Stakeholder engagement briefing pack

Proposed changes to the river Lark Mildenhall

Introduction

An exciting opportunity to restore and improve the natural function of the river Lark in Mildenhall has developed as part of the Brecks Fen Edge & Rivers Landscape Partnership Scheme (BFER), supported by the National Lottery Heritage Fund.

BFER is hosted by Suffolk Country Council and will deliver a series of dynamic community-orientated projects focused on restoring and celebrating the unique cultural and natural heritage of the Brecks' fen edge and rivers landscape. The partnership is made up of regional, national, and local organisations with an interest in the area, community groups and members of the community. (For more information visit www.brecks.org/bfer).

The river Lark is a nationally important Chalk Stream habitat, one of only 200 streams known globally. A rare and valuable habitat, chalk streams are important for wildlife and support a massive range of plants and animals. They are home to some of our most threatened plants and animals, such as the water vole and brown trout. As part of a wider programme of river restoration, the Environment Agency (EA) and Suffolk County Council are now in consultation with stakeholders, landowners, partners, and the public asking for their comments on the proposed options (set out below). A wider online consultation will take place towards winter to gather more comments and feedback.

There are multiple aims of the work in Mildenhall:

- to enable the free migration of the native wild Brown Trout and other river species along the course of the river, and allow them to access natural habitat in the river Lark upstream of Mildenhall where habitats are being improved, whilst,
- to ensure river management for flood defence is sustainable and affordable going into the future, and
- to use the opportunity to enhance the areas around the Lark for recreation and enjoyment by local communities *(Fig 1)*

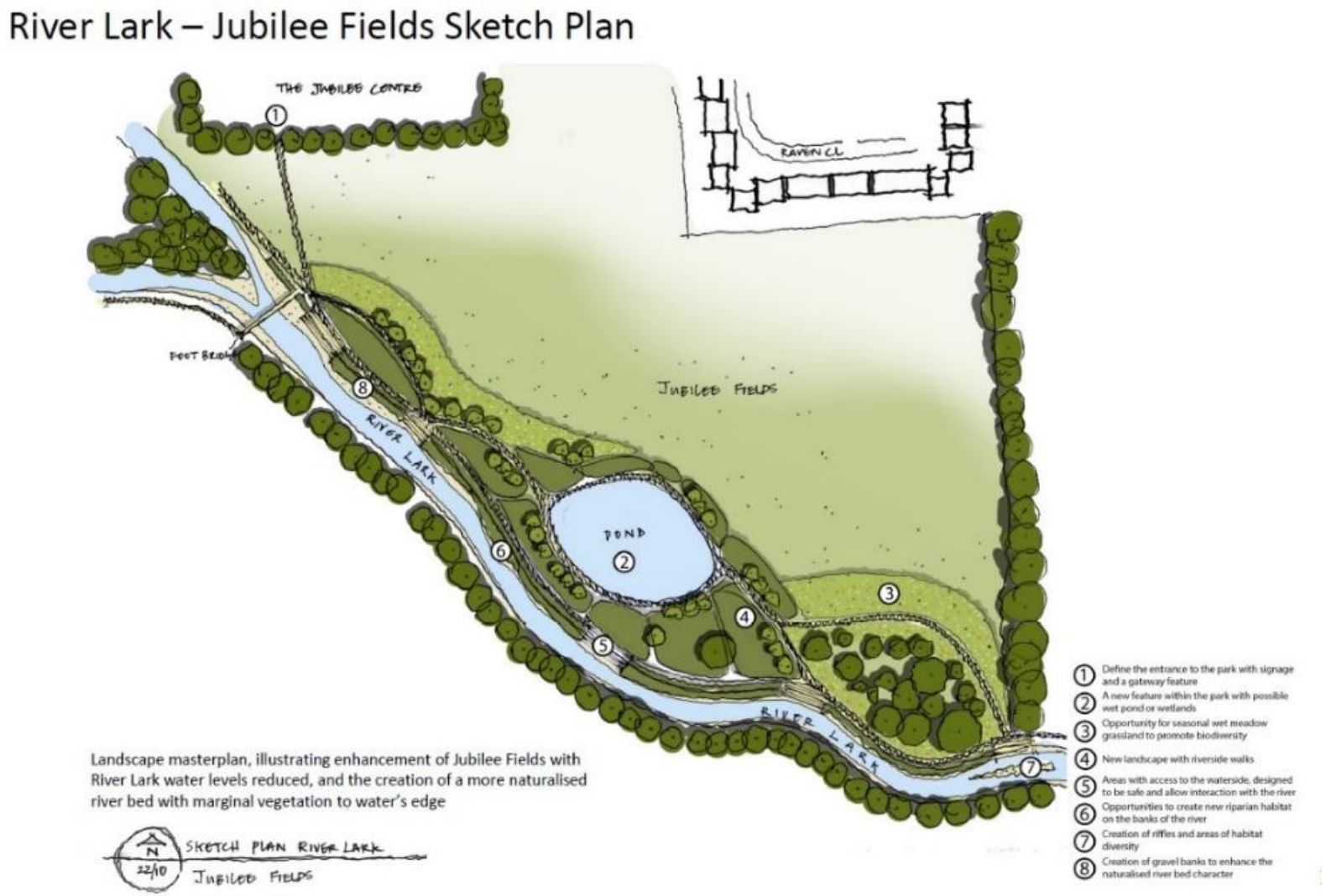

Fig 1. Proposed Park area

Background

A feasibility study commissioned by the Environment Agency in 2018 investigated fish passage options in Mildenhall as part of the development stage for the BFER Scheme.

At the time of the study a large breach across Gas Pool Island appeared and threatened to divert the whole river across the island *(Fig 2)*. In response, the EA lowered the river temporarily using the Gas Pool sluice *(Fig 3)* so the landowner could carry out repairs.

The scope of the study was broadened to include an investigation of the cause of these historic breaches, as well as the function of the river and options for improving fish passage at Turf Lock and Gas Pool sluice.

Fig 2. Flooding across the island in 2018

Fig 3. Gas Pool sluice, automated sluice gate and weir

Findings of the feasibly study

Flooding

The report found that the bank breaches were the result of the river having been raised above the surrounding land. This has left the river perched unnaturally above the natural flood plain *(Fig 4)*. The water level was artificially engineered in 1714 when the Lark was constructed into a canal. This can be seen best in Jubilee Fields near Sainsburys, where surrounding land levels are a lot lower than the river, and the water is perched high above the flood plain. As a result, the river is constantly pushing down and outward trying to get to the lower ground.

Also, American Signal Crayfish (a non-native invasive species) are now widespread in the Lark: their burrows have been weakening the embankments and accelerating bank leaks.

The EA, along with other landowners have spent over £100k on ad-hoc bank works over the last 15 years. The most significant bank failure took place at Norah Hanbury meadows in 2011, flooding large areas, and cutting off the footpath to Barton Mills *(Fig 5).* As the navigation banks continue to age and degrade, it is expected that costs and incidents of bank failure will continue to rise for the town and landowners.

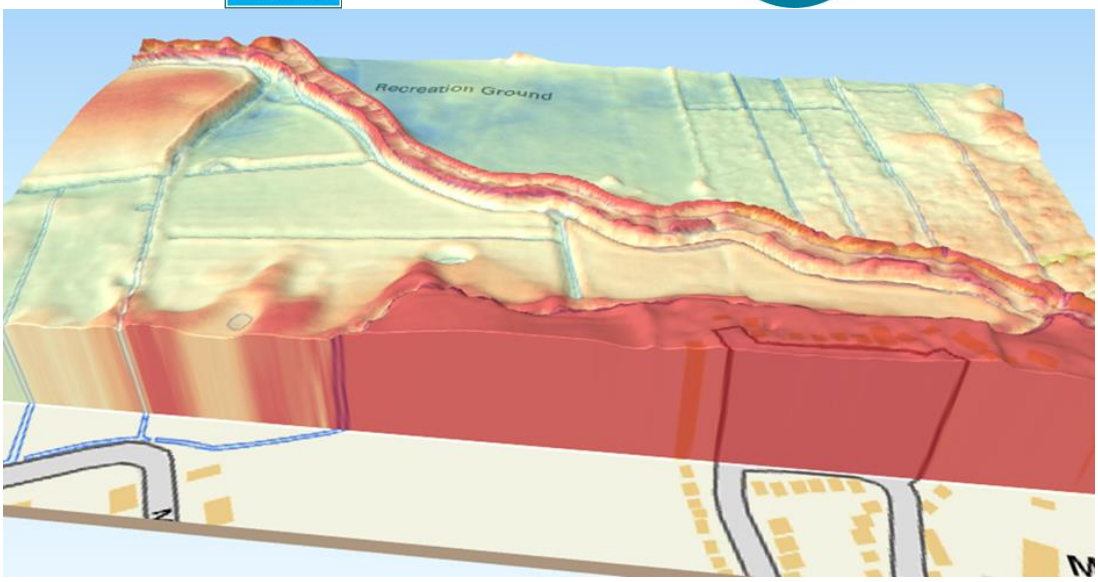

Fig 4. LIDAR map of the river at Jubilee Fields, the river is elevated above the surrounds land

Fig 5. Large bank breach in 2011 filling up Norah Hanbury Meadows in 2011

The report highlighted that Gas Pool sluice currently has two functions; it holds a level of water for amenity and discharges flood water. The structure could get blocked or fail leading to over topping (Fig 6). The report found that removing the gate and weir would lower the flood risk in Mildenhall, eliminate the risk of blockage or gate failure whilst reducing the risk of bank failure.

Fig 6. Flooding to Mildenhall Jubilee Fields in winter 20/21

Back Channel

The back channel that flows around the north of Gas Pool Island and passes the Riverside Hotel and Parkers Mill historically is silted up and stagnant in the summer *(Fig 7)*.

It was found that water only discharges in the back channel because of leakages in the structure rather than structure operation. Water also does not discharge through Parkers Mill as the gate is closed and the hydropower turbine has never been commissioned.

The report found that by creating a new channel around Gas Pool side sluice *(Fig 8)* and splitting the flows will stop the accumulation of duck weed and reduce silt build up whilst ensuring the river functions better and creates fish passage for returning migratory species.

Fig 7. Back channel around Parkers Mill, structure that discharges in the Gas Pool

Fig 8. Gas Pool side sluices

Fish passages

Within Mildenhall there are two different sites being assessed for fish passage and for which stakeholder comments are being sought:

Turf Lock *(Fig 9)* and **Gas Pool sluice** *(Fig 3)*, both sites are a barrier to natural fish passage and eels upstream to restored areas of habitat suitable for spawning. Turf Lock and Gas Pool sluice are unique and need different options to allow fish passage. Both structures have been screened for fish passage options with two most feasible being selected for stakeholder comments.

Options for fish passage

Turf Lock

Turf Lock is an old canal staunch *(Fig 9),* with a weir built into the upper wing walls and is a complete barrier to fish and eel passage. The structure is of historical interest, and our aim is to keep the curved walls so that the visual characteristic of the structure is kept.

There are two options at the lock: a rock ramp *(Fig 10*) and a Larinier technical fish pass *(Fig 11).*

Fig 9. Turf lock locking upstream

Option 1 - Rock ramp

The rock ramp has many advantages:

- it reduces flood risk (compared to the current configuration)
- it reduces maintenance compared to a technical pass
- it is cost effective to build
- it has lower carbon footprint to construct
- there will still be the sound of water flowing through the structure
- it allows passage for all species and all class sizes

A rock ramp's only disadvantage:

- It is not as effective as removing the full structure (which is not an option here because of its historical interest).

Fig 10. Rock ramp, the bed is lowered and replaced with designed boulder placement, the cross section of the channel is increased improving flood discharge.

Option 2 - Larinier technical pass

A Larinier fish pass is a common pass in the UK and is relatively easy to design in most applications where there is a weir and fixed upstream water level.

However, a technical fish pass set into the weir at Turf Lock will be hard to design and hard to install due to the layout of the current weir, a lot of the weir bed will need removing to allow construction.

The Larinier advantages are:

- it will enable passage for sea trout and elver
- it's a standard construction technic
- the sound of flowing water will still be heard

The Larinier disadvantages are:

- it will be difficult to construct in this location
- it will be expensive to construct
- it will have a high CO2 footprint to construct
- it will need maintaining frequently
- it will not reduce flood risk
- it is not passable for all fish species

Fig 11. Larinier technical pass

Gas Pool sluice

Gas Pool sluice is a complex of structures:

- an automated sluice gate that retains the level of water and opens when the flow and level increases *(Fig 3)*
- a side weir *(Fig 12)*
- and the Gas Pool sides sluices *(Fig 8)*

All the structures are remnants of the canalised river and milling operations. The complex of structures now holds a level of water for amenity, with the Gas Pool sluice gate having to be opened to allow for flood flows to be discharged. The side sluices keep the level of water in the back channel and currently discharge a fraction of the river flow and are not operated in a flood flow.

There are a variety of issues with keeping the level of water in place at current levels:

- it prevents fish passage
- it stops fish movement in times of stress
- it accumulates silt
- it is putting pressure on the perched (navigation) banks causing leaks
- if the sluice fails to operate will led to over topping and floods
- it prevents the river functioning naturally as a Chalk Stream
- it prevents native chalk stream species establishing
- there's an unsustainable carbon footprint associated with operating and maintaining the structures
- maintaining the structures diverts budgets away from areas with a greater flood risk need
- local landowners will have to continue to maintain and repair the bank

Fig 12. Gas Pool Side weir, notch cut in the weir when the river was last lowered.

Options for fish passages

Option 1

This option will change the environment and make the river sustainable and natural, reducing the risk of flooding, reducing maintenance costs, operation costs, reducing CO2 and the long-term liability for the riparian owners to keep on carrying out repairs along its course.

This option will have a new community park area created along the Jubilee Fields, a recreational area and improved habitats, providing a new asset and focal point of the town. Through this option the river will be restored back to a more naturally functioning river rather than the impounded, wide, slow river that was created for an industrial era, and is causing so many problems for Mildenhall.

The main work will involve the removal of Gas Pool sluice and side weir, lowering the river back to a natural hard (gravelly) riverbed *(Fig 13),* and creating a new channel round the Gas Pool side sluices to allow the back channel to flow and function.

Removing the structures reduces the flood risk to the town and riverside land, risk of the gate failing to open or getting blocked and reducing the risk of the banks over topping.

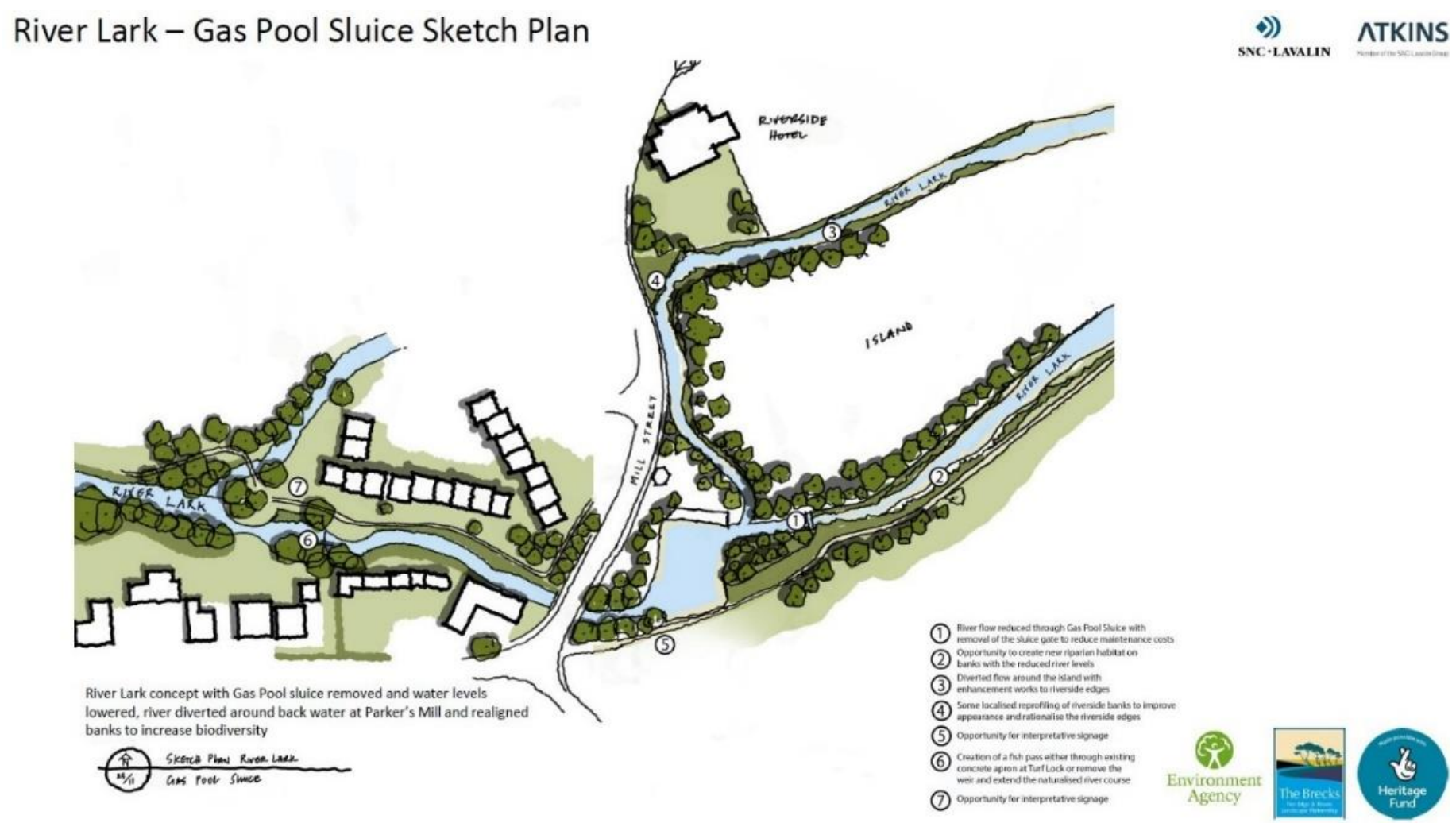

Fig 13. Option 1, Gas Pool sluice filled in and weir removed back channel created and both channels lowered to hard bed.

River Lark – View 03 Gas Pool Sluice

River Lark concept with Gas pool sluice removed and water levels lowered, opportunity for more waterside planting

Fig 14. Gas Pool sluice channel looking upstream with sluice removed and river lowered

The water levels at Gas Pool sluice would see the greatest change *(Fig 14)*:

- the channel would sit lower on a natural hard bed
- water depth would be shallower
- the width would be narrower
- flow would be more visible with the structures removed flowing faster

The river at this location would revert to a chalk stream, with gravels and chalk stream flora and fauna repopulating naturally.

The river Lark at Jubilee Fields would undergo a transformation *(Fig 15)*: the proposed river restoration changes will be complimented with a new park area which could have:

- new river access points
- wildflower area, nature areas
- tree planting
- circular routes
- and a new lake

The proposals would see most of the grass playing fields kept for events like; 'Lark in the park', fairs and other events historically held on the park. The river within Jubilee Fields would feature chalk stream landscape and a planted riparian buffer zone *(Fig 15**).***

The Lark will be allowed to naturalise within Jubilee Fields; this will be staggered but the Lark width and depth eventually will resemble the Lark nearby in Worlington *(Fig 16)*.

It is expected that the channel will vary in depth finding natural highs and lows in the hard bed, exposing gravels, exposing naturally hidden pools and colonising with greater biodiversity and rare native species more suited to a chalk stream.

This option will create an interesting and varied river alongside the Jubilee Fields. The margins will vegetate as the water level comes down in managed increments over several years allowing riverside vegetation to grow over, stabilise any exposed silt and protecting water voles residents along the riverbank.

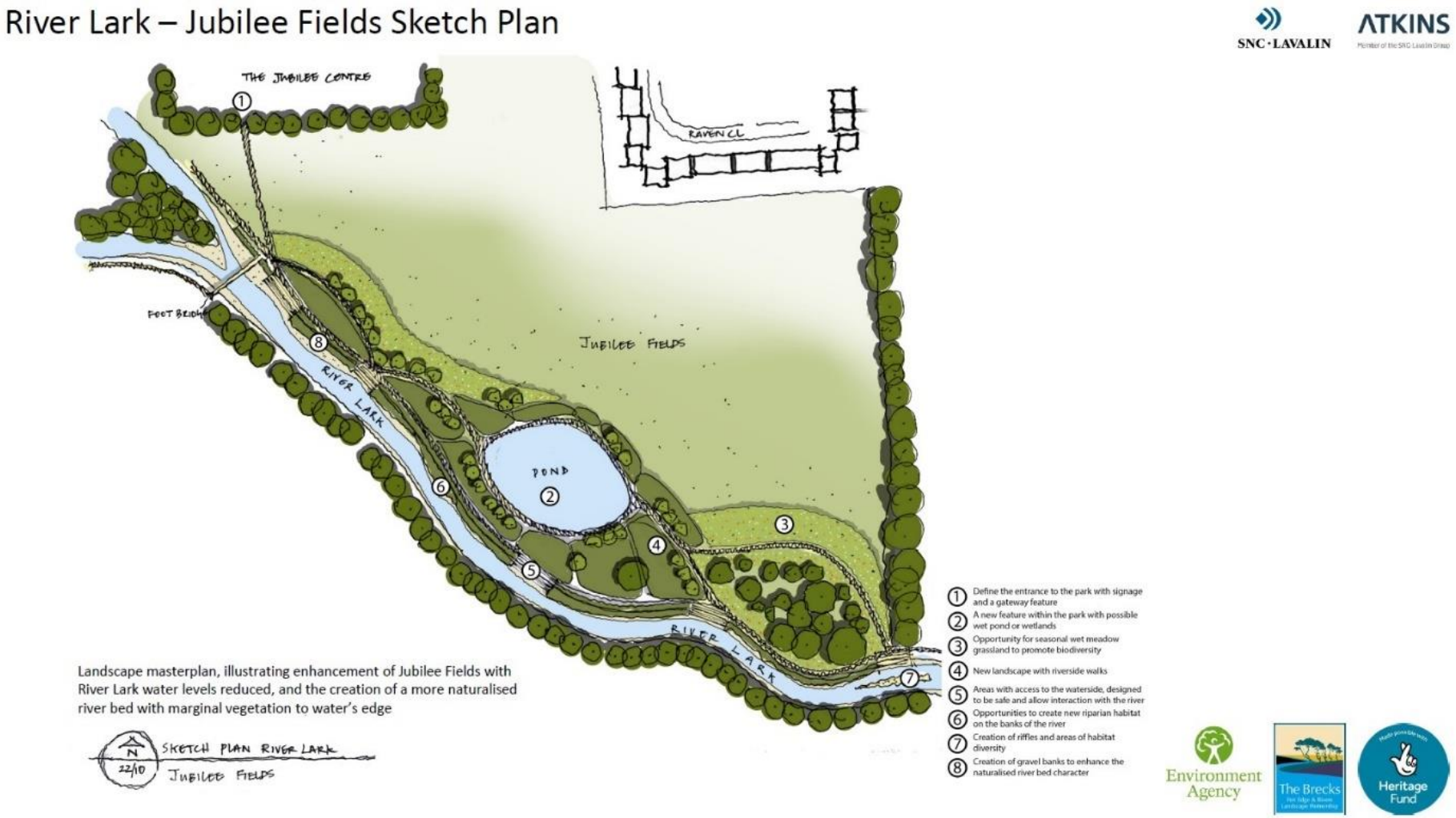

Fig 15. Restored area within Jubilee Fields and new park area

Fig 16. The Lark at Worlington

Fig 17. Looking toward Jubilee Fields and the new park area from foot bridge.

The old navigation banks will be left in place and the footpath will be kept along the top of the bank. Because the river will be away from the current path, access points will be created along its lengths *(Fig 17),* and these can be designed where there are natural features like pools and riffles and can provide new recreational activities.

Currently, the Gas Pool sluices hold back an impound of water up to the Barton Mills sluice by the A11; lowering the levels to hard bed would lower the river to Barton Mills, to prevent this, and degradation of the water abstraction point for Norah Hambury meadows. A long, constructed riffle will be installed on the eastern corner of Jubilee Field. This will create a natural impoundment for the water abstraction point for Norah Hambury meadows, will protect the coarse fishery at Barton Mills and maintain the width of the watercourse behind the residential properties *(Fig 18)*.

The phasing of the potential works will start with the construction of the riffle to protect the river upstream of Jubilee fields and Nora Hanbury abstraction. The river can then be lowered slowly using the Gas Pool sluice over several years; this is done to allow marginal vegetation along its length to follow the new water level This will help bind the silt into the margins whilst protecting water voles from predation by providing continued cover.

A hard bed survey has indicated that the bed is non uniformed; once lowered there would be pools and riffles forming naturally within the bed substrate, but these can be adjusted to provide more prominent natural features.

There is currently little flow in the back channel resulting in silt build up. Some of the boards from the Gas Pool side sluices *(Fig 8)* were removed in summer 2022 as there was no flow on this section of the river. This was done to prevent the back-channel stagnating and building up with duck weed *(Fig 19)*. The current structure is inoperable and does not open in a flood flow so the silt in the channel cannot be flushed out.

When the back channel is reconnected and allowed to flow, it will restore natural chalk river features and scour out accumulated silt back to a hard bed, naturalising along its length *(Fig 20)*.

The back channel would be narrower, shallower with a gradient and faster flowing. It will have in-channel features and the margins will colonise with aquatic plants *(Fig 21).* The bed and channel will be reprofiled with a series of constructed features, to allow a flow split between the main channel and back channel.

River Lark – View 01 Jubilee Fields East

River Lark water levels lowered, creation of riverside footpaths and potential for a wet meadow parkland with ponds

Fig 18. Upstream extent of the lowering, bottom left corner is the start of the impounding riffle

Fig 19. Mildenhall back channel, in the summer it fills with duck weed

Fig 20. The back channel looking downstream from the Riverside hotel, lower and faster flowing.

Fig 21. Reference reach for the back channel, new riparian planting and gravel bottom

This option has many advantages:

- it provides fish passage for all species in both directions
- it restores chalk stream habitat
- it improves the chalk stream fishery
- it reduces the risk of flooding by removing the structure
- it removes future expense/CO2/ liability of having a structure at the site
- it takes away the need for landowners to continue to maintain and repair the banks
- it reduces maintenance on the river
- enhances the area and provides a new amenity
- Lower whole life costs

This option's disadvantages:

- change to the current outlook of the river
- larger initial out lay, but whole life cost is lower
- the river will be narrower for paddle sports but still navigable

The changes to the river environment will make the area more sustainable and natural for the future, with reduced CO2 footprint, reduced maintenance and reduced revenue costs whilst improving the area's features.

Option 2

This option will open the back channel up to create a natural bypass channel providing fish passage. This will be done by constructing a bypass channel around the Gas Pool side sluices within the footprint of the island and dropping the river to hard bed along some of its new route *(Fig 22).*

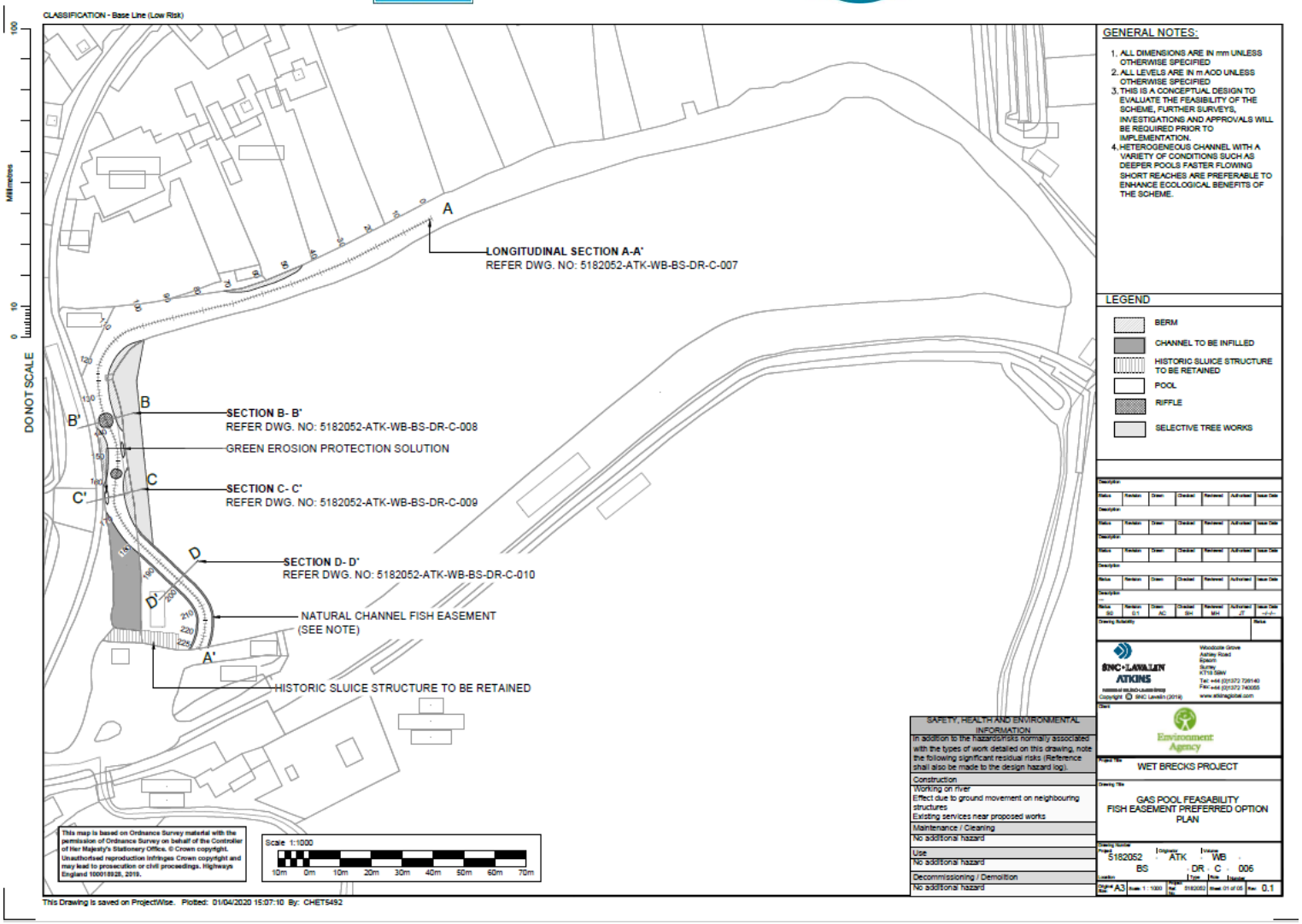

Fig 22. Natural channel fish pass utilising the back channel

With the Gas Pool side sluices bypassed and the back channel lowered to hard bed a series of pool and riffles will be constructed in the back channel to gradually return the water level back to the retention level *(Fig 23)*. The riffle sequence will enable a flow split between the back channel and main channel, to stop the entire river diverting down the back channel.

The length of the reprofiled back channel is expected to be between 150m-300m to allow natural fish passage. With a new gradient and reduced width, the back channel will flow faster, the stagnation of the water would cease, and silt would clear. For the entirety of the bypass channel chalk stream features and species would colonise naturally.

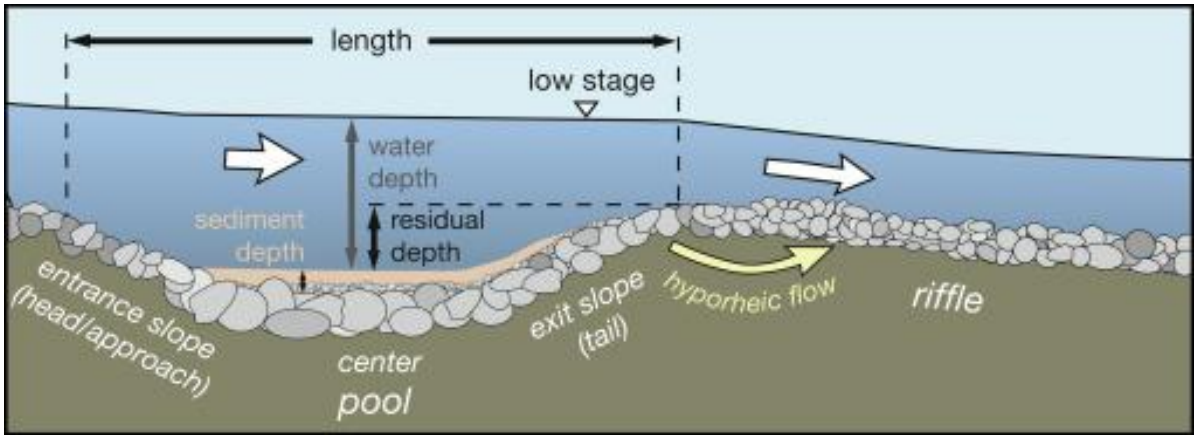

Fig 23. Pool and riffle sequence, this gradually returns the water to the required retention level held at Gas Pool

Under option 2 the Gas Pool sluice and side weir *(Fig 24)* will remain until the end of its life or if it falls beyond economical repair. At this point the EA will review its future and whether there is a cost benefit of replacing it. The Gas Pool sluice and weir would still control the retention level of the river and would operate in flood conditions to discharge flood flows.

There is still a risk of the banks failing or overtopping under option 2, this is because the banks remain perched above the surrounding land and the river is constantly putting pressure on them. Under this option when embankment present defects the river retention levels will be reviewed with the landowners. The EA would continue to assess the possibility of lowering the water level to take the pressure off the banks in each instance and tweaking the pool and riffle sequence to keep the back channel flowing.

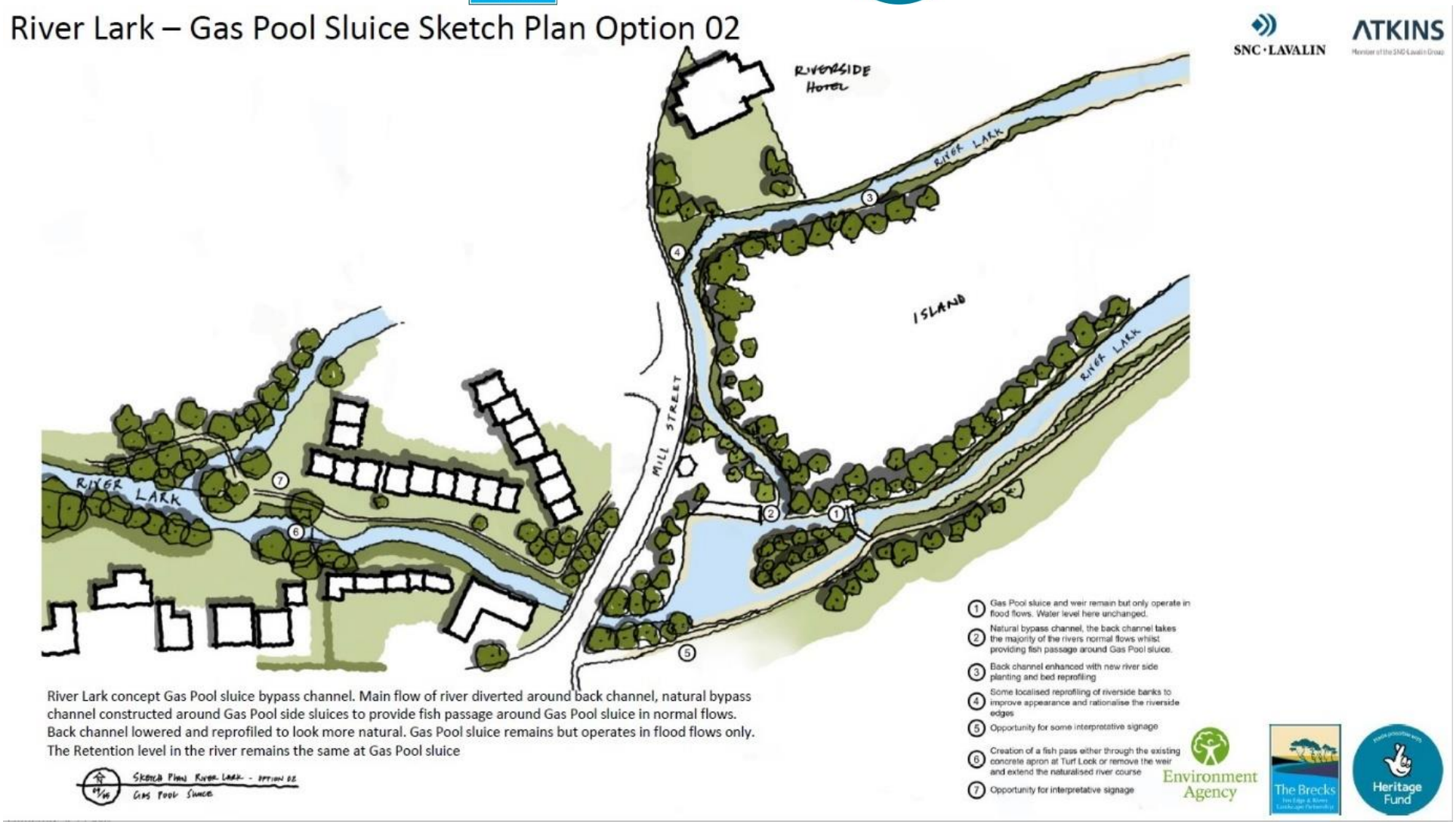

Fig 24. Option 2. Natural channel fish pass with Gas Pool sluice and weir remaining controlling the retention level.

This option has many advantages:

- it addresses the original scope of the project and allows migratory species to pass upstream and downstream
- it restores 300m chalk stream habitat
- it improves the chalk stream fishery
- enhances the back channel
- lower expenditure cost
- delivered quicker
- keeps the current outlook the same for a period
- when the banks fail, EA will lower the water level so the landowner will not have to repair them

This option's disadvantages:

- whole life costs are greater than removing the structures completely
- public money used to maintain assets that have no use and could be removed
- increased carbon footprint
- flood risk not reduced

Constructing the bypass channel, opening the back channel and keeping the retention level at Gas Pool means little will change in the Jubilee fields area, but it keeps the risk and burden of the landowners having to maintain the embankments. However, under this option as the banks fail there is a degree of flexibility and the chance to review the situation and lower the level of the river as necessary. Landowners will not have to carry out costly repairs, it makes the situation a little more sustainable than what currently present.

Conclusion

The Environment Agency has carried out an extensive study of the river at Mildenhall and is presenting viable options to improve the river ecology and sustainability, and is looking for landowner, stakeholder, and public views on the proposals.

Once views have been gathered, both verbally and online (coming soon) agreements are in place with landowners and designs are finalised, construction could start.

Views, comments and questions welcomed via email at: eaconsultation@brecks.org