Dŵr Cymru Welsh Water

Environmental Assessment of the Afon Teifi at Llechryd Drought Order (8202-1)

Final

March 2019

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NON-TECHNICAL SUMMARY

INTRODUCTION AND PURPOSE OF THIS REPORT

Welsh Water's Drought Plan provides a comprehensive statement of the actions Welsh Water will consider implementing during drought conditions to safeguard essential water supplies to customers and minimise environmental impact. It encompasses a number of drought management options that will only be implemented if and when required and includes drought permit / order options.

A drought permit or order is a management action that, if granted, can allow more flexibility to manage water resources and the effects of drought on public water supply and the environment.

The objective of this report is to provide an independent and robust assessment of the potential environmental effects of implementing a drought order of the Afon Teifi at Llechryd, over and above those arising due to natural effects of drought and those which would occur under "normal" abstraction licence conditions.

The Afon Teifi is located in Welsh Water's Mid & South Ceredigion Water Resource Zone (WRZ) which covers the Teifi Valley and the coastal area from south of Cardigan, northwards to just south of Aberystwyth. The study area (see **Figure 2.2**) is identified as the Afon Teifi from Welsh Water's Llechryd intake (around 4.4km upstream) to the tidal limit, a catchment area of around 910km^2. The main Afon Teifi and its tributaries are part of the designated Afon Teifi SAC and has a concurrent boundary with the Afon Teifi Site of Special Scientific Interest (SSSI). Therefore consideration has been given to the potential impacts of drought order implementation on the features and species of these designated sites.

The assessment also considers how the proposed drought order may affect the environment in combination with the effects of other existing abstraction licences, environmental permits and other drought management plans.

This report is a 'shelf-copy' report which would be updated to support an application to the Welsh Ministers for a drought order of the Afon Teifi at Llechryd, which may be required by Welsh Water in the future.

PROPOSED DROUGHT ORDER DETAILS

In order to protect public water supplies within Welsh Water's Mid & South Ceredigion WRZ in the event of a future severe drought, Welsh Water would make an application to Welsh Ministers for a drought order to vary the conditions of abstraction from the Afon Teifi at Llechryd.

If granted, the drought order involves a proposed increase in the daily abstraction rate at the Llechryd intake, whereby the licence condition relating to the abstraction rate in any 24 hour period would be increased by 2Ml/d to 21Ml/d. This would also require amendment of the hourly abstraction rate condition. The drought order would increase the unsupported river abstraction from the Afon Teifi. The implementation of the drought order enables Welsh Water to increase abstractions and meet a temporary increased level of demand in the water resource zone.

The drought order is most likely to occur during the summer period. This has been confirmed by Welsh Water's water resources modelling.

The revised abstraction arrangements would legally be authorised for 6 months but would be removed sooner if water resources have returned to adequate levels to safeguard future water supplies, as agreed with the Welsh Ministers.

NEED FOR THE DROUGHT ORDER

Application for a drought order is a precautionary approach. Due to the time needed to determine a drought order application, Welsh Water will potentially apply for a drought order more frequently than it will be used.

The justification for the drought order sought will be set out in a "Needs Statement". This will be produced by Welsh Water at the time of a potential future application, and will form part of the full drought order application.

ALTERNATIVE SOURCES CONSIDERED

Details of alternative sources considered by Welsh Water will be completed at the time of application for the drought order of the Afon Teifi at Llechryd. This will demonstrate justification for the proposed drought option details applied for.

POTENTIAL IMPACTS OF DROUGHT ORDER IMPLEMENTATION

The scope of this drought order environmental assessment has been defined by a screening and scoping exercise in accordance with national drought planning guidance.

Summary of the Hydrological Assessment

The assessment has concluded that there is a **negligible** impact on flows in the Afon Teifi as a result of implementing the drought order. These hydrological impacts are assessed as leading to **negligible** impacts on the physical environment of the river, including water quality.

Summary of the Environmental Features Screening

In accordance with national drought planning guidance, environmental assessment is neither required nor included for features where screening has identified a minor or negligible impact. Screening has not identified any environmental features for which environmental assessment is required. No environmental impacts have, therefore, been identified for any of the features identified in the screening exercise.

Cumulative Impacts

No cumulative effects of implementing the drought order with other existing licences, consents and plans are currently anticipated. However, this should be reviewed at the time of any future application for a drought order at the Afon Teifi at Llechryd.

MITIGATION AND MONITORING

The environmental assessment has identified negligible environmental impacts of implementation of a drought order at Afon Teifi at Llechryd. This has included consideration and assessment of impacts on sites designated for their environmental importance. No mitigation measures are currently proposed as a consequence.

CONCLUSIONS

In summary, it has been concluded that the environmental effects on river flows, water quality and ecology of implementing an all year drought order at Afon Teifi at Llechryd over and above those conditions that already exist under "normal", i.e. licensed, baseline conditions, with the onset of a natural drought, would be **negligible.** This includes consideration of the effects on the Afon Teifi SAC and SSSI in accordance with the requirements of the Habitats Directive and the Crow Act.

Contents

1 INTRODUCTION

1.1 PURPOSE OF THE ENVIRONMENTAL ASSESSMENT

The objective of this Environmental Assessment Report (EAR) is to provide an independent and robust assessment of the potential environmental effects of the implementation of a drought order by Dŵr Cymru Welsh Water (Welsh Water) to temporarily increase the daily maximum licensed abstraction quantity at Llechryd from 19Ml/d to 21Ml/d, to enable Welsh Water to increase abstractions and meet a temporary increased level of demand in the Mid & South Ceredigion Water Resource Zone (WRZ) (see Section 2.1).

This EAR is a 'shelf-copy' report which would be updated in the event that Welsh Water needs to make an application during any future drought to Natural Resources Wales (NRW) for a drought order of the Afon Teifi at Llechryd. A drought order is a management action that, if granted, can help ensure essential water supplies are maintained to homes and businesses. The circumstances under which a drought order may be required is set out in the Welsh Water Drought Plan.

The assessment presented in this EAR considers the effects of an all year implementation of the drought order most likely to occur in the summer period, th e period for which Welsh Water has determined it might require a drought order for this water source. The purpose of the assessment is to determine the environmental impacts of the drought order over and above any effects arising from natural drought conditions.

The study area and focus of this environmental assessment of the Afon Teifi at Llechryd drought order, covers the following waterbodies:

- Teifi - Afon Ceri to estuary (GB110062043563)

This EAR includes discussion of the following:

- an assessment of the likely changes in river flow / water level regime due to implementing the proposed drought order (**for a summary, see Section 4 of this report**)
- identification of the environmental features that are sensitive to these changes and an assessment of the likely impacts on these features (**see Section 5 of this report**)
- identification of mitigation measures that may be required to prevent or reduce impacts on sensitive features (**see Section 6 of this report**)
- recommendations for baseline, in-drought and post-drought order monitoring requirements (**see Section 10 of this report**).

The environmental assessment has been conducted in accordance with Government

regulations and using the Welsh Government / Natural Resources Wales Drought Plan Guideline[1] (DPG); specifically Section 5 and Appendices I and J, and Welsh Government / Defra / NRW / Environment Agency guidance on drought permits and drought orders[2].

Consideration has been given to the potential impacts of drought order implementation on statutory designated sites, including those designated under international law (Habitats Directive, Birds Directive and the Ramsar Convention) and national legislation (notably Sites of Special Scientific Interest (SSSIs).

In accordance with the DPG, the assessment also considers how the proposed drought order may affect the environment in combination with the effects of existing abstraction licences, environmental permits and other relevant activities and plans. This is discussed further in Sections 3 and 7.

1.2 SUPPORTING STUDIES

The DPG identifies in Section 5.4 that EARs are required as supporting documents to any drought permit or drought order application. The circumstances for which an environmental assessment is required are set out in **Box 1** below.

Box 1: Drought Plan Guidance - requirement for environmental assessment

The DPG requires that all features that could be affected by implementation of a drought order /permit are listed in the EAR and that an assessment is made of how sensitive each feature is to the likely changes in hydrology, hydrogeology and geomorphology, due to implementing the drought order /permit.

The DPG requires a detailed environmental assessment for applications where sensitive features are likely to be subject to a major or moderate impact, or a minor impact where this applies to environmentally designated features. Further environmental assessment is **not** required for those drought orders / permits where there is certainty that there are no such impacted sensitive features.

This environmental assessment is based on data available at the time of writing and includes the environmental features and data types determined by Box 1 in Appendix I of the DPG (except where these are considered not to be relevant to this drought order). Data were requested from key consultees (including NRW).

Where appropriate, this report also identifies areas where there are deficiencies in data availability and makes recommendations for future data / information gathering and

[1] Natural Resources Wales (2017) *Water Company Drought Plan Technical Guideline*. Available at https://cdn.naturalresources.wales/media/684414/final-wc-drought-plan-guidance-2017.pdf?mode=pad&rnd=131656713580000000, Accessed 04 February 2019.
[2] Welsh Government / Defra / Natural Resources Wales / Environment Agency (2015) *Apply for a drought order or emergency drought order*, https://www.gov.uk/government/collections/apply-for-a-drought-permit-drought-order-or-emergency-drought-order Accessed 21 December 2018.

monitoring. Welsh Water will continue to engage closely with NRW to ensure that adequate and sufficient data / information are collated and kept up-to-date in subsequent years to inform future environmental assessments.

1.3 CONSULTATION

Consultation is identified as an essential exercise in the preparation of the EAR. In preparing this 'shelf-copy' EAR for a drought order of the Afon Teifi at Llechryd , consultation with regulators and wider stakeholders has been undertaken to gain feedback on potential adverse effects, gather data and discuss any required monitoring and / or mitigation measures.

Further consultation will be also be undertaken at the time of any future applications for the drought order.

1.4 STRUCTURE AND CONTENT OF THE REPORT

This EAR comprises the following sections:

Section 1: Introduction

Section 2: Background to the Drought Order

Section 3: Approach

Section 4: Hydrology and the Physical Environment

Section 5: Environmental Features Assessment

Section 6: Mitigation

Section 7: Cumulative Impacts

Section 8: Summary of Residual Impacts

Section 9: Habitats Regulations Assessment: Stage 1 Screening

Section 10: Environmental Monitoring Plan (EMP)

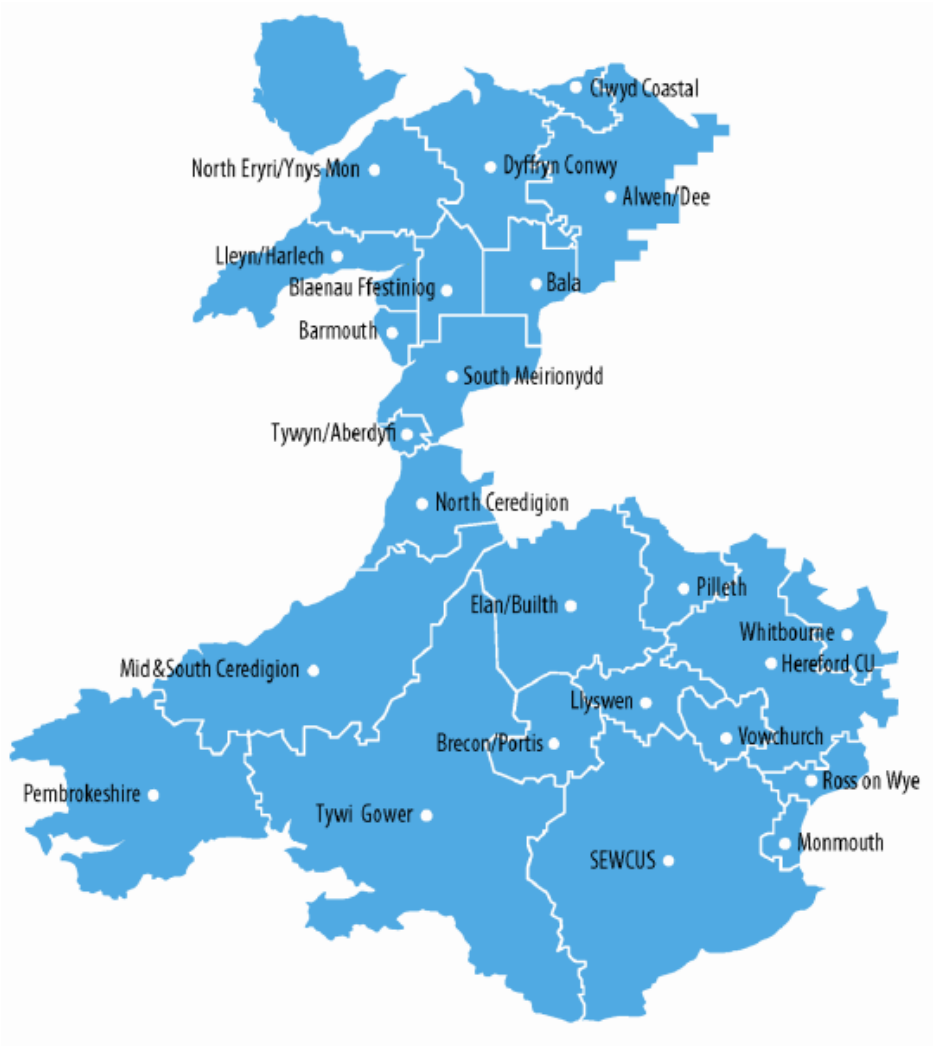
Section 11: Conclusions

2 BACKGROUND TO THE DROUGHT ORDER

2.1 WELSH WATER'S SUPPLY SYSTEM

Welsh Water supplies water to more than 3 million people. The Welsh Water supply area covers the majority of Wales and a small part of England. It is split into 24 WRZ's (see **Figure 2.1**).

Figure 2.1 Welsh Water Water Resource Zones



The Mid & South Ceredigion WRZ covers the Teifi Valley and the coastal area from south of Cardigan, northwards to just south of Aberystwyth.

The trigger levels for applying for a drought order of the Afon Teifi at Llechryd are based on low storage in the Teifi pools and the need to preserve this storage in the WRZ. The drought order involves a temporary increase in the daily maximum licensed abstraction quantity at Llechryd, from 19Ml/d to 21Ml/d. Welsh Water's assessment in its draft Drought Plan 2020 indicates that drought conditions severe enough to require an application for this drought option are unlikely to occur more frequently

than at a return period of around once every 200 to 500 years. Fuller details of the work undertaken to assess this risk are provided in Annex 1 to the draft Drought Plan 2020.

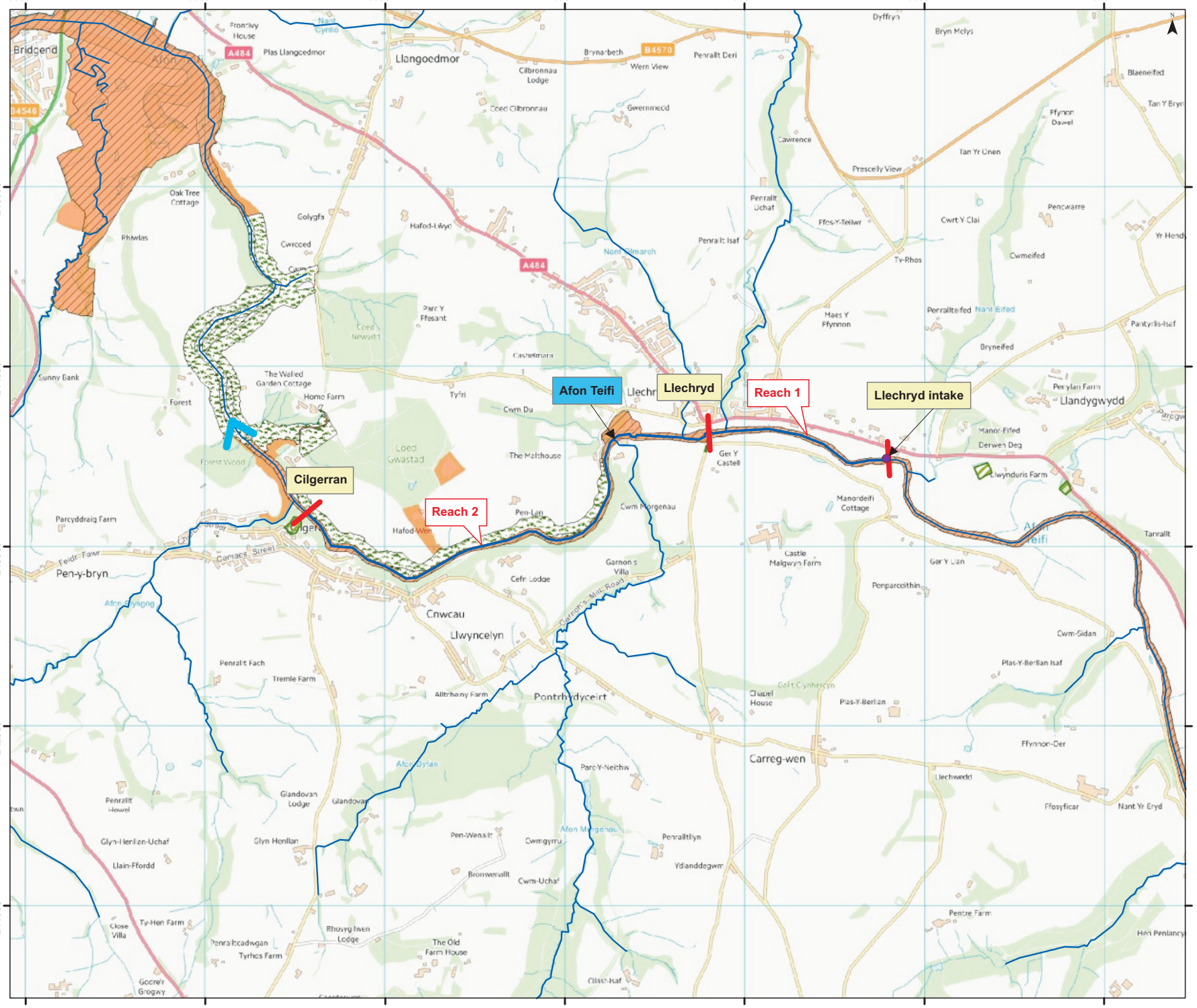
2.2 DESCRIPTION OF EXISTING ARRANGEMENTS OF THE AFON TEIFI AT LLECHRYD

Welsh Water's licence (number 22/62/3/0005) to abstract water under the Water Resources Act from the Afon Teifi at Llechryd includes the following conditions:

- 5,750 million litres (Ml) authorised to be abstracted per annum
- At a daily abstraction rate not exceeding 19Ml in any consecutive 24 hour period
- At an abstraction rate not exceeding 0.8Ml in any hour
- There are no river hands-off flow conditions in the abstraction licence.

The abstraction is made directly from a river intake and pumped to nearby Llechryd Water Treatment Works (WTW) for treatment, from where it is put into supply.

The study area is illustrated on **Figure 2.2**.



Legend

- Abstraction
- Hydrological Reach
- Water Courses
- Flow Direction
- Site of Special Scientific Interest
- Special Area of Conservation
- Scheduled Ancient Monuments
- National Nature Reserve

RICARDO

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1:20,000

Note: All locations are approximate

This drawing incorporates Ordnance Survey Information

Project Title: Welsh Water Drought Plan Environmental Assessment

Figure Title: Study Area: 8202_1 Increase in the Llechryd abstraction

Figure Number: Figure 2.2

Date: February 2019

2.3 WELSH WATER'S DROUGHT PLANNING PROCESS

Water companies in England and Wales are required to prepare and maintain Statutory Drought Plans under Sections 39B and 39C of the Water Industry Act 1991, as amended by the Water Act 2003, which set out the management and operational steps a water company will take before, during and after a drought. The Water Industry Act 1991 defines a drought plan as '*a plan for how the water undertaker will continue, during a period of drought, to discharge its duties to supply adequate quantities of wholesome water,* with *as little recourse as reasonably possible to drought orders or drought permits*'.

The Drought Direction (Wales) 2017 states that revised Drought Plans should be submitted according to the following schedule:

> *4(b) for a revised drought plan –*
>
> *if section 39B(6)(a) of the Act applies, within 6 months after the date on which the material change of circumstances occurs; and*
>
> *if section 39B(6)(c) of the Act(c) applies, no later than 4 years after the date on which its drought plan, or its last revised drought plan, is published.*

2.4 STATEMENT OF THE NEED FOR DROUGHT ORDER

This section will be completed at the time of application for a drought order.

2.5 DROUGHT ORDER– REGULATORY ARRANGEMENTS

In periods of unusually low rainfall, when water resources become scarce, the Water Resources Act 1991, as amended by the Environment Act 1995 and the Water Act 2003, allows for three mechanisms for temporarily augmenting water supplies from rivers, lakes, reservoirs and groundwaters: drought permits; ordinary drought orders; emergency drought orders.

Drought permits are granted by NRW, and allow a water company powers to abstract from specified water sources, or to modify or suspend the conditions set out in existing abstraction licences. Drought orders are granted by the Welsh Ministers and give powers either to a water company or to NRW to abstract from specified water sources, or to modify or suspend the conditions set out in existing abstraction licences, but also to allow the discharge of water to specified places, modify or suspend conditions relating to a discharge or prohibit or limit particular non-essential uses of water as set out in the Drought Plan (Wales) Direction 2017. Emergency drought orders grant the same powers as a drought order, but in addition, confer powers to prohibit or limit water uses as specified by the water company and allow the set up and supply of water by means of standpipes and/or water tanks or rota cuts.

Drought permits and orders may be granted for a period of up to six months and they can be extended for up to a further six months.

As part of the drought order/permit application process, water companies are required to prepare an Environmental Report setting out anticipated effects of the proposal, including the effect on other abstractors and sufficient information to inform assessments, where applicable, in relation to the Habitats Directive, Countryside and Rights of Way Act (CRoW), and the Water Framework Directive (WFD).

Further information on the requirements for the environmental assessment and reporting according to legislation and national guidance are provided in Section 3.

2.6 REVIEW OF ALTERNATIVE OPTIONS

This section will be completed at the time of application for a drought order, setting out the alternative options to the drought order that Welsh Water has considered in addressing the risks to essential public water supplies due to drought.

2.7 PROPOSED DROUGHT ORDER DETAILS

In order to protect essential public water supplies within Welsh Water's Mid & South Ceredigion WRZ in the event of a future severe drought, Welsh Water may need to make an application to NRW for a drought order to vary the conditions of its abstraction licence of the Afon Teifi at Llechryd.

If granted, the drought order involves a proposed increase in the daily abstraction rate at the Llechryd intake, whereby the licence condition relating to the abstraction rate in any 24 hour period would be increased by 2Ml/d to 21Ml/d. This would also require amendment of the hourly abstraction rate condition. The drought order would increase the unsupported river abstraction from the Afon Teifi. The implementation of the drought order enables Welsh Water to increase abstractions and meet a temporary increased level of demand in the water resource zone.

The drought order is most likely to occur during the summer period. This has been confirmed by Welsh Water's water resources modelling.

Table 2.1 Afon Teifi at Llechryd Existing and Proposed Drought Order Abstraction

Abstraction Water Source	NGR	Normal Abstraction	Proposed Drought Order Abstraction	Benefit Ml/d
Afon Teifi at Llechryd	SN 22802 43492	Welsh Water's licence (number 22/62/3/0005) to abstract water under the Water Resources Act from the Afon Teifi at Llechryd includes the following conditions: • 5,750 million litres (Ml) authorised to be abstracted per annum • At a daily abstraction rate not exceeding 19Ml in any consecutive 24 hour period • At an abstraction rate not exceeding 0.8Ml in any hour • There are no river hands-off flow conditions in the abstraction licence. The abstraction is made directly from a river intake and pumped to nearby Llechryd Water Treatment Works (WTW) for treatment, from where it is put into supply. Llechryd WTW has a maximum capacity of approximately 21Ml/d.	The drought order involves a proposed increase in the daily abstraction rate at the Llechryd intake, whereby the licence condition relating to the abstraction rate in any 24 hour period would be increased by 2 Ml/d, from 19Ml/d to 21Ml/d. This would also require amendment of the hourly abstraction rate condition. The drought order would increase the unsupported river abstraction from the Afon Teifi. The implementation of the drought order enables Welsh Water to increase abstractions and meet a temporary increased level of demand in the water resource zone.	2 Ml/d

[Note: it will probably be necessary to remove the NGR for any public domain version]

2.8 DROUGHT ORDER PROGRAMME

Drought orders may remain in force for a period of up to six months, and they can be extended for up to a further six months. There is an all year period of implementation for this drought order, however implementation is likely to occur in the summer period, as confirmed by water resources modelling carried out by Welsh Water.

Prevailing weather conditions and rainfall in the intervening period may delay the requirement for applications, or even result in no requirement to apply. An order may be granted but not actually implemented if weather conditions improve or, equally, the order may only be partially implemented.

2.9 DROUGHT ORDER BASELINE

It is important for the assessment to establish the environmental "baseline" conditions that would exist in drought conditions but in the absence of the drought order being implemented. For the purposes of this assessment, the "without drought order" baseline includes the continuation of abstraction from the Afon Teifi at Llechryd in accordance with the abstraction licence conditions, including the continuation of a daily abstraction rate not exceeding 19Ml in any consecutive 24 hour period. The assessed drought order involves a temporary increase in the daily maximum licensed abstraction quantity at Llechryd, from 19Ml/d to 21Ml/d.

3 APPROACH

3.1 INTRODUCTION

The DPG states that the environmental report must include:

i. the likely changes in flow, level, channel/riparian form and sediment due to implementing the action;
ii. the features that are sensitive to these changes;
iii. potential impacts on sensitive features;
iv. a plan of baseline, in-drought and post-drought monitoring; and
v. mitigation or compensation measures that may be required

Items i and ii above were subject to an initial screening process as part of the scoping exercise. Section 3.2 below describes the approach taken. This has provided the relevant study area and a list of features scoped into the environmental assessment which are the subject of this EAR.

Section 3.3 describes how the environmental assessment has been undertaken, including discussion of the general approach, guidance used, provision of data, assessment methodologies and consideration of mitigation and monitoring. Limitations to the environmental assessment are described in Section 3.4, 4 and 5.

To set the context of the studies, it should be noted that EAR considers the environmental impacts of implementing a drought order during the worst environmental conditions (natural drought) that the order could be implemented in.

In accordance with the DPG and the Habitats Regulations, the assessment considers how the proposed drought order may affect the environment in combination with the effects of other existing abstraction licences, environment permits and other plans. This includes assessment of the potential cumulative effects of the following:

- Welsh Water's existing abstraction licences that operate within the hydrological zone of influence of the drought option, as well as other abstraction and discharge consents
- Assessment of cumulative impacts of the drought order with other Welsh Water supply side and drought permit / order options within the hydrological zone of influence (including both intra- and inter- zone options)
- Other plans and projects of relevance, including:
    - Welsh Water's WRMP schemes which are scheduled to be implemented and become operational within the time period of the revised Drought Plan (i.e. before 2025)
    - Drought options from other neighbouring water company Drought Plans,

Natural Resource Wales Drought Plans

- National Policy Statements for Wastewater and Renewable Energy Infrastructure.

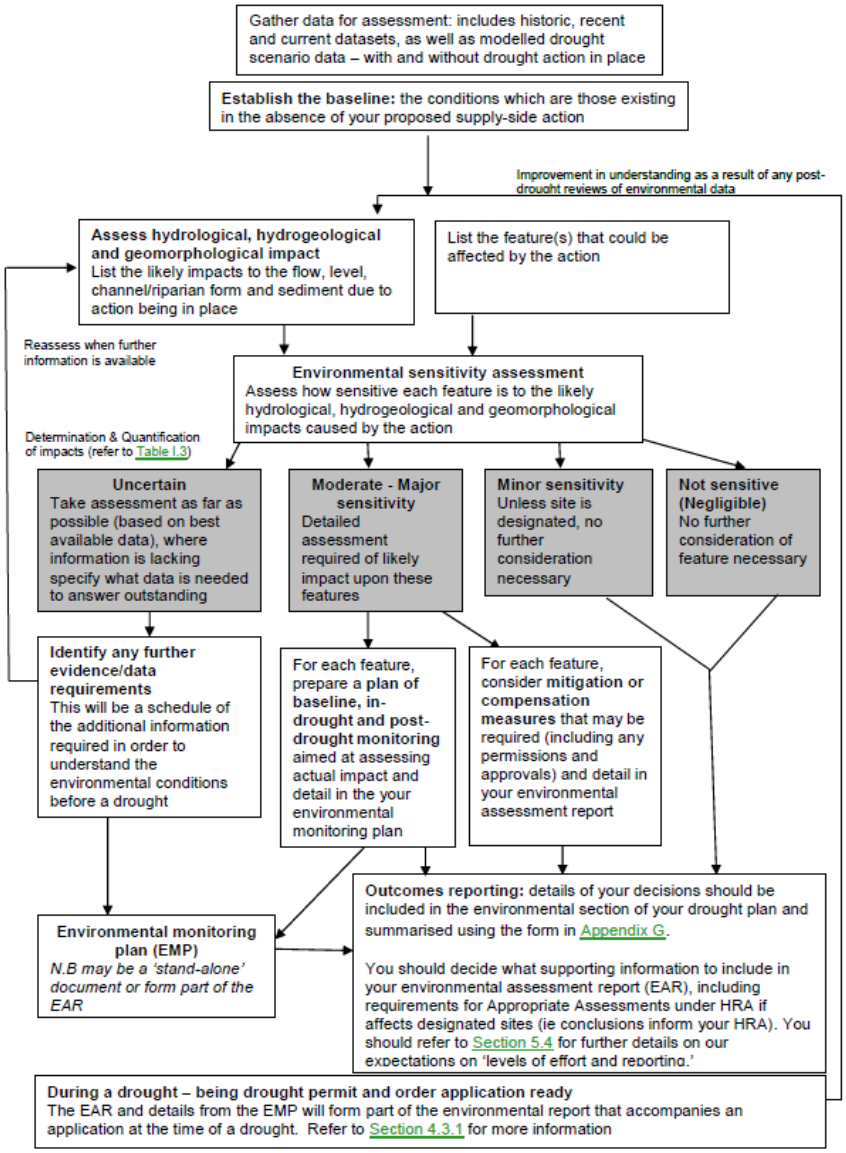
This is discussed further in Section 7.

3.2 APPROACH TO SCREENING AND SCOPING

3.2.1 Screening

Screening was undertaken using the DPG; specifically Section 5 and Appendix I. Figure 2 of the DPG (replicated in **Figure 3.1** below) identifies the environmental impact activities required.

Figure 3.1 Environmental Impact Activities Identified in the Drought Plan Guideline



The screening fulfils the requirement to "Assess how sensitive each feature is to the

likely hydrological, hydrogeological and geomorphological impacts caused by the action". Stage 1 (hydrological impact) fulfils the requirement to "List the likely impacts to the flow, level, channel/riparian form and sediment due to action being in place". Stage 2 (environmental sensitivity) fulfils the requirement to "list the feature(s) that could be affected by the action" and to "Assess how sensitive each feature is to the likely hydrological, hydrogeological and geomorphological impacts caused by the action"

It is important to acknowledge the basis of the assessment; i.e. impacts of drought order implementation should be considered in the context of what would occur without drought order implementation (see Sections 2.2, 2.7 and 2.9).

The approach to undertaking Stages 1 and 2 is described below.

Stage 1 – Hydrological and Hydrogeological Impact

Consideration is required (by the DPG) of the likely impacts on the hydrology, hydrogeology and geomorphology of every river reach, wetland or lake area influenced by the proposed drought management action, specifically:

- identify the drought conditions which trigger the proposed action;
- identify any changes that the action is likely to bring about, specifying their length, severity and location in relation to existing natural and artificial features;
- describe the likely conditions in the absence of the proposed action;
- describe how the likely conditions would differ with the action in place compared to the same (or analogous) watercourse under natural conditions; and
- identify the extent of the area affected by the planned actions.

The hydrogeological and hydrological information is used together with information on the other environmental features in the study area from Stage 2 - Environmental Sensitivity (see below) to identify the environmental risk of implementing the drought order.

Although the DPG informs the hydrometric data to be used as part of environmental features for consideration within the environmental assessment (see Box 1 Appendix I of the DPG), it does not provide a methodology for identifying the hydrological impact. A bespoke assessment has therefore been undertaken.

The full hydrological assessment approach is set out in **Appendix A**.

The output from these studies provides an understanding of the scale of change in the hydrological characteristics as a result of implementing the drought order. Where

changes have been identified, the potential significance of adverse or beneficial impacts has been assessed.

Quantitative and qualitative measures have been used to grade the impacts on surface waters. The assessment has identified the potential severity of impact based on the following criteria:

- **Positive or Negative Impact** – all impacts are considered to be negative unless otherwise stated in the feature assessment.
- **Extent** – the extent of the impact is covered as part of the magnitude consideration.
- **Magnitude** – the magnitude of the impact is identified as**:**
    - *High*: There is a long-term large-scale (i.e. catchment) change in the physical environment.
    - *Medium*: There is a short-term large-scale change or long-term short-scale (i.e. reach) change in the physical environment, however, no changes in the overall integrity of the physical environment.
    - *Low*: There is a short-term small-scale change in the physical environment, but its overall integrity is not impacted.
    - *Negligible*: No perceptible change in the physical environment.
- **Duration** – the duration of impact is considered to be for 6 months, which is the duration for which a drought option is implemented, unless otherwise stated.
- **Reversibility** – all hydrological impacts are considered to be reversible**.**
- **Timing and Frequency** – the drought option could be implemented at any point in the year, unless otherwise stated. The assessment is based upon the operation of a single drought order, with subsequent applications for a drought order required to consider cumulative effects of multiple drought order.
- **Probability** – all impacts are considered to be probable, unless otherwise stated.

The hydrological impact assessment is described fully in **Appendix B**.

Section 4 provides a summary of the hydrology and physical environment assessment as a result of implementing a drought order of the Afon Teifi at Llechryd.

Stage 2 - Environmental Sensitivity

With the extent and level of flow impact mapped, using GIS and other data sources, potentially sensitive receptors (sites / features) located within the extents of impact have been identified. Potentially sensitive features investigated in the screening have been drawn from Box 1 in Appendix I of the DPG. These include:

- designated biodiversity sites (Local Nature Reserve (LNR), National Nature Reserve (NNR), Marine Protected Areas, National Parks, Areas of Outstanding Natural Beauty (AONB), SSSI, Special Area of Conservation (SAC), Special Protection Area (SPA), Ramsar) and Environment (Wales) Act Section 7 species / habitats which are located on or within 500m of the impacted reaches;
- protected species;
- ecological communities (fish, bryophytes & lichen, macro-invertebrates, macrophytes, algae) and, where identified, Water Framework Directive (WFD) status of designated waterbodies which contain the impacted reaches;
- invasive non-native species;
- sensitive ecological features as advised by NRW;
- wider features which should be taken into account in determining the potential impacts of drought option implementation – specifically socio-economic & health, amenity & aesthetics, recreation, navigation, architectural & archaeologicalheritage.

Each of the identified sensitive receptors within the extent of impact have been listed, alongside a brief summary of their potential susceptibility to flow impacts. For designated sites, this has included an indication as to whether the sites have water dependent qualifying interests.

The environmental sensitivity of each site has been identified according to the ecological and nature conservation interests of the area and, in particular, the proximity of and / or connectivity with the designated protected area. Each site has been assessed according to whether the extent of hydrological influence includes or is considered to affect a designated or protected site. Designated or protected sites outside the extent of hydrological influence are considered not to be influenced by the drought order.

The outcome of Stage 1 and Stage 2 of the screening exercise are presented in Sections 4 and 5 respectively.

3.2.2 Scope

The screening exercise establishes the study area for the Afon Teifi at Llechryd drought order together with identification of relevant, sensitive environmental features within those study areas (based on the risk of them being impacted by the drought order during the period of its operation).

As set out in **Figure 3.1**, the environmental sensitivity screening identifies the outcome for each listed feature. Four outcomes are possible from the screening: uncertain; moderate-major sensitivity; minor sensitivity; not sensitive (negligible);

and identifies appropriate next steps. Sections 4.2 and 5.2 present the findings which show that a number of features were identified as either: 1) uncertain; 2) moderate-major sensitivity; or 3) minor sensitivity in a designated site and in accordance with the DPG are features for which further assessment work will be required. These features alone form the scope of monitoring, environmental assessment, and consideration of mitigation actions.

The DPG states that environmental assessment, mitigation and / or monitoring is not required for features where screening has identified a minor (unless a site is designated) or negligible impact. However, the requirement for assessment, monitoring and / or mitigation has been reviewed on a case-by-case basis. In some cases, mitigation and / or monitoring has been recommended where minor impacts are identified, where considered appropriate on a precautionary basis.

3.3 APPROACH TO ASSESSING IMPACTS, MITIGATION AND MONITORING

3.3.1 General Approach

The assessment approach is in accordance with legislation, national regulations and guidance, including:

- NRW (2017) Water Company Drought Plan Technical Guideline (DPG)
- Welsh Ministers (2017) The Drought Plan (Wales) Direction
- Institute of Environmental Management and Assessment (2004) Guidelines for Environmental Assessment
- Chartered Institute of Ecology and Environmental Management (CIEEM) (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland[3]
- UKWIR (2007, updated 2012) Strategic Environmental Assessment – Guidance for Water Resources Management Plans and Drought Plans. Prepared by Cascade Consulting
- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (Habitats Directive)
- Council Directive 2009/147/EC of 30 November 2009 on the conservation of wild birds
- The Convention on Wetlands of International Importance especially as Waterfowl Habitat , December 1975
- Conservation of Habitats and Species Regulations 2017

[3] CIEEM, Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial. Freshwater and Coastal. September 2018.

- The Countryside and Rights of Way Act 2000.

All aspects of the drought order of potential environmental significance are considered in the environmental assessment.

The DPG states that a water company should clearly show what evidence and data have been used in decision making, that uncertainties should be identified, and which additional data requirements are provided for through the environmental monitoring plan.

In accordance with the DPG the approach to the assessment addresses the following: i) potential effects on each sensitive receptor; ii) definitions for impacts (adverse / beneficial); iii) the data requirements; iv) assessment methodology (including the treatment of uncertainty where the complete data requirements are not available).

This EAR presents the environmental baseline, i.e. habitats and environmental pressures (including flow and water quality) in the study identified zone of hydrological influence without the drought order in place, utilising a description of the catchment, geomorphology, anthropogenic features and water quality. Key changes to the physical environment as a result of implementing the drought order have been identified and described and, where appropriate, this information is used to frame and support the assessments of features which have been scoped in further to the screening and scoping exercise (see Section 3.2).

3.3.2 Assessment Methodologies

The aim of the Environmental Assessment is to provide:

- A clear summary of the outcome of each assessment (per feature) from which NRW can readily identify the significance of the impact when determining the drought order application
- Identification of those predicted impacts which are to be taken forward to consider additional monitoring and mitigation actions.

The assessment considers the environmental impacts of implementing the drought order against baseline operating conditions of Welsh Water's abstraction licence in advance of drought order implementation. Environmental sensitivity has been assessed considering the context of the timing of drought order implementation. **It is important to acknowledge the basis of the assessment; i.e. impacts of drought order implementation are assessed against what would occur without drought order implementation**.

The impact assessment for sensitive features is feature specific and is dependent on the availability and resolution of available data. Where possible, quantitative assessments have been undertaken. However, for many features, it is acknowledged

that the assessments are qualitative and based on professional judgement, and using, where relevant, experience of local knowledge and reference to literature. This introduces uncertainty into the impact assessment. A precautionary approach has been used to assigning impact significance where data are absent or found not to be robust.

The assessment of impacts on designated sites has been undertaken using professional judgement with reference to conservation objectives and condition status of habitats and species, for which a site has been designated. The ecological assessment has been undertaken recognising the IEMA[4,5] and the CIEEM study guidelines[6]. The assessment of impacts on other environmental receptors e.g. recreation and landscape has been carried out largely by qualitative expert judgement.

Assessment of impacts on specific features has then been undertaken. Specific assessment methodologies have been developed for key environmental features. These are set out in **Appendix C** (assessment methodologies for the ecological assessment of Environment (Wales) Act Section 7 species, designated sites and other flora and fauna).

Other abstractors, including other water company abstractions, are features that have been reviewed within the assessment. This has been undertaken to determine whether other abstractors could potentially be affected by changes to surface water flows and levels as a result of implementation of the drought order.

3.3.3 Mitigation and Monitoring

Section 5.3 of the DPG identifies the specific requirements for mitigation of serious impacts on the environment as a result of implementing a drought management measure. The assessments undertaken in this EAR confirm the features requiring consideration of mitigation and appropriate monitoring triggering mitigation. Appropriate mitigation actions identified are both available and practicable.

The DPG also identifies the specific requirements for monitoring. The assessments undertaken in this EAR inform the features requiring consideration for monitoring prior to, during, or after implementation of the drought order.

The mitigation and monitoring proposals (see Sections 6 and 10) will act as a safeguard that responds and is responsive to both predicted and unpredicted drought impacts. Future data collection and monitoring can then be focused to identify the aquatic ecosystem interaction to better quantify the potential impacts where gaps in the evidence base are identified and ensure the appropriate targeting of monitoring and

[4] IEMA (2004) Guidelines for Environmental Impact Assessment.
[5] IEMA (2011) Special Report – The State of Environmental Impact Assessment Practice in the UK
[6] CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland.

mitigation response. The EMP will need to be finalised in agreement with NRW.

3.4 LIMITATIONS OF THE ASSESSMENT AND UNCERTAINTIES

The DPG states that a water company should clearly show what evidence and data have been used in decision making, that uncertainties should be identified, and which additional data requirements are provided for through the environmental monitoring plan.

The assessment presented in this document draws on available information from surveys and investigations undertaken by Welsh Water, NRW, as well as other bodies over a number of years. Reference has also been made to wider studies from published and grey literature, i.e. academic literature that is not formally published, where appropriate.

Specific details are provided on the quality of the data collected and used in the assessment. Where uncertainties remain with respect to the quantification and prediction of impacts, the limitations and any assumptions made are included in the relevant technical sections (Sections 4 and 5).

Overall, it is considered that the conclusions are based on information that is robust and valid at the time of writing. However, it should be noted that this EAR would be updated to support any future actual application, including a review of data.

4 AFON TEIFI AT LLECHRYD DROUGHT ORDER - HYDROLOGY AND THE PHYSICAL ENVIRONMENT

4.1 INTRODUCTION

Consideration of hydrology and the water physical environment sets the context for the potential range of environmental effects of the drought order. **Appendix B** sets out an assessment of the potential impacts on the physical environment of the Afon Teifi at Llechryd during the period of implementation of the drought order. The "without drought order" baseline is set out in Section 2.9.

The water physical environment assessment includes consideration of hydrology and hydrodynamics; geomorphology; and water quality. The assessment has three key objectives:

1. It is used to "list likely changes in flow, level, channel/riparian form and sediment due to implementing the action' as required by the DPG and set out in Figure 2 of the DPG
2. It is used to support the screening and assessment of sensitive features (including ecological features and designated sites) as required by the DPG and set out in Section 5 of this report
3. Where sensitive features are the physical environment itself, it provides supporting technical information for their screening and assessment.

Each of these are summarised below.

4.2 SUMMARY OF STAGE 1 SCREENING

This fulfils the DPG requirements of Stage 1 of the screening of potential drought order impacts, identifying the likely changes in flow / level regime due to implementing the drought order. The specific requirements of the DPG are summarised as:

- identify any changes that the drought order is likely to bring about, specifying their length, severity and location in relation to existing natural and artificial features (e.g. flow, water level, channel dynamics and sediment changes);
- describe the likely conditions in the absence of the drought order;
- describe how the likely conditions would differ with the drought order in place compared to the same (or analogous) watercourse under natural conditions; and
- identify the extent of the area affected by your planned actions.

These requirements are addressed in the following sections.

1. The perceived extent of potential impact:

The study area (see **Figure 2.2**) is identified as the Afon Teifi from Welsh Water's Llechryd intake (around 4.4km upstream) to the tidal limit, a catchment area of around 910km^2.

2. The nature and duration of the potential impact:

A description of the likely conditions with the drought order in place, in comparison to the baseline conditions (absence of the proposed action) is provided in **Appendix B**. Given the conditions of the proposed drought order, the key areas for the assessment of the physical environment have been identified as:

- Change in river flows downstream of Welsh Water's Llechryd intake.

The **Appendix B** assessment has been summarised in **Table 4.1** in terms of the magnitude and duration of each of these potential physical environment impacts.

3. The length of the potential impact:

The **Appendix B** assessment has been summarised in **Table 4.1** in terms of the timing of each of the potential physical environment impacts. The drought order is most likely to occur during the summer period.

4.3 SUMMARY OF POTENTIAL EFFECTS ON THE PHYSICAL ENVIRONMENT

The potential changes to the physical environment (water quality and geomorphology) due to implementation of the drought order are summarised in **Table 4.1.** These impacts are presented in detail in **Appendix B**.

Table 4.1 Summary of Potential Hydrodynamic and Water Quality Impacts of the Drought Order

Afon Teifi (Reach 1)	
Flows in the Afon Teifi *Negligible impacts for six months from summer/early autumn onwards*	• Small decrease (up to 1.8%) in summer low and extreme low flows, with negligible effects on hydrology and geomorphology
Afon Teifi (Reach 2)	
Flows in the Afon Teifi *Negligible impacts for six months from summer/early autumn onwards*	• Small decrease (up to 1.8%) in summer low and extreme low flows, with negligible effects on hydrology and geomorphology

4.3.1 Support to the Screening and Assessment of Sensitive Features

The assessment included in **Appendix B** has provided information to support the screening and assessment of sensitive features in Section 5. This includes information on short and long term (acute and chronic) direct and indirect, cumulative, and permanent and temporary effects. The assessment is also specific on the difference between the drought order impacts and the baseline condition without a drought order in place.

4.3.2 Supporting Technical Information for Assessment of any Physical Environment Sensitive Features

As described in Section 5, several sensitive features relate to the physical environment, rather than ecology or human interaction (e.g. landscape, recreation). The assessment included in **Appendix B** has provided supporting technical information for their screening and assessment in Section 5.

5 AFON TEIFI AT LLECHRYD DROUGHT ORDER ENVIRONMENTAL FEATURES ASSESSMENT

5.1 INTRODUCTION

In compliance with the DPG, environmental sensitivity screening has been undertaken within the zone of hydrological influence. As set out in **Box 1** above, further environmental assessment is neither required nor included for features where screening has identified a minor (where there are no environmentally designated sites) or negligible impact.

Points of interest referred to throughout the text in Section 5 are indicated on **Figure 2.2**.

5.2 SUMMARY OF STAGE 2 SCREENING AND SCOPING

5.2.1 Designated Sites and Other Sensitive Fauna and Flora

In accordance with the DPG, **Table 5.1** identifies designated biodiversity sites (including LNR, NNR, SSSI, SAC, SPA), Environment (Wales) Act Section 7 species / habitats and other sensitive receptors that could be affected by the drought order. Susceptibility to the flow / level impacts resulting from the drought order (see Section 4) is identified according to whether interest features of the site or the species are water dependent. Sensitivity is then determined according to professional judgment based on susceptibility and the level of hydrological impact at the location.

Table 5.1 Designated Sites and Other Sensitive Receptors Within the Zone of Influence of the Afon Teifi at Llechryd Drought Order

Site/Feature and designation	Hydrological Impact at Location (Major, Moderate, Minor)	Susceptibility to flow and level impacts	Sensitivity (Uncertain, Moderate/ Major, Minor, Negligible)	Further Consideration Required (Yes/No)
Afon Teifi SSSI/SAC	Negligible	The sites are designated for aquatic ecological features including a number of different habitats and species including bullhead; river, brook and sea lamprey; otter; Atlantic salmon; and water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation, which will be sensitive to flow and level changes.	Negligible	No
Coed-a-Corsydd-Aber Teifi SSSI	Negligible	The Teifi woodland and estuarine SSSI, the lower reaches of the estuarine are noted for Pentood marsh an extensive area of fresh water-salt water marshland. The upper regions contain unvegatated mudflats, rich feeding grounds for birds. The middle reaches contain Roe hill marsh; a rare estuarine/terrestrial mire habitat; Teifi gorge woods; notable ancient woodland habitat containing multiple important species of lichen and sensitive ground flora and Hafod wen; unimproved pasture containing extensive mosaic habitats.	Negligible	No
Notable Species – Fish Bullhead *Cottus gobio* River lamprey Lampetra fluviatilis Brook Lamprey *Lampetra planeri* Sea Lamprey *Petromyzan marinus* Atlantic Salmon *Salmo salar*	Negligible	**Afon Teifi** is noted for containing fish species such as; bullhead, river lamprey, brook lamprey, sea lamprey and Atlantic salmon.	Negligible	No
Notable Species – Mammals Otter *Lutra lutra*	Negligible	Afon Teifi is known to host otter populations *Luttra luttra*.	Negligible	No
Notable Species – Macrophytes Floating water plantain *Luronium natans* Water crowfoot *Ranunculion fluitantis* American shoreweed *Litorella uniflora*	Negligible	The Afon Teifi contains notable macrophytes including; floating water plantain, water crowfoot and American shoreweed.	Negligible	No
Invasive flora and fauna	Negligible	The negligible hydrological impact is not anticipated to change the status of invasive flora and fauna.	Negligible	No

Site/Feature and designation	Hydrological Impact at Location (Major, Moderate, Minor)	Susceptibility to flow and level impacts	Sensitivity (Uncertain, Moderate/ Major, Minor, Negligible)	Further Consideration Required (Yes/No)
Landscape and visual amenity	Negligible	The study area covers five areas of cultural landscape; Teifi valley historic landscape, Lowland landscape, Teifi Valley (Pembrokeshire) and Crymych. However, given the negligible hydrological impacts no material impact on landscape or visual amenity are anticipated.	Negligible	No
Archaeology	Negligible	Five ancient monument sites fall within 500m of the reach including; Cilgerran Castle, Llechryd Bridge, Castle Malgwyn Bridge, Cilgerran Castle Additional Area and Onnen-Deg Defended Settlement (fort). However, given the negligible hydrological impacts no material impact on archaeology are anticipated.	Negligible	No

5.2.2 WFD Waterbody Status

Table 5.2 identifies the WFD status classification of the WFD waterbodies that may be impacted by implementation of the drought order. Waterbodies classified as overall high / good status / potential, and / or high / good ecological status for fish or macroinvertebrates are likely to be more sensitive to flow impacts. **Table 5.2** summarises the risk to WFD status and indicates where further assessment has been carried out as reported in Section 5.3 below.

Table 5.2 WFD Status Classifications

Waterbody Name	**Teifi - Afon Ceri to estuary (GB110062043563)**	
Hydrological Impact at Location (Major, Moderate, Minor, Negligible)	Negligible	
Heavily Modified Waterbody (Y/N)	No	
RBMP Cycle	RBMP2 (2015)[7]	2018 C2 Interim[8]
Overall Biological	Moderate	Moderate
Fish	High	High
Macrophytes	Not assessed	Good
Phytobenthos	Moderate	Moderate
Macro-invertebrates	High	High
Total P/ Phosphate	Good	Good
Ammonia	High	High
Dissolved Oxygen	High	High
pH	High	High
Sensitivity (Uncertain, Moderate/ Major, Minor, Not sensitive)	Not Sensitive	
Further Consideration Required (Y/N)	No	

5.3 FEATURES ASSESSMENT

The hydrological impact of the drought permit has been assessed as negligible. Screening has not identified any environment features for which environmental assessment is required. No environmental impacts have, therefore, been identified for any of the features identified in screening (see Section 5.2).

[7] NRW (2017) https://drive.google.com/file/d/0B2hsDbbdxz1tZHItRU9lNkg1YWs/view.
[8] NRW (2018) https://drive.google.com/file/d/14w17jL05sNuToVELqMCK_yc6DdHU7STb/view

6 AFON TEIFI AT LLECHRYD DROUGHT ORDER– MITIGATION

The hydrological impact of the drought order has been assessed as negligible. Screening has not identified any environment features for which environmental assessment is required and, therefore, no mitigation is required during drought order implementation.

7 CUMULATIVE IMPACTS

In accordance with the DPG and the Habitats Regulations, consideration has been given to how the proposed drought order may affect the environment in combination with the effects of existing abstraction licences, environmental permits and other plans. This includes assessment of the potential cumulative effects of the following:

- Welsh Water's existing abstraction licences that operate within the hydrological zone of influence of the drought option, as well as other abstraction licences and discharge permits, as identified in NRW Review of Consents reports;
- Assessment of cumulative impacts of the drought order with other Welsh Water supply-side and drought order options within the hydrological zone of influence (including both intra- and inter- zone options);
- Other plans and projects of relevance, including;
  - Any Welsh Water WRMP schemes which are scheduled to be implemented and become operational within the time period of the Drought Plan (i.e. before 2025).
  - Drought supply-side and drought order / permit options from NRW Drought Plans.
  - National Policy Statements for Wastewater and Renewable Energy Infrastructure.
- Environmental monitoring before, during and after drought order implementation (see Section 10).

If a drought order application is progressed in the future, the potential for cumulative effects will be reviewed and revised to reflect any changes which are relevant to the timing of the drought order specified in the application.

Welsh Water's existing abstraction licences and other abstraction licences and discharge permits

The assessment of hydrological impacts presented in **Appendix B**, and summarised in Section 4, has considered how the proposed drought order may affect the environment in combination with the effects of existing licences and consents. Therefore no relevant licences or consents have been identified as relevant for assessment of cumulative effects.

Other relevant Welsh Water drought permit / orders

No cumulative effects of implementing the Afon Teifi at Llechryd drought order with other drought order / permit schemes have been identified. However, this should be

reviewed at the time of any future application for a drought order of the Afon Teifi at Llechryd .

Welsh Water WRMP schemes

No WRMP schemes identified with cumulative impacts.

NRW Drought Plans

No cumulative impacts of options in NRW Drought Plan with a drought order of the Afon Teifi at Llechryd are anticipated. However, this should be reviewed at time of future application for a drought order.

National Policy Statements for Wastewater and Renewable Energy Infrastructure

No cumulative schemes have been identified for assessment.

Environmental Monitoring

Recommendations for environmental monitoring before, during and after drought order implementation have been made in the EMP which is presented in Section 10 of this EAR. The EMP has been developed in consultation with NRW.

It is assumed that all monitoring activities will be undertaken with the best interests of the site in mind, and in discussion and agreement with NRW. Where activities which require in-river working are proposed, a method statement for the survey will be prepared and agreed with NRW in advance of the survey.

Assuming rigorous implementation of the method statements, there will be no adverse impacts of the monitoring on hydrology, water quality or ecology, and no adverse impacts of environmental monitoring on the site are anticipated.

8 AFON TEIFI AT LLECHRYD DROUGHT ORDER - SUMMARY OF RESIDUAL IMPACTS

The residual impact on environmental features is dependent on the effects observed during environmental monitoring, and the mitigation measures that are taken forward and their timely and effective application once the trigger for their need has been identified.

At this stage, no mitigation measures have been identified as required as the hydrological influence of the drought order has been assessed as negligible (see Section 4).

9 HABITATS REGULATIONS ASSESSMENT: STAGE 1 SCREENING

The.

9.1 INTRODUCTION

Under Regulation 63 of the Habitats Regulations, the competent authority (in the case of a drought order in Wales this would be Welsh Ministers, advised by NRW) is required to undertake an Appropriate Assessment of any plan / project which is likely to have a significant effect on a European site, to determine the implications for the site in view of the site's conservation objectives. The Regulations state that a person applying for any such consent (in this case Welsh Water), must provide such information as the competent authority (Welsh Ministers, advised by NRW) may reasonably require for the purposes of the assessment or to enable them to determine whether an appropriate assessment is required.

9.1.1 HRA Stages

Stage 1 – Screening

The first stage in the Habitats Regulations Assessment (HRA) is screening to determine the potential of the drought order to have a likely significant effect (LSE) on any European site (either alone or in-combination with other plans and projects) and thus if a full 'Appropriate Assessment' of any of the drought order would be required.

An in-combination assessment is carried out to establish the possibility of cumulative or synergistic impacts.

The screening stage identifies if the drought order is likely to have significant effects on European designated site, and requires Appropriate Assessment.

Stage 2 – Appropriate Assessment

Drought orders that are identified during HRA Screening (Stage 1) as having LSEs (either alone or in combination) will be taken forward to Appropriate Assessment. The Appropriate Assessment will consider the impacts of the drought order, against the conservation objectives of a European Site, in order to identify whether there are likely to be any adverse effects on site integrity and site features. The assessment will conclude whether or not the drought order, either alone or in combination with other plans and projects, would adversely affect the integrity of the European site in question. This is judged in terms of the implications of the plan for a site's conservation objectives, which relate to its 'qualifying features' (i.e. those Annex I habitats, Annex II species, and Annex I bird populations for which it has been designated). The

responsibility for undertaking the Appropriate Assessment lies with the (Welsh Ministers, advised by NRW).

Stage 3 – Alternative Options Stage

Where significant adverse effects are identified at the Appropriate Assessment stage, alternative options would be examined to avoid any potential damaging effects to the integrity of the European site.

Stage 4 – Assessment where adverse impacts remain

Stage 4 comprises an assessment of compensatory measures where, in the light of an assessment of Imperative Reasons of Overriding Public Interest, it is deemed that the project or plan should proceed. Imperative Reasons of Overriding Public Interest will only be progressed if no alternatives are identified as part of Stage 3.

9.2 STAGE 1 SCREENING OF AFON TYWI DROUGHT ORDER

The objective of this section is to bring together all relevant information to enable a screening exercise to be undertaken of the impacts of the Afon Teifi at Llechryd drought order on relevant European designated sites.

These assessments have been completed in accordance with the DPG (see Section 3.3).

This section considers each of the Afon Teifi SAC qualifying features and discusses the potential for the Afon Teifi at Llechryd drought order to influence their status. For species, impacts on populations, range and supporting habitats and species have been considered.

9.2.1 Potential Impacts on Afon Teifi SAC Qualifying Features

In carrying out the screening process, the assessment has considered the main possible sources of effects on the sites arising from the potential drought order, possible pathways to the designated sites and the effects on possible sensitive receptors in the sites. Only if there is an identifiable pathway between the impacted reaches and the designated sites, or individual receptors, is there likely to be an impact and where this is absent those sites have been screened out.

The screening assessment has also considered the Afon Teifi SAC conservation objectives. The development of conservation objectives is required by the 1992 'Habitats' Directive (92/43/EEC). In accordance with the Habitats Directive, the objectives aim to achieve the 'favourable conservation status' of habitats and species features for which SAC is designated (see **Figure 9.1**).

Site-specific conservation objectives provide a description of what is considered to be the favourable conservation status of the feature within the whole plan area.

Conservation objectives for the site have been prepared by NRW.

In addition to the conservation objectives, the Core Management Plan has been used to determine LSEs against each of the specific attributes and targets for each of the qualifying features. A summary of the overall screening conclusion for each feature is provided below, with **Table 9.1** providing the assessment against each attribute and target.

Figure 9.1 Favourable conservation status as defined in Articles 1(e) and 1(i) of the Habitats Directive

"The conservation status of a natural habitat is the sum of the influences acting on it and its typical species that may affect its long-term natural distribution, structure and functions as well as the long term survival of its typical species. The conservation status of a natural habitat will be taken as favourable when:

- *Its natural range and areas it covers within that range are stable or increasing, and*
- *The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and*
- *The conservation status of its typical species is favourable.*

The conservation status of a species is the sum of the influences acting on the species that may affect the long-term distribution and abundance of its populations. The conservation status will be taken as 'favourable' when:

- *Population dynamics data on the species indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and*
- *The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and*
- *There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis."*

European otter

This species is not expected to be impacted by the drought order implementation. Habitat availability and quality for otter is not anticipated to be altered, as such, it can be concluded that the drought order will <u>not have likely significant effects on the feature</u>.

Water Courses of Plain to Montane Levels with the Ranunculion fluitantis and Callitricho-Batrachion Vegetation

The reaches impacted by this drought order are located within Management Units 2 of the Afon Teifi SAC. The Core Management Plan identifies that Annex II habitat Rivers with *Ranunculion fluitantis and Callitricho-Batrachion* vegetation is "not present" within this management unit[9].

As a result, it can be concluded that implementation of a drought order will have no likely significant effects on the water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation feature in Reaches 1 and 2 within the Afon Teifi SAC.

Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea

The reaches impacted by this drought order are located within Management Units 2 of the Afon Teifi SAC. The Core Management Plan identifies that oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* as present in Unit 7. As such, the Annex II habitat is not present within the hydrological zone of influence.

As a result, it can be concluded that implementation of a drought order will have no likely significant effects on the oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* feature in Reaches 1 and 2 within the Afon Teifi SAC.

Floating water-plantain Luronium natans

The reaches impacted by this drought order are located within Management Units 2 of the Afon Teifi SAC. The Core Management Plan identifies that oligotrophic to mesotrophic standing waters with vegetation of the floating water-plantain *Luronium natans* as present in Unit 4 & 5. As such, the Annex II habitat is not present within the hydrological zone of influence.

As a result, it can be concluded that implementation of a drought order will have no likely significant effects on the floating water-plantain *Luronium natans* feature in Reaches 1 and 2 within the Afon Teifi SAC.

Brook, river and sea lamprey

Migrating adult sea lamprey, spawning adults and dead individuals are reported from the lower reaches of the Teifi each year, regularly occurring as far upstream as Henllan (Unit 2). In 2007 (a wet summer) spawning adults were recorded at Llandysul.

[9] Natural Resources Wales (2017) Core Management Plan Including Conservation Objectives for Afon Teifi/River Teifi Special Area Of Conservation.

Anecdotal evidence suggests that both brook lamprey and river lamprey are likely to be present in many reaches of the Afon Teifi, though brook lamprey are expected to predominate in the headwaters and river lamprey may be the more abundant species in the main channel and the lower reaches of larger tributaries. The drought order will result in a decrease in low and extreme low flows of 1% and 1.8% respectively. This will not affect wetted width and depth. As such, there is limited potential for reduced flow to result in a decrease in river levels and wetted width throughout the areas of the Teifi where juvenile lamprey species are considered present. This has particular significance for juvenile (ammocoetes and transformer) lamprey habitat which tends to consist of silt in shallow, marginal areas and is utilised year-round. The drought order could also be implemented during the latter parts of the downstream migration period of river and sea lamprey. The potential decreases in flow are with in the flow targets for the SAC (<10% of Q_{95} flows), and will not affect downstream passage. As such, it is concluded that there would be no likely significant effects to the populations.

Bullhead

Records obtained from juvenile salmon monitoring show that bullhead are widespread in the main river and tributaries. Although there is a need for quantitative information on bullhead abundance, it is assumed that bullhead is present throughout the hydrological zone of impact. The potential decreases in flow are within the flow targets for the SAC (<10% of Q_{95} flows), and will result in negligible impacts on wetted width and depth. As such, it is concluded that there would be no likely significant effects to the populations.

Atlantic salmon

The Conservation Limit for adult run size has been exceeded in nine out of the past ten years, but for juvenile population densities, around 50% of the surveys carried out between 1995-2005 produced densities at a level to cause concern (categories D-F) with little improvement observed in recent years. The drought order could affect the Atlantic spring spawning run, especially the latter parts of the spawning runs (April and May). The drought order could also impact on juvenile densities and potentially the downstream smolt migration (occurring between March and May). However, potential decreases in flow are within the flow targets for the SAC (<10% of Q_{95} flows), and will result in negligible impacts on wetted width and depth. As such, it is concluded that there would be no likely significant effects to the populations.

Table 9.1 Summary of Likely Significant Effects of Afon Teifi at Llechryd Drought Order Implementation Against Conservation Objectives for the Afon Teifi SAC

Feature	Attribute (taken directly from Natural Resources Wales Conservation Objectives document)	Site Specific Target range and Measures	Potential Impact of Drought Order	LSE?
Sea Lamprey	Distribution within catchment	Any silt beds adjacent to or downstream of suitable spawning sites should contain *Pertromyzon* ammocoetes.	The potential decreases in flow are within the flow targets for the SAC (<10% of Q_{95} flows), and will not affect downstream passage. The changes in flow will result in negligible impacts on wetted width and depth resulting in negligible impacts on nursery and spawning habitat. As such, it is concluded that <u>there would be no likely significant effects</u> to the populations.	No
		Spawning adults to be reported from units 1-2 in at least 5 years out of 6		No
	Ammocoete density	Ammocoetes should be present in at least four sampling sites each not less than 5km apart.		No
Brook Lamprey and River Lamprey	Age/size structure of ammocoete population	Samples < 50 ammocoetes 2 size classes Samples > 50 ammocoetes at least 3 size classes	The potential decreases in flow are within the flow targets for the SAC (<10% of Q_{95} flows), and will not affect downstream passage. The changes in flow will result in negligible impacts on wetted width and depth resulting in negligible impacts on nursery and spawning habitat. As such, it is concluded that <u>there would be no likely significant effects</u> to the populations.	No
	Distribution of ammocoetes within catchment	Present at not less than 2/3 of sites surveyed within natural range No reduction in distribution of ammocoetes		No
	Ammocoete density	Optimal habitat: >10 m^{-2} Overall catchment mean: > 5 m^{-2}		No
Atlantic salmon	Adult run size	Conservation Limit complied with at least four years in five	The potential decreases in flow are within the flow targets for the SAC (<10% of Q_{95} flows), and will not affect upstream migration of adults of the downstream passage of smolt. The changes in flow will result in negligible impacts on wetted width and depth resulting in negligible impacts on juvenile and spawning habitat. As such, it is concluded that <u>there would be no likely significant effects</u> to the populations. Assessment of the risk associated with water quality has determined negligible impacts on water temperature and dissolved oxygen.	No
	Juvenile densities	Expected densities for each sample site using HABSCORE		No
	Water quality – biological	Biological GQA class A		No
	Water quality – chemical	RE1		No
	Hydromorphology – flow	Targets are set in relation to river/reach type(s).		No
Bullhead	Population densities	No less than 0.2 m^{-2} in sampled reaches	The potential decreases in flow are within the flow targets for the SAC (<10% of Q_{95} flows), and will not affect downstream drift of young-of-the year fish. The changes in flow will result in negligible impacts on wetted width and depth resulting in negligible impacts on spawning habitat. As such, it is concluded that <u>there would be no likely significant</u>	No
	Distribution	Bullheads should be present in all suitable reaches. As a minimum, no decline in distribution from current.		No
	Reproduction/ age structure	Young-of-year fish should occur at densities at least equal to adults		No

Feature	Attribute (taken directly from Natural Resources Wales Conservation Objectives document)	Site Specific Target range and Measures	Potential Impact of Drought Order	LSE?
			effects to the populations.	

9.2.2 Summary

In summary, likely significant effects have been identified for the brook and river lamprey, Atlantic salmon and bullhead populations within the River Usk SAC as a result of the implementation of the drought order.

A Stage 2 Appropriate Assessment has therefore been carried out to identify whether the implementation of the drought order will result in adverse effects on the site's conservation objectives and therefore whether the overall site integrity would be compromised. This is reported separately.

9.2.3 Cumulative and In-combination Impacts

The Habitats Directive requires a consideration in the assessment of '*any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plan or projects*'.

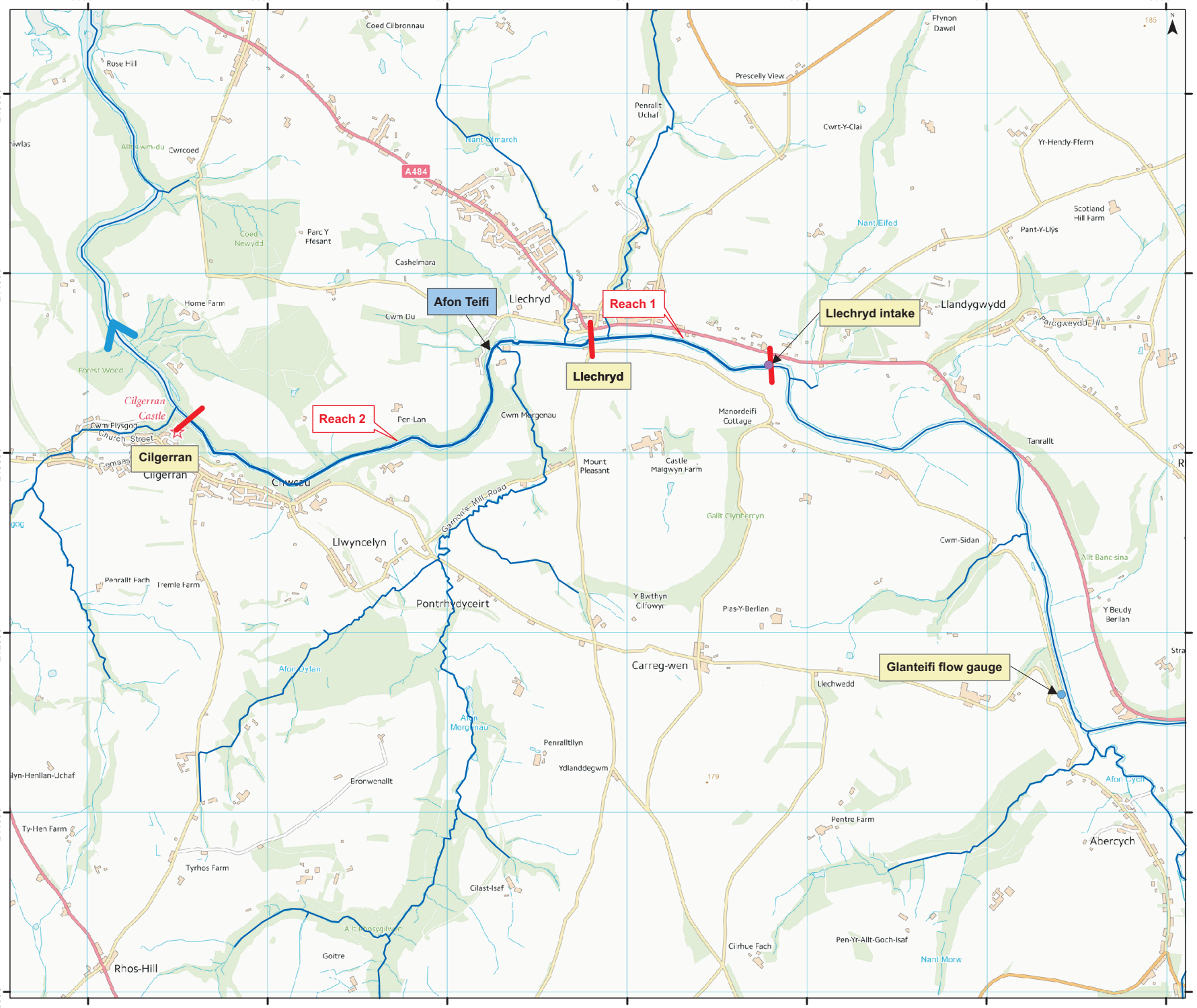
Consideration of potential plans or projects with in-combination effects is presented in Section 7, and the Stage 2 Appropriate Assessment.

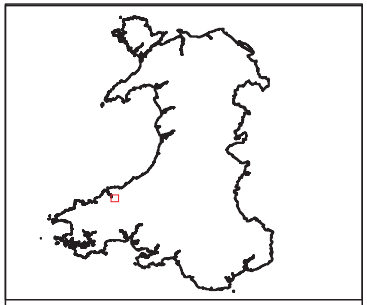
10 ENVIRONMENTAL MONITORING PLAN (EMP)

The hydrological impact of the drought order has been assessed as negligible. Screening has not identified any environment features for which environmental assessment is required and, therefore, no feature specific monitoring will be required.

However, it is recommended that current hydrological monitoring should continue to be carried out during the development of drought conditions and implementation of the drought order, in order to monitor the adherence (or otherwise) of the river system to that expected from the baseline assessment in Section 4. Such monitoring is mapped on **Figure 10.1,** and should include:

- Daily abstraction data from Llechryd River intake;
- Glanteifi flow gauge daily river flow data.





Legend

- Flow Gauge
- Abstraction
- Hydrological Reach
- Water Courses
- Flow Direction

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1:20,000

Note: All locations are approximate

Project Title: Welsh Water Drought Plan Environmental Assessment

Figure Title: Environmental Monitoring: 8202-1 Increase in the Llechryd abstraction

Figure Number:	Date:
Figure 10.1	February 2019

11 CONCLUSIONS

This EAR provides an assessment of the potential environmental impacts relating to the implementation of the Afon Teifi at Llechryd drought order. If granted and implemented, the drought order would enable Welsh Water to temporarily increase the abstraction of the Afon Teifi by 2Ml/d, enabling Welsh Water to meet a temporary increased level of demand in the water resource zone.

The scope of the assessment has been defined by an impact screening and scoping exercise. In accordance with the DPG, the screening exercise involved two stages, a hydrological impact assessment (Stage 1) and the identification of the environmental features that could be affected by the drought order (Stage 2).

The hydrological impact assessment identified a **negligible** impact on flows in the Afon Teifi.

The DPG states that further environmental assessment is not required for features where screening has identified a minor (if there are no designated environmental sites) or negligible impact. Screening has not identified any environment features for which further environmental assessment is required. No environmental impacts greater than negligible have, therefore, been identified for any of the features identified in the screening exercise. In light of this and in accordance with the DPG no mitigation or feature specific monitoring is identified. However, hydrological monitoring has been recommended during the development of drought conditions and implementation of the drought order, in order to monitor the adherence (or otherwise) of the river system to that expected from the assessment presented in this EAR.

No cumulative effects of implementing the drought order with existing licences, consents and plans are currently anticipated. However, this should be reviewed at the time of any future application for a the Afon Teifi at Llechryd drought order.

APPENDIX A
HYDROLOGY AND HYDROGEOLOGY METHODOLOGY

A.1 HYDROLOGICAL AND HYDROGEOLOGY IMPACT METHODOLOGY (STAGE 1 SCREENING)

Consideration is required (by the DPG[1]) of the likely changes in flow / level regime due to implementing the drought management action, specifically:

- the perceived extent of potential impact
- the nature and duration of the potential impact
- the timing of the potential impact.

The hydrogeological and hydrological information is used together with information on the other environmental features in the study area from Stage 2 - Environmental Sensitivity (see Section 3.2.1 in main report) to identify the environmental risk of the drought order / permit.

Although the DPG informs the hydrometric data to be used as part of environmental features for consideration within the environmental assessment (see Box 1 Appendix H of the DPG), it does not provide a methodology for identifying the hydrological impact.

Cascade has developed a flexible approach[2] to identifying the spatial extent of the study area from hydrological information and characterising the hydrological impact within the study area, in terms of the scale, nature, duration and timing of impacts, although this is only appropriate to apply to reaches that do not dry naturally. A hydrological methodology for watercourses that naturally dry for part of the year is also presented that characterises the hydrological impact within the study area, in terms of the scale, nature, duration and timing of impacts. These are presented below.

<u>Perennially flowing watercourse hydrological methodology</u>

This methodology is applied to watercourses that flow throughout the year and that are potentially impacted on by the drought order / permit.

Core to this approach is the use of relevant long term flow statistics to inform the scale of hydrological impact and thereby delimit the zone of influence in the downstream river system. To determine these, potential reductions in flow resulting from implementation of the drought order / permit are compared with flows without the drought order / permit in place (i.e. the additional abstraction advocated by the drought order / permit over and above the existing abstraction). This helps to determine the scale of potential impact at any particular site/ feature using the matrix in **Figure A.1** or **Figure A.2** depending on the altitude of the waterbody and whether it is classified as lowland or upland[3]. Where possible, the hydrological assessments presented in previous EMPs and EARs of the drought options have been used to

1 Welsh Government / Defra / NRW / Environment Agency (2011). Water Company Drought Plan Guideline. June 2011.
2 Hydrological impact approach used in previous drought plan environmental assessments for water companies including Thames Water, Yorkshire Water and United Utilities
3 The River Basin Districts Typology, Standards and Groundwater threshold values (Water Framework Directive) (England and Wales) Directions 2010. ISBN 978-0-85521-192-9.
The Directions set out the principles of classification of surface water and groundwater bodies, including the use of 80m above Ordnance Datum as the altitude that differentiates water quality requirements for upland and lowland biology. Where there are ambiguities, or thresholds are crossed, upland is assumed to apply to ensure a precautionary assessment.

help identify the spatial extent of the study area from hydrological information and characterising the hydrological impact within the study area.

Figure A.1 Hydrological Assessment Matrix (Upland)

		Summer Q99		
	% reduction in flow	<10%	10-25%	>25%
Summer Q95	<10%	Negligible	Minor	Moderate
	10-25%	Minor	Moderate	Major
	>25%	Moderate	Major	Major

Figure A.2 Hydrological Assessment Matrix (Lowland)

		Summer Q99		
	% reduction in flow	<10%	10-25%	>25%
Summer Q95	<20%	Negligible	Minor	Moderate
	20-50%	Minor	Moderate	Major
	>50%	Moderate	Major	Major

Figure A.1 illustrates that at the time of implementation of a drought order / permit, upland river systems of relevance to each of these proposed options will exhibit high sensitivity to changes in low flow (represented by Q_{95}, summer[4]) and very high sensitivity to changes in extreme low flow (represented by Q_{99}, summer). As illustrated by **Figure A.2**, lowland rivers of relevance to each of these proposed options are considered to be less sensitive to reductions in summer low flows (summer Q_{95}), but similarly sensitive to reductions in extreme summer low flows (summer Q_{99}).

Figures A.1 and **A.2** are appropriate for the assessment of hydrological impacts on low flow regimes in watercourses during the spring, summer and autumn. However, in some cases there is a need to assess the impacts of drought order schemes on watercourses during the winter. For example, a reduction in compensation release may remain in force during the winter high flow period, to increase the probability of reservoir refill prior to the following year's spring/summer drawdown period. During the winter season, watercourses have relatively lower sensitivity to changes in low flow, and moderate sensitivity to changes in moderate flow. This can be reflected by the use of the matrices in **Figures A.3** and **A.4** for the assessment of drought order / permit schemes which are only likely to impact on a watercourse during the winter. The categorisation of impacts as negligible, minor, moderate or major is based on the percentage reduction in year round low flow (Q95) and year round median flow (Q50).

Figure A.3 Hydrological Assessment Matrix (Upland / Winter)

		Year round Q95		
	% reduction in flow	<10%	10-25%	>25%
Year round Q50	<10%	Negligible	Minor	Moderate
	10-25%	Minor	Moderate	Major
	>25%	Moderate	Major	Major

[4] Flow statistics indicate the proportion of days a flow is equalled or exceeded. Therefore Q95 indicates flow equalled or exceeded on 95% of days in the measured record (equivalent to an average of 347 days per year)

Figure A.4 Hydrological Assessment Matrix (Lowland / Winter)

		Year round Q95		
	% reduction in flow	<10%	10-25%	>25%
Year round Q50	<20%	Negligible	Minor	Moderate
	20-50%	Minor	Moderate	Major
	>50%	Moderate	Major	Major

The matrices are used to identify 1) the overall study area – which extends downstream of the abstraction until the hydrological impact has reduced to negligible; 2) reaches with similar scales of impact within the overall study area; and 3) the scale of hydrological impact within each reach. Typically reaches have been delimited by the addition of flow from a significant tributary or discharge; although the similarity of geomorphological characteristics of the reach may also be important in reach specification. The matrices can be applied to a variety of upland or lowland catchments respectively including those dominated by groundwater, and can be applied until the tidal limit.

In addition to the information provided by summary flow statistics in the matrix, information on the timing, duration and relevant seasons of the drought order / permit impacts have been informed by licence details and river gauging data have also been used to characterise the likely nature of the drought order / permit impacts.

If the drought order / permit does not impact on the magnitude of low flows in a watercourse, but does cause changes in the duration of low flow periods (which can be quantified), then the matrix in **Figure A.5** may be appropriate. The assessment is based on the percentage increase in the number of days for which flow is at or below the low flow (Q95) value. Typically this would be the case when the low flow regime in a watercourse downstream of a reservoir is protected by a statutory compensation release from the reservoir, but the reservoir may be drawn down below top water level for longer periods due to increased direct abstraction under the drought order / permit conditions.

If low flows in a watercourse are adversely affected in both magnitude and duration, then the impacts on magnitude are always used to determine the significance of hydrological impacts, using the appropriate matrix from **Figures A.1** to **A.4** inclusive. **Figure A.5** is only used when the impacts on low flows are on duration only.

Figure A.5 Hydrological Assessment Matrix (Low Flow Duration)

Percentage increase in low flow duration	Significance
<5%	Negligible
5-10%	Minor
10-25%	Moderate
>25%	Major

Intermittently flowing watercourse hydrological methodology

This methodology is applied to watercourses, potentially impacted on by the drought order / permit, that flow for most of the time but seasonally or occasionally ceasing to flow in response to decreased water availability e.g. due to increased evapotranspiration or bed seepage. . Such watercourses are identified from previous investigations and available data. Examples of watercourses where this methodology would be applied include winter bournes or watercourses that dry along their route due to losses to underlying aquifers. The impact classification of this methodology is as follows:

- Major - If the drought order / permit resulted in sections drying that did not dry up anyway
- Moderate - If the drought order / permit resulted in sections drying earlier (by more than a week) and / or recovering later (by more than a week) and hence flow reduction occurring in the channel for more than a week
- Minor - If the drought order / permit resulted in sections drying earlier (up to a week) and/or recovering later (by up to a week) and hence flow reduction occurring in the channel for up to a week OR if the drought order / permit were a secondary flow driver (e.g. flow through gravels being primary cause of flow losses rather than the drought order / permit)
- Negligible - No significant impact

In addition to the derived classifications, information on the timing, duration and relevant seasons of the drought order / permit impacts have been informed by licence details, available data and findings of previous investigations. These have been used to characterise the likely nature of the drought order / permit impacts.

Reservoir hydrological methodology

More recently Cascade has developed a similar approach to categorise the significance of hydrological impacts of drought order / permit operations on reservoirs. The assessment requires an estimate of the relative change in duration of reservoir drawdown (i.e. the period for which water in the reservoir is below top water level), and the percentage decrease in the minimum reservoir level reached during the drawdown period. These two parameters are then compared against the reservoir impacts hydrological assessment matrix in **Figure A.6**.

This approach would be a suitable method to assess the impacts of a drought order / permit which involves significant changes to the reservoir water level regime (that would not normally be experienced during a drought without any additional measures implemented). For example, a drought order / permit may involve increasing daily or annual licensed abstraction limits to allow an increased rate of direct abstraction from the reservoir. This may enable some or all of a reservoir's emergency storage volume to be utilised, but is likely to lead to both lower water levels and increased periods of time below top water level.

Figure A.6 Hydrological Assessment Matrix (Reservoir Impacts)

	% Increase in duration of reservoir drawdown			
% Decrease in minimum reservoir level	<5%	5-10%	10-25%	>25%
<5%	Negligible	Negligible	Minor	Moderate
5-10%	Negligible	Minor	Moderate	Major
10-25%	Minor	Moderate	Major	Major
>25%	Moderate	Major	Major	Major

Additional Considerations

For groundwater schemes, hydrogeological data, where available, has been reviewed to inform the study area and duration of any impacts (noting impacts on groundwater may extend beyond the six month period of drought order / permit implementation - see below). An increase in groundwater abstractions would lead to an increased cone of depression in groundwater levels for groundwater abstraction. This impact can affect other non-surface water receptors such as other wells, springs or groundwater dependent ecosystems. It could also mean that surface water impacts would extend upstream of the abstraction point or, in significant instances, to other watercourses some distance from the abstraction.

For groundwater abstractions, the impact of a drought order / permit could extend beyond the six month period (time limited) of abstraction depending on the local hydrogeology of the area. During drought situations, where there is limited recharge to the aquifer system, the abstraction can be mainly at the expense of groundwater stored in the aquifer. This can, in the long run, delay groundwater level recovery and have a knock on effect on baseflow contributions to watercourses. Flows could, therefore, be reduced for longer than the six month period during which the drought order / permit could be implemented and, as such, has been considered as part of the assessment described in this report.

APPENDIX B
HYDROLOGY AND PHYSICAL ENVIRONMENT ASSESSMENT

B1 INTRODUCTION

This appendix assesses the potential impacts on the physical environment of the lower Afon Teifi River catchment during the period of implementation of the Afon Teifi Increased Daily Abstraction drought order.

For the purposes of this assessment, the "without drought order" baseline is based on continuation of abstraction from Welsh Water's intake at Llechryd on the Afon Teifi under the existing licence conditions. The drought order involves a temporary increase in the daily maximum licensed abstraction quantity at Llechryd, from 19Ml/d to 21Ml/d, to enable Welsh Water to increase abstractions and meet a temporary increased level of demand in the water resource zone.

B.1.1 Welsh Water's Existing Operations

Welsh Water's licence (number 22/62/3/0005) to abstract water under the Water Resources Act from the Afon Teifi at Llechryd (see **Figure B1.1**) includes the following conditions:

- 5,750 million litres (Ml) authorised to be abstracted per annum
- At a daily abstraction rate not exceeding 19Ml in any consecutive 24 hour period
- At an abstraction rate not exceeding 0.8Ml in any hour
- There are no river hands-off flow conditions in the abstraction licence.

The abstraction is made directly from a river intake and pumped to nearby Llechryd Water Treatment Works (WTW) for treatment, from where it is put into supply. Llechryd WTW has a maximum capacity of approximately 18Ml/d, however it may be possible to increase the works' throughputs with upgrades to the process.

B.1.2 Welsh Water's Proposed Drought Order Operations

The drought order involves a change in the daily abstraction rate at the Llechryd intake (see **Figure B1.1**). The licence condition relating to the abstraction rate in any 24 hour period would be increased by 2Ml/d to 21Ml/d. This would also require amendment of the hourly abstraction rate condition. The drought order would increase the unsupported river abstraction from the Afon Teifi. The drought order is most likely to occur during the summer period. The study area is shown on **Figure B1.1**.

The physical environment includes consideration of: hydrology and hydrodynamics; geomorphology; and water quality. The assessment has three key objectives:

1. It is used to "list the likely impacts to the flow, level, channel/riparian form and sediment

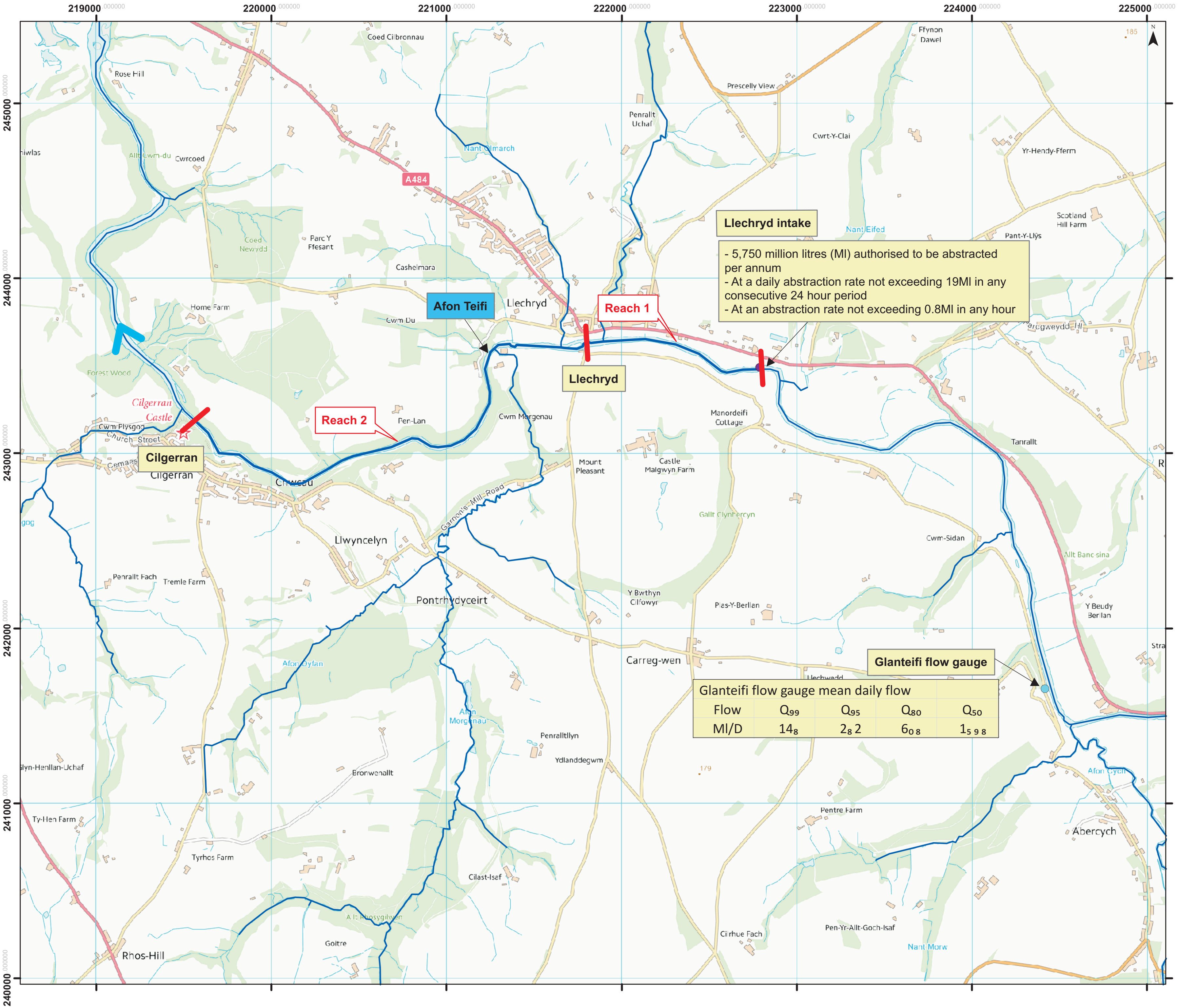
due to action being in place" as required by the DPG[1] and set out in Figure 2 of the DPG.

2. It is used to support the screening and assessment of sensitive features (including ecological features and designated sites) as required by the DPG and set out in Section 5 of this report.
3. Where sensitive features are the physical environment itself, it provides supporting technical information for their screening and assessment.

This appendix is set out in the following sections:

Section B.2 Hydrological Impact
Section B.3 Physical Environment Assessment
Section B.4 Physical Environment Impact Summary
Section B.5 Cumulative Impacts.

[1] Natural Resources Wales (2017) *Water Company Drought Plan Technical Guideline*. Available at https://cdn.naturalresources.wales/media/684414/final-wc-drought-plan-guidance-2017.pdf?mode=pad&rnd=131656713580000000, Accessed 04 February 2019.

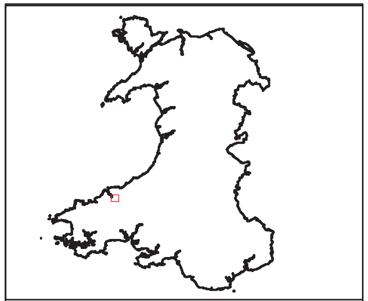


Llechryd intake

- 5,750 million litres (Ml) authorised to be abstracted per annum
- At a daily abstraction rate not exceeding 19Ml in any consecutive 24 hour period
- At an abstraction rate not exceeding 0.8Ml in any hour

Glanteifi flow gauge

Glanteifi flow gauge mean daily flow				
Flow	Q_{99}	Q_{95}	Q_{80}	Q_{50}
Ml/D	148	282	608	1598



Legend

●	Flow Gauge
●	Abstraction
▬	Hydrological Reach
—	Water Courses
>	Flow Direction

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Dŵr Cymru Welsh Water

1:20,000
Note: All locations are approximate
This drawing incorporates Ordnance Survey Information

Project Title: Welsh Water Drought Plan
Environmental Assessment

Figure Title:
Hydrological Overview: 8202_1
Increase in the Llechryd abstraction

Figure Number: Figure B1.1

Date: February 2019

B2 HYDROLOGICAL IMPACT

B.2.1 Reference Conditions

B.2.1.1 Catchment Overview

Afon Teifi

The Afon Teifi is a major river in Wales, with its source in the Cambrian Mountains at 455m above sea level. The river flows in a roughly south westerly direction to its estuary at Cardigan Bay. The course of the Afon Teifi flows through moorland and forestry, before reaching and flowing through Tregaron Bogs (Environment Agency Wales, 1999). There are a number of small impoundments and hydropower stations in the upper catchment. The river continues through rural areas largely supporting dairy and mixed stock farms. Rocky, tree-lined sections are a feature of the catchment and there are a number of impressive gorges, particularly at Maesycrugiau, Alltycafan, Henllan and Cilgerran. After this, the river route is noted for having a long lowland section up to its tidal limit, with typical lowland features such as wide meanders and a gentle slope. No major tributaries join the Afon Teifi. At the tidal limit, the catchment area of the Afon Teifi is around 940km^2. Welsh Water's Llechyrd intake is around 4.4km upstream of the tidal limit, where the catchment area is around 910km^2.

Flow in the Afon Teifi is unsupported by upstream releases, and the surface water abstraction results in a removal of a proportion of the downstream flow. During a drought, river flows would be low and the drought order increase in abstraction rate would further reduce river flow downstream of the intake. There are no hands-off flow licence conditions which would assist in the management of river flows during low flow periods.

A review of the flows and physical habitat characteristics of the river network around the Llechyrd intake has identified the study area for this assessment (see **Figure B1.1**). The study area runs from the intake down to the tidal limit; comprising two distinct hydrological reaches, as listed in **Table B2.2** and identified on **Figure B1.1**.

The potential hydrological impact of the drought order has been reviewed separately for both of the hydrological reaches, and is discussed below.

B.2.1.2 Baseline Data Availability

Continuous monitoring is undertaken by Welsh Water to monitor its operations in the lower Afon Teifi catchment. The following data were available for the assessment:

- Daily abstraction data from Llechryd River intake: 1994 - present.

Flows in the Afon Teifi are recorded by Natural Resources Wales (NRW)at a gauging station in the lower Teifi catchment at Glanteifi (Grid reference: SN2441941655).

- Glanteifi flow gauge daily river flow data: 1959-2014.

The reference conditions of the lower Afon Teifi catchment are summarised below, based on the available hydrological data outlined above.

B.2.1.3 Hydrology

Afon Teifi at Glanteifi

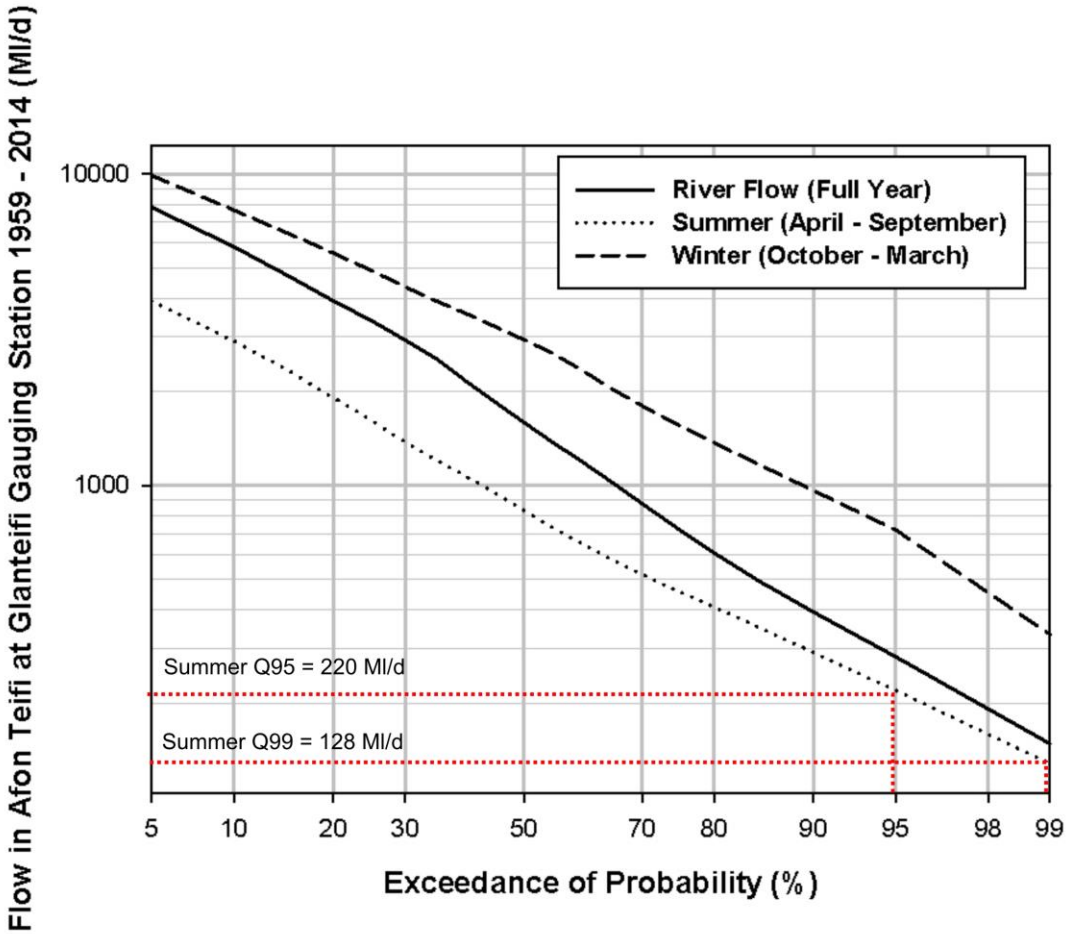
The Afon Teifi is 122km long with a total catchment area of 942km². At the Glanteifi gauging station, located at an altitude of 5.2m, the catchment area is 894km². A summary of recorded flow between 1959 and 2014 in the Afon Teifi is presented in **Table B2.1,** and the flow duration curve for this location is shown in **Figure B2.1**.

Table B2.1 Summary of Recorded Mean Daily Flow in the Afon Teifi at Glanteifi Gauging Station (1959 - 2014)

Percentage of time river flow equalled or exceeded	Mean daily flow Ml/d, per month and all year maximum/minimum flows												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	All year
Maximum flow	21,263	19,155	21,341	11,785	9,029	10,757	12,096	12,537	14,005	32,279	28,080	26,153	32,279
10% (high flow)	8,726	6,866	4,997	3,811	2,903	2,109	1,848	2,436	3,433	6,884	8,382	9,112	5,848
50%	3,651	2,667	1,858	1,471	1,099	668	507	657	765	2,101	3,531	3,800	1,598
80%	1,961	1,403	1,142	833	596	384	301	297	365	829	1,832	1,918	608
90%	1,305	1,086	884	638	445	304	221	190	273	525	1,262	1,425	393
95% (low flow)	883	901	746	537	375	265	184	139	202	319	812	1,172	282
99% (extreme low flow)	473	626	565	418	298	212	137	103	87	214	581	830	148
Minimum flow	313	237	421	365	235	169	128	63	78	78	442	583	63

The low flow statistics for the summer period (1 April to 30 September inclusive) are: Summer Q_{95} = 220Ml/d; Summer Q_{99} = 128Ml/d.

Figure B2.1 Afon Teifi Mean Daily Flow at Glanteifi (1959 – 2014)



A number of spot flow gaugings were undertaken at Glanteifi during the period 1972 to 2011, and at some of these visits the velocity, cross-sectional area and wetted width was recorded. The measurement closest to the summer Q_{95} was a flow of 222Ml/d recorded on 26/7/2006. The mean velocity on that occasion was 0.391m/s whilst the wetted cross sectional area was 6.6m^2, and the wetted width was 36.4m.

B.2.2 Hydrological Impact

B.2.2.1 Hydrological Zone of Influence

A review of the flows and physical habitat characteristics of the river network downstream of the Llechryd river intake has identified the likely hydrological zone of influence of the drought order, which has been used to define the study area. The study area includes a length of the Afon Teifi and comprises two distinct hydrological reaches as identified on **Figure B1.1**:

- Reach 1 is the 1.5km stretch of the Afon Teifi between the Llechryd intake and the B4343 road bridge at Llechryd.

- Reach 2 is the 2.9km stretch of the Afon Teifi between the Llechryd road bridge and the tidal limit at Cilgerran.

Potential hydrological impacts of the drought order have been assessed for each of the two separately identified river reaches, as summarised in **Table B2.2** at the end of this section. The details of the assessment for each river reach are presented below.

B.2.2.2 Hydrological Impact Assessment

Reach 1 – Afon Teifi (Llechryd river intake to B4343 road bridge)

In Reach 1, the river meanders through a wide floodplain (typically 500m wide) of alluvial deposits. The river is typically constrained within steep or vertical natural earth banks typically ~20m in width. River flow is smooth over a cobble and pebble substrate.

The road bridge (B4343) marks the end of Reach 1, as it is a significant control on the local river flow. The presence of the bridge and a small weir causes ponding at lowest river flows, as confirmed by recent NRW field survey and hydraulic modelling work. Hence, any reduction in river wetted widths and depths from a reduction in flow is likely to be minimal.

Since there are no significant tributaries downstream of the intake and prior to the tidal limit, the magnitude of flow reductions associated with the drought order would be similar in both reaches. Flow reductions due to increased abstractions will be most likely to occur during the summer or early autumn when zonal demands are at their highest, and therefore it is the low and extreme low summer flows which will be most sensitive to the changes.

At the Glanteifi flow gauging station upstream of the intake, the summer low and extreme low flow values are 220Ml/d (Q_{95}) and 128Ml/d (Q_{99}) respectively; after the maximum daily abstraction of 19Ml/d has been taken at the Llechryd intake, these values would be reduced to 201Ml/d and 109Ml/d respectively. A further abstraction of up to 2Ml/d at the intake would therefore represent a 1% reduction in the Q_{95} flow value and a 1.8% reduction in the Q_{99} flow value. The hydrological impact of the drought order on Reach 1 has therefore been assessed as **negligible**.

Reach 2 – Afon Teifi (B4343 road bridge at Llechryd to tidal limit at Cilgerran)

In Reach 2, the river is sinuous in a channel constrained by local topography, without a significant floodplain. The bank remains steep or vertical natural earth banks, the channel typically ~20m in width. River flow is smooth over a pebble and gravel substrate. Bankside tree cover is extensive.

There are no significant tributaries providing additional flow in either Reach 1 or Reach 2, and the flow will not increase significantly between the two reaches. Distinction between the two reaches is in terms of hydro-morphology and hydroecology, not the measured flow.

Consequently, the hydrological assessment described for Reach 1 remains valid. Reductions in summer low and extreme low flow values would be 1% and 1.8% respectively or less. The

hydrological impact of the drought order on Reach 2 has therefore also been assessed as **negligible.**

B.2.2.3 Hydrological Impact Summary

Two river reaches have been considered, both of which are considered to have negligible hydrological impacts as a result of the increased abstractions under the drought order. The two impacted reaches are shown in **Table B2.2,** and establish the full in-channel zone of influence of the drought order for environmental sensitivity screening (see **Figure B1.1**).

Table B2.2 Hydrological River Reaches identified in the Study Area

Hydrological Reach		Reach boundary		Reach length	% flow reduction due to Drought Order		Hydrological Impact
		Upstream	Downstream		Summer Q_{95}	Summer Q_{99}	
1	Afon Teifi	Llechryd river intake	B4343 road bridge at Llechryd	1.5km	1%	1.8%	**Negligible**
2	Afon Teifi	B4343 road bridge at Llechryd	Tidal limit at Cilgerran	2.9km	1%	1.8%	**Negligible**

B3 PHYSICAL ENVIRONMENT ASSESSMENT

Given that there is no adverse hydrological impact associated with the drought order, effects on the drought order on geomorphology and water quality are equally assessed as negligible. Similarly, there would be no flow pressures or water quality pressures that would pose an increased risk to any water-dependent environmental features within the vicinity of the Llechryd intake.

B4 PHYSICAL ENVIRONMENT IMPACT SUMMARY

Potential impacts on the physical environment associated with the Afon Teifi Increased Daily Abstraction drought order are summarised in **Table B4.1.**

Table B4.1 Summary of Potential Changes to the Physical Environment of the Impacted Reaches from Implementation of the Afon Teifi Increased Daily Abstraction Drought Order

Afon Teifi (Reach 1)	
Flows in the Afon Teifi *Negligible impacts for six months from summer/early autumn onwards*	• Small decrease (up to 1.8%) in summer low and extreme low flows, with negligible effects on hydrology and geomorphology
Afon Teifi (Reach 2)	
Flows in the Afon Teifi *Negligible impacts for six months from summer/early autumn onwards*	• Small decrease (up to 1.8%) in summer low and extreme low flows, with negligible effects on hydrology and geomorphology

B5 CUMULATIVE IMPACTS

The focus of this Environmental Assessment Report (EAR) is the Afon Teifi (Llechryd) Increased Daily Abstraction drought order. The assessment, as described in previous sections, has considered how the proposed drought order may affect the environment in combination with the effects of existing licences and consents. In accordance with the DPG, the assessment also considers the potential cumulative effects of Welsh Water implementing other drought permits / orders within a similar timeframe. The potential for drought permit/orders to act in combination is set out in **Table B5.1**.

Consideration has also been given to the potential for cumulative impacts of drought management options implemented by neighbouring water companies (see **Table B5.1**). The assessment of potential for cumulative impacts of Welsh Water's supply side and drought permit / order options with drought options listed in neighbouring water companies' drought plans has also been undertaken as part of the Strategic Environmental Assessment (SEA) of Welsh Water's Draft Statutory Drought Plan. The SEA was informed by the most recent information available on the neighbouring water companies' drought plans.

Table B5.1 Cumulative Impacts of the Afon Teifi (Llechryd) Drought Order with other Drought Management Options

Organisation	Potential In-combination Impacts	Further Consideration Required (Yes/No)
Welsh Water - other drought options in the Mid South Ceredigion WRZ / Teifi catchment	N/A	N/A
Natural Resources Wales - Drought options in the Teifi catchment	No previous drought order applications have been made in the South West Wales region.	No