

Tullamore Living River Project

Riparian Habitat Enhancement and Water Quality Improvement Measures

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Introduction

This report is prepared at the request of Íde O'Connell of Offaly County Council to set out measures to improve the Tullamore river ecosystem function as it flows through Tullamore town as identified in Tullamore Living River Project – feasibility assessment finalised in July 2019.

The Tullamore Living River Report identified nine project areas along, on and in the river to develop increased amenity and recreational opportunities through restoring the river's ecological integrity, improving biodiversity and water quality. The measures outlined here are based on four of the nine projects from the Tullamore Living River report and are designed to maximise the habitat value for riparian wildlife, to enhance the area for biodiversity and improving water quality

The project will also help to fulfil Offaly's commitments in the Offaly Climate Adaptation Plan by providing carbon sequestration potential in the proposed wetland areas.

Consultation Process

The success of this project depends on full collaboration with all those people who can offer expertise, input and knowledge about the river, its history and its passage through the town. As part of the overall process of design and works, we will be consulting with, *inter alia*, the OPW, NPWS, IFI, others within Offaly County Council, local conservation bodies such as Birdwatch Ireland - Midlands, Irish Wildlife Trust (Laois Offaly branch), Offaly PPN's 'Green Offaly' Sustainable Development Trust and residents of Tullamore town to get a broad range of views about the proposals in this report.

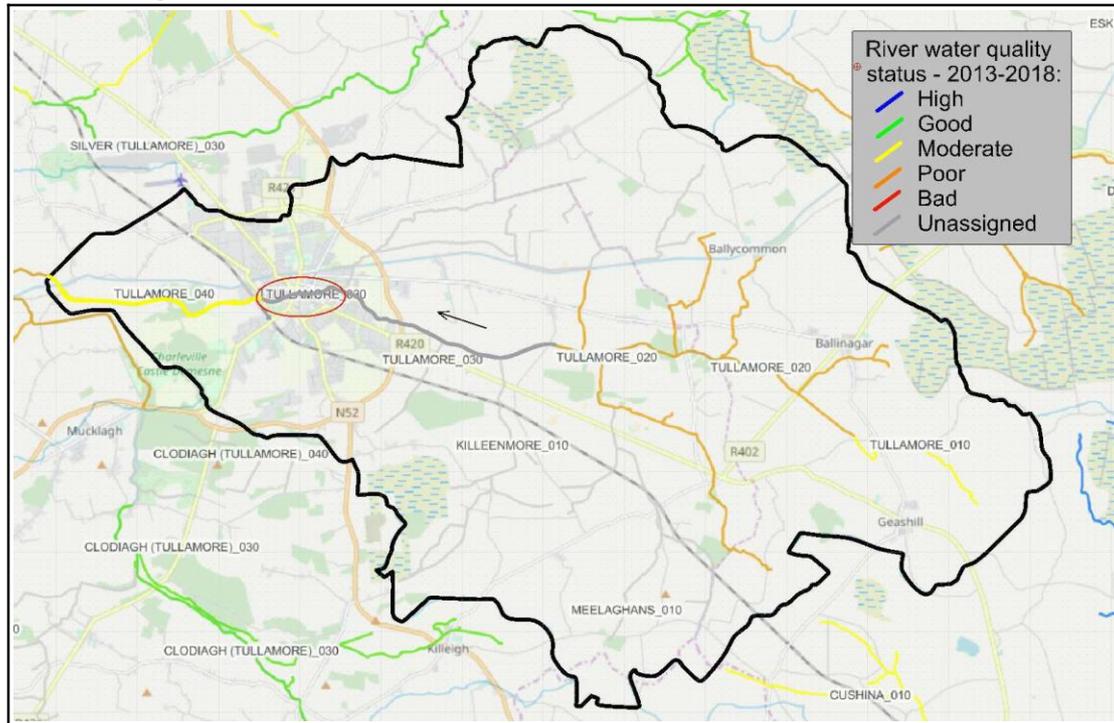
This element of the project is important to ensure that there is as much local participation as possible, and to encourage those within the town and wider county to really embrace the ecological benefits proposed and encourage catchment-wide landuse practices that will further enhance the water quality and wildlife value of the river.

To date, the project has been prepared for OCC in collaboration with LAWPro; as well as receiving initial input from the OPW to assess any potential issues with the proposed works; with Blackthorn Ecology to assess the potential for detrimental impacts on designated ecological sites; and with the River Restoration Centre in the UK to assess the potential for fluvial morphological impacts.

Tullamore River in context

The Tullamore river catchment is located predominantly east of Tullamore Town and flows mostly through agricultural land. The town is sited close to the lowest point within the catchment. Downstream from Tullamore the river flows west via the Clodiagh, Brosna and Shannon rivers to the Atlantic. The total catchment size is c.120km² or c.12,000ha, as shown in Figure 1.

Fig. 1. Tullamore River Catchment, showing Tullamore River flowing E to W.
(Project area shown in red.)



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(Map source: www.catchments.ie)

In terms of water quality, the overall Tullamore River catchment is classed as poor to moderate, as shown in figure 1. Water quality is classed as poor (orange) or moderate (yellow) in the upper catchment; unassigned (grey) in the mid catchment region; and moderate (yellow) below the town.

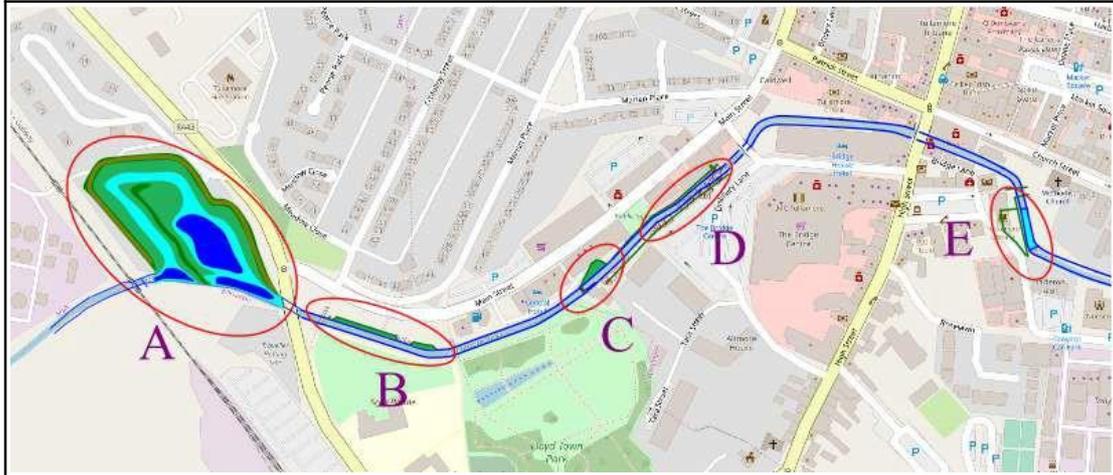
There are no river quality assessments that have yielded good or high status in the mapped results in this subcatchment since the opening records from 2007 (see www.catchments.ie). The Tullamore Living River Project is designed to help redress this low status and enhance the water quality and wildlife value of the river, as well as bring about enhancements to the amenity value of the river for those in Tullamore to enjoy.

The proposals included in this report will lead to some improvements in water quality, but in reality a greater benefit can best be gained by using it as a springboard to work in tandem with other catchment-wide measures. In parallel with water quality enhancements, the measures outlined here will help to provide wetland habitat for flora and fauna within the Tullamore River as it flows through the town, thus bolstering local aquatic and riparian biodiversity.

Project locations

This project covers an area of the Tullamore River from the rear of the Tullamore Library, following the river downstream and westwards to the railway line, as shown here:

Figure 2. Works areas for each project location.



Map source: www.openstreetmap.com

Summary of locations

- A – Main Wetland area at Srah and Kilcruttin
- B – Riparian Widening at Marian Place
- C – Wetland creation at old mill pond (Main st. and Kilcruttin)
- D – Tree trimming at rear of Main St. and Bridge Centre Car Park.
- E – River enhancement measures to the rear of Tullamore library

Proposals for each project area

A – Main Wetland area at Srah and Kilcruttin

This area is a low-lying piece of land between road and railway line. It is proposed to convert this land into an attractive wetland filter area and wetland park as part of the project. Figure 3 shows the proposed layout for the new wetland area.

A raised berm is to be sited perpendicular to the existing route of the river channel and used as an island for habitat value. The plan is to allow the main river channel to flow through a wide wetland area, creating filter and habitat marsh areas within the main body of the site. Over time it is envisaged that the river channel itself will become encroached with tall vegetation to provide physical filtration of any floating debris within the river and to slow the flow of water to allow sediments to settle out.

Wetlands and ponds used in Swedish catchment filtration examples vary from 0.02 to 0.3% of the total catchment size¹. A wetland built on this site is within the lower size range relative to catchment size. It is expected that alongside providing habitat for aquatic wildlife we would also see a modest uptake/retention of nitrates and phosphates from the water, helping to improve the overall quality of the river from this point forward.

The wetland will also help to provide space for settlement of river washed sediments, which will also help with downstream water quality improvement. Sediment accumulation will need to be addressed as part of an ongoing maintenance programme. The frequency of desilting events will be dictated by the accumulation rate and the space available for silt storage. It is estimated that desilting will be required every 5 to 20 years depending on the rate of accumulation. Any sediments removed can be used on nearby farmland to enrich the soil and build topsoil levels.

This area of the project will provide valuable habitat for wetland wildlife such as riverside flora, dragonflies, butterflies and bird species. Flowers such as lady's smock, meadowsweet, yellow flag, water mint and king cup are all beautiful wetland plant species that would grow well in this new area. In Ireland we have 28 species of damselfly and dragonfly, so the more wetland habitat that is available, and the greater the diversity of types of wetland habitat, the more species we can attract to an area. Many species of butterfly value wetland habitat including the rare and beautiful Marsh Fritillary.

Wetland habitats are particularly vulnerable in both the Irish and European context, so any recreated wetland areas can be very valuable for supporting wetland biodiversity. Bird species such as willow warblers, reed warblers, snipe, heron and many others all rely on different types of wetland habitat. The diversity of depths and vegetation in this new wetland area will help to encourage as wide a diversity of birds as possible.

From a wider environmental perspective, wetland habitats sequester atmospheric carbon as they grow, and build up peat layers year after year. The wetlands of Ireland are our rainforest equivalent, our species-rich habitats that also mop up carbon dioxide as well as providing invaluable habitats for wildlife. By reinstating wetland habitats such as this one, we can help to mitigate our county and national carbon emissions as well as assist with the recovery of wetland wildlife.

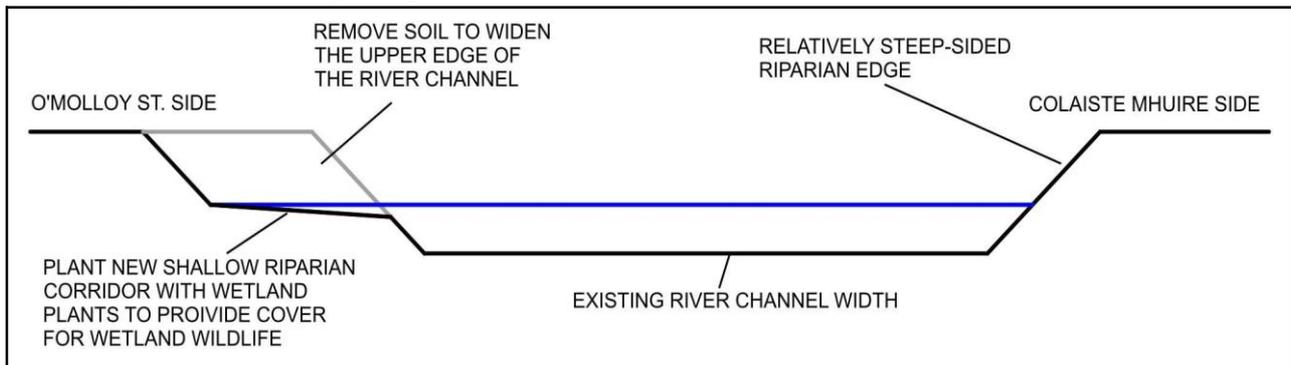
1 LB-M Vought and JO Lacourisère, *Wetlands for treatment of polluted waters: Swedish experiences*. In: U Mander and P Jenssen (2002) *Natural Wetlands for Wastewater Treatment in Cold Climates*. WIT Press, MA, USA

B – Riparian Widening at Marian Place

The area on the north of the river may be widened slightly where it flows through the park at Marian Place. This area is very small in terms of water filtration, but has the potential to offer aesthetic and habitat benefits. Planted corridors along riparian zones are valuable for wildlife, allowing animals, birds and other flora and fauna to move from one area of the river to another.

The proposal for this location is to lower the ground level and allow natural or introduced regeneration of riparian vegetation. Figure 4 shows a 20-30% widening of the river channel, but more may be taken if space is available. Allow a water depth of between zero and 200mm across the new riparian zone, to allow for proliferation of emergent vegetation and to allow for ease of movement by wildlife through the corridor. Works will be carried out in consultation with an arborist to ensure that the existing trees on the other side of the footpath are protected during all project excavation works.

Figure 4. Widening of riparian zone at Marian Place.



Other biodiversity features at this site include careful placing of boulders for variation in the river bed habitat. The use of in-stream boulders at this location will be done in consultation with an ecologist or environmental consultant to ensure that they maximise the value for fish and aquatic invertebrates.

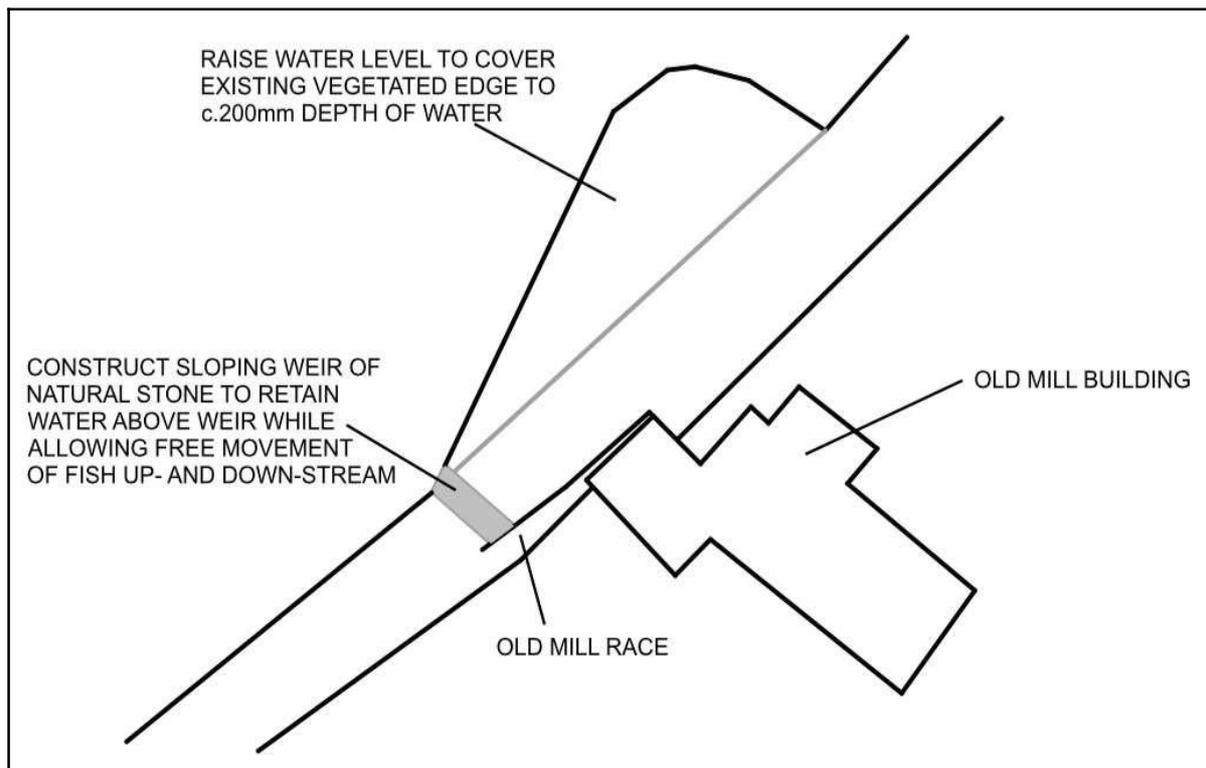
There is also the potential to construct a fishing stand at the opposite side of the river from the widening works and footpath, at the eastern end of the works area. This will permit access by anglers without inconveniencing others visiting or passing through the park.

C – Wetland creation at old mill pond (Main st. and Kilcruttin)

To the rear of the buildings on the south side of Main St., the river flows past the old mill. The weir and mill race are in disrepair, and the mill pond has become silted and grown over with riparian vegetation. It is proposed to reinstate a riffle feature at the location of the old weir, with natural stone over a long run to allow ease of fish movement while at the same time allowing for a slight rise in the elevation of water levels upriver. This will raise the water level across the vegetated area within the mill pond and create a wetland habitat with the potential to allow greater silt removal than is currently the case, thus contributing to water quality improvements in the river. Works here will be carried out only after consultation with the NPWS, IFI and with the River Restoration Centre in the UK to provide input into the assessment of the final riffle design elements such as stone sizes, width and reach and gradient.

Reinstatement of the old mill for electricity generation would make sense in the context of the current climate emergency, but this will need to be done with great care to ensure that the otters here have been satisfactory rehoused in new holts before any mill works commence.

Figure 5. Wetland habitat creation at the old mill pond site.



D – Tree trimming at rear of Main St. and Bridge Centre Car Park.

The two issues discussed at this location during the site investigation were litter and shading by overhanging trees. For the first part, litter has accumulated along the riverbank and gathered where the trees come in contact with the water. Provision of access for litter picking would allow for safe and straightforward removal by Tidy Towns groups or others as needed. Other areas for possible litter screening and collection from the river will be investigated as part of the project, and will be introduced where feasible.

With respect to tree cover, bear in mind that in the natural environment trees naturally germinate and thrive along riverbanks. In the wild, the predator/prey dynamics of grazers and foragers and the predators that hunt them are in a balance with the natural river dynamics, creating areas of open water and areas of shaded river. Much of the Tullamore River is open to full light, and thus having areas of shade provides needed balance to this. Therefore it is proposed to avoid clearing too much overhanging vegetation at this location. Sycamore can be removed or cut back if desired, but alder, willow and elder all provide food for pollinators and birds and should be left to thrive.

Similarly the bramble cover also provides food and shelter for birds and pollinators and should be left as is. Indeed, any tree or vegetative cover provides shelter for birds and mammals, including the otter. If litter picking access is provided, the branches overlying the river will continue to provide a screen to intercept plastic en route to the sea and give an opportunity for removing it. Thus it is recommended not to remove any branches that are in contact with the water surface.

E – River enhancement measures to the rear of Tullamore library

The river has become relatively canalised and slow in the area upstream of the library building. The plan for this location is to import gravel to raise the river bed level along a section of the canalised river base to allow for greater turbulence of the flowing water.

The new riffle area will be start just above the bridge to the rear of the library building, and continue upstream for c.50m, as shown in the accompanying drawings for area E. Note that for further habitat enhancement the area could be extended to the new Lidl car park, with alternating pool and riffle sections. This would further increase movement, sound and aeration of the water.

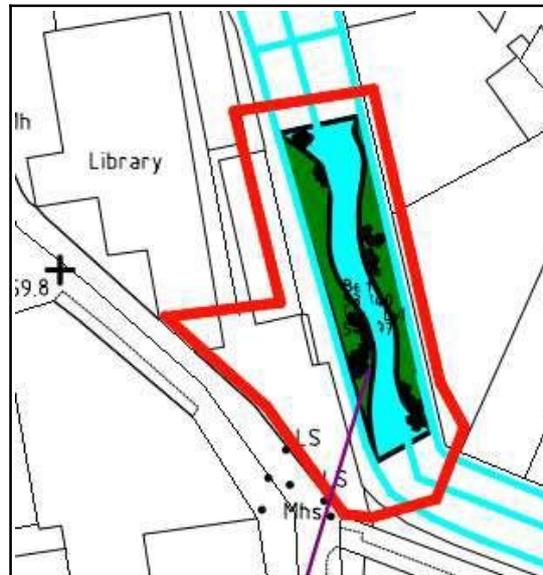
The sinuous nature of the gravel placement will increase edge habitat and encourage more natural flow dynamics than straight channel edges. Benefits for wildlife will include greater diversity of habitat for fish, aquatic insects and other wildlife. Planting of the new riverbank with selected native wetland plants will be carried out to provide aesthetic interest, habitat and edge stabilisation.

The accompanying drawings show boulders on either side of the riffle area. The locations on the drawings are indicative and the final locations will be agreed with an ecologist or environmental consultant on site during construction works to maximise

the habitat value. Some boulder placement will specifically include in-stream boulders for permanent habitat value in the river channel. All introduced stone will be consistent with the underlying stream bed characteristics.

East of the library building, adjacent to the river, there is an open gravel courtyard area. At present this is cut off from the river by a wall and relatively steep drop to the water. In this area it is proposed to lower the ground level and remove the river wall upstream to allow greater visual access and appreciation of the river. A flood risk assessment is needed prior to this work to check that the existing wall does not act as a flood defence, in which case this measure may be inappropriate from a flooding perspective. Similarly, all proposed works will be assessed by RRC prior to commencement to confirm the correct stone sizing and placement; and to assess the potential for post-works sediment redistribution.

Fig. 6. River enhancement measures at the rear of Tullamore library building



Other catchment measures

The wider catchment land-use has a significant bearing on the overall quality of any watercourse. Similarly here in Tullamore, the upper catchment area will dictate the water quality entering the upper end of town. There are many measures that help to improve water quality, such as exclusion zones for ploughing or grazing, introduction of trees within the catchment as native woodlands, agroforestry, silvopasture, contour planting on slopes, or planting of buffer zones along rivers and streams.

Even where landuse and farming style remain unchanged, it is possible to make changes within small streams and drains. Wherever farm streams enter the main river channel investigate the possibility of installing a small marsh area to filter incoming water. This may be as modest a size as simply providing a slight widening within the existing stream channel, or may be a larger size if water contamination is apparent and land area is readily available. Always carry out this work with an ecologist or environmental consultant to ensure that the impacts on the downstream habitat and water quality are all positive.

Where low-lying farmland borders the main river channel it may be possible to implement a farm payment scheme to recompense land owners for creation of flood-plain and wetland areas for filtration and wildlife habitat. Ideally this measure would form part of the Common Agricultural Policy, but in the absence of this, any measures that can be implemented by LAWPro or Offaly County Council could potentially have considerable positive impacts on the water quality in the entire catchment, and be replicable nationwide.

Similarly the stormwater runoff from industrial yards, roads and roof surfaces throughout town would benefit from being filtered via a number of Sustained Urban Drainage Systems (SUDS) components to protect the river water quality. Example of SUDS components include oil interception, grassed swales, ponds, wetlands, bioretention areas etc., the aim of which is to undo the hydrological impacts of laying concrete and other impermeable surfaces in the catchment, and filtering the water. Paved surfaces increase overall runoff volumes and increase flood peak volumes and reduce the time taken for stormwater to leave the catchment – all of which lead to potential flooding and/or drought conditions lower down the catchment. Water quality is also effected negatively; sometimes having a pollution load of up to 15% of the impact of raw sewage.

The CIRIA SUDS Manual² proposes one SUDS component for areas receiving roof water only; two components in series for residential roads, parking areas and commercial zones; and three components in series for areas filtering runoff from refuse collection, industrial areas, loading bays, lorry parks or highways. Thus the mixed use of the lands in this part of the Tullamore River call for two to three SUDS components in series for all stormwater inlet pipes. The space may not currently be available (unless evidence of pollution is present, thereby requiring action under the

² Woods-Ballard B, Kellagher R, Martin P, Jeffries C, Bray R, Shaffer P (2007) *The SUDS Manual*. CIRIA, London

Water Pollution Act regardless of available space), but as part of the overall planning policy for any new development within the Tullamore river catchment, earmark sufficient space for adequately designed and sized SDUS components to filter all water entering the river.

Significant measures have already been carried out by Offaly County Council to remove grey water pipes from storm drains around the town. This is something that should be continued, to ensure that no foul sewers or grey water piping enters the river without proper treatment.

Project Implementation and Follow-up

In order to bring the above measures to completion, a number of distinct measures are required, summarised as follows:

1	A topographic survey of each area is required to allow an appraisal of any earth moving to be carried out. On smaller sites a number of spot heights will be sufficient. Such surveying will also help to inform flood risk assessments for each location.	Completed.
2	A flood risk assessment is needed for each area to ensure that the works will be neutral or net beneficial from a flood protection perspective. Note that recent research into natural flood amelioration include such features as leaky dams, brash dams, stormwater wetlands and other in-channel amelioration measures that are designed to store water within river and stream catchments rather than maximising the speed with which water flows off the catchment. By canalising and draining rivers, the problems of flooding are often transferred downstream rather than solved and are exacerbated in the process. The primary measures described in this report are in line with more up to date stormwater filtration and flood amelioration examples – but a risk assessment on a case by case basis is still required to offer a guarantee of safety.	In process.
3	A hydromorphological assessment is also needed to assess flow morphology and sediment transport within the river channel and likely impacts of all proposed measures. Note that the measures are specifically designed to reduce the silt loading on the stream, and thus improve the overall water quality, but such an assessment is an important element of the overall works required.	Completed.
4	Detailed drawings are required for relevant locations for construction, tender and/or planning purposes. Such drawings to include plans and sections of the areas where works are needed, construction details for weir or riffle areas, dimensions of bank amendment works and such like.	Completed.

5	Liaison with Inland Fisheries Ireland, National Parks and Wildlife Service, the Office of Public Works, local residents and other relevant stakeholders prior to finalisation of the designs in order to incorporate their expertise, views and opinions as early in the overall process as possible.	In process.
6	Liaise with groundworks contractors, wetland plant suppliers, tree surgeons and other contractors to assess the likely costs of each project area prior to commencement.	Due to be commenced.
7	<p>Conduct a baseline environmental assessment prior to commencement of works and compared with further assessments upon completion. Follow-up assessments to be carried out for up to 5yrs after the works have been completed in order to assess the benefits of the project.</p> <p>Monthly analysis to be carried out for BOD, SS, TN, NH3-N, TP and Ortho-P to assess the effectiveness of measures from a water quality perspective. In tandem with this an ecological survey is to be carried out to assess the benefits for birdlife, fish, plants and macroinvertebrates.</p>	In process, and to be continued for the first 5 years after completion of works.
8	In the medium to longer term, periodic maintenance may be necessary to ensure that water levels do not rise above a certain set level – different for each area under examination. In advance of such works, introduce a maintenance protocol that recognises the importance of riparian wetland vegetation as part of the overall habitat value and filtering mechanisms of the river system, as well as for flood control. Avoid unnecessary excavation of silt that may accumulate within the river system and allow maximum flexibility for the river and tributary streams to deposit silt naturally, providing for a return where possible to a meandering system in this part of the river catchment over time.	Follow-up measures.

Works Method Statement

1 - Consultation Process

The project is to be implemented only after an extensive public consultation process and liaison process with relevant authorities.

All plant species, construction processes and planting works will be agreed in full with Offaly County Council, OPW and NPWS prior to commencement any works. All works and methodology used will be reviewed with these authorities to ensure that the maximum benefits for the river and for wildlife are assured.

All land access/ownership issues are to be fully clarified and regularised prior to commencement of works in a given area.

2 - Construction Process

For each project area the site perimeter will be cordoned off and made safe for the general public prior to any works.

Existing site levels will be checked prior to commencement of works. Regard the current topographic survey details as indicative rather than absolute.

Any removal of soil or other material from a project area (areas A, B and C) will be carried out insofar as possible without contact with the river channel. Only when all new contours have been achieved should the final interface with the river channel be removed. This is to ensure a dry working environment for health and safety reasons.

Import or export of material from Area A will be carried out predominantly during off-peak traffic times, and should be co-ordinated such that material is removed only as part of an external project that requires stone or subsoil, to minimise the overall carbon footprint of the project by avoiding unnecessary double handling of material.

Machine works will be supervised by a suitably qualified, competent and authorised ecologist or equivalent consultant.

Tree thinning is to be carried out by a suitably qualified, competent and authorised tree surgeon. All cut material from area D is to be reused in the margins and/or island of area A for habitat enhancement.

3 - Planting

Many of the areas already have wetland plants growing in abundance, however areas A and E will need to be fully planted with stock from outside the site area; and other areas (notably areas B and C) may benefit from additional introduced plants.

Planting will take place within the relevant areas as soon after harvesting as practical in order to maximise the success rate. Planting will be carried out into a fully saturated (but not submerged) environment to maximise plant success.

Planting at the correct levels is important to ensure that when the works area is integrated with the river, the plants are not too deep and neither are they allowed to dry out by being too high.

4 - Safety

All relevant Health and Safety legislation will be adhered to. In addition, FH Wetland Systems Ltd. have developed a Health and Safety Protocol over the years that is adapted to water and wetland environments, and the specific risks and amelioration responses necessary for safe and healthy work in such environments.

The primary health and safety risks include use of heavy machinery, proximity to open water and possible presence of contamination within the water.

For all machine works, standard best practice will be employed to ensure public and employee/contractor safety on the site.

In most working areas the water depth is not sufficient to warrant the necessity of life jackets, however for safety reasons they are recommended while working adjacent to any waterbody. For safety reasons there will be at least two people present at all times when personnel are planting in water over 600mm deep.

A typical planting day will consist of the following:

- Unloading of plants into the wetland area to be planted.

- Planting with spades into the ground,

- Removing boxes and tools and tidying site where necessary.

High visibility jackets and hard hats will be worn while on site. Life vests will be worn when working adjacent to deep and/or swift flowing water. All site personnel will be given a safety induction prior to any work commencing on site.

The site will be kept in a tidy manner during the day and will be left as it was found, with the exception of plant introduction and possible water level changes.

Conclusion

As can be seen from this report, there are plenty areas where projects can be initiated within the Tullamore River as it flows through the town. The proposals are predominantly low-cost, low-tech solutions that rely on natural watercourse dynamics and the interaction with natural wetland plant growth to be effective.

The measures set out in this report help to meet a number of different needs within the catchment of the Tullamore River. These can be summarised as follows:

1. Water quality will be improved. Wetland habitats have evolved alongside rivers. The plants slow the flow of water and thrive on the deposited silt carried from further up the catchment. In this way the water is filtered and cleaned as it moves through wetland habitats. The larger the wetland area the better, in relation to the size of the watercourse. The Tullamore River has a large overall catchment size relative to the size available for wetland habitat creation within the town, but nonetheless it will help to create net beneficial impacts rather than net deterioration as the river flows through this urban area. The presence of paved surfaces, occasional grey water connections from washing machines and dish washers, and possibly even sewer pipe connections all take their toll on urban water quality, so the more wetland filters there are throughout the town the better.
2. The introduction of native riparian and marsh habitats within the existing channel of the river, streams or tributary drains helps to support and encourage a whole host of wetland flora. Not only the tall showy species that are used for filtering water, but the smaller, less conspicuous ones as well. The tall species include bulrush (*Typha latifolia*), yellow flag (*Iris pseudacorus*) and branched burr reed (*Sparganium erectum*). Smaller, lower growing species include the likes of watercress (*Rorippa nasturtium-aquaticum*), brooklime (*Veronica beccabunga*) and water mint (*Mentha aquatica*).
3. The introduction of riparian wetland and marsh habitats also encourages a whole host of wetland fauna. Birdlife such as waders, warblers, duck species and many others rely on wetland habitats for their survival, and are often the first species to move into newly created wetland projects such as the ones outlined here.

Nationally our insect species numbers have plummeted, by as much as 75% in recent decades. The seriousness of this catastrophic loss of insect numbers forms part of the basis for our current national Climate and Biodiversity Emergency. Without insects, a whole host of other species up along the food chain will also die out. Thus wetland projects such as the ones outlined here provide invaluable opportunity for a range of wetland insects to thrive. Species such as damselflies, dragonflies, butterflies, hoverflies and more, will all thrive within the range of flora that grow in wetland habitats. Already there are

otters on the river within Tullamore town, which is something to be celebrated. The expansion of habitat areas will also provide valuable space for frogs, newts and improve the river for fish.

4. From a climate change perspective, the introduction of wetland habitats can be of great benefit as a carbon sequestration measure. As the wetland plants grow and then die down into the water each year they build up a peat layer which is essentially sequestered atmospheric carbon dioxide. This locks up carbon for as long as those sediments remain intact, keeping it fixed in the ground and out of the air. The Drawdown Project³ lists protection of peatlands as the 13th most significant thing that can be done to reverse climate breakdown. Protection of coastal wetlands is listed as number 52.

The Offaly Adapts report, *Offaly Climate Change Adaptation Strategy*⁴ sets out specific “high level goals” for climate adaptation. Of these, carbon sequestration is specifically identified, as follows “Research and identify areas considered beneficial for use as local carbon offset through carbon sequestration and support green infrastructure. (Section 5.1.4). Thus the proposed measures can help to play a valuable part in helping Offaly ameliorate climate breakdown in a constructive way. Water quality and biodiversity are listed in the report as impacts of climate breakdown, both of which are addressed by the measures outlined in this report.

5. Finally from an amenity perspective, wetland habitats have the potential not only to be beautiful places in their own right, but to attract wildlife that adds interest and beauty to any walk. Some of the measures provide specific amenity benefits in and of themselves, helping to facilitate direct enjoyment of the river as it flows through the town, whereas others contribute to the overall improvement in water quality that then helps to enhance any contact with the river downstream of the point of filtration.

We all enjoy having some wild space in which to relax and to appreciate nature. The river is already enjoyed by walkers and canoers, and the proposed measures will all help to enhance such enjoyment and make the centre of Tullamore a more pleasant place to be.

Overall, the measures proposed here will contribute to supporting local biodiversity, water quality, climate measures and the enjoyment of the river by people in the area and can help Tullamore to be a more attractive town, meeting its obligations under our national climate and biodiversity emergency and international obligations.

3 Hawken P (2017) *Drawdown: the most comprehensive plan ever to reverse global warming*. Penguin Books, London, UK. <https://www.drawdown.org/solutions/land-use/peatlands>

4 OCC (2019) *Offaly Adapts: Offaly County Council – Offaly Climate Change Adaptation Strategy – September 2019*. OCC, Tullamore.



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