

## 7. HYDROGEOLOGY & HYDROLOGY

### 7.1 Introduction

This chapter of the EIAR comprises of an assessment of the likely impact of the proposed development on the surrounding surface water and hydrogeological environments (including flood risk, surface water drainage, foul drainage and water supply) as well as identifying proposed mitigation measures to minimise any impacts.

In summary, the project comprises the development of 366 no. residential units consisting of the following mix of unit types:

- 28 no. 1 bed apartments
- 118 no. 2 bed apartments
- 36 no. 3 bed duplex units
- 20 no. 2 bedroom house
- 75 no. 3 bedroom house
- 77 no. 4 bedroom house
- 12 no. 5 bedroom house

In addition, the development will also include ancillary public open space, ancillary residential parking spaces and a childcare facility with associated parking spaces.

The Capdoo Link Road which will transverse the site is listed as a "Priority Road Scheme" in the Kildare County Council Development Plan 2017 – 2023 and will be constructed as part of the development. This link road along with a roundabout/junction upgrades will facilitate the primary access points to development. A separate independent access point is provided off a rural road north of the site.

The surface water drainage system accords with SUDs principles with the main body of the site divided into three drainage catchments with two additional catchments for the link road. Attenuation will be provided in each catchment utilising Stormtech Underground Chamber systems, with a controlled greenfield run-off rate of 2.00l/sec/ha. A surface water outfall will be constructed along the rural roads east of the site and will discharge to the Gollymochy Stream.

The majority of the foul drainage will connect to an existing foul sewer south east of the site with a small isolated section connecting north west of the site. The proposed foul drainage discharge point south east of the site is slightly elevated above the eastern side of the site. As such, a foul pumping station, rising main and associated rising main discharge (header) manhole will be required to service a large portion of the development (185 out of 366 units). The north western and southern regions of the site will discharge by gravity in to the appropriate discharge manholes.

Infill Material will be imported on-site. This material will be either quarried product from quarries that have planning permission; greenfield/inert soil imported under a Waste Permit issued by the local authority; or materials that have been approved as by-products by the EPA in accordance with the EPA's criteria for determining a material is a by-product, per the provisions of article 27(1) of the European Communities (Waste Directive) Regulations, 2011.

## 7.2 Methodology

Assessment of the likely impact of the proposed development on the surrounding surface water and hydrogeological environments included the following activities:

- Site inspection / walkover
- Review of existing topographic survey information
- Review of Irish Water utility plans (surface water drainage, foul drainage and water supply). Refer to Appendix 7.A.
- Ground investigations including trial pits, infiltration testing and environmental testing (waste acceptance criteria for landfills)
- Review of information available on the Environmental Protection Agency (EPA) online mapping service
- Review of information available on the Geological Survey of Ireland (GSI) online mapping service
- Review of Office of Public Works (OPW) National Flood Hazard Mapping and CFRAM Studies (Catchment Flood Risk Assessment and Management Studies)
- Consultation with Kildare County Council's Water Services Section
- Consultation with Irish Water
- Submission of a Pre-Connection Enquiry Application to Irish Water

As part of assessing the likely impact of the proposed development, surface water runoff, foul drainage discharge and water usage calculations were carried out in accordance with the following guidelines:

- Greater Dublin Strategic Drainage Study (GDSDS)
- Method outlined in Irish Water's Pre-Connection Enquiry Application (water demand and foul drainage discharge)

## 7.3 Receiving Environment

### 7.3.1 Hydrology

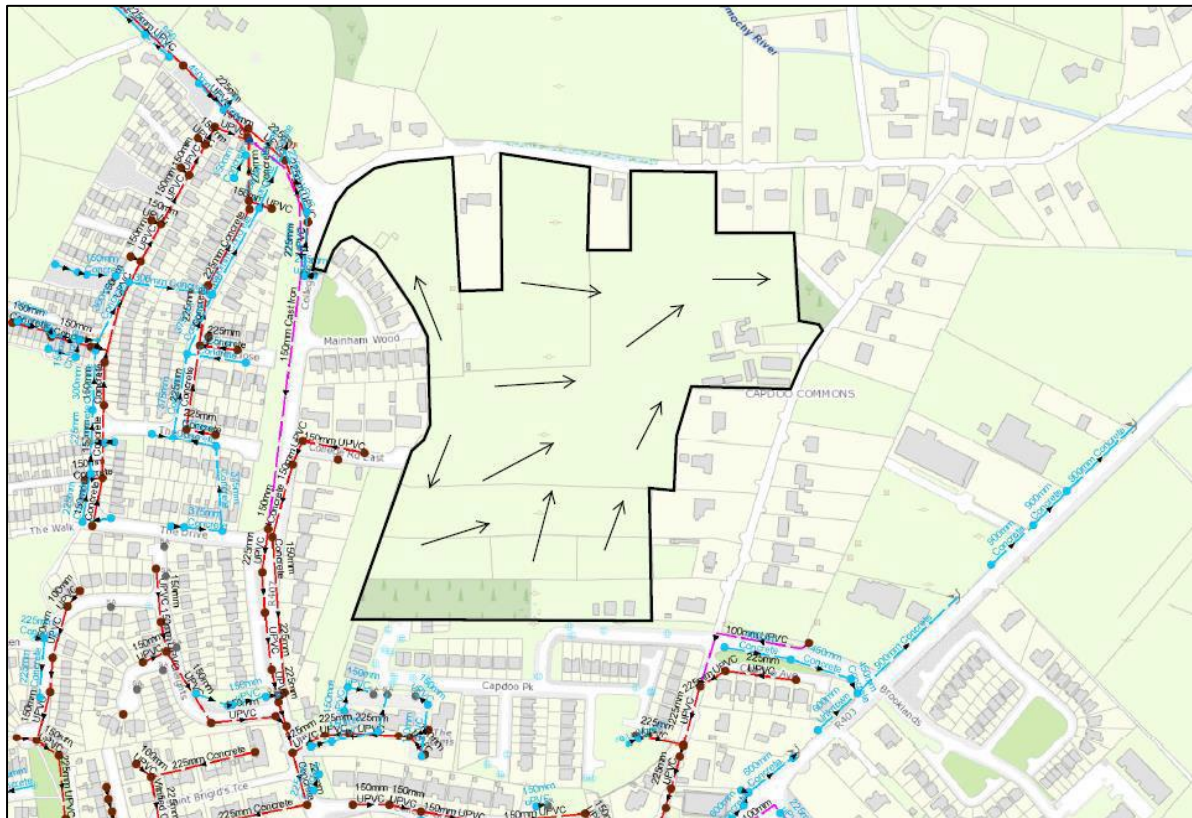
The Gollymochy River is the closest hydrological feature running north of the site. The river Liffey is also in the locality running south east of the site (refer to Figure 7.1).

Existing public surface water drains are located to the south and west of the site (refer to Figure 7.2). As the site naturally falls from west to east, it is proposed to construct a surface water outfall along the roads north east of the site and discharge to the Gollymochy Stream north. The majority of the site will discharge to this new outfall with the link road and a small isolated section north west of the site draining to the public surface water drains to the south and west as mentioned above.

Figure 7.1 Extract from EPA Online Mapping Service (Site Boundary Indicative Only)



Figure 7.2 Extract from Irish Water Utility Plan



### 7.3.2 Hydrogeology

GSI's Groundwater Data Viewer indicates that the site is located on a "Bedrock Aquifer" and classifies the underlying aquifers as "Locally Important Aquifer – Bedrock which is moderately productive only in local zones".

GSI also classify the site's groundwater vulnerability as High with a small area deemed to have Extreme groundwater vulnerability and have Rock at or near surface or Karst.

Figure 7.3 Extract from GSI Online Mapping Service – Groundwater Aquifers

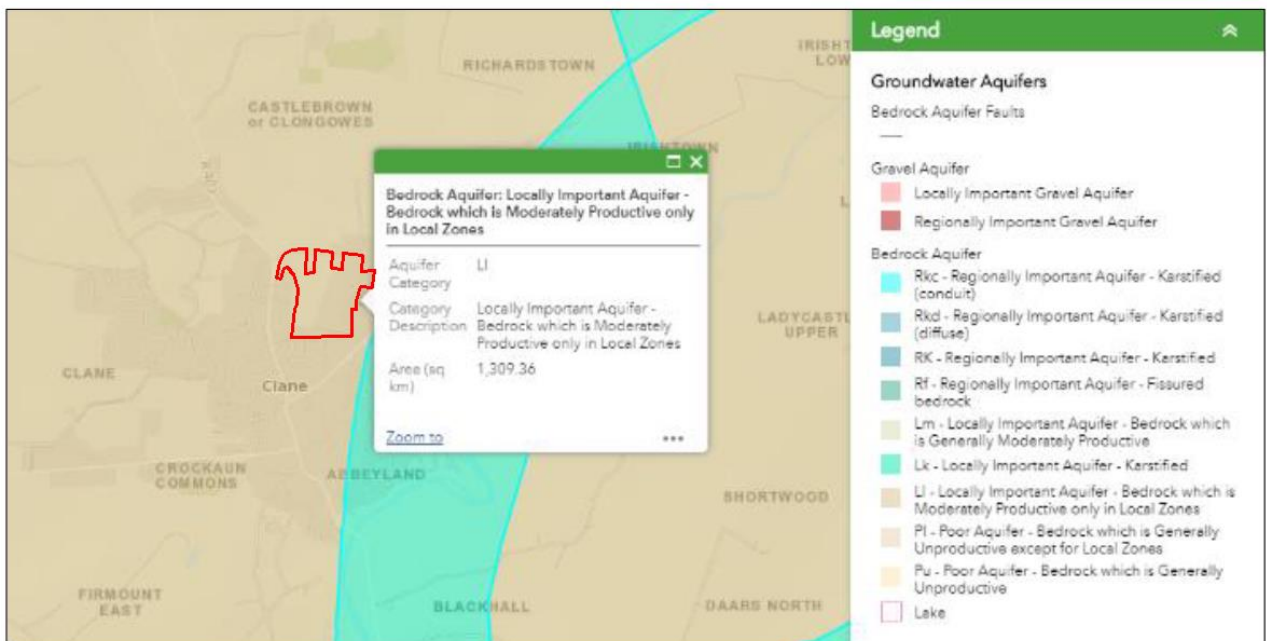
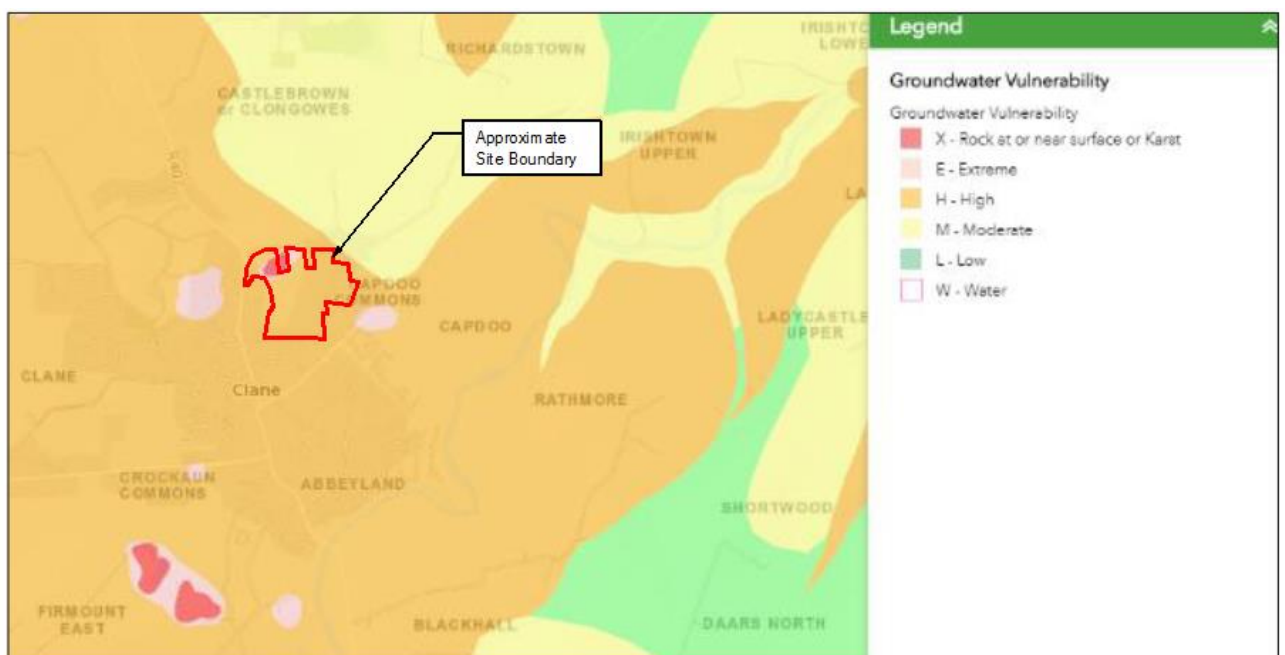


Figure 7.4 Extract from GSI Online Mapping Service – Groundwater Vulnerability



### 7.3.3 Flood Risk

A flood hazard assessment has been undertaken by reviewing information from the Office of Public Works (OPW) National Flood Hazard Mapping ([www.floods.ie](http://www.floods.ie)), the Eastern CFRAM Study and the Clane Local Area Plan (LAP) 2017 to 2023.

This assessment has been carried out in accordance with the procedures for a "Flood Risk Assessment" as outlined in the OPW's Guidelines for Planning Authorities – The Planning System and Flood Management (November 2009) and also includes a Justification Test (in accordance with Box 5.1, Section 5.15 of OPW's Guidelines)

#### *OPW Flood Hazard Mapping*

OPW's Summary Local Area Report summarises all flood events within 2.5 km of the site.

- A recurring flood point (Loughbollard) is identified to the north-west of the site in the adjacent housing development. The proposed development is located on high ground with the proposed Capdoo link road traversing the site to the west and therefore should not be affected.
- No benefiting lands are identified in the vicinity of the site. Note: Benefiting lands are defined as lands that might benefit from implementation of a major drainage scheme or lands subject to flooding or poor drainage.

The flood point noted above is also referred to in the Kildare County Council Area Engineer's Meeting Minutes from March 2005 ("It is a low lying area that floods every year after heavy rain due to inadequate drainage." –and also includes a Justification Test (in accordance with Box 5.1, Section 5.15 of OPW's Guidelines)

#### *Eastern CFRAM Study*

OPW's Eastern CFRAM Study indicates the extent of fluvial flooding in the Clane area.

Extracts from OPW's Eastern CFRAM Study ([www.floodinfo.ie](http://www.floodinfo.ie)) shows Fluvial Flood Extent and Fluvial Flood Depth Plans and are included in Appendix 7.B (Flood Hazard Information).

No fluvial flooding is indicated in the vicinity of the site.

#### *Clane Local Area Plan (2017-2023)*

The Clane LAP 2017 to 2023 (Strategic Flood Risk Assessment) assesses flood risk indicators in relation to proposed land use (e.g. new residential, community & educational, open space & amenity etc.) and identifies land parcels that require a justification test in relation to their proposed zoning.

It is noted that the proposed development lands were identified as "new residential" and a "Key Development Area (KDA)" in the Clane Local Area Plan 2017-2023 – Land Use Zoning Objectives Map.

However, the Strategic Flood Risk Assessment Recommendations map also identifies that the site is partially located in an area that requires a "site-specific flood risk assessment in accordance with the flood risk management guidelines and appropriate to the type and scale of the development being proposed".

#### 7.3.4 Foul Drainage

Existing 225mm diameter public foul sewers are located south east of the site and north west of the site which ultimately discharge to the Clane Pumping Station.

For the location of the existing foul sewer described above refer to the Topographic Survey Plans included in Appendix 7.C and Irish Water's Network Plan included in Appendix 7.A.

On the existing foul sewer south east of the site there is a manhole located near the entrance to Capdoo Avenue which is expected to provide a suitable foul drainage discharge point for the majority of the proposed development. On the existing foul sewer north west of the site there is a manhole located next to the proposed roundabout as is expected to serve the north west portion of the site.

Pre-connection enquiry feedback has been received from Irish Water.

*"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 condition listed below, your proposed connection to the Irish Water network can be facilitated"*

#### 7.3.5 Surface Water Drainage

Existing public surface water drains are located to the south and west of the site (refer to Irish Water's Network Plan included in Appendix 7.A). The topography of the site generally falls from west to east at gradients ranging from 1/15 to 1/100. As such, it is only possible to connect the link road and the north west section of the site to the existing surface water infrastructure with the remaining main body of the site discharging to the Gollymochy stream.

The site currently drains through a network of open drains located to the east of the site which ultimately discharges to the Gollymochy Stream. Surface water also drains from the site via infiltration. Varied infiltration rates were observed during Soakaway Testing carried out by IGSL in July 2017 (e.g. moderate levels of infiltration were observed where granular soils were present but very low levels of infiltration were observed where underlying clays were encountered).

It is proposed to construct a surface water outfall along the rural roads east of the site to discharge to the Gollymochy Stream.

#### 7.3.6 Water Supply

The locations of the existing public water mains are shown on Irish Water's Service Plan (refer to Appendix 7.A).

An existing 400mm diameter ductile iron watermain and a 2" diameter uPVC watermain run along the site's northern and eastern boundary. An existing 6" diameter uPVC watermain is also runs along the western boundary of the site.

Pre-connection enquiry feedback has been received from Irish Water. No issues are noted in relation to the existing public water supply network.

## **7.4 Characteristics of the Proposed Development**

### **7.4.1 Hydrology**

The proposed development is located south of the Gollymochy River and west of the River Liffey. No adverse effects on surrounding hydrology is anticipated as the proposed development has minimal impact on the adjacent 1% AEP Flood Extent (minor flood compensation measures are proposed) and attenuation of surface water flows to greenfield runoff rates is being provided.

### **7.4.2 Hydrogeology**

During construction, the deepest excavations are expected to be required for installation of attenuation tanks and a foul pump station (up to approximately 4.0m deep).

At soakaway test locations and trial pits locations, excavations were carried out to depths ranging from 1.2m to 3.0m below existing ground level.

Groundwater was noted at approximately 4.0m in one of the boreholes and in rare trial pits generally below 1.0m.

It is not envisaged that the proposed development works will have any direct impact on the underlying hydrogeology.

### **7.4.3 Flood Risk**

The Site-Specific Flood Risk Assessment for proposed development was undertaken in accordance with the requirements of "The Planning System and Flood Risk Management, Guidelines for Planning Authorities" and its Technical Appendices.

Following the Flood Risk Assessment, it was determined that the site is located in Flood Zone C as defined by the Guidelines. It concluded that the;

- Proposed residential development is appropriate for the site's flood zone category.
- The sequential approach outlined in the Guidelines has been adhered to and that the 'Avoid' principal has been achieved.

The proposed development is considered to have the required level of flood protection up to and including the 1% AEP flood event. Overland flow paths have been identified for pluvial flooding exceeding the capacity of the surface water drainage network.

#### 7.4.4 Foul Drainage

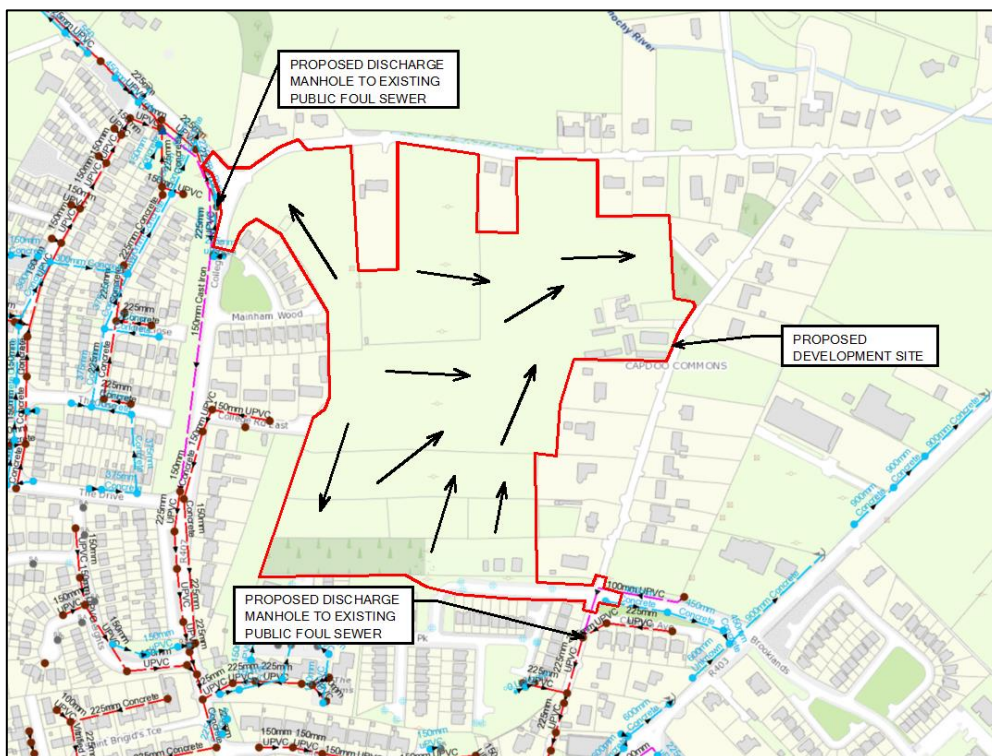
The Topography of the site generally falls from the western boundary to the east at gradients ranging from 1/15 to 1/100 i.e. foul drainage flows by gravity towards the site's eastern boundary.

The majority of the foul drainage will connect to an existing foul sewer south east of the site with a small isolated section connecting north west of the site. The proposed foul drainage discharge point south east of the site is slightly elevated above the north-eastern corner of the site. As such, a foul pumping station, rising main and associated rising main discharge (header) manhole will be required to service this section of the development (185 out of 366 units located in the north east of the site). The north western and southern portions of the site will discharge by gravity in to the appropriate discharge manholes.

The proposed foul pumping station is to be located along the eastern side of the proposed development.

The proposed foul drainage network comprises of a series of 225mm diameter pipes with each residential unit serviced by an individual 100mm diameter connection.

**Figure 7.5 Extract from Irish Water Network Plan (Site Boundary Indicative Only)**



An existing manhole is located on the foul sewer (adjacent to the entrance of Capdoo Avenue, refer to Figure 7.5 above) and is expected to provide a suitable foul drainage discharge point for the majority of proposed development.



The remaining isolated section to the north west of the site is to discharge in to the existing foul sewer on College Road.

The foul drainage network for the proposed development has been designed in accordance with the Department of the Environment's Recommendations for Site Development Works for Housing Areas, the Department of the Environment's Building Regulations "Technical Guidance Document Part H Drainage and Waste Water Disposal", BS EN 752: 2008 Drain and Sewer Systems Outside Buildings, IS EN 12056: Part 2 (2000) Gravity Drainage Systems Inside Buildings and BS 8301:1985 Building Drainage.

A daily foul discharge volume of 163m<sup>3</sup> has been calculated as outlined in Irish Water's Pre-Connection Enquiry Application Form.

A BOD loading (based on 60g per person per day) of 65,880g has been calculated for the proposed development as outlined in the EPA Waste Water Treatment Manual.

#### 7.4.5 Surface Water Drainage

Figure 7.6 Extract from Irish Water Network Plan (Site Boundary Indicative Only)



It is proposed to construct a surface water outfall along the rural roads north east of the site and discharge to the Gollymochy Stream. This will serve the majority of the site.

The north west section and the upper link road will discharge to an existing surface water manhole north west of the site on College Road and the lower link road will discharge to an existing surface water manhole south east of the site adjacent to Capdoo Avenue. Refer to Figure 7.6 above. Surface water runoff from the site's road network will be directed to the proposed pipe network via conventional road gullies while surface water runoff from driveways will be captured by permeable paving.

Surface water runoff from roofs will be routed to the proposed surface water pipe network via the porous aggregates beneath permeable paved driveways (providing an additional element of attenuation).

Each surface water catchment has been assessed separately in relation to surface water attenuation. Surface water discharge rates from the proposed surface water drainage network will be controlled by a Hydrobrake type flow control device and associated underground attenuation tanks (Stormtech Chambers). Surface water discharge will also pass via a full retention fuel / oil separator (sized in accordance with permitted discharge from the site).

Surface water calculations are based on an allowable outflow / greenfield runoff rate of 2 l/sec/ha resulting in a total attenuation volume for the 3 no. Surface Water Drainage Catchments of 2,911 m<sup>3</sup>.

The proposed link road is treated as a completely separate drainage network. The surface water runoff from the road will drain through a distinct piped network before discharging to the public sewer via an attenuation tank, flow control and interceptor arrangement.

Proposed surface water drains have been designed in accordance with the Greater Dublin Strategic Drainage Study (GDSDS), the Department of the Environment's Recommendations for Site Development Works for Housing Areas, the Department of the Environment's Building Regulations "Technical Guidance Document Part H Drainage and Waste Water Disposal" and BS EN 752: 2008 Drain and Sewer Systems Outside Buildings.

#### **7.4.6 Water Supply**

It is proposed to link the existing 400mm diameter watermains (north-west and southeast of the site) via a 200mm diameter watermain running along the proposed Capdoo Link Road. This new watermain will then service the proposed development.

A 150mm diameter looped water main will then be provided (generally along the site's arterial roads) with a number of 100mm diameters looped branch mains provided elsewhere.

All connections, valves, hydrants, meters etc. have been design and are to be installed in accordance with Irish Water's Code of Practice / Standard Details and the Department of the Environment's Building Regulations "Technical Guidance Document Part B Fire Safety".

An average daily domestic demand of 148m<sup>3</sup> has been calculated as outlined in Irish Water's Pre-Connection Enquiry Application Form.

## 7.5 Potential Impact of the Proposed Development

### 7.5.1 Construction Phase

Potential impacts that may arise during the construction phase are noted below:

- Surface water runoff during the construction phase may contain increased silt levels (e.g. runoff across areas stripped of topsoil) or become polluted by construction activities.
- Discharge of rain water pumped from excavations may also contain increased silt levels (potential impact on existing hydrology e.g. discharge to existing open drain).
- Accidental spills and leaks associated with storage of oils and fuels, leaks from construction machinery and spillage during refuelling and maintenance.
- Concrete runoff, particularly discharge of wash water from concrete trucks (potential impact on existing hydrology e.g. infiltration to ground).
- Discharge of vehicle wheel wash water (potential impact on existing hydrology e.g. discharge to existing surface water drainage infrastructure).
- Improper discharge of foul drainage from contractor's compound (impact on existing hydrology e.g. cross-contamination of existing surface water drainage).
- Cross contamination of potable water supply to construction compound.

### 7.5.2 Operational Phase

Potential operational phase impacts are noted below:

- Increased impermeable surface area will reduce local ground water recharge and potentially increase surface water runoff (if not attenuated to greenfield runoff rate).
- Accidental hydrocarbon leaks and subsequent discharge into piped surface water drainage network (e.g. along roads and in driveway areas).
- Increased discharge to foul drainage network (Daily Foul Discharge Volume = 163 m<sup>3</sup>).
- Increased potable water consumption (Average Daily Domestic Demand = 148m<sup>3</sup>).

### 7.5.3 'Do Nothing' Scenario

There are no predicted impacts should the proposed development not proceed.

## 7.6 Ameliorative, Remedial or Reductive Measures

### 7.6.1 Construction Phase

The following measures are proposed during the construction phase to mitigate against risks to the surrounding hydrological environment.

- A site-specific Construction and Environment Management Plan will be developed and implemented during the construction phase. Site inductions will include reference to the procedures and best practice as outlined in the Construction and Environment Management Plan.
- Surface water runoff from areas stripped of topsoil and surface water collected in excavations will be directed to on-site settlement ponds where measures will be implemented to capture and treat sediment laden runoff prior to discharge of surface water at a controlled rate.
- Weather conditions and typical seasonal weather variations will also be taken account of when planning stripping of topsoil and excavations with an objective of minimising soil erosion.
- In order to mitigate against spillages contaminating the surrounding surface water and hydrogeological environments, all oils, fuels, paints and other chemicals will be stored in a secure bunded hardstand area. Refuelling and servicing of construction machinery will take place in a designated hardstand area which is also remote from any surface water inlets (where not possible to carry out such activities off site).
- Concrete batching will take place off site and wash down and wash out of concrete trucks will take place off site (at authorised concrete batching plant in full compliance with relevant planning and environmental consents).
- Discharge from any vehicle wheel wash areas will be directed to on-site settlement ponds.
- The construction compound will include adequate staff welfare facilities including foul drainage and potable water supply. Foul drainage discharge from the construction compound will be tankered off site to a licensed facility until a connection to the public foul drainage network has been established.
- The construction compound's potable water supply will be protected from contamination by any construction activities or materials.

### 7.6.2 Operational Phase

The design of proposed site levels (roads, FFL etc.) has been carried out to ensure the proposed development is elevated and set in such a way as to avoid concentrating additional surface water flow in a particular location.

Following the Site Specific Flood Risk Assessment, it has been determined that the site / zoned developable area is located in Flood Zone C as defined by the Guidelines.

No proposed dwellings are located in Flood Zone A or B

Surface water runoff from the site will be attenuated to the greenfield runoff rate as outlined in the Greater Dublin Strategic Drainage Study (GSDSDS). Surface water discharge rates will be controlled by a Hydrobrake type vortex control device in conjunction with below ground attenuation storage. Also refer to DBFL Infrastructure Design Report (162074-rep-002).

The following methodologies are being implemented as part of a SuDS surface water treatment train approach:

- Permeable paving in driveway areas
- Surface water runoff from roofs will be routed to the proposed surface water pipe network via the porous aggregates beneath permeable paved driveways

- Attenuation of the 30 and 100 year return period storms
- Installation of a Hydrobrake (limiting surface water discharge from the site to 2 l/sec/ha)
- Surface water discharge will also pass via a fuel / oil separator (sized in accordance with permitted discharge from the site)

A contract will be entered into with a suitably qualified contractor from maintenance of the attenuation system, Hydrobrake and full retention fuel / oil separator noted above.

No specific mitigation measures are proposed in relation to foul drainage however, all new foul drainage lines will be pressure tested and be subject to a CCTV survey in order to identify any possible defects prior to being made operational.

No specific mitigation measures are proposed in relation to water supply, however, water conservation measures such as dual flush water cisterns and low flow taps will be included in the design.

The potential impact of climate change has been allowed for as follows;

Pluvial flood risk - attenuation storage design allows for a 20% increase in rainfall intensities, as directed by Kildare County Council's Water Services Engineer.

Pluvial flood risk - drainage system design allows for a 20% increase in flows, as recommended by the GSDSDS.

Provision of min. freeboard (500mm) from 1% AEP as required by GSDSDS (mitigation against impact of climate change).

### **7.6.3 'Do Nothing' Scenario**

No mitigation measures are proposed in relation to water and the hydrological environment if the development does not proceed.

## **7.7 Predicted Impact of the Proposed Development**

### **7.7.1 Construction Phase**

Implementation of the measures outlined in Section 7.6.1 will ensure that the potential impacts of the proposed development on water and the hydrogeological environment do not occur during the construction phase.

### **7.7.2 Operational Phase**

As surface water drainage design has been carried out in accordance with the GSDSDS and SuDS methodologies are being implemented as part of a treatment train approach, there are no predicted impacts on the water and hydrogeological environment arising from the operational phase.

### 7.7.3 'Do Nothing' Scenario

There are no predicted impacts should the proposed development not proceed.

## 7.8 Monitoring

Proposed monitoring during the construction phase in relation to the water and hydrogeological environment are as follows:

- Adherence to Outline Construction Management Plan
- Inspection of fuel / oil storage areas.
- Monitoring cleanliness of adjacent road network, implementation of dust suppression and vehicle wheel wash facilities.
- Monitoring sediment control measures (sediment retention ponds, surface water inlet protection etc.)
- Monitoring of discharge from sediment retention ponds (e.g. pH, sediment content)

During the operational phase an inspection and maintenance contract will be implemented in relation to the proposed Class 1 full retention fuel / oil separators.

## 7.9 Reinstatement

Oil, fuel etc. storage areas will be decommissioned on completion of the construction phase. Any remaining liquids will be removed from site and disposed of at an appropriate licenced facility. Kildare County Council's Environmental Control Section will be notified of the proposed destination for disposal of any liquid fuels.

All sediment control measures (e.g. sediment retention ponds) will be decommissioned on completion of the construction phase. Such areas will be reinstated in accordance with the landscape architects plan and engineer's drawings.

## 7.10 Interactions and Potential Cumulative Impacts

### 7.10.1 Interactions

#### *Soils and Hydrology*

Surface water runoff during the construction phase may lead to erosion and contain increased silt levels (e.g. runoff across areas stripped of topsoil) or become polluted by construction activities.

Increased impermeable surface area will reduce local ground water recharge and potentially increase surface water runoff (if not attenuated to greenfield runoff rate).

### **7.10.2 Potential Cumulative Impacts**

The proposed surface water drainage infrastructure has been designed in accordance with the relevant guidelines. Any other future development in the vicinity of the site would have to be similarly designed in relation to permitted surface water discharge, surface water attenuation and SuDS, therefore, no potential cumulative impacts are anticipated in relation to surface water drainage and flooding.

No potential cumulative impacts are anticipated in relation to foul drainage and water supply (Irish Water have advised that provision of a water and wastewater connections is feasible without infrastructure upgrade).

### **7.10.3 Unplanned Events**

The following accidents & disasters involving hydrology could potentially give rise to a serious incident putting people at risk:

- Accidental spills and leaks may result in contamination of water.

With the implementation of the aforementioned mitigation measures, the likelihood of such events occurring would be local and not significant.

### **7.10.4 Risks to Human Health**

The following risk to human health can occur during construction:

- Cross contamination of potable water supply to construction compound.

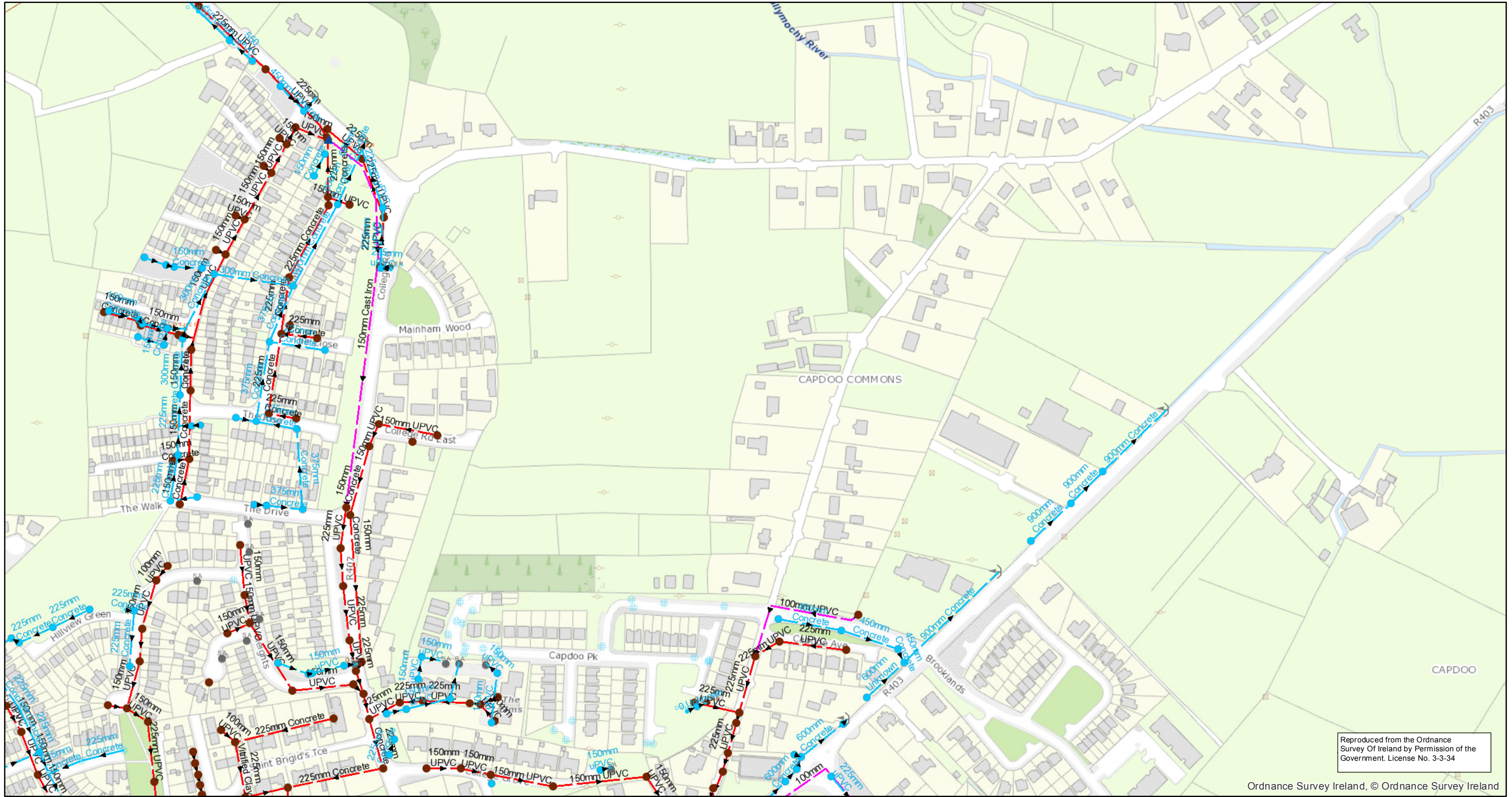
With the implementation of the aforementioned mitigation measures, the likelihood of such events occurring would be local and not significant.

## APPENDIX 7.A Irish Water Service Plan

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# Irish Water Web Map

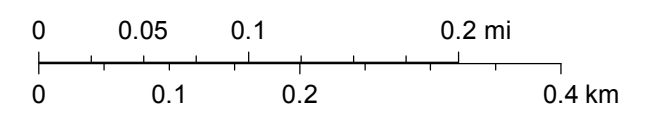


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## Legend

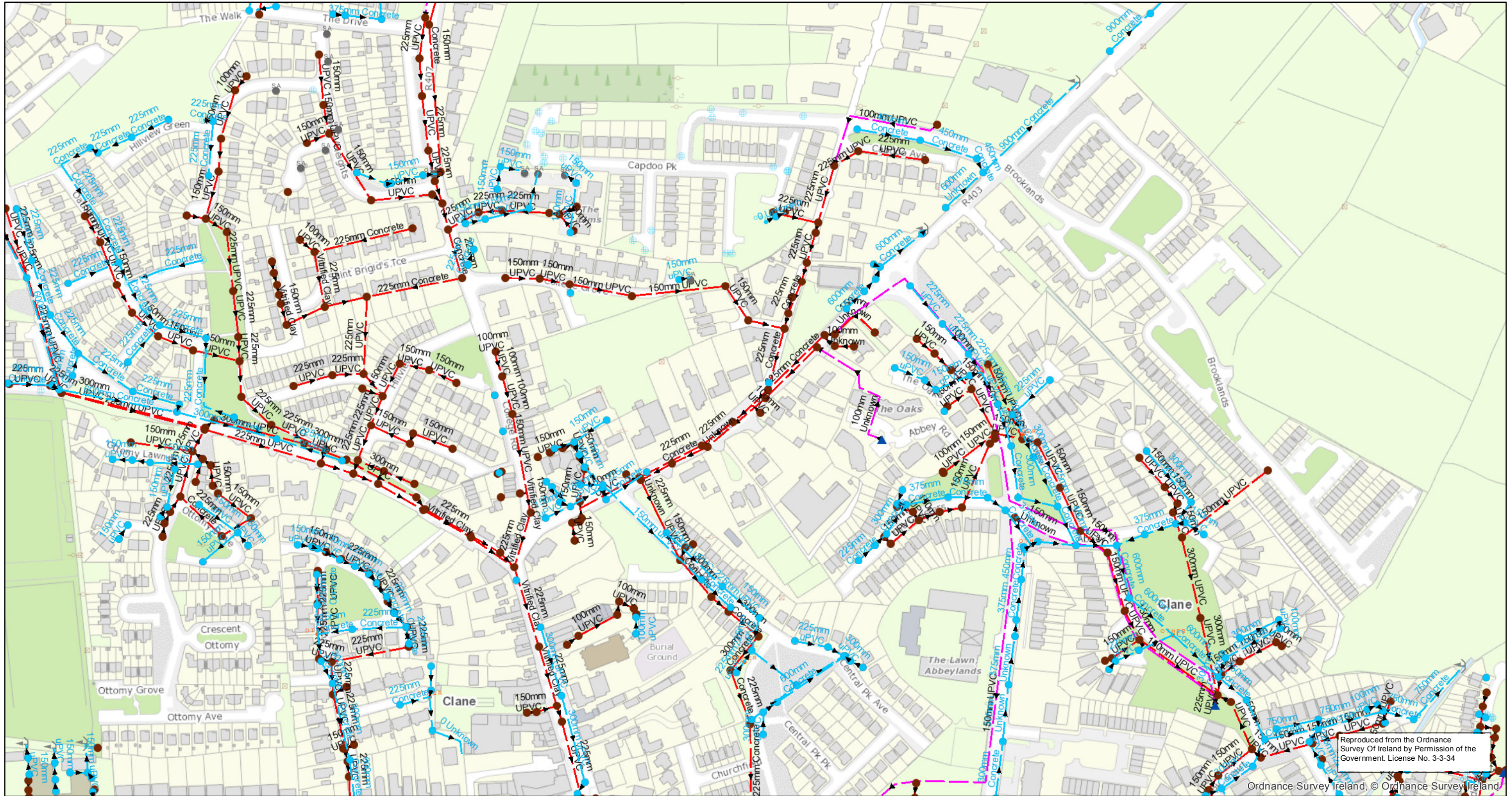
Surface	Other; Unknown	Overflow	Soakaway	Treatment plant	Catchpit	Combined	Unknown
Surface	Gully	Soakaway	Standard Outlet	Pump station	Hatchbox	Foul	Combined
Cascade	Standard	Storm Culverts	Other; Unknown	Gully	Lamphole	Overflow	Foul
Catchpit	Other; Unknown	Storm Clean Outs	Rodding Eye	Standard	Other; Unknown	Combined	Overflow
Hatchbox	Vent/Col	Outfall	Other; Unknown	Other; Unknown	Vent/Col	Foul	Unknown
Lamphole	Other; Unknown	Overflow	Sewer Flow Control Valves	Cascade	Other; Unknown	Overflow	

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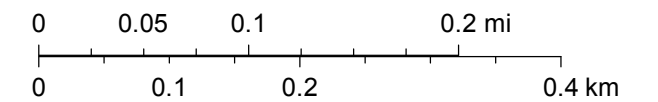


# Irish Water Web Map



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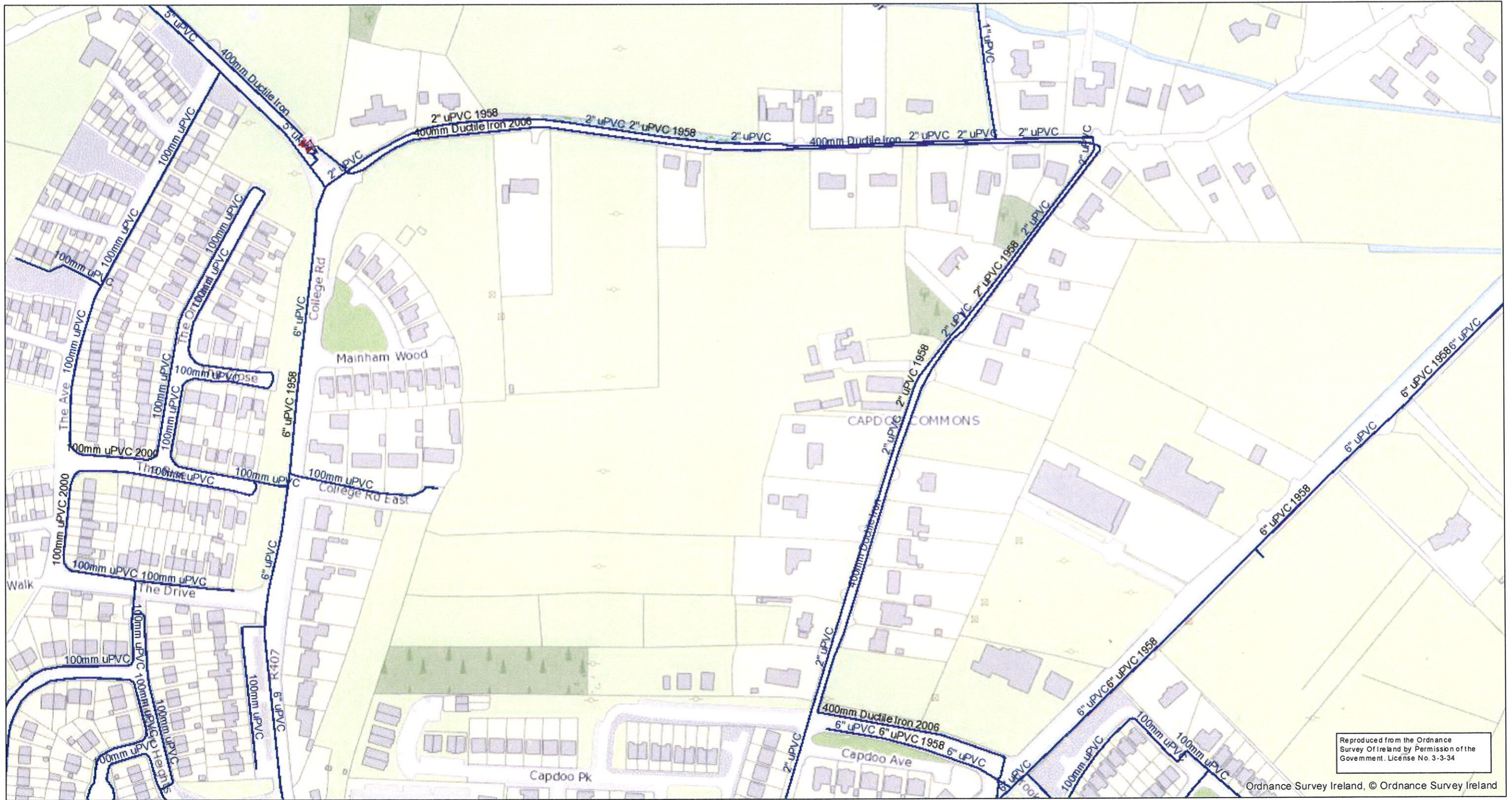
Surface	Other; Unknown	Overflow	Soakaway	Treatment plant	Catchpit	Combined	Unknown
Surface	Gully	Soakaway	Standard Outlet	Pump station	Hatchbox	Foul	Combined
Cascade	Standard	Other; Unknown	Other; Unknown	Catchpit	Lamphole	Overflow	Foul
Catchpit	Other; Unknown	Storm Culverts	Rodding Eye	Gully	Standard	Unknown	Overflow
Hatchbox	Vent/Col	Storm Clean Outs	Flushing Structure	Other; Unknown	Other; Unknown	Combined	Unknown
Lamphole	Other; Unknown	Outfall	Other; Unknown	Other; Unknown	Vent/Col	Foul	Overflow
Standard	Outfall	Overflow	Sewer Flow Control Valves	Cascade	Other; Unknown	Overflow	

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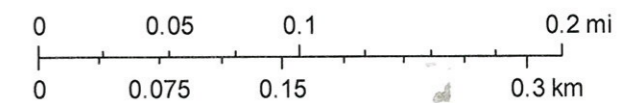
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## Legend

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|-----------------|-----------------------------|-------------------|-----------------|---------------------------|
| ▶ Non-return    | ○ Other                     | ■ Treatment Plant | — Potable Water | --- Water Abandoned Lines |
| ○ Hydro         | ⊗ Open                      | ■ Potable         | - - - Untreated | ≡ Water Casings           |
| □ Orifice Plate | ⊗ Closed                    | ■ Raw Water       | — Potable Water |                           |
| ▶ PRV           | ⊗ Part Closed               | ▲ Pump Stations   | — Irish Water   |                           |
| ▽ PSV           | M District (Boundary Meter) | --- Untreated     | — Non IW        |                           |

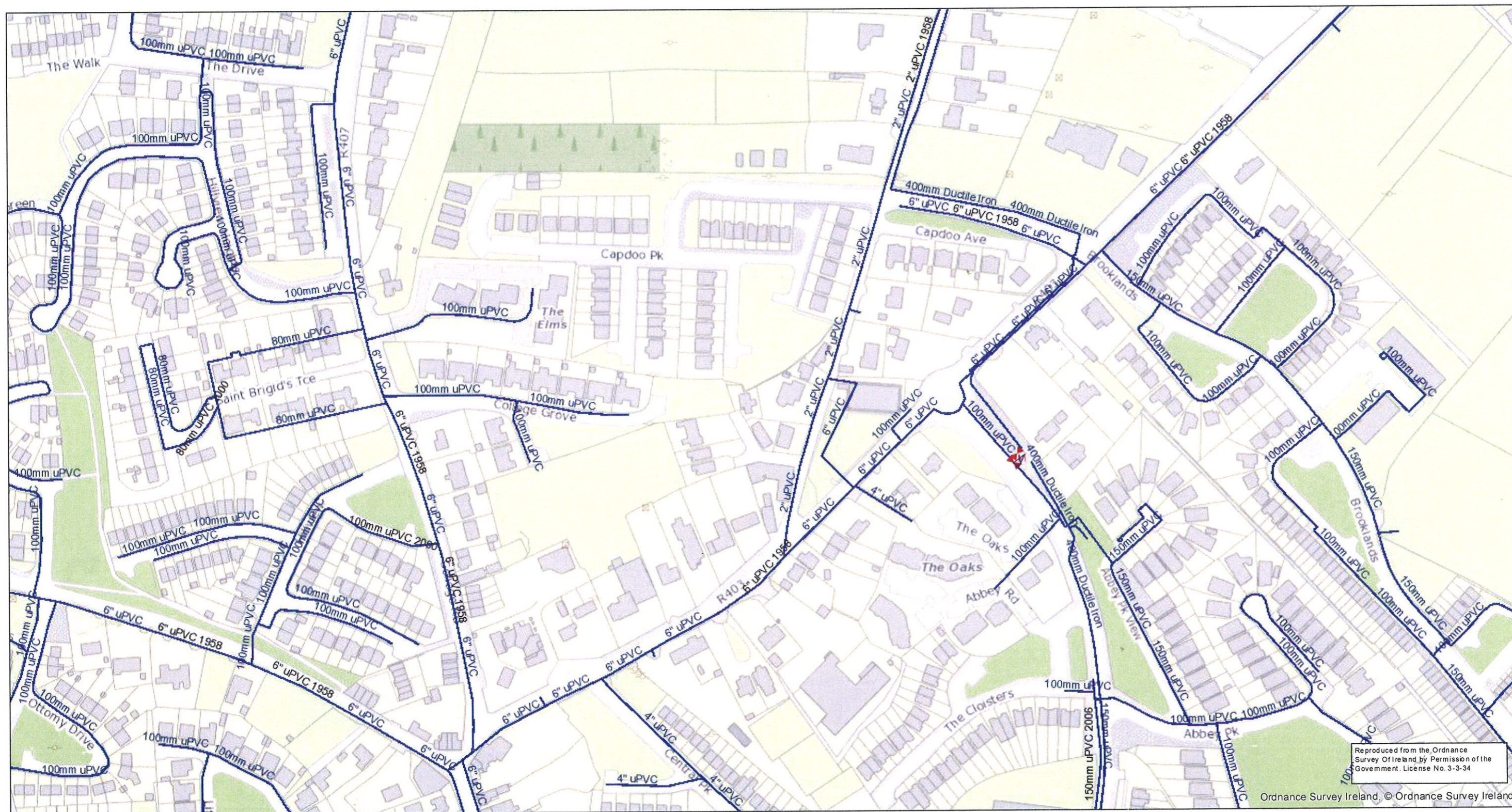


Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

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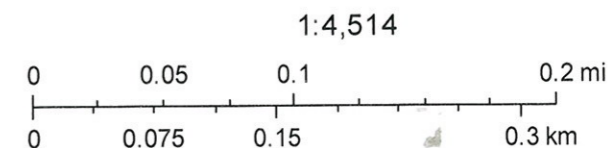
# Irish Water Web Map



September 1, 2016

## Legend

- |                 |                             |                   |                 |                           |
|-----------------|-----------------------------|-------------------|-----------------|---------------------------|
| ▶ Non-return    | ○ Other                     | ■ Treatment Plant | — Potable Water | --- Water Abandoned Lines |
| ○ Hydro         | ⊠ Open                      | ■ Potable         | --- Untreated   | ≡ Water Casings           |
| □ Orifice Plate | ⊠ Closed                    | ■ Raw Water       | — Potable Water | — Irish Water             |
| ▽ PRV           | ⊠ Part Closed               | ▲ Pump Stations   | — Irish Water   | — Non IW                  |
| ▽ PSV           | M District (Boundary Meter) | --- Untreated     | — Non IW        |                           |



Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish Water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

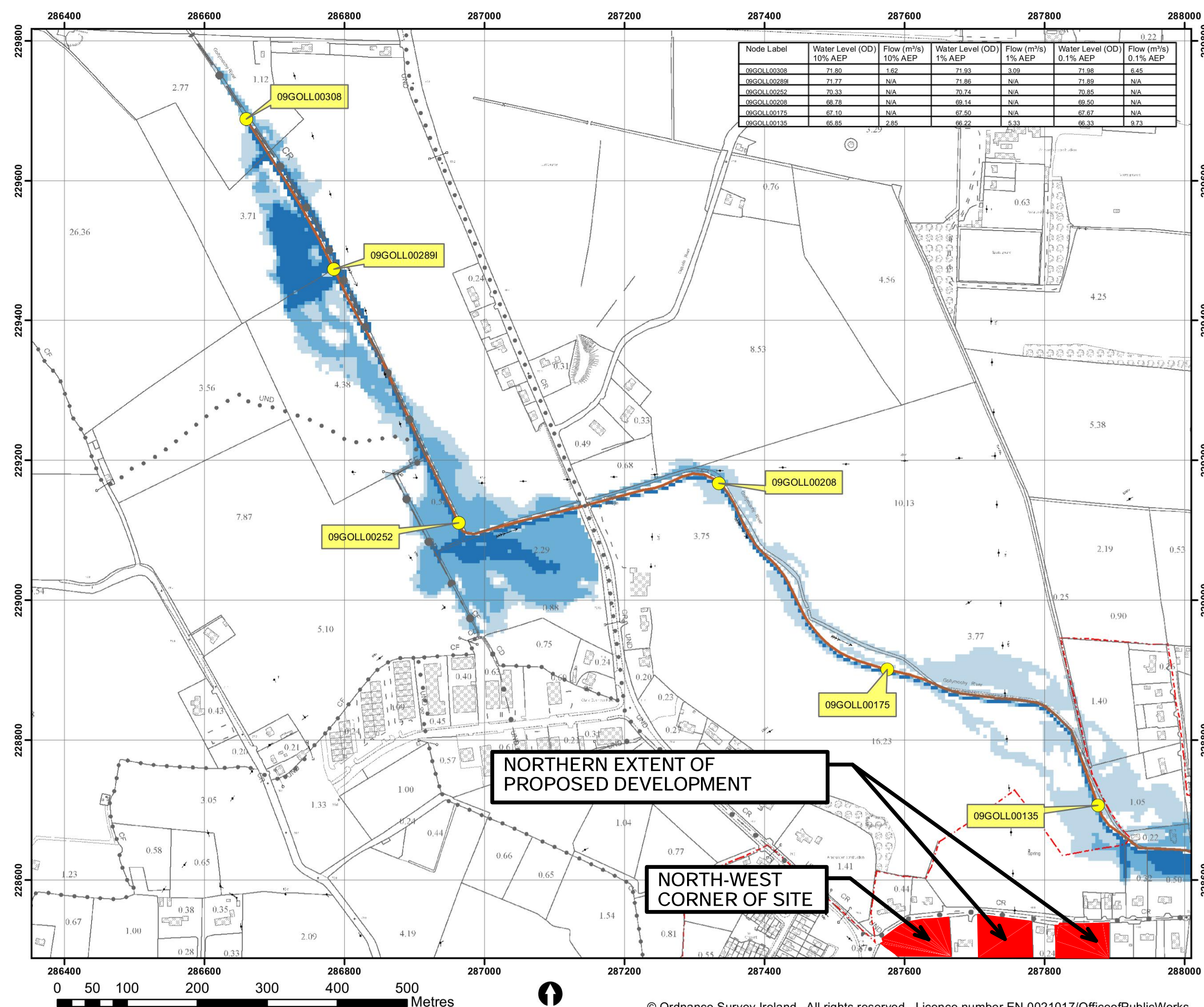
© Copyright Irish Water



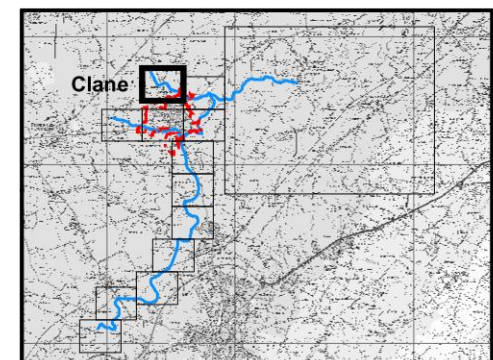
## **APPENDIX 7.B Flood Hazard Information**

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Extracts from OPW's Eastern CFRAM Study



Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
09GOLL00308	71.80	1.62	71.93	3.09	71.98	6.45
09GOLL00289I	71.77	N/A	71.86	N/A	71.89	N/A
09GOLL00252	70.33	N/A	70.74	N/A	70.85	N/A
09GOLL00208	68.78	N/A	69.14	N/A	69.50	N/A
09GOLL00175	67.10	N/A	67.50	N/A	67.67	N/A
09GOLL00135	65.85	2.85	66.22	5.33	66.33	9.73



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

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

**FINAL**

REV: 01	NOTE: Aquaduct was clipped from Page 4 of all maps	DATE: 30/10/17
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Co Meath

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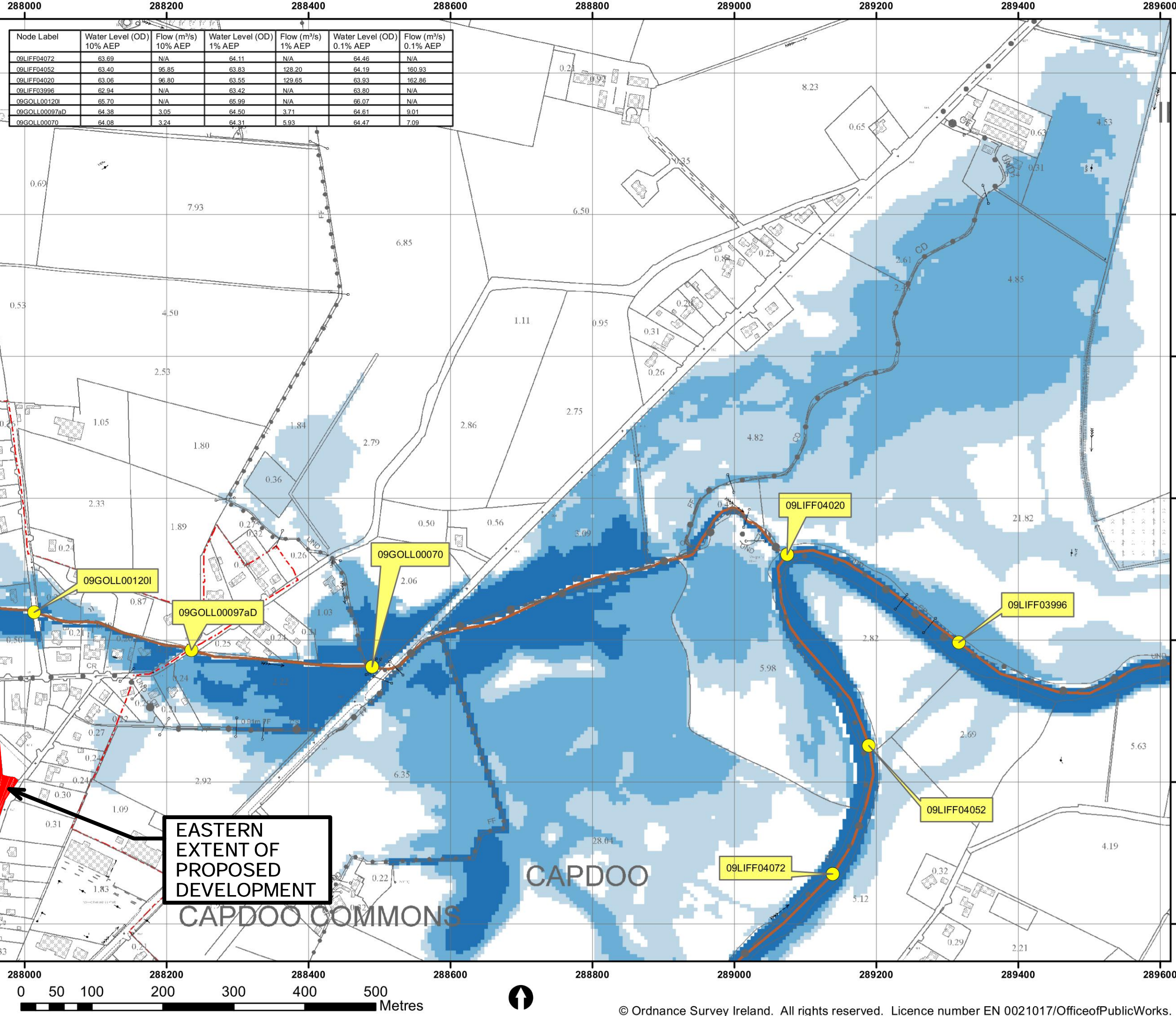
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**NORTHERN EXTENT OF PROPOSED DEVELOPMENT**

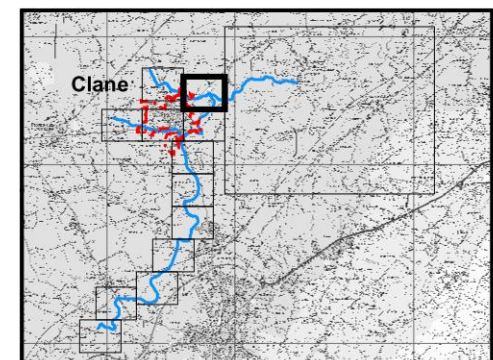
**NORTH-WEST CORNER OF SITE**

**Map:**  
Clane Fluvial Flood Extents

Map Type:	EXTENT
Source:	FLUVIAL
Map Area:	HPW
Scenario:	CURRENT
Drawn By:	C.C. Date: 30 October 2017
Checked By:	M.W. Date: 30 October 2017
Approved By:	S.P. Date: 30 October 2017
Drawing No.:	E09CLA_EXFCD_F1_11
Map Series:	Page 11 of 13
Drawing Scale:	1:5,000 @A3



Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
09LIFF04072	63.69	N/A	64.11	N/A	64.46	N/A
09LIFF04052	63.40	95.85	63.83	128.20	64.19	160.93
09LIFF04020	63.06	96.80	63.55	129.65	63.93	162.86
09LIFF03996	62.94	N/A	63.42	N/A	63.80	N/A
09GOLL00120I	65.70	N/A	65.99	N/A	66.07	N/A
09GOLL00097aD	64.38	3.05	64.50	3.71	64.61	9.01
09GOLL00070	64.08	3.24	64.31	5.93	64.47	7.09



**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**

REV: 01	NOTE: Aquaduct was clipped from Page 4 of all maps	DATE: 30/10/17
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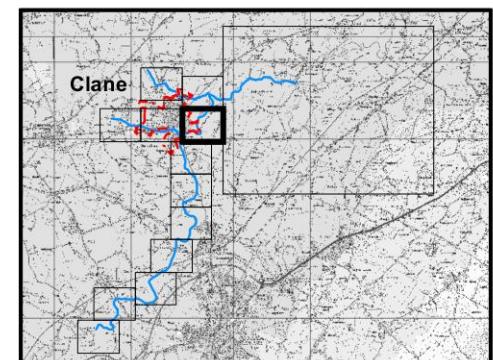
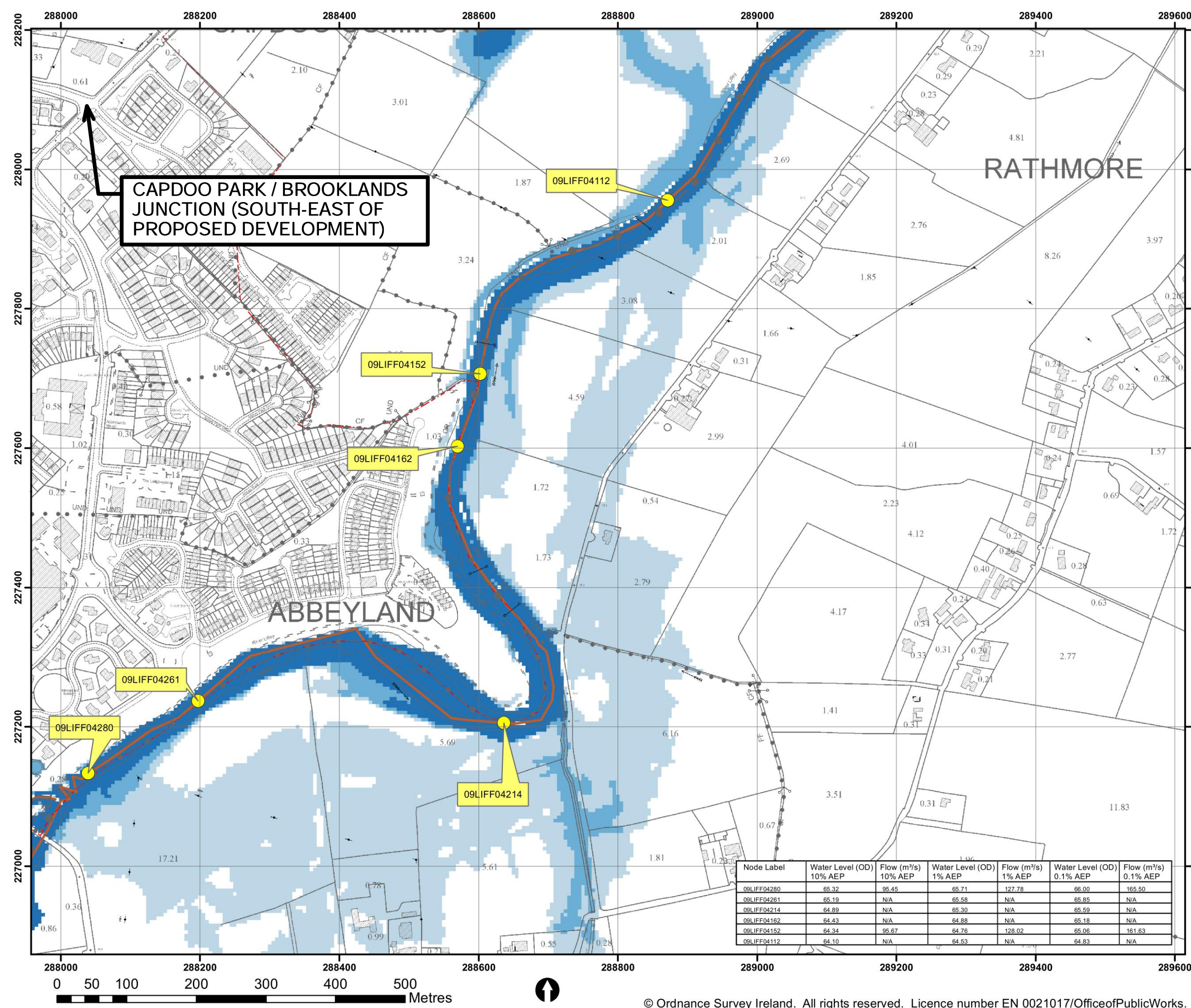
**EASTERN EXTENT OF PROPOSED DEVELOPMENT**

CAPDOO

CAPDOO COMMONS



<b>Map:</b>	
Clane Fluvial Flood Extents	
Map Type: EXTENT	
Source: FLUVIAL	
Map Area: HPW	
Scenario: CURRENT	
Drawn By: C.C.	Date: 30 October 2017
Checked By: M.W.	Date: 30 October 2017
Approved By: S.P.	Date: 30 October 2017
Drawing No.:	
E09CLA_EXFCD_F1_12	
Map Series: Page 12 of 13	
Drawing Scale: 1:5,000 @A3	



**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**

REV: 01	NOTE: Aquaduct was clipped from Page 4 of all maps	DATE: 30/10/17
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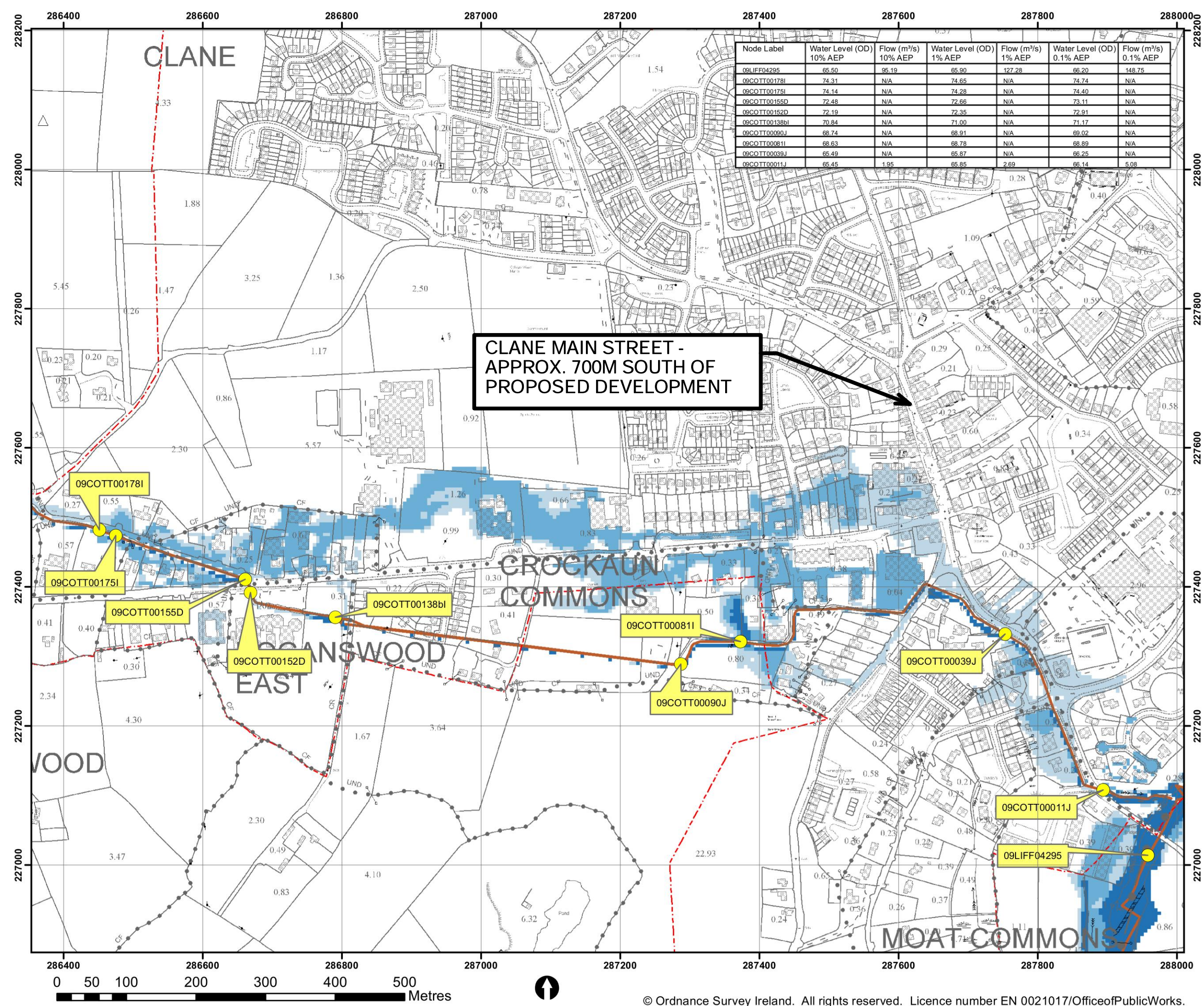
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<b>Map:</b>	
Clane Fluvial Flood Extents	
Map Type: EXTENT	
Source: FLUVIAL	
Map Area: HPW	
Scenario: CURRENT	
Drawn By: C.C.	Date: 30 October 2017
Checked By: M.W.	Date: 30 October 2017
Approved By: S.P.	Date: 30 October 2017
Drawing No.:	
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Map Series: Page 10 of 13	
Drawing Scale: 1:5,000 @A3	

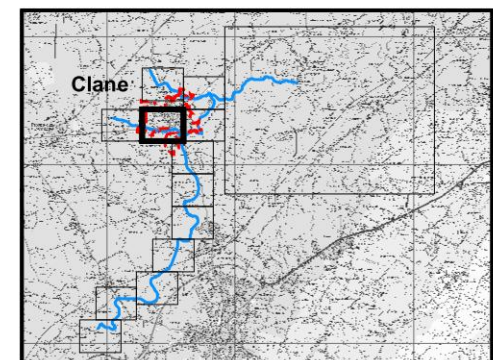
Node Label	Water Level (OD) 10% AEP	Flow (m <sup>3</sup> /s) 10% AEP	Water Level (OD) 1% AEP	Flow (m <sup>3</sup> /s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m <sup>3</sup> /s) 0.1% AEP
09LIFF04280	65.32	95.45	65.71	127.78	66.00	165.50
09LIFF04261	65.19	N/A	65.58	N/A	65.85	N/A
09LIFF04214	64.89	N/A	65.30	N/A	65.59	N/A
09LIFF04162	64.43	N/A	64.88	N/A	65.18	N/A
09LIFF04152	64.34	95.67	64.76	128.02	65.06	161.63
09LIFF04112	64.10	N/A	64.53	N/A	64.83	N/A







Node Label	Water Level (OD) 10% AEP	Flow (m³/s) 10% AEP	Water Level (OD) 1% AEP	Flow (m³/s) 1% AEP	Water Level (OD) 0.1% AEP	Flow (m³/s) 0.1% AEP
09LIFF04295	65.50	95.19	65.90	127.28	66.20	148.75
09COTT00178I	74.31	N/A	74.65	N/A	74.74	N/A
09COTT00175I	74.14	N/A	74.28	N/A	74.40	N/A
09COTT00155D	72.48	N/A	72.66	N/A	73.11	N/A
09COTT00152D	72.19	N/A	72.35	N/A	72.91	N/A
09COTT00138bI	70.84	N/A	71.00	N/A	71.17	N/A
09COTT00090J	68.74	N/A	68.91	N/A	69.02	N/A
09COTT00081I	68.63	N/A	68.78	N/A	68.89	N/A
09COTT00039J	65.49	N/A	65.87	N/A	66.25	N/A
09COTT00011J	65.45	1.95	65.85	2.69	66.14	5.08



**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**

REV: 01	NOTE: Aquaduct was clipped from Page 4 of all maps	DATE: 30/10/17
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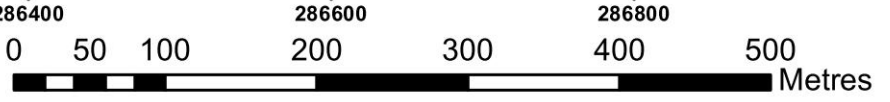


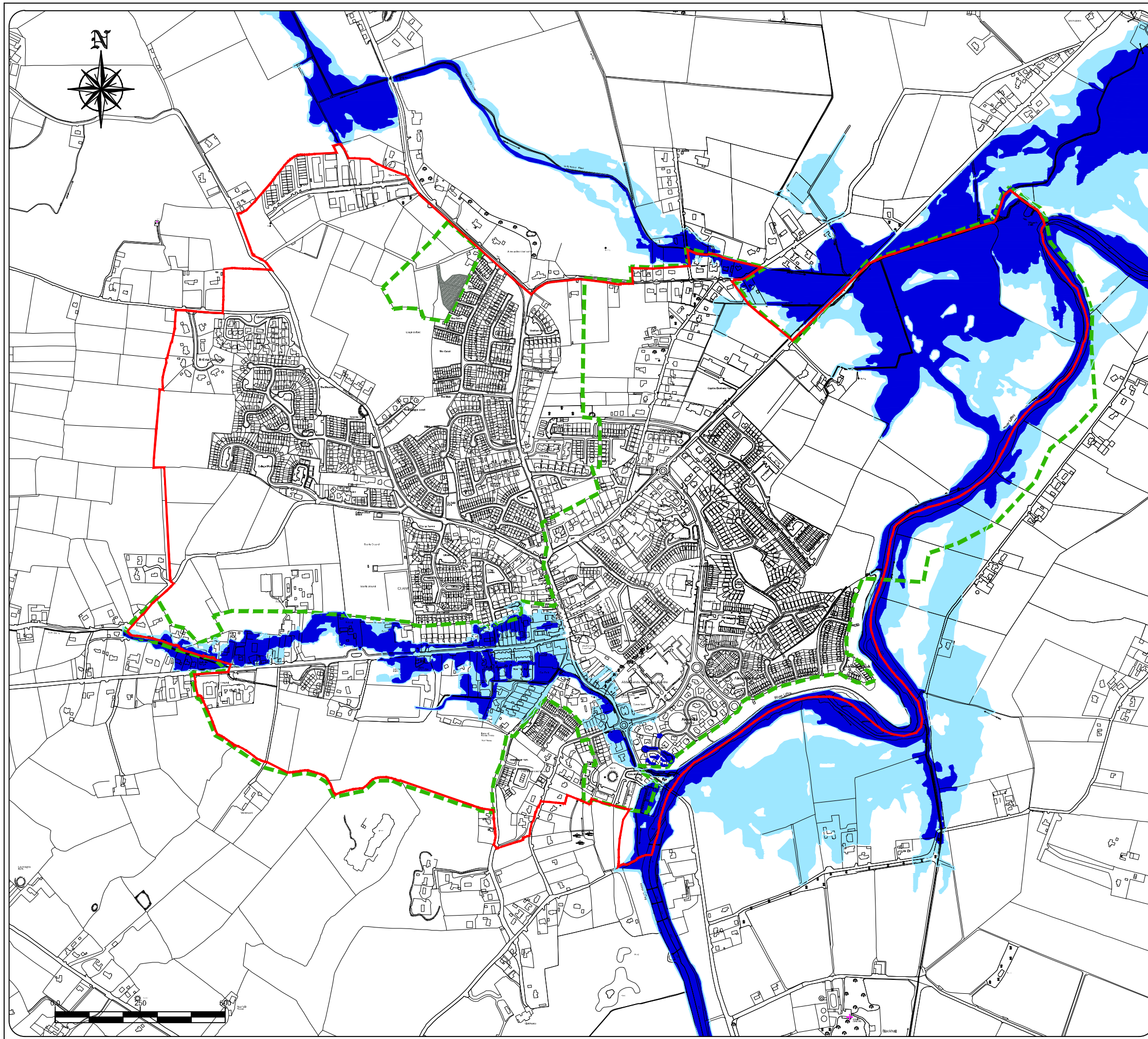
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<b>Map:</b> Clane Fluvial Flood Extents	
<b>Map Type:</b> EXTENT	
<b>Source:</b> FLUVIAL	
<b>Map Area:</b> HPW	
<b>Scenario:</b> CURRENT	
<b>Drawn By:</b> C.C.	<b>Date:</b> 30 October 2017
<b>Checked By:</b> M.W.	<b>Date:</b> 30 October 2017
<b>Approved By:</b> S.P.	<b>Date:</b> 30 October 2017
<b>Drawing No.:</b> E09CLA_EXFCD_F1_09	
<b>Map Series:</b> Page 9 of 13	
<b>Drawing Scale:</b> 1:5,000 @A3	










Kildare County Council  
 Planning Department  
 Áras Chill Dara,  
 Devoy Park, Naas,  
 Co Kildare.

Clane Local Area Plan 2017 - 2023

Legend

-  Local Area Plan Boundary
-  Development proposals for lands outlined thus are to be the subject of site-specific Flood Risk Assessment in accordance with the Flood Risk Management Guidelines and appropriate to the type and scale of the development being proposed.

- Such Development Proposals shall also:
- Indicate and quantify loss of floodplain storage arising from the development proposal;
  - Provide compensatory storage located within or adjacent to the proposed development;
  - Indicate measures to ensure that water-vulnerable elements of the Development would not be flooded during the 1000year flood;
  - Ensure that existing flow paths for flood waters will not be compromised.

-  Flood Risk Zone A (1.0% AEP)
-  Flood Risk Zone B (0.1% AEP)
-  Pluvial Flood Risk Zone

Source:



Strategic Flood Risk Assessment  
 Recommendations

Scale: N.T.S.	Map Ref.: 9.1
Date: June 2017 (Adopted LAP)	Drawing No.: 200/16/1000
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This drawing is to be read in  
 conjunction with the written statement

### Summary Local Area Report

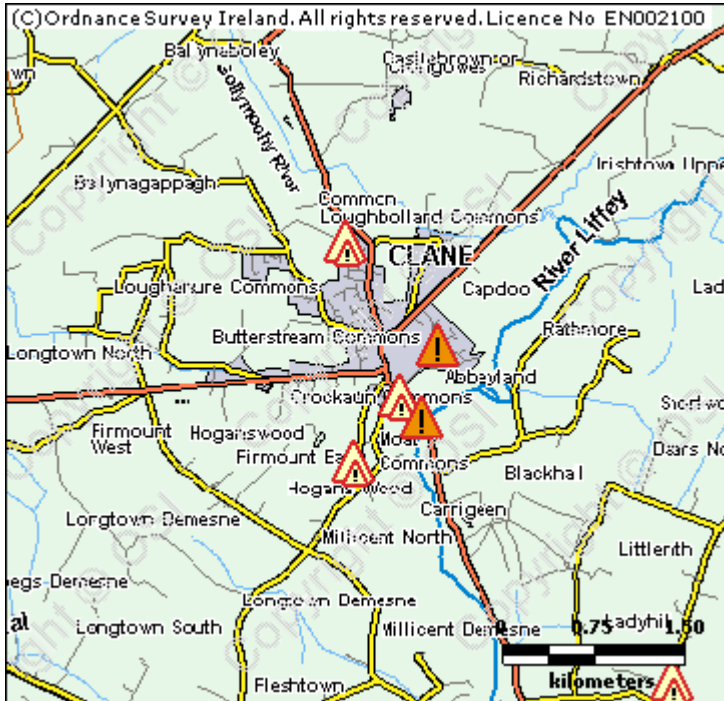
This Flood Report summarises all flood events within 2.5 kilometres of the map centre.

The map centre is in:

County: Kildare

NGR: N 875 276

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 *

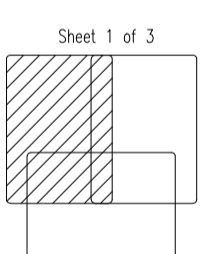
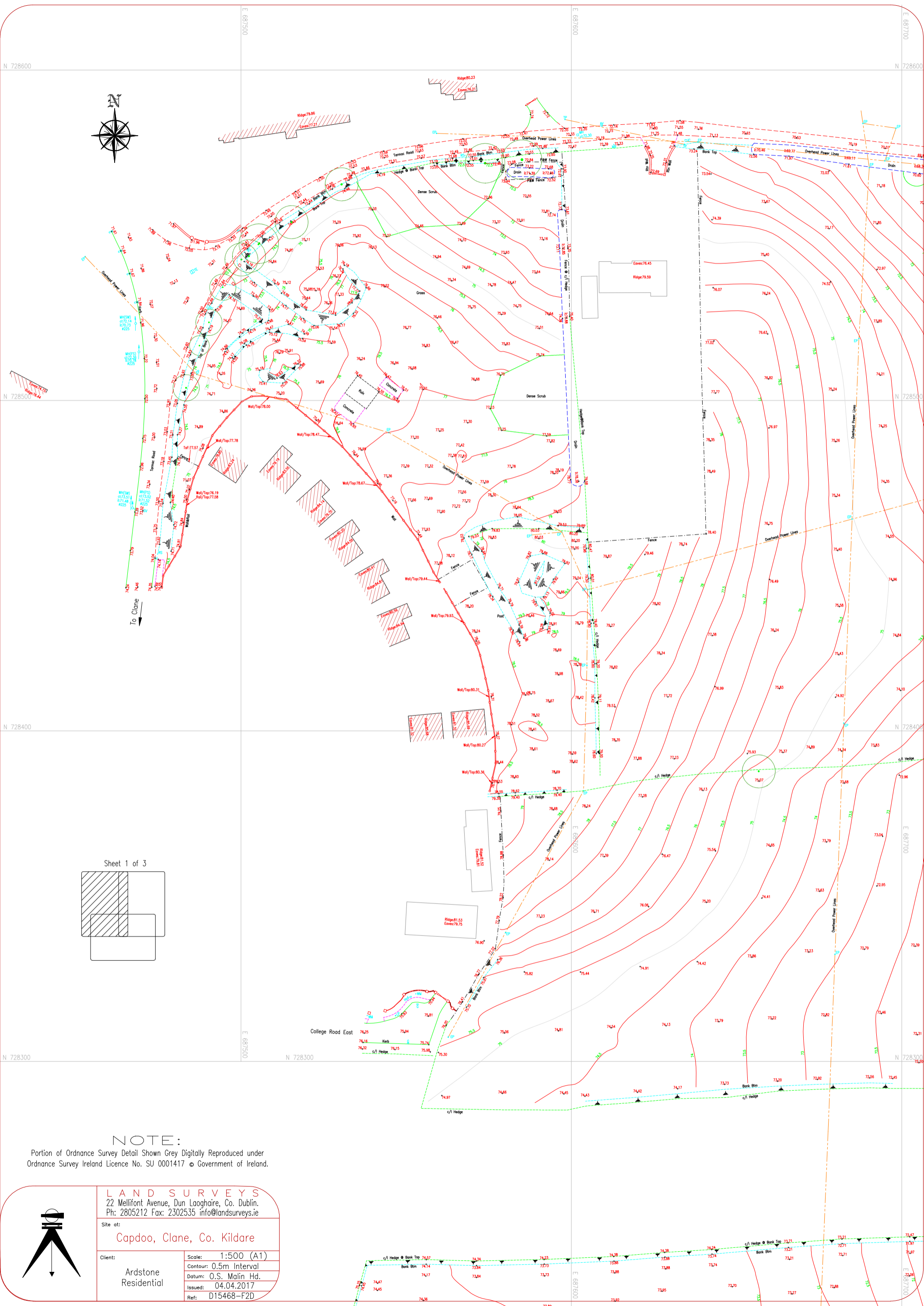
\* Important: These maps do not indicate flood hazard or flood extent. Their purpose and scope is explained in the Glossary.

### 5 Results

	1. Liffey Clane Dec 1954 County: Kildare Additional Information: Reports (2) Press Archive (1) More Mapped Information	Start Date: 08/Dec/1954 Flood Quality Code:2
	2. Morrell Clane 30th Dec to 1st Jan 2010 County: Kildare Additional Information: Reports (1) More Mapped Information	Start Date: 30/Dec/2009 Flood Quality Code:3
	3. Loughbollard, Clane Recurring County: Kildare Additional Information: Reports (1) More Mapped Information	Start Date: Flood Quality Code:4
	4. Millicent Rd, Clane Recurring County: Kildare Additional Information: Reports (1) More Mapped Information	Start Date: Flood Quality Code:4
	5. Commons, Clane Recurring County: Kildare	Start Date: Flood Quality Code:4

## Appendix 7.C Topographical Survey

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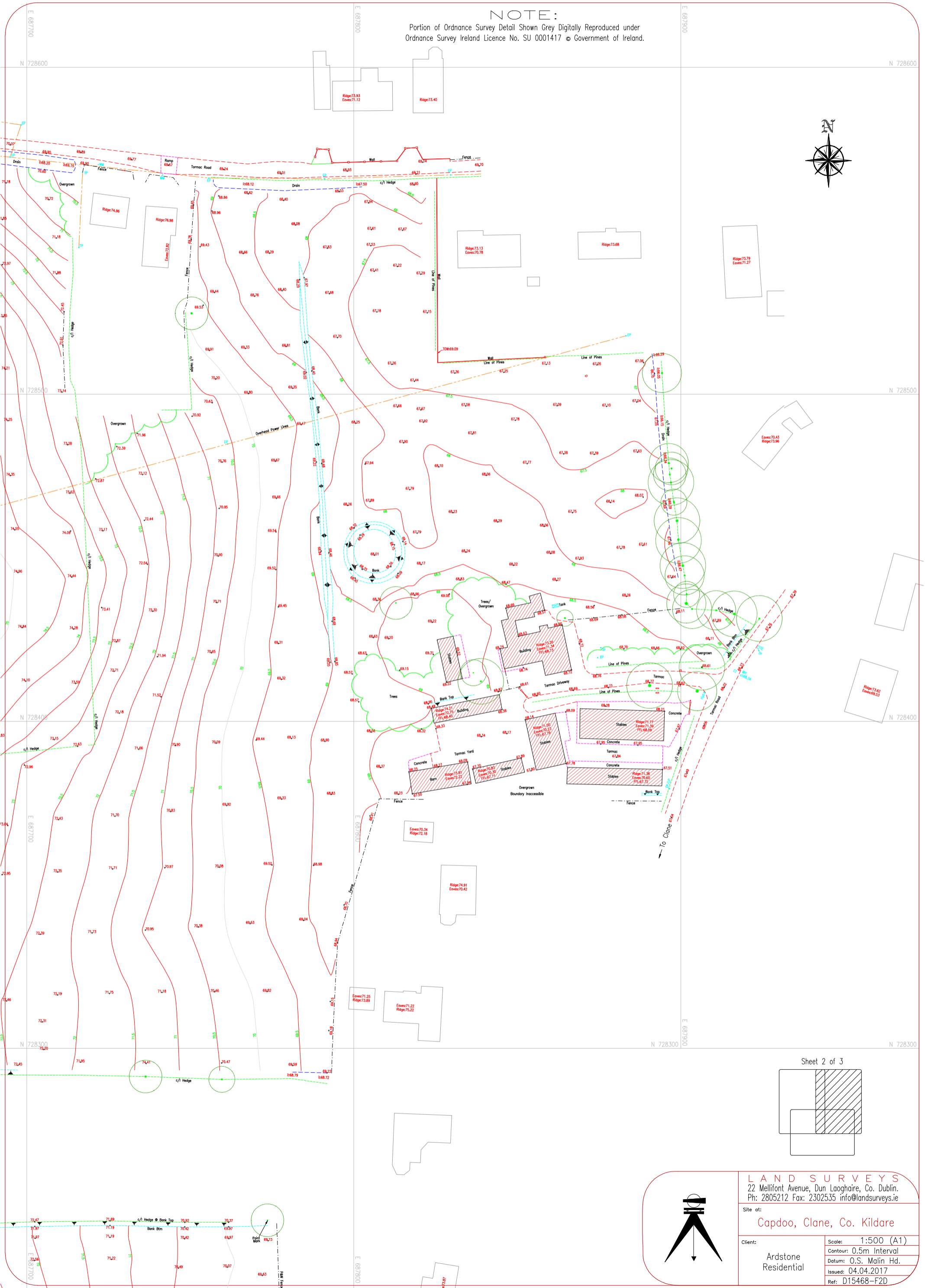
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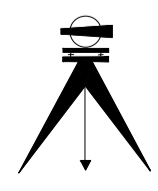
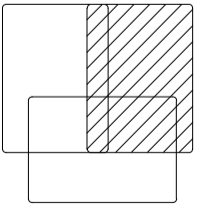
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**Capdoo, Clane, Co. Kildare**

Client:	Ardstone Residential
Scale:	1:500 (A1)
Contour:	0.5m Interval
Datum:	O.S. Malin Hd.
Issued:	04.04.2017
Ref:	D15468-F2D

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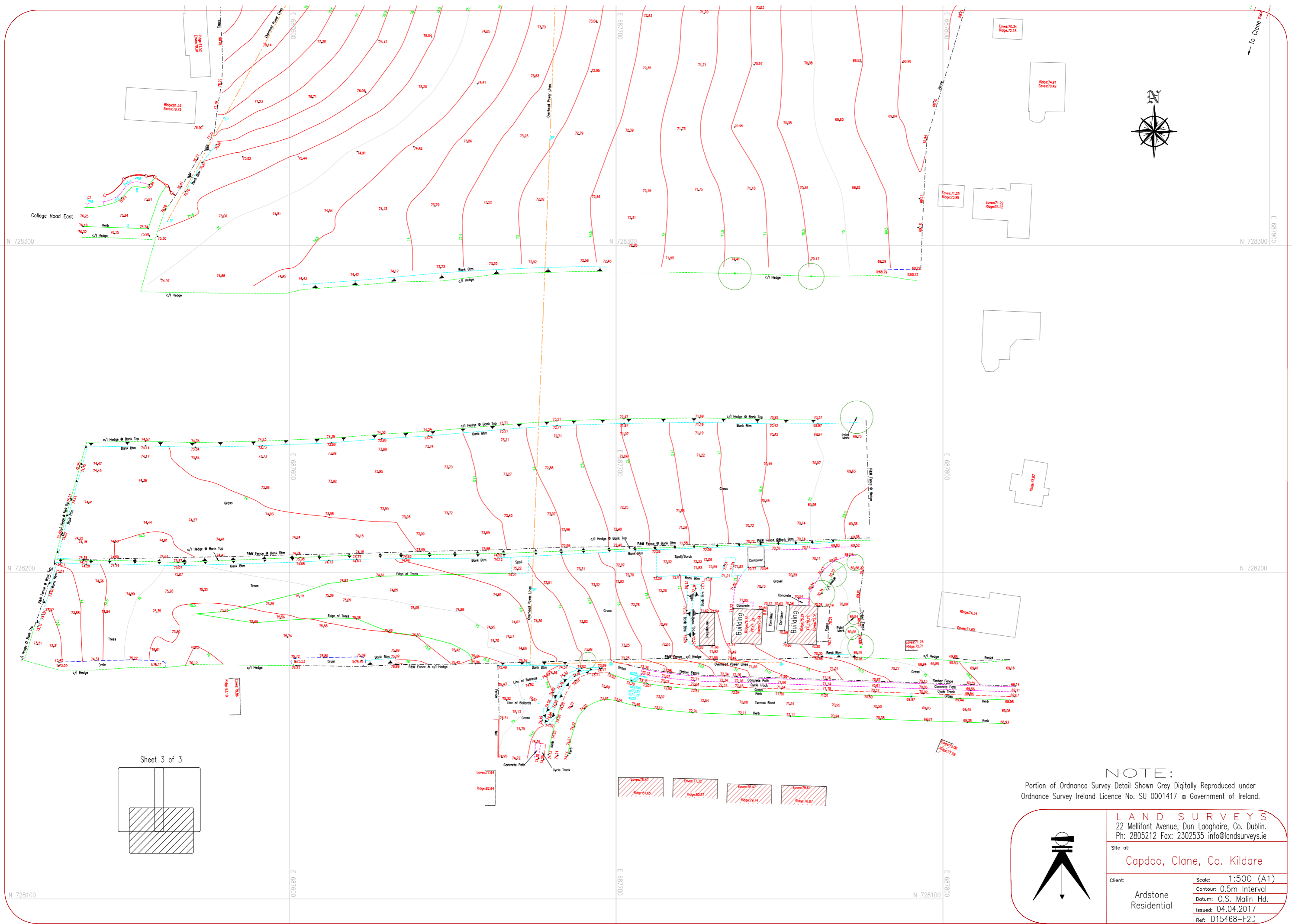


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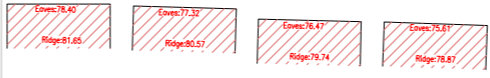
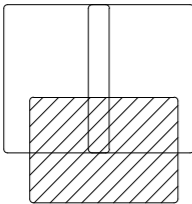
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Client: **Ardstone Residential**

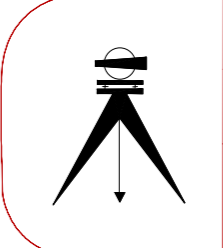
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 Issued: **04.04.2017**  
 Ref: **D15468-F2D**



Sheet 3 of 3



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Site at: <b>Capdoo, Clane, Co. Kildare</b>	
Client: <b>Ardstone Residential</b>	Scale: <b>1:500 (A1)</b> Contour: <b>0.5m Interval</b> Datum: <b>O.S. Malin Hd.</b> Issued: <b>04.04.2017</b> Ref: <b>D15468-F2D</b>