

# CRAIGIE BURN

## Flood Protection Scheme

### 01\_INTRODUCTION

#### Welcome to the community public exhibition for the Craigie Burn Flood Protection Scheme

The purpose of this event is to provide you with an update on the extensive work carried out as part of the **Craigie Burn Flood Protection Scheme**, including:

- Flood risk and flooding mechanisms in the catchment;
- Proposal for managing flood risk within the Craigie Burn Catchment, and;
- Other action to raise awareness of flood risk and improve flood resilience.

#### Your Views

We value your input and want to ensure that your opinions are clearly heard. This consultation event provides a platform for you to express your views on the recommended flood protection scheme. Your feedback is important to us in deciding how to take our proposals forward.

Representatives from the Council’s Flooding Team and the design consultant, Amey Consulting Ltd, are here today.

As you review the information boards, please consider:

- Do the flood maps reflect flooding you have experienced or observed locally?
- Are there any locations where you believe flooding has not been represented accurately?
- Do you have any concerns about the proposed flood protection scheme?
- Is there any local knowledge that could help inform the ongoing design of the flood protection scheme?
- Are there any potential impacts that should be considered as the project develops?

We thank you for taking the time to attend this event. Your views matter, and we look forward to hearing your feedback on the recommended flood protection scheme.

#### Flood history

There is a history of flooding in Perth from the Craigie Burn, and its tributaries — the Scouring and Buckie Burns.

Notable flood events that have caused significant flooding in the Craigie Burn catchment have occurred in September 1981, February 1990, January 1993, June 2002, November 2012, August 2020, September 2022 and more recently in October 2023 and July 2025.

Flooding in the catchment can be driven by short intense storm events (typically during summer) and from more prolonged rainfall (typically during winter).

As well as flooding directly from the watercourses, surface water flooding (both overland flows and sewer) has also been observed previously.

1993



**January 1993** // Overtopping of Necessity Brae towards Low Road (Source — The Great Flood, Perth & Kinross District Council, 1993)

2002



**June 2002** // Flooding at Queens Avenue  
Source: Cargill *et al.* (2004) Flash Floods on the Craigie Burn, Perth, Scotland. Weather (vol. 59) pp 12-14.

2020



**11-12 August 2020** // Queens Street  
(Source: The Courier)



**11-12 August 2020** // Post-flood damage at Windsor Terrace  
(Source: PKC records)

2022



**8 September 2022** // Queen Street  
(Source: SEPA)



**8 September 2022** // Murray Crescent  
(Source: PKC)

2023



**October 2023** // Queen Street  
(Source: PKC)



**July 2025** // Queen Street  
(Source: PKC records)



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# CRAIGIE BURN Flood Protection Scheme

## 02\_BACKGROUND

### Craigie Burn Flood Study:

Under the Flood Risk Management (Scotland) Act 2009, SEPA and lead local authorities publish Flood Risk Management Plans (FRMP) and Local Flood Risk Management Plans (LFRMP) every 6 years. A FRMP and LFRMP include actions to further improve our understanding of flood risk in areas most at risk of flooding (also known as Potentially Vulnerable Areas).

The Craigie Burn is located in the River Tay catchment within the Perth and Almondbank Potentially Vulnerable Area (PVA) 02/08/12 as defined by SEPA's National Flood Risk Assessment for Scotland. An action was included within this PVA in the current Tay LFRMP (2022 to 2028) to carry out a flood study (Ref: 25302) to investigate the risk of river (fluvial) flooding from the Craigie Burn.

In order to address this, the Council engaged consulting engineers, Amey Consulting, to undertake a flood study. The flood study considered a range of options, detailed in Figure 1 on this slide, for managing flood risk in the Craigie Burn area. However, the benefit of these options was limited mainly due to the presence of the existing Perth flood protection scheme assets in the catchment, such as flood storage ponds at Broxden and the South Inch reservoir.

However, the study concluded that Option 11 be taken forward as the recommended scheme as it achieved a Benefit Cost Ratio (BCR) of 1.42 and a 1 in 100-year standard of protection, Figure 2 details the catchment and location for this option.

Option 11 consists of:

- **Upsizing the twin 800mm pipe culvert at Queen's Avenue to a box culvert;**
- **Dredging 200 mm of the Craigie Burn riverbed along Balmoral Place and Queen's Avenue.**

The study was the subject of a public consultation exercise during June 2023 via the Council's Consultation Hub and local drop-in sessions. All feedback from the consultation exercise was collated and addressed through a Question and Answer Report and published at that time on the Consultation Hub.

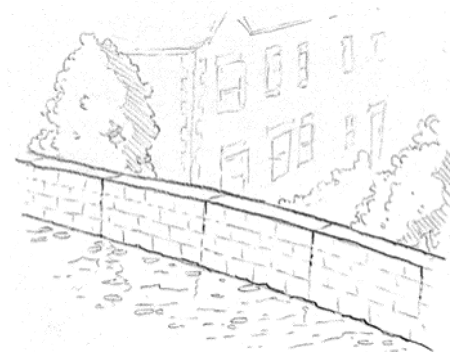
The conclusions and recommendations of the study were presented and approved at the Climate Change and Sustainability Committee on 27 November 2023.

### What was considered in the study?

A range of structural and non structural options were considered, including:

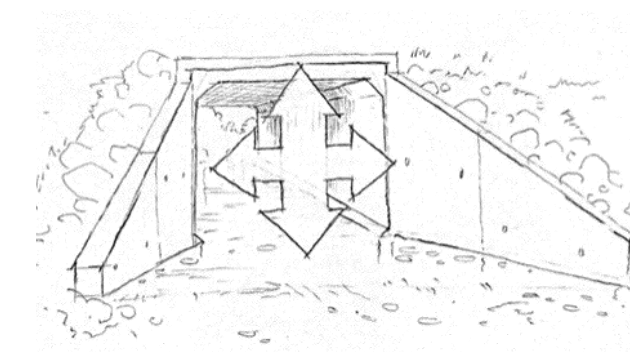
#### Direct Defences

This group of measures include construction of flood walls and embankments.



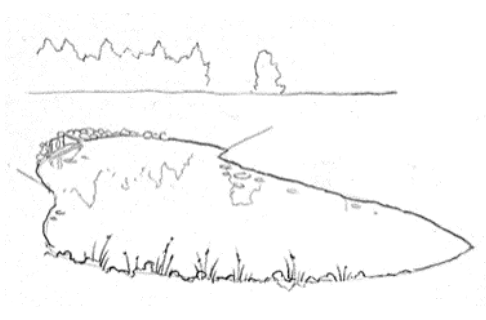
#### Conveyance Improvements

This includes channel modifications and culvert upgrades to increase flow capacity



#### Upstream Storage

Measures to create new, or up-size existing storage areas were considered



#### Natural Flood Management (NFM)

NFM techniques work with natural processes to manage flood risk, and work on the principle of slowing the flow down in the upper catchment. Measures include, tree planting, field ditch/drain blocking, leaky barriers and channel re-profiling.



#### Non-structural measures

Property level flood resilience and flood warning schemes These were considered separately from the structural measures.

The flashy nature of the Craigie Burn means that limited warning time is available to make a formal flood warning scheme feasible. The community is working with SFF to install a rivertrack system that will help to improve personal resilience to flooding.

Property level flood resilience measures are encouraged to be

### What progress has been made since the study was completed?

On 28 February 2024, Perth and Kinross Council took the decision to invest £1M to bring forward the delivery of the recommend Dunkeld and Craigie Burn flood protection schemes.

In April 2025, consulting engineers, Amey Consulting, were appointed to progress the recommended flood protection scheme. Their appointment includes:

- The review and refinement of the hydraulic model (see board 3),
- Assessment of its environmental impact (see board 3),
- Development of the recommended option into an outline design and public consultation (see board 4),
- Statutory process - including Publication and confirmation of the scheme, and application of Deemed Planning Consent (see board 8),
- Development of detailed design and public consultation (see board 8),
- Procurement of a contractor (see board 8),
- Site supervision (see board 8).

### Study Option Appraisal

A summary of the study short listed options appraisal is shown in the table below:

| Short-list of options                                                                                       | Benefit Cost Ratio |
|-------------------------------------------------------------------------------------------------------------|--------------------|
| Option 1 - Upstream Storage and NFM South of M90                                                            | <1                 |
| Option 3 – Improved Storage at A93 Glasgow Road ('Wet' Ponds)                                               | 0.66               |
| Option 4 – Improved Attenuation at Perth FPS Storage Area ('Dry' Ponds)                                     | Not assessed       |
| Option 5 – Necessity Brae (Cherrybank) Culvert Upsizing and Storage Area                                    | Not assessed       |
| Option 7 – Channel Modifications from Buckie Braes to South Inch                                            | 1.00*              |
| Option 8 – Attenuation Low Road to Woodside Crescent                                                        | 0.60               |
| Option 9 – Orchard Place Raised Embankments and Flood Walls                                                 | Not assessed       |
| Option 10 – Queen's Avenue Culvert Upsizing                                                                 | 1.39               |
| <b>Option 11 – Balmoral Place and Queen's Avenue Channel Modification + Queen's Avenue Culvert Upsizing</b> | <b>1.42</b>        |
| Option 12 – Croft Park Overtopping and Sewers Alleviation                                                   | Not assessed       |
| Option 16 – South Inch Spill Mechanism Reprofiling                                                          | 0.88               |

Figure 1: List of options assessed in the 2023 Craigie Burn Flood Study

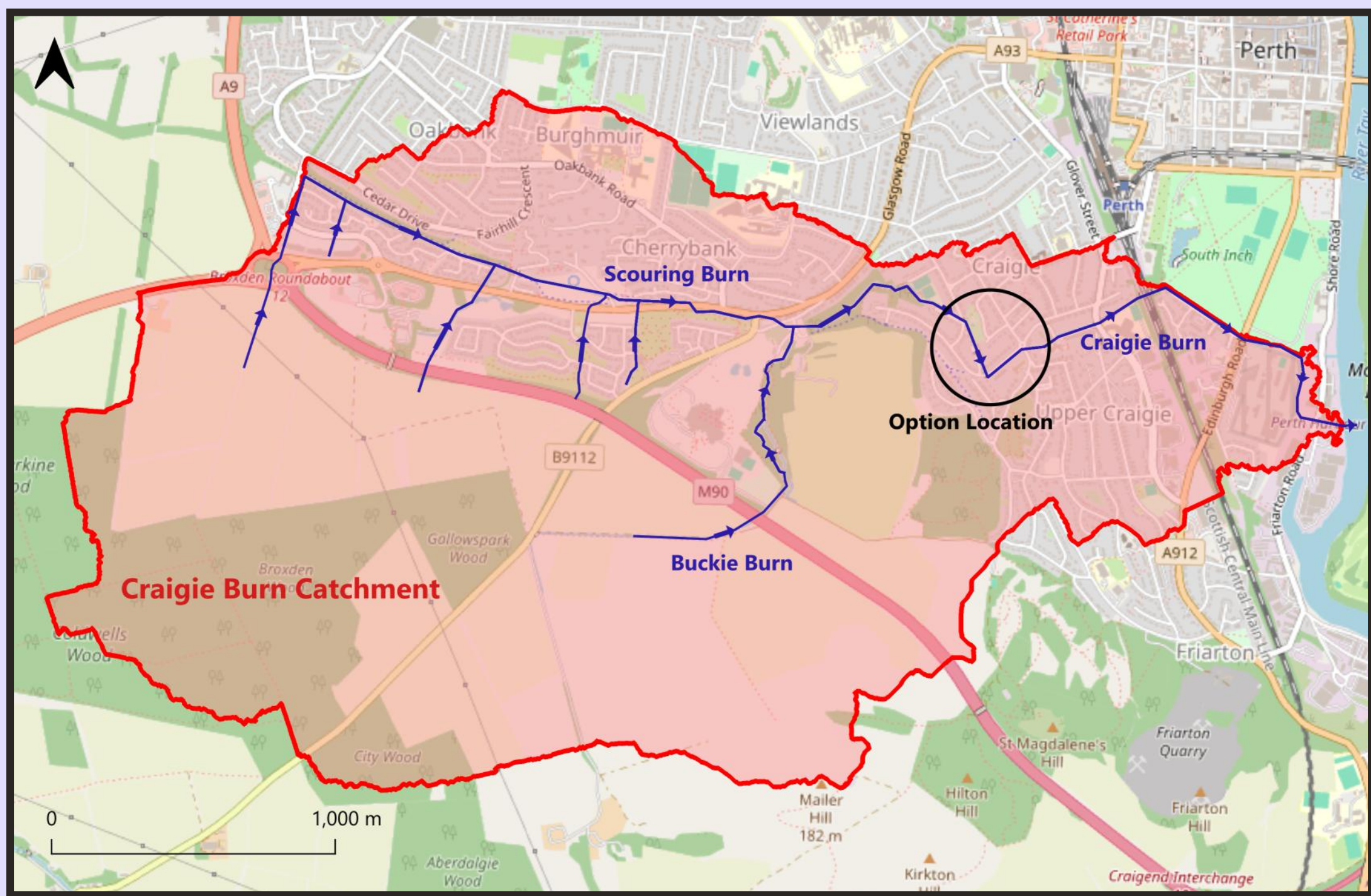


Figure 2: Craigie burn catchment and Option 11 location.

# CRAIGIE BURN

## Flood Protection Scheme

### 03\_FLOOD RISK

#### Flood Risk Maps

The flood maps in board 4 display the estimated **1% Annual Exceedance Probability (AEP) design flood event** (i.e. *A 1% annual chance means a 1 in 100 chance of a flood of this size or larger in any year. It does not mean flooding happens only once every 100 years*).

The main areas of flooding are well defined, but your experience may differ slightly from the flood extents predicted by the hydraulic model—for more information refer to 'What about my property'.

The model shows that flooding is caused by a combination of watercourse and surface water mechanisms. The recommend scheme is expected to reduce flooding associated with the water-course, but they are not intended to address all surface water flooding identified by the model.

**The flood maps and statistics presented are based on the present-day 1% AEP (1 in 100 year) modelled event with an 11-hour storm duration.**

A 39% climate change uplift to peak rainfall intensity has been identified for the catchment and was considered separately as part of the future resilience assessment. Climate change is expected to increase peak rainfall intensity within the catchment, which may increase the frequency and extent of flooding in the future.

#### Residual Flood Risk

It is very important to be aware that a flood scheme can never completely eliminate the risk of flooding, as there will always be a residual risk of water overtopping the flood defences, should a greater flood occur than the designed level of flood protection.

Climate Change is increasing the severity and frequency of extreme rainfall events and Property Flood Resilience would always be recommended for any vulnerable areas located behind flood protection schemes as another layer of resilience to reduce the impact of flooding both now and in the future.

#### Initial Environment Assessment

An Initial Environmental Review was undertaken to assess the potential environmental effects of the proposed Craigie Burn Flood Protection Scheme. The assessment concluded that a formal Environmental Impact Assessment (EIA) is not required because the proposed works are relatively small in scale, are located within an existing urban watercourse corridor, and do not meet the thresholds set out in the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 for flood relief works. The review found that significant environmental effects are unlikely, provided that appropriate mitigation measures are implemented during construction.

The mitigation measures will be considered further during the development of detailed design.

#### Flood Mechanisms

The hydraulic model is an **integrated model**, meaning it considers surface water flood risk alongside the risk from the watercourse. It includes watercourses, overland flow and the existing sewer drainage network. The sewer network was provided by Scottish Water.

This has allowed us to further improve our understanding of the well-observed flood risk mechanisms in the catchment. Notable findings are:

The **critical duration** of the catchment for the specific modelled river-flood scenarios, which is the duration of the storm that causes the flooding with the highest damages, is **11 hours**. This means that the worst **flooding from the watercourses** is expected to happen when a storm of this duration occurs in the catchment.

While flooding from rivers and watercourses is a significant contributor to flooding, **surface water flooding** has also been identified as having a major impact on the extent of flooding in these areas. This means that the flooding in these areas cannot be attributed solely to one source. This is particularly noticeable during **shorter storms**.

The catchment is made up of both **urban** and **rural** areas, and this mix of environments leads to substantial flows even during shorter storms. The combination of urban and rural areas contributes to the overall flood risk in the catchment, regardless of the storm duration.

#### Level of Flood Protection

The proposed flood scheme considered various standards of protection up to the 0.5% AEP including climate change. A detailed analysis found the **1% AEP** (1 in 100 year) event was the most appropriate and cost-effective standard of protection.

#### Surface Water Flood Risk

The outline design of the preferred scheme directly targets watercourse flooding, but some localised surface water flood risk remains. The secondary flooding mechanism from surface water is currently being considered further to determine if additional storage can be provided to reduce or remove this to the 1% AEP standard of protection. Where surface water flood risk remains, please come and speak to us about options to resolve this on a property-by-property basis. Examples are shown in the figures below.



Air Brick Cover



Door Barrier



Synthetic Sandbag



Toilet Seat Seal

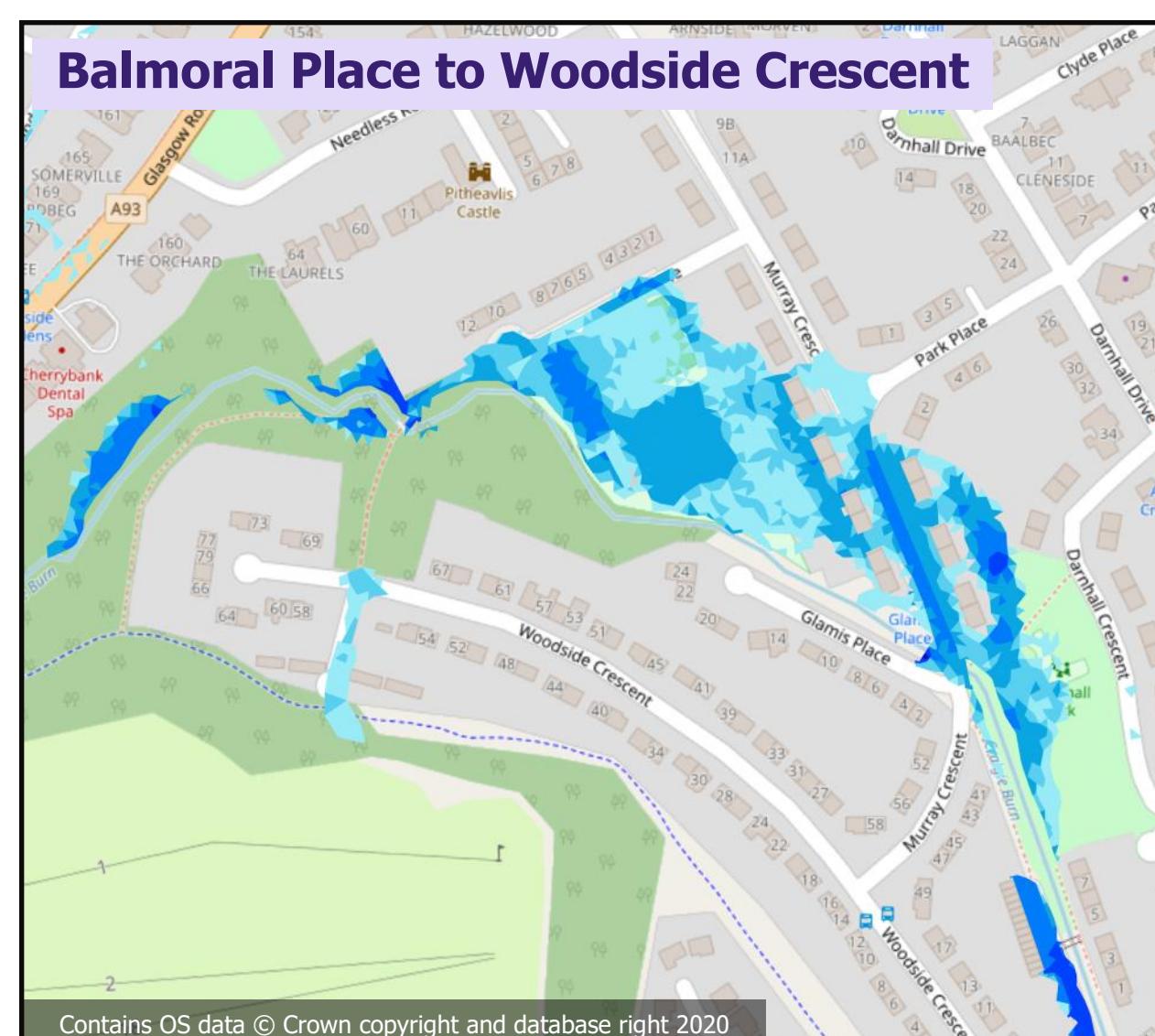


*Example property flood resilience options courtesy of the Scottish Flood Forum*

# CRAIGIE BURN

## Flood Protection Scheme

### 04\_FLOOD RISK



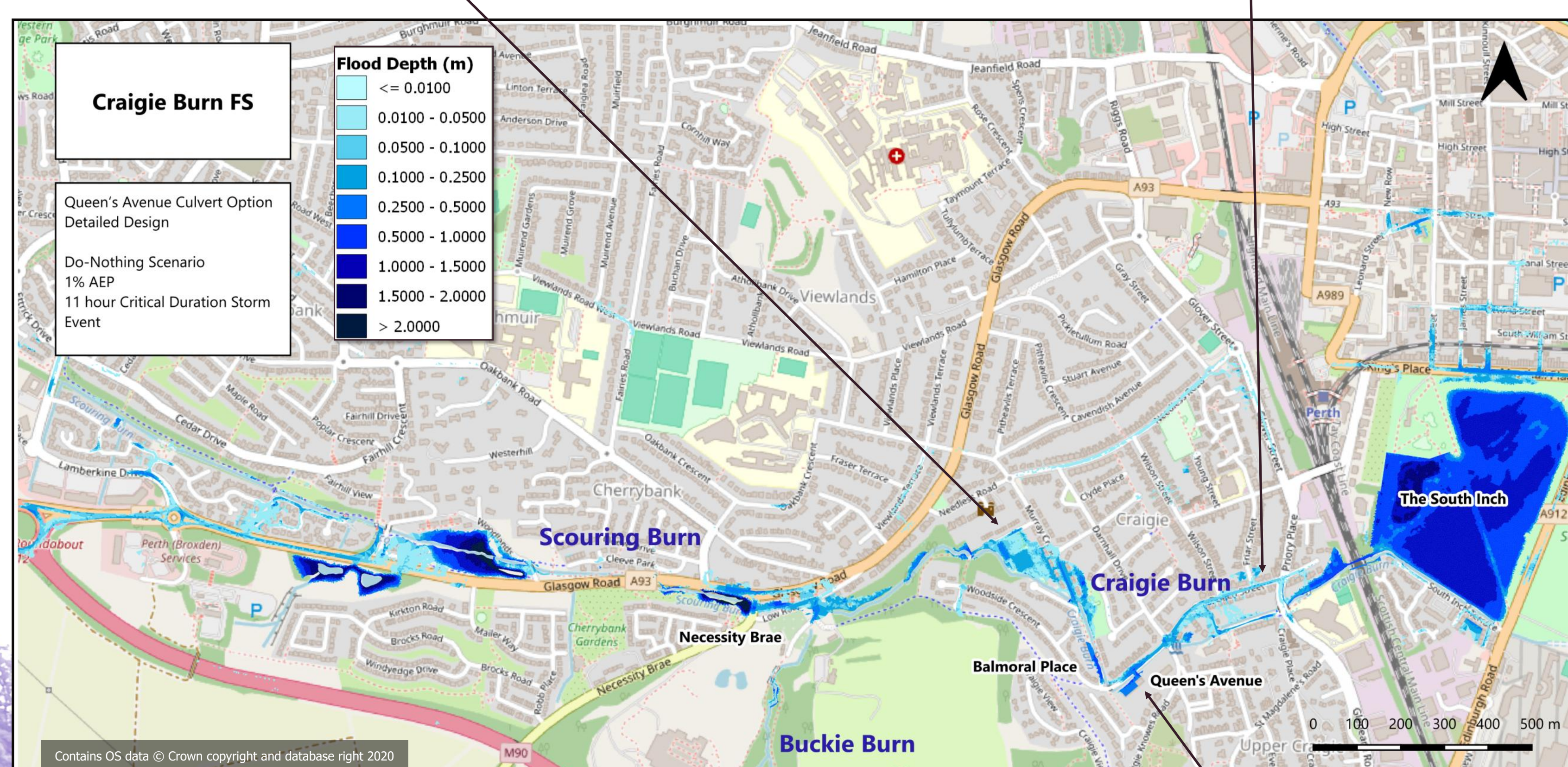
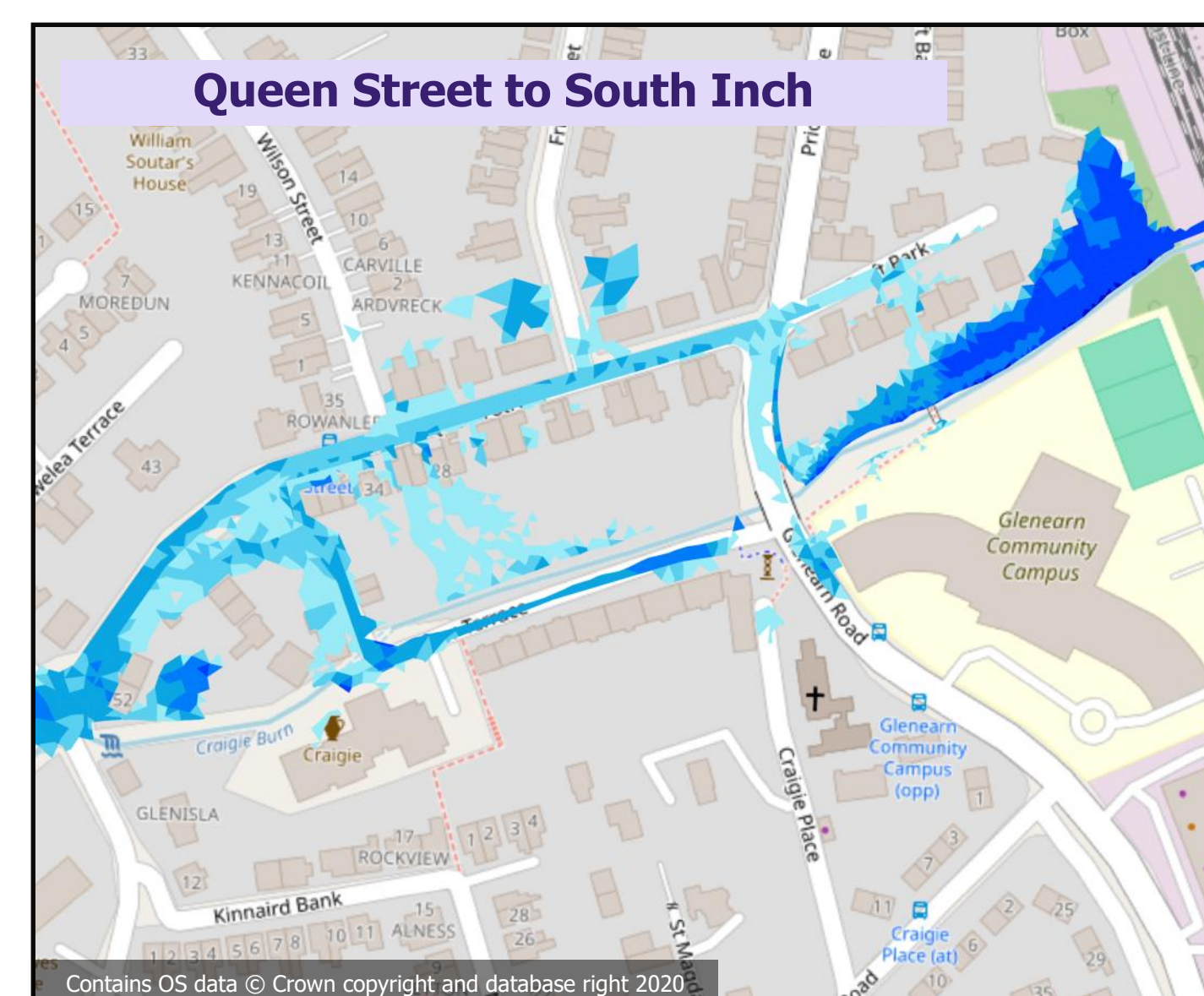
#### Flood Risk in Numbers

Properties are classified as being at flood risk where modelled flood depths **exceed 0.15 m** adjacent to the property.

**67 properties** are predicted to be at flood risk across the assessed study area under the Do Nothing scenario

- **64** residential properties
- **3** non-residential

**£1,530,000** estimated discounted present value flood damages for the 100-year appraisal period.



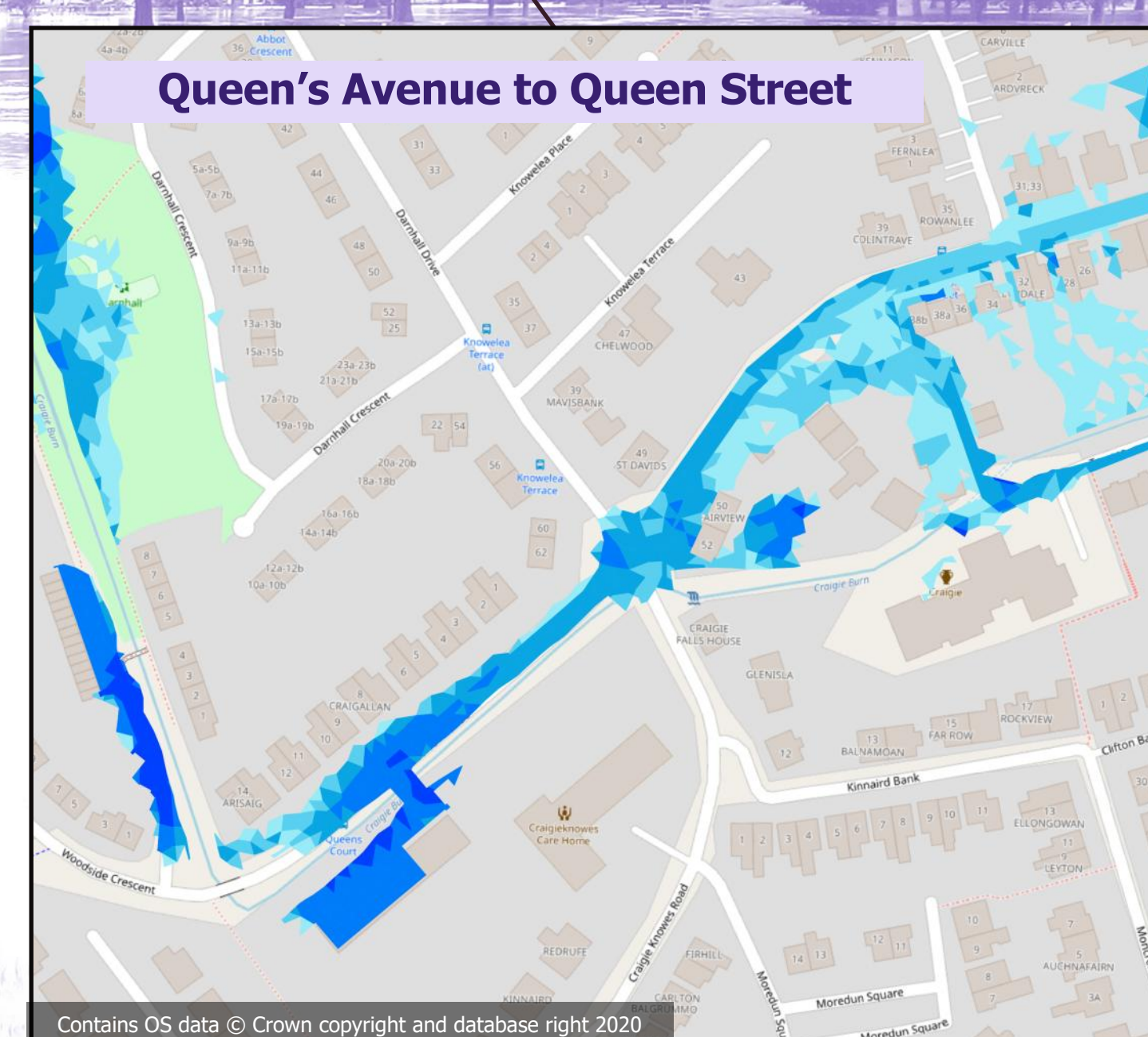
#### Findings:

- Queen's Avenue culvert provides a severe restriction on the flows in the channel with only 2.84 m<sup>3</sup>/s flows being able to pass through.
- Water levels upstream of the Queen's Court culvert reach approximately 22.64 mAO, resulting in out-of-bank flooding in the Queen's Avenue area.
- Flows overtop the channel banks and spread into adjacent low-lying residential areas during the 1 in 100 year event.

#### What about my property?

Feel free to check the flood maps here to see the general flood risk in your area. It's important to keep in mind that the computer modelling used for these maps looks at the overall catchment area and **may not capture every property-level detail.**

Please tell us where they differ from your experience.



CRAIGIE BURN

Flood Protection Scheme

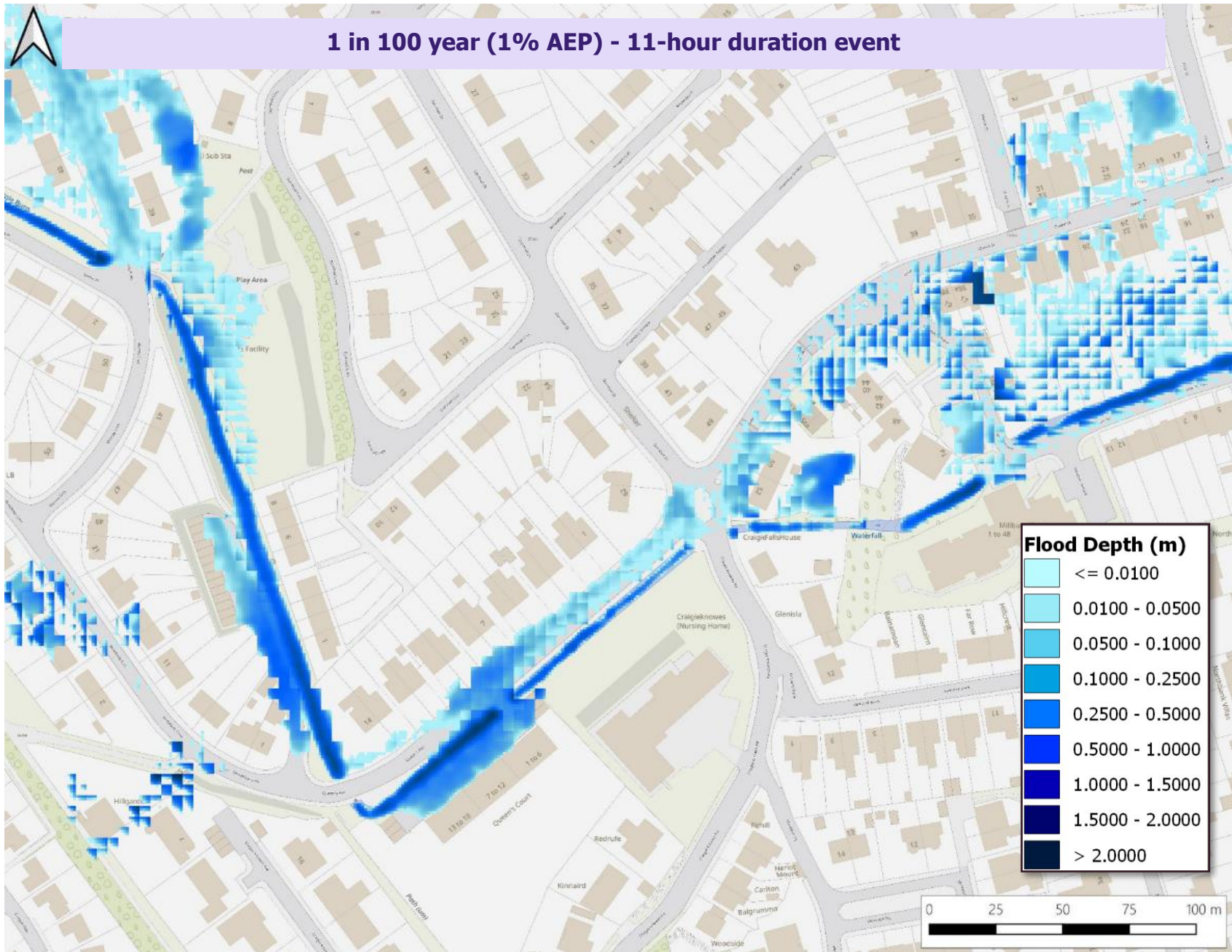
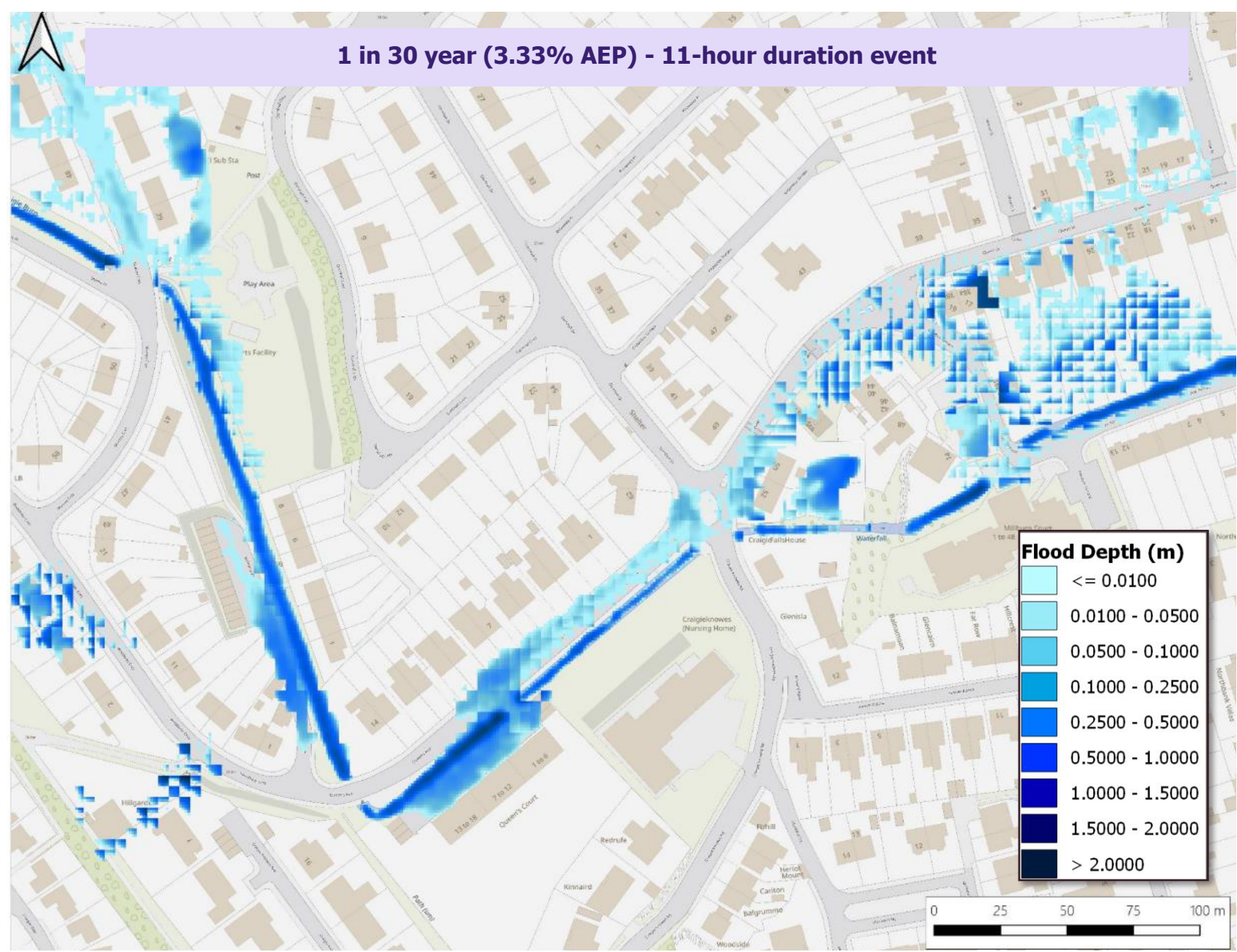
05\_ FLOOD RISK BENEFIT OF RECOMMENDED SCHEME

Following detailed hydraulic modelling and economic assessment, the recommend scheme has been refined and includes the replacement of the existing Queens Court culvert with a new 2.4 m × 1.5 m box culvert and removal of 200 mm of accumulated sediment from the Craigie Burn channel. This option provides the best overall reduction in flood risk and now achieves a Benefit Cost Ratio of 1.82. Below are flood maps illustrating the present day situation and how it would improve with the recommended scheme.

What is a 'Do Minimum' Scenario?

The 'Do Minimum' scenario includes regular maintenance of the watercourse and structures in the watercourse for the length of the Craigie Burn catchment. This includes debris and sediment removal from around structures and where it has built up in the channel. This scenario allows for an annual debris clearance and 5 yearly sediment clearance in the watercourse.

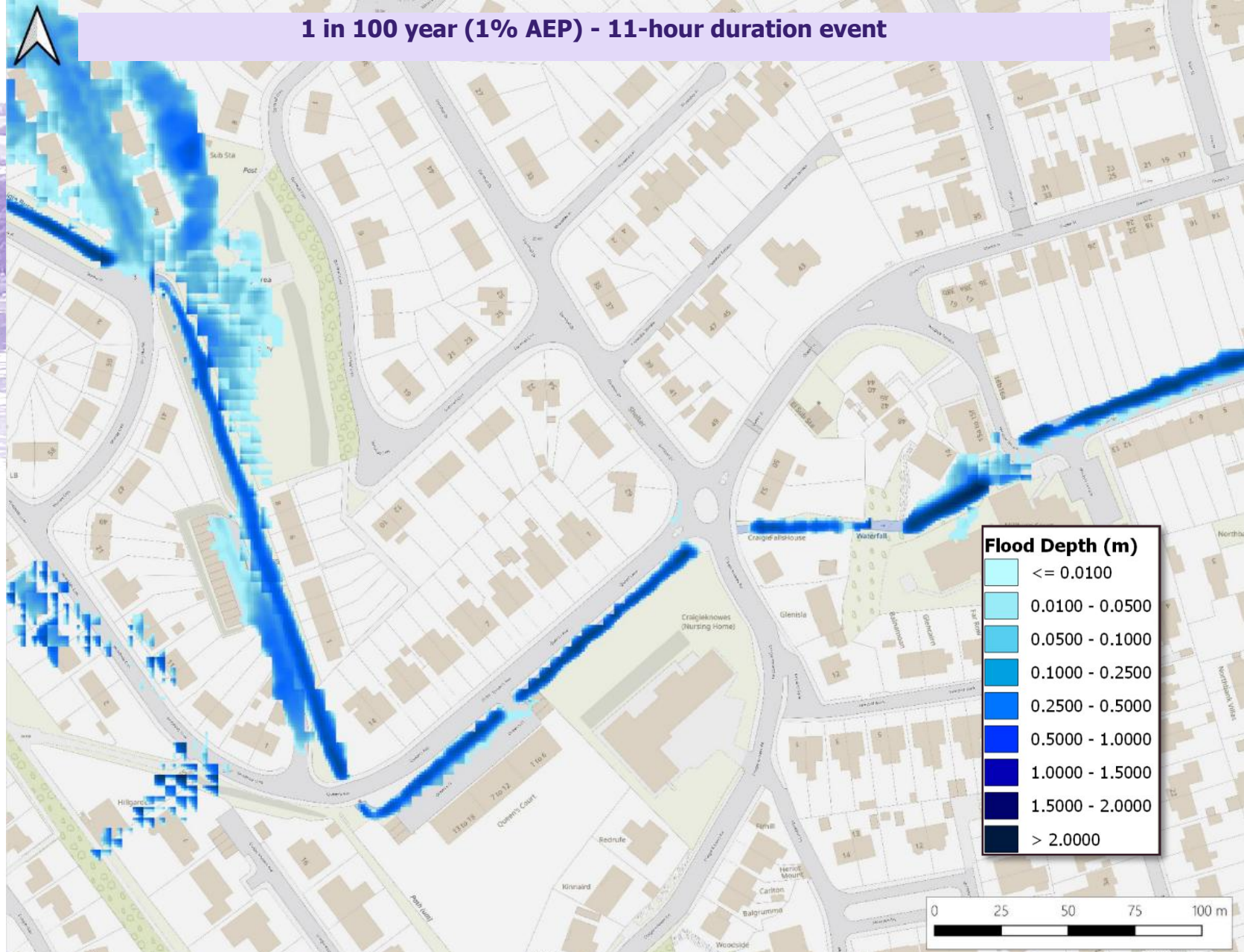
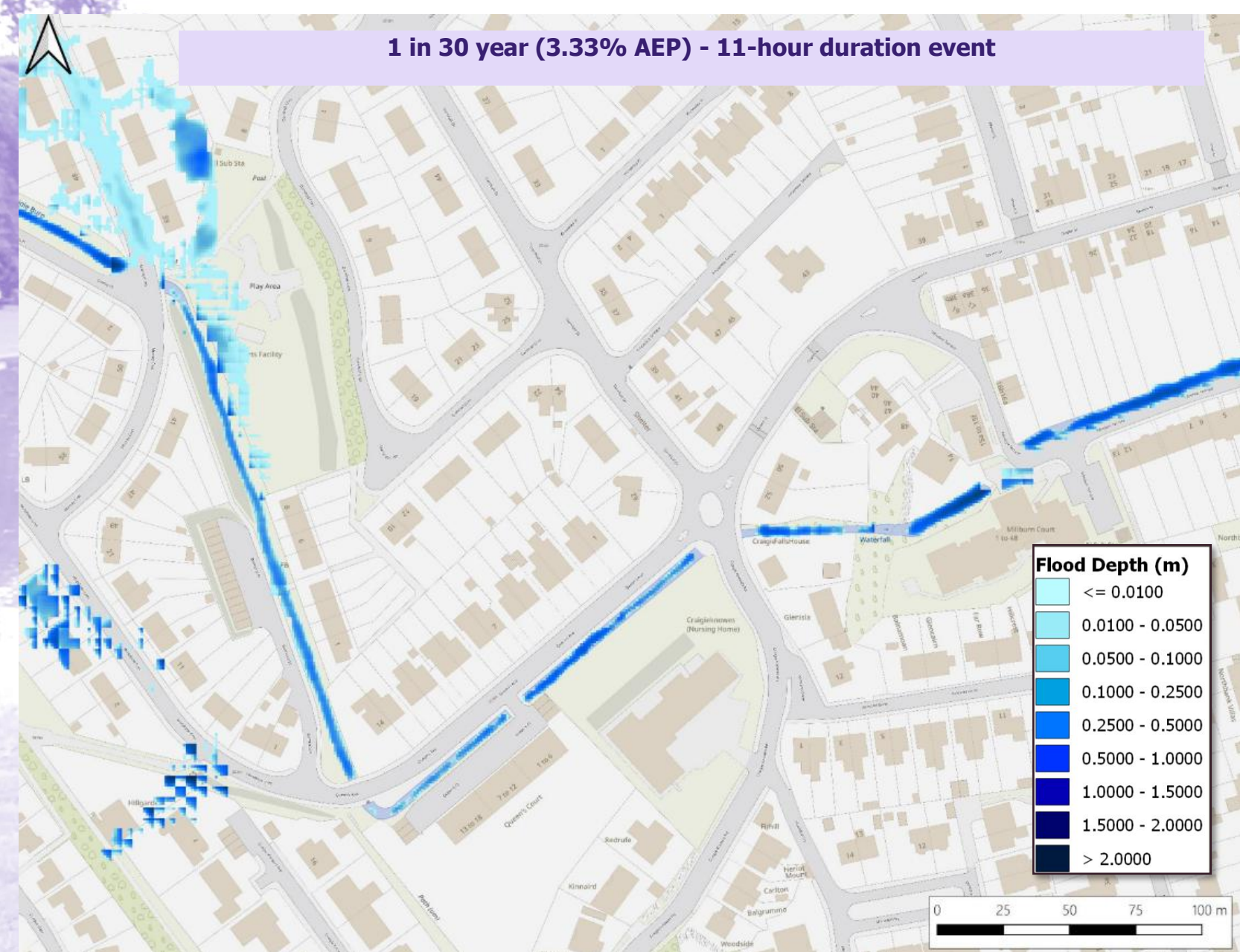
Present Day—Existing twin 800mm culvert — 11 hour critical duration events - 'Do Minimum' Scenario



| DO NOTHING DEPTHS AND FLOWS |                    |             |                    |             |
|-----------------------------|--------------------|-------------|--------------------|-------------|
| Location                    | M30-660min         |             | M200-660min        |             |
|                             | Water Level (mAOD) | Flow (m3/s) | Water Level (mAOD) | Flow (m3/s) |
| Queen's Avenue Culvert US   | 22.47              | 2.83        | 22.69              | 2.85        |
| Queen's Avenue Culvert DS   | 21.43              | 2.83        | 21.78              | 2.85        |

Recommended Scheme – Culvert Upgrade + 200 mm Sediment Removal — 11 hour critical duration events

Residual flooding remains in some areas surrounding the Craigie Burn, this is primarily confined to the localised low-lying areas adjacent to the channel. The proposed scheme substantially reduces flood risk during the 0.5 AEP event, but does not eliminate all risk associated with a 1-in-200 year return period storm event. The updated outline design has a higher BCR (1.82) than the 2023 optioneering value (1.42) because the appraisal was refreshed using updated FEH22 hydrology, resulting in greater quantified benefits despite increased capital costs. The construction cost is estimated at £398k, with a 20% optimism bias included.



| 200MM SEDIMENT REMOVAL AND BOX CULVER DEPTHS AND FLOWS |                    |             |                    |             |
|--------------------------------------------------------|--------------------|-------------|--------------------|-------------|
| Location                                               | M30-660min         |             | M200-660min        |             |
|                                                        | Water Level (mAOD) | Flow (m3/s) | Water Level (mAOD) | Flow (m3/s) |
| Queen's Avenue Culvert US                              | 21.73              | 6.93        | 22.39              | 12.46       |
| Queen's Avenue Culvert DS                              | 21.62              | 6.92        | 22.25              | 12.46       |

Benefits of recommended scheme

- Provides a 1 in 100 year (1% AEP) standard of protection against flooding.
- More than **four times greater modelled culvert flow capacity** during the 200-year flood event (2.85 m<sup>3</sup>/s to 12.46 m<sup>3</sup>/s).
- 31 fewer properties at risk of flooding**, reducing from 67 to 36 properties above the 0.15 m flood-depth threshold.
- Approximately **75% reduction in assessed flood damages** compared with the Do Nothing scenario.
- Up to **0.30 m reduction in water levels upstream of the culvert** during the 200-year flood event.
- BCR of 1.82**, equating to approximately **£1.82 of benefit for every £1 invested**

# CRAIGIE BURN

## Flood Protection Scheme

### 06\_RECOMMENDED SCHEME OUTLINE DESIGN

#### Outline Design

Following completion of the detailed hydraulic modelling, option appraisal and economic assessment, replacing the existing Queens's Court culvert and removing accumulated sediment from the Craigie Burn provides the most effective and economically viable flood mitigation solution for the area.

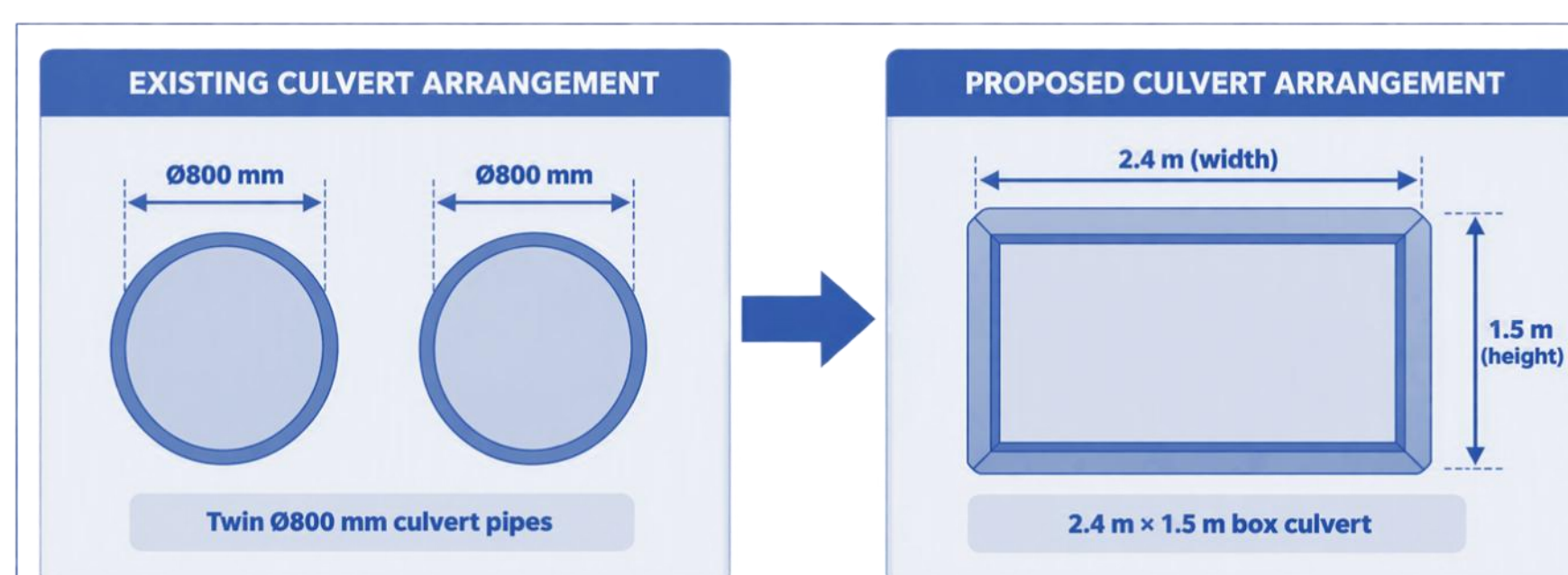
A draft outline design has been developed for the recommended scheme and is to be considered for consultation and further development by the Council.

#### Upgrading the Queen's Court Culvert:

- The recommended scheme includes replacing the existing twin 800mm diameter culvert beneath the Queens Court access road with a new **2.4 m wide by 1.5 m high box culvert**. The existing culvert is a significant restriction to flow, limiting conveyance through this section of the Craigie Burn and contributing to flooding upstream during severe rainfall events. The proposed box culvert substantially increases flow capacity, allowing flows to pass more freely through the system and reducing water levels along Queens Avenue and Balmoral Place.
- The culvert upgrade removes a longstanding restriction within the Craigie Burn, allowing flood flows to move more freely through the channel and reducing flood risk for properties in the area. While modelling predicts some localised increases in downstream water levels (directly after the new culvert) as flows pass more efficiently through the upgraded structure, these changes are not expected to result in any significant increase in downstream flood risk. Existing residual flooding is primarily influenced by other constraints within the wider catchment.



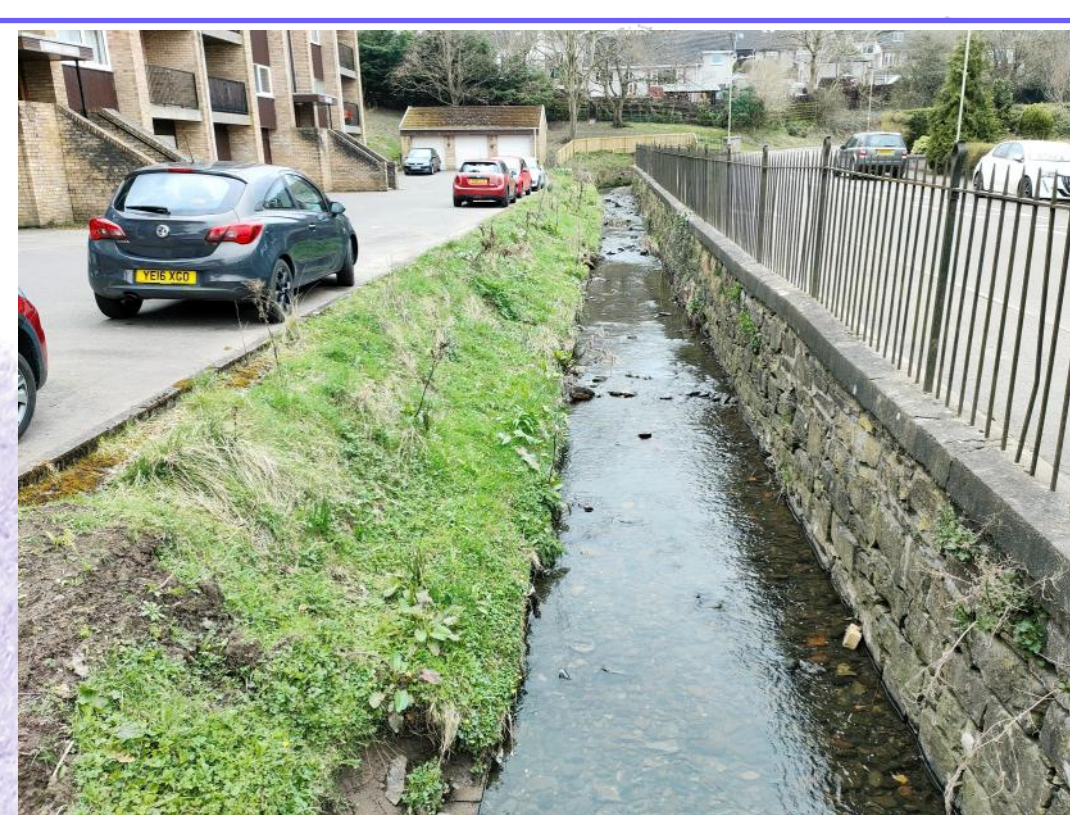
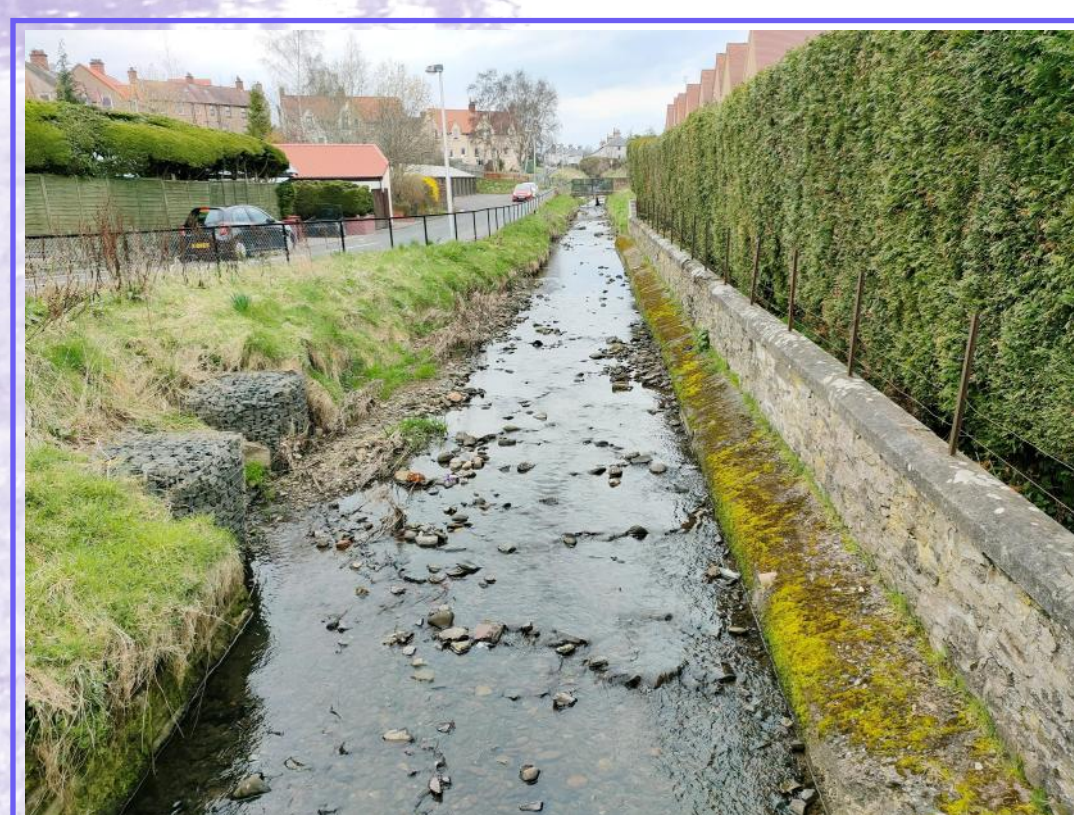
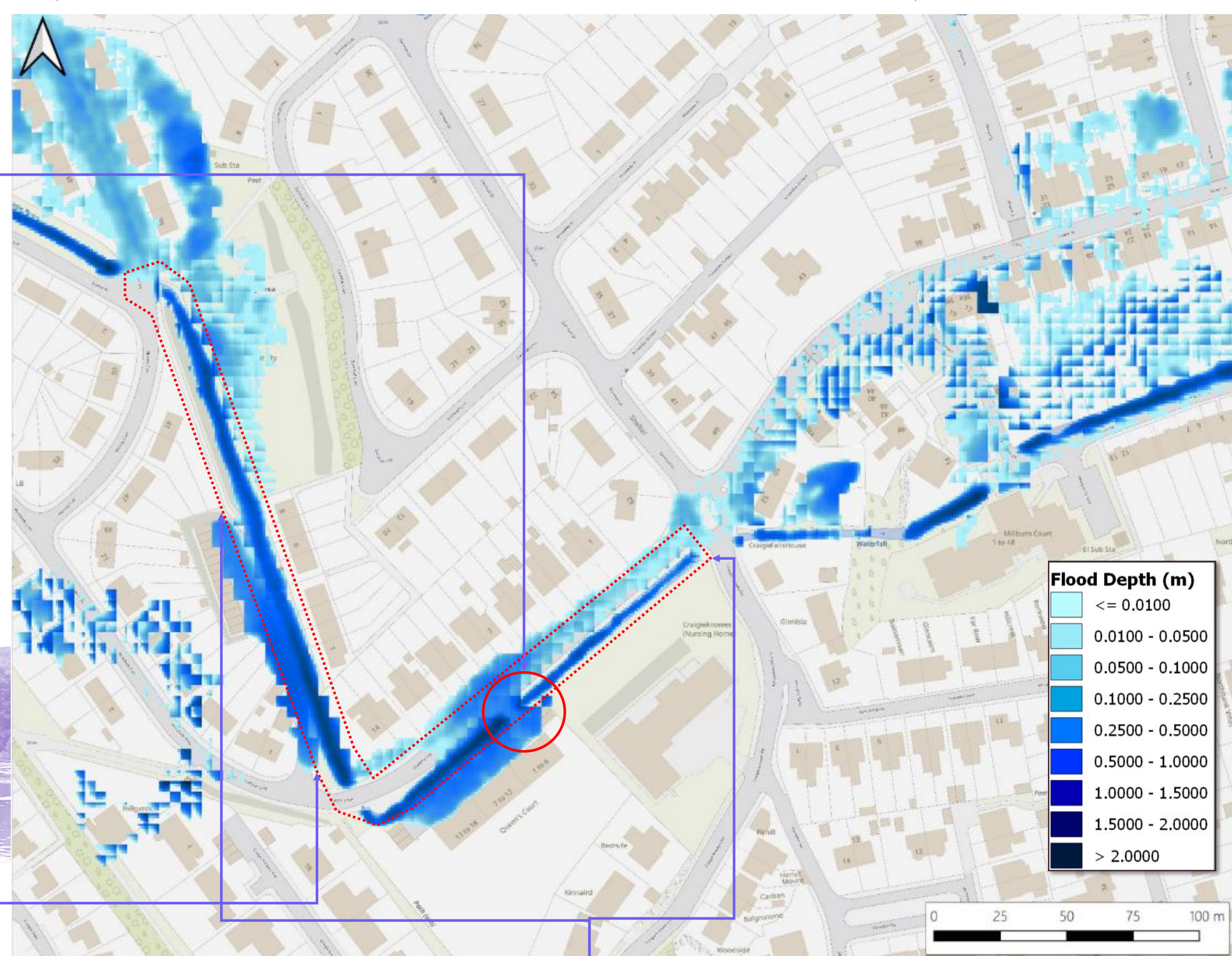
Upgrading the Culvert



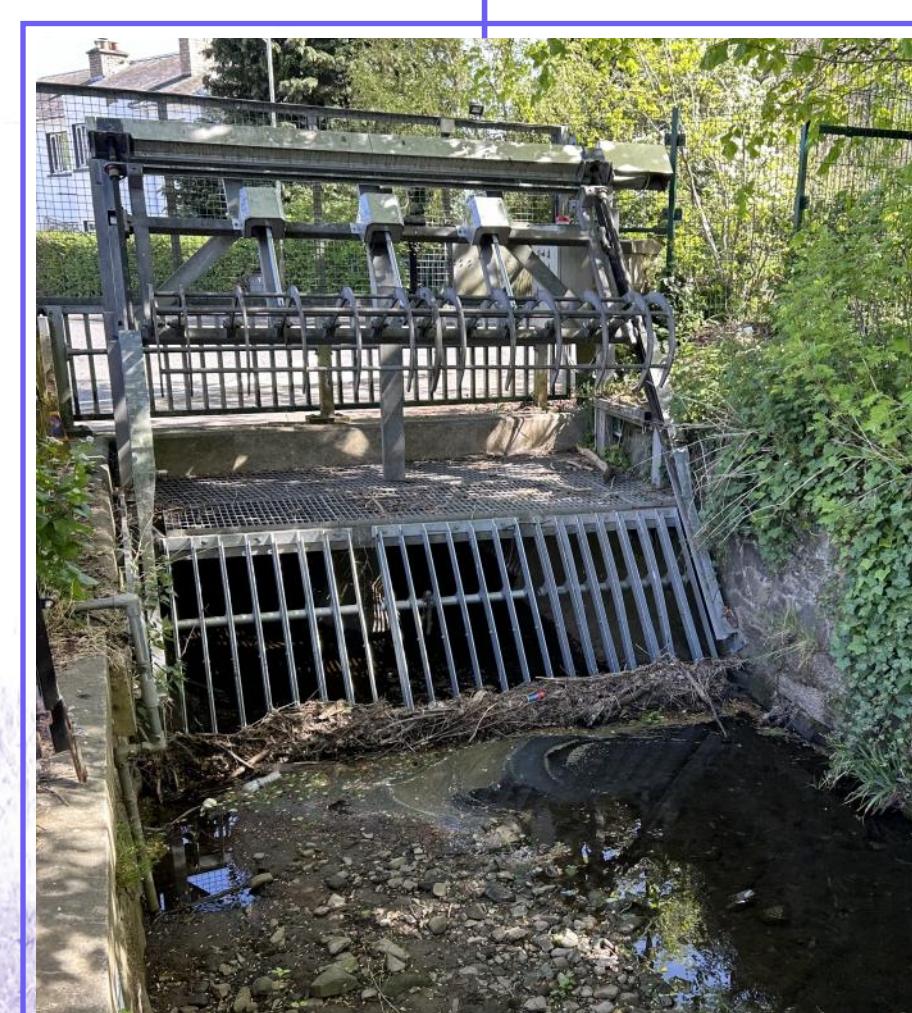
#### Channel modification (Balmoral Place and Queens Avenue):

The preferred option also includes the removal of approximately **200 mm of accumulated sediment** from the Craigie Burn channel in the vicinity of Balmoral Place and Queens Avenue as indicated by the red dotted line. This has been assessed as the maximum depth without affecting the integrity of adjacent banks or retaining walls. Modelling has shown that increasing culvert capacity and the removal of sediment will increase the channel capacity and lower flood water levels. These have a significant improvement in the performance of the watercourse during flood events and reduce the likelihood of overtopping of the river banks.

Ongoing maintenance will be required to manage future sediment accumulation and preserve the benefits of the scheme.



Channel modifications



Additional Improvements

#### Additional Improvements being considered (Balmoral Place and Queens Avenue):

- Installing trash screens at Balmoral place to reduce vegetation build up downstream.
- Improving/upgrading the existing screen at Queens Avenue Roundabout.

# CRAIGIE BURN

## Flood Protection Scheme

### 07\_HOW THE CULVERT COULD BE BUILT

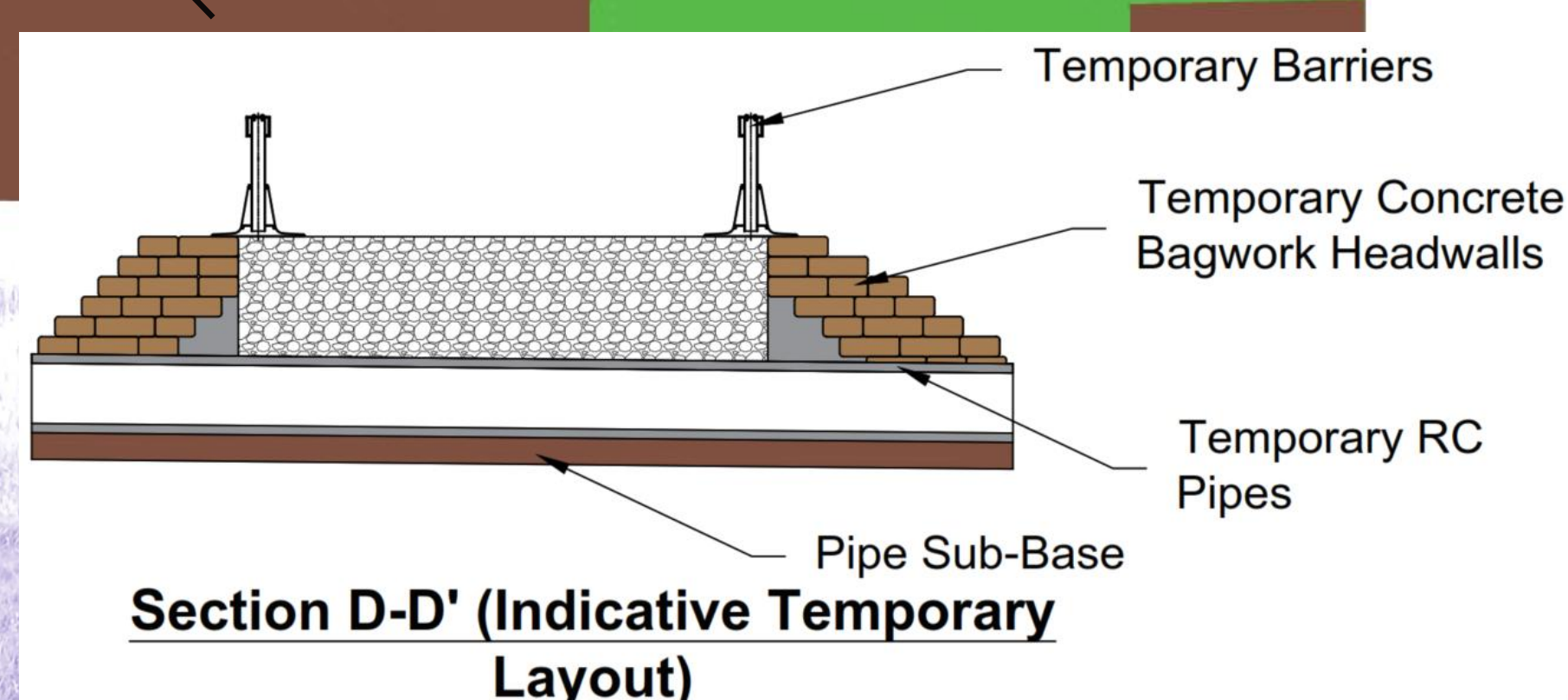
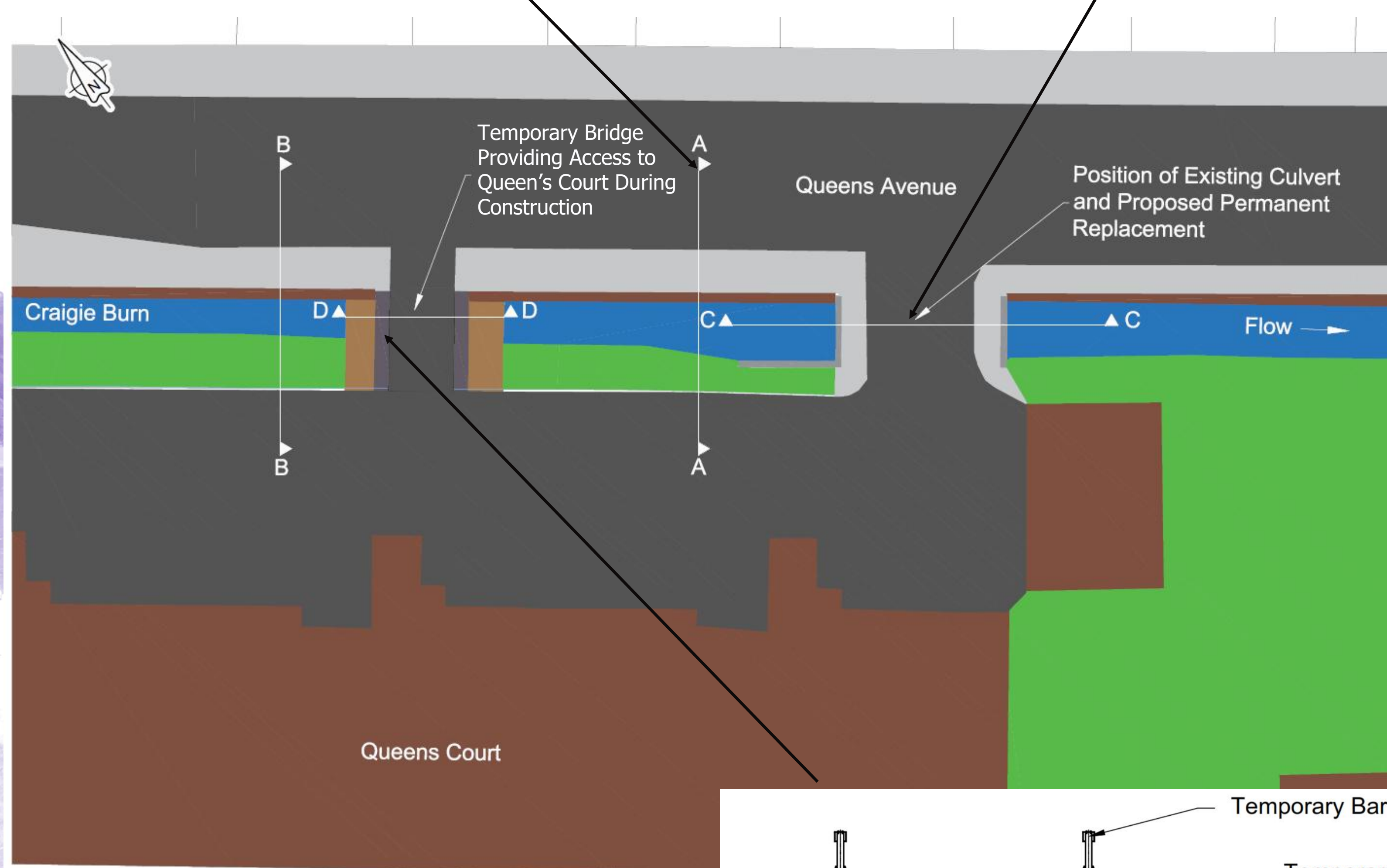
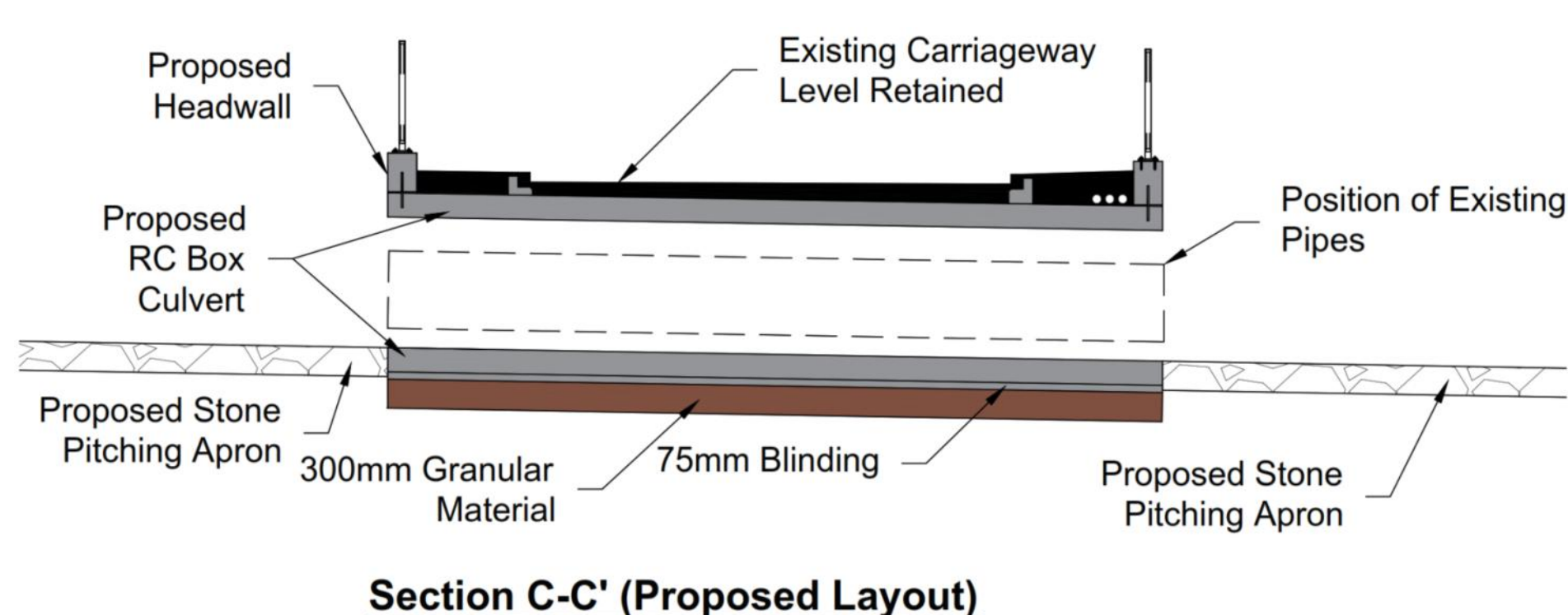
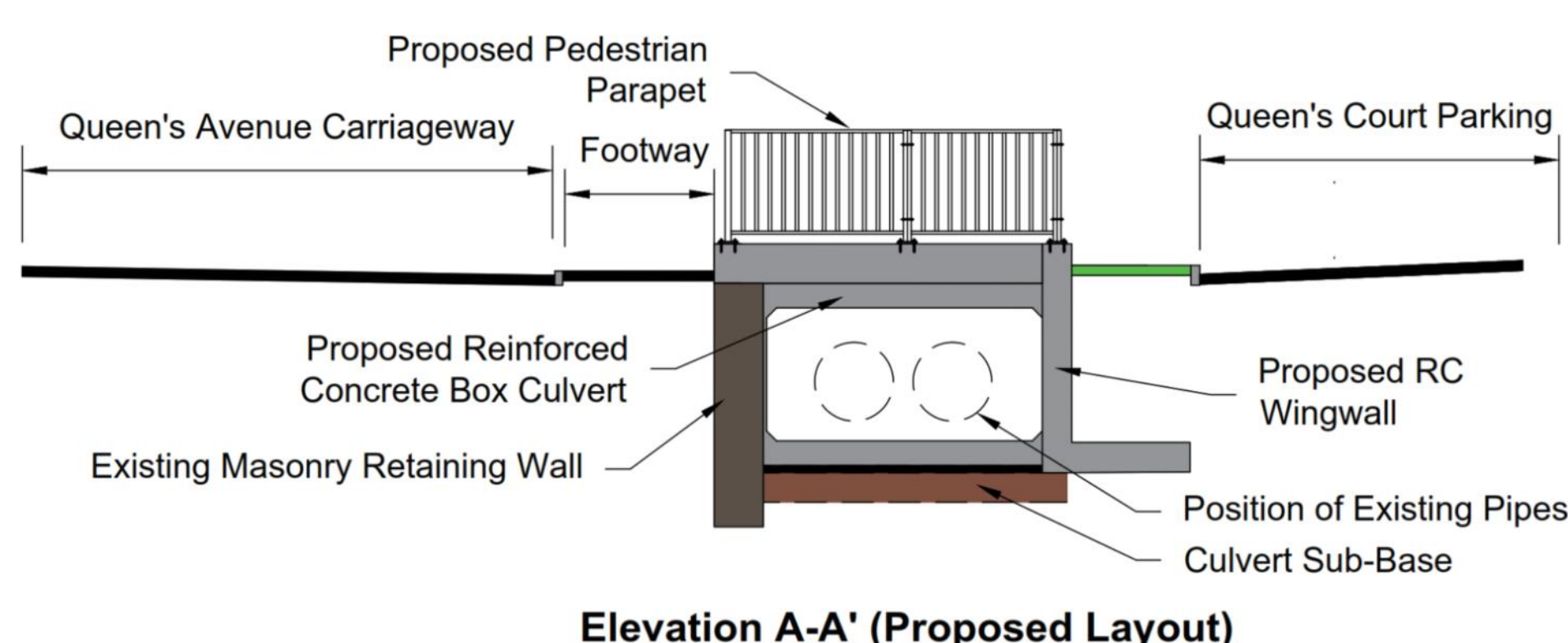
An options appraisal has evaluated three potential construction methodologies for installation of the new culvert. The three options considered were:

- Replacement Culvert Option A — Construction of the new culvert in two halves in the existing position.
- Replacement Culvert Option B — Construction of a temporary culvert upstream with the permanent replacement constructed in the existing position.
- Replacement Culvert Option C — Construction of the new culvert upstream of the existing culvert with the existing culvert providing access to Queen's Court until the new culvert is constructed.

The options appraisal found that Option B performed best against chosen optioneering criteria. The sequence to construct Option B involves the following steps with indicative details shown below:

- Construct temporary access 'bridge' upstream to maintain vehicular and pedestrian access to Queen's Court during the works.
- Remove the existing pipe culvert and replace with reinforced concrete box culvert.
- Remove upstream temporary access 'bridge' and reinstate works area.

Following the installation of the permanent culvert, the temporary culvert will be removed and the channel and banks of the Craigie Burn reinstated. It is anticipated that access to Queen's Court will be maintained throughout the works, except at key stages. The exact arrangements to maintain access to Queen's Court via a temporary access for vehicles, pedestrians and emergency vehicles will be developed during the detailed design phase and discussed with affected residents.





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# CRAIGIE BURN

## Flood Protection Scheme

### 08\_ WHAT HAPPENS NEXT

#### Thank You

Thank you for your participation in this public exhibition. Community involvement is a key part of flood risk management and your views are appreciated.

#### Next Steps

The Council will collect any questions and feedback provided by you and will respond in the form of a Public Consultation Report. This report will be published and demonstrate how your views have been considered in the final proposal.

The Council will then seek committee approval on the proposed outline design before publishing final proposals under the Flood Risk Management (Scotland) Act 2009.

We will continue to update the community in future through the scheme website and periodic newsletters that will summarise progress to date. Further public exhibition events will be held at detailed design stage.

The below flow chart shows the provisional timeline for future work before construction of the flood scheme can commence.

#### Any Comments or Questions?

Please complete our feedback form; or visit the PKC Consultation Hub page for this project at:

<http://consult.pkc.gov.uk/communities/craigieburnfloodscheme>

- Please ensure that all comment forms or online submissions are returned to PKC by **Friday 16 October 2026**.

#### Contact Details

For further information on the proposals, please contact:

**Flooding Team**  
Perth and Kinross Council  
Pillar House  
35 Kinnoull Street  
Perth  
PH1 5GD



**Flood@pkc.gov.uk**

#### Phase of work

Outline Design

Statutory Approvals and Permissions

Detailed Design

Procurement of Contractor

Construction Period

#### Timescale and Description

##### April 2025—September 2026

Development of the initial scheme design and assessment of options

\*Community consultation and a public exhibition (this consultation)

##### October 2026 to March 2027

Approvals required under the Flood Risk Management (Scotland) Act 2009.

\*Delays are possible during this stage if objections are lodged to the scheme and are indicative only.

##### April 2027 to June 2027

Preparation of detailed design information for construction.

\*Further community consultation will take place during this stage.

##### July 2027 to September 2027

Process to appoint a contractor for delivery of the scheme.

##### October 2027 to October 2028

On-site construction and delivery of the flood scheme.