

Lowestoft Flood Risk Management Project

Consultation 30th October to 14th December 2017

Flooding from rivers and extreme rainfall



Introduction

Lowestoft is a coastal town with low lying areas draining to Lake Lothing through pumping stations and surface water sewers with a long history of flooding from streams and sewers. In July 2015, 42 residential properties flooded internally as a result of an intense rainfall in Lowestoft. This event and subsequent “near misses” have highlighted the need to investigate ways to better manage flood risk across Lowestoft from the Kirkley Stream and surface water flooding.

In early 2017 the Lowestoft Flood Risk Management Project identified a long list of options for the management of river and surface water flood risk across Lowestoft. The Project has now completed a more detailed study using computer models of the streams, pumping stations and underground drainage network. Results of the model are used to predict the extent and depth of flooding across the town and surrounding areas. We have also taken scientific advice on the likely effects of climate change and how this is expected to change our rainfall patterns.

This study has allowed us to identify the communities and individuals most vulnerable to flood risk, both today and in the foreseeable future. We have used this information to refine the options that will make Lowestoft a more flood resilient town.

Study area

Flooding in Lowestoft arises from three sources;

- 1 River and stream flooding (Fluvial flooding)
- 2 Surface water arising from rainfall and underground sewers and land drainage systems (Pluvial flooding)
- 3 The sea and tidal waters (Coastal flooding)

We have been working with other partners, such as Anglian Water and the Environment Agency to understand how these sources of flood water interact and the flood risk they pose to Lowestoft. This booklet focuses on fluvial and pluvial flooding, but we have not ignored tidal influences, as this affects how easily our streams and drainage systems can flow into the sea.

The hydraulic model we have created is called an Integrated Catchment Model. This model combines the Anglian Water sewer system with the river and stream network and topography to replicate the town of Lowestoft. The model also accounts of the changes in the tide levels on the coast and in Lake Lothing.

We used this model to drop 'rain' on the virtual Lowestoft to visualise how the town drains, both underground and above ground, and where flooding is likely to occur, taking into account both extreme and more frequent flood events. The model results were checked against known flooding 'hotspots' and the results were found to produce a close match, which provides us with confidence that the model is suitable for estimating flood risk. The flood outlines for the 5% and 1% annual exceedance probability (also referred to as the 1 in 20 year and 1 in 100 year flood events) are shown in the images below. The mapping tells us that if a 5% storm occurred today around 267 properties are likely to flood and if a 1% storm occurred today 673 properties are likely to flood.



Options

We reviewed the model results and prepared a long list of potential options to manage flood risk across Lowestoft. Each option was screened based on, reduction in flood risk, ability to build, environmental impacts, cost, and potential wider benefits. The options considered are summarised in the table below.

Option	Review outcome
<p>Improvements to the existing sewer system</p> <p>Upgrading the network to improve flow capacity, adding flood storage, and non-return valves on the pipes as they empty into the rivers and streams.</p>	<p>Very high cost, cause significant disruption during construction and not resilient to climate change.</p> <p>Option not taken forward.</p>
<p>Operation of pumps on Kirkley Stream</p> <p>Early operation of surface water pumps on the Kirkley Stream</p>	<p>Review of current conditions and changing the pumping station operation in model showed no benefit to flood risk reduction. Option not taken forward.</p>
<p>Creating new on-line and off-line flood storage areas</p> <p>Creating new on-line and off-line flood storage areas within and around the town, particularly on the Kirkley Stream in the Carlton Coleville area.</p>	<p>Provides limited reduction to flood risk.</p> <p>Option not taken forward.</p>
<p>Modifications to the Kirkley Stream channel</p> <p>Modifications to the Kirkley Stream channel by diverting, reshaping, or containing the channel within embankments or walls to increase the flow capacity.</p>	<p>Two measures below where found to provide reduction in flood risk and potential buildable.</p> <p>Measure 1 A new channel diversion of the Kirkley Stream from The Street to Low Farm Drive in Carlton Coleville.</p> <p>Measure 2 Construction of around 200m of flood defences between Velda Close/Aldwyck Way and the bank of the Kirkley Stream, with a pump station and underground storage to drain the surface water sewer when river levels are high.</p> <p>Options proposed to progress.</p>
<p>Reduction in impermeable surfaces</p> <p>Replace 20-40% of the impermeable surfaces, such as roofs, roads, and car parks that drain to the sewer system with permeable surfaces such as green roofs and porous pavements that would reduce the amount of water flowing into the sewer system.</p>	<p>This option is too costly to deliver through a capital scheme. This option will be addressed though future development that will be encouraged to deliver an improvement in impermeable area.</p> <p>Option not taken forward.</p>
<p>Overland flow routes</p> <p>Create new over land flow routes that direct flood waters into green landscaped areas away from property.</p>	<p>There is limited green space where over land flow occurs, meaning limited flood risk reduction can be achieved with this option.</p> <p>Option not taken forward.</p>
<p>Maintenance of Kirkley stream</p> <p>Increase the maintenance, silt and vegetation clearance on the Kirkley Stream</p>	<p>Recently introduced Kirkley Stream maintenance plan (provided on page X) cannot be increased during summer months due to ecological constrains. Maintenance at the current level will continue.</p>
<p>Individual/community resilience</p> <p>Increase flood resilience of individual properties, or community resilience measures where possible</p>	<p>Option is technically buildable and has no ecological constrains.</p> <p>Measure 3 Increase property level protection (resilience) to 261 residential and commercial properties to provide a reduction in flood risk.</p> <p>Option proposed to progress.</p>

Measure 1

A new channel diversion of the Kirkley Stream from The Street to Low Farm Drive in Carlton Colville

A small number of properties within Carlton Colville suffer from surface water flooding. It is estimated that if a 5% storm occurred today around 10 properties are likely to flood and if a 1% storm occurred today 12 properties are likely to flood. After this measure is constructed it is estimated that the flood risk will be reduced to 0 for a 5% storm and 2 for a 1% storm.

The local surface water sewer system drains into the Kirkley Stream, which flows along The Street to Belle Vue Farm. In this location the stream is normally dry and little more than a shallow land drainage ditch that is very flat and prone to silting up. The point where the surface water sewer system drains into the stream is difficult to access and often partially blocked by silt and debris. Our investigations indicate that surface water flooding in this area is connected to poor channel capacity in the Kirkley Stream and the associated Anglian Water sewer system. The proposed solution to reduce the current risk of flooding is to build a new open channel to reduce the flow of water into the drainage system, increase the channel capacity of the stream and help routine maintenance and inspection. The new channel would be

approximately 4m wide and 700m long with an average gradient of 1 in 700. A new 3m wide by 1.5m deep by 5m long bridging culvert could provide access for Belle Vue Farm to the surrounding farm land.

The diversion would start to the west of Belle Vue Farm before the existing stream drains into the surface water sewer system under The Street. The channel will then flow east, picking up existing land drainage channels along the way to the existing culvert under Low Farm Drive. Using these locations, a better channel slope, which increases the channel capacity and reduces the risk of blockage and siltation can be achieved. At the location where the watercourse enters the pipe at Low Farm Drive, a new easily accessible headwall and screen would be constructed.



The construction of the channel would provide an opportunity to restore the Kirkley Stream to a more natural looking channel that could be enhanced to include wider environmental benefits in Carlton Colville. This could include tree planting and new community blue/green space, enhancing local facilities alongside and flood management. The land identified for this solution is in private ownership and currently being considered for a new housing allocation under the Waveney District Council Local Plan. Below is an artist's impression of what this could look like.



Measure 2

Construction of around 200m of flood defences between Velda Close/ Aldwyck Way and the bank of the Kirkley Stream, with a pump station and underground storage to drain the surface water sewer when river levels are high.

Velda Close and Aldwyck Way has a long history of flooding. Our investigations suggest that properties along Velda Close and Aldwyck Way are at risk of flooding for all flows above the 10% Annual Exceedance Probability (sometimes termed as the 1 in 10 year return period). The river channel at this location is narrow and the bank low. Unrestricted surface water sewer connections to the watercourse do not allow water to escape during heavy rainfall and flooding can occur out of the road gullies and manholes. Flood levels are also very sensitive to any blockage in the downstream channel due to the very shallow incline along the watercourse.

Velda Close and Aldwyck Way flood risk could be reduced though localised improvements. The project has highlighted the benefit of a flood defence wall, approximately 200m long and maximum of 1m high. The defence is proposed between the stream and the houses along much of the existing fence and wall line downstream from the Bloodmoor roundabout culvert. The defences will be finished with a suitable covering to compliment the surroundings. Currently, we think the most effective way of doing this is to construct a timber fence either side of the sheet pile, which will recreate a similar looking garden boundary to the existing condition. Please see the images below.



A number of outline design options have been considered for the wall including cantilever walls, gravity walls, anchored walls and sheet pile walls. The selected wall design will consider a number of factors to ensure safe construction and operation. These include;

- The proximity of the houses to the river channel and the space available to construct the defence.
- Resilience against ongoing maintenance operations, which could weaken the structures over time.
- Flood water seepage under the defence, which could lead to flooding and weakening of the defences over time.
- The environmental and aesthetic impact.
- Underground soil conditions.

At this stage our engineers are recommending a sheet pile wall to provide the most sustainable solution because;

- It can be built quickly in a very narrow corridor between the houses and the stream, limiting disruption to residents.
- It requires little excavation and has the least impact on the banks of the stream, retaining the existing character.
- It has deep foundations (around 8m) which provides protection against flood water flowing under the defences.
- It has a long design life, making the defences easier to maintain and operate alongside annual channel clearance
- The defences can be hidden between timber fences and will look very similar to existing fence lines.

The final design will be reviewed at the detailed design stage once we have gathered more information.

To manage flooding from the sewer system, a below ground pumping station with an above ground kiosk will be needed. This will ensure the sewer system can drain when the river level is high and will be located near the existing surface water sewer outlet. In addition, some below ground temporary flood water storage may be needed, this could be constructed below the car park to the rear of Aldwyck Way.



Before



After

Measure 3

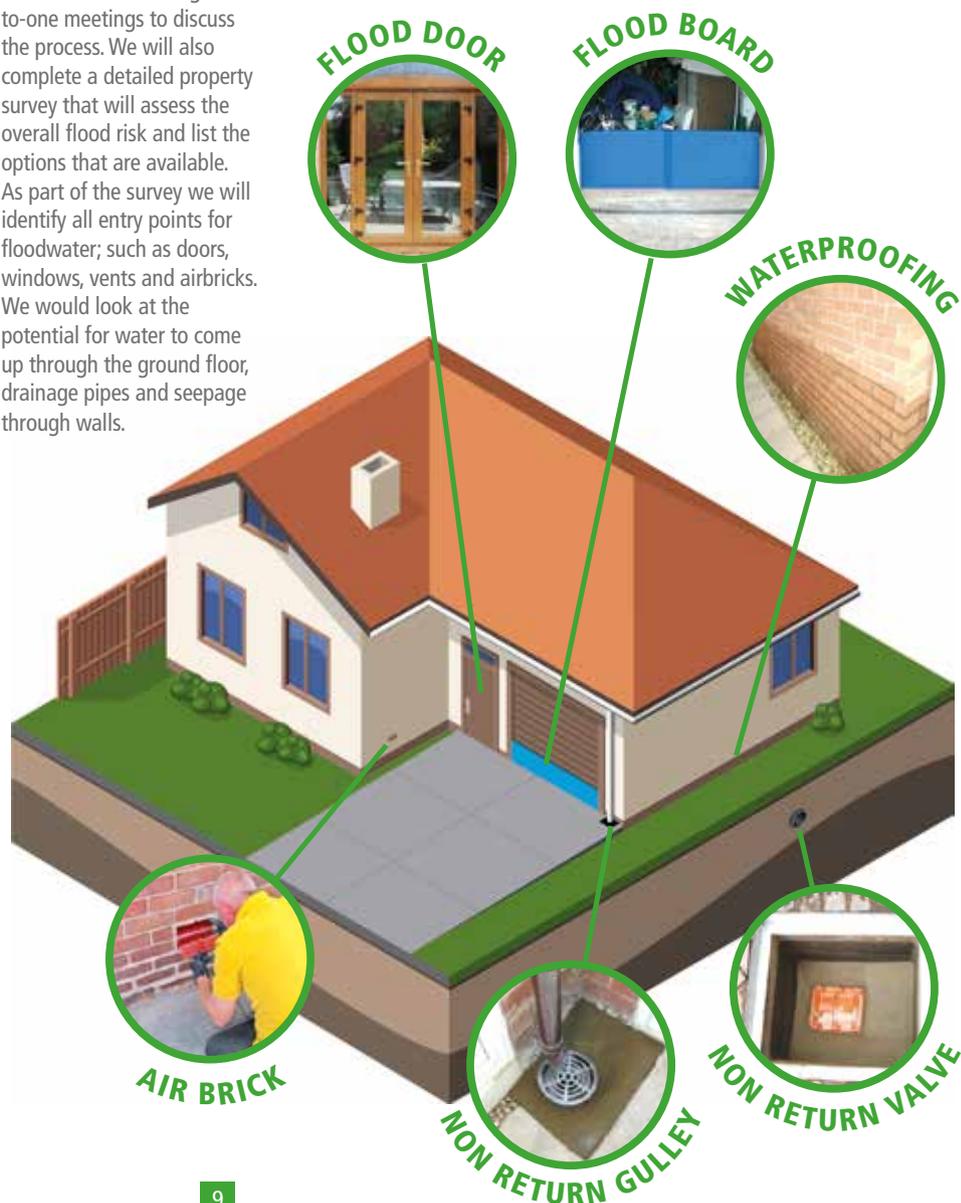
Property level protection (resilience) to 261 residential and commercial properties across Lowestoft

Surface water flooding occurs during heavy downpours of rain, influenced by topography and the ability of the drainage network to cope. Houses in low lying areas, or at the foot of slopes may be at particular risk of surface water flooding. Houses at risk tend to be spread over a wide areas from multiple flow paths and large scale defences are unlikely to be effective or have very high cost. Our integrated catchment model tells us that around 261 properties across Lowestoft are at a very significant risk of surface water flooding and could potentially benefit from property level protection.

There are many routes by which flood water can enter a house. Some are very obvious such as doorways, windows, airbricks and cracks in walls. Others are not so visible such as washing machine outlets, downstairs toilets, soaking through brick walls, below ground gaps in the walls and floors. The chance of water getting into a house will also depend on things like the depth of flood water and the time it takes to drain away.

Property level protection (resilience) reduce the risk of water entering a property. As every property is different there are a number of products that can be fitted to a house to reduce the risk of water entering. Typical products include flood doors, water resisting airbricks, and non-return valves in your drainage, but may also include sealing service entry points, weep holes, internal pumps and repointing brickwork.

We will contact individual homeowners to arrange one-to-one meetings to discuss the process. We will also complete a detailed property survey that will assess the overall flood risk and list the options that are available. As part of the survey we will identify all entry points for floodwater; such as doors, windows, vents and airbricks. We would look at the potential for water to come up through the ground floor, drainage pipes and seepage through walls.



Maintenance of the Kirkley Stream

The Kirkley Stream has a long history of being managed by land owners and drainage authorities, becoming highly modified stream over the years. The stream and adjacent land is an important blue/green corridor through the urban area. It supports wildlife, containing nationally endangered species, such as the water vole and iconic bird species like the Kingfisher.

However, the flat stream bed means that natural and man-made changes to the stream can have a big influence on flood levels. Alongside naturally occurring deposits like fallen branches, fly tipping of general and garden waste is prevalent along the channel. These pressures make continued sympathetic management of the watercourse an essential part of any future flood risk management strategy.

Suffolk County Council and its partner, Anglian Water are responsible for the current and future maintenance of the Kirkley Stream. The council have made a commitment to a written maintenance strategy which includes regular maintenance; occasional tasks as needed; and remedial work. The council strategy makes a commitment to complete;

- Two clearances of channel and banks per year (outside the bird nesting season). This includes alternate bank clearance during the year to minimise impact on ecology – generally East bank in Early Spring and West bank in Early Autumn.
- Yearly rough cut of a 6m-9m wide corridor along the East Bank with a reduced schedule on areas designated under 'County Wildlife Site' as sensitive.
- Spray emergent vegetation in the channel during Early Spring clearance.
- Check culverts for obstruction at each clearance and clear when required.
- Inspect the Highway Ponds and Flood Storage Basin every 5 years, and undertake clearance as and when required.

This management programme is designed to ensure the Kirkley Stream functions as effectively as possible and its ecological value is maintained. Works are carried out in a manner that has the least impact on ecology and is a factor to why in channel and bank maintenance can only be done twice a year.



Frequently asked questions

Why are you consulting with the public?

We are carrying out public consultation to gather people's views and thoughts on a potential scheme. This is an important step in any flood alleviation project carried out by Suffolk County Council.

What will the design standard be and how many homes will it protect?

We are aiming to lift all properties out of the very significant flood risk band (sometimes referred to as the 1 in 20 year event). Along the Kirkley Stream we would like to achieve a 1% annual probability (100 year flood) plus an allowance (40%) for climate change. The channel diversion in Carlton Coville we would like to achieve 1% annual probability (100 year flood) to the majority of residential properties.

Why can't the works be undertaken now?

Once finalised, an Outline Business Case (OBC) will be submitted for approval through the Environment Agency. It is likely that the scheme will not achieve full grant funding and we will need to seek partnership funding to support the scheme.

When will the scheme be constructed?

The flood protection scheme is programmed for construction in 2018/19, after it is complete the risk of fluvial and pluvial flood risk will be significantly reduced.

What was the return period of previous floods?

The flood in 2015 on the Kirkley Stream was estimated to have a 2.5% annual probability, or 40 year flood.

Can we support, or object to the proposals?

Your thoughts on the proposed options for the Lowestoft Flood Risk Management Project can be submitted at the website address below. If you do not have access to the internet a paper copy of the feedback form can be request.

If you have any further question or would like to get involved further information can be found at www.lowestoftfrmp.org.uk

Tell us what you think

Your views are extremely important to the development and successful delivery of the Lowestoft Flood Risk Management Project. We'd like to know what you think about our proposals.

Telling us what you think is simple, please visit our website www.lowestoftfrmp.org.uk and you can complete our feedback form online. Or if you'd like a hard copy telephone 03456 066 067

Keeping in touch

If you'd like to be kept in touch with the project's development please email Project Manager Sharon Bleese at sharon.bleese@eastsoffolk.gov.uk You can also contact us by telephone on 01502 523346

Or by post:

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