

# Forgotten Landscapes Project

## Landscape Conservation Action Plan

### 5.9 Project: The Power of Water HP

#### 5.9.1 Introduction

This Project will help the Partnership address climate change through the generation of electricity from a renewable source. Awareness of its value will be promoted, to the local population and visitors, through interpretation, talks, site visits and presentations. Key target audiences will be the farming community, institutions and local businesses. These groups will be encouraged to install similar systems throughout the landscape area, further helping to offset the impacts of climate change.

The Project will also be used to explore the relationships between water's former role as a source of power for industrial processes and its potential role today as a source of renewable energy available to generate 'clean' electricity.

Water was a vital source of energy during the area's industrial period. To harness this resource, many water bodies (header ponds) were created and water was managed and channelled through the landscape by an extensive system of leats (small water channels). However, the use of water, in tandem with coal, had significant impacts on wildlife, landscape and atmospheric pollution levels

Awareness raising, interpretation and educational elements of this Project will be covered in Implementation Programme B.

Ultimately, as a significant element of FLP Scheme sustainability, the finances raised from the system will be used to maintain the work of the volunteer workforce based on a community enterprise model.

#### 5.9.2 Links with other Implementation Programmes

This Project links directly to all conservation Projects being delivered in Programme A and cross cuts with Programme B as it provides opportunities for education and community involvement.

#### 5.9.3 Purpose

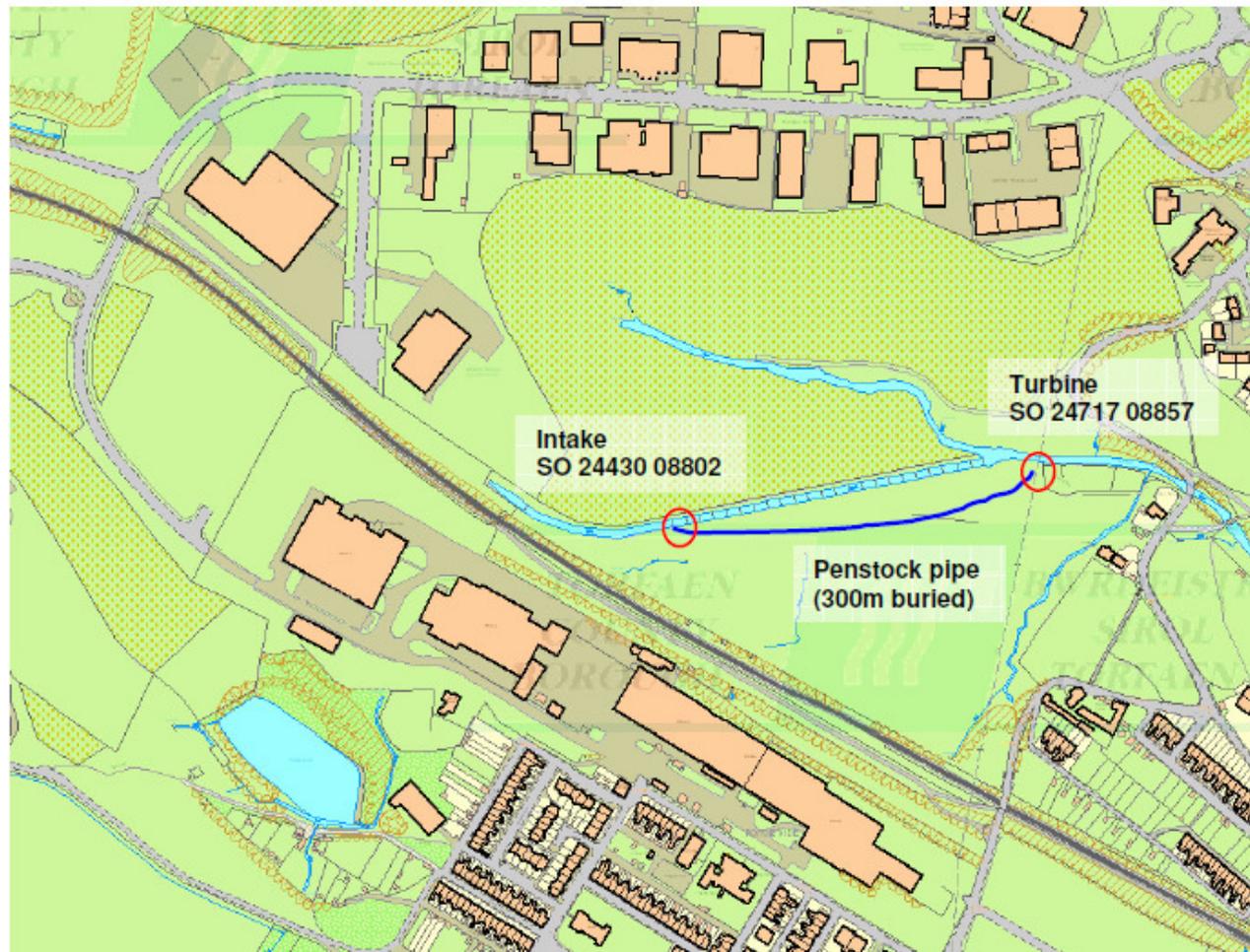
The Hydro system will reduce greenhouse gas emissions through the production of electricity from a renewable resource, but it will also do much more in its role as a focus for important interpretive messages relating to:

- The historic and contemporary role of water as a source of energy
- Modifications to the route of the Afon Lwywd following industrialisation
- The role of the adjacent reedbed which was created to 'clean up' outflows from the nearby Big Pit mine
- The role that individuals / community groups can play in helping counter climate change through the installation of micro hydro and related technologies

<b>Principal Aim</b>	Produce electricity from a renewable resource, sell the electricity and use the proceeds to help resource the FLP volunteer workforce
<b>Outcomes</b>	Electricity being sold and revenue earned
	Greenhouse gas emissions reduced
	Awareness of technology raised and local landowners encouraged to install micro hydro and related technologies
	Better understanding of the historic and contemporary role of water as a source of energy and changes its use caused in the historic landscape

## Scheme layout

The following map sections and photographs outline the proposed layout of the scheme.



# Forgotten Landscapes Project

## Landscape Conservation Action Plan

<b>Delivery Plan Title</b>	<b>Dragons Teeth Micro Hydro System HP 1</b>																																				
<b>Budget</b>	<p><b>£162,299 (Contingency 10%)</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 5%;"></th> <th style="width: 85%;">Item</th> <th style="width: 10%;">Ex VAT £</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">1</td> <td>Turbine and belt drive system</td> <td style="text-align: right;">38,000</td> </tr> <tr> <td style="text-align: center;">2</td> <td>Generator, control and grid connection system</td> <td style="text-align: right;">16,000</td> </tr> <tr> <td style="text-align: center;">3</td> <td>Intake</td> <td style="text-align: right;">9,500</td> </tr> <tr> <td style="text-align: center;">4</td> <td>Civil building works Intake Power house</td> <td style="text-align: right;">21,500</td> </tr> <tr> <td style="text-align: center;">5</td> <td>Penstock pipe (quote attached – Wolseley)</td> <td style="text-align: right;">11,300</td> </tr> <tr> <td style="text-align: center;">6</td> <td>Penstock pipe installation (quote attached)</td> <td style="text-align: right;">20,000</td> </tr> <tr> <td style="text-align: center;">7</td> <td>Grid connection (quote attached)</td> <td style="text-align: right;">27,000</td> </tr> <tr> <td style="text-align: center;">8</td> <td>Turbine generator installation including lifting hire</td> <td style="text-align: right;">10,000</td> </tr> <tr> <td style="text-align: center;">9</td> <td>Project management Supervision of civil works and pipe installation</td> <td style="text-align: right;">4,999</td> </tr> <tr> <td style="text-align: center;">10</td> <td>Commissioning G59/1 Commissioning including utility witness test fees Grid connection agreement and ROC / FiT registration Operator training and project documentation</td> <td style="text-align: right;">4,000</td> </tr> <tr> <td></td> <td><b>Project budget</b></td> <td style="text-align: right;"><b>162,299</b></td> </tr> </tbody> </table>		Item	Ex VAT £	1	Turbine and belt drive system	38,000	2	Generator, control and grid connection system	16,000	3	Intake	9,500	4	Civil building works Intake Power house	21,500	5	Penstock pipe (quote attached – Wolseley)	11,300	6	Penstock pipe installation (quote attached)	20,000	7	Grid connection (quote attached)	27,000	8	Turbine generator installation including lifting hire	10,000	9	Project management Supervision of civil works and pipe installation	4,999	10	Commissioning G59/1 Commissioning including utility witness test fees Grid connection agreement and ROC / FiT registration Operator training and project documentation	4,000		<b>Project budget</b>	<b>162,299</b>
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<b>Work undertaken</b>	Years 1, 2 and 3																																				
<b>Location</b>	<p>Map see previous page</p> <p>Grid ref: SO 24370 08850</p> <p>Ownership: Torfaen County Borough Council</p> <p>Designation: Privately owned agricultural land</p>																																				
<b>Description and current condition</b>	<p>A micro hydro electricity generating turbine system will be installed on the Afon Lwywd at a site known locally as the Dragon's Teeth. Here, the river emerges from a long culvert and runs into a series of concrete weirs, hence the site's name. A Feasibility Study has been performed and the site is highly suitable (see Blaenavon 'Dragons Teeth' Micro Hydro Feasibility and Outline Scheme Design, Pico Energy 2009 which accompanies this document). Not only are flow rates and water resources good, but the man made interventions to the course of the river over the last few decades means that biodiversity interest is very low.</p> <p>The site is currently in the ownership of Torfaen County Borough Council, and it has good visitor access as it is near a public footpath and community recreation area.</p>																																				

# Forgotten Landscapes Project Landscape Conservation Action Plan



Upstream view of the Dragon's Teeth river diversion

<p><b>Plan Description</b></p>	<p>This Plan will explore the relationships between water's former role as a source of power for industrial processes and its potential role today as a source of renewable energy available to generate 'clean' electricity.</p> <p>Through interpretation, talks, site visits and presentations, the local population will be made aware of the former role of water in an industrial context. Following the installation of the Micro Hydro scheme specific groups, especially the farming community, institutions and local businesses, will be invited to visit the site and be encouraged to consider using water as a means of generating electricity from a renewable source. Opportunities to develop 'community' Micro Hydro schemes will also be explored. Proceeds from electricity sales will be used to fund FLP Projects.</p>
<p><b>Aims</b></p>	<ol style="list-style-type: none"> <li>1. To offset climate change impacts</li> <li>2. To demonstrate a sustainable use of water in comparison with how it was used during the industrial period</li> <li>3. To generate income to help FLP Scheme sustainability</li> <li>4. To demonstrate the system to potential installers</li> </ol>
<p><b>Objectives</b></p>	<ol style="list-style-type: none"> <li>1. Proceeds of electricity sales are used for FLP Scheme sustainability</li> <li>2. Ensure the site is used for awareness raising</li> <li>3. Develop links with Sustainable Energy schemes, e.g. BBNPA Green Energy Programme, Farming Connect Climate Change Development Programme</li> </ol>

# Forgotten Landscapes Project

## Landscape Conservation Action Plan

<b>Detailed Proposals and Specification</b>	<p>To ensure system viability, a site survey and feasibility study was undertaken by Pico Energy Ltd to confirm the potential for electricity generation using micro hydropower at the river diversion known locally as the 'Dragons Teeth' in Blaenavon near Pontypool in South Wales. The scheme design shows that the Project is viable and would result in very worthwhile production of renewable energy.</p> <p><b>Hydropower resource</b> A rainfall catchment model has been used to estimate the mean flow available and likely range in the absence of long term gauged data from the site. A scheme layout which makes maximum use of the available head without excessive pipe length has been proposed</p> <p><b>Scheme outputs</b> The proposed scheme is expected to generate typically around 150,000 kWh per year given current flow estimates. This would provide sufficient electricity to meet the needs of around 35 average UK households and offset the production of 70 Tonnes of CO2 per year assuming this power was otherwise generated by burning fossil fuel. Assuming annual generation of 150,000 kWh, the value of this electricity should be <b>£25,500 per year</b> with the combined export tariff and feed-in-tariff of £0.17 per kWh currently proposed by the UK Government from April 2010.</p>		
<b>Monitoring and Evaluation Criteria</b>	<b>Outputs</b>	<b>Targets</b>	<b>Measure</b>
	Electricity generated	150,000 kWh pa	kWh
	Electricity sold	£25,500 pa	£ earned
	Awareness raising demonstration site	No. of visitors	Monitoring
	FLP volunteer work resourced in the long term	Unknown – see Project Sustainability below	
<b>Beneficiaries / Key audiences</b>	FL Partnership – volunteer workforce through income derived, Community Groups, educational groups, Heritage features, visiting public and Local community, especially landowners / farmers		
<b>Outcomes</b>	<ul style="list-style-type: none"> <li>• Electricity generated and revenue earned</li> <li>• FLP is benefiting from income</li> <li>• FLP volunteer workforce resourced to pursue heritage projects</li> <li>• More people aware of viability and costs of installing similar systems</li> <li>• Reduced climate change related impacts on Heritage features</li> <li>• Scheme becomes part of a regional network</li> <li>• Better understanding of the historic and contemporary role of water as a source of energy and changes its use caused in the historic landscape</li> <li>• Demonstration site used to encourage others to follow suit</li> </ul>		

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## Landscape Conservation Action Plan

<b>Integration</b>	<b>Links with other delivery plans</b>  <b>Conservation and Climate Change</b> <ul style="list-style-type: none"> <li>• Monitoring MON 1</li> <li>• Reedbed BIO 2</li> </ul> <b>Visitor Management and Interpretation</b> <ul style="list-style-type: none"> <li>• Interpretation – at the WHC IOS 2 and 3</li> <li>• Promoted short trail from Principal Gateways WHC and Big Pit VMA 1</li> </ul> <b>Community Engagement and Education and Training</b> <ul style="list-style-type: none"> <li>• School Explorer Programme SCED 1</li> <li>• Volunteer Programme – Friends Group VOL 1</li> </ul>		
<b>Key Stakeholders / Consultees</b>	TCBC – as landowner FLP volunteer workforce Blaenavon Town Council		
<b>Risk Appraisal</b>	Periods of excessive drought may lead to reduced water flow and affect electricity production  Vandalism of generator house (unlikely)		
<b>Implementation Programme (3 year timeframe)</b>	See Project Register - below		
<b>Finance Plan Yrs 1, 2 and 3</b>	<b>Yr 1 budget</b>	<b>Yr 2 budget</b>	<b>Yr 3 budget</b>
	£162,299		
<b>Total cash</b>	<b>£162,299</b>		
<b>Delivery Roles and Responsibilities</b>	FLP Scheme Manager working with Specialist contractor to install hydro system		
<b>Maintenance and Management Implications</b>	FLP Commons Officer / volunteers take regular electricity production readings and submit to purchasing Electricity Utilities Company  FLP Commons Officer / trained volunteers maintain water course  Volunteer input covered in VOL 1		
<b>Sustainability / Exit Strategy</b>	The Partnership will seek approval from the volunteer workforce that it should become constituted as a 'not for profit' business / Charitable Trust – Friends of Forgotten Landscapes.  Income generated will be used to resource ongoing volunteer effort		
<b>Recommendations for further work</b>	Link this scheme with others in the area to create a regional sustainable energy group that will be able to recruit an Officer to manage the various installations and provide secretariat for the various community groups / enterprises involved.  Liaise with BBNPA and Torfaen CBC Sustainability Officers to develop this.		

## HE 1 Micro Hydro Plan Register

Ref	Feature	Management Frequency	Months work can be carried out	Legislative constraints	Work undertaken by	Lead Partner	Supporting Orgs
HP 1	Hydro Project	Annually	Regular maintenance	Health and Safety	Commons Officer	FLP	Volunteers



Afon Lwywd - Location of Dragon's Teeth micro hydro system

### HE 1 Dragon's Teeth Work Programme Year 1 (2010 – 11)

	<b>Blaenavon micro hydro</b>											
	<b>Plan implementation</b>		<b>2010</b>									
	<b>Plan stage</b>	<b>Responsibility</b>	<b>Jan</b>	<b>Feb</b>	<b>Mar</b>	<b>Apr</b>	<b>May</b>	<b>Jun</b>	<b>Jul</b>	<b>Aug</b>	<b>Sep</b>	<b>Oct</b>
<b>1</b>	Confirm abstraction license conditions and design flow rates	PEL	XXXX	XXXX								
<b>2</b>	Review scheme design including powerhouse construction and appearance	FLP / PEL		XXXX	XXXX							
<b>3</b>	Bidder confirmation and contract tendering	FLP / PEL			XXXX	XXXX						
<b>4</b>	Contract awards	FLP					XXXX					
<b>5</b>	Orders placed for capital equipment with long lead times (turbine, generator, controls)	PEL					XXXX	XXXX	XXXX	XXXX	XXXX	
<b>6</b>	1st phase civil works (secure site, excavations for intake and powerhouse foundations)	Building Contractors						XXXX				
<b>7</b>	De-silting upstream of intake location	??						XXXX				
<b>8</b>	Construction of intake and powerhouse foundations	Building Contractors							XXXX			

	Plan stage	Responsibility	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
9	Pipe purchase and delivery								XXXX			
10	Construction of powerhouse	Building Contractors								XXXX	XXXX	
11	Penstock pipe and control cable installation	Pipeline contractors								XXXX	XXXX	
12	Grid connection	Western Power Distribution							XXXX	XXXX	XXXX	
13	Turbine and generator installation	PEL										XXXX
14	Commissioning and handover	PEL								XXXX		
15	Payment stages						A		B			C
16	Establishing arrangements with Power C's to buy electricity	PEL / FLP Staff										

Payment stage	£	Items
A	27,000	Deposit with equipment supply order (50%)
B	23,300	Pipeline / intake materials purchase + 50% project management fee
C	95,500	Payment to civil engineers / building contractors, balance payment to equipment suppliers, Grid connection
D	16,500	Turbine generator installation and commissioning + 50% project management fee
<b>total</b>	<b>162,300</b>	

### HE 1 Dragon's Teeth Work Programme Year 2 (2011 – 12)

Date	Task
January/ February 2011	Commons Officer annual maintenance  Inspect system and maintain a clear water course  Prepare report for funders FLP Scheme Manager
March 2011	Organise programme of site visits, presentations and awareness raising events. 3 per year  FLP Education and Interpretation Officer
April 2011	Site visit 1
May 2011	Site visit 2
June 2011	Site visit 3
July 2011	Establish FLP volunteer workforce as a not for profit company or charitable trust  Commons Officer to liaise with TCBC Legal team on process
General 2011 - 2012	Submit electricity generation data to purchasing electricity company as required

### HE 1 Dragon's Teeth Work Programme Year 3 (2012 – 13)

Date	Task
January/ February 2012	Commons Officer annual maintenance Inspect system and maintain a clear water course
March 2012	Organise programme of site visits, presentations and awareness raising events. 3 per year FLP Education and Interpretation Officer
April 2012	Site visit 1
May 2012	Site visit 2
June 2012	Site visit 3
Nov 2012	Prepare final report for funders FLP Scheme Manager
General 2011 - 2012	Submit electricity generation data to purchasing electricity company as required