

# **FLOOD RISK ASSESSMENT**

**Applicant: Rockture 1 Limited**

**Site Location: Proposed Strategic Housing Development at  
Dunshaughlin East, Dunshaughlin, Co. Meath**

**Date of Report: 14<sup>th</sup> December 2018**

*Document No: HCE - 1003*

**Prepared By:**

**HYDRO****CARE**  
ENVIRONMENTAL LTD

---

## Document Control Sheet

**Project No.:** 18-519

**Project Title:** Flood Risk Assessment at Dunshaughlin, Co. Meath

**Document Number:** HCE - 1003

**Revision:** E

**Status:** FINAL

**Prepared By:**

Daniel Nolan, *BA BAI, Msc Environmental Engineering, FETAC Site Assessor, MIEI*

James Kelliher, *BSc. Environmental Management*

Adrian Bacaoanu, *BSc. App Physics*

## CONTENTS

1.0	INTRODUCTION .....	1
1.1	Site Location .....	2
1.2	Proposal Description .....	3
1.3	Planning Stage .....	4
2	LEVEL 1 – SCREENING ASSESSMENT – FLOOD RISK IDENTIFICATION.....	5
2.1	Introduction.....	5
2.2	Potential Sources of Flooding.....	5
2.3	Source – Pathway – Receptor – Risk .....	7
2.4	Discussion of Source – Pathway – Receptor Assessment.....	8
2.5	OPW Flood Hazard & Risk Maps.....	10
2.5.1	Fluvial Flooding.....	10
2.5.2	Pluvial Flooding (i.e. Rainwater Runoff Flooding) .....	11
2.6	Summary of OPW Flood Mapping .....	12
2.7	OPW Channel C1/11 – Benefitting Lands – Arterial Drainage Scheme .....	13
2.8	Previous Flood History.....	15
2.9	Vulnerabilities Class of Development.....	17
2.10	Flood Zones .....	18
2.11	Other Information .....	19
2.12	Summary of Level 1 Screening Assessment .....	19
3	LEVEL 2 SCOPING ASSESSMENT.....	20
3.1	Topographical Levels (Ordnance Datum Malin Head).....	20
3.2	Site Walkover.....	22
3.2.1	Observations.....	22
3.2.2	Discussion of Items from Walkover .....	22
3.3	Catchment Analysis .....	24
3.4	Storm Drainage Proposals .....	25
3.4.1	Proposed Drainage Design Requirements.....	25
3.4.2	Level of Service .....	26
3.4.3	River Flooding .....	26
3.4.4	Proposed Swale Design (Storage Systems).....	27
3.4.5	Flooding from Overland Flow .....	27
3.4.6	Climate Change.....	28
3.5	Proposed Foul Drainage .....	28
3.6	Access & Egress .....	29
3.7	Exacerbation of flooding.....	29
3.8	Summary of Level 2 - Scoping Assessment.....	29

4	LEVEL – 3 - DETAILED FLOOD RISK ASSESSMENT.....	30
4.1	Proposed Stormwater Drainage Detailed Assessment .....	30
4.1.1	Introduction.....	30
4.1.2	Description.....	30
4.1.3	Detailed Assessment of Proposed Drainage System .....	30
4.1.4	Other - Infiltration to Stormwater System .....	32
5	DISCUSSION & MITIGATION MEASURES .....	33
5.1	Discussion of findings .....	33
5.1.1	Fluvial Flooding.....	33
5.1.2	Pluvial Flooding.....	33
5.1.3	Groundwater Flooding.....	33
5.1.4	Foul Sewer .....	33
5.1.5	Stormwater Drainage .....	33
5.1.6	Diversion of OPW Channel C1/11.....	33
5.2	Summary of Findings .....	34
5.3	Mitigation Measures .....	34
5.4	Operation & Maintenance.....	34
6	REPORT CONCLUSION .....	35
6.1	Recommendation .....	35
7	REFERENCES.....	36
	APPENDIX A – OPW MAPPING & IRISH WATER LETTER .....	37
	APPENDIX B – STORMWATER DRAWINGS & SITE LAYOUT .....	38
	APPENDIX C – OPW FLOOD HISTORY AND BENEFITTING MAPS .....	39
	APPENDIX D – TRIAL HOLE LOGS .....	40



## 1.0 INTRODUCTION

This Flood Risk Assessment Report will detail the potential flood risk impacts associated with the proposed development. The report is structured in stages. The stages progress from Level 1 to Level 2 to Level 3.

Level 1 is carried out for all proposed developments. Subsequent to the Level 1 assessment, it shall be decided whether or not it is required to proceed to the next stage, i.e. to Level 2. The same follows in that subsequent to the Level 2 assessment it will be decided whether to proceed to Level 3.

Level 1 is Flood Risk Identification and will review the requirement for the site to be considered for a further detailed flood risk assessment.

Level 2 of the assessment is a scoping assessment and will focus on the specific development details. The scoping assessment will be a preliminary assessment which will aim to assess the probability and impact of flood waters to the site during the relevant rainfall return periods. Topographical survey data and potential flood levels will be detailed and analysed at this stage. Local knowledge of the area will be acquired from local residents, local authorities and/or other government agencies. The finished levels of the site, i.e. roads, floor levels, may be proposed at this stage. Subsequent to the Level 2 preliminary assessment, it shall be discussed and recommended whether the site requires to proceed to a more detailed Level 3 assessment.

Level 3 of the flood risk assessment procedure is a detailed flood risk analysis of the proposed development and local topography. A high degree of detail will be required with local catchment runoff calculations and modelling likely to be provided to describe and establish and mitigate, flood impact to the development.

The following guidance documents have been used in the preparation of this report:

- The Planning System and Flood Risk Management - Guidelines for Planning Authorities (November 2009) - DOEHLG and OPW
- Planning Policy Guidelines for Flooding – OPW
- Development and Flood Risk. Guidance for the Construction Industry - CIRIA C624
- Greater Dublin Strategic Drainage Study, GSDSDS (Volume 2)
- SUDS Manual C753

## 1.1 Site Location

The proposed development site is located within an agricultural land holding bordering the town of Dunshaughlin in County Meath. See Discovery Series Map from the EPA Envision Mapping Portal in Figure 1 below for location of the proposed development site.

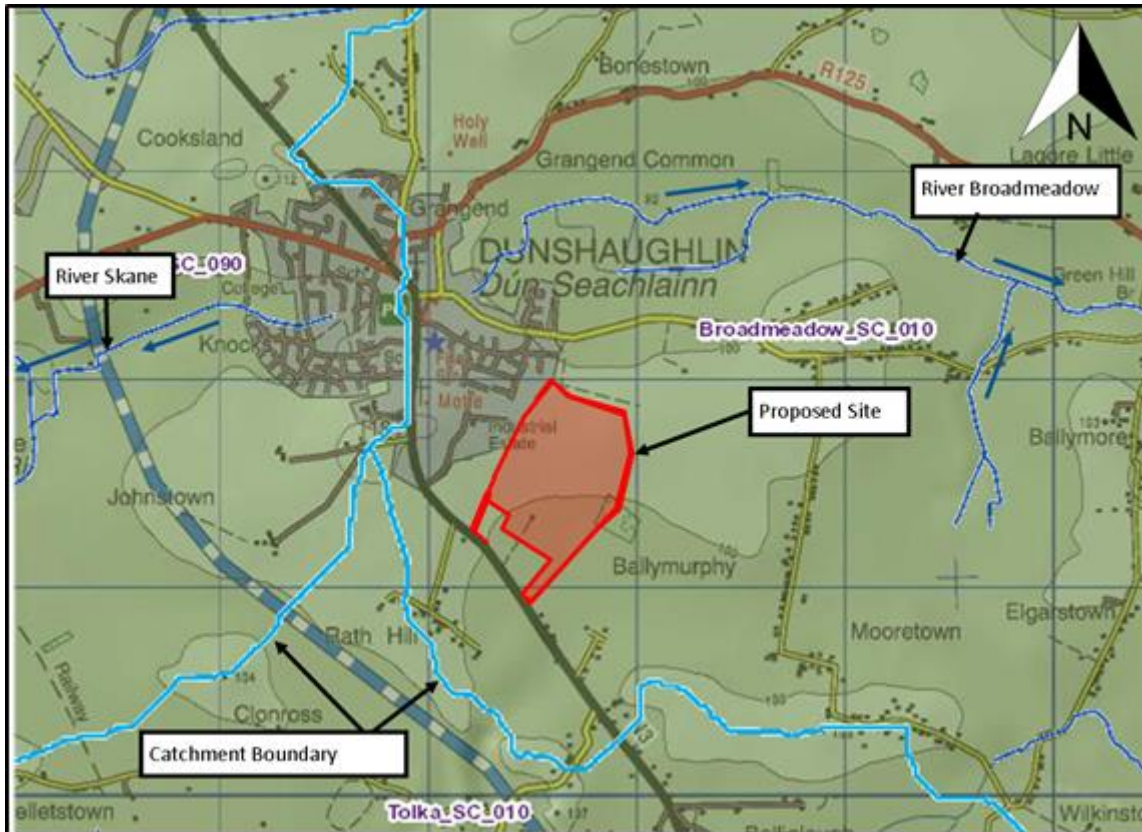


Figure 1 – Site Location. EPA ENVISION MAP

The proposed development site is within the townland of Ballymurphy and is located to the rear of 'The Willows' housing development which is currently under construction. This proposed development will be a continuation of 'The Willows' development which adjoins the proposed development to the SW. This Flood Risk Assessment Report is to accompany the planning application for a strategic housing development at this site location. The site is located within the catchment area of the Broadmeadow River as demonstrated in Figure 1 above.



Figure 2 – Aerial Photograph & Site Location

## 1.2 Proposal Description

The proposed development consists of a residential development comprising of 913 no. residential units, a neighbourhood centre, including 2 no. retail units, a café / restaurant unit, a primary healthcare / gym, a community facility and a childcare facility, all associated open space, a section of the Dunshaughlin Outer Relief Road, internal roads, cycle and pedestrian infrastructure, services and all other associated development on a site of c. 28.3 hectares.

The 913 no. residential units proposed consist of 505 no. houses (single, two, and three storey), 186 no. duplex units (three storey), and 222 no. apartments (four and five storey).

The 505 no. houses proposed consist of the following:

- 45 no. 2-bedroom houses
- 382 no. 3-bedroom houses (including 4 no. bungalows)
- 50 no. 4-bedroom houses (including 5 no. bungalows)

- 28 no. 4/5-bedroom houses (three storey)

The 186 no. duplex units consist of the following:

- 20 no. 1-bedroom duplex units
- 84 no. 2-bedroom duplex units
- 73 no. 3-bedroom duplex units
- 9 no. 4-bedroom duplex units

The 222 no. apartments consist of the following:

- 50 no. 1-bedroom apartments
- 151 no. 2-bedroom apartments
- 21 no. 3-bedroom apartments

The proposed neighbourhood centre facilities consist of a childcare facility with a GFA of 1,282 sq.m, a community facility with a GFA of 180 sq.m, 2 no. retail units with GFA of 1,000 sq.m and 190 sq.m, a café / restaurant unit with a GFA of 370 sq.m, and a primary healthcare / gym unit with a GFA of 1,040 sq.m.

The development includes the delivery of a section of the Dunshaughlin Outer Relief Road from the Phase 1 site boundary to the northern site boundary, including connections to adjacent lands, improvements to a section of the Outer Relief Road delivered with the Phase 1 development to the south, a bus bay and toucan crossing on the Dublin Road, all associated open space, boundary treatment, internal roads, cycle and pedestrian infrastructure, foul and surface water drainage, a pumping station, attenuation tanks, car and cycle parking, ESB substations, other services and all other associated development.

### 1.3 Planning Stage

This report is to accompany a new planning application.

## 2 LEVEL 1 – SCREENING ASSESSMENT – FLOOD RISK IDENTIFICATION

### 2.1 Introduction

The proposed development site is to be first screened with potential flood risks identified. This section aims to identify potential flood threats which may impact the proposed development and neighbouring lands.

### 2.2 Potential Sources of Flooding

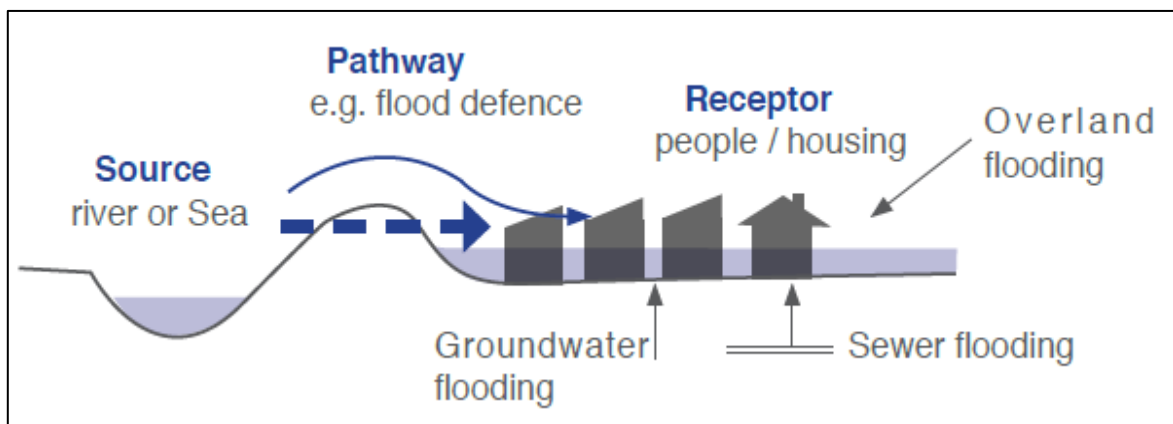


Figure 3 – Example of Source Pathway Receptor Model. Source: Flood Risk Management Guidelines – Appendix B

#### Fluvial Sources

The River Skane (Boyne Catchment) and the River Broadmeadow (Broadmeadow Catchment) both rise in Dunshaughlin. Both rivers are located downgradient of the subject site and are >500m from the proposed development. The proposed development will be located within the catchment for the Broadmeadow River. The Broadmeadow River will be assessed with regards to potential for flooding of the proposed development.

A minor watercourse traverses the site, flowing west to east which is classified as OPW Channel C1/11 and is maintained by the OPW. This channel is proposed to be diverted through the site by a swale and culvert combination and must be done so in accord with OPW requirements. The diversion of the channel must be assessed for its potential to impact on flooding within the proposed development and neighbouring upstream and downstream lands.

### Pluvial Sources

The proposed development site consists of undulating pasture fields and accumulations of rainfall runoff is possible. The proposed development will be assessed further in this report with regard to potential pluvial flood threats.

### Coastal Source

The site topographical survey determined the site datum to be over 90 metres above Ordnance Datum (Malin Head) therefore coastal flooding is not considered a risk to this development.

### Groundwater

Groundwater flooding in this reasonably elevated location is unlikely however the groundwater risk will be evaluated further in this report.

### Artificial Drainage Systems

A new stormwater management drainage system to control runoff from within the development will be proposed. The performance of the proposed stormwater drainage system will be critical to ensure runoff waters are controlled on site and do not result in flooding of the development or negatively impact the receiving watercourse with regard to flooding. The proposed stormwater drainage design must be assessed in detail to provide assurance that any potential flood impacts are mitigated. Artificial drainage systems, i.e. storm & foul sewers, will therefore be assessed with regard to their potential to cause flooding within or adjacent to the proposed development.

## 2.3 Source – Pathway – Receptor – Risk

The potential flood sources are analysed for the potential risk to the subject site should a flood event occur. See Table 1 below.

Possible Source	Possible Pathway	Possible Receptor	Likelihood	Consequence	Magnitude of Risk to Subject Site
<b>River Broadmeadow (Fluvial)</b>	Overtopping	Site (Structures & People)	Remote	Very High	Low
<b>River Broadmeadow (Fluvial)</b>	Sewers via backflow/surcharge	Site (Structures & People)	Remote	Very High	Low
<b>Existing On-Site Watercourses including OPW Channel C1/11</b>	Overland from Blockage of Culvert	Site (Structures & People)	Possible	Moderate to High	Medium to High
<b>Artificial Drainage Systems</b>	Foul & Storm Sewers	Site & neighbouring lands	Possible	Moderate to High	Medium to High
<b>Coastal</b>	Overland Sheet Flow	N/A	Remote	Very High	Very Low
<b>Coastal</b>	Sewers via backflow/surcharge	N/A	Remote	Very High	Very Low
<b>Pluvial</b>	Accumulations from Runoff	Site & neighbouring lands	Possible	Very High	High
<b>Pluvial</b>	Sewers via backflow/surcharge	N/A	Possible	High	High
<b>Groundwater</b>	Low lying locations	Site (Structures & People)	Unlikely but possible	High	Low to Medium

Table 1 – Source, Pathway, Receptor & Risk Factors



## 2.4 Discussion of Source – Pathway – Receptor Assessment

### Artificial Drains

The foul sewerage and stormwater drainage plan will be prepared by the design engineers, *Joseph O'Reilly Consulting Engineer*, for this development. The proposed stormwater drainage plan will be responsible for ensuring that the site is adequately drained and protected from flooding in rainfall events to the requirements of the Greater Dublin Strategic Drainage Study (Volume 2) and Meath County Council Requirements. It is considered that the proposed drainage systems will pose a medium to high risk to the development should best practice not be maintained in design, construction and maintenance of the proposed drainage system. Appropriate mitigation measures may be required following a detailed assessment of the stormwater drainage proposals.

### Pluvial

Pluvial flooding potential is likely to exist in low spots within the agricultural land due to the CLAY type subsoil and undulating landscape. The proposed drainage system will be required to cater for any predicted fluvial flood extents which may exist on the land in its pre-development state with attenuation required to ensure that flooding is not exacerbated elsewhere. Analysis of the site contouring and *OPW Pluvial Flood Mapping* in the following section will identify potential pluvial flood threats on the development site. An appropriately designed stormwater drainage system will cater for the risks associated within any pluvial flood risk associated with the proposed development.

### Fluvial

Fluvial flooding from the Broadmeadow River is considered unlikely and therefore fluvial flooding is considered a low risk to this site, however this risk will be explored further in the following section.

### OPW Channel C1/11

OPW Channel C1/11 is a minor watercourse which was constructed under the Arterial Drainage Scheme in 1961 by the Bord of Works. The channel was constructed to drain lands so that they were more suitable for agricultural use, such lands are termed benefitting lands. The channel traverses the site from west to east and is proposed to be diverted via a swale and culvert through the proposed development. Residual risks with regards to blockages of the culvert must be assessed in full and any predicted flood impacts to be mitigated. Proposed amendments to OPW Channel C1/11 must be in accordance with OPW requirements and OPW consent must be sought prior to construction.



Groundwater

The subsoil classification is a CLAY soil type, see figure 4 below. Transmissivity is low in CLAY subsoil with gradual increases and decreases in groundwater levels expected. WTLs were recorded at depths up to 0.6m BGL and 1.5m BGL across the development site. The new development will result in less recharge to the groundwater due to the high levels of impermeable surfacing, and runoff will be collected in attenuation systems before discharge to downstream water courses. Groundwater will not be considered a flood threat to this site and will therefore not be assessed as part of this report.

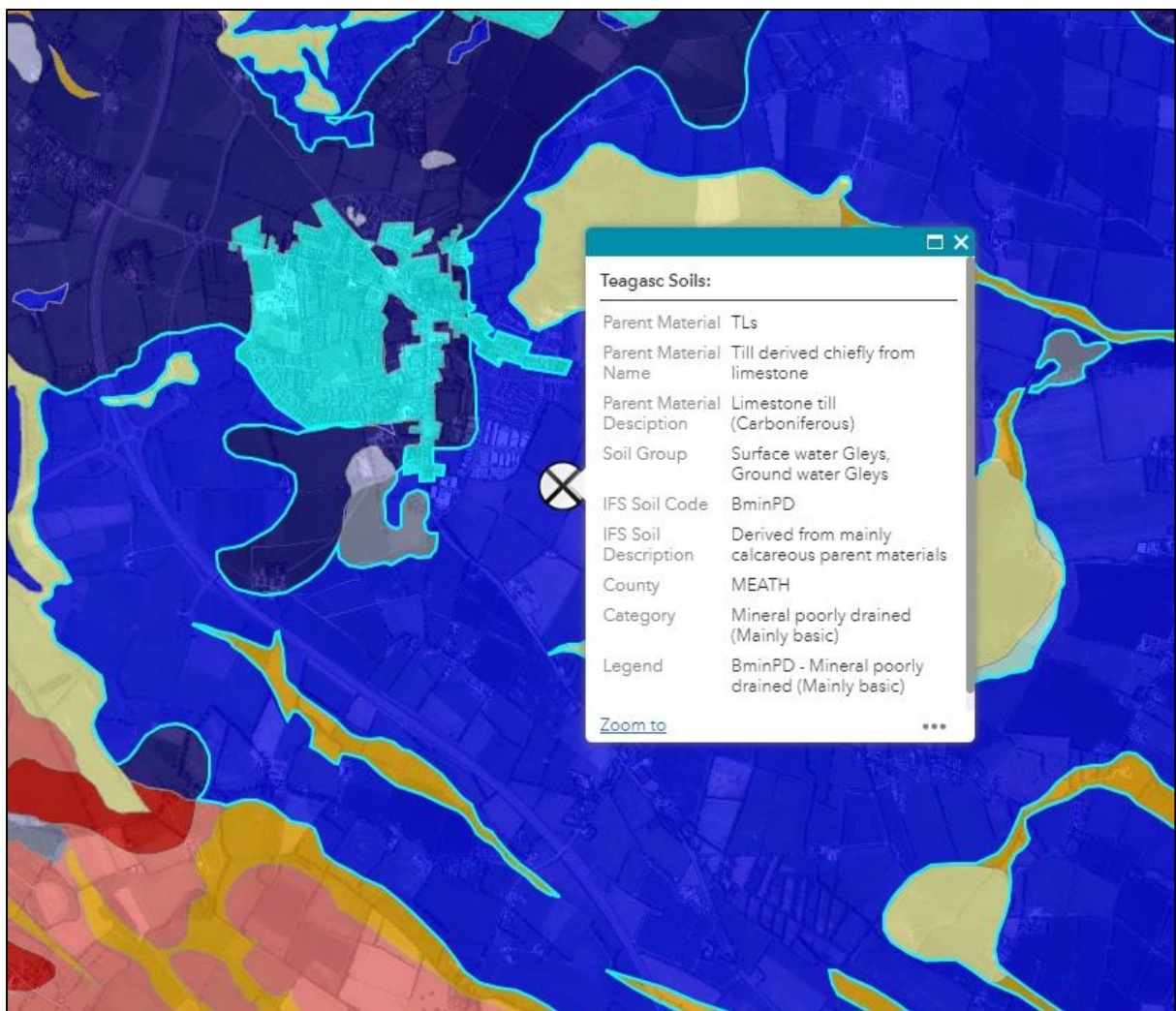


Figure 4 - Soils Map -EPA, accessed Nov, 2009)

## 2.5 OPW Flood Hazard & Risk Maps

### 2.5.1 Fluvial Flooding

The proposed development is located within the catchment of the Broadmeadow River. The proposed development will be located over 750m south of the Broadmeadow River itself.

The OPW PFRA flood mapping and the OPW CFRAM study has modelled the potential flood extents of the Broadmeadow River 750m North of the subject site, which determines the proposed development site is not located within either the 1% or 0.1% AEP fluvial flood extent of the river. The 0.1% AEP fluvial flood level is predicted by the CFRAM model to be between 94.65mOD and 92.33mOD at its closest point to the proposed development site. See figure 5 below. The existing site ground levels vary from ca. 105mOD to 99mOD which verifies the proposed development lands to be in Flood Zone C, i.e. not within the 1 in 100 or 1 in 1000-year predicted fluvial flood extent.

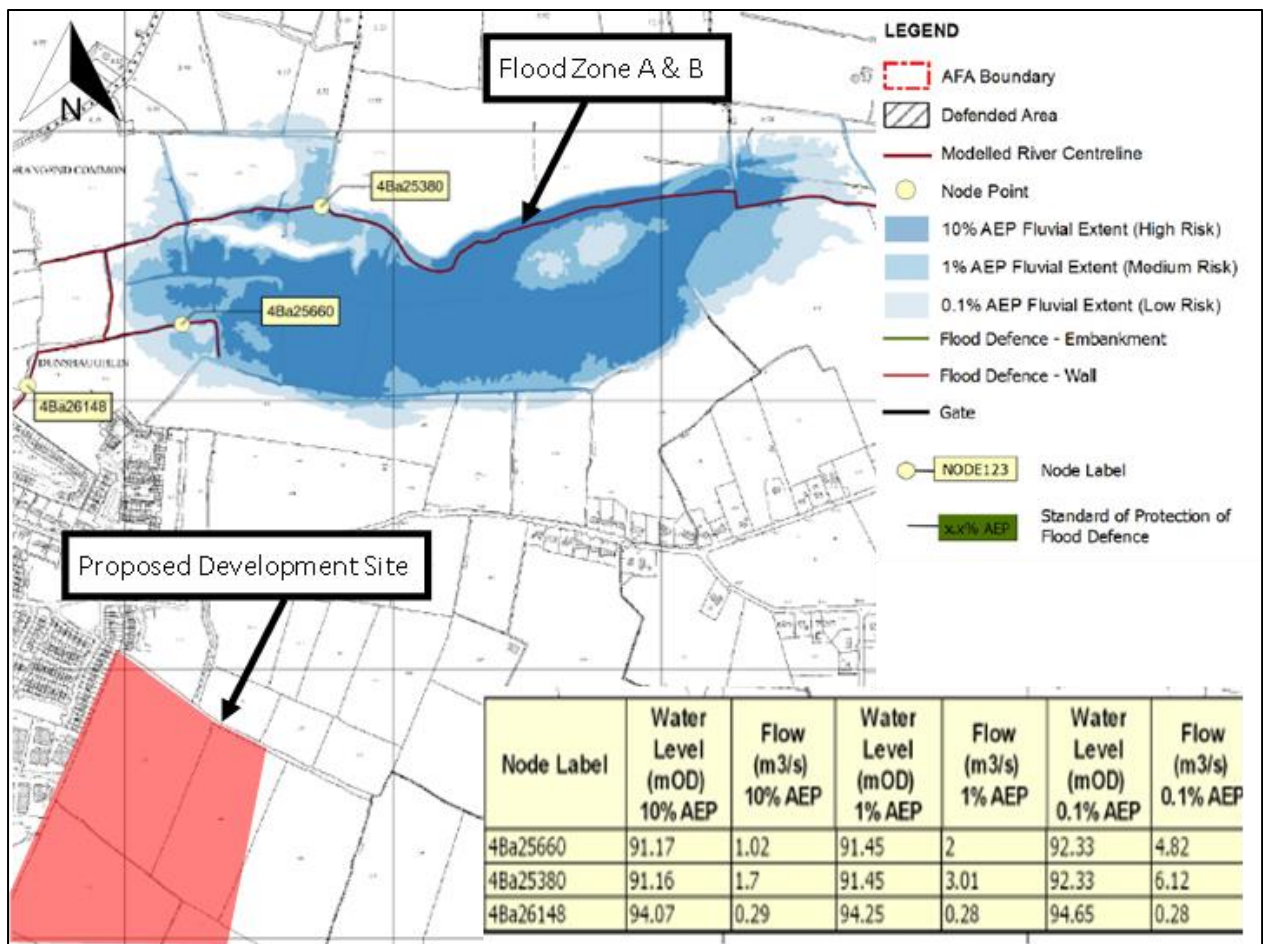


Figure 5 – Site Location & CFRAM Map (Source: OPW November 2018) – Note map ended so not all of the proposed site is shown.





Figure 6 – Satellite imagery with site and fluvial flood zone displayed

### 2.5.2 Pluvial Flooding (i.e. Rainwater Runoff Flooding)

The OPW PFRA maps indicate that some sections of the proposed development lands are within pluvial flood zones. Refer to figure 7 below. Accumulation of waters on low lying concave depressions within the existing land is possible due to the field’s natural shallow undulating gradients and the soil’s poor drainage characteristics.

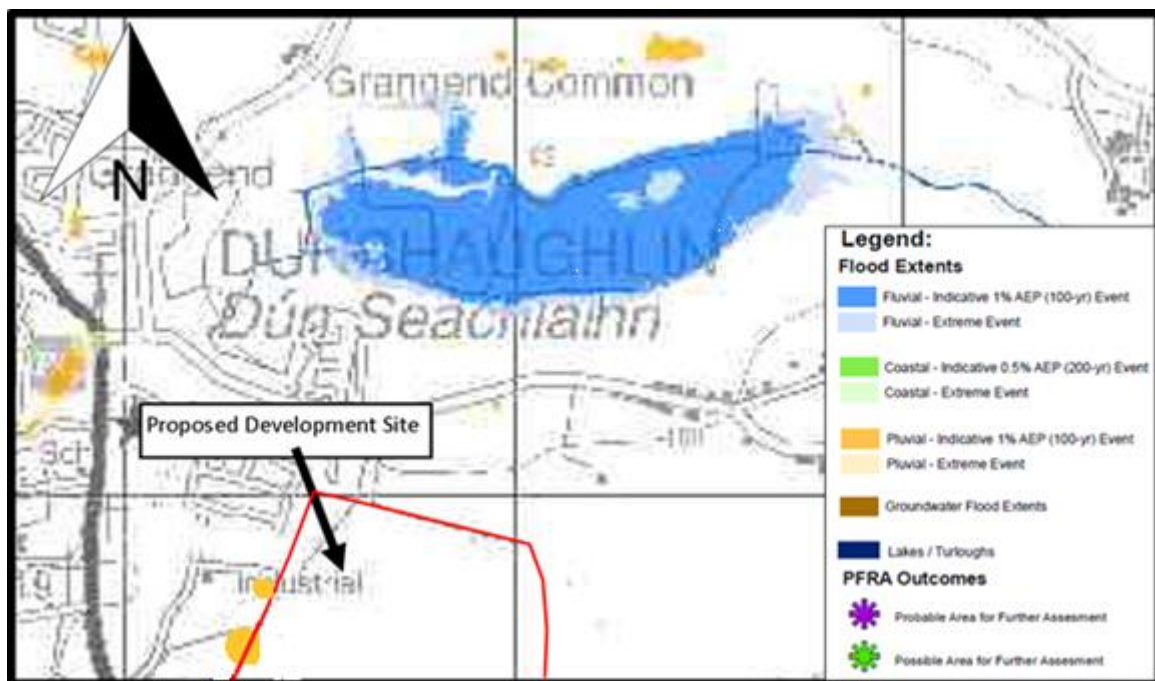


Figure 7 - Source: OPW Flood Risk Management & Planning Maps 255. Refer to Appendix A for full map.

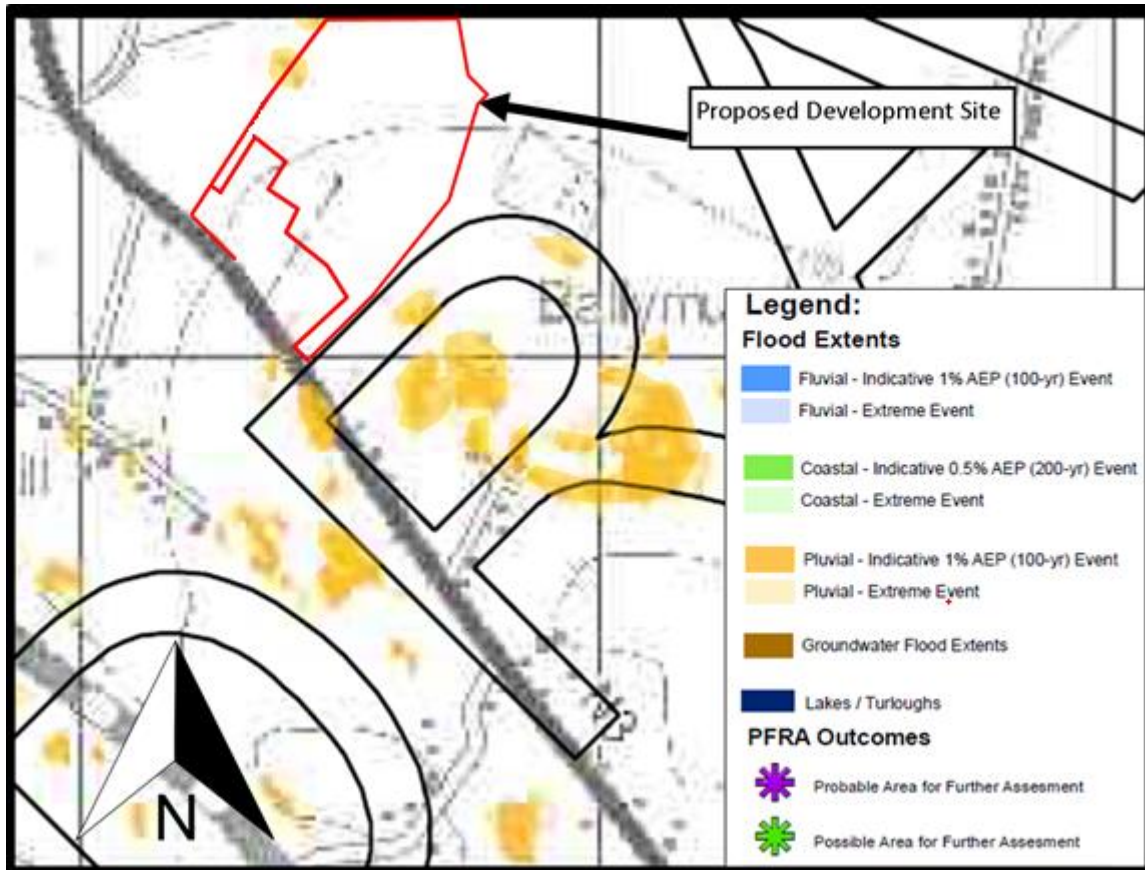


Figure 8 - Source: OPW Flood Risk Management & Planning Map 273. Refer to Appendix A for full map.

## 2.6 Summary of OPW Flood Mapping

The OPW flood risk and management mapping identifies the site within Flood Zone C and therefore not at risk of flooding from either the Broadmeadow River or the Skane River.

The OPW PFRA maps identify that spot pluvial flooding is likely to occur within the existing site in low lying concave depressions within the agricultural fields.

The OPW Flood Hazard mapping does not identify any significant flooding in recent history on this site. The maps do however identify the Dunshaughlin area to be susceptible to pluvial flooding in various other locations across the town.

## 2.7 OPW Channel C1/11 – Benefitting Lands – Arterial Drainage Scheme

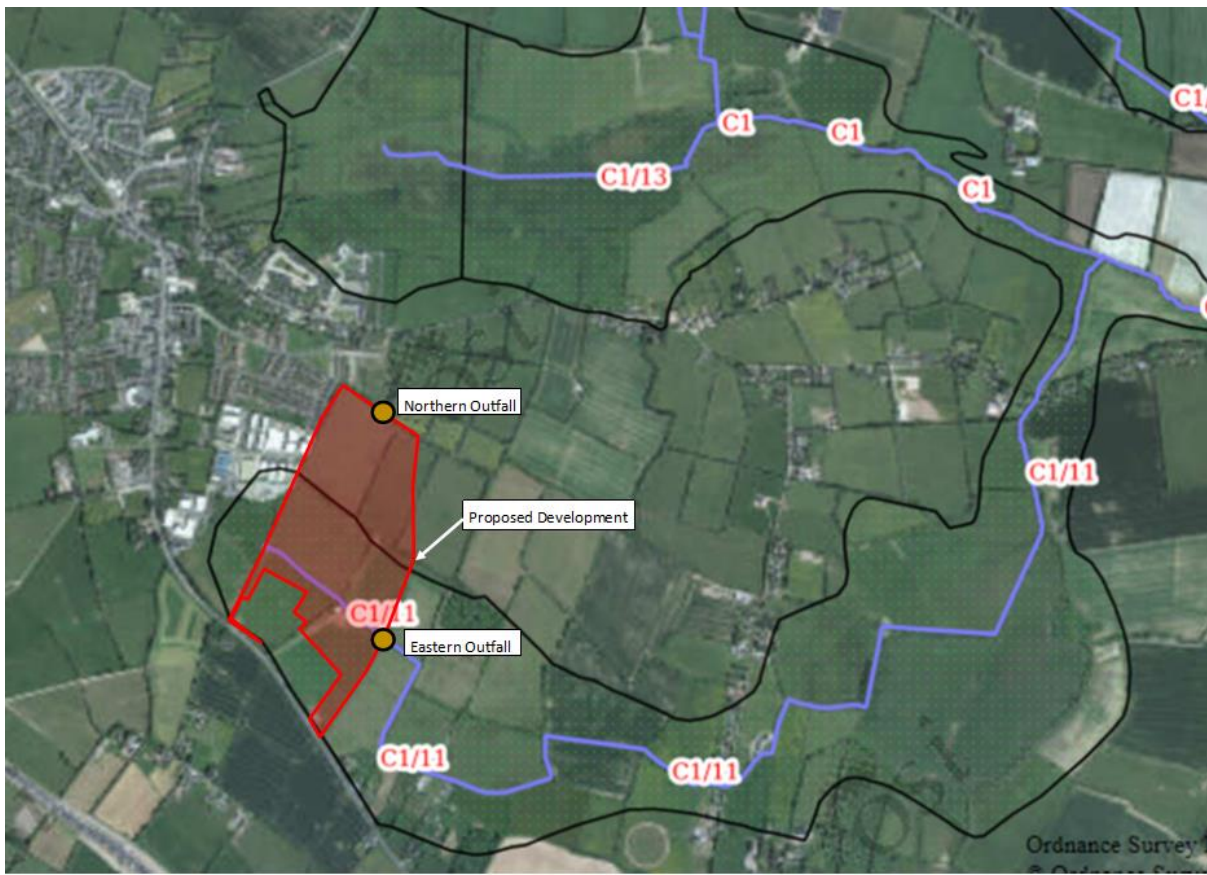


Figure 9 – OPW Benefitting Lands Map

The proposed site is partially located within benefitting lands, refer to OPW Benefitting Lands map above. Note that this particular OPW map above incorrectly marks the route of the OPW Channel C1/11. The OPW Broadmeadow Catchment Department have confirmed the actual route to be shown on the original OPW map drawn in 1961 which is included in Appendix C. Refer to corrected OPW Channel C1/11 route on figure 10 below.

The OPW Broadmeadow Catchment Management Dept, has provided information regarding flooding within the locality which shows no flood events within 2.5km of the site (See Appendix C).

It is evident from the drawn sections through the OPW Channel C1/11 (Appendix C) as part of the Broadmeadow & Ward CMT Drainage Schemes 1961, that bedrock has been removed from within the downstream channel which is likely to have had a long-term positive drainage impact, benefitting the upstream proposed development in the recent past and into the future. The OPW Channel C1/11 rises within the site boundary and drains a small upstream catchment of <math><0.2\text{ km}^2</math> Hectares which consists predominantly of a business park. The channel drains agricultural lands within the site boundary of



the proposed development and does not benefit any lands outside of the site boundary except for the upstream business park. The proposed diversion of the channel must take into account the upstream catchment. The remainder of the agricultural lands to which the OPW Channel C1/11 currently drains will be part of the new development and will be positively drained by the proposed stormwater drainage system.

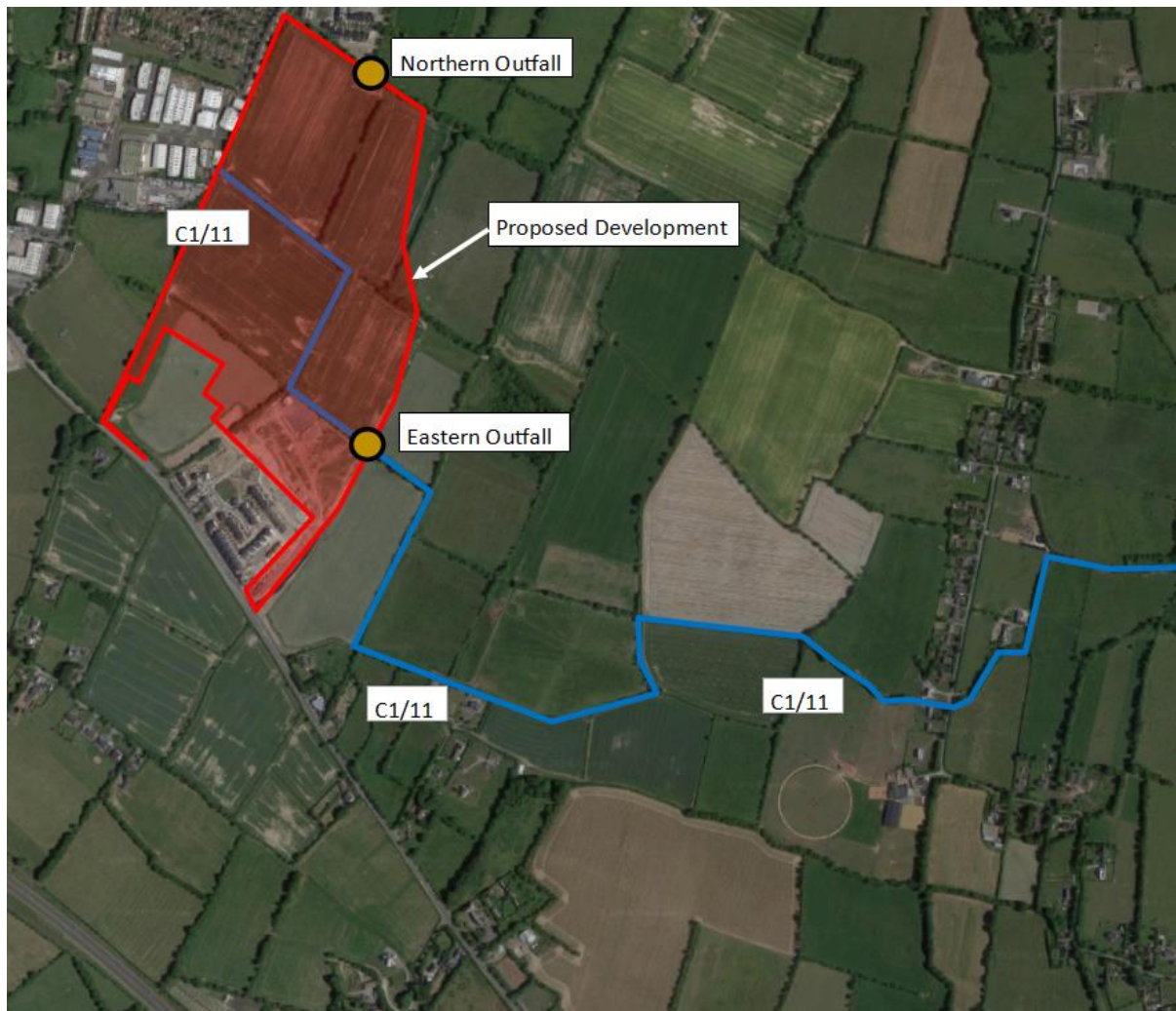


Figure 10- Actual Route for OPW Channel C1/11

## 2.8 Previous Flood History

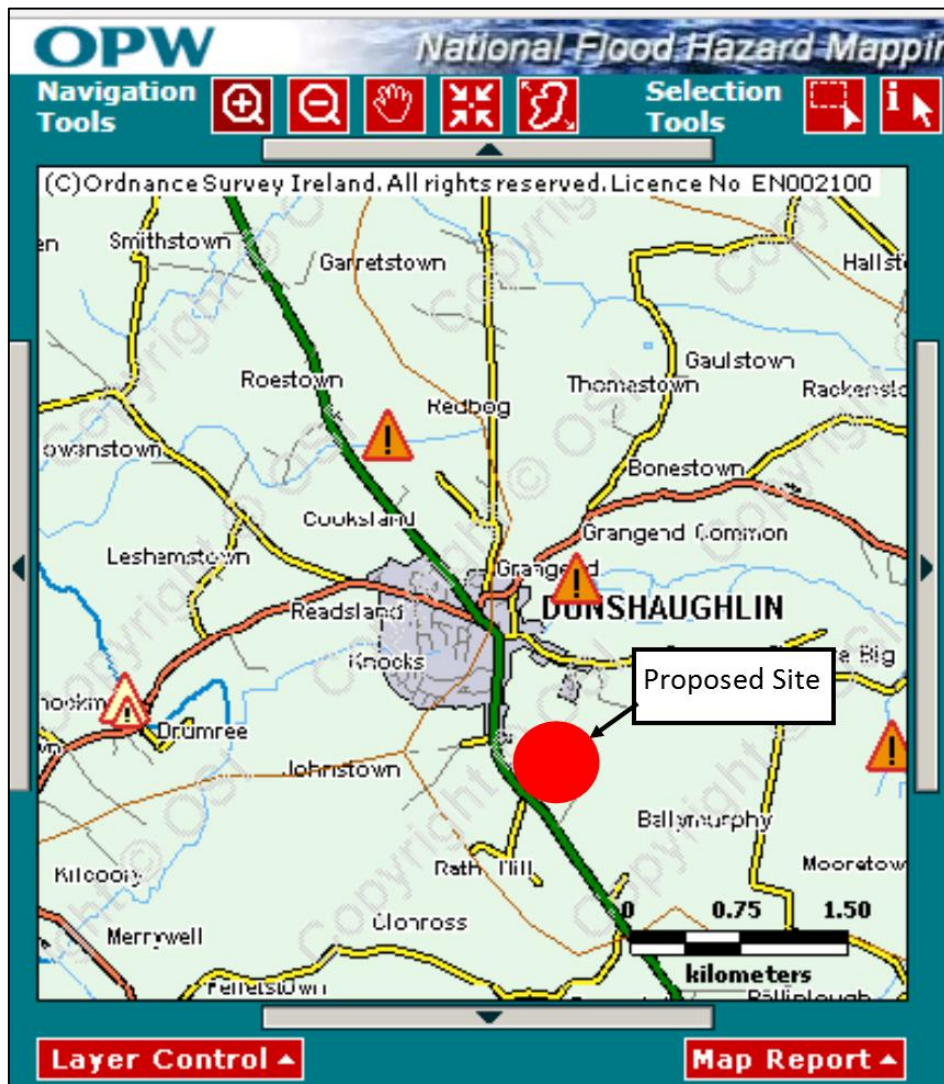


Figure 11 - OPW Flood Hazard Map

The OPW Flood Hazard Mapping identifies a flood event in November 2000, which resulted in considerable surface water accumulation within the Dunshaughlin area. Figure 12 below is an aerial photo taken following the rainfall event. No major flooding is evident at the proposed development although it is difficult to see every section of the proposed site on the photograph.

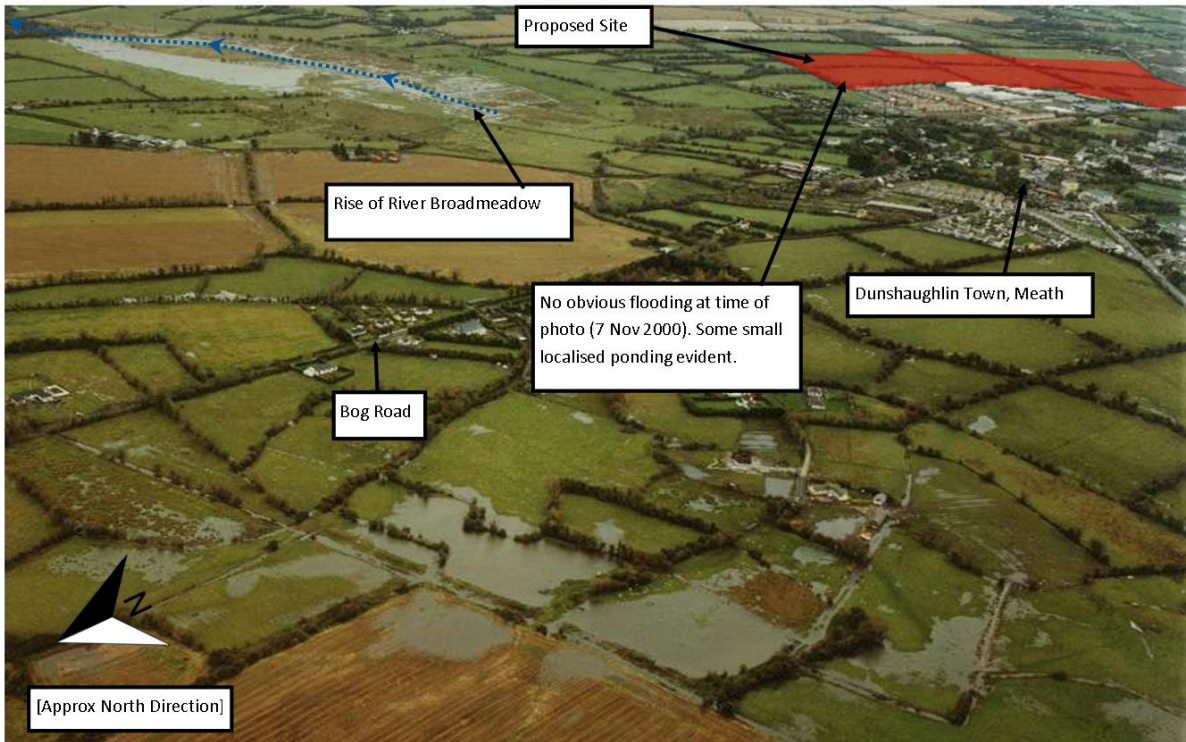


Figure 12 – Aerial Photograph of Flood Event in November 2000 (OPW Flood Hazard Map)



## 2.9 Vulnerabilities Class of Development

Vulnerability class	Land uses and types of development which include*:
<b>Highly vulnerable development (including essential infrastructure)</b>	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children’s homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.
<b>Less vulnerable development</b>	Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions; Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans; Land and buildings used for agriculture and forestry; Waste treatment (except landfill and hazardous waste); Mineral working and processing; and Local transport infrastructure.
<b>Water-compatible development</b>	Flood control infrastructure; Docks, marinas and wharves; Navigation facilities; Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location; Water-based recreation and tourism (excluding sleeping accommodation); Lifeguard and coastguard stations; Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan).
*Uses not listed here should be considered on their own merits	

Table 2 - Vulnerability Classification for Several Development Types (Source: The Planning System and Flood Risk Management: Guideline for Planning Authorities, 2009)

The proposed development will consist of a 913 residential units, and is considered a highly vulnerable development in accordance with The Planning Systems and Flood Risk Management: Guidelines for Planning Authorities OPW, 2009.

### 2.10 Flood Zones

The Planning Systems and Flood Risk Management: Guidelines for Planning Authorities 2009, categorizes the probability of flooding into three sections.

- **Flood Zone A: High Probability**  
In Flood Zone A the probability of flooding from rivers and the sea is highest. Greater than 1% or 1 in a 100 for river flooding, or 0.5% or 1 in 200 for coastal flooding.
- **Flood Zone B: Moderate Probability**  
In Flood Zone B the probability of flooding from rivers and sea is moderate. It is between 0.1% and 1% or 1 in 1000 and 1 in a 100 for river flooding and between 0.1% and 0.5% or 1 in 1000 and 1 in 200 for coastal flooding.
- **Flood Zone C: Low Probability**  
In Flood Zone C the probability of flooding from rivers or sea is lowest. Less than 0.1% or 1 in a 1000 for coastal and river flooding. All areas of a plan not explicitly shown in Flood Zone A or B fall in Flood Zone C.

The Planning Systems and Flood Risk Management: Guidelines for Planning Authorities 2009 provides a table to decide which class of development is appropriate to each flood zone or if a further justification test is needed. Please see Table 3 below.

	Flood Zone A	Flood Zone B	Flood Zone C
Highly vulnerable development (including essential infrastructure)	Justification Test	Justification Test	Appropriate
Less vulnerable development	Justification Test	Appropriate	Appropriate
Water-compatible development	Appropriate	Appropriate	Appropriate

Table 3 - Vulnerability Vs. Flood Zone (Source: Planning Systems and Flood Risk Management: Guidelines for Planning Authorities 2009)

The proposed development is located within Flood Zone C and is considered an appropriate type development for the land located.

## 2.11 Other Information

An Environmental Impact Assessment Report Chapter relating to Soil and Water Environmental Impacts has been carried out by Hydrocare Environmental Ltd for the proposed development. Trial hole logs are included in Appendix D From a flood risk analysis perspective, the key findings of report are outlined below:

- Soil is classified as CLAY across the entire subject lands.
- Water table levels vary between 0.6m & 1.5m below existing ground levels.

## 2.12 Summary of Level 1 Screening Assessment

- The proposed Development is located within Flood Zone C and is considered to be at a low risk of flooding from fluvial or coastal sources.
- The proposed development is considered appropriate for this site location.
- The minor watercourse, OPW Channel C1/11 will require to be diverted through the development site and will need to be further assessed with regard to residual flood risk management i.e. from blockages, in the following sections of this report.
- Further analysis of the proposed stormwater drainage system will be required to ensure that the designed stormwater drainage system is suitably robust.

### 3 LEVEL 2 SCOPING ASSESSMENT

#### 3.1 Topographical Levels (Ordnance Datum Malin Head)



Figure 13 – Site Location with Contours

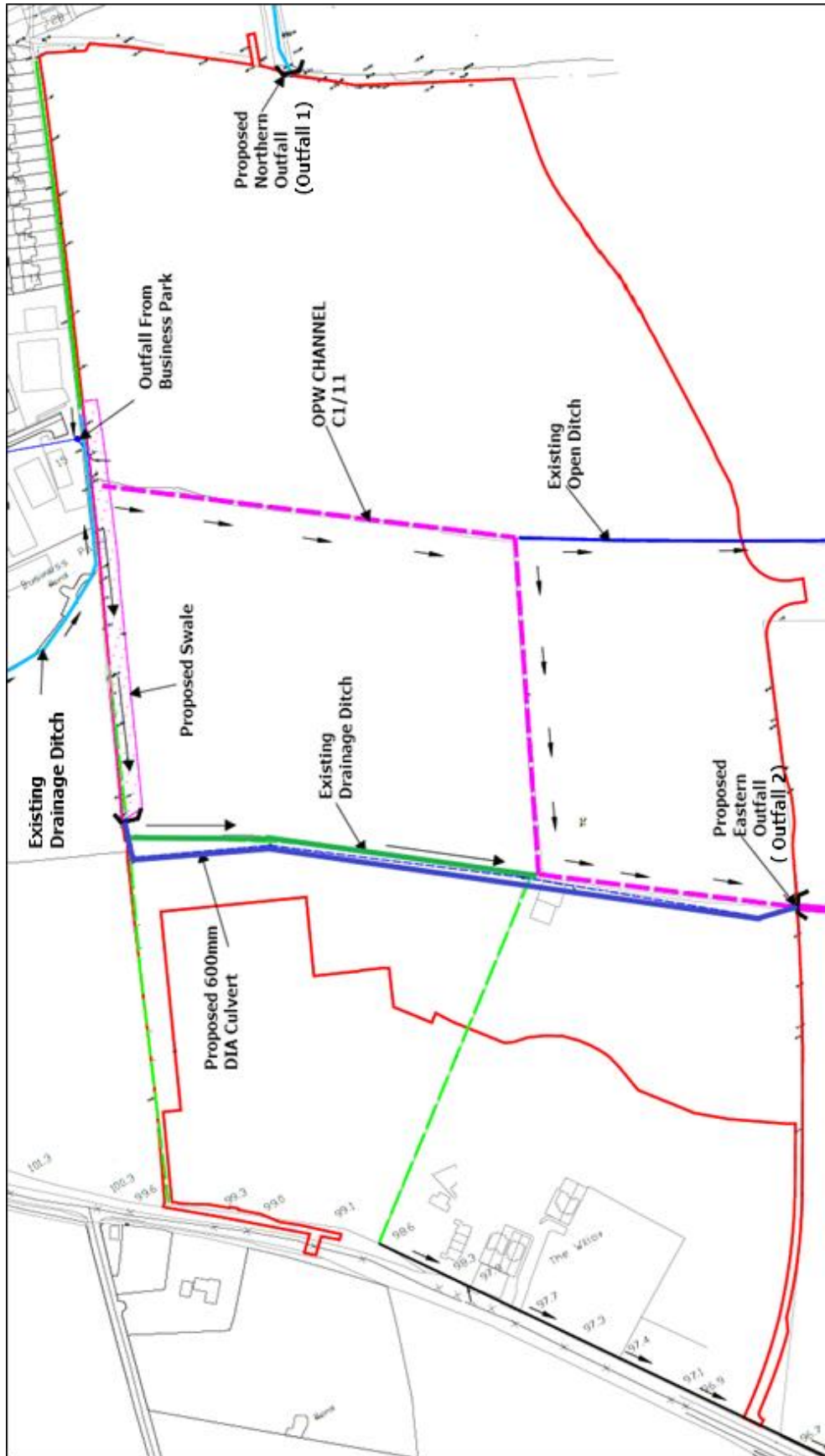


Figure 14 - Existing Watercourses & Ditch Drain Layout (details from JOR drawing J18-001-019-A)



## 3.2 Site Walkover

### 3.2.1 Observations

A site walkover was carried out on the 17<sup>th</sup> & 18<sup>th</sup> January 2018. The walkover followed an extended wet weather period. The site exists entirely of agricultural land. The northern half of the site had recently been ploughed following a potato harvest and was soft underfoot with some waterlogging on the 17<sup>th</sup> instant however the ground was drier on the 18<sup>th</sup> instant. The lower, southern portion of the site was soft underfoot with ponding evident in machinery tracks only. The grassland fields in the south of the site had no significant water ponding present following the extensive rainfall, with the disturbed ploughed soil in the northern section of the site holding water in most machinery tracks, as may be expected in slowly percolating CLAY soils following heavy rainfall after ploughing. It is evident that waterlogging is mainly due to recent ploughing of the field.

The site undulates south to north, gently increasing in elevation in the northern direction to the crown of the site before a shallow downward slope to the north links the site boundary to the lower residential lands North of development. A gradual shallow downward slope also exists in the west to east direction.

The ditch drains generally displayed a relatively low water level i.e. mostly >1.5m BGL. For most of the site, it is apparent the surface water ponding on the surface is not due to an elevated WTL or saturated subsoil, but rather to a very slow percolating CLAY type subsoil.

### 3.2.2 Discussion of Items from Walkover

Due to the slow percolating nature of the subsoil underlying the site, a high percentage of rainfall is likely to currently runoff the existing grassland surface to the ditch drains within the site in its current condition albeit at a slow rate due to the gradual sloping on site. The high percentage of runoff is especially true in winter months with the short grass vegetation and bare ploughed fields reducing the potential for evapotranspiration and trapping runoff waters in vegetation.

Conveyance of surface waters is provided by the existing ditch drain network. There is only one ditch drain which discharges into the development land. This is the ditch drain flowing west to east from the adjacent business park. This ditch drain has been investigated and receives flow from a 300mm diameter pipe and a 450mm diameter pipe which drains the business park. This ditch drain had a small and slow flow of water, on investigation during heavy rainfall periods in January 2018. Although a very small flow is evident, the ditch drain must be accounted for in the proposed drainage design for the development as it is the only inflow ditch drain to this proposed development. The ditch drain which

diverts into OPW Channel C1/11 within the subject lands, is proposed to be diverted to a new swale and culvert system which will traverse the site before reconnecting with OPW Channel C1/11 at the eastern outfall (outfall 2).

- The new proposed stormwater management system will be required to take the above conditions into consideration when sizing attenuation systems with regard to soil type, sloping.
- A high percentage of impermeable surfacing will be constructed in the new development. As the existing agricultural land has limited permeability, the percentage increase in runoff volume to the receiving environment post-development is considerably less than if the existing land was to demonstrate highly permeable soil and subsoils.

### 3.3 Catchment Analysis

Catchment Analysis is provided in the detailed modelling report by JBA Consulting Ltd, document title: *2018s900 JOR Consulting Engineers Ltd - Dunshaughlin, SW Assessment v3.0*. Refer to Section 4.0 (Level 3) of this report for further details.



## 3.4 Storm Drainage Proposals

### 3.4.1 Proposed Drainage Design Requirements

The proposed drainage design must satisfy conditions as per:

- Greater Dublin Strategic Drainage Study requirements
- Meath County Council, Water Services & Infrastructure
- OPW requirements for consent to amend Channel C1/11

Consultation with Meath County Council, Water Services and Infrastructure Departments, has been ongoing throughout this Flood Risk Assessment and stormwater drainage design proposals.

Guidance from OPW Broadmeadow Catchment department, was also sought prior to submission of this report. The department stated –

- The OPW has a legal duty to maintain to original scheme design for all the channels that form an Arterial Drainage Scheme under the 1945 Arterial Drainage Act.
- Allowance should be made for all drainage points into the proposed piped section of channel, including the upstream end of channel C1/11.

The OPW Channel C1/11 commences within the development site itself however it does drain an upstream catchment of <20 km<sup>2</sup> of developed lands. The upstream catchments contributing to OPW Channel C1/11 have been included within Joseph O'Reilly Consulting Engineers drainage proposals and are catered for by a swale and culvert. Downstream stormwater discharges to OPW Channel C1/11 are controlled by attenuation restricted to Greenfield Runoff Rates. The proposed development will be constructed upon the remaining contributing land area to OPW Channel C1/11 upstream of the proposed eastern outfall (outfall 2) which is also on OPW Channel C1/11.

The diversion of the OPW Channel C1/11 will therefore have no negative impact on any lands to which the arterial drainage system served either upstream or downstream of the site.

All lands within the development site will be drained by the proposed stormwater drainage system and will divert to either the northern or the eastern outfall (outfall 1 or 2). The eastern outfall (outfall 2) will discharge downstream to OPW Channel C1/11. The flows contributing to OPW Channel C1/11 which will be affected by this development are proposed to be diverted via a swale and culvert back to OPW Channel C1/11 further downstream at the eastern outfall (outfall 2) location.

It will be the recommendation of this report that:

- Any amendments to OPW Channel C1/11 must not take place until consent has been granted prior to construction by the OPW.

### 3.4.2 Level of Service

When considering designs and protection against flooding the following three criteria must be considered [GSDSDS, Volume 2].

- Protection against river flooding.
- Protection against flooding from storage systems.
- Protection against flooding from overland flows

Return Period (years)	Design Objectives
30	No flooding on site except where specifically planned flooding is approved. Summer design storm of 15 or 30 minutes are normally critical.
100	No internal property flooding. Planned flood routing and temporary flood storage accommodated on site for short high intensity storms. Site critical duration events.
100	No internal property flooding. Floor levels at least 500mm above maximum river level and adjacent onsite storage retention.
100	No flooding of adjacent urban areas. Overland flooding managed within the development.

Table 4 - Design Objectives for Flood Protection

### 3.4.3 River Flooding

It is recommended that the 100-year return period is applied to all criteria for protection of flooding within properties.

In addition, a minimum level of flood nuisance to the community requires the selection of the 30-year return period, or similar, for the occurrence of any significant unplanned flooding anywhere on site.

It is recommended that floor levels of all houses are at least 500mm above the predicted maximum 100-year flood level.

The proposed development site is categorised within Flood Zone C and is not considered to be at risk up to the 0.1%AEP flood level of the River Broadmeadow. Owing to the size of this Strategic Housing Development, a detailed model assessment of the entire stormwater drainage system, and its ability to cater for inflow to the site and outflow via the proposed outfalls downstream in flood conditions, has been prepared by JBA Consulting Engineers for this Flood Risk Assessment Report. This is a conservative measure but will ensure a robust design is in place. This detailed assessment is provided by JBA Consulting Engineers and is discussed in more detail within the following ‘Level 3’ chapter of this report.

#### 3.4.4 Proposed Swale Design (Storage Systems)

Swale water levels are designed specifically, and therefore there is less uncertainty than for river flood water levels. However, property floor levels must be provided with a safety freeboard and it is recommended that this is 500mm [GDSDS, Volume 2].

Also, important to consider in regard to Swales are the following [GDSDS, Volume 2]..

- Hydraulic constraints to the swale outlet.
- Overflow provision and risk of failure.
- Hydraulic backwater effects at the swale inlet.

The detailed analysis carried out by JBA Consulting Engineers will assess the swale for its capacity to deal with the required flood flow. Furthermore, an analysis on the residual risk of a blockage along the culvert downstream of the swale is also detailed in the detailed assessment which is provided by JBA Consulting Engineers and is discussed in more detail within the following ‘Level 3’ chapter of this report.

#### 3.4.5 Flooding from Overland Flow

“Consideration needs to be given to short very high intensity thunderstorm type events. These events, often lasting for only 20 or 30 minutes, involve so much rainfall in this short period that the drainage system cannot cope with the runoff. In this situation water runs off down roads and overland through properties unless it is specifically taken into account. The impact of such events will generally be much less for SUDS based systems which tend to be based on provision of volume (swales, infiltration units etc).” – GDSDS Volume 2.

The upstream catchment to this development, consists of a business park which drains via two pipes, a 300mm diameter and a 450mm diameter pipe, into a ditch drain entering the proposed development site, which then diverts flow to OPW Channel C1/11. The business park drainage system is

unattenuated and will have much higher runoff than the typical greenfield runoff rates. It is therefore required that overland flow be catered for from the upstream development.

A model has been prepared by JBA Consulting Engineers, to aid with design and to test the capacity of the proposed swale and culvert which will cater for flows up to the 0.1%AEP runoff rate. Specification of the 0.1%AEP flood level was a specific request from Meath County Council. The full detailed assessment is discussed in more detail within the following 'Level 3' chapter of this report.

#### 3.4.6 Climate Change

The GSDS Climate Change policy document advises that rainfall event depths should be factored by 10%. Climate change allowances have been made by JBA Consulting Engineers in their assessment of the proposed stormwater drainage system as per Table 5 below. Refer to Section 4 of this report.

Climate Change Category	Characteristics
River flows	20% increase in flows for all return periods up to 100 years
Sea level	400+mm rise (see Climate Change policy document for sea levels as a function of return period)
Rainfall	10% increase in depth (factor all intensities by 1.1) Modify time series rainfall in accordance with the GSDS climate change policy document

Table 5 - Climate Change Factors to be Applied to Drainage Design [GSDS]

### 3.5 Proposed Foul Drainage

The foul sewerage is to be designed to discharge the wastewater from the proposed development into the existing 225mm gravity sewer main which is located in Willow Way/Willow Drive roadways. This gravity sewer was installed a number of years ago and discharges into two waste water pumping stations, one located adjacent to the development site on the R147 and the second one is located along Lagore Road which is north of the proposed site. This waste water pump station is operated and maintained by Meath County Council.

Irish Water have provided correspondence to Joseph O'Reilly Engineers that there is adequate capacity in the local wastewater network to cater for this development and that there is adequate capacity in wastewater treatment plant to cater for this development.

Flooding related to the proposed foul drainage system is considered to be very unlikely.

### 3.6 Access & Egress

Adequate access and egress to the site will be available at all times. The site is accessible from the R147 road which is located within Flood Zone C.

### 3.7 Exacerbation of flooding

The entire site area will be drained to the proposed stormwater drainage system, which will have a controlled outfall flow rate to the receiving watercourses.

The stormwater drainage system if designed and constructed to Meath County Council requirements, and the Greater Dublin Strategic Drainage Study requirements with routine, scheduled maintenance will result in discharge to receiving watercourses as per the calculated greenfield runoff rates. The risk of exacerbation of flooding is therefore mitigated.

### 3.8 Summary of Level 2 - Scoping Assessment

- A detailed model assessment on re-routing of the OPW Channel C1/11 via Swale and Culvert is required. Refer to following sections.
- A detailed assessment is required to model the performance of the proposed drainage system and its outfalls in flood conditions. Refer to following sections.

## 4 LEVEL – 3 - DETAILED FLOOD RISK ASSESSMENT

### 4.1 Proposed Stormwater Drainage Detailed Assessment

#### 4.1.1 Introduction

The receiving ditch-drain network condition is critical in reducing the potential for flooding within this development site. The outfall locations will discharge stormwater to ditch drains from attenuation devices. The hydrological connectivity of the existing ditch-drain and stream network from the proposed outfalls to the Broadmeadow River must be maintained in the future to prevent hydraulic restrictions e.g. debris and siltation of ditch-drains. Restricted or flooded ditch drains could result in the attenuation device underperforming and reducing its capacity for stormwater storage and discharge potential in heavy rainfall events. Suitable assessment of the outfall discharge rates during peak downstream flood conditions must be considered.

#### 4.1.2 Description

The stormwater drainage design proposals by *Joseph O'Reilly Consulting Engineers* proposes to drain the new development into three separate catchments, diverting to two outfalls. One outfall will divert stormwater to a watercourse to the north of the site and the other outfall will divert stormwater to a watercourse to the east of the site. The new stormwater drainage system designed for this development will not be connected to any other development site drainage system and will outfall direct to the existing ditch drain system before eventually diverting to the Broadmeadow River.

A small catchment comprising the business park to the NW of the site drains runoff to the subject site ditch drain network via a 300mm and 450mm diameter pipe.

The ditch drain diverts runoff from the business park to OPW Channel C1/11 which will be re-routed through the proposed development via a swale and culvert to OPW requirements before diverting back to OPW Channel C1/11 further downstream at the eastern outfall (outfall 2) location. A swale and culvert are proposed to be constructed to ensure any flood flows from the business park will be attenuated and conveyed to the downstream watercourse east of the site.

#### 4.1.3 Detailed Assessment of Proposed Drainage System

JBA Consulting Ltd have prepared a detailed model assessment to analyse flows through the drainage network to the receiving ditch drains in flood events as a check to ensure the drainage system is functional in flood events. This model includes all contributing catchments to the site and analyses the flood levels in the receiving ditch drains to ensure outfalls operate as intended at the required flow rates.

The entire JBA Consulting Ltd report is a separate report issued for the planning application, its document title is *2018s900 JOR Consulting Engineers Ltd - Dunshaughlin, SW Assessment v3.0*. A brief summary of the key points are outlined below.

- The proposed swale design is large enough to contain the peak water levels of the 1%AEP 1%AEP MRFS and the 0.1%AEP flood events.
- The swale design provides a freeboard of at least 500mm above the 1% AEP+MRFS.
- These freeboards values are sufficient to mitigate the risk of flooding to the road and proposed site during the assessed storm events.
- Based on the flows presented in Table 2-2 of JBA Report document title: *2018s900 JOR Consulting Engineers Ltd - Dunshaughlin, SW Assessment v3.0*, and the corresponding 1% AEP peak flow for the catchment, the 1% AEP flood level was estimated at the stormwater discharge points of the development. The peak flood level was modelled at 96.5mOD at Stormwater outlet 2 and 3.
- Regarding the outlet Stormwater outlet 1, there is no impact on the discharge from the northern stormwater system and therefore no requirement to include this system in the Windes model (See JBA Report document title: *2018s900 JOR Consulting Engineers Ltd - Dunshaughlin, SW Assessment v3.0*).
- As outlined in Section 1, one of the main outcomes of this assessment was to appraise the potential impact that a 1% AEP flood event could have on the operation of the development's stormwater system. It was therefore necessary to apply the calculated 1% AEP flood level at the stormwater system outlets.
- To undertake the analysis, the proposed stormwater design was built into a Windes model to test the system against the current design standards to ensure compliance. Once the baseline was tested and confirmed that it operates as intended, a second scenario was developed with the calculated 1% AEP flood levels to test the impact on the system.
- The results confirm that the system will operate in accordance to the design standards during a 1% AEP flood event and does not present a flood risk to the development.
- A full technical report outlining the model development, methodology employed, and results are contained in Appendix A of JBA Report.
- JBA Consulting was appointed to ensure that the proposed stormwater design for a residential development will operate as intended during a 1%, 1%+MRFS, and 0.1% AEP flood event.
- This analysis was achieved by estimating the relevant 1% peak flow rate through the site from various sources which was subsequently input into a hydraulic model. The main contributory

inflows to the site were accounted for including potential overland flow from the Dunshaughlin Business Park following surcharging of their stormwater system.

- The hydraulic model provided the relevant flood levels at the proposed stormwater discharge points. A proposed diversionary swale was tested as part of the hydraulic modelling and found to be of sufficient capacity to convey the predicted inflows without overtopping. The proposed swale will discharge into a proposed 600mm culvert which conveys flow across the site to the existing upstream extent of the Eastern Stream.
- A Windes model was built of the proposed stormwater system to ensure that the system operates as intended and to the design standards.
- In summary, the system has been tested during a 1%, 1%+MRFS, and 0.1% AEP flood with no risk of flooding found to the proposed development and no increased flood risk to adjacent lands.

#### 4.1.4 Other - Infiltration to Stormwater System

An elevated WTL ranging from 0.6m BGL to 1.5m BGL was determined from Trial Hole logs carried out across the proposed development site by Hydrocare Environmental Ltd. The proposed attenuation tanks must be a sealed water tight tank to ensure against infiltration of groundwater. Infiltration of groundwater would likely reduce the attenuation capacity of the tanks.



## 5 DISCUSSION & MITIGATION MEASURES

### 5.1 Discussion of findings

#### 5.1.1 Fluvial Flooding

Fluvial flooding is not considered a threat. The proposed development is located >750m south from the River Broadmeadow and is between 4m to 10m higher in elevation compared to the 0.1% AEP flood levels associated with the Broadmeadow River. The site is located within Flood Zone C.

#### 5.1.2 Pluvial Flooding

The proposed development site and all contributing flows to the site have been catered for by the stormwater drainage system. The stormwater drainage proposals have been modelled for their expected performance up to the 1%, 1%+MRFS, and 0.1% AEP flood with no risk of flooding found to the proposed development and no increased flood risk to adjacent lands.

#### 5.1.3 Groundwater Flooding

Groundwater flooding is not considered a risk to the proposed development, due to the poorly draining nature of the underlying CLAY subsoil and the small contributing catchment to the development site. Fluctuations of groundwater levels are considered not to be volatile. Recharge to the groundwater in this location will be less once construction is complete as all runoff waters from impermeable surfaces will be diverted to downstream watercourses. There are no basements proposed for this development.

#### 5.1.4 Foul Sewer

The foul sewer system poses no threat to flooding at the proposed development.

#### 5.1.5 Stormwater Drainage

The stormwater drainage system has been modelled for its expected performance up to the 1%, 1%+MRFS, and 0.1% AEP flood with no risk of flooding found to the proposed development and no increased flood risk to adjacent lands.

#### 5.1.6 Diversion of OPW Channel C1/11

The agricultural lands which benefit from OPW Channel C1/11 upstream of the site outfalls, are within the ownership of the applicant. The proposed diversion of OPW Channel C1/11 must be carried out in accordance with OPW consent requirements. OPW consent to divert the channel must be sought prior to construction. The proposed diversion has been assessed to the 0.1% AEP flood with no risk of flooding found to the proposed development and no increased flood risk to adjacent lands

## 5.2 Summary of Findings

A detailed Flood Risk Assessment report has been carried out for the proposed development.

The development site is located within Flood Zone C indicating the site is at a low risk of fluvial or coastal flooding.

The proposed site stormwater drainage system has been modelled by JBA Consulting Engineers to robustly test the drainage proposals carried out by Joseph O'Reilly Consulting Engineers and it is deemed no risk of flooding to the proposed development was found and no increase of flood risk to adjacent lands was found.

The site will be accessible via the R147 road and shared entrance to 'The Willows' development with no flood zone evident along the road or access entrance.

The swale and culvert diversion of the minor watercourse for OPW Channel C1/11 which also caters for overland flow from the upstream business park is suitably sized up to cater for the 0.1% AEP flood flow. Consent for diversion of the channel is to be sought prior to construction.

## 5.3 Mitigation Measures

- Attenuation tanks are required to be a sealed water tight system to prevent infiltration of groundwater.

## 5.4 Operation & Maintenance

Prior to commencement of construction an Operation and Maintenance manual is to be implemented to ensure all aspects of the site drainage system are fit for purpose until 'taken in charge' by the local authority.

## 6 REPORT CONCLUSION

### 6.1 Recommendation

- Hydrocare Environmental Ltd consider the proposed development to be within Flood Zone C and therefore not at risk of coastal or fluvial flooding up to the 0.1% AEP flood extent.
- The proposed development is considered appropriate for this site location.
- The proposed stormwater drainage system was assessed and found no risk of flooding to the development and no increase of flood risk to adjacent lands.
- Prior to construction, consent from the OPW for diversion of Channel C1/11 must be sought.
- All attenuation tanks are required to be sealed and watertight.
- Prior to commencement of construction an Operation and Maintenance manual is to be implemented to ensure all aspects of the site drainage system are fit for purpose until 'taken in charge' by the local authority.

## 7 REFERENCES

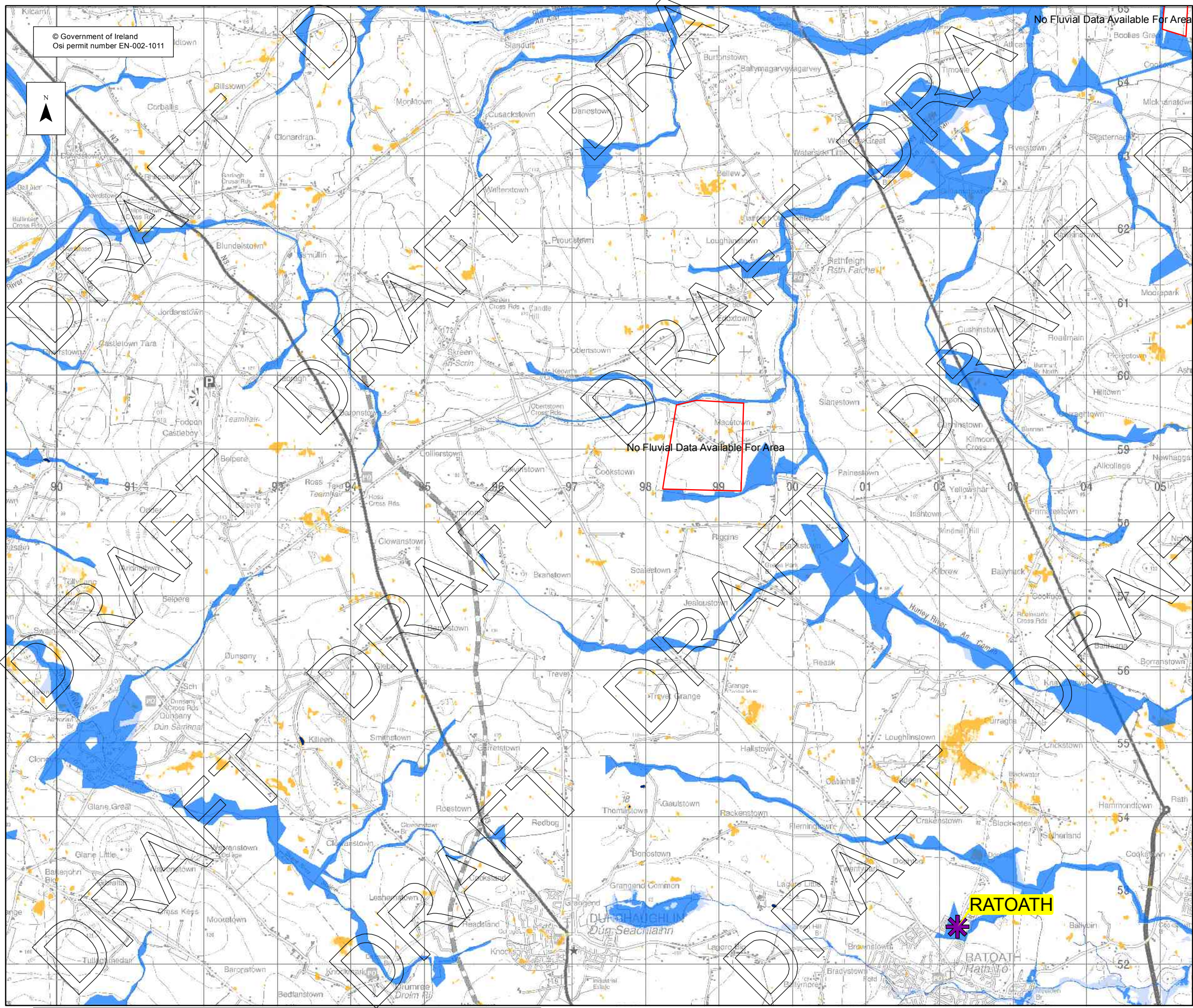
- Office of Public Works.
- Preliminary Flood Risk Assessment (PFRA) Study Maps (<http://www.cfram.ie/pfra/interactive-mapping/>).
- Catchment and Flood Risk Management Program (OPW Website <http://www.cfram.ie>).
- OPW online viewer - <https://maps.opw.ie/fhrm/viewer/>
- The Planning System and Flood Risk Management Guidelines for Planning Authorities.
- Greater Dublin Strategic Drainage Study, Volume 2
- EPA Envision Mapping ([gis.epa.ie/envision](https://gis.epa.ie/envision))
- [maps.google.ie](https://maps.google.ie)
- [www.floodmaps.ie](http://www.floodmaps.ie)
- SUDS Manual C753

## APPENDIX A – OPW MAPPING & IRISH WATER LETTER

Refer overleaf for:

- OPW Catchment Flood Risk Management & Planning Mapping
- Refer overleaf for PFRA Maps 255 and 273
- Irish Water Correspondence Letter Ref: CUSTO180157





© Government of Ireland  
Osi permit number EN-002-1011

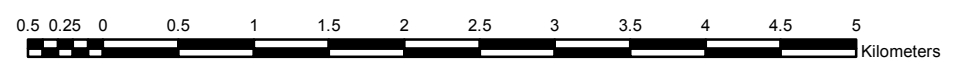


No Fluvial Data Available For Area

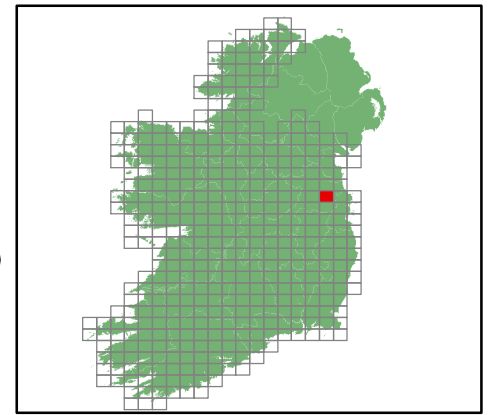
No Fluvial Data Available For Area

**RATOATH**

RATOATH



**Location Plan :**



**Legend:**

- Flood Extents**
- Fluvial - Indicative 1% AEP (100-yr) Event
  - Fluvial - Extreme Event
  - Coastal - Indicative 0.5% AEP (200-yr) Event
  - Coastal - Extreme Event
  - Pluvial - Indicative 1% AEP (100-yr) Event
  - Pluvial - Extreme Event
  - Groundwater Flood Extents
  - Lakes / Turloughs
- PFRA Outcomes**
- ✱ Probable Area for Further Assesment
  - ✱ Possible Area for Further Assesment

**Important User Note:**  
The flood extents shown on these maps are based on broad-scale simple analysis and may not be accurate for a specific location. Information on the purpose, development and limitations of these maps is available in the relevant reports (see www.cfram.ie). Users should seek professional advice if they intend to rely on the maps in any way.

If you believe that the maps are inaccurate in some way please forward full details by contacting the OPW (refer to PFRA Information leaflets or 'Have Your Say' on www.cfram.ie).

Office of Public Works  
Jonathon Swift Street  
Trim  
Co Meath  
Ireland

Project :  
**PRELIMINARY FLOOD RISK ASSESMENT (PFRA)**

Map :  
PFRA Indicative extents and outcomes  
- Draft for Consultation

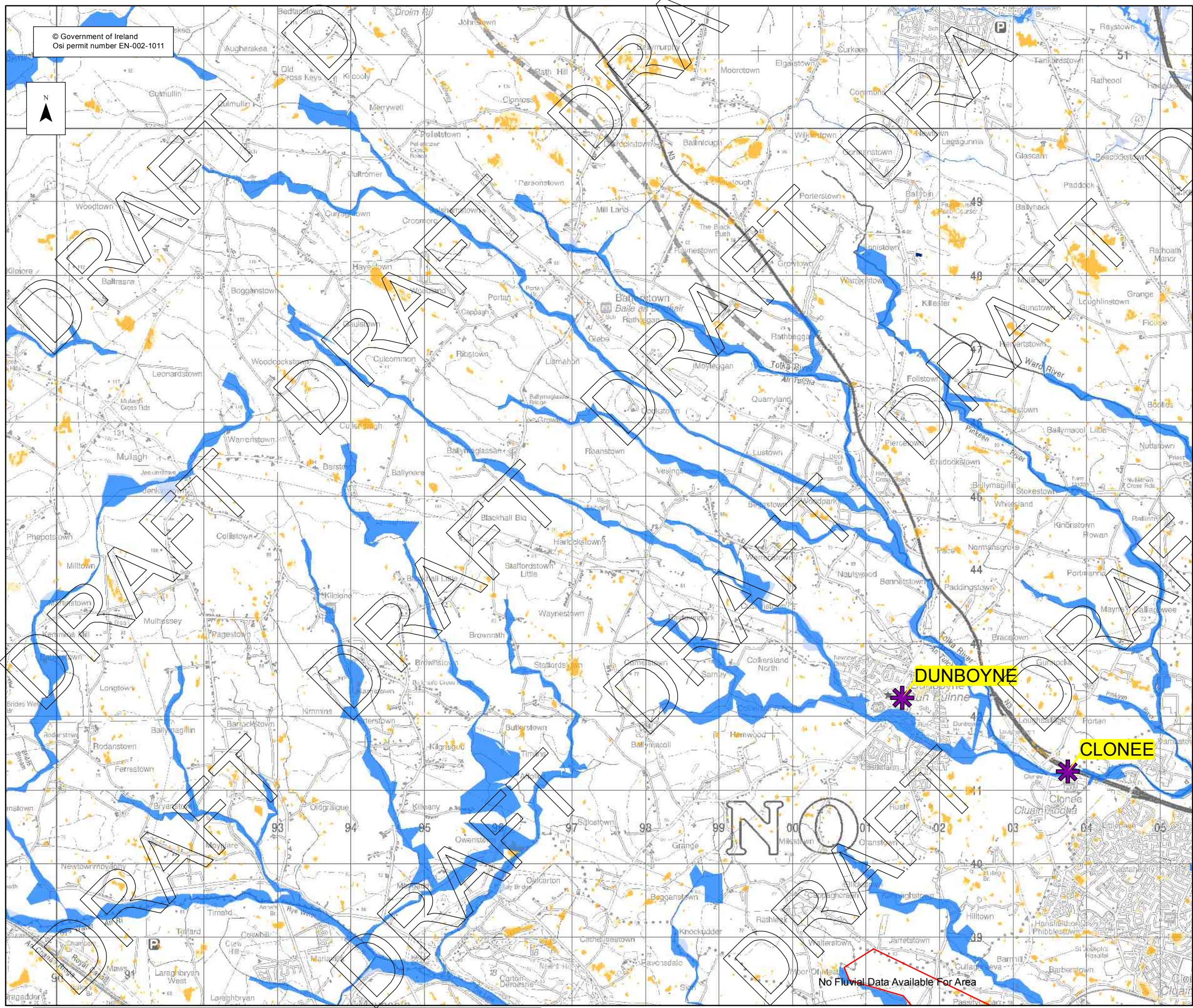
Figure By : PJW Date : July 2011  
Checked By : MA Date : July 2011

Figure No. :  
**2019 / MAP / 273 / A** Revision  
**0**

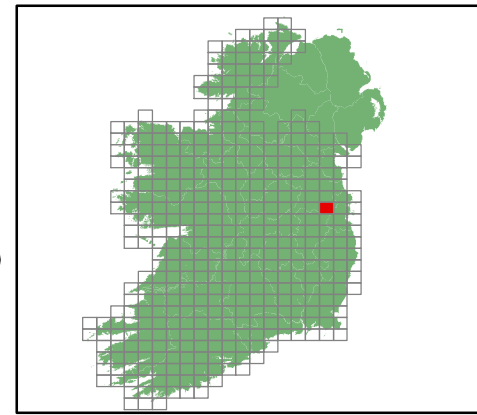
Drawing Scale : 1:50,000 Plot Scale : 1:1 @ A3



© Government of Ireland  
Osi permit number EN-002-1011



### Location Plan :



### Legend:

- Flood Extents**
  - Fluvial - Indicative 1% AEP (100-yr) Event
  - Fluvial - Extreme Event
  - Coastal - Indicative 0.5% AEP (200-yr) Event
  - Coastal - Extreme Event
  - Pluvial - Indicative 1% AEP (100-yr) Event
  - Pluvial - Extreme Event
  - Groundwater Flood Extents
  - Lakes / Turloughs
- PFRA Outcomes**
  - Probable Area for Further Assesment
  - Possible Area for Further Assesment

**Important User Note:**  
The flood extents shown on these maps are based on broad-scale simple analysis and may not be accurate for a specific location. Information on the purpose, development and limitations of these maps is available in the relevant reports (see www.cfram.ie). Users should seek professional advice if they intend to rely on the maps in any way.  
If you believe that the maps are inaccurate in some way please forward full details by contacting the OPW (refer to PFRA Information leaflets or 'Have Your Say' on www.cfram.ie).

Office of Public Works  
Jonathon Swift Street  
Trim  
Co Meath  
Ireland



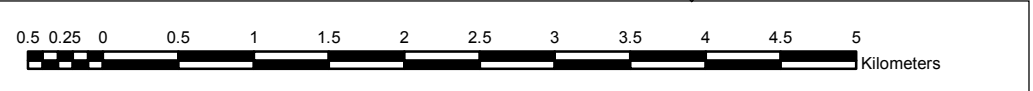
Project :  
PRELIMINARY FLOOD RISK ASSESSMENT (PFRA)

Map :  
PFRA Indicative extents and outcomes  
- Draft for Consultation

Figure By : PJW Date : July 2011  
Checked By : MA Date : July 2011

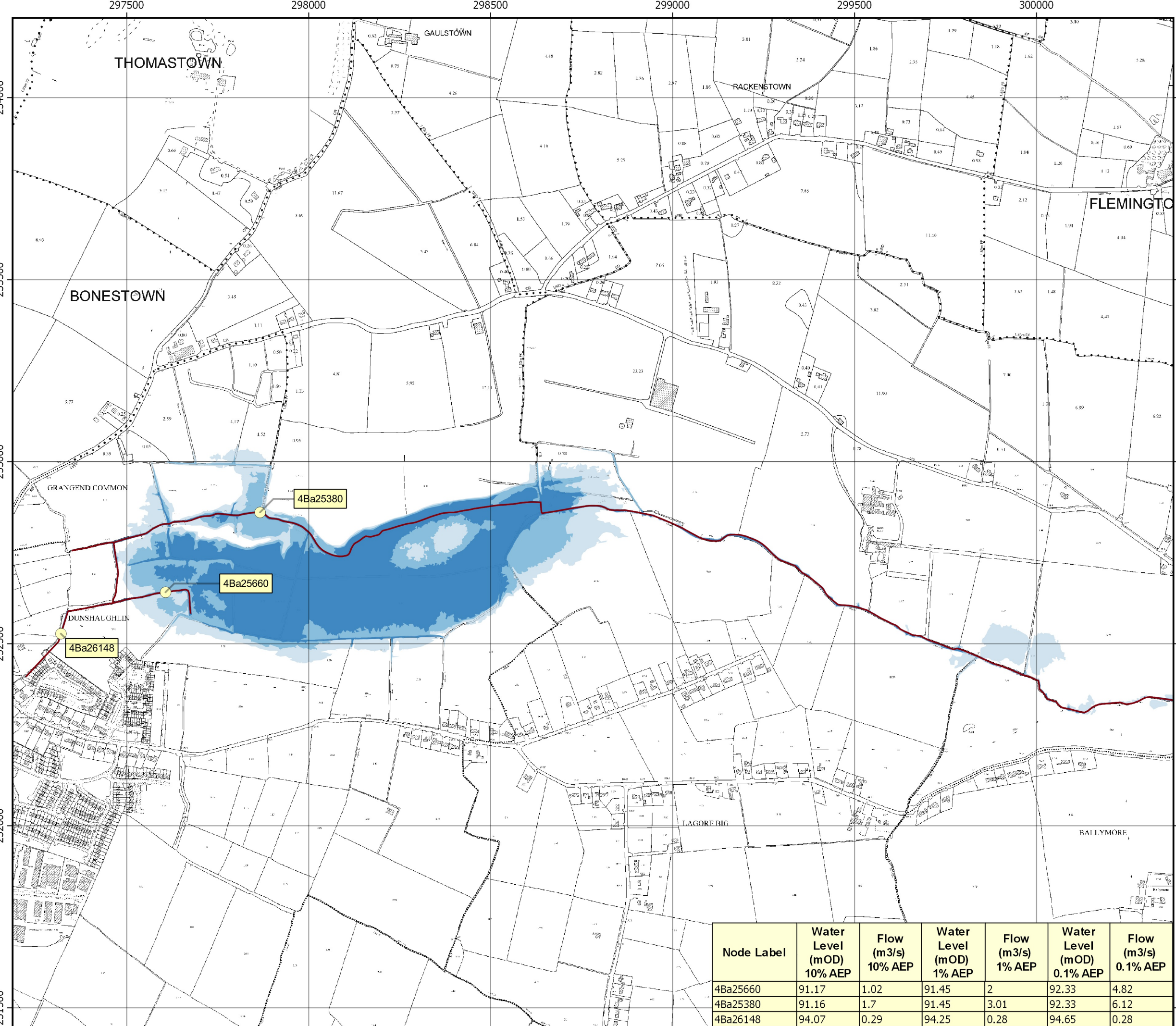
Figure No. :  
2019 / MAP / 255 / A Revision  
0

Drawing Scale : 1:50,000 Plot Scale : 1:1 @ A3

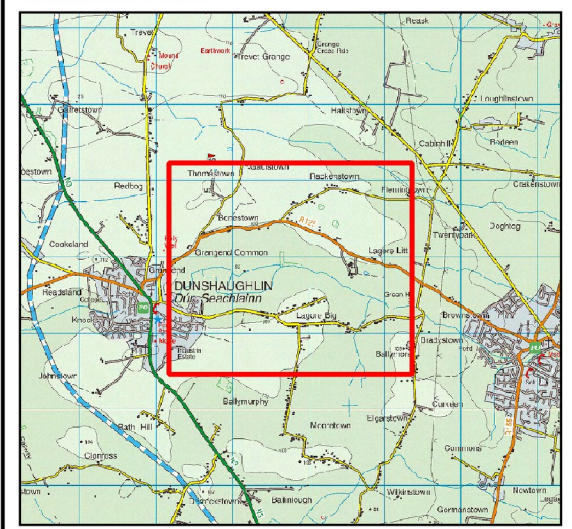


No Fluvial Data Available For Area





**Location Plan:**



**LEGEND**

- AFA Boundary
- Defended Area
- Modelled River Centreline
- Node Point
- 10% AEP Fluvial Extent (High Risk)
- 1% AEP Fluvial Extent (Medium Risk)
- 0.1% AEP Fluvial Extent (Low Risk)
- Flood Defence - Embankment
- Flood Defence - Wall
- Gate
- NODE123 Node Label
- x.x% AEP Standard of Protection of Flood Defence

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



The Office of Public Works  
 Jonathan Swift Street  
 Trim  
 Co. Meath

Project:  
**FINGAL EAST MEATH FRAM STUDY**

Map: **Broad Meadow Model**  
**FLUVIAL FLOOD EXTENT MAP**

Map Type:	EXTENT	
Source:	FLUVIAL	
Map Area:	HPW	
Scenario:	CURRENT	
Drawn by:	IH	Date: Sep - 2016
Checked by:	MC	Date: Sep - 2016
Approved by:	JM	Date: Sep - 2016

Map No.:  
**BRO/HPW/EXT/CURS/001**  
 Revision: F0

Map Scale: 1:10,000 Plot Scale: 1:1 @ A3

Node Label	Water Level (mOD) 10% AEP	Flow (m3/s) 10% AEP	Water Level (mOD) 1% AEP	Flow (m3/s) 1% AEP	Water Level (mOD) 0.1% AEP	Flow (m3/s) 0.1% AEP
4Ba25660	91.17	1.02	91.45	2	92.33	4.82
4Ba25380	91.16	1.7	91.45	3.01	92.33	6.12
4Ba26148	94.07	0.29	94.25	0.28	94.65	0.28



Joesph O'Reilly  
JOR Consultants  
Unit 1  
St. Therese's Place,  
Flower Hill,  
Navan,  
Co. Meath

Letter Ref: CUSTO180157



**Uisce Éireann**  
Bosca OP 860  
Oifig Sheachadta  
na Cathrach Theas  
Cathair Chorcaí

**Irish Water**  
PO Box 860  
South City  
Delivery Office  
Cork City

[www.water.ie](http://www.water.ie)

14/02/2018

Dear Sir/Madam,

**Re: 3522128496 pre-connection enquiry – Subject to contract |  
Contract denied  
Water and wastewater connections for 844 residential units at  
Willows, Dunshaughlin, Co. Meath**

Irish Water has reviewed your pre-connection enquiry in relation to water and wastewater connections at **Willows, Dunshaughlin, Co. Meath** (the **Premises**). Based upon the details you have provided with your pre-connection enquiry and on the capacity currently available as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place and the conditions listed below, your proposed connection to the Irish Water network can be facilitated.

#### Strategic Housing Development

Irish Water notes that the scale of this development dictates that it is subject to the Strategic Housing Development planning process. Therefore:

- A. In advance of submitting your full application to An Bord Pleanála for assessment, you must have reviewed this development with Irish Water and received a Statement of Design Acceptance in relation to the layout of water and wastewater services.
- B. You are advised that this correspondence does not constitute an offer in whole or in part to provide a connection to any Irish Water infrastructure and is provided subject to a connection agreement being signed and appropriate connection fee paid at a later date.
- C. In advance of submitting this development to An Bord Pleanála for full assessment, the Developer is required to have entered into a Project Works Services Agreement to deliver an investigation to confirm the available capacity in the water network and to determine the full extent of any upgrades which may be required to be completed to Irish Water infrastructure.

**Wastewater:** There is adequate capacity in the local wastewater network to cater for this development. There is adequate capacity in wastewater treatment plant to cater for this development.

**Water:** Irish Water's GIS shows a reduction in watermain size from 200mm DI to 100mm DI size for 4 meters on the R147 local to the proposed development. An investigation is required to determine if this break exists. The developer shall pay for this investigation and shall pay for the upsizing of the 4 meters of 100mm to 200mm DI watermain. There is adequate capacity in the water treatment plant to cater for this development.

A connection agreement can be applied for by completing the connection application form available at **[www.water.ie/connections](http://www.water.ie/connections)**. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Energy Regulation.

Should you wish to have any of the above progressed by Irish Water or if you have any further questions, please contact Pat O'Neill from the design team on 018925250 or email [patoneil@water.ie](mailto:patoneil@water.ie) For further information, visit **[www.water.ie/connections](http://www.water.ie/connections)**

Yours sincerely,

**Maria O'Dwyer**

**Connections and Developer Services**

## APPENDIX B – STORMWATER DRAWINGS & SITE LAYOUT

Refer overleaf for:

- Proposed Site Layout
- Proposed Drainage Drawings from The Proposed Water, Wastewater Services and Surfacewater Management Design Report, Compiled By Joseph O'Reilly Consulting Engineers



















## APPENDIX C – OPW FLOOD HISTORY AND BENEFITTING MAPS

Refer overleaf for:

- Broadmeadow & Ward CMT Drainage Scheme Layout and sections from 1961 which were provided by OPW and depict the actual layout of OPW Channel C1/11.
- OPW Hazard mapping provided for the Dunshaughlin Area.

### Summary Local Area Report

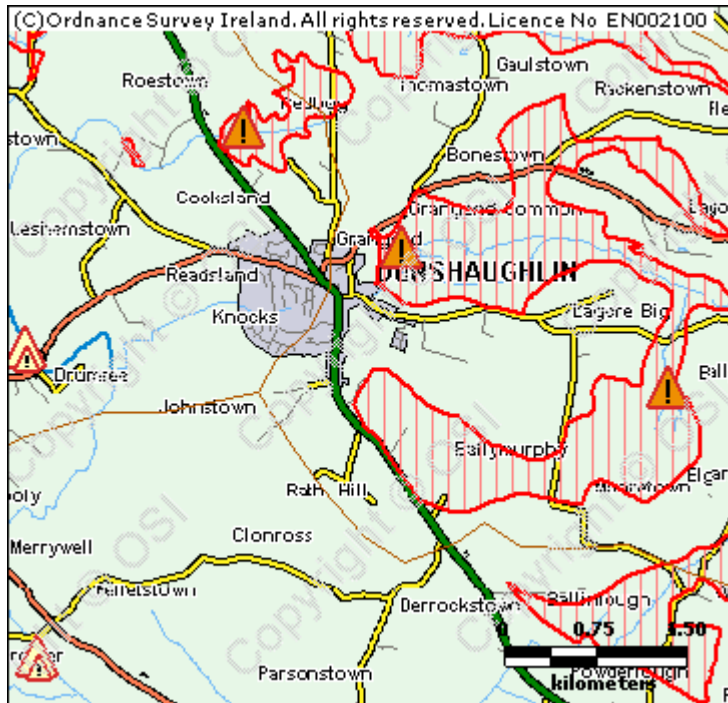
This Flood Report summarises all flood events within 2.5 kilometres of the map centre.

The map centre is in:

County: Meath

NGR: N 972 518

This Flood Report has been downloaded from the Web site [www.floodmaps.ie](http://www.floodmaps.ie). The users should take account of the restrictions and limitations relating to the content and use of this Web site that are explained in the Disclaimer box when entering the site. It is a condition of use of the Web site that you accept the User Declaration and the Disclaimer.



Map Scale 1:62,129

Map Legend	
	Flood Points
	Multiple / Recurring Flood Points
	Areas Flooded
	Hydrometric Stations
	Rivers
	Lakes
	River Catchment Areas
	Land Commission *
	Drainage Districts *
	Benefiting Lands *

\* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained in the Glossary.

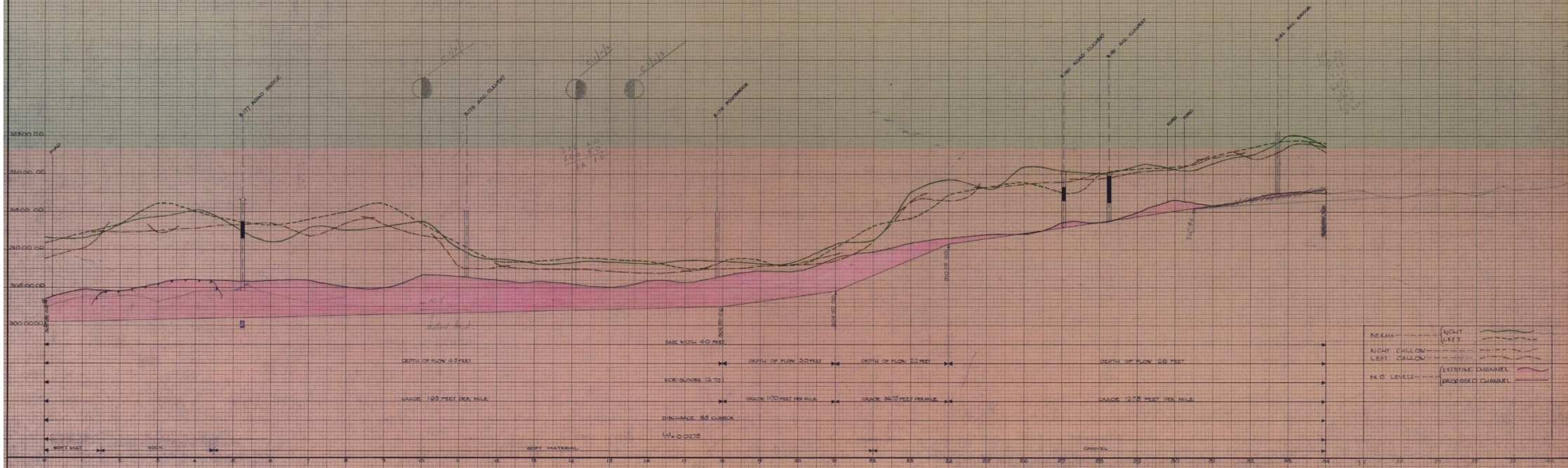
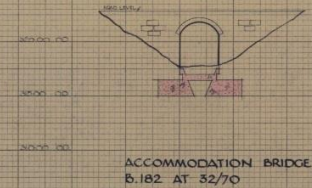
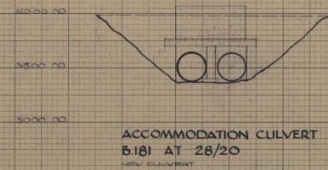
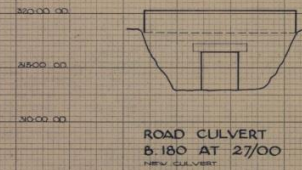
### 3 Results

	1. Dunshaughlin north Redbog Nov 2000 County: Meath Additional Information: <a href="#">Photos (1)</a> <a href="#">Press Archive (1)</a> <a href="#">More Mapped Information</a>	Start Date: 07/Nov/2000 Flood Quality Code:2
	2. Dunshaughlin East Nov 2000 County: Meath Additional Information: <a href="#">Photos (1)</a> <a href="#">Press Archive (1)</a> <a href="#">More Mapped Information</a>	Start Date: 05/Nov/2000 Flood Quality Code:2
	3. Ratoath Commons area Nov 2000 County: Meath Additional Information: <a href="#">Photos (1)</a> <a href="#">Press Archive (1)</a> <a href="#">More Mapped Information</a>	Start Date: 07/Nov/2000 Flood Quality Code:3









OFFICE OF PUBLIC WORKS DUBLIN  
**BROADMEADOW & WARD CMT.  
DRAINAGE SCHEME**

CI/11  
LONGITUDINAL SECTION 0/00 TO 34/00  
DETAILS OF BRIDGES

PREPARED BY: DPO  
CHECKED BY: JTG  
CORRECTED BY: JTG  
ENGINEER-IN-CHARGE


APPROVED  
1974/61

## APPENDIX D – TRIAL HOLE LOGS

Refer overleaf for Trial Hole Log data report by Hydrocare Environmental Ltd



Hydrocare Environmental Ltd


Trial Pit Investigation			HOLE ID: TP1				
Job No: 18-030		Ground Level (mOD): 100.150 mOD					
Client: Rockture One Limited		Coords: 53.503181, -6.534258					
Site Location: 'The Willows', Dunshaughlin, Co. Meath		Logged By: Daniel Nolan					
Type of Excavator: Hitachi EX130		Date: 01/02/2018					
Strata Description	Unit Depth (m)	Legend	Elevation (mOD)	Samples & Tests			Water Depth (m)
				Depth (m)	Type	Ref No.	
TOPSOIL - Firm grey brown CLAY with occasional pebbles	0.0 0.1 0.2 0.3 0.4			0.35	Bulk	18-11	
Firm to stiff orange blue brown CLAY mottled, occasional pebbles, blocky & massive	0.5 0.6 0.7 0.8 0.9			0.55	Bulk	18-12	
Stiff blue brown CLAY, occasional pebbles, massive, mottled	1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7 2.8 2.9 3.0			2.1	Bulk	18-13	
							WTL <sup>^^</sup> WTL at 1.2m BGL
END-----END	3.1 3.2 3.3 3.4 3.5 3.6 3.7 3.8						
Plan View (TP)		Remarks: Very stiff CLAY					
		Width: 1.7m		Length: 3.3m			1.2m (mottled to 0.35m BGL)
		Groundwater Depth:					



### **TRIAL PIT 1**

**Dims:** 3.3m L x 1.7m W x 3.1m D  
**Date:** 01/02/2018  
**Client:** Rockture One Limited  
**Location:** The Willows', Dunshaughlin, Co. Meath

Hydrocare Environmental Ltd

Trial Pit Investigation			HOLE ID: TP2					
Job No: 18-030			Ground Level (mOD): 100.60 mOD					
Client: Rockture One Limited			Coords: 53.505377, -6.532668					
Site Location: 'The Willows', Dunshaughlin, Co. Meath			Logged By: Daniel Nolan					
Type of Excavator: Hitachi EX130			Date: 01/02/2018					
Strata Description	Unit Depth (m)	Legend	Elevation (mOD)	Samples & Tests			Water Depth (m)	
				Depth (m)	Type	Ref No.		
TOPSOIL - Grey brown gravelly CLAY with humus, freq. pebbles, soft to firm ----- Soft to firm, grey brown CLAY mottled below 0.5m BGL freq. pebbles & cobbles, very damp & blocky ----- Firm grey brown CLAY occasional pebbles & cobbles, wet, blocky & massive ----- END-----END	0.0							
	0.1							
	0.2							
	0.3				0.3	Bulk	18-21	
	0.4							
	0.5					Bulk	18-22	
	0.6							
	0.7				0.7			
	0.8							
	0.9							
	1.0							
	1.1					Bulk	18-23	
	1.2							
	1.3							
	1.4							
	1.5							
	1.6							
	1.7							
1.8				1.8				
1.9								
2.0								
2.1								
2.2								
2.3								
2.4								
2.5								
2.6								
2.7								
2.8								
2.9								
3.0								
3.1								
3.2								
3.3								
Plan View (TP) 			Remarks: Very wet side walls collapsing immediately following dig Width: 2.1m Length: 4.2m Groundwater Depth: 1.6m (mottled to 0.5m BGL)					




### **TRIAL PIT 2**

**Dims:** 4.2m L x 2.1m W x 2.8m D  
**Date:** 01/02/2018  
**Client:** Rockture One Limited  
**Location:** The Willows', Dunshaughlin, Co. Meath



Hydrocare Environmental Ltd


Trial Pit Investigation				HOLE ID: TP3			
Job No: 18-030		Ground Level (mOD): 104.2 mOD					
Client: Rockture One Limited		Coords: 53.507614, -6.531006					
Site Location: 'The Willows', Dunshaughlin, Co. Meath		Logged By: Daniel Nolan					
Type of Excavator: Hitachi EX130		Date: 01/02/2018					
Strata Description	Unit Depth (m)	Legend	Elevation (mOD)	Samples & Tests			Water Depth (m)
				Depth (m)	Type	Ref No.	
TOPSOIL - Light brown firm gravelly CLAY, humus crumb, blocky, freq. pebbles	0.0						
	0.1						
-----	0.2						
	0.3			0.35	Bulk	18-31	
Firm brown gravelly CLAY pebbles & freq. occasional cobbles & boulders, blocky & massive	0.4						
	0.5				Bulk	18-32	
	0.6						
	0.7			2.65			
	0.8						
	0.9						
	1.0						
	1.1						
	1.2						
	1.3						
	1.4						
	1.5						
	1.6						
	1.7						
	1.8						
	1.9						
	2.0						
	2.1						
	2.2						
	2.3						
	2.4						
	2.5						
	2.6						
	2.7						
	2.8						
	2.9						
END-----END	3.0						
	3.1						
	3.2						
	3.3						
	3.4						
	3.5						
Plan View (TP)		Remarks: On the Northern slope away from sight. Higher ground content than TP 1, 2, 4, 5, 6					
		Width: 1.6m		Length: 3.7m		Groundwater Depth: 2.3m	



### **TRIAL PIT 3**

**Dims:** 3.7m L x 1.6m W x 3.0m D  
**Date:** 01/02/2018  
**Client:** Rockture One Limited  
**Location:** The Willows', Dunshaughlin, Co. Meath

Hydrocare Environmental Ltd


Trial Pit Investigation			HOLE ID: TP4				
Job No: 18-030		Ground Level (mOD): 103.50 mOD					
Client: Rockture One Limited		Coords: 53.506620,-6.528515					
Site Location: 'The Willows', Dunshaughlin, Co. Meath		Logged By: Daniel Nolan					
Type of Excavator: Hitachi EX130		Date: 01/02/2018					
Strata Description	Unit Depth (m)	Legend	Elevation (mOD)	Samples & Tests			Water Depth (m)
				Depth (m)	Type	Ref No.	
TOPSOIL - Grey brown gravelly CLAY with humus, freq. pebbles, soft to firm	0.0 0.1 0.2 0.3			0.4	Bulk	18-41	
----- Soft to firm, grey brown CLAY mottled below 0.7m BGL freq. pebbles & cobbles, very damp & blocky	0.4 0.5 0.6 0.7 0.8 0.9 1.0			0.6	Bulk	18-42	
----- Firm grey brown CLAY occasional pebbles & cobbles, wet, blocky & massive	1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7				Bulk	18-43	
	1.5					WTL^^^WTL at 1.5m BGL	
	1.8			1.8			
END-----END	2.8 2.9 3.0 3.1 3.2 3.3						
Plan View (TP)		Remarks: Very wet side walls collapsing immediately following dig					
		Width: 2.0m		Length: 3.5m		Groundwater Depth: 1.5m (mottled to 0.7m BGL)	



#### **TRIAL PIT 4**

**Dims:** 3.5m L x 2.0m W x 2.8m D  
**Date:** 01/02/2018  
**Client:** Rockture One Limited  
**Location:** The Willows', Dunshaughlin, Co. Meath

Hydrocare Environmental Ltd

Trial Pit Investigation				HOLE ID: TP5			
Job No: 18-030		Ground Level (mOD): 98.7 mOD					
Client: Rockture One Limited		Coords: 53.503733, -6.529158					
Site Location: 'The Willows', Dunshaughlin, Co. Meath		Logged By: Daniel Nolan					
Type of Excavator: Hitachi EX130		Date: 01/02/2018					
Strata Description	Unit Depth (m)	Legend	Elevation (mOD)	Samples & Tests			Water Depth (m)
				Depth (m)	Type	Ref No.	
TOPSOIL - Grey brown gravelly CLAY with humus, freq. pebbles, soft to firm	0.0 0.1 0.2 0.3 0.4			0.45	Bulk	18-51	
----- Soft to firm, grey brown CLAY mottled below 0.6m BGL freq. pebbles & cobbles, very damp & blocky	0.5 0.6 0.7 0.8 0.9			0.55	Bulk	18-52	
----- Firm grey brown CLAY occasional pebbles & cobbles, wet, blocky & massive	1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 1.9 2.0 2.1 2.2 2.3 2.4 2.5 2.6 2.7				Bulk	18-53	
END-----END	2.8 2.9 3.0 3.1 3.2			1.8		<b>WTL^^^WTL at 1.7m BGL</b>	
Plan View (TP)		Remarks: Very wet side walls collapsing immediately following dig					
		Width: 1.4m		1.7m (mottled to 0.6m BGL)			
		Length: 3.7m		Groundwater Depth:			






### **TRIAL PIT 5**

**Dims:** 3.7m L x 1.4m W x 2.8m D  
**Date:** 01/02/2018  
**Client:** Rockture One Limited  
**Location:** The Willows', Dunshaughlin, Co. Meath

Hydrocare Environmental Ltd

Trial Pit Investigation			HOLE ID: TP6				
Job No: 18-030			Ground Level (mOD): 97.60 mOD				
Client: Rockture One Limited			Coords: 53.502007, -6.529953				
Site Location: 'The Willows', Dunshaughlin, Co. Meath			Logged By: Daniel Nolan				
Type of Excavator: Hitachi EX130			Date: 01/02/2018				
Strata Description	Unit Depth (m)	Legend	Elevation (mOD)	Samples & Tests			Water Depth (m)
				Depth (m)	Type	Ref No.	
TOPSOIL - Grey brown gravelly CLAY with humus, freq. pebbles, soft to firm	0.0						
	0.1						
-----	0.2						
	0.3			0.4	Bulk	18-61	
	0.4						
Soft to firm, light brown CLAY mottled below 0.7m BGL freq. pebbles & cobbles, very damp & blocky	0.5				Bulk	18-62	
	0.6						
	0.7			2.4			
	0.8						
	0.9						
	1.0						
	1.1						
	1.2						
	1.3						
	1.4						
	1.5						
	1.6						
	1.7						
	1.8						
	1.9						
	2.0						
	2.1						
	2.2						
	2.3						
	2.4						
	2.5						
	2.6						
	2.7						
END-----END	2.8						
	2.9						
	3.0						
	3.1						
	3.2						
	3.3						
Plan View (TP)			Remarks: Very wet side walls collapsing immediately following dig				
			Width: 1.5m		1.8m (mottled to 0.7m BGL)		
			Length: 3.1m		Groundwater Depth:		



### **TRIAL PIT 6**

**Dims:** 3.1m L x 1.5m W x 2.8m D  
**Date:** 01/02/2018  
**Client:** Rockture One Limited  
**Location:** The Willows', Dunshaughlin, Co. Meath