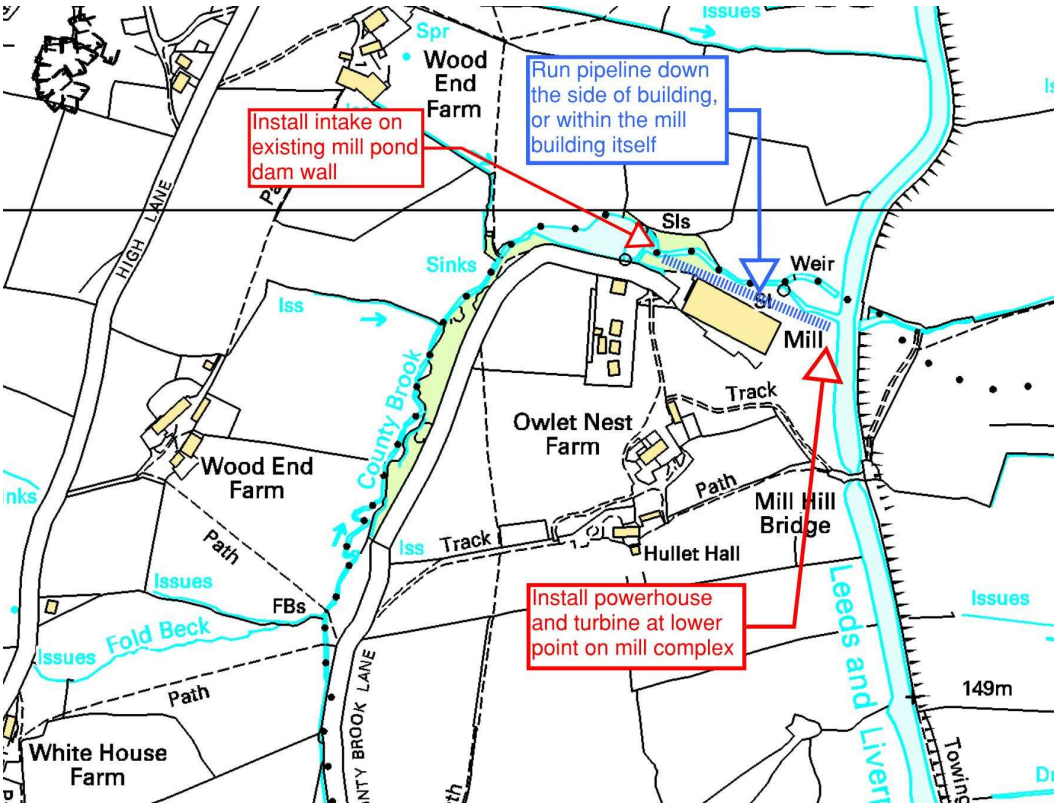
Site 29: County Brook Mill, Foulridge

Site Assessment

Figure 1 Map showing general layout



County Brook Mill (originally Hey Mill) was built as a water-powered textile mill in the late 18th century. The mill has an internal end waterwheel chamber fed from two mill dams. The mill buildings are in good condition and are occupied.

Figure 2 Looking along the weir with the outlet at the far end

Figure 3 The outlet from the pond

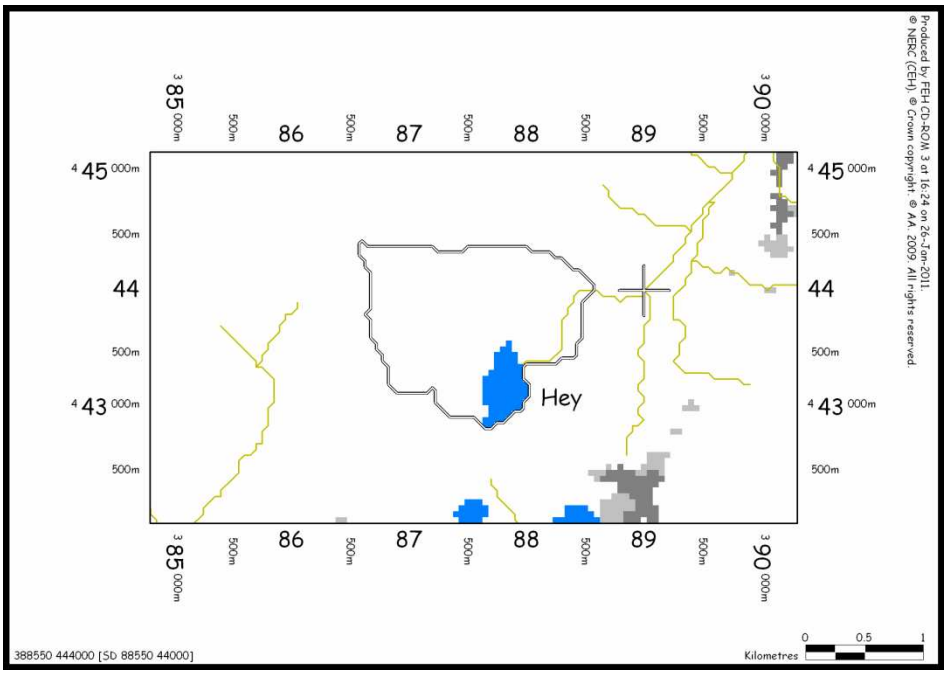
Figure 4 Looking along the leat or pipe route

Figure 5 A possible powerhouse building

It is proposed that an intake is constructed at the existing mill pond dam, and a pipe brought down to below the main mill building. The pipe could be buried alongside the building, and run to a buried powerhouse by the beck, or potentially brought through the building itself down to a small shed (Figure 5) as the powerhouse.

Catchment Analysis

Figure 6 Catchment boundary defined by Flood Estimation Handbook Software



The Flood Estimation Handbook software is used to determine the following catchment descriptors, for the proposed intake location, selected during the site visit.

Intake Grid Reference	388580, 444000
Powerhouse Grid Reference	388680, 444000
Catchment Area	2.2 km^2
Annual Rainfall	1295 mm

Annual Flow Statistics

Low Flows software is used to produce a Flow Duration Curve (FDC), which demonstrates how the river flow varies throughout the year. It presents the percentage time of the year each flow rate is exceeded. A particular notation is used to refer to FDC flow rates; e.g. 'Q_{95}' refers to the flow rate which is exceeded 95% of the year.

Table 1 Mean flow rate and flow rate at Q_{95}

Period	Mean Flow Rate [m^3/s]	Flow Rate at Q_{95} [m^3/s]
Annual	0.0593	0.00557
January	0.0966	0.0149
February	0.0735	0.0122
March	0.0766	0.0125
April	0.0507	0.00938
May	0.0345	0.00619
June	0.0215	0.00422
July	0.0265	0.00455
August	0.0392	0.00346
September	0.043	0.00411
October	0.066	0.0066
November	0.0843	0.0105
December	0.0994	0.015

Table 2 Annual flow duration data

Exceedance Probability	Flow Rate [m^3/s]
5	0.218
10	0.143
20	0.084
30	0.055
40	0.038
50	0.028
60	0.02
70	0.015
80	0.011
90	0.007
95	0.006
99	0.004

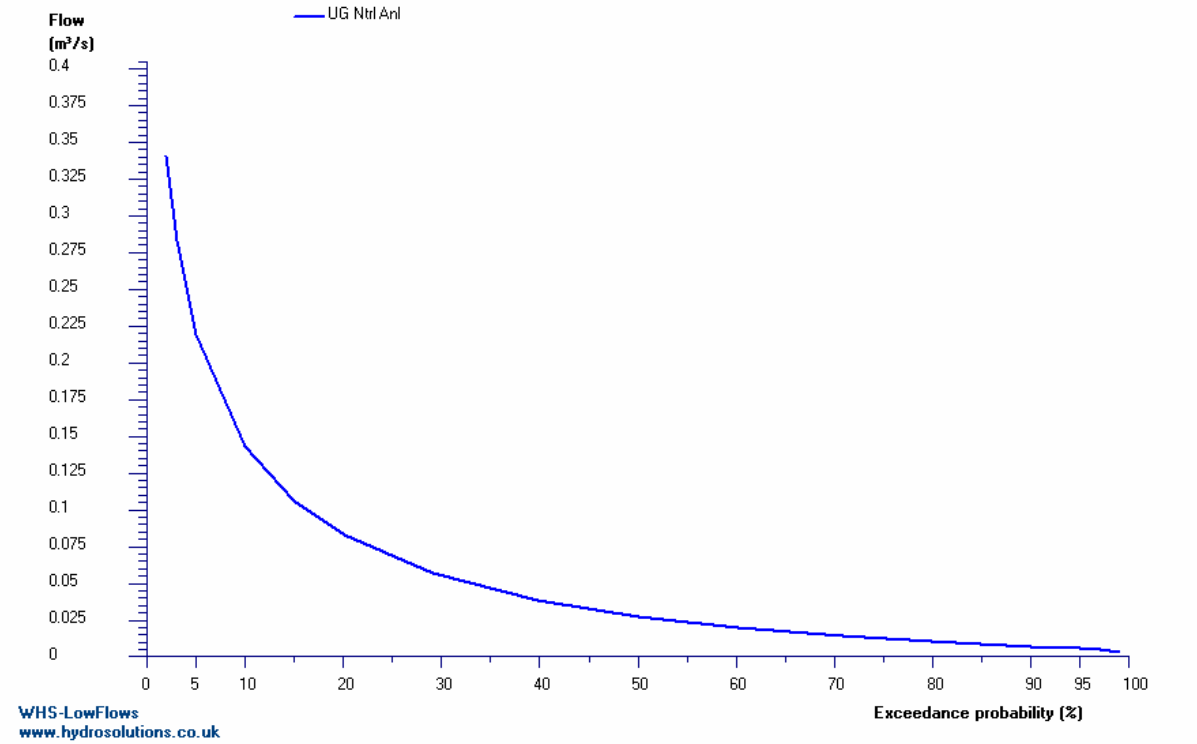


Figure 7 Annual flow duration curve produced using low flows software

It is recommended that should this be further investigated, and flow monitoring equipment be installed at the earliest opportunity, as the flow from the reservoir may be controlled (i.e. this may not be a natural catchment).

Hydropower Analysis

Site: County Brook Mill
Run Date / Time: 12 January 2011 at 14:32

Mean Flow: 0.050 m3/s
Provisional Rated Flow: 0.056 m3/s
Residual Flow: 0.006 m3/s

Rated Flow: 0.050 m3/s
Gross Hydraulic Head: 10.00 m
Nett Hydraulic Head: 9.50 m

Applicable Turbines	Gross Annual Average Output	Nett Annual Average Output	Maximum Power Output	Rated Capacity	Minimum Operational Flow
Crossflow	14.1	14.0	3.7	3.5	0.014
	MWh	MWh	kW	kW	m3/s

Table 3 Hydropower Analysis

Gross Head [m]	10
Net Head [m]	9.5
Design Flow [m³/s]	0.05 m³/s
Rated Capacity [kW]	3.5 kW
Average Annual Energy Output [MWh]	14MWh
Average annual Carbon Dioxide offset	32.2 tonnes

Impact Assessment

County Brook Mill is not within the Forest of Bowland AONB. It has a Lancashire Landscape Character Assessments of Moorland Fringe and the downstream land towards the canal is classified as Drumlin Fields. Developing a scheme here has obvious historical benefits. It is not thought that a fish pass will be required at this site due to the existing dam barrier on the mill pond.

Statutory Requirements

It will be necessary to apply to the Environment Agency for an abstraction licence, and planning permission will be required to install a pipeline and a powerhouse. The mill building is on the Historic Environment Record so any alterations to the building may require consultation with the county archaeologist. An ecologist will be able to advise on the extent of environmental investigation required.

Budget Development Cost

The total budget cost for the whole scheme is **£184,400**. It should be noted that the civil works costs can vary considerably as material costs fluctuate. Likewise, mechanical and electrical (M&E) equipment costs vary in accordance with demand. Professional fees should be considered subject to change, as the scope of licensing and planning requirements are not yet defined. Consequently the budget estimate at this stage should be considered accurate to plus or minus 20%.

Revenue and Simple Payback period

Energy produced by a scheme here would be consumed by the mill itself, and it is unlikely that a grid connection is required

Under the current government feed-in tariff regulations, hydropower schemes receive a generation tariff according to their rated capacity. Schemes less than 15kW receive 19.9p/kWh. This generation tariff is received regardless of how the electricity is used. The owner has indicated that the electricity would be used on site, thereby offsetting import costs. This increases the value of the generated electricity by the import tariff, which we have assumed is 5p/kWh.

In conclusion, the total value of the generated electricity would be 24.9p/kWh, giving an average annual value of approximately **£3200.** The simple payback period for this scheme is **58 years**.

Conclusion

There are obvious historical benefits to reinstating a hydro scheme at this mill. However, the payback time would suggest that this scheme is not economically viable.

Further Information

This site report is produced by Inter Hydro Technology on behalf of Forest of Bowland AONB, and funded by a partnership including Lancashire County Council, Lancaster & District Local Strategic Partnership, Pendle Borough Council and Ribble Valley Local Strategic Partnership.

This site report should be read in conjunction with the rest of the Forest of Bowland AONB Hydro Feasibility Study which can be downloaded at http://www.forestofbowland.com/climatechange#hydro

Table 4 Development Budget Cost

Budget Scheme Cost Estimate
County Brook Mill

ITEM	UNIT	QUANTITY	MIN	MAX
Turbine				
Turbine Quotation	No	1	£30,000.00	£37,500.00
Grid Connection				
Grid Connection	No	1	£0.00	£0.00
Civils				
Concrete Works	m^3	4	£2,000.00	£2,500.00
Fish Pass	m^3	0	£0.00	£0.00
Metalwork	m	1	£2,000.00	£2,500.00
Fish Pass Length	m	0	£0.00	£0.00
Pipe Installation	m			
Rock	m	0	£0.00	£0.00
Gravels	m	0	£0.00	£0.00
Soft	m	200	£11,000.00	£13,750.00
Pipe Materials	No	1	£20,000.00	£25,000.00
Temporary Access	m			
Rock	m	0	£0.00	£0.00
Gravels	m	0	£0.00	£0.00
Soft	m	0	£0.00	£0.00
Temporary Access on Good Ground	m	0	£0.00	£0.00
Powerhouse				
Powerhouse	kW	3.5	£15,000.00	£18,750.00
Prelims				
Duration	Months	12	£36,000.00	£45,000.00
Sub Total				
Sub Total			£116,000.00	£145,000.00
Professional Fees				
Professional Fees			£17,400.00	£29,000.00
Sub Total				
Sub Total			£133,400.00	£174,000.00
Contingency				
Contingency			£26,680.00	£34,800.00
GRAND TOTAL			£160,080.00	£208,800.00