WATER MEANS BUSINESS

Water resources, sustainability and growth in the Weaver-Gowy catchment

Water Resources West

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INTRODUCTION

Water is a critical resource for business. It underpins major parts of the economy. But it is also a vital part of our natural environment. Finding a sustainable balance, so there is sufficient water for habitats, native species and the economy to thrive is not easy. Climate change makes it harder. Less summer rainfall means lower river flows, impacting both the plants and animals that live there and the businesses that abstract water. New low-carbon technologies often require significant volumes of water. This challenge is becoming particularly apparent in Cheshire and the Weaver-Gowy catchment.

In the modern world there is no conflict between business and environmental objectives. To secure their future, investment, and jobs, businesses need confidence that their operations are sustainable – underpinned by environmentally protective licences and consents.

This paper describes work undertaken by Water Resources West in 2023/24 to engage with abstractors in the Weaver-Gowy catchment and assess the local water resources issues. Water Resources West is a group of abstractors, their representatives, and their regulators. We are working together to ensure the sustainability of water resources, considering wider societal needs, environmental improvement and working across sectors.

The catchment was chosen as a priority because it unusually contains a predominance of water abstraction for business. This includes large chemical companies, agriculture, minerals extraction and other industries. It is also a focus for the net-zero industrial transition linked to Hynet and neighbouring developments.

Our investigation, and conversations with abstractors in the catchment, has revealed a low awareness of potential impacts from climate change upon future water availability amongst abstractors, and virtually no awareness of potential changes to abstraction licences by the Environment Agency beginning in 2028.

There is water available in the catchment for new abstractions and most abstraction licences may contain sufficient provision for future growth. However, there are places where no water is available for abstraction at low flows, and these sites do coincide with industrial areas. Some abstraction licences may need to change to protect nature. However, there may also be opportunities to mitigate risks through nature based investments.

CATCHMENT OVERVIEW

The Weaver Gowy Management Catchment covers most of Cheshire, the northern edges of Shropshire and Staffordshire and the western edge of the Derbyshire Peak District. It is characterised by low-lying rolling countryside and beautiful plains. Rainfall over this area flows through brooks, into either the River Weaver or the River Gowy before entering the Mersey Estuary.

This large catchment is largely rural (dairy & beef farming) with some heavily industrialised parts. Key centres of industrial activity are Northwich and the lower catchment near Runcorn and Ellesmere Port. The catchment is also known for its salt mines which supply salt for industrial use and for road gritting, and for sand and gravel quarries.[i]

The catchment covers a varied landscape and supports a wide range of habitats and wildlife. The area is particularly known for its large number of natural lakes, ponds and wetlands, known locally as meres and mosses. The River Weaver flows through dairy farmed areas of Cheshire, through Nantwich and onto Winsford where it becomes impounded and navigable, joining the Manchester Ship Canal at Runcorn. The Gowy runs to the east of Chester and meets the Mersey Estuary near the oil refinery at Stanlow.

Navigable waterways in the catchment include the Manchester Ship Canal, Shropshire Union Canal, Trent and Mersey Canal and the Weaver Navigation, the latter two being connected together by the Anderton Boat Lift near Northwich.

Two important industries in the catchment are agriculture, which is generally based around the dairy trade and the petrochemical and chemical industry. The chemical industry in Cheshire was founded in the Roman times with the mining of salt in Middlewich, Nantwich and Northwich. Salt is still mined in the area. The salt mining has led to a continued chemical industry around Northwich. More chemical companies have plants at Runcorn. The Stanlow oil refinery is at Ellesmere Port.

There are four operational sub-catchments in the Weaver-Gowy catchment:

The **River Gowy** rises in western Cheshire very close to the source of the River Weaver. While the Weaver flows south initially, the Gowy flows north and for several miles provides the valley used by the Shropshire Union Canal. It runs just to the east of Chester and passes through a syphon under the Manchester Ship Canal to meet the Mersey near Stanlow. Its total length is around 20 miles.

The **Upper Weaver** rises to the east of the Peckforton Hills, a sandstone outcrop on the western perimeter of the Cheshire Plain. It then flows some 55 miles from its source to its confluence with the Mersey and Manchester Ship Canal, just north of Frodsham. The Weaver drains a catchment of some 160 square miles. Initially, the river flows in a south-easterly direction until its confluence with the River Duckow, after which point it flows north to Northwich, then generally west after the confluence with the River Dane.

Since 1880, the **Lower Weaver** downstream of Winsford, has been canalised. In places, additional parallel stretches of canal were constructed so that the river splits into the new canalised section and the original course of the river. To ensure adequate depth is maintained for boats and barges, locks were installed at various points between Winsford and Frodsham. The Weaver was originally made navigable to accommodate the salt trade of Winsford and Northwich. At Anderton, a boat lift made a connection for barges between the Weaver Navigation and the Trent & Mersey canal system. The Weaver flows over Sutton Weir into the 'tidal' Weaver which is a branch of the Manchester Ship Canal. A set of Sluices in the embankment of the Ship Canal allows excess flows to pass into the Mersey Estuary.

The **River Dane** is a tributary of the River Weaver that originates in the Peak District. It forms the border between first Cheshire and Derbyshire, and then between Cheshire and Staffordshire where it then flows north-west through Cheshire before meeting the Weaver near Northwich.

The industrial history of the catchment has left a legacy of industrial pollution and physical modification of waterbodies, with may waterbodies failing to meet the Water Framework Directive (WFD) objective of good ecological status.

Table 1: Environment Agency assessment of ecological status in the catchment[ii]

Ecological status or potential	Bad	Poor	Moderate	Good
Number of water bodies	7	29	41	3

Figure 1. Map of the Weaver Gowy catchment, with the River Gowy to the west, the River Weaver running through the centre of the catchment and the River Dane to the east. Canals are shown in a darker shade of blue. [ii]

WATER RESOURCES IN THE WEAVER-GOWY

Around 800mm of rain falls across the catchment in a typical year. Much of this evaporates or soaks away into aquifers, but hundreds of billions of litres of water each year find their way through the rivers and ultimately discharge into the Mersey estuary. Along the way some of this is taken by abstractors to support their business operations, much of which is returned, perhaps in a different location to where it was abstracted.

The Weaver-Gowy catchment is unusual in the Water Resources West region in that the largest proportion of licenced water abstraction is for non-Public Water Supply (non-PWS). This is because public water supply for Cheshire, Runcorn and Warrington is mainly from outside of the catchment, sourced from the Dee and Vyrnwy catchments. We can see this in Figure 2.

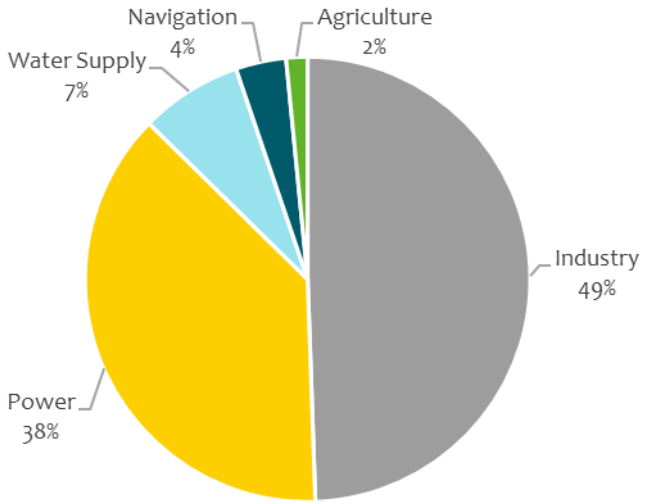
In this look at the management catchment there is a large allocation of resource to hydropower which is non-consumptive. We can get a better view of water use in the individual catchments by looking at licenced consumptive use by sector, i.e. that water which is taken from the environment and used up, or returned to a location some distance away from the point of abstraction. This is shown in Figure 3.

The **Gowy** operational catchment has the smallest consumptive abstraction of 22 million litres per day (Ml/d). Water use is primarily for public water supply with abstractions by United Utilities and Severn Trent Water within the catchment. The remainder of water use in the catchment is by agriculture (3 Ml/d) and general industry (1 Ml/d).

The **Upper Weaver** operational catchment has similar uses of water with 62 Ml/d being taken for public water supply. The remaining water use in the catchments is for agriculture (2 Ml/d).

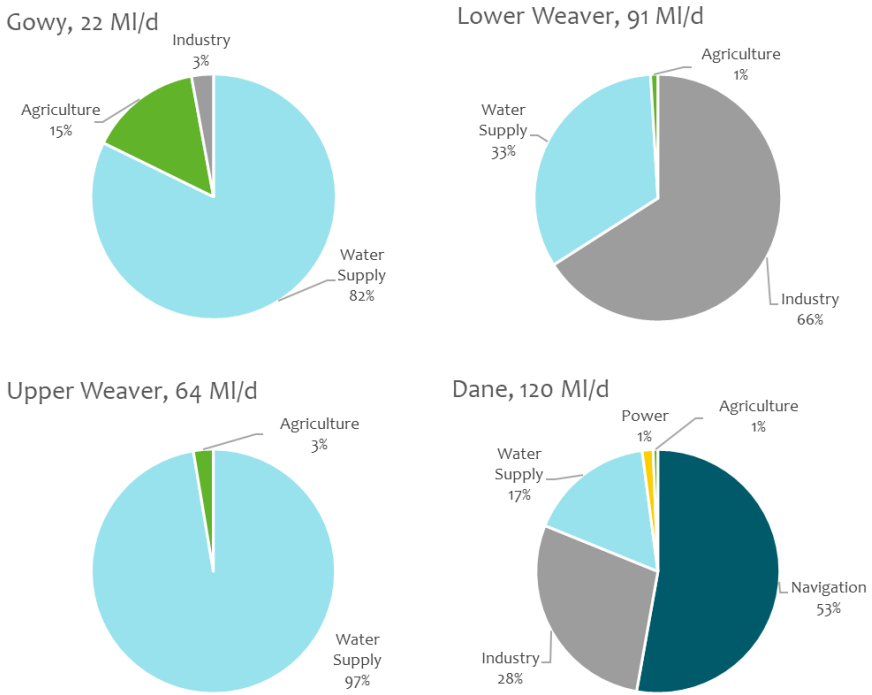
The **Lower Weaver** operational catchment sees the balance of water use switch to non-PWS, with 60 Ml/d) being taken by industry. Most of this use (45 Ml/d) is by the chemicals sector. Public water supply makes up most remaining abstraction (30 Ml/d).

Figure 2. Licenced abstraction in the Weaver-Gowy Management Catchment (EA & CRT data 2010-2015 and 2011-2017; estimates for transfer licences)



The **Dane** operational catchment has the highest overall consumptive abstraction of 122 Ml/d, with over half of the water use (65 Ml/d) being used for navigation. Industry also takes a substantial proportion of water from the catchment with 35 Ml/d being used by the chemicals sector, 6 Ml/d by food and drink manufacturing and 4 Ml/d by the minerals sector. Public water supply accounts for 22 Ml/d of consumptive abstraction in this catchment.

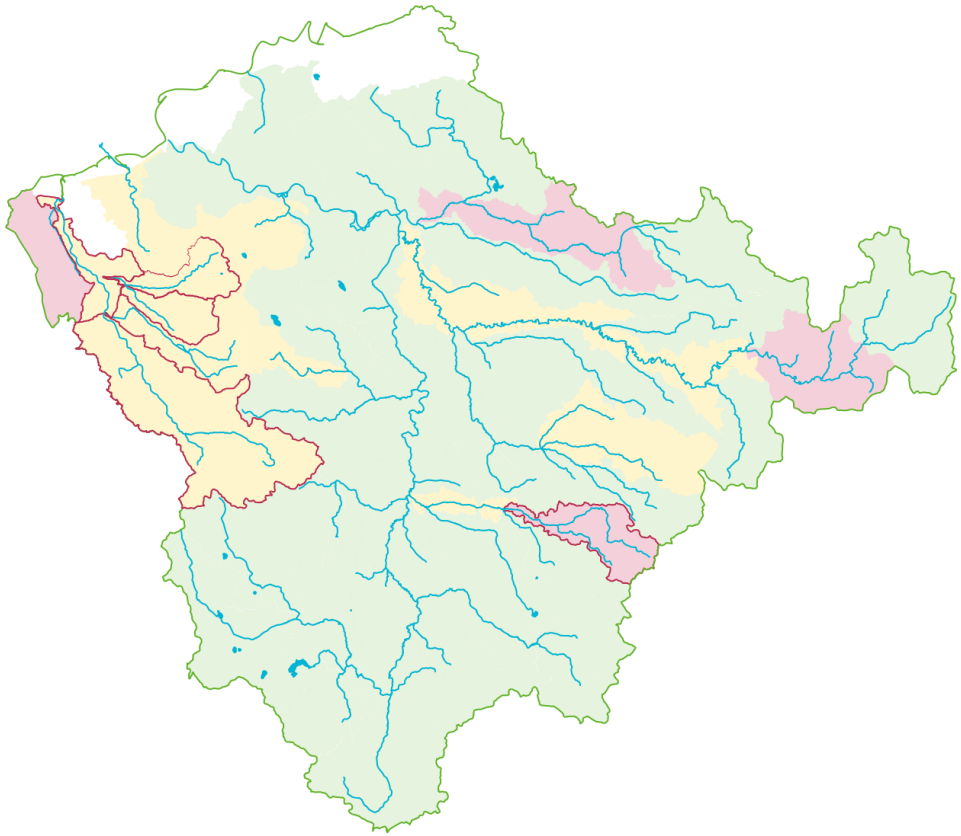
Figure 3. Licenced consumptive abstraction in the four operational catchments (EA & CRT data 2010-2015 and 2011-2017)



The Environment Agency's **Abstraction Licensing Strategy** (ALS)[iii] sets the overall picture of water availability in the catchment. It provides information about where water is available for further abstraction and an indication of how reliable a new abstraction licence may be.

In general terms it shows water to be available for abstraction at higher flows, seen 50% of the time or more. There are areas within the catchment where more water is not available to abstractors at lower flows. For example, Figure 4 shows locations where there is no water available for new abstractions in the Lower Weaver and Dane catchments at Q95. Q95 is the point at which low flows are reached 5% of the time or less. These areas of no water availability coincide with clusters of industry in the catchment.

Figure 4. Water availability risks in the catchment. Red shading indicates no new abstractions with high reliability (Q95). Yellow shading indicates limited water availability. Red outlines show areas which currently do not meet WFD requirements for river flow. [ii]



Published WFD classification data shows the Environment Agency's current assessment of water body health and 'reasons for not achieving good'. From this, we have been able to identify waterbodies in the catchment where

flows are falling below levels needed to protect the ecology. This indicates where changes to abstraction licences may be needed. This may take the form of capping licences to prevent abstraction increasing above recent actual, reducing the allowed volume to reduce abstraction below what it has been recently, or introducing other conditions such as "hands-off flows" where abstraction is not permitted when the river is below a certain level.

This data shows there to be five waterbodies which are classified as having a flow regime which 'does not support good'. These generally correlate to the areas where new abstractions are restricted. They are shown in Figure 4 and Table 2.

Table 2. Waterbodies where flow may be a concern for WFD compliance. [ii]

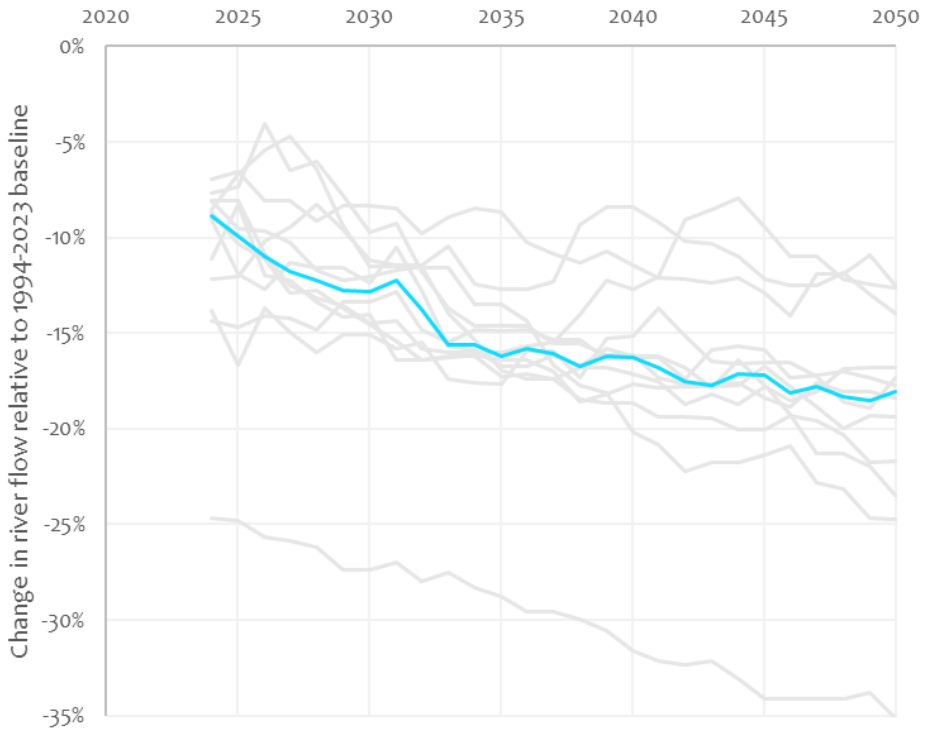
Water Body	2022 classification
Ashton Brook	Does not support good
Gowy (Milton Brook to Mersey)	Does not support good
Salters Brook	Does not support good
Gowy and tribs (Source to Milton Brook)	Does not support good
Valley Brook (Source to Englesea Brook)	Does not support good

Notably both the abstraction licencing strategy and the WFD classifications are based on historical data and do not contemplate the potential impact of climate change upon water availability.

Climate change predictions for the catchment clearly show declining low flows in the future that may further impact water availability. Figure 5 shows a typical low flow that an abstractor on the River Dane would expect to see in dry summers for the next 30 years, relative to what it has been over the 30 years up to 2024. For example, today in 2024 low flows for the next 30 years are expected to be 9% lower than the last 30 years. An abstractor in the 2040's would expect to see low flows around 18% lower we know them today.

There is a large uncertainty in climate projections and different parts of the catchment will be affected differently. Nonetheless, the trend is clear, and it will result in more severe droughts in the future and less water available for abstractors. This is likely to exacerbate the issues seen in the areas highlighted on the map in Figure 4.

Figure 5. River Dane at Rudheath predicted low river flows as the climate changes over the 30-years following the date shown. This is Q95, which means flows would be expected to reach this level 5% of the time. Grey lines show 12 different regional climate models illustrating the range of uncertainty, and the blue line shows the median of these 12. [iv]



WATER ABSTRACTORS IN THE CATCHMENT

The Weaver-Gowy catchment provides water to a variety of abstracting businesses. Several have engaged with WRW, sharing an understanding of their water resources needs and experiences. Here we give a summary of the major sectors that abstract water in the catchment.

The **chemicals sector** uses a lot of water in the Lower Weaver and Dane catchments. **Salt mining** is a traditional industry in the area, using abstracted water for solution mining where water is injected 200 metres underground and a concentrated brine is extracted. In general, chemicals have a long history in the catchment and as such abstraction licences tend to be 'permanent', i.e. without an expiration date and often have significant unused capacity that can be flexed as business needs change. Water is sometimes shared between industrial sites, meaning that a single abstraction can sometimes supply more than one firm. These arrangements are not published and not part of abstraction licence conditions. Chemicals companies may be open to further arrangements, but some are limited by available capacity and constraints on obtaining new abstraction licences.

The chemicals sector is also becoming involved with **Hynet**, an alliance of businesses across the North-West that seeks to reduce carbon emissions through carbon capture and storage, and the production of hydrogen as a low carbon energy source[v]. Underground storage for hydrogen is being developed from salt caverns that are currently used for natural gas storage and there is a wider plan for carbon capture that involves transport of carbon dioxide by pipeline to exhausted gas fields under Liverpool Bay.

Hynet is focussed on the industrial cluster around Ellesmere Port and Runcorn. There are several water intensive developments to support the net zero energy transition expected in that area. Alongside hydrogen production and carbon capture, there are waste to energy plants being considered. The picture is evolving but there is expected to be significantly increased water demand in this lower part of the catchment. Such demand may be met by United Utilities sources outside the catchment or businesses may turn to new or increased abstractions within the Weaver-Gowy.

Quarries in the area are an important source of silica sand, aggregates and stone. High purity silica sand is a nationally important industrial material. There are only a limited number of deposits in the UK. Water is abstracted for dewatering to allow extraction of the materials, also for washing and dust-mitigation. Most quarry water use is not consumptive. Water features are routinely developed in quarry restoration to deliver enhanced biodiversity.

Public water supply within the catchment and neighbouring settlements like Chester, Ellesmere Port, Runcorn and Warrington is mainly sourced from beyond the Weaver-Gowy – mainly from the River Dee and Vyrnwy reservoir in Wales. There are however some water company abstractions in the catchment, from groundwater and the River Dane. though both United Utilities and Severn Trent Water are alert to the possibility of licence changes to ensure the environment is protected in line with WFD requirements. Both water companies would welcome more options for supply and are looking at what options could be developed in the catchment. For example, Severn Trent has highlighted the potential for a new abstraction from the Weaver in the 2040's.

The industrial history of the catchment means that **canals** are prominent in the area. The Weaver Navigation, Trent and Mersey Canal, Llangollen Canal, Macclesfield Canal, Bridgewater Canal and Manchester Ship Canal all convey water through the catchment. The Canal & River Trust has two reservoirs, Bosley and Sutton, in the Dane catchment which feed the Macclesfield Canal. There is also a historic feeder that previously conveyed water from the River Dane catchment to Rudyard Reservoir which feeds the Caldon Canal. Canals can provide a source of water to businesses and there are some existing canal abstractions in the catchment. The Canal & River Trust allows abstraction from its canals via formal agreements, although these are still regulated by the Environment Agency via the abstraction licencing system. We are advised by the Trust that some water may be available in the catchment for additional abstraction on a case-by-case basis.

WRW and Groundwork presenting at a sustainability event for the Golf Sector held near Macclesfield.

There are several **golf courses** in the catchment who rely on abstracted water to maintain turf. Sustainability is important for the sector, and many clubs therefore irrigate only the greens and tees to reduce their water demand. Some clubs in the catchment have high-tech irrigation systems that can be controlled by apps and linked to GPS moisture meters. Irrigation water is then used sparingly to protect against sward loss. Golf clubs would generally be open to working with others on water resources issues, although their needs are typically much smaller than industrial users.

Our attempts to engage with **agricultural abstractors** in the catchment has not been successful to date. We attempted to organise a workshop in the catchment, with the Environment Agency issuing invitations on our behalf. One hundred and twenty invitations were issued, but only two responses were received, and the event did not go ahead. We also attempted to engage with abstractors through the local catchment partnership. One thousand handbills that highlighted the issues with water resources in the catchment were distributed widely, but again no responses were received.

Headlines from Engagement

From our conversations with abstractors in the catchment it appears that abstractors feel comfortable that they have enough water for the future with existing licences. Though water companies and the Canal & River Trust are more aware than others of the risks posed by climate change and regulation to avoid deterioration and restore environmental flows. Consequentially, engagement with other sectors about water resources is difficult as there is no perceived threat, or reason to take action.

Equally, there is no appetite amongst abstractors to surrender licences or licenced volumes, indeed they are seen as a business asset and the fee to retain a licence is small in comparison to the utility of holding a licence.

That said, our experience in attempting to contact abstractors in the catchment has revealed what we think are substantial changes in the number of licences in the catchment. Our original 2010-2015 dataset from the Environment Agency contained 427 non-PWS licences. A data extract from the Agency in March 2024 to provide address details for abstractors contained only 105 non-PWS licences. We believe this difference is due to efforts by the Agency to encourage the surrender (and perhaps revocation) of unused licences nationally. We will be looking for significant changes in abstracted volumes across the region when the next national dataset is released.

CHALLENGES FOR THE WEAVER-GOWY CATCHMENT

The greatest challenges for the abstractors in the catchment are **climate change** and **licence changes** to prevent (WFD) deterioration and restore environmental flows. These challenges are common across the WRW region.

The **climate change challenge** is difficult to communicate. Our general expectation is that flows will decrease in the summer, exacerbating low flows. This we can see in the plot for the River Dane from the eFlag website above. However, the mainstream picture of water availability is the Abstraction Licencing Strategy for the catchment shown in the figure above. The ALS uses historical data to predict current water availability. It does not take any account of climate change predictions and for that reason, likely over-reports what water is going to be available in the future. This presents a risk to abstractors and the environment. For abstractors the risk is that water may not be available when it is required, even though there is a licence in place. The risk to the environment is that by using data that looks backwards waterbodies may become over-licenced during the life of a licence, usually 12 or 24 years.

Our current understanding of **licence changes** is that time limited licences are currently being reviewed ahead of the 2025 common end date for the catchment. At this point licences which have a time limit will need to be reviewed. Abstractors will need to evidence their continued need for the water and that they are using it efficiently. Some licences may have new conditions attached when they are renewed, for example limiting the volume to recent actual use, or introducing hands off flow conditions. We understand that some letters have been issued to abstractors in the catchment who have time-limited licences warning them of potential changes to their licence, but we have not heard from anyone who has received such a letter, nor have their contact details been shared by the Agency.

Beyond this we expect licences across the catchment to be reviewed together by the Environment Agency, starting in 2026 and concluding by 2031. After January 2028 the right to compensation for licence modification is lost so any changes to permanent licences under this review will not be eligible for compensation. From our engagement the presumption of abstractors is that if they have a licence to abstract water issued by the Environment Agency then it must be environmentally protective. However, this may not be the case particularly in the areas highlighted in Figure 4.

These two issues come to the fore when considering the development of high-water demand projects such as Hynet in the region. Abstractors in the chemical and industrial sectors may be basing business cases for investment upon existing abstraction licences that have been in place for many decades without considering changes to water availability or the potential impact of licence reviews. We have shared this view with the Environment Agency team looking into development of the Hynet cluster. The water companies are however aware of both risks where development is dependent upon public water supplies and have built the anticipated demand into their Water Resource management Plans. The water companies are also carrying out environmental investigations in the catchment into the risk of deterioration posed by their abstractions.

We have also identified, in Table 2 above, individual waterbodies where flows are currently below what would be classified as supporting (WFD) good status. We expect that these waterbodies will be allocated measures to restore flows to more natural levels in the next River Basin Management Plan and abstractions from these sites are likely to be candidates for licence review.

OPPORTUNITIES IN THE CATCHMENT

At face value the Weaver-Gowy catchment appears well supplied with water resources. As part of our regional planning process, we have looked at forecast water consumption out to 2050 using national growth factors for different business sectors and, based on our 2010-2015 dataset there appears to be a healthy surplus of licenced capacity above forecast use in each river catchment. This is shown in Figure 6 to the right.

There are also a number of areas where the Abstraction Licencing Strategy reports that water is available. Most notably, the lower Weaver has around 40 Ml/d currently available at high reliability.

The uncertainty in this analysis is the potential impacts of climate change, licence recovery by the Environment Agency since 2015 and future licence reviews mentioned above.

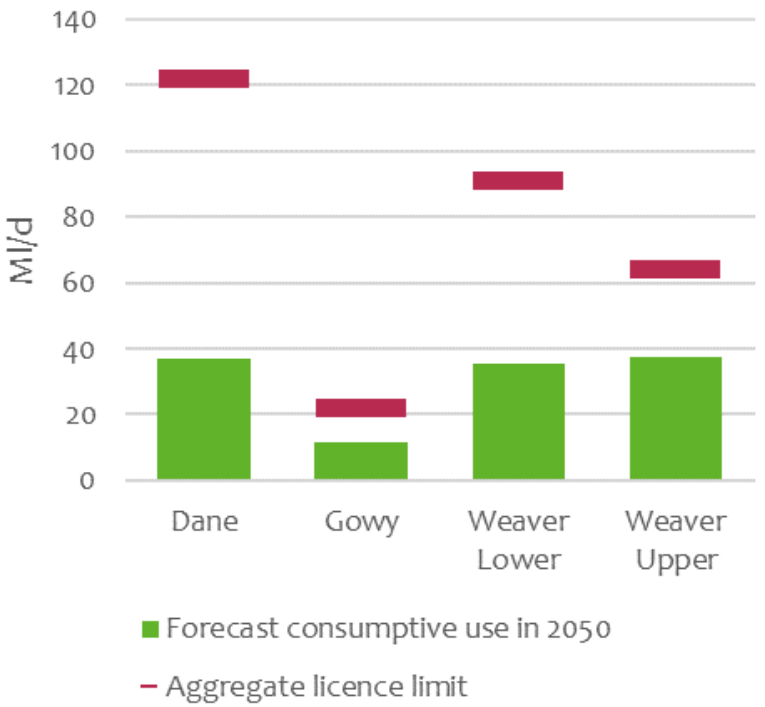
Against that background our conversations with abstractors across the catchment have highlighted a general willingness to share water at a local level where there is sufficient resource available.

The ambition for WRW in this catchment is to establish a local abstractor group, to facilitate joint working by abstractors on water availability risks and opportunities. We recognise that there is little motivation for abstractors to do so until the licence review process becomes more tangible and any need for additional water resource becomes apparent.

Another opportunity is presented within the local nature strategy. Investment in nature-based solutions, e.g. via biodiversity net gain could be targeted in those areas highlighted in Figure 4. By increasing and protecting habitat, e.g. riparian tree cover, reconnecting wetlands, removing barriers to access spawning grounds, the ecosystem can become more resilient to low flow pressures. This means that it may be better able to cope with abstraction.

Quarries represent a longer-term opportunity. Once the mineral extraction is complete, large bodies of water could be created for environmental or water resources benefit as part of the restoration. This requires long-term planning. There may also be potential for other users to tap into the non-consumptive element of quarry dewatering.

Figure 6. Comparison of licenced capacity and forecast use in the catchments in 2050.



RECOMMENDATIONS

The core message from WRW to abstractors is that there will be increasing pressure on water availability from climate change. Abstractors should develop long term plans for water security. Developments in the catchment need to be future-proofed against climate change and licence reviews.

Forming a local abstractor group will ease communications with licence holders and promote understanding of local issues surrounding abstraction. However, groups will only have a purpose once a threat of reduced water availability becomes apparent.

The River Basin planning process, which starts again in December 2024, will raise awareness of environmental objectives that are likely to impact upon existing and future abstraction licences. WRW will encourage abstractors to join in this process to understand the environmental requirements that are coming their way in from 2028 onwards.

Abstractors facing licence review should be made aware the support WRW can offer. This is something that the Environment Agency can promote when the licence review process commences.

This catchment review contains lessons for WRW. It has for example been a surprise to discover the change in the number of abstraction licenses in the catchment since 2015. For the next regional plan, we will consider carefully the temporal alignment of data between sectors and particularly between public, and non-public, water supplies.

We note also that there is no easy way of viewing or discovering where flows in a waterbody are below what would be regarded as environmentally acceptable. There is we think good reason to place more information in the public domain as it will build awareness of water resource issues across the region.

Appendix: Sources and methodology

This document has been produced by Water Resources West using data from our draft Regional Plan and interviews with abstractors in the Weaver-Gowy catchment. Our draft plan is available on our website: waterresourceswest.co.uk/publications. This will be updated with our final plan later this year.

Our primary data source is an extract from the national database held by the Environment Agency for the period 2010. This has been supplemented by additional sources, notably data from the Canal & River Trust for the period 2011-2017.

We have met with abstractors in the chemicals sector, golf clubs, waste management and engaged with the Environment Agency team looking at environmental capacity in industrial clusters; particularly the Hynet cluster, much of which will fall within the Weaver-Gowy catchment. We have also held discussions with United Utilities and Severn Trent Water, both of whom have abstractions in the catchment.

We would like to thank the Weaver-Gowy Catchment Partnership, hosted by Groundwork Cheshire, Lancashire and Merseyside, for supporting local engagement.

The engagement message from WRW to abstractors has been one of 'Prepare for the future'. The work we have undertaken for our Regional Plan indicates that Water resources are under pressure from climate change and that in the future there will be less water available for abstractors. Water Resources West exists to help abstractors work together to understand their water needs and make plans to ensure enough water is available in the future.

Picture acknowledgements

Cover image: The River Weaver in Winnington (© Mat Fascione, CC BY-SA 2.0)
Page 2: River Weaver at Mill Island in Nantwich (WRW)
Page 13: The River Dane near Glebe Farm (© Gary Rogers, CC BY-SA 2.0)

Notes

[i] Catchment descriptions have been sourced from the Weaver Gowy Story map hosted on the Catchment Based Approach website with additional material from Wikipedia and the Environment Agency's Catchment Data Explorer.

.[ii] Data in Tables 1 and 2, and the maps, has been sourced from the Environment Agency's Catchment Data Explorer. Accessed 8 August 2023. Licenced under the Open Government Licence 3.0.

[iii] The Weaver and Dane Abstraction Licencing Strategy covers most of the catchment. The Gowy catchment is covered in the Lower Mersey and Alt Abstraction Licencing Strategy.

[iv] Climate change predictions in figure in Figure 5 are from the Centre for Ecology and Hydrology's e-Flag tool. We used the PDM rainfall-runoff model data as this gave the closest fit to the Q95 of the observed historic data.

[v] More information is available on the Hynet website.