

## **Carrochan Burn Feasibility Study**

### **Flood Alleviation Options**

#### **Background**

##### Levenhowe Flood Risk

- Increased flood risk in recent years as a result of climate change
- The most recent major event was in October 2023.
- Damage to multiple residences and local businesses with high levels of costs to property owners
- Increase insurance costs
- River Leven Study undertaken in 2019 as part of our cycle 2 actions. Decision on any funding from Scottish Government has been delayed indefinitely.
- River Leven Study split into several cells with proposed mitigation for this area included in Flood Cell 8 to undertake improvements in the Ballagan and Carrochan Burns.
- £500k assigned for this element however completion of this in isolation would have resulted in increased flood risk further downstream and was unable to be progressed.

#### **Works to date**

The funding available was used instead to progress other flood mitigation measures and improve flood resilience to properties. The Council has progressed several projects over the last few years. These included:-

- Property Level Protection (WDC 100%) contribution
- Vegetation Clearance
- Reinstatement of Culvert Overflow
- Undertake Surface Water Management Plan for Alexandria.
- Through discussions with local residents, we have been working to identify a potential solution. Engaged consultant to undertake a feasibility and options report to identify any potential mitigation measures.

## Target Standard of Protection

- **Design Target Standard of Protection**

- The standard guideline for grant funding purposes is typically protection against a 1 in 100-year event, though 1 in 200-year is common for major projects to account for climate change and future risk.
- A 1 in 75-year standard is often considered the minimum to allow for affordable insurance, but new schemes aim for 1 in 100-year or higher.

- **Explanation of Terminology**

- *Return period*

- The average length of time between events of a similar magnitude
- 1 in 100 year return period does not necessarily mean it happens once every 100 years

- **Annual Exceedance Probability (AEP)**

- The probability of a specific magnitude event occurring or being exceeded in any given year.
- For instance, a 1% AEP event has a 1 in 100 chance of being exceeded in any single year, while an AEP of 0.1% corresponds to a 1 in 1,000 year event.

## Options Appraised

### Option 1 Enclosed Culvert Removal

**Estimated Cost £601,948**

Removal of enclosed culvert to increase burn capacity and remove possible flow restrictions.



Provides flood alleviation for 47 properties



Provides flood alleviation for 1:100 year events but allows for future improvements.

## **Option 2 – Removal of burn with construction of additional hard defences**

**Cost - £1,430,059**

Removal of enclosed culvert as identified in option 1 with added reinforced concrete was set along the riverbank to prevent out of bank flooding.



### **Benefit**

Increased flood risk alleviation to 1:200 year event with flood alleviation provided for 56 properties.

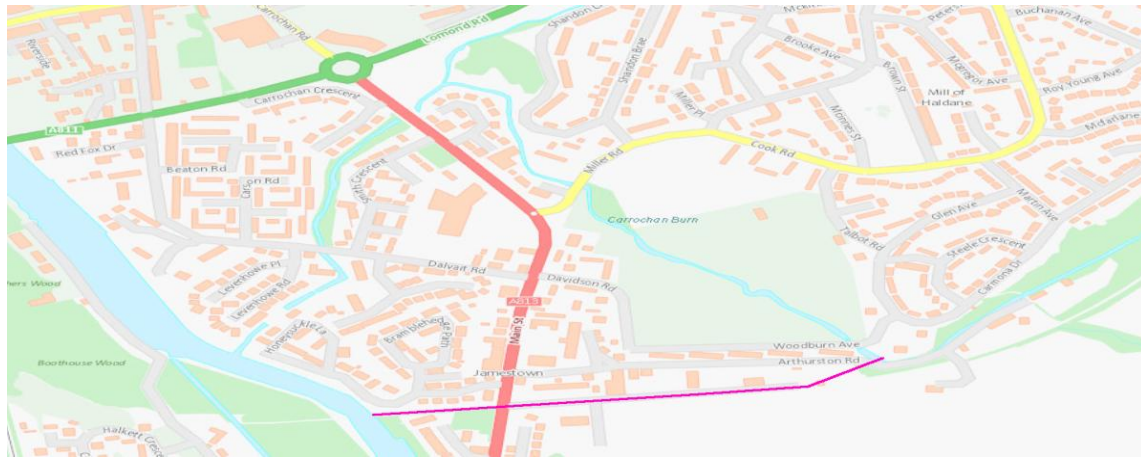


Could be delivered in stages with culvert removed initially and hard defences undertaken at a later date.

### **Option 3 – New Burn Overflow Diversion**

**Cost - £8,728,212**

Description – Installation of 3m x 1m diversion culvert to divert flow away from the risk area.



#### **Benefits**

Provides flood alleviation to 56 Properties

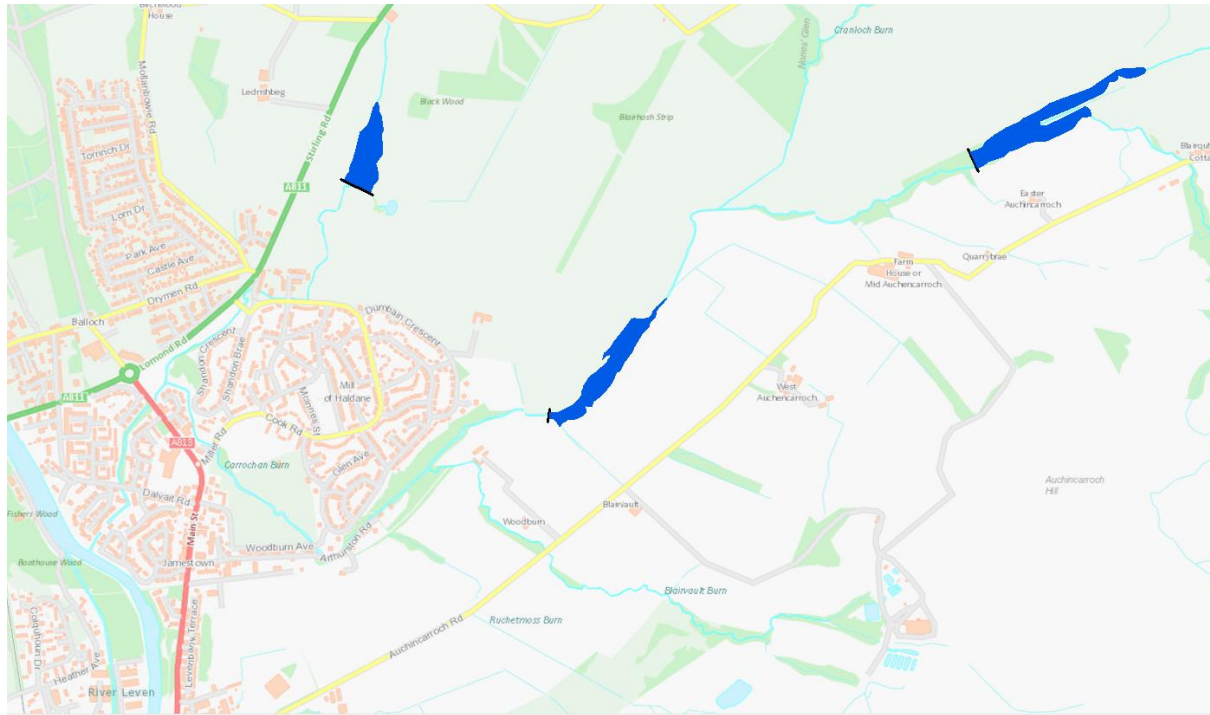


Provides 1:200 year flood alleviation.

## **Option 4 – Upstream Storage**

**Cost – £4,960,885**

Creation of 3 No 4m high embankments further upstream to hold water back during severe events which could be slowly discharged as water levels return to normal.



## **Benefits**

Increased flood prevention of 1:200 improving condition for 56 properties

## Summary of Options

<b>Option Name</b>	<b>Standard of Protection (AEP)</b>	<b>Total Cost</b>
<b>Option 1 – Culvert Removal</b>	1% AEP	£0.60m
<b>Option 2 – Culvert Removal and Hard Defences</b>	0.5% AEP	£1.43m
<b>Option 3 – Flow Diversion</b>	0.5% AEP	£8.73m
<b>Option 4 – Upstream Storage</b>	0.5% AEP	£4.96m