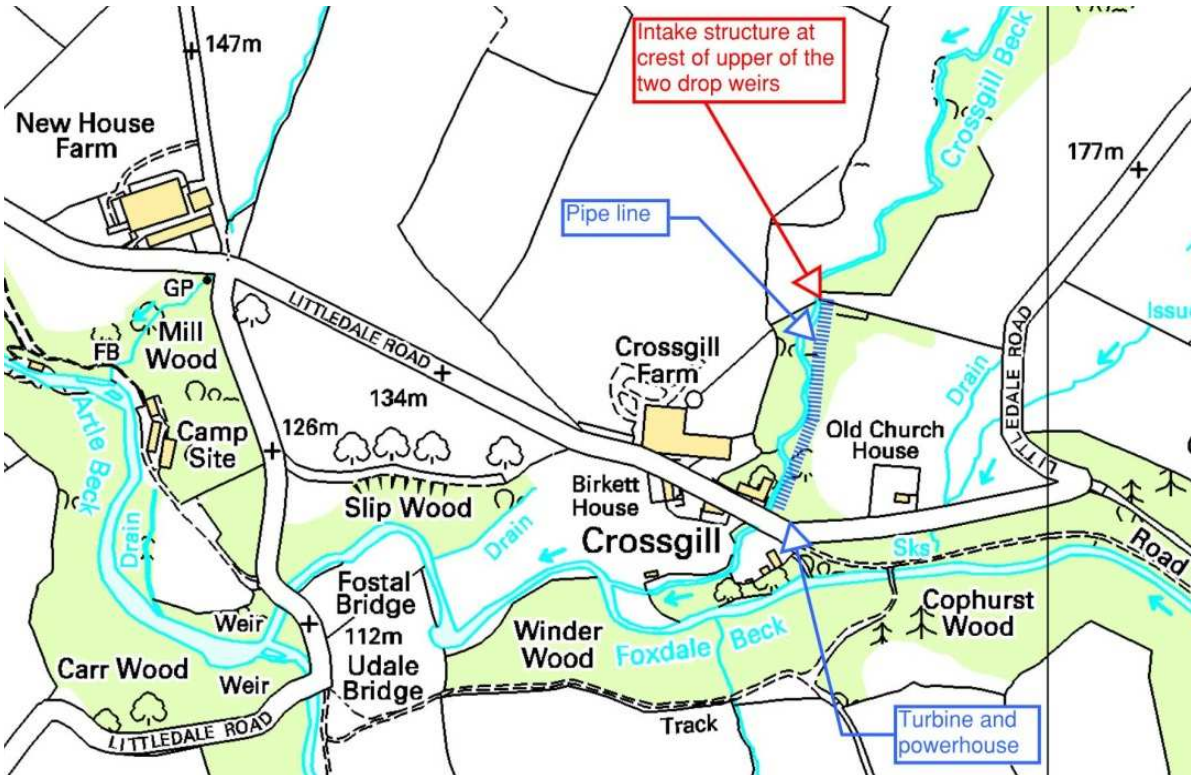
Site 35: Crossgill Village Weir

Site Assessment

Figure 1 Map showing general layout



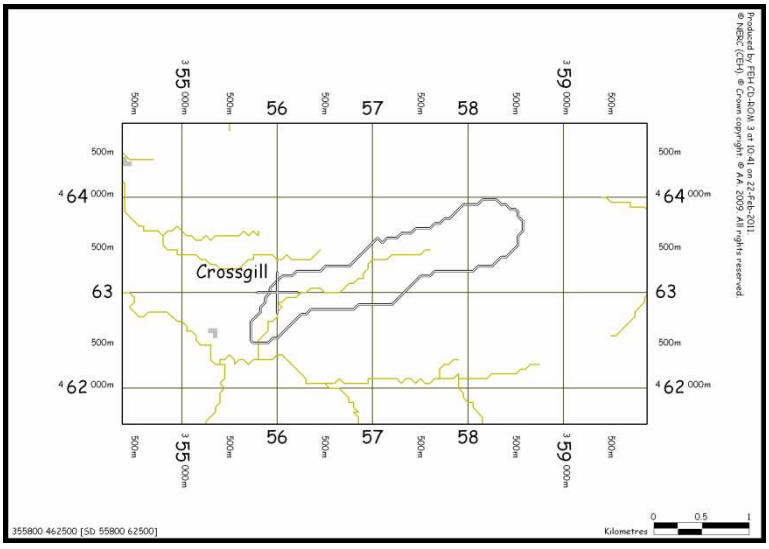
Site Assessment

Crossgill Beck is located immediately east of Crossgill Farm and discharges to Foxdale Beck. The Crossgill Beck channel is fairly steep and fast flowing and is within an incised valley. There is no evidence of historic hydropower at this site however; there is evidence that there is water abstraction taking place. Approximately 150 upstream of where the beck crosses Littledale Road there are two drop weirs, 10m apart, and immediately upstream of these a farm access track crosses the beck. The head loss between the upper weir and the beck as it crosses the road has been estimated as 3m. It would be possible, though access would be problematic, to construct an intake on the upper weir and lay a pipeline along the east side of the beck to Littedale Road where a turbine could be located. Flow would then be returned to the beck upstream of the bridge. It is unlikely that a grid connection could be made and any power generated would be best used in providing electricity to the adjacent Crossgill Farm and local properties on the south side of Littledale Road.

Figure 2 Weir constructed in channel

Catchment Analysis

Figure 3 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	355830, 462520
Powerhouse Grid Reference	355796, 462363
Catchment Area	1.53 km^2
Annual Rainfall	1367 mm

Site observations are that water abstraction takes place on this watercourse.

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 [m³/s]	Flow Rate at Q_{95} [m³/s]
Annual	0.0425	0.00411
January	0.0672	0.0103
February	0.051	0.00865
March	0.0545	0.00875
April	0.0367	0.00697
May	0.0239	0.00426
June	0.0161	0.0031
July	0.0186	0.0034
August	0.0296	0.00265
September	0.0321	0.00318
October	0.0479	0.00448
November	0.0608	0.00774
December	0.0716	0.0112

Table 2 Annual flow duration data

Exceedance Probability	Flow Rate [m³/s]
5	0.155
10	0.103
20	0.061
30	0.041
40	0.028
50	0.02
60	0.015
70	0.011
80	0.008
90	0.005
95	0.004
99	0.003

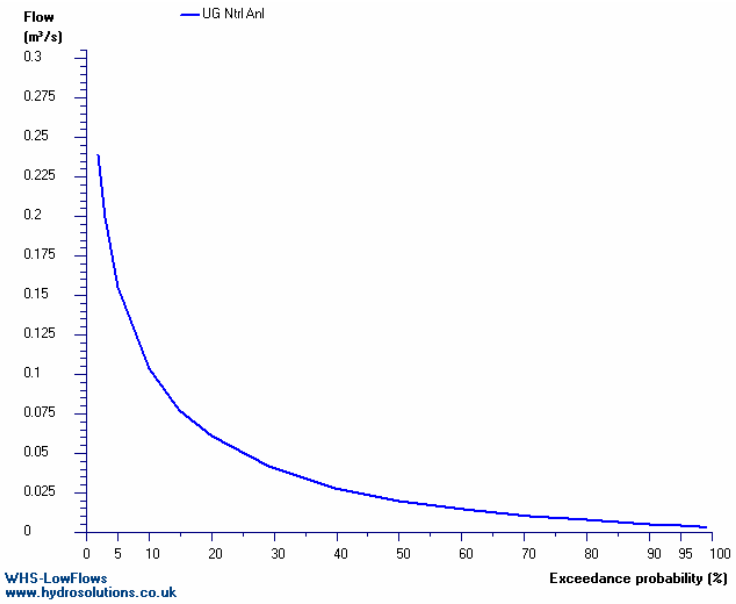


Figure 4 Annual flow duration curve produced using low flows software

Hydropower Analysis

Low flows analysis predicts the Q_{95} flow rate of 0.004 m³/s, the rate at which water would be available for use by a turbine. This figure forms the basis of the hydropower analysis in specifying a turbine that would operate at this flow. No standard turbines operate with such a low flow rate. As such the hydropower analysis has been based on the minimum flow that a turbine would operate, in this case 0.087 m³/s. This equates to flow occurring in Crossgill Beck with a frequency of less than 20% of the year indicating that there is no viable hydropower scheme at this site.

Site: Crossgill (Site 35)
Run Date / Time: 22 February 2011 at 11:25

Mean Flow: 0.052 m3/s
Provisional Rated Flow: 0.090 m3/s
Residual Flow: 0.003 m3/s
Rated Flow: 0.087 m3/s
Gross Hydraulic Head: 3.00 m
Nett Hydraulic Head: 2.85 m

Applicable Turbines	Gross Annual Average Output	Nett Annual Average Output	Maximum Power Output	Rated Capacity	Minimum Operational Flow
Crossflow	5.6	5.5	1.9	1.8	0.016
	MWh	MWh	kW	kW	m3/s

Table 3 Hydropower Analysis

Gross Head [m]	3.0 m
Net Head [m]	2.85 m
Design Flow [m³/s]	0.087 m³/s
Rated Capacity [kW]	1.8 kW
Average Annual Energy Output [MWh]	5.5 MWh
Average annual Carbon Dioxide offset	2.98 tonnes

Impact Assessment

Crossgill is within the Forest of Bowland AONB and is classified as Wooded Rural Valley. If a scheme were pursued on here the turbine would be housed immediately upstream of the Littledale Road crossing. It is not thought that the development would have any significant environment impact.

Statutory Requirements

In-river works will be required to build the intake weir and the tail race, and the Environment Agency will need to be consulted in order to acquire consent for this, as well as to apply for an abstraction license. Work in the river will only be allowed between May and September. Planning permission is likely to be required for the weir, pipeline and turbine. An ecologist will advise on the extent of any environment assessment required.

Conclusion

Based on the hydropower analysis undertaken there is insufficient flow to install a turbine at this location. Coupled with the access difficulties and construction costs, a scheme at this site would not be 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