planning Policy and Guidance	3
2.3 Consents	3
2.4 Relevant Documents	3
3 SITE DETAILS AND PROPOSED DEVELOPMENT	4
3.1 Site Location	4
3.2 Existing and Proposed Development.....	4
3.3 Waterbodies in the Vicinity of the Site	4
3.4 Ground Conditions	5
3.5 Site Levels	5
3.6 Access and Egress	5
4 REVIEW OF FLOOD RISK.....	6
4.1 Flood Zone Designation	6
4.2 Justification Test.....	7
4.3 Historical Records of Flooding	7
4.4 Fluvial Flood Risk – River Gwenfro	7
4.5 Flood Risk from Reservoirs, Canals and Other Artificial Sources	9
4.6 Flood Risk from Groundwater	10
4.7 Flood Risk from Surface Water	10
5 FLOOD RISK MITIGATION MEASURES.....	12
5.1 Flood Mitigation	12
5.2 Flood Risk Elsewhere	12
6 SUMMARY	13
7 RECOMMENDATIONS.....	14

List of Figures

Figure 1: Site Location 4

Figure 2: Development Advice Map 6

Figure 3: Natural Resources Wales Flood Risk Map 7

Figure 4: Culvert Locations 9

Figure 5: Groundwater Flooding Hazard Map 10

Figure 6: Risk of Flooding from Surface Water 11

List of Appendices

Appendix A: Development Proposals

Appendix B: Topographic Survey

Appendix C: Model Plot – Baseline

Appendix D: Model Plot – Blockage

1 INTRODUCTION

1.1 PURPOSE OF REPORT

Weetwood Services Ltd ('Weetwood') has been instructed by Castlemead Group Limited to undertake a Flood Consequences Assessment (FCA) for the proposed redevelopment of the Former Jacques Yard, Jacques Way, Wrexham.

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 and recommendations

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 letter¹ and supporting guidance note² 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'.

¹ Welsh Government consultation letter 23 August, 2016 (Ref: CL-03-16)

² <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) 1996-2011 was adopted in 2005 and is the current Development Plan for the Borough.

The following policies are relevant in respect of flood risk:

Policy EC12; Development and Flood Risk

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

WCBC is currently preparing a Local Development Plan for the Borough covering the period 2018-2028, which will replace the current UDP once adopted.

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 website³

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:

- Local Flood Risk Management Strategy (LFRMS), WCBC, April 2013
- Flood Risk Management Plan (FRMP), WCBC, July 2016

³ <https://naturalresources.wales/apply-for-a-permit/flood-risk-activities/flood-risk-activity-permits-information/?lang=en>

3 SITE DETAILS AND PROPOSED DEVELOPMENT

3.1 SITE LOCATION

The site is located south of Jacques Way at Ordnance Survey National Grid Reference SJ 328 506, as shown in **Figure 1**. The site is approximately 0.528 hectares (ha) in area.

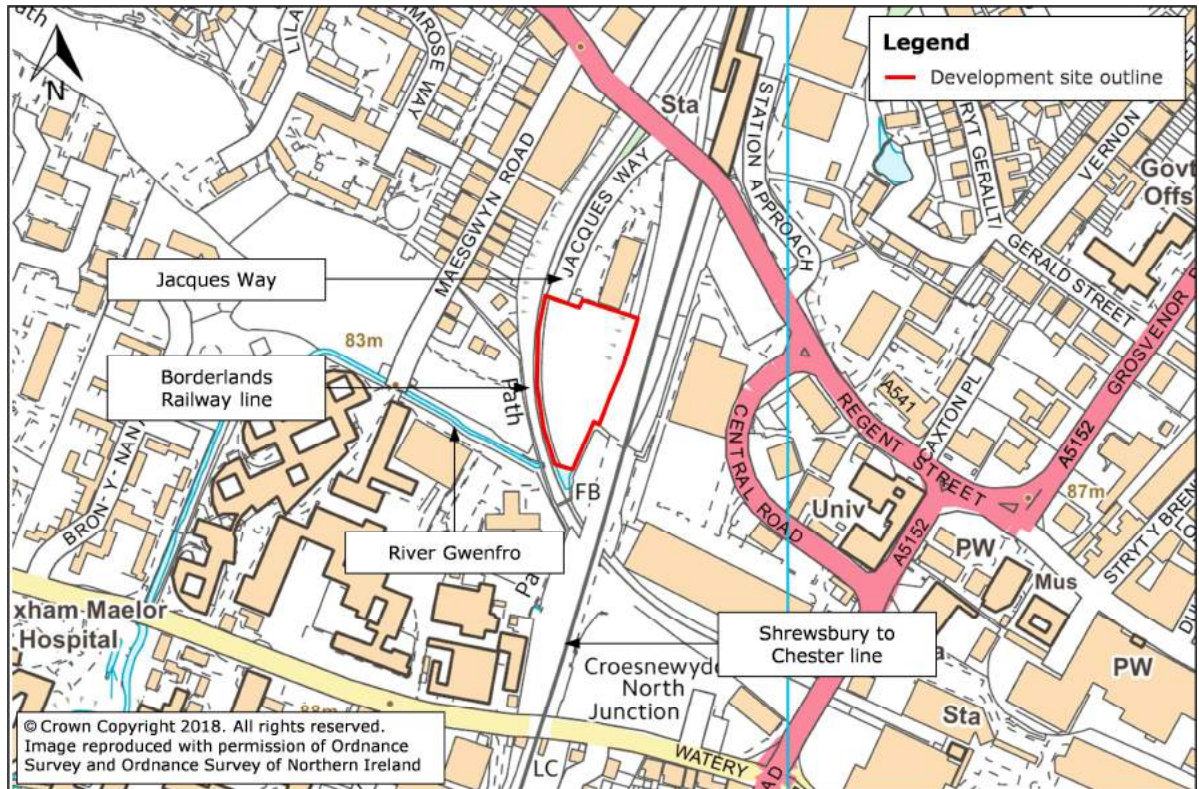


Figure 1: Site Location

3.2 EXISTING AND PROPOSED DEVELOPMENT

The site currently comprises of previously developed land which is now mainly levelled rough grassland and concrete.

The current proposals are for 25 residential dwellings with associated car parking. An illustrative layout is provided in **Appendix A**.

TAN15 classifies residential development as 'highly vulnerable' land use.

3.3 WATERBODIES IN THE VICINITY OF THE SITE

The River Gwenfro is classified as an 'ordinary watercourse'. The watercourse flows in a south-easterly direction to the south of the site where it is then culverted through Wrexham town centre before eventually outfalling to the River Cylwedog.

3.4 GROUND CONDITIONS

According to the Soilscales maps produced by the National Soils Research Institute⁴, soil conditions at the site and within the surrounding area are described as 'freely draining slightly acidic loamy soils'.

British Geological Survey (BGS) mapping indicates that the development site is underlain by alluvial and glaciofluvial deposits of clay, silt and gravel with some glaciofluvial sand and gravels to the north of the site, all of which overlays a bedrock of Mudstone (associated with the Etruria Formation).

BGS borehole records⁵ in the vicinity of the site indicate ground conditions to comprise of made ground underlain by clay, dense sand and gravel in excess of depths of circa 3.5 metres below ground level (m bgl).

3.5 SITE LEVELS

A topographic survey of the site has been undertaken by Invar Mapping Surveys and is provided in **Appendix B**.

This indicates that site levels are typically between 85.0 to 86.2 metres Above Ordnance Datum (m AOD). Along the western and southern boundaries of the site steep banks are present whereby ground levels fall down to 81.5 m AOD, adjacent to the Borderlands Railway Line.

3.6 ACCESS AND EGRESS

Existing access to the site is gained via Jacques Way.

Levels along Jacques Way are shown to be in the region of 84.79 to 88.94 m AOD, falling from Regent Street to the site.

⁴ Soilscales www.landis.org.uk/soilscales/

⁵ www.bgs.ac.uk/data/boreholescans/home.html, Ref: SJ35SW938, SJ35SW942

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 follows⁶:

- **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 Environment Agency 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

According to the Development Advice Map the site is located partially within Zone A and Zone B (**Figure 2**), albeit Zone C2 is located adjacent to the southern and western boundaries of the site.

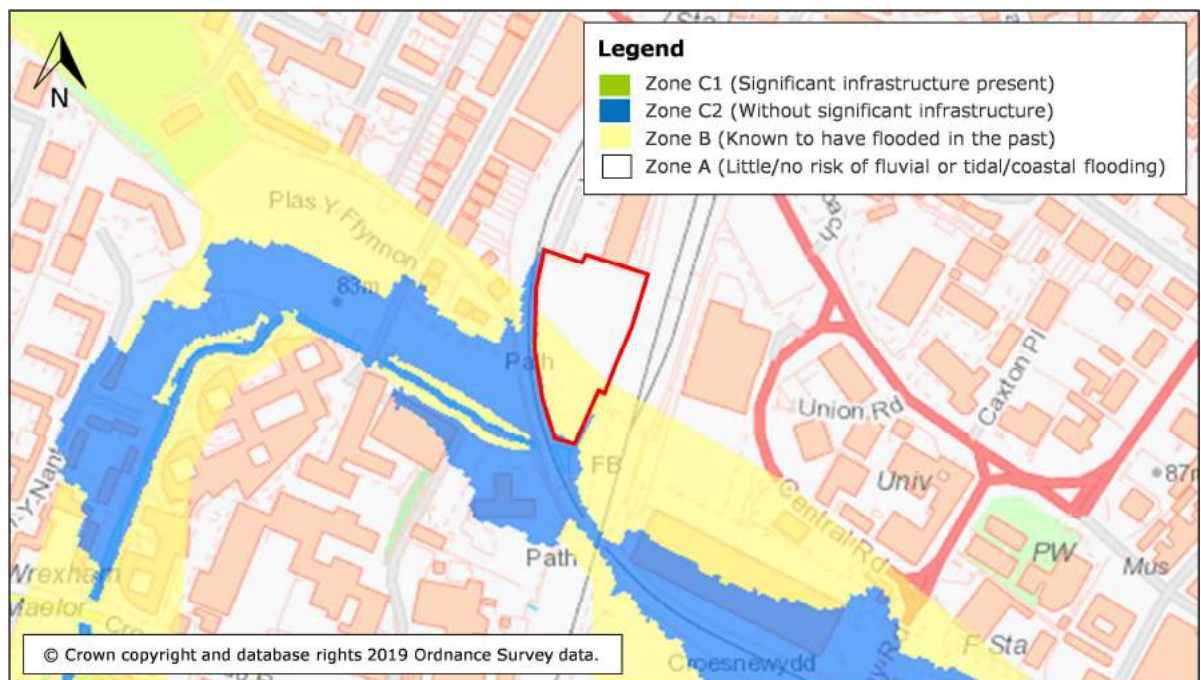


Figure 2: Development Advice Map
(Source: NRW website)

⁶ TAN15, Figure 1

4.1.2 Natural Resources Wales Flood Risk Map

According to the NRW Flood Risk Map the site is generally located outside the 1:1,000 annual probability flood outline. The 1:100 and 1:1,000 annual probability flood outlines are located adjacent to the southern and western boundaries of the site.

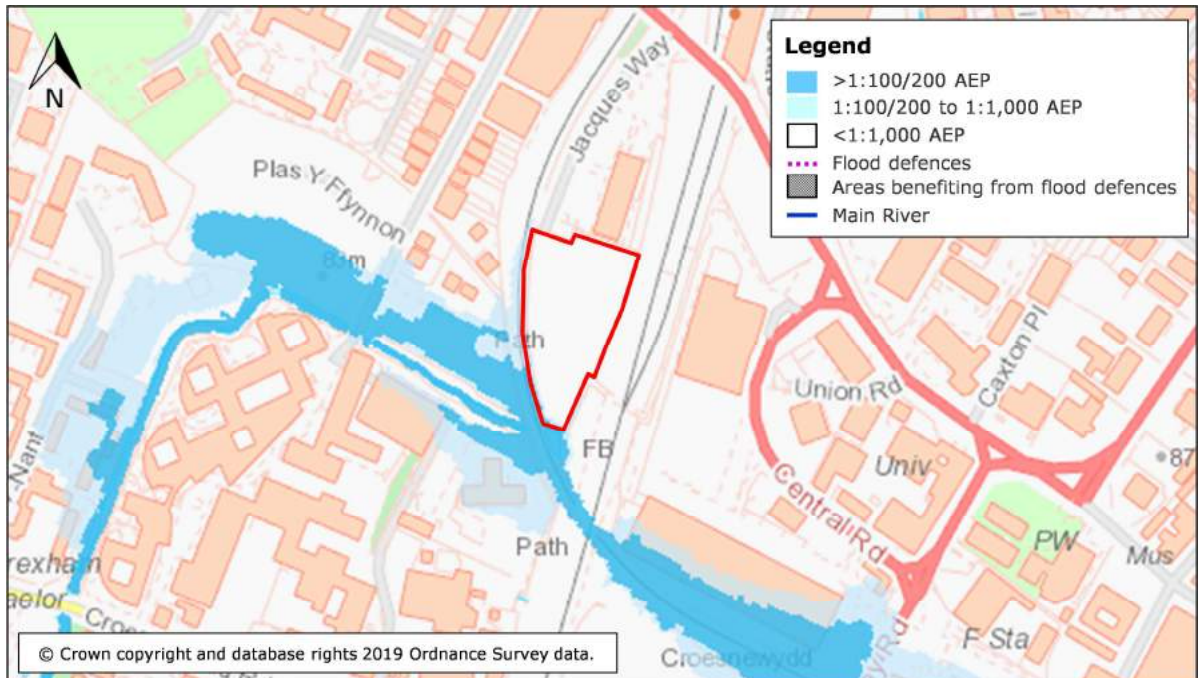


Figure 3: Natural Resources Wales Flood Risk Map
(Source: NRW website)

4.2 JUSTIFICATION TEST

The development proposals are of a highly vulnerable nature and will be located solely within Zone A and Zone B, which is considered acceptable in accordance with TAN15 subject to a suitable assessment of flood risk.

The application of the Justification Test is subsequently not deemed to be necessary.

4.3 HISTORICAL RECORDS OF FLOODING

The WCBC FRMP does not identify any past flooding in the vicinity of the proposed development. The site is also not located within the NRW historic flood outline.

4.4 FLUVIAL FLOOD RISK – RIVER GWENFRO

As discussed in **Section 3.3**, the River Gwenfro flows to the south of the site in an easterly direction, before becoming culverted beneath the railway line and through Wrexham town centre.

The River Gwenfro Model Update was completed by JBA Consulting on behalf of WCBC in December 2016⁷. 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.

⁷ 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 Modelled Flood Levels and Extents

Modelled flood levels for the River Gwenfro have been provided by NRW for the present day 1:100 and 1:1,000 annual probability events and the 1:100 plus 20% and 45% climate change (+CC) annual probability events (**Table 1**).

In up to the (largest) 1:1,000 annual probability event, no flooding of the site would be expected other than water lapping the steep banks along the southern and western boundaries of the site, as presented in **Appendix C**, which is not considered to impact the developable areas of the site.

Table 1: Site Flood Information - Baseline

Annual Probability Event	Max Level (m AOD)
1:100	81.50
1:100 +CC (20%)	81.91
1:100 +CC (45%)	82.37
1:1,000	82.49

4.4.1.1 Blockage Scenario

Culvert blockage of the River Gwenfro has been modelled by Weetwood as a sensitivity assessment.

The watercourse is culverted beneath two railway lines near to the southern boundary of the site (**Figure 4**). The stretch of open channel before the Shrewsbury-Chester Railway Culvert is very short and therefore the likelihood of a significant blockage of the Shrewsbury-Chester Railway Culvert is considered to be low. Significant debris within the watercourse upstream of the site may be expected to block the Borderlands Railway Culvert, before reaching the Shrewsbury-Chester Railway Culvert. Therefore, a blockage assessment of the Borderlands Railway Culvert has been assessed as this is considered to be the most realistic blockage scenario.

A 30%, 67% and 95% blockage of the Borderlands Railway Culvert has been modelled for the 1:100 +CC (20%) and 1:1,000 annual probability events (**Table 2**).

When compared to the baseline scenario, flood levels may increase by approximately 250 mm in the vicinity of the site during the 1:1,000 annual probability event when accounting for a 95% culvert blockage. However, the flood extent (**Appendix D**) in the vicinity of the site is not shown to significantly differ given the steep banks along the southern and western site boundaries. No flooding of the developable parts of the site would be expected.

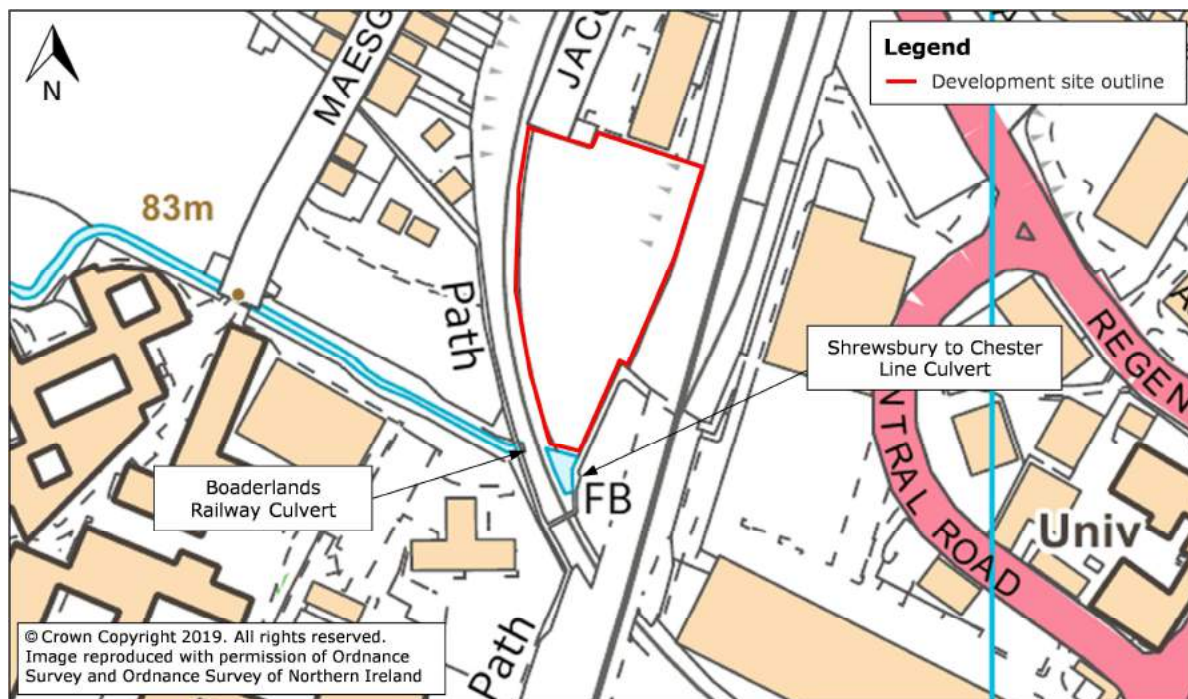


Figure 4: Culvert Locations

Table 2: Site Flood Information - Blockage

Annual Probability Event	Max Level (m AOD)
1:100 +CC (20%)	
30% blockage	81.93
67% blockage	82.04
95% blockage	82.16
1:1,000	
30% blockage	82.49
67% blockage	82.51
95% blockage	82.74

4.5 FLOOD RISK FROM RESERVOIRS, CANALS AND OTHER ARTIFICIAL SOURCES

Reservoir or canal flooding may occur as a result of the facility being overwhelmed and/or as a result of dam or bank failure.

There are no canals or other artificial sources 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

Groundwater flooding generally occurs during intense, long-duration rainfall events, when infiltration of rainwater into the ground raises the level of the water table until it exceeds ground levels. It is most common in low-lying areas overlain by permeable soils and permeable geology, or in areas with a naturally high water table.

According to the BGS Groundwater Flooding Hazard map (**Figure 5**) the susceptibility to groundwater flooding is moderate.

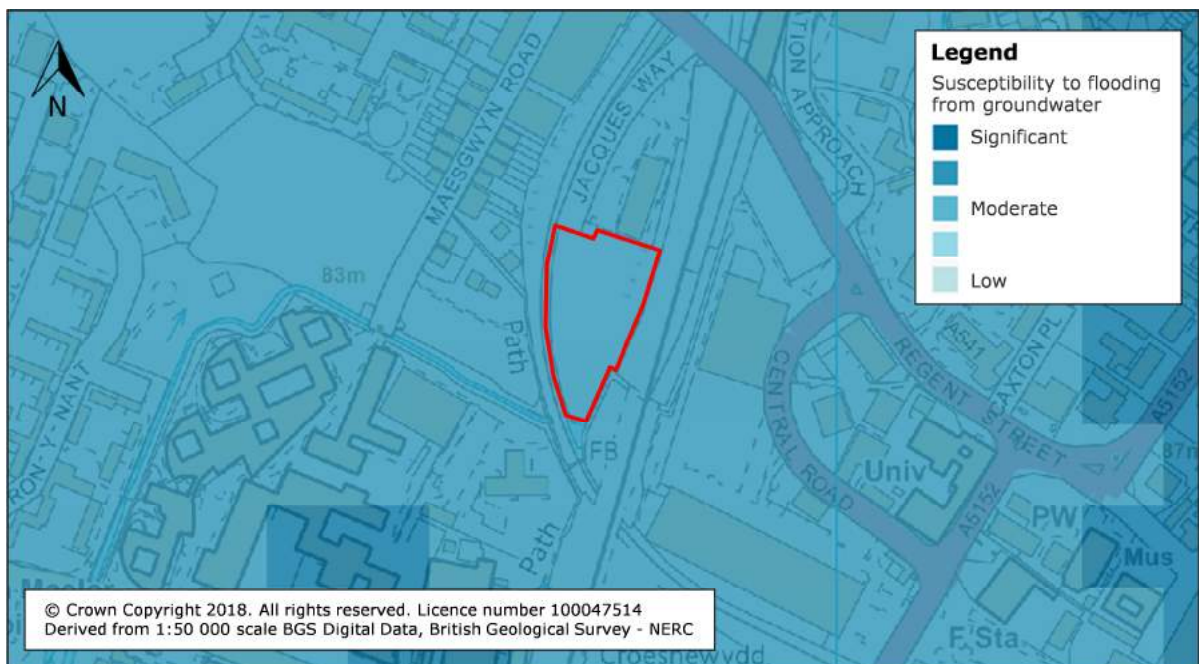


Figure 5: Groundwater Flooding Hazard Map
(Source: Findmaps)

Based on the BGS data, the risk of groundwater flooding is assessed to be moderate. The residual risk of flooding from this source will be mitigated through the implementation of the measures proposed in **Section 5** of this report.

4.7 FLOOD RISK FROM SURFACE WATER

Surface water flooding results from rainfall-generated overland flow, before the runoff enters any watercourse or sewer, or where the sewerage/drainage systems and watercourses are overwhelmed and therefore unable to accept surface water.

Surface water flooding is usually associated with high intensity rainfall events but may also occur with lower intensity rainfall where the ground is saturated, developed or otherwise has low permeability resulting in overland flow and ponding within depressions in the topography.

Figure 7.2.4.1 in the WCBC FRMP indicates that the site is located outside a surface water flood risk area.

The NRW Risk of Flooding from Surface Water map (**Figure 6**) indicates that the site and access/egress route are at very low risk from such sources.

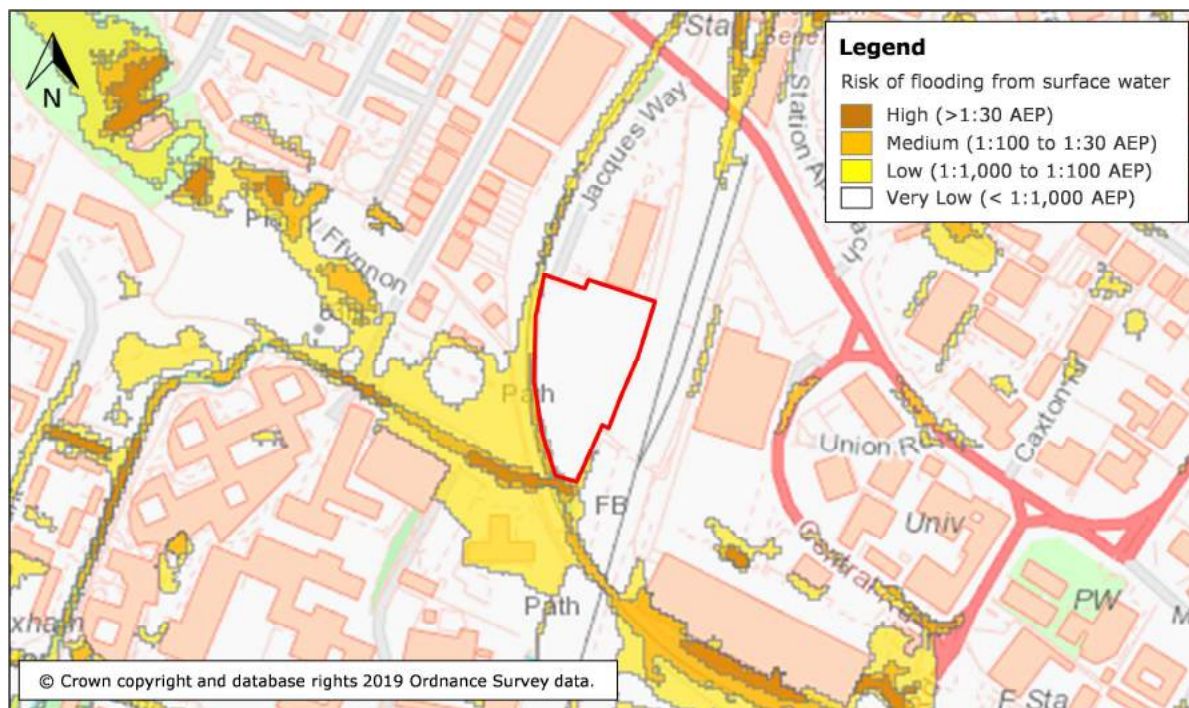


Figure 6: Risk of Flooding from Surface Water
(Source: NRW website)

5 FLOOD RISK MITIGATION MEASURES

5.1 FLOOD MITIGATION

Any residual risk of flooding from the River Gwenfro and groundwater will be mitigated though the implementation of the measures proposed within the following section of this report.

5.1.1 Development Platform

The development platform should be set at a minimum of 83.04 m AOD, which would provide a 300 mm freeboard over the modelled 1:1,000 annual probability flood level with a 95% blockage of the railway culvert.

5.1.2 Finished Floor Levels

Finished floor levels should be set at a minimum of 0.15 m above the development platform level, and therefore should be a minimum of 83.19 m AOD.

It is advised that external levels fall away from the proposed buildings and any overland flows generated by the proposals are carefully controlled (safe avenues directing flow away from any existing and proposed buildings are advised).

These measures, subject to a suitable surface water management strategy, will enable any potential overland flows to be conveyed safely across the site without affecting property in accordance with the approach promoted by government policy.

5.2 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 1:1,000 annual probability event. It is understood that NRW seek to ensure that, where necessary, climate change and breach and blockage scenarios are considered for assessing the impact on flood risk elsewhere.

Given that no flooding of the main platform of the site is expected and that flood outlines just encroach on the boundary of the site, the development is not expected to impact flood risk elsewhere.

6 SUMMARY

This FCA has been prepared on behalf of Castlemead Group Limited and relates to the proposed redevelopment of the former Jacques Yard, Jacques Way, Wrexham.

According to the NRW Flood Risk Map the proposed development site is located outside the 1:1,000 annual probability flood outline and is therefore defined by TAN15 as being situated within Zone A and Zone B, albeit the southern extremity of the site borders Zone C2.

No flooding of the site is anticipated from the River Gwenfro in up to the 1:1,000 annual probability event, during both the free-flowing and culvert blockage scenarios.

The site is not considered to be at risk of flooding from reservoirs, canals or other artificial sources.

The susceptibility of the site to groundwater flooding is shown to be moderate. The site is shown to be at very low risk from surface water flooding.

The development platform should be set at a minimum of 83.04 m AOD, which should provide a 300 mm freeboard over the 1:1,000 annual probability flood level with a 95% blockage of the railway culvert.

Finished floor levels should be set at a minimum of 0.15 m above the development platform level, and therefore should be a minimum of 83.19 m AOD.

It is advised that external levels fall away from the proposed buildings and any overland flows generated by the proposals are carefully controlled (safe avenues directing flow away from any existing and proposed buildings are advised).

The development is not expected to impact flood risk elsewhere.

7 RECOMMENDATIONS

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

- Development platform should be set at a minimum of 83.04 m AOD
- Finished floor levels to be set a minimum level 83.19 m AOD, which is 0.15 m above the development platform level

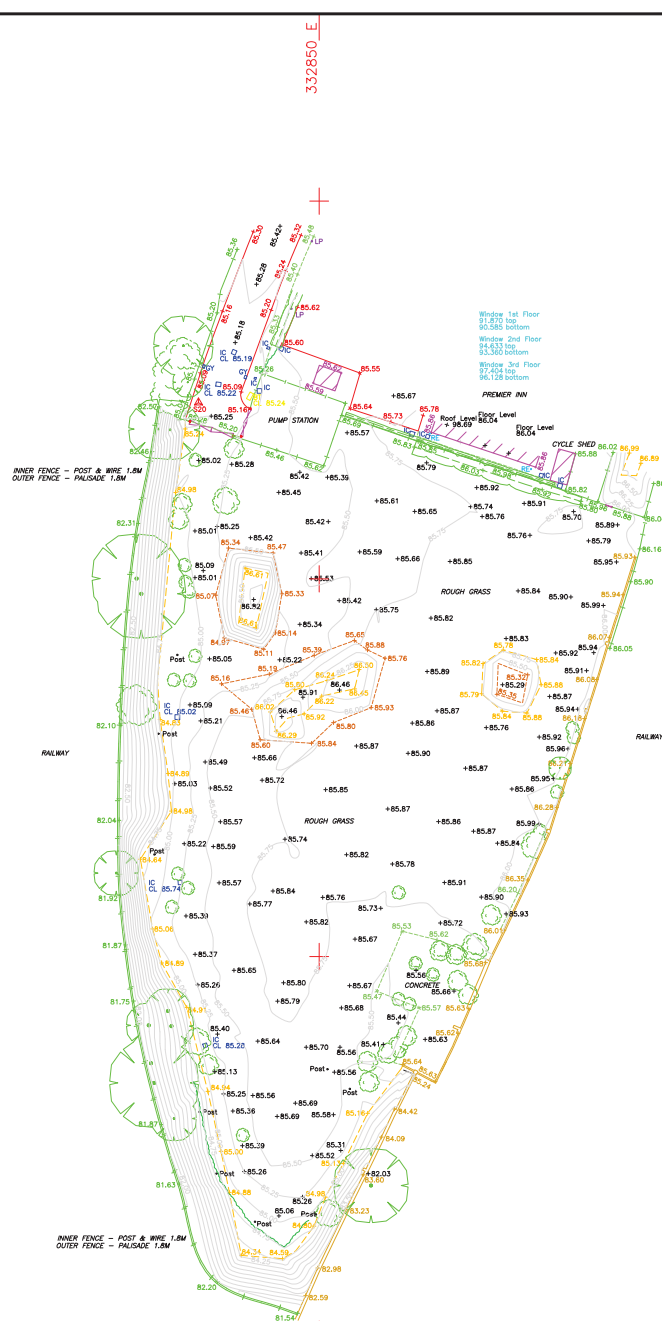
APPENDIX A:

Development Proposals



APPENDIX B:

Topographic Survey



ABBREVIATIONS

AC - AIR CON UNIT
 AV - AIR VALVE
 BEL - BELISHA BEACON
 BL - BOLLARD
 BM - BENCH MARK
 BH - BOREHOLE
 BT - TELECOM COVER
 BS - BUS STOP
 CAM - CAMERA
 CB - CONTROL BOX/CABINET
 C-LIGHT - CELLAR LIGHT
 COL - STEEL COLUMN
 CTV - CABLE TV COVER
 DP - DOWN PIPE
 EB - ELECTRIC BOLLARD
 EH - ELECTRIC HOOKUP
 EIC - ELECTRIC INSPECTION
 EMKR - ELECTRIC MARKER
 EP - ELECTRICITY POLE
 ER - EARTH ROD
 FDL - FLOODLIGHT
 FH - FIRE HYDRANT
 FL - FLOOR LEVEL
 GAS - GAS PIPE/GAS BOX
 GP - GATE POST
 GV - GAS VALVE
 GY - GULLEY
 IC - INSPECTION COVER
 IL - INVERT LEVEL
 JB - JUNCTION BOX
 KO - KERB OUTLET
 LB - LITTER BIN
 L/BOL - LIGHTING BOLLARD
 LP - LAMP POST
 MH - MANHOLE
 MKR - MARKER POST
 MP/1 - MONITORING POINT
 MS - MILESTONE
 NP - NAMEPLATE
 PI - PIPE INVERT
 PO - POST
 PUMP - FUEL PUMP
 RE - RODDING EYE
 RS - ROAD SIGN
 RSJ - STEEL JOIST
 RW - RETAINING WALL
 SAP - SAPLING
 SC - STOP COCK
 SD - SLOT DRAIN
 SP - SIGN POST
 ST - STOP TAP
 SV - STOP VALVE
 SY - STAY
 TAC - TACTILE PAVING
 TCB - TELEPHONE CALL BOX



TREE (TO SCALE)

TREE CANOPY



BUSH - (TO SCALE)

FOLIAGE LINE

SURVEY STATION

GATE

CB

CLOSE BOARD FENCE

PW

POST AND WIRE FENCE

PR

POST AND RAIL FENCE

JR

IRON RAILINGS

OVERHEAD TELEPHONE CABLES

OVERHEAD ELECTRICITY CABLES

FOUL WATER DRAIN

FOUL WATER DRAIN ASSUMED

A>> A>>

STORM WATER DRAIN

STORM WATER DRAIN ASSUMED

A> A>

TH - TRIALHOLE

TL - TRAFFIC LIGHTS

TLB - TRAFFIC LIGHT BOX

TP - TELEGRAPH POLE

TS - TRAFFIC SENSOR

VP - VENT PIPE

WM - WATER METER

WO - WASH OUT POINT

YG - YARD GULLEY

NOTES

Survey contents are correct as of date of survey
 Kerb levels where shown are channel levels
 Dimensional accuracy is commensurate with scale of survey
 There will be no man entry into any manhole chambers. Pipe depths and diameters are measured from the surface.
 Tree spreads are measured to the nearest metre and are shown concentric to the trunk, girths are measured 1 metre up from the ground. A qualified arboriculturalist should be consulted to verify tree species and condition.

GRID & LEVELS TO OS NATIONAL GRID (OSTN15)

CLIENT

CASTLEMEAD GROUP LIMITED

JOB TITLE

LAND AT JACQUES YARD,
WREXHAM

DRAWING TITLE

TOPOGRAPHICAL SURVEY

SCALE 1:500

DRG No G1080/1

DATE 24/05/2017

DRAWN BY A.C.E.


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APPENDIX C:

Model Plot – Baseline

Notes:

1. Do not scale from this drawing.
2. Map backdrop reproduced from Ordnance Survey digital map data. Crown Copyright under licence.

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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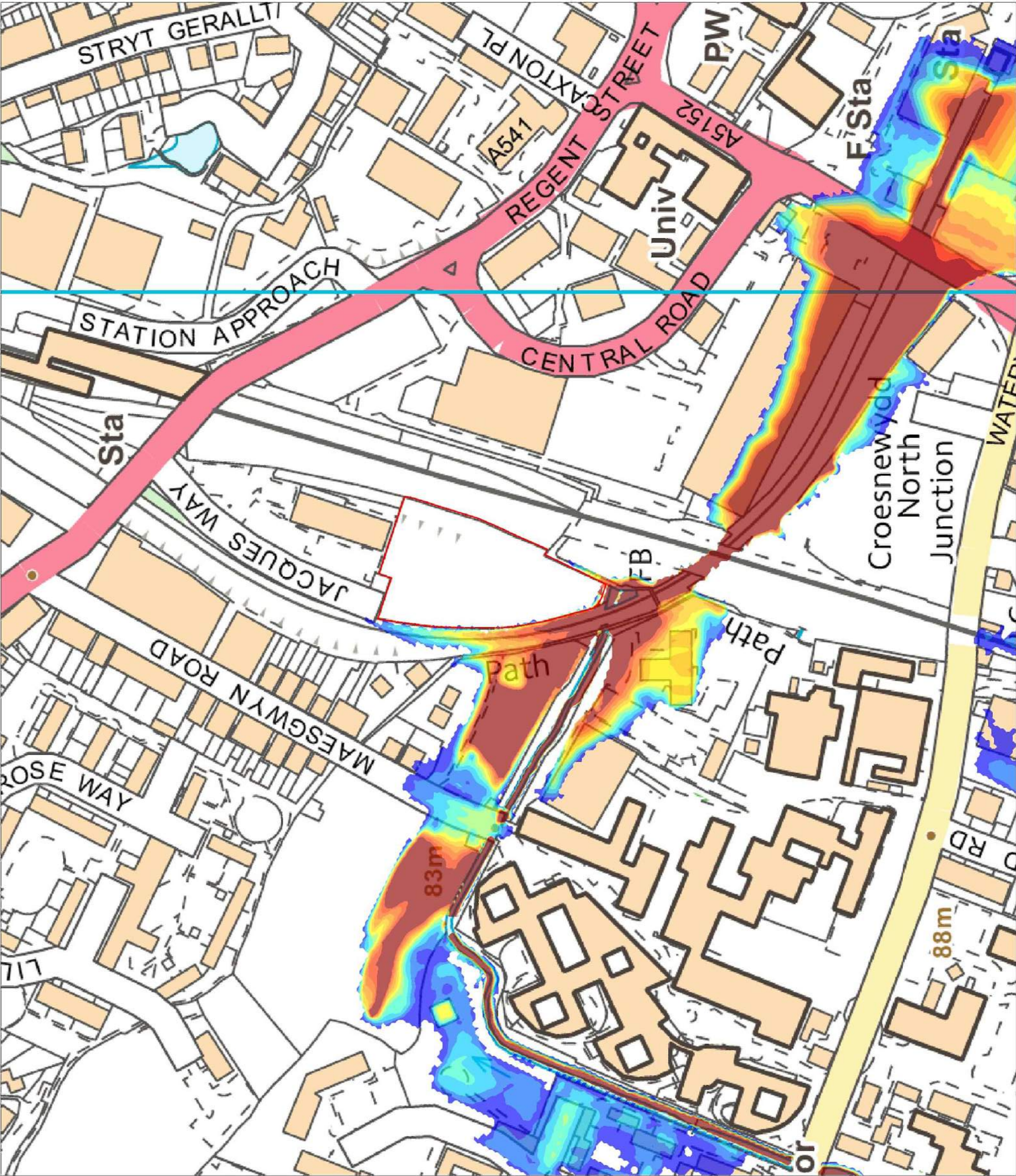
Project Title: **Jacques Way, Wrexham**

Drawing Title: **Maximum Flood Depth: 1:1,000 Annual Probability Event**

Map Orientation:  Scale: 

Drawn: LR Checked: AE Date: 11 March 2019

Drawing No: 3972_WS_001_Gwen_Q1000_d Rev: A



APPENDIX D:

Model Plot – Blockage

Notes:

1. Do not scale from this drawing.

2. Map backdrop reproduced from Ordnance Survey digital map data. Crown Copyright under licence.

KEY:

- Site Location
- Blockage Location
- 0% Blockage (baseline scenario)
- 95% Blockage

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Client:

Castlemead Group Limited

Project Title:

Jacques Way, Wrexham

Drawing Title:

Structure Blockage, 1:1,000 Annual
Probability Event

Map Orientation:



Scale:
0 30 60
metres

Drawn:

LR

Checked:

AE

Date:

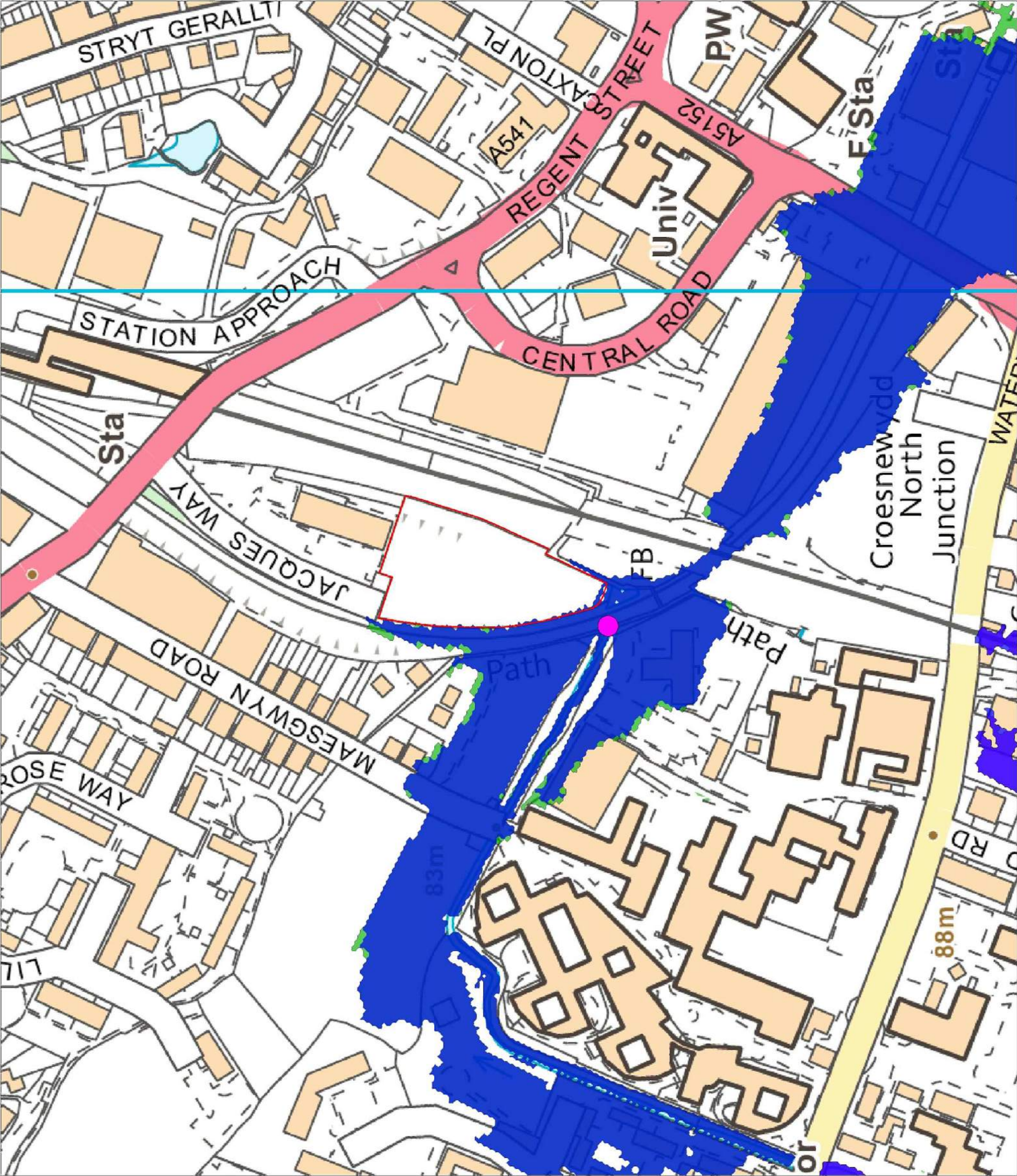
11 March 2019

Drawing No:

3972_WS_001_004_Gwen_Q1000

Rev:

A





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Delivering client focussed services

Flood Risk Assessments
Flood Consequences Assessments
Surface Water Drainage
Foul Water Drainage
Environmental Impact Assessments
River Realignment and Restoration
Water Framework Directive Assessments
Flood Defence Consent Applications
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