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HCE Job Ref: 22-048

19th May 2022

Planning Dept / Water Services
South Dublin County Council,
County Hall Tallaght,
Dublin 24,
D24 A3XC

Re: Site-Specific Flood Risk Assessment for Further Information Request Planning Ref. No. SD21B/0585

Applicant: Remy Farrell.

To whom it concerns,
The applicant has retained Hydrocare Environmental Ltd. to prepare a site-specific flood risk assessment report in response to Items 1 and 2 of the Further Information Request for the planning reference no. SD21B/0585.

Please find appended herewith the site-specific flood risk assessment report for this proposed development.

Yours sincerely,

Daniel Nolan

Daniel Nolan, MIEI, BA BAI, Msc Environmental Engineering

Land Use Planning & Transportation
27 MAY 2022
South Dublin County Council

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FLOOD RISK ASSESSMENT

Applicant: Remy Farrell

Site Location: Lissadell, Whitechurch Road, Rathfarnham, Dublin 16

Date of Report:19/05/2022

Prepared By:

HYDROCARE
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Document Control Sheet

Project No.: 22-048

Project Title: Remy Farrell, Lissadell, Whitechurch Road, Rathfarnham, Dublin 16

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Prepared By:

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Disclaimer: This Flood Risk Assessment Report is carried out based on available information at the time of writing. All flood water levels identified in this report are predicted flood water levels based on computational models which are recommended for use by local authorities, government organisations and industry leaders as tools to establish flood risk. All models used are accurate based only on the variables used in compiling the models and are not to be used as a precise representation of flood water levels and flood extents. As a result, flood water levels and extents may differ in an actual flood event compared to any modelled flood event.

CONTENTS

1.0 INTRODUCTION

1.1 Site Context & Location

The proposed development site is located at Lissadell, Whitechurch Road, Rathfarnham, Dublin 16. The proposed site location can be seen on the OSI Discovery Map in Figure 1 below.

Figure 1 – Site Location. OSI Discovery Map

The proposed development is located within an existing site at Lissadell, Whitechurch Road, Rathfarnham, Dublin 16. The existing development site consists of two no. dwellings within the site boundary and several sheds. Access to the development is achieved via an existing access lane down from the Whitechurch Road which is located along the east site boundary. The Kilmashogue/ Whitechurch Stream flows through the centre of the proposed development site from south to north, creating a natural separation between the two existing dwellings on site. There are a number of hydraulic features across the stream at the proposed development site. At the southern boundary of the proposed development site, the stream flows into the site via a waterfall. In the centre of the site, a historic weir/gate facilitates flow control of the stream through the site. The weir/gate was constructed when the site operated as a laundry service facility. A wooden footbridge and a larger stone vehicular bridge facilitate access to either side of the stream within the site.

To the south and to east of the development site is the Edomondstown Golf Course. To the west of the development site is an existing housing estate and to the north is an existing dwelling house

development. The development site is located ca. 7km inland from the Irish Sea. An aerial image of the proposed site location can be seen below in Figure 2.

Figure 2 - Aerial Image and Site Location

1.2 Proposal Description

The applicant is seeking planning permission for the demolition of existing single storey structures; porch to front, bay window and store to rear; construction of single storey flat roof extension to front, part single storey flat roof extension and part two storey extension with pitch roof to match existing dwelling to rear and internal modifications with associated site works at Lissadell, Whitechurch Road, Rathfarnham, Dublin 16. The proposed site layout drawing can be seen in Figure 3.

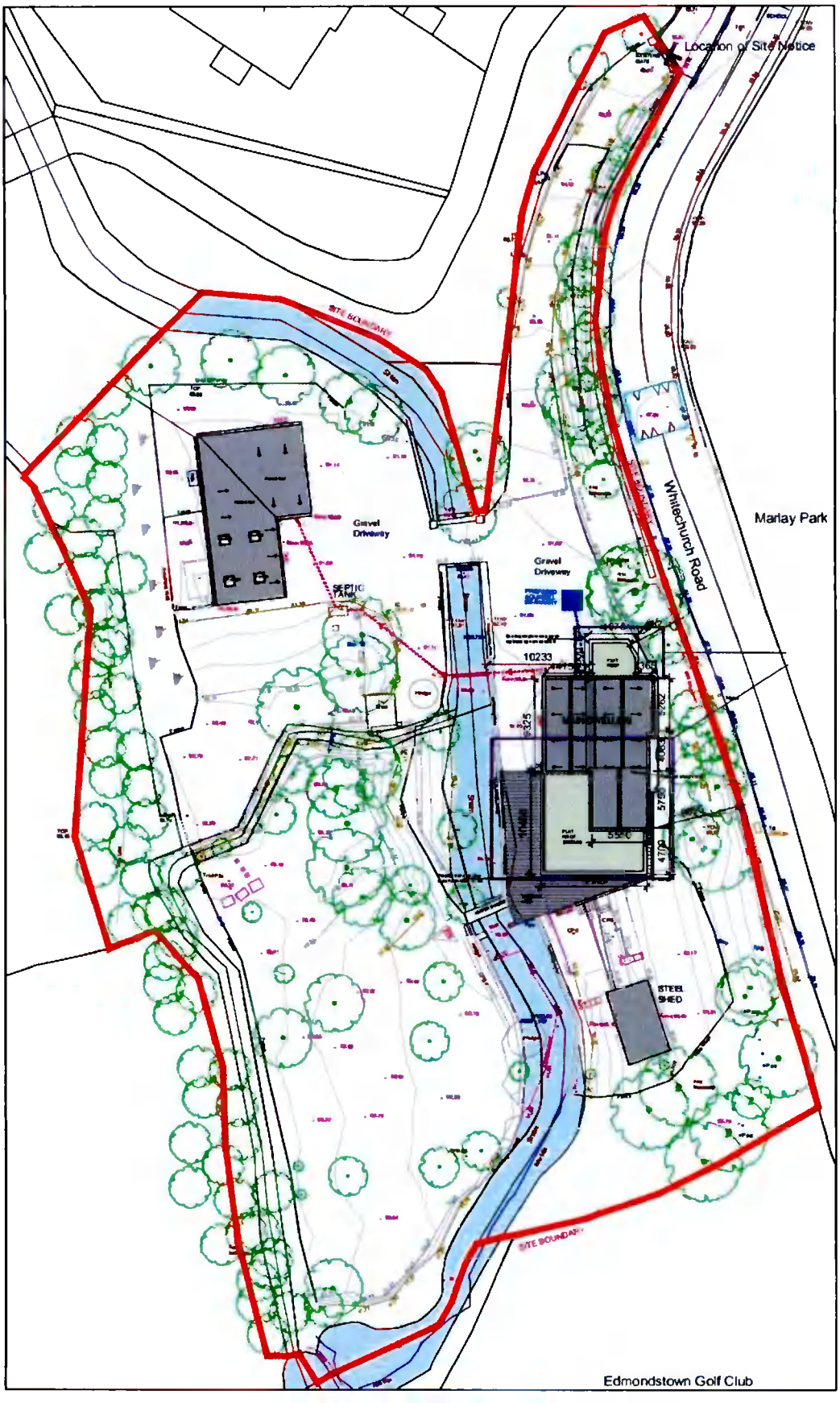


Figure 3 - Proposed Site Layout

1.3 Planning Status

The applicant has sought planning permission for this proposed development site under the planning ref. no. DS21B/0585. The planning authority has issued the applicant with an additional information request for this proposed development under the aforementioned reference number. Hydrocare Environmental Ltd. has been retained by the applicant to carry out and prepare a site-specific flood risk assessment report in response to Items 1 and 2 of the additional information request.

Item 1 of the FI request for the planning ref. no. DS21B/0585 states:

"The proposed extension to the south of the existing dwelling is located in an area that is at risk of 1 in 100-year flood risk event. The applicant is requested to carry out a site-specific Flood Risk Assessment to an appropriate level of detail, addressing all potential sources of flood risk. The FRA should demonstrate compliance with the Flood Risk Guidelines, paying particular attention to residual flood risks and any proposed site-specific flood management measures.

The applicant is requested to submit a report to outline what mitigation measures are proposed for the development to ensure flood risk is mitigated against on site as well as downstream/upstream of the site."

Item 2 of the FI request for the planning ref. no. DS21B/0585 states:

"Depending what the results are from the flood risk assessment, an extension to the existing dwelling may be acceptable so long as it does not further encroach on the Whitechurch Stream. Any proposed extension should not decrease the current setback of the existing dwelling from Whitechurch Stream at the closest point. The applicant is requested to submit a revised proposal addressing this. A full set of revised drawings should be submitted.

The applicant is advised that Policy G3 Objective 2 of the Development Plan states: To maintain a biodiversity protection zone of not less than 10 metres from the top of the bank of all watercourses in the County, with the full extent of the protection zone to be determined on a case-by-case basis by the Planning Authority, based on site specific characteristics and sensitivities..."

This Site-Specific Flood Risk Assessment (SSFRA) report will address the issues outlined in the additional information request.

1.4 Approach to SFRA

In accordance with *The Planning System & Flood Risk Management Guidelines for Planning Authorities, DOEHLG & OPW (Nov 2009)*, a Site-Specific Flood Risk Assessment (SSFRA) has been undertaken for the subject site and proposed development. The guidelines state site-specific flood risk assessments should be undertaken in stages, with the need for progression to a more detailed stage dependent on the outcomes of the former stage until the level of detail of the FRA is appropriate to support the planning matter. In this case a decision on an individual planning application. These stages progress from Level 1 to Level 2 to Level 3.

Level 1 is Flood Risk Identification and is carried out for all proposed developments and is essentially a desktop exercise to identify whether there are any potential flooding impacts that may affect the subject site. If any potential flood impacts are uncovered, further investigation is required.

Level 2 is an Initial Flood Risk Assessment which will analyse all available flooding data pertaining to the proposed development site. This will include all OPW & SDCC flood mapping, local area knowledge

from people within the community, surveyed site topography, soil mapping and any other useful data. It will be established at Level 2 stage if the site is suitable for development based on the available information or if further detailed assessment is necessary.

Level 3 is a Detailed Flood Risk Assessment. A high-level of detailed analysis is required with catchment runoff calculations and hydraulic modelling provided to describe and establish the potential flooding levels and their impact to the proposed development. An appraisal of potential flood risk to the proposed development, of its potential impact on flood risk elsewhere and of the effectiveness of any proposed mitigation measures should be undertaken and the findings clearly set out, together with any recommendations.

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

- The Planning System and Flood Risk Management - Guidelines for Planning Authorities (November 2009) - DOEHLG and OPW
- Planning Policy Guidelines for Flooding – OPW
- Development and Flood Risk. Guidance for the Construction Industry - CIRIA C624
- Strategic Flood Risk Assessment for South Dublin County Council Development Plan 2016-2022

2 LEVEL 1 – FLOOD RISK IDENTIFICATION

2.1 OPW PFRA MAP

The OPW Preliminary DRAFT Flood Risk Assessment (PFRA) Map-238 indicates that the proposed site is partially located within an area susceptible to flooding within the predicted 1% AEP (1 in 100-year Event) fluvial flood extents, see Figure 4 below. Refer to Appendix A for the full PFRA Map-238.

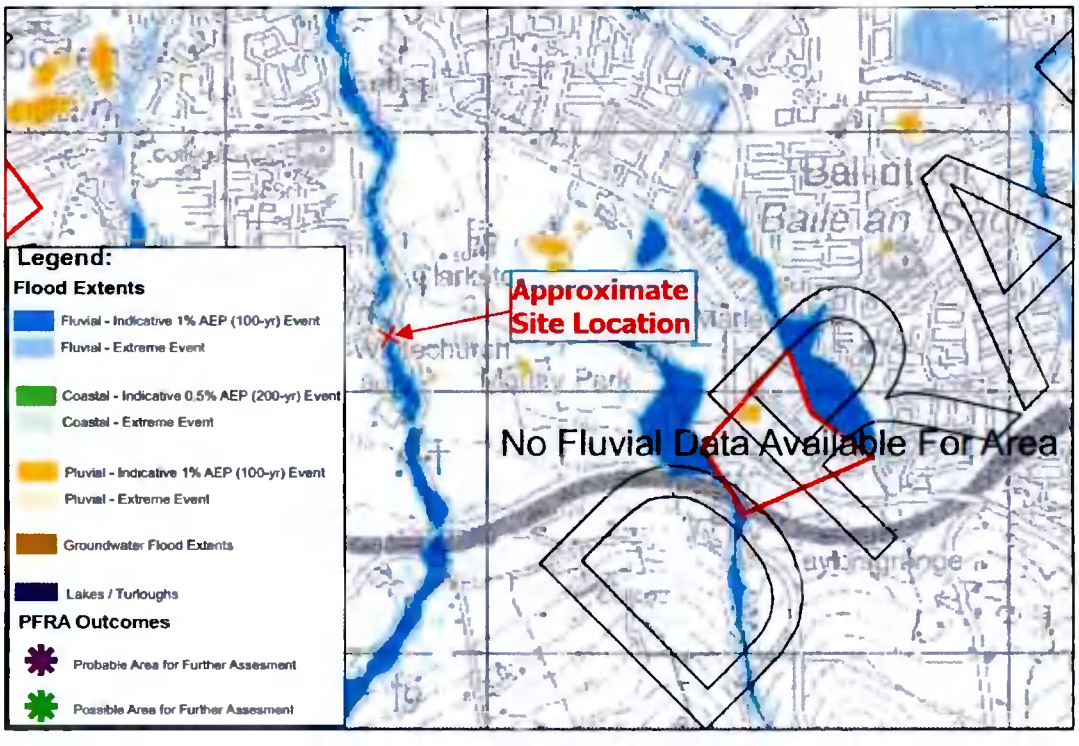


Figure 4 – OPW PFRA Map-238

2.2 Findings of Screening Assessment

The Preliminary Flood Risk Assessment (PFRA) is a national screening exercise that was undertaken to identify areas at potential flood risk. The National Preliminary Flood Risk Assessment Report states *"It is important to note that the PFRA is not a detailed assessment of flood risk. It is rather a broad-scale assessment, based on available or readily-derivable information, to identify where there is a genuine cause for concern that may require national intervention and assessment, rather than locally developed and implemented solutions"*.

Section 6.1 of the PFRA Main Report states: *"It is not possible based on the PFRA (a preliminary assessment) to determine definitively where significant flood risks exist, but it is rather the objective to determine where, based on a preliminary assessment only, where it is considered that such risk might potentially exist"*.

The PFRA map indicates that the proposed development site is partially located within Flood Zones A or B with regard to fluvial flooding. The close proximity of the site to the Kilmashogue/Whitechurch Stream indicates that a Stage 2 Initial Flood Risk Assessment is required for the proposed development to suitably assess potential flood impacts.

3 LEVEL 2 – INITIAL FLOOD RISK ASSESSMENT

3.1 Potential Sources of Flooding

The flood risk assessment requires an awareness of the Source-Pathway-Receptor Model. The Source is where the water comes from. In Ireland, the main sources of flooding are due to extensive rainfall or higher than average sea levels. The Pathway is how and where flood waters flow, which can include rivers, drains, sewers, overland flow and river or coastal floodplains and their associated defences. Lastly, the Receptors are the vulnerable people, their buildings and property and the environment which may be affected by flooding. All three elements must be examined as part of the flood risk assessment including the vulnerability and exposure of receptors to determine its potential consequences.

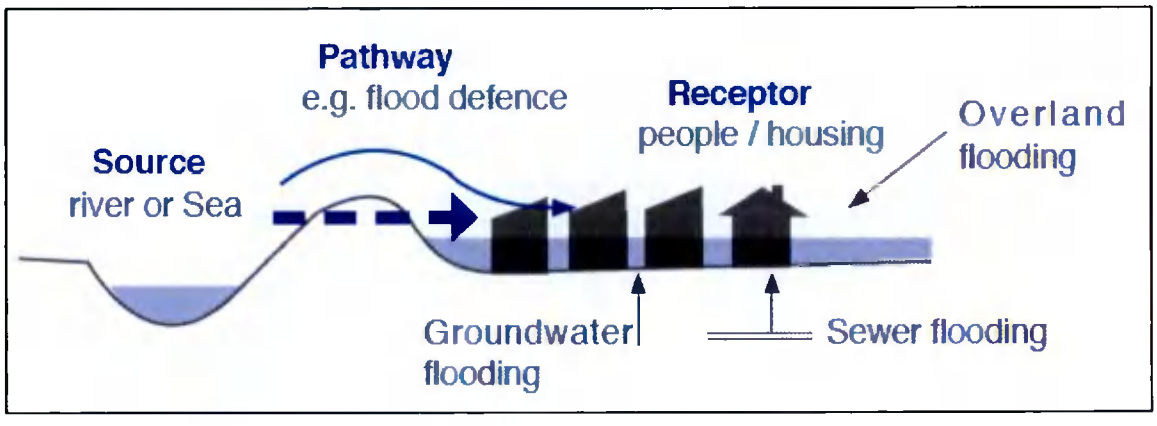


Figure 5 – Example of Source Pathway Receptor Model. Source: Flood Risk Management Guidelines

3.1.1 Fluvial Sources

The EPA Envision Mapping Portal notes only one watercourse local to this site.

Figure 6 - Site Location & River Catchment. EPA ENVISION MAP (Note incorrect position of stream through the site)

3.1.1.1 The Kilmashogue / Whitechurch Stream

The Kilmashogue / Whitechurch Stream is a significant waterbody which traversed through the centre of the proposed development site. For the remainder of this report, this waterbody will be referred to as the Whitechurch Stream. The EPA Envision map indicates that the Whitechurch Stream flows in a south to north direction, close to the western site boundary. However, the actual path of the Whitchurch Stream is directly through the centre of the site as shown above in Figure 2, rather than how it is portrayed in the EPA Envision Map. The Whitchurch Stream rises ca. 4km south of the proposed development site in the valley formed between the Tibradden Mountain and Two Rock Mountain in south county Dublin. The stream has a catchment area that is approximately 6.3km^2, measured downstream of the proposed site location. This is the most significant water body local to the proposed development site and is likely to have the largest flood impact to the development.

As the stream flows through the centre of the site, it includes a number of hydraulic features. At the southern site boundary, the stream flows into the site via a waterfall. In the centre of the site, a disused weir/gate provides a form of flow control for the stream which would have been installed for the former laundry development. A wooden footbridge and a larger vehicular bridge provide access across the stream within the site. The banks of the stream have been altered historically with mostly stone walls forming the channel sides.

3.1.2 Pluvial Sources

The PFRA Map shown in Figure 4 does not indicate that the subject site is at risk of pluvial flooding. However, the proposed development will be assessed further in this report regarding any potential pluvial flood threat.

3.1.3 Coastal Source

The proposed site is located circa 7.4km from the east coast of Ireland and the Irish Sea. The proposed development site has an average ground elevation of approximately 91.00mAOD. The proposed development site is therefore not considered to be at risk of tidal flooding up to the extreme flood event. Therefore, the proposed development site is considered to be located in Flood Zone C with regard to tidal flooding.

3.1.4 Artificial Drainage Systems

The proposed development is a brownfield site. There are pre-existing artificial drainage systems for the foul and surface waters arising from the existing dwellings present at the proposed development site.

3.2 Source – Pathway – Receptor – Risk

The potential flood sources are analysed for the potential risk to the subject site should a flood event occur. See Table 2 below. It is evident that the greatest risk to the subject site would be a fluvial flood event as a result of the Whitechurch Stream overtopping.

Possible Source	Possible Pathway	Possible Receptor	Likelihood (assumes no Flood Defence Measures in place)	Consequence	Magnitude of Risk to Subject Site
Whitechurch Stream (Fluvial)	Overtopping	Site, Structures & People	Possible	High	High
Whitechurch Stream (Fluvial)	Ditch Drain via backflow/surcharge	Site, Structures & People	Possible	Medium	Moderate
Artificial Drainage Systems	Foul & Storm Sewers	Site, Structures & People	Not possible	High	Very Low
Coastal	Overland Sheet Flow	Site, Structures & People	Not Possible	High	Very Low
Coastal	Sewers via backflow/surcharge	Site, Structures & People	Not Possible	Medium	Very Low
Pluvial	Accumulations from Runoff	Site, Structures & People	Not Likely due to site sloping towards Whitechurch Stream	Low to Medium	Low
Pluvial	Sewers via backflow/surcharge	Site & Structures, People	Not Possible	Low to Medium	Very Low

Table 1 – Source, Pathway, Receptor & Risk Factors

3.3 Previous Flood History

3.3.1 Historical Records

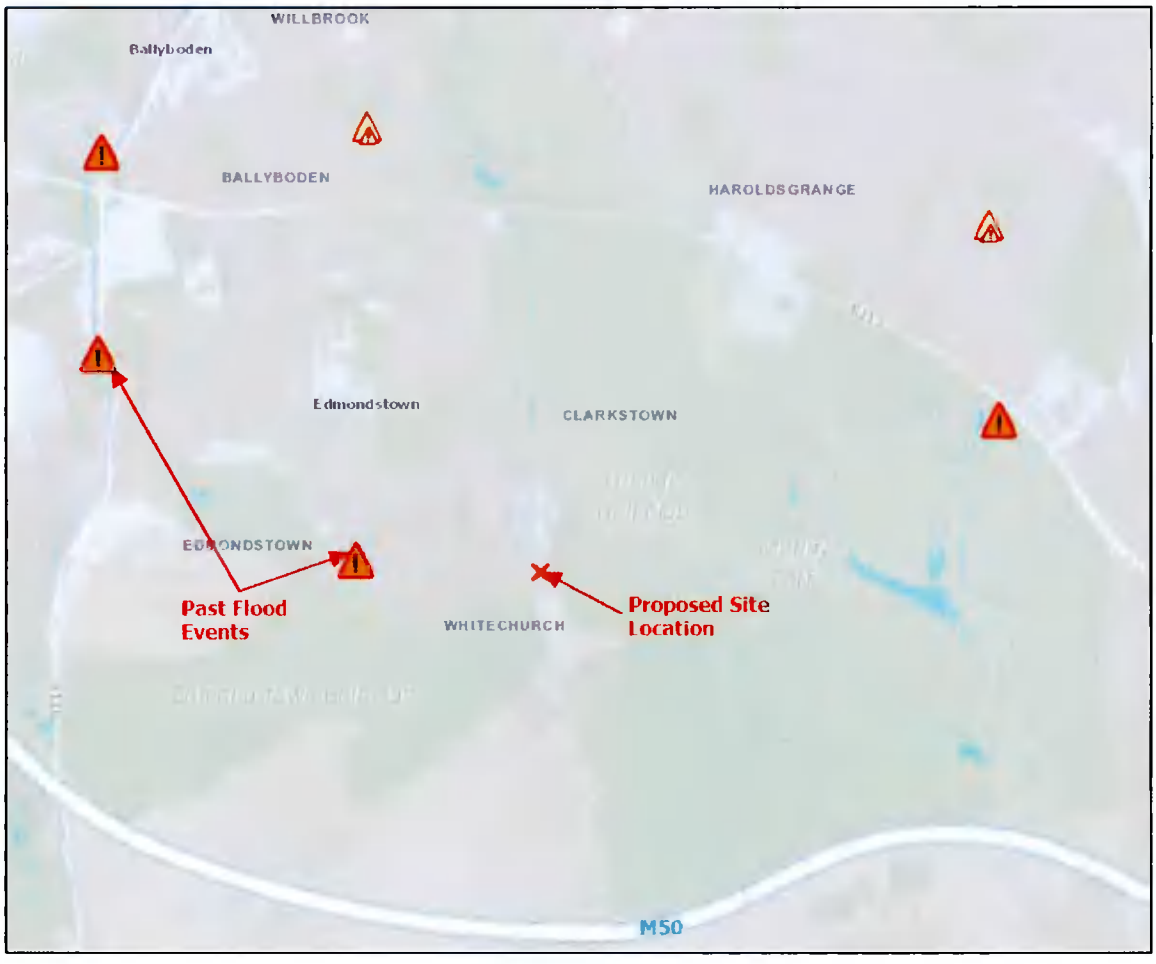


Figure 7 - OPW Flood Hazard Mapping

The OPW Flood Hazard map indicates that there is no recorded history of past flood events at the proposed development site location. The nearest identified past flood event is located ca. 420m to the west of the proposed development site location. Refer to Appendix B for details of past flood events and the Past Flood Event Local Area Report which highlights all recorded past flood events within a 2.5km radius from the proposed development site. Over the years, 18 records of past flood events have been documented within a 2.5km radius from the proposed development site.

3.4 Flood Hazard & Risk Mapping

3.4.1 South Dublin County Council SFRA – Flood Map

The Strategic Flood Risk Assessment for South Dublin County Council Development Plan 2016-2022 provides several flood maps for South County Dublin, including flood maps for areas surrounding the proposed development site. The Fluvial Flood Zone Mapping of the SFRA SDCCDP 2016-2022 Fig. No. MDW657_0017 displays the fluvial flood extents at the proposed development site. The map indicates that the proposed development site is partially within the 1% and 0.1% AEP fluvial flood extents, i.e.

in Flood Zones A and B. Figure 8 below, shows the predicted fluvial flood extents at the proposed site location. The full SFRA SDCCDP 2016-2022 Fig. No. MDW657_0017 can be seen in Appendix A of this report.

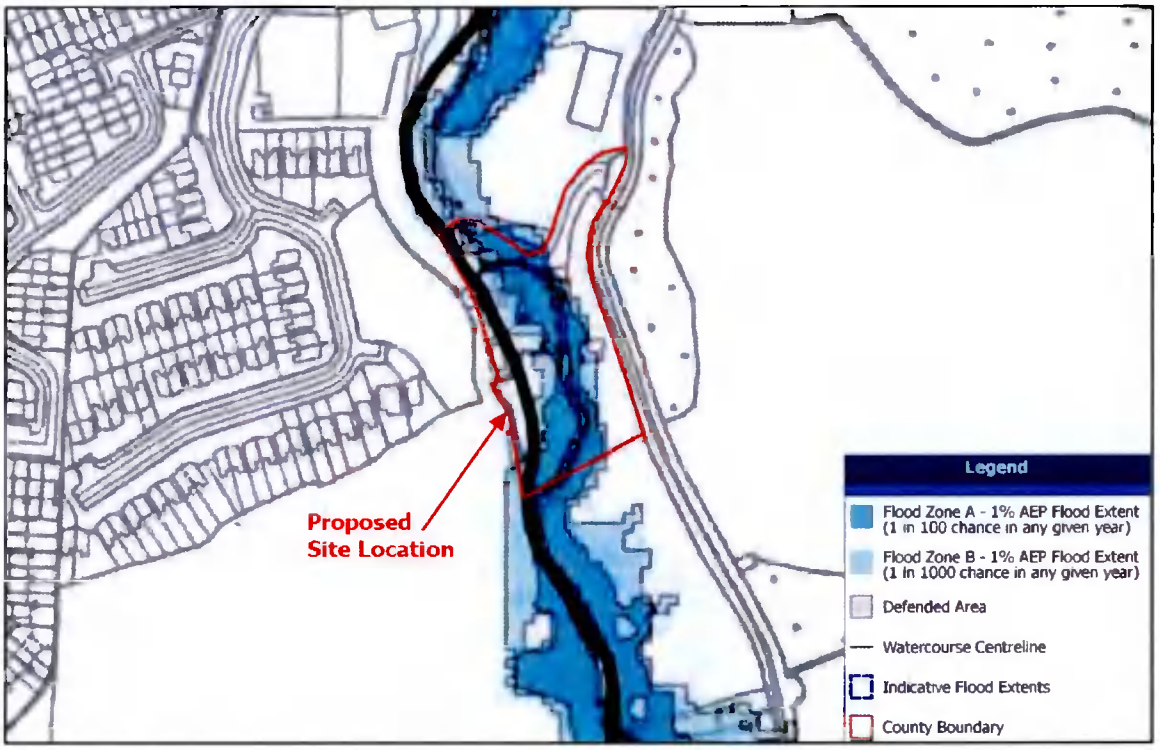


Figure 8- SFRA SDCCDP 2016-2022 Fig. No. MDW657_0017

3.4.2 CFRAM Flood Mapping

The Eastern Catchment Flood Risk Assessment and Management (CFRAM) study was carried out following the initial Preliminary Flood Risk Assessment (PFRA) which was a national screening exercise that was undertaken to identify areas at potential flood risk. The proposed development site and the Whitechurch Stream has been assessed as part of the CFRAM Study.

"The Eastern CFRAM Study covers an area of approximately 6,250 km^2 and includes four Units of Management, HA07 (Boyne), HA08 (Nanny–Delvin), HA09 (Liffey-Dublin Bay) and HA10 (Avoca-Vartry). There is a high level of flood risk within the Eastern CFRAM Study area with significant coastal and fluvial flooding events having occurred in the past."

The CFRAM Fluvial Flood Extents Map OSWS/EXT/UA/CURS/103 indicates that the proposed site is partially located within an area susceptible to flooding during the predicted 1% AEP (1 in 100-year) and 0.1% AEP (1 in 1000-year) fluvial flood event. Figure 9 below shows the predicted CFRAM fluvial flood extents at the proposed development site. Refer to Appendix A of this report for the full CFRAM Fluvial Flood Extents Map OSWS/EXT/UA/CURS/103.

The flood mapping data is mixture of Moderate to High Accuracy flood models. The PFRA, the SFRA for SDCCDP and the CFRAM Flood Maps all indicate that the proposed development site is located partially within the predicted fluvial flood extents, i.e. in Flood Zones A and B. Therefore, a Site-Specific Flood Risk Assessment (SSFRA) must be carried out per the tiered approach set out.

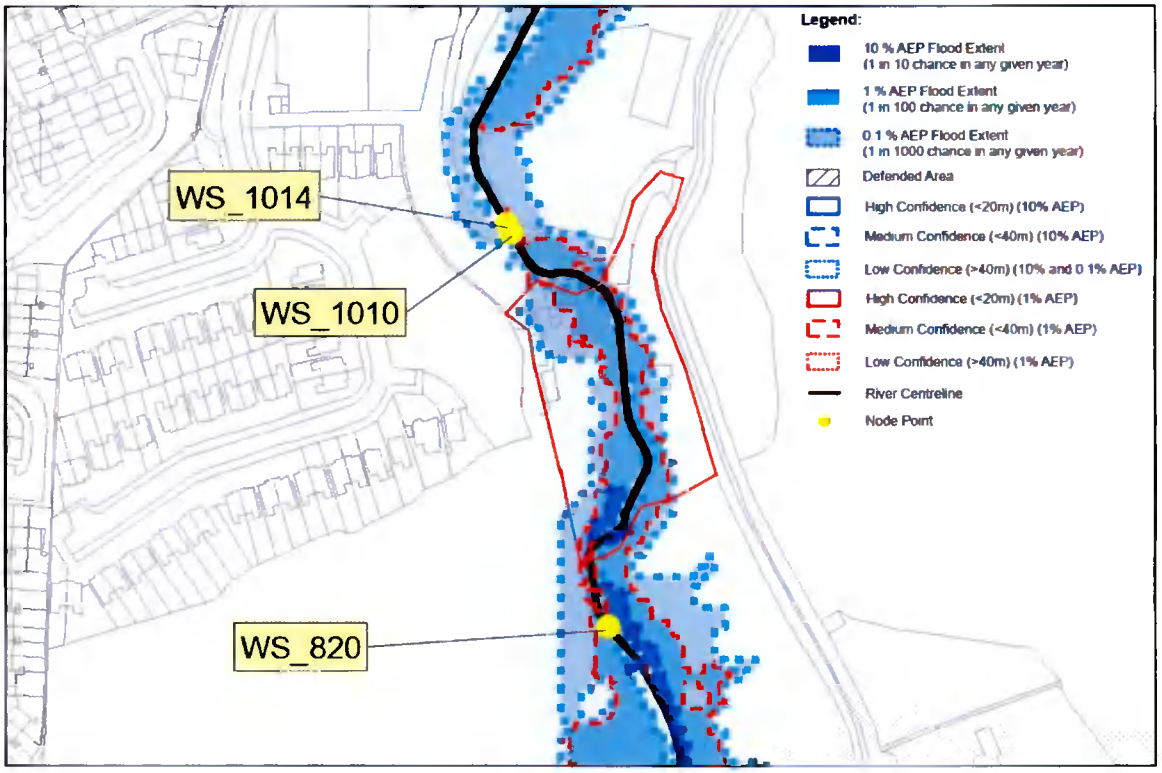


Figure 9 - Dodder CFRAM Flood Extents Map OSWS/EXT/UA/CURS/103

This site-specific flood risk assessment report follows the tiered assessment approach identified in the *Strategic Flood Risk Assessment for South Dublin County Council Development Plan 2016-2022*. The Scales and Stages of Flood Risk Assessment are broken down into different tiers, the relevant tiers to this SSFRA are:

- **Strategic Flood Risk Assessment (SFRA)** - an assessment of all types of flood risk informing land use planning decisions. This will enable the Planning Authority to allocate appropriate sites for development, whilst identifying opportunities for reducing flood risk. This SFRA will revisit and develop the flood risk identification undertaken in the PFRA and give consideration to a range of potential sources of flooding. An initial flood risk assessment, based on the identification of Flood Zones, will also be carried out for those areas, which will be zoned for development. Where the initial flood risk assessment highlights the potential for a significant level of flood risk, or there is conflict with the proposed vulnerability of development, then a site-specific FRA will be recommended, which will necessitate a detailed flood risk assessment.
- **Site Specific Flood Risk Assessment (SSFRA)** - site or project specific flood risk assessment to consider all types of flood risk associated with the site and propose appropriate site management and mitigation measures to reduce flood risk to and from.

3.4.3 OPW BENEFITTING LANDS

The site is not indicated to be located within areas delineated by the OPW as benefitting lands. Benefitting lands are titled as such as they are deemed to have benefitted by local drainage schemes aiding the agricultural potential of the lands. Benefitting lands often had recurring flood issues.

3.5 Topographical Survey and Site Walkover

3.6.1 Site Topographical Survey Data

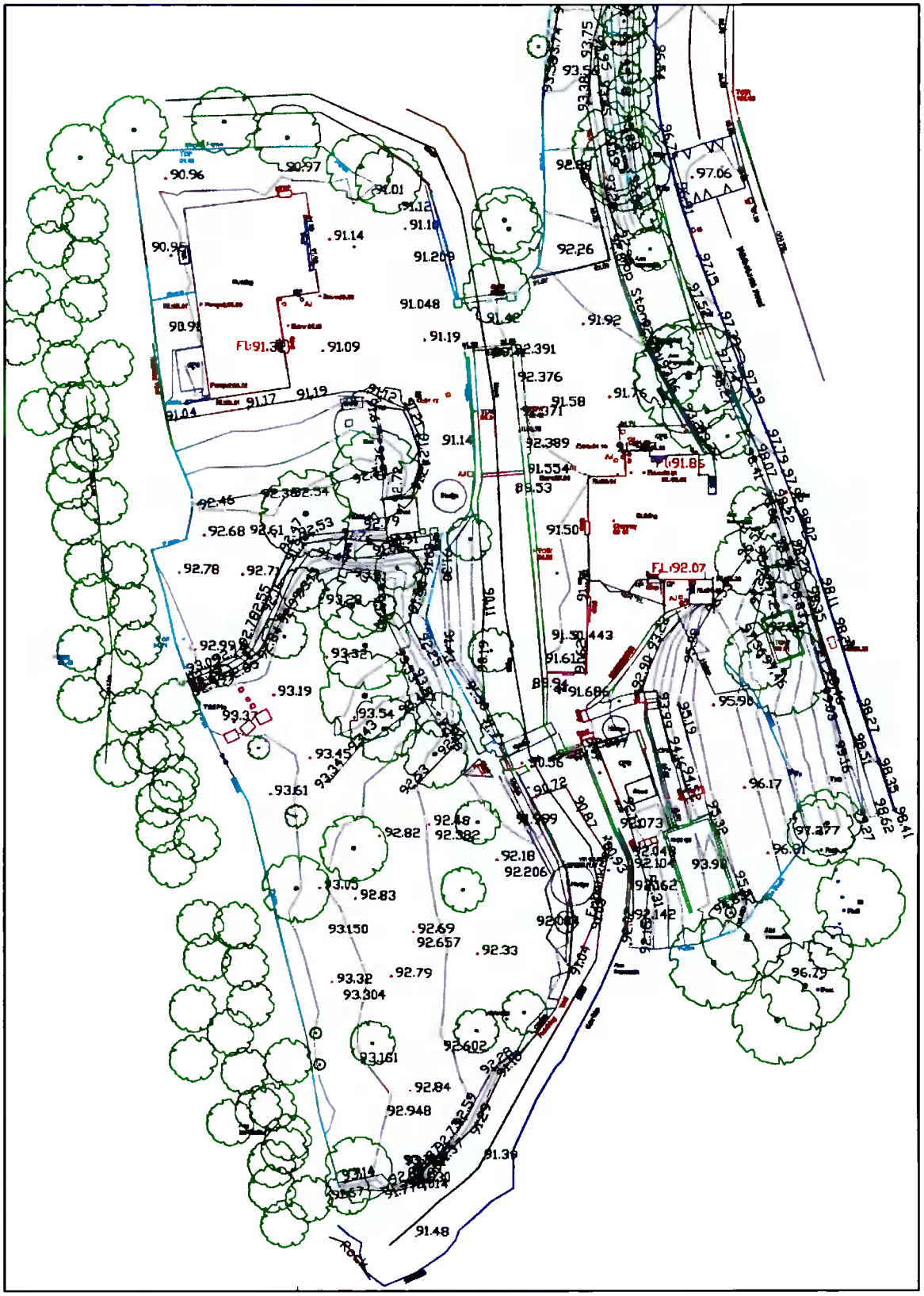


Figure 10 – Site Layout Drawing with Topographical Survey Data (Surveyed March 2022)

A topographical survey was carried out across an area of approximately 0.6 hectares. The topographical survey covered the proposed site and the Whitechurch Stream which flows through the centre of the site. The topographical survey covered a 145m length of the Whitchurch Stream, for which bed and bank data was gathered to create the model surface. Contour lines and levels across the proposed development site are shown above in Figure 10. The full topographical survey is included in Appendix D of this report.

The contouring indicates the land surface at the proposed development site slopes down from the east and west towards the Whitechurch Stream in the centre of the site. The land also falls in a south to north direction with the flow of the Whitechurch Stream. The existing dwelling house is raised above the banks of the river.

Relevant topographical levels to the subject site are listed in the table below. The subject site ground levels range between 99.27mAOD at the highest level to 90.96mAOD along the banks of the Whitechurch Stream.

Location	Road (front of site at entrance)	Lowest Site Level	Highest Site Level	Whitechurch Stream Lowest Bank Level	Existing Dwelling House FFL	Outbuilding FFL
Level (mAOD) (March 2022)	95.55	90.96	99.27	90.96	92.07	91.32

Table 2 - Topographical Survey Details

The hydraulic features, particularly the weir/gate and the vehicular bridge on the Whitechurch Stream are likely to restrict flows and be the greatest contributors to flooding at the proposed development site. Any flood water pathway upstream of the weir/gate or the bridge is likely to be impacted and possibly lead to surcharging of the water levels upstream.

3.6 Findings of Level 2 Assessment

3.6.1 Summary of Collected Information and Mapping

- The Strategic Flood Risk Assessment for South Dublin County Council Development Plan 2016-2022 flood risk and management mapping indicates that the subject site is partially within the predicted 1% and 0.1% AEP fluvial flood extents i.e. the site is predicted to be located in Flood Zones A and B.
- The OPW PFRA flood maps indicate that the subject site is partially within the predicted 1% and 0.1% AEP fluvial flood extents i.e. the site is predicted to be in Flood Zones A and B.
- The CFRAM OSWS/EXT/UA/CURS/103 flood map indicates that the subject site is partially within the predicted 1% and 0.1% AEP fluvial flood extents i.e. the site is predicted to be in Flood Zones A and B.
- OPW flood records do not identify any historical flooding near to the proposed development site.
- The benefitting lands extents do not encroach upon the proposed development site.

The data collected in the Level 2 Assessment and the flood mapping data indicate a potential flood threat to the proposed development site. This data is not site-specific as it does not include detailed channel section data to produce the flood model and does not account for the structures on the Whitechurch Stream which may impact flood risk to the development site.

The site-specific data indicates less risk of flooding to the development site however it does not prove the site to be outside of the 1 in 100-year or 1 in 1000-year fluvial flood extent which are the critical flood events to which the development must be assessed. It is likely that during a flood event the centre of the proposed development site may be at risk of fluvial flooding in the lower areas.

A high accuracy flood model which combines the 2D catchment data and the 1D channel section data is necessary to accurately evaluate the proposed development with regards to flooding.

The findings of the Level 2 Scoping Assessment indicate that this SSFRA must progress to Level 3 Detailed Flood Risk Assessment.

4 LEVEL 3 – DETAILED FLOOD RISK ASSESSMENT

4.1 Introduction

A 145m section of the Whitechurch Stream has been modelled using Jacob's Flood Modeller. A software surface for the flood model was created based on the topographical survey carried out.

The flow hydrograph for the Whitechurch Stream must be estimated for a number of flood events including the 1% AEP return period, the 1% AEP return period including a 20% allowance for climate change and the extreme 0.1% AEP return period flood event.

A 1D/2D model along the stretch of the Whitechurch Stream will outline the expected flood flow paths, flood extents and flood water levels for the above flood events relative to the development site.

The model is a 1D/2D model taken along a 145m stretch of the Whitechurch Stream. This 1D/2D model integrates the channel flow characteristics with the overland floodplain and provides a much higher flood model accuracy compared to models used in the public flood maps available for this site location.

All computational flood models are a simplification of reality. It is crucial that data in the model is as accurate as possible while maintaining a balance between compatibility and maintainability of the model.

4.2 Climate Change

Consideration must be provided for the effects of climate change and how it will affect flooding at the proposed development site. Two climate change scenarios can be considered. The Mid-Range Future Scenario (MRFS) and the High-End Future Scenario (HEFS). These are both assessed on the 100-year time horizon. The OPW provides a table with the recommended allowances for climate change for these two scenarios. This table can be seen in Figure 11 below, which was extracted from the website https://www.floodinfo.ie/map/general_map_user_guidance_notes/.

Parameter	MRFS	HEFS
Extreme Rainfall Depths	+ 20%	+ 30%
Peak Flood Flows	+ 20%	+ 30%
Mean Sea Level Rise	+ 500 mm	+ 1000 mm
Land Movement	- 0.5 mm / year[1]	- 0.5 mm / year[1]
Urbanisation	No General Allowance – Reviewed on Case-by-Case Basis	No General Allowance – Reviewed on Case-by-Case Basis
Forestation	- 1/6 Tp[2]	- 1/3 Tp[2] + 10% SPR[3]

Figure 11 – Table for Climate Change Allowances

For this proposed development site, fluvial flooding was assessed to the mid-range future scenario (MRFS) for climate change which allows 20% additional flow to the Stream & River Network and / or 0.5m increase in sea level.

Section 4.2.1 of the *Strategic Flood Risk Assessment for South Dublin County Council Development Plan 2016-2022* states: "All new development must allow for climate change as set out in the GDSDS Technical Document, Volume 5, Climate Change.

i. River flows 20% increase in flows for all return periods up to 100 years
ii. Rainfall 10% increase in depth (factor all intensities by 1.1)"

The mid-range future scenario (MRFS) for climate change was selected to be suitable for this development.

4.3 Modelling Methodology

This Site-Specific Flood Risk Assessment Report has been prepared based on the available data at the time of issue. Flood water levels identified in this report are predicted flood water levels based on computational modelling software. The modelling software used for this assessment is Jacobs Flood Modeller. The model accuracy is dependent on the accuracy of current hydrological and topographic datasets and the accuracy of predicted future environmental variations. The methodology is outlined below.

The hydrology was first assessed to determine the appropriate flood flows to be modelled within the catchment.

The catchment area is 6.339km^2. The catchment area is calculated based on node_label 09_1368_7 from the OPW FSU web portal. This node is located ca. 350m downstream of the proposed development site and is therefore suitably representative as it overestimates the true catchment for the Whitechurch Stream at the development site.

Three different methods were used to calculate the flow for the Whitechurch Stream which will be used in the flood model. These are:

1. Flood Studies Update FSU4.2a Regression Calculation for Small Catchments
2. The Institute of Hydrology Report no. 124
3. Flood Studies Report, 1975.

The IH124 calculation yielded a Q_{100} flow rate of 12.122m^3/s based on soil type 5 with a value of 0.53. The Greenfield Runoff Rate calculations can be seen in Appendix C of this report.

The FSR calculation yielded a Q_{100} flow rate of 13.956m^3/s. The same soil value of 0.53 was used in the FSR calculation as was used in the IH124 calculation. The FSR calculations can be seen in Appendix C of this report.

The FSU4.2a Regression Calculation for Small Catchments yielded a Q_{100} flow rate of 8.085m^3/s. The FSU4.2a Regression Calculation for Small Catchments can be seen in Appendix C of this report.

The FSU web portal was also used to determine the peak flows in the stream during the 1% AEP and 0.1% AEP peak rainfall events. The dataset is available in Appendix C of this report.

- The node selected to calculate Q_{MED} is ca. 350m downstream of the subject site.
- The 1% AEP (1 in 100-yr) peak flow was determined as 6.91m^3/s. See Appendix C.

The CFRAM flood map OSWS/EXT/UA/CURS/103 also provides the estimated 1% AEP and 0.1% AEP fluvial flow rates for the Whitechurch Stream. The Q_{100} flow rate based on the CFRAM map data is 13.54m^3/s. However, this flow rate was measured ca. 750m upstream of the proposed development site.

The different flow rate values have been tabulated below in Table 3 for the 1% AEP and the 0.1% AEP return period as well as the MRFS for climate change allowance.

Return Period	1% AEP	1% AEP MRFS	0.1% AEP
IH124 Greenfield Runoff Rate (m^3/s)	12.122	14.546	20.293
FSR Flow Calculations (m^3/s)	13.956	16.747	24.088
FSU4.2a Regression Calculation for Small Catchments (m^3/s)	8.085	9.702	13.955
FSU Web Portal Flow Rate (m^3/s)	6.91	8.292	9.21
CFRAM OSWS/EXT/UA/CURS/103 Flow Rate (m^3/s)	13.54	16.248	23.37

Table 3 - Flow Rate Values

The FSR Flow Rate Calculations shown in Table 3 above were chosen as the flow rate to be used in the Flood Model for the Whitechurch Stream. This yielded the highest flow rate of the five methods used to calculate the flow of the stream and will yield the most conservative results.

Multiple cross sections were analysed over the 145m length of the Whitechurch Stream. The weir/gate and the bridges crossing the Whitechurch Stream were also modelled as they are likely to have a significant impact and be the largest contributors to upstream flooding. The stone vehicular bridge and was also assessed under 66% partial blockage conditions.

The model was carried out using a downstream boundary condition of the Whitchurch Stream of 1:19.5 fall which is similar to the slope of the stream based off the S1085 values from the OPW FSU Web Portal.

The riverbed was a mix of clay and gravel with rounded gravel with no large boulders and no vegetation in the stream. The channel is aligned quite straight, with sinuosity set to 1.0 and is not considered to be meandering for the 145m stretch of stream analysed. The banks of the Whitechurch Stream have some vegetation in areas, but they are primarily vertical block-stone walls.

The model includes the weir/gate and bridges on the Whitechurch Stream.
The model uses a manning's friction no. of 0.04 for the stream's riverbed and bank sections.
The model uses a manning's friction no. of 0.04 for the flood plain.

The base flows throughput in the models are:

- 1 in 100-year Fluvial Flood Flow
- 1 in 100-year Fluvial Flood Flow + 20% for MRFS
- 1 in 100-year Fluvial Flood Flow + 66% Blockage Test
- 1 in 1000-year Fluvial Flood Flow

A number of models were also carried out to assess the potential of remedial works to improve the flood conditions to the proposed development site. The first proposed remedial work was to test the impact to flooding by removing the weir/gate from the stream. The Whitechurch Stream was remodelled without a weir/gate for the following flow rates:

- 1 in 100-year Fluvial Flood Flow
- 1 in 100-year Fluvial Flood Flow + 20% for MRFS
- 1 in 100-year Fluvial Flood Flow + 66% Blockage Test
- 1 in 1000-year Fluvial Flood Flow

The second proposed remedial work was to test the impact to flooding by removing the weir/gate from the stream and building a flood wall along the southeast bank of the stream. The Whitechurch Stream was remodelled without a weir/gate and with a retaining wall for the following flow rates:

- 1 in 100-year Fluvial Flood Flow
- 1 in 100-year Fluvial Flood Flow + 20% for MRFS
- 1 in 100-year Fluvial Flood Flow + 66% Blockage Test
- 1 in 1000-year Fluvial Flood Flow

4.4 Modelled Flood Extents

The modelled flood extents of the Whitechurch Stream have been overlaid onto the proposed site layout drawing for the current configuration of the stream and the configuration with the proposed removal of the weir/gate and addition of a flood wall. The modelled flood extents maps for the current and post development configurations can be seen in Figures 12 and 13 below respectively. The flood extents mapping also includes a number of nodes along the length of the Whitechurch Stream for which water levels have been recorded during the modelled flood events.

A more detailed breakdown of each modelled flood extents map from the 1D/2D hydraulic flood model can be seen below. Scaled images of the overlaid flood extents mapping and the proposed site layout drawing can be seen in Appendix D of this report.

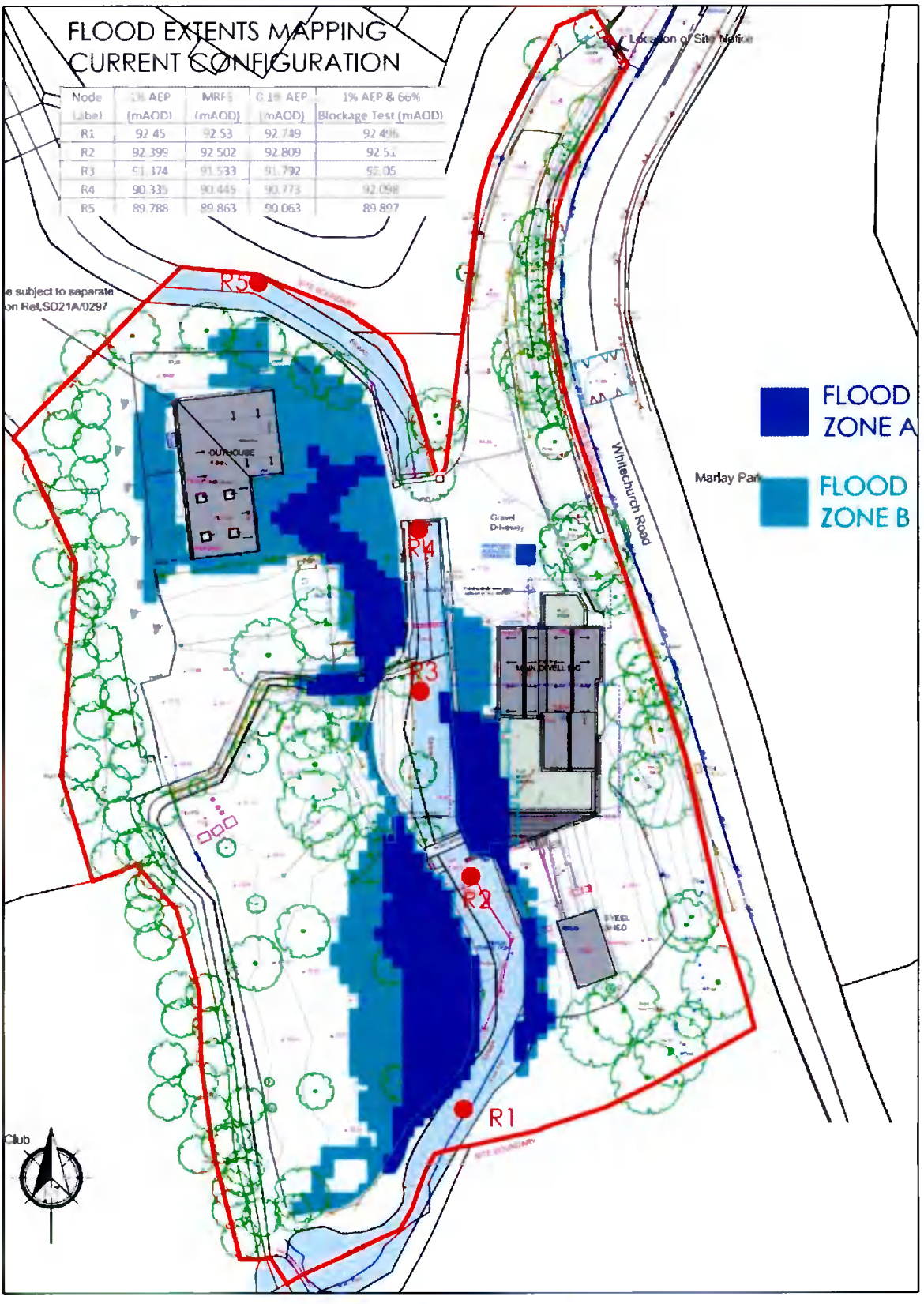


Figure 12 - Flood Extents Mapping Current Configuration

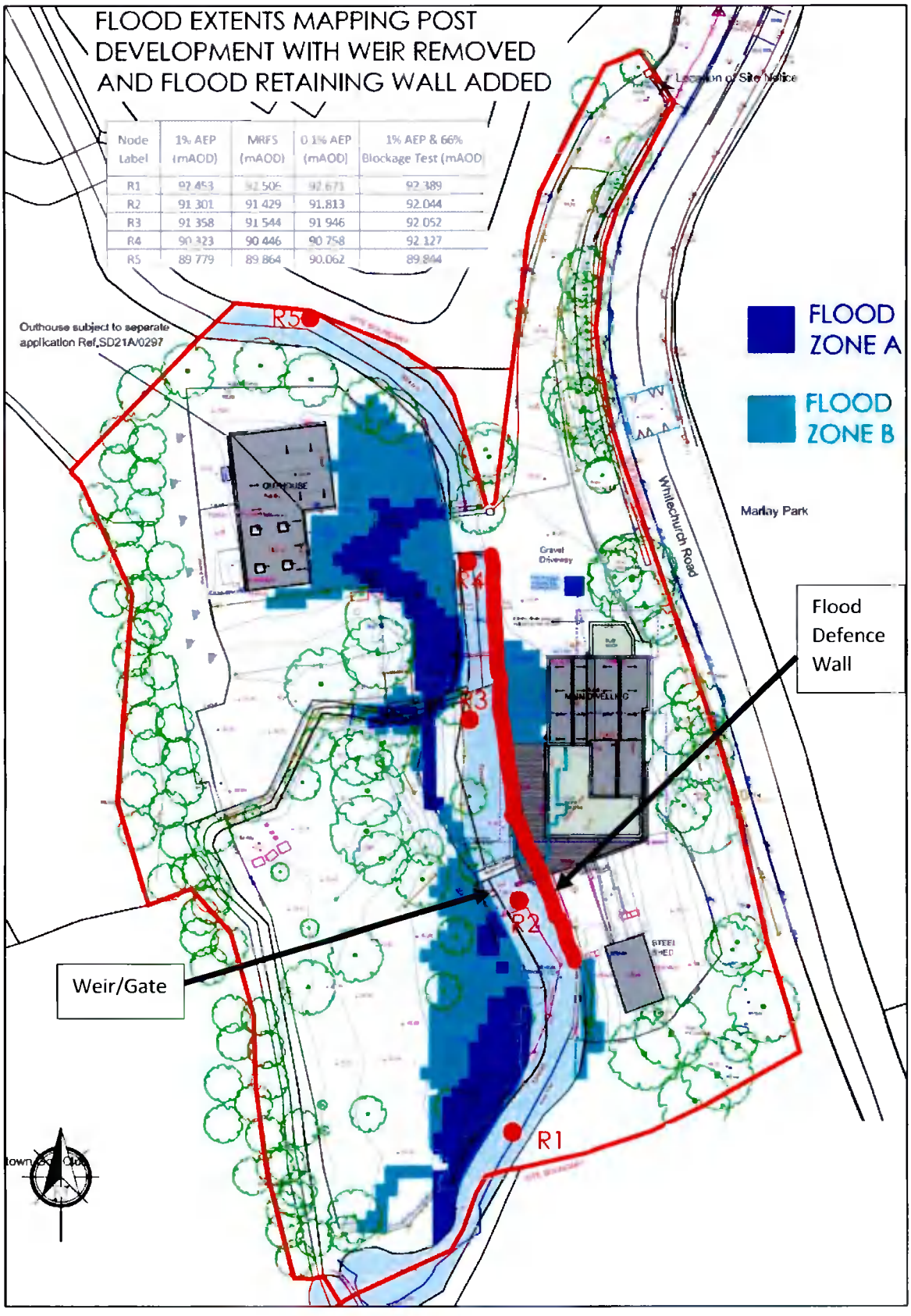


Figure 13 - Flood Extents Mapping Post Development

4.5 Flood Extents Indicated by Modelling (Current Configuration)

The below mapping indicates the resultant flood extents from the flood modelling. Please also see larger format drawings of the proposed layout drawing and modelled flood extent in Appendix D. Notable outcomes of the existing stream configuration are:

In the current configuration, the model indicates that the proposed development site is partially at risk of fluvial flooding during the 1% AEP, 1% AEP MRFS and 0.1% AEP flood events. The proposed development site is partially located in Flood Zones A and B which corresponds with the flood extents shown in the PFRA, SFRA for SDCCDP and CFRAM flood maps.

The 1% AEP flood flow causes flooding in the centre of the site near the banks of the stream. The peak flood water level within the channel immediately upstream of the weir/gate during this flood event is predicted to be 92.399mAOD.

The 1% AEP MRFS flood flow predicts the site to be flooded to a greater extent than the 1% AEP flood event. The increased flood flows in the river lead to a greater level of flooding within the site. The main increase in flood extents is along the west bank of the stream. The peak flood water level within the channel immediately upstream of the weir/gate during this flood event is predicted to be 92.502mAOD.

The 0.1% AEP flood flow predicts a much larger flood extent within the development site. The increased flooding during the 0.1% AEP flood event is primarily concentrated along the west banks of the site. However, the model also predicts an increase in flood extents along the existing house location. The peak flood water level within the channel immediately upstream of the weir/gate during this flood event is predicted to be 92.809mAOD.

The 1% AEP flood flow and the 66% blockage test of the bridge produces the greatest increase in fluvial flood extents. This indicates that the partial blockage of the bridge is likely to have a significant impact on flooding to the development site. The peak flood water level within the channel immediately upstream of the weir/gate during this flood event is predicted to be 92.51mAOD.

The point immediately upstream of the weir/gate was selected as the critical flood level due to the significant impact of the weir/gate. The model includes nodes downstream and closer to the existing dwelling house, however they are considerably lower than the water levels upstream of the weir/gate. This indicates that the weir/gate has a large impact on the flow regime of the stream, creating a backwater profile which is more likely to lead to flooding.

4.5.1 1% (1 in 100yr) AEP Flood Model (Current Configuration)

Refer to the below imagery of the flood model extents for the 1% AEP fluvial flood event.

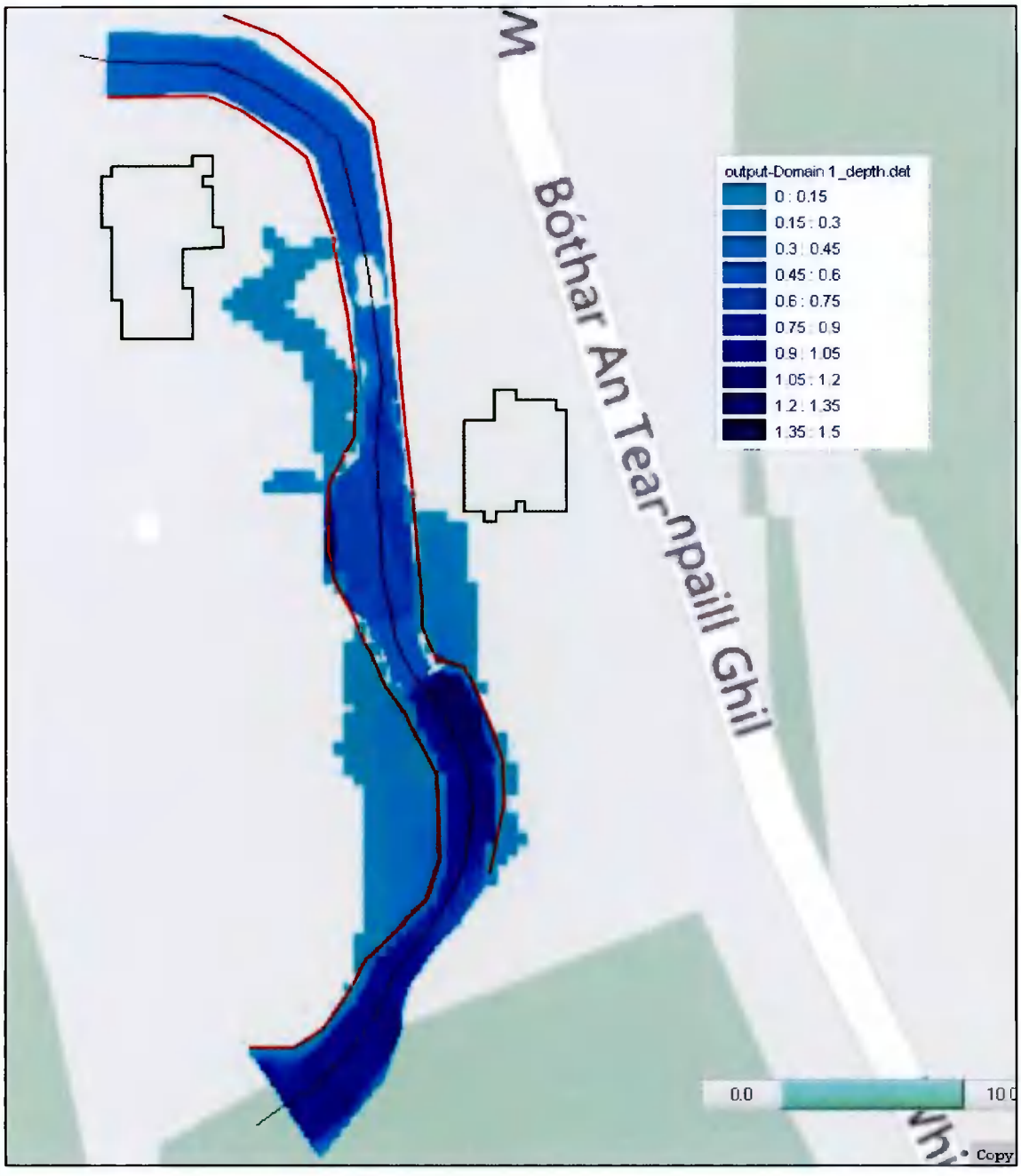


*Figure 14 – 1% AEP Flood Extents at 10hrs **(Peak)***

4.5.2 1% (1 in 100yr) AEP MRFS Flood Model (Current Configuration)

Refer to the below imagery of the flood model extents for the 1% AEP MRFS fluvial flood event.

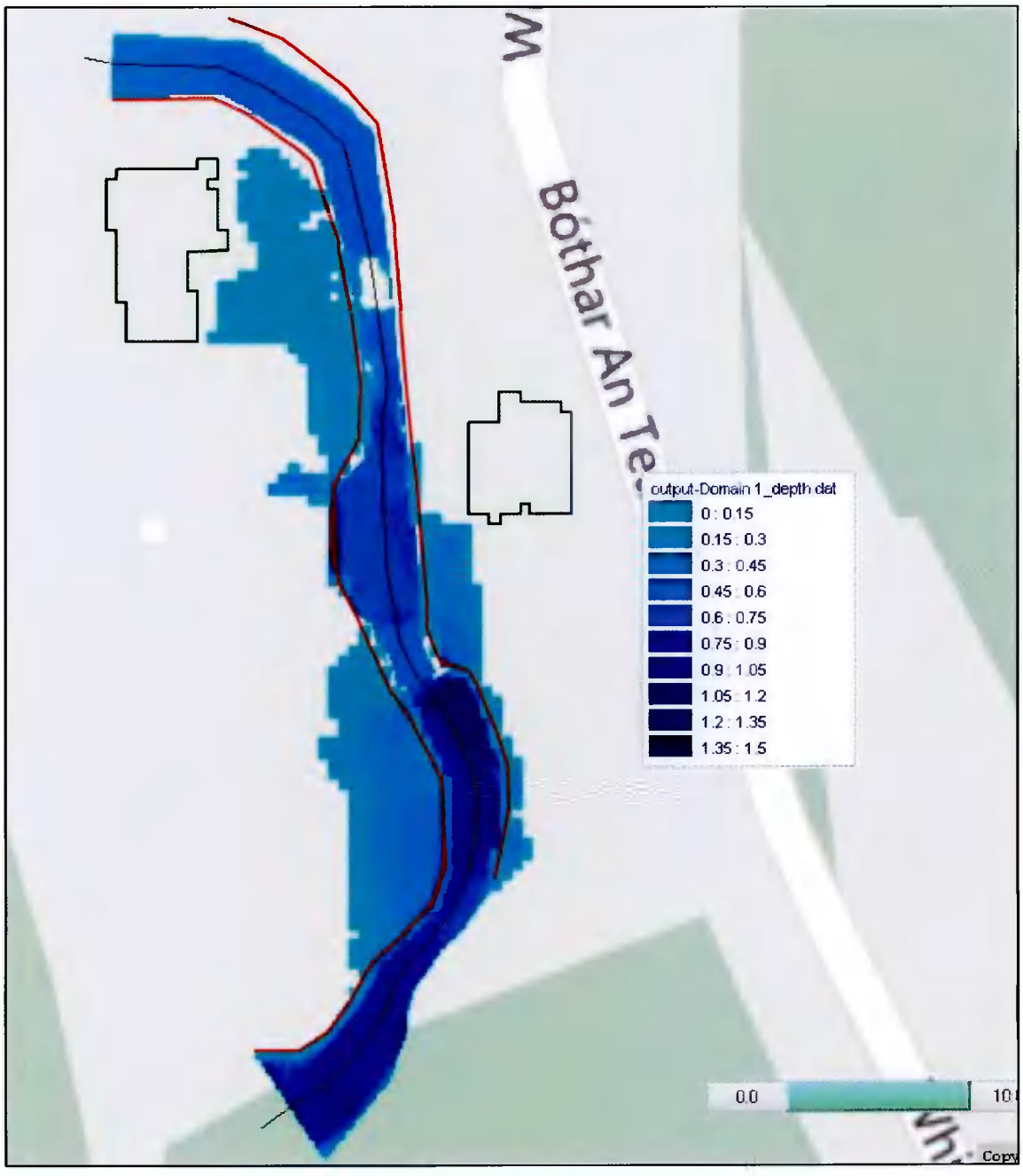


*Figure 15 - 1% AEP MRFS Flood Extents at 10hrs **(Peak)***

4.5.3 0.1% (1 in 1000yr) AEP Flood Model (Current Configuration)

Refer to the below imagery of the flood model extents for the 0.1% AEP fluvial flood event.

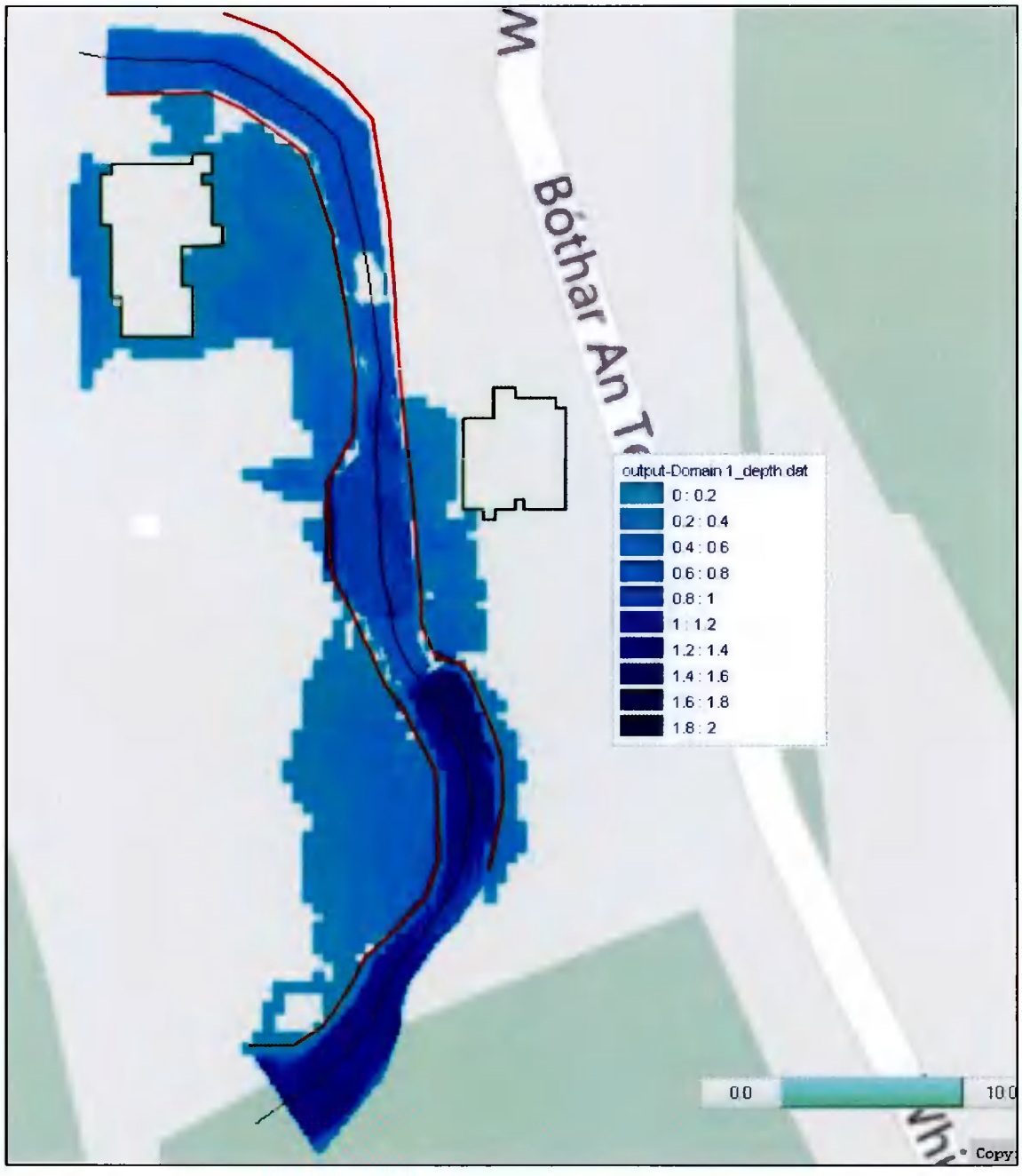


*Figure 16 – 0.1% AEP Flood Extents at 10hrs **(Peak)***

4.5.4 1% (1 in 100yr) AEP & 66% Blockage Test Flood Model (Current Configuration)

Refer to the below imagery of the flood model extents for the 1% AEP fluvial flood event and 66% blockage test.

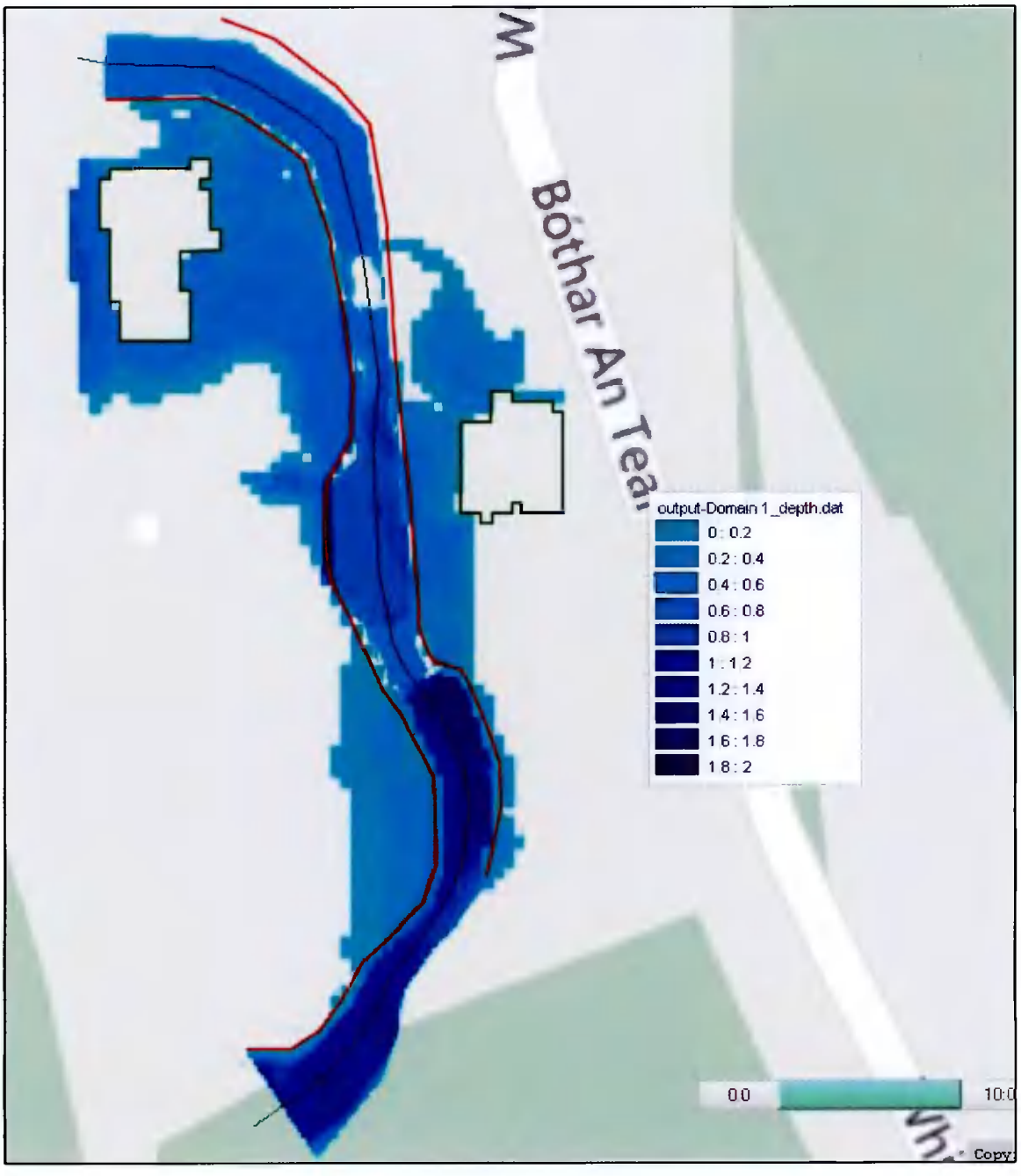


Figure 17 - 1% AEP & 66% Blockage Test, Flood Extents at 10hrs (Peak)

4.6 Flood Extents Indicated by Modelling (Weir/Gate Removed)

The below mapping indicates the resultant flood extents from the flood modelling analysing the impact of removing the weir/gate on the flood extents. Please also see larger format drawings of the proposed layout drawing and modelled flood extent in Appendix D. Notable outcomes of the stream configuration with the weir/gate removed are:

In the configuration with the weir/gate removed, the model indicates that the proposed development site is partially at risk of fluvial flooding during the 1% AEP, 1% AEP MRFS and 0.1% AEP flood events. The proposed development site is therefore still partially located in Flood Zones A and B.

The 1% AEP flood flow causes flooding in the centre of the site only on the west banks of the stream. The peak flood water level within the channel immediately upstream of the weir/gate location during this flood event is now predicted to be 91.252mAOD. This is an improvement compared to the current configuration with the weir/gate in place.

The 1% AEP MRFS flood flow predicts the site to be flooded to a greater extent than the 1% AEP flood event with no weir/gate. However, the 1% AEP MRFS flood model with no weir/gate is an improvement over the current configuration with the weir/gate. The 1% AEP MRFS model without the weir/gate indicates, a much smaller flood extent along the east bank of the stream close to the proposed dwelling house. The peak flood water level within the channel immediately upstream of the weir/gate location during this flood event is now predicted to be 91.439mAOD.

The 0.1% AEP flood flow with no weir/gate predicts a smaller flood extent within the development site compared to the current configuration with the weir/gate. There is a lower flood extent beside both dwellings in the 0.1% AEP configuration with the weir/gate removed. There are some increased flood extents on the development in the southeast corner of the site. This indicates that the offset flooding is retained within the development site away from the buildings. The peak flood water level within the channel immediately upstream of the weir/gate location during this flood event is now predicted to be 91.728mAOD.

The 1% AEP flood flow and the 66% blockage test of the bridge produces the greatest increase in fluvial flood extents. However, this appears to be a smaller flood extent than the same model for the existing configuration with the existing weir/gate. This indicates that the partial blockage of the bridge is likely to have a significant impact on flooding to the development site. The peak flood water level within the channel immediately upstream of the weir/gate during this flood event is now predicted to be 92.038mAOD.

4.6.1 1% (1 in 100yr) AEP Flood Model (Weir/Gate Removed)

Refer to the below imagery of the flood model extents for the 1% AEP fluvial flood event.

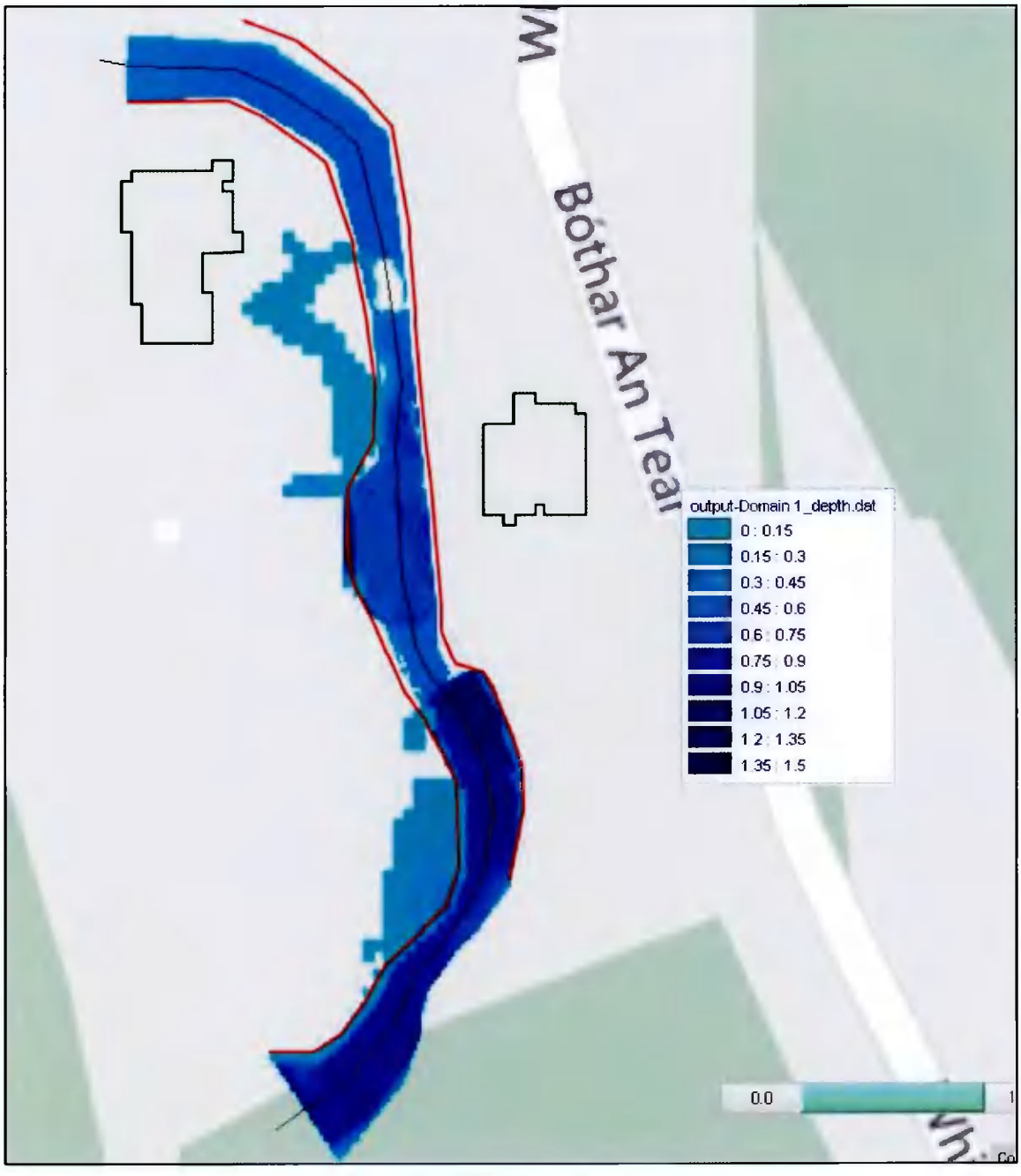


*Figure 18 - 1% AEP Flood Extents (No Weir/gate) at 10hrs **(Peak)***

4.6.2 1% (1 in 100yr) AEP MRFS Flood Model (Weir/Gate Removed)

Refer to the below imagery of the flood model extents for the 1% AEP MRFS fluvial flood event.

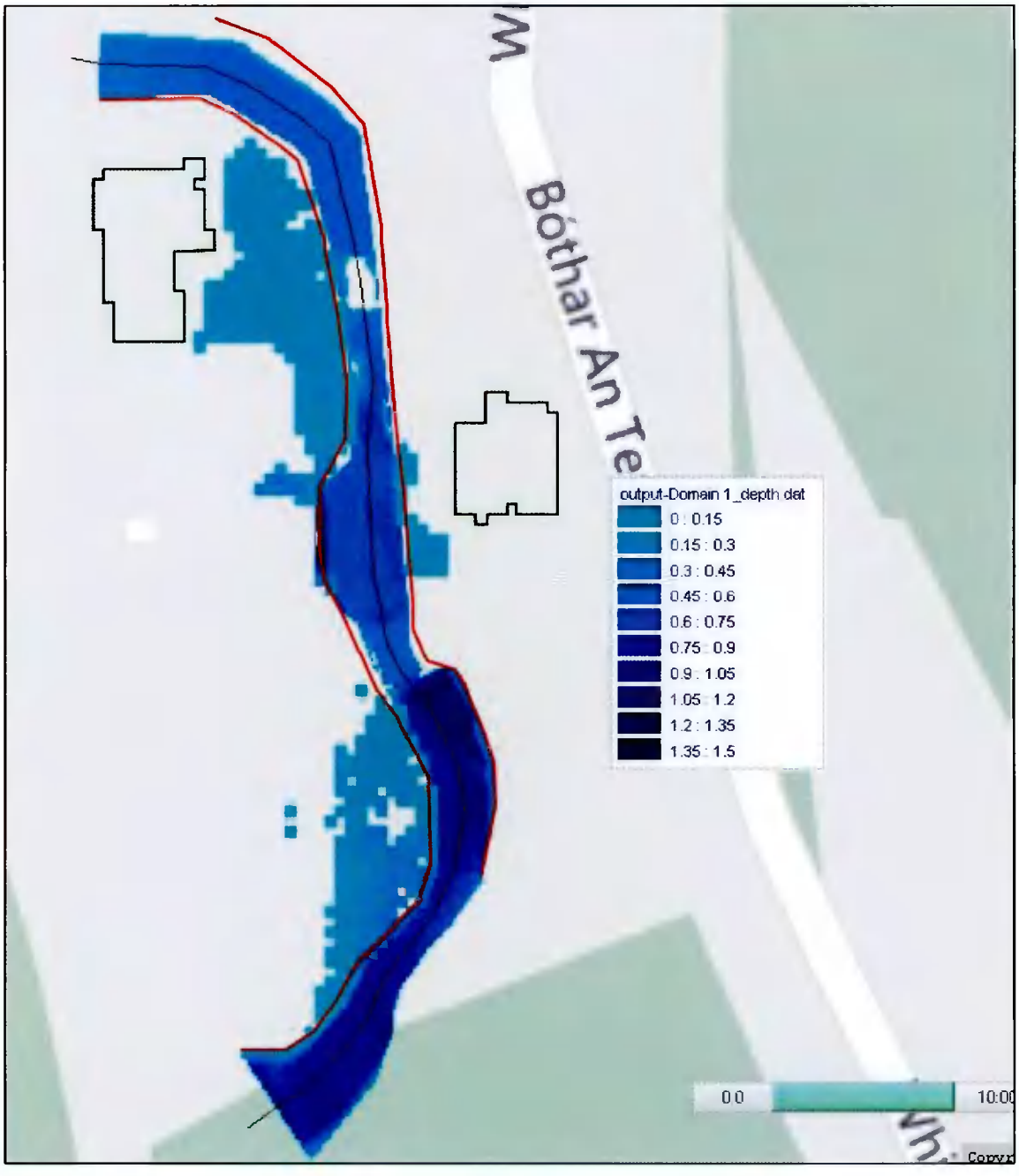


Figure 19 - 1% AEP MRFS Flood Extents (No Weir/gate) at 10hrs (Peak)

4.6.3 0.1% (1 in 1000yr) AEP Flood Model (Weir/Gate Removed)

Refer to the below imagery of the flood model extents for the 0.1% AEP fluvial flood event.

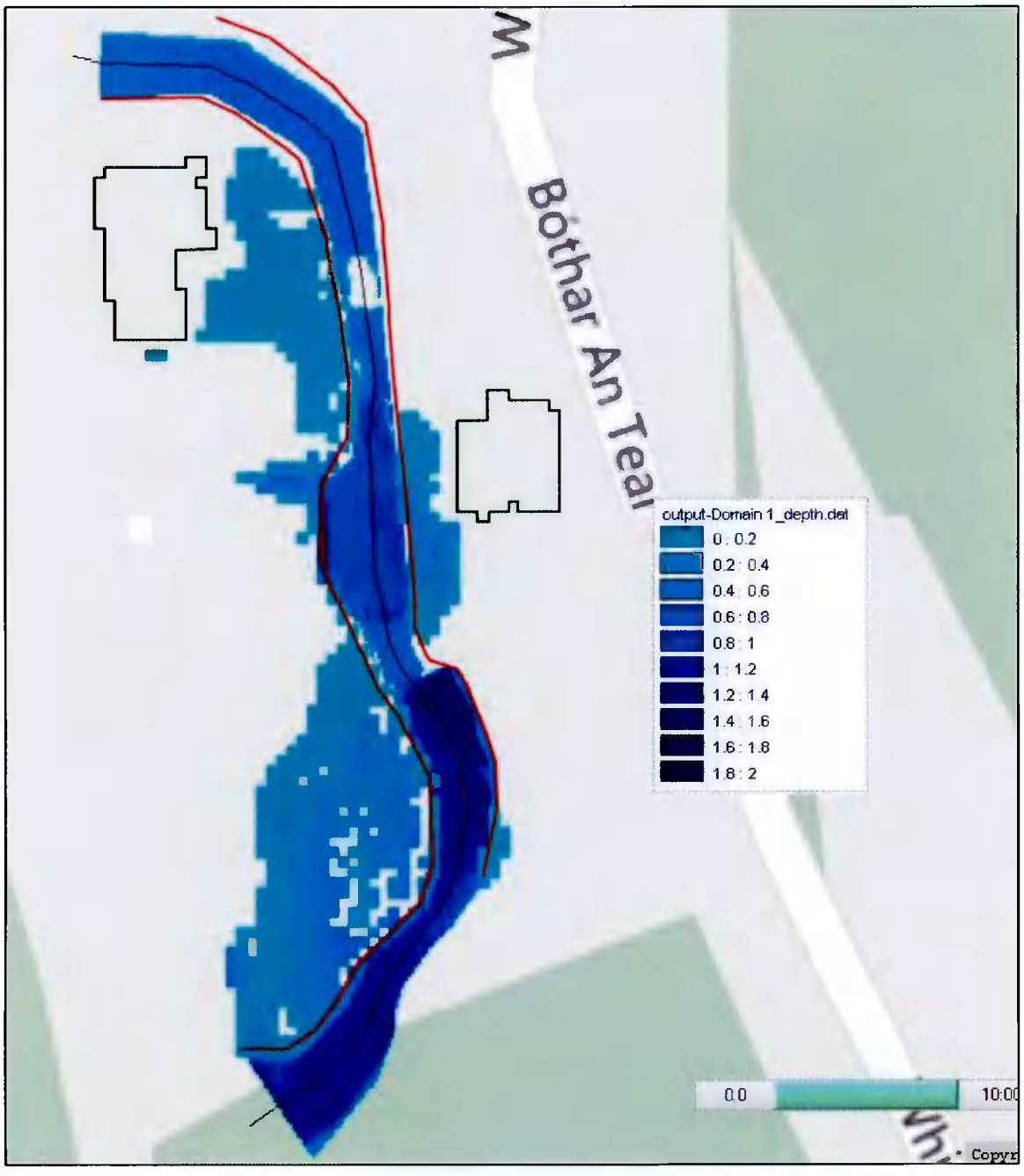


Figure 20 - 0.1% AEP Flood Extents (No Weir/gate) at 10hrs (Peak)

4.6.4 1% (1 in 100yr) AEP & 66% Blockage Test Flood Model (Weir/Gate Removed)

Refer to the below imagery of the flood model extents for the 1% AEP fluvial flood event and 66% blockage test.

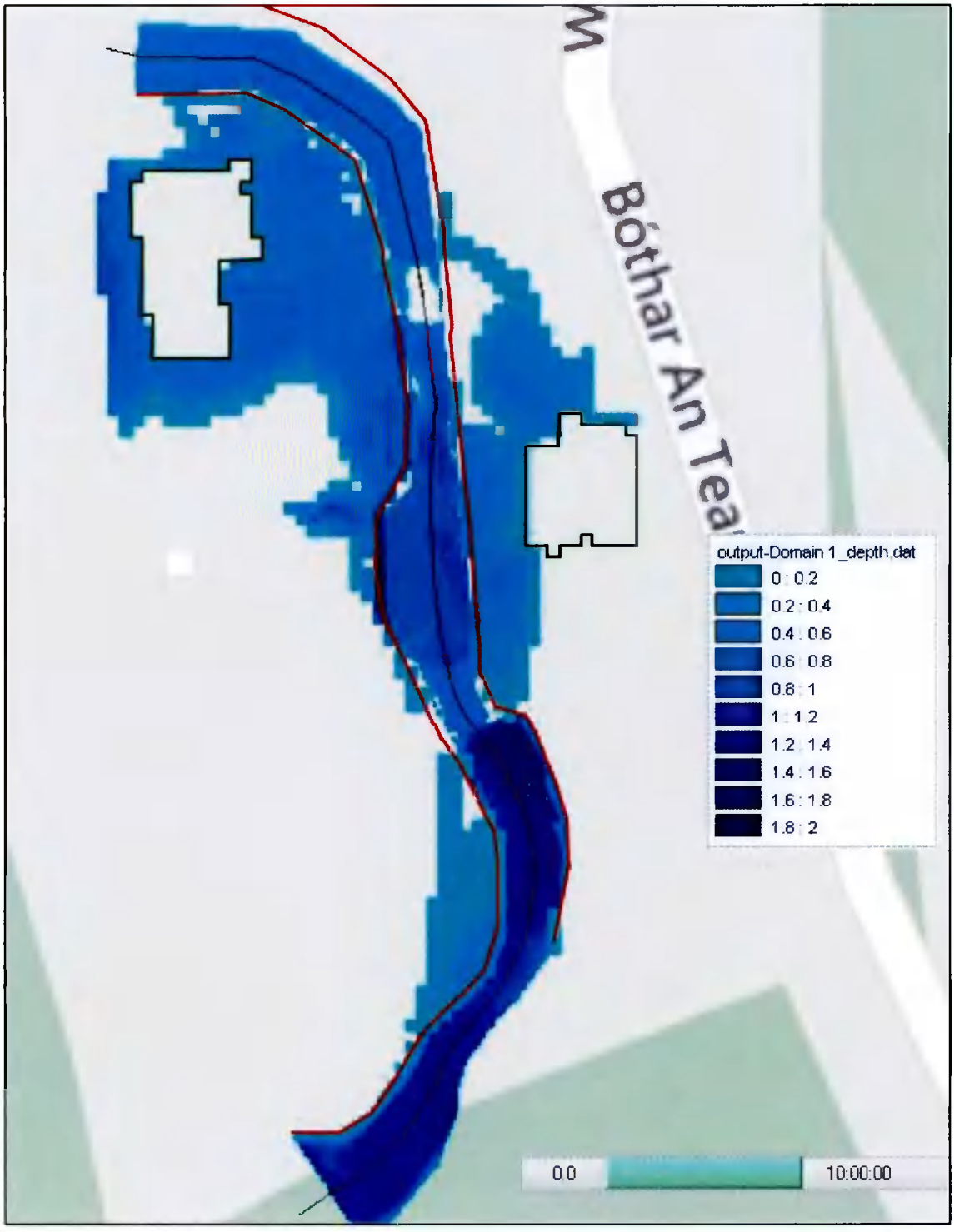


Figure 21 -1% AEP & 66% Blockage Flood Extents (No Weir/Gate) at 10hrs (Peak)

4.7 Flood Extents Indicated by Modelling (Weir/Gate Removed and Flood Wall Added)

The below mapping indicates the resultant flood extents from the flood modelling analysing the impact of removing the weir/gate and adding a flood retaining wall along the east bank of the stream. The flood retaining wall has a proposed top of wall height of 93.00mAOD. Please also see larger format drawings of the proposed layout drawing and modelled flood extent in Appendix D. Notable outcomes of the stream configuration with the weir/gate removed and the flood retaining wall added are:

In the configuration with the weir/gate removed and the flood retaining wall, the model indicates that the proposed development site is partially at risk of fluvial flooding during the 1% AEP, 1% AEP MRFS and 0.1% AEP flood events. The proposed development site is therefore still partially located in Flood Zones A and B.

The 1% AEP flood flow causes flooding in the centre of the site only on the west banks of the stream. The peak flood water level within the channel immediately upstream of the weir/gate location during this flood event is now predicted to be 91.301mAOD. This is almost identical to the flood extents with only the weir/gate removed. This indicates that the flood retaining wall does not have a significant impact on flooding during the 1% AEP flood event.

The 1% AEP MRFS flood flow with the added flood wall predicts the site to be flooded to a lesser extent than the 1% AEP MRFS flood event with only the weir/gate removed. The 1% AEP MRFS flood model with no weir/gate and the added flood wall is an improvement. However, the flood wall does not seem to prevent flood waters from reaching the proposed development house on the east bank, but the flood extents appear to be smaller. The peak flood water level within the channel immediately upstream of the weir/gate during this flood event is now predicted to be 91.429mAOD.

The 0.1% AEP flood flow with no weir/gate and a flood protection wall installed predicts a smaller flood extent within the development site compared to the configuration with only the weir/gate removed. There is a lower flood extent beside both dwellings in the 0.1% AEP configuration with the weir/gate removed and the flood protection wall added. The peak flood water level within the channel immediately upstream of the weir/gate location during this flood event is now predicted to be 91.813mAOD.

The 1% AEP flood flow and the 66% blockage test of the bridge with the weir/gate removed and a flood protection wall still produces the greatest increase in fluvial flood extents. However, this appears to be a smaller flood extent than the same model for the existing configuration with the existing weir/gate. This indicates that the partial blockage of the bridge is still likely to have a significant impact on flooding to the development site. The peak flood water level within the channel immediately upstream of the weir/gate during this flood event is now predicted to be 92.044mAOD

4.7.1 1% (1 in 100yr) AEP Flood Model (Weir/Gate Removed & Flood Wall Added)

Refer to the below imagery of the flood model extents for the 1% AEP fluvial flood event.

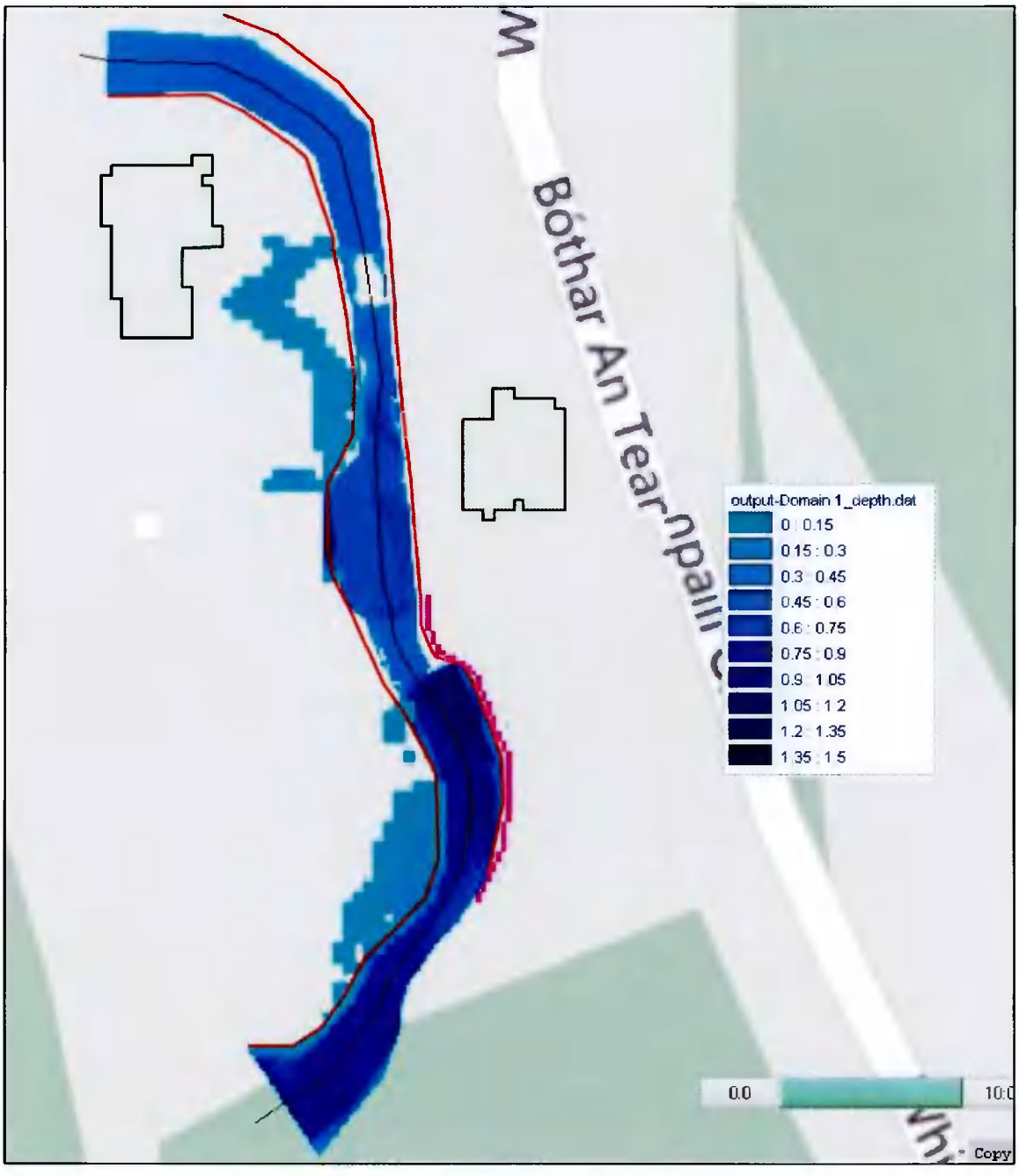


*Figure 22 - 1% AEP Flood Extents (No Weir/Gate & Flood Wall Added) at 10hrs **(Peak)***

4.7.2 1% (1 in 100yr) AEP MRFS Flood Model (Weir/Gate Removed & Flood Wall Added)

Refer to the below imagery of the flood model extents for the 1% AEP MRFS fluvial flood event.

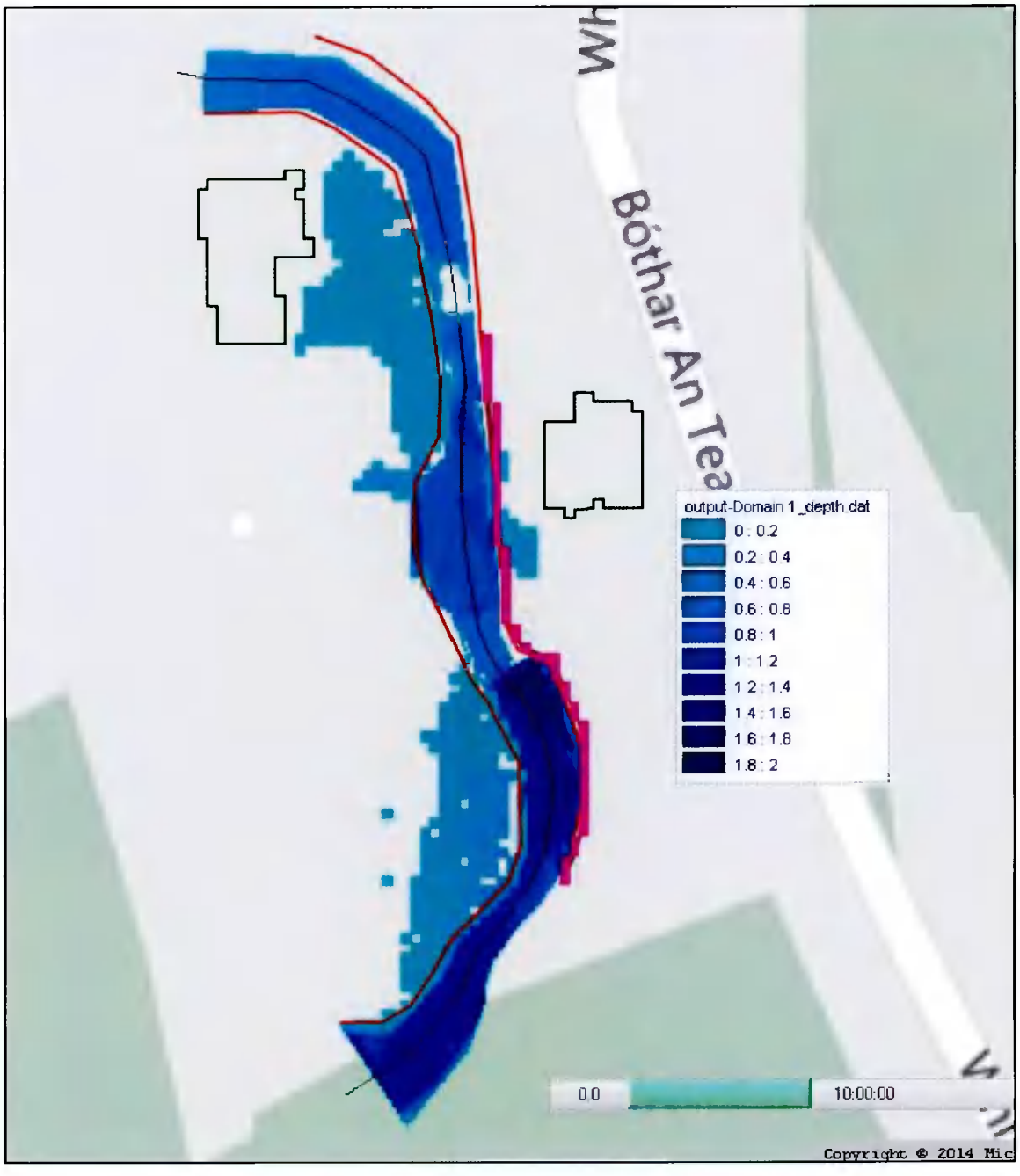


Figure 23 - 1% AEP MRFS Flood Extents (No Weir/Gate & Flood Wall Added) at 10hrs (Peak)

4.7.3 0.1% (1 in 1000yr) AEP Flood Model (Weir/Gate Removed & Flood Wall Added)

Refer to the below imagery of the flood model extents for the 0.1% AEP fluvial flood event.

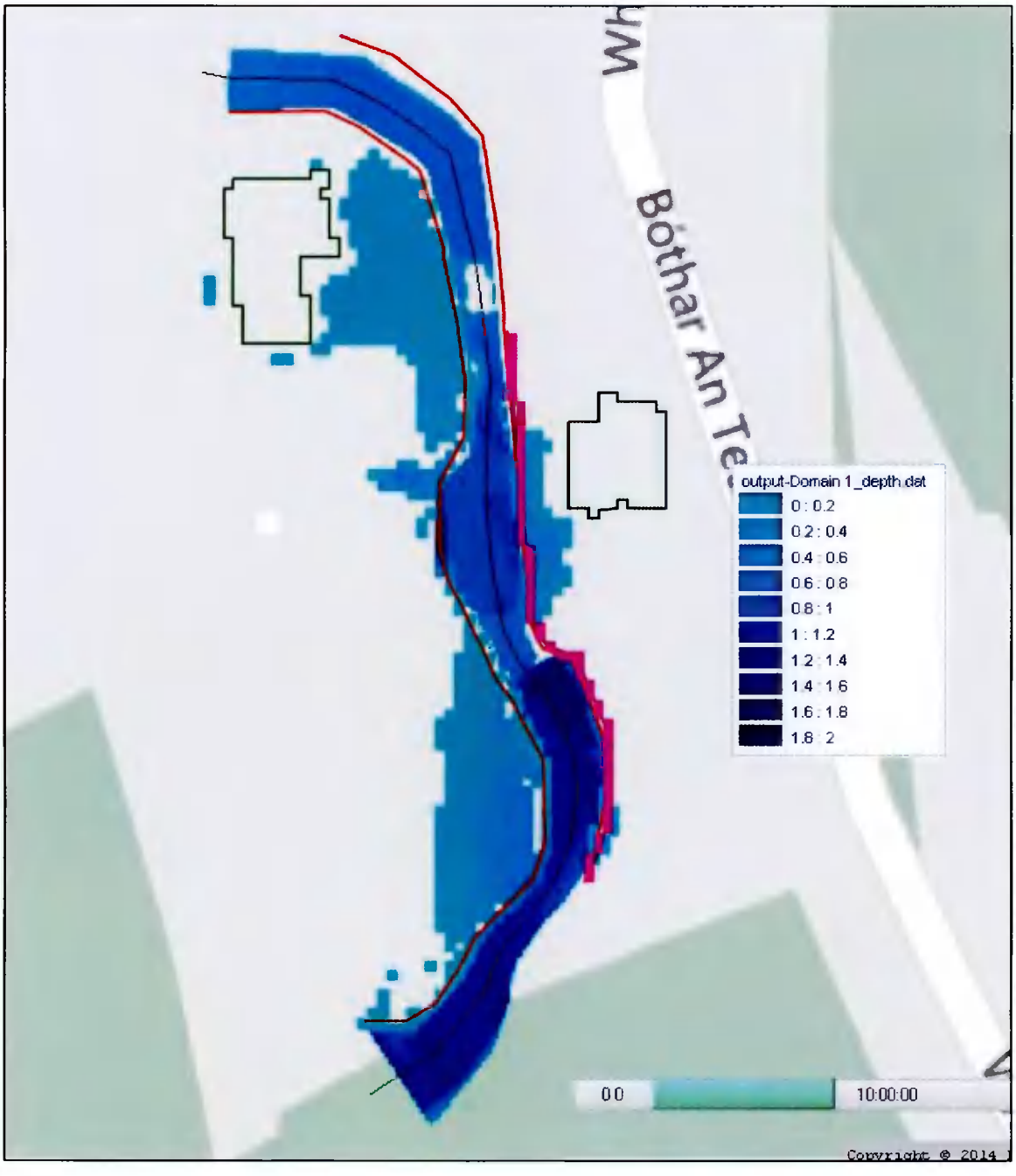


Figure 24 - 0.1% AEP Flood Extents (No Weir/Gate & Flood Wall Added) at 10hrs (Peak)

4.7.4 1% (1 in 100yr) AEP & 66% Blockage Flood Model (Weir/Gate Removed & Flood Wall Added)

Refer to the below imagery of the flood model extents for the 1% AEP fluvial flood event and 66% blockage test.

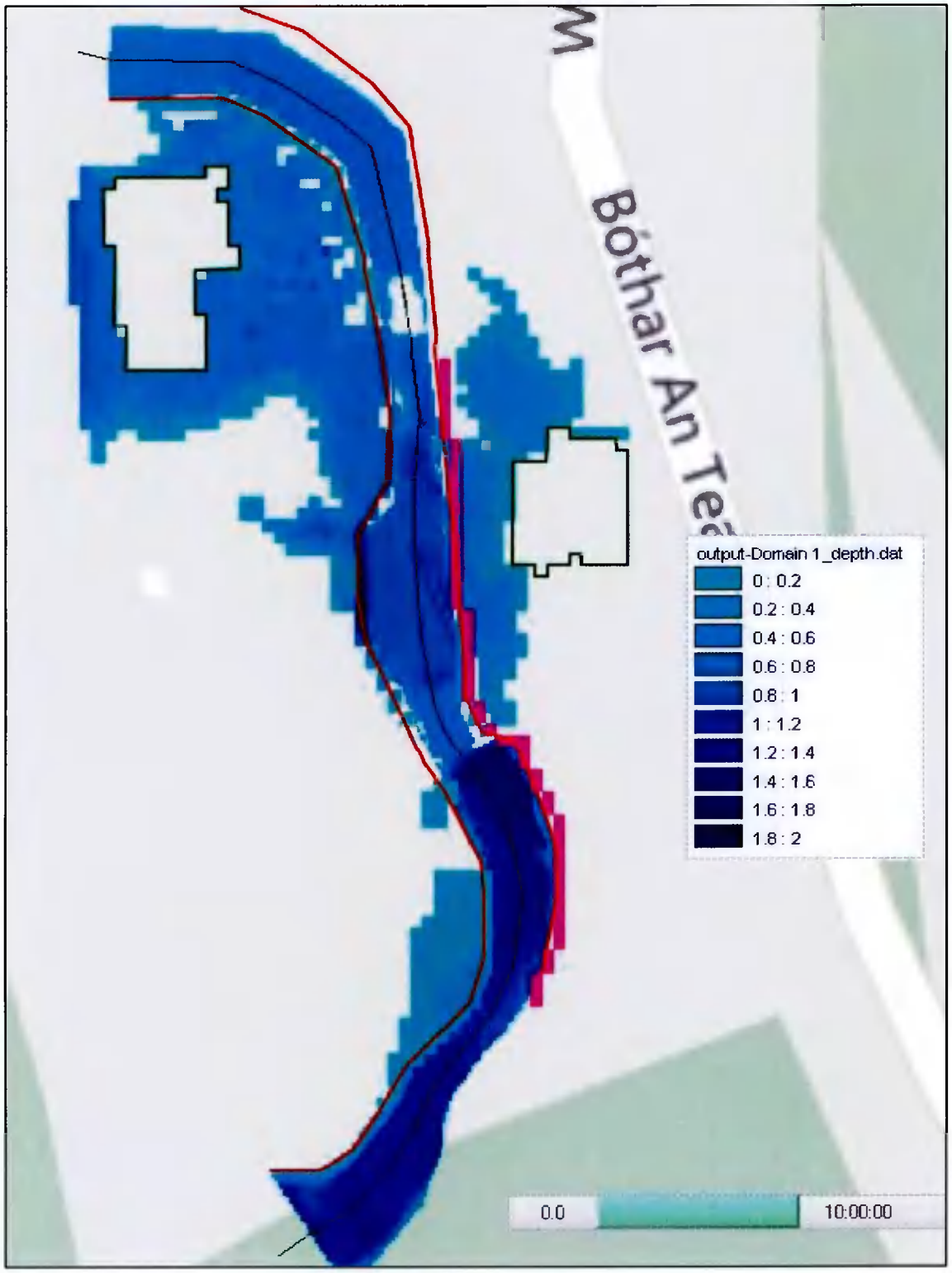


Figure 25 - 1% AEP & 66% Blockage Test Flood Extents (No Weir/Gate & Wall Added) at 10hrs (Peak)

4.8 Discussion of Findings & Mitigation Measures

4.8.1 Fluvial Flooding

The SSFRA 1D/2D model outputs indicate the main potential sources of fluvial flooding to the site arise due to the sheer volume of water predicted during these flood events. The proposed development site is partially within Flood Zones A and B. However, the flooding is limited to the centre of the site along the banks of the stream, particularly along the west bank.

The peak flood water level predicted by the flood model in the channel of the stream immediately upstream of the weir/gate location can be seen in Table 4 below. The point immediately upstream of the weir/gate was selected as the critical flood level due to the significant impact of the weir/gate. The model includes nodes downstream and closer to the existing dwelling house, however they are considerably lower in the current configuration than the water levels upstream of the weir/gate. This indicates that the weir/gate has a large impact on the flow regime of the stream, creating a backwater profile which is more likely to lead to flooding.

Flood Event	Node R2 Level (mAOD)
Current Configuration 1% AEP	92.399
Current Configuration 1% AEP MRFS	92.502
Current Configuration 0.1% AEP	92.809
Current Configuration 1% AEP & 66% Blocked	92.51
Weir/Gate Removed 1% AEP	91.252
Weir/Gate Removed 1% AEP MRFS	91.439
Weir/Gate Removed 0.1% AEP	91.728
Weir/Gate Removed 1% AEP & 66% Blocked	92.038
Weir/Gate Removed & Flood Wall Added 1% AEP	91.301
Weir/Gate Removed & Flood Wall Added 1% AEP MRFS	91.429
Weir/Gate Removed & Flood Wall Added 0.1% AEP	91.813
Weir/Gate Removed & Flood Wall Added 1% AEP & 66% Blocked	92.044
Proposed Extension FFL	92.35
Existing Dwelling House FFL	92.07

Table 4 - Flood Model Fluvial Flood Water Levels

The model implements a flow in flow out regime, which means that flood waters on-site must return to the channel before they can exit the model. This model indicates that the proposed changes will likely only affect the site locally, before returning to the channel and continuing downstream. There, are no 2D Boundary Outflow links in the model which would permit overland flows of floodwaters where it could exacerbate flooding downstream.

The flow in and flow out of the model during the 1% AEP existing configuration event and 1% AEP with the weir/gate removed can be seen below in Figures 26 and 27 respectively. It can be seen that the Inflow/ Outflow graphs are almost identical, indicating that the removal will likely not have an effect on downstream flooding.

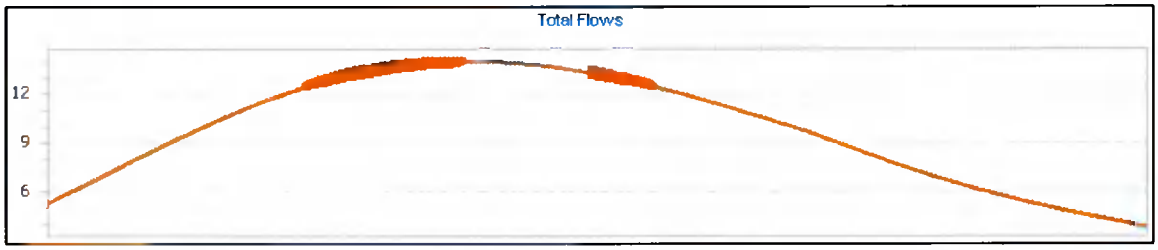


Figure 26 - Inflow-Outflow Graph Current Configuration 1% AEP Flood Event

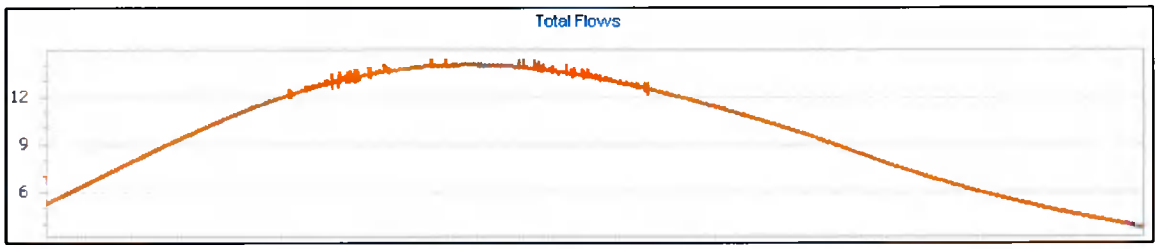


Figure 27 - Inflow-Outflow Graph with Weir/gate Removed 1% AEP Flood Event

The site entrance and driveway and entire road frontage is predicted to be within Flood Zone C.

In all modelled flood events, the model predicts that site entrance and the road are not at risk of flooding. The proposed development site is considered accessible to emergency services via the public road Whitechurch Road.

4.8.2 Other Flooding

Surface water will be disposed of by an aquacell soakaway per BRE 365 protocol with all stormwaters generated by the development confined within the site boundary. The soakaway is provided to dispose of the generated runoff from the proposed extension to the ground within the site boundary. Any pluvial flooding that may occur will be managed by the stormwater system and disposed of within the site boundary thereby ensuring there is no offset or exacerbation of flooding elsewhere. The soakaway will be designed per BRE Digest 365 requirements.

Wastewater from the proposed development site is discharged to the existing septic tank system currently serving the existing dwelling. As a mitigation measure, it is recommended to install a non-return valve to the existing foul water drainage system to prevent foul water surcharge during a flood event. The non-return valve must be located as close as feasibly possible to the existing dwelling house. Additionally, all foul water manholes are recommended to be sealed manholes.

4.8.3 Mitigation Measures

The following mitigation measures are proposed to protect against the fluvial flood threat.

- In the current channel configuration, it is not feasible to increase the FFL of the proposed new extension which ensures a minimum freeboard of 300mm to the peak fluvial flood water levels. This would require the FFL of the extension to be 93.109mAOD, which is 1.039m higher than the FFL of the existing dwelling house. A partial raise is recommended to allow a higher level of protection than currently exists.
- It is recommended to install a non-return valve to the existing foul water drainage system to prevent foul water surcharging during a flood event. Additionally, all foul water manholes are recommended to be sealed manholes.
- The model indicates that the removal of the weir/gate from the Whitchurch Stream upstream of the existing dwelling and proposed extension, will likely benefit this development. Removal of the weir/gate will likely alleviate the predicted flood extents within the proposed development site as well as significantly reduce the upstream flood water levels. Any changes to the channel of the Whitechurch Stream will require Section 50 Consent from the OPW.
- The model indicates that the addition of a flood defence wall set at a level of 93.00mAOD on the eastern bank of the Whitechurch Stream will likely provide an additional small level of protection to the proposed development. More importantly, the addition of the flood defence wall, does not appear to have a negative impact or increase the flood extents within the development site. This will help to improve the flood protection to the existing dwellings and the proposed new extension. Note that at the vehicular crossing flood waters may by-pass the flood defences. A temporary flood defence, i.e. sandbags or flood-gate may be necessary to mitigate potential risks of flooding in extreme scenarios. A flood emergency plan for the development should be prepared prior to occupation.
- The recommended FFL of the proposed new extension will be set at 92.35mAOD, this is below the predicted flood water levels upstream of the weir/gate in the current configuration for all modelled scenarios. However, the proposed FFL will provide ca. 300mm freeboard to the peak exceedance flood event which occurs during the 1% AEP & 66% Blockage Test if the weir/gate is removed from the channel.

Refer to the site location layout drawing in Appendix D of this report.

5 JUSTIFICATION TEST

The flood risk assessment is for a development that will consist of the demolition of existing single storey structures; porch to front, bay window and store to rear; construction of single storey flat roof extension to front, part single storey flat roof extension and part two storey extension with pitch roof to match existing dwelling to rear and internal modifications with associated site works at Lissadell, Whitechurch Road, Rathfarnham, Dublin 16. This development is considered to be highly vulnerable development per *Table 3.1: of The Planning System and Flood Risk Management Guidelines for Planning Authorities – November 2009*. Figure 28 below is a section of Table 3.1 which describes what is classified as highly vulnerable development.

Highly vulnerable development (including essential infrastructure)	Garda, ambulance and fire stations and command centres required to be operational during flooding; Hospitals; Emergency access and egress points; Schools; Dwelling houses, student halls of residence and hostels; Residential institutions such as residential care homes, children's homes and social services homes; Caravans and mobile home parks; Dwelling houses designed, constructed or adapted for the elderly or, other people with impaired mobility; and Essential infrastructure, such as primary transport and utilities distribution, including electricity generating power stations and sub-stations, water and sewage treatment, and potential significant sources of pollution (SEVESO sites, IPPC sites, etc.) in the event of flooding.

Figure 28 - Classification of Highly Vulnerable Development

This proposed development site is considered to be at risk of fluvial flooding during the 1% AEP and 0.1% AEP, flood events. Therefore, this proposed development is considered to be partially located within Flood Zones A and B.

Table 3.2: of The Planning System and Flood Risk Management Guidelines for Planning Authorities – November 2009 indicates that the proposed new dwelling house is required to satisfy the justification test as it is considered highly vulnerable development that is deemed to be located in Flood Zone B. Figure 29 below is the table 3.2 of *The Planning System and Flood Risk Management Guidelines for Planning Authorities – November 2009.*

	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 29 - Table 3.2 Matrix of Vulnerability Vs. Flood Zone

However, as this development is for an extension to an existing dwelling house, the proposed development is considered to be an application for a minor proposal in an area at risk of flooding and is not required to satisfy the justification test. Section 5.28 of *The Planning System and Flood Risk Management Guidelines for Local Authorities (Nov, 2009)* states:

"Applications for minor development, such as small extensions to houses, and most changes of use of existing buildings and or extensions and additions to existing commercial and industrial enterprises, are unlikely to raise significant flooding issues, unless they obstruct important flow paths, introduce a significant additional number of people into flood risk areas or entail the storage of hazardous substances. Since such applications concern existing buildings, the sequential approach cannot be used to locate them in lower-risk areas and the Justification Test will not apply. However, a commensurate assessment of the risks of flooding should accompany such applications to demonstrate that they would not have adverse impacts or impede access to a watercourse, floodplain or flood protection and management facilities. These proposals should follow best practice in the management of health and safety for users and residents of the proposal."

6 COMMENSURATE ASSESSMENT

6.1 Site Drainage

Foul Water

Wastewater from the proposed development site is discharged to the existing septic tank system currently serving the existing dwelling. As a mitigation measure, it is recommended to install a non-return valve to the existing foul water drainage system to prevent foul water surcharging during a flood event. Additionally, all foul water manholes are recommended to be sealed manholes. The existing septic tank is located in Flood Zone C.

Stormwater

Surface water will be disposed of by an aquacell soakaway per BRE 365 protocol with all stormwaters generated by the development confined within the site boundary. The soakaway is provided to dispose of the generated runoff from the proposed extension to the ground within the site boundary. Any pluvial flooding that may occur will be managed by the stormwater system and disposed of within the site boundary thereby ensuring there is no offset or exacerbation of flooding elsewhere. The soakaway will be designed per BRE Digest 365 requirements. The proposed new aquacell soakaway will be located in Flood Zone C.

6.2 Access & Egress

The 1D/2D flood model and all flood mapping data available predicts the site to be located partially within Flood Zones A and B. The proposed development is for an extension to an existing dwelling house. The site will be accessed via the eastern site boundary from the Whitechurch Road which traverses in a north and south direction. The site entrance and the public road are both indicated to be located in Flood Zone C and the site is considered to be accessible to emergency services during all flood events.

6.3 FFL

The proposed development site is partially located within Flood Zones A and B. Under the current configuration of the Whitechurch Stream channel, the existing dwelling house is considered to be located within the 0.1% AEP fluvial flood extents, i.e., the existing dwelling house is located in Flood Zone A and B. The FFL of the existing dwelling house is set at 92.07mAOD, which is ca. 740mm below

the water level in the channel of the Whitechurch Stream immediately upstream of weir/gate. It is recommended to set the FFL of the proposed new extension to 92.350mAOD. This is ca. 460mm below the 0.1% AEP flood water level during in the current channel configuration, measured immediately upstream of the weir/gate location.

However, this will provide ca. 300mm freeboard to the peak exceedance flood event which occurs during the 1% AEP & 66% Blockage Test if the weir/gate is removed from the channel.

6.4 Displacement of Flood Waters

The proposed development site is partially located within Flood Zones A and B. The proposed new extension will be located partially within Flood Zones A and B. However, as this is an existing development, level for level compensation cannot be provided for small developments such as this. The proposed mitigation measures such as the removal of the existing weir/gate in the channel of the Whitechurch Stream are indicated to mitigate the level of flooding on the site by removing the obstruction. The removal of the weir/gate is not likely to exacerbate downstream flooding or exacerbate flooding elsewhere. The predicted flooding caused by the weir/gate will not have crossed across the yard of the proposed development site before re-joining into the channel and continuing to flow downstream. Therefore, this is likely to not exacerbate or displace flood waters elsewhere.

6.5 Residual Risk

Per the *Strategic Flood Risk Assessment for South Dublin County Council Development Plan 2016-2022.* *"As well as assessing the surface water management risk for a site, all development including that in Flood Zone C, should consider residual risk factors such as culvert / bridge blockages and the effects of climate change which may expand the extents of Flood Zones A and B. These residual risk factors should influence the potential mitigation measures for a site which could include setting the finished floor levels."*

The residual risk to this development from partial blockage of the bridge has been assessed. The residual risk posed by partial blockage of the bridge has been partially mitigated to the proposed development by raising the FFL of the proposed new extension to ensure a freeboard of 300mm to the predicted fluvial flood water level in this scenario, provided the weir/gate is removed from the channel. A 66% blockage of this culvert is very unlikely.

7 REPORT CONCLUSION

7.1 Conclusion

The flood extents of the Whitechurch Stream are similar to those indicated by the PFRA flood map, SFRA for SDCCDP flood maps and the CFRAM flood maps and are indicated to partially encroach upon the applicant's site during the 1% AEP and 0.1% AEP fluvial flood events. The proposed development is predicted to be partially located within Flood Zones A and B per this SSFRA. This SSFRA includes a Level 3 detailed assessment with a high-accuracy flooding model.

The proposed extension is indicated to be partially located withing Flood Zone B after the recommended mitigation measure of removing the existing weir/gate and adding a flood protection wall has been implemented. If the existing weir/gate is not removed, then the proposed new

extension will be located in both Flood Zones A and B. Mitigation measures are also provided to allow for suitable freeboard to the predicted flood levels. There is no predicted risk of exacerbation of flooding to any other property caused by the proposed development and the recommended mitigation measures.

Fluvial flooding was assessed to the mid-range future scenario (MRFS) for climate change which allowed 20% additional flow to the Stream & River Network and / or 0.5m increase in sea level.

Residual risk has been analysed and mitigated against by performing a 66% blockage test to the bridge during the 1% AEP flood event and selecting a FFL for the proposed extension that will provide a minimum freeboard of 300mm to the highest predicted flood water levels.

The site will be accessed via the eastern site boundary from the Whitechurch Road which traverses in a north and south direction. The site entrance and the public road are both indicated to be located in Flood Zone C and the site is considered to be accessible to emergency services during all flood events.

A flood emergency plan for the development which is to be agreed with the planning authority should be prepared prior to occupation.

Taking all into consideration, this SSFRA deems the proposed development to be appropriate and to comply with "Strategic Flood Risk Assessment for South Dublin County Council Development Plan 2016-2022" and the "Planning System and Flood Risk Management – Guidelines for Planning Authorities" (DoEHLG/OPW, 2009).

8 REFERENCES

- Office of Public Works.
- Preliminary Flood Risk Assessment (PFRA) Study Maps (http://www.cfram.ie/pfra/interactive-mapping/).
- Catchment and Flood Risk Management Program (OPW Website *http://www.cfram.ie*).
- OPW online viewer - https://maps.opw.ie/fhrm/viewer/
- OPW viewer – www.floodinfo.ie
- The Planning System and Flood Risk Management Guidelines for Planning Authorities, 2009
- EPA Envision Mapping (gis.epa.ie/envision)
- Google Maps
- Ordnance Survey of Ireland
- www.floodmaps.ie
- Jacob's Ltd - Flood Modeller Software Package
- HR Wallingford: Defra & Environment Agency – R&D Outputs: Flood Risks to People Phase 2, FD2321/TR2 Guidance Document, 2006.
- Strategic Flood Risk Assessment for South Dublin County Council Development Plan 2016-2022

APPENDIX A

- Refer overleaf for OPW PFRA Flood Mapping.
- Refer overleaf for SFRA SDCCDP 2016-2022 Fig. No. MDW657_0017.
- Refer overleaf for CFRAM Flood Extents and Flood Depth Mapping.

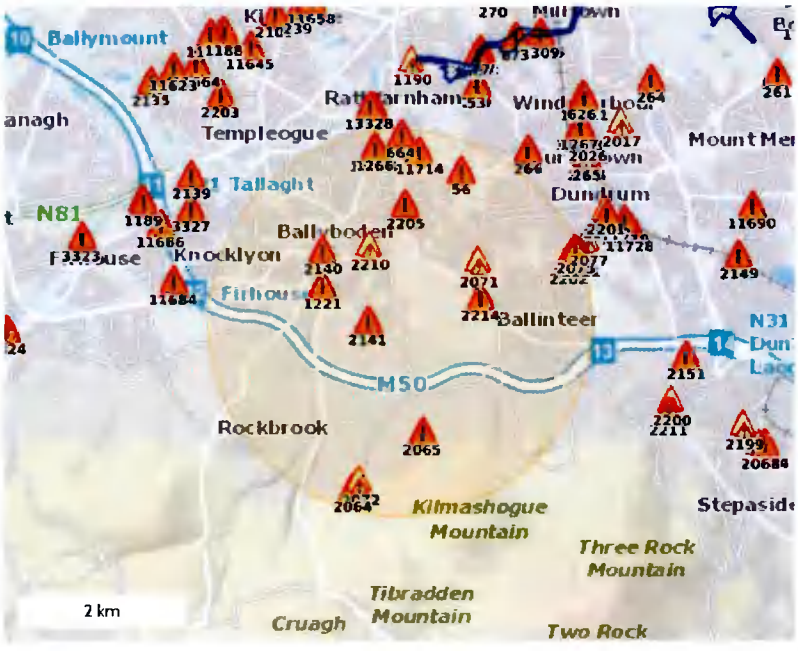
APPENDIX B

- Refer overleaf for Historical Flooding Information.

Past Flood Event Local Area Summary Report

Report Produced: 21/4/2022 9:45

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



Map Legend

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

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

18 Results

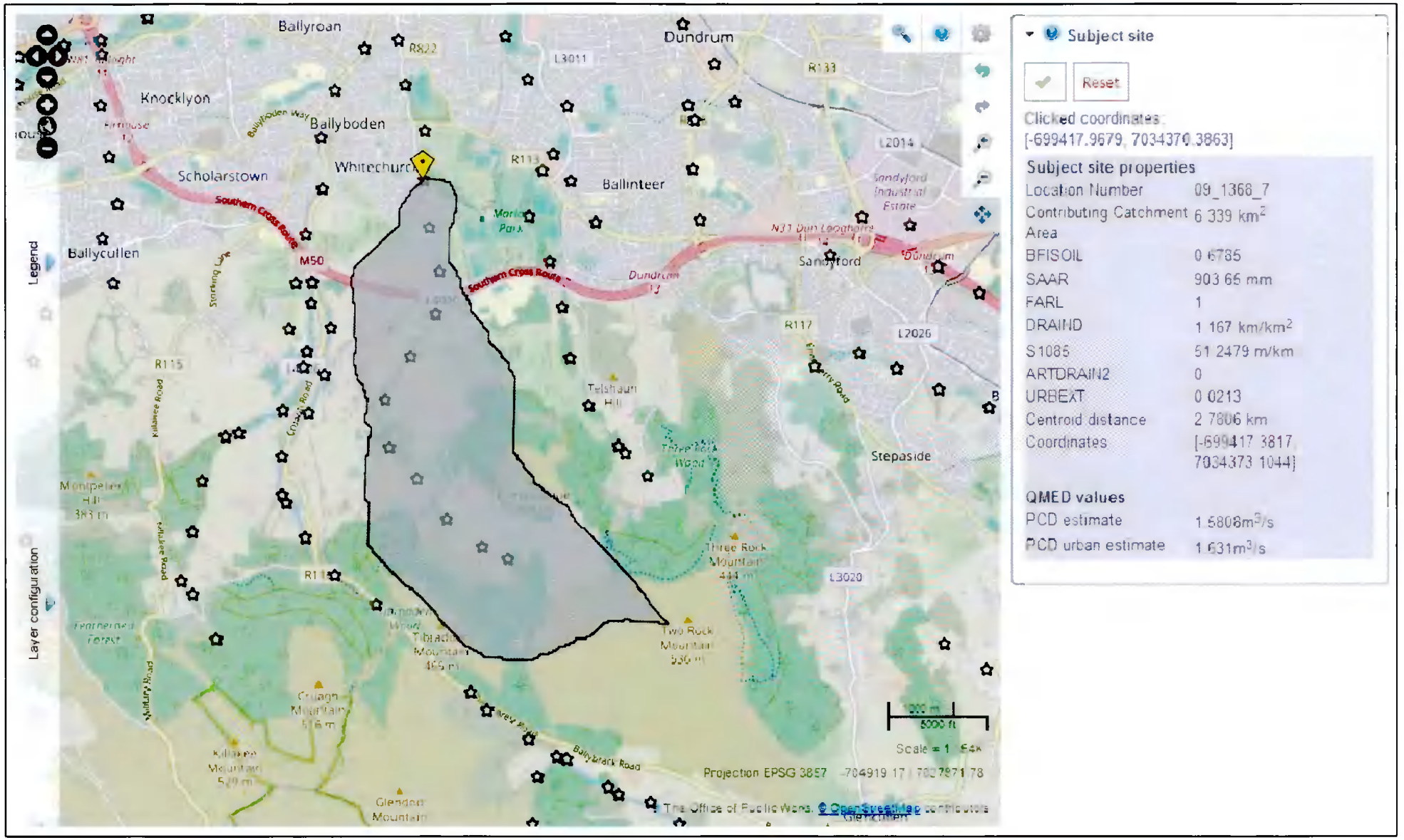
	Name (Flood_ID)	Start Date	Event Location
1.	Little Dargle Sept 1957 (ID-56)	24/09/1957	Approximate Point
	Additional Information: Reports (3) Press Archive (0)		
2.	Willbrook Rathfarnham Dec 1958 (ID-664)	16/12/1958	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
3.	Owenadoher Edmondstown Road. Nov 2000 (ID-1221)	05/11/2000	Approximate Point
	Additional Information: Reports (3) Press Archive (0)		
4.	Owendoher Willbrook Road August 1986 (ID-1266)	25/08/1986	Approximate Point
	Additional Information: Reports (2) Press Archive (1)		
5.	Grange River Tibradden Lane June 2003 (ID-2064)	30/06/2003	Exact Point
	Additional Information: Reports (2) Press Archive (0)		
6.	Grange River Kilmashogue Lane June 2003 (ID-2065)	30/06/2003	Exact Point
	Additional Information: Reports (2) Press Archive (0)		

	Name (Flood_ID)	Start Date	Event Location
7.	Manor Rise Recurring (ID-2071)	n/a	Exact Point
	Additional Information: Reports (2) Press Archive (0)		
8.	Grange Stream Tibradden Lane Mutton Lane Recurring (ID-2072)	n/a	Exact Point
	Additional Information: Reports (2) Press Archive (0)		
9.	Pine Copse Willow Road Recurring (ID-2075)	n/a	Exact Point
	Additional Information: Reports (2) Press Archive (0)		
10.	Boden Villas Feb 1994 (ID-2140)	03/02/1994	Exact Point
	Additional Information: Reports (1) Press Archive (0)		
11.	Whitechurch Court Feb 1994 (ID-2141)	03/02/1994	Exact Point
	Additional Information: Reports (1) Press Archive (0)		
12.	Ludford Area Ballinteer Recurring (ID-2202)	n/a	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
13.	Barton Drive Ballyboden Feb 1994 (ID-2205)	03/02/1994	Exact Point
	Additional Information: Reports (1) Press Archive (0)		
14.	Ballyboden Road Whitecliff Recurring (ID-2210)	n/a	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
15.	Little Dargle Grange Road Nov 1982 (ID-2214)	07/11/1982	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		
16.	Flooding at Nutgrove Avenue, Rathfarnham, Dublin 14on 24th Oct 2011 (ID-11714)	24/10/2011	Exact Point
	Additional Information: Reports (1) Press Archive (0)		
17.	Pine Copse Road Ballinteer Nov 1982 (ID-2137)	05/11/1982	Exact Point
	Additional Information: Reports (1) Press Archive (0)		
18.	Owendoher River 24th Oct 2011 Willbrook Road (ID-11484)	24/10/2011	Approximate Point
	Additional Information: Reports (1) Press Archive (0)		

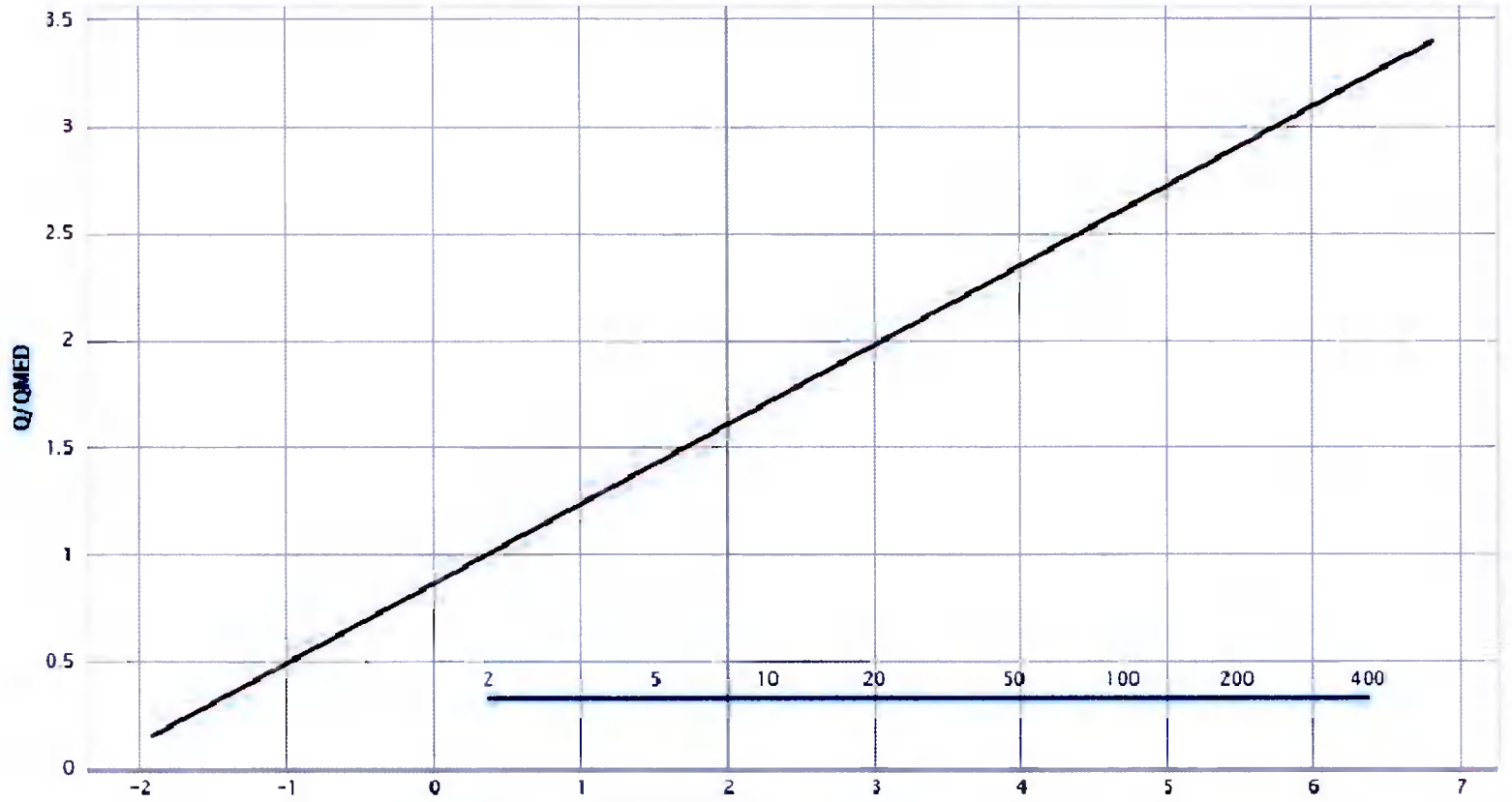
APPENDIX C

Refer overleaf for

- OPW FSU Data
- FSR Calculation
- IH124 Calculation
- FSU4.2a Regression Calculation for Small Catchments
- Flood Modeller Data


Ballyroan
Dundrum
Knocklyon
Ballyboden
Whitechurch
Scholarstown
Ballinteer
Ballycullen
Sandyford
Stepaside
Southern Cross Route
M50
R822
L3011
R133
L2014
R113
R115
R117
L2026
L3020
Legend
Layer configuration
Subject site
Reset
Clicked coordinates
[-699417.9679, 7034370.3863]
Subject site properties
Location Number 09_1368_7
Contributing Catchment Area 6.339 km²
BFISOIL 0.6785
SAAR 903.65 mm
FARL 1
DRAIND 1.167 km/km²
S1085 51.2479 m/km
ARTDRAIN2 0
URBEXT 0.0213
Centroid distance 2.7806 km
Coordinates [-699417.3817, 7034373.1044]
QMED values
PCD estimate 1.5808m³/s
PCD urban estimate 1.631m³/s
Projection EPSG:3857 -704919.17 | 7027971.78
© The Office of Public Works, © OpenStreetMap contributors

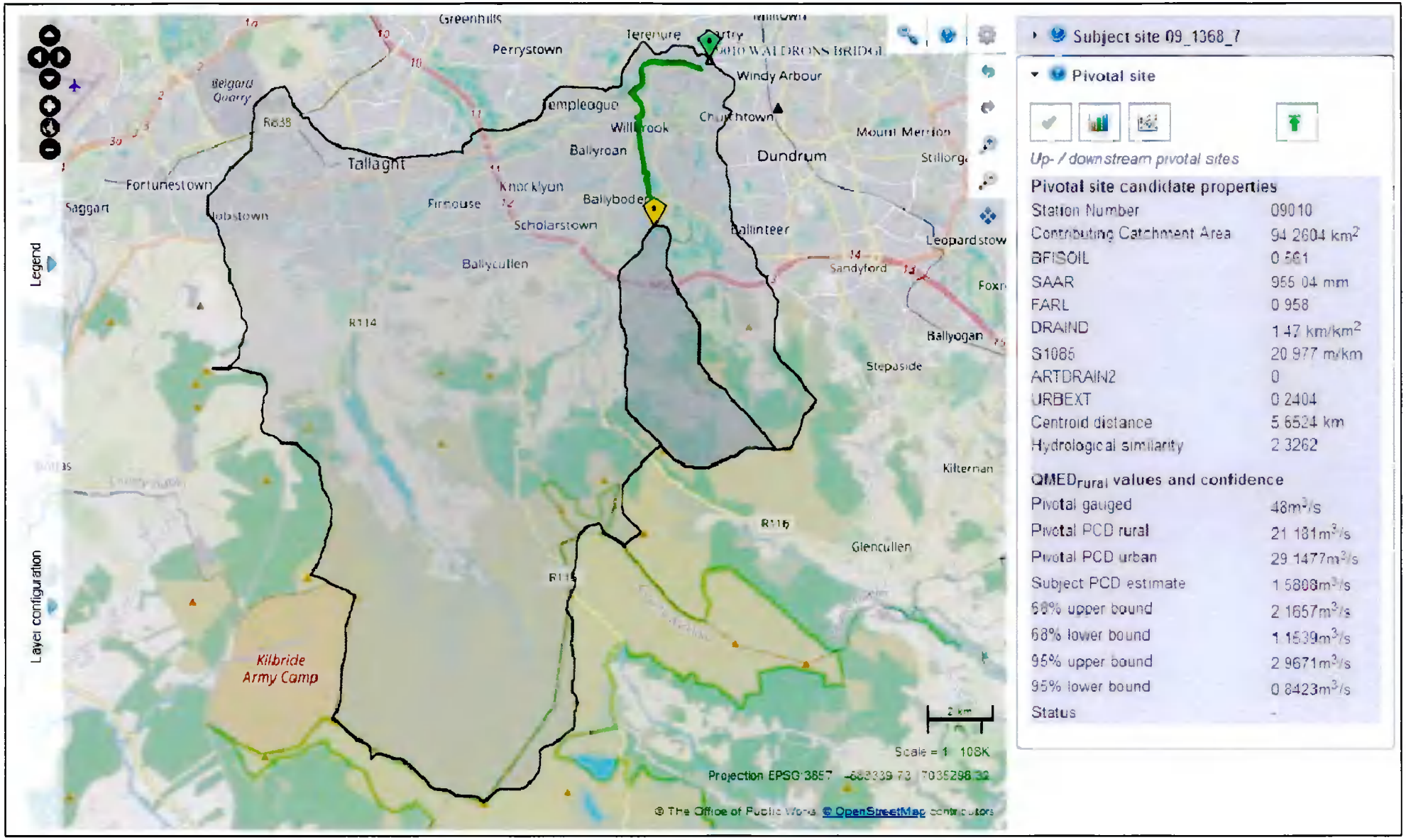
Final Analysis



Distribution EV1

	t=1.3	t=2	t=5	t=10	t=20	t=30	t=50	t=100	t=200	t=500	t=1000
Growth Factors	0.72	1	1.42	1.7	1.97	2.12	2.31	2.57	2.83	3.17	3.43
Design Peak Flows (m^3/s)	1.94	2.69	3.82	4.56	5.28	5.7	6.21	6.91	7.6	8.52	9.21

Filter Cancel Finish



Subject site 09_1368_7

Pivotal site

Up- / downstream pivotal sites

Pivotal site candidate properties

Station Number	09010
Contributing Catchment Area	94.2604 km^2
BFISOIL	0.561
SAAR	955.04 mm
FARL	0.958
DRAIND	1.47 km/km^2
S1085	20.977 m/km
ARTDRAIN2	0
URBEXT	0.2404
Centroid distance	5.6524 km
Hydrological similarity	2.3262

$QMED_{rural}$ values and confidence

Pivotal gauged	48m^3/s
Pivotal PCD rural	21.181m^3/s
Pivotal PCD urban	29.1477m^3/s
Subject PCD estimate	1.5808m^3/s
68% upper bound	2.1657m^3/s
68% lower bound	1.1539m^3/s
95% upper bound	2.9671m^3/s
95% lower bound	0.8423m^3/s
Status	-

Descriptor	Subject	Pivotal	F. eq. M2.1a	F. subject	F. pivotal site	F. difference	Rank
Contributing Catchment Area	6.339	94.2604	$area^{0.937}$	5.6428	70.7859	12.5445	7
BFISOIL	0.6785	0.561	$bfisoil^{-0.922}$	1.43	1.7039	1.1916	6
S1085	51.2479	20.977	$s1085^{0.185}$	2.0715	1.756	1.1797	5
FARL	1	0.958	$farl^{2.217}$	1	0.9093	1.0998	4
DRAIND	1.167	1.47	$draind^{0.341}$	1.0541	1.1404	1.0819	3
SAAR	903.65	955.04	$saar^{1.306}$	7253.3115	7796.6522	1.0749	2
ARTDRAIN2	0	0	$artdrain2^{0.408}$	0	0	0	1

Candidates that are hydrologically or geographically closer to the subject site than the pivotal site

Select a site for comparison

☐ In case of acceptance please check to confirm that you reject the listed closer pivotal sites in preference for the chosen pivotal site

Please insert argument as to why you choose to reject or accept this candidate pivotal site

Warnings:
- Catchment urbanisation differs appreciably. Difference: (0.2191).

Please insert arguments as to why you choose to ignore the given warnings

Review information for a different candidate pivotal site | Reject | Accept

Display of hydrograph shapes for gauging station 16005 AUGHNAGROSS

Hours before peak

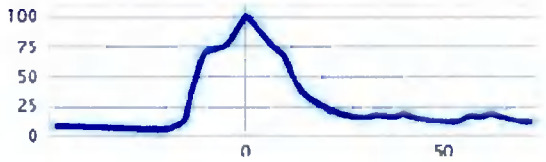
48

Hours after peak

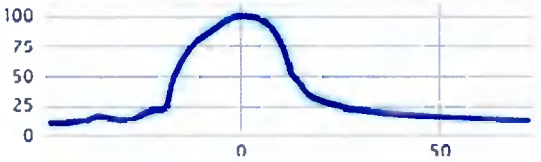
72

Plot chart | Proceed

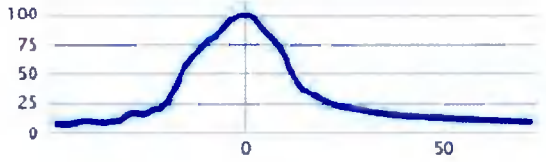
34.07m3/s at 0 -09-1997 (largest)



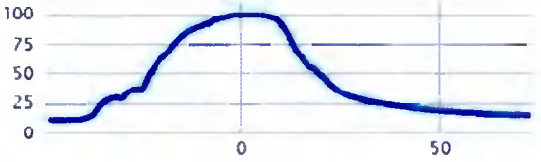
26.66m3/s at 21-04-1978



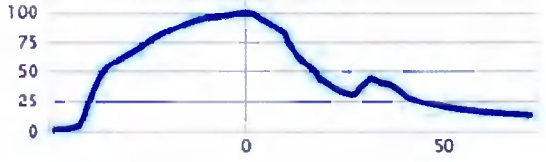
33.02m3/s at 17-10-1997 (2nd largest)



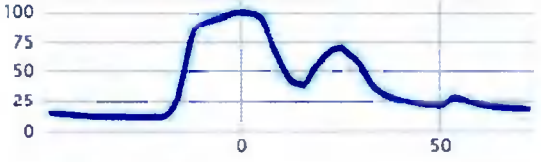
26.59m3/s at 31-01-2009



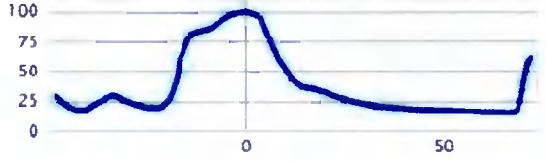
29.01m3/s at 05-08-1997



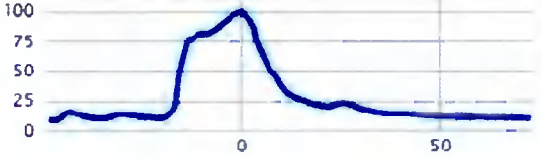
26.04m3/s at 06-02-1990



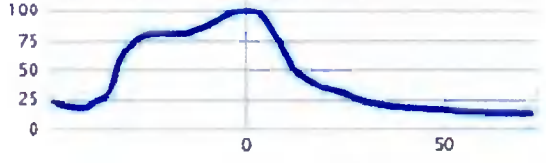
27.57m3/s at 12-01-1984



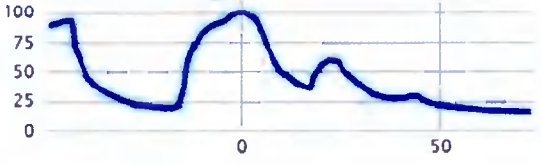
26m3/s at 01-02-1983 (2nd smallest)

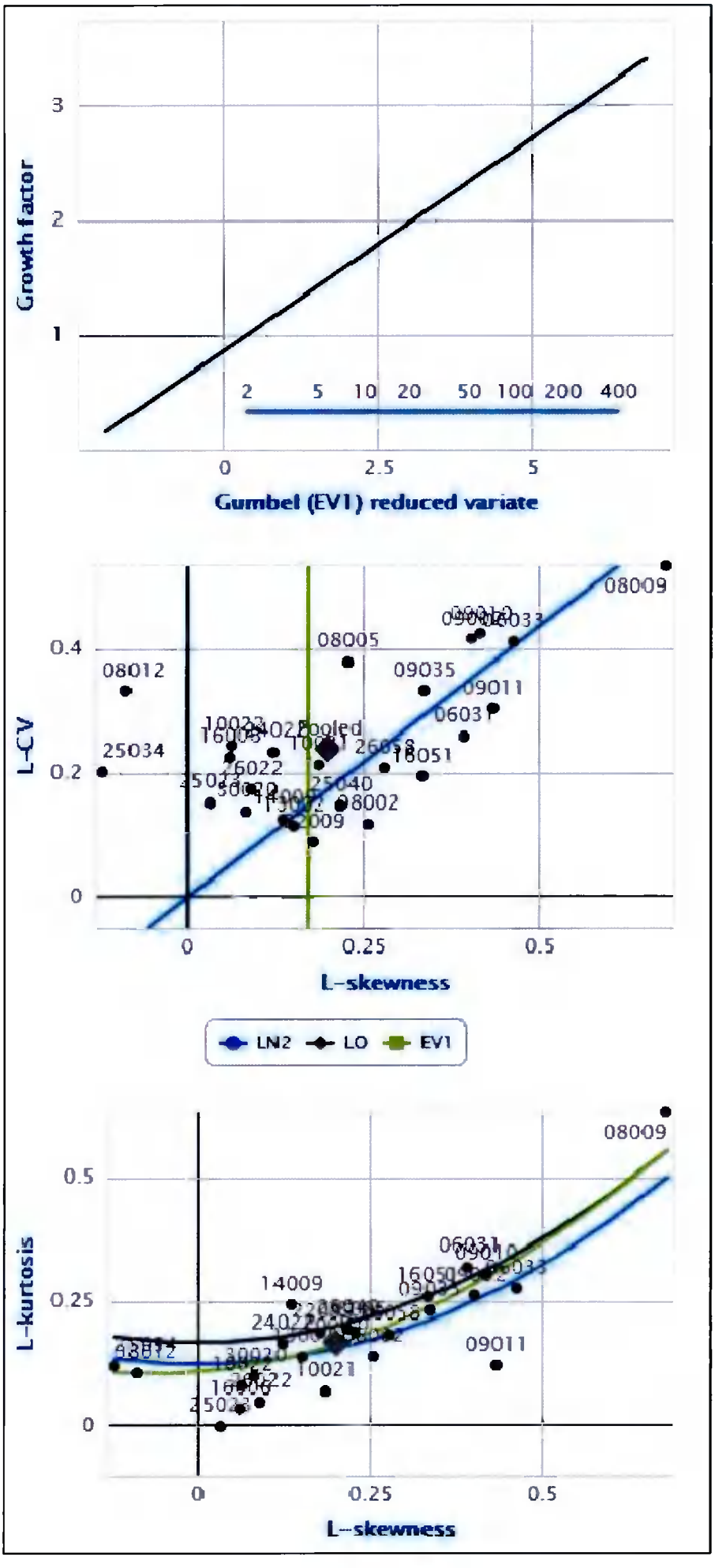


27.51m3/s at 06-02-1984



25.99m3/s at 27-01-1995 (smallest)




Growth factor
3
2
1
2
5
10
20
50
100
200
400
0
2.5
5
Gumbel (EV1) reduced variate
L-CV
0.4
0.2
0
08009
08005
08012
09035
09011
06031
25034
Pooled
16051
25040
08002
0
0.25
0.5
L-skewness
LN2
LO
EV1
L-kurtosis
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0.25
0
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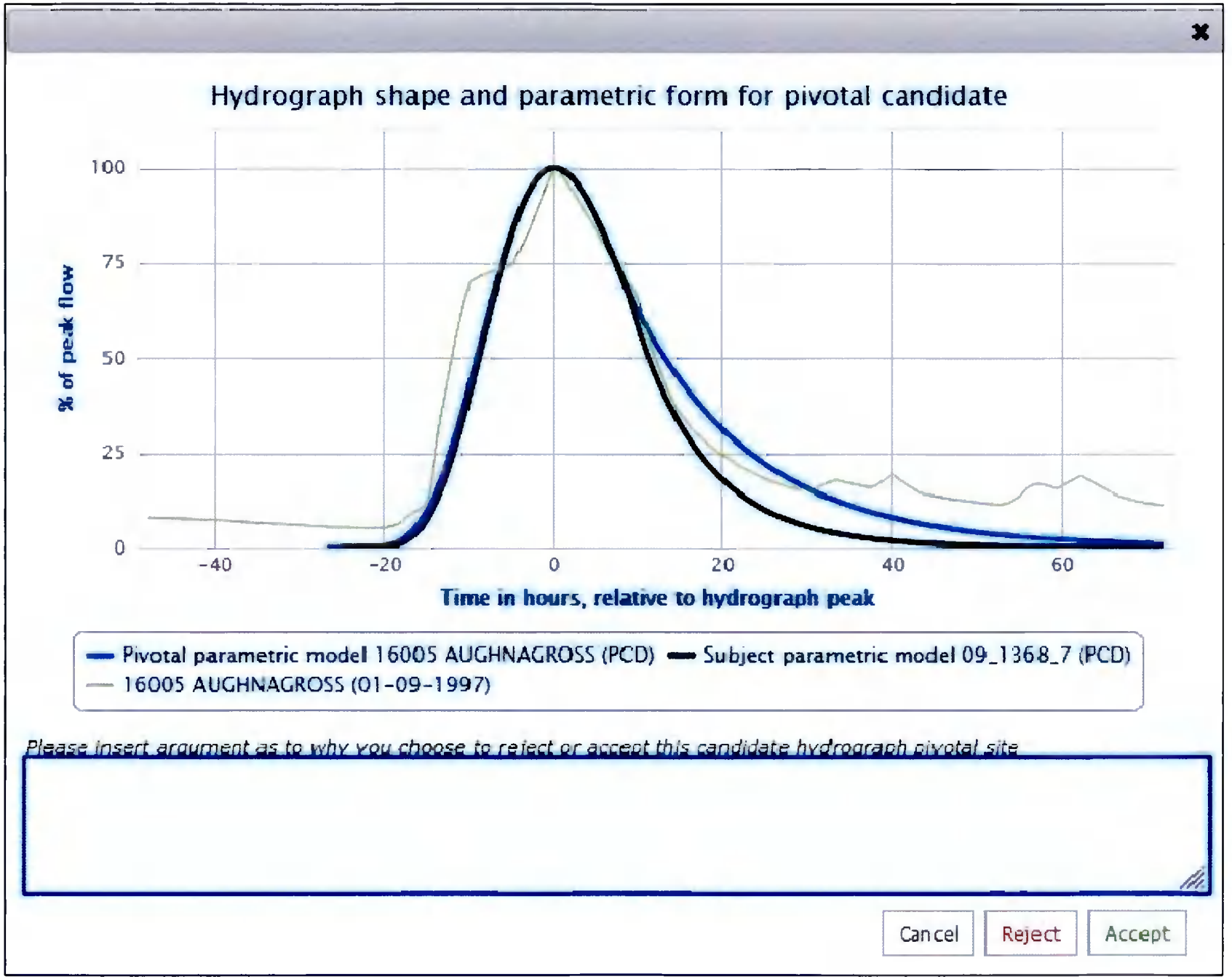
09011
10021
0
0.25
0.5
L-skewness


Hydrograph shape and parametric form for pivotal candidate
100
75
50
25
0
% of peak flow
-40
-20
0
20
40
60
Time in hours, relative to hydrograph peak
Pivotal parametric model 16005 AUGHNAGROSS (PCD)
Subject parametric model 09_1368_7 (PCD)
16005 AUGHNAGROSS (01-09-1997)
Please insert argument as to why you choose to reject or accept this candidate hydrograph pivotal site
Cancel
Reject
Accept

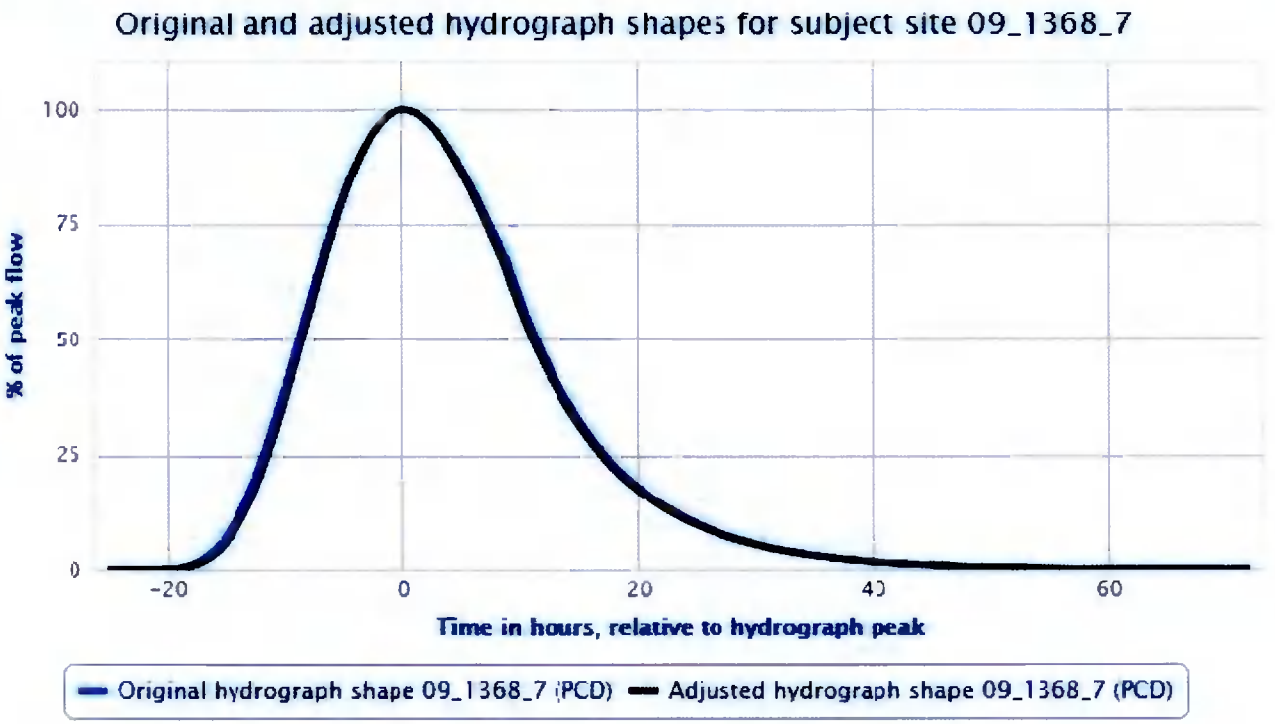
Transfer of characteristic hydrograph to the subject site

Adopted hydrograph	AdjustedPCD hydrograph
Original n	~9.15
Original T_r	~25.1
Original C	~8.5
Deformation factor	~1
Deformed T_r	~25.1
Δn	~0.77
Adjusted n	~9.93

Adjusted estimate

Deformation factor 1

Plot chart Accept



-20	0	0	0	0.01	**0.01**	0.01
-19	0.01	0.01	0.02	0.02	**0.02**	0.02
-18	0.03	0.04	0.04	0.05	**0.05**	0.06
-17	0.07	0.08	0.1	0.11	**0.12**	0.13
-16	0.13	0.16	0.19	0.21	**0.24**	0.26
-15	0.23	0.28	0.34	0.38	**0.42**	0.47
-14	0.38	0.46	0.55	0.62	**0.69**	0.76
-13	0.58	0.69	0.83	0.94	**1.04**	1.15
-12	0.82	0.98	1.19	1.34	**1.49**	1.64
-11	1.11	1.33	1.6	1.81	**2.01**	2.21
-10	1.43	1.71	2.07	2.33	**2.59**	2.86
-9	1.78	2.13	2.57	2.9	**3.22**	3.55
-8	2.14	2.55	3.08	3.48	**3.87**	4.25
-7	2.49	2.97	3.59	4.05	**4.5**	4.95
-6	2.81	3.37	4.06	4.58	**5.09**	5.61
-5	3.11	3.72	4.49	5.06	**5.63**	6.2
-4	3.36	4.02	4.85	5.47	**6.08**	6.7
-3	3.56	4.26	5.14	5.8	**6.45**	7.09
-2	3.7	4.43	5.35	6.03	**6.7**	7.38
-1	3.79	4.53	5.47	6.17	**6.86**	7.55
0	3.82	4.56	5.51	6.21	**6.91**	7.6
1	3.79	4.53	5.47	6.17	**6.86**	7.55
2	3.72	4.44	5.36	6.05	**6.73**	7.4
3	3.6	4.3	5.19	5.86	**6.51**	7.17
4	3.44	4.12	4.97	5.61	**6.24**	6.86
5	3.26	3.9	4.71	5.31	**5.91**	6.5
6	3.06	3.66	4.42	4.98	**5.54**	6.1
7	2.85	3.4	4.11	4.63	**5.15**	5.67
8	2.62	3.14	3.79	4.27	**4.75**	5.22
9	2.36	2.82	3.41	3.84	**4.27**	4.7
10	2.1	2.51	3.03	3.41	**3.8**	4.18
11	1.86	2.23	2.69	3.04	**3.38**	3.72
12	1.66	1.98	2.39	2.7	**3**	3.3
13	1.47	1.76	2.13	2.4	**2.67**	2.94
14	1.31	1.57	1.89	2.13	**2.37**	2.61
15	1.16	1.39	1.68	1.9	**2.11**	2.32
16	1.04	1.24	1.5	1.69	**1.87**	2.06
17	0.92	1.1	1.33	1.5	**1.67**	1.83
18	0.82	0.98	1.18	1.33	**1.48**	1.63

19	0.73	0.87	1.05	1.18	**1.32**	1.45
20	0.65	0.77	0.93	1.05	**1.17**	1.29
21	0.58	0.69	0.83	0.94	**1.04**	1.15
22	0.51	0.61	0.74	0.83	**0.93**	1.02
23	0.45	0.54	0.66	0.74	**0.82**	0.91
24	0.4	0.48	0.58	0.66	**0.73**	0.8
25	0.36	0.43	0.52	0.58	**0.65**	0.72
26	0.32	0.38	0.46	0.52	**0.58**	0.64
27	0.28	0.34	0.41	0.46	**0.51**	0.57
28	0.25	0.3	0.36	0.41	**0.46**	0.5
29	0.22	0.27	0.32	0.37	**0.41**	0.45
30	0.2	0.24	0.29	0.32	**0.36**	0.4
31	0.18	0.21	0.26	0.29	**0.32**	0.35
32	0.16	0.19	0.23	0.26	**0.29**	0.31
33	0.14	0.17	0.2	0.23	**0.25**	0.28
34	0.12	0.15	0.18	0.2	**0.23**	0.25
35	0.11	0.13	0.16	0.18	**0.2**	0.22
36	0.1	0.12	0.14	0.16	**0.18**	0.2
37	0.09	0.1	0.13	0.14	**0.16**	0.17
38	0.08	0.09	0.11	0.13	**0.14**	0.16
39	0.07	0.08	0.1	0.11	**0.13**	0.14
40	0.06	0.07	0.09	0.1	**0.11**	0.12
41	0.05	0.07	0.08	0.09	**0.1**	0.11
42	0.05	0.06	0.07	0.08	**0.09**	0.1
43	0.04	0.05	0.06	0.07	**0.08**	0.09
44	0.04	0.05	0.06	0.06	**0.07**	0.08
45	0.03	0.04	0.05	0.06	**0.06**	0.07
46	0.03	0.04	0.04	0.05	**0.05**	0.06
47	0.03	0.03	0.04	0.04	**0.05**	0.05
48	0.02	0.03	0.03	0.04	**0.04**	0.05
49	0.02	0.03	0.03	0.03	**0.04**	0.04
50	0.02	0.02	0.03	0.03	**0.03**	0.04
51	0.02	0.02	0.02	0.03	**0.03**	0.03
52	0.01	0.02	0.02	0.02	**0.03**	0.03
53	0.01	0.02	0.02	0.02	**0.02**	0.03
54	0.01	0.01	0.02	0.02	**0.02**	0.02
55	0.01	0.01	0.02	0.02	**0.02**	0.02
56	0.01	0.01	0.01	0.02	**0.02**	0.02
57	0.01	0.01	0.01	0.01	**0.02**	0.02
58	0.01	0.01	0.01	0.01	**0.01**	0.01

FSU4.2a Regression Calculation for Small Catchments

$$Q_{med} = (2.0951 \times 10^{-5}) \times (AREA^{0.9245}) \times (SAAR^{1.2695}) \times (BFI^{-0.9030}) \times (FARL^{2.3163}) \times (S1085^{0.2513})$$

Catchment Area	6.339	km^2
SAAR	1016	mm
BFI	0.6785	
FARL	1	
S1085	51.2479	m/km

Q_{med}	2.90	m^3/s
Q_{bar}	3.10	m^3/s
Q_{100}	8.085	m^3/s
Q_{1000}	10.842	m^3/s

IH124 Calculation Sheet

7th April 2022

Project: Remy Farrell
Site Location: Lisasadell, Whitchurch Road, Rathfarnham, Dublin 16
Agent: Jakulla Architecture and Design, 56a Rameh Park, Milltown, Dublin 6

The IH124 method was specifically introduced as an update to the original Flood Studies Report (1975) to address the runoff from small catchemnts (CI RIA C697 and IH124)

$$Q_{BAR}\ RURAL\ (m^3/s) = 0.00108\ AREA^{0.89} \times SAAR^{1.17} \times SOIL^{2.17}$$

- Q_{BAR} RURAL Is the mean annual flood flow from a rura catchment (43% AEP or 2.3 year return period)
- AREA is the area of the catchment (km^2)
- SAAR is the standard average annual rainfall
- SOIL is the Soil Index, SOIL - 0.1 SOIL1 + 0.3 Soil2 + 0.37 Soil3 +0.47 Soil4 + 0.53 Soil5
- The soil type is selected based on the Flood Studies or the Wallingford Procedure WRAP maps.

Inputs

AREA:	633.9 Ha	Site AREA is 633.9Ha. As site is >50Ha, use 633.9Ha
SAAR:	1016 mm	Grid Reference E:314611 N:226237
Soil:	0.530	FSR SPR value for SOIL type 5 is 0.53

Outputs

Q_{BAR} RURAL (l/s/Ha)-	7.33
Site Area (Ha)-	633.9
Q_{BAR} RURAL (l/s)-	4644.79

	l/s
Q_1 =	3948.08
Q_{30} =	9754.07
Q_{100} =	12122.91
Q_{200} =	13469.90
Q_{1000} =	16256.78

1	0.85
Q_{BAR}	1
10	1.7
30	2.1
100	2.6
200	2.9
1000	3.5

FSR Qbar Calculation

Qbar = C[(AREA^0.94)*(STMFRQ^0.27)*(SOIL^1.23)*(RSMD^1.03)*(S1085^0.16)*((1-LAKE)^-0.85)]

C = 0.0172 For Ireland

Qbar = 0.0172[(AREA^0.94)*(STMFRQ^0.27)*(SOIL^1.23)*(RSMD^1.03)*(S1085^0.16)*((1-LAKE)^-0.85)]

AREA = Area of the Catchment
STMFRQ = No of Junctions along the length of the Stream
Soil = Soil Index (should be averaged over entire catchment area)
= 0.15g1, 0.30g2, 0.40g3, 0.45g4, 0.50g5
RSMD = Adjusted Rainfall to account for catchment area and Soil Moisture Deficit
S1085 = Channel Slope between 10% upstream and 85% upstream
Given by equation (h2-h1)/(0.75L) where L is total Length of Stream
LAKE = Lake Index W - Proportion of Catchement Draining through Lakes
A lake is considered only if the area of the Lake is >1% of total Cathcment Area

Inputs

AREA	6.339	km2
No. of Junctions	4	n
Lake Surface Area	0	km2
Rainfall Event Duration	24	hr
5Y, 24Hr Rainfall Intensity	61.1	mm
Soil Moisture Deficit Value	6.5	mm
% of Catchment Soil Type 1	0	%
% of Catchment Soil Type 2	0	%
% of Catchment Soil Type 3	0	%
% of Catchment Soil Type 4	0	%
% of Catchment Soil Type 5	100	%

STMFRQ	1.59
ARF	0.98
RSMD	53.56
Soil	0.5
S1085	51.25
LAKE	0

Qbar	5.35 m^3
Q_{100}	13.956 m^3
Q_{1000}	18.715 m^3

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 314611, Northing: 226237,

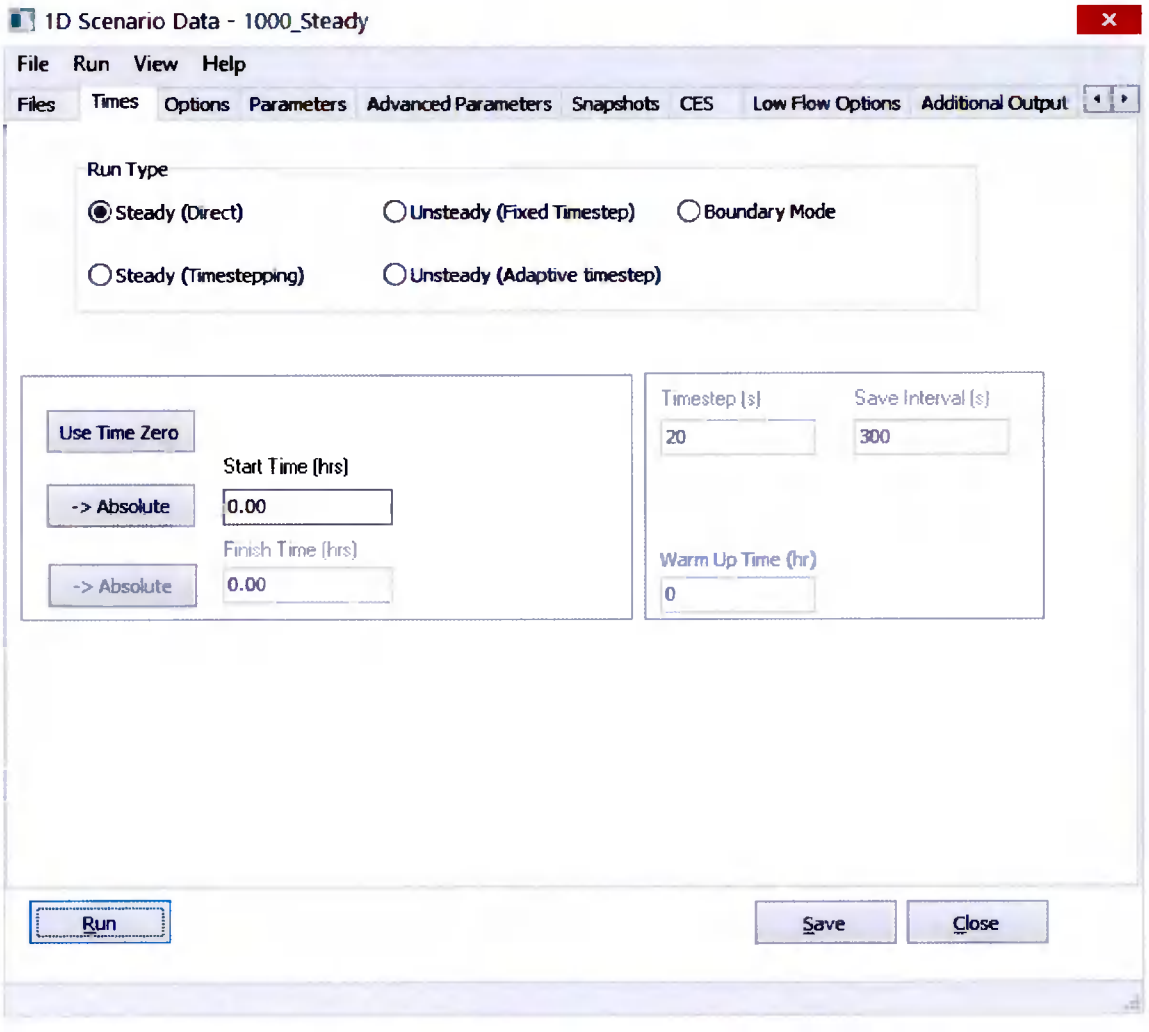
	Interval		Years												
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.7,	4.0,	4.7,	5.8,	6.6,	7.2,	9.2,	11.5,	13.1,	15.4,	17.4,	19.0,	21.5,	23.5,	25.1,	N/A ,
10 mins	3.8,	5.6,	6.6,	8.1,	9.2,	10.0,	12.8,	16.1,	18.3,	21.4,	24.2,	26.5,	29.9,	32.7,	35.0,	N/A ,
15 mins	4.5,	6.6,	7.8,	9.6,	10.8,	11.8,	15.1,	18.9,	21.5,	25.2,	28.5,	31.1,	35.2,	38.5,	41.1,	N/A ,
30 mins	5.9,	8.6,	10.1,	12.3,	13.9,	15.1,	19.2,	24.0,	27.2,	31.7,	35.8,	39.0,	44.0,	47.9,	51.2,	N/A ,
1 hours	7.7,	11.2,	13.1,	15.9,	17.9,	19.4,	24.5,	30.4,	34.4,	39.9,	45.0,	48.9,	55.0,	59.8,	63.7,	N/A ,
2 hours	10.1,	14.5,	16.9,	20.6,	23.0,	25.0,	31.3,	38.6,	43.5,	50.3,	56.5,	61.3,	68.7,	74.5,	79.3,	N/A ,
3 hours	11.9,	17.0,	19.7,	23.9,	26.7,	28.9,	36.1,	44.4,	49.9,	57.6,	64.5,	69.9,	78.3,	84.8,	90.2,	N/A ,
4 hours	13.3,	18.9,	21.9,	26.5,	29.6,	32.0,	40.0,	49.0,	55.0,	63.4,	70.9,	76.8,	85.9,	92.9,	98.8,	N/A ,
6 hours	15.6,	22.1,	25.6,	30.8,	34.3,	37.1,	46.1,	56.3,	63.1,	72.6,	81.1,	87.6,	97.8,	105.7,	112.3,	N/A ,
9 hours	18.3,	25.8,	29.7,	35.7,	39.8,	42.9,	53.1,	64.7,	72.3,	83.1,	92.6,	100.0,	111.4,	120.3,	127.6,	N/A ,
12 hours	20.5,	28.8,	33.1,	39.7,	44.1,	47.6,	58.8,	71.4,	79.7,	91.4,	101.8,	109.8,	122.2,	131.8,	139.7,	N/A ,
18 hours	24.1,	33.6,	38.6,	46.1,	51.1,	55.1,	67.8,	82.1,	91.5,	104.7,	116.3,	125.4,	139.2,	149.9,	158.8,	N/A ,
24 hours	27.0,	37.4,	43.0,	51.2,	56.8,	61.1,	75.0,	90.6,	100.9,	115.2,	127.9,	137.7,	152.7,	164.3,	173.9,	207.4,
2 days	33.9,	45.9,	52.1,	61.3,	67.5,	72.2,	87.3,	104.0,	114.8,	129.8,	143.0,	153.1,	168.5,	180.4,	190.1,	223.7,
3 days	39.6,	52.7,	59.6,	69.5,	76.1,	81.2,	97.3,	114.9,	126.3,	142.0,	155.7,	166.2,	182.1,	194.2,	204.2,	238.5,
4 days	44.5,	58.7,	66.0,	76.7,	83.7,	89.0,	106.0,	124.5,	136.4,	152.7,	166.9,	177.7,	194.1,	206.5,	216.8,	251.8,
6 days	53.1,	69.1,	77.3,	89.1,	96.7,	102.6,	121.1,	141.1,	153.8,	171.2,	186.3,	197.7,	214.9,	228.0,	238.7,	275.2,
8 days	60.8,	78.3,	87.2,	99.9,	108.2,	114.5,	134.3,	155.5,	169.0,	187.4,	203.2,	215.2,	233.2,	246.8,	257.9,	295.7,
10 days	67.9,	86.8,	96.2,	109.8,	118.6,	125.3,	146.2,	168.6,	182.8,	201.9,	218.4,	230.9,	249.6,	263.7,	275.2,	314.2,
12 days	74.5,	94.6,	104.7,	119.0,	128.3,	135.3,	157.3,	180.7,	195.4,	215.4,	232.5,	245.4,	264.7,	279.3,	291.2,	331.3,
16 days	86.8,	109.1,	120.2,	135.9,	146.1,	153.7,	177.5,	202.7,	218.5,	239.9,	258.1,	271.8,	292.3,	307.7,	320.2,	362.2,
20 days	98.2,	122.5,	134.5,	151.4,	162.3,	170.5,	196.0,	222.8,	239.5,	262.1,	281.3,	295.7,	317.2,	333.3,	346.4,	390.2,
25 days	111.6,	138.1,	151.1,	169.5,	181.2,	190.0,	217.3,	245.9,	263.7,	287.6,	307.9,	323.1,	345.7,	362.7,	376.4,	422.2,

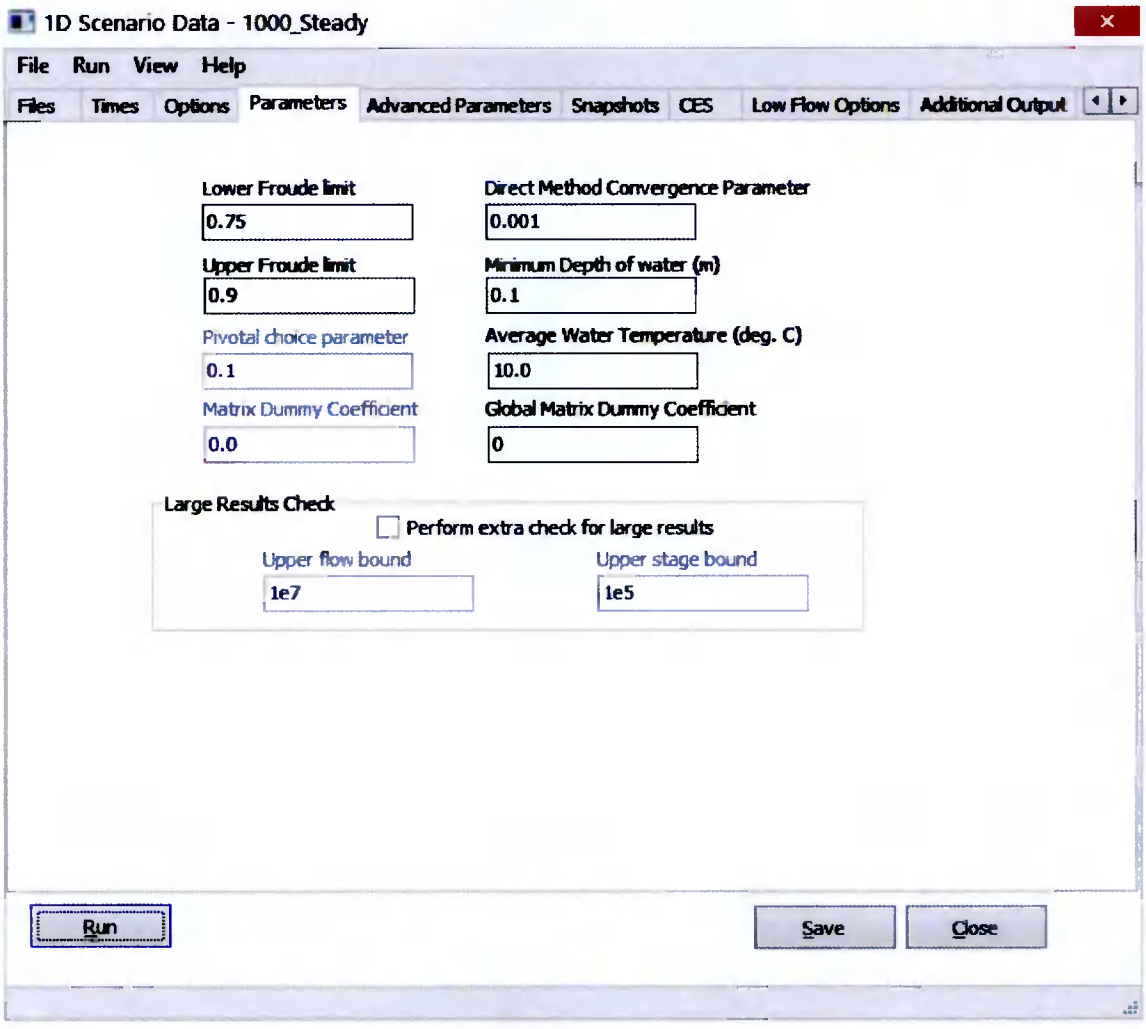
NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

Manning's Values Used in the Flood Model taken from:

Manning's n for Channels (Chow, 1959).

Type of Channel and Description	Minimum	Normal	Maximum
Natural streams - minor streams (top width at floodstage < 100 ft)			
1. Main Channels			
a. clean, straight, full stage, no rifts or deep pools	0.025	0.030	0.033
b. same as above, but more stones and weeds	0.030	0.035	0.040
c. clean, winding, some pools and shoals	0.033	0.040	0.045
d. same as above, but some weeds and stones	0.035	0.045	0.050
e. same as above, lower stages, more ineffective slopes and sections	0.040	0.048	0.055
f. same as "d" with more stones	0.045	0.050	0.060
g. sluggish reaches, weedy, deep pools	0.050	0.070	0.080
h. very weedy reaches, deep pools, or floodways with heavy stand of timber and underbrush	0.075	0.100	0.150

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File
Run
View
Help
Files
Times
Options
Parameters
Advanced Parameters
Snapshots
CES
Low Flow Options
Additional Output
Lower Froude limit
0.75
Upper Froude limit
0.9
Pivotal choice parameter
0.1
Matrix Dummy Coefficient
0.0
Direct Method Convergence Parameter
0.001
Minimum Depth of water (m)
0.1
Average Water Temperature (deg. C)
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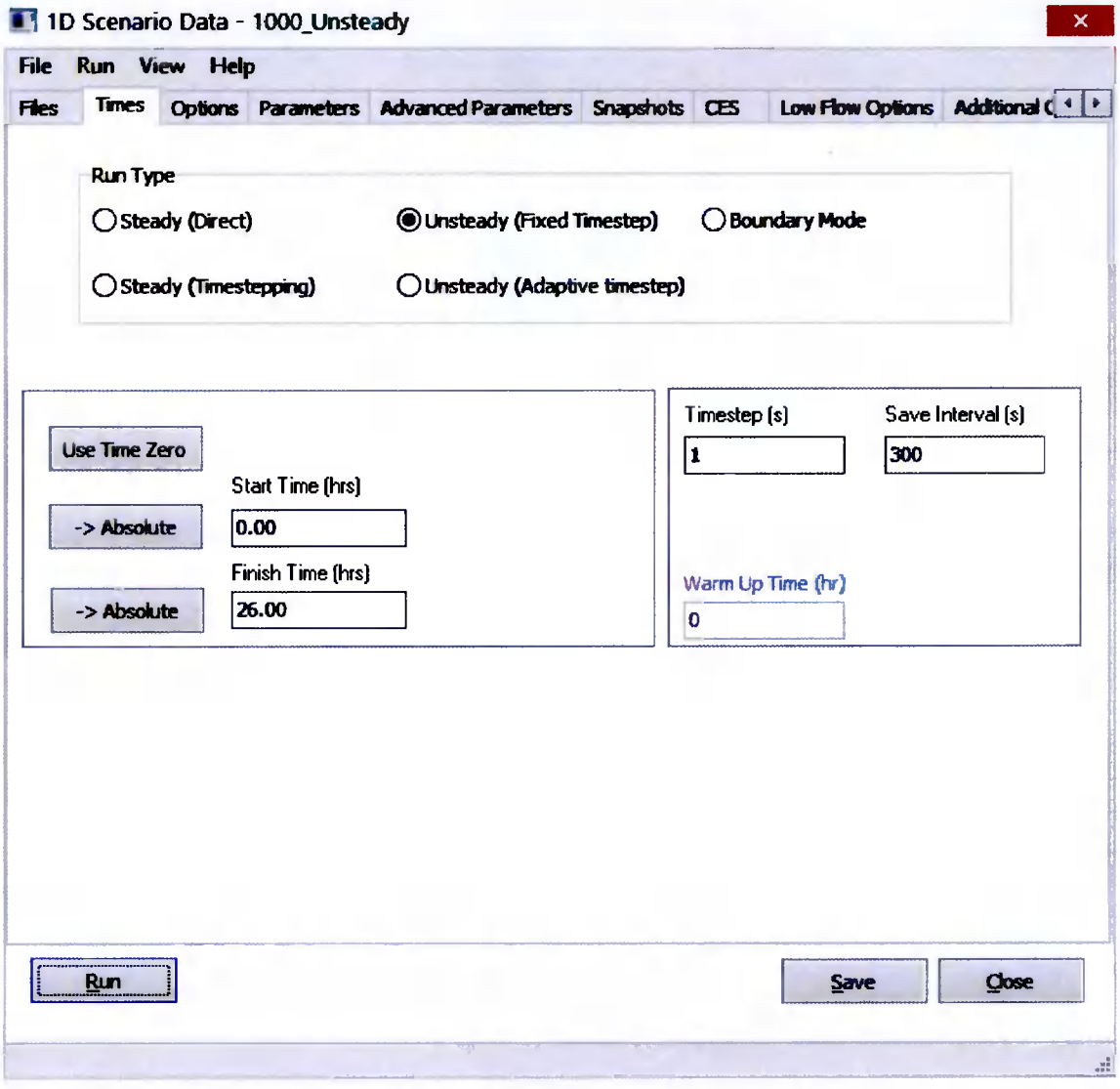
Global Matrix Dummy Coefficient
0
Large Results Check
Perform extra check for large results
Upper flow bound
1e7
Upper stage bound
1e5
Run
Save
Close


1D Scenario Data - 1000_Unsteady
File
Run
View
Help
Files
Times
Options
Parameters
Advanced Parameters
Snapshots
CES
Low Flow Options
Additional C
Run Type
Steady (Direct)
Unsteady (Fixed Timestep)
Boundary Mode
Steady (Timestepping)
Unsteady (Adaptive timestep)
Use Time Zero
Start Time (hrs)
-> Absolute
0.00
Finish Time (hrs)
-> Absolute
26.00
Timestep (s)
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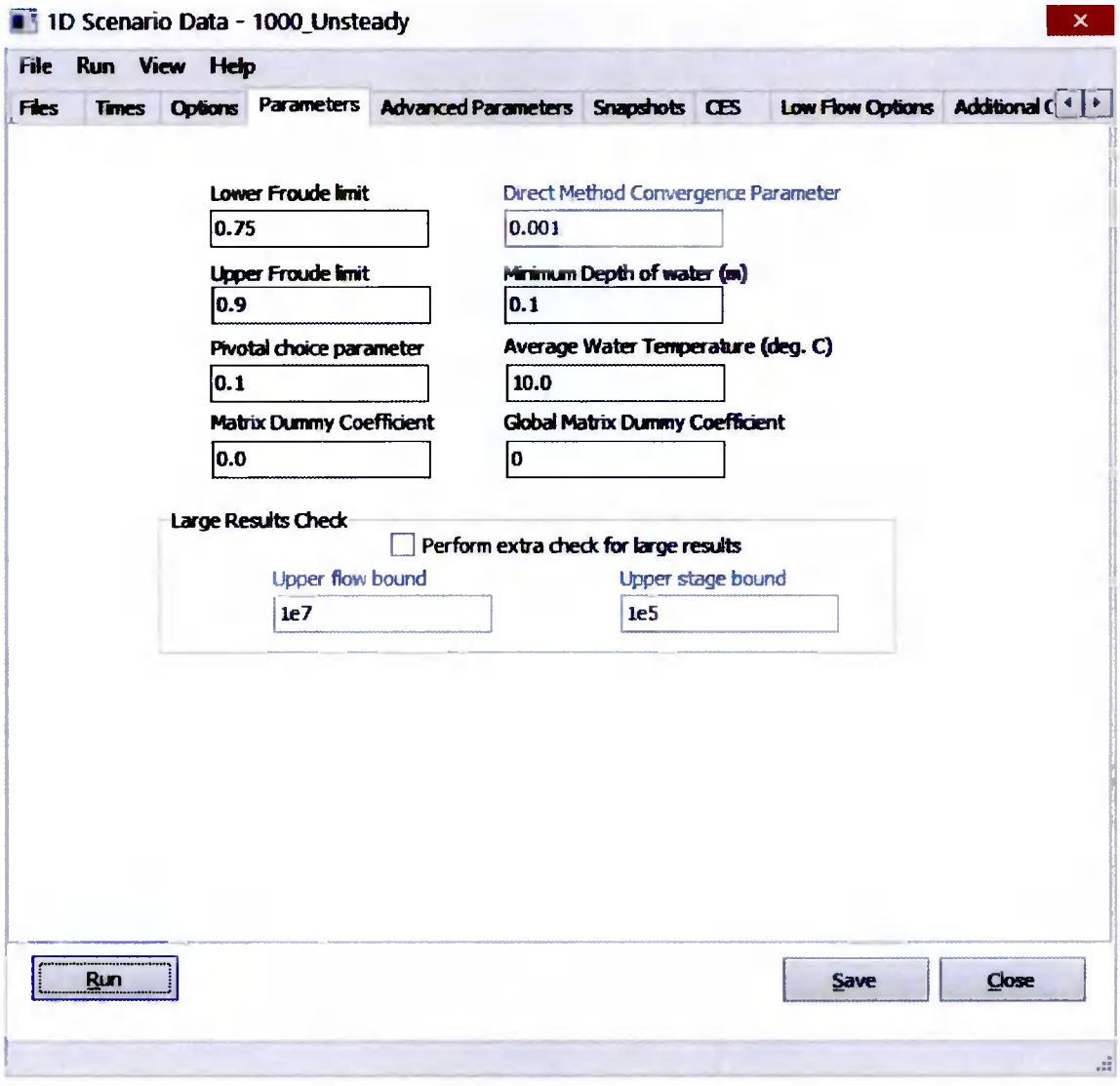
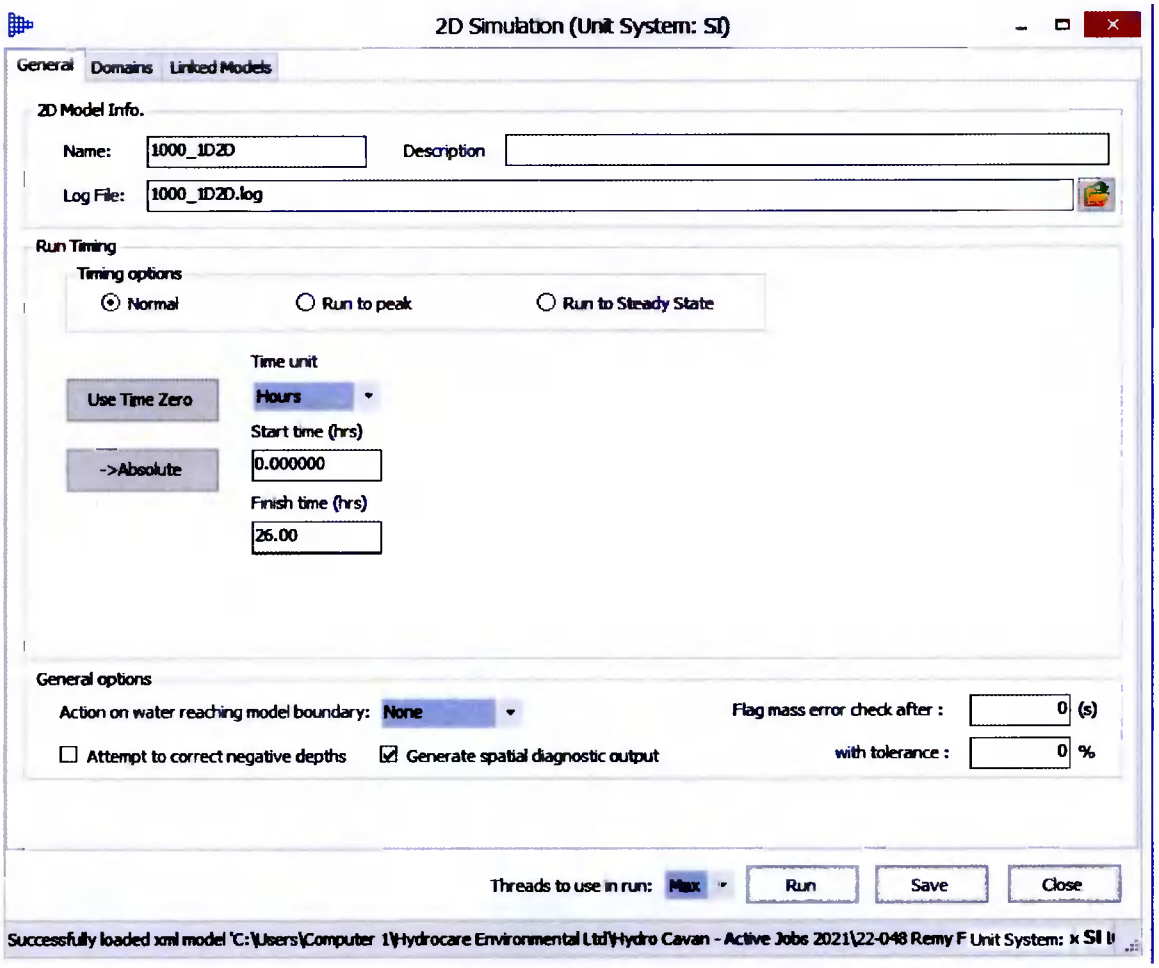
Save Interval (s)
300
Warm Up Time (hr)
0
Run
Save
Close


1D Scenario Data - 1000_Unsteady
File
Run
View
Help
Files
Times
Options
Parameters
Advanced Parameters
Snapshots
CES
Low Flow Options
Additional C
Lower Froude limit
0.75
Direct Method Convergence Parameter
0.001
Upper Froude limit
0.9
Minimum Depth of water (m)
0.1
Pivotal choice parameter
0.1
Average Water Temperature (deg. C)
10.0
Matrix Dummy Coefficient
0.0
Global Matrix Dummy Coefficient
0
Large Results Check
Perform extra check for large results
Upper flow bound
1e7
Upper stage bound
1e5
Run
Save
Close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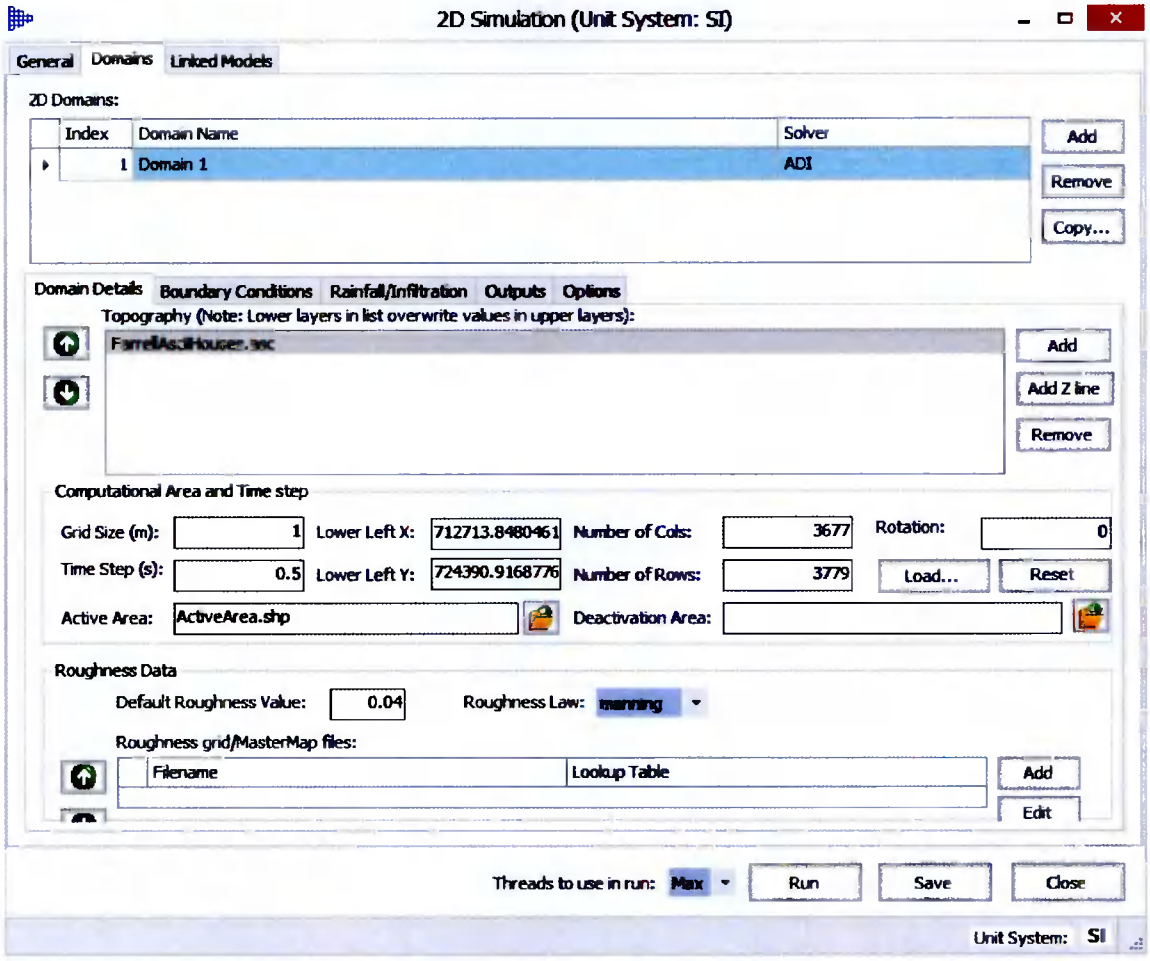
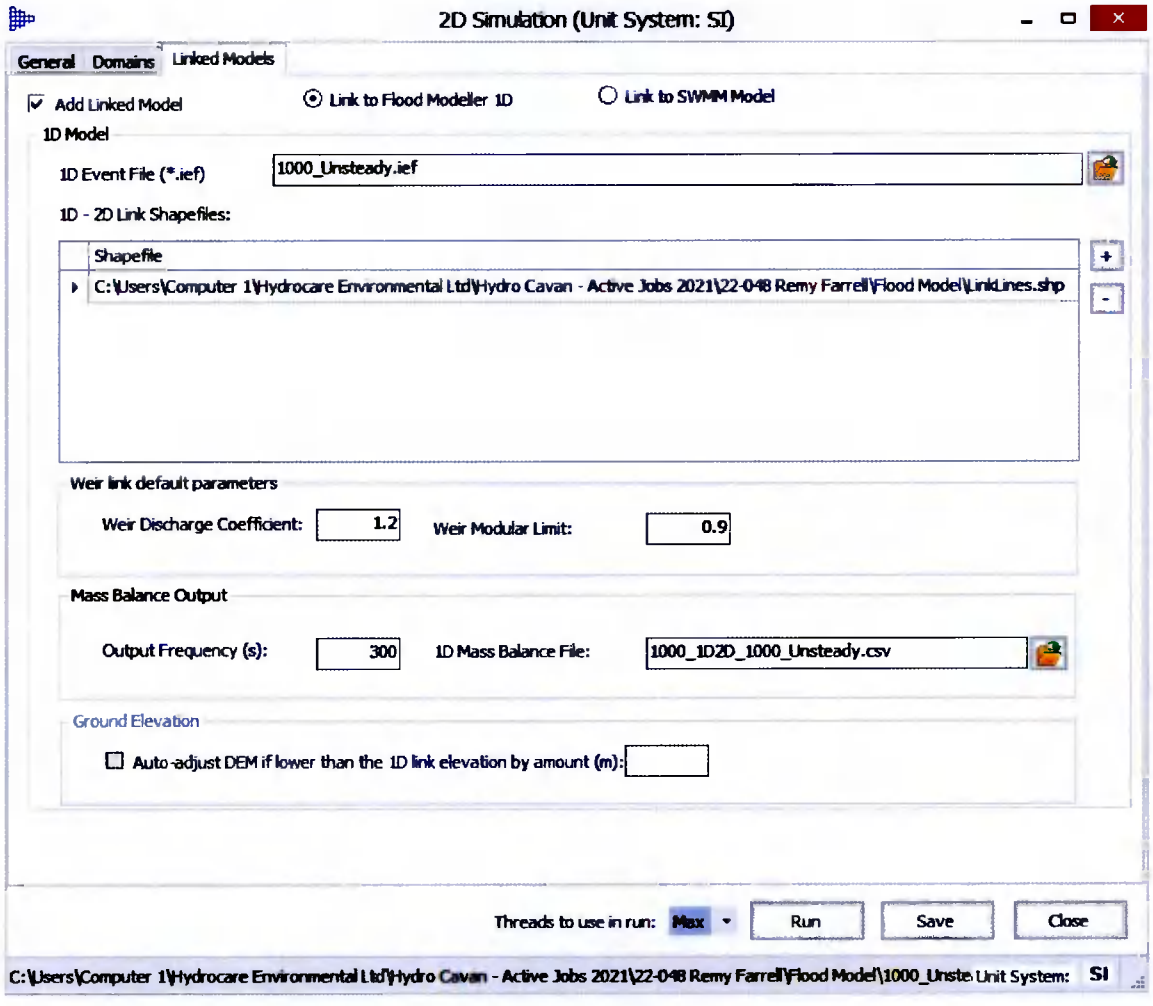
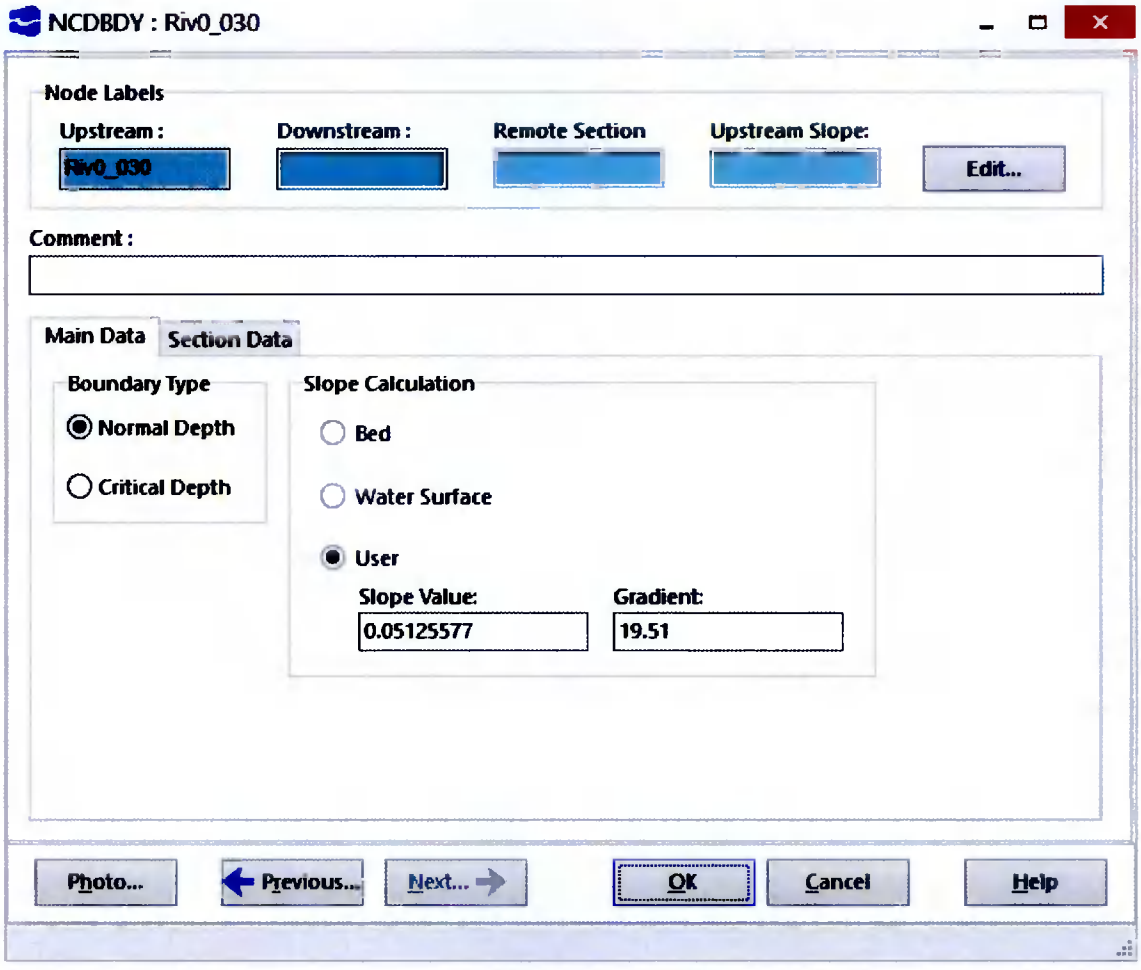
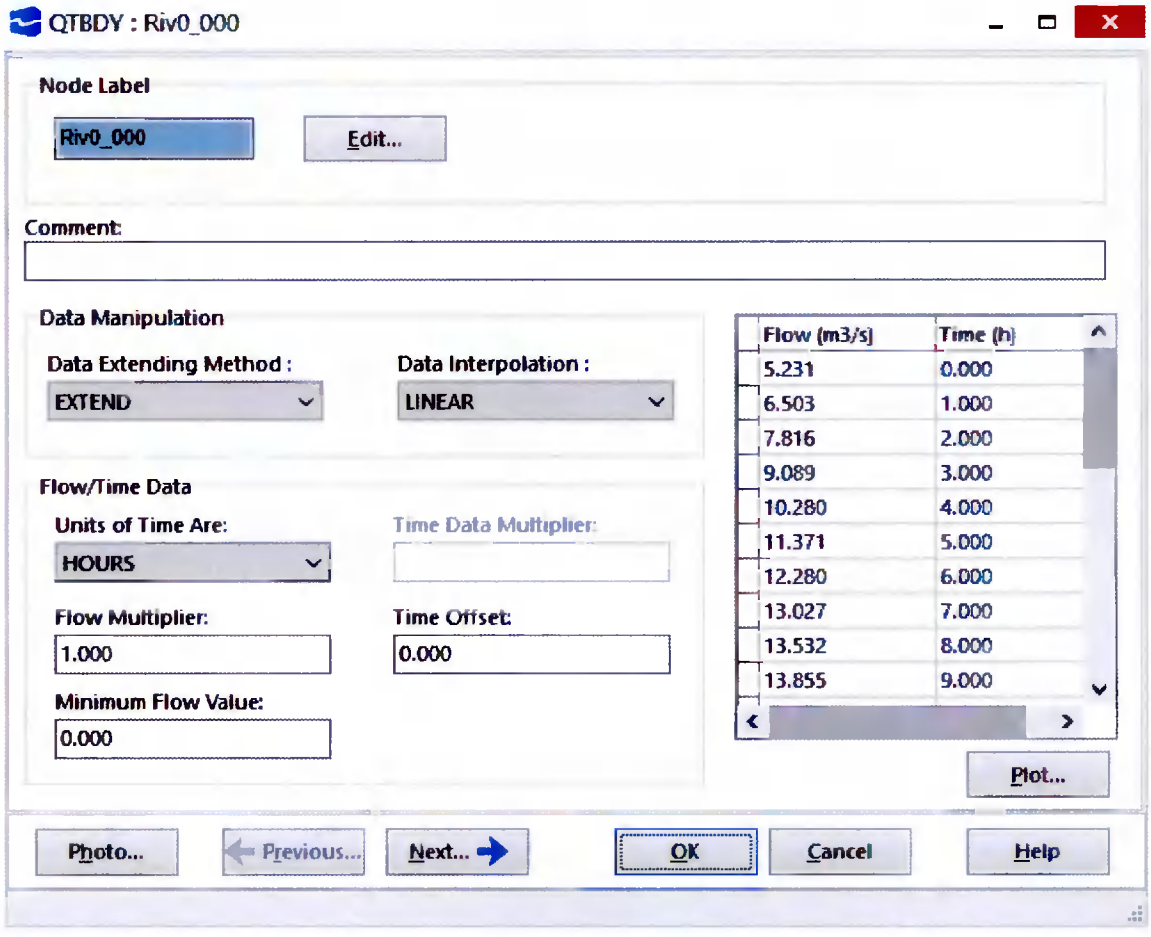
General
Domains
Linked Models
2D Model Info.
Name:
1000_1D2D
Description
Log File:
1000_1D2D.log
Run Timing
Timing options
Normal
Run to peak
Run to Steady State
Use Time Zero
->Absolute
Time unit
Hours
Start time (hrs)
0.000000
Finish time (hrs)
26.00
General options
Action on water reaching model boundary:
None
Flag mass error check after :
0
(s)
Attempt to correct negative depths
Generate spatial diagnostic output
with tolerance :
0
%
Threads to use in run:
Max
Run
Save
Close
Successfully loaded xml model 'C:\Users\Computer 1\Hydrocare Environmental Ltd\Hydro Cavan - Active Jobs 2021\22-048 Remy F Unit System: x SI

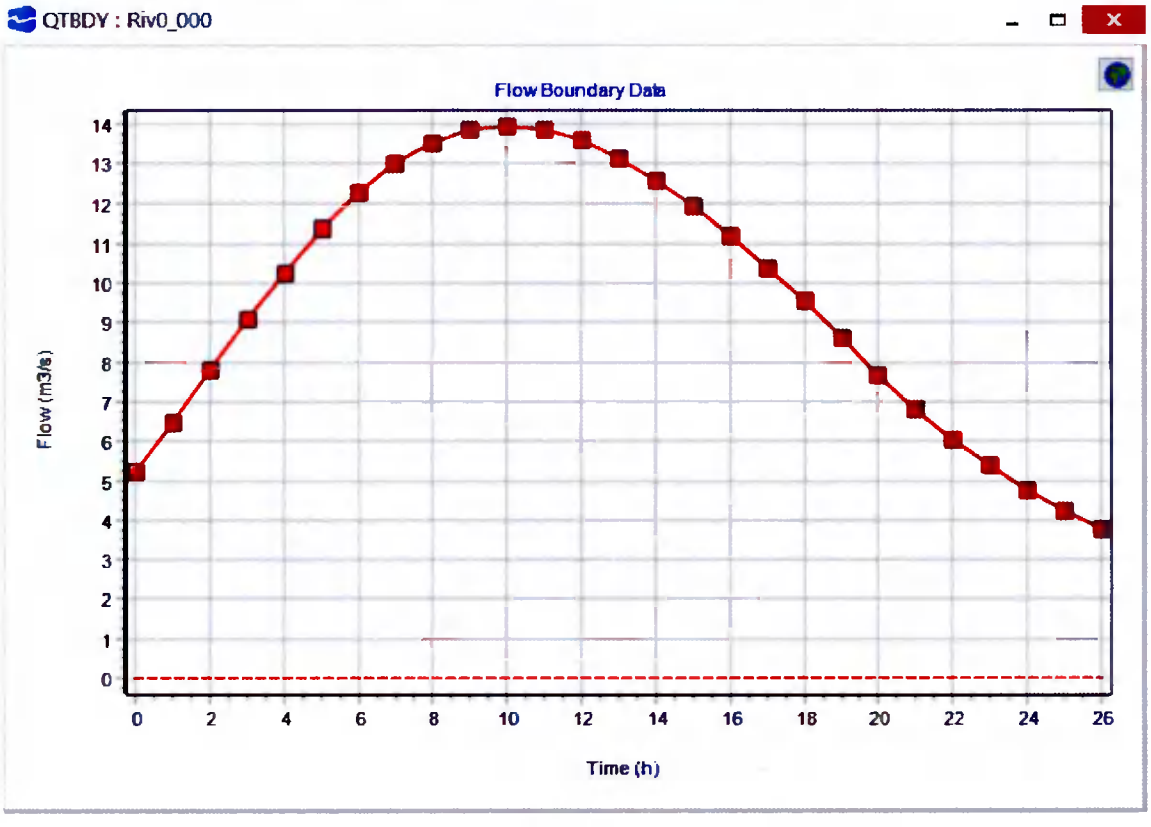

2D Simulation (Unit System: SI)
General
Domains
Linked Models
2D Domains:
Index
Domain Name
Solver
1
Domain 1
ADI
Add
Remove
Copy...
Domain Details
Boundary Conditions
Rainfall/Infiltration
Outputs
Options
Topography (Note: Lower layers in list overwrite values in upper layers):
Add
Add Z line
Remove
Computational Area and Time step
Grid Size (m):
1
Lower Left X:
712713.8480461
Number of Cols:
3677
Rotation:
0
Time Step (s):
0.5
Lower Left Y:
724390.9168776
Number of Rows:
3779
Load...
Reset
Active Area:
ActiveArea.shp
Deactivation Area:
Roughness Data
Default Roughness Value:
0.04
Roughness Law:
manning
Roughness grid/MasterMap files:
Filename
Lookup Table
Add
Edit
Threads to use in run:
Max
Run
Save
Close
Unit System:
SI


2D Simulation (Unit System: SI)
General
Domains
Linked Models
Add Linked Model
Link to Flood Modeller 1D
Link to SWMM Model
1D Model
1D Event File (*.ief)
1000_Unsteady.ief
1D - 2D Link Shapefiles:
Shapefile
C:\Users\Computer 1\Hydrocare Environmental Ltd\Hydro Cavan - Active Jobs 2021\22-048 Remy Farrell\Flood Model\LinkLines.shp
Weir link default parameters
Weir Discharge Coefficient:
1.2
Weir Modular Limit:
0.9
Mass Balance Output
Output Frequency (s):
300
1D Mass Balance File:
1000_1D2D_1000_Unsteady.csv
Ground Elevation
Auto-adjust DEM if lower than the 1D link elevation by amount (m):
Threads to use in run:
Max
Run
Save
Close
C:\Users\Computer 1\Hydrocare Environmental Ltd\Hydro Cavan - Active Jobs 2021\22-048 Remy Farrell\Flood Model\1000_Unste
Unit System:
SI


NCDBDY : Riv0_030
Node Labels
Upstream :
Riv0_030
Downstream :
Remote Section
Upstream Slope:
Edit...
Comment :
Main Data
Section Data
Boundary Type
Normal Depth
Critical Depth
Slope Calculation
Bed
Water Surface
User
Slope Value:
0.05125577
Gradient:
19.51
Photo...
Previous...
Next...
OK
Cancel
Help

Riv0_000	QTBDY	
Riv0_000	RIVER	SECTION
Riv0_001	RIVER	SECTION
Riv0_002	RIVER	SECTION
Riv0_003	RIVER	SECTION
Riv0_004	RIVER	SECTION
Riv0_005	RIVER	SECTION
Riv0_006	RIVER	SECTION
Riv0_007	RIVER	SECTION
Riv0_008	RIVER	SECTION
Riv0_009	RIVER	SECTION
Riv0_010	RIVER	SECTION
Riv0_011	RIVER	SECTION
Riv0_012	RIVER	SECTION
Riv0_012	RNWEIR	
Riv0_013	RIVER	SECTION
Riv0_014	RIVER	SECTION
Riv0_014	BRIDGE	ARCH
Riv0_015	RIVER	SECTION
Riv0_016	RIVER	SECTION
Riv0_017	RIVER	SECTION
Riv0_018	RIVER	SECTION
Riv0_019	RIVER	SECTION
Riv0_020	RIVER	SECTION
Riv0_021	RIVER	SECTION
Riv0_022	RIVER	SECTION
Riv0_023	RIVER	SECTION
Riv0_023	BLOCKAGE	
V_BR1	BRIDGE	ARCH
Riv0_024	RIVER	SECTION
Riv0_025	RIVER	SECTION
Riv0_026	RIVER	SECTION
Riv0_027	RIVER	SECTION
Riv0_028	RIVER	SECTION
Riv0_029	RIVER	SECTION
Riv0_030	RIVER	SECTION
Riv0_030	NCDBDY	


QTBDY : Riv0_000
Node Label
Riv0_000
Edit...
Comment:
Data Manipulation
Data Extending Method :
EXTEND
Data Interpolation :
LINEAR
Flow/Time Data
Units of Time Are:
HOURS
Time Data Multiplier:
Flow Multiplier:
1.000
Time Offset:
0.000
Minimum Flow Value:
0.000
Flow (m3/s)
Time (h)
5.231 0.000
6.503 1.000
7.816 2.000
9.089 3.000
10.280 4.000
11.371 5.000
12.280 6.000
13.027 7.000
13.532 8.000
13.855 9.000
Plot...
Photo...
Previous...
Next...
OK
Cancel
Help


QTBDY : Riv0_000
Flow Boundary Data
Flow (m3/s)
Time (h)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
0
2
4
6
8
10
12
14
16
18
20
22
24
26

RIVER SECTION: Riv0_000

Node Labels

Section: Riv0_000 | First Spill: | Second Spill: | Edit Labels...

Lateral Inflow Labels

First: | Second: | Third: | Fourth:

Comment :

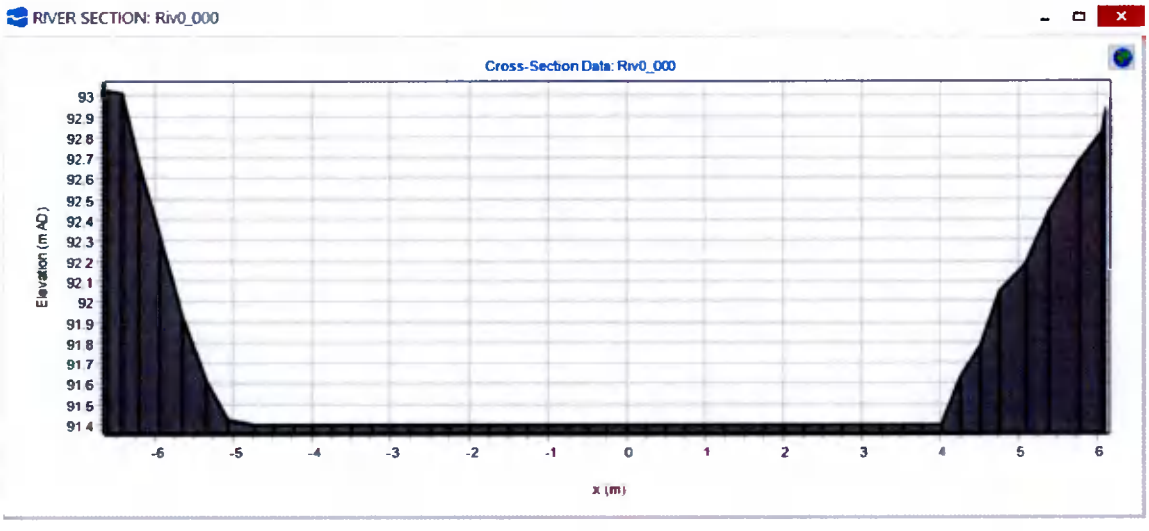
x (m)	y (m AD)	Mannings n	Panel	RPL	Marker	Easting	Northing	Deactivation	Sp. Marke
-6.617	93.026	0.040		0.000		714540.48	726203.69		1024
-6.430	93.014	0.040		0.000		714540.58	726203.53		1024
-6.208	92.683	0.040		0.000		714540.70	726203.34		1024
-5.937	92.329	0.040		0.000		714540.84	726203.11		1024
-5.646	91.928	0.040		0.000		714540.99	726202.86		1024
-5.345	91.617	0.040		0.000		714541.15	726202.60		1024
-5.069	91.422	0.040		0.000		714541.29	726202.37		1024

Distance to Next Section: 4.198 | Slope for normal depth: 0.000100 | Density: 1000.000 | Plot...

Photo... | Previous... | Next... | OK | Cancel | Help

The node label cannot be edited on this dialogue

RIVER SECTION: Riv0_000



RIVER SECTION: Riv0_006

Node Labels

Section: Riv0_006 | First Spill: | Second Spill: | Edit Labels...

Lateral Inflow Labels

First: | Second: | Third: | Fourth:

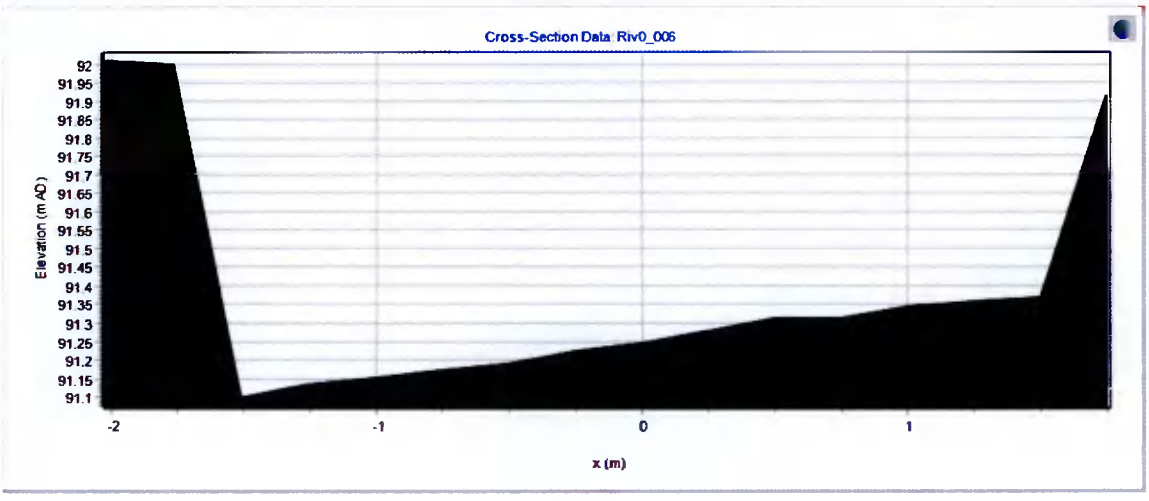
Comment :

x (m)	y (m AD)	Mannings n	Panel	RPL	Marker	Easting	Northing	Deactivation	Sp. Marke
-2.017	92.009	0.040	☐	0.000		714558.01	726218.31		1024
-1.766	91.997	0.040	☐	0.000		714558.22	726218.17		1024
-1.514	91.097	0.040	☐	0.000		714558.43	726218.03		1024
-1.261	91.134	0.040	☐	0.000		714558.64	726217.89		1024
-1.009	91.152	0.040	☐	0.000		714558.85	726217.75		1024
-0.757	91.172	0.040	☐	0.000		714559.06	726217.61		1024
-0.505	91.189	0.040	☐	0.000		714559.27	726217.47		1024

Distance to Next Section: 4.858 | Slope for normal depth: 0.000100 | Density: 1000.000 | Plot...

Photo... | Previous... | Next... | OK | Cancel | Help

RIVER SECTION: Riv0_006



RIVER SECTION: Riv0_012

Node Labels

Section: Riv0_012 | First Spill: | Second Spill: | Edit Labels...

Lateral Inflow Labels

First: | Second: | Third: | Fourth:

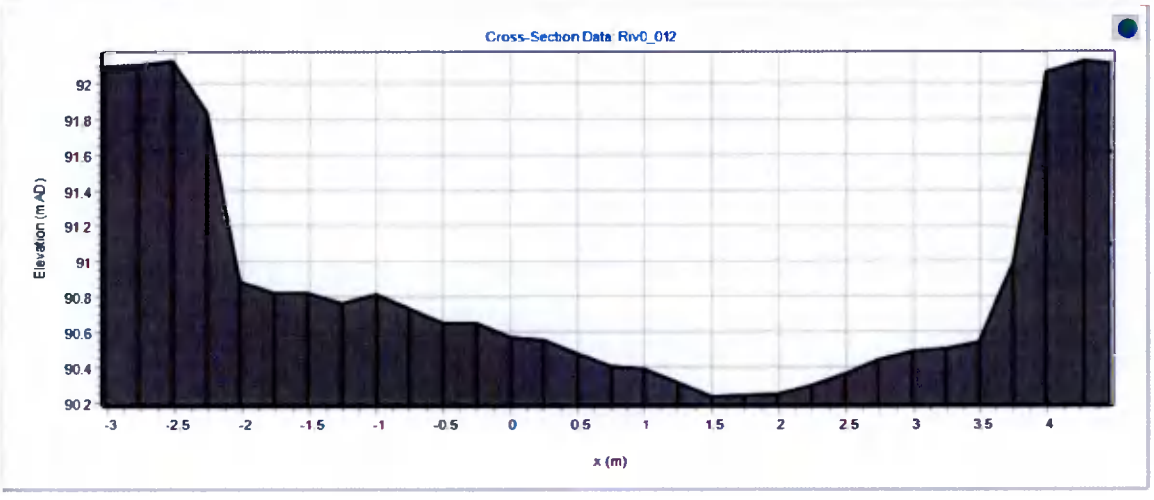
Comment :

x (m)	y (m AD)	Mannings n	Panel	RPL	Marker	Easting	Northing	Deactivation	Sp. Marke
-3.022	92.103	0.040		0.000		714555.85	726236.91		1024
-2.771	92.113	0.040		0.000		714556.05	726237.07		1024
-2.519	92.131	0.040		0.000		714556.25	726237.22		1024
-2.267	91.848	0.040		0.000		714556.45	726237.37		1024
-2.015	90.887	0.040		0.000		714556.65	726237.52		1024
-1.763	90.826	0.040		0.000		714556.85	726237.68		1024
-1.511	90.826	0.040		0.000		714557.05	726237.83		1024

Distance to Next Section: 0.000 | Slope for normal depth: 0.000100 | Density: 1000.000 | Plot...

Photo... | Previous... | Next... | OK | Cancel | Help

RIVER SECTION: Riv0_012



RNWEIR : Riv0_012

Node Labels

Upstream : Riv0_012

Downstream : Riv0_013

Edit...

Comment :

Modular Limit

Calculation Method: FIXED

Value if Fixed: 0.700

Height of Weir Crest Above Bed

Upstream (p1): 90.230

Downstream (p2): 89.600

Geometry

Elevation of Crest: 90.580

Breadth of Crest: 2.300

Length of Weir: 0.3

Coefficient of Velocity: 1.000

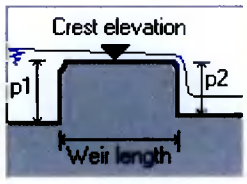


Photo... Previous... Next... OK Cancel Help

RIVER SECTION: Riv0_014

Node Labels

Section: Riv0_014 | First Spill: | Second Spill: | Edit Labels...

Lateral Inflow Labels

First: | Second: | Third: | Fourth:

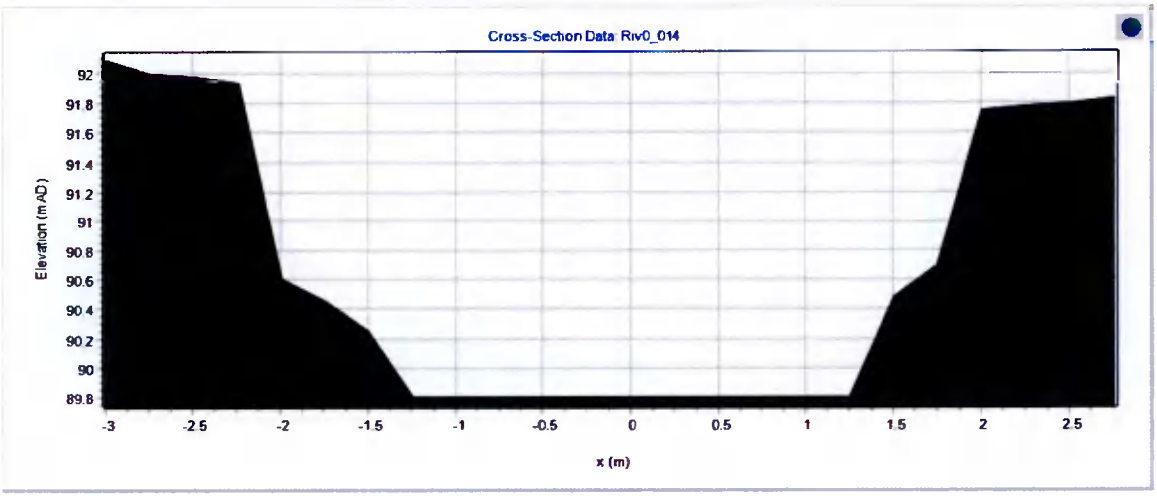
Comment :

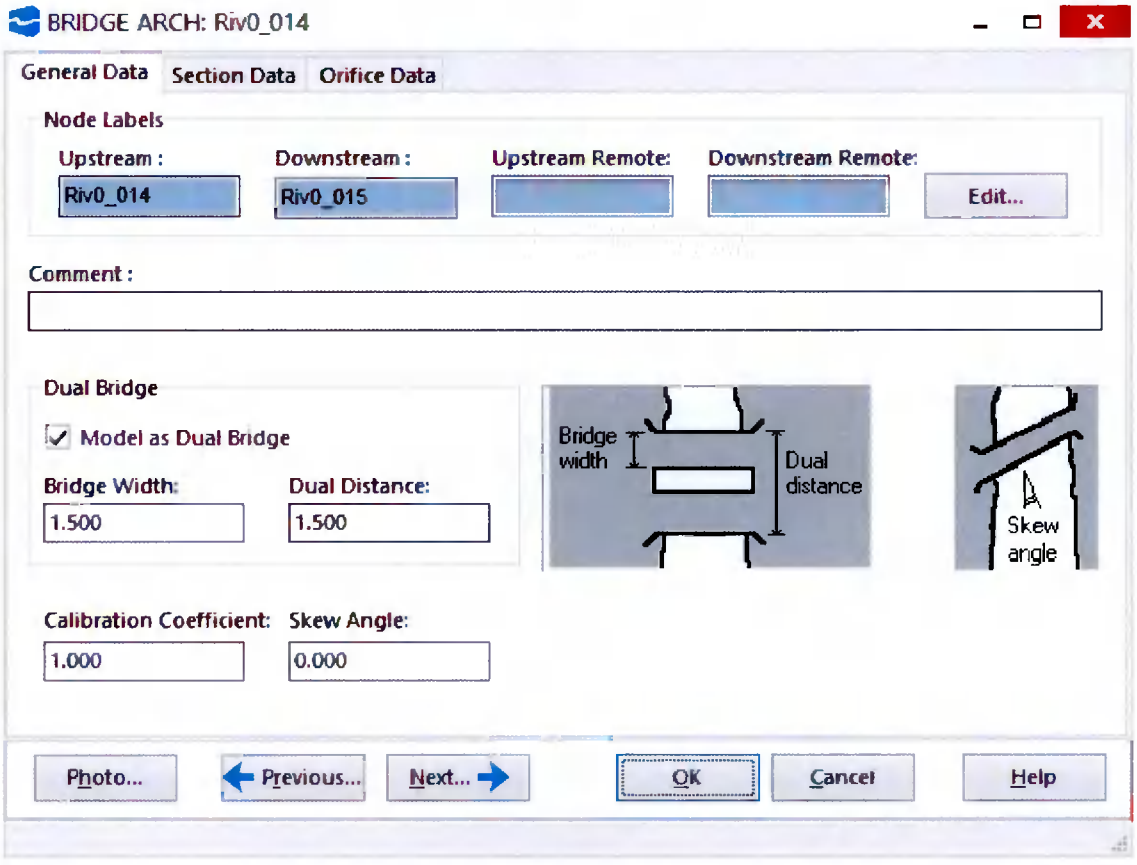
x (m)	y (m AD)	Mannings n	Panel	RPL	Marker	Easting	Northing	Deactivation	Sp. Marke
-2.991	92.087	0.040		0.000		714553.49	726240.58		1024
-2.742	91.993	0.040		0.000		714553.72	726240.68		1024
-2.493	91.976	0.040		0.000		714553.94	726240.79		1024
-2.244	91.931	0.040		0.000		714554.17	726240.90		1024
-1.994	90.600	0.040		0.000		714554.39	726241.01		1024
-1.745	90.459	0.040		0.000		714554.62	726241.12		1024
-1.496	90.250	0.040		0.000		714554.84	726241.22		1024

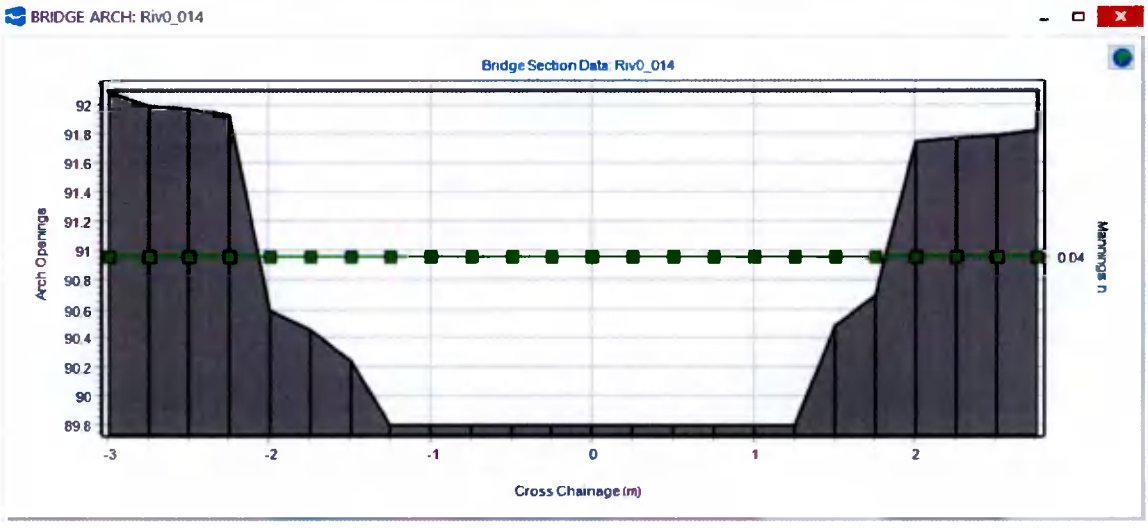
Distance to Next Section: 0.000 | Slope for normal depth: 0.000100 | Density: 1000.000 | Plot...

Photo... | Previous... | Next... | OK | Cancel | Help

RIVER SECTION: Riv0_014




BRIDGE ARCH: Riv0_014
General Data
Section Data
Orifice Data
Node Labels
Upstream :
Riv0_014
Downstream :
Riv0_015
Upstream Remote:
Downstream Remote:
Edit...
Comment :
Dual Bridge
Model as Dual Bridge
Bridge Width:
1.500
Dual Distance:
1.500
Bridge width
Dual distance
Skew angle
Calibration Coefficient:
1.000
Skew Angle:
0.000
Photo...
Previous...
Next...
OK
Cancel
Help


BRIDGE ARCH: Riv0_014
Bridge Section Data: Riv0_014
92
91.8
91.6
91.4
91.2
91
90.8
90.6
90.4
90.2
90
89.8
Arch Openings
0.04
Manning's n
-3
-2
-1
0
1
2
Cross Chainage (m)

RIVER SECTION: Riv0_018

Node Labels

Section: Riv0_018 | First Spill: | Second Spill: | Edit Labels...

Lateral Inflow Labels

First: | Second: | Third: | Fourth:

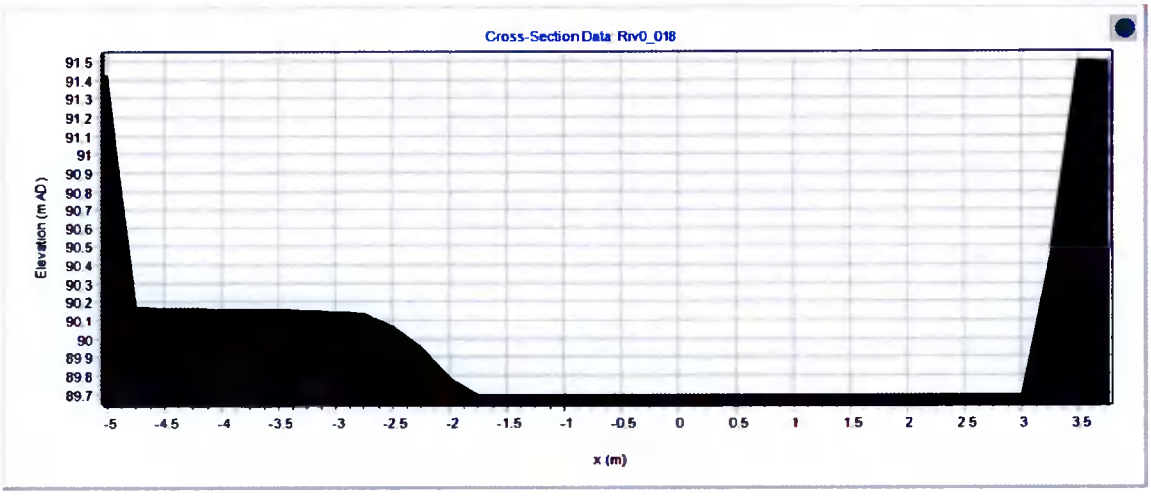
Comment :

x (m)	y (m AD)	Mannings n	Panel	RPL	Marker	Easting	Northing	Deactivation	Sp. Marke
-5.010	91.416	0.040		0.000		714548.25	726253.75		1024
-4.759	90.167	0.040		0.000		714548.50	726253.77		1024
-4.509	90.164	0.040		0.000		714548.75	726253.78		1024
-4.258	90.161	0.040		0.000		714549.00	726253.80		1024
-4.008	90.158	0.040		0.000		714549.25	726253.81		1024
-3.757	90.155	0.040		0.000		714549.50	726253.83		1024
-3.507	90.152	0.040		0.000		714549.75	726253.84		1024

Distance to Next Section: 5.647 | Slope for normal depth: 0.000100 | Density: 1000.000 | Plot...

Photo... | Previous... | Next... | OK | Cancel | Help

RIVER SECTION: Riv0_018



RIVER SECTION: Riv0_023

Node Labels

Section: Riv0_023 | First Spill: | Second Spill: | Edit Labels...

Lateral Inflow Labels

First: | Second: | Third: | Fourth:

Comment :

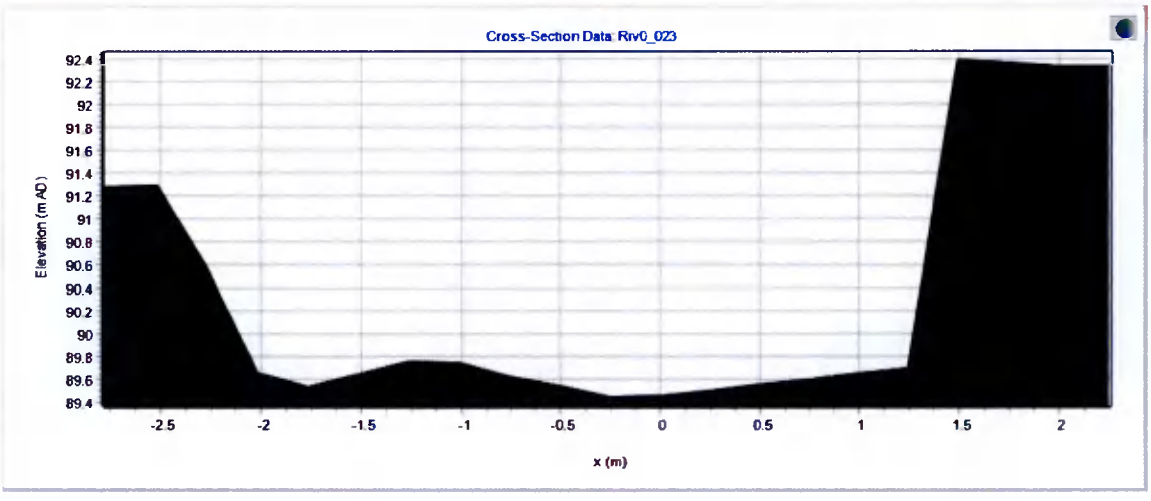
x (m)	y (m AD)	Mannings n	Panel	RPL	Marker	Easting	Northing	Deactivation	Sp. Marke
-2.776	91.286	0.040		0.000		714550.12	726276.37		1024
-2.524	91.293	0.040		0.000		714550.38	726276.41		1024
-2.271	90.580	0.040		0.000		714550.62	726276.44		1024
-2.019	89.658	0.040		0.000		714550.88	726276.48		1024
-1.767	89.542	0.040		0.000		714551.12	726276.51		1024
-1.514	89.653	0.040		0.000		714551.38	726276.54		1024
-1.262	89.765	0.040		0.000		714551.62	726276.58		1024

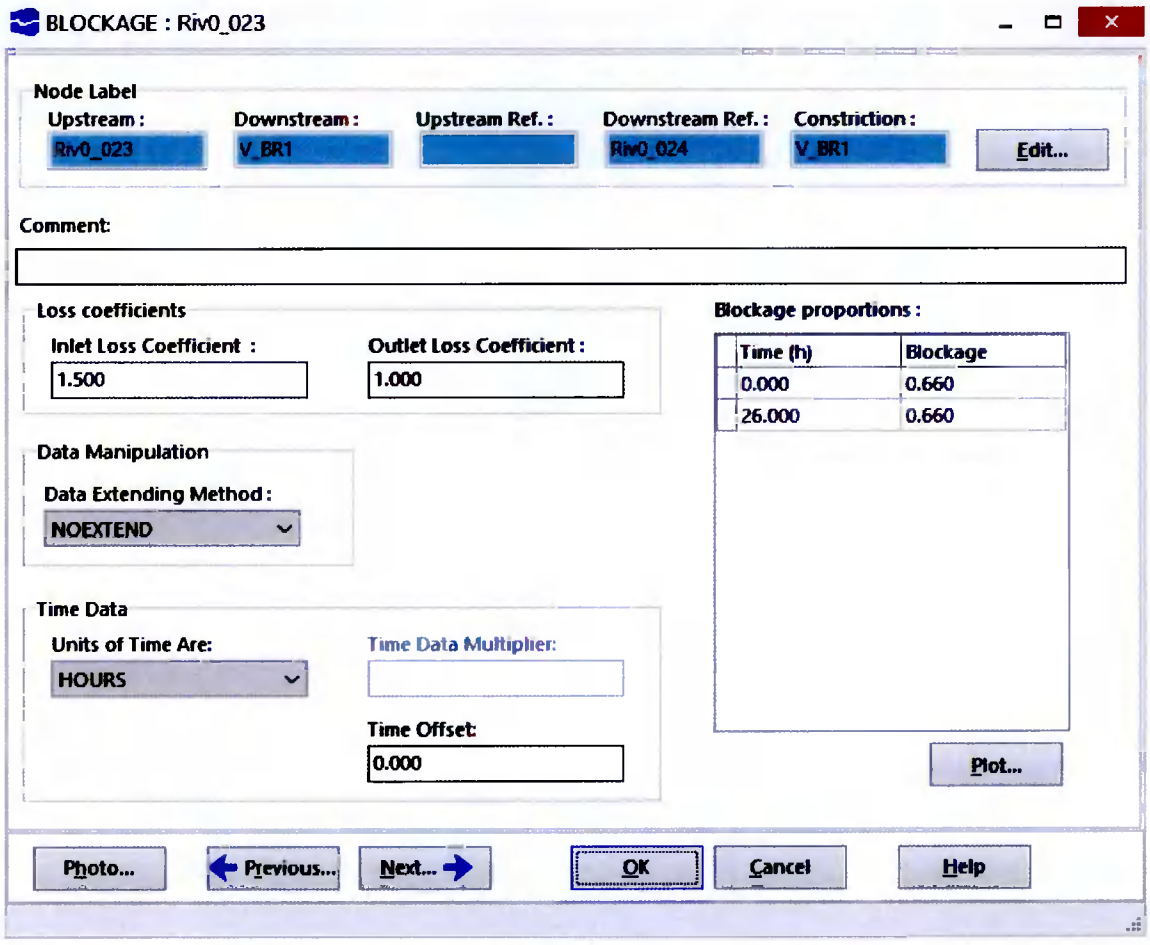
Distance to Next Section: 0.000 | Slope for normal depth: 0.000100 | Density: 1000.000 | Plot...

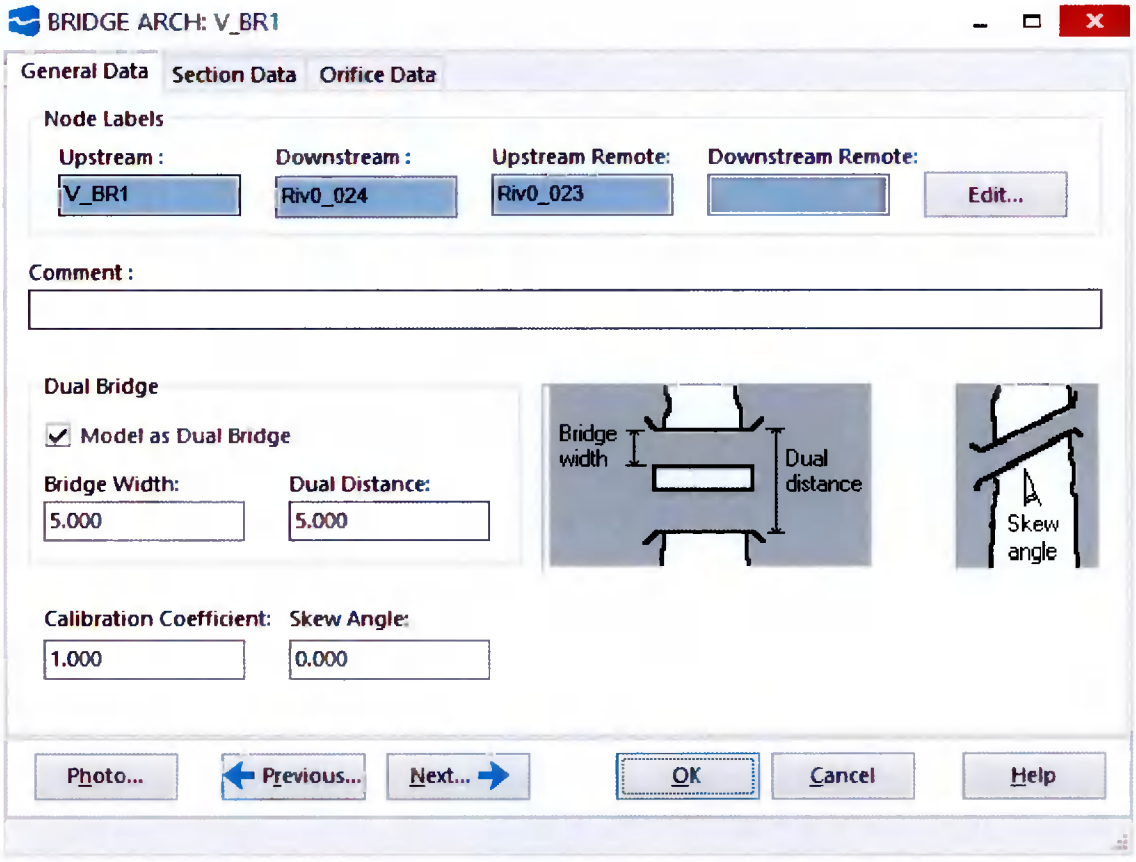
Photo... | Previous... | Next... | OK | Cancel | Help

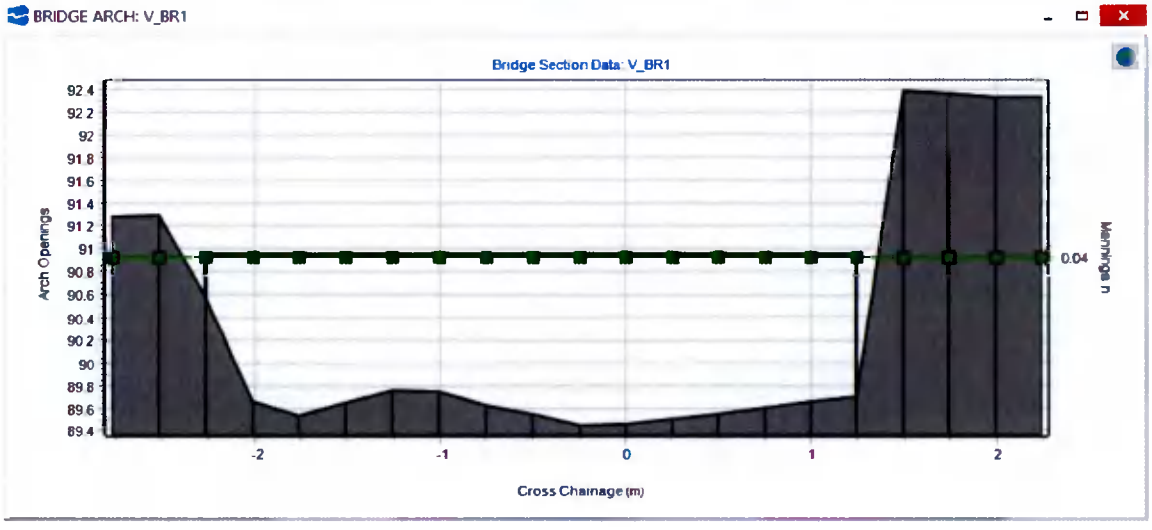
The node label cannot be edited on this dialogue

RIVER SECTION: Riv0_023




BLOCKAGE : Riv0_023
Node Label
Upstream :
Riv0_023
Downstream :
V_BR1
Upstream Ref. :
Downstream Ref. :
Riv0_024
Constriction :
V_BR1
Edit...
Comment:
Loss coefficients
Inlet Loss Coefficient :
1.500
Outlet Loss Coefficient :
1.000
Blockage proportions :
Time (h)
Blockage
0.000
0.660
26.000
0.660
Data Manipulation
Data Extending Method :
NOEXTEND
Time Data
Units of Time Are:
HOURS
Time Data Multiplier:
Time Offset:
0.000
Plot...
Photo...
Previous...
Next...
OK
Cancel
Help


BRIDGE ARCH: V_BR1
General Data
Section Data
Orifice Data
Node Labels
Upstream :
Downstream :
Upstream Remote:
Downstream Remote:
V_BR1
Riv0_024
Riv0_023
Edit...
Comment :
Dual Bridge
Model as Dual Bridge
Bridge Width:
Dual Distance:
5.000
5.000
Bridge width
Dual distance
Skew angle
Calibration Coefficient:
Skew Angle:
1.000
0.000
Photo...
Previous...
Next...
OK
Cancel
Help


BRIDGE ARCH: V_BR1
Bridge Section Data: V_BR1
92.4
92.2
92
91.8
91.6
91.4
91.2
91
90.8
90.6
90.4
90.2
90
89.8
89.6
89.4
Arch Openings
0.04
Manning n
-2
-1
0
1
2
Cross Chainage (m)

RIVER SECTION: Riv0_030

Node Labels

Section: Riv0_030 | First Spill: | Second Spill: | Edit Labels...

Lateral Inflow Labels

First: | Second: | Third: | Fourth:

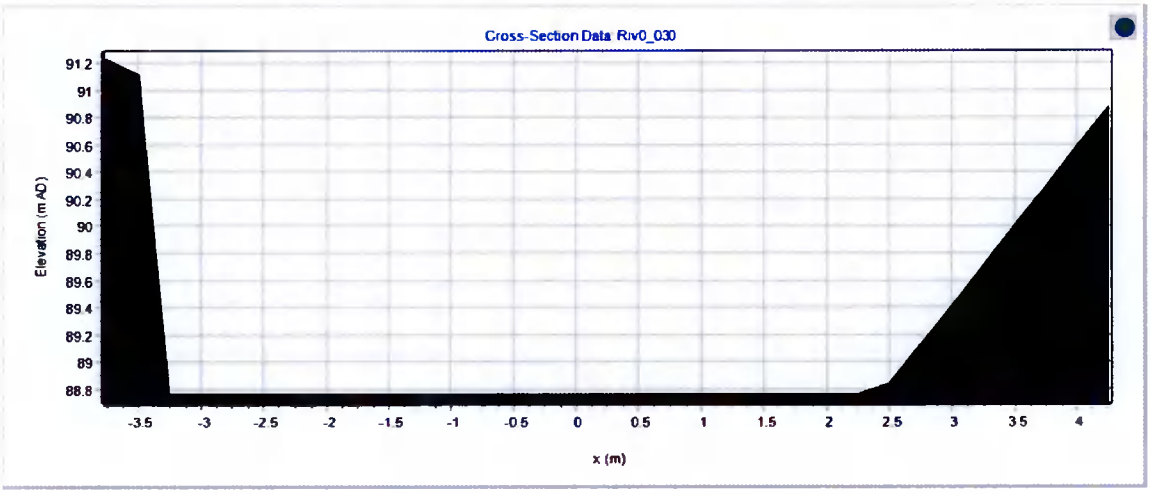
Comment :

x (m)	y (m AD)	Mannings n	Panel	RPL	Marker	Easting	Northing	Deactivation	Sp. Marke
-3.757	91.220	0.040		0.000		714526.38	726297.81		1024
-3.506	91.110	0.040		0.000		714526.40	726298.06		1024
-3.256	88.764	0.040		0.000		714526.41	726298.31		1024
-3.005	88.764	0.040		0.000		714526.43	726298.56		1024
-2.755	88.764	0.040		0.000		714526.45	726298.81		1024
-2.504	88.763	0.040		0.000		714526.46	726299.06		1024
-2.254	88.763	0.040		0.000		714526.48	726299.31		1024

Distance to Next Section: 0.000 | Slope for normal depth: 0.000100 | Density: 1000.000 | Plot...

Photo... | Previous... | Next... | OK | Cancel | Help

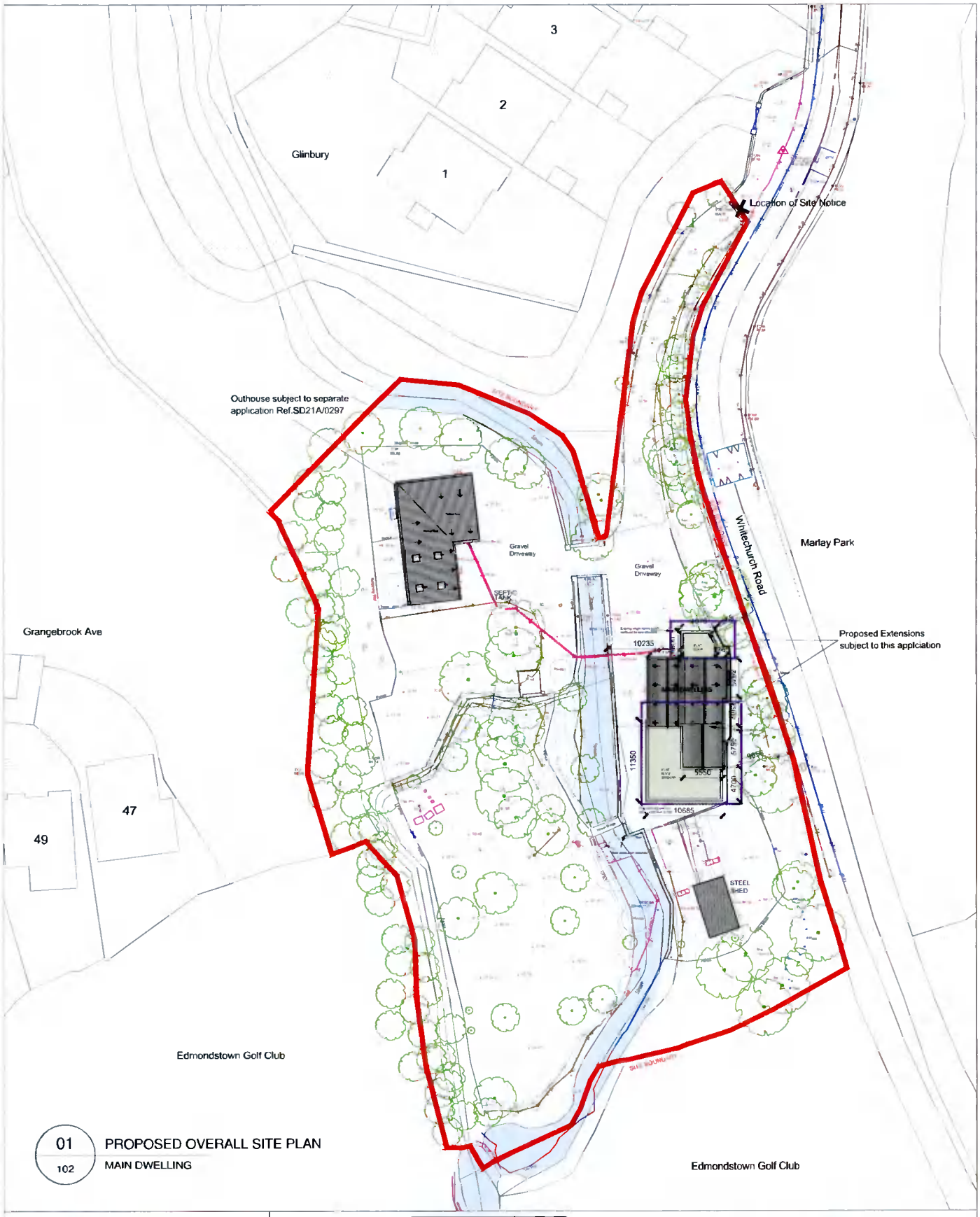
RIVER SECTION: Riv0_030



APPENDIX D

Refer Overleaf for

- Current Site Layout Drawing
- Scaled Site Survey Drawing
- Flood Extent Mapping



01 / 102 PROPOSED OVERALL SITE PLAN

MAIN DWELLING

NOTES

EXISTING FOUL DRAINAGE

N

NORTH

56A RAMLEH PARK
MILLTOWN
DUBLIN 6
m. + 353 (0)87 7982356
e : katie.jakkulla@gmail.com

RIAI Registered Architect 2022 PSDP Accreditation P

JAKKULLA ARCHITECTURE & DESIGN

ARCHITECTURE & DESIGN CONSULTANCY

CLIENT NAME	REMY FARRELL
PROJECT NAME	PROPOSED EXTENSION AT LISSADELL, WHITECHURCH ROAD, RATHFARNHAM, DUBLIN 16
DRAWING TITLE	PROPOSED OVERALL SITE PLAN

PROJECT NR	DRAWING NO	REV	SCALE(S)	STATUS	DATE DRAWN	DRAWN BY	CHECKED BY
2021-111	3.1_102	A	1:500 @A3	3.1 FURTHER INFORMATION	APR 22	KJ	

REV	DATE	DESCRIPTION

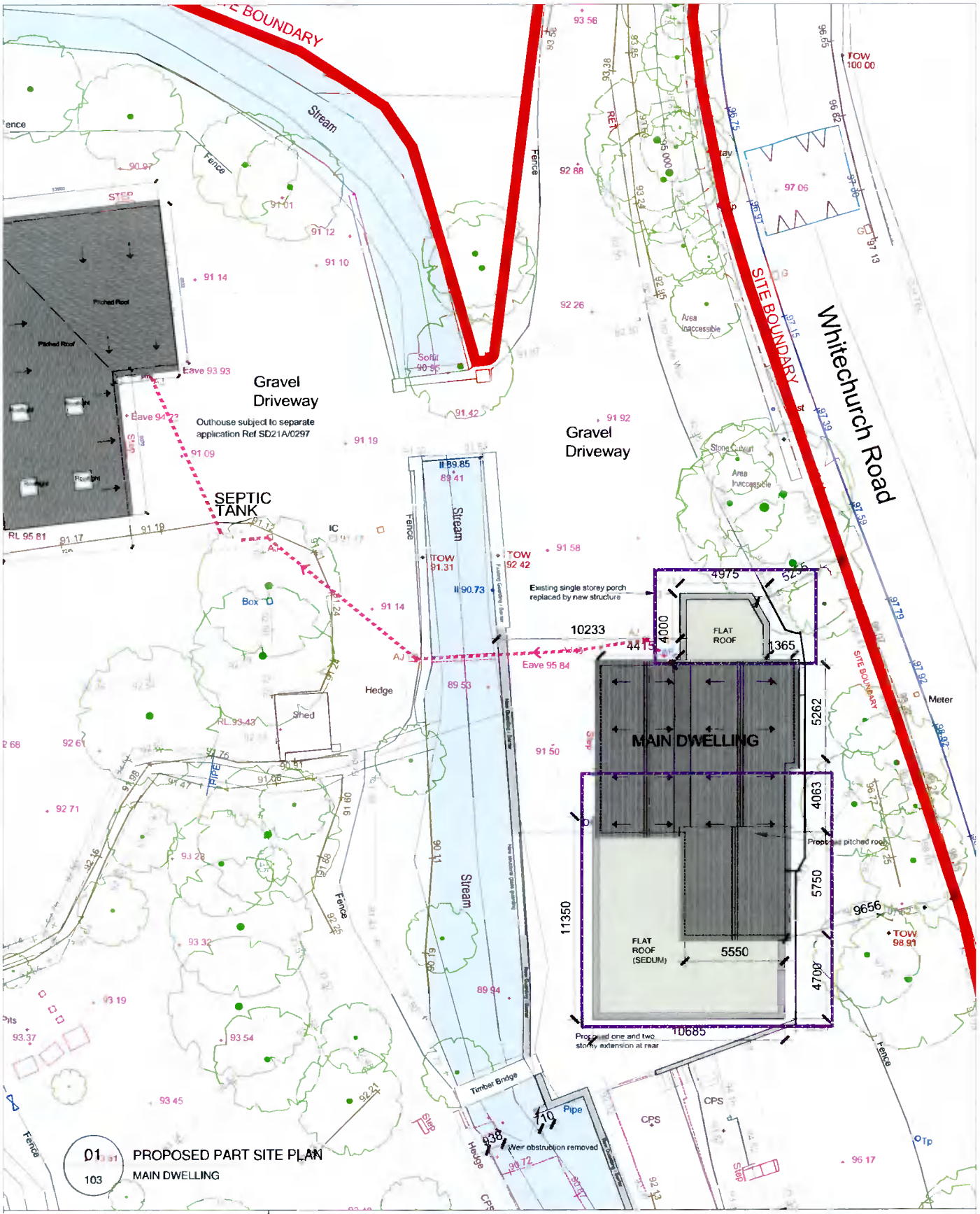
HYDROCARE ENVIRONMENTAL LTD

Tel: 0419842378 / 0877905155
E-mail: info@hydrocare.ie

TOPOGRAPHICAL SITE SURVEY

REMY FARRELL
LISADELL, WHITECHURCH RD.,
RATHFARNHAM, DUBLIN 16

SCALE 1:500 DATE: 29/04/2022



01 PROPOSED PART SITE PLAN
103 MAIN DWELLING

NOTES

N
NORTH

56A RAMLEH PARK
MILLTOWN
DUBLIN 6
m: + 353 (0)87 7982356
e: katie.jakkulla@gmail.com

RIAI Registered Architect 2022 PSCP Accredited P

JAKKULLA ARCHITECTURE & DESIGN

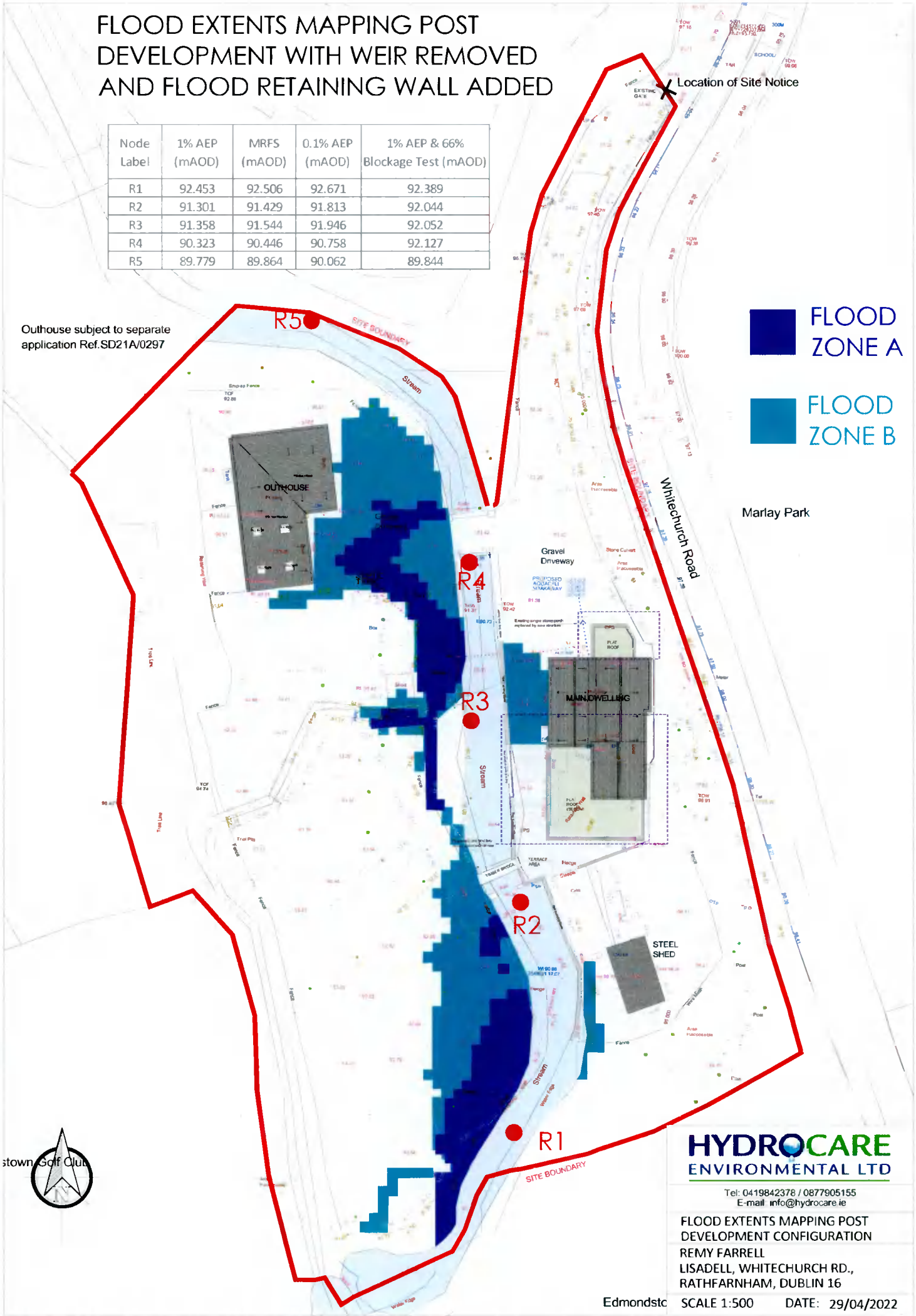
CLIENT NAME	REMY FARRELL
PROJECT NAME	PROPOSED EXTENSION AT LISSADELL, WHITECHURCH ROAD, RATHFARNHAM, DUBLIN 16
DRAWING TITLE	PROPOSED PART SITE PLAN - MAIN DWELLING

PROJECT NO	DRAWING NO	REV	SCALE(S)	STATUS	DATE DRAWN	DRAWN BY	CHECKED BY
2021-111	3.1_103	A	1:200 @A3	3.1 FURTHER INFORMATION	APR 22	KJ	

REV	DATE	DESCRIPTION

FLOOD EXTENTS MAPPING POST DEVELOPMENT WITH WEIR REMOVED AND FLOOD RETAINING WALL ADDED

Node Label	1% AEP (mAOD)	MRFS (mAOD)	0.1% AEP (mAOD)	1% AEP & 66% Blockage Test (mAOD)
R1	92.453	92.506	92.671	92.389
R2	91.301	91.429	91.813	92.044
R3	91.358	91.544	91.946	92.052
R4	90.323	90.446	90.758	92.127
R5	89.779	89.864	90.062	89.844



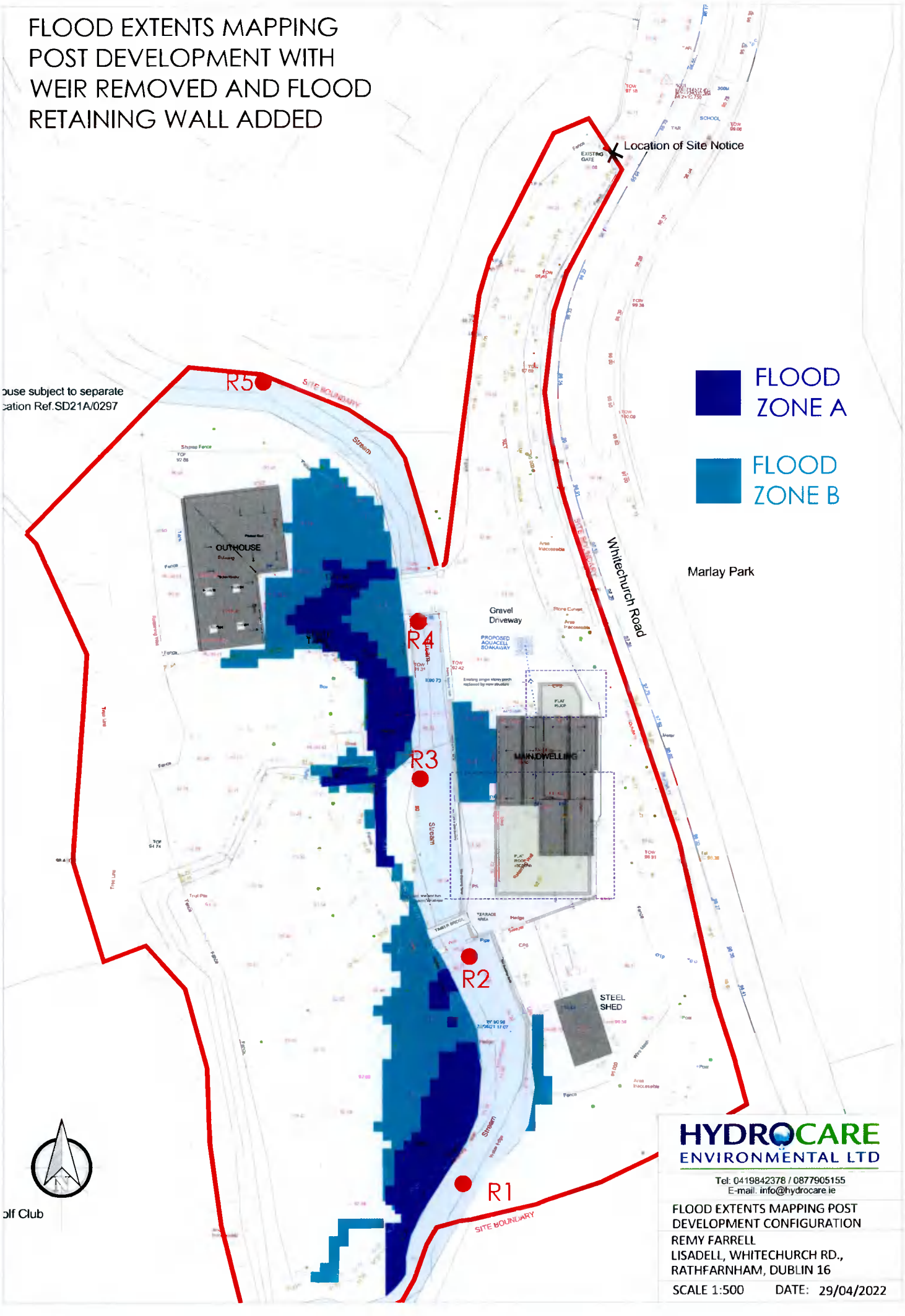
HYDROCARE ENVIRONMENTAL LTD

Tel: 0419842378 / 0877905155
E-mail info@hydrocare.ie

FLOOD EXTENTS MAPPING POST DEVELOPMENT CONFIGURATION
REMY FARRELL
LISADELL, WHITECHURCH RD.,
RATHFARNHAM, DUBLIN 16

SCALE 1:500 DATE: 29/04/2022

FLOOD EXTENTS MAPPING POST DEVELOPMENT WITH WEIR REMOVED AND FLOOD RETAINING WALL ADDED



HYDROCARE ENVIRONMENTAL LTD

Tel: 0419842378 / 0877905155
E-mail. info@hydrocare.ie

FLOOD EXTENTS MAPPING POST DEVELOPMENT CONFIGURATION

REMY FARRELL
LISADELL, WHITECHURCH RD.,
RATHFARNHAM, DUBLIN 16

SCALE 1:500 DATE: 29/04/2022