

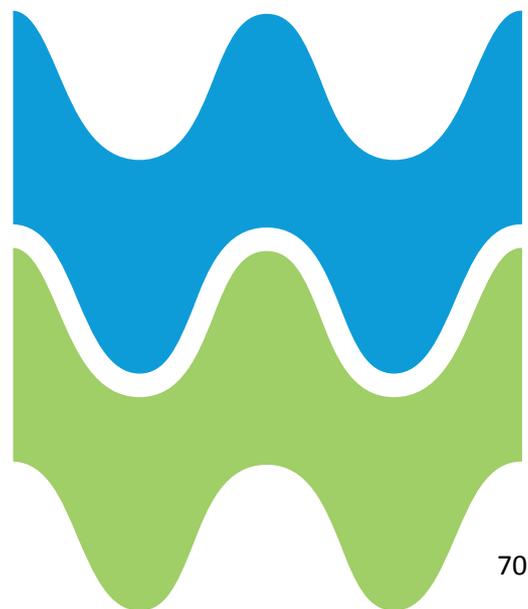
Draft

Drought Plan 2020:

Annex 1h – Lleyrn

Harlech WRZ

March 2019



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# 1. Llyn Harlech – WRZ Reference no. 8034

## 1.1. Llyn Harlech Water Resources Overview

The Llyn Harlech Water Resource Zone covers the entire Llyn Peninsula and the coastal strip south to Harlech (see Figure 1).



Figure 1 - Map of the Llyn Harlech WRZ

The water resources within the zone consist of four impounding reservoirs (Cwmystradllyn, Cwm Dulyon, Tecwyn Uchaf and Eiddew Mawr) and one river abstraction (Afon Dwyfor at Dolbenmaen). A list of our raw water sources for the zone is presented in Table 1.

Site Name	Licence No.	Source Type	Status
Llyn Cwm Dulyn	23/65/14/0002	Impounding Reservoir	Operational
Llyn Cwmystradllyn	23/65/08/0019	Impounding Reservoir	Operational
Afon Dwyfor	23/65/08/0016	Regulated River Intake	Operational
Llyn Tecwyn Uchaf	23/65/03/0001	Impounding Reservoir	Operational
Llyn Eiddew Mawr	23/64/16/0008v2	Non-Impounding Reservoir	Operational

*Table 1 - Licensed sources in the Llyn Harlech WRZ*

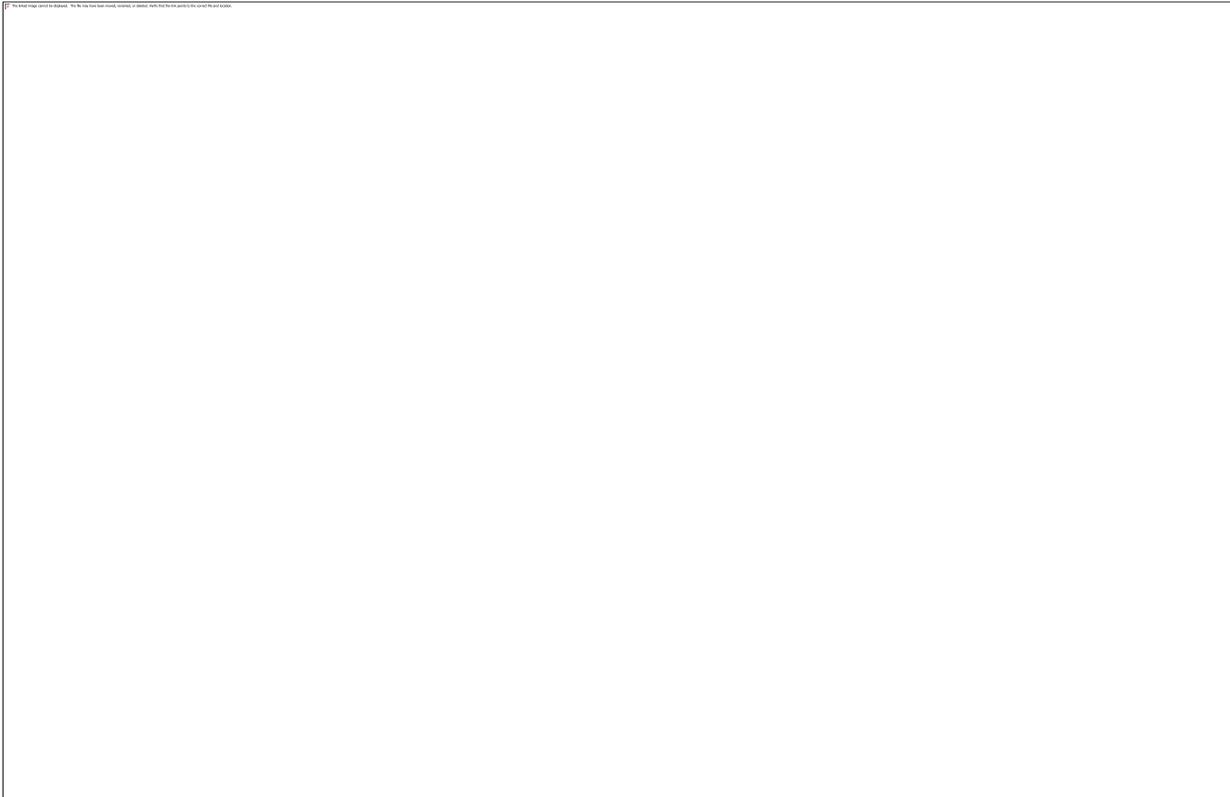
Since publication of our 2015 Drought Plan we have built a new water treatment works at Dolbenmaen which is fed from Llyn Cwmystradllyn and the Afon Dwyfor abstraction. This has replaced two treatment works at Garndolbenmaen and Cwmystradllyn. Llyn Cwm Dulyn has its own works and water from Llyn Tecwyn Uchaf and Llyn Eiddew Mawr is treated at Cilfor and Rhiwgoch works respectively.

The Dwyfor abstraction is the subject of a Section 20 Operating Agreement with Natural Resources Wales (NRW). When we abstract from this source, if river levels are low we have to release a specified volume of water from Llyn Cwmystradllyn to ensure we do not negatively impact the ecology of the river.

During dry weather, treated water can be transferred from the Cwm Dulyn zone to conserve stocks in Cwellyn in the North Eryri Ynys Mon WRZ and from Cilfor and/or Rhiwgoch to conserve stocks in Bodlyn in the Barmouth zone to the south. The transfer to Barmouth can also be used to help meet peak demands in excess of the Eithinfynydd works capacity. In the winter, water can also be moved northwards from Eithinfynydd to allow Rhiwgoch works to be mothballed, reducing our operating costs.

## 1.2.Drought Triggers

The drought status of the zone is assessed by the reservoir storage position at any time in relation to the Drought Action Zones (DAZs), defined for Llyn Cwmystradllyn and Llyn Tecwyn Uchaf combined, as shown in Figure 2. Eiddew Mawr and Cwm Dulyn aren't used in the DAZ as their supply areas can also be supplied by Tecwyn Uchaf and Cwmystradllyn respectively. The use of the DAZs are described in more detail in Chapter 2 of the main report.



*Figure 2 - Llyn Cwmystradllyn and Tecwyn Uchaf Reservoir Drought Action Zones showing the results of scenario testing*

### 1.3. Assessment of Drought Risk

Using a stochastically generated timeseries, we've looked at the performance of our individual reservoirs against more severe events than those which exist in our historic record. Figure 2 shows a sample of results from the drought library scenario testing together with output from our baseline scenario testing. The chart shows that the zone is resilient to historic droughts such as 1976 and 1995, and that we're unlikely to need a hosepipe ban to preserve resource during a repeat of either of these events. The testing also shows that in the Llyn Harlech zone, it is only under the more extreme droughts such as a 1:200 and 1:500 year return period drought (i.e. droughts that have a 0.5% and 0.2% chance respectively of occurring in any year) that we may consider implementing temporary use and non essential use bans .

Although our scenario testing tells us that the risk of needing to implement extreme supply side measures, such as widespread pressure management or water rationing is negligible, during these severe drought events we need to ensure careful management of our water resources as reservoir storages will fall to levels we have not experienced before. Based on this information we have therefore chosen to retain one Drought Permit option to provide additional support, should it ever be required. Section 1.5 provides further details.

## 1.4.Drought Management of the WRZ

As the identified drought risk in the zone is low then our management philosophy is to ensure we operate our water resources in line with our control curves and take all necessary actions in good time, in order to maintain this high level of drought resilience.

The following sections describe the operation of the zones as we move into a drought period and the actions that we will take to ensure that we minimise the impact on customers. In the event of extreme drought, an option to increase the quantity of water resource available for public water supply may be required. This is outlined in Section 1.5, with supporting summary information on the requirements of this option.

### 1.4.1. Normal Action Zone

During normal weather conditions we optimise our sources to minimise the cost of operations. In the Llyn Harlech zone this means that we make maximum use of the Dolbenmaen treatment works which can gravitate supplies to our customers thus reducing energy costs. As reservoir storages decline we commence abstraction from the Afon Dwyfor to provide an alternative raw supply. If flows in the Afon Dwyfor are low we are required to make regulation releases from Llyn Cwmystradllyn to support this abstraction at Dolbenmaen.

### 1.4.2. Developing Drought Action Zone

As reservoir storages move into the developing drought action zone, we are more likely to have to carry out operations which are not routinely undertaken and as a result increase the risk of impacting our customers. To authorise these activities, the 'Gold' command centre may convene.

In the developing drought zone we will pump more water from the Afon Dwyfor, especially during summer spates when the associated regulation releases would not be required. We will also increase our leakage efforts to minimise losses in the network.

Depending on reservoir levels in the North Eryri Ynys Mon and Barmouth zones, we may be transferring water from Llyn Harlech to both of these zone to support reservoir stocks. The level of support provided will be reviewed as storage in the Llyn Harlech zone reduces.

### 1.4.3. Drought Action Zone

Once all changes to our water supply systems have been made, the operation of the zone will be fully optimised to balance the available water resource. In the event that dry weather continues, and our forecasts indicate that storage may continue to decline, we will consider implementing temporary use bans (hosepipe bans) and submit the application for our drought permit option to NRW. This permit will allow us to reduce our regulation releases from Cwmystradllyn reservoir into the Afon Dwyfor, thus preserving resource whilst continuing to abstract water at the rate required to meet customer demands. To support this request, we will commence environmental monitoring in line with our Environmental Assessment Report (Appendix 15) and submit our application for the option identified in Section 1.5.

### 1.4.4. Severe Drought Action Zone

As reservoir storage enters the Severe Drought Action zone, we will look to implement non-essential use bans and, subject to receiving the necessary permissions from NRW, we will implement our drought permit scheme. As set out in Section 1.5, the option available to us is reducing the regulation release

from Cwmystradllyn reservoir. This will help preserve storage in Cwmystradllyn and enable us to maintain customer supplies for longer.

### 1.5. Supply-side drought management action

Table 2 below provides the information required by Appendix G of NRW's Water Company Drought Plan Technical Guideline (Dec 2017). The table summarises the key information from within the associated Environmental Assessment Report (EAR) including any potential environmental impacts, risks to the scheme implementation and any necessary mitigation that may be required.

Action Implementation Assessment	<b>Name:</b>	<b>Afon Dwyfor temporary abstraction increase of 1 MI/d</b>
	<b>Trigger(s)</b>	Combined storage in Llyn Cwmystradllyn and Llyn Tecwyn Uchaf crosses into Severe Drought Action Zone.
	<b>Deployable Output or yield of the action</b>	1 MI/d
	<b>Location</b>	Lleyn Peninsula and Porthmadog.
	<b>Implementation timetable</b>	<b>Preparation time:</b> We assume a decision from NRW within 14 days of submitting the Drought Permit application. The practical implementation of the option could be effected immediately. <b>Time of year effective:</b> The option is most likely to be implemented during September to January. <b>Duration:</b> Drought orders are valid for up to six months, but is most likely to be for up to five months.
	<b>Risks associated with action</b>	The application, as applied for, is not approved.
	<b>Other considerations</b>	N/A
Environmental Assessment: alone & in-combination	<b>Risk to the Environment</b>	Decrease in flows on the Afon Dwyfor downstream of our Garndolbenmaen intake.
	<b>Summary of likely environmental impacts</b>	The hydrological assessment has concluded that there is no impact on river flows on the Afon Henwy from immediately downstream of Llyn Cwmystradllyn to the confluence with the Afon Dwyfor, and no impacts on the Afon Dwyfor downstream as far as the Garndolbenmaen Welsh Water abstraction intake. Impacts on the Afon Dwyfor are assessed as being negligible downstream of the intake. There are negligible impacts on the physical environment of the river, including water quality.
	<b>Baseline information used</b>	<b>Hydrological data:</b> <ul style="list-style-type: none"> <li>• Daily Llyn Cwmystradllyn water level</li> <li>• Daily Llyn Cwmystradllyn compensation weir flow gauge data</li> <li>• Daily Garndolbenmaen intake abstraction flows</li> <li>• River flow data at Garndolbenmaen weir and Cwmystradllyn</li> <li>• Spot flow gaugings</li> </ul>
	<b>Summary of additional monitoring requirements</b>	The EAR has not identified any environment features for which environmental assessment is required and, therefore, no feature specific monitoring will be required. However, continued hydrometric monitoring of the Llyn Cwmystradllyn water level and compensation weir flow gauge and the Garndolbenmaen intake abstraction flows is recommended to confirm the baseline conditions identified in the EAR.
	<b>Mitigation &amp; Compensation measures</b>	The mitigation measures that could be considered at the on-set of drought, during implementation of the drought permit and post-drought permit implementation include: <ul style="list-style-type: none"> <li>• Temporary reduction or cessation of the terms of the Drought Order/Permit</li> <li>• Fish distress monitoring with triggers and response plan</li> <li>• Protection of 'spate flows'</li> <li>• Reduction of fish predation</li> <li>• Physical in-river works</li> <li>• Provision of alternative compensation flows</li> <li>• Provision of alternative water supplies if other water users are at risk of derogation.</li> </ul>

		Potential mitigation measures have also been proposed and further discussion with NRW is required in order to develop suitable mitigation measures.
	<b>Impact on other activities</b>	The EAR identified no significant adverse impacts on other activities including; landscape and visual amenity, recreation (including angling) and archaeology and cultural heritage.
	<b>Any permissions or approvals required and constraints that apply</b>	N/A

*Table 2 - Option 8034-1 Reduce Regulation Release for Afon Dwyfor Abstraction*