Improving the River Beult for People and Wildlife

Non-technical summary

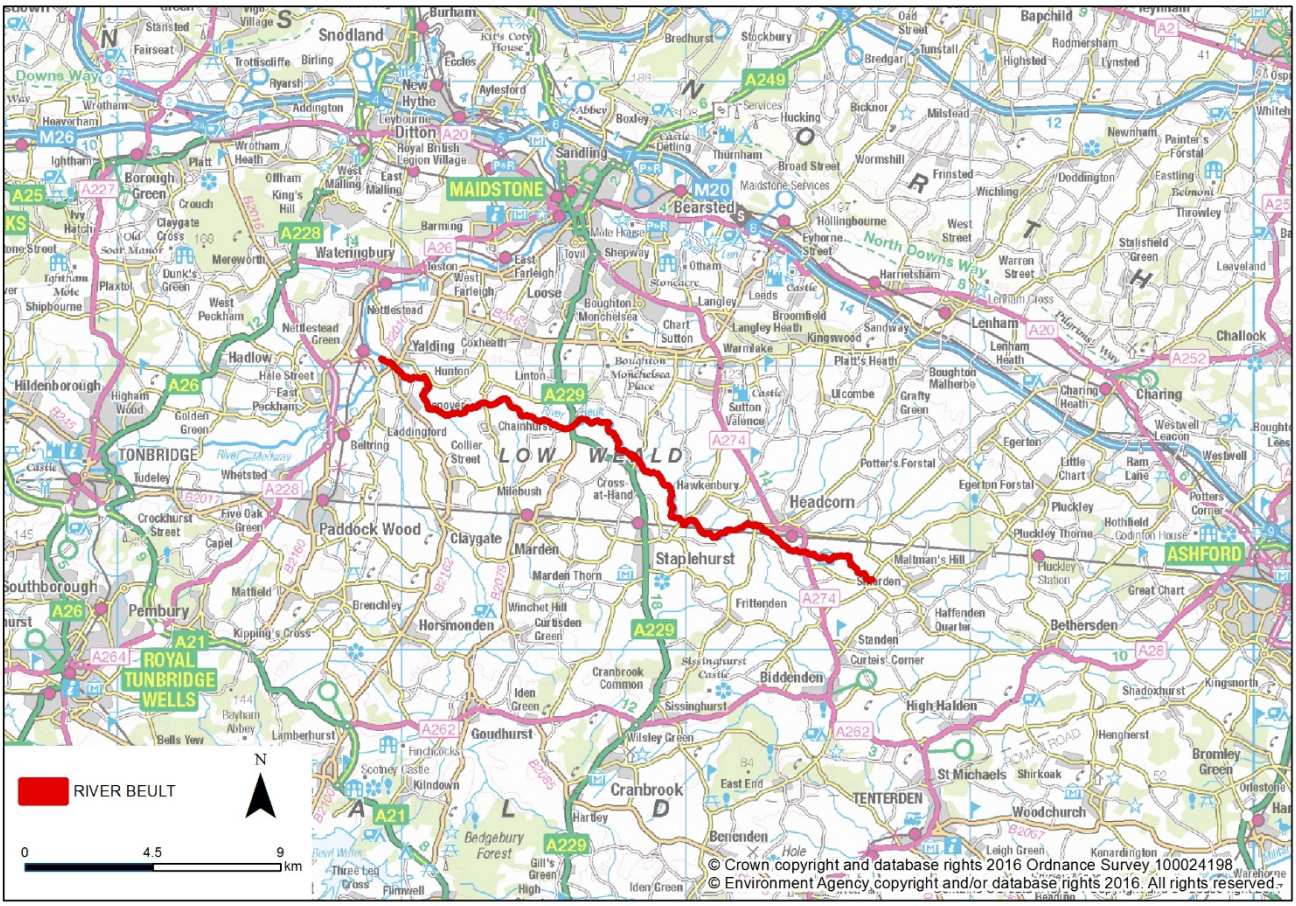
June 2018

CAPITA

Part of the
Medway Flood Partnership

The River Beult Site of Special Scientific Interest (SSSI)

The River Beult SSSI is approximately 25km in length, from Hadmans Bridge near Smarden to the confluence with the River Medway in Yalding. The river flows slowly over the lowland Wealden Clays, making it naturally nutrient rich. Its waters drain through a largely agricultural landscape. The River Beult is designated as a SSSI because it is one of the best remaining examples of this type of river in the country.



Location map of the River Beult SSSI

Why we need to improve the River Beult SSSI

The River Beult is a vital natural resource for both people and wildlife. It is a source of fresh water for wildlife and agriculture, controls and stores flood waters, supports crop pollination and improves the wellbeing of the local community through interests such as fishing and walking. It is protected because it still supports some of the habitats, plants and animal species expected in this kind of river.

However, issues linked to historic modifications prevent it from fulfilling its potential as a natural resource for people and wildlife. Many of these issues have affected the River Beult since before it was designated as a SSSI. These issues include flooding, declining angling participation, pollution, loss of habitat, and manmade barriers that impound the water.

Flooding is a key issue. The River Beult is one of the tributaries of the River Medway flowing through Smarden, Headcorn and Yalding. Water from the Beult catchment contributes to flooding in the 8 parish council areas near the confluence of the Rivers Medway, Beult and Teise. The Medway Flood Partnership has created a Flood Action Plan and are committed to working with local stakeholders to better manage water in this catchment.

Assessments of SSSI condition and Water Framework Directive (WFD) status help measure whether the river supports people and wildlife in the best way possible. These have highlighted concerns about the poor ecological condition of the river. The SSSI is not meeting its required standards. This is because the river has been damaged by historic modifications, low dissolved oxygen levels and phosphate pollution.

Angling © Environment Agency

Hairy dragonfly image by Katie Fuller, licensed under CC BY-SA 3.0

Chub © Environment Agency

The River Beult has the potential to be a beautiful environment for recreation and better support local agriculture and wildlife. In some places the river is home to nationally scarce insects including the hairy dragonfly and a species of water beetle, which enjoy slow flowing, well vegetated sections. In stretches where there is thick emergent vegetation you can find uncommon species like the white-legged damselfly and the ruddy darter dragonfly. This vegetation also provides cover for breeding birds, particularly the reed warbler and reed bunting. In quiet stretches, bare clay banks provide essential nesting sites for the numerous kingfishers that can be seen dashing along the channel hunting for fish. In the better oxygenated, free flowing sections of the river fish like chub, dace, pike, roach, rudd and tench are found.

Greater diversity of plants occurs where the river banks are relatively shallow and slope into low, wet ledges called berms. In such places the river banks contain great yellow cress, water plantain and purple loosestrife. The wet margins are home to flowering rush, bur-reed and bulrush. The channel contains five types of pondweed, spiked water milfoil and various types of water lily.

Common Kingfisher by Shantanu Kuveskar licensed under CC BY-SA 4.0

Arrowhead leaves by Christian Fischer licensed under CC BY-SA 3.0

Water lily leaves and flowers by Manfred Schulenburg, licensed under CC BY-SA 4.0.

Purple loosestrife by Ivar Leidus, licensed under CC BY-SA 3.0

There are opportunities to improve the river to support people and wildlife, ensure current benefits continue and make it more resilient to future pressures, like climate change.

This document sets out what the river currently provides and supports and how these 'ecosystem services' can be improved for people and wildlife. It identifies how to develop a more naturally functioning river channel and floodplain that is resilient to climate change and can provide: natural flood management; a healthy fishery; a secure, clean water supply; and an attractive, resilient landscape that supports sustainable agriculture and flourishing wildlife.

Best of the River Beult

- ✓ Some sections are well used by the angling community
- ✓ Supports rare insects including hairy dragonfly and white legged damselfly
- ✓ Has areas with diverse plant life typical of clay rivers
- ✓ Great for kingfishers
- ✓ A beautiful landscape
- ✓ Historic medieval bridges

Worst of the River Beult

- × An over wide and deepened channel causes faster flooding
- × Boards, weirs and sluices stop the movement of fish, sediment and water
- × Ponded water and low oxygen harms fish and insect populations
- × Too much floating weed and algal growth makes it difficult to fish
- × Not enough plants and trees to slow flood water and pollutants or support wildlife movement

The vision for the River Beult SSSI

An artistic interpretation of what the River Beult could look like after improvement work.

An improved River Beult SSSI that meets its full potential as a natural resource will be mostly free from weirs, sluices and boards. This will allow free-flowing water and movement of fish and sediment. Fish-passable structures will support water levels where these are vital to heritage features and angling. There will be more space for habitat next to the river and trees casting dappled shade over the channel. Shallow berms and shallower banks will create a self-clearing channel that supports enough water in low flows for wildlife and agriculture without compromising the ability to contain high flows when this is needed. A meandering channel and appropriately connected areas of the floodplain will be used to slow flood waters. Backwaters and varying bed depths with riffles and pools will add oxygen to the water and give fish and other aquatic wildlife places to shelter and breed. People will be able to enjoy the SSSI through recreation and it will support their livelihoods.

The image above shows what this might look like: more natural meander bends with re-graded banks, natural vegetation; shallow berms and flowing water. Added gravels create rippling, rushing water, providing aeration for wildlife and enhancing people's experiences. The channel is bordered by waving reeds and rushes and there is a diverse mix of colourful floating and emergent plants in the deep, slower sections with trailing submerged plants in the shallow, faster flowing water.

The following images show the contrast between segments 2 and 6. Segment 2 has a modified water level control structure to restore a free flowing river. Segment 6 has

deep, ponded water maintained to support angling and keep the historic wheel at Cheveney Mill running. Graded banks provide habitat and better access for angling in this section.

An artistic interpretation of what Segment 2 could look like after improvement work.

An artistic interpretation of what Segment 6 could look like after improvement work.

How do we achieve this vision?

The Environment Agency and Natural England have been working in partnership with local stakeholders, as part of the Medway Flood Action Plan, to identify improvements that work towards this vision.

We commissioned Capita to produce an improvement plan that identifies what services the River Beult SSSI currently provides or supports and how these benefits for people and wildlife can be improved.

We want to work together with stakeholders to develop a more natural river and floodplain that are resilient to pressures including climate change.

Our aim is to create a River Beult that provides:

- Natural flood management
- A healthy fishery with good angling participation
- A secure, clean water supply
- An attractive, resilient landscape that supports sustainable agriculture, flourishing wildlife and recreation

Our objectives:

1. Identify what the River Beult does for people and wildlife and what it needs to do better
2. Identify options that work with natural processes to improve the value of the river for people and wildlife, in both the short and long term
3. Develop an outline improvement plan for the River Beult with local stakeholders
4. Work with local stakeholders to design and build improvement measures in both the short and long term
5. Measure success through stakeholder benefits, SSSI condition and WFD status.

Natural Flood Management (NFM)

NFM uses natural processes to reduce the risk of flooding. For example, restoring bends in rivers so it takes longer for water to move downstream or changing the way land is managed so soil can absorb more water before it gets to the channel.

NFM also achieves multiple benefits for people and wildlife by helping restore habitats, improve water quality and help make river catchments more resilient to the impacts of climate change.

How we identified improvements

We have divided the river into seven segments to help tailor improvements to local needs. There is a structure which controls the water levels at the end of each segment except segments 1 and 7. Segment 1 has a structure at each end and segment 7 finishes in the River Medway.

The segments are as follows:

Segment 1: Hadmans Bridge to New Bridge

Segment 2: Downstream of New Bridge to Stephen's Bridge

Segment 3: Downstream of Stephen's Bridge to Hawkenbury Bridge

Segment 4: Downstream of Hawkenbury Bridge to Hertsfield Bridge

Segment 5: Downstream of Hertsfield Bridge to Stile Bridge Gauging Station (GS)

Segment 6: Downstream of Stile Bridge GS to Cheveney Mill

Segment 7: Downstream of Cheveney Mill to the Medway confluence

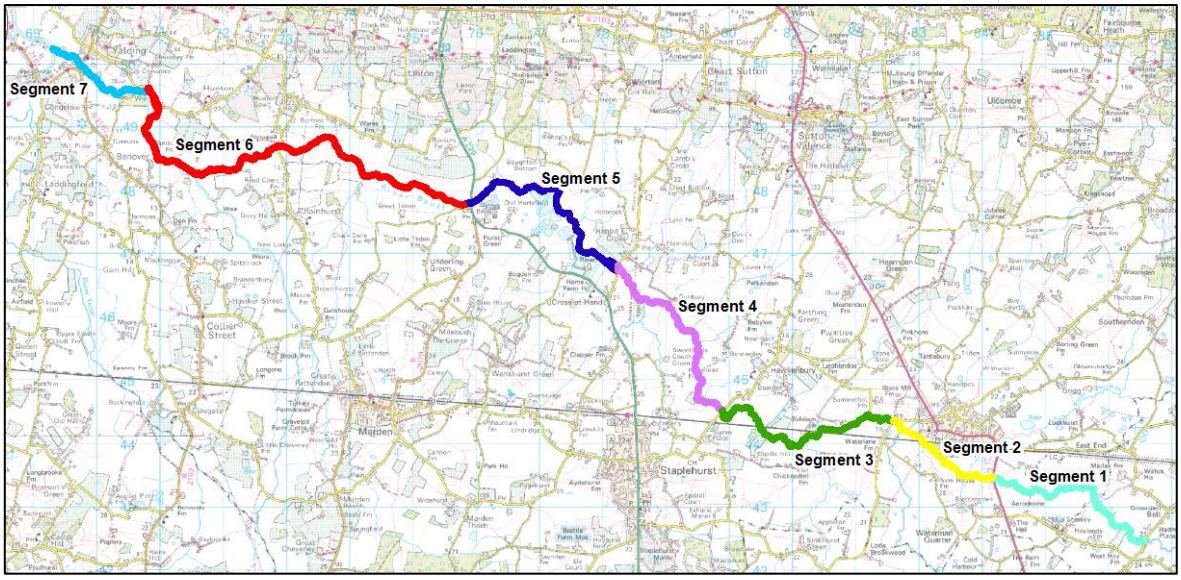


Figure 1: Map of the segments of the River Beult SSSI © Crown copyright. All rights reserved. Environment Agency. 100026380. 2018. © Environment Agency copyright and / or database rights 2018. All rights reserved.

An ecosystem services approach

What are ecosystem services?

Ecosystem services are benefits people gain from the natural environment.

For example, ecosystems like wetlands or woodlands can slow the passage of water, which has the potential to reduce flooding. The potential to prevent flooding is a benefit with value to people, so this is an ecosystem service.

Ecosystem services assessment is a way of analysing options that considers the value of nature and the benefits nature provides for people and wildlife.

Stakeholders, current information and previous studies helped identify the benefits that the River Beult SSSI provides for people and wildlife.

These benefits were split into four categories:

- **Provisioning** of products like food, fuel, timber and clean water
- **Regulating** services like pollination, temperature regulation, carbon storage, water purification, and flood prevention
- **Supporting** services that are necessary for all other ecosystem services like soil formation, nutrient recycling, photosynthesis and habitat
- **Cultural** benefits people obtain through spiritual enrichment, recreation, aesthetic experiences and tourism

Options to increase the value of the benefits provided by the River Beult SSSI were assessed by:

- Identifying what ecosystem services the river provides and what pressures affect its ability to do so
- Identifying, with stakeholders, what options could improve the services provided
- Scoring which options would provide the greatest benefits to the most services
- Producing outline designs for the highest scoring improvement options
- Creating a cost estimate for the highest scoring options, including lower cost alternatives

Example Services

✓ River supports fish stocks and angling participation
✓ Trees and meandering channel slow flood waters

Example Pressures

× Stop-boards prevent fish escaping pollution events
× Loss of trees and degraded channel speeds flood water towards people downstream

Stakeholder involvement

Who are the stakeholders?

The individuals, businesses and community groups that have an interest in the River Beult and were invited to input to this process include:

Kent County Council, borough councils, parish councils, Upper Medway Internal Drainage Board, Natural England, Environment Agency, Historic England, National Farmers Union, water companies, Network Rail, Kent Highways, private landowners and farmers, angling clubs, Kent Fisheries Consultative Association, Beult Catchment Improvement Group, Medway Flood Partnership, Medway Catchment Partnership, Country Land and Business Association, Kent Wildlife Trust, Medway Valley Countryside Partnership, Joint Parish Flood Group, local residents and the South East Rivers Trust.

We asked local landowners, residents, farmers, and organisations with an interest in the River Beult to help us identify how people use the river and how it could be improved. We met with key stakeholders and held three public consultation workshops at Smarden, Headcorn and Yalding to discuss methods and improvement ideas. During these workshops we asked stakeholders the following questions:

- Were the criteria for the needs of people and wildlife suitable and prioritised in the correct order? If not, how should they be changed?
- Was the method for ranking the improvement options adequate?
- Are there any further ideas for options to improve the river?
- Are there any improvement options that they could deliver, or deliver in partnership?

Their responses included:

- All stakeholders agreed that flood risk was a high priority
- People suggested that ecology and natural processes should have a higher priority to ensure there is maximum ecological benefit with any improvement option
- Mill operation should only be a priority for segment 6, equally structures without heritage value should be of low priority
- Respondents suggested that the criteria priority for land use should be decreased slightly, as ecology and natural functioning supports land use
- Water levels must not become so low that people cannot fish
- All agreed that the method and ranking of the improvement options was adequate, particularly the high significance given to flood risk
- Several offers were made to aid the delivery of the project in partnership

We used this feedback to re-prioritise the needs of people and wildlife for ecology, natural processes and land use. We ensured that improvement options with the most local value were ranked highest and will only select options that either reduce or avoid increasing flood risk.

The current condition of the River Beult

The table below describes the pressures facing ecosystem services in the River Beult and the impacts on people and wildlife.

Eco-system Services	Description	Impacts on People and Wildlife	Example images of the river
Provisioning	**Lack of trees:** Some sections of river lack trees due to historic removal.	Lack of supply of woody material which should be providing unique habitat, and helping to add oxygen to the water and provide natural flood management by slowing flood flows. Lack of trees can make the banks more prone to erosion as roots help to bind the soils. Lack of shading increases water temperature and reduces oxygen content, which impacts on fishery health. Lack of cover for fish and other animals.	
	Lack of bank slope diversity: Uniform, steep bank slopes in many segments of the river are a result of historic channel modifications.	Reduces the space available for marginal habitat that would otherwise slow pollutants and flood flows. Reduces the habitat variety along the banks, meaning fewer species can use it, limiting the amount of pollinating insects and predators of crop pests. Lack of cover and places to hide from high flows for fish and aquatic insects makes the fishery less resilient. Lack of transitional habitats between land and water which are suitable for aquatic plants.	
Regulating	**Degraded riparian vegetation:** Loss of characteristic vegetation next to the river due to high nutrient deposition and pressures from run-off, livestock, cultivation and spray drift.	Increases the amount of surface runoff reaching the channel leading to high loads of fine sediment or dissolved nutrients polluting the water. Increases the vulnerability to erosion, leading to soil loss, endangering livestock and making access for angling more difficult.	

Degraded in channel vegetation: Loss of characteristic vegetation within the river channel due to pollution and also historic modifications to deepen and widen the channel.	Reduces habitat availability and variety. Reduces cover for fish, and habitat for aquatic invertebrates. Results in flashier flood events Reduces aesthetic value. Can contribute towards algal blooms which are toxic to people and animals.	
Accelerated bank erosion: Increased bank erosion due to land use from livestock poaching, and historic modifications from channel straightening.	Higher rates of bank erosion lead to greater quantities of sediment deposited further downstream. Leads to sediment pollution, and can create blockages that increase the risk of flooding.	
Lack of sediment diversity: Historic channel modifications to deepen, widen and straighten have led to uniform bed depths and uniform sediment composition. The subsequent need for dredging, and excessive silt deposition has further depleted gravels.	The shallow, faster flowing sections of river over gravel are damaged or removed by dredging and channel modification. Leaves long slow flowing 'glides' where the channel becomes choked by emergent vegetation. A balanced erosion and deposition regime is absent, leading to excessive erosion or silt deposition in areas of the channel. Damages insect populations including pollinators and predators of crop pests. Prevents recovery of gravel spawning fish.	
Over deep channel: Historic modifications deepened the channel. Subsequent dredging to increase the amount of water that the channel can hold means that less water spills onto parts of the floodplain that could store water away from houses.	Reduced use of floodplain means that fine sediment, which is normally deposited in the floodplain, is deposited in the river channel. This can cause blockages, and back-up water reducing flows impacting flooding. It also pollutes the water. High flows damage fish and invertebrate populations as there are few refuge habitats (lack of berms, backwaters, woody material). Flood flows are sped downstream towards local communities, whereas better use of suitable, unoccupied floodplain would slow flows.	

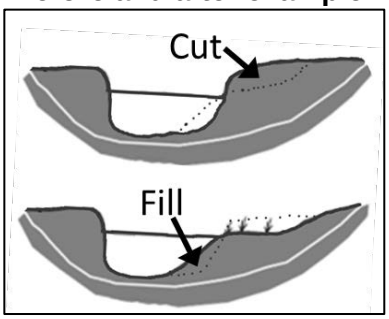
	Over wide channel: Over wide channel exacerbates low flows in summer and during dry winters when stop boards are removed.	Excessively wide channel with shallow flows in summer results in fish kills and impacts abstraction and livestock wet fencing. Higher water temperatures, increased siltation and reduced dissolved oxygen levels combine with poor water quality, resulting in fish kills. Channel becomes choked with emergent vegetation, creating a flood risk in flashy flood events.	
Supporting	**Impounded flows:** Weirs, stop boards (located at each bridge structure) and sluices increase water levels upstream and cause ponding. Channel gradient is low and large lengths of channel are impounded.	Reduces the variety of flow depths and velocities, leading to long, slow and deep stretches. This restricts the variety of habitats for fish and reduces fishery health. Deep, slow impoundments facilitate coarse angling however, the slow, ponded water in the channel leads to weed growth and poor oxygen levels, endangering fish and other aquatic life and impeding angling. Barriers prevent fish movement and prevent the fishery recovering naturally after damaging events. Barriers and impoundments prevent sediment replenishment, which result in more erosion downstream and stops the natural processes that would improve the river.	
	Uniform flow: Historic channel modification to deepen, straighten, dredge and remove any woody material	Uniform flow leads to lack of habitat variety, build-up of sediment, more vegetation choking the channel and little oxygen during low summer flows. Reduces ability of natural processes to improve the value of the river by moving sediment around and creating habitat features.	

	Uniform channel shape: Historic channel modification to straighten the rivers route.	Reduces the variation in flow patterns associated with sinuous channels such as fast and slow areas. This reduces the range of habitat types associated with different flow velocities. Straightened sections have uniformly steep bank slopes reducing the natural and varied occurrence of erosion and deposition. Reduces ability of natural processes to improve the value of the river by moving sediment around and creating habitat features. High flows damage fish and invertebrate populations as there are few refuge habitats (lack of berms, backwaters, woody material). Flood flows are sped downstream towards local communities, whereas a meandering channel shape would slow flows. Over-wide channel results in excessively shallow water in summer, affecting abstraction and livestock wet fencing.	
Cultural	**Limited Access:** Lack of footpaths, high or steep river banks and eroded banks result in difficult access to the channel.	Poor access reduces the possibility for recreational use and appreciation of the river's natural beauty. Steep banks at points along the river make accessing the river a safety concern for anglers.	
	Unnaturalness: Much of the channel has been modified and impounded.	Impoundments affect fish migration, and also lead to stagnation reducing water quality and variety of depth and flow speed. This reduces fishery health, the ability for the river to sustain valuable habitats and species and the amount of places where wildlife can take refuge from extremely high or low flows and temperatures. Historic modification has removed the natural features and processes found in the river, reducing its aesthetic value. Heritage features such as bridges and mills, which limit natural processes, do have cultural and aesthetic value of their own.	

Improvement options

Together with partners and stakeholders, we have identified a set of improvement options that will address the issues affecting people and wildlife in the River Beult. The table below describes each option and the impact it will have. These are the best scoring options from the ecosystem services assessment. They offer the best way of re-establishing natural processes to increase the value of the River Beult for people and wildlife.

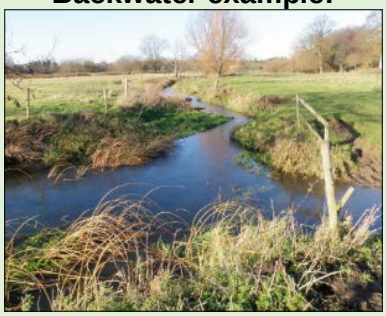
Option	Description	Pros & Cons for People and Wildlife
Gravel riffles	Gravel riffles are shallow but fast flowing sections of river with coarse gravel bed materials found between bends. They span the full width of the channel and are up to twice as long as they are wide. **Riffle example:** 	✓ Improve water quality and fish health by introducing more oxygen ✓ Aid channel maintenance through improving natural processes and removing the need for de-silting ✓ Regulate water levels for angling and water supply ✓ Provides specialised habitat important for river invertebrates, which are often predators of crop pests ✓ Provide spawning habitat for fish ✓ Enable safer access to river for education and some angling methods ✓ Simple to construct with low costs

Shallow berms	Berms are low, wet ledges, at or just above waterline. They create a more meandering, self-clearing channel with varied speed, direction and depth of flow. **Before and after example:** 	✓ Berms can be used to encourage floodwaters onto un-occupied floodplain (where appropriate) to reduce flood risk to properties downstream ✓ Regulates erosion and deposition by protecting banks, directing flow and trapping sediment ✓ Aid channel maintenance through improving natural processes, reducing build-up of material in centre of channel and associated need for de-silting ✓ Maintains water levels in summer by creating a two stage channel. Low flows meander around the berm and keep the channel clear, whilst higher flows move over the top of the berm ✓ Provide a variety of different habitats for wildlife ✓ Enables safer access to the water for education, angling and other forms of recreation ✓ Can stabilise bank slumps by providing a buttress to prevent further slipping ✓ Low to medium complexity to build which is dependent on specific location needs ✓ Medium cost although material can be sourced from re-grading banks and creating pools. ✗ Must avoid over-deepening the channel, when creating berms
Re-grade banks	Reshaping the channel bank to create a gentler slope to the water's edge. The channel becomes wider at the top, whilst the bottom is narrowed often forming a shallow berm by re-using the material. **Before and after example:** 	✓ Can be used to encourage floodwaters onto un-occupied floodplain (where appropriate) to reduce flood risk to properties downstream ✓ Enables safer access to the water for education, angling and other forms of recreation ✓ Provide a variety of different habitats for wildlife ✓ Can regulate erosion by making banks more stable ✓ Provide more of a buffer against agricultural run-off to improve water quality ✓ Can mitigate any detrimental effects of barrier removal by varying the channel shape so that it is more resilient to fluctuations in flow ✓ Secures water supply by creating a resilient low flow channel that is less likely to dry up in summer ✓ Increases the available area of riparian habitat for crop pollinators and predators ✓ Medium complexity to build as it requires machinery ✓ Low cost

Backwaters

Backwaters are small areas of slow flowing or still water connected to the main channel at the downstream end. Backwaters can be a second or smaller channel running alongside the main channel.
Backwaters can be a ponded area to the side of the main channel.

Backwater example:



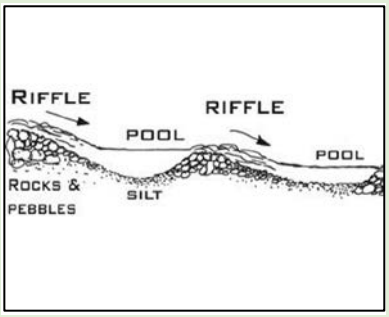
- ✓ Regulate erosion and deposition by trapping sediments and debris
- ✓ Can temporarily store floodwater and release it slowly to reduce flood peaks to communities downstream
- ✓ Provides unique habitats for rare wildlife like the hairy dragonfly
- ✓ Improves water quality by trapping and cleaning up pollutants
- ✓ Improves fish population health by providing more habitat for spawning, places to find food and rear young
- ✓ Can protect fish from high flows and pollution by giving them refuges
- ✓ Support plants which encourage crop-pollinators and predators of crop-pests
- ✓ Medium complexity to build as it requires machinery and a small additional area of land
- ✓ Low cost

Barrier removal

Barrier removal is the complete removal, partial removal or modification of a weir, sluice or dam structure within a river channel to restore more natural movement of water and sediment.

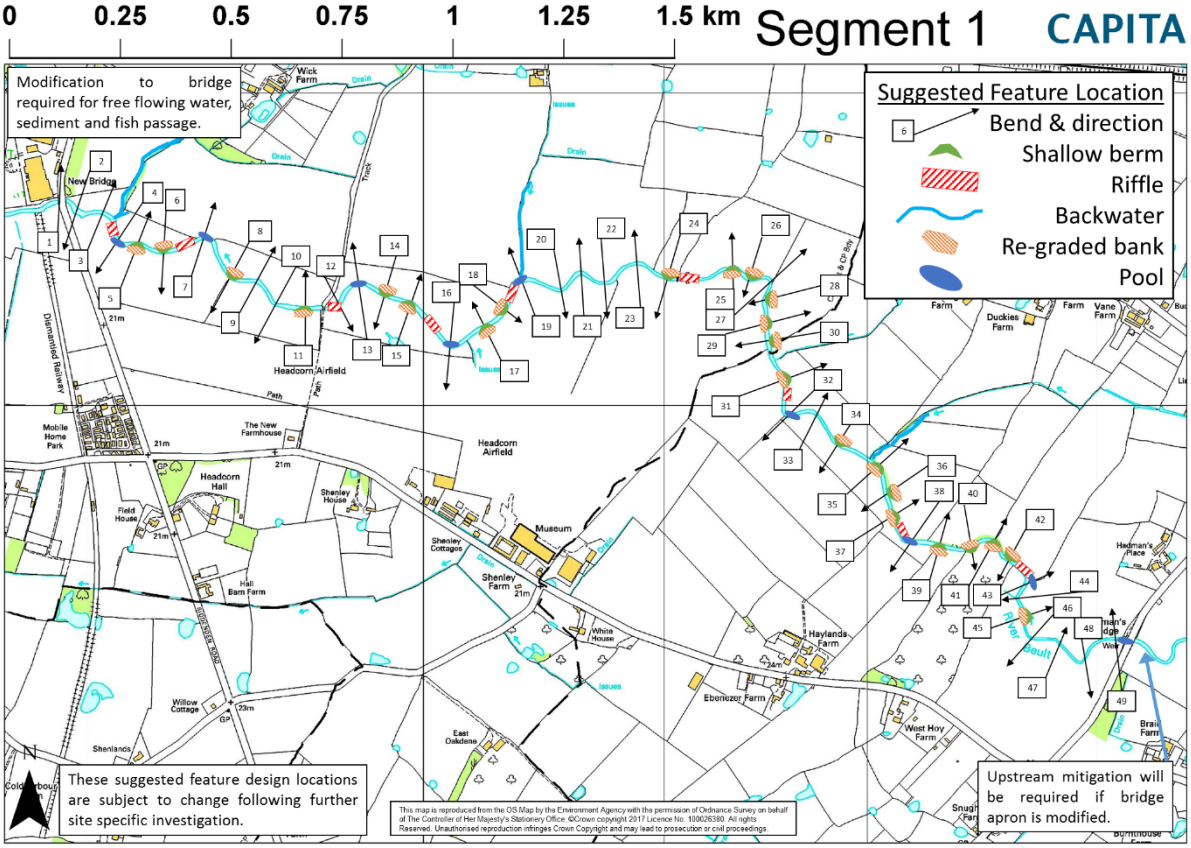
Before and after example:

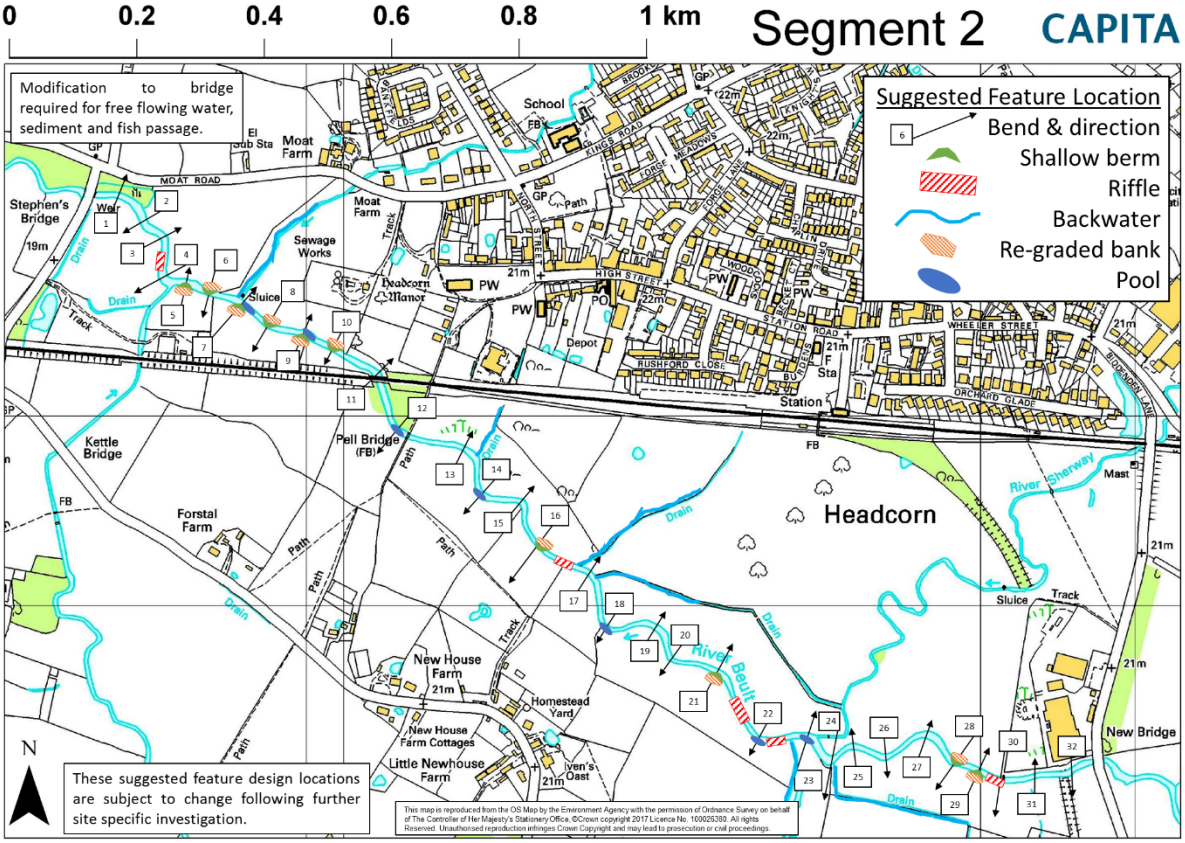
- ✓ Opens up previously impounded stretches of river so that natural flood management measures can be installed to slow the flow of floodwaters
- ✓ Improves water quality by flushing through pollutants and reducing the likelihood of a large fall in oxygen levels
- ✓ Reduces excessive vegetation cover in the channel by speeding up flow
- ✓ Provide greater variety of habitats for wildlife, including more varied temperature, flow, depth and speed
- ✓ Regulates erosion and deposition by encouraging sediment to move through the river system
- ✓ Increases the available area of riparian habitat for crop pollinators and predators
- ✓ Allows fish access to more spawning sites, shelter and food
- ✓ Enables fish migration so they can escape high flows and pollution and return when conditions improve
- × Medium to high complexity to build as it will require detailed investigation, machinery and monitoring
- × Varied cost depending on method (removal of drop boards is low, whereas construction modification will be high)

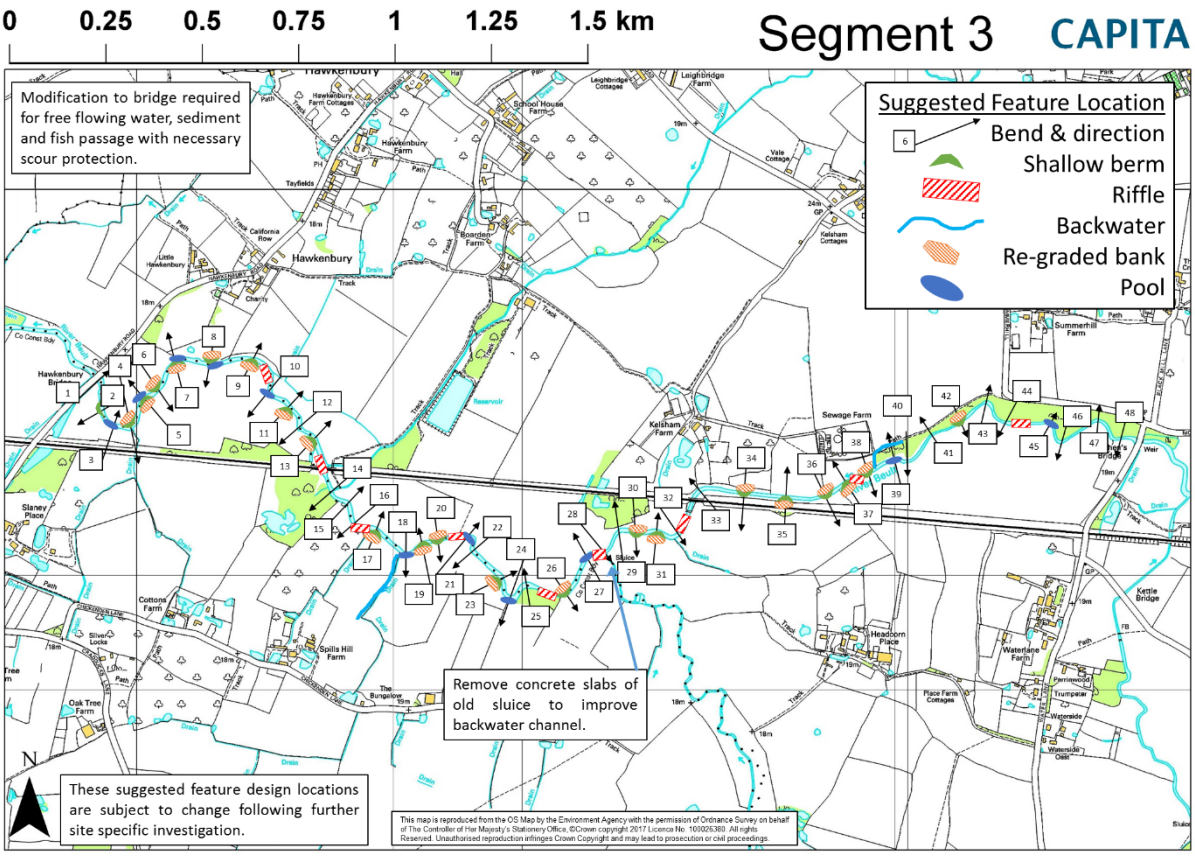
Pools	Pools are deep, slack water areas in contrast to the fast, shallow riffle areas. Pools are often found on the outside of meander bends. **Pool riffle sequence diagram:**  	✓ Provides a specialised habitat for wildlife that have difficulty feeding or navigating faster water ✓ Important refuge for fish, particularly in warm weather and droughts ✓ Regulate water levels for angling and water supply ✓ Medium complexity to build as it requires machinery ✓ Low cost × Can lead to erosion of outer meander bends, creating a bare cliff or bank suitable for kingfishers × Can worsen instability in banks or structures
Riparian planting	Riparian planting is the creation and enhancement of riverside habitat using local, native plant species. The plants are able to withstand wet and dry conditions that result from changing river levels. Plants can be transplanted from other areas within the river channel (preferred) or in certain cases imported from nurseries, using local species. Trees can also be used to provide shading, which some riparian plant species prefer, and the trees can also change root zone wetness. **Before and after example:** 	✓ Can be used to encourage floodwaters onto un-occupied floodplain (where appropriate) to reduce flood risk to properties downstream ✓ Can regulate erosion by making banks more stable ✓ Increases the available area of riparian habitat for insect which can pollinate crops and regulate pests ✓ They can slow the flow of flood waters which delays the flood peak to give communities more preparation time ✓ Keeps the river cool in a warming climate by creating shade ✓ Improves water quality by buffering the river and absorbing pollutants ✓ Protects fish from high flows and predation by giving them refuge ✓ Improves fish population health by providing more habitat for spawning, places to find food and rear young ✓ Planting of trees provides vital habitat, helping to vary and redirect flow and sediment when they encroach into the channel, and provide shelter for birds, fish and insects ✓ Simple solution with low costs

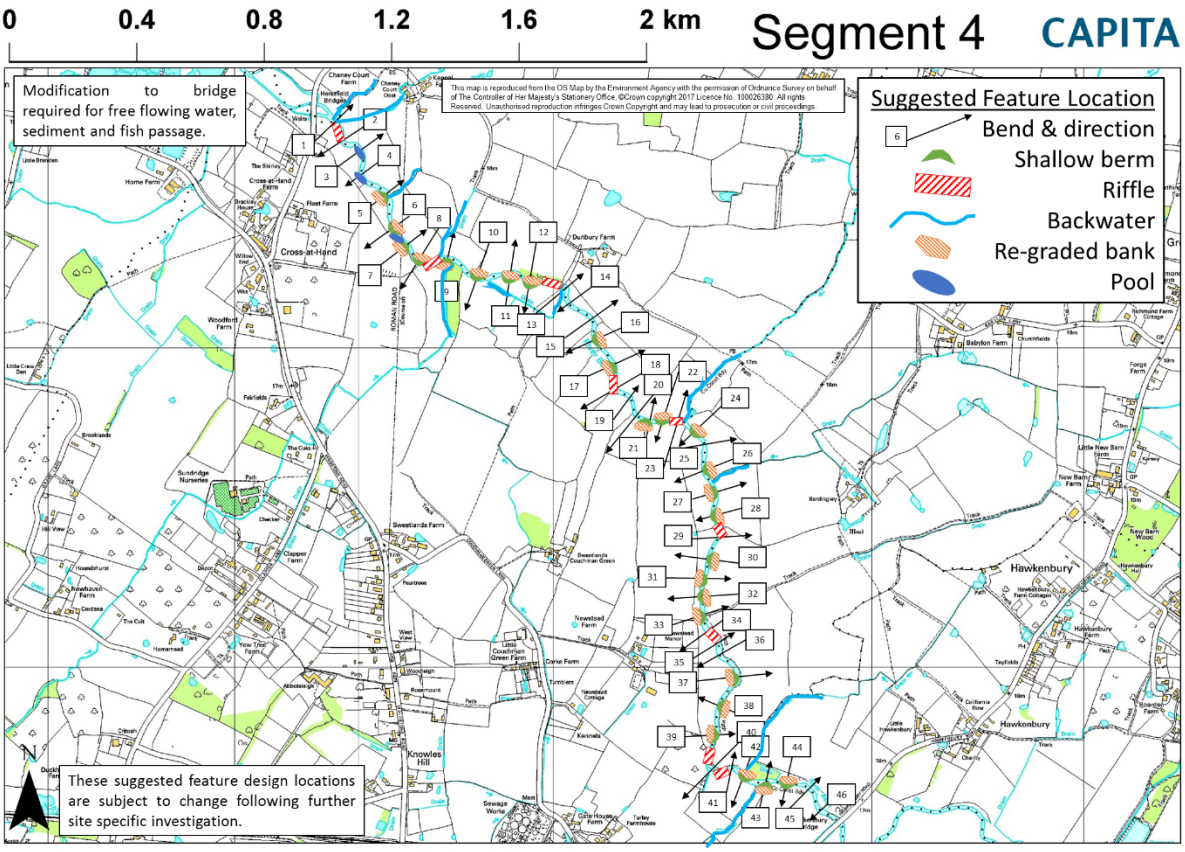
Location Maps

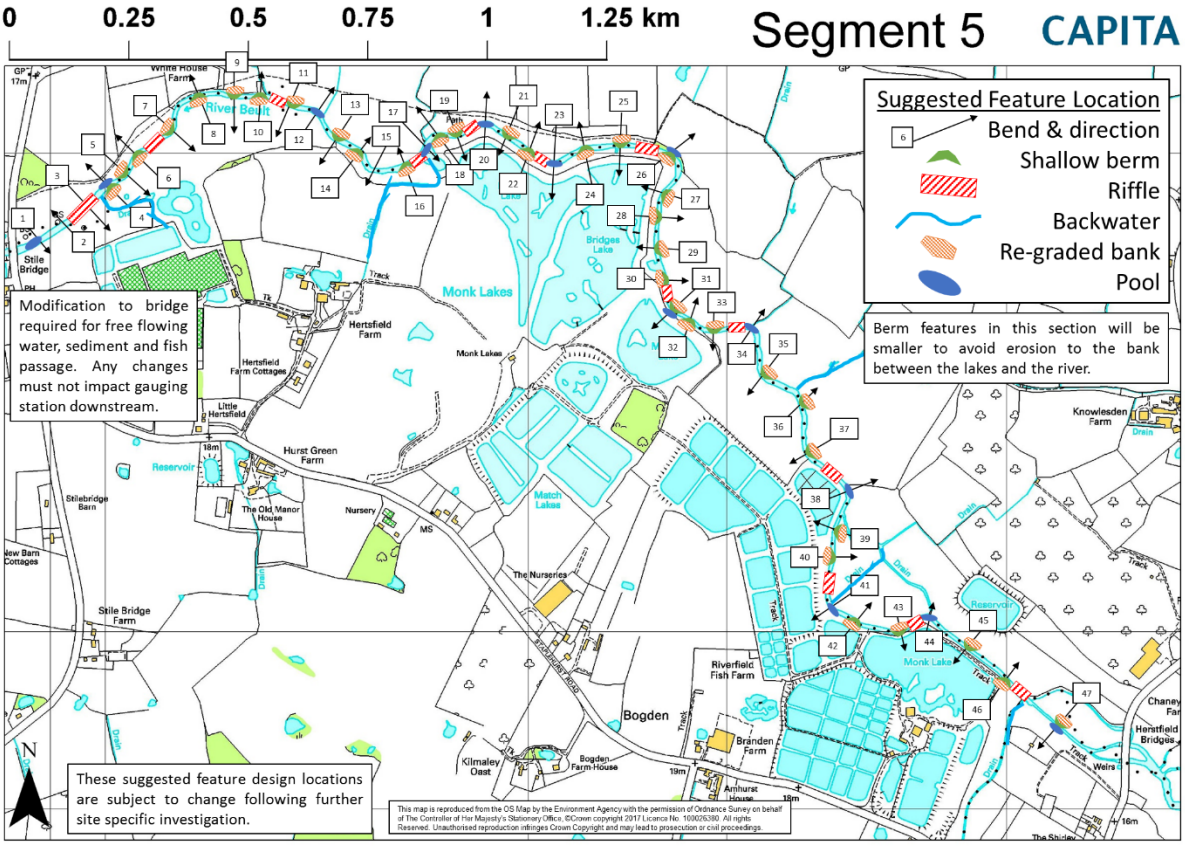
The following maps show where the best scoring options could have most benefit.






0 0.25 0.5 0.75 1 1.25 1.5 km
Segment 3
CAPITA
Modification to bridge required for free flowing water, sediment and fish passage with necessary scour protection.
Suggested Feature Location
Bend & direction
Shallow berm
Riffle
Backwater
Re-graded bank
Pool
Remove concrete slabs of old sluice to improve backwater channel.
These suggested feature design locations are subject to change following further site specific investigation.
N


0 0.4 0.8 1.2 1.6 2 km
Segment 4
CAPITA
Modification to bridge required for free flowing water, sediment and fish passage.
Suggested Feature Location
Bend & direction
Shallow berm
Riffle
Backwater
Re-graded bank
Pool
These suggested feature design locations are subject to change following further site specific investigation.
N


0
0.25
0.5
0.75
1
1.25 km
Segment 5
CAPITA
Suggested Feature Location
Bend & direction
Shallow berm
Riffle
Backwater
Re-graded bank
Pool
Modification to bridge required for free flowing water, sediment and fish passage. Any changes must not impact gauging station downstream.
Berm features in this section will be smaller to avoid erosion to the bank between the lakes and the river.
These suggested feature design locations are subject to change following further site specific investigation.
N
Monk Lakes
Hurst Green Farm
Hertsfield Farm
Bogden
Riverfield Fish Farm
Monk Lake
Match Lakes
Bridges Lake
Knowlesden Farm
Stile Bridge Farm
Kilmaley Oast
Bogden Farm House
Amhurst House
Brenden Farm
The Nurseries
Nursery
The Old Manor House
Hertsfield Farm Cottages
Little Hertsfield
Stilebridge Barn
Hertsfield Bridges
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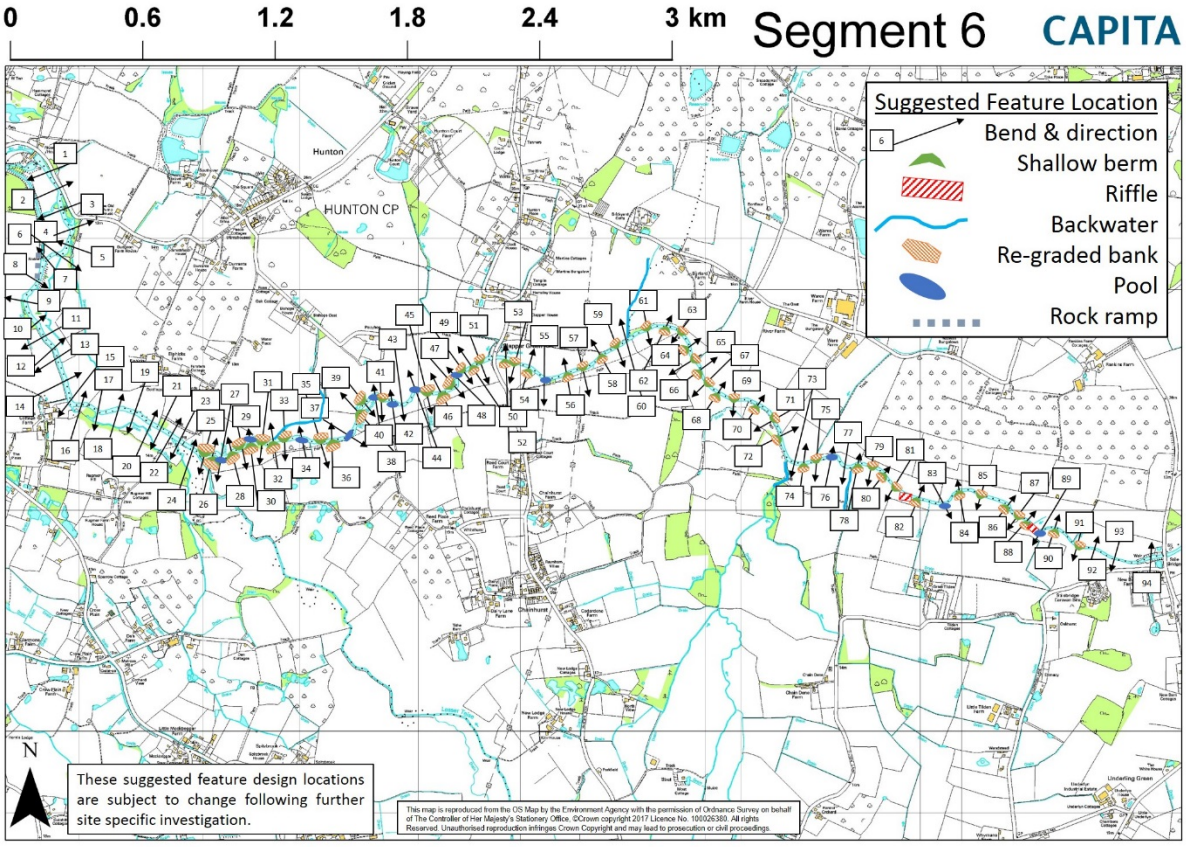
0
0.6
1.2
1.8
2.4
3 km
Segment 6
CAPITA
Suggested Feature Location
Bend & direction
Shallow berm
Riffle
Backwater
Re-graded bank
Pool
Rock ramp
These suggested feature design locations are subject to change following further site specific investigation.
N
Hunton
HUNTON CP
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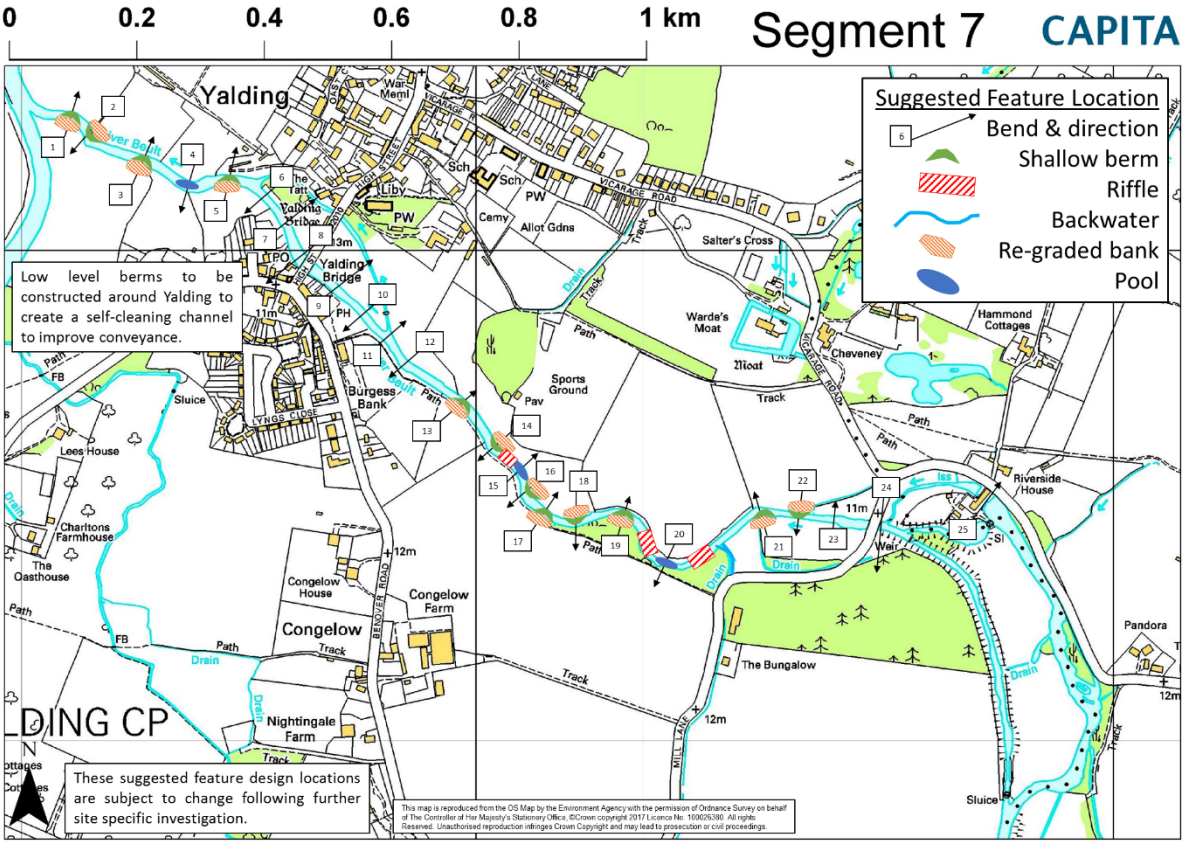

What happens next?

We will use the improvement plan for the River Beult SSSI to work with partners and stakeholders to design and build improvement measures. The success of the improvement options is dependent on further discussions with stakeholders and information gathering. The following surveys and actions will inform the design of options:

Flood risk modelling	Flood risk modelling must form part of the detailed design of improvement options to make sure they reduce or avoid increasing flood risk to people and properties.
Abstraction points	The locations of any abstraction points within the channel must be identified as they may need to be altered. These may coincide with an improvement feature, or be affected by the change in water level from the removal of impoundments.
Geomorphology walkover	A survey is required after impoundments are removed to inform the detailed design and precise locations of the restoration options.
Ecological surveys	Appropriate ecological surveys must be built into delivery of the improvement options to provide an updated assessment of the current habitat and species of value. This will inform the design, and enable an appropriate selection of vegetation for planting the riparian and wet berm areas, and selection of areas to transplant species from. These must be carried out within the appropriate survey season. Invasive species are also present in the catchment and must be considered before, during and after works to stop them spreading.

Fish surveys	Gaps in fish survey data must be identified and filled to understand any likely positive or negative impacts to the river or angling clubs. Identifying existing spawning and nursery habitat will help better understand the fishery health.
Design monitoring strategy	A monitoring regime consisting of pre, during and post works will be required to examine the changes in the river. The River Restoration Centre has published Practical River Restoration Appraisal Guidance for Monitoring Options (PRAGMO) survey guidance that could be implemented.
Water company consultation	Point source pollution and phosphate. Increasing processing and nutrient cycling, including through tertiary treatments, will help in the remediation of pollutants. Working with water companies to identify common work programmes, funding or contribution in kind is required.
Landowner consultation	Landowners must be consulted where design plans are associated with their land. Also, several landowners came forward during the consultation period to offer help, and this should be identified and utilised. This engagement should be coordinated with Catchment Sensitive Farming initiatives and Agri-environment Scheme opportunities
Bridge Structure Investigations	Investigations are required for each water level control structure under the bridges to understand what modifications are possible, prepare designs and understand the change upstream in flow regime and depth without artificial impoundments. This will enable more accurate, appropriate and sustainable design to be prepared.
Fisheries consultation	All stakeholders, including angling clubs, should be consulted to tailor improvement options to deliver the most benefits to the fishery. This should include a discussion of the possibility for appropriate stocking of suitable species if necessary, in conjunction with delivery of improvement options.
Listed Structures and Archaeology	The modifications to water level control structures under 5 of the bridges may require listed building consent. Consultation is required with the relevant LPA Conservation Officer or Historic England. The Kent County Council Archaeology Team should also be consulted to identify any archaeologically sensitive locations.

Costs

We have produced three cost scenarios for the River Beult improvement works.

We need to balance the role of natural processes creating features with the time it takes to realise the benefits for each scenario. We can do this by deciding how much of each feature we construct with machinery. This will allow the designs to be tailored to the needs of the river and stakeholders, within the budgets that become available.

Quick, fully engineered	• Full construction of features to provide immediate changes to natural processes and river services; • Provides restoration of processes where possible alongside associated features • Benefits realised in relatively short timescales and are long lasting • Provides greater resilience to climate change due to more use of mature and robust features, which shape natural processes; • Reliable, controlled delivery of improved river services • Estimated relative cost for the whole SSSI is £58 per metre
Medium, partially engineered	• Construction of effective features to provide reliable changes to natural processes and river services; • Will deliver identified WFD mitigation measures and achieve SSSI status change in the long term; • Copes with average climate change but will not provide resilience to extreme or unexpected climate change in the short term; • Delivers long term reliable benefits for people and wildlife through a changing river regime; • Relies on natural processes developing over time for full benefits • Estimated relative cost for the whole SSSI is £35 per metre
Slow, natural process driven	• Absolute minimum needed to change natural processes • May take centuries for benefits to fully realise • Probably doesn't cope with variations of climate change • Some river services are likely to be temporarily damaged, for example low flows until the narrowed channel stabilises, including the loss of wet fencing and fish; • Relies on natural processes developing to bring about ecological change; • There may not be enough channel gradient or sediment supply for natural processes to successfully develop on their own • Estimated relative cost for the whole SSSI is £21 per metre

Each scenario is dependent on removal of stop boards and modification of the associated concrete sills, in all segments except 6 and 7. Improvements in segment 6 are dependent on the option which is chosen for Cheveney Autosluice. Segment 7 has no major water level control structures apart from one small weir, which impounds a short stretch of river downstream of Cheveney Autosluice. We have costed the modification or removal of barriers separately. These costs should be added to the totals for each scenario.

The recommended options and cost for modifying the water level control structures under New Bridge and Stephen's Bridge were identified in a previous report by Jacobs in 2010. The approximate cost for the structures under other bridges has been estimated using the average cost and adjusted for inflation.

Scenario costs

Quick, fully engineered scenario

Segment Number	Number of features	Price per metre	Total cost
Segment 1	94	£36	**£125,100.00**
Segment 2	49	£42	**£90,600.00**
Segment 3	85	£49	**£182,800.00**
Segment 4	100	£57	**£197,700.00**
Segment 5	134	£79	**£283,000.00**
Segment 6	174	£68	**£453,800.00**
Segment 7	43	£44	**£108,600.00**
Total cost			**£1,441,600.00**

Medium, partially engineered scenario

Segment Number	Number of features	Price per metre	Total cost
Segment 1	94	£21	**£75,000.00**
Segment 2	49	£30	**£63,300.00**
Segment 3	85	£30	**£112,900.00**
Segment 4	100	£38	**£134,200.00**
Segment 5	134	£48	**£172,700.00**
Segment 6	174	£36	**£241,200.00**
Segment 7	43	£25	**£63,100.00**
Total cost			**£862,400.00**

Slow, natural process driven scenario

Segment Number	Number of features	Price per metre	Total cost
Segment 1	70	£12	**£44,300.00**
Segment 2	39	£22	**£48,200.00**
Segment 3	64	£20	**£73,900.00**
Segment 4	74	£28	**£99,100.00**
Segment 5	99	£31	**£111,800.00**
Segment 6	122	£18	**£179,600.00**
Segment 7	31	£15	**£37,700.00**
Total cost			**£536,600.00**

Water level control structure modification combined with scenario 1 costs

Segment Number	Number of features	Features cost	Barrier removal cost	Total cost
Segment 1	94	£125,100.00	£475,000.00	**£600,100.00**
Segment 2	49	£90,600.00	£229,000.00	**£319,600.00**
Segment 3	85	£182,800.00	£233,500.00	**£416,300.00**
Segment 4	100	£197,700.00	£233,500.00	**£431,200.00**
Segment 5	134	£283,000.00	£233,500.00	**£516,500.00**
Segment 6	174	£453,800.00	£327,000.00	**£780,800.00**
Segment 7	43	£108,700.00	£233,500.00	**£342,100.00**
Total cost		**£1,441,600.00**	**£1,965,000.00**	**£3,406,600.00**

Funding

This River Beult SSSI improvement plan is dependent on multi-partner working between all stakeholders. We need to secure funding, using a wide variety of available sources. The table below lists key sources used for river improvement works.

Funding Body	Grant or Scheme	Amount of funds provided
Defra	Flood and Coastal Risk Management Funding, Water Environment Improvement Funding, Fisheries Improvement Funding	Amount and likelihood of funding dependent on flood risk, WFD and fisheries benefits respectively
	Rural Development Programme for England: LEADER	A total of £138 million is available in England between 2015 and 2020 under the scheme
	Water Environment Grant Scheme	A total of £27 million is available nationally for delivery between 2019 and 2021
	Agri-environment Schemes	Amount dependent on options applied for
Local Authorities	Environment and amenity funding	Up to £10,000, but may be more depending on local circumstances
European Funding	EU LIFE programme	For the 2014 - 2020 funding period, it has a total budget of €3.4 billion
National Lottery	Landscapes Partnerships, Heritage Grants, Funds for All	Large projects £100,000 to £300,000 Small capital projects up to £10,000
Charitable Trusts	Esmee Fairbairn Foundation	Up to £150,000
	The David Ross Foundation	Up to £100,000
	The Cummins Foundation Development Grant	Up to £20,000
	Garfield Weston Foundation	Up to £100,000
	People's Trust for Endangered Species	£10,000 to £20,000
	Ernest Kleinwort Charitable Trust	Up to £20,000
	Nineveh Trust	Up to £7,500
	Dulverton Trust	Up to £5,000
	D'Oyly Carte Charitable Trust	Up to £5,000
	Idlewild Trust Grant	Up to £2,000
	Whitley Wildlife Conservation Trust	Up to £15,000
Other	AVIVA Community Fund	Up to £25,000
	Tesco Bags of Help	Up to £4,000
	Water Company Grants	Amount and likelihood of funding dependent on benefits to water resources and quality.
	Angling Trust Grants	Around £5,000
	Landfill Communities Fund	Around £50,000
	People's Postcode Lottery	Up to £20,000

We will also look at Contribution in Kind (CiK) to carry out some of the improvement works. CiK removes financial costs, yet still delivers the project. Local landowners, businesses and community groups can provide key resources including materials and volunteers for construction and monitoring.

Further information

Improving the River Beult SSSI – Technical Report

A full technical version of the River Beult SSSI Improvement Plan is available. This includes detailed information regarding:

- Ecosystem services assessment methodology and scoring
- Descriptions of all improvement options identified on the long list
- Outline design specifications for each improvement option
- Assessment of improvement options for Cheveney Auto sluice
- A full breakdown of costs

Medway Flood Action Plan

The Medway Flood Partnership was established in January 2017 and on 1 December 2017 the Partnership launched the Medway Flood Action Plan. The Plan focusses on immediate collaborative actions and long term strategies to reduce the risk of flooding from non-tidal rivers and surface water in the Medway catchment. This includes all the land draining into the rivers Medway, Beult, Teise and Eden as well as their tributaries.

In addition to improving existing flood protection and providing new defences, the Partnership is looking at ways to slow the flow of floodwaters and reduce flood levels through natural flood management. We are also seeking to improve community preparedness and resilience through emergency planning.

You can view the Medway Flood Action Plan on the gov.uk website using the link below or by searching 'Medway Flood Action Plan':
www.gov.uk/government/publications/the-river-medway-partnership-objectives-members-and-action-plan

Previous reports for the River Beult SSSI

Available on request from the Environment Agency or Natural England, including:

- River Beult Outline Restoration Plan, Natural England, 2007
- River Beult Restoration: Bridges Modification Options Report, Jacobs, 2010
- River Beult Restoration Plan Technical Note, Capita, 2016

Practical River Restoration Appraisal Guidance for Monitoring Options

PRAGMO guidance http://www.therrc.co.uk/monitoring-guidance

Manual of river restoration techniques

www.therrc.co.uk/manual-river-restoration-techniques

Please contact us with any further questions at

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