Dunkeld Flood Protection Scheme
Outline Design Stage
Community Consultation

INTRODUCTION

1

Welcome

Welcome to this community consultation event for the proposed Dunkeld Flood Protection Scheme.

The aim of this event is to provide you with more information on:

- The risk of flooding in Dunkeld
- The history of the work done in Dunkeld in relation to flooding
- The Council's proposals for the flood scheme and the progress made to date
- Other action to raise awareness of flood risk and improve flood resilience

The **public exhibition** will be held at:

Atholl Arms Hotel and Residence
Bridgehead, Tay Terrace
Dunkeld
PH8 0AQ

on the following dates:

DAY 1
Wednesday 10th June 2026
From 3pm to 7pm

DAY 2
Tuesday 16th June 2026
From 3pm to 7pm

Council officers and the design consultants will be present to provide an opportunity for residents to learn more about the proposed scheme and ask any questions.

Share Your Views

Your views are important to us and will help to inform the final proposals for the flood scheme.

Comment forms are available to allow you to record your views. You can also record your views on the Council's consultation hub at:

http://consult.pkc.gov.uk/communities/dunkeldfloodscheme

The closing date for submitting comments is **Wednesday 1st July 2026.**

Flood History

Notable flooding took place in February 1990 and January 1993. In December 2015 and January 2016, Storm Desmond and Frank caused prolonged rainfall which affected properties and roads in Dunkeld. The most recent flooding occurred in February 2020 and late 2023, with properties on Atholl Gardens being threatened by flooding or were flooded from exceedance of the Sawmill Brae Burn.

The last significant flood event was caused by Storm Gerrit in December 2023. Subsequent events have resulted in localised flooding only.

Figure 1: *Previous flooding on High Street, Dunkeld*

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PROJECT PROGRESS (1 of 2)

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Study Background

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).

Dunkeld and Birnam are located in the River Tay catchment within Potentially Vulnerable Area (PVA) 02/08/08 as defined by SEPA's National Flood Risk Assessment for Scotland. The *Tay Local Flood Risk Management Plan includes an action* to investigate river and small watercourse flooding as part of a flood study for this area.

In 2020, consulting engineers, AECOM, were engaged to investigate the fluvial flood risk across the Dunkeld area and identify potential options for managing that risk. The flood study involved several detailed assessments, outlined in Figure 2. AECOM completed the study in 2023, and it recommended a flood protection scheme for Dunkeld consisting of culvert upgrades and the creation of a flood storage area.

Unfortunately none of the shortlisted options for the River Tay and Inchewan Burn were economically viable and were discounted.

A public consultation exercise took place between 17 February to 10 March 2023 to disseminate the draft findings of the study and obtain feedback from the community. A Question and Answer Report was published on the Council's Consultation Hub that collated the main comments received and provided the Council's response to those questions.

The study was updated and finalised, and the conclusions and recommendations were reported and approved at the Climate Change and Sustainability Committee on 31 May 2023.

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.

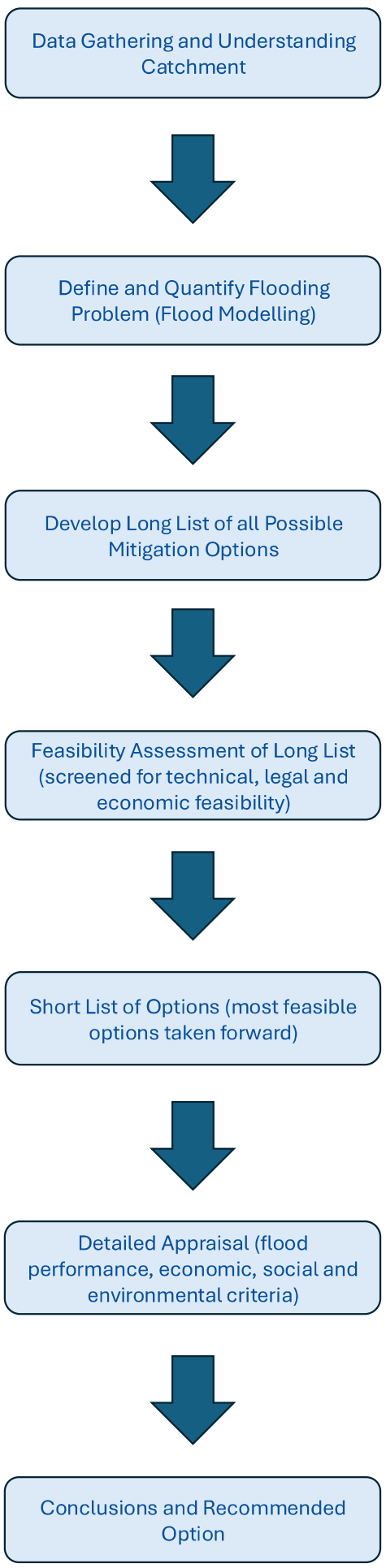

Figure 2: *Feasibility Study Progress Stages*

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PROJECT PROGRESS (2 of 2)

Recent Progress

In April 2025, AECOM were reengaged by PKC to develop the preferred option (from the 2023 flood study) into a flood protection scheme. The scheme is now at outline design stage and is being presented for public consultation. Work to date has included:

- Data Gathering and Analysis
  The local community, Perth and Kinross Council, SEPA and Scottish Water have provided all relevant data, including records of previous flooding in the area.

- Site Surveys
  Various site surveys have been undertaken to record the features in the catchment. These included topographic surveys, condition assessments, public utility searches, and CCTV surveys.

- Hydrological and Hydraulic Modelling
  The model from the 2023 study has been updated using the latest methodologies and most recent data gathered. This updated model was then used to determine the current level of flood risk and assess and refine the proposed flood protection scheme.

- Ground Investigation
  A preliminary ground investigation has been carried out to determine the ground conditions which inform the design of the proposed flood defences.

- Economic Appraisal
  An economic appraisal in the form of a cost benefit analysis has been performed. This process involved the comparison of the estimated costs and predicted benefits, offered over time, by the proposed flood scheme. The cost of the scheme must not exceed the benefits, i.e. the benefit/cost ratio must be greater than 1.0.

- Environmental, Heritage and Landscape Appraisals
  Landscaping and visual, heritage, conservation, ecology, archaeology and environmental surveys and screening appraisals have been carried out to evaluate the impacts of the proposed scheme and recommend mitigation options.

- Fluvial Geomorphology Analysis
  An analysis of the channel geomorphology in the scheme areas has been carried out to consider the changes to the watercourses due to the movement of sediment and erosion.

Consultation

Throughout the various stages of the flood protection scheme the Council's Flooding team and the consulting engineers Aecom have consulted with the Community, affected landowners, SEPA, Scottish Water, PKC Planning officers, PKC Conservation officers, PKC Roads Maintenance Partnership and Perth and Kinross Heritage Trust. This is an ongoing process and is carried out to ensure that potential impacts of the scheme are considered and can be mitigated in agreement with key partner agencies and stakeholders where possible.

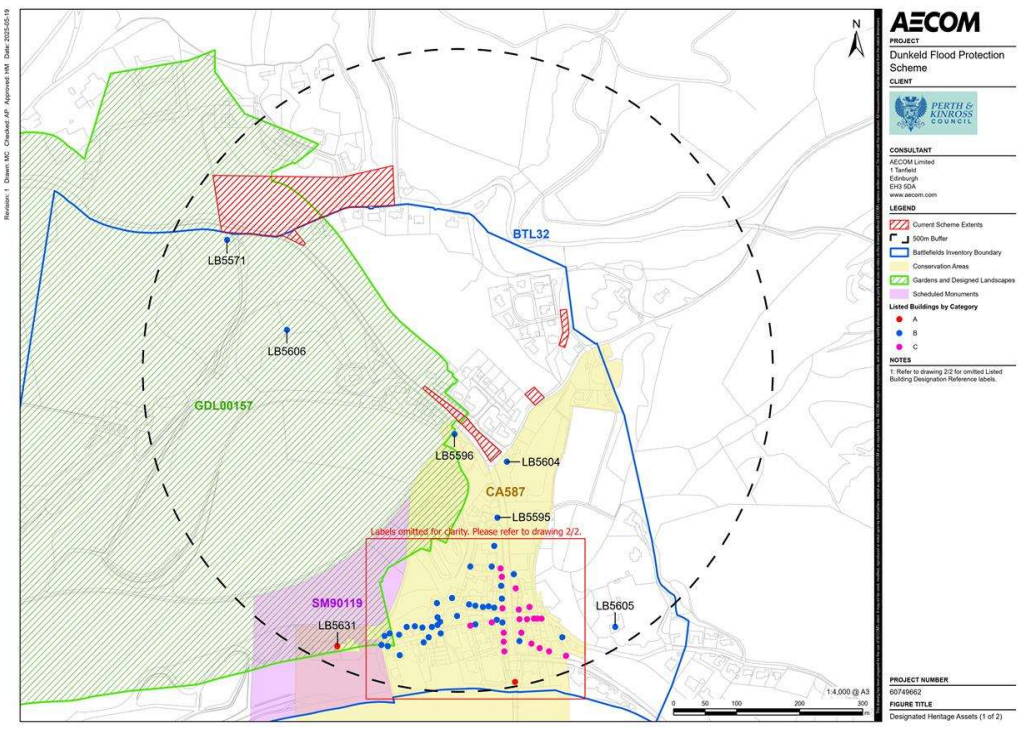

Figure 3: *Extract from the scheme heritage appraisal showing the extents of the battlefield of the Battle of Dunkeld (blue line).*

Heritage Appraisal

As an example of the consultation carried out for the scheme the heritage appraisal undertaken noted that sections of the scheme lie within the Battle of Dunkeld extents shown in Figure 3. The required Ground Investigation works also sat within the designated battlefield area of the Battle of Dunkeld. Following consultation with Perth and Kinross Heritage Trust, the ground Investigation works were supervised by archaeological specialists and the main scheme construction works will also be overseen and supervised by specialists where required.

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UNDERSTANDING FLOODING TERMS

Flows, Return Periods and Probabilities

River flows are measured in cubic metres per second (m^3/s), and we often refer to the largest flow during a flood event as the "peak flow".

Flooding is a natural phenomenon which can never be entirely prevented. The language used to describe flooding can be confusing. Floods of different magnitudes are described on a statistical basis as either:

- An annual probability – the percentage chance of a flood occurring in any year. This is known as the Annual Exceedance Probability – or AEP for short. The lower the AEP, the more severe the flood event (e.g. the flood with a 0.5% AEP will result in more flooding than the 10% AEP event).
- A return period - the statistical average length of time separating flood events of a similar size. The return period is a measure of the rarity of a flood event.

For example, the flood with a return period of 50 years can also be described as having a 2% chance of occurring in any one year.

This does not mean that the 1 in 200 year flood will only happen every 200 years, or that it will not happen again for 200 years - flooding can happen at any time.

See Figure 4 for a visual representation of AEP/return periods.

Joint Probability

The smaller watercourses represented in the study and subsequently the scheme model, combine at a chamber at the entrance to Atholl Gardens and flow through Dunkeld via a culvert, roughly following Atholl Street. This culvert then diverts down High Street before bearing South to its outfall at the River Tay.

A joint probability analysis was carried out in order to determine the interaction between the smaller watercourses and the River Tay. This enabled us to determine if high flow events on the Tay catchment and the minor watercourses modelled within the scheme were likely to coincide. Thus, determining if the culvert outfall will likely be free to discharge or alternatively submerged during a given rainfall event.

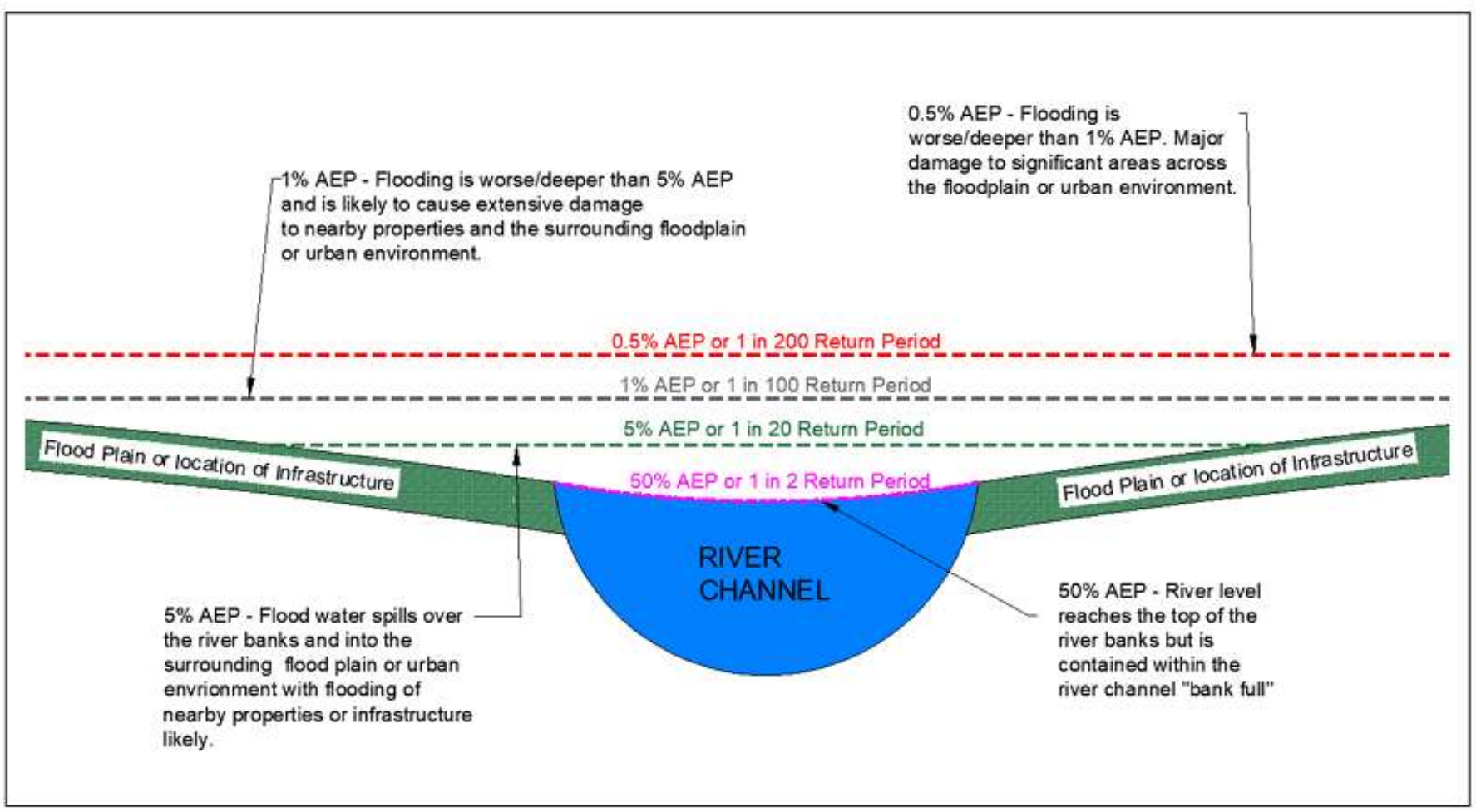

Figure 4: Visual representation of AEP and return periods.

FLOOD RISK

Defining the Flood Risk for the Proposed Scheme

A hydraulic model is used to estimate the likelihood of flooding from a watercourse(s). Estimated river flows are then applied to the hydraulic model which contains the river channels, structures and floodplains, allowing us to see which areas may be at flood risk. We check the model outputs against historic flood data to verify the estimated flood extent, depth, and velocity through the study area.

The original hydraulic model from the 2023 flood study was updated to provide a more comprehensive understanding of flood risk in Dunkeld. The updated hydraulic model focused on the area of the proposed scheme and incorporated more detailed data including the sewer network, topographical survey data, and refinement of the watercourse catchment boundaries and tributaries.

Cause of Flooding

Dunkeld is surrounded by steep catchments which result in 'flashy' watercourses – causing water levels to rise quickly in response to rainfall. These converge at culvert inlets which restrict flow and cause flooding.

Figure 5: *Upper catchment of Unnamed Watercourse 1*

Flooding Sources

The main source of flood risk was found to be flooding from the Sawmill Brae Burn and its tributaries – however some localised pockets of surface water flooding were also identified.

During extreme storm events, the burn exceeds its channel capacity and spills onto the A923 before flowing down into Dunkeld. This predominantly occurs at the three key locations marked on Figure 6 below, where the existing culverts are either in poor condition, prone to blockage or lack capacity.

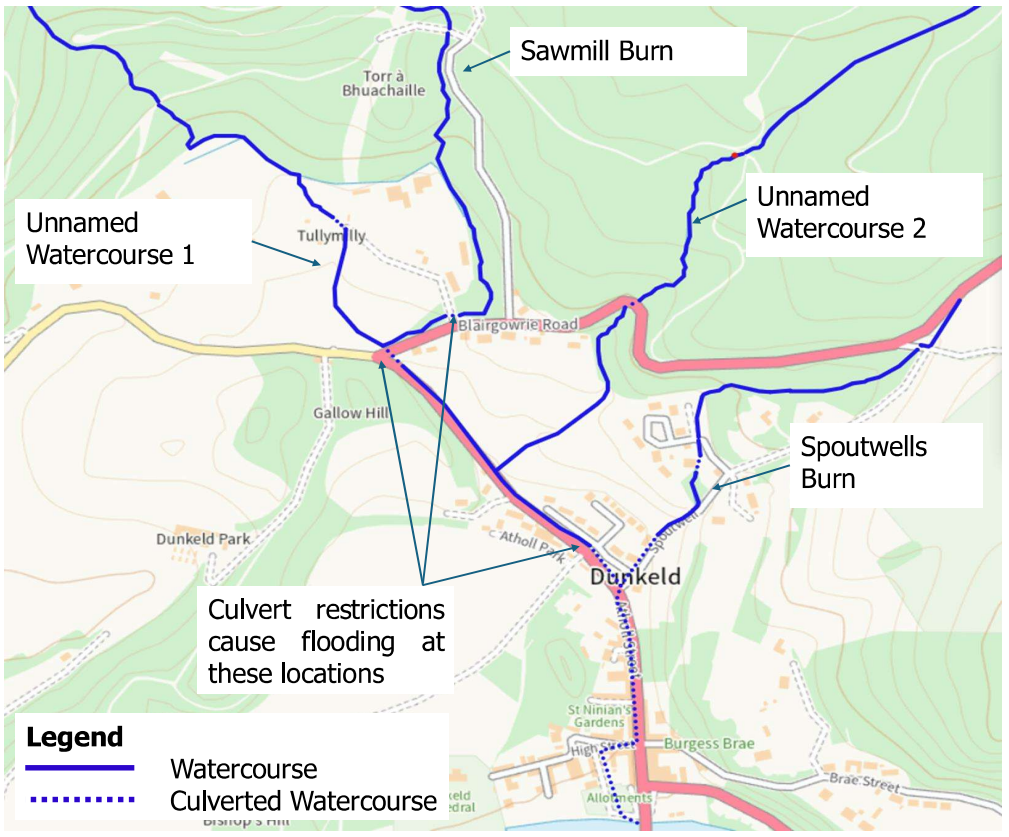

Figure 6: *Watercourses of interest within the scheme area.*

Model Changes

A notable improvement in the updated flood maps includes refinement of flooding mechanisms on the Spoutwells Burn where this was previously overestimated. This improvement is due to the inclusion of more detailed catchment analysis of the unnamed watercourse located to the north of Atholl Gardens, which reduces the amount of flow predicted to enter the Spoutwells Burn. As a result of the reduced flood risk, earlier proposals to upgrade culverts on this watercourse do not require to be taken forward.

OVERVIEW OF PROPOSED SCHEME

Outline Design Proposals

The original scheme proposed as part of the 2023 flood study was refined using the updated hydraulic model. Figure 8 indicates the revised layout of the proposed Flood Protection Scheme consisting of :

- Upgraded 750mm diameter culvert at the Cally Industrial Estate access – including new headwalls and debris screen
- New 300mm diameter culvert beneath Blairgowrie Road – including new headwalls and debris screen
- New flood wall to create temporary flood storage area in field adjacent to Kings Pass / Blairgowrie Road junction
- Partial re-alignment of Sawmill Brae Burn at new flood wall
- New twin 450mm diameter culvert at Atholl Gardens – including new headwall and debris screen

More detailed information on each of the three Work Areas is shown in the following slides.

Figure 7: *Flooding from burn at Atholl Gardens*

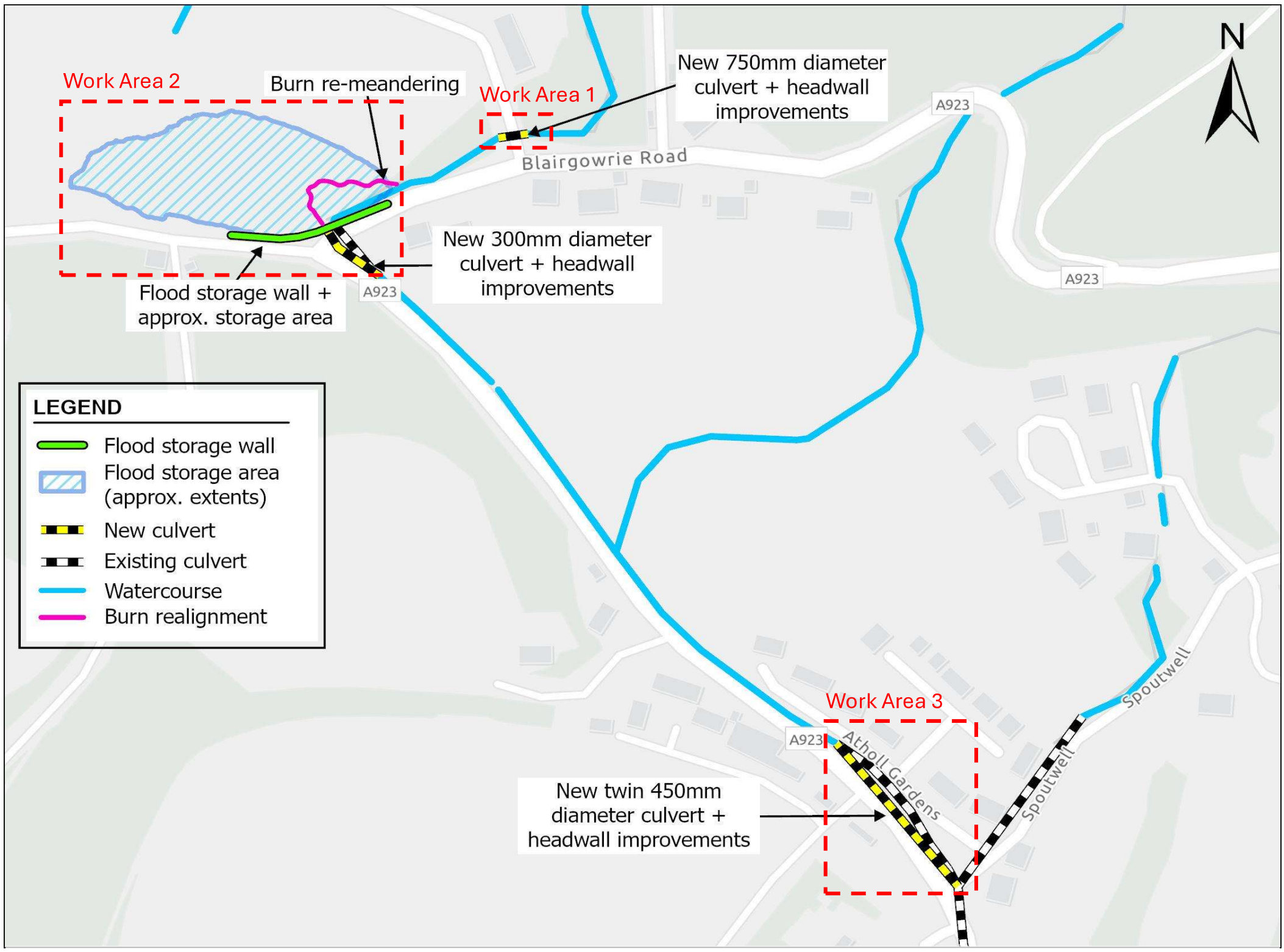

Figure 8: *Overview of proposed flood protection scheme and work areas*

DETAILS OF PROPOSED SCHEME (1 OF 4)

WORK AREA 1

Cally Industrial Estate

The culvert at the Cally Industrial Estate entrance (Figure 10) has been identified as a key structure to upgrade due to its tendency to block with debris, exacerbating flooding.

An assessment estimates that the upstream catchment generates around 50m^3 of woody debris every year. To manage this, a large **two-stage debris screen** is proposed – similar to that shown in Figure 11.

The culvert has previously undergone remedial repair works which has reduced the available flow area, further increasing flood risk. The scheme therefore proposes to **fully replace and upgrade the culvert** to secure its long-term performance and reliability. New fencing (not shown on Figure 9) may also be installed to secure the area and prevent unauthorised access.

Construction will necessitate the temporary closure of the access road to / from Cally Industrial Estate. Alternative access arrangements are currently being investigated. Affected residents and businesses will be consulted to inform the proposals for alternative access arrangements.

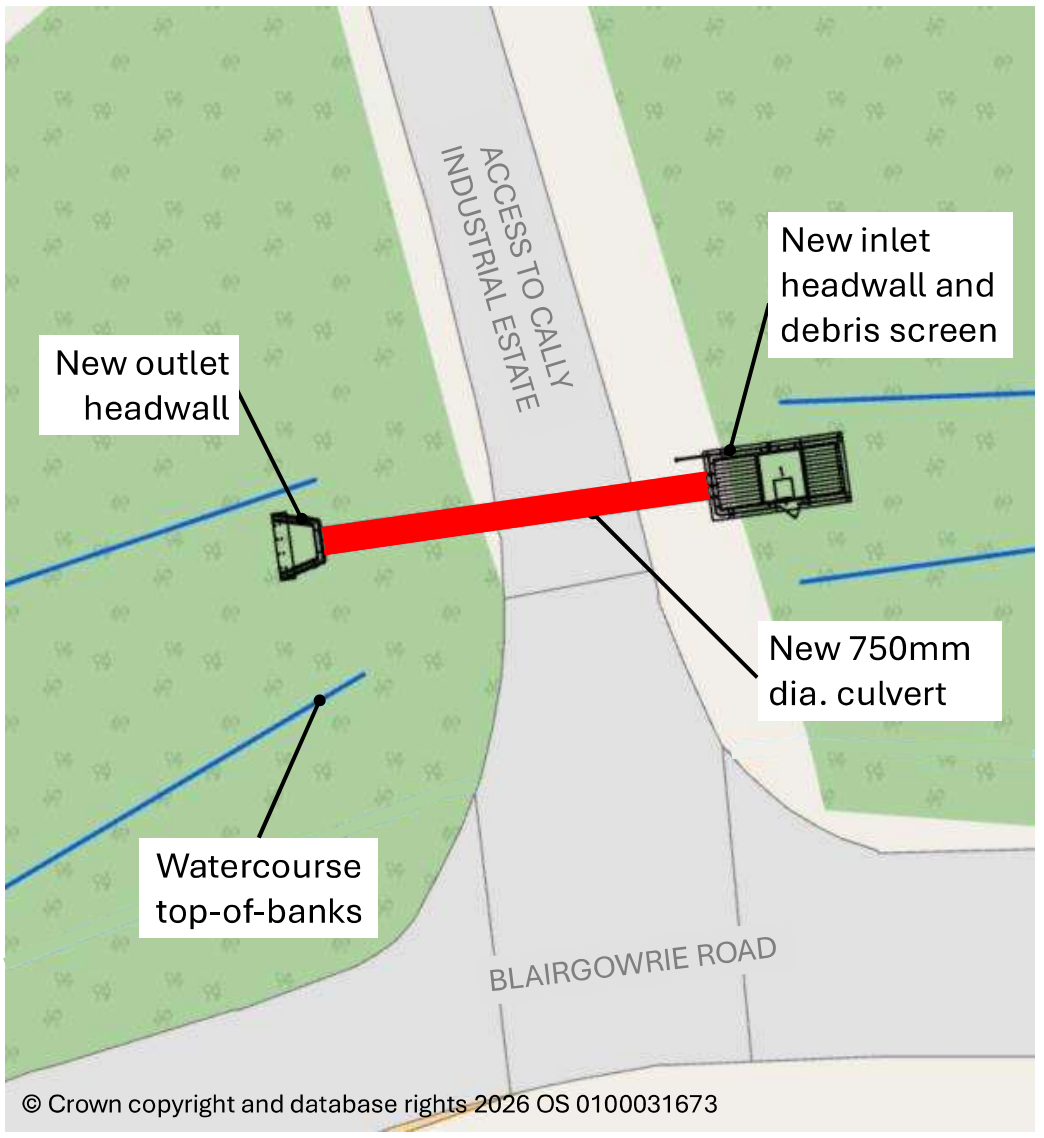

Figure 9: *Proposed replacement culvert route at Work Area 1*

Figure 10: *Existing culvert inlet at industrial estate*

Figure 11: *Illustration of example two-stage debris screen*

DETAILS OF PROPOSED SCHEME (2 OF 4)

WORK AREA 2

Flood Storage Wall

A **new flood storage wall** is being proposed north of the Kings Pass / Blairgowrie Road junction.

The purpose of the wall is to reduce flooding in Dunkeld by temporarily storing floodwater from nearby watercourses within the adjacent field. During periods of heavy rainfall, water will be held back by a new controlled outfall (by way of a downsized culvert) and encouraged to collect in this field, creating a temporary flood storage area and reducing the volume of water flowing downstream into Dunkeld.

The field has historically acted as a natural flood storage area during previous flood events, see Figure 14 on page 9. The proposed scheme would formalise this natural process and further utilise the existing low point in the topography to increase the total storage volume.

Culvert and Headwall Upgrade

A CCTV survey of the watercourse culvert beneath Blairgowrie Road found it to be in poor condition. The proposed scheme intends to replace this with a smaller pipe to control discharge from the flood storage area. This would be accompanied by the installation of a **new headwall and two-stage debris screen** to increase resilience against blockage.

Figure 12 presents two options for the new alignment. The final route will depend on the location of underground services which are being investigated.

Burn Re-meandering

It is proposed to **re-meander part of the Sawmill Brae Burn** through the field behind the wall to suit the new outfall arrangement. This would also create a more natural channel shape and alignment, further supporting the scheme by promoting normal watercourse functions, such as sediment deposition, and reducing blockage risk to the culvert.

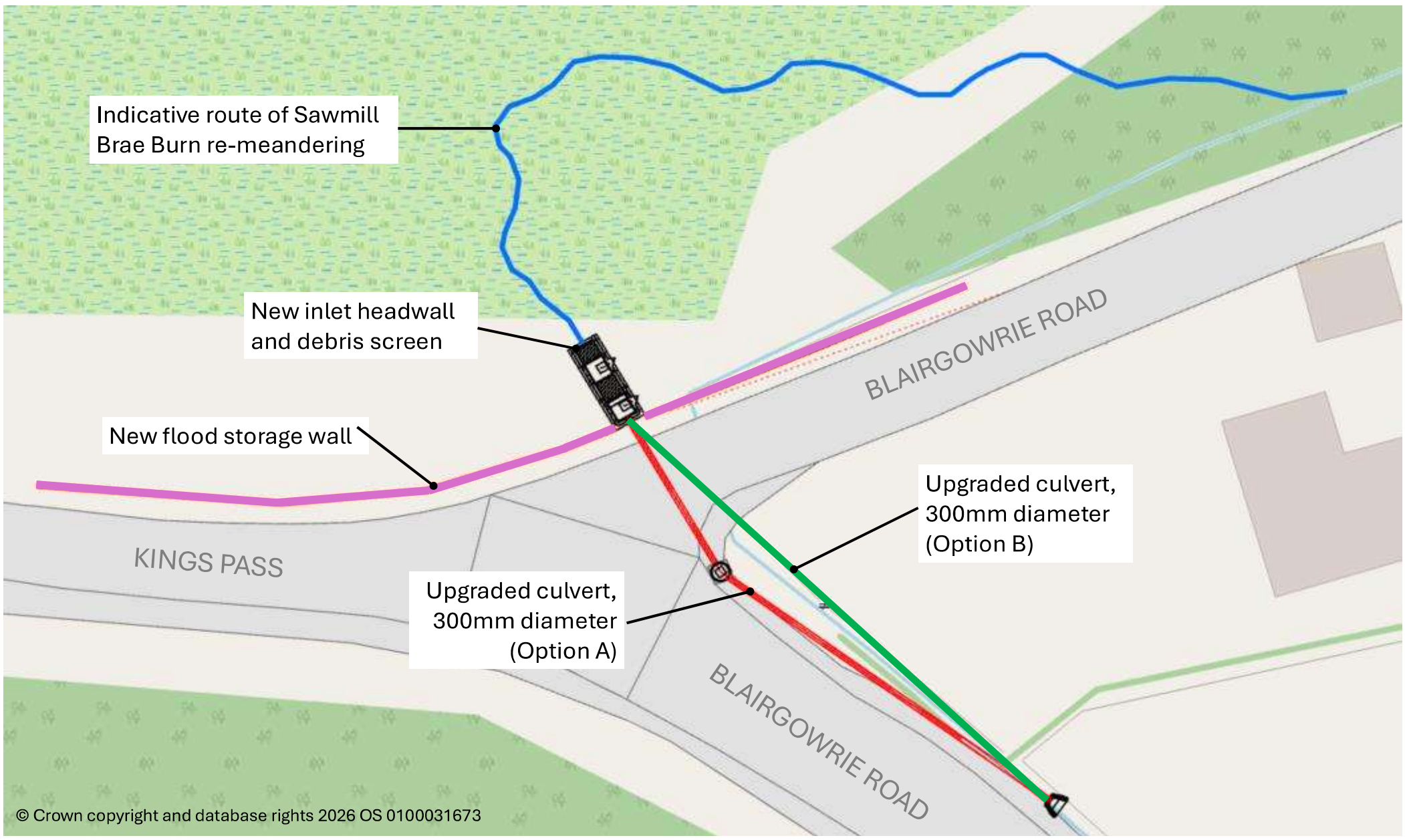

Figure 12: *Proposed flood storage wall, upgraded culvert options and burn re-meandering at Work Area 2*

DETAILS OF PROPOSED SCHEME (3 OF 4)

WORK AREA 2 (CONTINUED)

Visual Impacts

The proposed wall would be around **70 metres long** at an average height of **0.9 metres** relative to the road. The new culvert inlet headwall and debris screen would be hidden behind the wall, however (restricted) access arrangements (not shown in Figure 13) for operational and maintenance staff may be visible, including safety railings.

Some tree removal would also be required to enable construction; however, a detailed landscaping plan will be developed, including consideration of compensatory planting.

We will work with PKC's Conservation and Heritage teams to mitigate the visual impact of the wall as far as possible. This may include finishing the wall with **natural stone cladding or a suitable concrete finish**. An indicative visualisation of what the flood wall could look like with a potential stone cladding option is shown in Figure 13.

Water Level Monitoring

A **remote telemetry gauging system** will monitor water levels in the flood storage area and provide an early warning alert if there is a risk of this overspilling in an event that exceeds the standard of protection (discussed in slide 11).

Figure 13: *AI generated visualisation of proposed flood wall showing potential cladding option.*
(Disclaimer: This image is for indicative purposes only and does not reflect required tree losses or other ancillary works, such as headwall access)

Figure 14: *Natural low point North of the Kings Pass / Blairgowrie Road junction, shown to be currently subject to flooding.*

DETAILS OF PROPOSED SCHEME (4 OF 4)

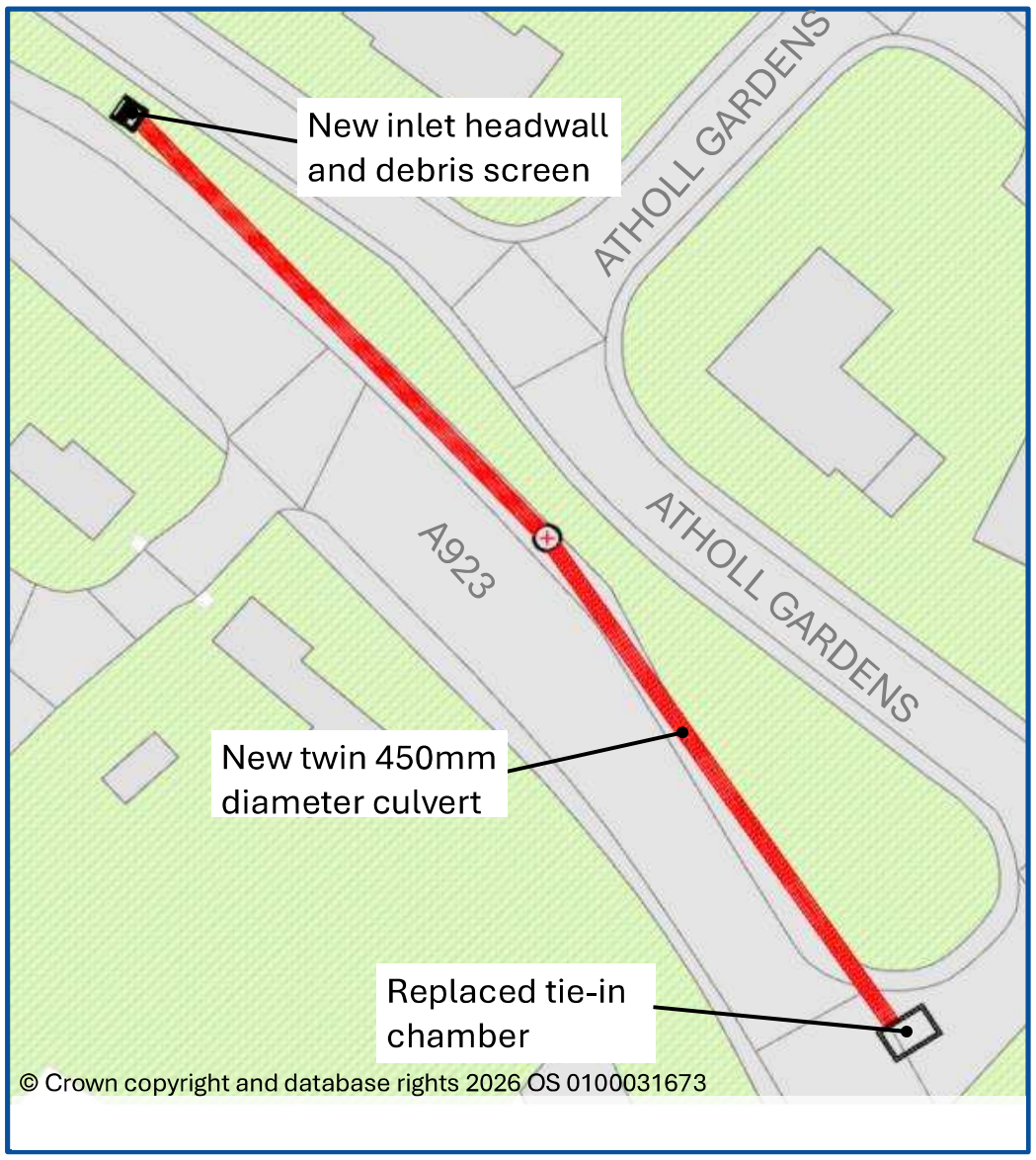

Figure 15: Proposed replacement culvert route at Work Area 3

Gully Connections

CCTV and site investigation works discovered multiple road gully connections from Atholl Gardens to the existing culvert, which has significant root ingress. As part of the scheme, it is proposed to install a **new carrier pipe** to collect these connections and drain them to the new culvert.

Tie in Chamber Replacement

The current tie in chamber at the junction between Atholl gardens and the A923, shown in Figure 16, will be replaced to accommodate the revised layout of the proposed flood scheme.

WORK AREA 3

Culvert Upgrade

The scheme hydraulic model confirmed the existing culvert at Atholl Gardens is too small to manage flows during extreme events. It is proposed to upsize this to a new culvert that has **3x more capacity**.

The final alignment is subject to the location of underground services. Some tree and hedge removal would be required to enable construction; however, a detailed landscaping plan will be developed, including consideration of compensatory planting.

Figure 16: *Tie in Chamber surcharging at the Atholl Gardens A923 junction.*

REDUCING FLOOD RISK

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.

Impact on Flood Risk

The Hydraulic model was developed to represent the watercourses in Dunkeld and identify the most suitable location for the proposed defences. This has been useful because adding defences in one location can alter the flow of the burn elsewhere. This also helps us understand the potential impacts on water levels upstream and downstream of the proposed flood scheme.

Figure 19 (on Page 12) illustrated the predicted extent of the 1% AEP flood event without the recommend scheme in place.

Figure 20 (on Page 13) illustrates the predicated extent of the 1% AEP flood event with the recommended flood scheme in place.

Figure 21 (on Page 14) illustrates the predicated reduction in flood depths as a result of the proposed scheme.

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 of which are shown in Figures 17 and 18.

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.

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.

Figure 17: Photo showing the deployable flood barriers used by the Atholl Gardens community resilience group

Figure 18: Example property flood resilience options courtesy of the Scottish Flood Forum

PRE-SCHEME FLOOD MAP, 1% AEP

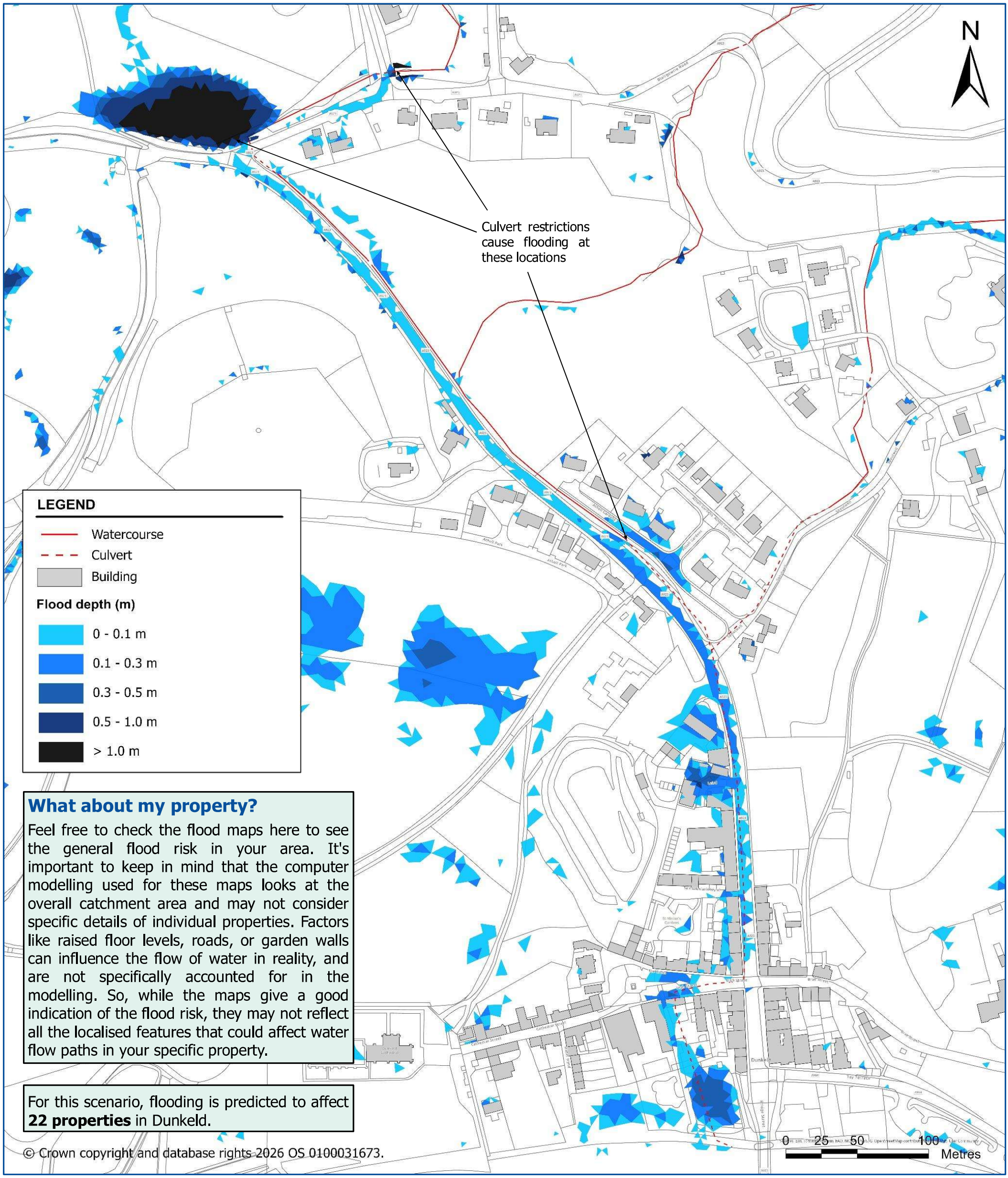

Figure 19: *Pre-scheme flood map, 1% AEP*

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POST-SCHEME FLOOD MAP, 1% AEP

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LEGEND

- Watercourse
- Culvert
- Building

Flood depth (m)

- 0 - 0.1 m
- 0.1 - 0.3 m
- 0.3 - 0.5 m
- 0.5 - 1.0 m
- > 1.0 m

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 consider specific details of individual properties. Factors like raised floor levels, roads, or garden walls can influence the flow of water in reality, and are not specifically accounted for in the modelling. So, while the maps give a good indication of the flood risk, they may not reflect all the localised features that could affect water flow paths in your specific property.

For this scenario, flooding is predicted to affect **16 properties** in Dunkeld.

0 25 50 100 Metres

Figure 20: *Post-scheme flood map, 1% AEP*

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REDUCTION IN FLOOD DEPTH MAP, 1% AEP

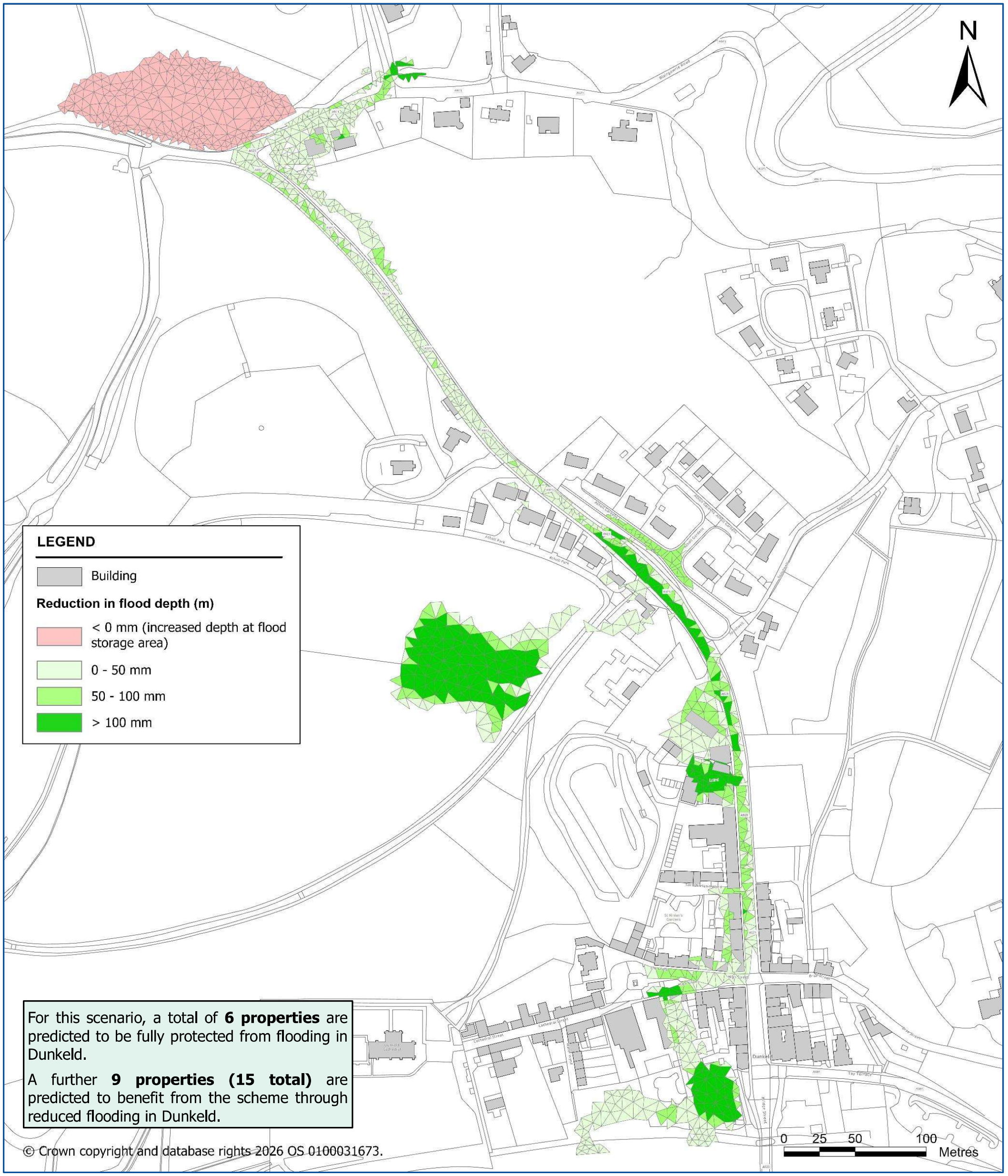

Figure 21: *Reduction in flood depth map, 1% AEP*

ECONOMIC APPRAISAL

Scheme Economic Appraisal

In managing flood risk, the Council must have regard to the economic impact of its actions. The cost of the flood scheme can't exceed the benefits, i.e. the **benefit/cost ratio** must be greater than 1.0.

An economic appraisal (or cost benefit analysis) was carried out and the estimated outline cost and predicted benefits offered over time by the flood scheme were assessed. Industry-standard, 'best practice' techniques were used to estimate the potential flood damages and costs. This included the HM Treasury Green Book, Scottish Government Flood Risk Management Option Appraisal guidance, and the Multi-Coloured Manual (MCM).

Figure 22: *Economic appraisal guidance*

Estimated Flood Damages

Estimates of the economic losses associated with flooding were calculated to establish baseline damages and quantify scheme benefit. This assessment considered the following:

- Damage to residential properties
- Damage to non-residential properties (e.g. commercial / industrial properties)
- Cost of residential evacuation
- Damage to vehicles due to submergence
- Emergency services costs
- Impacts on health

Estimated Costs

Estimates of total scheme cost consider all design, construction, maintenance and operational costs over a 100-year assessment period.

The outline design – and therefore the cost - may change following consultation with the community and further consultation with other key organisations such as SEPA, SNH and public utility companies. Construction costs could also change as elements of the scheme are developed in more detail during detailed design and as more information is obtained about the site. As there are many risks and uncertainties, a contingency amount (known as an 'optimism bias') is applied to the cost calculations.

Scottish Government guidance recommends applying an optimism bias factor of 60% at the outline design stage, where uncertainty is greatest. As the project progresses to detailed design and cost certainty improves, it is recommended this is reduced to 30% for scheme costs.

Benefit Cost Ratio (BCR)

The current benefit cost ratio is 2.0, therefore the **scheme is economically viable**.

Element	Present Value (£)
Estimated whole life cost	£ 1,082,883
Estimate benefits	£ 2,174,991

Table 1: *Summary of estimated costs and benefits*

Note that the scheme economic appraisal is **subject to revision**. Costs and benefit estimates are correct at time of public exhibition.

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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/dunkeldfloodscheme

Please ensure that all comment forms or online submissions are returned to PKC by **Wednesday 1st July 2026.**

Contact Details

For further information on the proposals, please contact:

Flooding Team
Perth and Kinross Council
Pullar House
35 Kinnoull Street
Perth, PH1 5GD

Flood@pkc.gov.uk

Further information on the proposed flood scheme can also be viewed on the Council's website at:

www.pkc.gov.uk/article/24017/Dunkeld-Flood-Protection-Scheme

Phase of Work	Timescale and Description
Outline Design	**April 2025 to September 2026** Development of the initial scheme design and assessment of options.
Statutory Approvals and Permissions	**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.
Detail Design	**April 2027 to March 2028** Preparation of detailed design information for construction. *Further community consultation events will take place during this stage.
Procurement of Contractor	**April 2028 to September 2028** Process to appoint a contractor for delivery of the scheme.
Construction Period	**October 2028 to December 2029** On-site construction and delivery of the flood scheme.