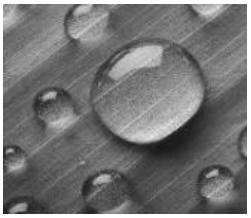

ELEMENTS ENERGY

Cilybebyll Hydro Scheme

Cumulative Geomorphology Impact Assessment

January 2026

Hydropower Consultancy & Development

Document Control

Scheme Name: Cilybebyll Hydro
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1.1 Overview:

This project is a proposed 26 kW micro hydro scheme for the generation of electricity from a renewable source, water. This is in additional to the 11kW hydro station already present on another watercourse at the site. This proposal shares a powerhouse with the existing scheme and the first 438m of the full 900m pipeline has already been installed as part of the first hydro project. Installed making use of the same trench but it is a separate pipeline to the other hydro scheme (and a separate turbine, just the outfall is shared).

The applicant is the landowner of the project. The applicant owns the farm and holiday cottages beside the powerhouse location and the electricity will be connected to the farm demand as well as the National Grid network. The applicant supports efforts to address and seek solutions to climate change and is therefore making an effort to contribute towards National and regional requirements for clean energy. The applicant is also committed to environmental protection and is committed to minimising the impact of the project on the local ecology.

1.2 Overview of Development

The works will include:

- A small intake structure across the watercourse on the face of a small waterfall/cascade, incorporating a Coanda screen with 1.3mm apertures and stilling chamber.
- A pipeline of HDPE plastic pipe (315mm outside dia.) running from the intake down to the turbine house on the West side of the watercourse. (Burial depth generally 400mm to crown) The pipeline is 900m long in total but 462m is already installed as part of the previous project. The pipeline is mainly buried with the one section overground up at the top near the intake where trees are present as detailed in the General Layout.
- The turbine house building is already built as Plas Farm Hydro shares the building, the works will be to install a second hydroelectric turbine, generator, and control panel within this building.
- A buried electrical cable from the turbine house to the Plas Farmhouse connection point. (Buriel Depth 600mm)

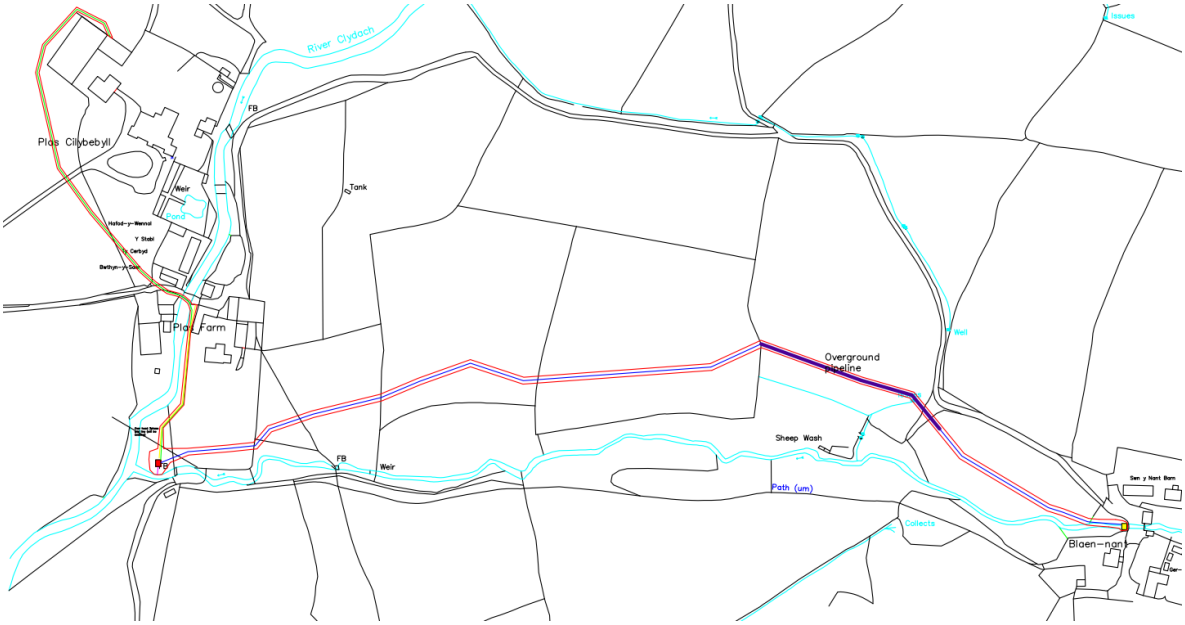
Plas Farm powerhouse is also Cilybebyll Powerhouse (shared) building already built as per Plas Farm Hydro planning permission (P2024/0496)

1.2 Other Hydro in vicinity

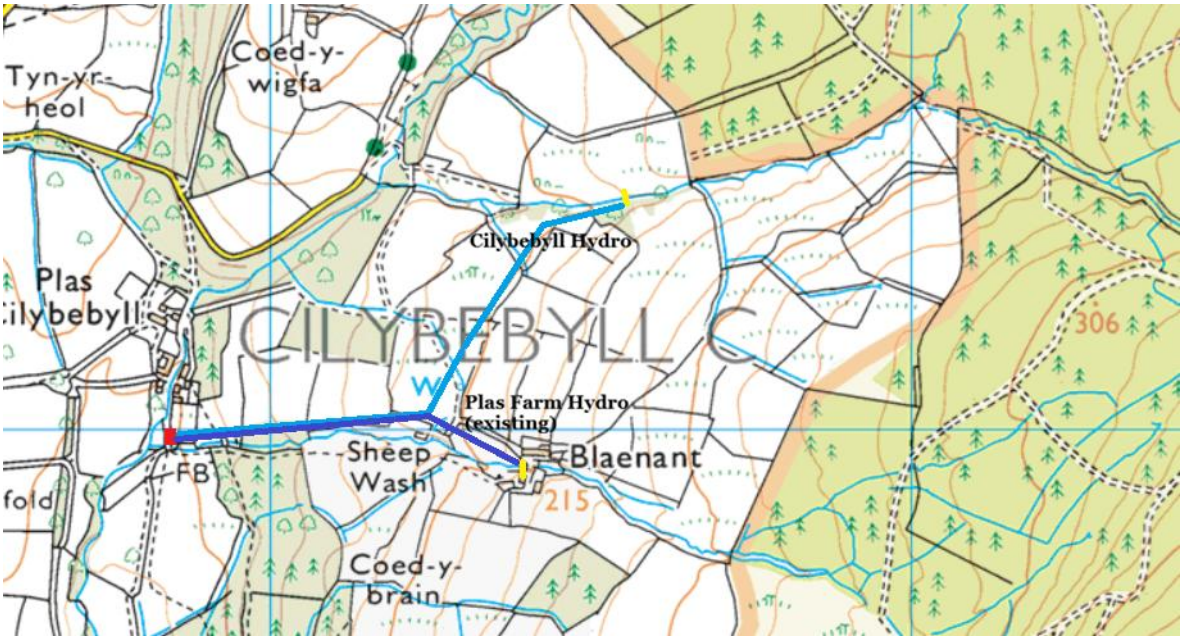
Back in the 2024 and early 2025 Plas Farm hydro was built. This 11kW hydro scheme is on an unnamed watercourse which flows from Blean Nant down to the Clydach with the tributary's confluence at Plas Farm close to the powehouse.

Background information

The project was built with this hydro in mind, and thus the powerhouse building was built with a large enough floor space and twin sump in the floor for two turbines. The first hydro is called Plas Farm Hydro and this hydro being applied for is called Cilybebyll Hydro. Plas Farm hydro has been fully installed with the turbine in place etc but the grid connection (3 phase) is not yet installed so the system is not in fact yet running. National Grid were planning on upgrading the farm to 3 phase in the summer of 2025 but this has been delayed to early 2026. Once the 3 phase is installed the Plas Farm scheme will start abstracting/generation electricity. The electricity from Plas Farm hydro supplies Cilybebyll Manor and the Swansea Valley cottages all on site at Plas Farm. Surplus electricity is exported to the grid network. Being 3 phase infrastructure (3 phase control panel and connection switchgear etc) the Plas Farm system has had to wait untill the National Grid upgrade, as the current single phase electrical connection on site is not suitable. Hence the system is not yet running.



The existing Plas Farm Hydro General Layout



The existing Plas Farm hydro and the applied for Cilybebyll Hydro

5.Impacts of Plas Farm Hydro

Here we highlight the impacts of Plas farm hydro and as generally it is only when an impact occurs that a culmination of impact can then be at risk of occurring, thus highlighting possible impacts is a starting point for assessing cumulative impact. Aspects of the Plas farm scheme that have zero impact are not going to cumulate with the second scheme, albeit impacts that are small enough to be negligible on a single scheme basis may combined with an additional hydro scheme become no longer negligible. Hence below is the detail on potential impacts however minor.

Sediment movement


Plas Farm Intake during the latter stages of its build (note the orange colour is natural to the area in low flows and from upstream not related to the hydro). Note no weir pool and thus no sediment sink at intake.

The Plas farm intake (this is the existing hydro on the unnamed tributary up at Blean Nant) does not have a sediment sink. The intake is on a very large waterfall, so tall that the tank and screen had to be built in a bespoke tall and thin size to fit appropriately.

Sediment transfer through the depleted reach

The Plas farm hydro station has a max abstraction of 21lps which is also the mean flow figure for the watercourse (Qmean). The hands off flow is Q95 and it has a 70% flow split. The maximum abstraction at the mean flow ensures that during flows which permit sediment movement (e.g. Q5 and above) the flows are not greatly affected. As shown in the table below

Flow percentile	Natural River flow	Depleted Reach River flow during abstraction (hydro running)
Qmean	21lps	8lps
Q10	48lps	27lps
Q5	71lps	50lps
Q3	102lps	81lps
Q1	170lps	149lps

The flow in which sediment moves through the watercourse varies upon location and sediment size but in general on a watercourse of this nature with its sediment and its flows will see very modest amount of sediment movement in flows of around Q5 or more. So around 70lps. This scenario will occur around 5% of the year without the abstraction being present and will occur around 4% of the year with the abstraction regime. At flows of significant movement (around Q1 or more) the impact on flows is very little and thus

the frequency of significant sediment transfer is not greatly changed by the presence of the hydro with its abstraction regime. This is due to the max abstraction flow being modest in relation to the watercourse size.

5.Impacts of the proposed Cilybebyll Hydro

Cilybebyll follows the same design principles as Plas Farm hydro with a Qmean max abstraction and Q95 hand off flow. The proposed flow split is 50% rather than the 70% to the hydro which is present on the Plas Farm licence. (Plas Farm having a steeper than 1in10 watercourse whereas Cilybebyll Hydro falling short due to having a less steep watercourse at 6% gradient rather than above 10%).

The intake at Cilybebyll is on a waterfall but not a significantly large waterfall and therefore the intake has been designed to have its crest at the top of the waterfall and the extra effort of building it this way will be worthwhile to ensure that there is not potential for a sediment sink being created of upstream of the weir. The small addition of excavation at the intake being worthwhile to achieve this. This is a variation from the initial application submitted in December 2025 where the crest level was slightly higher. The new photo mark up of the crest level is below.

Also material from the intake footprint will be used to ensure that the back of the weir is flush with the crest level and thus no sediment sink is formed on the upstream side of the weir.

<u>Sediment transfer through the depleted reach</u>

The proposed Cilybebyll hydro station has a max abstraction of 59lps which is also the mean flow figure for the watercourse (Qmean). The hands off flow is Q95 and it has a 50%

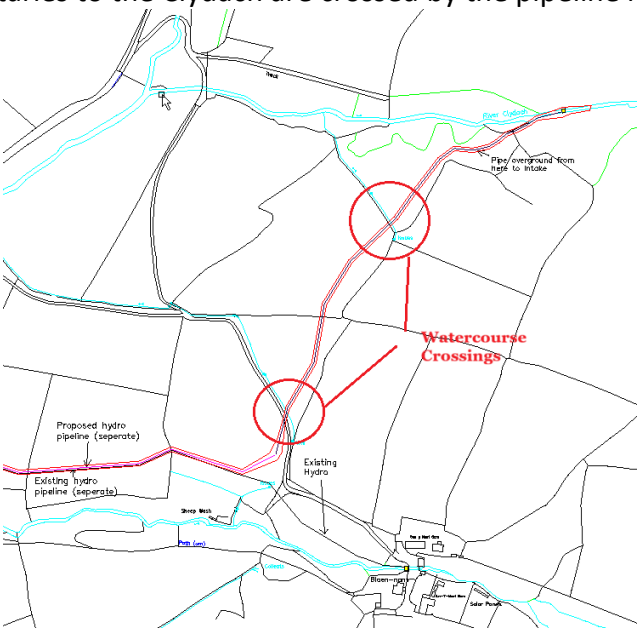
flow split. The maximum abstraction is set at the mean flow ensuring that during flows which permit sediment movement (eg Q5 and above) the flows are not greatly affected. As shown in the table below

Flow percentile	Natural River flow	Depleted Reach River flow during abstraction (hydro running)
Qmean	59lps	33lps
Q10	137lps	78lps
Q5	192lps	133lps
Q3	237lps	178lps
Q2	275lps	216lps
Q1	352lps	293lps
Q0.1	652lps	593lps

The flow in which sediment moves through the watercourse varies upon location and sediment size but in general on a watercourse of this nature with its sediment and its flows will see very modest amount of sediment movement in flows of around Q5 or more. So around 192lps. This scenario will occur 5% of the year without the abstraction being present and will occur around 3% of the year with the abstraction regime. At flows of significant movement (around Q1 or more) the impact on flows is very little and thus the frequency of significant sediment transfer is not greatly changed by the presence of the hydro with its abstraction regime. This is due to the max abstraction flow being modest in relation to the watercourse size.

Pipeline Watercourse Crossings

Two very small tributaries to the Clydach are crossed by the pipeline route.



Reg rings highlight the location of watercourse crossing along the pipeline route

The crossings will be installed with the pipe significantly above the watercourses which are both deep ditches with high sides and relatively short crossing. The pipe structure itself is sufficiently stiff to allow these crossings albeit a H beam will be used to ensure longevity. The bed of the watercourses will not be disturbed and the pipe in the vicinity will be close to ground level to ensure not excavation of banks is necessary.

Proposed level of pipe shown in blue (pipe crossing at SN 75392 04273)

2 Cumulative impact

2.1.1 Reach between outfall and confluence (10 meters of watercourse)

10m long section of Watercourse receiving outfall flows from the shared outfall

The shared outfall means that a short section of the unnamed watercourse has both the Cilybebyll Hydro flows on the Plas Farm flows. The flow at max discharge (max abstraction) is 21lps plus 59lps so a total of 80lps. This flow is naturally experienced by this tributary in flows of between Q4 and Q5 (Q5 flow is 71lps). So the section of watercourse is used to receiving the flow.

Flow percentile	Natural Unnamed Trib flow	Outfall discharge (both hydros running)	Flow down 10m stretch of unnamed trib (between outfall and Clydach Confluence)
Qmean	21lps	39lps	47lps
Q10	48lps	80lps	107lps
Q5	71lps	80lps	130lps
Q3	102lps	80lps	161lps
Q1	170lps	80lps	229lps

During high flow events when the turbines are both running, there will be an extra 59lps along this 10m stretch of watercourse. The nature of the large stable banks here mean that flood flows do not pose a threat to the bank stability, vegetation and so on along this short reach. Flow figures for the stretch of watercourse between the outfall and the confluence are shared above.

2.1.2 *Cumulative impact from sediment sinks and depleted reaches*

Neither hydro intake weirs have a sediment sink, Plas Farm intake can't really be described as a weir at all being on the face of a large waterfall and the Cilybebyll intake is being constructed with its crest level at the bed level of the small waterfall at its location.

The two depleted reaches will receive reduced flows from the hydros but at times of high flows and sediment mobility the reduction is small and therefore the movement of sediment will be only marginally hindered. Long term effects will be negligible due to the severe high flow events (flood events every few years) being so significantly larger than the max abstractions volumes which are limited to modest figures (Qmean).

The Clydach Watercourse has no other hydro stations in the vicinity apart from the existing and the proposed. The extent of reaches experiencing depleted flows are small in comparison with the rest of the catchment which includes other tributaries. The tributary to the north for example is as large as the Clydach watercourse and provides flows to the second half of the Cilybebyll hydro depleted reach.

3 Conclusion

Due to the system designs and abstraction regimes set on the NRW guidelines which have been followed, with the max abstractions set at mean flows and the Q95 hands off flows along with the flow splits (50% for Cilybebyll Hydro and 70% for the Plas Farm Hydro), the Clydach has been safeguarded effectively from cumulative impacts of these two small hydro stations in close proximity to each other.