# Case Study: Brynau and Preswylfa Natural Flood Management Scheme

Figure 1 Site 2 Brynau West Field pre-construction, showing the existing tree planting by Woodland Trust

| | |
|---|---|
| **Project Location** | Brynau and Preswylfa, Neath Port Talbot.<br>Preswylfa and Brynau sites are situated within the Gnoll catchment. |
| **Lead Delivery Organisation** | Neath Port Talbot Council (NPTCBC), Welsh Government |
| **Key Partners** | Woodland Trust (WT), NPT Gnoll Country Park, NPT Biodiversity.<br><br>NFM opportunities within the upper catchment area, primarily within Brynau Fields are owned by WT. Alongside NPTCBC NFM Project, Woodland Trust was underway completing its own Woodland Creation Project, across its land in the upper reaches of the catchment. Close collaboration with the Woodland Trust team was required during the project's option selection process, concept design, and detail design stages. This ensured NFM features work in conjunction with Woodland Trust tree planting plans. |
| **Main funding stream(s) for project delivery** | Welsh Government – Small scale flood risk management Grant |

## 1. NFM Measures Implemented

**Site 1: Preswylfa Dingle**

- Stepping stones - catch debris in high flows, slowing the flow of water and preventing material from blocking structures downstream.
- Woody deflector – Promoting floodplain reconnection, by diverting flow into the low-lying floodplain behind the embankment.
- Three woody features – located upstream of the floodplain reconnection.

**Site 2: Brynau Field (NFM features not yet installed)**

- 2 x Pond and bunds features – excavation to create 2 ponds will be re-used in the formation of bunds. Two flow pathway bunds and ponds are proposed on a primary flow pathway. The bunds would block the flow pathway to temporarily store water in an excavated pond behind the bund.
- A-frame leaky barriers – overland flow interception.
- Live and dead hedges work with A-frame woody features. A combination of dead wood leaky barriers and living hedges, and A-frame woody barriers to slow and temporarily store water behind the features.

## 2. Key drivers for the project

### 2.1. Flood Risk Management

The main flood risk management drivers for the project were as follows:

- Climate change pressures on existing flood risk management structures
- Adaption to changing river behaviour, in this instance, flashy flooding behaviour of the Gnoll catchment
- Increased maintenance call outs of existing assets downstream. The intensity of previous rainfall events has resulted in increased flow velocities within the catchment, leading to greater erosion and transportation of sediment and larger material (incl. wood).
- Community resilience and protection.

### 2.2. Wider Environmental Enhancements

Creating a natural habitat within the catchment area, restoration of wetland and increasing the interaction between terrestrial and aquatic ecosystems.

The installation of in-channel woody debris and woody deflectors will allow water to pool behind such features during high flows, reconnecting wetland areas, as they will receive more frequent flooding.

Live and dead hedges, promotes infiltration into the soil/substrate and is a mechanism to trap suspended sediment and larger debris. This in turn is a mechanism that can improve water quality by the removal of certain pollutants.

### 2.3. Societal Benefits

Delivering the scheme on a community scale including meeting and consulting with the landowners will ensure that the community is well connected and cohesive.

The Brynau and Preswylfa NFM scheme will assist in improving the community's resilience to flooding, reducing the stress and health effects associated with internal flooding, contributing to a more resilient and healthier Wales.

## 3. Project Description

The source of flooding from three Ordinary Watercourses named the Gnoll Brook, Gnoll Park Brook and Llantwit Brook. The catchment is within the Gnoll Country Park, which flows downstream to three critical intakes at the Gnoll Avenue, Ivy Avenue and Llantwit Road as seen in the below plan (Figure 2).


Figure 2 Flooding sources indicated by the purple crosses.

Three culverts (purple crosses on map above) were identified where water flow exceeds the culvert capacity during heavy rainfall despite regular maintenance, contributing to flood risk to the community of Neath immediately downstream of the culverts.

The culverts have been cleaned immediately prior to and during heavy rainfall events and have still overtopped as the topography leads to flashy river behaviour in the catchment that results in continuous accumulation of debris.

The key objective in implementing NFM is to store and slow the flow of water on the land and in the channel upstream to relieve pressure on the downstream culverts.

Stakeholder engagement included two workshops online via MS Teams due to the initial lockdowns and working from home arrangements due to COVID-19. The workshop activity enhanced our local knowledge of hydrological issues, ecological issues, and ongoing pressures from community groups. Learning of known issues in the surrounding three catchment areas prior to further site investigation permitted faster identification of possible NFM opportunities and allowed us to progress the project further.

## 4. Key Project Outcomes

### 4.1. Successes

**Site 1 Preswylfa Dingle**

The monitoring plan of fixed point photography has been installed and set up prior to construction at this site. Fixed point photography pre-construction, post-construction as well as pre and post storm event provides photographic evidence of the features working during heavy rainfall events and showcasing its function. (see photos located below)

**Site 2 at Brynau Field**

Site 2 at Brynau Field is not yet under construction.

The construction of NFM features, whether in channel or over land, will raise awareness among the general public of the importance of working with nature. It will showcase working relationships with landowners/farm owners to provide opportunities to maximise upstream land management practices to combat the effects of climate change. NFM features improves amenity and brings benefit to the local community.

Brynau Project in conjunction with Woodland Trust Woodland Creation Project will showcase nature based, soft engineering solutions as a mode to reduce flood risk and to help alleviate pressure on downstream communities.

### 4.2. Lessons Learnt

Two key lessons learnt:

- Gaining knowledge of the local area and hydrological issues.
- Learning of known issues in the surrounding three catchment areas prior to further site investigation allowed faster identification of possible NFM opportunities.

We have encountered significant delay in commencement in construction phase as a result of finalising the Deed of Easement between NPTCBC and WT. This delay and legal process has highlighted differing views/ on-going discussions from both parties in relation to liability issues and maintenance plans.

## 4.3. Monitoring and Maintenance

The monitoring scope selected for Brynau and Preswylfa NFM Scheme is to capture images of the NFM features working to slow water flow using fixed point photography.

Implementing fixed point photography in Preswylfa Dingle and Brynau West Field will capture the slowing of flow behind woody features, water being diverted onto the floodplain.

Maintenance and management plans have been arranged at Preswylfa Dingle with Gnoll Country Park Rangers.

Woodland Trust (WT) is undertaking its own research and monitoring programme in partnership with Aberystwyth University. WT aims to evaluate the physical and economic impacts of woodland creation. As part of its monitoring programme, Aberystwyth University has installed data loggers and sensors to establish baseline soil conditions and water levels and flows within the upper catchment. NPTCBC scheme at Brynau West Field will impact the flow in the upper catchment area. Agreement with Aberystwyth University to obtain baseline flow data pre- construction and post-construction to monitor any changes in water levels.

## 5. Project Photographs

Figure 3 Site 1 Preswylfa Dingle post leaky barriers implementation and post flood event.

Figure 4 Site 1 Preswylfa Dingle stepping stones capturing debris in high flow.

Figure 5 Illustration of the proposed features including breaking out the ancient underground drain and bringing water flow to the surface.

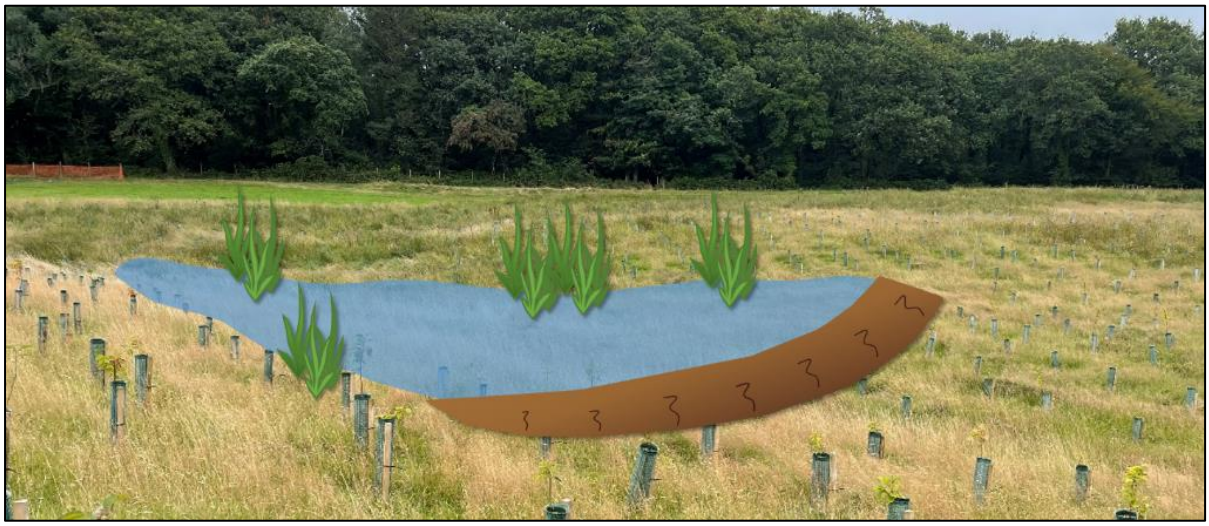

Figure 6 Diagram illustrating the proposed features storage pond and bunds at Brynau Field.