Invergowrie Natural Flood Management Study

1. Overview

Perth & Kinross Council has been carrying out a Natural Flood Management (NFM) study for Invergowrie and the surrounding area and is seeking the views of the community on the draft outputs.

Invergowrie has experienced flooding in the past from the Invergowrie Burn and other small watercourses. In August 2004 the Invergowrie Burn overflowed, affecting properties on Main Street, Burnside Road, Balruddery Farm and the road at Boniface Road and Boniface Place. In January 2011 the Invergowrie Burn overflowed, affecting roads and a residential property. The most recent flood was recorded in January 2016 when one residential property flooded.

Under the Flood Risk Management (Scotland) Act 2009, Invergowrie was designated as a Potentially Vulnerable Area (reference 07/12) within the Tay Estuary & Montrose Basin Local Plan District. Actions to manage flood risk are contained within the published Tay Estuary and Montrose Basin Local Flood Risk Management Plan, and this included the requirement for a NFM study. Further information can be found at www.pkc.gov.uk/frmplans.

The Council engaged consulting engineers, Sweco, to deliver the NFM study. The purpose of the study is to improve our understanding of flood risk to homes and businesses within Invergowrie and the surrounding area and to explore potential natural flood management options for managing and, where possible, reducing the identified risk.

A substantial amount of data was collected to inform the study from site walkovers, topographic and environmental surveys, and river and rainfall records. Local information was gathered by issuing a community questionnaire (in May 2020) to supplement existing records of flooding.

2. Predicted Flood Risk

A hydraulic model was developed to represent the watercourses in the area including the Invergowrie, Fowlis, Liff, Balruddery and Lochee Burns. The hydraulic model was used to produce maps showing the estimated extent of floods of various magnitudes.

Figure 1 shows the estimated extent and depth of the 1 in 200 year flood (the flood with a 0.5% chance of occurring in any given year). Figure 2 indicates how this will change in the future due to climate change.

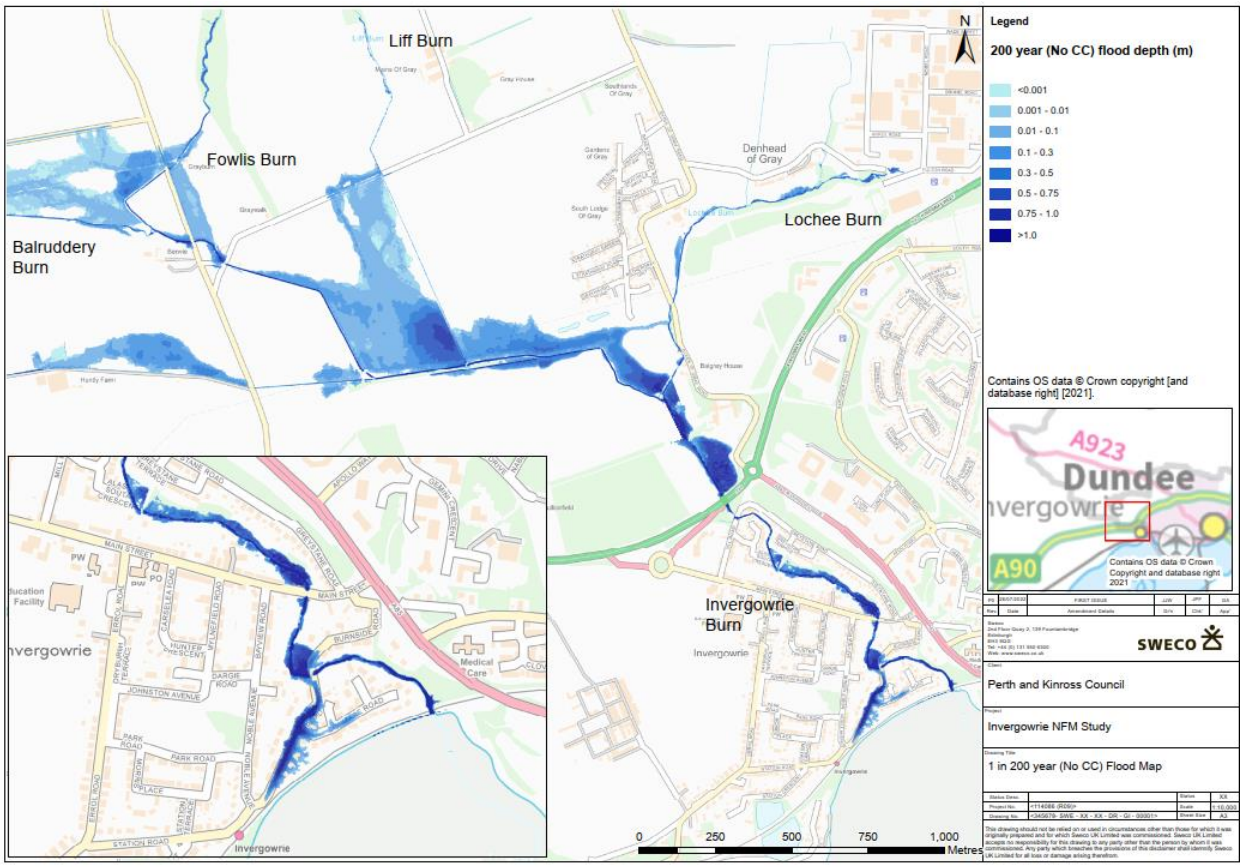


Figure 1 – The estimated extent and depth (in metres) of the 1 in 200 year flood

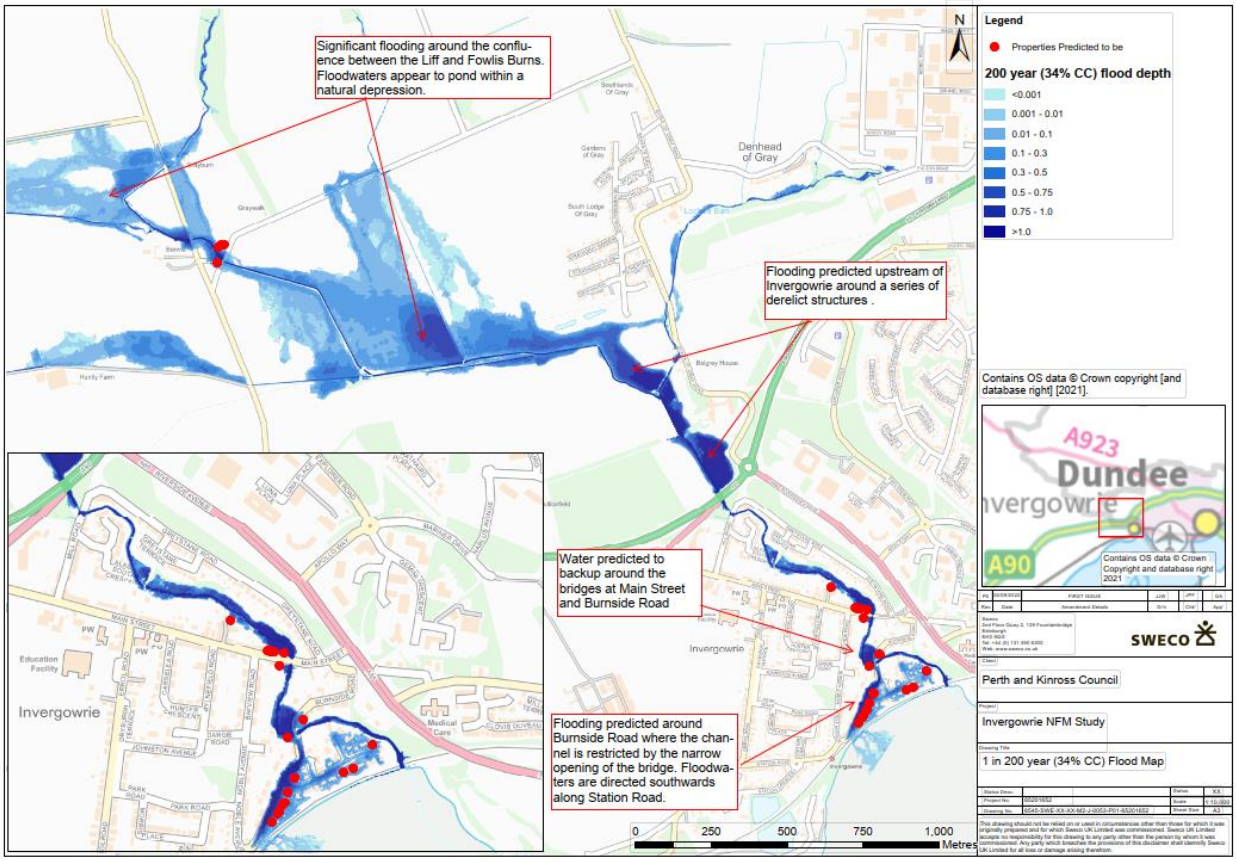


Figure 2 – The estimated extent and depth of the 1 in 200 year flood with an allowance for climate change

The flood maps indicated that 26 properties are at risk of flooding in the 1 in 200 year flood. In the future this will increase to 28 due to climate change. This is less than previously indicated in this area and confirms that the level of flood risk to properties is lower than anticipated.

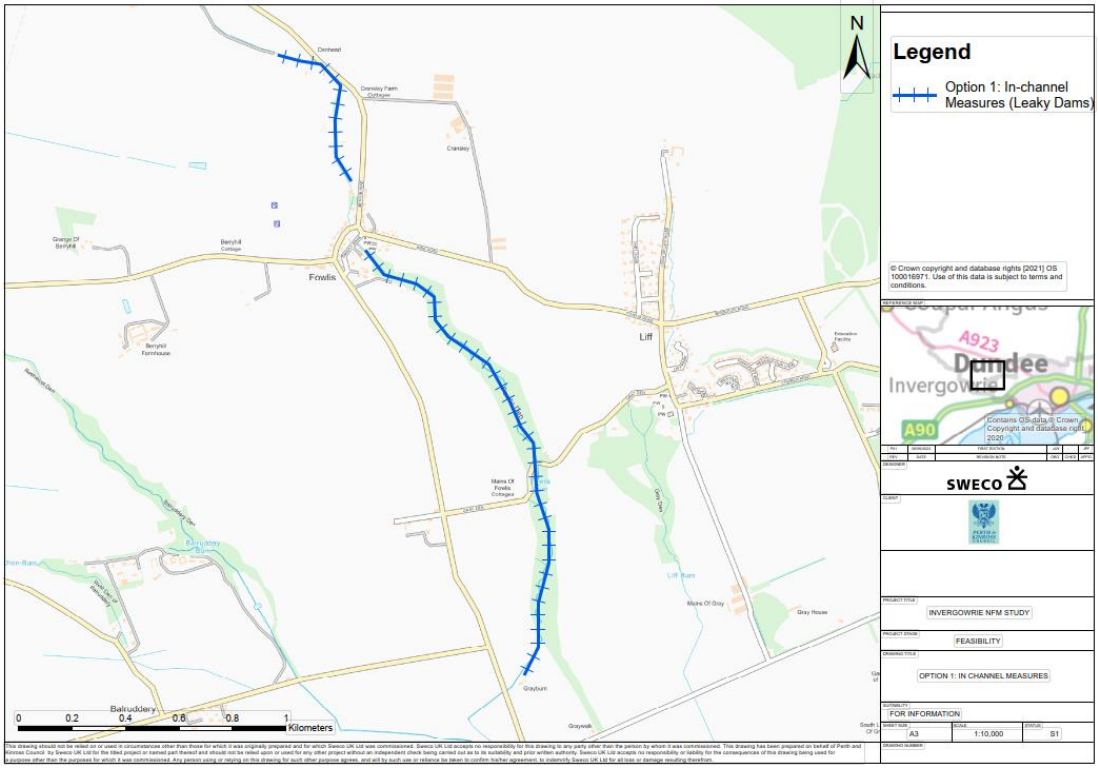
3. Flood Risk Management

The next step involved consideration of the potential options to manage the predicted flood risk. A long list of actions was developed, including natural flood management measures as well as more traditional flood defences - see Figure 3. These actions were then screened (on technical, environmental, social and economic grounds) to produce a short list for further appraisal.

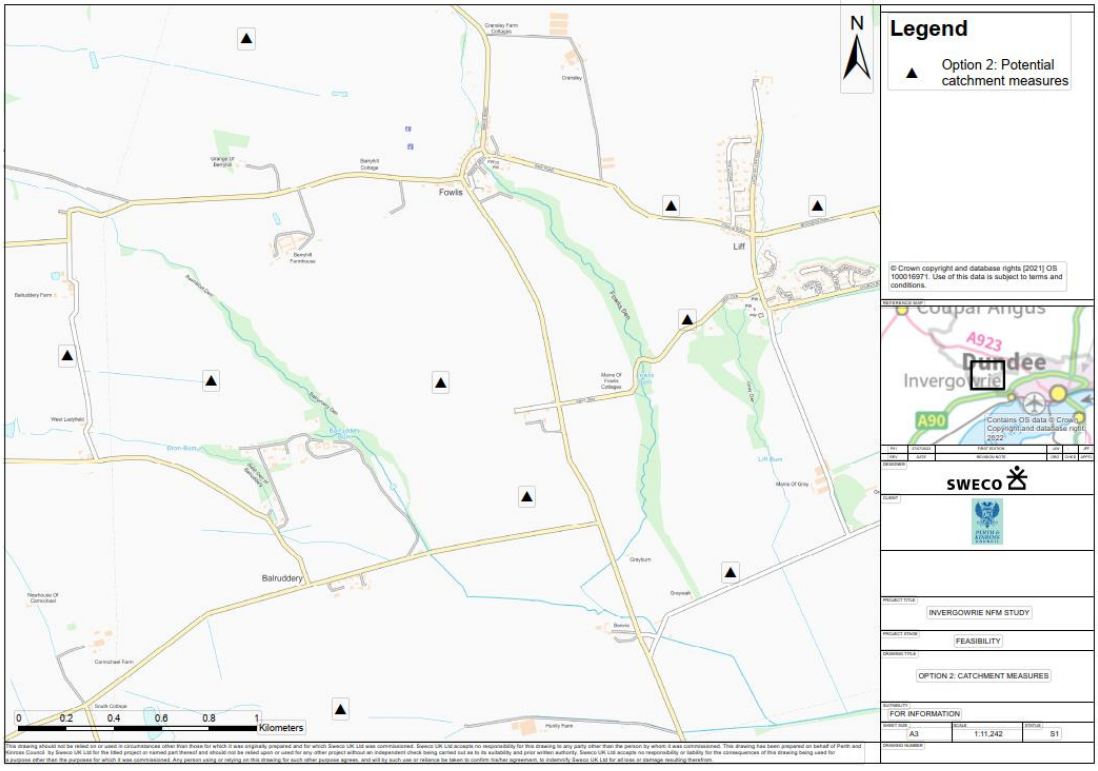
Figure 3 – Long list of potential actions

The short listed actions were combined into five options that were tested using the hydraulic model to assess their performance:

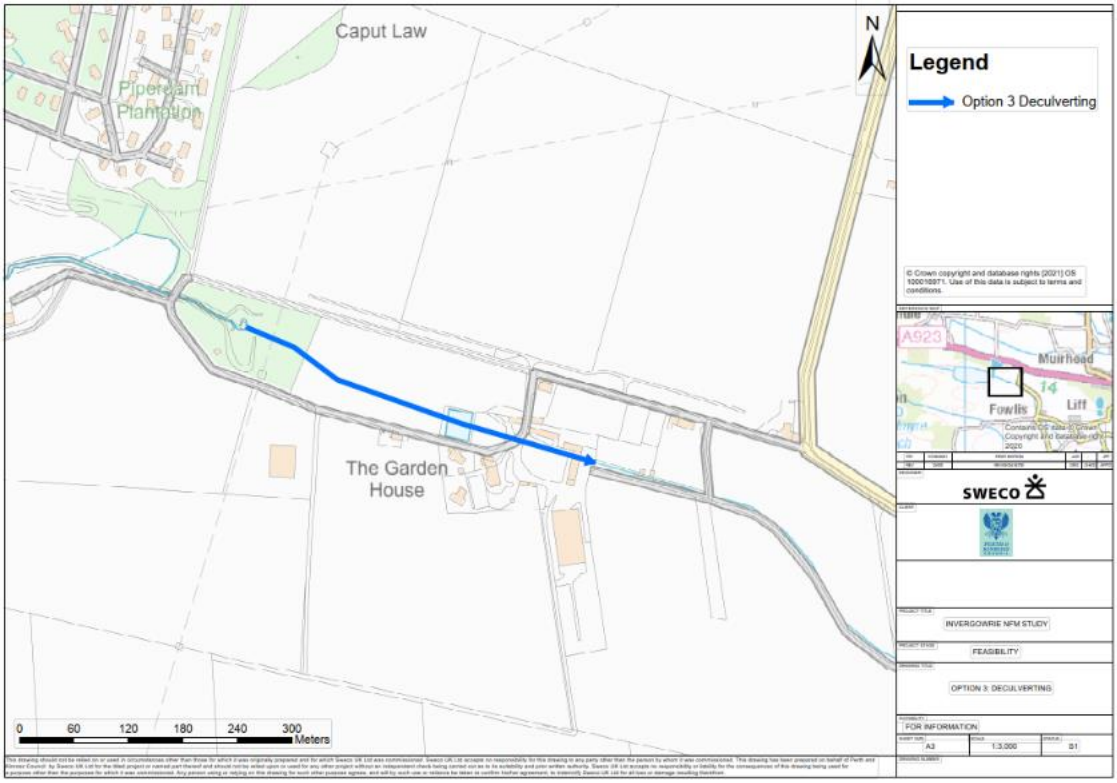
- **Option 1:** In channel measures to attenuate flows along the upper Fowlis Burn including riparian planting, leaky dams, and woodland management in Fowlis Den.

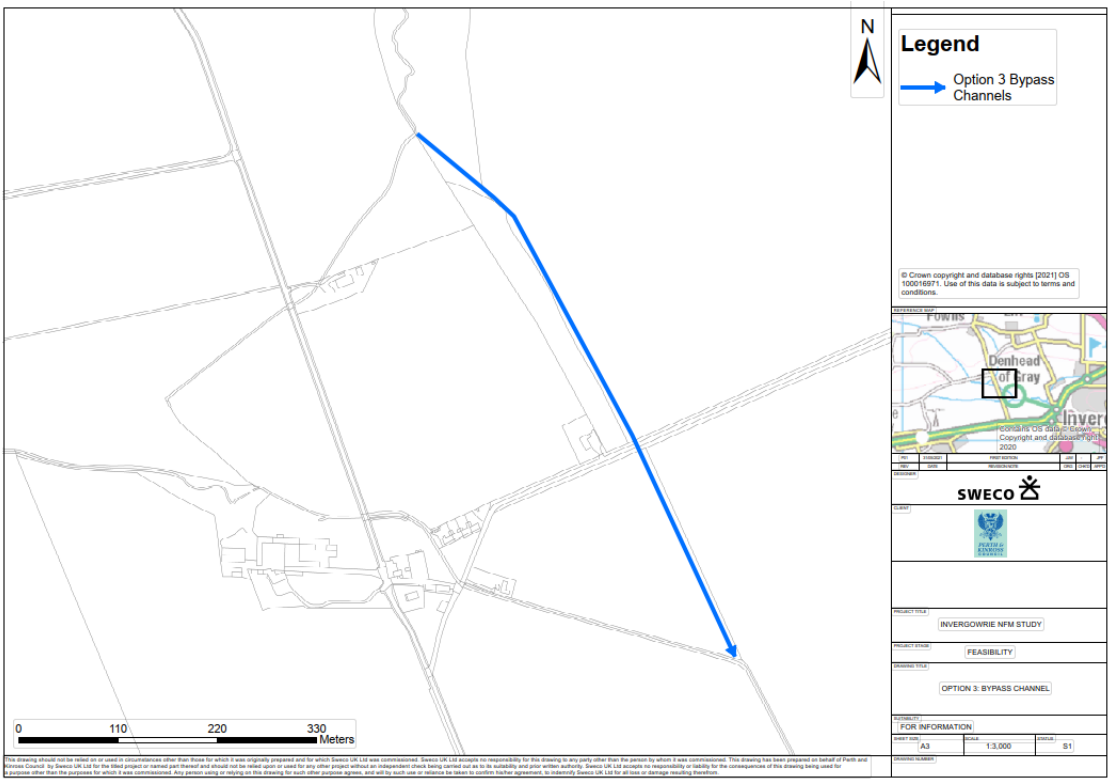


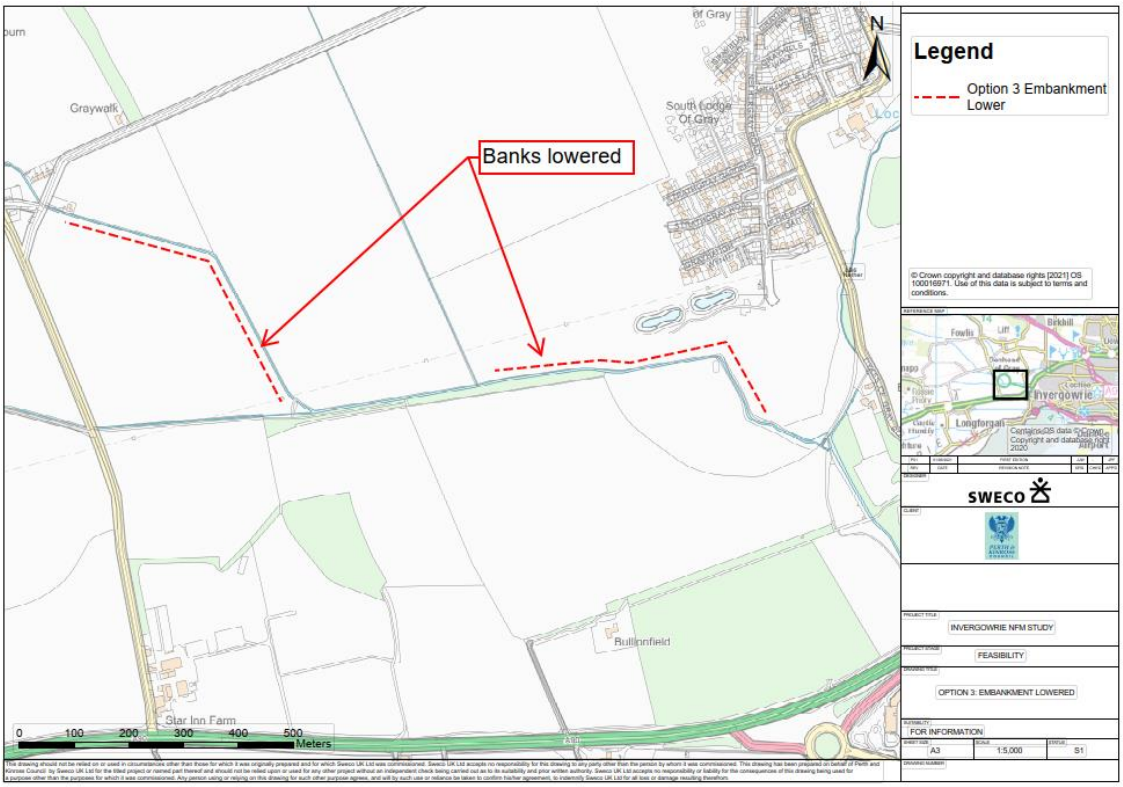
- **Option 2:** Catchment wide measures including reforestation, distributed surface water storage, and sustainable land management practices.



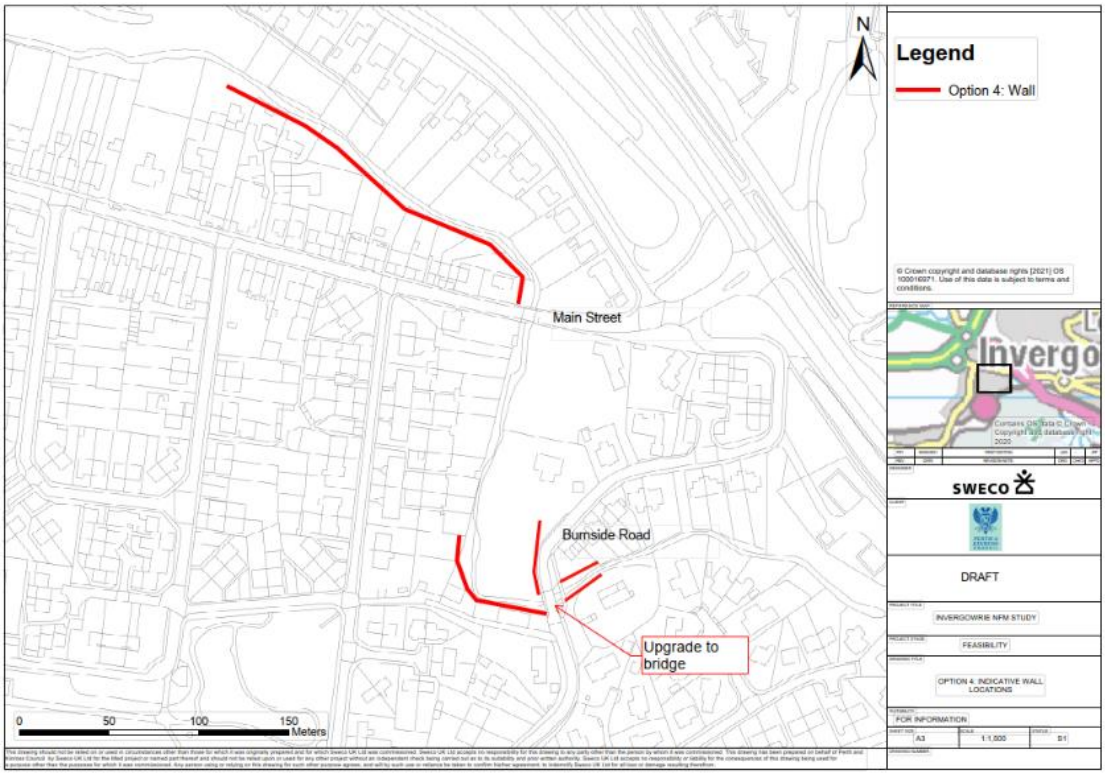
- **Option 3**: Structural measures including de-culverting sections of the Fowlis Burn, incorporating a bypass channel close to Fowlis, and removing embankments to reconnect the Fowlis Burn with its floodplain.







- **Option 4:** Direct flood defences within Invergowrie including walls upstream and downstream of Main Street and Burnside Road.



- **Option 5** - Non-structural measures such as more frequent and extensive inspection visits of structures in the upper catchment; the promotion of sustainable land management (such as enhanced flood water storage or woodland planting),

property buy-back, awareness raising, and updates to local planning policies to consider flood plain management.

Each of the five short-listed options has varying levels of benefit. The options were discussed at a steering group workshop held with key stakeholders including SEPA and Scottish Water.

The assessment included an economic appraisal (cost benefit analysis) of the options. In managing flood risk, the Council must have regard to the economic impact of its actions. The cost of a flood scheme can't exceed the benefits, i.e. the benefit/cost ratio must be greater than 1.0. Some benefits are difficult to monetise (for example health and wellbeing or biodiversity) and hence the benefit/cost ratio only forms part of the final overall assessment.

Table 1 summarises the options assessment.

	Option 1	Option 2	Option 3	Option 4	Option 5
Properties protected in 1 in 200 year flood	0	12	12	16	0*
Capital Cost	£425,600	£2,032,240	£2,340,800	£2,128,000	£4,583,240
Benefit Cost Ratio	0.00	0.21	0.30	0.08	0.20
Assessment	Option doesn't fully meet study objectives. Potential for the installation of leaky dams and riparian planting. Small ecological benefit noted, but unlikely to improve watercourse condition. Very limited benefit in terms of reducing flood risk.	Option doesn't fully meet study objectives. Modelling indicates that catchment wide measures would have a limited benefit in terms of reducing flood risk. Significant flood storage volume required to reduce flows reaching Invergowrie; this would be extremely large and benefit/cost would be low. Further issues noted with land ownership and maintenance.	Option doesn't fully meet study objectives. Measures are costly and would require extensive work on the watercourses. Option has a limited benefit in terms of reducing flood risk.	Option doesn't fully meet study objectives. Measures could potentially lead to a deterioration in the environmental status of the watercourse. Works would be intrusive and require substantial construction and land resources. Option has a limited benefit in terms of reducing flood risk.	Option doesn't fully meet study objectives. Option includes a mix of measures; the main benefit would be derived from buying (*not protecting) 28 properties & re-naturalising flood plains over the longer term. Landownership would be a major constraint. Benefits would be realised over long term; requiring long term investment. Would provide wider benefits from education and engagement.

Table 1 – Comparison of Options

Unfortunately, none of the short-listed options are viable and they all have a cost benefit ratio of less than 1.0. None of the options meet the study objectives as they only have a minor impact in terms of reducing flood risk.

4. Recommendations

The flood study was unable to identify a viable option that provided flood protection for the community of Invergowrie and the surrounding area. As a result, no flood scheme has been recommended.

However, the study has recommended a number of actions to help mitigate flood risk in the future:

- Property flood resilience measures (e.g. the use of flood protection products such as door guards, air brick covers, etc) should be considered by residents that have been affected by flooding or are located in at risk areas. Individual property surveys would be required to identify suitable measures. Further advice on this is available on the Council's website at www.pkc.gov.uk/plp and from the Scottish Flood Forum (https://scottishfloodforum.org)

- The Local Authorities should continue to inspect watercourses and carry out clearance and/or repair works of known 'at risk' areas, where this will significantly reduce flood risk. This includes:

    - Perth & Kinross Council – Invergowrie Burn (through village)
    - Dundee Council – Invergowrie/Lochee/Liff/Fowlis Burn
    - Angus Council – Fowlis/Balruddery/Iiff Burns

- Landowners are encouraged to adopt sustainable land use management and private NFM measures. These measures may provide benefits in terms of carbon storage, wildlife corridors and public amenity.

- The James Hutton Institute are encouraged to continue with trials for new land management techniques.

- Planning Authorities (for Perth & Kinross, Angus and Dundee City Councils) should continue to apply local and national planning policies with respect to flood risk. The geomorphological assessments undertaken found that the Invergowrie Burn is potentially at risk in terms of the deterioration of its Water Framework Directive (WFD) status. Any future planning applications involving channel modifications or nearby developments should be carefully considered so as not to result in any deterioration in the watercourse status. The information identified in this study should be used to inform the determination of planning applications within the study area and inform future Local Development Plans.

- Dundee City Council should continue to liaise with Scottish Water regarding the ongoing Lochee Burn model.

- The hydraulic model provides a sound representation of the watercourses appropriate for the purposes of this study. However, should a more detailed representation be required in the future, areas of potential improvement are:

    - Implementing a monitoring strategy along the Invergowrie Burn and its tributaries such as installation of river depth/flow gauges.
    - More detailed analysis of several structures which may influence flows reaching Invergowrie. This includes a large embankment across the Balruddery Burn, as well as several culverts and structures along the upper Fowlis Burn.

5. Next Steps

Residents are encouraged to provide their views on the draft study findings and recommendations. A comment form has been provided and should be returned to the Council at the address at the bottom of this page (preferably by e-mail) before Friday 23 September 2022.

A Question & Answer document will be produced following receipt of the comment forms and will be circulated to the community to answer any queries/comments received.

The NFM Study will then be updated and finalised. The conclusions of the flood study will then be reported to the next Environment, Infrastructure & Economic Development Committee. Thereafter, the Council will implement the recommendations of the report.

Contact Details:

For further information on the Invergowrie Natural Flood Management Study please contact:

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