FLOODPLAN
LIMITED

Project Title: 00602AB

Product: Level 3 Flood Consequence Assessment

Date: 04 November 2025

Find us at:

Web: www.floodplanreports.co.uk

Email: Reports@floodplanreports.co.uk

Blank Page

Table of Contents

Disclaimer

This document has been created for the purpose of a Flood Consequence Assessment only and should only be used by Layton Property LTD for its intended purpose. FloodPlan Limited accepts no responsibility or liability for misuse of the document.

Report Revision Log

Report Reference	Date Issued	Issued To	Notes
00602AB	04/11/2025	Client	

1. INTRODUCTION

1.1. PURPOSE OF THE REPORT

FloodPlan have been commissioned on behalf of Layton Property LTD to produce a Flood Consequence Assessment for 46 Corporation Road, Newport, NP19 0AW. This assessment has been conducted with the understanding that the document will be used as part of a planning permission proposal by Layton Property LTD.

1.2. LOCATION OF SUBJECT SITE

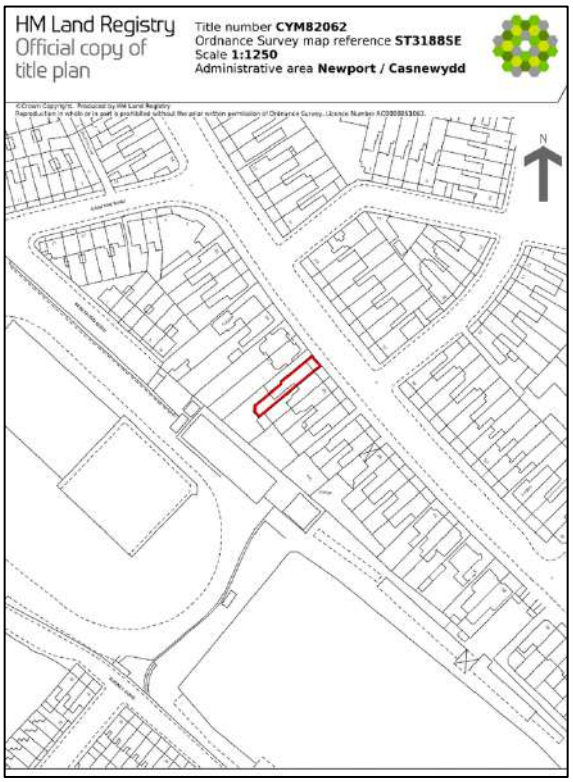


Figure 1: Site Location

1.3. SITE PROPOSALS

The development proposes the change of use of an existing 4-bedroom residential dwelling to that of an 8-bedroom HMO (House of Multiple Occupation). Both the existing and proposed are considered 'highly vulnerable development' as per TAN15.

2. ASSESSMENT OF TAN15

2.1. INTRODUCTION TO TAN15

Technical Advice Note 15 (TAN15 - 2025) is a Welsh Government published document. This document provides guidance to local planning authorities to ensure the effective implementation of the planning policy. The policy seeks to direct development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere. For these purposes: Flood risk (from river and sea) are categorised inro one of the below:

2.2. FLOOD RISK DEFINITION

Flood Zone	Flooding from rivers	Flooding from the sea	Flooding from surface water and small watercourses
Zone 1	Less than 1 in 1000 (0.1%) (plus climate change) chance of flooding in a given year		
Zone 2	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change	Less than 1 in 200 (0.5%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change	Less than 1 in 100 (1%) but greater than 1 in 1000 (0.1%) chance of flooding in a given year, including climate change
Zone 3	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change	A greater than 1 in 200 (0.5%) chance of flooding in a given year, including climate change	A greater than 1 in 100 (1%) chance of flooding in a given year, including climate change
Tan15 Defended Zones	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from rivers of 1:100(plus climate change and freeboard)	Areas where flood risk management infrastructure provides a minimum standard of protection against flooding from the sea of 1:200(plus climate change and freeboard)	Not Applicable

2.3. FLOOD RISK VULNERABILITY CLASSIFICATION

TAN15 categorises buildings by vulnerability. A summary of categories can be seen below:

Vulnerability Category	Types
Highly vulnerable	All Residential Purposes (including hotels, Gypsy and Traveller sites, caravan parks and camping sites) Schools and childcare establishments, colleges and universities Hospitals and GP surgeries Especially vulnerable industrial development (e.g power generating and distribution elements of power stations, transformers, chemical plants, incinerators), and waste disposal sites. Buildings used to provide emergency shelter in time of flood
Less vulnerable	General industrial, employment, commercial and retail development. Transport and utilities infrastructure. Car Parks. Mineral extraction sites and associated processing facilities (excusing waste disposal sites). Public Buildings including libraries, community centres and leisure centres (excluding those identified as in Highly Vulnerable category and emergency shelters). Places of worship. Cemeteries. Equipped play areas. Renewable energy facilities (excluding hydro generation)
Water compatible development	Boatyards, marinas and essential works required at mooring basins. Development associated with canals. Flood defences and management infrastructure. Open spaces (excluding equipped play areas). Hydro renewable energy generation.

2.4. TAN15 ACCEPTABILITY OF FLOOD CONSEQUENCES

The acceptability criteria for developments are detailed within Section 11 of TAN15(2025). The following requirements must be in place for any development that is permitted to be located win flood risk areas:

In all circumstances, developers should ensure the following conditions are met:

- No increase in flooding elsewhere
- Occupiers aware of flood risk
- Escape/evacuation routes present
- Flood emergency plans and procedures agreed and in place
- Flood resistant and resilient design,
- Acceptance consequences for type of use (below)

- Minimal risk to life,
- Minimal disruption to people living and working in the area,
- Minimal potential damage to property,
- Minimal impact of the proposed development on flood risk generally
- Minimal disruption to the sustainable management of natural resources

2.5. SUITABLE NEW DEVELOPMENT MATRIX

The below table outlines the suitable greenfield development type for the flood zone classification as per TAN15.

Flood risk vulnerability classification	Less Vulnerable	Highly Vulnerable	Water compatible Development
Zone 1			
Zone 2			
Zone 3			
TAN15 Defended Zones			

Figure 2: Suitable New Development Matrix

Key	New Development
Blue	New Development may be permitted
Red	New Development should not be permitted.
Purple	New Development may be appropriate in exceptional circumstances such as addressing national security or energy security needs, reasons of public health or to mitigate the impacts of climate change which have a clear locational need and cannot be located elsewhere.
Yellow	New development of greenfield sites is not appropriate in Defended Zones unless they are allocated in the LDP. Where new development is allocated within the LDP, adherence to Section 11 of Tan15 (2.4 within this report) is required.
Green	New development is suitable with the acceptability considerations set out in Section 11 of TAN15(2.4 within this report).
Orange	New development is suitable with the acceptability considerations set out in Section 11 of TAN15(2.4 within this report), and where the proposed development type is appropriate in accordance with the LDP.

2.6. SUITABLE REDEVELOPMENT MATRIX

The below table outlines the suitable redevelopment development type for the flood zone classification as per TAN15.

Flood risk vulnerability classification	Less Vulnerable	Highly Vulnerable	Water compatible Development
Zone 1			
Zone 2			
Zone 3			
TAN15 Defended Zones			

Figure 3: Suitable Redevelopment Matrix

Key	Redevelopment
Blue	Redevelopment may be permitted
Purple	Redevelopment should be avoided and may only be made in exceptional circumstances where it is essential to the strategy of the LDP or where it addresses national security or energy security needs, or public health or it mitigated the impacts of climate change.
Red	Redevelopment should be avoided. Redevelopment may be suitable if there is a clear commitment that flood mitigation measures will be provided to protect the site. Such measures must be set out in the LDP infrastructure plan.
Brown	Redevelopment is suitable on condition that they do not overly intensify use, neither should they reduce the area's ability to absorb flood water nor cause problems with flooding elsewhere. All applications should consider opportunities to incorporate flood resilient design.
Yellow	Redevelopment may be acceptable with adherence to Section 11 of Tan15 (2.4 within this report).
Green	Redevelopment will need to assist and be consistent with, the Development Plan strategy to regenerate an existing settlement or achieve key economic objectives.
Orange	Redevelopment will need to assist and be consistent with, the Development Plan strategy to regenerate an existing settlement or achieve key economic objectives. Where residential use is proposed at ground floor level, the development must be compatible with the tolerable conditions set out in Section 11(TAN15) and exhibit resilient flood design as described in section 12(TAN15).

3. FMFP SITE ASSESSMENT

3.1. FLOOD ZONE CLASSIFICATION

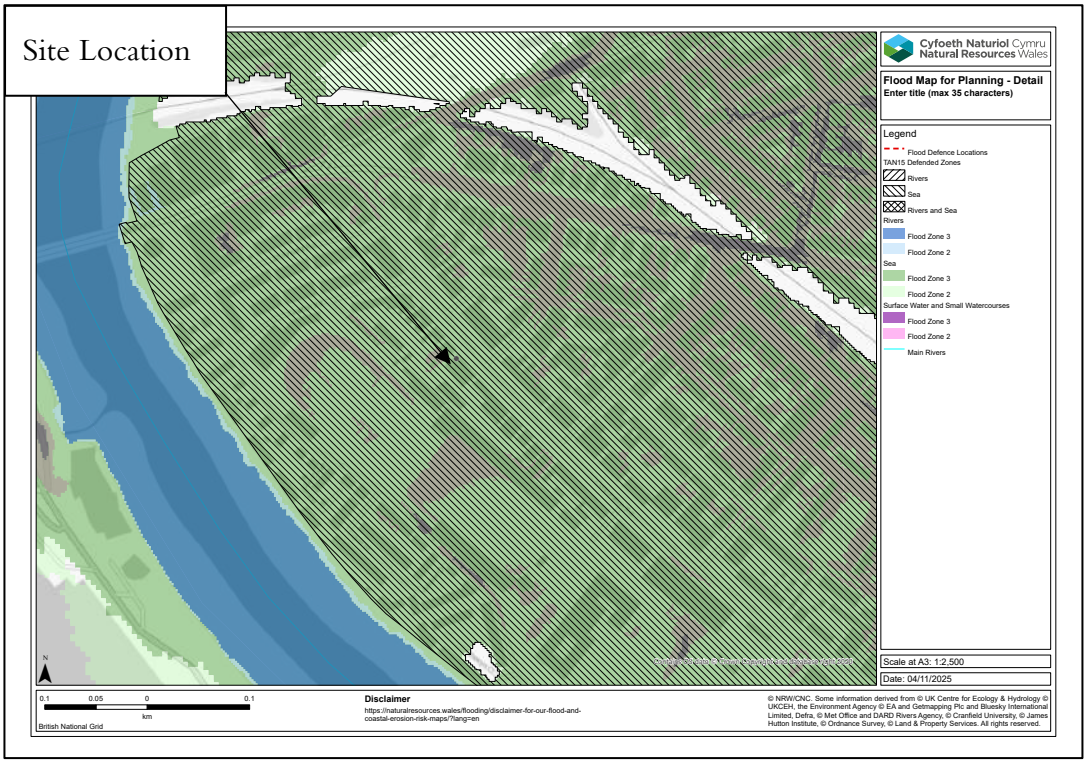


Figure 4: FMfP Flood Zone

3.2. FLOOD ZONE SUMMERY

Flood Source	Flood Zone 2	Flood Zone 3	TAN15 Defended Zone
Fluvial	X	X	X
Tidal	Affected	Affected	Affected
Surface Water	X	X	X

3.3. EXISTING LAND VULNERABILITY CLASSIFICATION

The existing use of the site is a residential dwelling and is therefore classified as 'highly vulnerable development' as per TAN15.

3.4. PROPOSED LAND VULNERABILITY CLASSIFICATION

The proposed use classification is also residential use and is also categorised as 'highly vulnerable development' as per TAN15. The proposals therefore retain the vulnerability classification of the building.

3.5. SITE SUITABILITY (TAN15)

The site is identified to be within TAN15 Defended Zone (Sea) of TAN15 as well as being affected by Flood Zones 3 (Sea).

As per NPPF, redevelopment in Tan15 defended Zones is suitable.

3.6. SITE GROUND LEVELS

LiDAR downloaded on the 4th November 2025 identifies the site to have a ground level of circa 7.6mOD. Levels should be verified with a topographic survey.

3.7. FLOOD MODELLING OUTPUTS

As part of this commission, FloodPlan contacted NRW to request flood modelling reports and outputs affecting the subject site. NRW confirmed they hold modelling outputs from two models. The models are listed below:

- Newport 5 V8.0 2022

3.8. NEWPORT 2022 MODEL

The site is modelled to experience a flood depth of 2.12m during the 'undefended' 2121 T200 even. The site is modelled to experience a flood depth of 0.59m during the 'defended' 2121 T200 event.

The 'defended' 2121 T200 event identifies a maximum flood level of 8.26mOD.

The 'defended' 2021 T200 event identifies the site to be protected.

The site is modelled to experience significant flooding during both the defended and undefended extreme tidal climate change events. Although significant, tidal flood defences are expected to be improved over time, with the site potentially benefiting from an increased standard of protection over time.

4. FURTHER SITE FLOOD RISK

4.1. THIRD PARTY FLOOD RISK DATA SUMMERY

A 'Groundsure' flood report has been acquired for advising this assessment. The full report can be found in Appendix B. The main findings are summarised below:

Type of Risk	Assessment of Risk
Overall Flood Risk	Low
Rivers and the Sea	Low
Surface Water	Negligible
Groundwater	Negligible
Historic Flood	Not Identified
Flood Defences	Yes
FloodScoreTM – insurance rating	Low

4.2. GROUNDWATER FLOODING

The 'Groundsure' flood report indicates that the site has a negligible risk of groundwater flooding.

4.3. RESERVOIR FLOODING

The site is mapped to be directly affected by reservoir flooding.

4.4. CANAL AND ARTIFICIAL WATER FLOODING

The site is at not believed to be at risk of flooding from artificial water sources.

4.5. HISTORIC FLOODING

The 'Groundsure' flood report failed to identify any historic flood records.

5. FURTHER SITE ASSESSMENT

5.1. SITE ACCESS AND EGRESS ROUTES

During extreme fluvial and pluvial events, the site may become severed. Safe refuge is expected to be available within the subject site (first floor). A bespoke flood evacuation plan should be created and maintained.

5.2. FLOOD COMPENSATION

The proposals are not expected to displace floodwater.

5.3. FLOOD WARNING AREAS

The below Figure 5, highlights the areas that are considered to benefit from Natural Resources Wales flood alerts. The site benefits from NRW flood warnings areas.

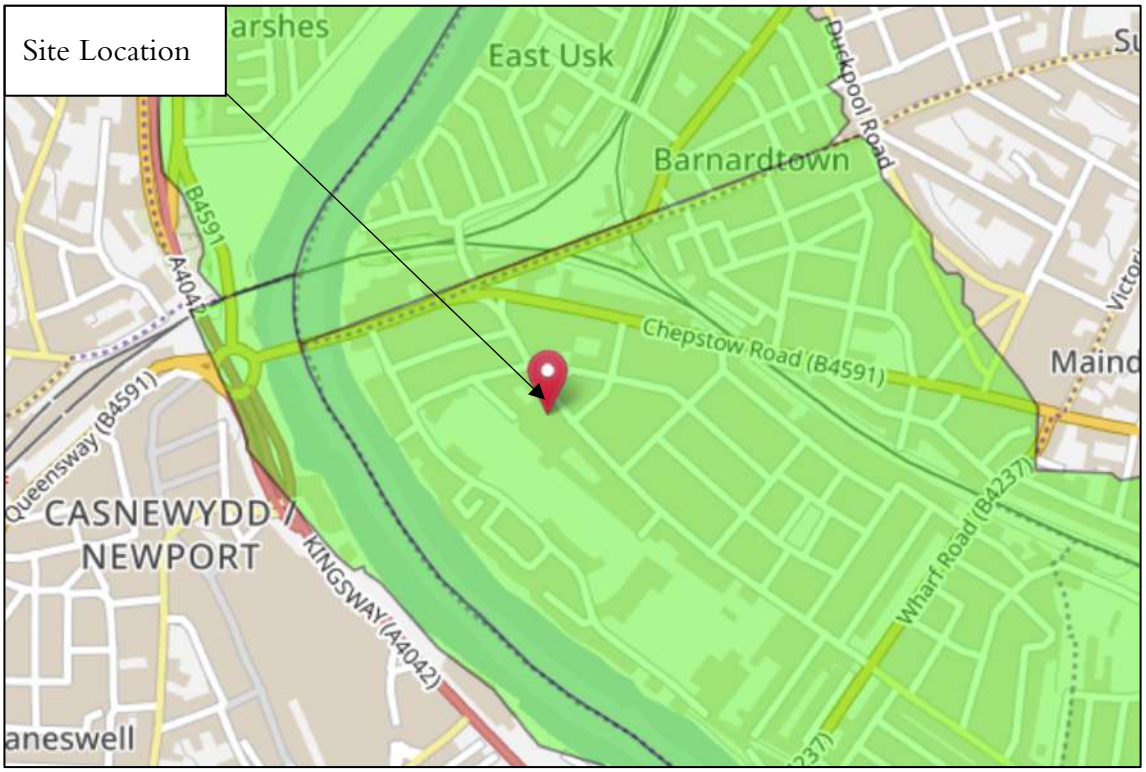


Figure 5: NRW Flood Warning Areas

5.4. AWARENESS OF FLOOD RISK

The developer should be aware that the site is not immune from flooding. It is recommended that future occupiers take the opportunity to develop emergency and non-emergency plans.

5.5. MITIGATION MEASURES

This report recommends the following be incorporated to lessen the potential impacts of flooding:

- Electrical fittings to be elevated to 1.2m above ground floor FFL
- Plasterboard to be fitted horizontally
- Non return valves to be fitted on pipework
- A bespoke flood evacuation plan should be created and maintained

6. FINDINGS AND RECOMMENDATIONS

6.1. FINDINGS

The development proposes the change of use of an existing 4-bedroom residential dwelling to that of an 8-bedroom HMO (House of Multiple Occupation). Both the existing and proposed are considered 'highly vulnerable development' as per TAN15.

The site is mapped to be within TAN15 defended zone (Sea). Site access and egress may become severed during extreme flood events.

6.2. RECOMMENDATIONS

This report recommends the following be considered to lower the risk and/or consequences that flooding may cause to the proposed development:

- A flood evacuation plan should be created and maintained.
- Flood mitigation measures should be incorporated
- Ground floor bedrooms should have access to upper floor safe refuge.

List of Appendices

Appendix A: Development Proposals

Appendix B: Groundsure Flood Report

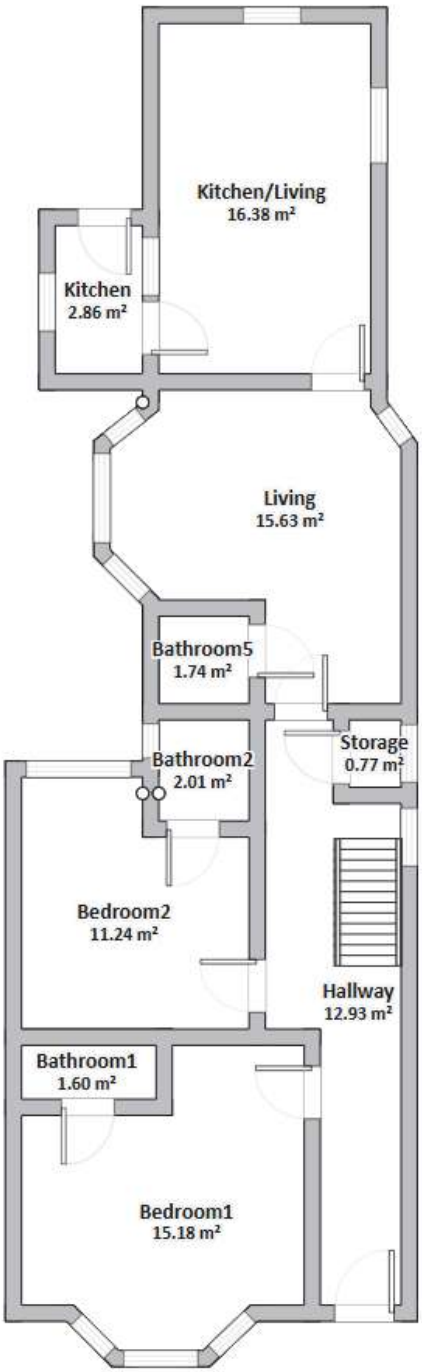
Appendix C: Flood Modelling Data

Appendix A: Development Proposals

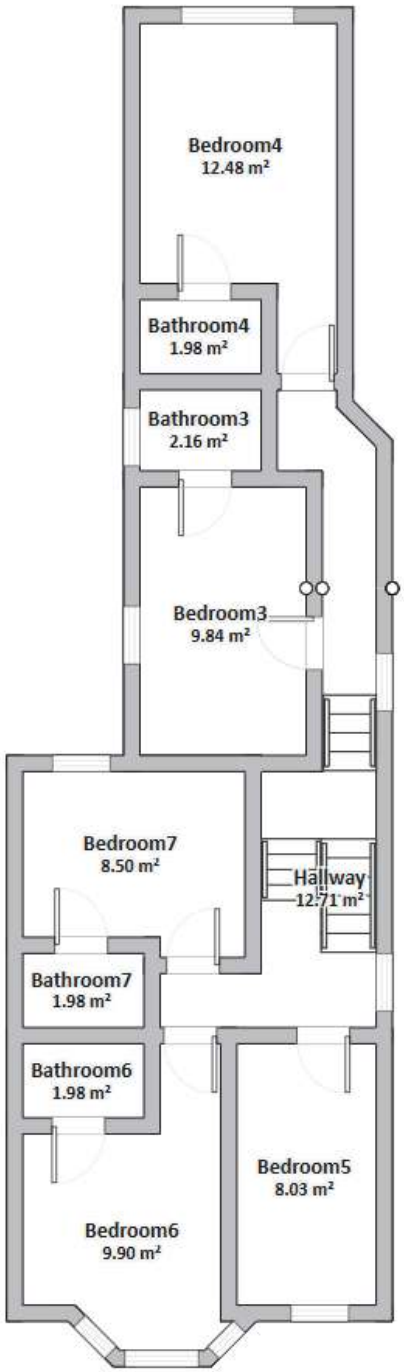
Existing Ground Floor | Existing First Floor | Existing Second Floor

Scale 1:100

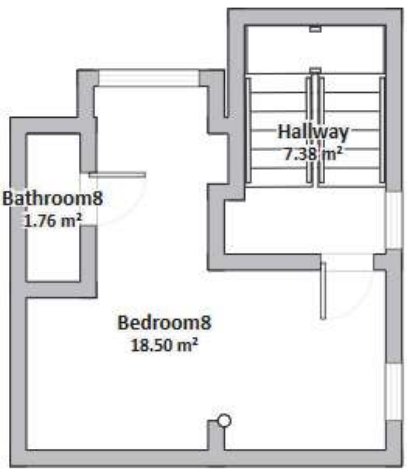
46 Corporation Road, Newport, NP19 0AW



Proposed Ground Floor



Proposed First Floor



Proposed Second Floor

Scale 1:100 | 46 Corporation Road, Newport, NP19 0AW

Appendix B: Groundsure Flood Report

Groundsure
LOCATION INTELLIGENCE

Flood

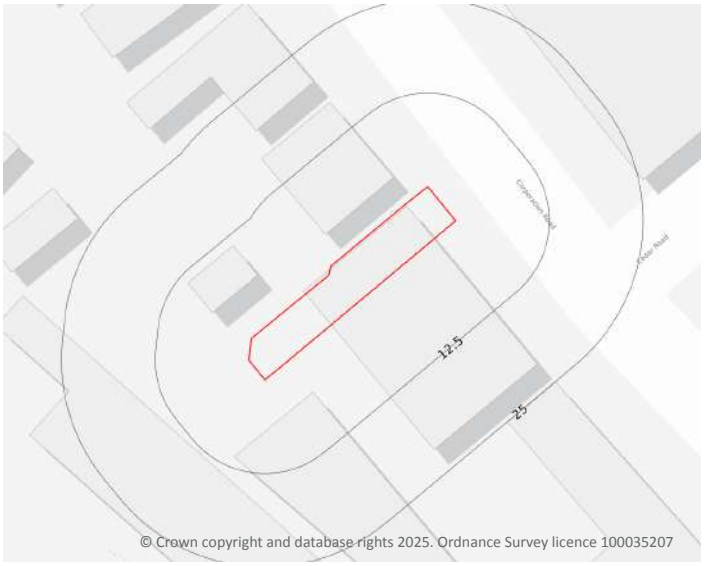
46 Corporation Road, NP19 0AW

Overall Flood Risk

LOW

Groundsure Flood complies with relevant Law Society practice notes on flood risk in property transactions.

Site plan



Search Results

Rivers and the Sea
Low
page 3 >

Surface Water
Negligible

Groundwater
Negligible

Historic Flood
Not identified

Flood Defences
Yes
page 4 >

FloodScore™ insurance rating
Low
page 6 >

Full assessments for other environmental risks are available in additional Groundsure searches including the Groundsure Avista 7 in 1 report. Contact Groundsure or your search provider for further details.

Overview of findings and recommendations

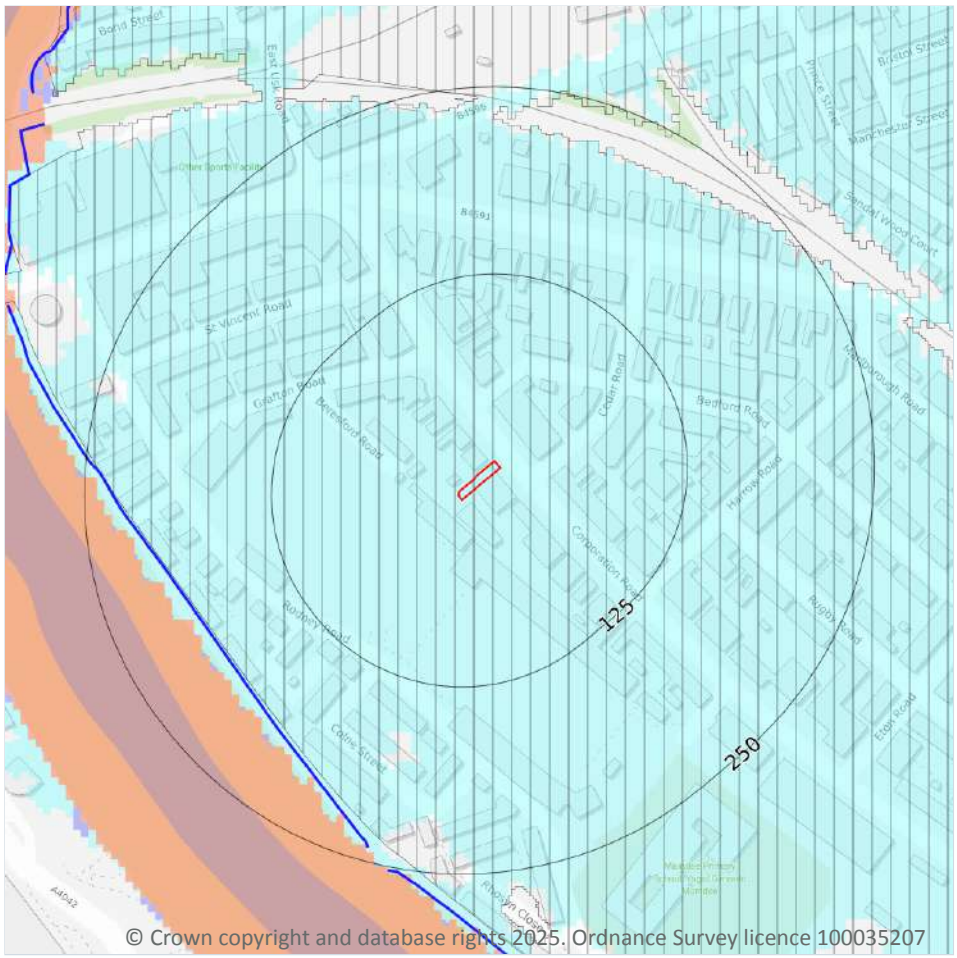
To save you time when assessing the report, we only provide maps and data tables of features within the search radius that we have identified to be of note. These relate to environmental risks that may have liability implications, affect insurance premiums, property values and/or a lender's willingness to lend.

You can view the fully comprehensive library of information we have searched on **page 5 >**.

No environmental risks that Groundsure believe require further action have been identified in relation to the property.

Contact us with any questions at:
info@groundsure.com ↗
01273 257 755

Flooding / Risk of flooding from rivers and the sea



Site Outline

Search buffers in metres (m)

River and coastal flooding:

- High
- Medium
- Low
- Very Low
- Historical Flood Events
- Areas Used for Flood Storage
- Reduced river/sea flooding risk due to defences
- Flood Defences

Risk of flooding from rivers and the sea

The property has a Low chance of flooding in any given year, according to Risk of Flooding from Rivers and Sea (RoFRaS)/Flood Risk Assessment Wales (FRAW) data. This could cause problems with insuring the property against flood risk. However, if built before 2009, it may be eligible for insurance assistance from the Flood Re scheme: www.floodre.co.uk/ ↗

RoFRaS/FRAW assesses flood risk from rivers and the sea in England and Wales, using local data and expertise. It shows the chance of flooding from rivers or the sea, taking account of flood defences and the condition those defences are in. The model uses local water level and flood defence data to model flood risk. Click here ↗ for explanation of the levels of flood risk.

Please see **page 2 >** for further advice.

This data is sourced from the Environment Agency and Natural Resources Wales.

Contact us with any questions at:
info@groundsure.com ↗
01273 257 755

Flooding / Flood defences

Reduction in Risk of Flooding from Rivers and Sea due to Defences

The property is located in an area whereby the risk of flooding from rivers or sea is reduced due to the presence of flood defences. These areas would flood if the defence were not present, but may not do so as it is.

We recommend discussing all flood defence in place as part of your discussions with insurance providers.

Details of flood defences and any areas of reduced river/sea flooding risk due to defences can be seen on the Risk of Flooding from Rivers and the Sea Map.

Flood defences

There are flood defences built in the vicinity of the property. Flood defences seek to reduce the risk of flooding and to safeguard life, protect property, sustain economic activity and the natural environment. Flood defences are designed to protect against flood events of a particular magnitude, expressed as risk in any one year.

Please see **page 2 >** for further advice.

Contact us with any questions at:
info@groundsure.com
01273 257 755

Datasets searched

This is a full list of the data searched in this report. If we have found results of note we will state "Identified". If no results of note are found, we will state "Not identified". Our intelligent filtering will hide "Not identified" sections to speed up your workflow.

Flooding	
Risk of flooding from rivers and the sea	**Identified**
Flood storage areas: part of floodplain	Not identified
Historical flood areas	Not identified
Reduction in Risk of Flooding from Rivers and Sea due to Defences	**Identified**
Flood defences	**Identified**
Surface water flood risk	Not identified
Groundwater flooding	Not identified

Methodologies and limitations

Groundsure's methodologies and limitations are available here: knowledge.groundsure.com/methodologies-and-limitations ↗.

Data providers

Groundsure works with respected data providers to bring you the most relevant and accurate information in your Flood report. To find out who they are and their areas of expertise see www.groundsure.com/sources-reference ↗.

Conveyancing Information Executive and our terms & conditions

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Groundsure Ltd. Groundsure adheres to the Conveyancing Information Executive Standards.

In addition to The Property Ombudsman (TPO) redress scheme covering consumers, TPO will also provide redress to small businesses (including Charities and Trusts) and where the customer meets the following criteria:

- a small business (or group of companies) with an annual turnover of less than £3 million;
- a charity with an annual income of less than £3 million;
- a Trust with a net asset value of less than £3 million.

Complaints Advice

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure.

If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award up to £5,000 to you if the Ombudsman finds that you have suffered actual financial loss and/or aggravation, distress or inconvenience as a result of your search provider failing to keep to the Standards.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs.

COMPLAINTS PROCEDURE: If you want to make a complaint, we will:

- acknowledge it within 5 working days of receipt
- normally deal with it fully and provide a final response, in writing, within 20 working days of receipt
- liaise, at your request, with anyone acting formally on your behalf

Complaints should be sent to:
Operations Director, Groundsure Ltd, Nile House, Nile Street, Brighton, BN1 1HW. Tel: 01273 257 755. Email: info@groundsure.com ↗ If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs): Tel: 01722 333306, E-mail: admin@tpos.co.uk ↗ We will co-operate fully with the Ombudsman during an investigation and comply with their final decision.

Groundsure's Terms and Conditions can be viewed here: www.groundsure.com/terms-and-conditions-april-2023/ ↗

All of the advice and reports that Groundsure produces are covered by a comprehensive Remediation Contribution policy to ensure customers are protected, see www.groundsure.com/remediation ↗ for full details.

Appendix C: Flood Modelling Data

Cyfoeth Naturiol Cymru
Natural Resources Wales

Newport Model Update

Jennifer Wilson

Rev No 1.0

Revision	Prepared By	Checked By	Approved	Date
1.0	Jennifer Wilson	Anna Minchinton	Richard Derrick	26/4/23

Contents

List of Figures

List of Tables

1 Newport model

1.1 Introduction

This document details the changes that have been made by Natural Resources Wales (NRW) up to October 2021 to the Newport model. Since version 6 of the Newport model in 2016, there has been additional topographic survey carried out including as-built drawings for the Crindau flood defence scheme. There have also been updates to the model as part of a Flood Consequence Assessment (FCA) /flood map challenge (Jacks Pill) and to assess the feasibility of new flood defence schemes (Home Farm and Pillgwenlly OBCs). The Extreme Sea Level dataset and fluvial inflows have been updated to reflect a current day of 2021. The aim of this project is to update the most recent version of the Newport model - Jacks Pill flood map challenge model (Dec 2019) and run for the full suite of events, including the T30 year needed for the NRW flood mapping products (Flood Risk Assessment Wales - FRAW and Flood Map for Planning - FMfP).

1.2 History

A summary of the version history along with key updates can be found in Table 1.

Table 1: Summary of version history of the Newport model

Version	Originated	Date	Details
1.0	Atkins	2000	Original delivery
1.1	Capita Symonds	May 2009	Riverside Project updated and to FRM Spec for V2
2.0	Capita Symonds	Aug 2009	Updated hydrology and flood defence data. Updated modelling approach using ESTRY/TuFLOW.
2.1	Capita Symonds	Sep 2010	No update. Model files missing from original submission in Aug-09 (i.e. V2). Model reissued with all supporting files and results.
2.2	Capita Symonds	Feb 2011	2050 T200 results redelivered, as original dataset included errors
3.0	JBA	Nov 2011	New Extreme Sea Level estimates
3.1	JBA	Dec 2011	2d-zln corrected at Riverside and Rodney Road. New Riverside defences incorporated into baseline model and new spot levels used to represent the City Vizion development.
3.2	JBA	Dec 2012	Error in grid results for CI scenarios. Stability patch added.
4.0	JBA	April 2014	Updated as part of Crindau Pill FRMS
4.1	JBA	July 2014	Corrected layers for Stephenson Street Embankment
5.0	NRW	Nov 2015	Updated as part of Stephenson Street PAR
5.1	NRW	April 2016	Updated as part of Home Farm PAR
5.2	Atkins	2016	New M4 Bridge over Usk and Ebbw
6.0	NRW	Nov 2016	Updates to; model geometries, tidal boundaries and model management
6.1	Arup	Aug 2017	Update for Pillgwenlly Outline Business Case. Updates to; model geometries, tidal boundaries and model management including the addition of the proposed Crindau defences and updates to the Caerleon defences
6.2	JBA	2018	Updated for Jacks Pill FCA model Undefended. Used the V6.1 model and undefended layers from V6. Added new LiDAR and updated tidal boundary.
6.3	JBA	Dec 2019	Updated Jacks Pill FMC model following a review including updated tide levels to 2019 – Final Undefended delivery
6.4	JBA	Dec 2019 (delivered Jan 2020)	Created a defended model for the Jacks Pill FMC – Final Defended delivery. Crindau and Stephenson Street defences removed.
7.0	NRW	June 2020	Update to Jacks Pill FMC defended/undefended models: • Tide levels (inc CC) updated to base year 2020 • Timing of fluvial and tidal peaks adjusted • Control files (DEF & UND) combined • Additional survey US Transporter Bridge (Stephenson St) • Revised return periods to include 30yr
8.0	NRW	Oct 2021	• Tide levels (inc CC) updated to 2021 • QMED inflows updated to current day 2021 from 2008 • Revised return periods to include 5yr • Crindau As Built 2021 survey added

2 Model Updates

The changes undertaken as part of this update are based on the Jacks Pill flood map challenge model which was delivered as separate undefended (V6.3 - dated 03/12/2019) and defended (V6.4 - dated 03/01/2020) models. The LiDAR from previous versions of the model remains unchanged and is a 2m DTM flown in 2010.

2.1 Updated Model Boundaries

2.1.1 Extreme Sea Level Data

The August 2009 Capita Symonds study of Newport (V2.0) showed that the dominant flood risk in this area is tidal. The fluvial boundaries are set at QMED in the model, originally calculated in 2008. These have been updated to 2021 figures for the v8 model update. The model runs four tide cycles with a total model run time of 50 hours. The base year for the model (v8) was updated to 2021, with climate change values set at 75 years (2096) and 100 years (2121). To account for climate change, the FCDPAG3 guidance was used (https://gov.wales/sites/default/files/publications/2018-11/flood-consequence-assessments.pdf), which adds 0.76m to sea levels for 2096 and 1.12m for 2121. Please note that part way through this model update a new set of extreme sea level guidance was published, UKCP18 (draft FCERM climate change guidance 2021 (gov.wales)). For consistency the FCDPAG3 guidance was retained but any further updates should use the current guidance (UKCP18).

2.1.2 Timing of the fluvial & tidal peaks

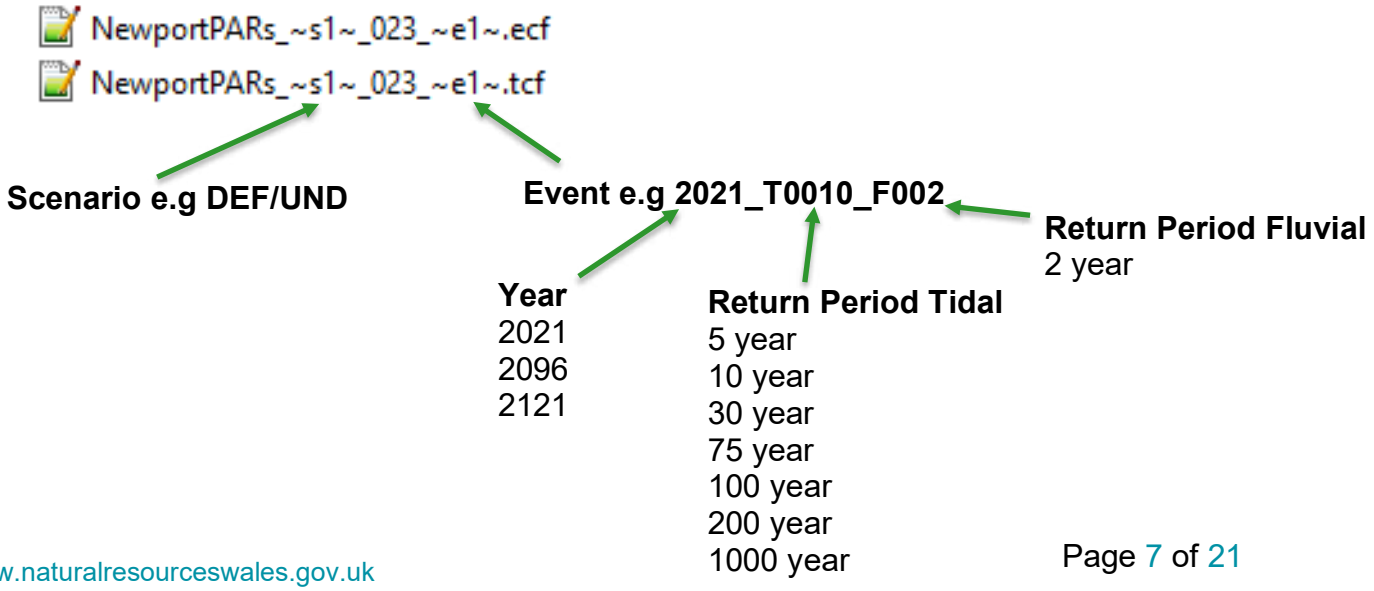
The tidal curves have been updated to ensure they coincide with the peak of QMed.

2.2 Modelling Software

The model has been run in the latest version of ESTRY TUFLOW at the time the simulations were run (2020-10-AA-iSP-w64). Model simulation times varied depending on the scenario and event but were in the region of 14-32 hrs per simulation.

2.3 Model Control Files

As the undefended and defended models for Jacks Pill were delivered separately, the relevant run files were combined into one folder structure. There are separate .tcf and .ecf for this model. The defended and undefended control files have been combined. See section 2.4 for details of DEF01.



If scenarios were used to point to the separate defended and undefended .trd general commands and .tgc geometry files.

```
If Scenario == DEF
    Read File == NewportPARs_General_Commands_DEF_023.trd !Defines general commands and output types
Else If Scenario == DEF01
    Read File == NewportPARs_General_Commands_DEF01_023.trd !Defines general commands and output types
Else If Scenario == UND
    Read File == NewportPARs_General_Commands_UND_023.trd !Defines general commands and output types
End If
```

```
If Scenario == DEF
    Geometry Control File == ..\Model\NewportPARs_Baseline_023_DEF.tgc ! Geometry
Else If Scenario == DEF01
    Geometry Control File == ..\Model\NewportPARs_Baseline_023_DEF01.tgc ! Geometry
Else If Scenario == UND
    Geometry Control File == ..\Model\NewportPARs_Baseline_022_UND.tgc ! Geometry
End If
```

2.3 Model Geometries

Updated survey has been added into the model in the locations as outlined below. Please note that in September 2016 the Ordnance survey changed their datum so any survey carried out after this date will have been transformed using the new OSTN/ OSGM 15 therefore is not directly comparable to the survey gathered prior to this.

2.3.1 Updated survey Southern Distributer Road (SDR) to Stephenson Street

Additional survey was added for the left bank of the Usk between the SDR and Stephenson Street (Transporter Bridge), surveyed on 09/08/2016 and 07/03/2017. These surveys fill a gap in the existing survey (2d_zln_survey_Dec08_627) and extend upstream just beyond the ship unloading wall area overlapping with the existing survey.

2.3.2 Caerleon

In July 2016 improvement works were completed for the defences at Isca Road and Caerleon Road, Caerleon. As these were not available at the time of the version 6 update this model used ‘design drawings’. As part of the Arup update in 2017 the model was updated with the ‘as built’ drawings (Figure 1) which are slightly higher than the design drawings. There are demountable defences across Caerleon Road that tie the two flood walls together. The model has assumed that the demountables are in place and have been modelled at a level of 8.86mAOD.

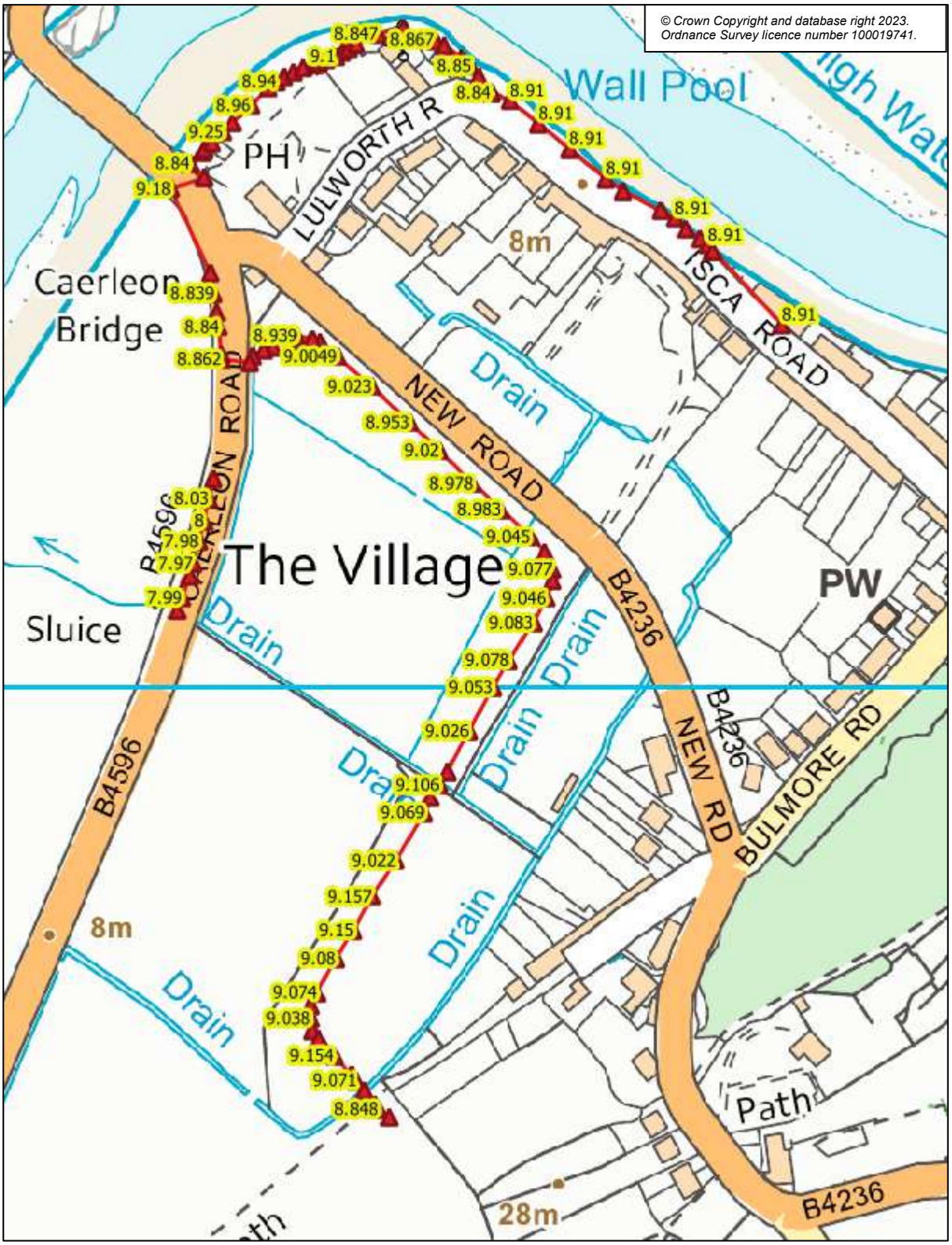


Figure 1: Defences at Isca Road and Caerleon Road

2.3.3 Home Farm

As part of the V6.1 update in December 2016, the Home Farm area was updated with topographic survey data taken in November 2016. This provides levels of the roads in the housing estate as well as the Network Rail embankment and railway underpasses as shown in Figure 2. This has been carried through to V8.

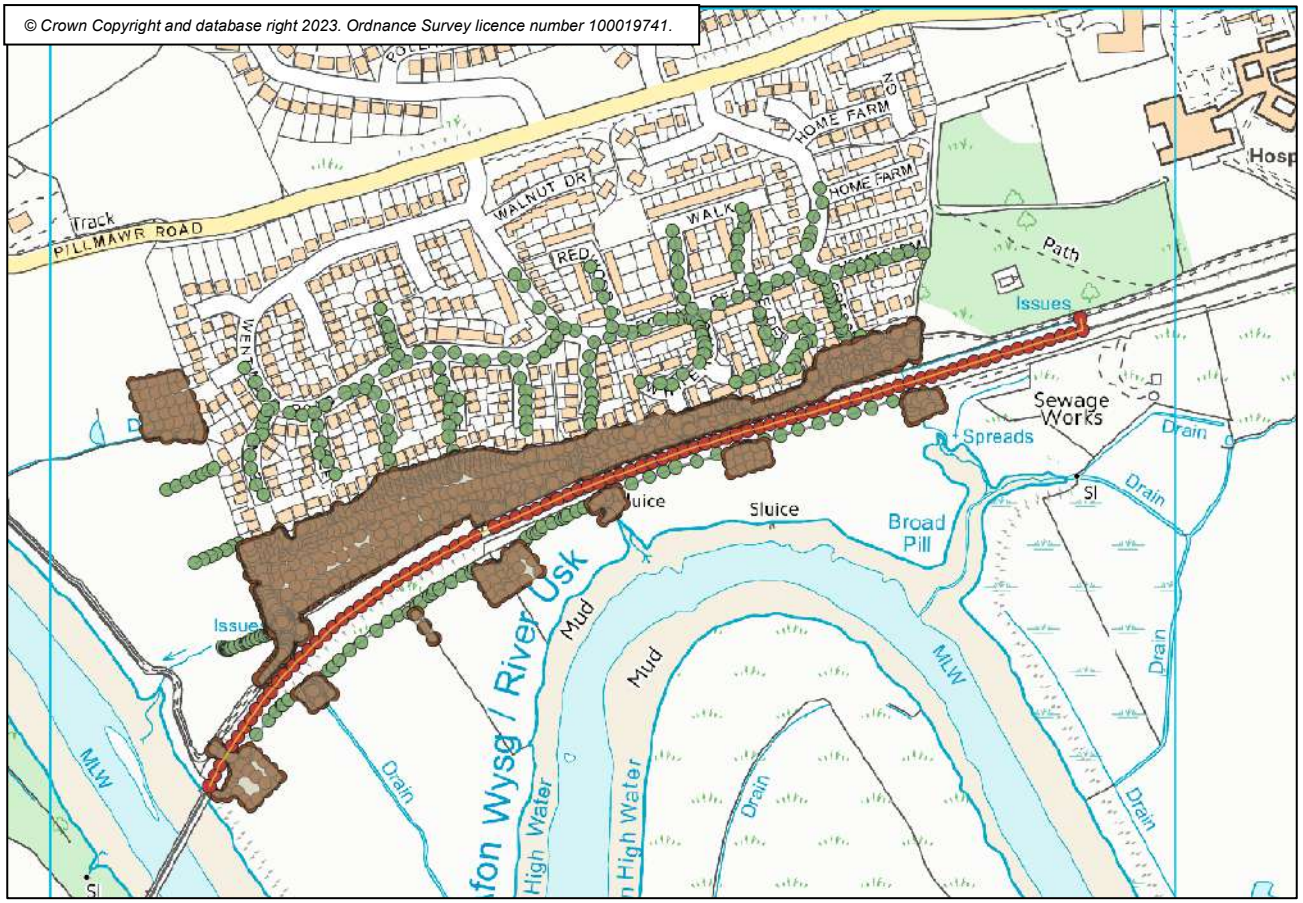


Figure 2: Geometry edits in the Home Farm area by Arup 2016

2.3.4 Crindau, Newport

As part of the v8 update (October 2021), 'as built' survey was added for the Crindau Pill Flood Alleviation Scheme. Construction work commenced in July 2016 and consisted of a mixture of flood walls and embankments, associated works such as steps and ramps along with amenity improvements. Separate to the NRW scheme there is also a third party 'temporary embankment' that connects to the southern extent of the NRW scheme. This consists of an approximately 325m long earth bund which was completed in June 2018. NRW surveyed this in March 2022 and this survey has been added to the model and run as a separate scenario (DEF01).

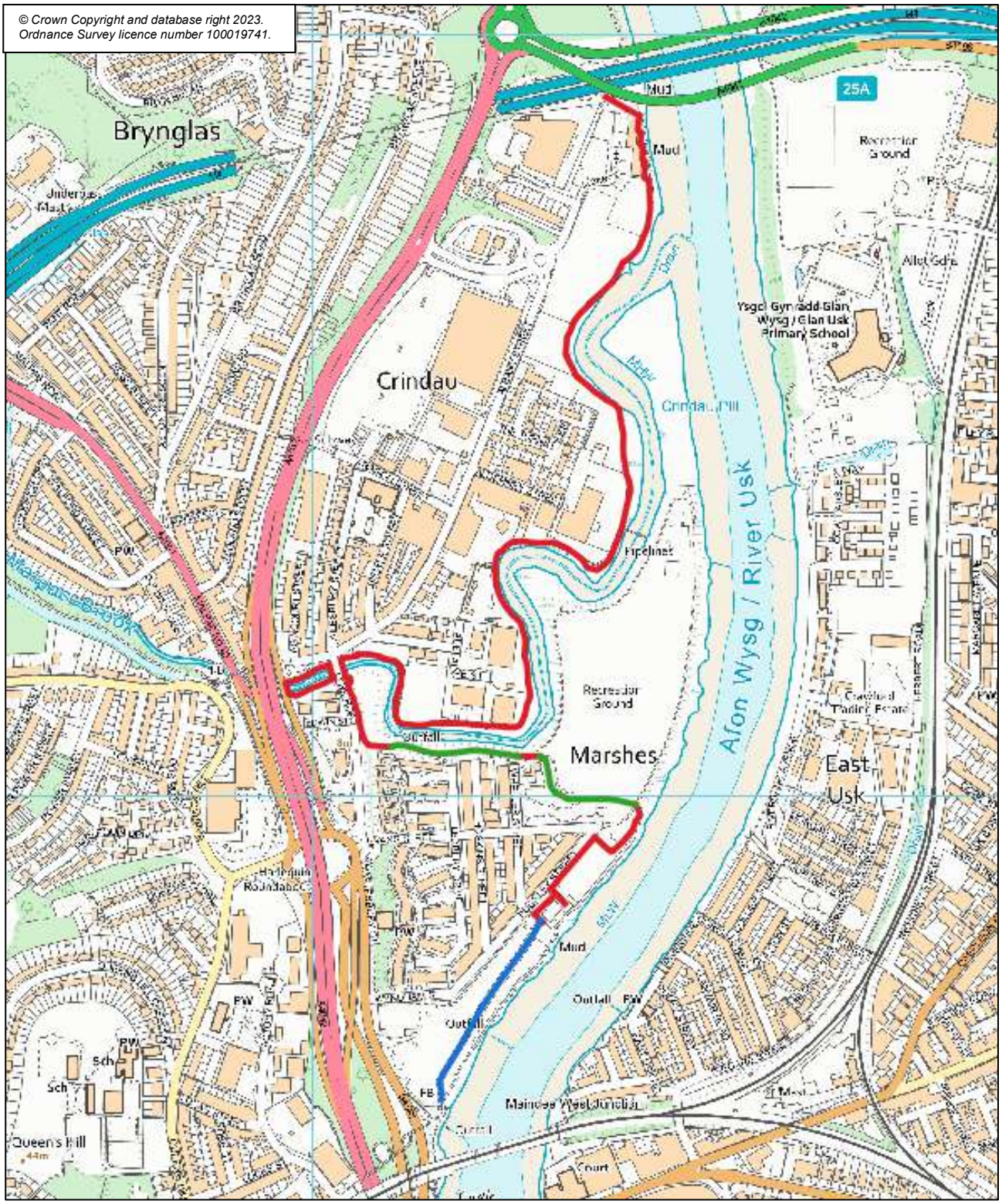


Figure 3: Crindau defences in V8 of the model as 2d_zsh and 2d_zln (red - Flood wall, green – embankment, blue – third party former Sainsburys embankment))

2.4 Modelled events & scenarios

Table 2 below shows the list of events and scenarios that were run as part of the study (from v8 model run). The **DEF** scenario includes all flood defences **excluding** the third party defence at the former Sainsburys site. The **DEF01** includes all flood defences **including** the third party defence. The **DEF** scenario was used when updating the NRW mapping products as there is no evidence of a maintenance programme in place for the Sainsburys defence, so this was not able to be added as a third party defence.

Table 2: Modelled tidal events and scenarios in v8 run

Event	Present Day (2021)			75 years time (2096)			100 years time (2121)		
	DEF	**DEF01**	**UND**	**DEF**	**DEF01**	**UND**	**DEF**	**DEF01**	**UND**
T5	✓	✓	✓						
T10	✓	✓	✓						
T30	✓	✓	✓	✓	✓	✓	✓	✓	✓
T75	✓	✓	✓						
T100	✓	✓	✓						
T200	✓	✓	✓	✓	✓	✓	✓	✓	✓
T1000	✓	✓	✓	✓	✓	✓	✓	✓	✓

Previous modelling studies within Newport have shown the dominant flood risk to the area is tidal, therefore all tidal simulations have been run with a QMED fluvial event. The QMED fluvial inflows were updated for the v8 model. No other fluvial scenarios have been run.

3 Model Results

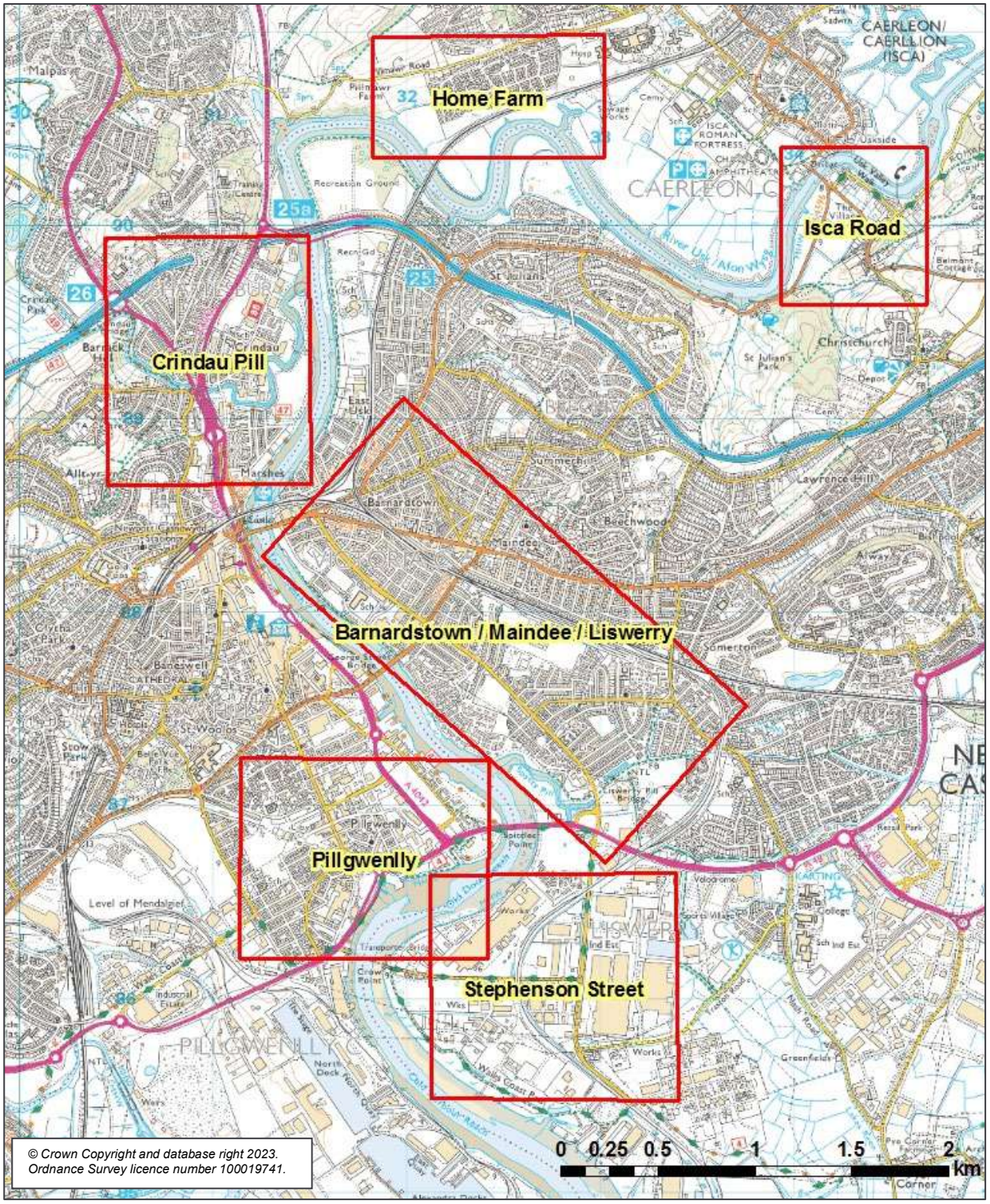


Figure 4: Key areas in Newport

This section summarises the results from the model for a range of events and scenarios. The mechanisms of flooding are broadly similar to those in the version 6 Newport model. However, due to changes in extreme sea levels, geometry and DTM there are some

significant differences. Figure 4 outlines the geographic location of these differences.

3.1 Defended results

3.1.1 Current Day (2021)

In the DEF current day (2021) scenarios from v8 of the model, up to the 1 in 30 year event flooding is largely contained within the channels of the River Usk and River Ebbw in the Newport area. Water starts to overtop the low spot by Hanson Yard (Stephenson Street), along with some overtopping in Shaftesbury Park, Crindau. Upstream of the M4 road bridge crossing there is out of bank flooding on the fields surrounding the Usk although no properities are affected.

A few industrial buildings start being flooded in the 1 in 75 year event as the inundation extents and depths increase in the Stephenson Street area. In Crindau, Shaftebury Park fills up with water.

The flood depth/extent increases in the 1 in 100 year event and a number of residential properities are at risk in the Liswerry area. Following the addition of the Crindau defences there is no longer property fooding in Crindau in this event.

In the 1 in 200 year event a few isolated residential properities in Caerleon flood on the right banks of the Usk and Lwyd as well as a few properities around Home Farm. There is also some property/industrial flooding around Spytty Pill and Liswerry. Flood water in the Stephenson Street area is restricted by the railway line. In Crindau without the third party defence (DEF) approximately 110 properities are flooding around Hoskins and Pugsley Streets. Water is coming out of bank from the Usk just downstream of NRW defences and flowing north up and around the multi use games areas. As Figure 5 shows this area is protected in this event with the third party defence (DEF01).

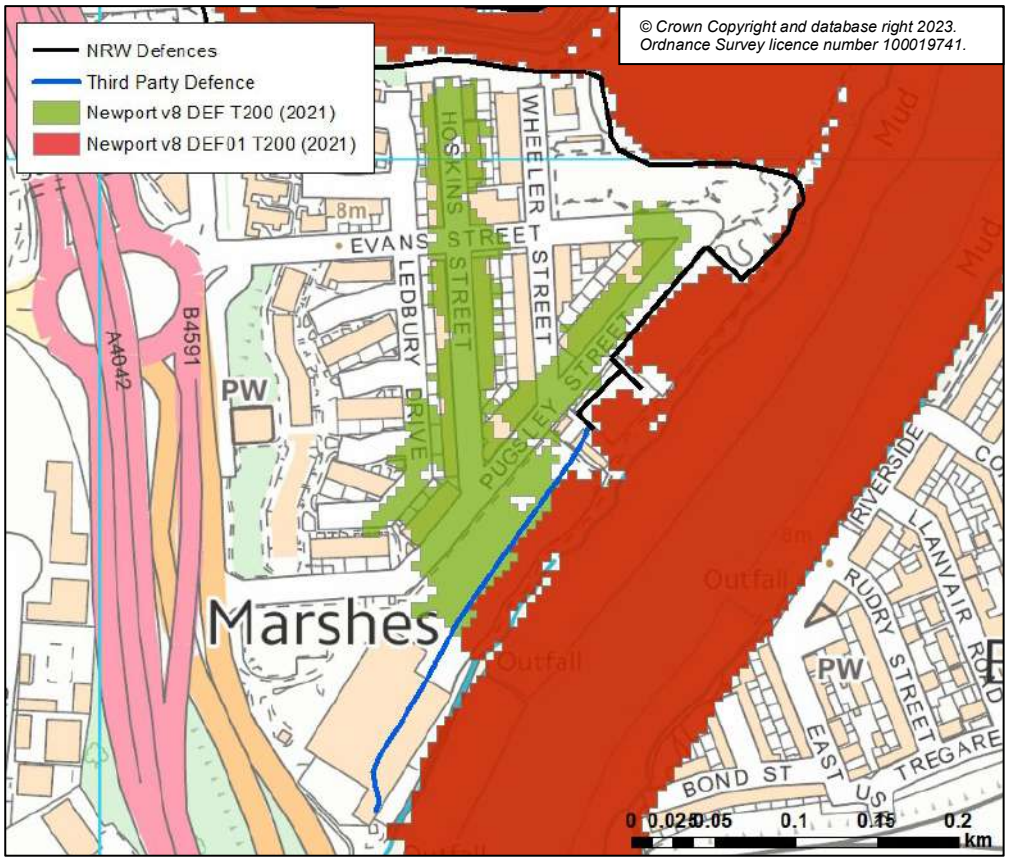


Figure 5: Comparison between the current day 1 in 200 year outlines for the defended scenario with (DEF01 – red) and and without (DEF – green) the third party embankment

There is widespread flooding in the 1 in 1000 year event. The Isca Road defences are overtopped in Caerleon and more properities flood in Home Farm and Crindau. Large areas of industrial and residential property flooding are seen on the east bank by Barnardstown, Stephenson Street and the Liswerry areas as the railway line is overtopped or water makes it through underpasses. Flooding extends to Pillgwenlly and into Newport Docks from the west bank of the River Usk. A large area of Duffryn is also flooded from the Ebbw.

3.1.2 Climate change scenarios

When additional years of sea level rise get added, the flood extent and depth increases significantly. More properities flood in Caerleon, Home Farm and St Julians. In Crindau there is also widespread flooding from the 1 in 200 year event in 75 years time (2096) meaning the defences will not provide a 1 in 200 year Standard of Protection in the future. There is also substantially more flooding on the east bank of the Usk including Barnardstown, Maindee, Liswerry and the flood outlines almost cover the entire model extent over the Caldicot Levels.

A comparison of the key events for current day and climate change scenarios can be seen in Figure 6 below.

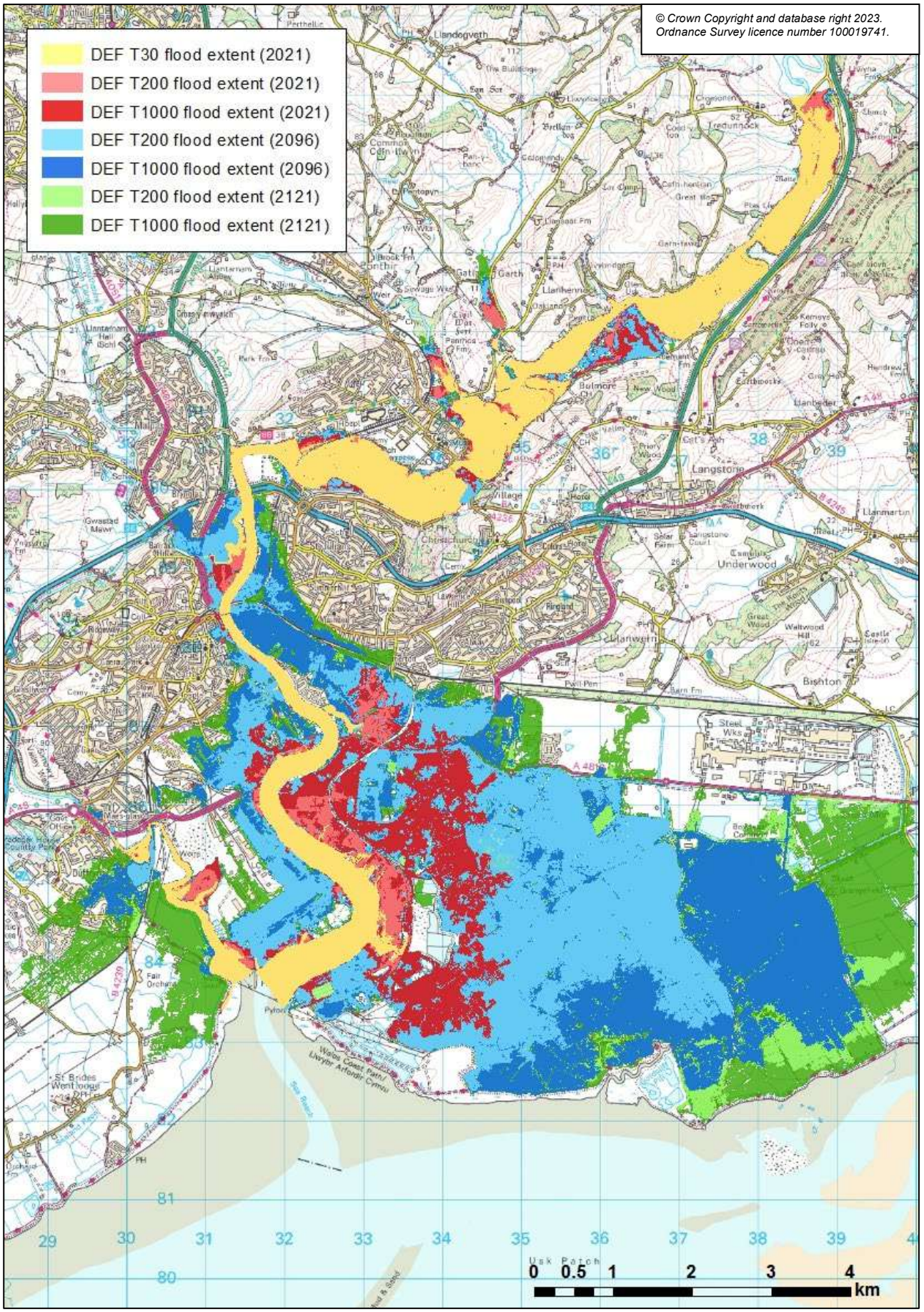


Figure 6: Comparison between the defended event outlines for current day and with 75 and 100 years of climate change from v8 of the Newport model

3.2 Comparison to undefended results

The modelling results show that large areas of Newport are well defended up to the 1 in 200 year event. Figure 7 shows the differences between the defended and undefended outputs in Newport. This shows that flood defences significantly reduce flooding within the Crindau, Duffryn, Barnardstown and Liswerry areas of Newport as well as a large area on the east bank of the Usk opposite the transporter bridge. The Isca Road area in Caerleon is also protected in the current day 1 in 200 tidal event.

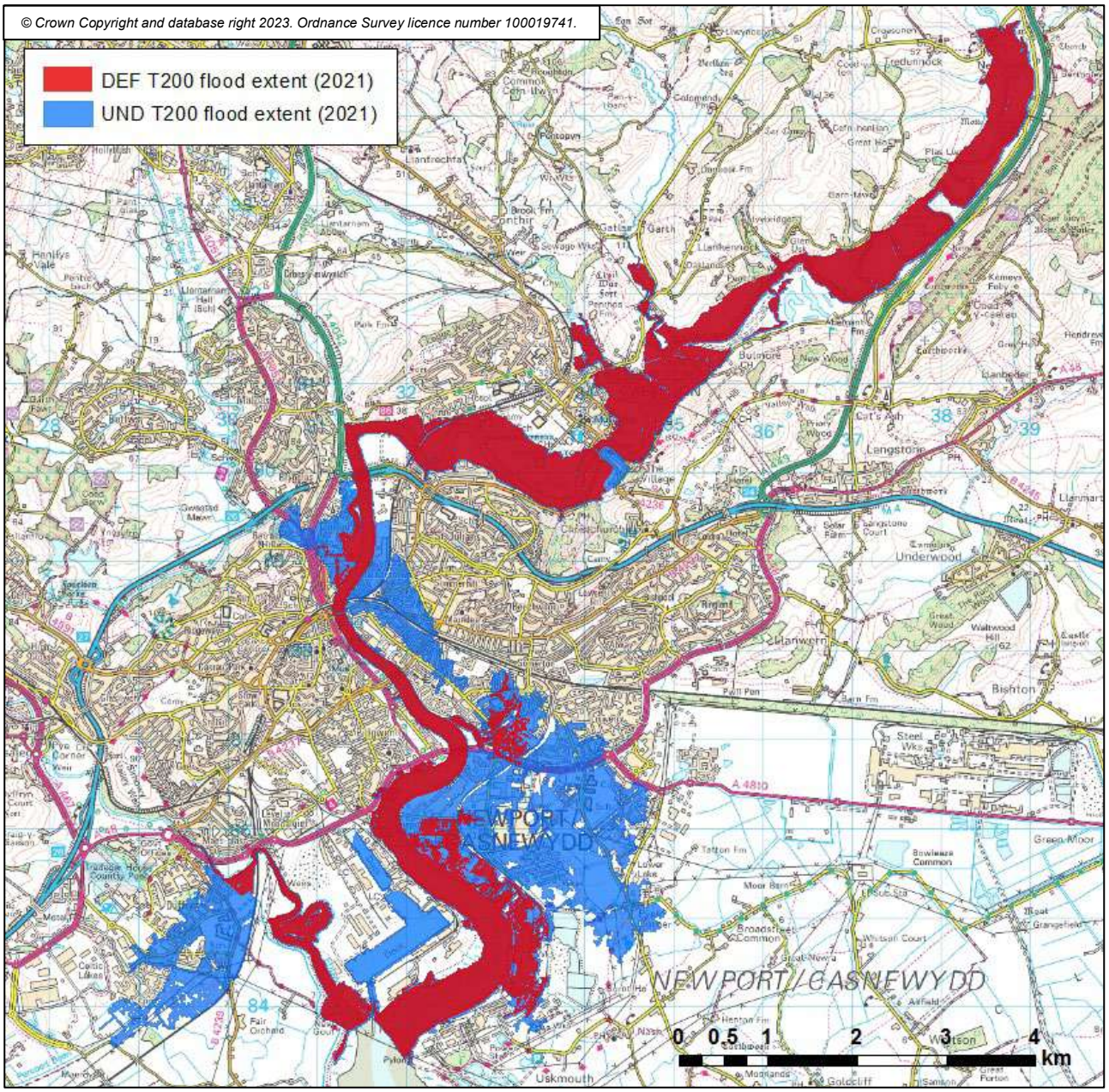


Figure 7: Comparison between the defended (red) and undefended (blue) outlines for the current day 1 in 200 year tidal event from v8 of the Newport model

Looking at the T200 year event with 75 years of climate change to 2096 you can see (Figure 8) that most defences have been overtopped/surpassed but they are still having a positive impact on the extent of flooding.

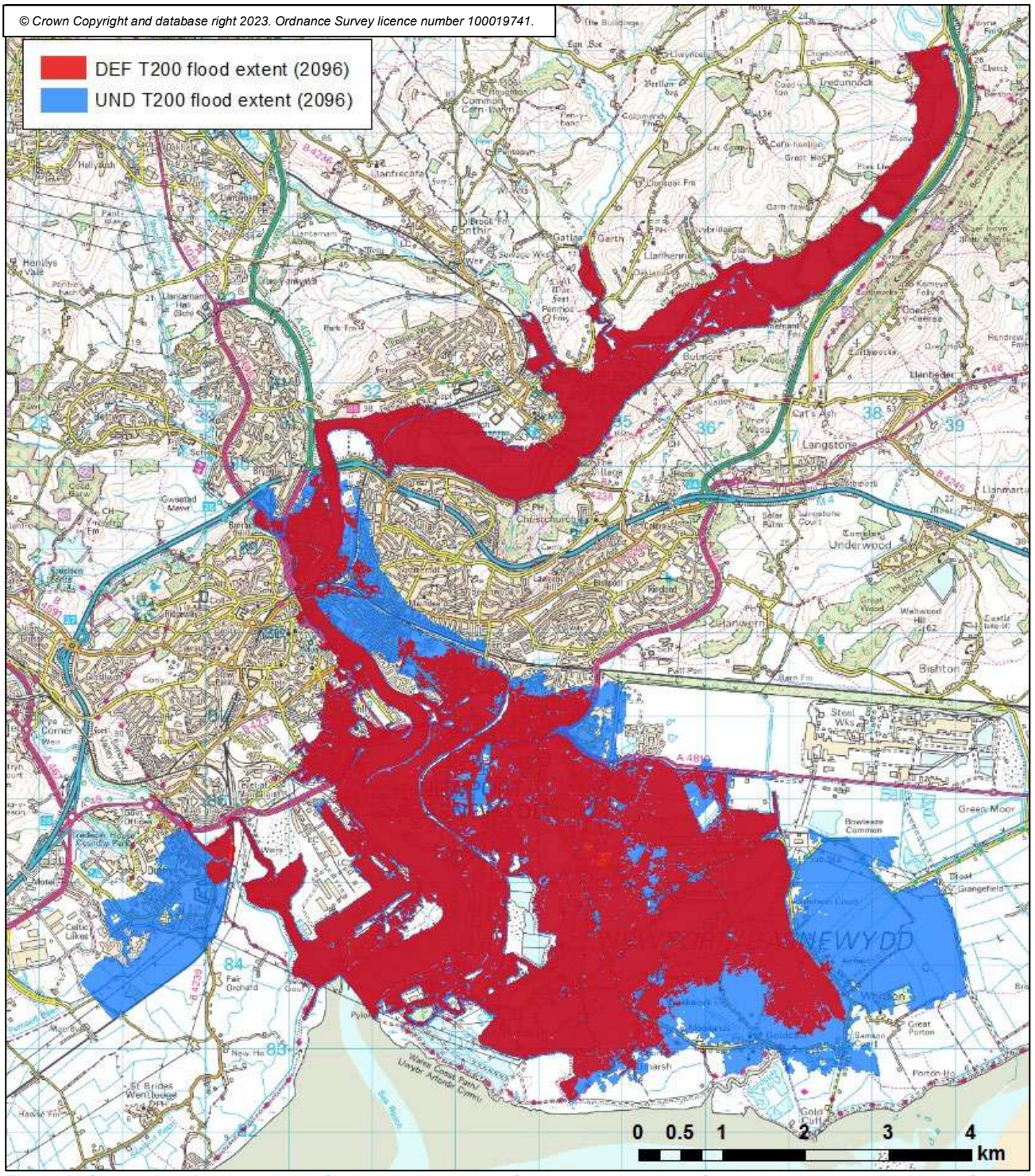


Figure 8: Comparison between the defended (red) and undefended (blue) outlines for the 1 in 200 year tidal event from v8 of the Newport model with 75 years of climate change (2096)

3.3 Model stability & error messages

Overall the mass balance error remains within the healthy limits specified in the TUFLOW manual.

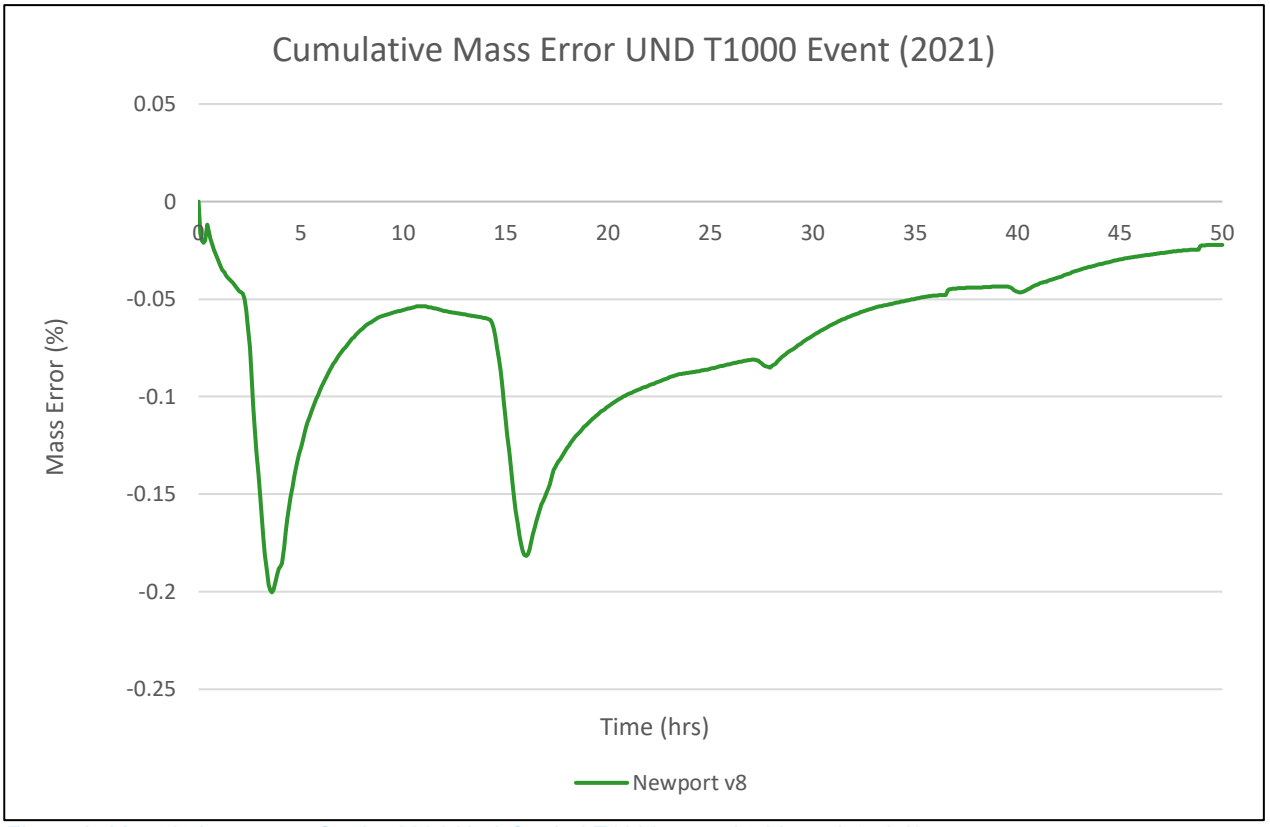


Figure 9: Mass balance error for the 2021 Undefended T1000 event in this update (v8)

In the 1 in 1000 year current day (2021) undefended run there were 497 checks and 1662 warnings. The majority of the checks were 'CHECK 2370 - Ignoring coincident point found in ORIGINAL layer', these occurred along the right bank of the River Ebbw. This is where the 2d_zln_USK_Ebbwdefences_545 are being read in. As the points are close together there are multiple elevations for each cell so some of these points are being ignored.

Most of the warnings were for negative depths such as 'WARNING 1991 - 0:05:44: Negative depth at Node CRD0423U.1: y = -0.54 Bed = -0.34 dh = -0.54'. Most of these occurred in the Crindau Pill channel and for the same nodes that negative depths occurred in version 6 of the Newport model. Any additional warnings are likely due to the fluvial and tidal boundaries.

These checks/warnings were carried over from previous versions of the model.

It should be noted that there is a large stability patch over the Caldicot levels that was created in previous model builds. The focus of this study is Newport rather than the Caldicot levels as there is a separate model covering the levels – The Caldicot and Wentlooge Coastal study, which should be used when assessing risk in this area.

4 Conclusions & Recommendations

4.1 Conclusions

In conclusion the Newport model has been updated to provide the full suite of results needed to update NRW's Flood Maps. In addition, the latest sea level rise figures and survey have been applied within the model. As noted above (Section 2.4) the DEF results will be used for the FRAW map as the third party embankment at the former Sainsburys

site does not meet the maintenance requirements to be included. Any further updates were beyond the scope of the study.

4.2 Recommendations

There are some outstanding issues with the model due to the patchwork nature of data sources, modelling assumptions and small modifications made over time. Future model recommendations include:

- Review the channel cross section survey, as most of it comes from 1997 and 2000
- Update the model to meet the latest TUFLOW best practice eg. BB and WW units for structures and review 1D-2D links
- Review and simplify the geometry edits following updates to LiDAR and survey as there are currently over 55 layers that modify model topography
- Review model stability with a view to reducing the extent of stability patches
- Review the application of climate change to fluvial inflows
- Assess any implications in changes to OSTN02 & OSTN15
- Consider using TUFLOW-GPU to improve model resolution and runtime
- Consideration should be given to taking the downstream boundary further out to sea to coincide better with the nearest coastal boundary data point.
- Incorporate the new 1m LiDAR for this area.

Published by:
Natural Resources Wales
Cambria House
29 Newport Road
Cardiff
CF24 0TP

0300 065 3000 (Mon-Fri, 8am - 6pm)

enquiries@naturalresourceswales.gov.uk
www.naturalresourceswales.gov.uk