

# TRANSPORTATION

Project

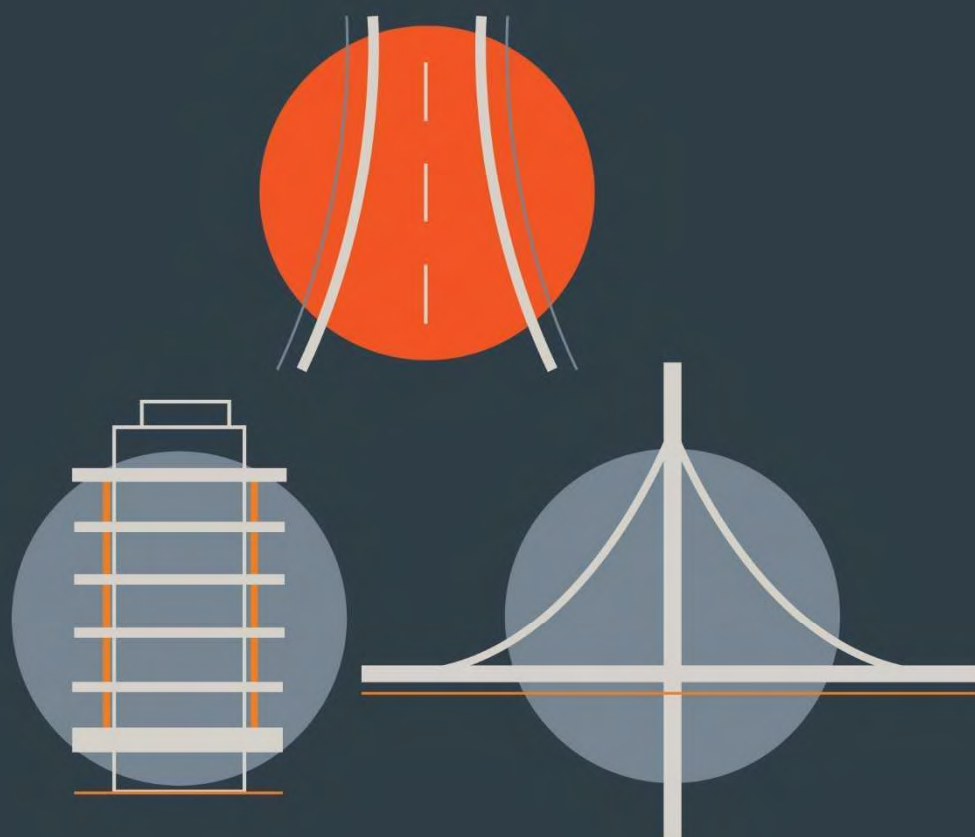
**Boyne Greenway**

Report Title

**Flood Risk Assessment**

Client

**Meath County Council**



**DBFL** CONSULTING ENGINEERS

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## 1.0 INTRODUCTION

### 1.1 Background

DBFL Consulting Engineers were appointed by Meath County Council (MCC) to prepare a preliminary design for a section of the Boyne Greenway commencing at Ship Street in Drogheda and terminating in Mornington at the Tower Road / Crook Road junction in advance of the beach (dunes area).

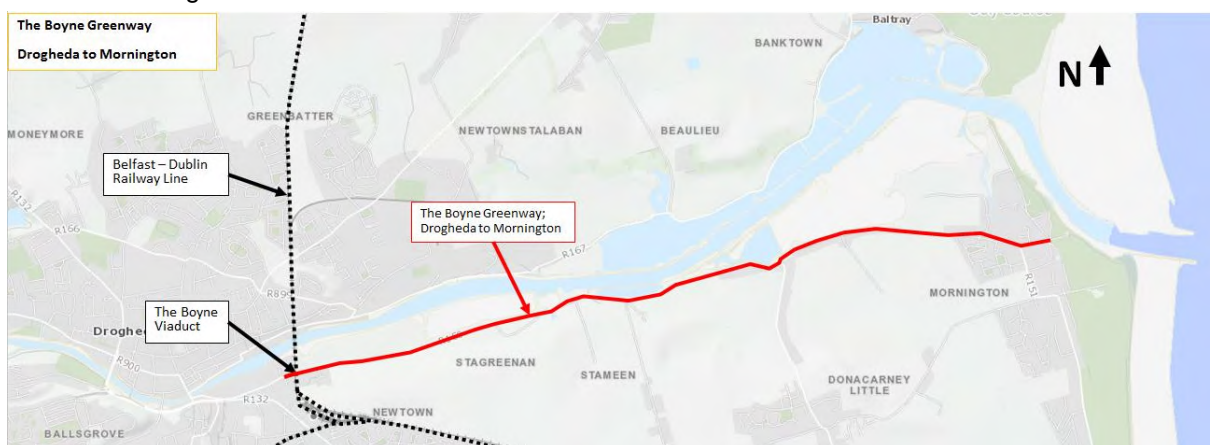
As part of the investigation into the feasibility of delivering this section of the proposed Boyne Greenway, between Drogheda and Mornington, DBFL have prepared this Flood Risk Assessment (FRA) report to accompany the planning application.

### 1.2 Objectives

The objective of this report is to inform the planning authority regarding flood risk for the proposed Boyne Greenway. The report assesses the proposed greenway route in accordance with the requirements of “The Planning System and Flood Risk Management Guidelines for Planning Authorities” determining the Flood Zone category along the route and presents information which would facilitate an informed decision of the planning application in the context of flood risk and level of vulnerability.

### 1.3 Greenway Route Drogheda to Mornington

As noted above, this flood risk assessment report will focus attention on the section of Boyne Greenway to the east of Drogheda, starting at Ship Street and terminating in Mornington at the Tower Road / Crook Road junction (see **Figure 1**). We would also note that this section of the proposed greenway will serve as a direct route for pedestrian and cyclists between Mornington/East Meath and the population employment centre in Drogheda. It will also provide local access points at key locations along the route.



**Figure 1 Proposed Greenway Route Drogheda East to Mornington**

The identified route for the Boyne Greenway, between Drogheda and Mornington, generally follows the existing R150/R151 Regional Road, moving away from the road due to levels, lack of space, or to ensure that open views to the Boyne Estuary are retained where possible and maximising the benefits of the greenway. As highlighted earlier a portion of the route falls within the boundary of the Boyne Estuary Special Protection Area (SPA) and Special Area of Conservation (SAC).

The route for this section of the Boyne Greenway is approximately 5.9 km in length with approximately 4.1 km of the route directly alongside the road, and 1.8km away from the road to ensure both a safe continuation of the route and the retention of the views across the Boyne Estuary. Although it would be preferable to have the greenway completely away from the road, this approach balances the reduced impact on the SPA/SAC with access and functionality yet still providing the outstanding views available. The route will be a mixture of at grade construction, when directly alongside the existing road, and elevated boardwalk where the route moves into the intertidal zone. Short span bridges will be utilised at surface water discharge points into the estuary. This report should be read in conjunction with the relevant planning drawings and construction methodology report.



## 2.0 Proposed Works

### 2.1 Overview

As outlined above the proposed section of the Boyne Greenway, running from Drogheda East out to Mornington, is to be made up of two fundamental construction forms depending on location:

1. Construction directly alongside, or within very close proximity of, the regional road within an area of existing roadside verge.
2. Construction significantly away from the roadside and/or within the intertidal zone/SPA/SAC.

Short span bridges will be used at two locations along the route where a stream and large culvert discharge to the estuary.

All of the above construction forms are summarised below for information with further detail provided as part of the Construction Methodology Report which also forms part of the submission.

### 2.2 Greenway Construction Alongside Road

There is approximately 4.1km of the proposed greenway to be constructed alongside the road, or very close to the road edge. There will be vertical segregation provided in the form of a vertical kerb between pedestrian/cyclist and vehicular traffic.

Given the location, access and low maintenance requirements, robust construction forms are preferred. Therefore, bituminous construction in accordance with the recommendations of the TII Design Manual for Roads and Bridges (TII DMRB) is considered the most appropriate. Some similar greenway examples are provided below for illustration. A typical section is provided as part of the drawing package submitted as part of the application.



**Figure 2 Examples of Bituminous Surfaced Greenways Alongside Road (Holland and Ireland)**

### 2.3 Greenway Construction Intertidal Zones/SPA/SAC

There is approximately 2.4km of proposed greenway within the SPA/SAC areas with approximately 610 metres of this within the intertidal zone. In these areas it is proposed that the greenway be elevated onto a boardwalk structure to minimise impact as agreed with the ecological consultant. The boardwalk will be constructed at a minimum level defined by this Flood Risk Assessment.

The elevated boardwalk will be formed using propriety recycled plastic elements. A section of Phase 1 of the Boyne Greenway has already been constructed using this form (see figure below).

[It should be noted that the current boundary of the SPA/SAC falls within the existing road corridor in places].



**Figure 3 Boyne Greenway Upstream Recycle Plastic Elements Construction**

### 2.4 Greenway Construction Bridge Sections

Bridge sections will be required at two locations along the route of the greenway to provide 20 metre clear spans. The first between chainage 3705 and 3725 and the second between chainage 4720 and 4740. The bridging sections are over a stream and surface water outfall respectively.

The proposed bridge at chainage 3705 to 3725 will be a prefabricated steel arch bridge placed on precast concrete cross beams on precast concrete piles. This construction form was agreed through discussions with the architectural heritage department of Meath County Council to limit impact on the existing stone arch bridge structure and not detract from the bridge visually.



**Figure 4 Typical Prefabricated Steel Arch Bridges**

The proposed bridge at chainage 4720 to 4740 will be a simpler option formed by providing a prestressed precast concrete beam resting on a precast concrete ground beam on precast concrete piles. The deck will be partially precast with in-situ finished surface.



**Figure 5 Typical Precast Concrete Bridges**

### 3.0 PLANNING SYSTEM FLOOD RISK MANAGEMENT GUIDELINES

#### 3.1 General

“The Planning System and Flood Risk Management, Guidelines for Planning Authorities” and its Technical Appendices outline the requirements for a Flood Risk Assessment.

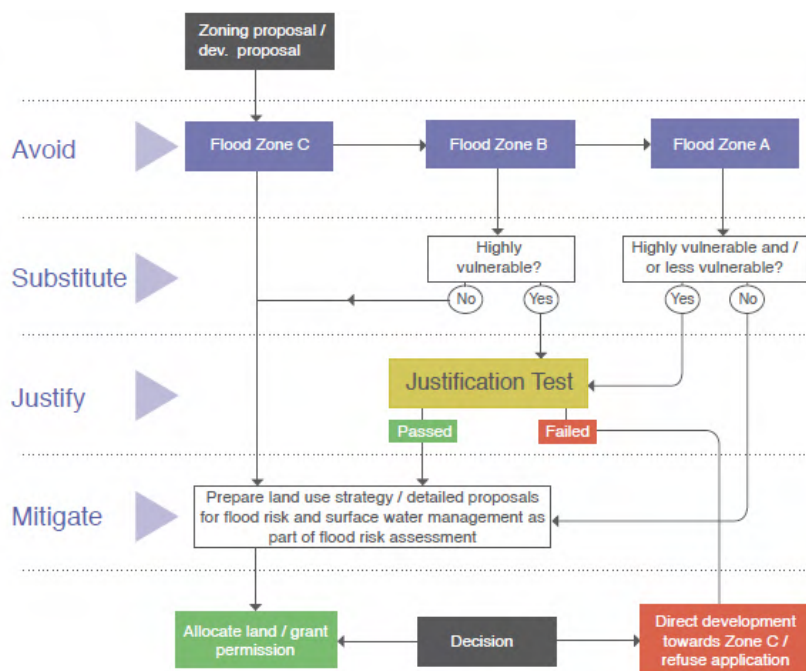
The assessment of flood risk requires an understanding of where water comes from (the source), how and where it flows (the pathways) and the people and assets affected by it (the receptors).

The principal sources are rainfall or higher than normal sea levels. The principal pathways are rivers, drains, sewers, overland flow and river and coastal floodplains and their defence assets. The receptors can include people, their property and the environment. All three elements are examined as part of the flood risk assessment including the vulnerability and exposure of receptors to determine potential consequences.

Risks to people, property and the environment should be assessed over the full range of probabilities, including extreme events. Flood risk assessment should cover all sources of flooding, including effects of run-off from development locally and beyond.

#### 3.2 Sequential Approach

This FRA applies the sequential approach to flood risk assessment as outlined in the aforementioned guidelines. The process begins by establishing the Flood Zone category of the site or location. The next stage is to determine the vulnerability classification for the proposed development. Using these determinations, the development is either considered appropriate or will require that a justification test be conducted (see figure below).



**Figure 6 Extract from The Planning System and Flood Risk Management Guidelines: (Sequential Approach Mechanism in the Planning Process)**



### 3.3 Flood Zones

The FRM Guidelines uses Flood Zones to determine the likelihood of flooding and for flood risk management as part of the planning process. There are three Flood Zones identified.

Flood Zone A – where the probability of flooding from rivers and the sea is highest (ie greater than 1% AEP for river flooding and 0.5% for coastal flooding)

Flood Zone B – where the probability of flooding from rivers and the sea is moderate (ie between 0.1% and 1% for river flooding and between 0.1% and 0.5% for coastal flooding).

Flood Zone C – where the probability of flooding from rivers and the sea is low (ie less than 0.1% or for both river and coastal flooding). Flood Zone C covers all areas of the plan which are not in zones A or B.

### 3.4 Vulnerability

The FRM Guidelines also categorises types of development as either;

- Highly Vulnerable e.g. dwellings, hospitals, fire stations, essential infrastructure,
- Vulnerable e.g. retail, commercial or industrial buildings, local transport infrastructure,
- Water Compatible e.g. flood infrastructure, docks, amenity open space.

### 3.5 Flood Zone vs Vulnerability

The aim of the FRM Guidelines, using the Sequential Approach, is to ensure that development is best positioned on land that is at the lowest risk of flooding appropriate to the level of vulnerability assigned. Where the form of development is not considered appropriate a Justification Test can be undertaken (refer to Figure 7 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  |

**Figure 7 Matrix of Flood Zone verses Vulnerability**

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### 3.6 Flood Risk Assessment Stages

The FRM Guidelines also outlines that a staged approach should be adopted when carrying out a flood risk appraisal or assessment. The stages of appraisal and assessment are:

*Stage 1 Flood risk identification* – to identify whether there may be any flooding or surface water management issues related to either the area of regional planning guidelines, development plans and LAP's or a proposed development site that may warrant further investigation at the appropriate lower level plan or planning application levels;

*Stage 2 Initial flood risk assessment* – to confirm sources of flooding that may affect a plan area or proposed development site, to appraise the adequacy of existing information and to scope the extent of the risk of flooding which may involve preparing indicative Flood Zone maps. Where hydraulic models exist the potential impact of a development on flooding elsewhere and of the scope of possible mitigation measures can be assessed. In addition, the requirements of the detailed assessment should be scoped; and

*Stage 3 Detailed flood risk assessment* – to assess flood risk issues in sufficient detail and to provide a quantitative appraisal of potential flood risk to a proposed or existing development or land to be zoned, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures.

This FRA comprises Stages 1, 2 and 3 involving both identification, initial assessment, and a more detailed assessment of flood risk. A Strategic Flood Risk Assessment (SFRA) was carried out for County Meath, in support of the Meath County Development Plan, 2013-2019.

## 4.0 STAGE 1 FLOOD RISK IDENTIFICATION

### 4.1 General

The initial flood risk identification stage uses existing information to identify and confirm whether there may be flooding or surface water management issues for the subject site which may warrant further investigation.

### 4.2 Information Sources

The following sources are considered relevant to the greenway route and have been researched in order to identify initial flood risks.

| Information Source  | Comments   |
|---|--|
| Predictive and historic flood maps, and Benefiting Lands Maps, such as those at <a href="http://www.floods.ie">www.floods.ie</a> ;                                  | Information obtained (and reviewed) from <a href="http://www.floods.ie">www.floods.ie</a> (OPW website).                       |
| Predictive flood maps produced under CFRAM Studies;<br><a href="https://www.floodinfo.ie/map/floodmaps/">https://www.floodinfo.ie/map/floodmaps/</a>                | Floodinfo.ie providing access to Eastern CFRAM study Flood Maps –Fluvial Flood Extents and Fluvial Flood Depth Maps consulted. |
| Information on flood defence condition and performance;   | No flood defences identified in the Eastern CFRAM Study in the immediate vicinity of the site.                                 |
| Walkover survey to assess potential sources of flooding, likely routes for flood waters and the site's key features, including flood defences, and their condition; | Walkover survey carried out.   |
| 'Liable to flood' markings on the old '6 Inch' maps;  | Historic OSI maps consulted.   |

### 4.3 Initial Findings & Flood Zone Determination

#### Floodmaps.ie

From consultation of flood information from the OPW's [floodmaps.ie](http://www.floodmaps.ie) website the route of the greenway has had numerous recurring flood events in the past with the most recent occurring on the Marsh Road (R150) in 2014. See [www.floodmaps.ie](http://www.floodmaps.ie) report in Appendix A.

#### OPW 'CFRAM' Mapping

From consultation of the Catchment Flood Risk Assessment and Management (CFRAM) Study and Mapping available on the OPW's Flood Portal (<https://www.floodinfo.ie/map/floodmaps/>) the proposed route of the greenway (typically following the Marsh Road R150 and R151) falls within an area that could be classified as Flood Zone A, Flood Zone B or Flood Zone C based on existing ground levels along the proposed route. It should be noted however that the existing road-based infrastructure along the route also falls within these same Flood Zones currently.

#### 4.4 Vulnerability Classification

The assignment of a vulnerability class for the proposed greenway is a key decision in the level of flood risk that is appropriate. The route will predominantly be used as a leisure route based on the objectives and policies detailed in the Meath County Development Plan 2013-2019. The route will also offer a sustainable transport link between Mornington and Drogheda Town Centre. Therefore, the greenway could be classified as either local transport infrastructure (**less vulnerable**) or amenity open space (**water compatible development**) (see figure below).

|                                     |  |
|-------------------------------------|--|
| <b>Less vulnerable development</b>  | Buildings used for: retail, leisure, warehousing, commercial, industrial and non-residential institutions;<br>Land and buildings used for holiday or short-let caravans and camping, subject to specific warning and evacuation plans;<br>Land and buildings used for agriculture and forestry;<br>Waste treatment (except landfill and hazardous waste);<br>Mineral working and processing; and<br>Local transport infrastructure.  |
| <b>Water-compatible development</b> | Flood control infrastructure;<br>Docks, marinas and wharves;<br>Navigation facilities;<br>Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location;<br>Water-based recreation and tourism (excluding sleeping accommodation);<br>Lifeguard and coastguard stations;<br>Amenity open space, outdoor sports and recreation and essential facilities such as changing rooms; and<br>Essential ancillary sleeping or residential accommodation for staff required by uses in this category (subject to a specific warning and evacuation plan). |

Figure 8: Extract from 'The Planning System and Flood Risk Management Guidelines'



## 5.0 STAGE 1 INITIAL FLOOD RISK ASSESSMENT

### 5.1 Flood Sources

A Source-Pathway-Receptor model has been produced to summarize the possible sources of floodwater, the pathways by which flood water could reach receptors and the receptors that could be affected by potential flooding, see Table below. It outlines effects of various potential sources, the performance and response of pathways and the consequences to the receptors in the context of the proposed development. These sources, pathways and receptors will be assessed further as part of the initial flood risk assessment stage.

| Source                  | Pathway  | Receptor         | Likelihood | Consequence | Risk        |
|-------------------------|--|------------------|------------|-------------|-------------|
| Coastal                 | Adjacent to tidal estuary  | People /Greenway | Probable   | High        | Significant |
| Fluvial                 | Adjacent to the Boyne River.   | People /Greenway | Probable   | High        | Significant |
| Surface Water (Pluvial) | Blockage and / or surcharging of the existing road surface water drainage network. | People /Greenway | Possible   | Low         | Moderate    |
| Groundwater             | Rising groundwater levels within the site  | People /Greenway | Rare       | Low         | Minor       |

**Table 1 Source-Pathway-Receptor Analysis**

|            |                 | Impact        |             |             |             |                |
|------------|-----------------|---------------|-------------|-------------|-------------|----------------|
|            |                 | Very Low<br>2 | Low<br>3    | Medium<br>4 | High<br>5   | Very High<br>6 |
| Likelihood | Highly Probable | Moderate      | Significant | Significant | Severe      | Severe         |
|            | Probable        | Moderate      | Moderate    | Significant | Significant | Severe         |
|            | Possible        | Minor         | Moderate    | Moderate    | Significant | Significant    |
|            | Unlikely        | Minor         | Minor       | Moderate    | Moderate    | Significant    |
|            | Rare            | Minor         | Minor       | Minor       | Moderate    | Moderate       |

The initial flood risks identified above are summarised below. These risks are assessed further in this section of the FRA.

- Significant risk of fluvial / coastal flooding from the River Boyne and Estuary.
- Moderate risk of pluvial flooding (surface water and human / mechanical error) in some locations.
- Minor/Negligible risk of groundwater flooding

The risk of groundwater flooding is considered negligible in comparison with the fluvial / coastal flooding risk and therefore will not be addressed any further in this Flood Risk Assessment.

## 5.2 Initial Fluvial & Coastal Flood Risk Assessment

The highest impacting flood risk on the greenway is fluvial/coastal. The Eastern CFRAM flood extents mapping (taken from OPW Flood Portal) identified that the route of the proposed greenway is generally influenced by *Coastal Flooding* more so than *Fluvial Flooding* and the reference levels for coastal flooding are provided only along the proposed route and will therefore be the driver for the basis of design. A summary of the Flood Zones is provided on this basis below for clarity

| Flood Zone | Coastal             |
|------------|---------------------|
| A          | < 3.54m AOD         |
| B          | 3.54mAOD – 3.74mAOD |
| C          | 3.54mAOD – 3.74mAOD |

**Table 2 Flood Zone Levels Over Route of Greenway**

As outlined above the route of the greenway and the proposed level for same is driven by many factors including Existing Road Infrastructure and Visually Intrusive Impact. The route varies in terms of Flood Zone subject to precise location. This is summarised in the following table which should be read in conjunction with the drawings submitted with the application.

| CHAINAGE |      | FLOOD ZONE A | ROUTE POSITION | CONSTRUCTION TYPE |
|----------|------|--------------|----------------|-------------------|
| 0        | 90   | YES          | ALONGSIDE ROAD | BITUMINOUS        |
| 90       | 340  | NO           | ALONGSIDE ROAD | BITUMINOUS        |
| 340      | 1470 | YES          | ALONGSIDE ROAD | BITUMINOUS        |
| 1470     | 1490 | NO           | ALONGSIDE ROAD | BITUMINOUS        |
| 1490     | 2000 | YES          | ALONGSIDE ROAD | BITUMINOUS        |
| 2000     | 2110 | YES          | ALONGSIDE ROAD | BOARDWALK         |
| 2110     | 2160 | YES          | ALONGSIDE ROAD | BITUMINOUS        |
| 2160     | 2270 | NO           | ALONGSIDE ROAD | BITUMINOUS        |
| 2270     | 2360 | NO           | AWAY FROM ROAD | BITUMINOUS        |
| 2360     | 2900 | NO           | AWAY FROM ROAD | BOARDWALK         |
| 2900     | 3110 | NO           | AWAY FROM ROAD | BITUMINOUS        |
| 3110     | 3690 | NO           | AWAY FROM ROAD | BOARDWALK         |
| 3690     | 3700 | NO           | ALONGSIDE ROAD | BOARDWALK         |
| 3700     | 3730 | NO           | ALONGSIDE ROAD | BRIDGE            |
| 3730     | 3750 | NO           | ALONGSIDE ROAD | BOARDWALK         |
| 3750     | 4350 | YES          | ALONGSIDE ROAD | BOARDWALK         |
| 4350     | 4430 | NO           | ALONGSIDE ROAD | BOARDWALK         |
| 4430     | 4640 | NO           | AWAY FROM ROAD | BITUMINOUS        |
| 4640     | 4720 | NO           | AWAY FROM ROAD | BITUMINOUS        |
| 4720     | 4750 | NO           | AWAY FROM ROAD | BRIDGE            |
| 4750     | 4860 | YES          | ALONGSIDE ROAD | BITUMINOUS        |
| 4860     | 5500 | NO           | ALONGSIDE ROAD | BITUMINOUS        |
| 5500     | 5660 | YES          | ALONGSIDE ROAD | BITUMINOUS        |
| 5660     | 5840 | YES          | ALONGSIDE ROAD | EXISTING          |

**Table 3 Route Breakdown, Location, and Flood Zone**

In summary of the table above, the greenway route has 4100metres of the route directly alongside the existing road infrastructure and 1740metres away from the road. Therefore, more than 70% of the route is driven by existing road-based infrastructure with levels typically set at a standard kerb height (150mm) above the road alongside.

We would also highlight that of the 4100metres of greenway alongside the existing road that 3050metres is currently within Flood Zone A (~75%). Given the extent of existing road-based infrastructure already within Flood Zone A, it would not be considered necessary to raise the level of the greenway to meet the aforementioned criteria but merely ensure that the lowest point on the proposed greenway is higher than the lowest existing level of the existing road-based infrastructure and ensure that the construction forms are both robust and resilient to flooding. This is considered further as part of the detailed Flood Risk Assessment and in the Construction Methodology Report.

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### 5.3 Initial Pluvial Flood Risk Assessment

The Source-Pathway-Receptor model identified a moderate risk of pluvial flooding relating to the existing surface water drainage network and human / mechanical error. As a significant portion of the route follows the existing road-based infrastructure, this is considered relevant and relates to the existing road drainage network.

The risk of the greenway impacting on the existing road drainage network will be mitigated by ensuring that the run-off from the proposed greenway is directed to soakage areas away from the road drainage network.

The risk of pluvial flooding affecting the operation of the greenway will be mitigated by setting the level of the greenway at a level above the road alongside (a minimum of 150mm). The road network is operated and maintained by Meath County Council on a periodic basis providing further mitigation against pluvial flooding impacting on the proposed greenway. A detailed risk assessment of the pluvial risk is therefore not considered necessary.

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## 6.0 STAGE 3 – DETAILED FLOOD RISK ASSESSMENT

### 6.1 General

The initial Flood Risk Assessment identified that the most significant flood risk relates to *Coastal Flooding*. It also identified that the proposed greenway route varies between Flood Zones dependent on location along the route. It also found that the majority of the route, where it is within Flood Zone A, was constrained as a result of the level of the existing road-based infrastructure alongside and limitations associated with same.

Given that the route is seen as predominately a leisure-based amenity, it will tend to operate during periods of good weather, and the need to raise the route out of Flood Zone A to meet the higher level for a local transport link would be considered impractical and commercially restrictive. It is also worth noting that coastal flooding often comes with advance warning allowing for management of same.

With the above in mind the following issues are considered in the context of a Detailed Flood Risk Assessment Stage for the proposed greenway.

- Surface Water Management Measures and SuDS
- Flood Risk Exceedance.
- Impact on Adjacent Areas.
- Access and Egress for Emergency Services during Flood Events.
- Flood Risk Mitigation

### 6.2 Surface Water Management & SUDs

The greenway will be drained naturally to the underlying soil along the entire route. This will be in the form of over the edge to grass verge for the greenway construction alongside the road and will pass through construction in the case of boardwalk or bridge.

### 6.3 Flood Risk Exceedance

As noted above, sections of the route of the greenway fall within Flood Zone A which represents coastal events greater than the 200-year return period (0.5% AEP) as having an impact. During these events, the surrounding road-based infrastructure will also be flooded as will be the existing drainage network. Following this significant future event, the road and greenway will drain back down following the tidal event, normally within a period of 12 hours. The road and closely associated infrastructure would be cleared by Meath County Council.

Where the greenway is away from the road, and on boardwalk, the level of same will be set above the Flood Zone A level.

### 6.4 Impact on Adjacent Areas

Adjacent areas will not be impacted greatly by the greenway, as the drainage will generally be straight to ground or river estuary not making use of any existing conveyancing or active drainage systems.

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## 6.5 Access and Egress for Emergency Services During Flood Events

Vehicular access / egress is directly from the R150/R151 road alongside. Access points will be provided along the route where it moves away from the road. During extreme flood events the greenway will be allowed to flood along with the road. Where extreme events occur beyond those considered manageable, permanently placed Variable Messaging Signs (VMS) will be used to warn users of the potential impact on the greenway and road network.

## 6.6 Flood Risk Mitigation

A practical approach to mitigating the flood risk associated with the proposed greenway would be to ensure that the following design assumptions are applied:

1. The level of the proposed greenway, alongside the road, is above the level of road.
2. The lowest level on the greenway route is above the lowest level of the road. and that the construction form of the greenway is robust, resilient, and easily maintained.
3. It would also be considered prudent to apply the principle that where a boardwalk structure is used away from the road that the level of same is kept out of Flood Zone A to reduce the maintenance levels associated with same.

## 6.7 Management of Flooding of the Greenway in Operation

Flooding of the greenway will be a rare event and only occur where flooding has taken place on the road alongside. Therefore, management of same will be similar to that for the R150 Marsh Road. Current procedures are relatively ad hoc with advance warning signs being placed where tidal swells are anticipated. To provide a more formal warning system, it is the intention of Meath County Council that permanent warning signage be put in place notifying both road and greenway users of the flood levels and directing them to an alternative route. The sign information will be switched by way of automatic level monitoring within Drogheda Port. Further detail on maintenance of same is provided in the Construction Methodology Report

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## 7.0 CONCLUSIONS

Based on a thorough review and assessment of the flood risks associated with the proposed greenway the following conclusions can be drawn

1. The proposed greenway can be classified both as less vulnerable when considered as a local transport link and water compatible when considered as a leisure-based amenity. Therefore, where possible the route should be kept above Flood Zone A (in Flood Zone B or C) when not constrained by existing physical infrastructure.
2. The most prominent flood risk associated with the greenway route is coastal flooding which is a reoccurring problem on the Marsh Road and R150/R151 generally. To reduce the impact on the existing road-based infrastructure would necessitate significant works in the form of flood defences or by raising the existing road by more than 1 metre in places. This is considered beyond the study requirements for the proposed greenway.
3. A substantial portion of the existing road-based infrastructure, where the proposed greenway route follows, is currently within Flood Zone A. It would therefore be impractical, commercially restrictive, and visually obtrusive to increase the greenway height to meet the required Flood Zone at this stage. (as much as 1.2 metres above the road level in places)
4. Approximately 48% of the proposed greenway route is within an appropriate Flood Zone for the more conservative local transport link infrastructure (ie Flood Zone B or C). The greenway route will be kept above Flood Zone A (ie Flood Zone B or C) when not constrained by being directly alongside the road. This ensures that the 'Avoid principle' has been applied in accordance with The Planning System and Flood Risk Management Guidelines Sequential Approach
5. Where the greenway is within Flood Zone A, it is directly alongside a road that is constraining any increase in level. This ensures that the 'Justification principle' has been applied in accordance with The Planning System and Flood Risk Management Guidelines Sequential Approach.
6. The construction forms, irrespective of location, will be robust and resilient requiring limited maintenance following a flood event. Automated advance warning signage will also be provided. This ensures that the 'Mitigation principle' has been applied in accordance with The Planning System and Flood Risk Management Guidelines Sequential Approach. Further detail on construction form is provided in the Construction Methodology report submitted as part of this application.
7. A further detailed Site-Specific Flood Risk Assessment is not required.

## **Appendix A**

### **OPW FLOOD RISK HAZARD MAPPING REPORT**



## Summary Local Area Report

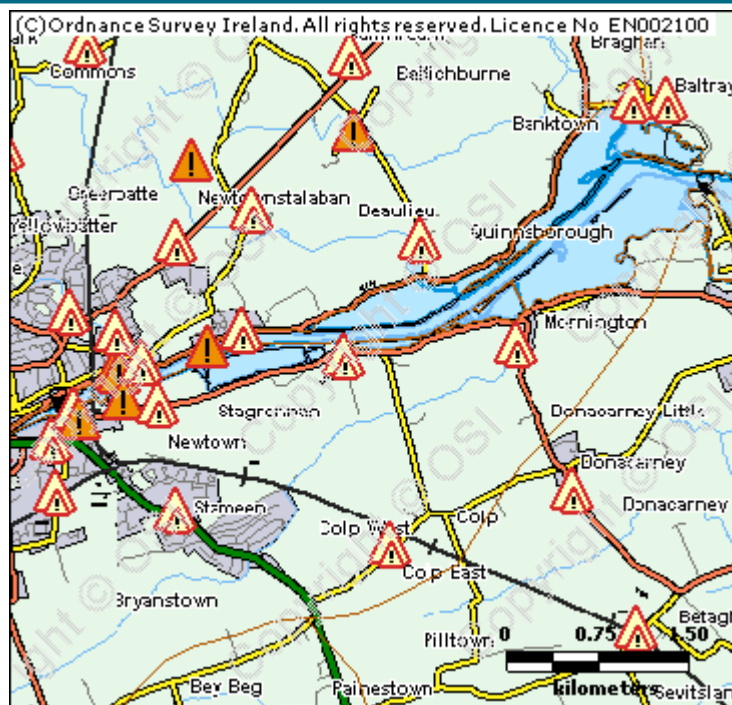
This Flood Report summarises all flood events within 2.5 kilometres of the map centre.

The map centre is in:

County: Meath

NGR: O 121 756

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. Thier purpose and scope is explained in the Glossary.

## 21 Results



1. Flooding at Ship Street, Drogheda, Co. Louth on 24th Oct 2011

County: Louth

Start Date: 24/Oct/2011

Flood Quality Code:2

Additional Information: Reports (1) More Mapped Information



2. Flooding at North Strand and Newtown Rd, Drogheda, Co. Louth on 24th Oct 2011  
County: Louth

Start Date: 24/Oct/2011

Flood Quality Code:2

Additional Information: Reports (1) More Mapped Information



3. Mornington West Recurring

County: Meath

Start Date:

Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information



4. Drogheda Quays (November 2000)

County: Louth

Start Date: 02/Nov/2000

Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information



5. Beaulieu, Termonfeckin, Co. Louth Recurring

County: Louth

Start Date:

Flood Quality Code:3



6. Drogheda October 2004

County: Louth

Start Date: 27/Oct/2004

Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information



7. Beaulieu Stream, Newtownstaban (November 2002)

County: Louth

Start Date: 15/Nov/2002

Flood Quality Code:2

Additional Information: Reports (1) More Mapped Information



8. Clarkestown Lane, Termonfeckin (November 2002)

County: Louth

Start Date: 15/Nov/2002

Flood Quality Code:2

Additional Information: Reports (4) More Mapped Information



9. North Quay Area Drogheda February 2002

County: Louth

Start Date: 01/Feb/2002

Flood Quality Code:4

Additional Information: Reports (1) More Mapped Information



10. Termonfeckin Road Drogheda Recurring

County: Louth

Start Date:

Flood Quality Code:3

Additional Information: Reports (3) More Mapped Information



11. Baltray Road Recurring

County: Louth

Start Date:

Flood Quality Code:3

Additional Information: Reports (4) More Mapped Information



12. Newtown Stalaban, Drogheda Recurring

County: Louth

Start Date:

Flood Quality Code:3

Additional Information: Reports (2) Press Archive (3) More Mapped Information



13. The Glen Drogheda Recurring

County: Louth

Start Date:

Flood Quality Code:3

Additional Information: Reports (1) More Mapped Information



14. Greenhills Industrial Estate Recurring

County: Louth

Start Date:

Flood Quality Code:3

Additional Information: Reports (3) More Mapped Information



15. Marsh Road Drogheda Recurring

County: Louth

Start Date:

Flood Quality Code:3

Additional Information: Reports (5) More Mapped Information



16. Greenmount and Boyne Recurring

County: Louth

Start Date:

Flood Quality Code:3

Additional Information: Reports (2) More Mapped Information



17. Ship Street Drogheda (Recurring)

County: Louth

Start Date:

Flood Quality Code:3

Additional Information: Reports (4) Press Archive (2) More Mapped Information



18. Dublin Road Drogheda Recurring

County: Louth

Start Date:

Flood Quality Code:4

Additional Information: Reports (1) More Mapped Information



19. Donacarney School R150 Recurring

County: Meath

Start Date:

Flood Quality Code:4

Additional Information: Reports (1) More Mapped Information



20. Marsh Road, Drogheda Recurring

County: Meath

Start Date:

Flood Quality Code:4

Additional Information: Reports (1) More Mapped Information



21. Colp West Recurring

County: Meath

Start Date:

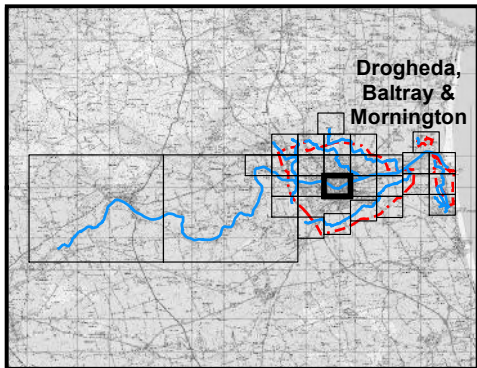
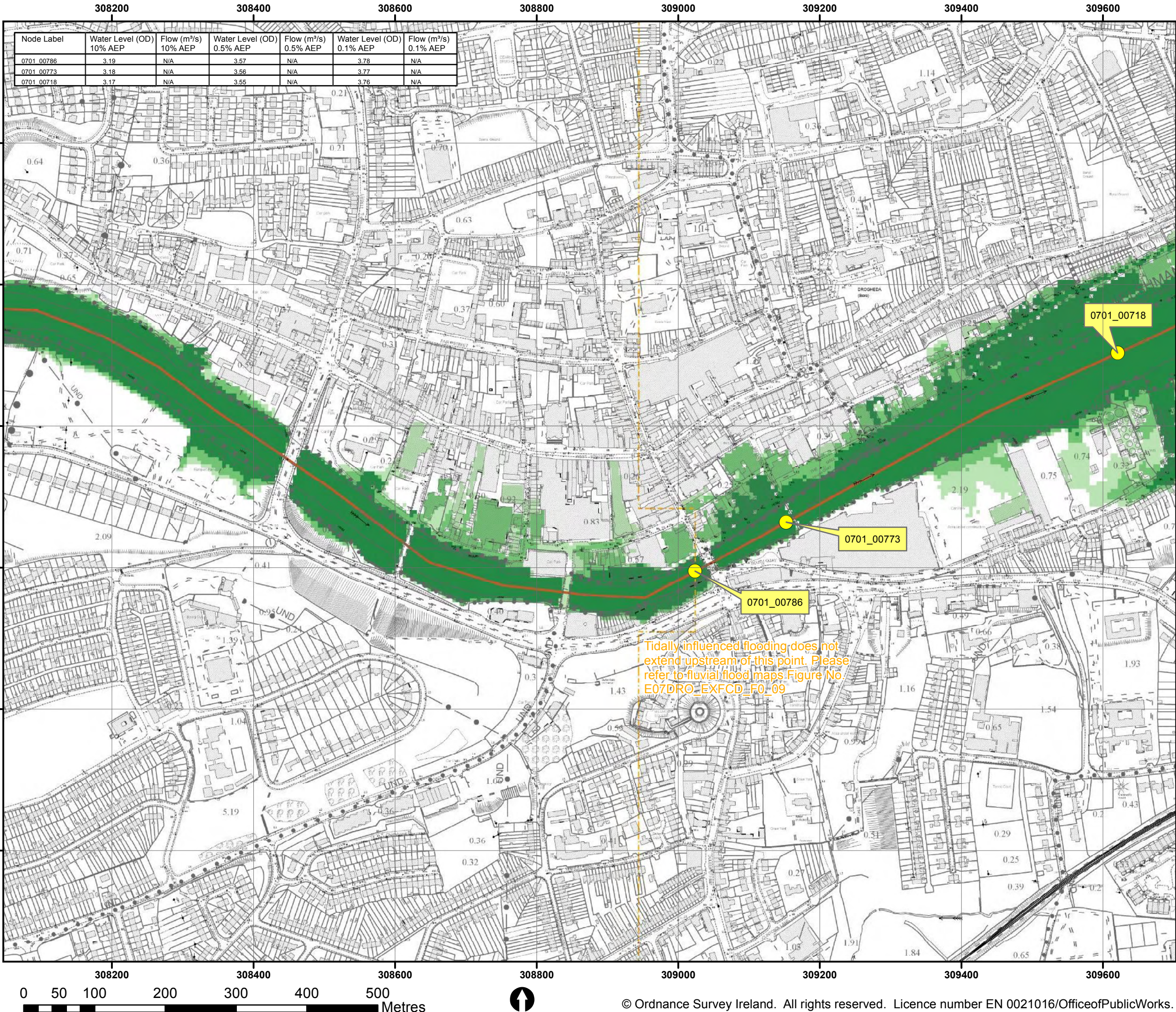
Flood Quality Code:4

Additional Information: Reports (1) More Mapped Information

## **Appendix B**

### **FINAL ECFRAM MAPPING (Downloaded from OPW Flood Portal)**





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

- Legend**
- 10% Tidal AEP Event
  - 0.5% Tidal AEP Event
  - 0.1% Tidal AEP Event
  - Modelled River Centreline
  - AFA Extents
  - Embankment
  - Wall
  - Defended Area
  - 1% AEP Standard of Protection of Flood Defence (Walls / Embankments)
  - 1% AEP
  - Node Point
  - Node ID

FINAL

|         |                                      |                |
|---------|--------------------------------------|----------------|
| REV: 01 | NOTE: Headings in Nodes Table fixed. | DATE: 24/10/16 |
|---------|--------------------------------------|----------------|



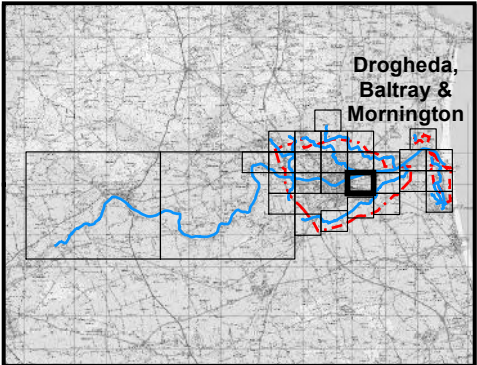
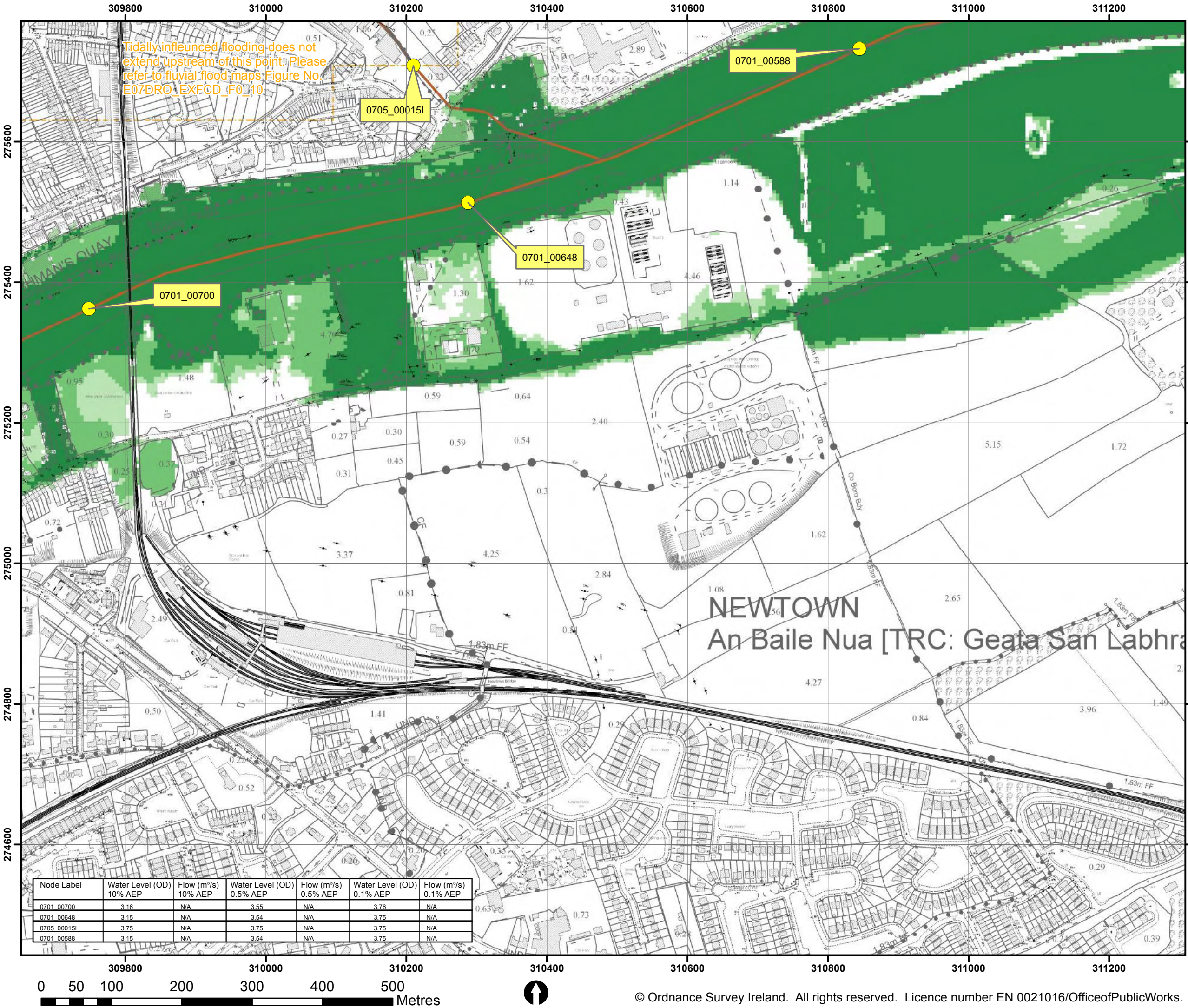
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Co Meath

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74 Boucher Road  
Belfast  
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|   |
|---|
| Map:<br>Drogheda Tidal Flood Extents      |
| Map Type: EXTENT                          |
| Source: TIDAL                             |
| Map Area: COASTAL                         |
| Scenario: CURRENT                         |
| Drawn By : C.C. Date : 27 October 2016    |
| Checked By : B.Q. Date : 27 October 2016  |
| Approved By : S.P. Date : 27 October 2016 |
| Drawing No. :<br>E07DRO_EXCCD_F0_09       |
| Map Series : Page 9 of 29                 |
| Drawing Scale : 1:5,000 @ A3              |





IMPORTANT USER NOTE:  
THE VIEWER OF THIS MAP SHOULD REFER  
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AND CONDITIONS OF USE THAT  
ACCOMPANY THIS MAP.

- Legend**
- 10% Tidal AEP Event
  - 0.5% Tidal AEP Event
  - 0.1% Tidal AEP Event
  - Modelled River Centreline
  - AFA Extents
  - Embankment
  - Wall
  - Defended Area
  - Standard of Protection of Flood Defence (Walls / Embankments)
  - Node Point
  - Node ID

**FINAL**

|         |                                      |                |
|---------|--------------------------------------|----------------|
| REV: 01 | NOTE: Headings in Nodes Table fixed. | DATE: 24/10/16 |
|---------|--------------------------------------|----------------|





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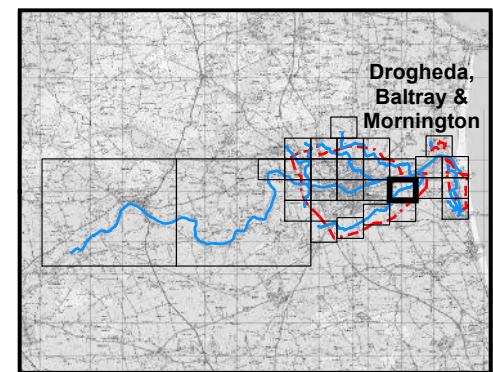
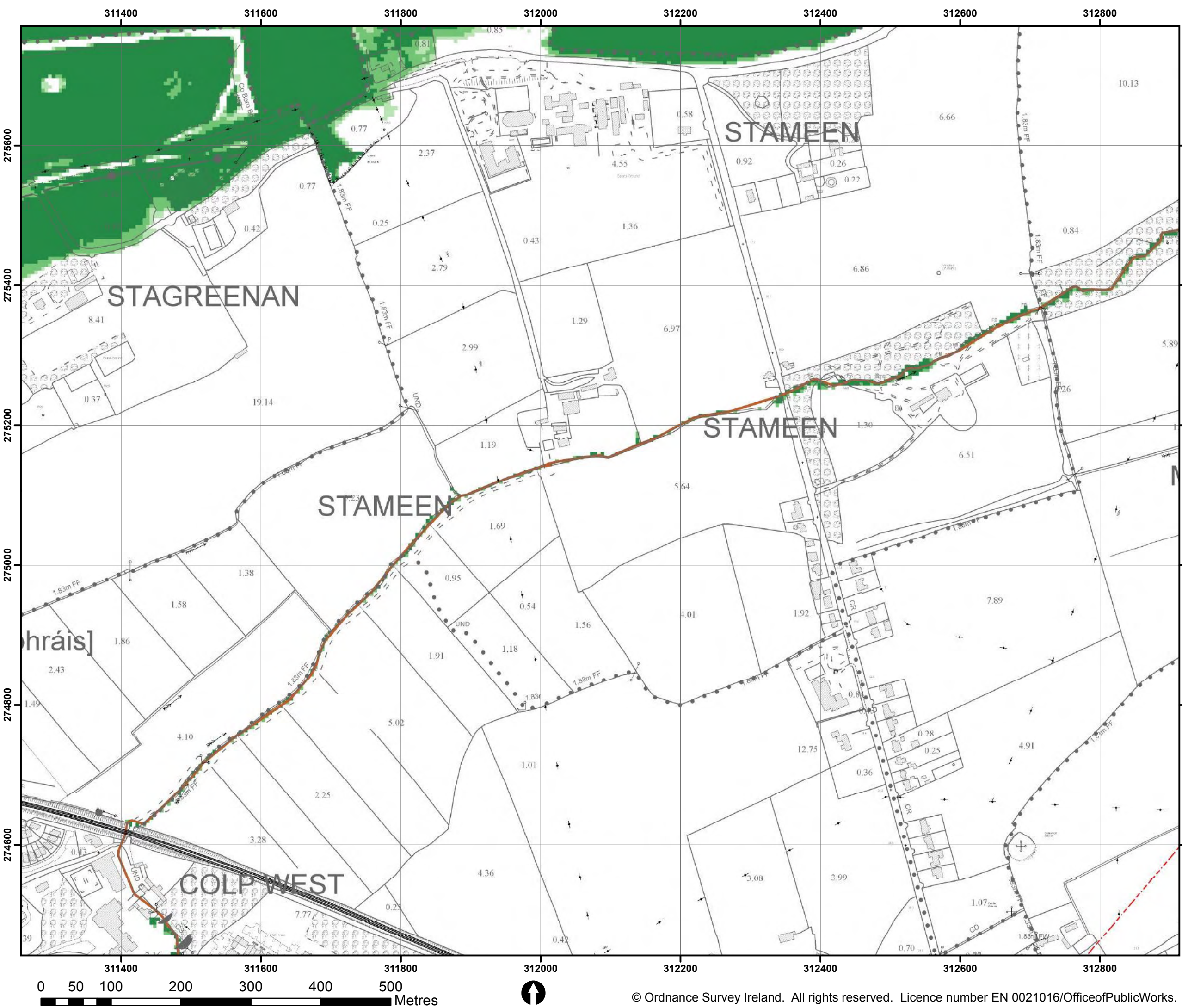
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Belfast  
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| Node Label  | Water Level (OD)<br>10% AEP | Flow (m³/s)<br>10% AEP | Water Level (OD)<br>0.5% AEP | Flow (m³/s)<br>0.5% AEP | Water Level (OD)<br>0.1% AEP | Flow (m³/s)<br>0.1% AEP |
|-------------|-----------------------------|------------------------|------------------------------|-------------------------|------------------------------|-------------------------|
| 0701_00700  | 3.16                        | N/A                    | 3.55                         | N/A                     | 3.76                         | N/A                     |
| 0701_00648  | 3.15                        | N/A                    | 3.54                         | N/A                     | 3.75                         | N/A                     |
| 0705_000151 | 3.75                        | N/A                    | 3.75                         | N/A                     | 3.75                         | N/A                     |
| 0701_00588  | 3.15                        | N/A                    | 3.54                         | N/A                     | 3.75                         | N/A                     |

|   |
|---|
| Map:<br>Drogheda Tidal Flood Extents      |
| Map Type: EXTENT                          |
| Source: TIDAL                             |
| Map Area: COASTAL                         |
| Scenario: CURRENT                         |
| Drawn By : C.C. Date : 27 October 2016    |
| Checked By : B.Q. Date : 27 October 2016  |
| Approved By : S.P. Date : 27 October 2016 |
| Drawing No. :<br>E07DRO_EXCCD_F0_10       |
| Map Series : Page 10 of 29                |
| Drawing Scale : 1:5,000 @ A3              |





IMPORTANT USER NOTE:  
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AND CONDITIONS OF USE THAT  
ACCOMPANY THIS MAP.

**Legend**

- 10% Tidal AEP Event
- 0.5% Tidal AEP Event
- 0.1% Tidal AEP Event
- Modelled River Centreline
- AFA Extents
- Embankment
- Wall
- Defended Area
- 1% AEP Standard of Protection of Flood Defence (Walls / Embankments)
- 1% AEP
- Node Point
- Node ID

**FINAL**

| REV: | NOTE:                          | DATE:    |
|------|--------------------------------|----------|
| 01   | Headings in Nodes Table fixed. | 24/10/16 |





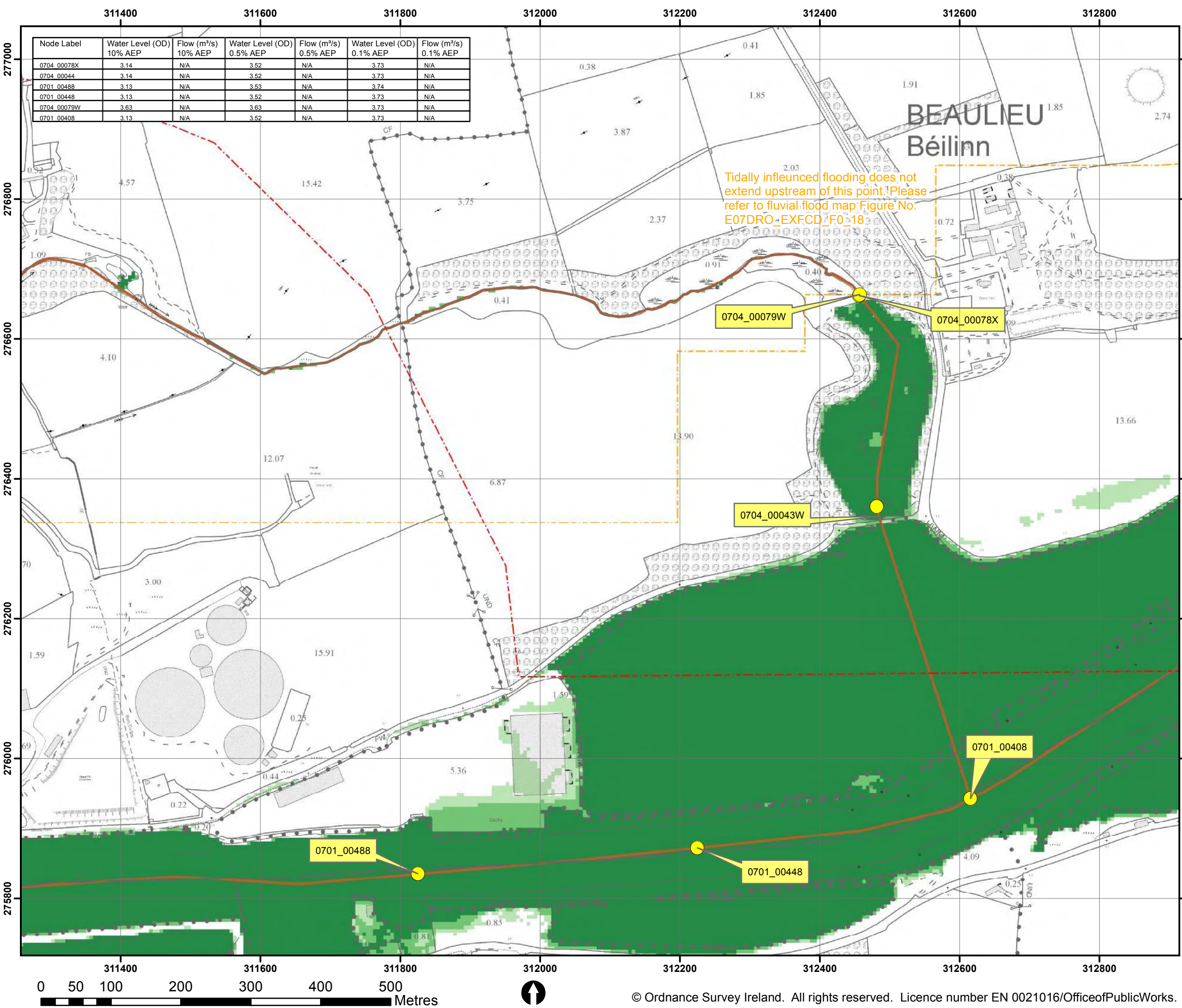
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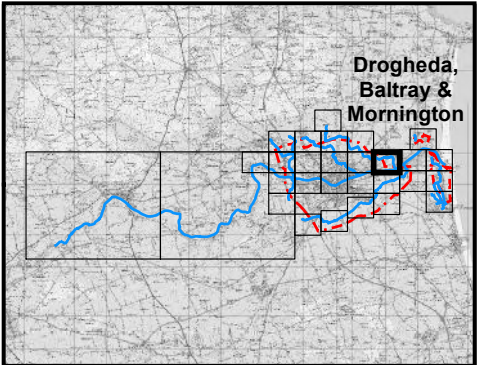
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|   |                               |
|---|-------------------------------|
| <b>Map:</b><br>Drogheda Tidal Flood Extents |                               |
| <b>Map Type:</b> EXTENT                     |                               |
| <b>Source:</b> TIDAL                        |                               |
| <b>Map Area:</b> COASTAL                    |                               |
| <b>Scenario:</b> CURRENT                    |                               |
| <b>Drawn By :</b> C.C.                      | <b>Date :</b> 27 October 2016 |
| <b>Checked By :</b> B.Q.                    | <b>Date :</b> 27 October 2016 |
| <b>Approved By :</b> S.P.                   | <b>Date :</b> 27 October 2016 |
| <b>Drawing No. :</b><br>E07DRO_EXCCD_F0_23  |                               |
| <b>Map Series :</b> Page 23 of 29           |                               |
| <b>Drawing Scale :</b> 1:5,000 @ A3         |                               |





| Node Label  | Water Level (OD)<br>10% AEP | Flow (m³/s)<br>10% AEP | Water Level (OD)<br>0.5% AEP | Flow (m³/s)<br>0.5% AEP | Water Level (OD)<br>0.1% AEP | Flow (m³/s)<br>0.1% AEP |
|-------------|-----------------------------|------------------------|------------------------------|-------------------------|------------------------------|-------------------------|
| 0704_00078X | 3.14                        | N/A                    | 3.52                         | N/A                     | 3.73                         | N/A                     |
| 0704_00044  | 3.14                        | N/A                    | 3.52                         | N/A                     | 3.73                         | N/A                     |
| 0701_00488  | 3.13                        | N/A                    | 3.53                         | N/A                     | 3.74                         | N/A                     |
| 0701_00448  | 3.13                        | N/A                    | 3.52                         | N/A                     | 3.73                         | N/A                     |
| 0704_00079W | 3.63                        | N/A                    | 3.63                         | N/A                     | 3.73                         | N/A                     |
| 0701_00408  | 3.13                        | N/A                    | 3.52                         | N/A                     | 3.73                         | N/A                     |



IMPORTANT USER NOTE:  
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- Legend**
- 10% Tidal AEP Event
  - 0.5% Tidal AEP Event
  - 0.1% Tidal AEP Event
  - Modelled River Centreline
  - AFA Extents
  - Embankment
  - Wall
  - Defended Area
  - Standard of Protection of Flood Defence (Walls / Embankments)
  - Node Point
  - Node ID

**FINAL**

|         |                                      |                |
|---------|--------------------------------------|----------------|
| REV: 01 | NOTE: Headings in Nodes Table fixed. | DATE: 24/10/16 |
|---------|--------------------------------------|----------------|





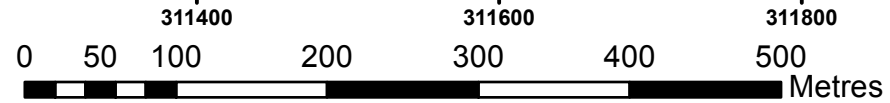
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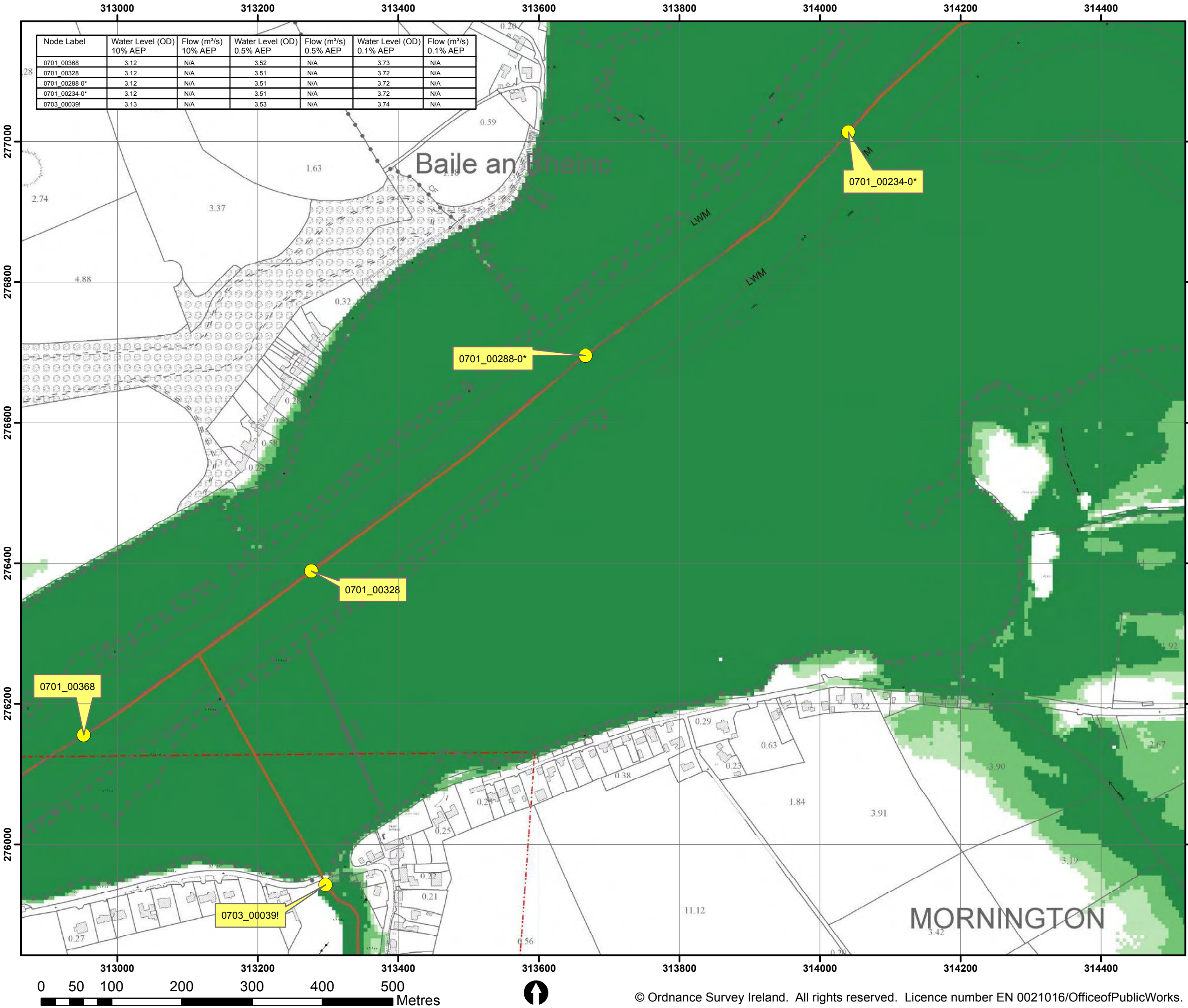
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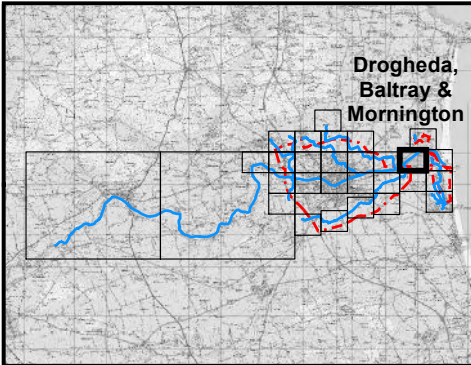
|   |                               |
|---|-------------------------------|
| <b>Map:</b><br>Drogheda Tidal Flood Extents |                               |
| <b>Map Type:</b> EXTENT                     |                               |
| <b>Source:</b> TIDAL                        |                               |
| <b>Map Area:</b> COASTAL                    |                               |
| <b>Scenario:</b> CURRENT                    |                               |
| <b>Drawn By :</b> C.C.                      | <b>Date :</b> 27 October 2016 |
| <b>Checked By :</b> B.Q.                    | <b>Date :</b> 27 October 2016 |
| <b>Approved By :</b> S.P.                   | <b>Date :</b> 27 October 2016 |
| <b>Drawing No. :</b><br>E07DRO_EXCCD_F0_18  |                               |
| <b>Map Series :</b> Page 18 of 29           |                               |
| <b>Drawing Scale :</b> 1:5,000 @ A3         |                               |







| Node Label    | Water Level (OD)<br>10% AEP | Flow (m³/s)<br>10% AEP | Water Level (OD)<br>0.5% AEP | Flow (m³/s)<br>0.5% AEP | Water Level (OD)<br>0.1% AEP | Flow (m³/s)<br>0.1% AEP |
|---------------|-----------------------------|------------------------|------------------------------|-------------------------|------------------------------|-------------------------|
| 0701_00368    | 3.12                        | N/A                    | 3.52                         | N/A                     | 3.73                         | N/A                     |
| 0701_00328    | 3.12                        | N/A                    | 3.51                         | N/A                     | 3.72                         | N/A                     |
| 0701_00288-0* | 3.12                        | N/A                    | 3.51                         | N/A                     | 3.72                         | N/A                     |
| 0701_00234-0* | 3.12                        | N/A                    | 3.51                         | N/A                     | 3.72                         | N/A                     |
| 0703_00039!   | 3.13                        | N/A                    | 3.53                         | N/A                     | 3.74                         | N/A                     |



IMPORTANT USER NOTE:  
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- Legend**
- 10% Tidal AEP Event
  - 0.5% Tidal AEP Event
  - 0.1% Tidal AEP Event
  - Modelled River Centreline
  - AFA Extents
  - Embankment
  - Wall
  - Defended Area
  - Standard of Protection of Flood Defence (Walls / Embankments)
  - Node Point
  - Node ID

**FINAL**

|            |   |                   |
|------------|---|-------------------|
| REV:<br>01 | NOTE:<br>Headings in Nodes Table fixed. | DATE:<br>24/10/16 |
|------------|---|-------------------|





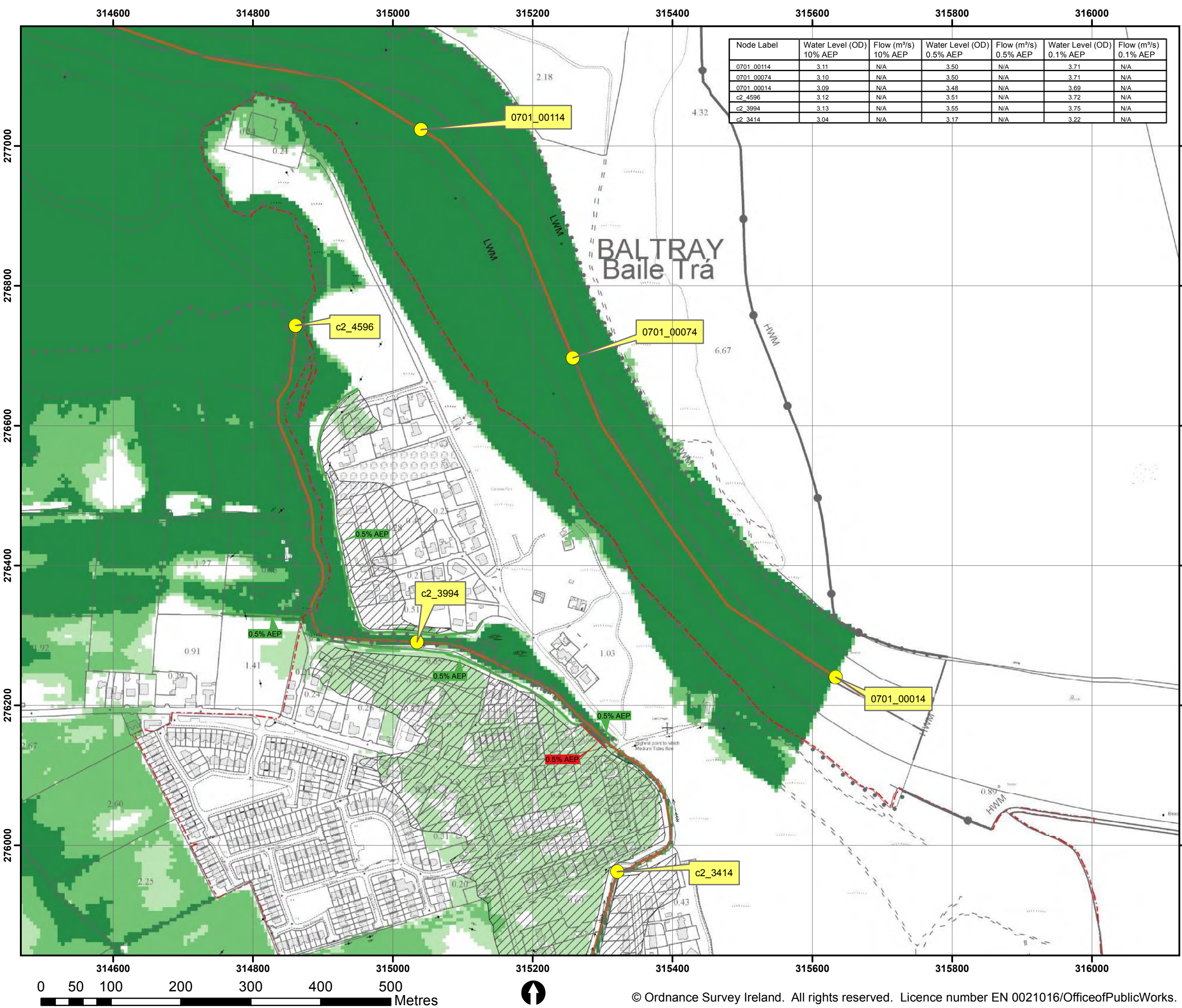
The Office of Public Works  
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Belfast  
BT12 6RZ

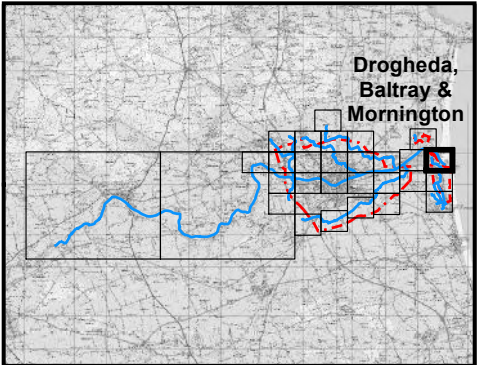
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F +44(0) 28 90 668286  
W www.rpsgroup.com  
E ireland@rpsgroup.com

|   |                               |
|---|-------------------------------|
| <b>Map:</b><br>Drogheda Tidal Flood Extents |                               |
| <b>Map Type:</b> EXTENT                     |                               |
| <b>Source:</b> TIDAL                        |                               |
| <b>Map Area:</b> COASTAL                    |                               |
| <b>Scenario:</b> CURRENT                    |                               |
| <b>Drawn By :</b> C.C.                      | <b>Date :</b> 27 October 2016 |
| <b>Checked By :</b> B.Q.                    | <b>Date :</b> 27 October 2016 |
| <b>Approved By :</b> S.P.                   | <b>Date :</b> 27 October 2016 |
| <b>Drawing No. :</b><br>E07DRO_EXCCD_F0_25  |                               |
| <b>Map Series :</b> Page 25 of 29           |                               |
| <b>Drawing Scale :</b> 1:5,000 @ A3         |                               |





| Node Label | Water Level (OD)<br>10% AEP | Flow (m³/s)<br>10% AEP | Water Level (OD)<br>0.5% AEP | Flow (m³/s)<br>0.5% AEP | Water Level (OD)<br>0.1% AEP | Flow (m³/s)<br>0.1% AEP |
|------------|-----------------------------|------------------------|------------------------------|-------------------------|------------------------------|-------------------------|
| 0701_00114 | 3.11                        | N/A                    | 3.50                         | N/A                     | 3.71                         | N/A                     |
| 0701_00074 | 3.10                        | N/A                    | 3.50                         | N/A                     | 3.71                         | N/A                     |
| 0701_00014 | 3.09                        | N/A                    | 3.48                         | N/A                     | 3.69                         | N/A                     |
| c2_4596    | 3.12                        | N/A                    | 3.51                         | N/A                     | 3.72                         | N/A                     |
| c2_3994    | 3.13                        | N/A                    | 3.55                         | N/A                     | 3.75                         | N/A                     |
| c2_3414    | 3.04                        | N/A                    | 3.17                         | N/A                     | 3.22                         | N/A                     |



IMPORTANT USER NOTE:  
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**Legend**

- 10% Tidal AEP Event
- 0.5% Tidal AEP Event
- 0.1% Tidal AEP Event
- Modelled River Centreline
- AFA Extents
- Embankment
- Wall
- Defended Area
- 1% AEP Standard of Protection of Flood Defence (Walls / Embankments)
- 1% AEP
- Node Point
- Node ID

**FINAL**

|         |                                      |                |
|---------|--------------------------------------|----------------|
| REV: 01 | NOTE: Headings in Nodes Table fixed. | DATE: 24/10/16 |
|---------|--------------------------------------|----------------|



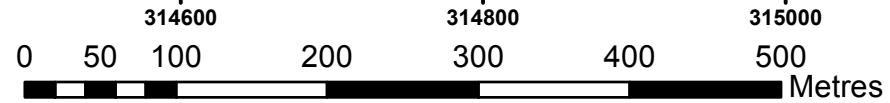


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Co Meath

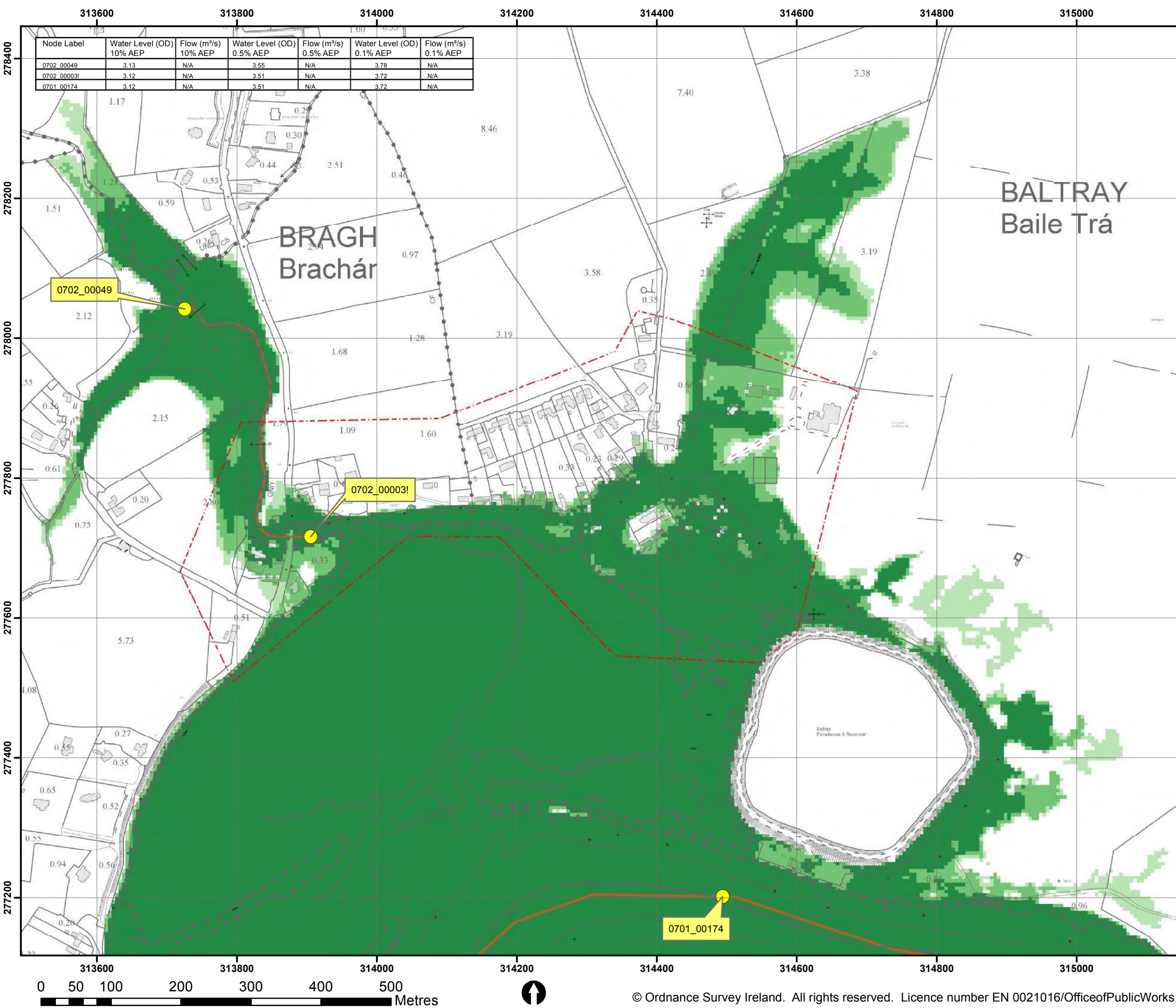
Elmwood House  
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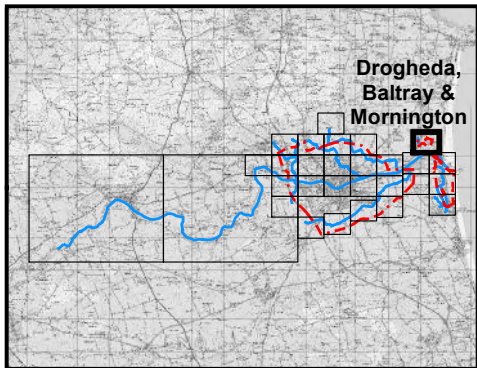
|   |                               |
|---|-------------------------------|
| <b>Map:</b><br>Mornington Tidal Flood Extents |                               |
| <b>Map Type:</b> EXTENT                       |                               |
| <b>Source:</b> TIDAL                          |                               |
| <b>Map Area:</b> COASTAL                      |                               |
| <b>Scenario:</b> CURRENT                      |                               |
| <b>Drawn By :</b> C.C.                        | <b>Date :</b> 27 October 2016 |
| <b>Checked By :</b> B.Q.                      | <b>Date :</b> 27 October 2016 |
| <b>Approved By :</b> S.P.                     | <b>Date :</b> 27 October 2016 |
| <b>Drawing No. :</b><br>E07DRO_EXCCD_F0_27    |                               |
| <b>Map Series :</b> Page 27 of 29             |                               |
| <b>Drawing Scale :</b> 1:5,000 @ A3           |                               |







| Node Label  | Water Level (OD)<br>10% AEP | Flow (m³/s)<br>10% AEP | Water Level (OD)<br>0.5% AEP | Flow (m³/s)<br>0.5% AEP | Water Level (OD)<br>0.1% AEP | Flow (m³/s)<br>0.1% AEP |
|-------------|-----------------------------|------------------------|------------------------------|-------------------------|------------------------------|-------------------------|
| 0702_00049  | 3.13                        | N/A                    | 3.55                         | N/A                     | 3.78                         | N/A                     |
| 0702_00003! | 3.12                        | N/A                    | 3.51                         | N/A                     | 3.72                         | N/A                     |
| 0701_00174  | 3.12                        | N/A                    | 3.51                         | N/A                     | 3.72                         | N/A                     |



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

- Legend**
- 10% Tidal AEP Event
  - 0.5% Tidal AEP Event
  - 0.1% Tidal AEP Event
  - Modelled River Centreline
  - AFA Extents
  - Embankment
  - Wall
  - Defended Area
  - Standard of Protection of Flood Defence (Walls / Embankments)
  - Node Point
  - Node Label

**FINAL**

| REV: | NOTE:                          | DATE:    |
|------|--------------------------------|----------|
| 01   | Headings in Nodes Table fixed. | 24/10/16 |





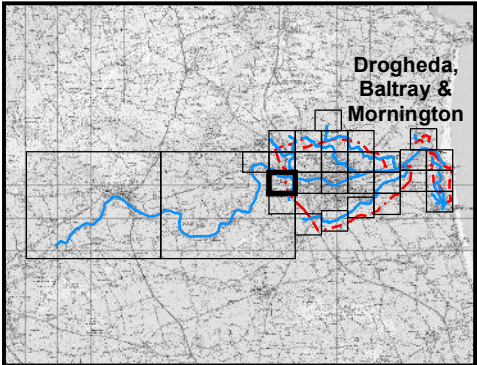
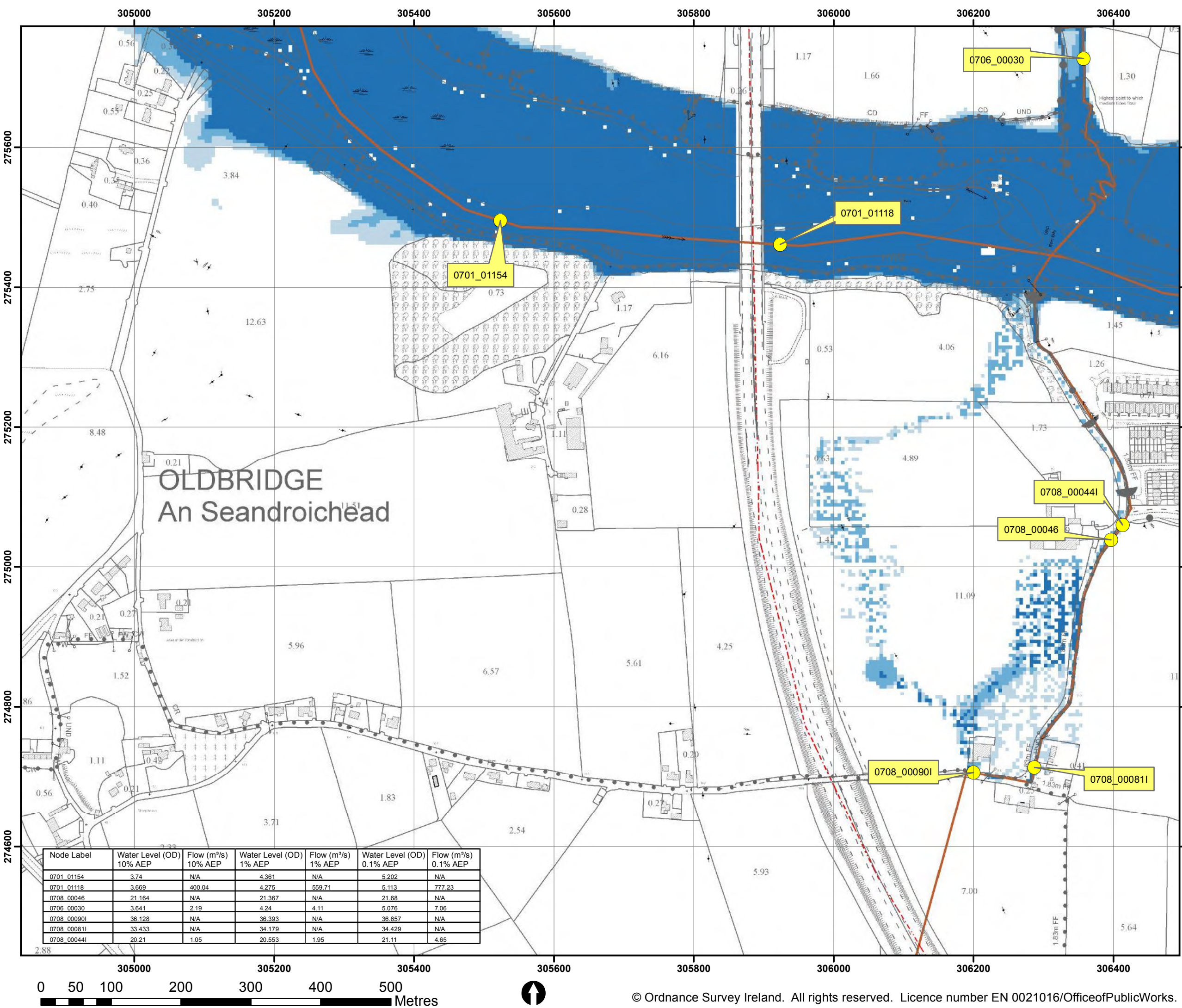
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Trim  
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|  |                               |
|--|-------------------------------|
| <b>Map:</b><br>Baltray Tidal Flood Extents |                               |
| <b>Map Type:</b> EXTENT                    |                               |
| <b>Source:</b> TIDAL                       |                               |
| <b>Map Area:</b> COASTAL                   |                               |
| <b>Scenario:</b> CURRENT                   |                               |
| <b>Drawn By :</b> C.C.                     | <b>Date :</b> 27 October 2016 |
| <b>Checked By :</b> B.Q.                   | <b>Date :</b> 27 October 2016 |
| <b>Approved By :</b> S.P.                  | <b>Date :</b> 27 October 2016 |
| <b>Drawing No. :</b><br>E07DRO_EXCCD_F0_26 |                               |
| <b>Map Series :</b> Page 26 of 29          |                               |
| <b>Drawing Scale :</b> 1:5,000 @ A3        |                               |





IMPORTANT USER NOTE:  
THE VIEWER OF THIS MAP SHOULD REFER  
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AND CONDITIONS OF USE THAT  
ACCOMPANY THIS MAP.

**Legend**

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

**FINAL**

| REV: | NOTE: | DATE: |
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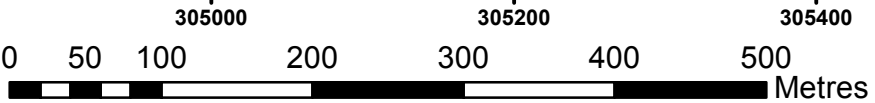
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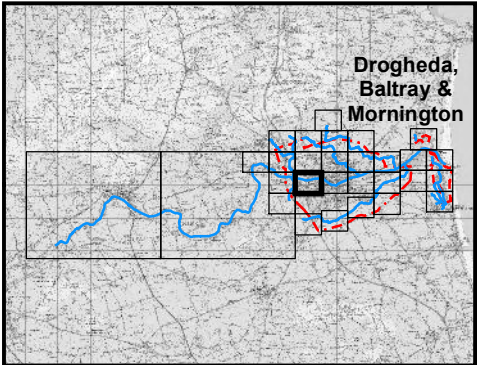
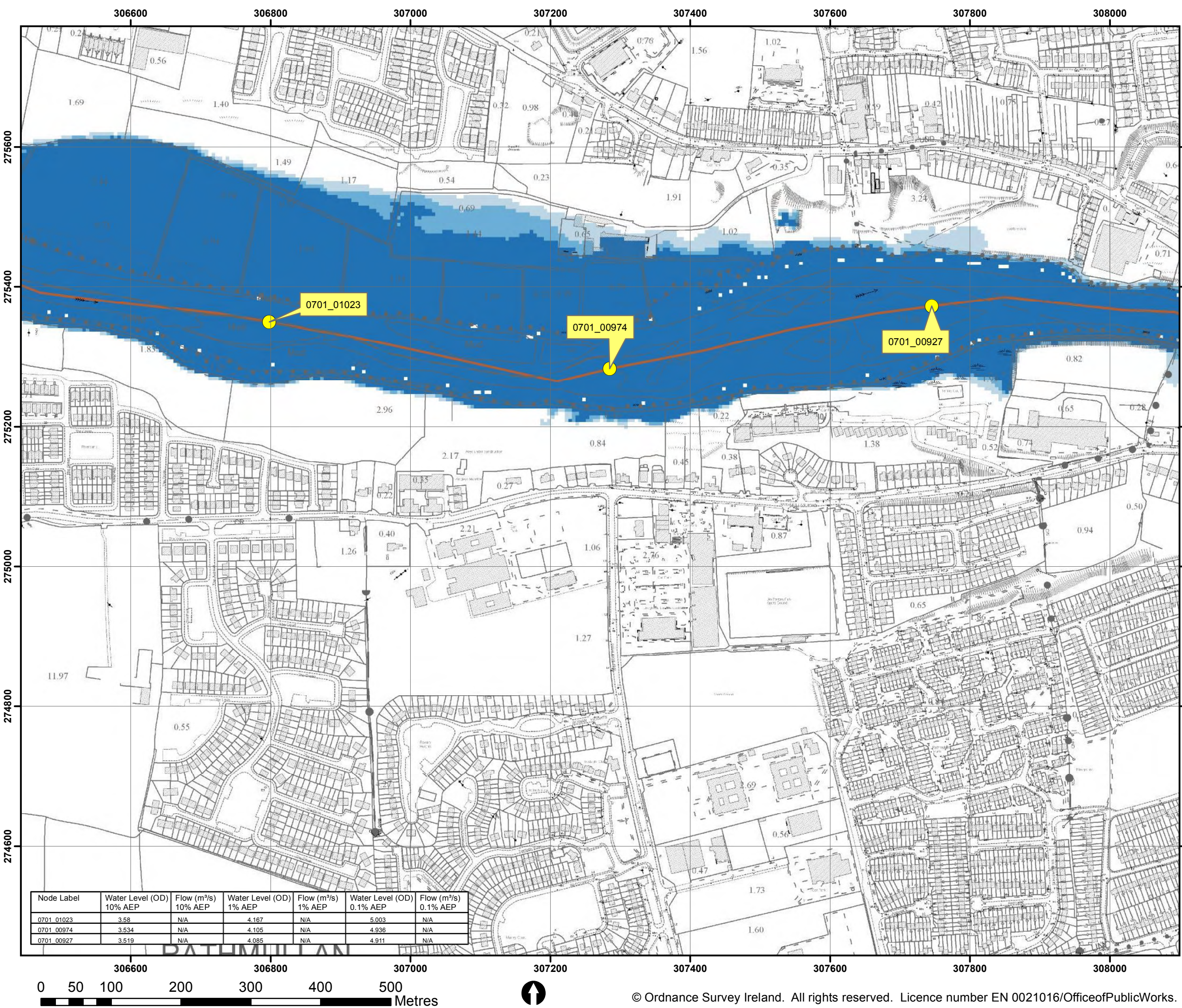
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|   |                                   |
|---|-----------------------------------|
| <b>Map:</b><br>Drogheda Fluvial Flood Extents |                                   |
| <b>Map Type:</b>                              | EXTENT                            |
| <b>Source:</b>                                | FLUVIAL                           |
| <b>Map Area:</b>                              | HPW                               |
| <b>Scenario:</b>                              | CURRENT                           |
| <b>Drawn By :</b>                             | C.McG. <b>Date :</b> 14 July 2016 |
| <b>Checked By :</b>                           | B.Q. <b>Date :</b> 14 July 2016   |
| <b>Approved By :</b>                          | S.P. <b>Date :</b> 14 July 2016   |
| <b>Drawing No. :</b><br>E07DRO_EXFCD_F0_07    |                                   |
| <b>Map Series :</b> Page 7 of 29              |                                   |
| <b>Drawing Scale :</b> 1:5,000 @ A3           |                                   |

| Node Label  | Water Level (OD)<br>10% AEP | Flow (m³/s)<br>10% AEP | Water Level (OD)<br>1% AEP | Flow (m³/s)<br>1% AEP | Water Level (OD)<br>0.1% AEP | Flow (m³/s)<br>0.1% AEP |
|-------------|-----------------------------|------------------------|----------------------------|-----------------------|------------------------------|-------------------------|
| 0701_01154  | 3.74                        | N/A                    | 4.361                      | N/A                   | 5.202                        | N/A                     |
| 0701_01118  | 3.669                       | 400.04                 | 4.275                      | 559.71                | 5.113                        | 777.23                  |
| 0708_00046  | 21.164                      | N/A                    | 21.367                     | N/A                   | 21.68                        | N/A                     |
| 0706_00030  | 3.641                       | 2.19                   | 4.24                       | 4.11                  | 5.076                        | 7.06                    |
| 0708_000901 | 36.128                      | N/A                    | 36.393                     | N/A                   | 36.657                       | N/A                     |
| 0708_000811 | 33.433                      | N/A                    | 34.179                     | N/A                   | 34.429                       | N/A                     |
| 0708_000441 | 20.21                       | 1.05                   | 20.553                     | 1.95                  | 21.11                        | 4.65                    |







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AND CONDITIONS OF USE THAT  
ACCOMPANY THIS MAP.

**Legend**

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

**FINAL**

|      |       |       |
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| REV: | NOTE: | DATE: |
|------|-------|-------|





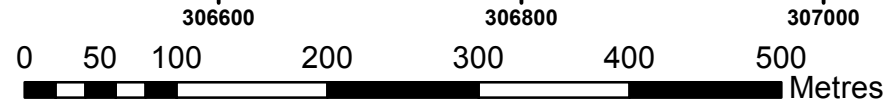
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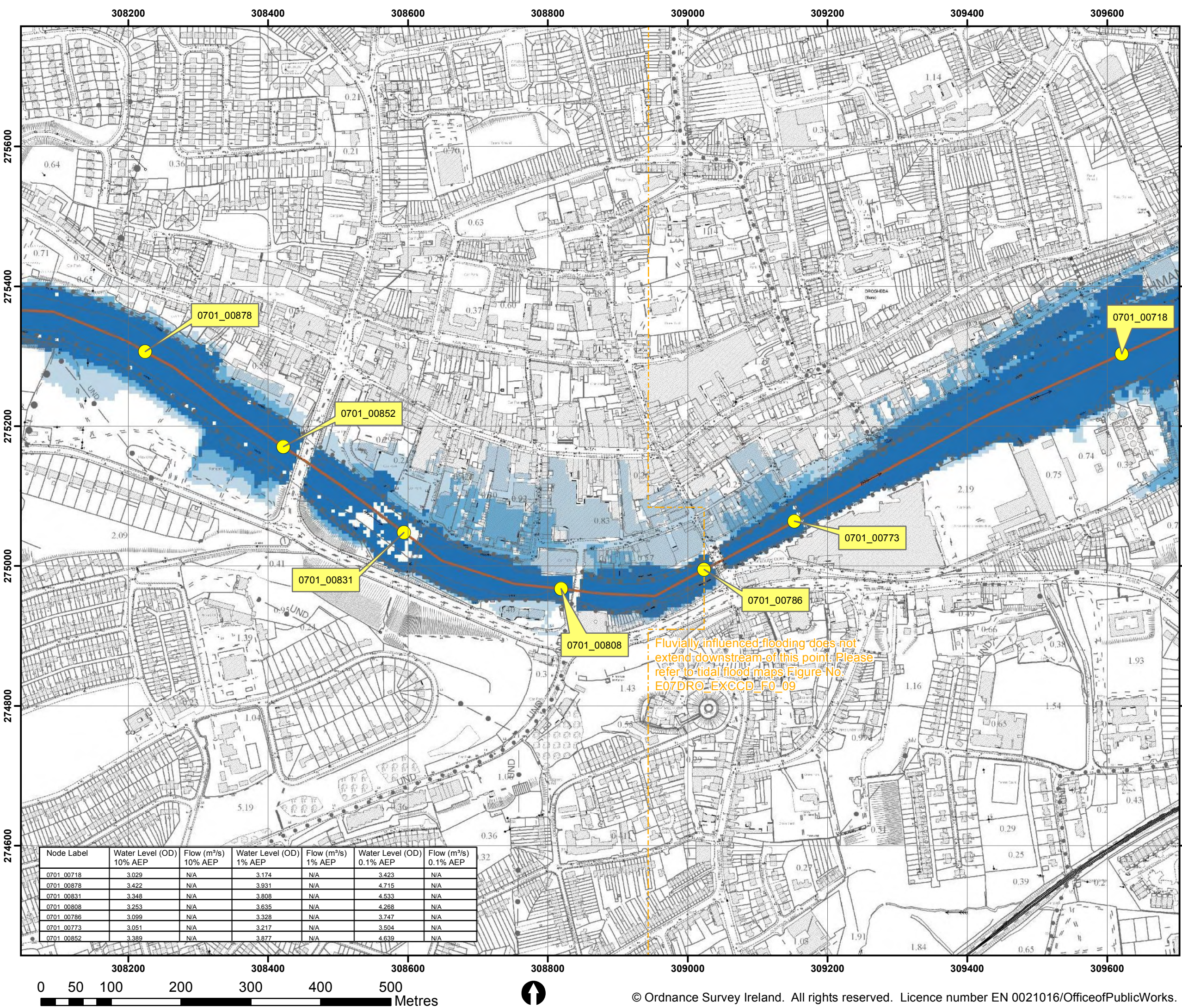
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|   |                                   |
|---|-----------------------------------|
| <b>Map:</b><br>Drogheda Fluvial Flood Extents |                                   |
| <b>Map Type:</b>                              | EXTENT                            |
| <b>Source:</b>                                | FLUVIAL                           |
| <b>Map Area:</b>                              | HPW                               |
| <b>Scenario:</b>                              | CURRENT                           |
| <b>Drawn By :</b>                             | C.McG. <b>Date :</b> 14 July 2016 |
| <b>Checked By :</b>                           | B.Q. <b>Date :</b> 14 July 2016   |
| <b>Approved By :</b>                          | S.P. <b>Date :</b> 14 July 2016   |
| <b>Drawing No. :</b><br>E07DRO_EXFCD_F0_08    |                                   |
| <b>Map Series :</b> Page 8 of 29              |                                   |
| <b>Drawing Scale :</b> 1:5,000 @ A3           |                                   |

| Node Label | Water Level (OD)<br>10% AEP | Flow (m³/s)<br>10% AEP | Water Level (OD)<br>1% AEP | Flow (m³/s)<br>1% AEP | Water Level (OD)<br>0.1% AEP | Flow (m³/s)<br>0.1% AEP |
|------------|-----------------------------|------------------------|----------------------------|-----------------------|------------------------------|-------------------------|
| 0701_01023 | 3.58                        | N/A                    | 4.167                      | N/A                   | 5.003                        | N/A                     |
| 0701_00974 | 3.534                       | N/A                    | 4.105                      | N/A                   | 4.936                        | N/A                     |
| 0701_00927 | 3.519                       | N/A                    | 4.085                      | N/A                   | 4.911                        | N/A                     |

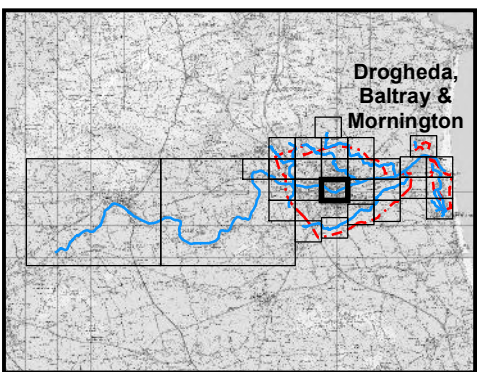






| Node Label | Water Level (OD) |        | Flow (m³/s) |        | Water Level (OD) |          | Flow (m³/s) |          |
|------------|------------------|--------|-------------|--------|------------------|----------|-------------|----------|
|            | 10% AEP          | 1% AEP | 10% AEP     | 1% AEP | 0.1% AEP         | 0.1% AEP | 0.1% AEP    | 0.1% AEP |
| 0701_00718 | 3.029            | N/A    | 3.174       | N/A    | 3.423            | N/A      |             |          |
| 0701_00878 | 3.422            | N/A    | 3.931       | N/A    | 4.715            | N/A      |             |          |
| 0701_00831 | 3.348            | N/A    | 3.808       | N/A    | 4.533            | N/A      |             |          |
| 0701_00808 | 3.253            | N/A    | 3.635       | N/A    | 4.268            | N/A      |             |          |
| 0701_00786 | 3.099            | N/A    | 3.328       | N/A    | 3.747            | N/A      |             |          |
| 0701_00773 | 3.051            | N/A    | 3.217       | N/A    | 3.504            | N/A      |             |          |
| 0701_00852 | 3.389            | N/A    | 3.877       | N/A    | 4.639            | N/A      |             |          |

Fluvially influenced flooding does not extend downstream of this point. Please refer to tidal flood maps Figure No. E07DRO\_EXCCD\_F0\_09



IMPORTANT USER NOTE:  
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- Legend**
- 10% Fluvial AEP Event
  - 1% Fluvial AEP Event
  - 0.1% Fluvial AEP Event
  - Modelled River Centreline
  - AFA Extents
  - Node Point
  - Node ID Node Label

**FINAL**

|      |       |       |
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| REV: | NOTE: | DATE: |
|------|-------|-------|



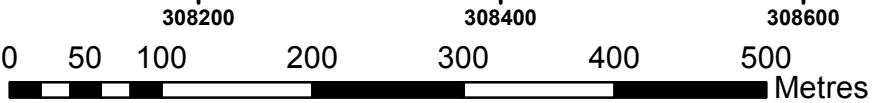


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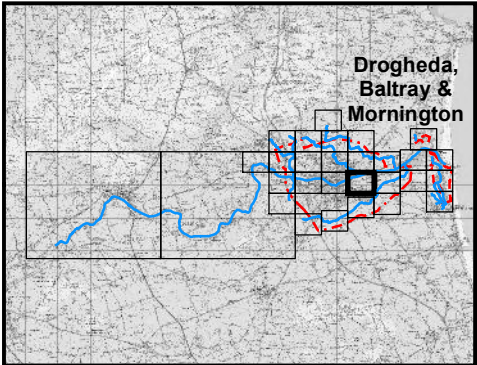
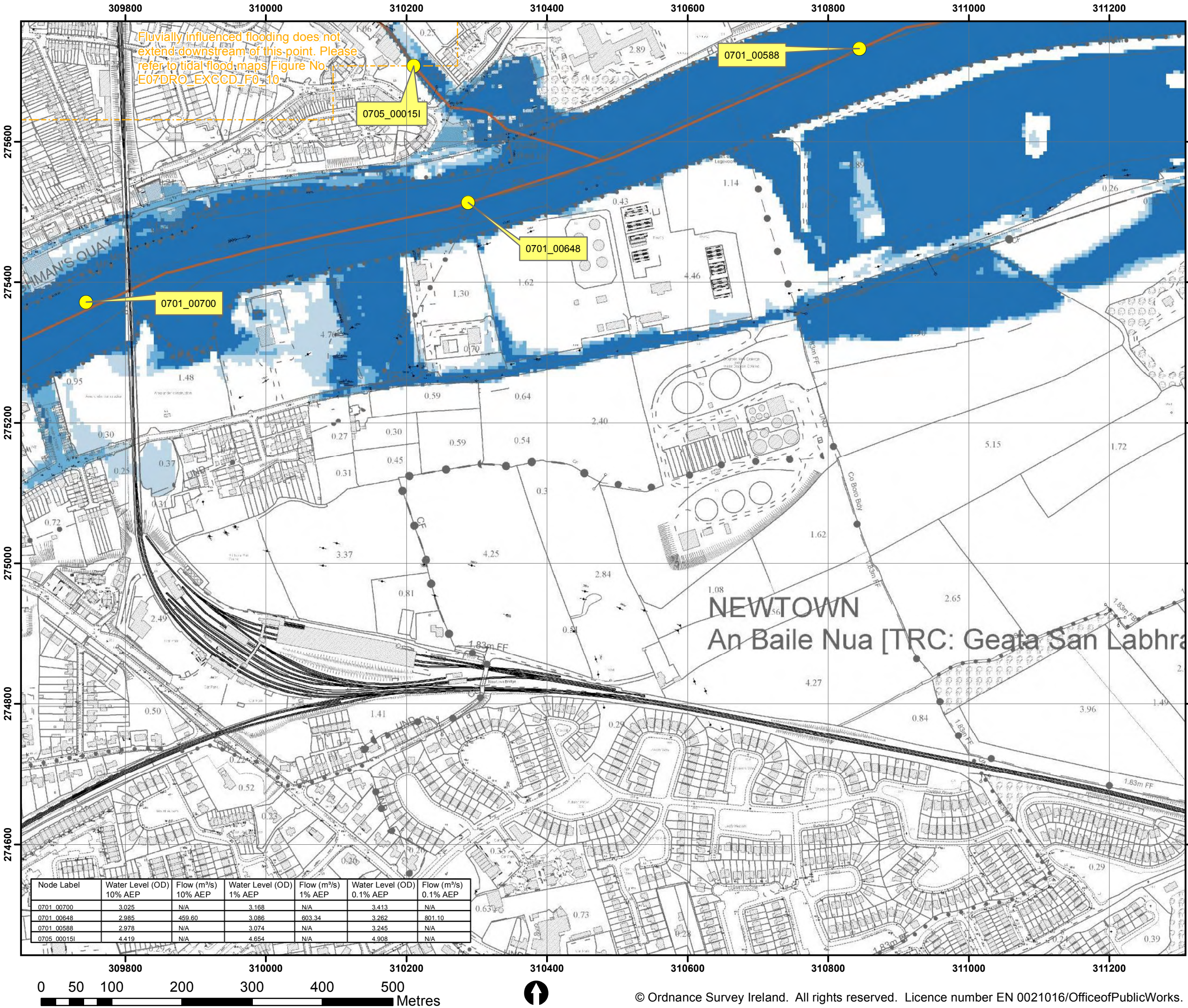
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|  |                            |
|--|----------------------------|
| Map:<br>Drogheda Fluvial Flood Extents |                            |
| Map Type:                              | EXTENT                     |
| Source:                                | FLUVIAL                    |
| Map Area:                              | HPW                        |
| Scenario:                              | CURRENT                    |
| Drawn By :                             | C.McG. Date : 14 July 2016 |
| Checked By :                           | B.Q. Date : 14 July 2016   |
| Approved By :                          | S.P. Date : 14 July 2016   |
| Drawing No. :                          | E07DRO_EXFCD_F0_09         |
| Map Series :                           | Page 9 of 29               |
| Drawing Scale :                        | 1:5,000 @ A3               |







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**Legend**

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

**FINAL**

|      |       |       |
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| REV: | NOTE: | DATE: |
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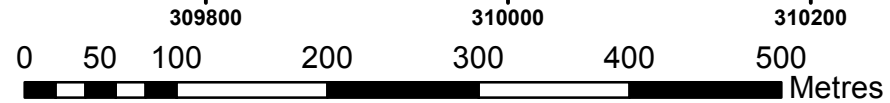


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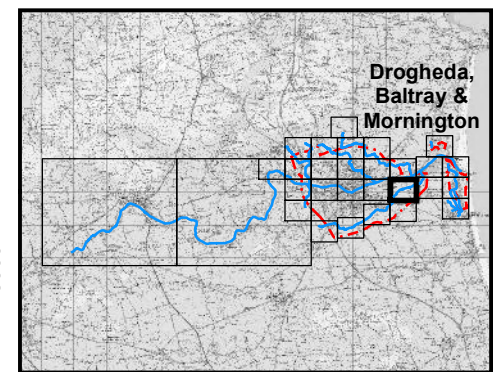
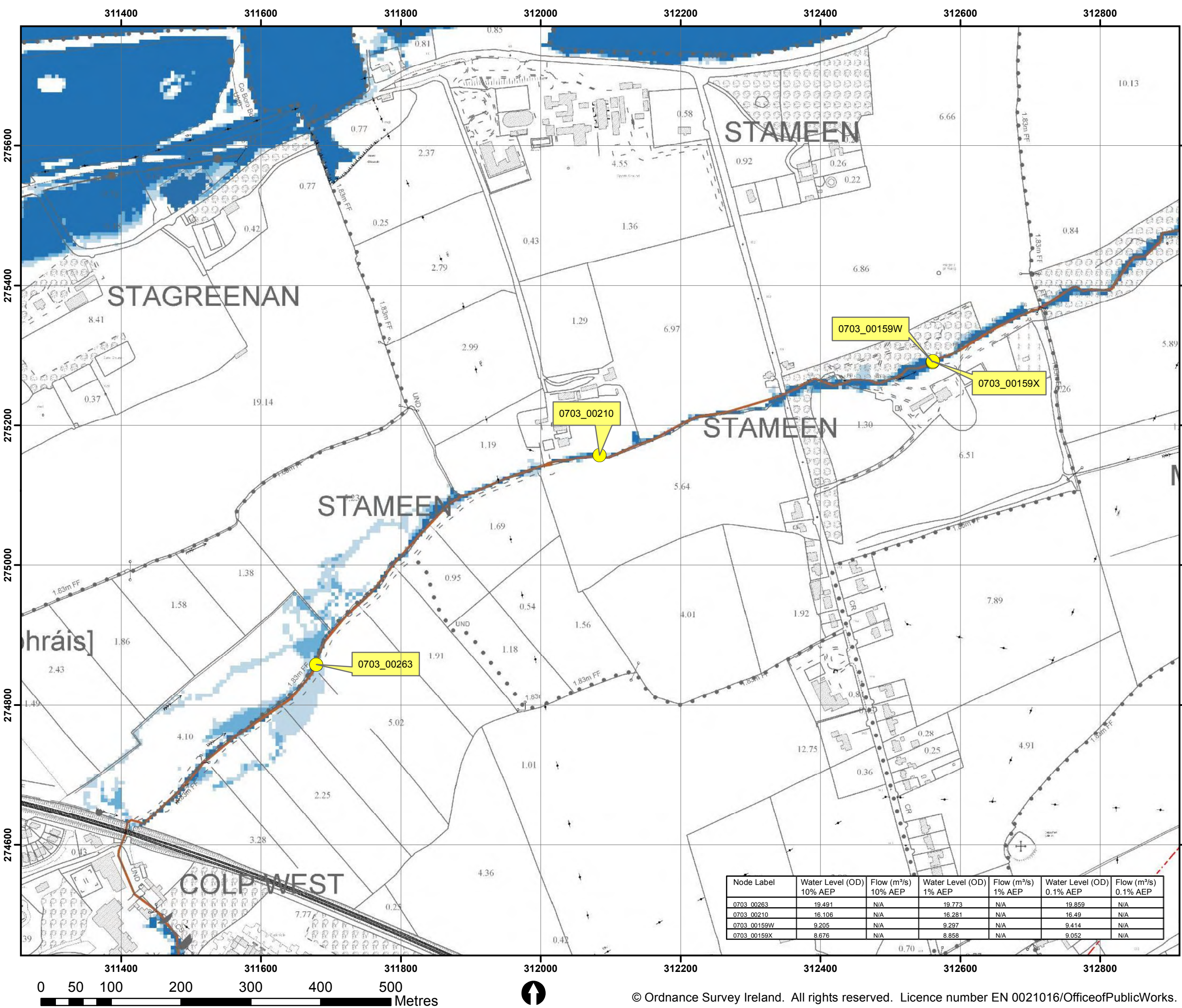
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|   |                            |
|---|----------------------------|
| <b>Map:</b><br>Drogheda Fluvial Flood Extents |                            |
| <b>Map Type:</b>                              | EXTENT                     |
| <b>Source:</b>                                | FLUVIAL                    |
| <b>Map Area:</b>                              | HPW                        |
| <b>Scenario:</b>                              | CURRENT                    |
| <b>Drawn By :</b>                             | C.McG. Date : 14 July 2016 |
| <b>Checked By :</b>                           | B.Q. Date : 14 July 2016   |
| <b>Approved By :</b>                          | S.P. Date : 14 July 2016   |
| <b>Drawing No. :</b><br>E07DRO_EXFCD_F0_10    |                            |
| <b>Map Series :</b> Page 10 of 29             |                            |
| <b>Drawing Scale :</b> 1:5,000 @ A3           |                            |

| Node Label  | Water Level (OD)<br>10% AEP | Flow (m³/s)<br>10% AEP | Water Level (OD)<br>1% AEP | Flow (m³/s)<br>1% AEP | Water Level (OD)<br>0.1% AEP | Flow (m³/s)<br>0.1% AEP |
|-------------|-----------------------------|------------------------|----------------------------|-----------------------|------------------------------|-------------------------|
| 0701_00700  | 3.025                       | N/A                    | 3.168                      | N/A                   | 3.413                        | N/A                     |
| 0701_00648  | 2.985                       | 459.60                 | 3.086                      | 603.34                | 3.262                        | 801.10                  |
| 0701_00588  | 2.978                       | N/A                    | 3.074                      | N/A                   | 3.245                        | N/A                     |
| 0705_000151 | 4.419                       | N/A                    | 4.654                      | N/A                   | 4.908                        | N/A                     |







IMPORTANT USER NOTE:  
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- Legend**
- 10% Fluvial AEP Event
  - 1% Fluvial AEP Event
  - 0.1% Fluvial AEP Event
  - Modelled River Centreline
  - AFA Extents
  - Node Point
  - Node ID Node Label

**FINAL**

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| REV: | NOTE: | DATE: |
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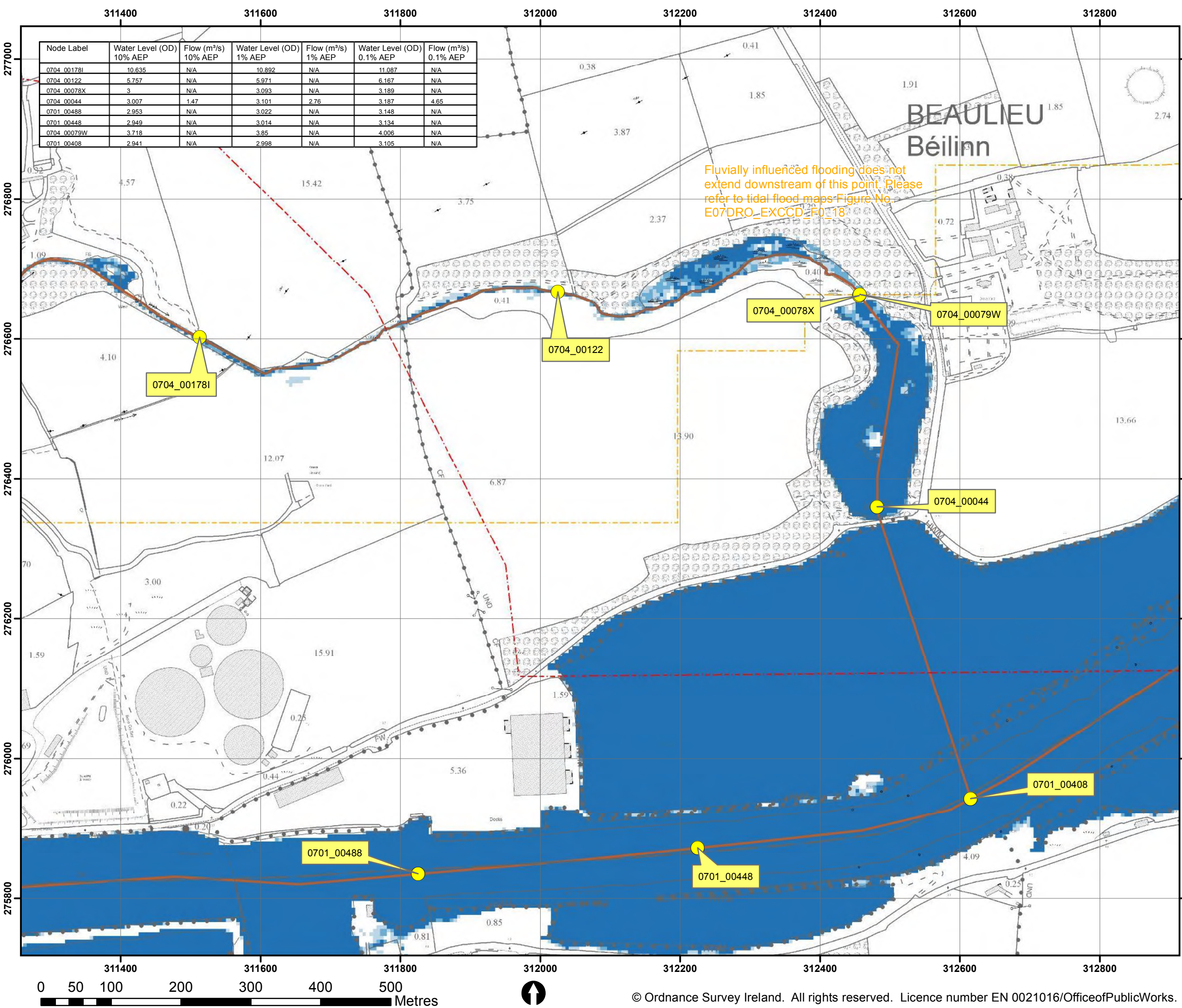
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|  |                            |
|--|----------------------------|
| Map:<br>Drogheda Fluvial Flood Extents |                            |
| Map Type:                              | EXTENT                     |
| Source:                                | FLUVIAL                    |
| Map Area:                              | HPW                        |
| Scenario:                              | CURRENT                    |
| Drawn By :                             | C.McG. Date : 14 July 2016 |
| Checked By :                           | B.Q. Date : 14 July 2016   |
| Approved By :                          | S.P. Date : 14 July 2016   |
| Drawing No. :                          | E07DRO_EXFCD_F0_23         |
| Map Series :                           | Page 23 of 29              |
| Drawing Scale :                        | 1:5,000 @ A3               |

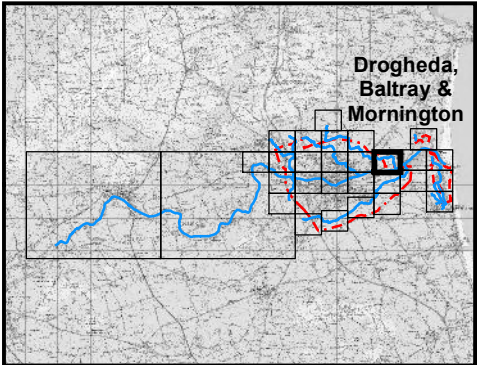
| Node Label  | Water Level (OD)<br>10% AEP | Flow (m³/s)<br>10% AEP | Water Level (OD)<br>1% AEP | Flow (m³/s)<br>1% AEP | Water Level (OD)<br>0.1% AEP | Flow (m³/s)<br>0.1% AEP |
|-------------|-----------------------------|------------------------|----------------------------|-----------------------|------------------------------|-------------------------|
| 0703_00263  | 19.491                      | N/A                    | 19.773                     | N/A                   | 19.859                       | N/A                     |
| 0703_00210  | 16.106                      | N/A                    | 16.281                     | N/A                   | 16.49                        | N/A                     |
| 0703_00159W | 9.205                       | N/A                    | 9.297                      | N/A                   | 9.414                        | N/A                     |
| 0703_00159X | 8.676                       | N/A                    | 8.858                      | N/A                   | 9.052                        | N/A                     |

0 50 100 200 300 400 500 Metres





| Node Label  | Water Level (OD)<br>10% AEP | Flow (m³/s)<br>10% AEP | Water Level (OD)<br>1% AEP | Flow (m³/s)<br>1% AEP | Water Level (OD)<br>0.1% AEP | Flow (m³/s)<br>0.1% AEP |
|-------------|-----------------------------|------------------------|----------------------------|-----------------------|------------------------------|-------------------------|
| 0704_00178I | 10.635                      | N/A                    | 10.892                     | N/A                   | 11.087                       | N/A                     |
| 0704_00122  | 5.757                       | N/A                    | 5.971                      | N/A                   | 6.167                        | N/A                     |
| 0704_00078X | 3                           | N/A                    | 3.093                      | N/A                   | 3.189                        | N/A                     |
| 0704_00044  | 3.007                       | 1.47                   | 3.101                      | 2.76                  | 3.187                        | 4.65                    |
| 0701_00488  | 2.953                       | N/A                    | 3.022                      | N/A                   | 3.148                        | N/A                     |
| 0701_00448  | 2.949                       | N/A                    | 3.014                      | N/A                   | 3.134                        | N/A                     |
| 0704_00079W | 3.718                       | N/A                    | 3.85                       | N/A                   | 4.006                        | N/A                     |
| 0701_00408  | 2.941                       | N/A                    | 2.998                      | N/A                   | 3.105                        | N/A                     |



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**Legend**

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

**FINAL**

|      |       |       |
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| REV: | NOTE: | DATE: |
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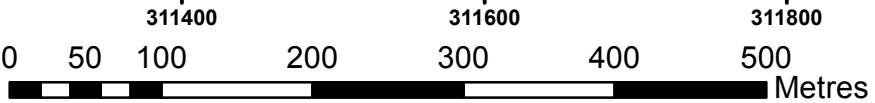
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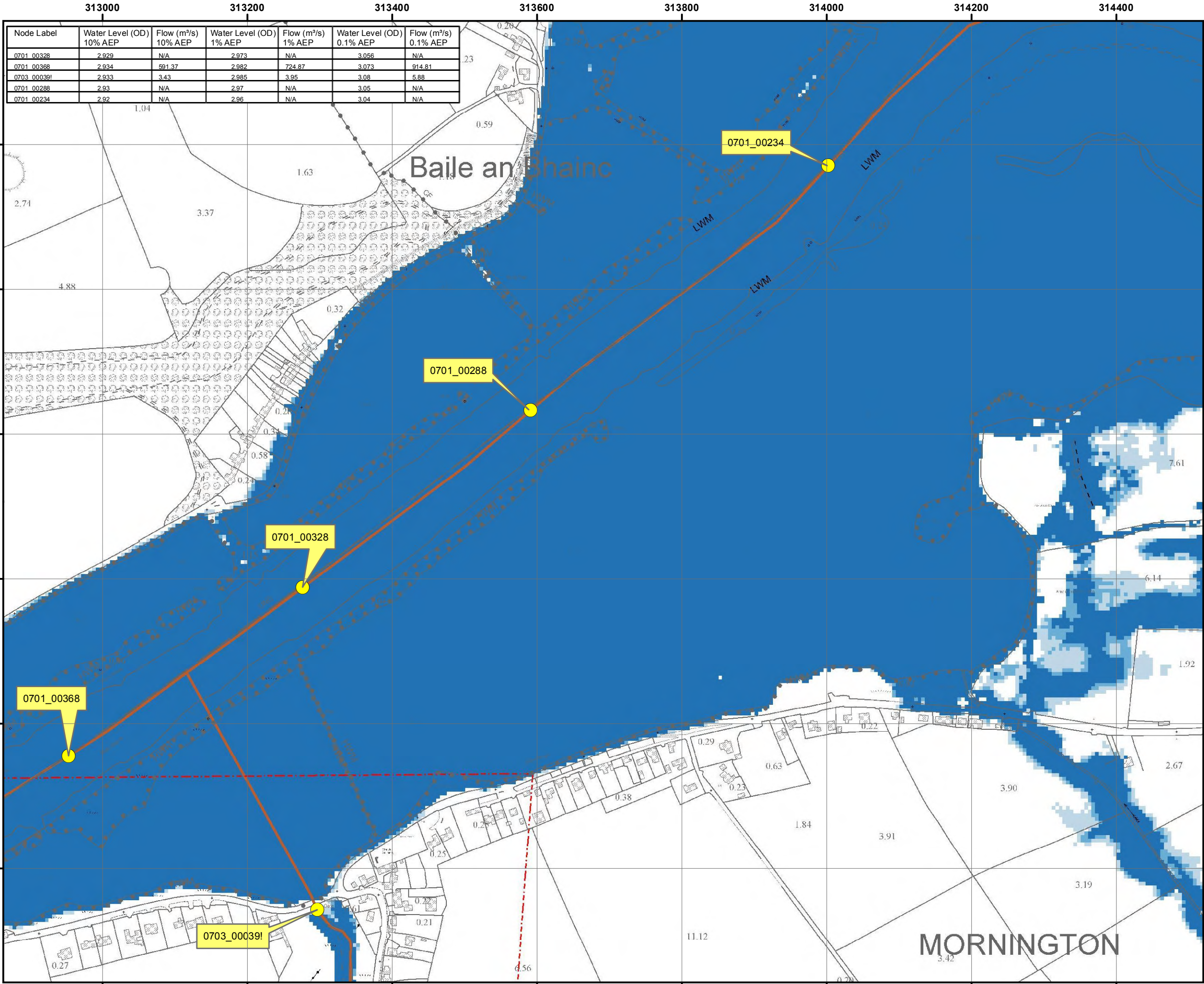
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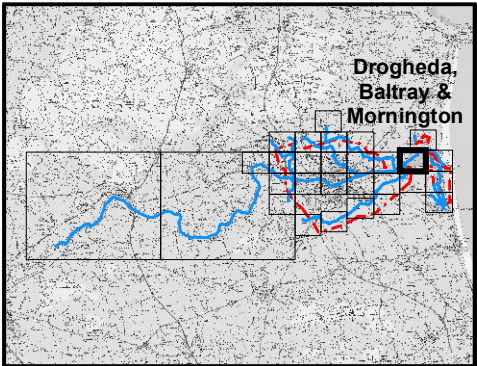
|   |                                   |
|---|-----------------------------------|
| <b>Map:</b><br>Drogheda Fluvial Flood Extents |                                   |
| <b>Map Type:</b>                              | EXTENT                            |
| <b>Source:</b>                                | FLUVIAL                           |
| <b>Map Area:</b>                              | HPW                               |
| <b>Scenario:</b>                              | CURRENT                           |
| <b>Drawn By :</b>                             | C.McG. <b>Date :</b> 14 July 2016 |
| <b>Checked By :</b>                           | B.Q. <b>Date :</b> 14 July 2016   |
| <b>Approved By :</b>                          | S.P. <b>Date :</b> 14 July 2016   |
| <b>Drawing No. :</b><br>E07DRO_EXFCD_F0_18    |                                   |
| <b>Map Series :</b> Page 18 of 29             |                                   |
| <b>Drawing Scale :</b> 1:5,000 @ A3           |                                   |







| Node Label  | Water Level (OD)<br>10% AEP | Flow (m³/s)<br>10% AEP | Water Level (OD)<br>1% AEP | Flow (m³/s)<br>1% AEP | Water Level (OD)<br>0.1% AEP | Flow (m³/s)<br>0.1% AEP |
|-------------|-----------------------------|------------------------|----------------------------|-----------------------|------------------------------|-------------------------|
| 0701_00328  | 2.929                       | N/A                    | 2.973                      | N/A                   | 3.056                        | N/A                     |
| 0701_00368  | 2.934                       | 591.37                 | 2.982                      | 724.87                | 3.073                        | 914.81                  |
| 0703_00039! | 2.933                       | 3.43                   | 2.985                      | 3.95                  | 3.08                         | 5.88                    |
| 0701_00288  | 2.93                        | N/A                    | 2.97                       | N/A                   | 3.05                         | N/A                     |
| 0701_00234  | 2.92                        | N/A                    | 2.96                       | N/A                   | 3.04                         | N/A                     |



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

**FINAL**

| REV: | NOTE: | DATE: |
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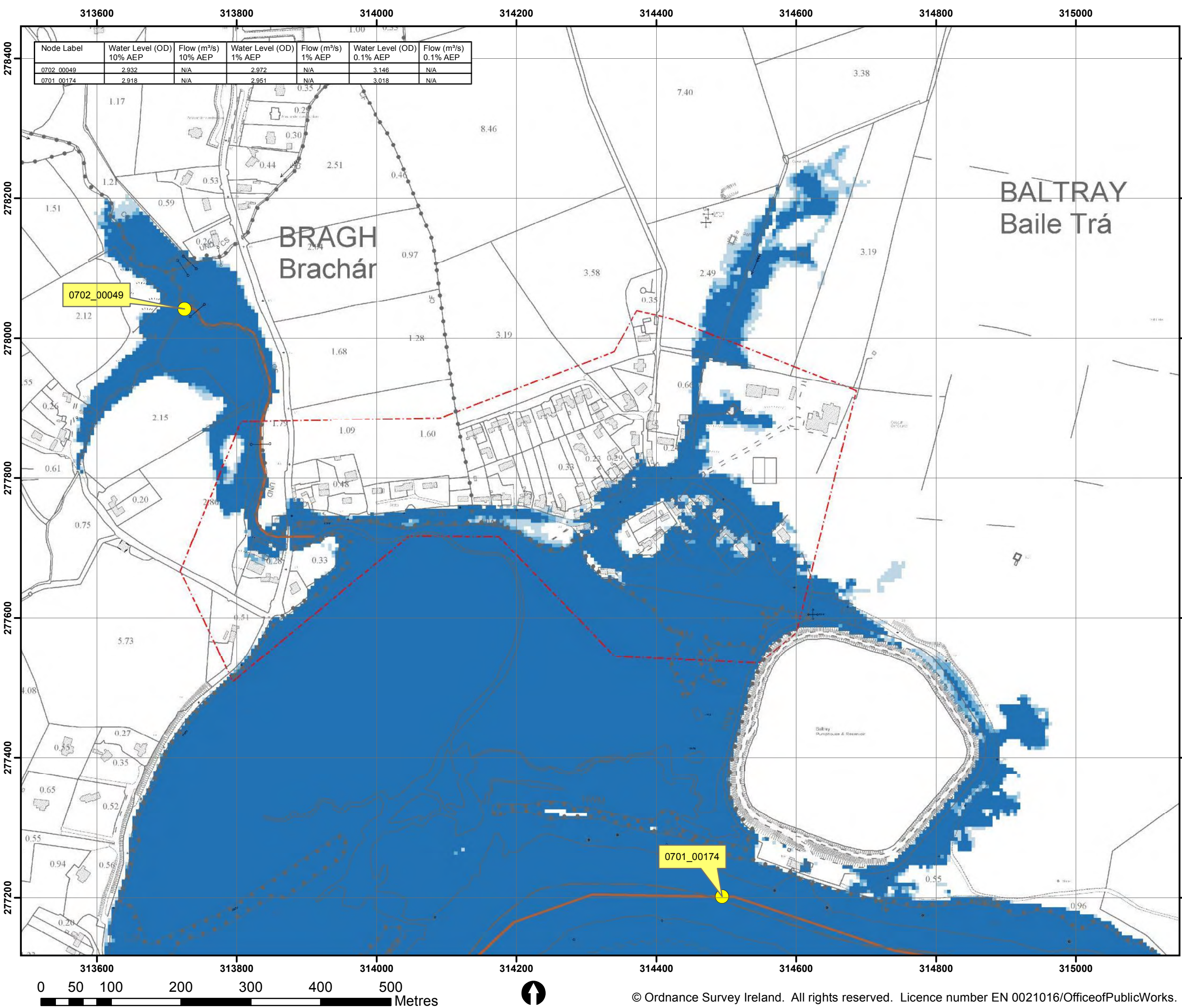
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|   |                                   |
|---|-----------------------------------|
| <b>Map:</b><br>Drogheda Fluvial Flood Extents |                                   |
| <b>Map Type:</b>                              | EXTENT                            |
| <b>Source:</b>                                | FLUVIAL                           |
| <b>Map Area:</b>                              | HPW                               |
| <b>Scenario:</b>                              | CURRENT                           |
| <b>Drawn By :</b>                             | C.McG. <b>Date :</b> 15 July 2016 |
| <b>Checked By :</b>                           | B.Q. <b>Date :</b> 15 July 2016   |
| <b>Approved By :</b>                          | S.P. <b>Date :</b> 15 July 2016   |
| <b>Drawing No. :</b><br>E07DRO_EXFCD_F0_25    |                                   |
| <b>Map Series :</b> Page 25 of 29             |                                   |
| <b>Drawing Scale :</b> 1:5,000 @ A3           |                                   |

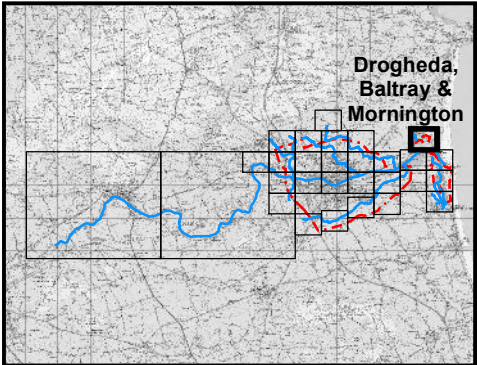








| Node Label | Water Level (OD)<br>10% AEP | Flow (m³/s)<br>10% AEP | Water Level (OD)<br>1% AEP | Flow (m³/s)<br>1% AEP | Water Level (OD)<br>0.1% AEP | Flow (m³/s)<br>0.1% AEP |
|------------|-----------------------------|------------------------|----------------------------|-----------------------|------------------------------|-------------------------|
| 0702_00049 | 2.932                       | N/A                    | 2.972                      | N/A                   | 3.146                        | N/A                     |
| 0701_00174 | 2.918                       | N/A                    | 2.951                      | N/A                   | 3.018                        | N/A                     |



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AND CONDITIONS OF USE THAT  
ACCOMPANY THIS MAP.

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

**FINAL**

| REV: | NOTE: | DATE: |
|------|-------|-------|
|------|-------|-------|





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|  |                            |
|--|----------------------------|
| <b>Map:</b><br>Baltray Fluvial Flood Extents |                            |
| <b>Map Type:</b>                             | EXTENT                     |
| <b>Source:</b>                               | FLUVIAL                    |
| <b>Map Area:</b>                             | HPW                        |
| <b>Scenario:</b>                             | CURRENT                    |
| <b>Drawn By :</b>                            | C.McG. Date : 14 July 2016 |
| <b>Checked By :</b>                          | B.Q. Date : 14 July 2016   |
| <b>Approved By :</b>                         | S.P. Date : 14 July 2016   |
| <b>Drawing No. :</b>                         | E07DRO_EXFCD_F0_26         |
| <b>Map Series :</b>                          | Page 26 of 29              |
| <b>Drawing Scale :</b>                       | 1:5,000 @ A3               |

