CS CONSULTING

GROUP

DUBLIN | LONDON | LIMERICK

Site-Specific Flood Risk Assessment

Proposed Residential Development

Drumlark, Co. Cavan

Client: Drumlark Investments Ltd

Job No. D111

February 2024

CS CONSULTING
GROUP

CS CONSULTING GROUP

SITE-SPECIFIC FLOOD RISK ASSESSMENT

PROPOSED RESIDENTIAL DEVELOPMENT, DRUMLARK, CO. CAVAN

CONTENTS

1.0 INTRODUCTION ____ 1

2.0 SITE LOCATION AND PROPOSED DEVELOPMENT ____ 2

3.0 LEVEL OF SERVICE ____ 6

4.0 FLOOD RISK AND MITIGATION MEASURES ____ 9

5.0 CONCLUSION ____ 13

Appendix A: Cavan County Development Plan Flood Maps and CFRAMS Map

Appendix B: OPW Historic Flood Maps

Appendix C: GSI Hydrogeology & Geological Maps

File Location: Job-D111\B_DOCUMENTS\1.0 Planning\Reports\SSFRA

BS 1192 FIELD	**D111-CSC-ZZ-XX-RP-C-0002**

Job Ref.	Author	Reviewed By	Authorised By	Issue Date	Rev. No.
D111	LJ	NB	OS	27.02.2024	P3
D111	LJ	NB	OS	21.02.2024	P2
D111	LJ	NB	OS	14.07.2023	P1

CS CONSULTING
GROUP

1.0 INTRODUCTION

Cronin & Sutton Consulting Engineers (CS Consulting) have been commissioned by Drumlark Investments Ltd to prepare a Site-Specific Flood Risk Assessment for a proposed 145-unit Large-scale Residential Development (LRD) at Drumlark, Cavan.

In preparing this report, CS Consulting has made reference to the following:

- Cavan County Development Plan 2022–2028
  (including Strategic Flood Risk Assessment)
- Greater Dublin Regional Code of Practice for Drainage Works
- Office of Public Works Flood Maps
- The Planning System and Flood Risk Management: Guidelines for Planning Authorities 2009 (Flood Risk Management Guidelines)
- Geological Survey of Ireland Maps
- Local Authority Drainage Records

The Flood Risk Assessment is to be read in conjunction with the engineering drawings and documents submitted by CS Consulting and with the various additional information submitted by the other members of the design team.

2.0 SITE LOCATION AND PROPOSED DEVELOPMENT

2.1 Site Location

The proposed development site in located approx. 3kms north from the Cavan Town Centre. The site is located in the administrative jurisdiction of Cavan County Council and has a development site area of circa 4.62ha.

Figure 1 – Location of proposed development site
(*map data and imagery: EPA, NTA, OSM Contributors, Google*)

The location of the proposed development site is shown in **Figure 1** above; the indicative extents of the development site as well as relevant elements of the surrounding road network, are shown in more detail in **Figure 2**.

Figure 2 – Site extents and environs
(*map data and imagery: NTA, OSM Contributors, Google*)

The subject site is bound by greenfield on all the sides. There are a few existing residential developments to the north-east of the development site.

2.2 Existing Land Use

The subject development is greenfield. There is an existing water course approx. 80m from the eastern boundary of the development site.

2.3 Description of Proposed Development

The development will consist of the provision of a total of 145no. residential units along with provision of a crèche. Particulars of the development comprise as follows:

a. Site excavation works to facilitate the proposed development to include excavation and general site preparation works.

b. The reprofiling of ground levels within the site as required.
c. The provision of a total of 91no. residential dwellings which will consist of 25no. 2 bed units, 55no. 3 bed units and 11no. 4 bed units. The dwellings range in height from single storey to two storey.
d. The provision of a total of 54no. duplex apartment units consisting of 15no.1 bed units and 39no. 2bed units. The duplex apartment blocks range in height from two storey to three storey in height.
e. Provision of a 2 storey creche with associated parking, bicycle and bin storage.
f. Provision of associated car parking at surface level via a combination of in-curtilage parking for dwellings and via on-street parking for the creche and duplex apartment units.
g. Provision of electric vehicle charge points with associated site infrastructure ducting to provide charge points for residents throughout the site.
h. Provision of associated bicycle storage facilities at surface level throughout the site and bin storage facilities
i. Creation of a new access point from the public road with associated works to include for a connections to the existing public footpath along with provision of a pedestrian crossing point with a raised table.
j. The provision of a new shared cycleway and footpath to serve the site.
k. Provision of internal access roads and footpaths and associated works.
l. Provision of residential communal open space areas to include formal play areas along with all hard and soft landscape works with public lighting, planting and boundary treatments to include boundary walls, railings & fencing.
m. Internal site works and attenuation systems which will include for provision of a hydrocarbon and silt interceptor prior to discharge into the surface water network.

n. All ancillary site development/construction works to facilitate foul, water and service networks for connection to the existing foul, water and ESB networks.

3.0 LEVEL OF SERVICE

There is an existing inherent risk of any flood event occurring during any given year. Typically, this likelihood of occurrence was traditionally expressed as a 1-in-100 chance of a 100-year storm event happening in any given year.

A less ambiguous expression of probability is the Annual Exceedance Probability (AEP), which may be defined as the probability of a flood event being exceeded in any given year. Therefore a 1-in-100-year flood event (with a return period of 100 years) has a 1% AEP. Similarly, a 100% AEP can be expressed as a 1-in-1-year event.

The Planning System and Flood Risk Management, Guidelines for Planning Authorities (Flood Risk Management Guidelines), published in 2009 set out the best practice standards for flood risk assessment in Ireland. These are summarised in **Table 1** below (Table 8.1 from Flood Risk Management Guidelines document).

Table 1 – Summary of Level of Service: Flooding Source

Development Category	Flooding Source		
	Drainage	River	Tidal/Coastal
Residential	1% AEP	0.1% AEP	0.1% AEP
Commercial	1% AEP	1% AEP	0.5% AEP
Water-compatible (docks, marinas)	-	>1% AEP	>0.5% AEP

Under these guidelines a proposed development site has first to be assessed to determine the flood zone category it falls under.

It is a requirement of Cavan County Council and the Flood Risk Management Guidelines that the predicted effects of climate change are

incorporated into any proposed design. **Table 2** below indicates the predicted climate change variations.

Table 2 – Predicted climate change variations

Design Category	Predicted Impact of Climate Change
Drainage	20% Increase in rainfall
Fluvial (river flows)	20% Increase in flood flow
Tidal / Coastal	Minimum Finished Floor Level 4.0 – 4.15m AOD

The flooding guidelines categorise the risks associated with flooding into three areas, Zone A, B & C. This categorisation is indicated below.

- **Zone A** – High Probability of Flooding. Where the average probability of flooding from rivers and sea is highest (greater than 1% annually or 1 in 100 for river flooding or 0.5% annually or 1 in 200 for coastal flooding).
- **Zone B** – Moderate Probability of Flooding. Where the average probability of flooding from rivers and sea is moderate (risk between 0.1% annually or 1 in 1000 years and 1% annually or 1 in 100 years for river flooding, and between 0.1% or 1 in 1000 years and 0.5% annually or 1 in 200 for coastal flooding).
- **Zone C** – Low Probability of Flooding. Where the probability of flooding from rivers and sea is moderate (risk is less than 0.1% annually or 1 in 1000 years for both rivers and coastal flooding).

In accordance with the Flood Risk Management Guidelines, dwellings are classified as 'highly vulnerable developments'.

A review of Cavan County Council flood risk mapping and CFRAMS maps shows the subject site to be located in Flood Zone C. See **Appendix A** for details of Flood Maps for the subject development site.

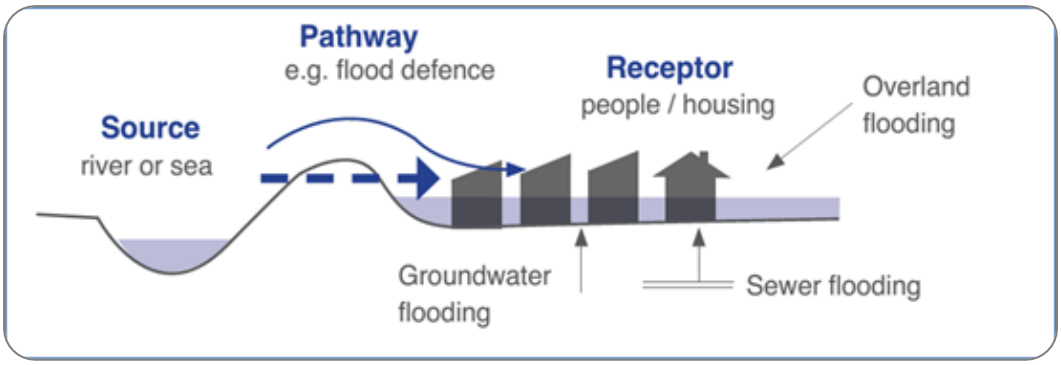


Figure 3 - Source-pathway-receptor model
(*The Planning System and Flood Risk Management Guidelines*)

The Flood Risk Management Guidelines have developed an 'appropriateness' matrix for various developments and their potential risk factor. The table indicates if further analysis is required in the form of a justification test. **Table 3** below outlines the conditions that require a justification test.

Table 3 – Flood Zone vs. Justification Test Matrix

Development Category	Flood Zone A	Flood Zone B	Flood Zone C
Highly Vulnerable Development	***Justification Test Required***	***Justification Test Required***	Appropriate
Less Vulnerable Development	***Justification Test Required***	Appropriate	Appropriate
Water-compatible Development	Appropriate	Appropriate	Appropriate

As noted above, the site is located within **Flood Zone C**. As such, a justification test is not required.

4.0 FLOOD RISK AND MITIGATION MEASURES

4.1 Historical Flooding

A review of Office of Public Works flooding records database (www.floodmaps.ie) does not indicate historical flooding at the site. See the OPW map-report included in **Appendix B**.

4.2 Fluvial Flooding

A review of the Catchment Flood Risk Assessment and Management (CFRAM's) maps and Cavan County Council's Flood Map indicate that the subject land is deemed to be located outside the 0.1% AEP fluvial flooding, based on the currently available maps.

The risk of fluvial flooding impacting upon the residential properties within the subject development is therefore negligible, even during a 1-in-1000-year flooding event, and no mitigation measures are required. Refer to **Appendix A** for further details.

4.3 Tidal Flooding

A review of the Office of Public Works flooding records confirms that the development site's location is such that it is not affected by tidal water bodies and as such the risk of tidal flooding is negligible. As such, the risk of tidal flooding is negligible.

4.4 Pluvial Flooding

Pluvial flooding is flooding which has originated from overland flow resulting from high intensity rain fall. From a review of the OPW flood maps there are no records of flood events due to high rainfall events in the area and assessing the local topography we understand the risk of fluvial flooding to

the site is negligible and the development site is deemed not to be at risk from pluvial flooding. See **Appendix B** for OPW Flood maps Report.

However, the proposed site development will be fitted with an attenuation system limiting storm water run-off to greenfield rate (i.e., 6.46l/sec/ha) and on-site storage facility for the 1-in-100-year extreme storm event increased by 20% for the predicated effects of climate change. By reducing the run-off from the site into the local authority surface water sewer the potential risk of flooding from pluvial action is deemed to be within acceptable limits.

4.5 Potential for Proposed Development to Contribute to Off-Site Flooding

The proposed development will require attenuation to be provided. Attenuation will be sized for a 1-in-100-year extreme storm event increased by 20% for the predicated effects of climate change. The attenuation will release the storm water in a controlled manner after the peak storm duration has passed. By restricting the flow, the likelihood of the proposed development adversely affecting the public drainage system or contributing to downstream flooding is mitigated. Please refer to Engineering Services Report, under separate cover submitted with this planning application.

4.6 Impact on Existing Off-Site Drainage Infrastructure

The proposed development shall not discharge any stormwater to public stormwater sewers, and therefore does not have the potential to impact upon the operation of public stormwater drainage infrastructure.

4.7 Groundwater Flooding

According to the Geological Survey of Ireland, GSI, interactive maps, the subject site is underlain with *Pale brown-grey flaggy, silty mudstone (Cooldaragh Formation)*. The area is listed as overlaying a locally important

aquifer which has bedrock which is *moderately productive only in local zones*. The groundwater vulnerability assessment of the site shows that the vulnerability of groundwater in the area is *low*. The proposed development will not increase the potential for groundwater flooding as such the risk is deemed acceptable. See **Appendix C** for GSI mapping information for background groundwater & geology data for the subject lands.

4.8 Residual Risk

Residual risks are defined as risks that remain after all risk avoidance, substitutions and mitigation measures have been taken. Consideration has been also given regarding flood risk caused by events or greater than the required design standards as summarized below.

Table 4 – Residual Risk, Hazard and Impact

Description of risk	Hazard	Residual Impact
Underestimation of fluvial flood level. Update of OPW/ CFRAMS Maps	Inundation of the site for a design event	Fluvial flood levels have been derived from detailed modelling carried out as part of the CFRAMS study and are therefore considered fit for purposed. Extreme flood events shall not impact the site, given the freeboard is excess of 4m. We again refer to minimum FFL's proposed providing circa 5.33m freeboard above fluvial flood levels.

Access and egress routes to and from the site during a 1%/ 0.1% AEP Flood event	Completely dry access/ egress not possible during flood event	All areas of the development lie outside flood plain areas and access/ egress route to and from the site will always be available.
Stormwater System	Failure of System	In the event of exceedance or blockage of the system the ground levels ensure that any overland flows is directed towards channels and green areas.

4.9 Climate Change

The Planning System and Flood Risk Management – Guidelines for Planning Authorities' DOEHLG 2009 Technical Appendix A, Section 1.6 recommends that where mathematical models are not available climate change flood extents can be assessed by using the flood Zone B outline as a surrogate for Flood Zone A with allowance for the possible impacts of climate change.

Therefore, and in accordance with the recommendation above, the predicted 0.1% AEP flood level of 60.33m OD is considered to be representative of the 1% AEP plus the 20% climate change flood level.

We again highlight the lowest finished floor level at the proposed development is 65.660m OD, which is 5.33m above the 1% AEP future change flood Level.

Therefore, the proposed development site is considered to be adequately protected in consideration of future scenario extreme fluvial flood event in the area.

5.0 CONCLUSION

- The proposed development site historically has no recorded flood events, as noted in the OPW's historical flood maps.
- Mapping of predicted future fluvial, pluvial, and tidal flooding extents indicates that the proposed development site shall not be affected by such flooding events.
- The permitted development will have a stormwater attenuation system to address a 1-in-100-year extreme storm events, increased by 20% for predicted climate change effects. This will allow the development to mimic the site's existing drainage regime, such that it is unlikely to result in offsite flooding.
- The likelihood of onsite flooding from the hydrogeological ground conditions is deemed to be minimal and within acceptable levels.

Appendix A

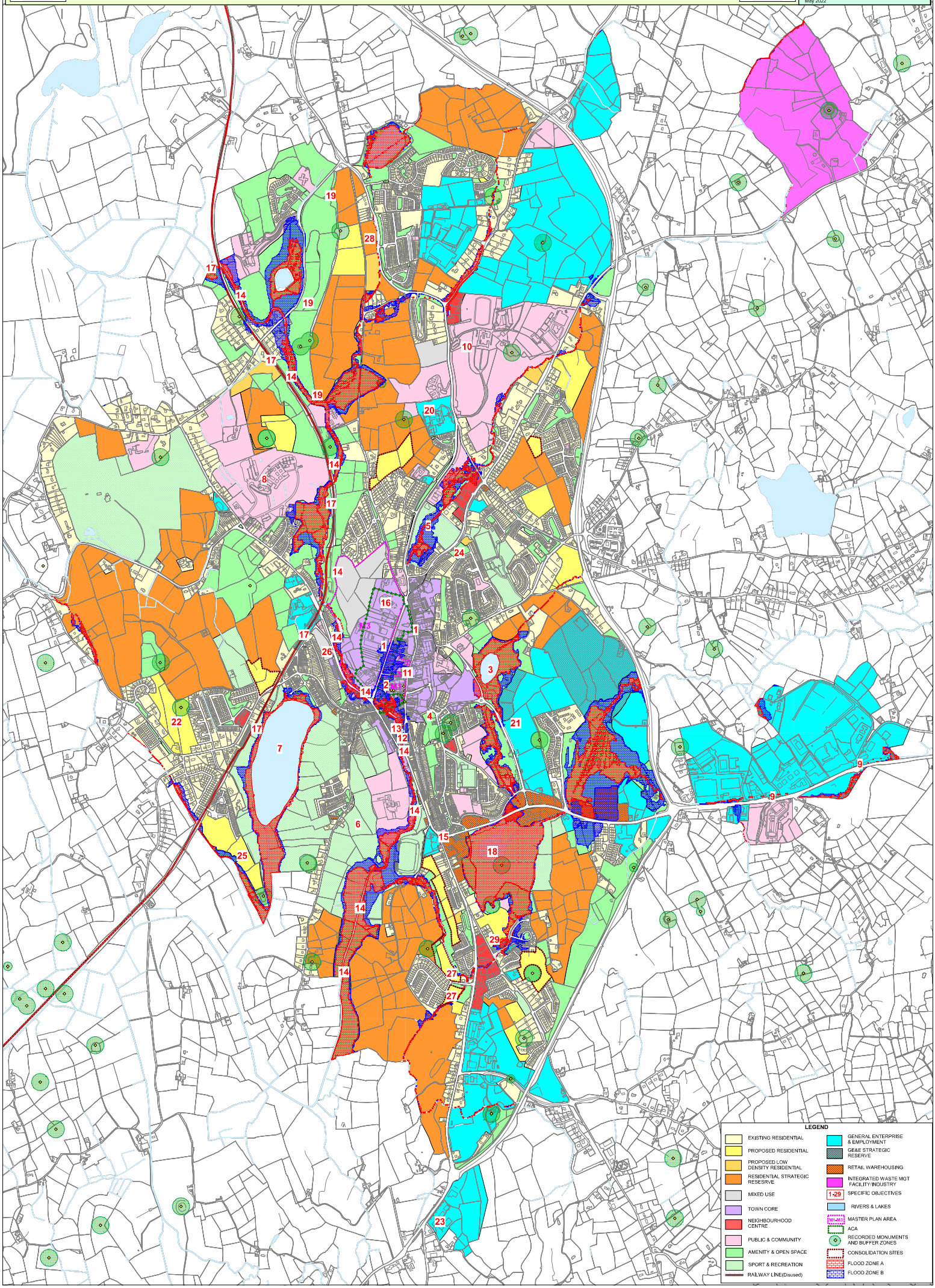
Cavan County Council Flood Map and CFRAMS Maps

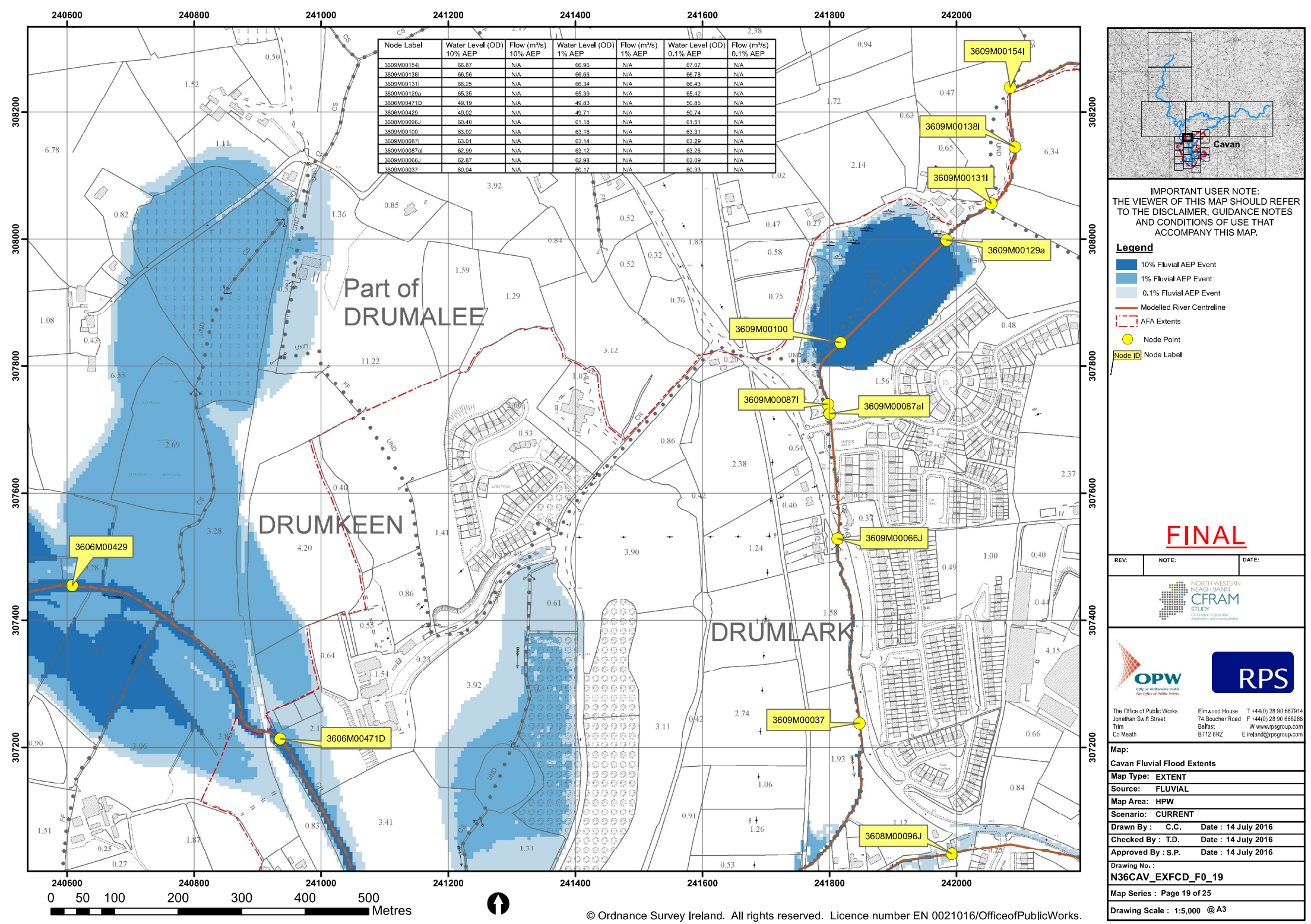
CS CONSULTING
GROUP

CAVAN COUNTY COUNCIL

CAVAN TOWN LOCAL AREA PLAN 2022 - 2028

Chief Executive: Tommy Ryan
Director of Service: Brendan Jennings
Senior Planner: Nicholas O'Kane
Mapping: Collette Burns
May 2022





Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
3609M00154I	66.87	N/A	66.96	N/A	67.07	N/A
3609M00138I	66.56	N/A	66.66	N/A	66.78	N/A
3609M00131I	66.25	N/A	66.34	N/A	66.43	N/A
3609M00129a	65.35	N/A	65.39	N/A	65.42	N/A
3606M00471D	49.19	N/A	49.83	N/A	50.85	N/A
3606M00429	49.02	N/A	49.71	N/A	50.74	N/A
3608M00096J	60.40	N/A	61.18	N/A	61.51	N/A
3609M00100	63.02	N/A	63.16	N/A	63.31	N/A
3609M00087I	63.01	N/A	63.14	N/A	63.29	N/A
3609M00087aI	62.99	N/A	63.12	N/A	63.26	N/A
3609M00066J	62.87	N/A	62.98	N/A	63.09	N/A
3609M00037	60.04	N/A	60.17	N/A	60.33	N/A

IMPORTANT USER NOTE:
THE VIEWER OF THIS MAP SHOULD REFER TO THE DISCLAIMER, GUIDANCE NOTES AND CONDITIONS OF USE THAT ACCOMPANY THIS MAP.

Legend

- 10% Fluvial AEP Event
- 1% Fluvial AEP Event
- 0.1% Fluvial AEP Event
- Modelled River Centreline
- AFA Extents
- Node Point
- Node ID Node Label

FINAL

REV:	NOTE:	DATE:

NORTH WESTERN NEAGH BANN CFRAM STUDY
CATCHMENT FLOOD RISK ASSESSMENT AND MANAGEMENT

OPW
Oifig na nOibreacha Poiblí
The Office of Public Works

RPS

The Office of Public Works
Jonathan Swift Street
Trim
Co Meath

Elmwood House
74 Boucher Road
Belfast
BT12 6RZ

T +44(0) 28 90 667914
F +44(0) 28 90 668286
W www.rpsgroup.com
E ireland@rpsgroup.com

Map:
Cavan Fluvial Flood Extents

Map Type:	EXTENT
Source:	FLUVIAL
Map Area:	HPW
Scenario:	CURRENT
Drawn By : C.C.	Date : 14 July 2016
Checked By : T.D.	Date : 14 July 2016
Approved By : S.P.	Date : 14 July 2016
Drawing No. :	N36CAV_EXFCD_F0_19
Map Series :	Page 19 of 25
Drawing Scale : 1:5,000	@ A3

Appendix B

OPW Historic Flood Maps

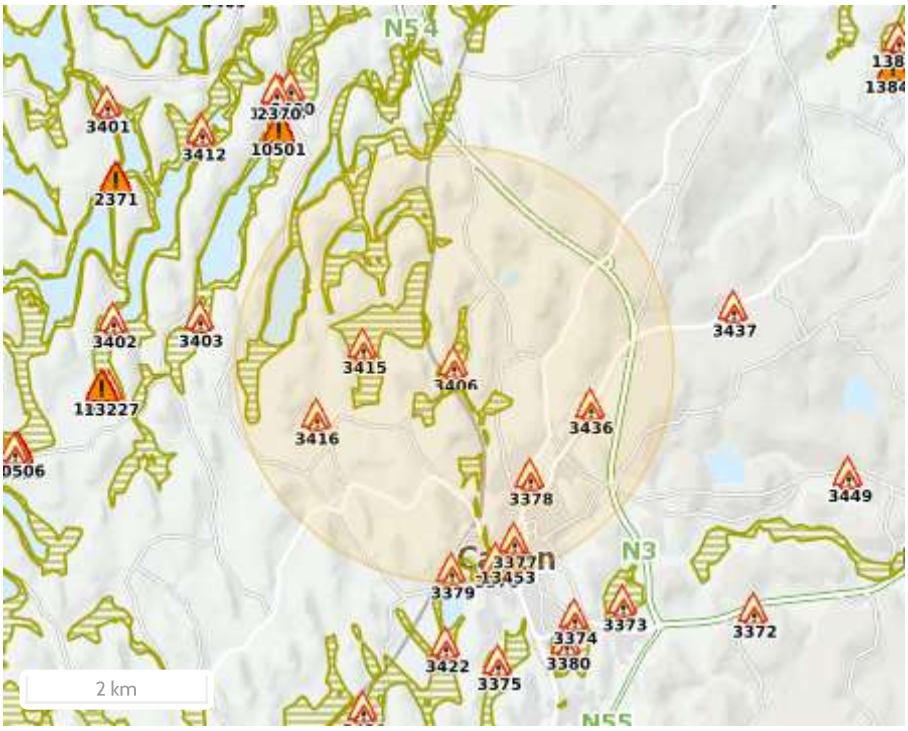
CS CONSULTING
GROUP

Past Flood Event Local Area Summary Report

OPW Oifig na nOibreacha Poiblí Office of Public Works

Report Produced: **12/6/2023 12:22**

This Past Flood Event Summary Report summarises all past flood events within 2.5 kilometres of the map centre.



Map Legend

- Single Flood Event
- Recurring Flood Event
- Past Flood Event Extents
- Drainage Districts Benefited Lands*
- Land Commission Benefited Lands*
- Arterial Drainage Schemes Benefited Lands*

* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained on Floodinfo.ie

9 Results

	Name (Flood_ID)	Start Date	Event Location
1.	Flooding at Cavan on 28/12/2015 (ID-13453)	28/12/2015	Approximate Point
	Additional Information: Reports (0) Press Archive (0)		
2.	Cavan Railway Road, Cavan Recurring (ID-3376)	n/a	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
3.	Farnham Street, Cavan Recurring (ID-3377)	n/a	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
4.	Con Smith Memorial Park Recurring (ID-3378)	n/a	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
5.	Swellan Lake, Glenlara, Cavan Recurring (ID-3379)	n/a	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
6.	Cavan Carrickane Recurring (ID-3406)	n/a	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		

	Name (Flood_ID)	Start Date	Event Location
7.	Cavan Tullylough Recurring (ID-3415)	n/a	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
8.	Farnham Recurring (ID-3416)	n/a	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
9.	Latt Recurring (ID-3436)	n/a	Approximate Point
	Additional Information: Reports (1) Press Archive (1)		

Appendix C

GSI Hydrogeology & Geological Maps

CS CONSULTING
GROUP

GSI Bedrock

Scale: 1:5,000

Geological Survey Ireland

0 0.035 0.07 0.14 mi

0 0.05 0.1 0.2 km

Map Centre Coordinates (ITM) 641,815 807,263

6/12/2023, 9:26:23 AM

Legend

Structural Symbols 100K ITM 2018

- Dip of bedding or main foliation, old GSI data
- First foliation parallel to bedding
- Foliation trend, Thorr and Rosses Granites
- Horizontal Bedding
- Strike and dip of bedding, right way up
- Strike and dip of bedding, way up unknown
- Strike and dip of first foliation
- Strike and dip of overturned bedding
- Strike and dip of second foliation
- Strike and dip of third foliation
- Strike and plunge of first generation fold axis
- Strike and plunge of second generation fold axis
- Strike and plunge of third generation fold axis
- Strike of vertical bedding/foliation
- Strike of vertical first foliation
- <all other values>

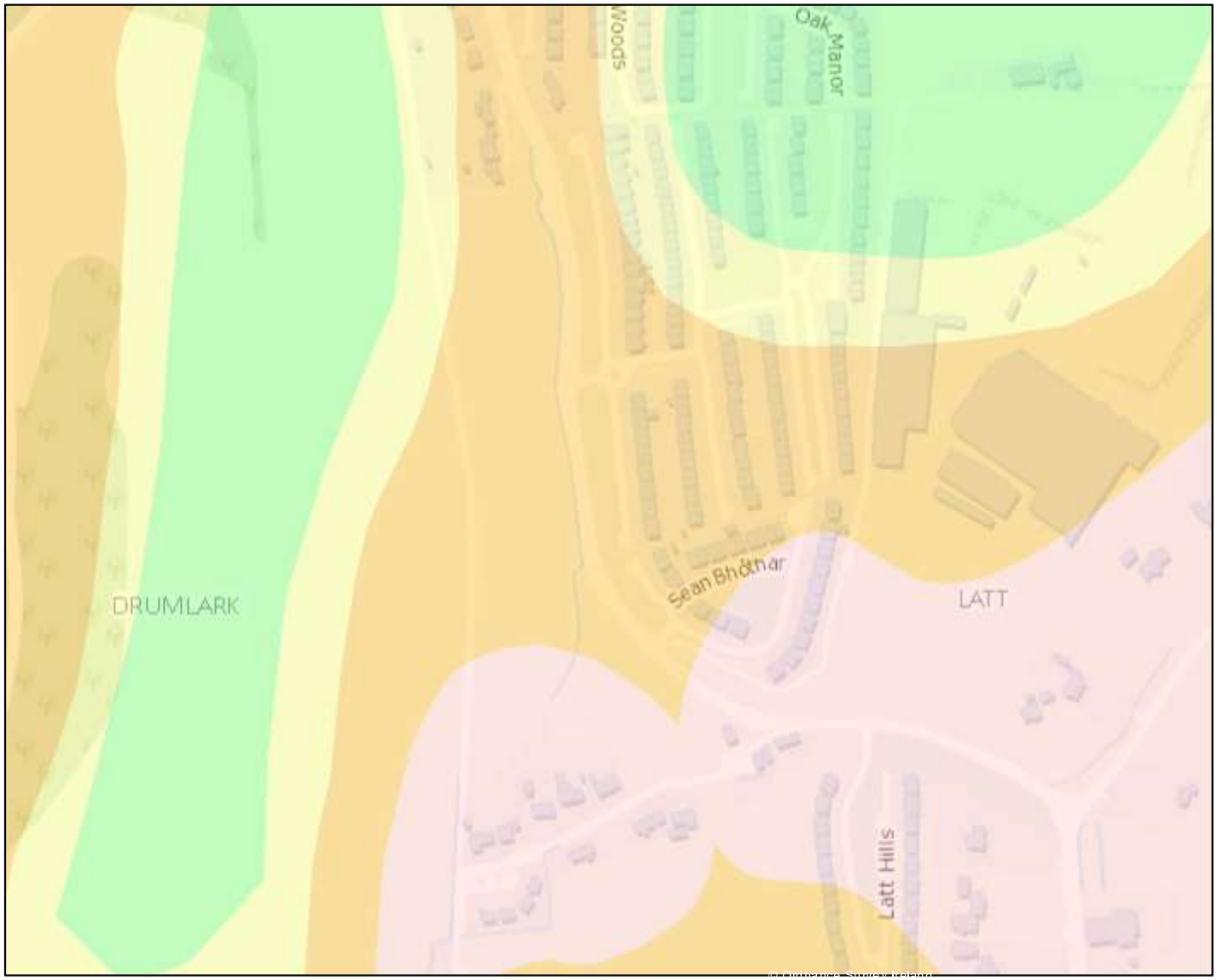
- Bedrock Outcrops 100 ITM 2018

Bedrock Linework 100k ITM 2018

- Anticlinal Axis
- Antiformal axis
- Aquifer Boundary
- Area
- Coal seam
- Dyke
- Fault
- Ghost Line
- Goniatite marine band (R1-R4)
- Lithological boundary offshore
- Metadolerite sheet, mainly sills
- Paleogene/ Tertiary Dyke
- Synclinal Axis
- Synformal axis
- Tectonic Slide, barbs on hanging-wall
- Thin stratigraphical unit, diagrammatic
- Thrust, barbs on hanging-wall side
- Tuff band
- Unconformity, dots on younger side
- X-Section

Geological Survey
Suirbhéireacht Gheolaíochta
Ireland | Éireann

GSI Groundwater



Legend

Groundwater Vulnerability

- Rock at or near Surface or Karst
- Extreme
- High
- Moderate
- Low
- Water

Scale: 1:5,000

Geological Survey Ireland

N W E S

0 0.035 0.07 0.14 mi

0 0.05 0.1 0.2 km

Map Centre Coordinates (ITM) 641,815 807,263

6/12/2023, 9:27:52 AM