

<b>Project Name:</b>	<b>Hydro Mills Project – Tiverton Weir</b>		
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## Business Case

### Background

The Hydro Mills Project has been developing since the end of 2015, and has been supported along the way by our own members, Neil Parish MP, Western Power Distribution, South West Water, the University of Exeter, numerous riparian owners, the National Trust, and others. The project has also engaged with key organisations including Tiverton Town Council, the local angler's association and rivers trust, and the Environment Agency (EA), along with local hydro-electric specialist company, Hydromatch Ltd. It has also been presented at Westminster to the then Energy Minister, Jesse Norman MP.

The wider Hydro Mills Project is being led by a group of riparian owners who have registered a business named the Hydro Mills Group. They aim to draw down funding from Government and other sources to develop hydro generation schemes at a number of locations across Mid Devon. They have been involved in joint funding bids with Mid Devon District Council to bring pilot schemes forward that would demonstrate the viability of a number of types of hydro generation on UK river networks. However, bids to date have been unsuccessful, in large part because hydro generation's benefits need to be considered over longer timescales than most funding streams measure.

The project aligns with the Low Carbon theme within the Mid Devon Economic Strategy, which explicitly mentions supporting hydro-generation projects.

This proposal is for Mid Devon District Council to lead on the development of a hydroelectric generation scheme at Tiverton Weir, adjacent to Rotary Way on the River Exe. The GED team has already commissioned viability work (using a local specialist company called Hydromatch Ltd) and work towards obtaining the Environment Agency permissions required to be able to take a scheme forward. Work is currently being undertaken to support a planning application for the project.

The full feasibility study has demonstrated that a scheme should be financially viable and that the preferred option, a twin Archimedes screw, would be expected to deliver a return on investment of 6.24% after maintenance and other costs are taken into account. Given the potential lifespan of a well maintained hydro system to be over 50 years (and this can be upgraded / have components replaced as required to increase longevity), this would mean a long term financial benefit to the local authority.

The project fits with the economic strategy priorities of supporting low carbon projects which will have knock-on economic benefits, making use of natural capital, and embracing the adoption of renewable technologies. It will create direct opportunities within a key sector identified as a priority. The project will also tie in with the priority of helping to make the Council more financially sustainable, and is the only major infrastructure project the Council is delivering to address the climate emergency declaration it has signed up to.

With regards to the corporate plan, the project will contribute towards a number of objectives within both the economy and environment themes:

Bringing new businesses to the town

The opportunity to work with hydro schemes enables us to market ourselves to businesses operating in the low carbon sector, riparian ecology sector, and others. The site could create

further business opportunities by allowing companies to use river monitoring equipment from the structure, granting access to our fish pools and any river data the scheme can provide.

#### Improving and regenerating our town centres

The scheme will put a focus upon the river running through the heart of Tiverton. The town has always turned its back on the river due to flooding issues, but this will create a strong focal point, and help to attract more people to Rotary Way. This also opens up the potential to have more activities taking place for Tiverton along Rotary Way, such as temporary market stalls.

#### Growing the tourism sector

There is a strong market for eco-tourism, and the scheme will create the perfect opportunity to bring these tourists to the town. It will also provide an educational facility that could be visited by schools and other parties to learn more about the Town's heritage and historic relationship with the river. This would only serve to enhance Tiverton's reputation, particularly in the minds of young people.

#### Reducing our carbon footprint

This project would effectively make Mid Devon District Council the first Council offices in the UK (though not the first public sector building) to be powered entirely through locally generated renewable energy. The sale of any additional energy to other sites, such as Premier Inn, could be used to offset part of the carbon footprint of our waste and recycling centre, moving us towards becoming the first zero carbon local authority in the UK.

#### Protecting the natural environment

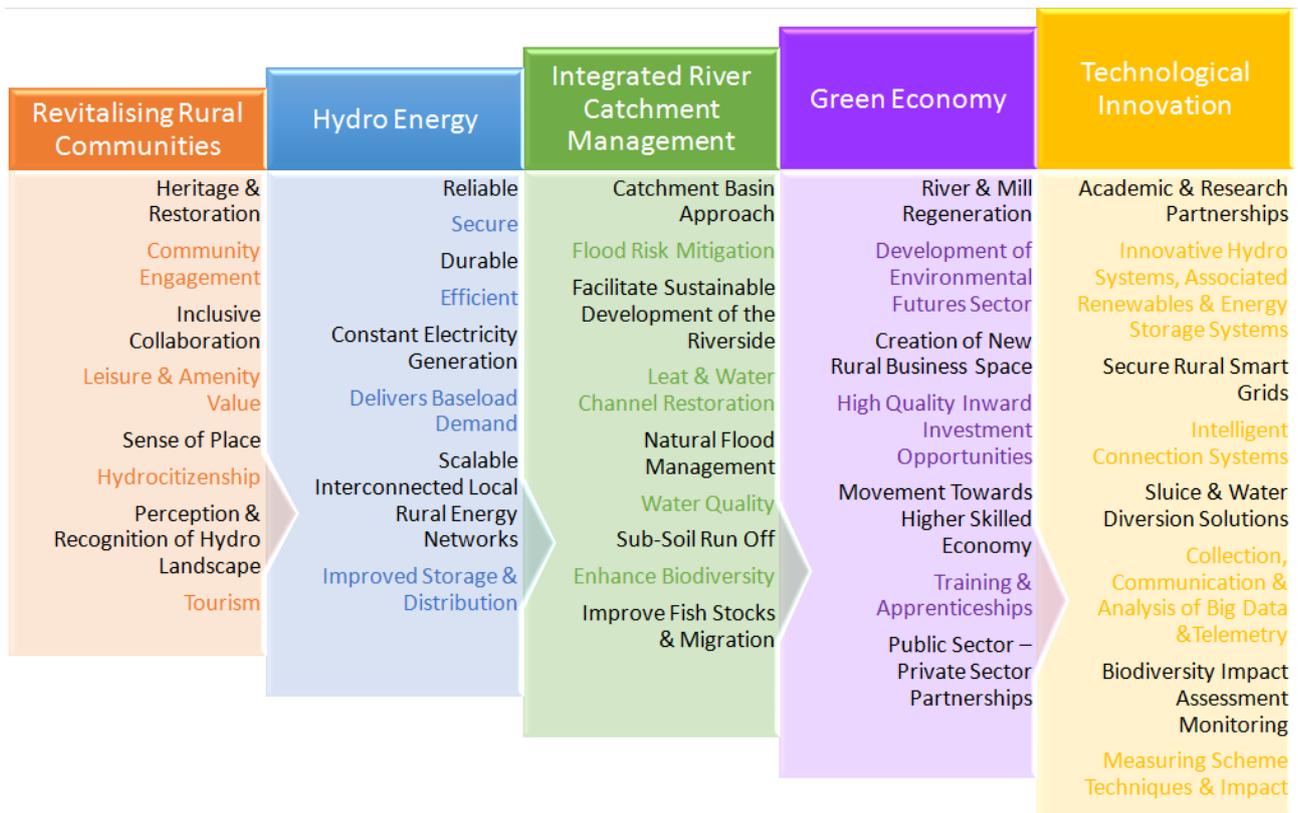
The project will greatly enhance the existing fish pass on Tiverton weir and will create a number of ecological improvements as part of its development. It will also create opportunities to trial schemes to enable species of invertebrates to be reintroduced to the river, helping to sustain fish and other elements of the river ecosystem.

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## **Benefits**

The project will generate a saving in energy to the local authority, which currently spends just under £50,000 on energy per annum. The hydro generation scheme could provide as much as £63,000 worth of electricity per annum, and most of this could offset the energy bill at Phoenix House and would be complimentary to our existing solar PV array. We would still need to keep our grid connection because there will be times when neither system is providing enough to fully cover the energy use of the building, but it is highly likely that we would have a negligible grid requirement. Given the upward trajectory of fuel prices, it is highly likely that over time the financial value of this saving would increase. We can also explore the opportunity to supply energy to other sites or to put other community focused measures in place which could use excess energy generated through the hydro scheme.

If Mid Devon District Council were to take forward a scheme at Tiverton Weir, it could act as a catalyst for drawing down funding to bring forward further schemes, and would help to deliver a range of other benefits and opportunities as part of a wider project:



The scheme could also consider the installation of lighting along Rotary Way (the riverside), which is currently unlit and is a potential health and safety hazard for pedestrians. It would be sensible to explore this opportunity to be implemented when work started on the scheme, as the electricity line from the scheme to Phoenix House could also serve the purpose of being utilised to connect lighting units to the system.

The project is going to deliver a hydroelectric generation system, a capital asset for the local authority which will generate approximately 536,000kWh per annum.

The housing unit for the electronics is being designed so that it can be used for visitors to learn about the system and the town's historic links with the River Exe.

It will also deliver improved fish passage and other general ecological improvements at Tiverton Weir.

Tangible benefits will be the value of the capital asset, and the energy savings to Phoenix House and potential income generated through any sale of excess energy through a PPA.

## Options

What other approaches have been considered and why have they been rejected?

Several options have been explored, both in terms of designs for the scheme and for financing the project. With regards to financing there are a number of options which have already been explored:

Funding Options	
ERDF Bid	A bid was made to the Low Carbon priority axis of ERDF in the summer of 2017. However, this bid was unsuccessful.
Heritage Lottery	An expression of interest was submitted to Heritage Lottery in autumn of 2018. This bid covered all 3 sites

	being looked at across Tiverton, and the feedback was that Thorverton is the only site which is eligible for the scheme.
MDDC to fund – Chosen Option	Though it is still possible to bid to other funds to support at Tiverton weir, it needs to be recognised that in the current funding environment the bulk of the funding will need to be made by MDDC. This would be a viable investment for the local authority, providing an ROI of approximately 6.24%

Through the development of the EA permissions application, and direct feedback from the EA, a variety of generator types were considered:

<b>Type of generator</b>	
Double Headed Kaplan	This option would have been the most innovative option, but could have caused other issues with the river and the weir as more information was gathered about the site. The amount of screening required became a prohibitive factor.
Twin Archimedes Screw – 100kW	This would be a smaller system, having less of a visual impact on the weir. However, this would generate less energy, and wouldn't have achieved the wider aim of taking the Council "off grid." Also, the payback period is worse for this scheme than for a larger turbine.
Twin Archimedes Screw – 150kW – Chosen Option	It was felt that this would be the best option, as it would generate enough energy to make the Council effectively "off grid" and it gives a reasonably good ROI despite the drop off of feed in tariffs.

A further consideration to the project is where to connect the hydroelectric generator and as a result, who would benefit from the generated energy:

<b>Energy Uses</b>	
Feed straight back into the grid	This option could have been the most simple to implement, but the feed in tariffs were stopped in March 2019, making it unviable to take a project forward without an end user in place.
3 Rivers Development Behind the Town Hall	There would be a number of complications in trying to link the project to a residential development, and it is likely that there would need to be energy storage options combined with the scheme in order to provide the capability of distributing the energy effectively. This could have added hundreds of thousands of pounds to the project, making it less viable.
Phoenix House – Preferred Option	This option would allow MDDC to make the claim that it has taken its main offices "off grid" (although a grid connection would stay in place for energy security reasons). There is a cost involved in getting the energy to Phoenix House, but this has already been factored into the project costs.

Consideration has also been given to the type of structure which will sit over the turbines to house the electronic equipment:

<b>Accompanying Structure</b>	
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Box Structure	This would be the most cost effective option, providing just the necessary housing for the electronics systems which sit behind the turbine. However, this option would bring no further benefits to Tiverton, and would not enable the public to properly see what has been installed and how it works.
Educational space with public viewing access to fish pass, turbines – Preferred Option	This would be a more complex structure than a simple box, and would need to be designed specifically to withstand flooding issues, as it would sit beneath the flood walls upon the river. It would provide public access to the site so that people could enter the facility and see the turbines in action and any creatures making use of the fish pass. They would also be able to learn about the River Exe ecology and the town's historic relationship with the river. The cost would be significantly increased, but it may be possible to attract funding to support the construction of the facility.

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## Risks & Mitigation

### Lease Arrangements

Although initial conversations with the EA (owners of the 3 land titles relating to this project) suggest that we would be able to get access to the site, either through a lease agreement or purchase of the riparian title deeds, it is possible that the EA could look to charge significantly more than we are expecting. It has been suggested that if MDDC took on the role of maintaining the weir (costs have been factored in to the ongoing maintenance costs of the project) that we could purchase the titles for a negligible fee.

### High Flood Waters

There is a slight risk of the structure being damaged at times of particularly high water. However, the structure and the generators are being designed in a way that they will be protected from debris, and will have an emergency shutdown (automated) so that damage to the electronics does not occur.

### Missed Opportunity

If the council doesn't take the project forward, it will be missing the opportunity to take a visible, leading role in developing renewable energy infrastructure. The development of this project will provide a strong USP for Mid Devon which will be based on evidence rather than ambition. Not taking the project forward would remove a great ability to market ourselves to the low carbon economy based on our own green credentials.

### EA Permissions Refusal

There is a risk that the project will be granted permission by the EA with a lower extraction license than we desire (We are aiming for a 150kW system, and the EA might grant us permission for a smaller scheme). This risk is mitigated as far as possible by our feasibility including the calculations for smaller schemes - a 100kW system and a 66kW system. As discussed above, these would provide fewer benefits than the larger scheme, but would nonetheless have a positive impact on the district and a good return on investment. If the EA were to refuse to grant permission for any scheme, this could prevent the project from moving any further forward, effectively ending the project, but the pre-app discussions suggested that this outcome is highly unlikely.

### Accuracy of Figures

The figures provided have been compiled by an expert consultant who has designed schemes which have been successfully delivered all across the UK. Hydromatch Ltd have made alterations to the schemes and re-analysed figures based on discussions with the EA to make them as accurate as possible. While they are subject to change as the scheme develops and through the tendering

process, there is a 10% contingency included within the cost, allowing for flexibility in the costing. Hydromatch Ltd are confident with these figures based on previous experience of implementing their designs.

#### Lower Energy Output

If the scheme is taken forward and installed, there will be times when the energy output is lower than capacity, due to changes in flow and water levels on the Exe. However, the proposals have been designed based on their average outputs throughout an “average year,” and to optimise the potential to generate throughout the year. Furthermore, the times when you would expect water flow to be at their lowest are also the times when you would expect the Council solar installation to be at its highest output and vice versa.

#### Insurance

Our legal services team have asked a question about the types of insurance that would be required for the scheme, and we are currently receiving expert advice from a specialist insurance company on exactly what would be needed and how much it would cost per annum. A concern was raised by legal services regarding the risk of people jumping off the unit housing the electronics of the system, but the insurance company advised that it would be treated just like any other building if someone chose to climb up it and jump off, but that we could put signs on the unit advising people not to do so.

#### Planning - Local Opposition

It is unlikely that the scheme will face significant local opposition. The key organisations which could rally support against the project are the Westcountry Rivers Trust and the Anglers Association. Both of these groups have been involved in the development of the project and have shown signs of supporting the project based on the enhanced fish pass proposal and the benefits this will bring to the local ecology.

#### Procurement Process

It is possible that no businesses would be interested in delivering the project or that businesses tender with different price expectations. However, the costing figures have been developed by Hydromatch Ltd who are experts in hydro scheme design, and have a wealth of experience in costing such projects.

#### Ongoing Costs

The project will have ongoing maintenance costs once it has been installed. These have been estimated by Hydromatch Ltd in their costing for each of the different options, based on schemes which have been delivered previously. For the desired project, the maintenance costs are likely to be around £5,300 per annum, which is calculated with a reasonable degree of accuracy, but may vary slightly as the project develops.

#### Timescales

Delays to decision making at any phase of the project could cause a delay to all of the follow-on activities. It is important to recognise that the EA applications are live at the time of writing this report, and that if they get approved, this will trigger a 12 month time period in which the project must be physically implemented (not completed, but started). Significant delays to the project could result in the implementation period starting beyond the deadline of the EA permissions.

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## **Timescales**

The proposed schedule is as follows:

Action	Estimated date
<b>Stage 1</b>	
LT Decision whether or not to include project on forward plan	February 2020
Seek cabinet approval to fund project subject to planning + EA outcomes	Aug/Sep 2020
<b>Stage 2</b>	
Planning application submission	Aug 2020
EA permissions result	Sep/Oct 2020
Development of tenders with procurement	Oct 2020
Planning application decision	Nov 2020
<b>Stage 3</b>	
Issuing of tenders	Dec 2020/Jan2021
Selection process (awarding of contract)	Feb 2021
Implementation	Mar 2021

At the end of each phase is a natural break in the project where it is expected that the project board would meet to approve moving the next phase.

## Resources Needed

### Cost

Project element	Cost
<b>Stage 1</b>	
Hydromatch Consultancy Work	
Phase 1 - Detailed feasibility	£5,000 completed
Phase 2 - Pre-App EA discussions & Supporting work	£5,400 completed
Phase 3 - Formal Application to EA	£6,200 completed
Planning application activities (architect drawings, noise survey and other related survey and design work)	£4,500
Purchase / Lease of titles for the weir	TBC - Formal ongoing
<b>Stage 2</b>	
Procurement & Related Activities (including legal)	Up to £2000 (mostly in staff time)
<b>Stage 3</b>	
Project Management	Assuming in kind, from within the assets team
Scheme Delivery	£797,000 (813,600 less the amount already paid to the consultants)
Includes:	
Civil Engineering works	
Manufacture of bespoke turbines	
Installation of turbines	
Configuration	

Construction of housing unit for electronics and visitors WPD connection to Phoenix House Fish Pass construction	
Ongoing site maintenance	£5,300 per annum (approx)

The lease / purchase costs of the titles for the weir are unlikely to be significant, as the land is owned by the EA, but is of little to no value to them. We will be aiming to obtain access to the land through a token purchase, but the LT will be updated when an actual figure is known.

Though the project would not require external funding to be financially viable, external funding could still be sought from places including Viridor, to support certain elements of the project such as the fish pass, and to create further enhancements to the ecological aspects of the river (such as weighted reed bed planting and other activities to the north of the scheme). GED would look to apply to Viridor for approximately £40,000 towards the cost of the fish pass.

It may also be possible to apply to lottery reaching communities funding to attract money towards the educational facility to sit above the turbines. This could mitigate some of the civil engineering costs and the construction costs allocated to the building. GED has put an expression of interest to the Reaching Communities fund with an initial ask for £160,000 towards the project.

## People

### Project Board

The project is now at the stage where it is recommended that a project board be created to oversee and coordinate the next stages. It is suggested that this consist of:

Portfolio Holder  
Representative of LT  
GED Group Manager

### Project Team

In addition the project will need the assistance of a range of skills from across the council. It is therefore recommended that a project team be put into place consisting of:

Legal  
Procurement  
Assets  
GED

It is difficult to determine the amount of time that would be required by members of the project team. We anticipate that there would need to be a meeting every few weeks to ensure that all elements of the project stay on track. Officers would also need to undertake individual tasks outside of these meetings to support the delivery of the project.

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## Key Stakeholders

### Internal and external stakeholders

The wider Hydro Mills Group had a partnership which met on a semi-regular basis. The partnership consisted of organisations including:

MDDC  
South West Water  
Western Power  
Anglers Association  
Riparian Owners

Other stakeholders may need to be brought in to the project as and when appropriate.

These organisations supported and guided the development of the 3 sites in the infancy of the project. Their help enabled Tiverton Weir to move from being a concept to a viable project.

To continue moving forward, Tiverton weir will need a much more focused group involving different sections of the local community. GED has already had conversations with a number of local groups, and will look to pull together a regular stakeholder meeting with:

Tiverton Town Council  
Local School Representatives  
Anglers Association  
Westcountry Rivers Trust  
MDDC  
Neighbourhood Plan Group  
Local Art Project Representatives

This group will help to ensure that the community is involved in shaping the project (less so with the physical element and more so with the contents of any structure and activities along the riverside), and that the learning element of the project is fit for purpose with the local community.

Potential partners

Hydromatch Ltd is the consultancy firm that GED have procured to develop the project with MDDC. They have a wealth of knowledge in delivering hydro projects across the UK, and are well connected in the industry to businesses with particular expertise in renewable project development, such as architects, ecological surveyors, and contacts with organisations like the Westcountry Rivers Trust.

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## **Case for Investment**

The project is a great investment opportunity for MDDC, and the proposed scheme would see a return on investment of approximately 6.24% per annum. The appended document, developed by Hydromatch Ltd shows the detailed breakdown of expected costs, energy generation capabilities and the ROI.

It should be recognised that the scheme will then continue to generate a saving, and possibly income, for the foreseeable future, which will only increase in value as time progresses and energy costs increase.

The scheme will make MDDC the first local authority in the UK to have its offices entirely powered by locally generated renewable energy. This will become a significant USP for MDDC, and has strong marketing potential, particularly to the low carbon sector which is emerging as a priority sector within the Economic Strategy. A significant driver behind the low carbon sector is working with other organisations who share the same ethos, and this would be a clear signal that MDDC is a local authority which takes the environment seriously.

The scheme will also be directly attractive to businesses operating in the low carbon economy and ecologically focused sectors, through the creation of research opportunities and demonstration of MDDC's willingness to support hydro delivery across the district.

The scheme also lends itself to attracting eco-tourism, and providing an educational facility for the town and visitors. It could also be used as a catalyst to install lighting along Rotary Way and to bring the riverside into use as a part of the town, creating further opportunities to attract visitors to Tiverton. Through the ecological improvements, fish stocks in the river should grow, creating opportunities to sustain and possibly grow the fishing tourism sector.

The groups we have been working with to develop the project (Angler's Association etc) should reduce any potential negative perceptions of the project, suggesting that the project will be widely supported by the local community.

Appendix 1. Tiverton Town Weir financial summary

	<b>Financial summary</b>	<b>100% site usage</b>
	<b>Installed system size and output</b>	Hydro Screw x 2
1	Design power (kW)	<b>66</b>
2	Estimated annual energy generation (kWh)	536,000
3	Maintenance downtime (1%) (kWh)	-5,360
4	Net generation (kWh)	<b>530,640</b>
5	<b>CAPEX Cost of scheme (ex VAT)</b>	<b>(See Appendix 3 for Breakdown) £813,694</b>
	<b>Additional CAPEX for screening</b>	£0
	<b>Additional CAPEX for MDDC connection</b>	£110,000
6	OPEX Annual operating costs (ex VAT)	£6,000
	<b>Value of energy generated</b>	
7	FIT rate (March 2020) / kWh	£0.0000
8	Export tariff (March 2020) / kWh	£0.0524
9	Assumed export	0%
10	Purchase tariff / kWh	£0.12
11	Income from FIT	£0
12	Income from Export	£0
13	Electricity saving	£63,677
14	Total value of electricity generated p.a.	<b>£63,677</b>
	<b>Payback and Annual Return</b>	
15	Simple payback ( years )	<b>16.02</b>
16	Annual return on investment	<b>6.24%</b>

Appendix 2. Summary of Civil Works

	<b>Civil works</b>	2 x Screw			
	<b>Town Weir</b>	Quan.	Unit	Rate (£)	(£)
	<b>Position</b>	RHS main weir			
1.0	<b>Access works</b>				<b>5,000</b>
2.0	<b>Temporary Works / Sheet piling</b>				
	Driving equipment hire			3,600	3,600
	Upstream shuttering	20	m	470	9,400
	Downstream shuttering	20	m	470	9,400
	Total				<b>22,400</b>
3.0	<b>Excavations / Silt removal</b>	384	m <sup>3</sup>	25	<b>9,600</b>
4.0	<b>Reinforced concrete and masonry</b>				
	Preliminaries				1,500
	Approach channel	11	m <sup>3</sup>	750	8,250
	Intake	20	m <sup>3</sup>	750	15,000
	Dividing walls / Turbine area	30	m <sup>3</sup>	750	22,500
	Tailrace channel	30	m <sup>3</sup>	750	22,500
	Total	91		720	<b>69,750</b>
5.0	<b>Building completion above Max flood level</b>				
	Side walls (215 blockwork)	80	m <sup>3</sup>	75	6,000
	Conc cover (Beam & Block)	50	m <sup>3</sup>	75	3,750
	Steelwork				10,000
	Roof				4,000
	External cladding				5,000
	Ancillaries				2,000
	Total				<b>30,750</b>
6.0	<b>New de-watering channel</b>	0	m <sup>3</sup>	750	<b>0</b>
7.0	<b>Penstock dewatering sluice</b>	0			<b>0</b>
8.0	Additional budget for fish passes 20.01.20				40,000
9.0	Additional costs for building and access 20.01.20				100,000
	<b>Totals</b>				<b>£277,500</b>

Appendix 3. Total Project Cost Breakdown



**Site Name : Town Weir, Tiverton**

Project Cost Schedule: Draft		HEP System Type:
21/01/2020		Twin Hydro Screw Dia. 3500 mm  Q: 12.2 m <sup>3</sup> /s P: 2 x 75 = 150 kW  Screw Turbines x 2 (£)
Item		
1	<b>Project Development</b> EA Pre-application Planning consultation Environmental Studies Design and drawings revisions Design and Access statement inc. FRA Planning consent application EA license application (abstraction, impoundment, FDC) Application fees OFGEM pre accreditation Topographical Survey Legal agreements regarding access	21,500
2	<b>Project Implementation</b> Construction drawings Pre-tender specification	6,000
3	<b>HEP system</b> Turbine, generator, drive, controls, ancillaries	268,443
4	<b>Intake screening</b>	6,500
5	<b>Project management</b> Project management, safety planning, administration	12,500
6	<b>Civil works and alterations (breakdown attached)</b>	277,500
7	<b>Fish Pass</b>	20,000
8	<b>HEP system transport and unloading</b>	19,000
9	<b>Grid connection upgrading</b>	68,500
10	<b>HEP installation and commissioning</b> Mechanical installation and assembly Electrical installation and assembly Operational tests Commissioning and accreditation	39,779
11	<b>Contingency (10% project costs)</b>	73,972
<b>Total (excluding VAT)</b>		<b>813,694</b>