Rathmullan, Co. Meath

Flood Risk Assessment

Final Report

August 2025

www.jbaconsulting.ie

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Revision History

Revision Ref/Date	Amendments	Issued to
S3-P01 03/06/2025	Site Layout	Earlsfort Developments Drogheda Limited
A3-C01 21/08/2025	Site Visit	Earlsfort Developments Drogheda Limited

Contract

This report describes work commissioned by Waterman Moylan, by a letter dated 7th January 2025 on behalf Earlsfort Developments Drogheda Limited. Justin Nangle of JBA Consulting carried out this work.

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Purpose

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Abbreviations

AEP ..... Annual Exceedance Probability
CFRAM ..... Catchment Flood Risk Assessment and Management
DoEHLG ..... Department of the Environment, Heritage and Local Government
FRA ..... Flood Risk Assessment
GSI ..... Geological Survey of Ireland
LAP ..... Local Area Plan
LDP ..... Local Development Plan
OPW ..... Office of Public Works
PFRA ..... Preliminary Flood Risk Assessment
SFRA ..... Strategic Flood Risk Assessment
mOD ..... Meters above Ordinance Datum

1 Overview

Under the Planning System and Flood Risk Management Guidelines for Planning Authorities (DoEHLG & OPW, 2009) proposed development must undergo a Flood Risk Assessment to ensure sustainability and effective management of flood risk. This requires a review of all available flood information and assessment of Flood Zones for the development site.

1.1 Term of Reference and Scope

JBA Consulting was appointed by Earlsfort Developments Drogheda Limited to prepare a Flood Risk Assessment (FRA) for the proposed development in Rathmullan, Co. Meath.

1.2 Aims and Objectives

This study is being completed to assess the level of flood risk to the proposed site. It aims to identify, quantify and communicate to the applicant, Planning Authority officials and other shareholders the risk of flooding to land, property and people and the measures required to manage the risk. The objectives are to:

- Identify potential sources of flood risk,
- Confirm the level of flood risk and identify key hydraulic features,
- Assess the impact that the proposed development has on flood risk in adjacent areas,
- Identify and develop appropriate flood risk mitigation and management measures (where required) to allow for the development.
- Consider the impacts of climate change on the proposed development.

1.3 Development Proposal

The proposed development consists of a Strategic Housing Development on residential zoned lands, west of Drogheda town centre. Located on an existing greenfield site the main access will be via the Rathmullan Road. The development proposal consists of;

(i) demolition/removal of all existing farm buildings/structures and associated hard standing on site;

(ii) construction of a large-scale residential development (LRD) of 249 no. units comprising 170 no. two-storey houses (including 37 no. two-bedroom houses, 111 no. three-bedroom houses and 22 no. four-bedroom houses), 16 no. three-storey duplex buildings (accommodating 16 no. one-bedroom and 16 no. two-bedroom units) and a mix of 8 no. three-storey and 3 no. four-storey apartments blocks accommodating a total of 22 no. one-bedroom and 25 no. two-bedroom apartments);

(iii) construction of a new vehicular entrance and access road off Rathmullan Road with associated junction works and associated internal access road network with pedestrian and cyclist infrastructure;

(iv) provision of a three-storey creche facility (411sq.m) with external play areas at ground and second floor levels and vehicular/bicycle parking area; and,

(v) all ancillary site and infrastructural works, inclusive of removal of existing vehicular entrances, general landscaping and public open space provision, vehicular parking provision (396 no. spaces in total), bicycle parking, boundary treatments, foul/surface water drainage, attenuation areas, provision of a pumping station and provision of an ESB substation, as

necessary to facilitate the proposed development. Each house will be served by vehicular parking to the front and private amenity space in the form of a rear garden. Each duplex building will be served by vehicular parking to the front and private amenity space in the form of balcony/terrace spaces to the rear. Each apartment block will have shared access to adjoining car parking bays with communal amenity space and bicycle/bin stores provided to the rear and each apartment will be provided with private amenity space in the form of a balcony or terrace. The development includes provision of a landscaped area of public open space to the north of the site, with 2 no. pedestrian/cyclist connections (via the northern/eastern site boundaries) to Rathmullan Road which will be subsequently ceded to Meath County Council. The application is accompanied by a Natura Impact Statement (NIS) and an Environmental Impact Assessment Report (EIAR).

Figure 1–1: Development Proposal Layout

2 Site Background

2.1 Location

The site is located on the western fringe of Drogheda, Co. Meath. It is situated south of the River Boyne between the M1 Motorway and Rathmullan Road. Riverbank and Highlands residential estates are neighbouring developed areas to the east of the site. The site is currently greenfield with further agricultural fields to the south and west of the site intersected by the M1 Motorway. The site location is shown in Figure 2–1.

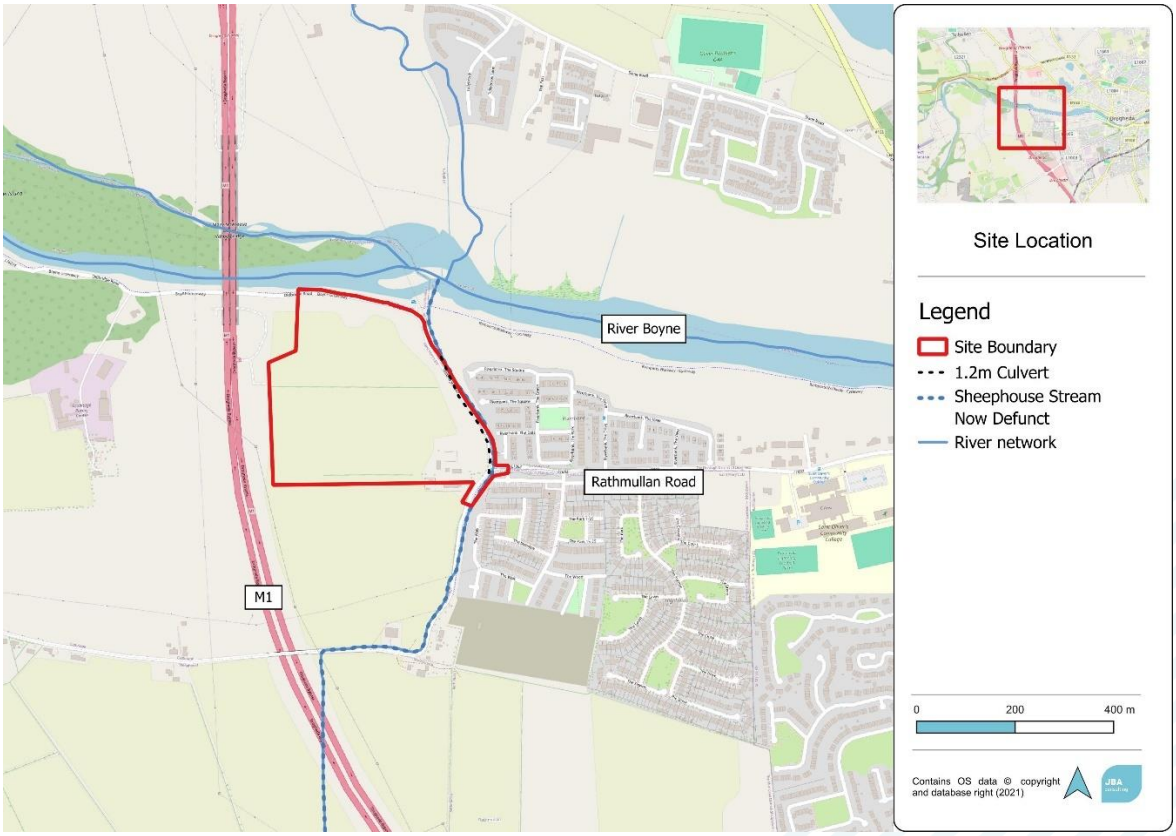


Figure 2–1: Site Location

2.2 Watercourses

There are two identified watercourses in the local area.

River Boyne

The River Boyne flows from west to east adjacent to the northern boundary of the site. The River Boyne is approximately 112km long flowing from Trinity Well, Newberry Hall, near Carbury in County Kildare and discharges into the Irish Sea between Mornington and Baltray just downstream of Drogheda. The total catchment area is approximately 2,695km^2.

Sheephouse Stream Ditch

Located adjacent to Rathmullan Road there is a ditch running in a south-north direction as identified in Figure 2–1. This ditch is a dry feature which does not appear to have any active hydraulic connectivity with lands to the south of the site. Prior to construction of the M1 motorway this ditch formed the lower reach of a watercourse originating to the south west of the site, however significant cutting

required for the M1 has disconnected this former watercourse. As discussed further in Section 2.5, flows from the upper catchment of the former watercourse are now incorporated into the surface water drainage network of the M1 and do not continue to flow into the new disused ditch. Photographs taken from site provided in Section 2.6 confirm the current disconnected status of the ditch and that it is no longer a functional fluvial watercourse adjacent to the site.

1.2m Culvert

It is noted that a 1.2m culvert is located along the eastern perimeter of the site along the existing ditch. This culvert conveys local drainage flows in the surrounding area including lands upstream of site to the east of the M1 motorway.

Refer to Figure 2–2 for a photograph of the culvert.

Figure 2–2: 1.2m Culvert (Source: Floodinfo.ie)

2.3 Topography

As shown in Figure 2–3, the construction of the M1 motorway has significantly altered the natural drainage direction of the lands to the south of the site.

Lidar surveyed by FUGRO-BKS from May 2010-May 2011 is publicly available from Open Topographic Data Viewer provided by Transport Infrastructure Ireland. The detail is sufficient to review the changes within the wider study area. The LiDAR as shown in Figure 2–3 and Figure 2–4 confirms the cutting of the M1 motorway to a depth of approximately 4-5m below natural levels within the vicinity of the site. This restricts the naturally draining catchment of the un-named ditch to the eastern side

of the M1 with an area of approximately 0.8km^2. Of this area, only 0.15km^2 is located upstream of the site.

The cross-section profile in Figure 2–5 shows the significant fall in elevation from south to north across the site with existing ground levels dropping by approximately 10m across the site. The northern boundary of the site still remains at elevation at approximately 19mOD, before dropping steeply down to the River Boyne.

The development named 'The Walk' and 'The Meadow' has further altered the remnants of the central section of the ditch. This section has been built over and consists of a walk and cycle path.

The changes to wider topography outlined in this section is fundamental to the findings from the flood risk assessment provided in Section 4.

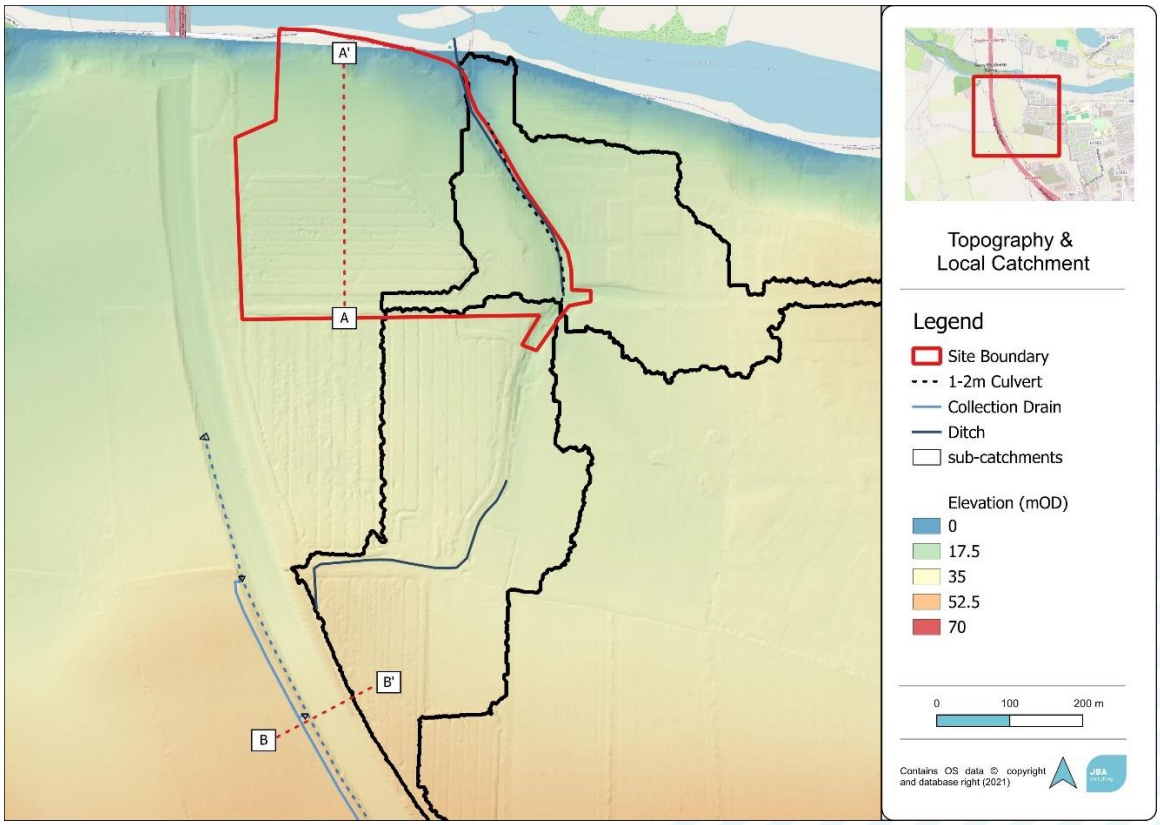


Figure 2–3: Topography of the site and local catchment

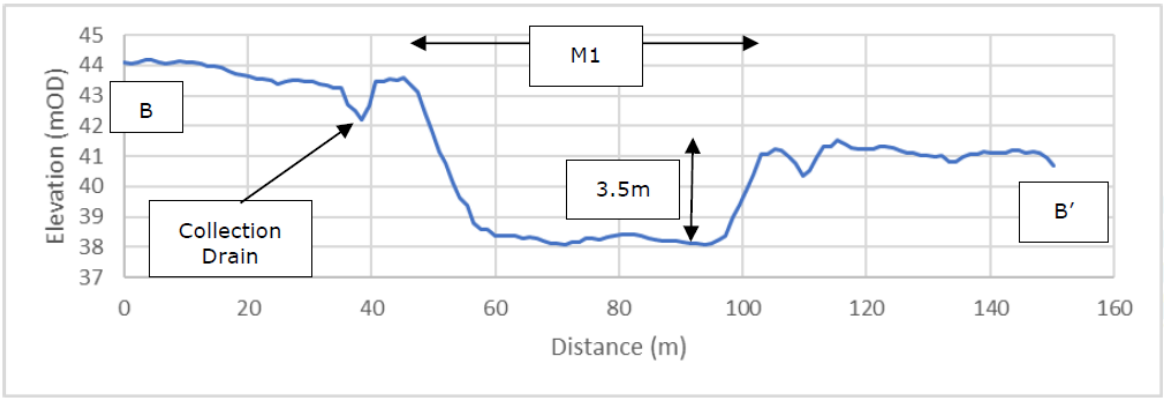


Figure 2–4: Cross-section profile across M1

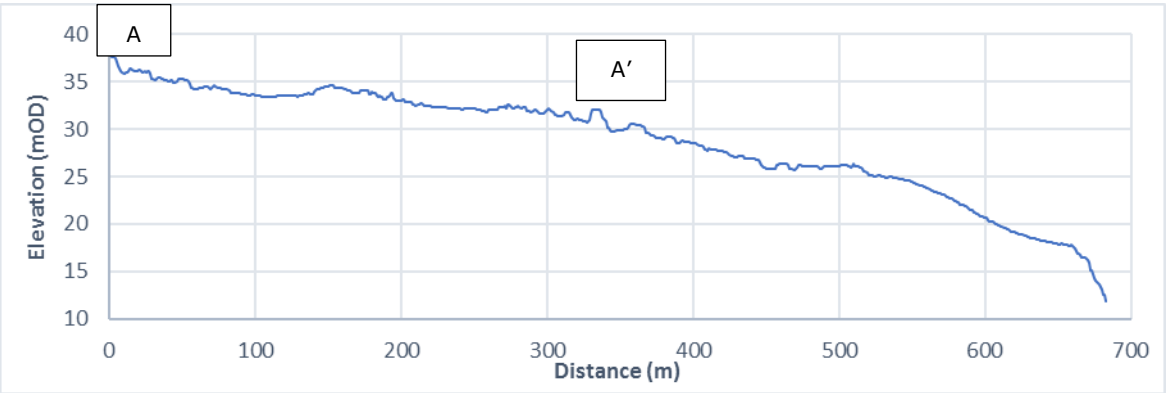


Figure 2–5: Cross-section profile south-north across the site

2.4 Site Geology

The groundwater and geological maps of the total site, provided by the Geological Survey of Ireland (GSI), have been studied and an extract of the quaternary soils map is presented in Figure 2–6. The subsoil at the proposed sites is till derived from sandstone and shales, a largely heterogenous and mixed soil type. There is alluvium deposits mapped within the northern site boundary, on the banks of the River Boyne, indicating historic fluvial flooding. This area however is proposed to be green space and is water compatible. Patches of Karstified bedrock are isolated to the historical drainage line of the un-named ditch adjacent to the eastern boundary of the site.

The underlying bedrock formation is Platin Formation. The dominant lithology is crinoidal and peloidal grainstone, locally conglomeratic.

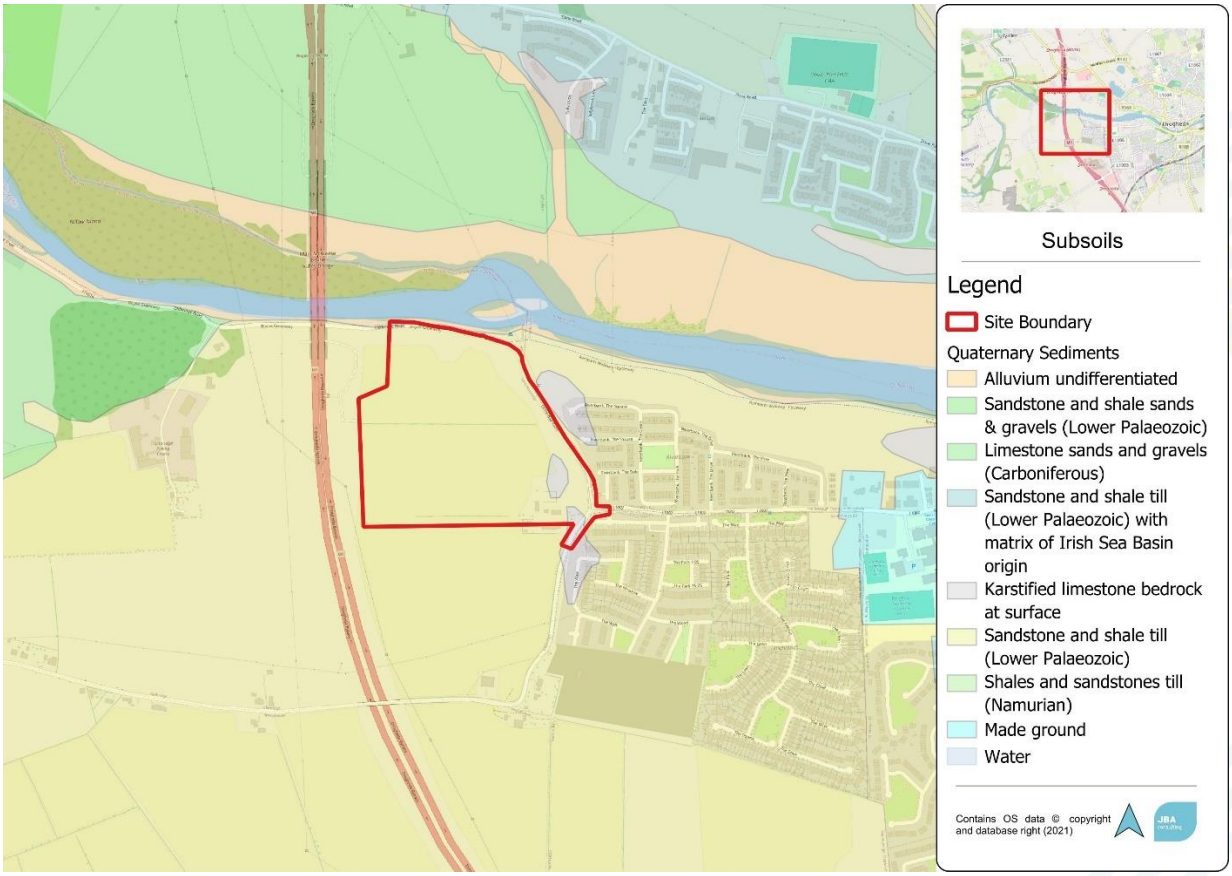


Figure 2–6: Quaternary Sediments

2.5 M1 Motorway

Prior to construction of the M1, the previous watercourse had a catchment area of approximately 1.9km^2 extending further to the south west. As shown in Figure 2–7 the Flood Studies Update (FSU) hydrological catchment still includes this larger catchment area pre-dating construction of the M1. The un-named watercourse is also shown to be crossing M1.

However, as discussed in Section 2.3, the construction of the M1 Motorway has significantly altered the topography of the natural catchment of the former watercourse. Appendix A includes construction drawings from the Northern Motorway Project (the M1) for the portion of the road crossing the prior watercourse. An extract of this is also provided in Figure 2–8. This confirms the significant cutting of the M1 road levels of at least 2.5m below natural ground levels.

The construction drawings also clearly show piped culverts intercepting the drain line of the prior watercourse along with overland flows from adjacent fields and redirects these flows into the surface water drainage network of the motorway. The culverted system then flows parallel to the road surface and discharges directly into the River Boyne.

None of the former overland flow or flows contained within the former watercourse are now able to cross the M1, resulting in the disconnection of the former watercourse into a dry ditch and reducing the catchment area to that as shown in Figure 2–3.

The above results in a significant change to flood risk presented by the stream which is fundamental to the findings from the flood risk assessment provided in Section 4.

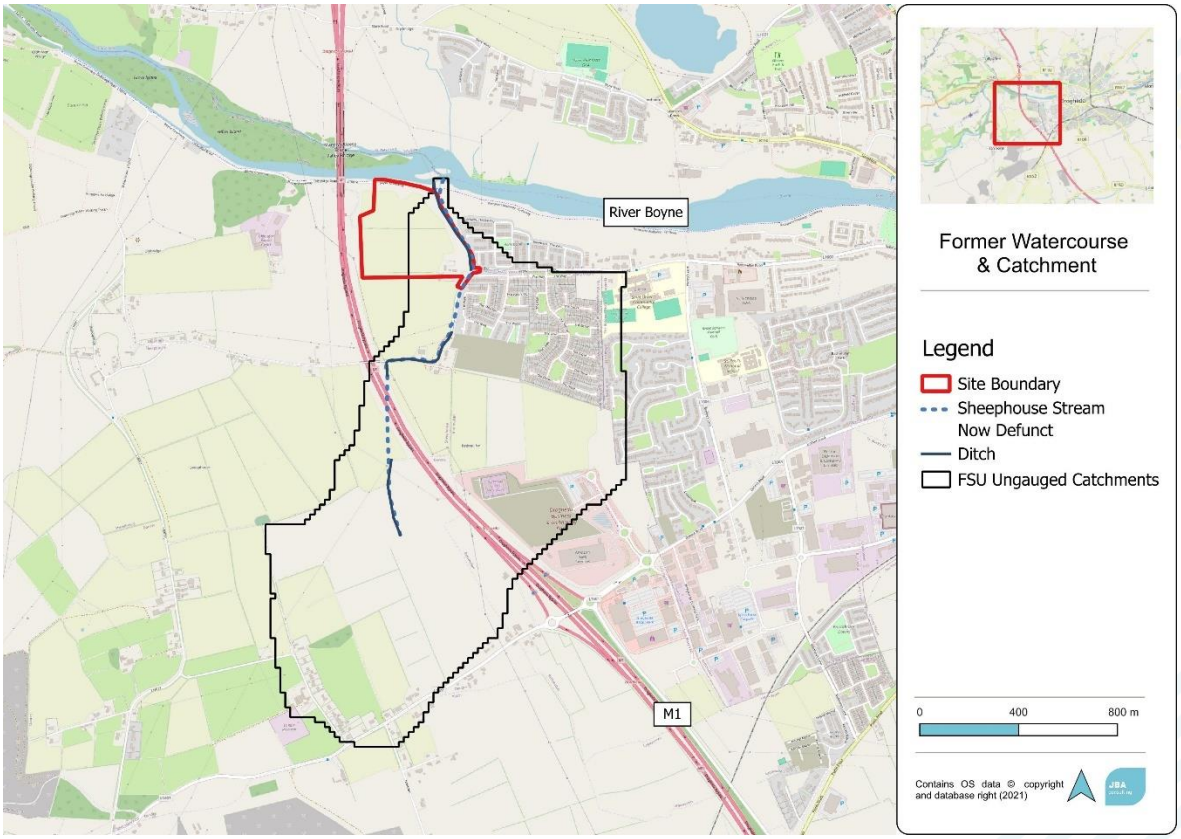


Figure 2–7: Former Watercourse & Catchment

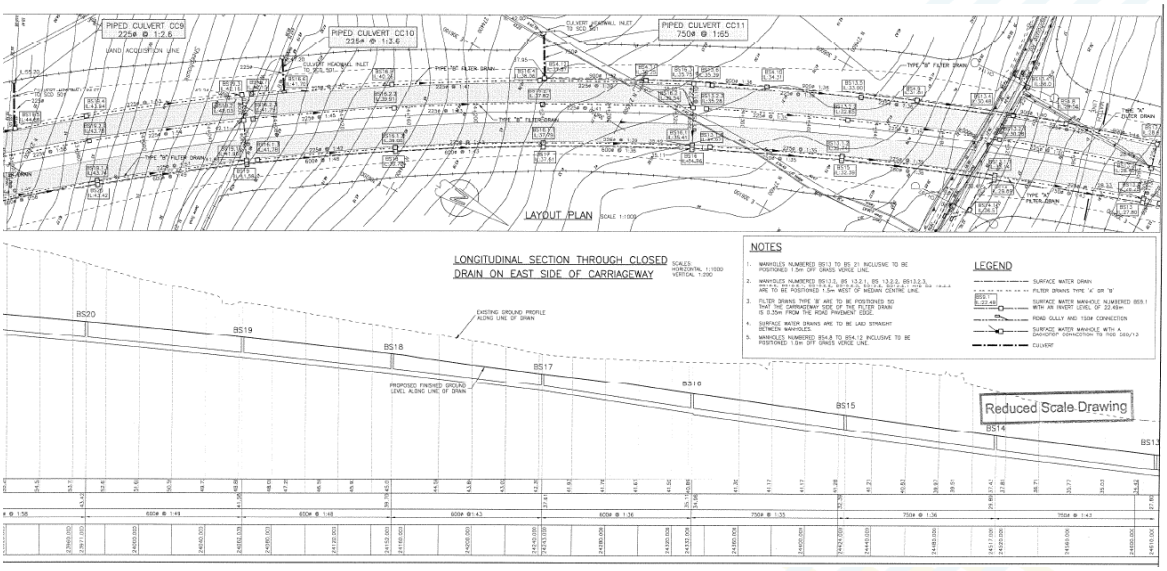


Figure 2–8: Extract of M1 Motorway construction drawings

2.6 Site Visit

A site visit was undertaken by JBA Consulting on Tuesday 5th August 2025. The site visit was able to confirm that the former watercourse has been disconnected by the M1 Motorway, verified the presence of piped culverts diverting surface water flows into the M1 surface water drainage network, and that the former watercourse adjacent to the site now exists as a dry ditch unable to convey flow.

Figure 2–9 identifies the locations and corresponding identification numbers for the photographs and details of the site visit summarised in Table 2-1.

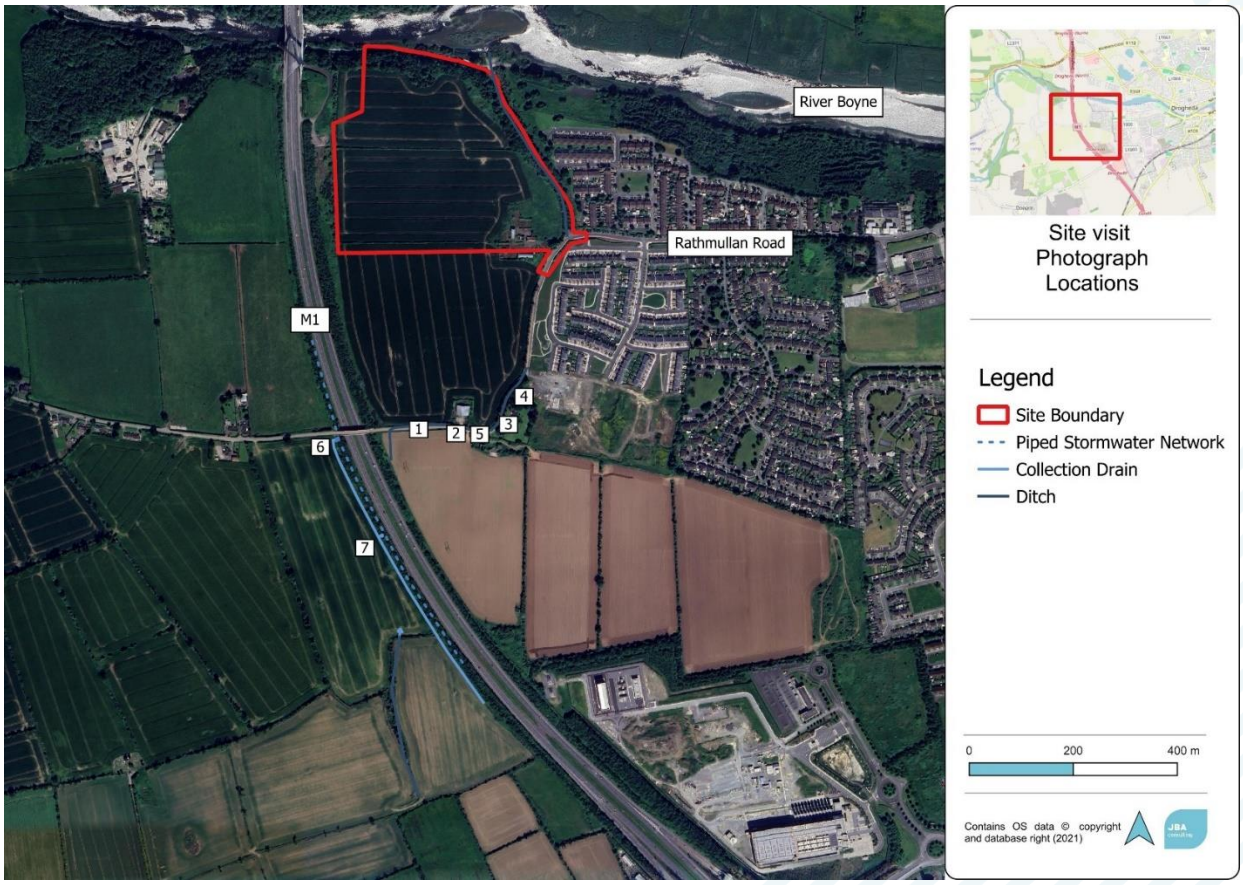


Figure 2–9: Site Visit - Photograph Locations

Table 2-1: Photographs from Site

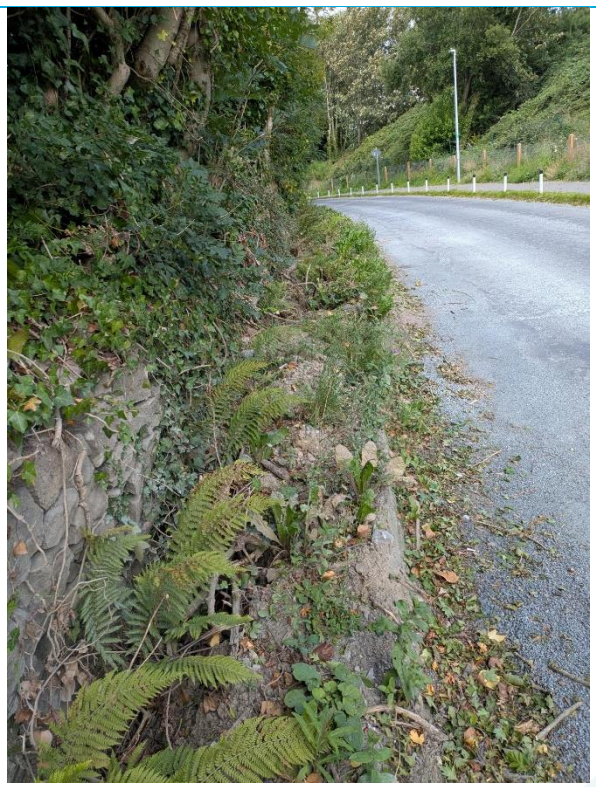
Photo No. 1 Dry ditch located at Rathmullan Road. The ditch is completely overgrown with vegetation and brambles, contained no water and shows no evidence of fluvial activity	
Photo No. 2 Access to farm sheds from Rathmullan Road across the ditch. The culvert is completely collapsed with 100% blockage. The hole at the location of collapse is clearly visible in the photograph.	

Photo No. 3 The ditch between residential properties and Rathmullan Road (looking north). The outlet of the culvert under Rathmullan Road has been completely blocked and is no longer visible. The ditch has been almost entirely infilled with garden refuse and green waste. There is no fluvial connection or possible watercourse remaining within the ditch.	
Photo No. 4 The ditch between residential properties and Rathmullan Road (looking south). The ditch has been almost entirely infilled with garden refuse and green waste.	
Photo No. 5 View of fields looking south from Rathmullan Road towards the M1. The blue motorway sign is barely visible highlighting the significant cutting of the M1 below natural ground levels. There is no ability for surface water flows to cross the M1.	

Photo No. 6 Culverted pipe entrance collecting surface water flows from the fields to the west of the M1 and redirecting into the motorway stormwater drainage network.	
Photo No. 7 Second observed culverted pipe entrance collecting surface water flows from the fields to the west of the M1 and redirecting into the motorway stormwater drainage network.	
Photo No. 8 Culverted pipe entrance of the former drain upstream of the M1	

3 Flood Risk Identification

An assessment of the potential and scale of flood risk at the site was conducted using historical and predictive information. This has identified any sources of potential flood risk to the site and reviewed historic flood information. The findings from the flood risk identification stage of the assessment are provided in the following sections. Further detail on the Planning Guidelines and technical concepts is provided in Appendix B.

3.1 Flood History

Several sources of flood information were reviewed to establish any recorded flood history at, or near the site. This includes the OPW's website, www.floodmaps.ie and information contained within the Meath CDP 2020-2026. Which highlights areas at risk of flooding through the collection of recorded data and observed flood events. Refer to Figure 3–1for location of the identified historic flood events in the area.

3.1.1 Floodmaps.ie

There is a well recorded history of flooding within Drogheda Town and surrounds however none of which has been recognised as having any impact on the site. Due to the rising topography of the site, flooding of the River Boyne at locations identified as 1, 2 and 3 in Figure 3–1 do not impact upon the site. Similarly localised recurring flooding from heavy rain, insufficient drainage capacity or stream overflow have occurred in adjacent areas but none of which have any record of affecting the site.

Table 3-1 provides further details of the recorded flood history in the general area.

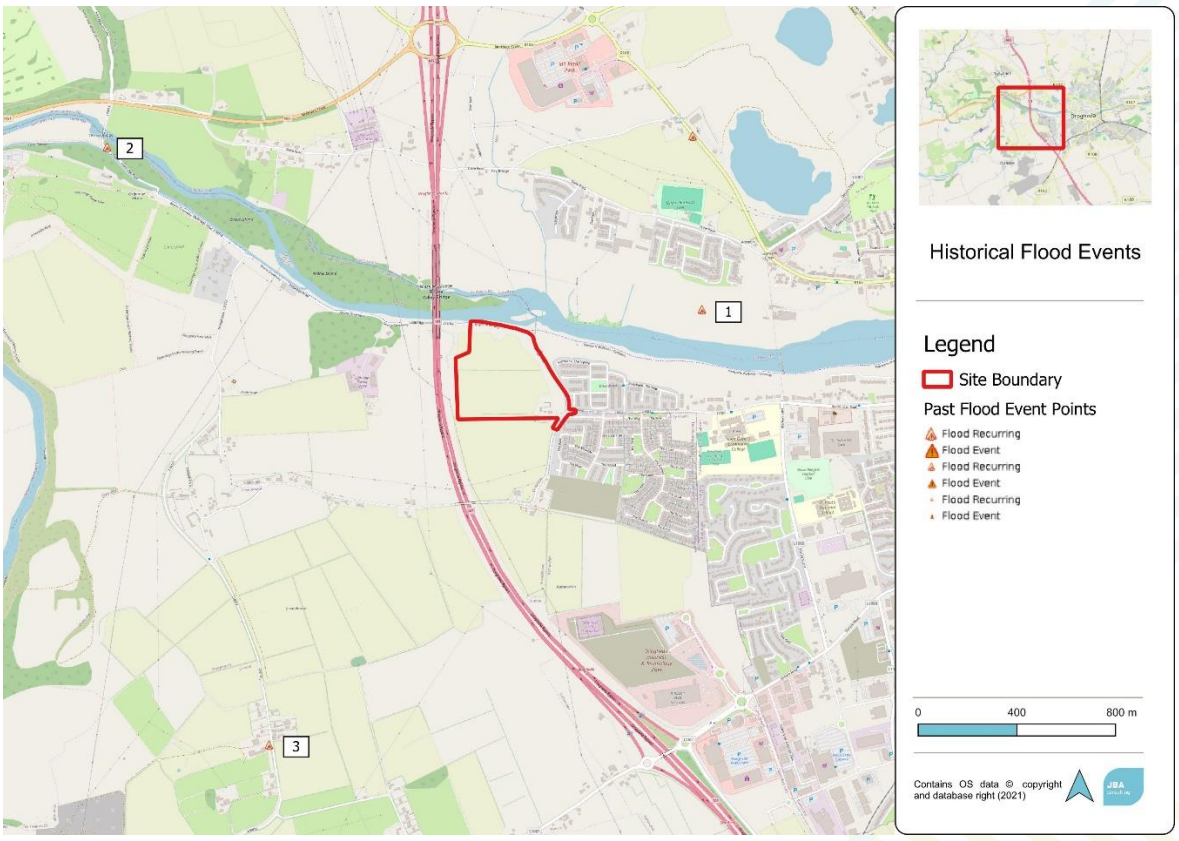


Figure 3–1: Historic Flood Map

Table 3-1: Local Flood History

Location ID	REPORT
1	***Drogheda/Louth Collection Meeting – Minutes/Map (21.02.2006/21.10.2006) – Minutes of meeting identifying areas subject to flooding in Drogheda Town Council area***
57. River Boyne, Left Bank upstream Drogheda Area subject to flooding. Part of floodplain. [Flood ID 4599] 71. Simcock's Lane/Trinity Street Junction Historically heavy rain caused flooding of two properties. Remedial works have been carried out. [Flood ID 4613] 72. Rathmullan Road Road floods due to insufficient drainage capacity. Backing up of drains results in lifting of manholes. [Flood ID 4614]  Floodmaps.ie Drogheda Collection Meeting Map Extract	
2	***Louth/Cooley/Slane Area Meeting – Minutes/Map (10.10.2005/05.04.2005) – Minutes of meeting identifying areas subject to flooding***

14. Slane Road (N51) near Curley Hole.
Stretch of road floods due to combination of river flooding and high tide. [Flood ID 3086]

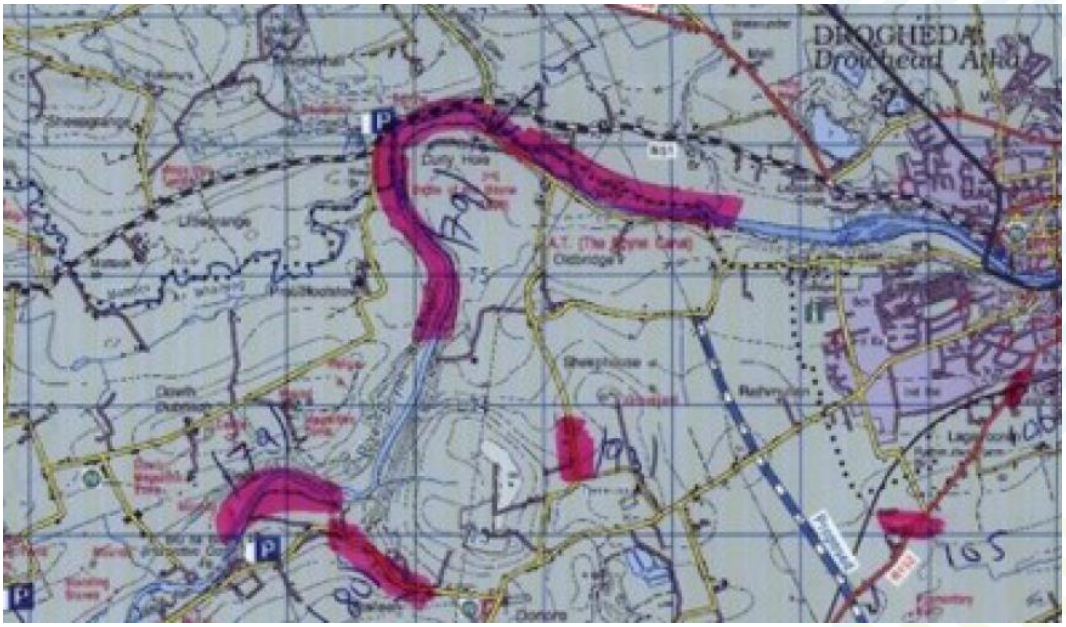
Floodmaps.ie Cooley Area Meetings – Map Extract

3	***Slane Area Engineer Meeting – Minutes/Map (15.04.2005) – Minutes of Meeting identifying areas subject to flooding***

79. 4 stretches of the Boyne from Slane to Drogheda– River Boyne flood plain. Floods 1 to 2 times per year. Roads are liable to flood.
Flood Id = 3086, 935, 936, 937

93. Sheephouse Road, Donore– Stream overflows its banks every year after heavy rain. Road is liable to flood.

105. R152 south of Drogheda – Stream overflow its banks after heavy rain every year. Road is liable to flooding.
Flood Id = 964



Floodmaps.ie Slane Area Meetings – Map Extract

3.1.2 Further Online Search

An internet search was conducted (21st August 2024) to gather any additional information of flood history at the site not found within floodmaps.ie. Whilst flooding in the Drogheda area has occurred at regularly intervals, no further information was available that indicated any flood impacts affecting the site.

3.2 Predictive Flood Mapping

The subject area has been assessed by 2 flood mapping or modelling studies which are listed below:

- Eastern CFRAM
- Meath County Council Strategic Flood Risk Assessment (SFRA)

The level of detail presented by each method varies according to the quality of the information used and the approaches involved. The Eastern CFRAM is the most detailed assessment of flood extent and supersedes the fluvial flood outlines presented by the OPW PFRA study.

3.2.1 Eastern Catchment Flood Risk Assessment (Eastern CFRAM)

The Eastern CFRAM study is the most detailed flood mapping produced for the Drogheda region. The Study commenced in June 2011 with final flood maps issued during 2016. The study involved detailed hydraulic modelling of rivers and their tributaries. Flood maps have been finalised for Drogheda and an extract of the fluvial flood map covering the site and surrounding area is provided in Figure 3–2.

Although, in the area around the proposed development the CFRAM Study does not accurately represent the current flood risk, it is the most up to date predictive study available.

The mapped CFRAM fluvial flood extents identified mottled flooding originating at the southern boundary of the site and flowing northwards across the site for all events equal to and greater than the 10%AEP. The mottled appearance indicates that predicted depths are extremely shallow and the steep slope of the site suggests that they convey overland flow across the site and are not floodplain storage.

However, the CFRAM hydraulic modelling does not replicate the existing form or function of the watercourse. Predicted flood extents have included the full former watercourse catchment to the west of the M1 as discussed within the Eastern CFRAM Study HA07 Hydrology Report and UoM07 Hydraulics Report. The CFRAM model fails to acknowledge the presence of the M1 Motorway and the discontinuation of the stream from its previous course. As discussed in Section 2 and confirmed during the site visit, the former watercourse is now redirected into the M1 surface water drainage network, leaving a disconnected and inactive dry ditch to the east of the M1. The predicted mapping produced within the ECFRAM Study is therefore not an accurate representation of fluvial flood risk to the site.

To note the CFRAM map is currently under review following an objection, submission and/or further information received.

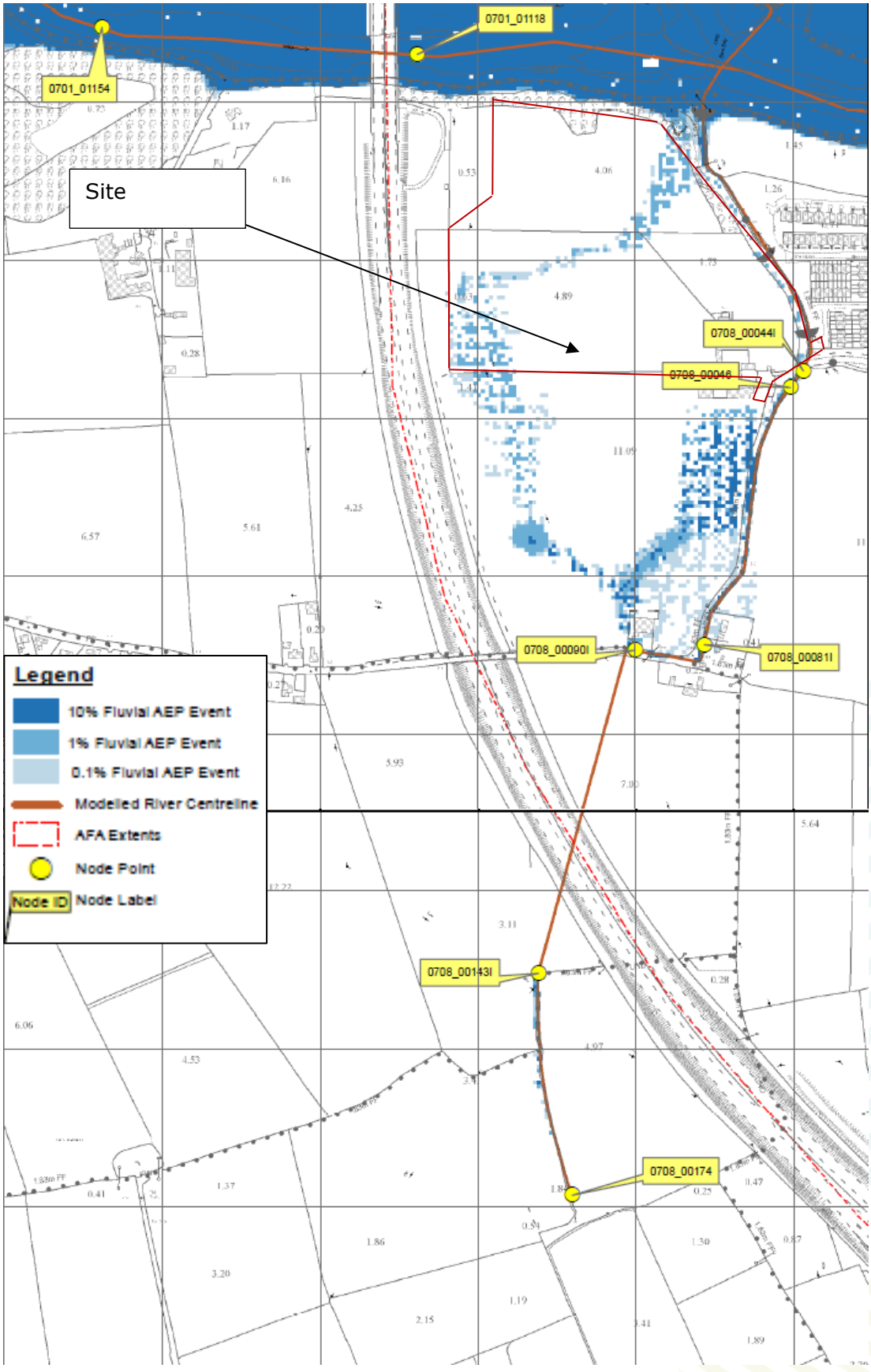


Figure 3–2: Eastern CFRAM Fluvial map

3.2.2 Flood Risk Assessment and Management Plan for the Meath CDP 2021 – 2027

The Strategic Flood Risk Assessment is designed to be updated as further flood risk information becomes available. The CFRAM mapping was incorporated into this document as shown in Figure 3–3.

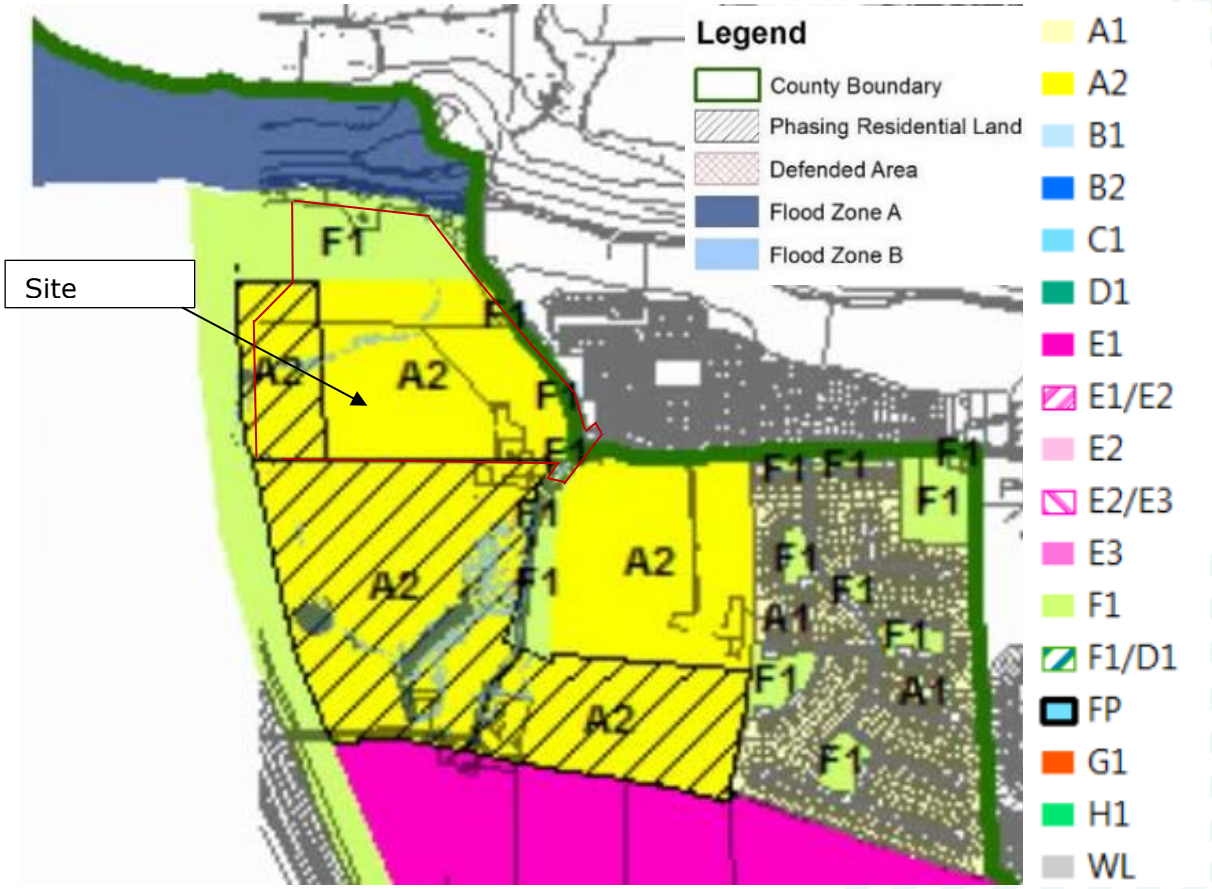


Figure 3–3: CDP Flood Zone Mapping

3.3 Sources of Flooding

The initial stage of a Flood Risk Assessment requires the identification and consideration of probable sources of flooding. Following the initial phase of this Flood Risk Assessment, it is possible to summarise the level of potential risk posed by each source of flooding. The flood sources are described below.

3.3.1 Fluvial

Prior to the construction of the M1 motorway, the primary source of flood risk to the site was fluvial flooding. This is recognised within the mapping output of the Eastern CFRAM Study. This study has been shown within Section 3.2.1 and confirmed during the site visit, to not accurately represent current conditions of the site and associated fluvial flood risk. The Eastern CFRAMs mapping does not consider the interception of the former watercourse and incorporation of flows into the stormwater drainage network of the M1 motorway. Nor does it take it account the derelict nature of the former watercourse adjacent to the site which no longer serves as a functional watercourse.

Upon detailed review of all available fluvial flood information and surface water drainage construction drawings of the M1 Motorway, it is determined within this report that fluvial flood risk from the former Sheephouse watercourse is no longer present, as there is no watercourse remaining which could be the source of flooding to the site.

Figure 2–3 identifies the upland catchment of the site as only 0.15km^2, and that a small portion of this is contained within the site boundary. The upslope area of the site should no longer be considered as a fluvial catchment as it is limited to localised surface run-off and is therefore surface water/pluvial. Additionally, site elevation levels remain sufficiently high that there is no direct risk of fluvial flooding from the River Boyne. Fluvial flood risk to the site is therefore screened out at this stage.

3.3.2 Coastal

The site has a fall in excess of 10m across the site, with the lowest proposed Finished Floor Level on the northern boundary adjacent to the River Boyne is at 19.60mOD, well above any potential coastal flood levels. Tidal flood sources have therefore been screened out at this stage.

3.3.3 Groundwater

Groundwater flooding results from high sub-surface water levels that impact upper levels of the soil strata and overland areas that are usually dry. There has been no groundwater flooding reported in this area by the OPW PFRA maps, or elsewhere.

No groundwater strikes were noted during the Site Investigation works which included trial pits and boreholes to depths of up to 8m below ground level. These works were carried out in November 2018 when it would be expected that ground water is relatively high due to the predominance of winter rainfall in Ireland. Due to the general stability of groundwater, it is considered that the site investigation is still relevant in assessing flood risk.

Groundwater is not expected to be a risk as confirmed by the OPW PFRA mapping and the geology on site. It has therefore been screened out at this stage.

3.3.4 Pluvial/Surface Water

Pluvial or surface water flooding is the result of rainfall-generated flows that arise before run-off can enter a watercourse or sewer. The OPW PFRA mapping indicates minimal potential for pluvial flood on the site, however, the poor design of a surface

water system or the inappropriate design of road, ground and finished floor levels can influence the specific surface water flood risk to a site.

To manage the potential generation of surface water run-off by the proposed development, careful consideration has been given to the overall site design. The flood risk presented by pluvial flooding has been assessed. To manage the identified pluvial flood risk, proposed mitigation measures to reduce risk of pluvial flooding are discussed in detail in Section 4.

4 Flood Risk Assessment

Following detailed review of all available flood information, groundwater and coastal sources have been screened out for this site.

Whilst two small isolated spots of pluvial flood are identified within the indicative PFRA pluvial mapping, the steep slope of the site and the mitigation measure included within the proposed design adequately address any flood risk from pluvial sources.

As discussed throughout Section 2 and summarised in Section 3.3.1, due to the outdated catchment conditions represented within the Eastern CFRAMs flood modelling and mapping incorrectly identifying fluvial flood risk to the site, it is the finding of this site-specific flood risk assessment that the Flood Zones for the site are not appropriate and the entire site should be redefined as Flood Zone C.

The Planning System and Flood Risk Management Guidelines for Planning Authorities, classes residential development as a highly vulnerable land use and is therefore appropriate for development only within Flood Zone C without the need to provide a Justification Test. This FRA confirms the proposed development footprint within the subject site as being located wholly within Flood Zone C and is therefore appropriate for residential development.

4.1 Mitigation

Although this site-specific flood risk assessment has concluded that the entire development footprint is located within Flood Zone C, mitigation measures have been considered and included within the proposed development where they may be necessary, to mitigate the risk of pluvial flooding to and from the site. The measures have been outlined in the following sections.

4.1.1 Finished Floor Levels

The lowest proposed Finished Floor Level on the northern boundary adjacent to the River Boyne is at 19.60mOD, well above any potential coastal flood levels as provided by the CFRAM study. The topographic gradient across the site minimises any natural accumulation or ponding of water on-site, however Finished Floor Levels across the site retain a minimum freeboard of at least 150mm surrounding hard surfaces including the road network.

4.1.2 Surface Water Run-Off

It is proposed to store excess storm water up to the 1 in 100-year storm event via attenuation tanks and flow control device. All stormwater discharges from the site will be limited to the greenfield equivalent and will comply with the governing Meath County Development Plan 2021-2027 policies.

The proposed development will contain permeable paving in front of each house and the pavement will consist of kerb inlets. Grass swales containing 100mm perforated pipes will be located at the western boundary of the open space area no.2 and adjacent to pavements in front of houses situated at the north and west. There will also be the same specification of swales at the central open space area number 1, at the south-eastern and south-western boundary. The central open space area no.1 will contain an underground storage area with a volume of 700m³, there will be an additional underground storage area at the northern section of the site with a volume of 1000m³ and a petrol interceptor.

It is noted the Sheephouse Stream Ditch will capture the majority of the surface water flows to the south (upgradient) of the site. Regarding the field directly to the south of the site the majority of the overland flows will be conveyed to the Sheephouse Stream, however some surface water flows will be diverted to the

proposed development. With reference to Figure 1–1, any surface water flows entering the development site will be cut off/captured by the road network and greenspace. All the residential properties along this boundary will be protected by the boundary wall. Overall, the volume of overland flows from the southern field will be minimal and does not present a pluvial flood risk to the development. Furthermore, the flow pathway will be removed following the completion of a residential development within these lands.

4.1.3 1.2m Culvert

The existing 1.2m culvert located along the eastern section of the development may present a flood risk, refer to Figure 4–1 for the location. The culvert inlet survey is provided in Figure 4–2. To appraise the flood risk the peak flows have been estimated at the culvert inlet. Based on the review of the local topography, the catchment area is 0.15km^2 and based on the rational method the peak 1% AEP flow (100-year) flood event has been estimated at 0.72m^3/s. Based on a slope of 0.035m/m the estimated peak capacity of the culvert is approximately 3m^3/s which is considerably higher than the estimated peak 1% AEP flood flow.

If complete blockage was to occur to the culvert and a surcharge event occurs, the resulting flood waters will overtop onto the Rathmullan Rd and will subsequently flow in a northerly direction along the roadway without impacting the site. Following a review of the site topography (Figure 4–1), the site is situated higher than the equivalent level alone Rathmullan Rd.

In summary, the culvert has sufficient capacity to convey the estimated 1% AEP peak flows and if a surcharging event was to occur the resulting flows will be conveyed down Rathmullan Rd without impacting the site.

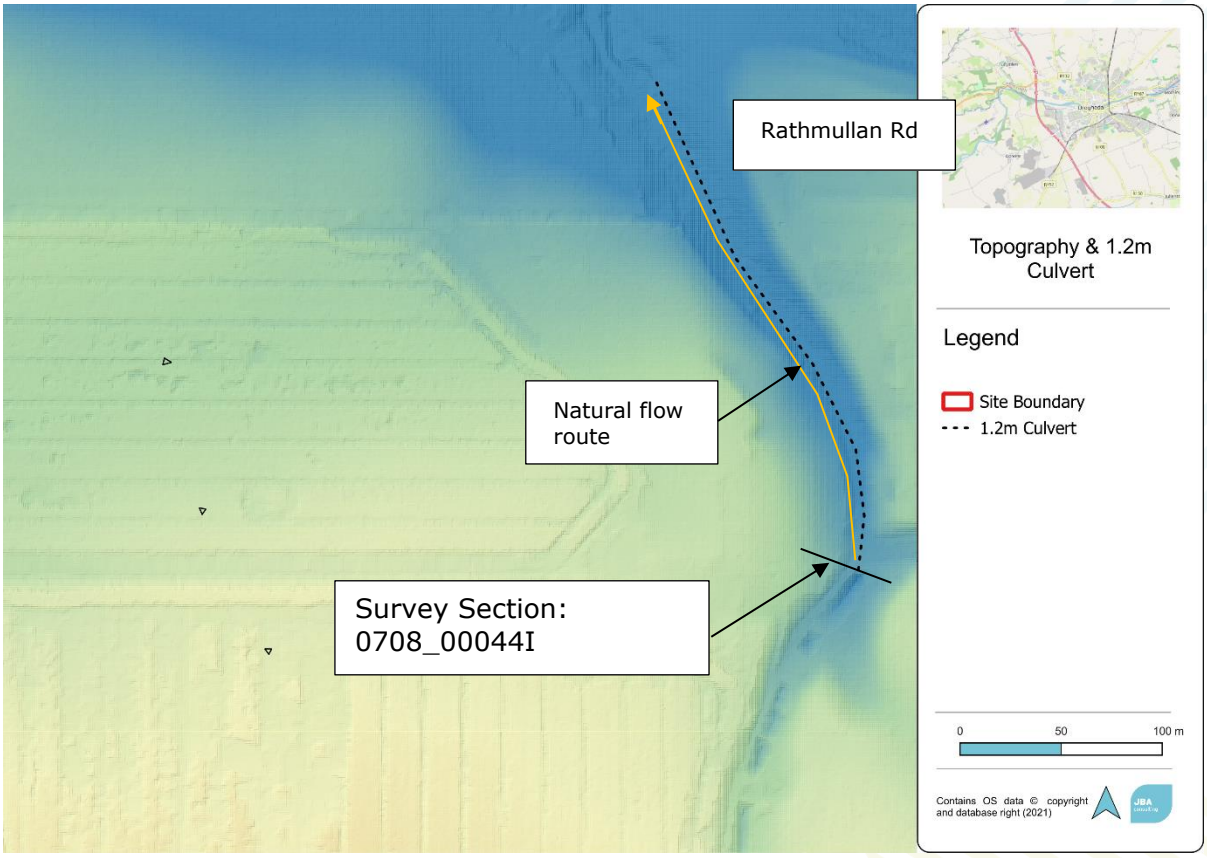


Figure 4–1: Culvert Location and Flow Path

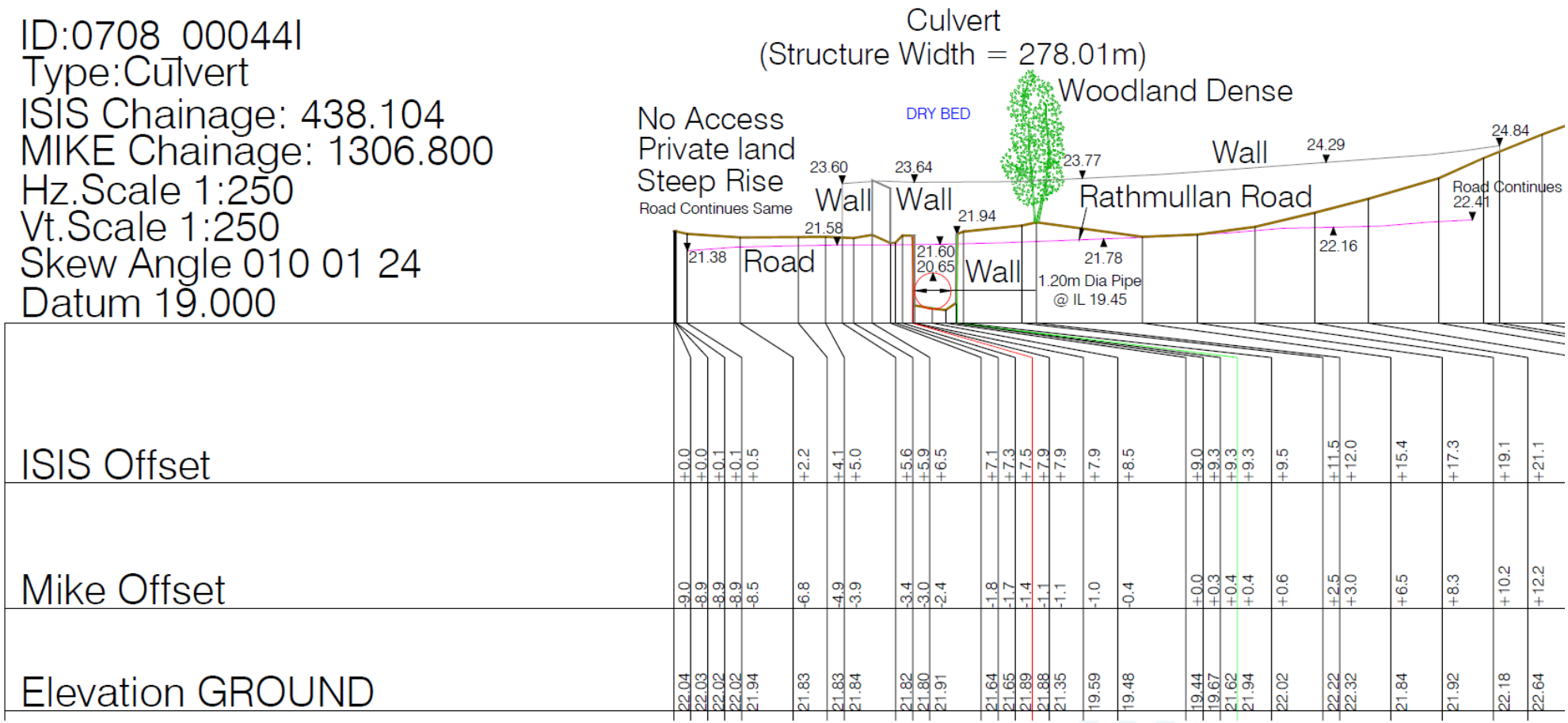


Figure 4–2: Culvert Survey Data

4.1.4 Access/ Flood Management Plan.

Access to the site is located directly from Rathmullan Road and is located within Flood Zone C. Whilst historical flooding is noted on Rathmullan Road from poor stormwater drainage further to the east, the road provides access from three separate directions to the site, ensuring safe access and egress from flood risk.

It is noted that access to the site could originate from the section of Rathmullan Rd located along the River Boyne. During a predicted 1% AEP flood event the section of the Rathmullan Rd will be inundated which could impede access to the development. As the main access route is provided to the south overall access to the site can be maintained.

Therefore, to manage the access along the River Boyne, an Emergence Management Plan has been implemented.

The following gives an outline of an Emergency Response Plan (EMP) that will be developed for the site. The main aim of the warning system is to ensure that residents are aware of a potential flood event along the River Boyne section of the Rathmullan Rd.

The following give a guide to what is required.

- Preparation - A communication system (text based or similar) will be developed by the operational management company based on trigger events (water level gauge, weather warning etc).
- Warning System- Warnings will be received from the county council, Met Eireann and local community groups of a flood event along Rathmullan Rd.
- Actions- Following the notification of a flood event, the residents will be notified of the closure of the Ruthmullan Rd and that alternative access is required.
- Post Flood Event- When the inundation has cleared along Rathmullan Rd, the residents will be notified.

4.1.5 Third Party Impacts

As the site is wholly contained within Flood Zone C and the surface water drainage system appropriately attenuates stormwater from the site, there is no increased flood risk to third parties from this development

5 Conclusion

JBA Consulting has undertaken a detailed Site-Specific Flood Risk Assessment for the proposed site development in Rathmullan Co. Dublin. The site is currently a greenfield site located on the western fringe of Drogheda, Co. Meath. It is situated south of the River Boyne between the M1 Motorway and Rathmullan Road. No historic flooding has been identified within the site boundary.

The site is elevated above the predicted flood levels along the River Boyne as confirmed the CFRAM flood maps and the flood risk from the River Boyne has been screened out. Review of the pluvial flood risk also confirms no historical or predicted fluvial flood risk to the development. This has been confirmed during the site visit.

A portion of the site is currently incorrectly classified as Flood Zone A/B with the CFRAM study, due to the outdated catchment conditions represented within the Eastern CFRAMs flood modelling and mapping. This CFRAM study does not reflect the interception of the former Sheephouse Stream and incorporation of its flows into the M1 motorway surface water drainage network.

From reviewing available sources of flooding and all relevant, available flood information, including the flood extent and depth maps produced as part of the Eastern CFRAM, the proposed development is at low risk of flooding and should be classified as Flood Zone C.

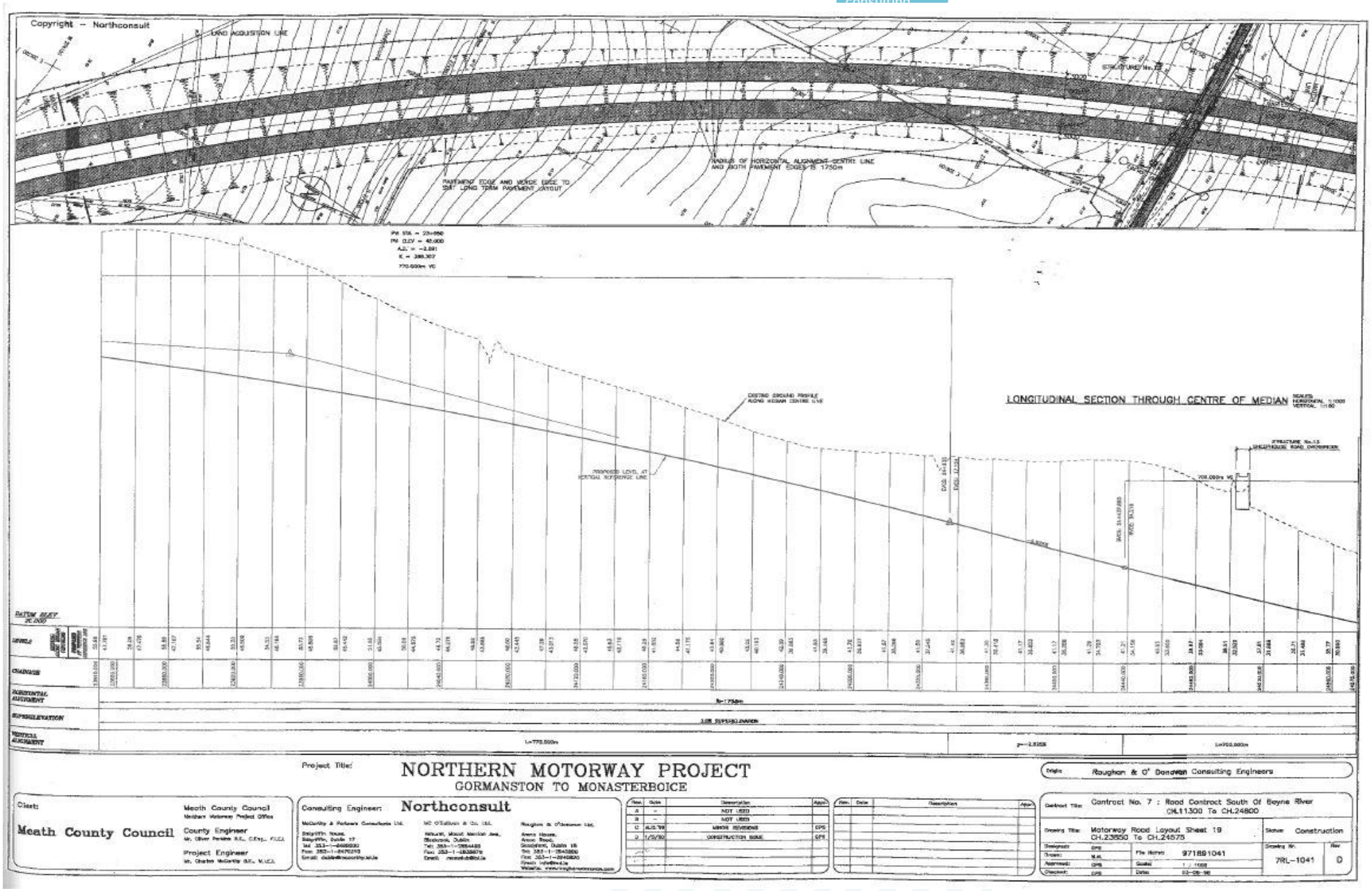
Finished Floor Levels across the site retain a minimum freeboard of at least 150mm surrounding hard surfaces including the road network. Surface water will be managed through the use of underground attenuation tanks swales and controlled discharge.

The main access for the site will be provided via a new 4 arm signalised junction with arms linking the Rathmullan Road (East).

The Flood Risk Assessment was undertaken in accordance with 'The Planning System and Flood Risk Management' guidelines and confirm that the development can manage risk in agreement with the core principles contained within the guidelines. It has been concluded that the site is located in Flood Zone C and appropriate mitigation measures has been implemented to manage flood risk to the development.

Appendices

A Appendix – Northern Motorway Project Drainage Layout


Copyright – Northconsult
LAND ACQUISITION LINE
PAVEMENT EDGE AND VERGE EDGE TO SUIT LONG TERM PAVEMENT LAYOUT
RADIUS OF HORIZONTAL ALIGNMENT CENTRE LINE AND BOTH PAVEMENT EDGES IS 1750m
EXISTING GROUND PROFILE ALONG MEDIAN CENTRE LINE
PROPOSED LEVEL AT VERTICAL REFERENCE LINE
LONGITUDINAL SECTION THROUGH CENTRE OF MEDIAN
Project Title:
NORTHERN MOTORWAY PROJECT
GORMANSTON TO MONASTERBOICE
Client:
Meath County Council
Meath County Council
County Engineer
Project Engineer
Consulting Engineer:
Northconsult
Roughan & O' Donovan Consulting Engineers
Contract No. 7 : Road Contract South Of Boyne River CH.11300 To CH.24800
Motorway Road Layout Sheet 19 CH.23850 To CH.24575
Construction
971891041
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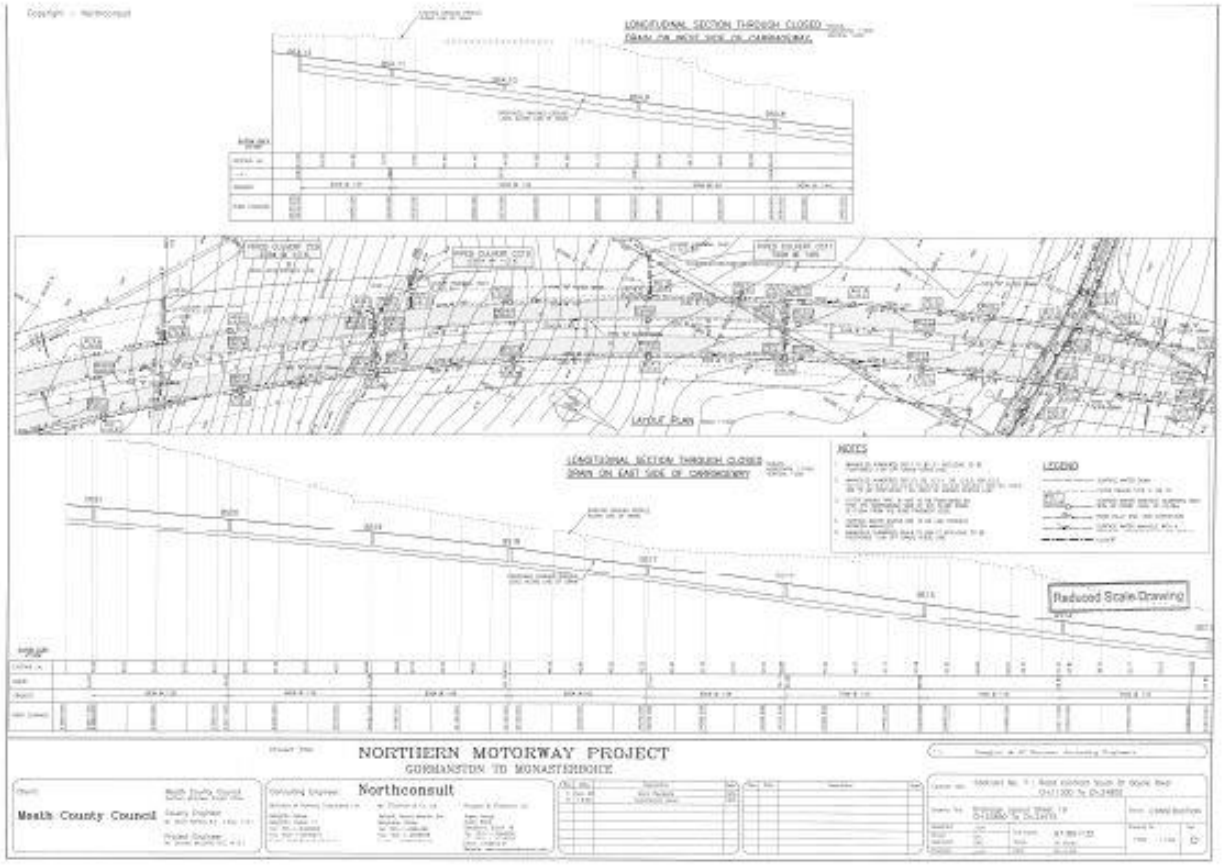
LONGITUDINAL SECTION THROUGH CLOSED
LAYOUT PLAN
LONGITUDINAL SECTION THROUGH CLOSED
NOTES
LEGEND
Reduced Scale Drawing
NORTHERN MOTORWAY PROJECT
GORMANSTON TO MONASTERBOICE
Meath County Council
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B Appendix – Understanding Flood Risk

Flood risk is generally accepted to be a combination of the likelihood (or probability) of flooding and the potential consequences arising. Flood risk can be expressed in terms of the following relationship:

Flood Risk = Probability of Flooding x Consequences of Flooding

B.1 Probability of Flooding

The likelihood or probability of a flood event (whether tidal or fluvial) is classified by its Annual Exceedance Probability (AEP) or return period (in years. A 1% AEP flood has a 1 in 100 chance of occurring in any given year. In his report, flood frequency will primarily be expressed in terms of AEP, which is the inverse of the return period, as shown in the table below and explained above. This can be helpful when presenting results to members of the public who may associate the concept of return period with a regular occurrence rather than an average recurrence interval and is the terminology which will be used throughout this report.

Table: Conversion between return periods and annual exceedance probabilities

Return period (years)	Annual exceedance probability (%)
2	50
10	10
50	2
100	1
200	0.5
1000	0.1

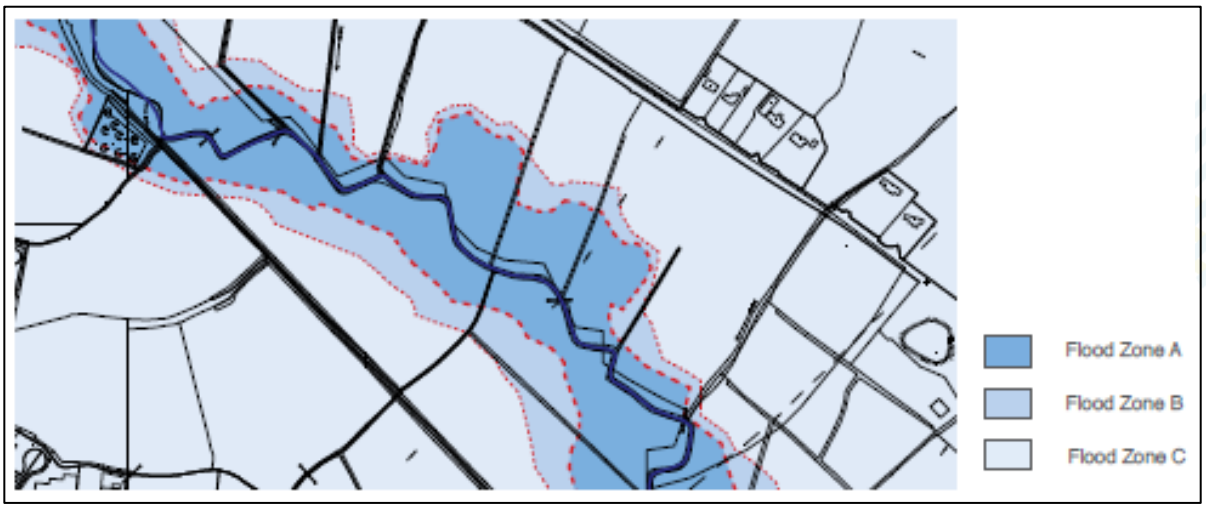
B.2 Flood Zones

Flood Zones are geographical areas illustrating the probability of flooding. For the purposes of the Planning Guidelines, there are 3 types of levels of flood zones, A, B and C.

Zone	Description
Flood Zone A	Where the probability of flooding is highest; greater than 1% (1 in 100) from river flooding or 0.5% (1 in 200) for coastal/tidal flooding.
Flood Zone B	Moderate probability of flooding; between 1% and 0.1% from rivers and between 0.5% and 0.1% from coastal/tidal.
Flood Zone C	Lowest probability of flooding; less than 0.1% from both rivers and coastal/tidal.

It is important to note that the definition of the flood zones is based on an undefended scenario and does not take into account the presence of flood protection structures such as flood walls or embankments. This is to allow for the fact that there is a residual risk of flooding behind the defences due to overtopping or breach and that there may be no guarantee that the defences will be maintained in perpetuity.

Figure: Indicative Flood Zones (OPW & DoEHLG 2009)



B.3 Consequences of Flooding

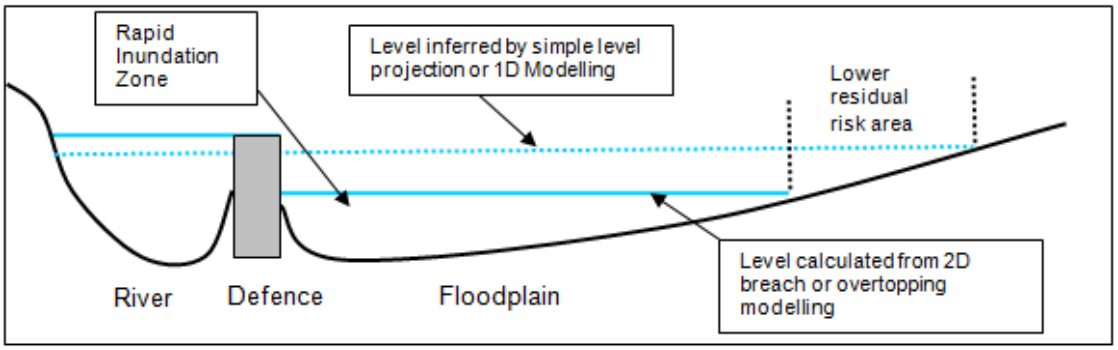
Consequences of flooding depend on the hazards caused by flooding (depth of water, speed of flow. Rate of onset, duration, wave-action effects, water quality) and the vulnerability of receptors (type of development, nature, e.g. age-structure, of the population, presence and reliability of mitigation measures etc. (non-exhaustive list))

The 'Planning System and Flood Risk Management' provides three vulnerability categories, based on the type of development, which are detailed in the Guidelines, and are summarised as:

- **Highly vulnerable**, including residential properties, essential infrastructure and emergency service facilities;
- **Less Vulnerable**, such as retail and commercial and local transport infrastructure.
- **Water compatible,** including open space, outdoor recreation and associated essential infrastructure, such as changing rooms.

B.4 Residual Risk

The presences of flood defences, by their very nature, hinder the movement of flood water across the floodplain and prevent flooding unless river levels rise above the defence crest level or a breach occurs. This is known as residual risk:



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