# STAGE 1 GEOMORPHOLOGY ASSESSMENT

This document provides information relating to the construction of a Micro Hydro Scheme on an unnamed watercourse, near Wembley Road, Ystalyfera, Swansea

# THE GREEN VALLEYS CIC

The Green Valleys Community Interest Company is a community-owned social enterprise that helps communities across Wales reduce their carbon emissions.


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## NON-TECHNICAL SUMMARY:

This extremely small-scale hydropower scheme, with a depleted reach of 80m, proposes an intake structure of up to 75mm in height above the existing level to enable the structures to operate in accordance with the published hydropower good practice guidelines. The watercourse is a combination of exposed bedrock and bedrock overlaid with a mixture of cobble sizes. The depleted reach contains a series of natural falls throughout reach up to 5m in height. The gradient of the depleted reach is approximately 25% and the dominance of exposed bedrock has resulted in very limited opportunities for natural in stream sedimentation or vegetation.

The applicant proposes to install an intake for a micro hydro scheme within an easily accessibly section of the watercourse, within close proximity to an existing access. From the intake the scheme proposes to run a pipe for approximately 85m on the northern bank to the turbine house. (See Figure 1).

Above the proposed intake the watercourse exits from an existing culvert. The stream progresses in an easterly direction and is flanked by a combination of cleared pasture and semi-mature deciduous trees. The depleted reach within the middle section is incised with steep gullies and well sheltered by the surrounding vegetation making this section of the watercourse generally inaccessible. This proposal seeks a peak abstraction of 10.6 l/s (Qmean) and is proposing a HOF of Q95 (1.5 l/s) and abstraction of 70% of the flows above HOF (a 70/30 split). Immediately below the intake location there is a waterfall of 5m that cascades onto bedrock with little chance that fish could pass either upstream or downstream. After the turbine house the watercourse enters into a long culvert.

We have followed NRWs guidance notes for geomorphology micro hydropower assessments, Stage 1.

## LOCATION OF IMAGES AND FIGURES

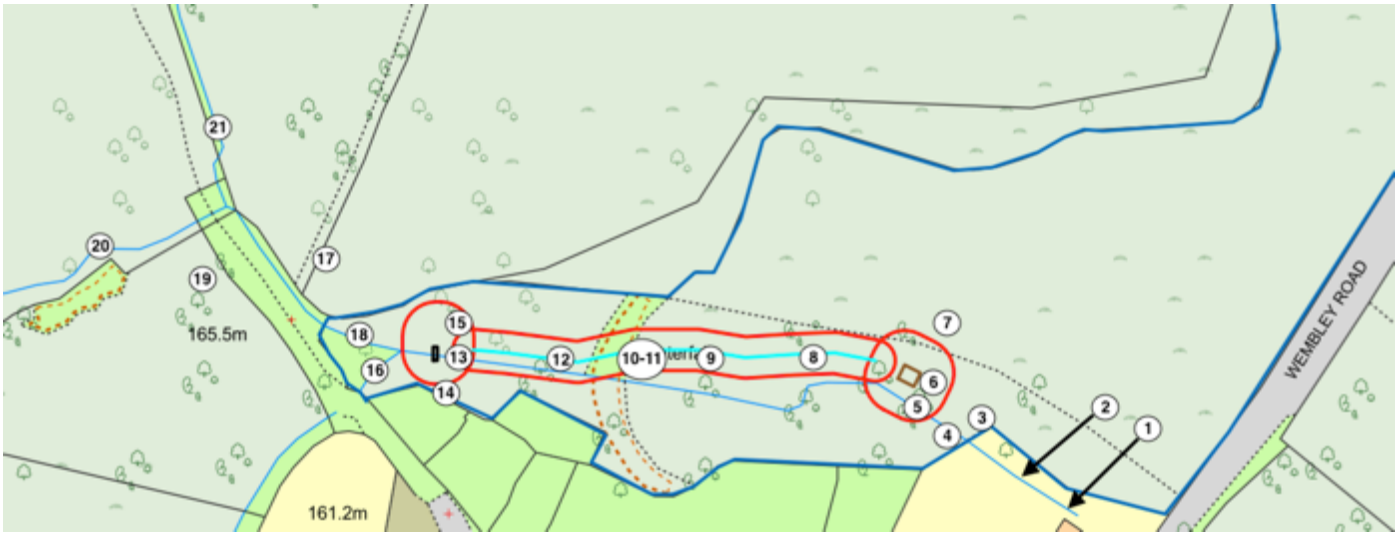


Figure 1: Location plan of all referenced images and photos (NTS).

## OVERVIEW OF SITE GEOLOGY

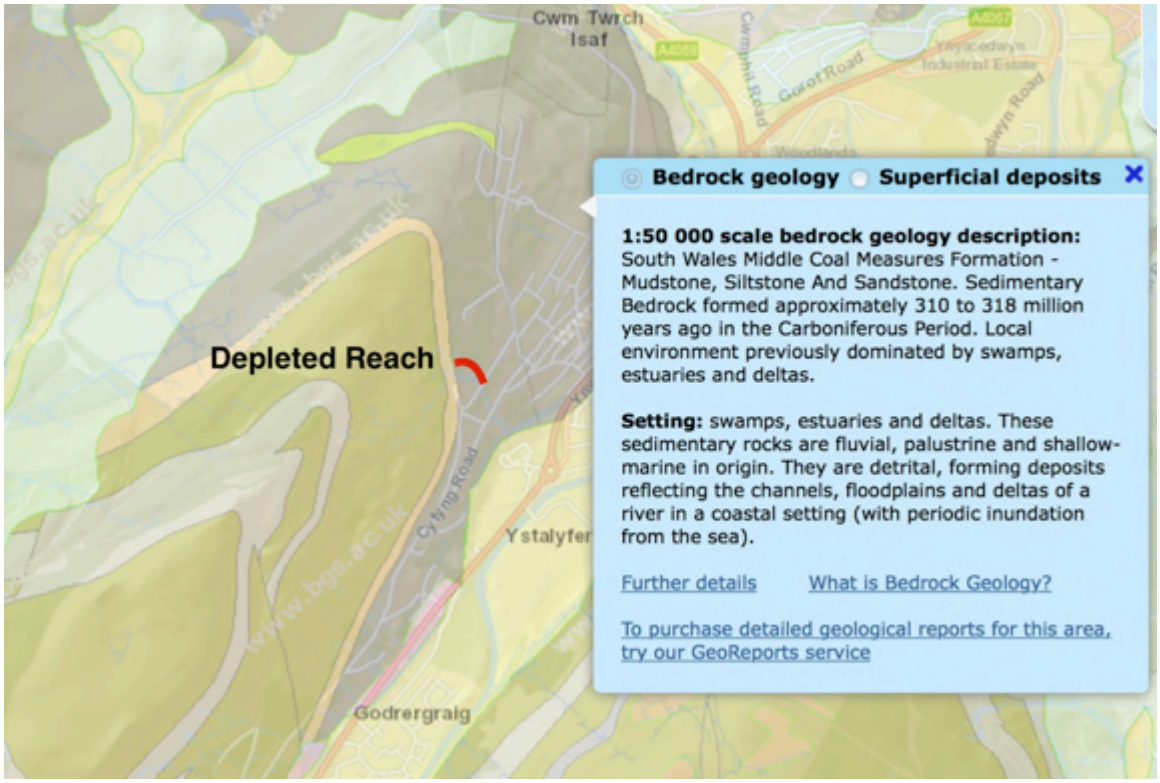


Figure 2: Bedrock geology of the area around the watercourse. Proposed Depleted Reach shown in Red. The underlying solid bedrock geology is mudstone and sandstone, the immediate stream valley supports a dominance of exposed bedrock.

## SCHEME VITAL STATISTICS

| | | |
|---|---|---|
| **LENGTH OF DEPLETED REACH:** | 85m | |
| **SCHEME HEAD:** | 20m | |
| **NGR:** | Intake: | SN 76243 08656 |
| | Discharge: | SN 76329 08639 |
| **GRADIENT:** | 25% (to lower stream channel). | |
| **HEAD LINE FLOW:** | 10.6 l/s (Qmean) | |
| **OUTPUT:** | 1.5 kW (peak power) | |
| **HEIGHT OF INTAKE (EXISTING):** | 160.00m AOD | |
| **HEIGHT OF INTAKE WEIR CREST (PROPOSED):** | 160.075m AOD | |
| **HEIGHT OF PROPOSED DISCHARGE:** | 140.000m AOD | |

## SITE PHOTOGRAPHS

### CATCHMENT AREA AND UPSTREAM OF INTAKE


Fig 3: Showing the aerial view of intake and catchment area, catchment area consists of conifer plantation and open common land.

Photo 1 (d/s). The watercourse downstream of the discharge, 1.5m wide channel (1m measuring stick). The watercourse is dominated by a concrete culvert that travels under the housing estate. (SN 76331 08633). Staff shown in photo is 1m long

Photo 2 (d/s). The watercourse downstream of the discharge, 1.5m wide channel (1m measuring stick). The watercourse is dominated by a concrete culvert that travels under the housing estate. (SN 86286 02589). Staff shown in photo is 1m long

Photo 3 (d/s). The watercourse downstream of the discharge, 1.5m wide channel (1m measuring stick). The watercourse is dominated by a concrete culvert that travels under the housing estate. (SN 86286 02589). Staff shown in photo is 1m long

Photo 4 (u/s). The watercourse downstream of the discharge, 1m wide channel (1m measuring stick). The watercourse is predominantly large boulders. (SN 76329 08639). Staff shown in photo is 1m long

Photo 5 (u/s). The proposed location of the discharge, where the watercourse is predominantly large rocks and boulders. Very little fine sediment and cobbles.1m wide channel (1m measuring stick). (SN 76329 08639). Staff shown in photo is 1m long

Photo 6 (u/s). Location of the proposed turbine slab. (SN 76329 08639). Staff shown in photo is 1m long. Turbine house will be 2m x 2m.

**Photo 7 (n/a).** Looking down onto the turbine house location from above the northern bank. (SN 76329 08639). Staff shown in photo is 1m long

**Photo 8 (u/s). Mid point of the depleted reach, approx. 1m high bedrock waterfall with no natural plungepool.** (SN 76311 08642). Staff shown in photo is 1m long

Photo 9 (u/s). Upper part of depleted reach, approx. 5m high waterfall of exposed bedrock cascading down onto further exposed bedrock. Little to no natural sedimentation. (SN 76283 08645). Staff shown in photo is 1m long

Photo 10 (d/s). View looking downstream from the top of the 5m waterfall. (SN 76283 08645). Staff shown in photo is 1m long

Photo 11 (u/s). Looking upstream from the top of the 5m waterfall towards the intake location (out of view). (SN 76283 08645). Staff shown in photo is 1m long

Photo 12a (u/s). Looking upstream towards the proposed intake which is located on the upper part of the exposed bedrock falls. Watercourse is entirely exposed bedrock. (SN 76243 08656). Staff shown in photo is 1m long

Photo 12b (u/s). Looking upstream towards the proposed intake with the approximate construction parameters shown in yellow. Watercourse is entirely exposed bedrock. (SN 76243 08656). Staff shown in photo is 1m long

Photo 12c (d/s). View downstream of the proposed intake, with the solid bedrock immediately below the intake clearly visible. No natural sedimentation in the watercourse channel. (SN 76243 08656). Staff shown in photo is 1m long

Photo 13 (d/s). Detailed view of the intake location with 1m fall immediately below. (SN 76243 08656). Staff shown in photo is 1m long

Photo 14 (d/s). Right hand bank of the proposed intake, solid rock channel. (SN 76243 08656). Staff shown in photo is 1m long

Photo 15 (d/s). Left hand bank of the proposed intake, solid rock channel. (SN 76243 08656). Staff shown in photo is 1m long

Photo 16 (u/s). Culvert discharging into watercourse from the southern bank immediately above the intake. (SN 76238 08646). Staff shown in photo is 1m long

Photo 17 (u/s). Small feeder tributary (not on map) coming into the watercourse from the northern bank. (SN 76236 08687 02589). Staff shown in photo is 1m long

Photo 18 (u/s). Main watercourse above the proposed intake, dominated by exposed bedrock. (SN 76238 08652). Staff shown in photo is 1m long

**Photo 19 (d/s).** Access area into the intake location from the southern bank. (SN 76234 08640). Staff shown in photo is 1m long

**Photo 20 (u/s).** Southern tributary upstream of the intake. (SN 76211 08711). Staff shown in photo is 1m long

Photo 21 (u/s). Northern tributary above the intake. (SN 76209 08748). Staff shown in photo is 1m long

## INTAKE DETAILS AND SEDIMENT RETENTION

The proposed Intake structure for the scheme on watercourse is to be cast from concrete. Because the system uses an existing waterfall of exposed bedrock the intake weir is very low, whereby the highest point of the intake will rise above the existing bedrock by only75mm. We anticipate that this small increase in height will have a small impact on this immediate area of watercourse (2.0m wide, and affecting as far back as 1.0m upstream) in terms of sediment transfer through this watercourse. However, due to the presence of the HOF notch extending below the weir crest this leaves the potential for sediment retention to peak significantly lower. We do not believe that this potential for sediment entrainment over long periods would occur as higher periods of flow will likely flush this out, as evidenced by similar falls within the depleted reach.

## SIGNIFICANCE OF IMPACT

We believe that the small-scale weir will not cause any significant impact. However, we have proposed an intake design of minimal possible height and width to reduce both the scale of the impoundment and the potential to cause impact. The streambed stratum at the point of abstraction is exposed bedrock.

## RETENTION OF SEDIMENT

The intake requires the creation of a small impoundment in order to function properly. Over a period of years there is therefore the potential for a very small amount of sediment to be retained (although the HOF notch would not enable this quantity to ever be retained). Taken in the context of the watercourses natural sedimentary processes and the downstream presence

of moderate falls and bedrock exposures we do not believe that the retention of sediment would have any measurable impact on the wider watercourse status as measured by the WFD and any long term impact would not be possible to measure or quantify.

### IMPACT OF FLOW REGIME ON EROSION AND DEPOSITION

The hydro scheme will affect the levels of water flow throughout the depleted reach. The HOF of Q95 and maximum abstraction of 10.6 l/s (Qmean) alongside a 70/30% split will result in zero difference in naturally occurring low flows and a limited change to higher flows. It is accepted that sedimentology deposition generally occurs in low flows (which are unchanged by the proposals) and that sediment transfer occurs in the higher flows (which are not changed to any significant level) and we therefore conclude that the scheme will have no meaningful impact on erosion or deposition within the depleted reach, and consequently will have no measurable impact on the current status of the watercourse.

### DISCHARGE

A drain sump will be incorporated into the slab directly beneath the turbine unit. This sump will discharge the water passing through the turbine unit to the stream channel through a 300 mm diameter plastic twin-wall Agripipe. The end of the pipes will be screened with a 10mm s/s mesh and the pipes will be surrounded by a combination of loose stones and boulders fixed to the existing bedrock shelf. The pipe will stop short of the stream and discharge onto an existing bedrock shelf that will dissipate energy as it enters the watercourse.

### CONSTRUCTION

Our efforts to minimise the potential impact on sedimentology during the construction phase will be described in the Construction Method Statements.

### CONCLUSION

A small-scale short-term impact may will occur as result of the small impoundment weir being built but will be limited through utilizing the proposed methodologies.

Although the watercourse has not been formally assessed in line with the WFD it is considered to potentially have a status of up to ‘moderate’.

We are confident that the potential status of the watercourse will not be significantly affected by the proposed hydro scheme.