

Appendix A - Summary of Potential Flood Scheme Options Considered

A number of potential actions have been considered to determine if they would be suitable as part of the proposed flood scheme. The actions were assessed on technical, environmental, social, and economic grounds to arrive at the recommended scheme. Some of the actions have also been assessed in combination to determine if this could provide an improved solution when compared to one action in isolation.

Potential Option	Description	Comment
The use of flow controls (at the M90 motorway) and managed flooding on upstream farmland.	Restricting the capacity of the existing culverts under the M90 motorway and utilising the M90 motorway embankment was considered as a possible way of alleviating flooding to South Kinross.	This option was ruled out due to doubt over the feasibility and cost of this option.
Flood walls and embankments	Flood walls and embankments built along rivers can defend properties from high water levels. The heights of the defences are determined by predicted flood levels, local ground levels and calculated freeboard (an allowance for uncertainty and a safety factor).	This action has been taken forward for the South Queich.
Improvement of Channel Conveyance	The limited capacity of river channels and culverts has been identified as contributing to flooding. Improvements would require increasing the capacity of the infrastructure to allow water to pass more freely without causing flooding.	The proposed scheme includes improvements to existing culverts to increase the flow capacity and alleviate flooding at key points on the Clash Burn.
A new river channel to divert the South Queich and Gelly Burn directly to Loch Leven (bypassing the town).	A diversion channel was considered which would have been designed to divert flood water from the Gelly Burn directly into Loch Leven, thereby bypassing Kinross and the confluence of the South Queich.	The action was ruled out based upon the flood walls and embankment options having a higher cost benefit ratio.
Online/offline flood storage	Where space is available, excess flood water can be temporarily stored upstream to reduce	While no suitably large areas were identified which could store sufficient flood water, a

	<p>flooding further downstream. The flood water can be released at a slower rate after the flood peak to protect properties further downstream. Areas that can typically be utilised include public parks, sports fields or agricultural land.</p>	<p>suitable area of upstream flood storage was identified to reduce the risk to the Kinross Services. This action has been taken forward for this area.</p>
<p>Partial diversion of the Clash Burn to the South Queich</p>	<p>The possibility of diverting the Clash Burn into the South Queich upstream of Smith Street was explored.</p>	<p>Although this option is technically feasible, it would only provide a partial solution to problems around Smith Street and was later ruled out in favour of culvert improvements.</p>
<p>Dredging</p>	<p>The hydraulic model was used to investigate the benefit of dredging the South Queich.</p>	<p>This action was ruled out as significant depths of dredging would be needed to achieve the required standard of flood protection and this was not found to be feasible. Dredging would also have to be repeated every 10 years to maintain riverbed levels and hence would require significant funding on an on-going basis.</p>
<p>Natural flood management</p>	<p>Natural flood management involves altering land management practices upstream to slow or store the flow of water into watercourses. This reduces flood risk and provides environmental and biodiversity improvements. An NFM study was carried out in the catchment to consider various measures including woodland creation, leaky barriers, floodplain reconnection, improved land management and buffer strips and hedges.</p>	<p>NFM measures would provide a standard of protection significantly below the 1 in 200 year flood (0.5% AEP). This action would require extensive work with upstream landowners and would not reduce flood levels sufficiently to work in isolation. This option would also take a number of years to implement fully. The use of natural flood management as an option has therefore been ruled out as part of this scheme.</p>
<p>Property flood resilience</p>	<p>Various flood products are available to protect properties or make them more resilient to the potential ingress of flood water through doors,</p>	<p>This action was ruled out for the majority of the area but will be taken forward for properties where there is no other viable solution, e.g. some properties adjacent to Loch Leven.</p>

	windows, brickwork and sewage systems. While this action would not address the sources of flooding, it would help to reduce damage due to internal flooding.	
Property relocation	Where the value of a property significantly outweighs the cost to protect it from flooding, then it may be viable to purchase the property and relocate the affected parties.	Given the scale of flooding in the area, and the location in the heart of the town, this action was ruled out at an early stage as being unacceptable.
Flood storage pond	A flood storage pond at the Myre playing fields was considered to manage flooding from the Clash Burn. This pond would be dry in normal conditions.	This action has been ruled out due to unfavourable loss of amenity space and the cost associated with a large area of excavation and disposal of material.
Loch Leven flood defences	Flood walls were considered in the vicinity of the Loch Leven Boat House, to provide protection to properties from high levels on Loch Leven and the South Queich.	Flood defences would result in these properties being surrounded, or ringfenced, and cut off from the Loch. This option was therefore ruled out as the business relies on access to the loch for social and economic reasons. Property Flood Resilience measures have been recommended instead.

Recommended Scheme

Following an assessment and appraisal of the various potential actions, the proposed flood scheme includes the provision of **new flood walls and embankments, culvert improvements, a flood storage area and property flood resilience measures.**