Dŵr Cymru
Welsh Water

Final Drought Plan 2025

Appendix 2 - Drought Risk Assessment

February 2026

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Table of Contents

1. Introduction 5
2. Assessing our Drought Risk 6
   2.1. Initial Screening 6
   2.2. Detailed analysis 6
3. Water Resource Zone Drought Risk – North Wales 8
   3.1. North Eryri Ynys Mon 8
   3.2. Clwyd Coastal 11
   3.3. Alwen Dee 14
   3.4. Bala 16
   3.5. Tywyn Aberdyfi 18
   3.6. Blaenau Ffestiniog 20
   3.7. Lleyn-Harlech-Barmouth 23
   3.8. Dyffryn Conwy 27
   3.9. South Meirionnydd 29
4. Water Resource Zone Drought Risk – South-West Wales 31
   4.1. Tywi Gower 31
   4.2. Mid & South Ceredigion 34
   4.3. North Ceredigion 36
   4.4. Pembrokeshire 38
5. Water Resource Zone Drought Risk – South East Wales 41
   5.1. Ross-On-Wye 41
   5.2. Elan-Builth 42
   5.3. Hereford Conjunctive Use System 43
   5.4. Llyswen 45
   5.5. Monmouth 46
   5.6. Pilleth 47
   5.7. Brecon 48
   5.8. Vowchurch 49
   5.9. Whitbourne 51
   5.10. SEWCUS 53

Table of Figures

Figure 1 - Our Operating Area and Water Resource Zones..... 5
Figure 2 - Drawdown events of the zonal storage over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 9
Figure 3 - Drawdown events of Llyn Cwellyn Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 10
Figure 4 - Drawdown events of Llyn Ffynnon Llugwy Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 10
Figure 5 - Drawdown events of the zonal storage over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 12
Figure 6 -- Drawdown events of Llyn Aled Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 13
Figure 7- Drawdown events of Llyn Aled Isaf Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 13
Figure 8 - Drawdown events of Llyn Alwen Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 15
Figure 9 - Drawdown events of Llyn Arenig Fawr Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 17
Figure 10 – Recent actual demand compared to supply side capability for the Tywyn Aberdyfi WRZ..... 19
Figure 11 - Drawdown events of Llyn Morwynion Reservoir over 2,500 years: (a) without the Afon Gam transfer active and (b) with the Afon Gam transfer active. Coloured lines show the events with return period of 200 and 500 years..... 21
Figure 12 - Drawdown events of the combined storage in Llyn Cwmystradllyn and Llyn Tecwyn Uchaf over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 25
Figure 13 - Drawdown events in Llyn Cwmystradllyn over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 26
Figure 14 - Drawdown events in Llyn Tecwyn Uchaf over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 26
Figure 15 - Drawdown events in Llyn Cowlyd over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 28
Figure 16 - Drawdown events in Llyn Conwy over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 28
Figure 17 - Drawdown events in Llyn Cynwch over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 30
Figure 18 - Drawdown events of the Crai Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 32
Figure 19 - Drawdown events of Ystradfellte Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 33
Figure 20 - Drawdown events of the Teifi Pools over 2,500 years at forecast levels of demand. Coloured lines show the events with return period of 200 and 500 years..... 35
Figure 21 - Drawdown events of the Teifi Pools over 2,500 years at current levels of demand. Coloured lines show the events with return period of 200 and 500 years..... 35
Figure 22 - Drawdown events of the combined Llyn Craig-y-Pistyll and Llyn Llygad Rheidol storage over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 37
Figure 23 - Drawdown events of Llys-y-Fran Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 39
Figure 24 - Drawdown events of Rosebush Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years..... 40
Figure 25 - Dunfield daily minimum groundwater level (2017 to 2024)..... 44
Figure 26 – Vowchurch BH5 combined source deployable output diagram..... 50

Figure 27 – Gauged flow at Tenbury station in 1976, 2020 and 2022. Red line shows the flow threshold when the abstraction is reduced. 52
Figure 28 - Drawdown events of the zonal storage over 2,500 years. Coloured lines show the events with return period of 200 and 500 years. 55
Figure 29 - Drawdown events of the combined storage in Pontsticill and Taff Fawr over 2,500 years. Coloured lines show the events with return period of 200 and 500 years. 55
Figure 30 - Drawdown events of the storage in Talybont reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years. 56
Figure 31 - Drawdown events of the storage in Llandegfedd reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years. 56

Table of Tables

Table 1 - Screening criteria for the 'Initial' assessment of water resource zone drought risk . 6
Table 2 - Screening criteria for the 'Detailed' assessment of water resource zone drought risk 7
Table 3 - Results of the Initial Screening assessment for the NEYM WRZ 9
Table 4 - Results of the Initial Screening assessment for the Clwyd Coastal WRZ 12
Table 5 - Results of the Initial Screening assessment for the Alwen Dee WRZ 14
Table 6 - Results of the Initial Screening assessment for the Bala WRZ 16
Table 7 - Results of the Initial Screening assessment for the Tywyn Aberdyfi WRZ 18
Table 8 - Results of the Initial Screening assessment for the Blaenau Ffestiniog WRZ 20
Table 9 - Results of the Initial Screening assessment for the Lleyn Harlech Barmouth WRZ 25
Table 10 - Results of the Initial Screening assessment for the Dyffryn Conwy WRZ 27
Table 11 - Results of the Initial Screening assessment for the South Meirionydd WRZ 29
Table 12 - Results of the Initial Screening assessment for the Tywi Gower WRZ 32
Table 13 - Results of the Initial Screening assessment for the M&S Ceredigion WRZ 34
Table 14 - Results of the Initial Screening assessment for the North Ceredigion WRZ 36
Table 15 - Results of the Initial Screening assessment for the Pembrokeshire WRZ 38
Table 16 - Results of the Initial Screening assessment for the Ross on Wye WRZ 41
Table 17 - Results of the Initial Screening assessment for the Elan Builth WRZ 42
Table 18 - Results of the Initial Screening assessment for the Hereford WRZ 43
Table 19 - Results of the Initial Screening assessment for the Llyswen WRZ 45
Table 20 - Results of the Initial Screening assessment for the Monmouth WRZ 46
Table 21 - Results of the Initial Screening assessment for the Pilleth WRZ 47
Table 22 - Results of the Initial Screening assessment for the Brecon WRZ 48
Table 23 - Results of the Initial Screening assessment for the Vowchurch WRZ 49
Table 24 - Results of the Initial Screening assessment for the Whitbourne WRZ 51
Table 25 - Results of the Initial Screening assessment for the SEWCUS WRZ 54

1. Introduction

As Welsh Water we provide essential services to more than 3 million people, including supplying drinking water to most of Wales and parts of Herefordshire and Deeside in England. We also provide wastewater services to most of Wales and parts of Chester and Deeside in England. We have around 110,000 business (or 'non-household') customers, which includes everything from large industrial sites to small high-street businesses, agricultural businesses, local authorities and charities.

For operational purposes we divide our water supply area into three regions: North Wales, South West Wales and South East Wales. However, for water resource planning purposes we further subdivide these three regions into twenty-three discrete water supply systems, which we call Water Resource Zones (Figure 1). These are defined by the extent of the supply network that share the water resources within each zone, whereby the customers in each zone have the same level of service in response to drought conditions. Both our water resource management plan and drought plan are based upon the same twenty-three zones.

Water resource zones can cope with different levels of drought though their inherent nature. Zones with greater access to water resources, such as large reservoir catchments or reliable river sources, will be more resilient as it will take a very severe drought for water supplies to run out. Equally, areas where the demand for water is small in relation to the available water resource will also have very high levels of drought resilience.

This means that some areas have such a resilient supply that no 'plausible' drought will cause us to run out of water and fail to meet our customers' demand. The term 'plausible' is key to our drought risk analysis since we only test the resilience of our systems against events that the meteorological and hydrological science tells us could happen.

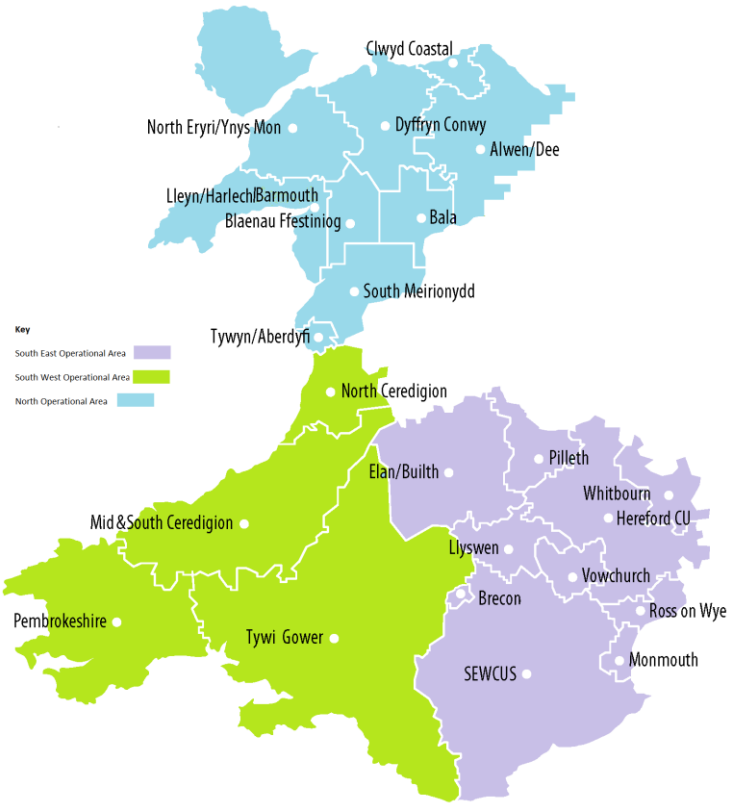


Figure 1 - Our Operating Area and Water Resource Zones

2. Assessing our Drought Risk

Drought Plan guidance[1] asks that we undertake an assessment of our drought risk to inform the response required in our Drought Plan. In our 2020 Drought Plan we utilised the UKWIR *Drought Vulnerability Framework (DVF)*[2] but subsequent work to understand our drought resilience for WRMP24 has demonstrated that the Drought Response Surfaces, which were the central output of this approach, did not adequately represent the drought risk across our WRZs given the nature of our water resources, and so for this Drought Plan we have updated our methodology accordingly, as described below.

2.1. Initial Screening

We have retained the DVF approach of comparing the amount of 'Available Headroom' in each water resource zone against our 'Target Headroom', to provide an initial view of the drought risk. We have utilised data from our WRMP24, assessing both the Dry Year Annual Average (DYAA) and/or Dry Year Critical Period (DYCP) for those zones constrained by high demand during the critical period. We have chosen to use the 'Baseline' supply demand balance data to reflect the drought risk we face until our planned investment in AMP8 is delivered.

Risk level	Metrics
High Risk	The SDB is negative in any year of the period of this Drought Plan i.e. 2025-2030. The WRZ is therefore classified at 'high risk' as we are unable to offer customers our target level of service and so drought actions will be required.
Potential Risk	The SDB is positive but the ratio between the available headroom and the target headroom is less than a factor of 2 and so there is some uncertainty that we will always achieve our target levels of service. Drought Actions are likely to be required to address this residual risk.
Low Risk	The SDB is positive, and the ratio between available to target headroom is greater than 2 and so we have high confidence there is little to no risk of having insufficient water resource to maintain customer's supply.

Table 1 - Screening criteria for the 'Initial' assessment of water resource zone drought risk

2.2. Detailed analysis

Alongside this initial 'supply demand balance' screening, we have undertaken in-depth assessment of drought risk using the outputs of our water resource modelling. For WRMP24 we generated a 19,200-year stochastic timeseries of inflow data for each of our key reservoir and river sources and have run this data through our water resource system simulation models. We have then analysed the model output, principally reservoir storage, to understand our water resource performance during severe drought events.

The key indicator we use to assess our drought risk with this methodology is the performance of our individual reservoirs and the frequency at which they breach their defined Emergency Storage provision, since this is the critical point for our supplies and is the trigger at which we would implement emergency drought orders to ration customer supplies, via the introduction of standpipes and rota cuts.

[1] Water company drought plan – technical guidance (Natural Resources Wales, July 2024)
[2] Drought Vulnerability Framework (UKWIR 2017, report ref: 17/WR/02/12)

Where WRZs are hydrologically constrained, DO can be very sensitive to the reservoir emergency provision, so much care has been taken in selecting an appropriate value for each reservoir. For our reservoir sources, the calculation of the standard emergency provision is the sum of the following components:

- 30 days of supply to customers at DO demand level in October (i.e. the expected end of a drought)
- 30 days of compensation releases (where required)
- 30 days of regulation releases (where required)
- Minus 30 days of supply from sources that can be reliably used at the end of a drought such as river sources and boreholes with reliable drought yields.

Risk level	Metrics
High Risk	Modelled reservoir storage using stochastic time series shows risk of individual reservoirs crossing their Emergency Storage provision more frequently than once every 200 years on average, which is our AMP8 target.
Potential Risk	Modelled reservoir storage using stochastic time series shows risk of individual reservoirs crossing their Emergency Storage provision as less frequent than 1 in 200 but more frequent than 1 in 500, which is our longer-term target.
Low Risk	Modelled reservoir storage using stochastic time series shows risk of individual reservoirs crossing their Emergency Storage provision as less frequent than 1 in 500 and so have a very high resilience to drought.

Table 2 - Screening criteria for the 'Detailed' assessment of water resource zone drought risk

The following sections provide an overview of each WRZ together with the results of the zonal drought risk assessment using the methodology described above and what our response to the drought risk will be in this Drought Plan.

3. Water Resource Zone Drought Risk – North Wales

3.1. North Eryri Ynys Mon

The WRZ is supplied from five raw water sources and their associated WTWs, namely: Alaw Reservoir (Alaw WTW), Cefni Reservoir (Cefni WTW), Cwellyn Reservoir (Cwellyn WTW), Ffynnon Llugwy Reservoir and Marchlyn Bach Reservoir (Mynydd Llandegai WTW). There is also a very small local supply from Capel Curig WTW which takes its supply from Ffynnon Llugwy.

The normal operation of the zone is to maximise supply from the three mainland reservoirs Cwellyn, Ffynnon Llugwy and Marchlyn Bach due to the reduced pumping required to distribute water from these upland gravity sources. During dry weather the transfer of water to Anglesey from the mainland is reduced and eventually stopped to preserve water resource on the mainland, as there is plentiful resource on Anglesey (primarily in Alaw Reservoir). Following the dry weather in 2018 (and so since WRMP19) we made several changes to the infrastructure and operation in NEYM. We can now operate the zone more conjunctively and balance the water resource risk better between sources.

3.1.1. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ.

Emergency Storage

For the NEYM zone the derived emergency storage provision for the zone as a whole is calculated through summation of the individual reservoir requirements:

- 30 days' October Alaw WTW supply (23 Ml/d) = 690 Ml
- 30 days Alaw reservoir compensation flow (3.28 Ml/d) = 98.4 Ml
- 30 days' October Cefni WTW supply (12.9 Ml/d) = 387 Ml
- 30 days' Cefni reservoir compensation flow (1.82 Ml/d) = 54.6 Ml
- 30 days' October Cwellyn WTW supply (4.87 Ml/d) = 146.1 Ml
- 30 days' Cwellyn reservoir compensation flow (11.4 Ml/d) = 342 Ml
- 30 days' October Ffynnon Llugwy WTW supply (12 Ml/d) = 360 Ml
- 30 days' Ffynnon Llugwy reservoir compensation flow (4.55 Ml/d) = 136.5 Ml
- Total NEYM ESP = 2,214.6 Ml (17.42% total storage)

3.1.2. Risk assessment

Although the supply demand balance presented in our WRMP24 shows a forecast surplus position throughout the period 2025-30, we have classified the zone as **'Potential Risk'** based on the results of our risk assessment:

1. The initial screening (Table 3) shows an 'Available-to-target' headroom ratio below 2 throughout the planning period.
2. Detailed analysis of reservoir storage shows risk of very low reservoir storages in Llyn Cwellyn (Figure 3) and Llyn Ffynnon Llugwy (Figure 4), particularly when compared to the overall reservoir storage position (Figure 2).

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	10.65	10.64	10.64	10.63	10.66	Potential risk
Target Headroom (Ml/d)	5.95	5.97	5.96	5.99	6.09	
Actual vs. Target headroom ratio	1.79	1.78	1.79	1.77	1.75	
Supply Demand Balance (Ml/d)	4.70	4.67	4.68	4.64	4.57	

Table 3 - Results of the Initial Screening assessment for the NEYM WRZ

Simulated data over 2,500 years show a healthy overall zonal storage position (Figure 2) with very few events either reaching very low levels (coloured lines in the chart) or not refilling by the end of winter. However, only assessing total zonal storage masks the vulnerability of individual reservoirs within the zone. Figure 3 and Figure 4 show that Llyn Cwellyn and Ffynnon Llugwy reservoirs are the most vulnerable sources in the zone, with storage reaching very low levels, and emptying completely in some extreme events. Based on the emergency storage requirements set out above, the risk of Cwellyn reaching its individual emergency storage provision is 1 in 228 years on average, whilst the equivalent analysis for Ffynnon Llugwy is 1 in 312 years on average. Although both are above our desired target of 1 in 200 years, given the level of uncertainty associated with stochastic data, our methodology would set the risk assessment as **"**Potential Risk**"** thus confirming and re-enforcing the results of the initial screening.

In response to the overall zonal classification of **"Potential Risk"** we have developed an updated set of drought action zones to minimise any risk to customer supplies.

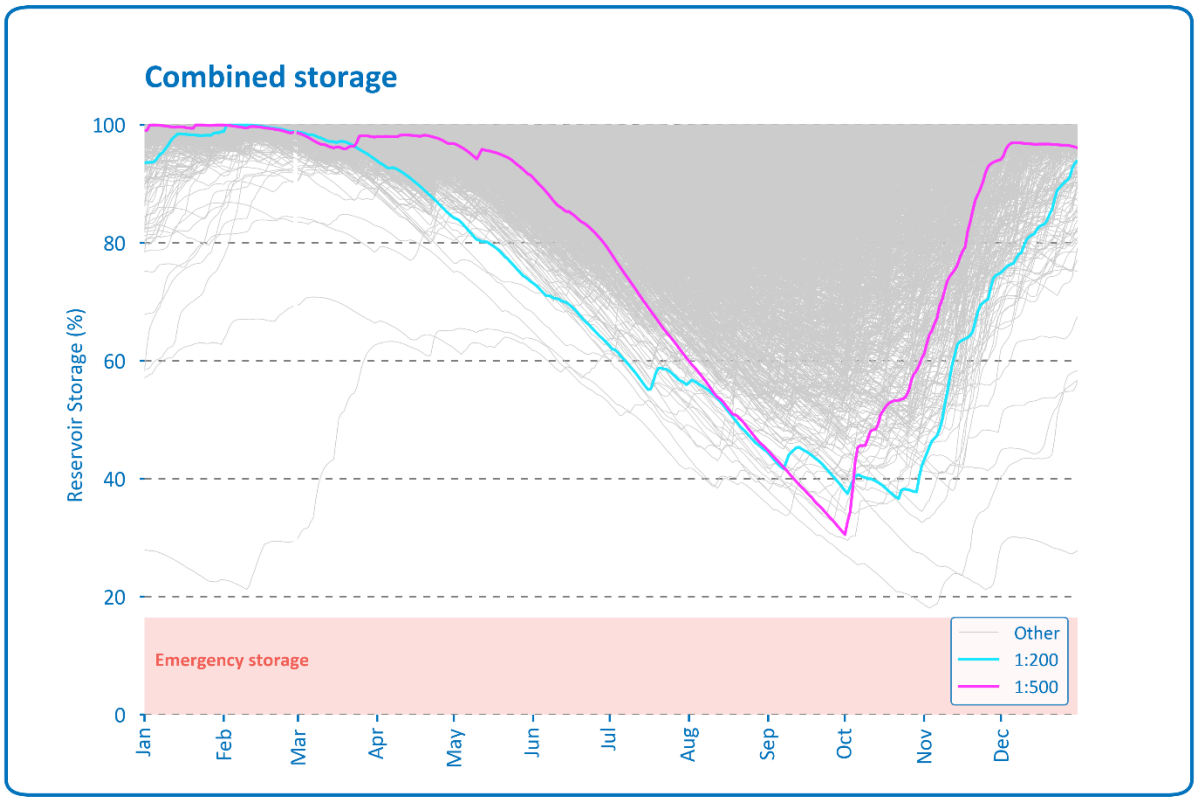


Figure 2 - Drawdown events of the zonal storage over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

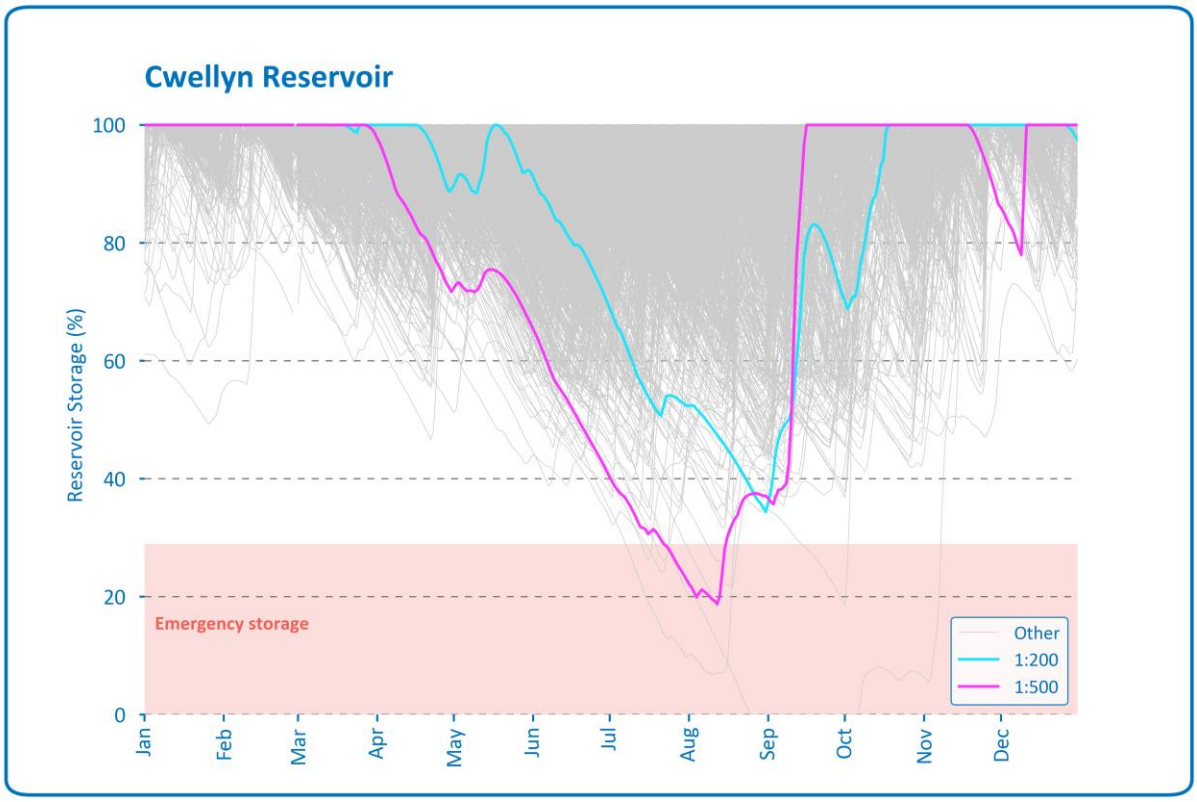


Figure 3 - Drawdown events of Llyn Cwellyn Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

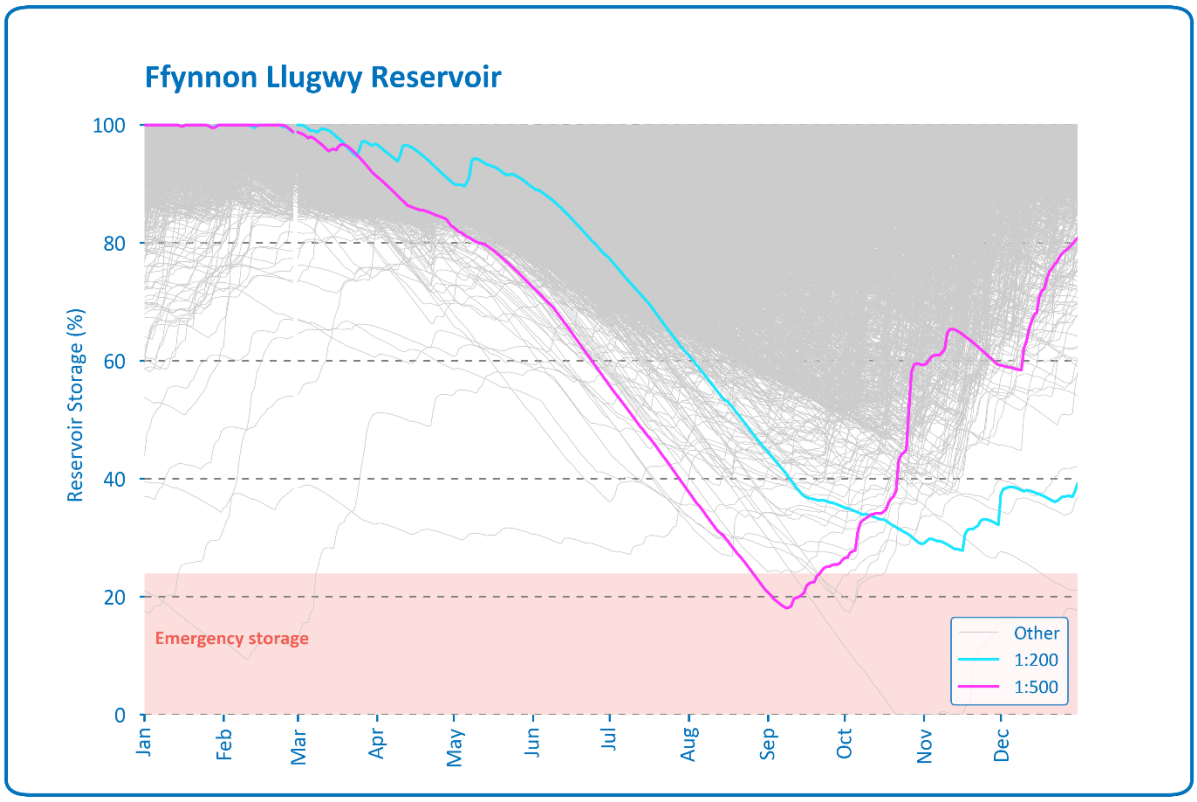


Figure 4 - Drawdown events of Llyn Ffynnon Llugwy Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

3.2. Clwyd Coastal

The WRZ is supplied from three raw water sources. These are: Aled Reservoir, Aled Isaf Reservoir, and Llannerch Park boreholes. The Clwyd Coastal WRZ is supplied by three WTWs; Glascoed (principal), Llannerch Park, and Trecastell. Glascoed WTW is fed from Plas Uchaf reservoir which stores water abstracted from the Afon Aled via the Bryn Aled Pumping Station. The Bryn Aled abstraction is supported by river regulation releases from Aled Isaf and Llyn Aled reservoirs. This arrangement is the subject of the Aled Section 20 Operating Agreement between DCWW and NRW.

Llannerch Park WTW is supplied by three boreholes which abstract from the Permo-Triassic Sandstone aquifer in the Vale of Clwyd. As well as abstracting water from the sandstone, the boreholes are known to draw water through the drift and reduce flows in the nearby Afon Clwyd. To mitigate this, when flows in the river are naturally low, we release water from a set of artesian boreholes (Llanynys, Glanywern, Ruthin, Plas yr Esgob, Llwyn Isaf and Efail Newydd) further up the Vale to augment the river flow. This is known as the Clwyd augmentation scheme and is also covered under a S20 Operating Agreement between DCWW and NRW.

Trecastell WTW is supplied solely from a spring source at Ffynnon Asaph, however, during heavy rainfall the spring can be affected by turbidity and the works is unable to treat the water. During such times, the Trecastell demand area is supplied from Glascoed WTW.

3.2.1. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ.

Emergency storage

For the Clwyd Coastal zone the emergency storage provision is calculated as follows:

- 30 days' October Glascoed WTW supply (10 Ml/d) = 300 Ml
- 30 days' Aled Isaf reservoir compensation flow (2.27 Ml/d) = 68.1 Ml
- 30 days' Aled Isaf reservoir fisheries allocation (2 Ml/d) = 60 Ml
- Total Aled/Aled Isaf ESP = 428.1 Ml (15% total storage)

3.2.2. Risk assessment

Llannerch boreholes' drought risk is assessed as being low. The Permo-Triassic Sandstone aquifer has high storativity and is hydraulically connected to the River Clwyd, which supports the aquifer in dry weather. Typical dry weather drawdown levels are over 15m above the pump intake and Deepest Advisable Pumping Water Level (DAPWL) for all boreholes.

Although the SDB is above zero, we have classified the zone a 'Potential Risk' based on:

1. The initial screening (Table 4) shows an 'Available-to-target' headroom ratio below 2 throughout the planning period.
2. Detailed analysis of reservoir storage (Figure 5 to Figure 7 below) shows risk of very low reservoir storages in Aled and Aled Isaf.

Simulated data over 2,500 years show that there are many events which lead to a low storage (coloured lines in the charts below), and some events where the reservoirs do not refill over the winter. Figure 5 shows that Llyn Aled is a vulnerable source where the storage drops below 30% for a number of drought events, with one drought event emptying the reservoir.

This further highlights the exposure to drought risk and so in response to the overall zonal classification of **"Potential Risk"** we have developed an updated set of drought curves to minimise any risk to customer supplies.

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	1.97	1.96	1.92	1.88	1.88	Potential risk
Target Headroom (Ml/d)	1.84	1.84	1.83	1.84	1.78	
Actual vs. Target headroom ratio	1.07	1.07	1.07	1.07	1.07	
Supply Demand Balance (Ml/d)	0.13	0.12	0.09	0.04	0.10	

Table 4 - Results of the Initial Screening assessment for the Clwyd Coastal WRZ

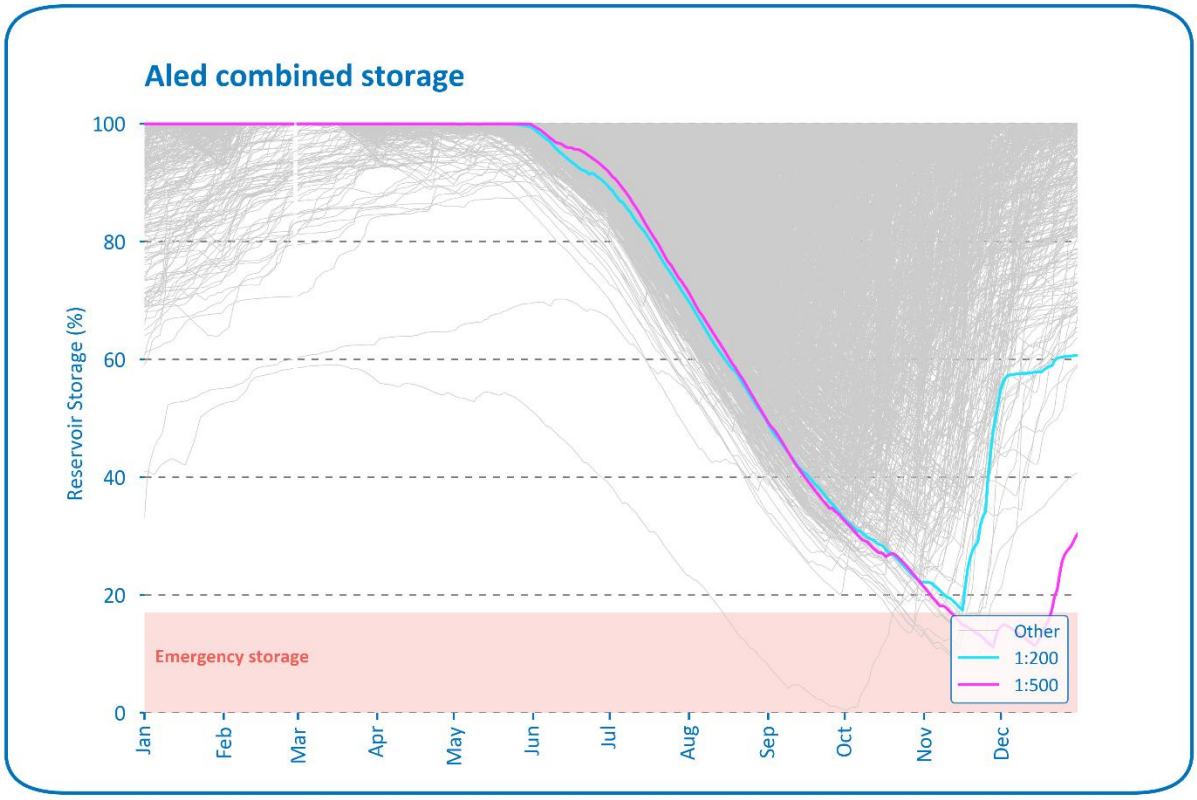


Figure 5 - Drawdown events of the zonal storage over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

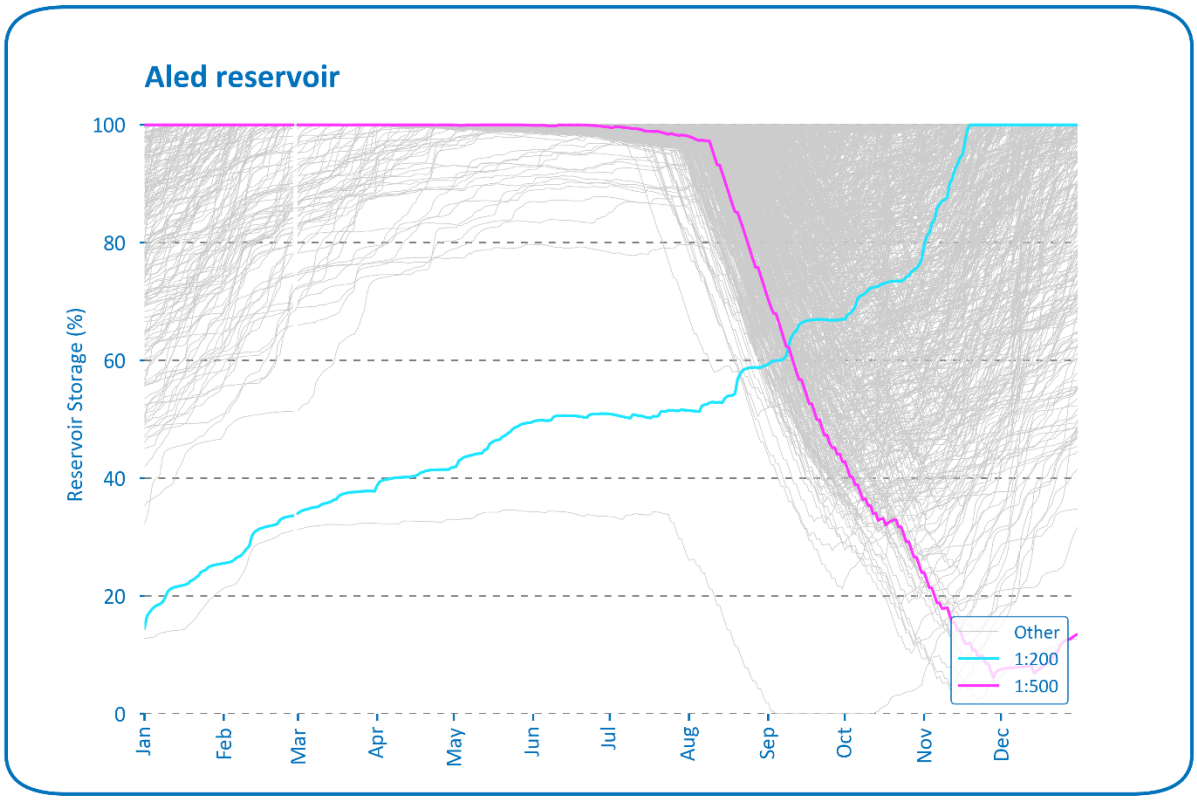


Figure 6 -- Drawdown events of Llyn Aled Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

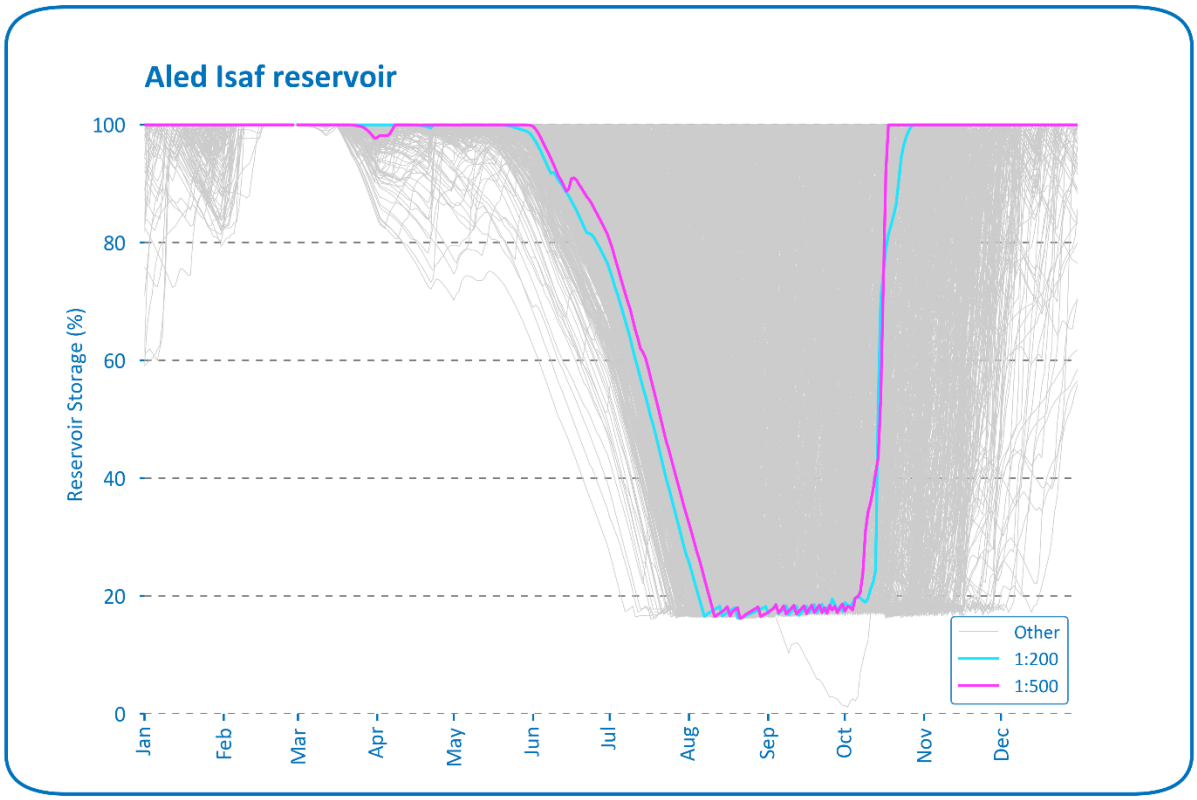


Figure 7- Drawdown events of Llyn Aled Isaf Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

3.3. Alwen Dee

The WRZ is supplied from two raw water sources, namely Alwen Reservoir and the River Dee at Poulton. We also have a licensed abstraction from three boreholes in the Bretton area, but they are not currently used and so have not been included within our modelling. During normal operation we maximise the use of Alwen WTW as this water is cheaper to treat and distribute than the Bretton water. The Alwen supply is reduced during drought to preserve resource in the reservoir, and we increase the amount of water we take from the River Dee (within our licenced limits according to the Dee General Directions).

3.3.1. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ.

Emergency storage

For the Alwen Dee zone the emergency storage provision is calculated as follows:

- 30 days' October Alwen WTW supply (39.6 Ml/d) = 1,188 Ml
- 30 days' Alwen reservoir compensation flow (13.6 Ml/d) = 408 Ml
- Total Alwen reservoir ESP = 1,596 Ml (11.7% total storage)

3.3.2. Risk assessment

Although the supply demand balance presented in our WRMP24 shows a healthy forecast surplus position throughout the period 2025-30, we have classified the zone as **'Potential Risk'** based on the results of our risk assessment:

1. The initial screening (Table 5Table 1) shows an 'Available-to-target' headroom ratio above 2 throughout the planning period, indicating a 'Low' risk.
2. However, analysis of reservoir storage shows risk of very low reservoir storage in Llyn Alwen (Figure 8).

Simulated data over 2,500 years show a large number of drought events that cause storage to fall below 30%, nine of which cause storage to breach our defined emergency provision. The modelling also indicates multiple drought events that continue beyond the summer and cause Alwen reservoir not to fully refill over the winter (Figure 8). With the calculated return period of approximately 1 in 280 for emergency storage breaches then we have revised the result of the 'Initial' screening to classify the zone as 'Potential' risk and have developed an updated set of drought curves to minimise any risk to customer supplies.

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	9.28	9.30	9.34	9.27	9.27	Low risk
Target Headroom (Ml/d)	2.23	2.21	2.24	2.16	2.21	
Actual vs. Target headroom ratio	4.16	4.21	4.17	4.29	4.19	
Supply Demand Balance (Ml/d)	7.05	7.10	7.10	7.11	7.06	

Table 5 - Results of the Initial Screening assessment for the Alwen Dee WRZ

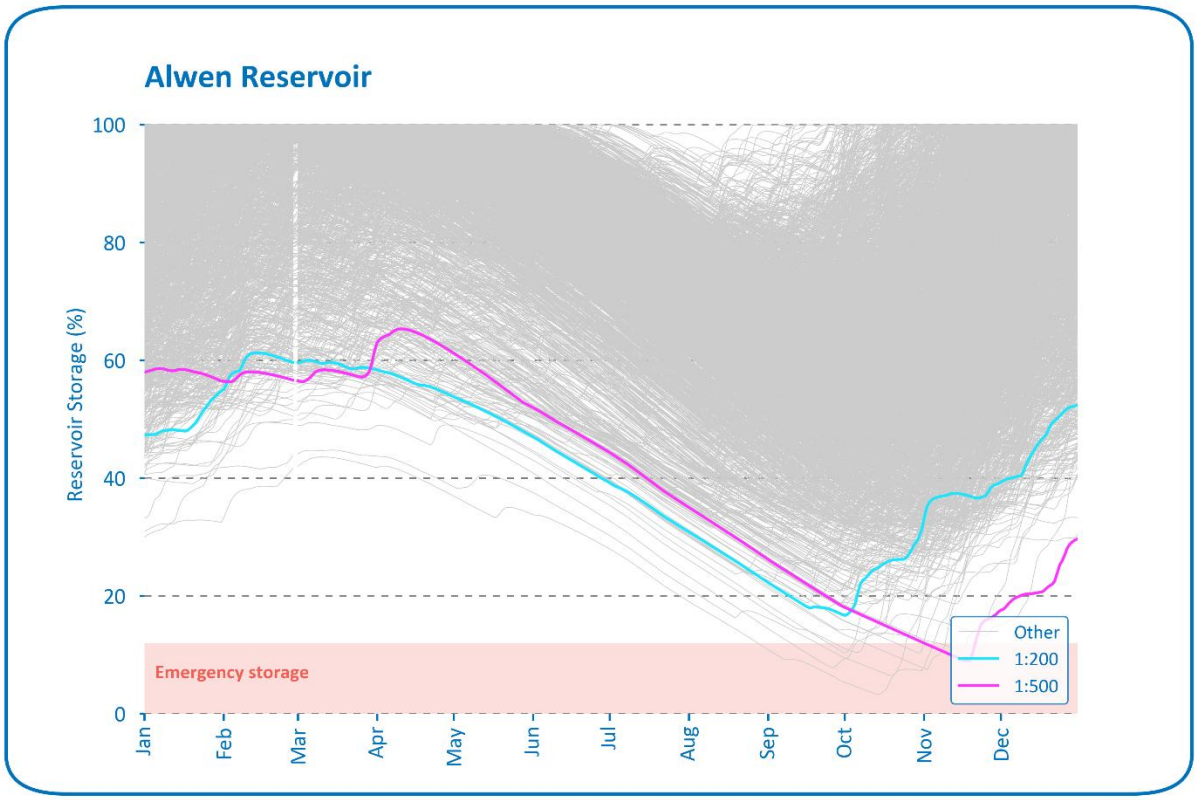


Figure 8 - Drawdown events of Llyn Alwen Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

3.4. Bala

The WRZ is supplied from one raw water source and one WTW: Arenig Fawr Reservoir and Llidiardau WTW, serving a population of approximately 4,000. It covers the town of Bala and the immediate surrounding area. In the summer the demand increases significantly due to tourism.

3.4.1. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ.

Emergency storage

For the Bala zone the emergency storage provision is calculated as follows:

- 30 days' October Llidiardau WTW supply (1.65 Ml/d) = 49.5 Ml
- Total Llyn Arenig Fawr ESP = 49.5 Ml (3% total)

Risk assessment

The zone is classified as **'Low Risk'** given both the robust supply demand balance position (Table 6) and our water resource modelling (Figure 9) which shows a minimum storage of 85% even when the full 19,400 year stochastic inflow record is simulated thorough our water resource models. We are therefore not deriving any drought control curves as there is no plausible risk to customer supplies in this zone.

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	0.55	0.55	0.55	0.54	0.54	Low risk
Target Headroom (Ml/d)	0.14	0.14	0.14	0.14	0.14	
Actual vs. Target headroom ratio	4.06	3.96	3.95	3.93	3.91	
Supply Demand Balance (Ml/d)	0.41	0.41	0.41	0.40	0.40	

Table 6 - Results of the Initial Screening assessment for the Bala WRZ

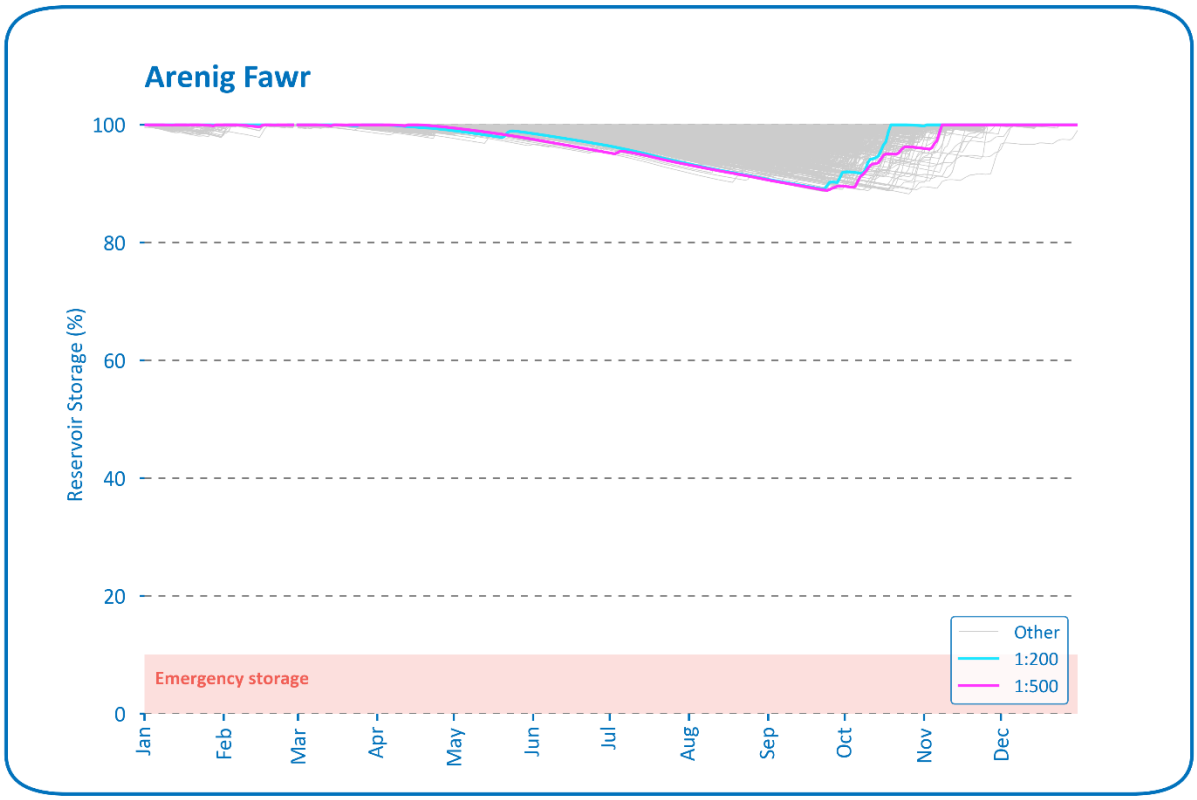


Figure 9 - Drawdown events of Llyn Arenig Fawr Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

3.5. Tywyn Aberdyfi

The WRZ is supplied from two raw water sources: the Afon Fathew and the Nant Braich-Y-Rhiw which provide raw water for Penybont WTW. The Nant Braich-y-Rhiw abstraction licence has a hands-off-flow condition which prevents its use when river levels are low. This comes into operation during most summer periods; we are then reliant upon the Afon Fathew. There are no exports or imports of water. This WRZ covers the small coastal area around the towns of Tywyn and Aberdyfi in Mid Wales. There are approximately 4,800 customers in this zone, but the demand increases significantly during the summer due to tourism.

3.5.1. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ.

Emergency storage

As there is no reservoir storage in the zone then we do not define an emergency storage provision.

Risk assessment

The zone is classified at **'Low Risk'** through the planning period. This zone is supplied by a single treatment works, and its maximum capacity constrains the deployable output which limits the actual-to-target headroom ratio (not the hydrological drought risk) (Figure 10). A hydrological study on the Afon Fathew conducted in 2021[3] found that there was a significantly greater baseflow on the river than previously thought. The hydrological drought risk to the zone is therefore considered to be low and thus, no drought action zones have been derived.

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	0.75	0.75	0.76	0.76	0.77	Low risk
Target Headroom (Ml/d)	0.29	0.29	0.29	0.29	0.29	
Actual vs. Target headroom ratio	2.61	2.59	2.63	2.66	2.65	
Supply Demand Balance (Ml/d)	0.46	0.46	0.47	0.48	0.48	

Table 7 - Results of the Initial Screening assessment for the Tywyn Aberdyfi WRZ

[3] DCWW Hydrology Update DG16_Final Report version 4

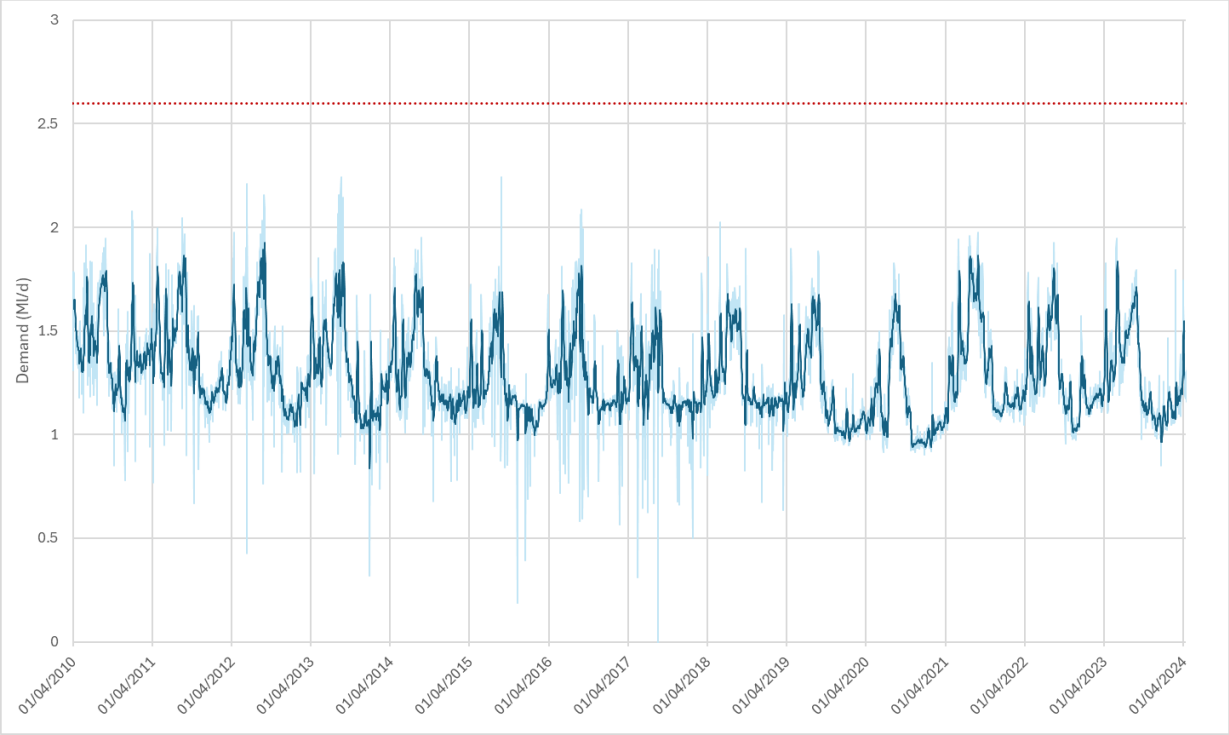


Figure 10 – Recent actual demand compared to supply side capability for the Tywyn Aberdyfi WRZ

3.6. Blaenau Ffestiniog

The WRZ is supplied from Llyn Morwynion Reservoir, supported through the winter by abstraction from the nearby Afon Gam (subject to HoF conditions and a refill control line) and provides raw water to Garreglwyd WTW.

3.6.1. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ.

Emergency storage

For the Blaenau Ffestiniog zone the emergency storage provision is calculated as follows:

- 30 days' October Garreglwyd WTW supply (2.25 Ml/d) = 67.5 Ml
- Total Llyn Morwynion ESP = 67.5 Ml (19% total storage)

Risk assessment

Despite the initial screening criteria (Table 8) returning a classification of 'Low Risk', we have derived updated drought action zones due to the vulnerability of the Afon Gam source. The modelling results used to inform the DAZs for this zone are from the "without the Afon Gam" scenario.

1. The initial screening (Table 8) shows an 'Available-to-target' headroom ratio above 2 throughout the planning period.
2. Detailed analysis of reservoir storage shows risk of very low reservoir storages in Llyn Morwynion if the Afon Gam transfer is not available (Figure 11a).
3. As set out in WRMP24, the Afon Gam transfer has modelled, and the results of this modelling are shown in Figure 11b.

Therefore, we have classified the zone as **'Potential Risk'** owing to its vulnerable reservoir refill via the Afon Gam, despite its robust supply demand balance. The performance of Llyn Morwynion without the Afon Gam transfer active indicates that it would be very vulnerable to extreme drought events (Figure 11a). The reason for this testing is because the Afon Gam's availability is very sensitive to flows at the beginning of a drought. The hands-off flow (HOF) is high (Q85), and at this level, the recession curve is steep. This means that the flow can recede quickly past Q85 before a drought (as assessed by Llyn Morwynion storage) has commenced. Therefore a 20% overestimation in catchment inflow from the rainfall runoff model could mean that rather than the Afon Gam being available for four weeks after the onset of drought, it is immediately unavailable. Our work deriving improved hydrological inflow data also noted the uncertainties with this source, particularly its use during low summer flows, and so there is a risk we are underestimating the severity of potential drought events.

Drought curves have been derived for this zone on the assumption that the Afon Gam is unavailable to present a worst-case scenario, and to position the drought curves in a suitably high position. Undertaking the assessment in this configuration still means we remain comfortably within our levels of service for triggering drought restrictions (see App3, table 19).

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	0.70	0.69	0.69	0.69	0.69	Low risk
Target Headroom (Ml/d)	0.27	0.27	0.26	0.27	0.27	
Actual vs. Target headroom ratio	2.63	2.59	2.62	2.58	2.54	
Supply Demand Balance (Ml/d)	0.43	0.43	0.43	0.42	0.42	

Table 8 - Results of the Initial Screening assessment for the Blaenau Ffestiniog WRZ

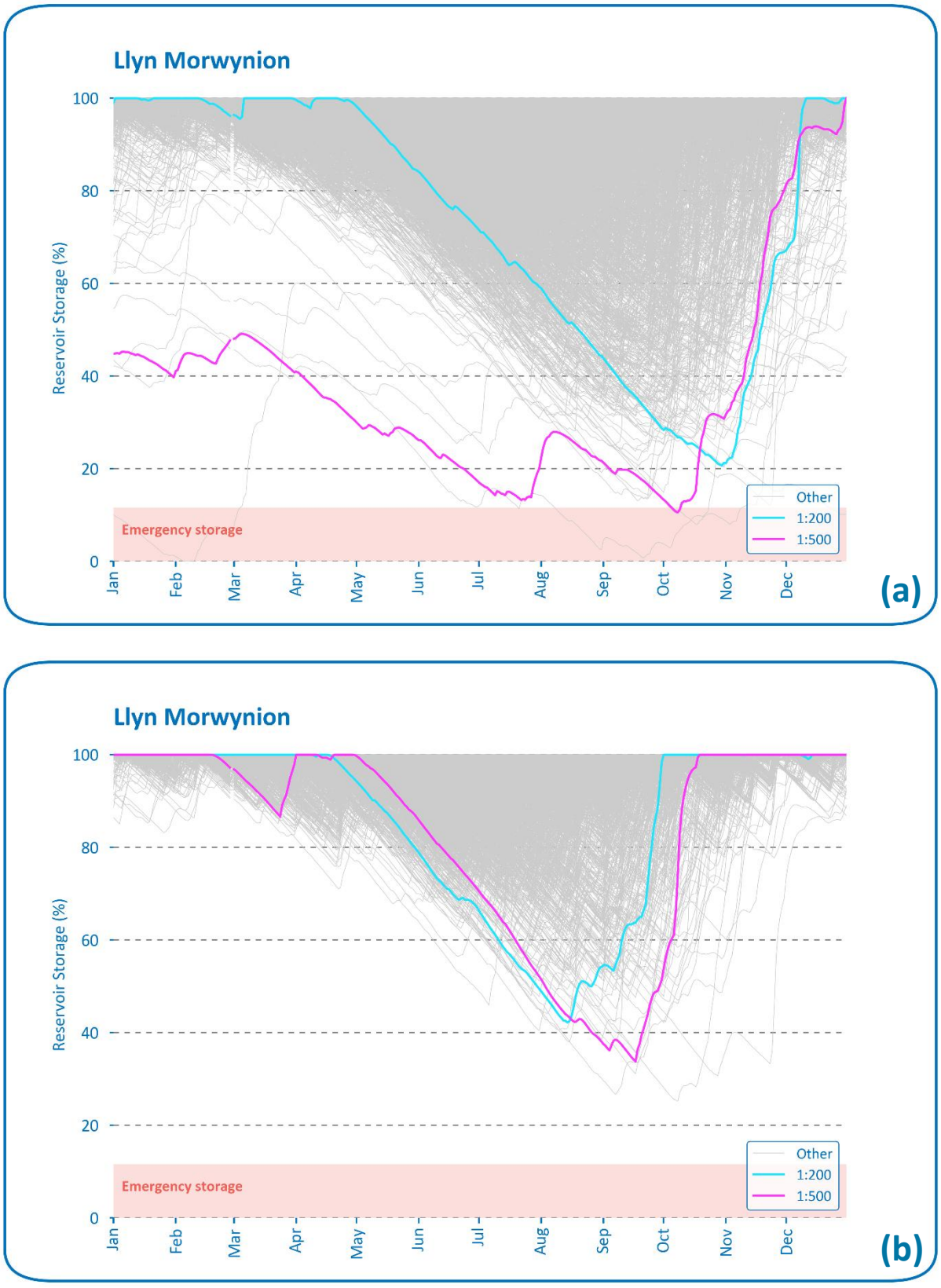


Figure 11 - Drawdown events of Llyn Morwynion Reservoir over 2,500 years: (a) without the Afon Gam transfer active and (b) with the Afon Gam transfer active. Coloured lines show the events with return period of 200 and 500 years.

3.7. Lleyn-Harlech-Barmouth

Water in the zone comes from five impounding reservoirs: Llyn Cwmystradllyn and Llyn Cwm Dulyn to the east of the Lleyn Peninsula and Llyn Tecwyn Uchaf, Llyn Eiddew Mawr and Llyn Bodlyn to the south. There is also a river abstraction on the Afon Dwyfor downstream of Llyn Cwmystradllyn.

Cwmystradllyn and the Afon Dwyfor feed the Dolbenmaen water treatment works which supplies most of the Lleyn peninsula. Llyn Cwm Dulyn has its own works and supplies its local area as well as Criccieth when needed. Llyn Tecwyn Uchaf, Llyn Eiddew Mawr and Llyn Bodlyn supply Cilfor, Rhiwgoch and Eithinfynydd works respectively. Under normal operations they each supply their own local area, but water can be moved between them to balance the drought risk and/or resolve any peak demand issues at Eithinfynydd.

3.7.1. Summary of modelling assumptions

Emergency storage

For the Lleyn-Harlech-Barmouth zone the emergency storage provision is calculated as follows:

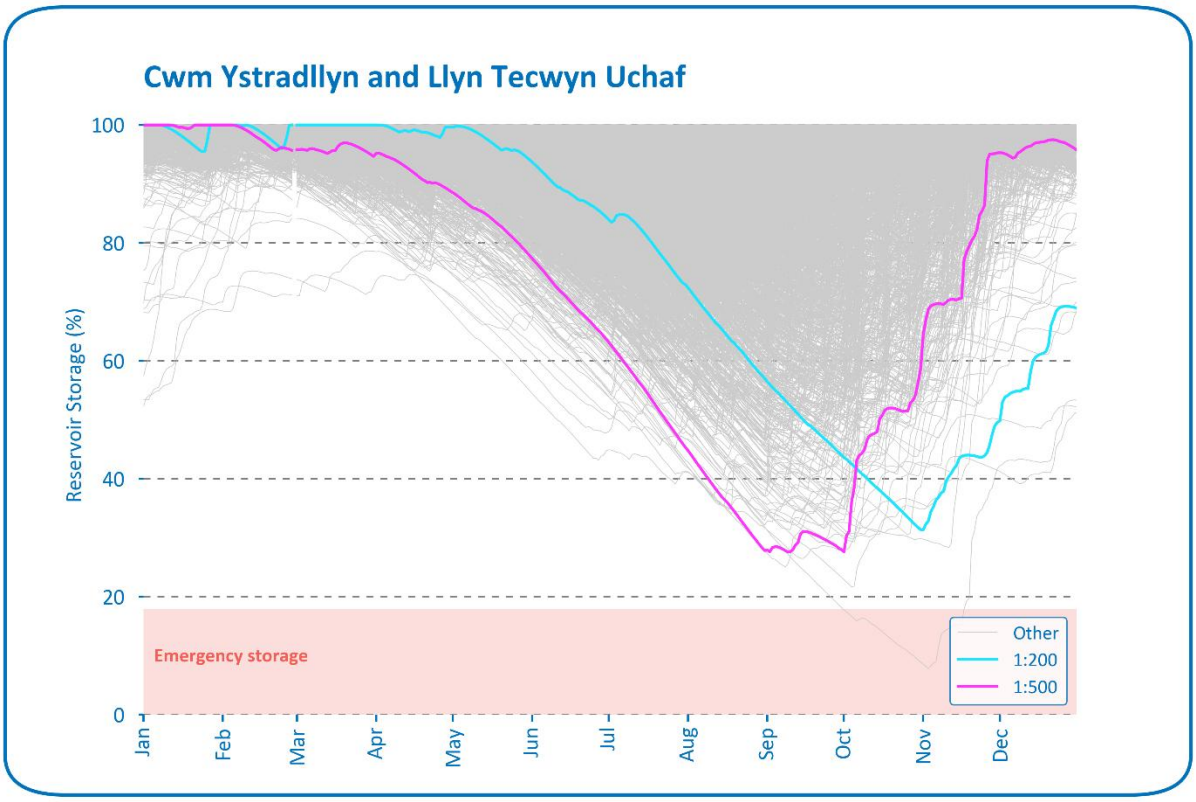
- 30 days' October Dolbenmaen WTW supply (9.7 Ml/d) = 291.0 Ml
- 30 days' October Rhiwgoch WTW supply (0.9 Ml/d) = 27.0 Ml
- 30 days' October Cwm Dulyn WTW supply (1.55 Ml/d) = 46.5 Ml
- 30 days' October Cilfor WTW supply (1.01 Ml/d) = 30.3 Ml
- 30 days' October Eithinfynydd WTW supply (2.46 Ml/d) = 73.8 Ml
- 30 days' Llyn Cwmystradllyn reservoir compensation flow (3 Ml/d) = 90.0 Ml
- Total combined Cwmystradllyn/Tecwyn Uchaf reservoir ESP = 558.9 Ml
- (16.2% total storage)

Risk assessment

Although the supply demand balance presented in our WRMP24 shows a forecast surplus position throughout the period 2025-30, we have classified the zone as **'Potential Risk'** based on the results of our risk assessment:

1. The initial screening (Table 9) shows an 'Available-to-target' headroom ratio below 2 throughout the planning period.

2. Detailed analysis of reservoir storage shows risk of very low reservoir storages in Cwmystradllyn and Tecwyn Uchaf (



3. Figure 12 to Figure 14).

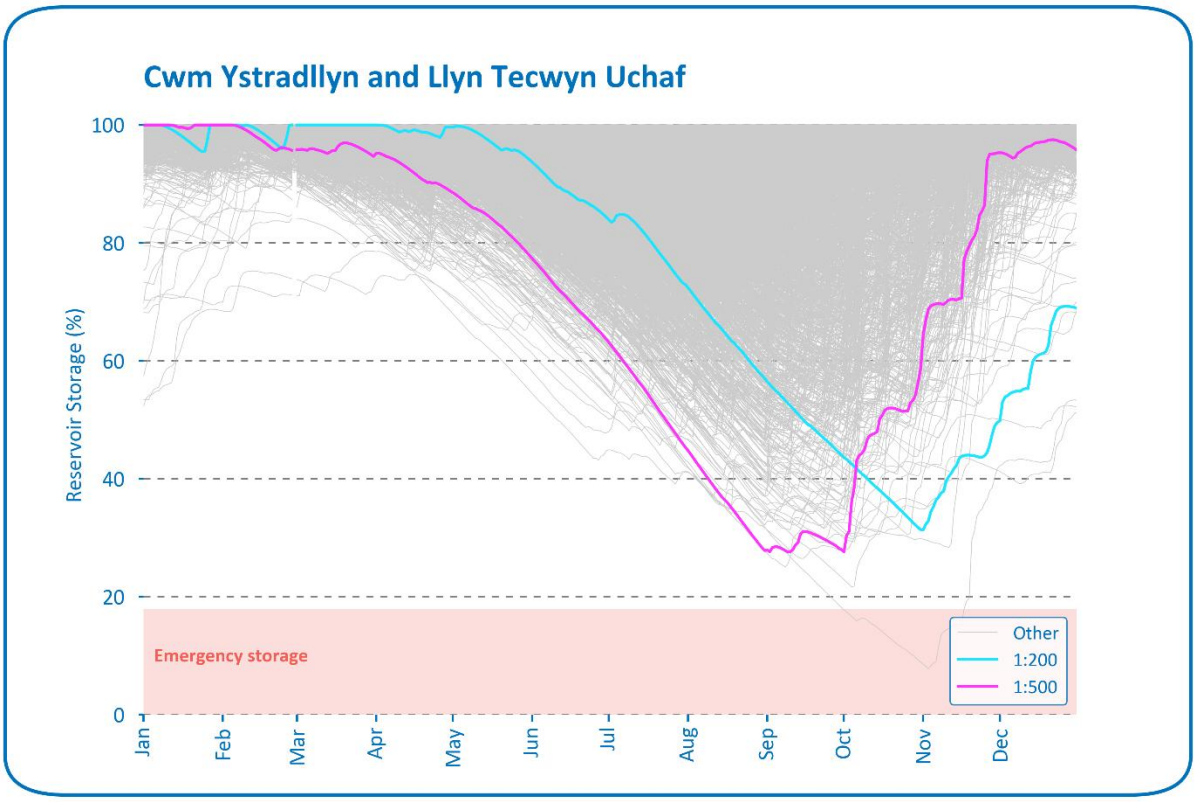


Figure 12 to Figure show the most severe drawdowns on the zone's key reservoirs. The charts show the zone is largely resilient to severe droughts, with only one event entering

emergency storage, and very few entering severe drought, with a calculated return period of around 1 in 300 years.

Although modelling using the 2,500-year stochastic record shows that the risk of needing to implement extreme supply side measures, such as widespread pressure management or water rationing is low, 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 our assessment of drought risk we have produced an updated set of drought action zones that are defined on the combined storage of Llyn Cwmystradllyn and Llyn Tecwyn Uchaf.

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	1.35	1.33	1.29	1.24	1.22	Potential risk
Target Headroom (Ml/d)	0.85	0.88	0.92	0.94	0.97	
Actual vs. Target headroom ratio	1.58	1.50	1.40	1.32	1.25	
Supply Demand Balance (Ml/d)	0.50	0.44	0.37	0.30	0.25	

Table 9 - Results of the Initial Screening assessment for the Lleyn Harlech Barmouth WRZ

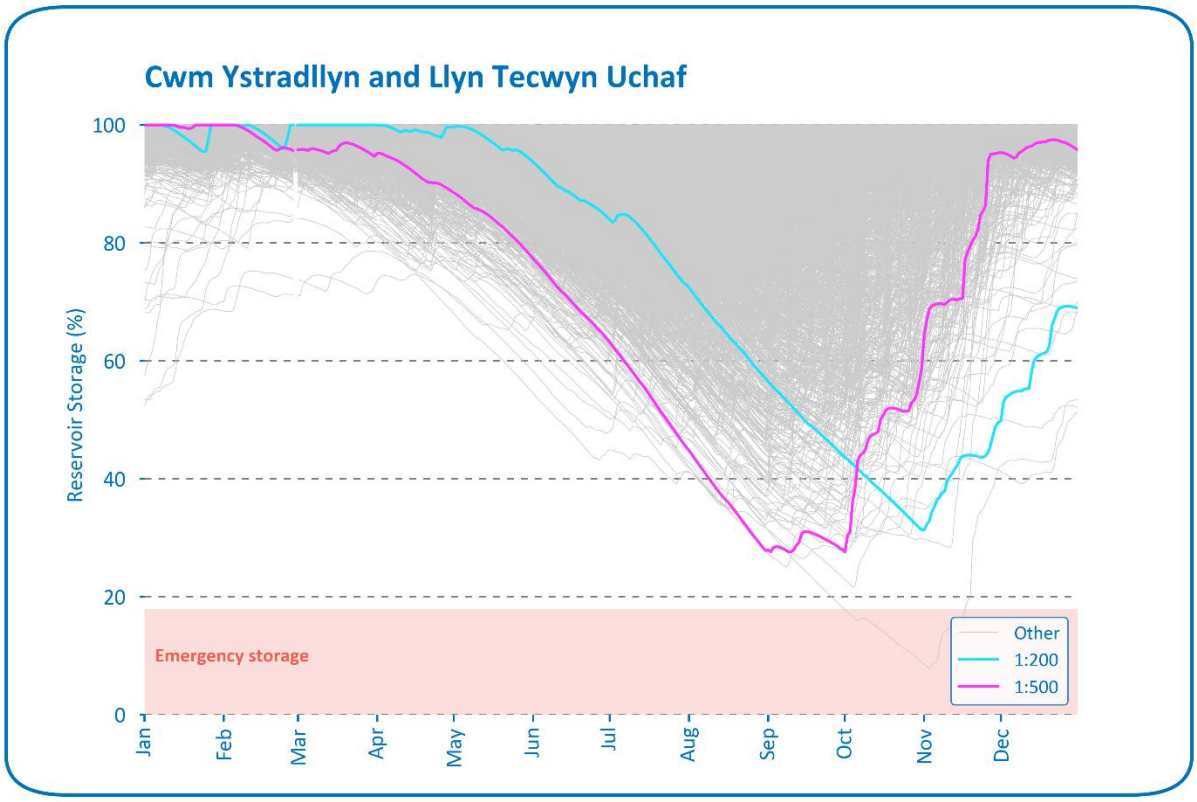


Figure 12 - Drawdown events of the combined storage in Llyn Cwmystradllyn and Llyn Tecwyn Uchaf over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

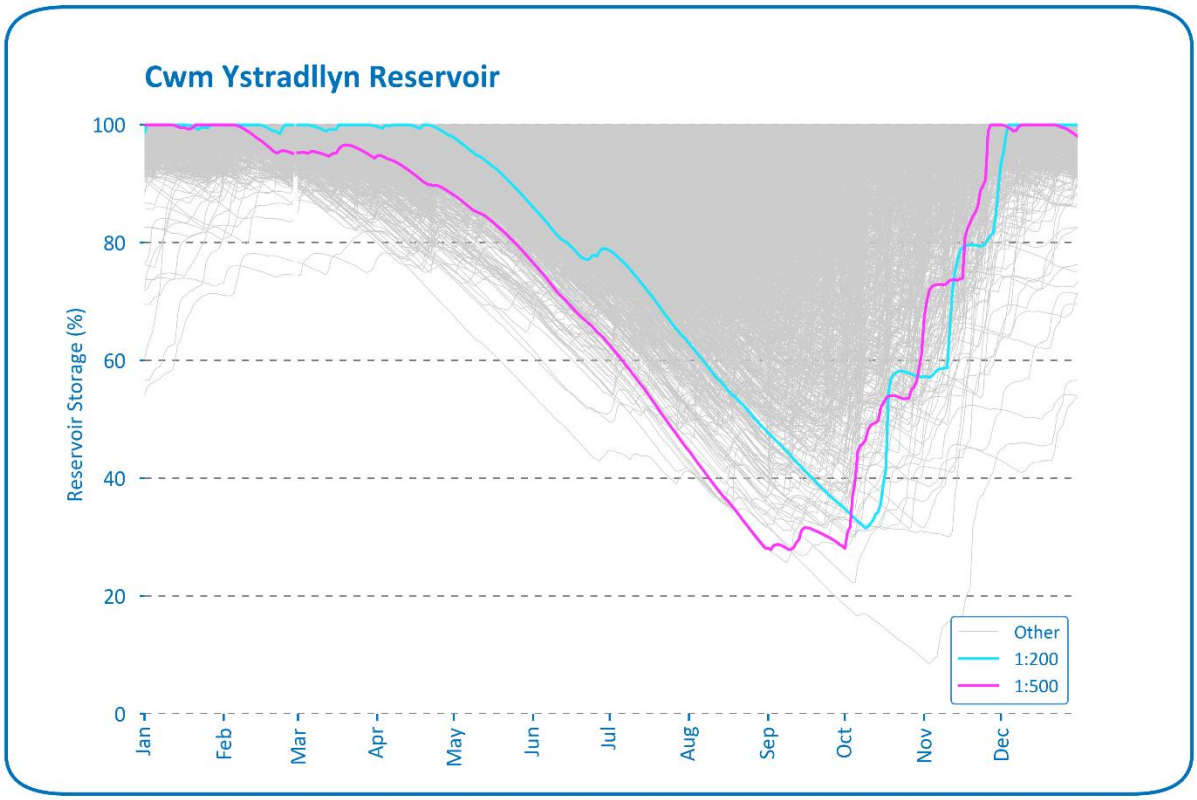


Figure 13 - Drawdown events in Llyn Cwmystradllyn over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

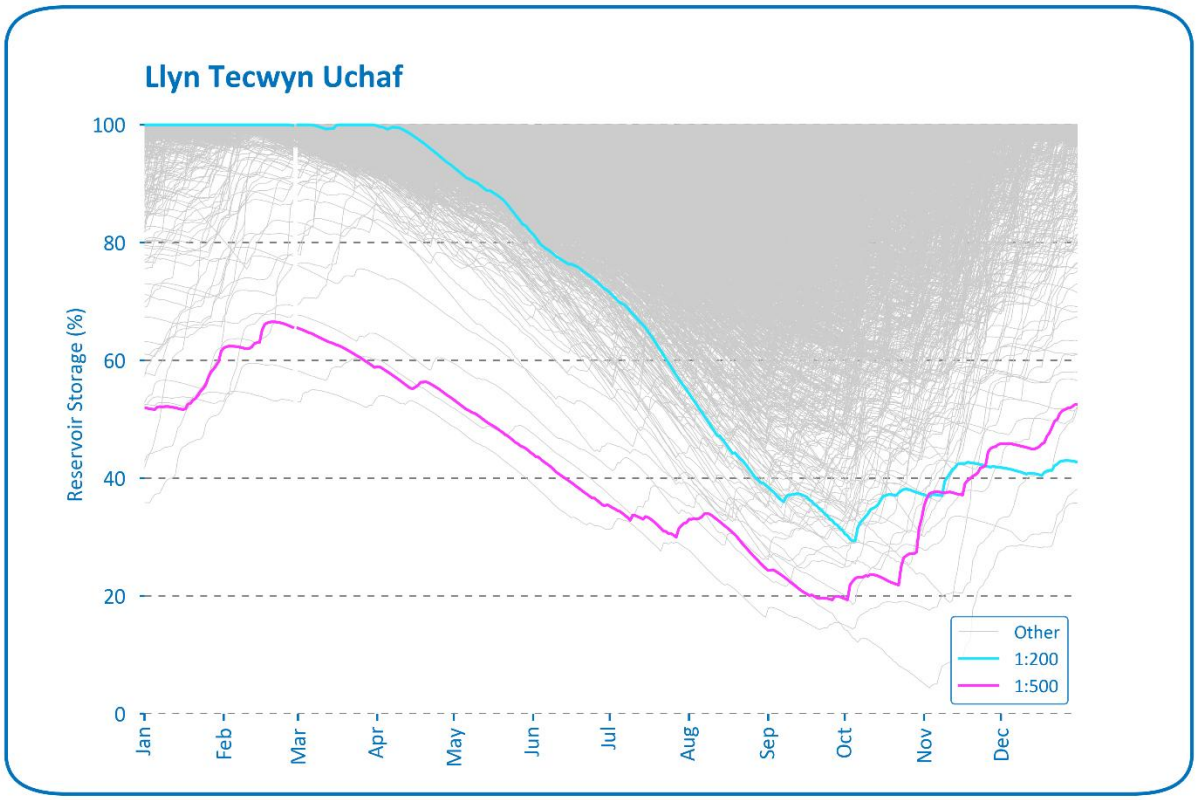


Figure 14 - Drawdown events in Llyn Tecwyn Uchaf over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

3.8. Dyffryn Conwy

Raw water in the WRZ is provided by two sources; Llyn Cowlyd Reservoir and Llyn Conwy Reservoir, which supply Bryn Cowlyd WTW and Conwy WTW respectively. The storage in Llyn Cowlyd is managed between DCWW and RWE Innogy, whereby the 'top' 47% of the storage is shared, but to ensure we have enough water in a dry year, the 'bottom' 53% is for our supply only.

3.8.1. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ.

Emergency storage

For the Dyffryn Conwy zone the emergency storage provision is calculated as follows:

- 30 days' October Conwy WTW supply (0.53 Ml/d) = 15.78 Ml
- 30 days' Llyn Conwy reservoir compensation flow (0.92 Ml/d) = 27.6 Ml
- Total Llyn Conwy reservoir ESP = 43.38 Ml (6.303 % total storage)

3.8.2. Risk assessment

We have classified the zone as **'Potential Risk'** based on the results of our detailed risk assessment.

1. The initial screening (Table 10) shows an 'Available-to-target' headroom ratio above throughout the planning period.
2. Detailed analysis of reservoir storage shows risk of low reservoir storages in Llyn Cowlyd and Llyn Conwy (Figure 15 to Figure 16).

Despite the initial screening criteria returning a classification of 'Low Risk', we have derived updated drought action zones given the importance of the zone for tankering elsewhere in North Wales, and the potential vulnerability of the Llyn Conwy reservoir. Therefore, updated drought action zones have been derived for Llyn Conwy storage only, given the very high resilience of Llyn Cowlyd.

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	6.50	6.51	6.51	6.49	6.51	Low risk
Target Headroom (Ml/d)	3.14	3.14	3.11	3.08	3.05	
Actual vs. Target headroom ratio	2.07	2.07	2.09	2.11	2.13	
Supply Demand Balance (Ml/d)	3.36	3.37	3.40	3.41	3.45	

Table 10 - Results of the Initial Screening assessment for the Dyffryn Conwy WRZ

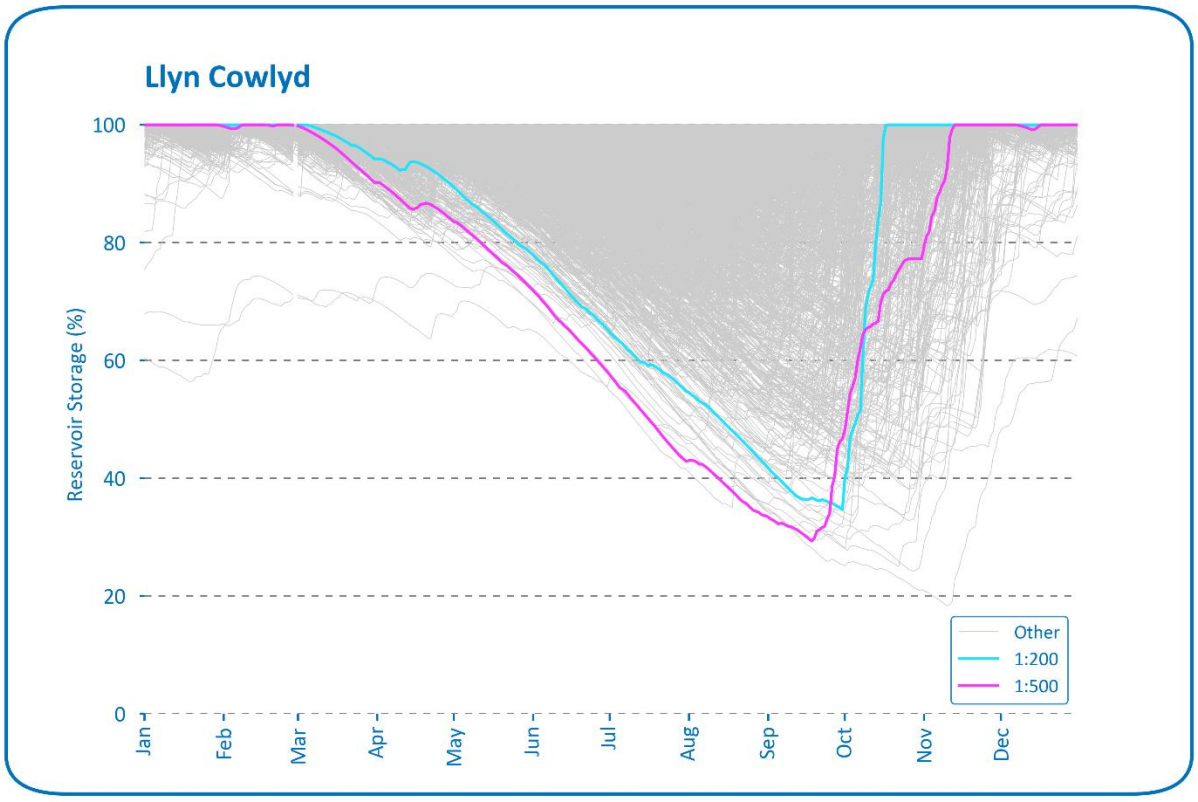


Figure 15 - Drawdown events in Llyn Cowlyd over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

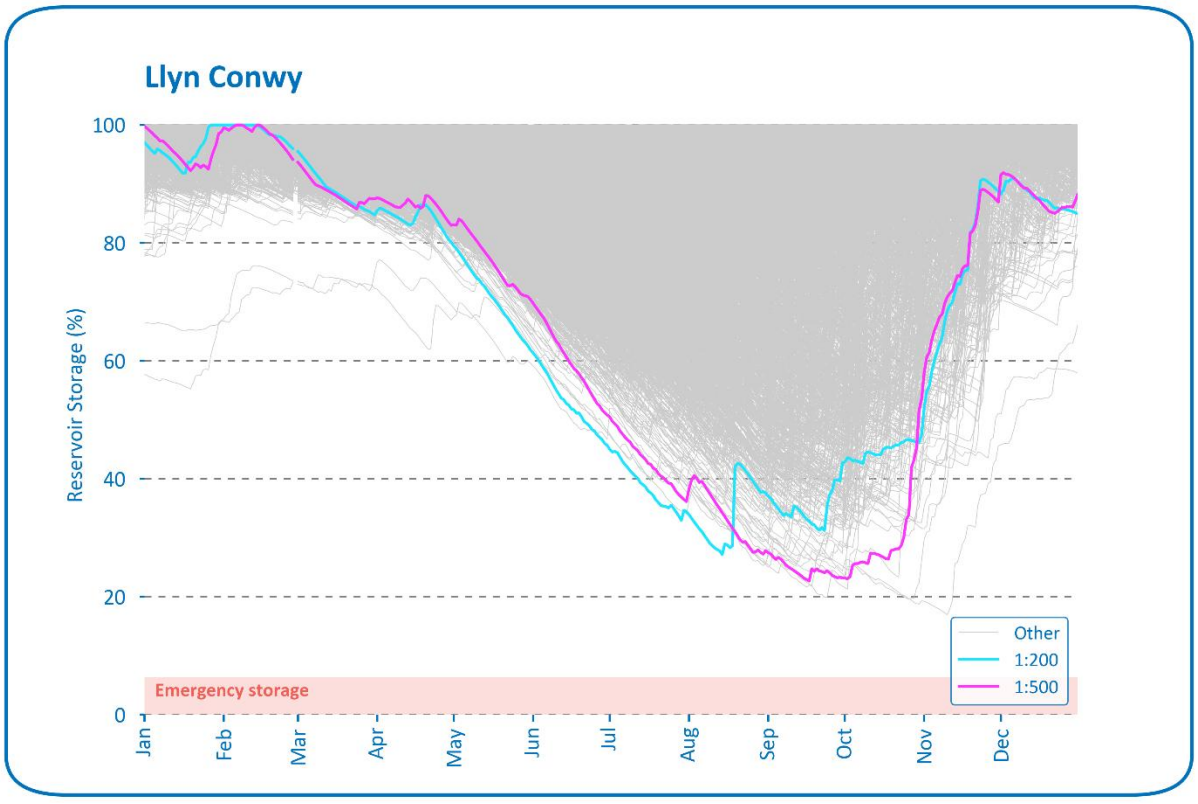


Figure 16 - Drawdown events in Llyn Conwy over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

3.9. South Meirionnydd

The WRZ is supplied from a variety of raw water sources, although the largest and principal supply of water in the zone is Llyn Cynwch which is supported by a winter refill scheme from the Afon Wnion and feeds Penycefn WTW. The WRZ also includes two river abstractions (Afon Gwril, Afon Calettwr) and three spring sources (Abergynolwyn, Brynllys and Pistyll Gwyn) which feed water to their local supply areas and associated WTWs. Although network connections between the sources of supply are limited, we have robust tankering capability that is used to meet peaks in demand.

3.9.1. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ.

Emergency storage

For the South Meirionnydd zone the emergency storage provision is calculated as follows:

- 30 days' October Penycefn WTW supply (2.25 Ml/d) = 67.5 Ml
- 30 days' October Gwastadgoed WTW supply (0.7 Ml/d) = 21 Ml
- Total Llyn Cynwch reservoir ESP = 88.5 Ml (16.5% total storage)

3.9.2. Risk assessment

Despite the Initial Screening indicating the zone is at 'Potential Risk', the outputs of our detailed assessment (Figure 17) demonstrate there is very little drought risk with our simulation modelling showing that across the 2,500-year subsample, storage in Llyn Cynwch only reaches a minimum storage of 57%. The winter refill scheme from the Afon Wnion works well in supporting drought resilience at Llyn Cynwch and so overall the zone has been classified as having a **'Low Risk'** to drought.

WRMP24 metric	**2025-26**	**2026-27**	**2027-28**	**2028-29**	**2029-30**	**Risk**
Available Headroom (Ml/d)	0.41	0.41	0.41	0.40	0.40	Potential risk
Target Headroom (Ml/d)	0.33	0.34	0.33	0.34	0.34	
Actual vs. Target headroom ratio	1.24	1.23	1.23	1.20	1.18	
Supply Demand Balance (Ml/d)	2.35	2.36	2.36	2.36	2.37	

Table 11 - Results of the Initial Screening assessment for the South Meirionydd WRZ

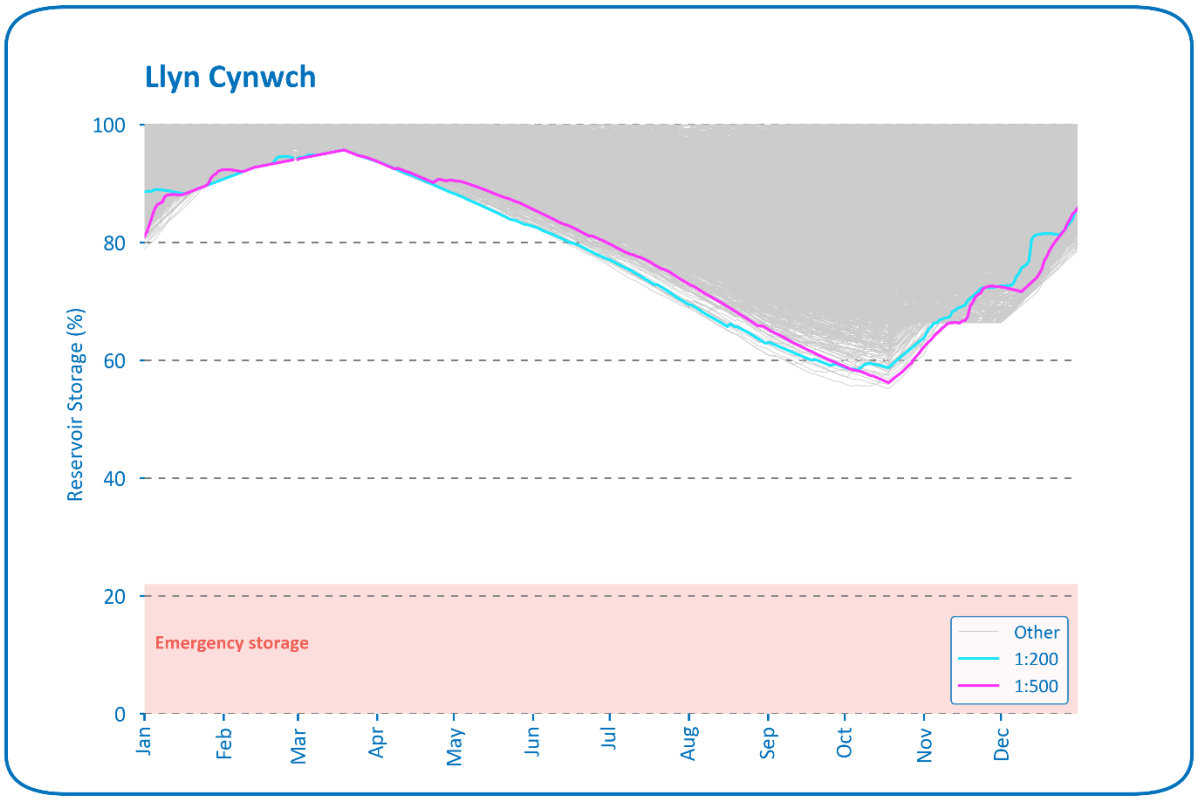


Figure 17 - Drawdown events in Llyn Cynwch over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

4. Water Resource Zone Drought Risk – South-West Wales

4.1. Tywi Gower

The water resources within the zone consist of four impounding reservoirs and two river abstractions which are operated conjunctively to make best use of the available water during years of average and below average rainfall.

Water is abstracted from the River Tywi at two locations - Nantgaredig and Manorafon. When levels are low in the River Tywi, water is released from Llyn Brianne reservoir to support abstraction of water at our intakes further downstream.

At Nantgaredig, a small portion of the water we abstract supplies Capel Dewi WTW which serves Carmarthen. Most of the abstracted water is pumped to Felindre WTW, the largest in the company, which supplies the bulk of our customer demand in Swansea, Neath, Bridgend, and the Vale of Glamorgan.

At Manorafon, water is only abstracted if storage in Usk reservoir is low. Under these conditions, water is pumped from Manorafon to Bryngwyn WTW. If storage in Usk is healthy, the reservoir provides the whole supply to Bryngwyn which feeds the upper Swansea Valley.

Ystradfellte and Crai reservoirs supply the upper parts of the Neath, Afan and Tawe Valleys. As storage in these reservoirs declines, the area served is gradually reduced to preserve supplies with this additional demand supported from Felindre. The Portis area, which was formerly supplied by Portis WTW (now abandoned), is now supplied from Crai reservoir following network upgrades to enable this.

There are no imports of water into the zone, but water is exported to the neighbouring SEWCUS zone.

4.1.1. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ.

Emergency Storage Provision (ESP)

ESP for the zone is calculated for both Ystradfellte and Crai reservoirs based on:

- 30 days' October Cefn Dryscoed WTW supply (11.27 Ml/d) = 338.1 Ml
- 30 days' Ystradfellte reservoir compensation flow (5 Ml/d) = 150 Ml
- Total Ystradfellte ESP = 488.1 Ml (17.18% total storage)

- 30 days' October Crai WTW supply (13.14 Ml/d) = 394.2 Ml
- 30 days' Crai reservoir Compensation flow (6.82 Ml/d) = 204.6 Ml
- Total Crai ESP = 598.8 Ml (14.24% total storage)

4.1.2. Risk assessment

We have classified the zone at 'High Risk' due to:

1. The initial screening (Table 12) shows a negative Supply Demand Balance throughout all the years in the planning period.
2. Detailed analysis of Crai and Ystradfellte reservoirs shows a risk of entering emergency storage more than once every 200 years.

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	-6.06	-6.40	-6.86	-7.35	-8.06	High risk
Target Headroom (Ml/d)	10.62	10.38	10.33	10.65	10.43	
Actual vs. Target headroom ratio	-0.57	-0.62	-0.66	-0.69	-0.77	
Supply Demand Balance (Ml/d)	-16.68	-16.77	-17.19	-18.00	-18.49	

Table 12 - Results of the Initial Screening assessment for the Tywi Gower WRZ

To test the resilience of the zone to drought, 2,500 years of stochastic inflow data was run through our WRMP24 baseline Tywi WRZ model, without the benefit of any drought restrictions in reducing demand. The results, which are presented below for Crai (Figure 18) and Ystradfellte (Figure 19), show that storage in both is expected to breach the respective Emergency Storage provisions more than once in every 200 years on average, and that in the most severe drought events Crai reservoir empties. This demonstrates the need for DAZs in the Tywi WRZ to protect storage in these reservoirs and ensure customers which are supplied from these sources continue to receive water in a drought.

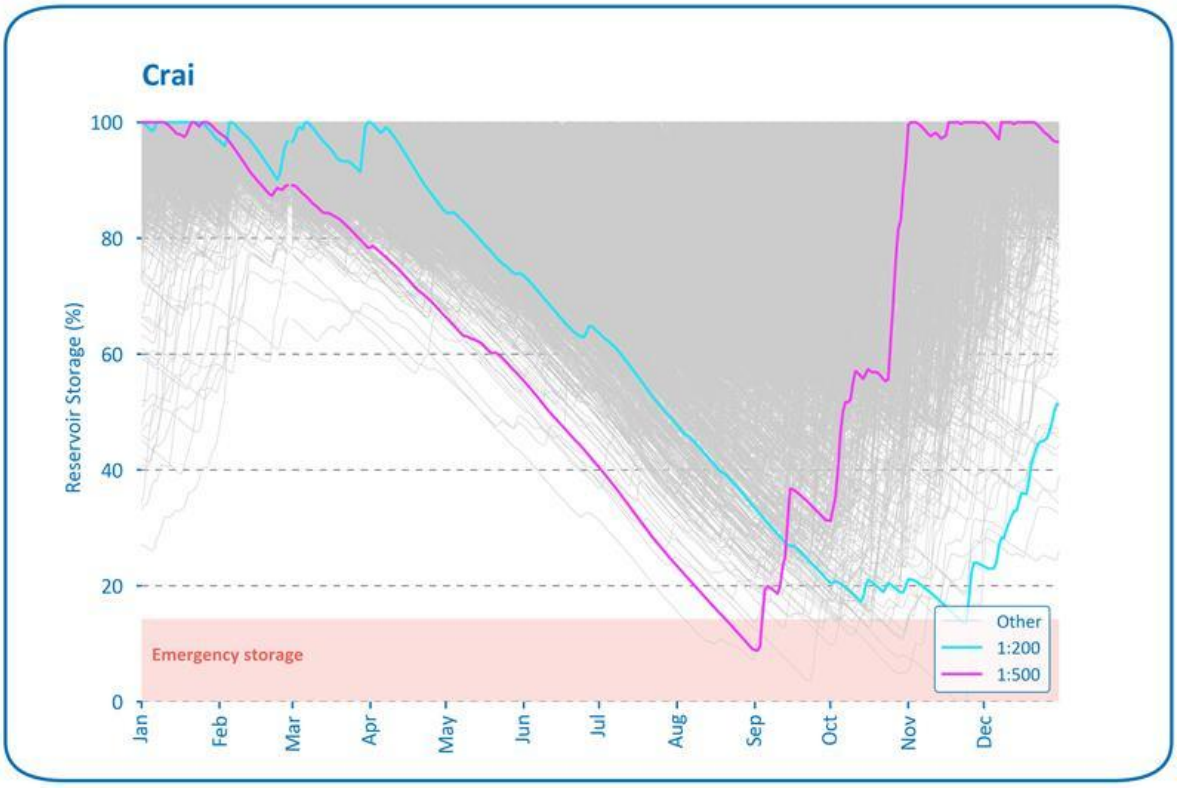


Figure 18 - Drawdown events of the Crai Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

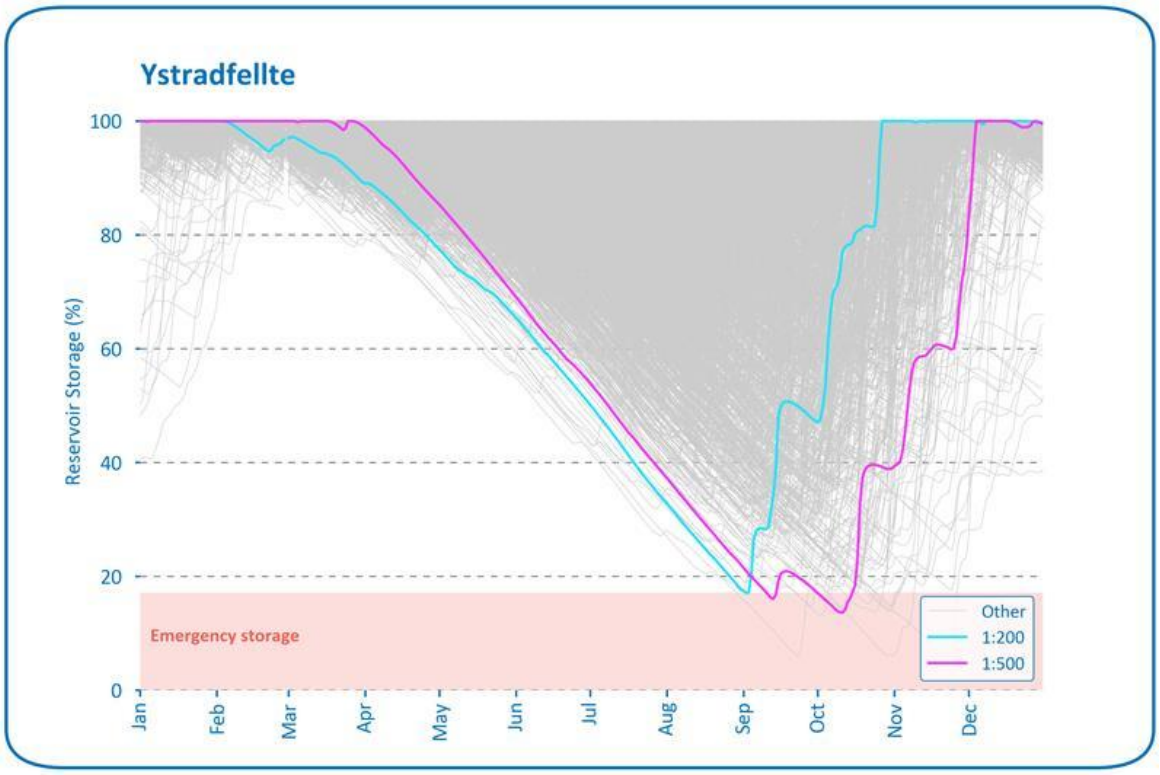


Figure 19 - Drawdown events of Ystradfellte Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

4.2. Mid & South Ceredigion

The zone is supplied from two sources. Llechryd WTW, which is reliant on the abstraction from the River Teifi at Llechryd, and Strata Florida WTW which is supplied by three small reservoirs: Llyn Teifi, Llyn Egnant and Llyn Pond y Gwaith, collectively known as Teifi Pools. As storage in the Teifi Pools declines in dry weather, the area served is gradually reduced to preserve storage, with this additional demand supplied by Llechryd.

4.2.1. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ.

Emergency Storage Provision (ESP)

ESP for the zone is calculated for the combined Teifi Pools reservoir group based on:

- 30 days' October Strata Florida WTW supply (5.97 Ml/d) = 179.1 Ml
- 30 days' reservoir compensation flow (0.79 Ml/d) = 23.7 Ml
- Total Teifi Pools ESP = 202.8 Ml (8.9% total storage)

4.2.2. Risk assessment

The initial screening (Table 13) classifies the zone as Low Risk because the actual-to-target headroom ratio is above 2 through the planning period. However, from the outputs of detailed assessment we have classified the WRZ as **'Potential Risk'** and so have derived an updated set of DAZs for the zone due to current levels of demand being higher than forecast in our WRMP24, meaning that our current drought resilience is not as high as assumed. Therefore, the zone is classified as "Potential risk".

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	2.94	2.94	2.94	2.93	2.94	Low risk
Target Headroom (Ml/d)	0.83	0.82	0.84	0.83	0.82	
Actual vs. Target headroom ratio	3.54	3.59	3.50	3.53	3.59	
Supply Demand Balance (Ml/d)	2.11	2.12	2.10	2.10	2.12	

Table 13 - Results of the Initial Screening assessment for the M&S Ceredigion WRZ

To test the resilience of the zone to drought, 2,500 years of stochastic inflow data was run through our WRMP24 baseline M&S Ceredigion WRZ model, at both our forecast and recent actual demand levels, without the benefit of any drought restrictions in reducing demand. The results based on our forecast demand level (Figure 20) show that the combined storage across the Teifi pools is unlikely to breach the combined Emergency Storage provision. However, the modelled results based on current demand levels (Figure 21) show multiple breaches of our Emergency Storage provision across the 2,500-year time series putting our expected level of service below 1 in 500 years, and so we have therefore classified the zone as **"Potential Risk".**

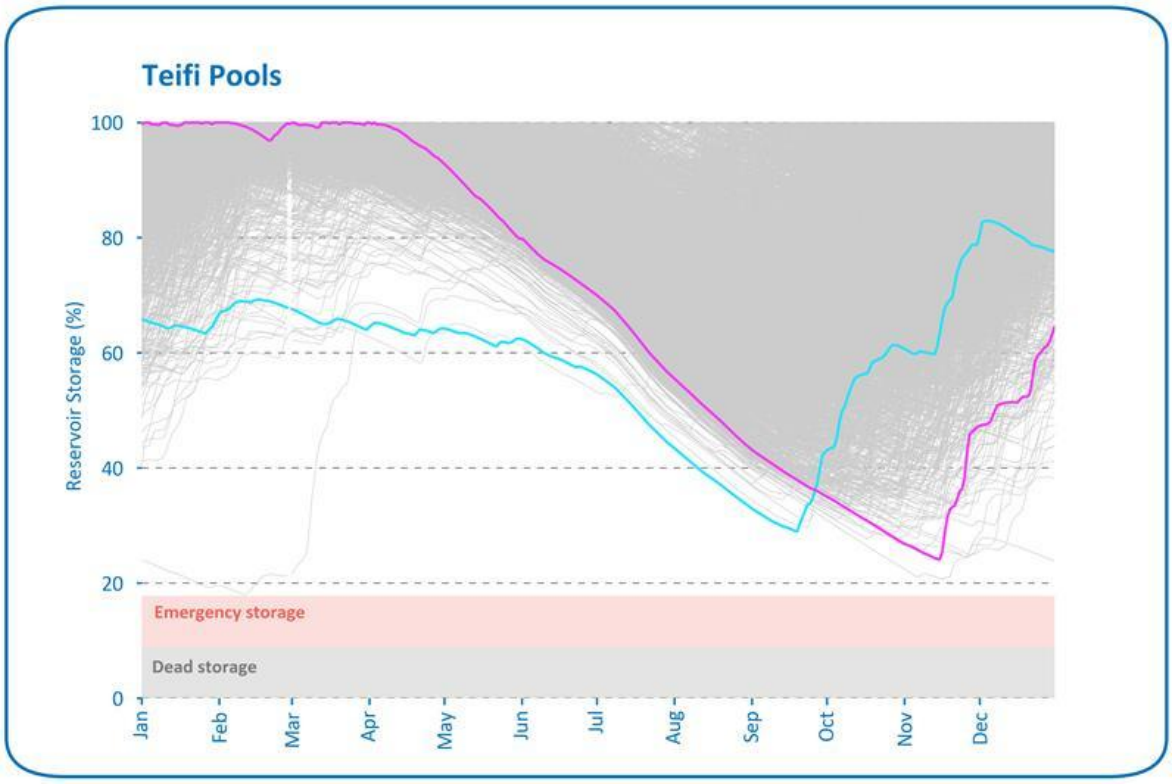


Figure 20 - Drawdown events of the Teifi Pools over 2,500 years at forecast levels of demand. Coloured lines show the events with return period of 200 and 500 years.

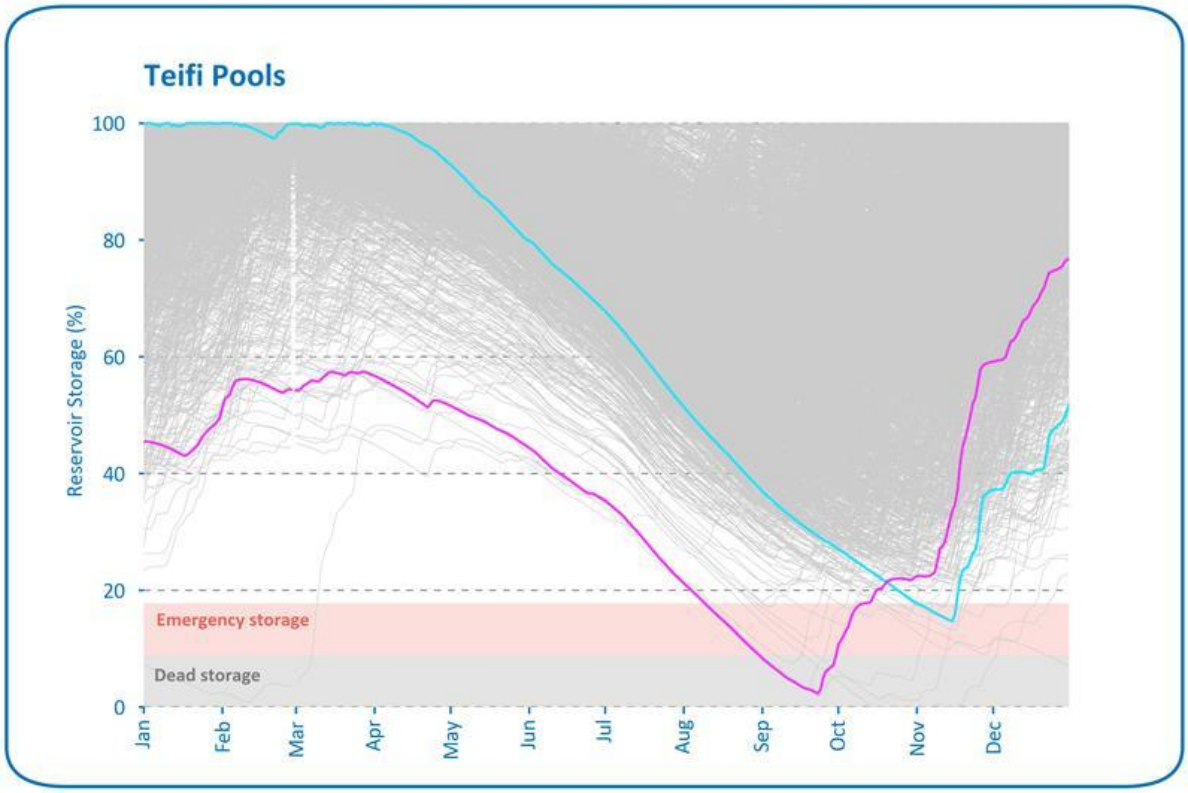


Figure 21 - Drawdown events of the Teifi Pools over 2,500 years at current levels of demand. Coloured lines show the events with return period of 200 and 500 years.

4.3. North Ceredigion

Much of the zone is supplied from the impounding reservoirs of Llyn Craig y Pistyll and Llyn Llygad Rheidol, which are supported by abstractions from the Nantymoch and Maesnant streams, and feed into our Bontgoch WTW. In the southwest of the zone, groundwater abstractions from the two boreholes at Lovesgrove, which provide raw water for Cefnllan WTW, meet the demand in Aberystwyth. As storage in the upland reservoirs decreases, water from the boreholes is pumped to serve the demand immediately north of Aberystwyth.

4.3.1. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ.

Emergency Storage Provision (ESP)

ESP for the zone is calculated for the combined storage in Llyn Llygad Rheidol and Llyn Craig y Pistyll based on:

- 30 days' October Bontgoch WTW supply (2.98 Ml/d) = 89.4 Ml
- 30 days' Llyn Craig y Pistyll reservoir compensation flow (1.82 Ml/d) = 54.6 Ml
- Total Llygad Rheidol / Craig y Pistyll combined ESP = 144 Ml (19.16% total storage)

4.3.2. Risk assessment

The initial screening classifies the zone as 'Low Risk' (see Table 14). However, the outputs of our detailed analysis of drought risk in the zone has led us to classify it as **"Potential risk",** and so we have developed an updated set of drought action zones.

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	1.80	1.79	1.78	1.76	1.73	Low risk
Target Headroom (Ml/d)	0.70	0.71	0.73	0.75	0.75	
Actual vs. Target headroom ratio	2.55	2.53	2.42	2.36	2.32	
Supply Demand Balance (Ml/d)	1.09	1.08	1.04	1.01	0.99	

Table 14 - Results of the Initial Screening assessment for the North Ceredigion WRZ

Drought resilience of the boreholes is very high as they take water from the connected river gravel deposits in the valley of the Afon Rheidol. The Rheidol is supported by substantial compensation flows from the upstream HEP reservoir, and so even under very dry weather conditions, the amount we take from the boreholes is small in comparison to the flow in the river.

To test the resilience of the reservoirs to drought, 2,500 years of stochastic inflow data was run through our WRMP24 baseline North Ceredigion WRZ model, without the benefit of any drought restrictions in reducing demand. The results, which are presented below for combined storage across Llygad Rheidol and Craig y Pistyll (Figure 22) show that in our simulated outputs, the combined storage position breached the Emergency Storage provision twice in the 2,500 year inflow timeseries, with another two events coming very close to doing so. sample.

Although this analysis indicates above 1 in 500 levels of service for breaches of our ESP, there is uncertainty with the hydrological inflows and stochastically generated timeseries. In 2018, reservoir storage declined very sharply but our rainfall runoff models have struggled to replicate this event. As such, there remains some uncertainty in the inflow records and drought

risk could be greater than currently understood, hence we have taken a precautionary approach with the drought risk classification for this zone.

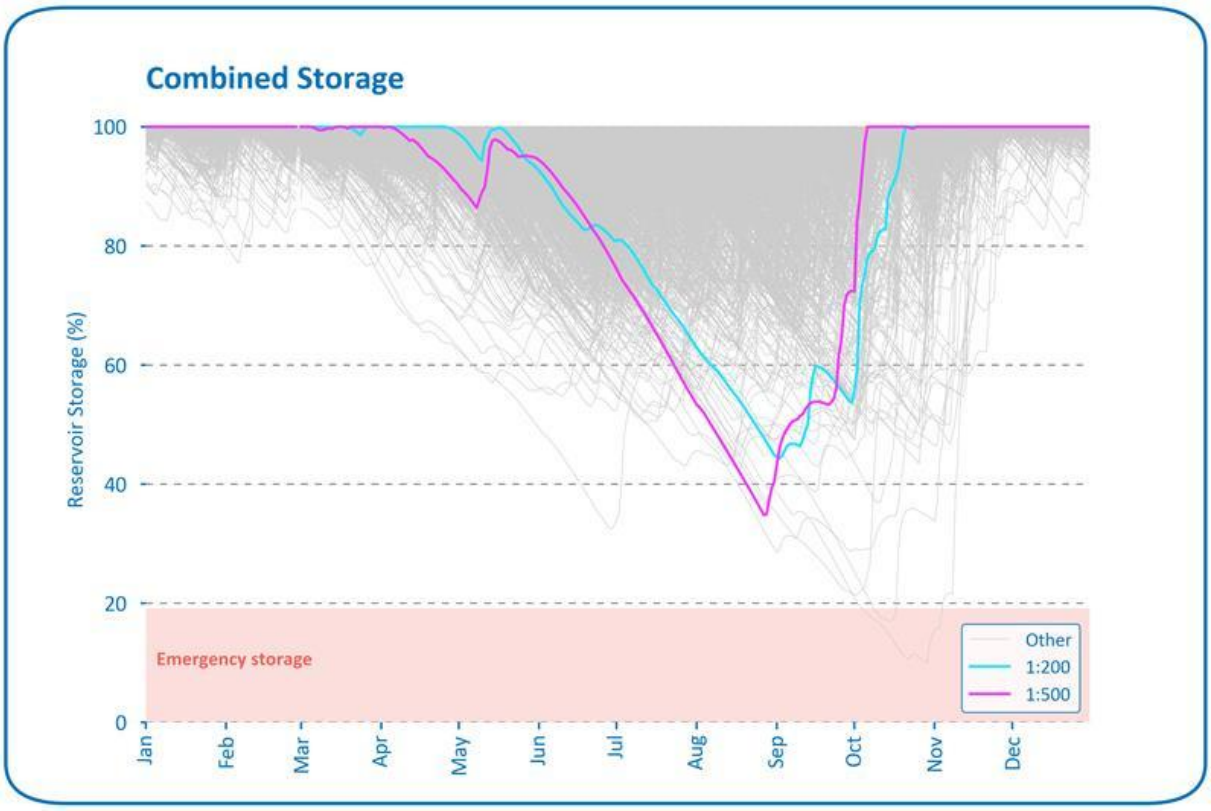


Figure 22 - Drawdown events of the combined Llyn Craig-y-Pistyll and Llyn Llygad Rheidol storage over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

4.4. Pembrokeshire

The largest treatment works in the zone is Bolton Hill, which is supplied by Canaston Bridge pumping station on the Eastern Cleddau and Crowhill pumping station on the Western Cleddau.

Canaston Bridge pumps water from two sources: a river intake on the Eastern Cleddau which is supported by releases of water from Llys-y-fran Reservoir, and a small, piped supply from Valley Court springs. In addition to treated water for domestic customers, the Canaston Bridge – Bolton Hill arrangement supplies untreated water to the oil refineries south and north of Milford Haven.

The other major treatment works in the zone is Preseli, which is supplied from Rosebush reservoir. If storage in Rosebush is low, Preseli can be supported with water pumped from Llys-y-fran whilst Rosebush can be supported with water pumped from a river intake on the Eastern Cleddau at Pont Hywel.

The two reservoirs, Llys-y-fran and Rosebush, are thus critical to supplying our water treatment works in a drought as availability from the river sources diminishes.

Pendine borehole supplies the Eastern part of the WRZ and can be partially supported from the Bolton Hill and Preseli systems. The borehole intercepts a large karstic feature within the Pembroke Limestone Group aquifer. Due to the karstic nature of the aquifer, transmissivity is very high (up to 12,000 m^3/d), resulting in minimal drawdowns. The maximum known drawdown amount is 1.5m below rest level, which is 3m above deepest advisable pumping water level. Therefore, the drought risk to the source is low.

4.4.1. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ.

Emergency Storage Provision (ESP)

ESP for the zone is calculated for the storage in Llys-y-fran reservoir based on:

- 30 days' October supply to Preseli WTW (8 Ml/d) = 240 Ml
- 30 days' release to support abstraction at Canaston (49.14 Ml/d) = 1,474.2 Ml
- Total Llys-y-Fran ESP = 1,714.2 Ml (16.32% total storage)

4.4.2. Risk assessment

The zone is classified as **"Potential risk"** because the actual-to-target headroom ratio is below 2 through the planning period (see Table 15) and detailed analysis of the zone indicates a water resource risk at Llys-y-fran reservoir (Figure 23) although it has also confirmed there is no water resource risk at Rosebush reservoir (Figure 24).

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	4.96	4.96	4.95	4.93	4.88	Potential risk
Target Headroom (Ml/d)	3.12	3.16	3.17	3.19	3.21	
Actual vs. Target headroom ratio	1.59	1.57	1.56	1.54	1.52	
Supply Demand Balance (Ml/d)	1.84	1.80	1.79	1.73	1.67	

Table 15 - Results of the Initial Screening assessment for the Pembrokeshire WRZ

To better understand the resilience of the zone to drought, 2,500 years of stochastic inflow data was run through our WRMP24 baseline Pembrokeshire WRZ model, without the benefit

of any drought restrictions in reducing demand, and assuming the full Llys-y-fran Freshet bank is unavailable for public water supply.

The results for Llys-y-fran are presented in Figure 23 and show that storage is expected to breach the Emergency Storage provision less frequently than once in every 200 years but more frequently than once in every 500 years, with the most severe drought events nearly emptying the reservoir.

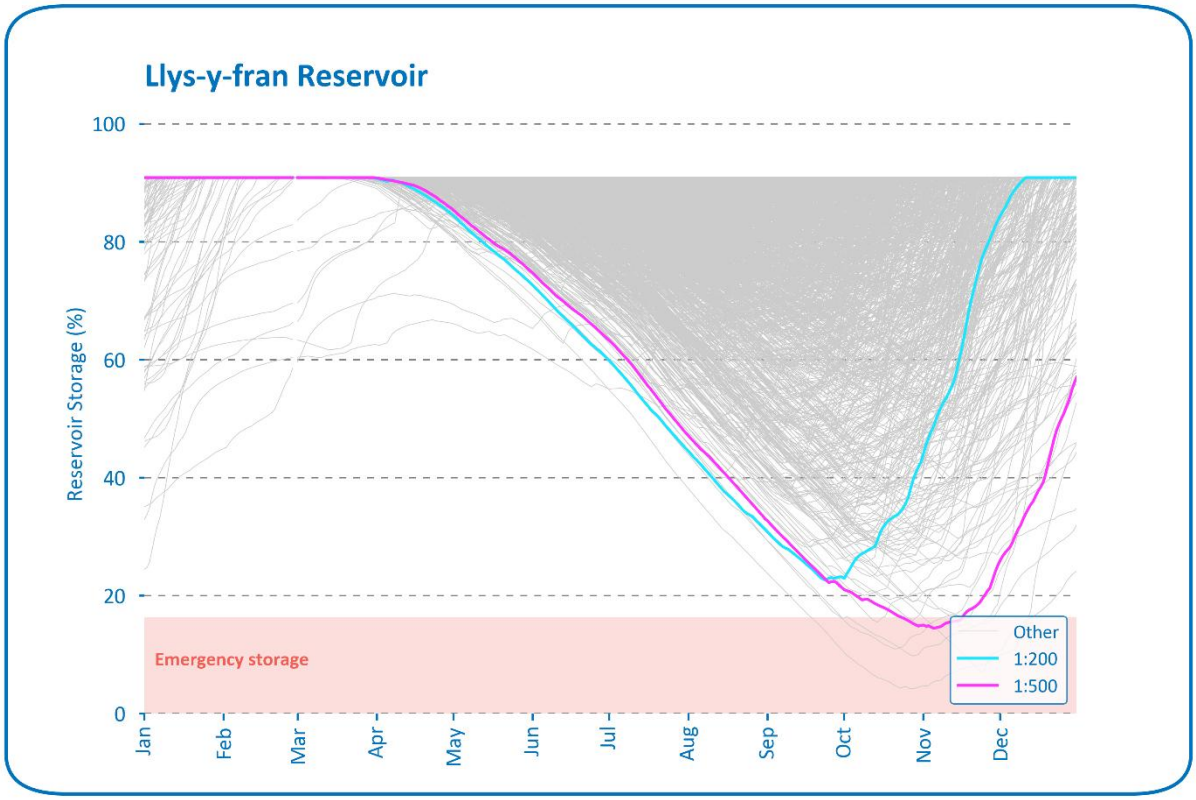


Figure 23 - Drawdown events of Llys-y-Fran Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

Figure 24 below shows the outputs of the 2,500-year system simulation for Rosebush reservoir and indicate a high level of drought resilience with no drought events expected to breach the defined Emergency Storage Provision. Storage in Rosebush is heavily supported by Llys-yfran reservoir which is able to provide up to 8 Ml/d in alternative resource for Preseli WTW.

The risk assessment has therefore demonstrated that storage in Llys-y-fran is the critical resource in the zone and so our approach to drought management will be triggered by its storage position and so we will derive an updated set of DAZs for Llys-y-fran only.

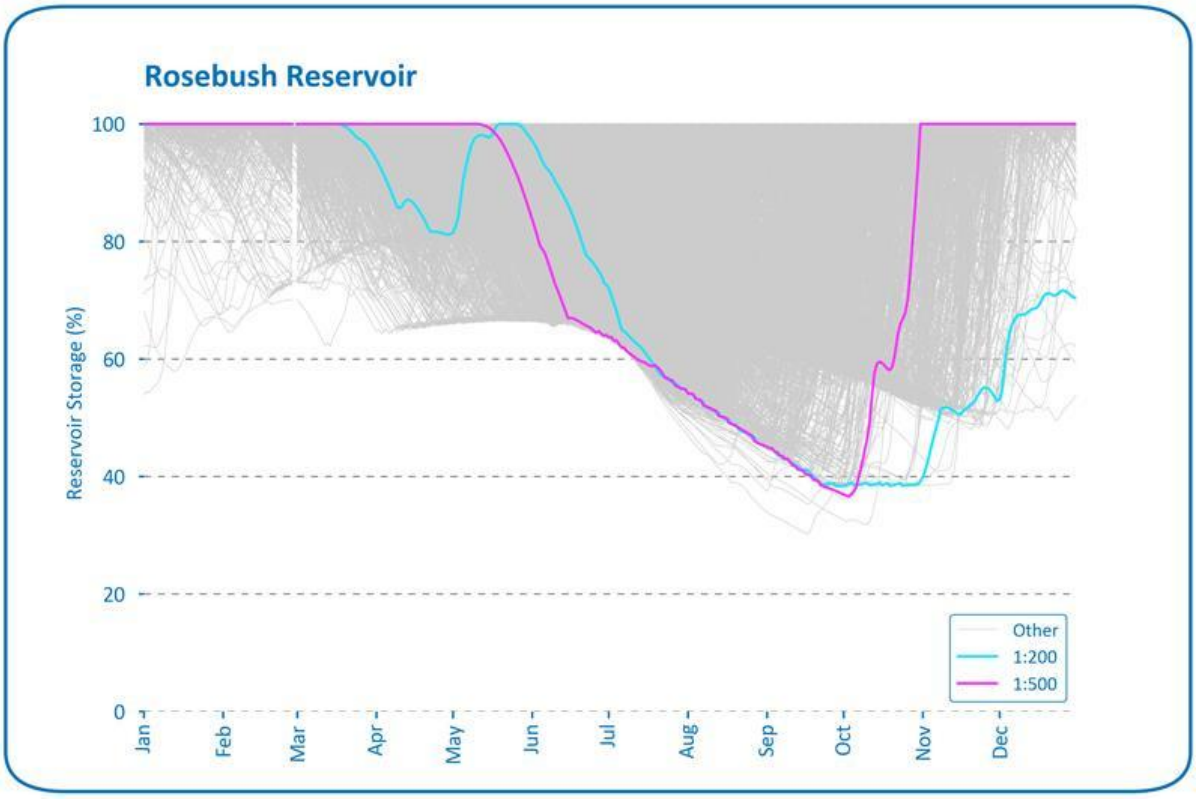


Figure 24 - Drawdown events of Rosebush Reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

5. Water Resource Zone Drought Risk – South East Wales

5.1. Ross-On-Wye

The WRZ covers the small area surrounding the market town of Ross-on-Wye and is supplied predominantly via a bulk transfer sourced from Severn Trent Water's Mitcheldean WTW with a maximum capacity of 9 Ml/d. The raw water source for Mitcheldean is an abstraction from the River Wye at Lydbrook.

5.1.1. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ.

Emergency provision

It has been assumed there will be no restriction upon the bulk supply from Severn Trent Water to meet our assumed end of drought October average demand (6.28 Ml/d).

5.1.2. Risk assessment

In our initial screening, we have classified the zone at 'Potential risk' because the actual-to-target headroom ratio is below 2 through the planning period (see table below).

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	0.96	0.93	0.90	0.86	0.84	Potential risk
Target Headroom (Ml/d)	0.50	0.50	0.50	0.50	0.49	
Actual vs. Target headroom ratio	1.94	1.86	1.80	1.74	1.71	
Supply Demand Balance (Ml/d)	0.47	0.43	0.40	0.37	0.35	

Table 16 - Results of the Initial Screening assessment for the Ross on Wye WRZ

We determined the final risk status for this zone to be **"Low risk"** for the following reasons:

- Severn Trent Water have confirmed the bulk import is always available and is not drought dependant.
- Although the demand forecast from our WRMP24 underestimates the current recent peak demand, we have also tested the zone in our model using recent demand data and are always able to meet supply. Should the demand go above 9.02 Ml/d in future, we are able to meet it by tankering from a neighbouring water resource zone.

5.2. Elan-Builth

This zone is supplied by both a small (5 Ml/d) abstraction from Caban Coch reservoir (part of the Elan Valley reservoirs group) and by an abstraction from the River Wye at Builth Wells (3.7 Ml/d).

5.2.1. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ.

Emergency Storage Provision (ESP)

No provision is made for the Builth Wells abstraction as flows in the River Wye will always be well above what we're licensed to abstract, even during a severe drought. No ESP is made for the local supply to Elan WTW as there will always be significantly greater storage than 30 days of supply at a maximum 5 Ml/d (150 Ml in total) available in the Elan Valley reservoir group.

5.2.2. Risk assessment

In our initial screening, we have classified the zone at 'Potential risk' because the actual-to-target headroom ratio is below 2 through the planning period (see table below).

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	0.48	0.48	0.49	0.49	0.49	Potential risk
Target Headroom (Ml/d)	0.47	0.48	0.48	0.47	0.48	
Actual vs. Target headroom ratio	1.01	1.00	1.02	1.03	1.04	
Supply Demand Balance (Ml/d)	0.00	0.00	0.01	0.01	0.02	

Table 17 - Results of the Initial Screening assessment for the Elan Builth WRZ

The constraint to our supply capacity in the zone is not water resources but is the maximum throughput of our supply infrastructure. The nature of the water resources in this zone means there is no plausible risk to having insufficient water available to maintain customer supply and so the final risk status for this zone is **"Low risk".**

5.3. Hereford Conjunctive Use System

The Hereford Conjunctive-Use WRZ covers the city of Hereford and other rural villages as far north as Leintwardine. The majority of the WRZ is supplied by Broomy Hill WTW which is fed by raw water abstracted from the River Wye at Hereford (with a maximum capacity of 52 Ml/d). Three boreholes at Dunfield (max abstraction rate 3.3 Ml/d) and two boreholes at Leintwardine area (max abstraction of 1 Ml/d) supply their local WTWs.

5.3.1. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ

Emergency provision

No provision is made for emergency storage as it is assumed that sufficient raw water resource will always be available, particularly at Broomy Hill given the relatively small scale of the abstraction licence compared to the flow in the River Wye at Hereford. There is no Hands-Off Flow condition in the abstraction licence.

5.3.2. Risk assessment

In our initial screening we have classified the zone as 'Low Risk' because the Supply Demand Balance and actual-to-target headroom ratio are both healthy.

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	6.32	6.18	6.05	5.89	5.73	Low risk
Target Headroom (Ml/d)	2.44	2.40	2.41	2.31	2.24	
Actual vs. Target headroom ratio	2.59	2.58	2.51	2.55	2.56	
Supply Demand Balance (Ml/d)	3.88	3.78	3.64	3.58	3.49	

Table 18 - Results of the Initial Screening assessment for the Hereford WRZ

Following this, we have undertaken an assessment of the drought risks for each individual source in the zone.

River Wye abstraction at Hereford

There is no plausible drought scenario under which the flows in the River Wye would fall below the abstraction licence.

Dunfield boreholes

The Dunfield borehole source is classified as low risk since boreholes 1 and 2 both have yields that are more than double the peak daily licence (based on recent actual drawdowns and pumping rates and historic pumping tests). During the dry summers of 2020 and 2022, there was minimal drawdown observed compared to other years at boreholes 1 and 2.

Borehole 3 at Dunfield is shallower than boreholes 1 and 2 and is thought to be yield constrained in dry weather. During the summer of 2022, groundwater levels at Borehole 3 began to decline below the levels previously seen in other recent summers (Figure 25), although the groundwater level always remained above the Deepest Advisable Pumping Water Level (DAPWL). In a future, more severe drought than 2022, we may experience a reduction in yield from this individual borehole but will always be able to meet demand from Boreholes 1 and 2, meaning we do not have any concerns during drought.

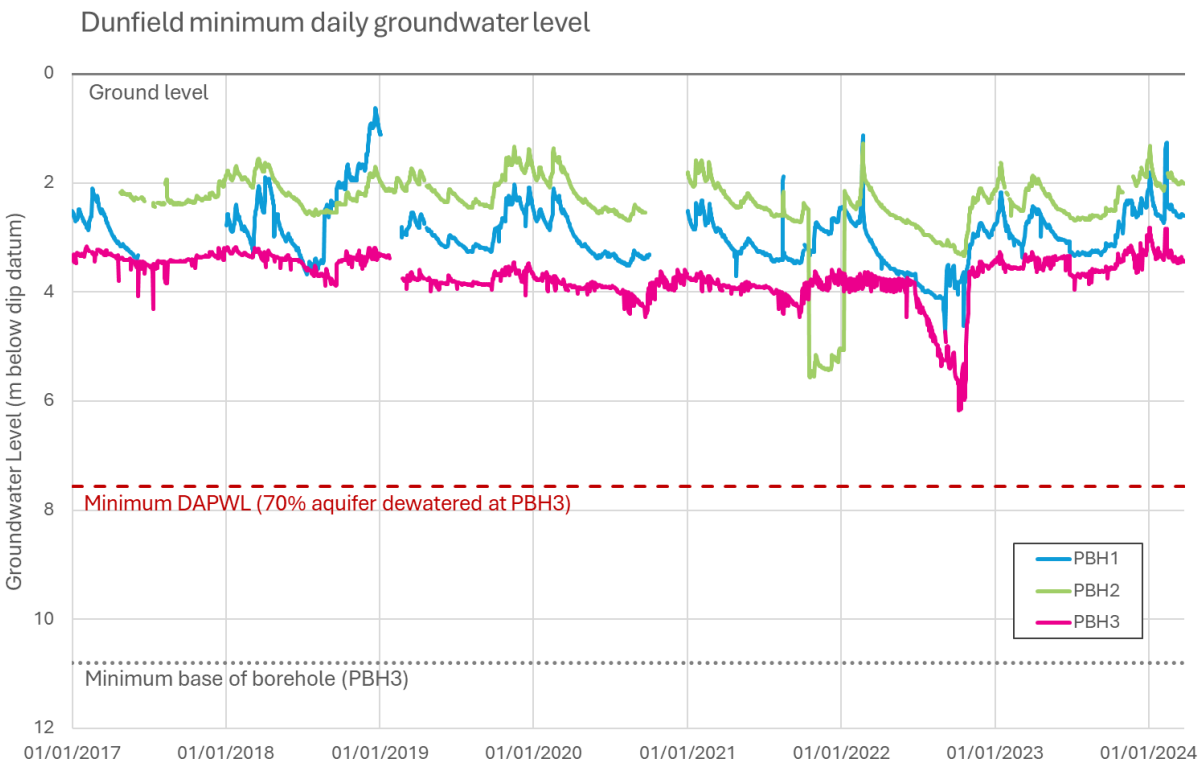


Figure 25 - Dunfield daily minimum groundwater level (2017 to 2024)

Leintwardine boreholes

The Leintwardine boreholes are classified as low drought risk. The boreholes abstract from an aquifer of superficial deposits that is in hydraulic connection with the adjacent River Teme, where Q95 flows are approximately 48 Ml/d, which is an order of magnitude greater than 1 Ml/d abstraction licence limit of the source. The source yield assessment (based on recent actual drawdowns and pumping rates and historic pumping tests) estimate the yield to be in excess of 9 Ml/d.

We have classified the zone as **'Low Risk'** for the following reasons:

- the supply demand balance position in Table 18 (based on the WRMP demand forecast) shows there always available headroom to meet demand.
- Analysis of recent maximum demand shows that this is always below or equal to the critical period demand stated in our WRMP24 except in 2022 when demand peaked at 46.7 Ml/d. However, we tested this demand scenario in our model and are confident there is always headroom available at the Broomy Hill intake (where we can abstract up to 52 Ml/d) as this is not constrained by the license or river flow.
- our detailed assessment of borehole sources shows a low supply risk and therefore we can meet demand during dry years.

We are not deriving any drought control curves as there is no plausible risk to customer supplies in this zone.

5.4. Llyswen

5.4.1. Water Resource Zone Overview

This zone covers the small rural communities in and around Hay-on-Wye. It is supplied by a single abstraction from the River Wye with a maximum volume of 5 Ml/d.

5.4.2. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ to assess the risk.

Emergency provision

No emergency provision is made for the zone as it is assumed the River Wye at this location will always be able to provide the abstraction volume required. There is no Hands-Off Flow condition in the abstraction licence.

5.4.3. Risk assessment

In our initial screening we have classified the zone as 'Low Risk' because the Supply Demand Balance and actual-to-target headroom ratio are both healthy.

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	1.26	1.26	1.26	1.26	1.26	Low risk
Target Headroom (Ml/d)	0.14	0.13	0.13	0.12	0.12	
Actual vs. Target headroom ratio	9.16	9.73	9.95	10.09	10.06	
Supply Demand Balance (Ml/d)	1.12	1.13	1.13	1.13	1.13	

Table 19 - Results of the Initial Screening assessment for the Llyswen WRZ

Analysis of stochastic river flow with our run-off model shows that the maximum abstraction volume is always available in the river due to the large extent of the upstream catchment. Therefore, we conclude that there is no plausible drought scenario under which the flows in the River Wye would fall below the abstraction licence and so the overall risk status for this zone is "Low risk".

5.5. Monmouth

5.5.1. Water Resource Zone Overview

This zone supplies the market town of Monmouth and the surrounding villages. Raw water is provided by abstraction from the River Wye at Monmouth which supplies Monmouth WTW (max capacity 5.3 Ml/d). A much smaller groundwater abstraction (max 0.5 Ml/d) at Ffynnon Gaer supplies a localised area.

5.5.2. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ to assess the risk.

Emergency provision

No emergency provision is made for the zone as the River Wye at this location will always be able to provide the abstraction volume required. Whilst the abstraction licence contains a volume cut back related to the flow in the river, the reduced volume is still in excess of the required supply volume.

5.5.3. Risk assessment

In our initial screening we have classified the zone as 'Low Risk' because the Supply Demand Balance and actual-to-target headroom ratio are both healthy.

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	0.94	0.94	0.94	0.94	0.94	Low risk
Target Headroom (Ml/d)	0.38	0.37	0.37	0.36	0.37	
Actual vs. Target headroom ratio	2.50	2.54	2.53	2.58	2.56	
Supply Demand Balance (Ml/d)	0.57	0.57	0.57	0.57	0.57	

Table 20 - Results of the Initial Screening assessment for the Monmouth WRZ

The final risk status for this zone is "Low risk" because there is no plausible drought scenario under which the flows in the River Wye would fall below the abstraction licence volume.

5.6. Pilleth

5.6.1. Water Resource Zone Overview

This zone supplies the small rural area surrounding Presteigne and extends into the adjacent catchment of the River Teme and serves Knighton. It is entirely supplied by three boreholes at Pilleth on the River Lugg. The boreholes operate at a maximum, licence constrained, abstraction rate of 3.8 Ml/d, without any additional constraints.

5.6.2. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ to assess the risk.

Emergency provision

No emergency provision is made as the expected end of drought demand (2.5 Ml/d) would continue to be met by abstraction from the Pilleth boreholes.

5.6.3. Risk assessment

In our initial screening we have classified the zone as 'Low Risk' because the Supply Demand Balance and actual-to-target headroom ratio are both healthy.

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	0.86	0.87	0.87	0.87	0.87	Low risk
Target Headroom (Ml/d)	0.19	0.19	0.19	0.19	0.19	
Actual vs. Target headroom ratio	4.57	4.59	4.64	4.57	4.58	
Supply Demand Balance (Ml/d)	0.68	0.68	0.68	0.68	0.68	

Table 21 - Results of the Initial Screening assessment for the Pilleth WRZ

The boreholes' combined yield has been assessed as being 7.5 Ml/d dry year annual average and 7.8 Ml/d dry year critical period based on the UKWIR Source Yield Methodology. This is well in excess of the source maximum daily licence limit of 3.8 Ml/d. Groundwater levels at the Pilleth boreholes are also monitored and data collected from them showed that during the dry summers of 2020 and 2022 the maximum summer drawdown was no greater than a typical summer, indicating the groundwater has a good degree of drought resilience. Therefore, the final drought risk status for this zone is "**Low risk**".

5.7. Brecon

5.7.1. Water Resource Zone Overview

The zone is situated in the headwaters of the River Usk, in the immediate vicinity of the town of Brecon and the Usk Reservoir. It is supplied by four boreholes adjacent to the River Usk in Brecon, licenced for a maximum abstraction rate 5.77 Ml/d.

5.7.2. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ to assess the risk.

Emergency provision

It has been assumed that Emergency Provision (3.28 Ml/d at the end of the drought) would be supplied by the boreholes, supported by regulation releases from Usk Reservoir. The required release volume to maintain our maximum abstraction licence rate is 2.4 Ml/d and so 72 Ml (30 days at 2.4 Ml/d) is included in the emergency storage provision of Usk Reservoir.

5.7.3. Risk assessment

In our initial screening we have classified the zone at 'Potential risk' because the actual-to-target headroom ratio is below 2 through the planning period (see table below).

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	0.33	0.35	0.36	0.37	0.37	Potential Risk
Target Headroom (Ml/d)	0.28	0.29	0.29	0.29	0.29	
Actual vs. Target headroom ratio	1.19	1.20	1.23	1.28	1.29	
Supply Demand Balance (Ml/d)	0.05	0.06	0.07	0.08	0.08	

Table 22 - Results of the Initial Screening assessment for the Brecon WRZ

At Brecon, the available supply from the boreholes is limited by the abstraction licence, rather than the yield of the aquifer. Historic pumping tests and ongoing operational data have shown that Borehole B and C have a combined average annual yield of at least equivalent to the maximum daily abstraction limit of 5.77 Ml/d. In addition to this, Borehole D was commissioned in 2018 with a sustainable yield of an additional 1.39 Ml/d while the other borehole pumps are operational. In a drought we would expect to be able to abstract up to the licence limited amount of 5.77 Ml/d from the boreholes. During low flows, the licence requires us to regulate from Usk reservoir, which more than meets our demand forecast.

Therefore, we have classified the zone as "Low Risk" given the expected high drought resilience of the aquifer and its ability to yield the full abstraction licence volumes, which are well in excess of the WRZ demands.

5.8. Vowchurch

5.8.1. Water Resource Zone Overview

This zone covers the small rural area south of Hay-on-Wye and is supplied by four boreholes that abstract from river terrace deposits with a maximum aggregated abstraction licence of 4 Ml/d. The abstraction is restricted to 3 Ml/d when the flow in the River Dore at Moorhampton falls below 12 Ml/d.

5.8.2. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ to assess the risk.

Emergency provision

No emergency provision is made as we expect to be able to meet demand at the end of a drought (2.52 Ml/d as October average) by continuing to abstract from the boreholes.

5.8.3. Risk assessment

In our initial screening we classified the zone at 'Potential risk' because the actual-to-target headroom ratio is below 2 through the planning period (see table below).

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	0.31	0.29	0.29	0.27	0.26	Potential Risk
Target Headroom (Ml/d)	0.18	0.18	0.18	0.18	0.18	
Actual vs. Target headroom ratio	1.73	1.64	1.56	1.56	1.47	
Supply Demand Balance (Ml/d)	0.13	0.11	0.10	0.10	0.08	

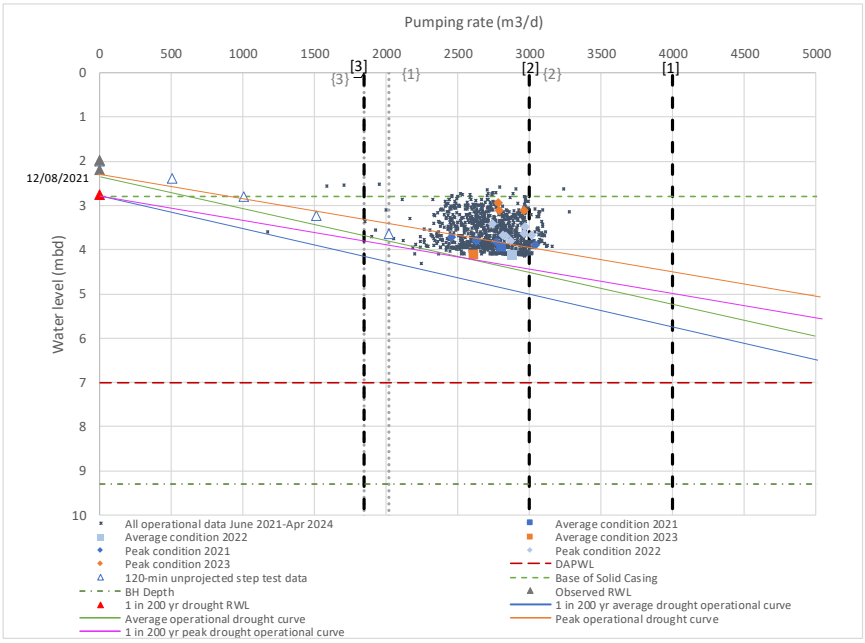
Table 23 - Results of the Initial Screening assessment for the Vowchurch WRZ

In our 2019 WRMP we assessed that Vowchurch was vulnerable to a 1 in 200-year drought based on extreme value analysis of low flows in the adjacent River Dore. This assessment was based on conservative assumptions that the aquifer is directly supported by the river. However, in 2022 the river dried upstream of the abstraction, and no discernible reduction in borehole yield or groundwater level was observed. This led us to commission a re-assessment of borehole yield by considering aquifer storage and using the methodology described by the UK Water Industry Research (UKWIR) Manual of Source Yields (UKWIR, 2014).

The 2024 reassessment of Vowchurch yield has found that the source output is not likely to be limited by a 1 in 200-year drought but by the abstraction licence HoF. DO summary diagrams for each operational borehole have been compiled based on rest water levels and lowest operational pumping water levels. The combined source output diagram for BH5 is given in Figure 26. The abstraction rate at which the drought curve intersects the first source-level constraint line on the summary diagram is taken as the DO. In all operational boreholes, the first source-level constraint the drought curve intersects is the environmental licence constraint limiting abstraction to a maximum of 3 Ml/d when flow in the River Dore at Moorhampton falls below 12 Ml/d. Full details of the assessment are available in Atkins (2024).

Therefore we have classified the zone as "**Low risk**" off the back of the more detailed hydrogeological assessment that was undertaken of the Vowchurch source.

Source name	**Vowchurch**
Borehole Name	**BH5**
Abstraction	**Combined Source**



Constraints (Avg)		Constraints (Peak)	
[1]	Combined Source Licence Rate	{1}	Individual Source Licence Rate
[2]	Environmental Constraint (River Flow)	{2}	Environmental Constraint (River Flow)
[3]	Individual Pump Capacity	{3}	Individual Pump Capacity

Average Deployable Output = 3000 m^3/d Peak Deployable Output = 3000 m^3/d

Figure 26 – Vowchurch BH5 combined source deployable output diagram

5.9. Whitbourne

5.9.1. Water Resource Zone Overview

The zone is located in east Herefordshire adjacent to the Worcestershire border and supplies the rural towns and villages in the surrounding area. Raw water is provided by a single abstraction on the River Teme at Tenbury with a maximum daily abstraction limit of 9 Ml/d, that supplies Whitbourne WTW.

5.9.2. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ to assess the risk.

Emergency provision

No emergency provision is made for the zone as it is assumed the River Teme at this location will always be able to provide the abstraction volume required. Whilst the abstraction licence contains a volume cut back related to the flow in the river, the reduced volume is still in excess of the required supply volume.

5.9.3. Risk assessment

In our initial screening we have classified the zone as 'Potential risk' because the actual-to-target headroom ratio is below 2 through the planning period (see table below).

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	0.73	0.70	0.68	0.65	0.62	Potential Risk
Target Headroom (Ml/d)	0.54	0.54	0.55	0.54	0.54	
Actual vs. Target headroom ratio	1.36	1.30	1.23	1.20	1.14	
Supply Demand Balance (Ml/d)	0.19	0.16	0.13	0.11	0.08	

Table 24 - Results of the Initial Screening assessment for the Whitbourne WRZ

As the WRMP24 demand forecast is lower than the recent actual maximum demand we experienced in 2020 of 7.4 Ml/d and 2022 of 7.6 Ml/d, we have also tested the zone against the higher recent actual peak demands.

Analysis of gauged flow at Tenbury gauging station Figure 27) shows that the river flow is very likely to drop below the licence threshold of 159 Ml/d during dry years; as happened in 1976, 2020 and 2022. Below that threshold, our maximum abstraction reduces from 9 Ml/d to a year-dependant maximum which was 8.4 Ml/d during 2020 and 2022. This maximum abstraction rate is approximately 1 Ml/d higher than the recent actual peak demand recorded in 2020 and 2022, which is larger than the target headroom of 0.54 Ml/d in Table 24.

In addition, DI in 2023 and 2024 shows demand is reducing compared to the 2022 levels as a result of our leakage strategy and demand reduction actions. For these reasons, the final risk status for this zone is "**Low risk**".

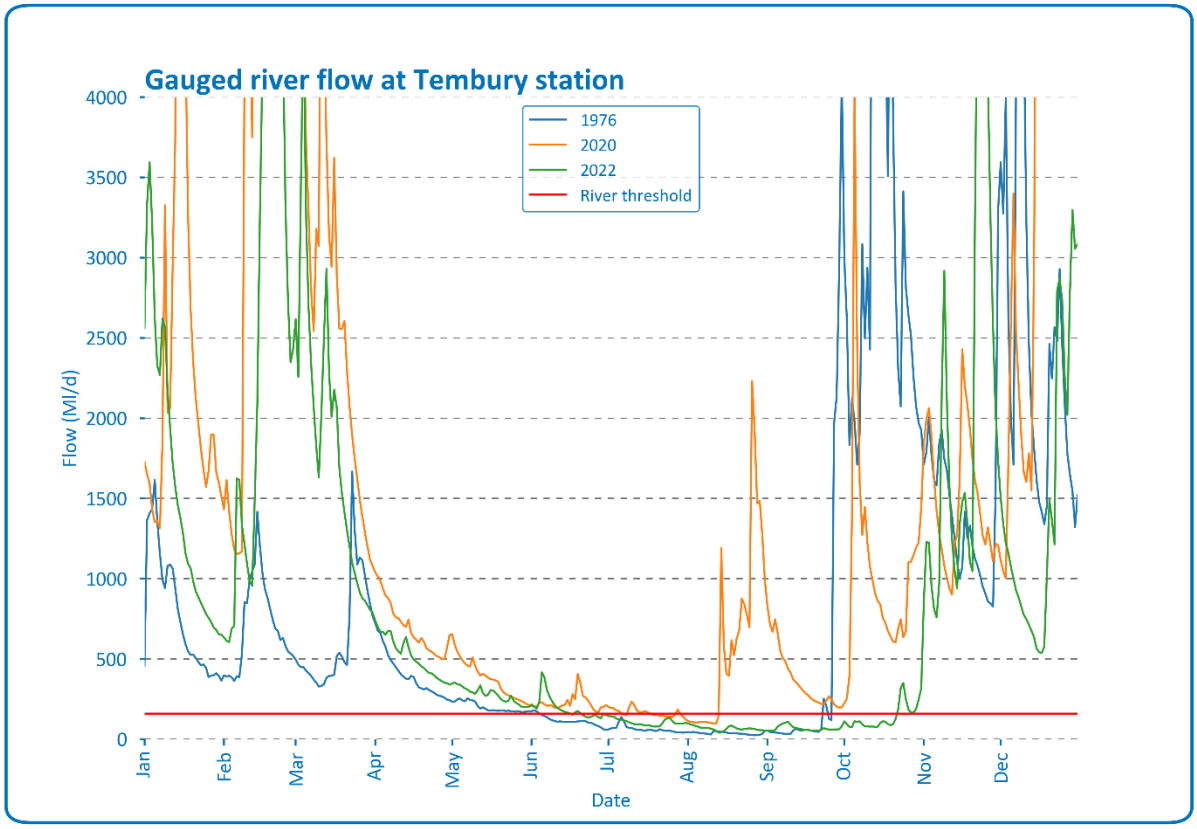


Figure 27 – Gauged flow at Tenbury station in 1976, 2020 and 2022. Red line shows the flow threshold when the abstraction is reduced.

5.10. SEWCUS

The largest of our WRZs, providing water to c1.3 million people, is almost wholly supplied from surface water sources, these being a mixture of impounding reservoirs, pumped storage reservoirs and river abstractions, as summarised below:

- "Big 5" reservoir group made up of the following five major reservoir systems: Usk Reservoir (regulating reservoir), Talybont Reservoir (Talybont WTW), Llandegfedd Reservoir (Sluvad WTW), Taff Fawr Reservoirs (Llwynon, (Llwynon WTW) Cantref (Cantref WTW) and Beacons Reservoirs) and Pontsticill reservoir (Pontsticill WTW).
- Heads of the Valley reservoirs. These supply our Nantybwch WTW and include Shon Sheffrey, Lower Rhymney Bridge, Upper Rhymney Bridge, Lower Carno, Upper Carno and Blaenycwm
- Small storage reservoirs: Llyn Fawr (Tynywaun WTW), Penderyn and Nant Moel (Hirwaun WTW), Lluest Wen and Castell Nos (Maerdy WTW) and Cwmtillery (Cwmtillery WTW)
- Intakes: River Wye at Monmouth (Wye Transfer) supplies Court Farm WTW. The River Usk at Prioress Mill transfers water to Llandegfedd reservoir. On the Tywynwaun WTW system: Nant Ffernol, Nant Selsig, Nant Melyn, Nant Garreg Lwyd and Nant Carnfoesen. On the Hirwaun WTW system Nant Bodwigiad and Nant Bwllfa provide water to Penderyn reservoir
- Penderyn borehole transfers water to Penderyn reservoir

During normal operations, abstraction for supply to the Cardiff/Newport area is prioritised from the Pontsticill and Taff Fawr Reservoirs. During dry weather when storage in these sources starts to decrease, abstraction is progressively reduced, and water is treated and supplied from the lowland sources of the Wye transfer and Llandegfedd reservoir.

5.10.1. Summary of modelling assumptions

The following assumptions were made in modelling the WRZ.

Emergency Storage Provision (ESP)

ESP for the zone is based on the "Big 5" group of reservoirs and is calculated as a summation of each individual reservoir requirements as detailed below:

- 30 days' October Pontsticill WTW supply (44.8 Ml/d) = 1,334.2 Ml
- 30 days' Pontsticill reservoir compensation flow (19.1 Ml/d) = 573 Ml
- Total Pontsticill reservoir ESP = 1,907.2 Ml (12.3% storage)

- 30 days' October Llwynon WTW supply (26 Ml/d) = 780 Ml
- 30 days' Llwynon reservoir compensation flow (18.18 Ml/d for) = 545.4 Ml
- Total Llwynon, Cantref and Beacons reservoir ESP = 1,325.4 Ml (16.84%)

- 30 days' October Sluvad WTW supply (153 Ml/d) = 4,590 Ml
- 30 days' Llandegfedd reservoir compensation flow (2.5 Ml/d) = 75 Ml
- Total Llandegfedd ESP = 4,665 Ml (17.16% total storage)

- 30 days' Talybont WTW supply (39.07Ml/d) = 1,172.1Ml
- 30 days' compensation flow of Talybont reservoir (10 Ml/d) = 300 Ml
- Total Talybont ESP = 1,472.1 Ml (14.76% total storage)

- 30 days' Bryngwyn WTW supply (10.85 Ml/d) = 325.5 Ml
- 30 days' Usk reservoir compensation (9.1 Ml/d) and Brecon Borehole regulation flow (2.4 Ml/d) = 345 Ml
- Total Usk ESP = 670.5 Ml (5.12 % total storage)

- Total Big5 ESP = 10,040.2 Ml (11.2% of total storage).

5.10.2. Risk assessment

We have classified the zone at 'High Risk'

This was based on:

1. The initial screening (Table 25) shows a negative 'Supply Demand Balance' throughout all the years in the planning period.
2. Detailed analysis of reservoir storage in the high-level reservoirs (Figure 29) shows a high risk of running out of water compared to the other reservoirs in the Big 5 aggregation (see Figure and Figure for Llandegfedd and Talybont reservoirs).

WRMP24 metric	2025-26	2026-27	2027-28	2028-29	2029-30	Risk
Available Headroom (Ml/d)	8.51	8.16	7.66	6.81	6.33	High risk
Target Headroom (Ml/d)	47.01	47.50	47.24	47.40	47.87	
Actual vs. Target headroom ratio	0.18	0.17	0.16	0.14	0.13	
Supply Demand Balance (Ml/d)	-38.50	-39.34	-39.59	-40.59	-41.54	

Table 25 - Results of the Initial Screening assessment for the SEWCUS WRZ

The simulated data from our Water resources model indicates that some events in key reservoirs such as Talybont and Llandegfedd (Figure 30 and Figure 31) reach a minimum storage of approximately 20% but the sources never empty or reach their respective emergency storages. However, modelling of Pontsticill and Taff Fawr (Figure 29) shows that the combined storage in in these reservoirs reaches very low levels, and these are the sources where our model 'fails' when it breaches the emergency storage provision. The return period of this happening is around 1 in every 100 years on average, below our target level of 1 in every 200 years. As was demonstrated in WRMP24, this highlights where the drought risk is in SEWCUS and the need to derive a set of drought curves that will trigger appropriate demand side and supply side actions to help mitigate as far as possible any risk to customer supplies.

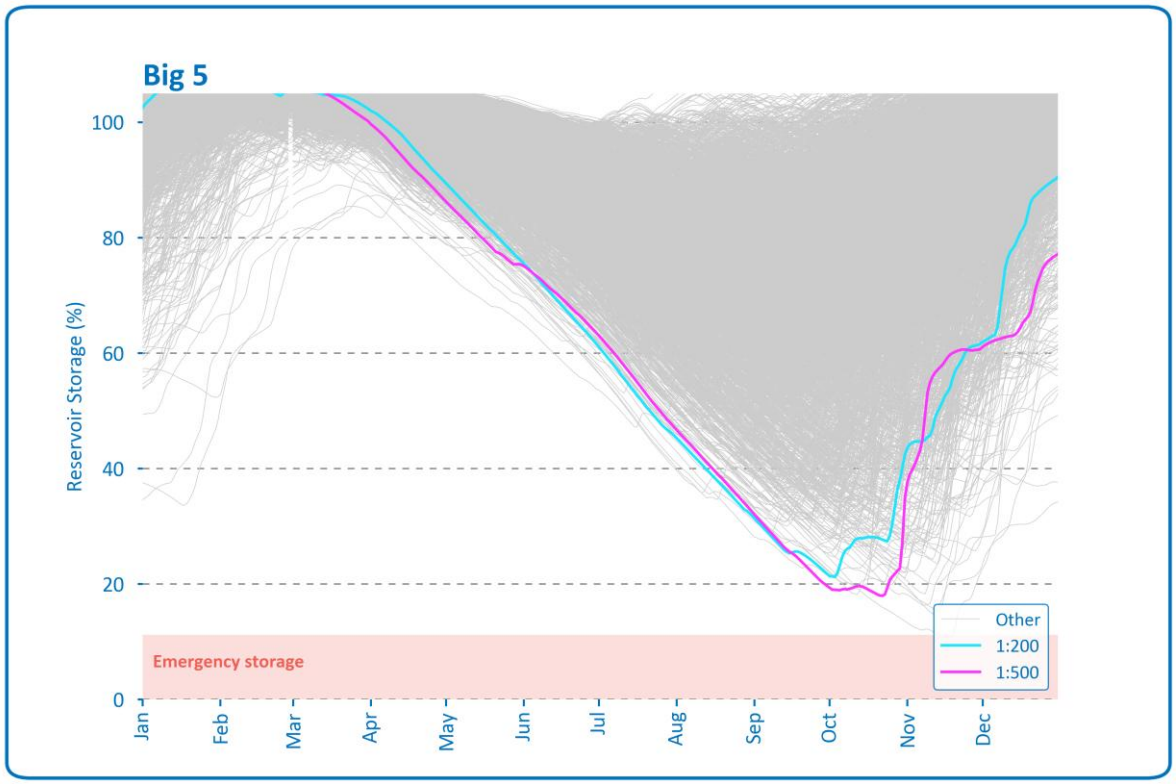


Figure 28 - Drawdown events of the zonal storage over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

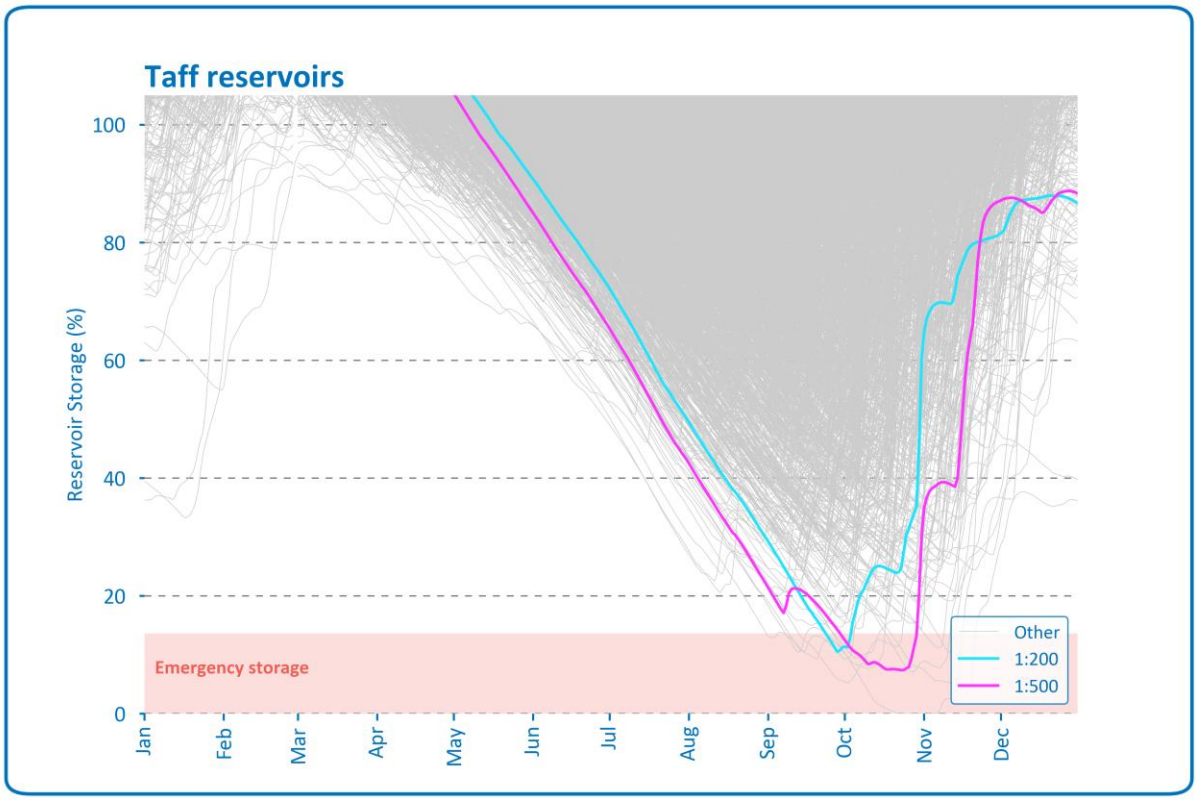


Figure 29 - Drawdown events of the combined storage in Pontsticill and Taff Fawr over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

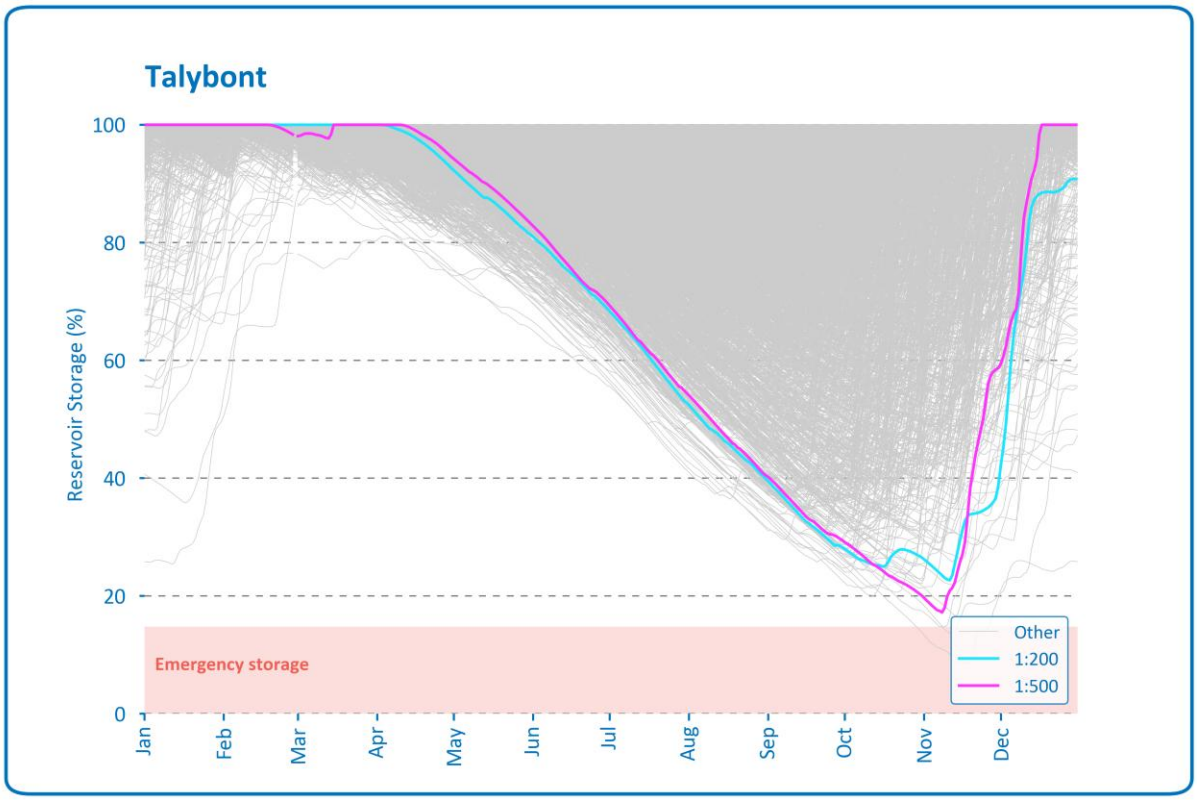


Figure 30 - Drawdown events of the storage in Talybont reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.

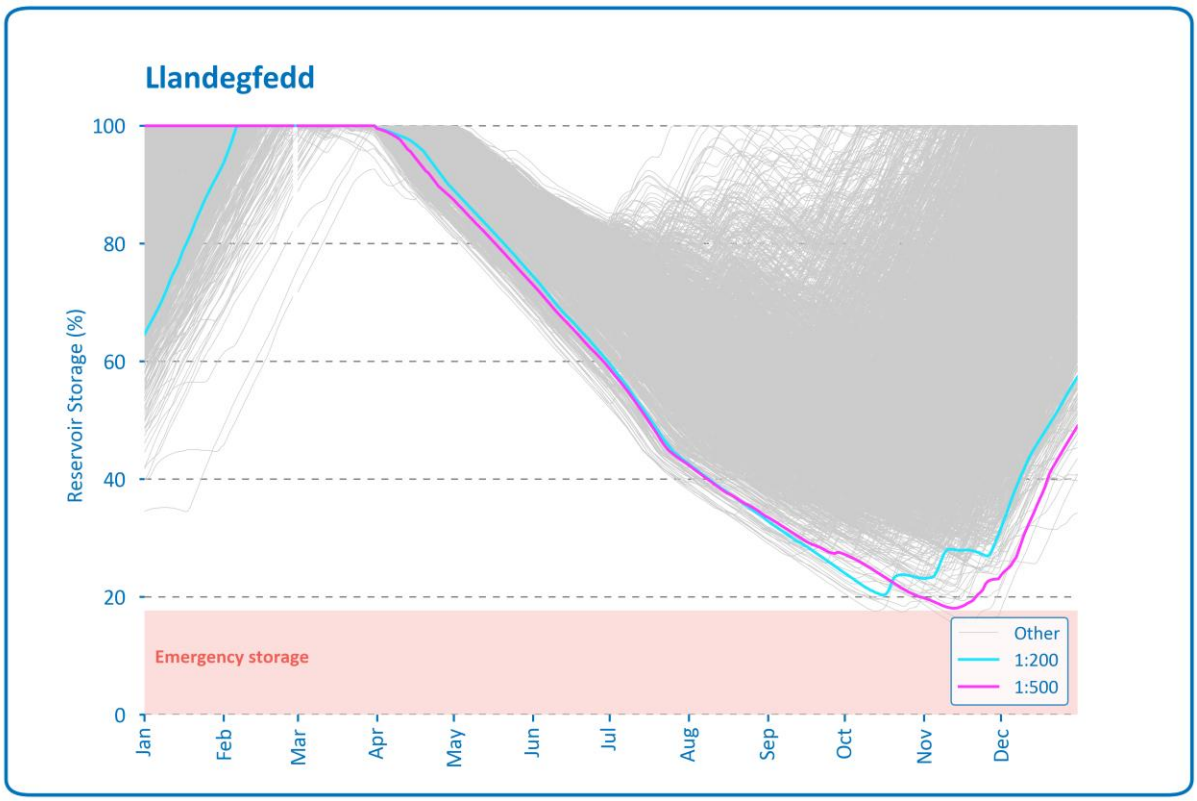


Figure 31 - Drawdown events of the storage in Llandegfedd reservoir over 2,500 years. Coloured lines show the events with return period of 200 and 500 years.