Affinity Water

Abstraction Incentive Mechanism- Methodology and Abstraction in 2021-2022

Asset Management document control sheet

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Executive Summary

The Abstraction Incentive Mechanism (AIM) was first proposed with the objective of encouraging water companies to reduce the environmental impact of abstracting water at environmentally sensitive sites during low flow periods (i.e. droughts). The purpose of this document is to set out the methodology and assumptions used to calculate the AIM triggers and baseline abstraction values. Actual abstraction data from the AIM sources for the financial year 2021-22 are shown in this report, in order to track performance and validate the AIM triggers selected.

In 2016 when AIM came into force, a total of 23 groundwater sources were identified as meeting the necessary criteria by Affinity Water and included in the company's business plan. Of these 23 groundwater sources originally identified, seven sources had sustainability reductions implemented in AMP6 or were included in our WRMP19 for sustainability reduction implementation in AMP7. As a result, 19 sources (18 with Chesham removed from 2021-22) were brought forward to AMP7 for inclusion in our AIM performance commitment.

A number of sources that are part of our AIM list, either have an operating agreement in place, a licence condition or have previously been under National Environment Programme (NEP) investigation. The AIM taskforce guidelines as set out by Ofwat were followed to calculate the triggers and abstraction baseline figures. The AIM triggers selected were based on the Environment Agency's Restoring Sustainable Abstraction (RSA) assessments, NEP investigations or other Environmental Impact Assessment (EIA) work. Q95 flows were generally adopted as the best indication of low flow conditions for the AIM triggers. Alternatively for five of the sources, the triggers adopted were either specified as a licence condition or based on an operating agreement. Baseline abstraction values were calculated based on the 20-year period of 1st April 1995 - 31st March 2015 as this period is considered representative of a range of hydrological conditions and include a number of droughts with and without demand restrictions. Where a sustainability reduction has resulted in a cessation in abstraction, these sources have been removed from AIM. Where sustainability reductions have already taken place which have not reduced the deployable output to zero Ml/d, we have kept these sources in AIM, with the new AIM baseline being defined as the new annual average equivalent licensed rate.

Following Ofwat guidance, two equations were used to calculate the AIM performance and the normalised AIM performance. In the reporting year of 2021-22, only two sources in one catchment reached the AIM trigger. For these two AIM sources the global AIM performance was -429.63 megalitres (Ml) and the normalised global AIM performance was -0.20. The negative AIM performance figure signifies an improved performance compared to historic droughts, as average abstraction was lower than the baseline at the global scale when AIM was active. This indicates that the company met and exceeded the AIM baseline figures for the financial year 2021-22, which is mainly the result of the proactive management of available sources and the lower than average demand through summer 2021 as a result of the wet weather.

Following the annual review of the AIM triggers and baseline abstractions, we have concluded that they are appropriate and representative of the catchment status. The validity of the triggers and baseline abstraction is constantly monitored. Since the start of AMP7 in April 2020, the global AIM score has been calculated on a monthly basis.

1. Purpose

The Abstraction Incentive Mechanism (AIM) has the objective of encouraging water companies to reduce the environmental impact of abstracting water at environmentally sensitive sites in low flow periods (i.e. droughts). The purpose of this document is to set out the methodology and assumptions used to calculate the AIM triggers and baseline abstraction values. Furthermore, actual abstraction data from the AIM sources for the financial year 2021-22 are shown in this report, in order to track performance and validate the AIM triggers selected. In 2016 when AIM came into force in reputational form, we put forward a total of 23 groundwater sources to be included in AIM, based on sources which had been deemed as potentially environmentally sensitive by previous studies. Since 2016, eight sources have been subject to sustainability reductions, with the deployable output (DO) at four of these sites being reduced to zero Ml/d. These four sources have been omitted from the AIM assessment, in addition to the Chalfont St Giles source, which has been deemed to be 'not environmentally sensitive', following discussion with the Environment Agency. This leaves a total of 18 sources that were assessed for AIM in this report and will be reported on for the remainder of AMP7.

2. Methodology

A total of 19 (18 with Chesham removed from 2021-22) sites have been assessed as potentially having an impact on a surface waterbody hence included in the AIM list. Seven sources have been subject to sustainability reductions as of 1 April 2018 (three of them resulted in full cessation, to zero DO) and so the post-reduction abstraction rates for the remainder four sources are considered for this assessment period. In addition, a voluntary sustainability reduction was implemented as of September 2020 at Chesham. Further sustainability reductions are planned for implementation in late AMP7. The remaining ten sources have either an operating agreement in place (i.e. augmentation scheme) or other licence condition or have previously been under National Environment Programme (NEP) investigation.

In order to calculate the trigger and abstraction baseline, the AIM Taskforce guidelines have been followed. Based on these, the AIM trigger is set based on a specific environmental trigger identified through the Environment Agency's (EA) RSA assessments, NEP investigations or other EIA work. Q95 flows have been adopted as the best indicator of low flow conditions below which AIM should operate.

Alternatively for five of the sources, the triggers adopted were either specified as a licence condition or based on an operating agreement. In the majority of cases, the potentially impacted surface water body is the river, so the trigger was set at the downstream gauging station that is considered to be representative of the groundwater catchment. There are exceptions to this, where a groundwater level trigger has been used instead, due to better representation of the aquifer baseline conditions and the absence of a gauging station. Where the Q95 or Q70 values have been used, these were adopted from the Centre of Ecology and Hydrology as published on their website[1] in July 2016.

Once the AIM triggers were identified, the baseline abstraction values were calculated based on the average abstraction during the historic period when river flows or groundwater levels were at or below the trigger. The duration of the abstraction record was chosen as the period between the 1st April 1995 and the 31st March 2015. This 20-year period was chosen as the most representative of current and future abstraction patterns, as the distribution network constantly evolves and reliance on particular sources may change accordingly. Also, if this were to extend further back, the uncertainty on data quality would increase. Following the AIM guidance stating that "the past needs to be representative of the future", the period from 1995 – 2015 was thought to best represent the future. Furthermore, this 20-year period includes a number of low flow periods (1997, 2003, 2005, 2006 and 2012) with some of them having demand restrictions and others being unrestricted. As such, this record is considered as being long enough to incorporate different types of droughts and also smooth out abstraction values that may be very low due to site outages. In cases where outliers were found that are deemed as not representative of the future use of the sources, these were highlighted and addressed appropriately as explained in the next sections.

3. Triggers and Abstraction Baseline

Table 1 below presents the sources that were submitted to Ofwat in September 2015 for inclusion in the AIM list.

Table 1 Sources Operated Under AIM from 1 April 2016

	Source	Group	Licence Number	Avg. Ann. Licence	Max Daily Licence	2015 DO		AMP6 SR	AMP7 SR
NEP further sites	Netherwild	Clay Lane	28/39/28/336		40.91	28.00	30.00	No	No
	Bricket Wood	Clay Lane	28/39/28/336		27.28	14.00	15.00	No	No
AMP5 sustainability operating agreements	Oughton Head	Individual	06/31/13/11	4.55	6.55	4.10	5.22	No	No
	Slip End	Individual	06/33/14/36	5.46	6.82	0.00	0.00	No	No
	Well Head	Individual	06/33/13/10	2.27	2.27	1.15	1.15	No	No
	Offley Bottom	Individual	06/33/13/09	1.14	1.14	0.00	0.00	No	No
	Primrose	Individual	9/40/4/497/G	3.00	4.00	3.00	3.00	No	No
	Buckland Mill	Individual	14/033	4.00	4.00	4.00	4.00	No	No
	Denge Gravels	Denge	9/40/5/71/G	9.04	15.00	4.65	9.04	No	No
AMP6 Sustainability reduction sites	Bow Bridge*	Kensworth	28/39/28/130	6.82	11.37	5.82	5.82	Yes	N/A
	Amersham	Missenden	28/39/28/334	7	18.18	7.00	12.00	Yes	Yes
	Whitehall	Whitehall	29/38/03/42	22.73	30.46	15.00	28.00	Yes	No
	Fulling Mill*	Digswell	29/38/02/46	9.09	9.09	5.60	9.09	Yes	No
	Marlowes**	Gaddesden	28/39/28/335		20.47	4.74	4.74	Yes	No
	Piccotts End	Gaddesden	28/39/28/335			15.72	15.72	Yes	No

	Source	Group	Licence Number	Avg. Ann. Licence	Max Daily Licence	2015 DO		AMP6 SR	AMP7 SR
	Hughenden*	Individual	28/39/25/47	2.28	2.27	1.60	1.75	Yes	N/A
AMP7 planned Sustainability reduction sites	Digswell	Digswell	29/38/02/46	11.37	11.37	7.88	7.88	No	Yes
	Holywell	St. Albans	28/39/28/337		9.09	8.20	9.09	No	Yes
	Mud Lane	St. Albans	28/39/28/337		11.37	10.03	11.37	No	Yes
	Periwinkle Lane	Individual	28/39/28/401	4.99	5	4.19	4.19	No	Yes
	Runleywood (Chalk)	Individual	29/38/01/09	9.55	9.55	6.30	6.30	No	Yes
	Chesham***	Individual	28/39/28/104	5.22	7.09	5.22	6.00	No	Yes
Removed from AIM list	Chalfont St. Giles	Missenden	28/39/28/334	4	4.55	4.00	4.50	No	N/A

*removed as an AIM source at the point of AMP6 sustainability reduction

** there was a slight increase in abstraction to facilitate a larger upstream abstraction reduction at Piccotts End

*** removed as an AIM source at the point of voluntary sustainability reduction

Some of these sources have individual licences whilst others are part of a group licence. The licence and DO values presented reflect the situation in September 2015 as since then, our conceptual understanding has improved and sustainability reductions have already been implemented (Bow Bridge reduced to zero as of 1 April 2016, Fulling Mill and Hughenden reduced to zero as of 1 April 2017, Whitehall reduced to an annual average of 2 Ml/d as of 1 April 2017, Amersham reduced to an annual average of 4 Ml/d as of 1 April 2018, the combined annual average of Marlowes and Piccotts End reduced by 6.4 Ml/d as of 1 April 2018 and Chesham reduced to zero as of September 2020). Hence the licence and DO values have been adjusted accordingly as shown in Table 5. Where DO has been reduced to zero Ml/d, AIM no longer applies to these sources as the impact of abstraction has been mitigated. Where DO has not been reduced to zero Ml/d, there remains the potential for a residual abstraction influence and so there is benefit in continuing to assess AIM against a lower AIM baseline. Therefore, Fulling Mill, Hughenden and Bow Bridge were

removed from the assessment whilst Marlowes, Piccotts End, Whitehall and Amersham remain. Chalfont St Giles source was removed, as agreed following discussion with the Environment Agency that the potential benefit from an abstraction reduction here is small. The same methodology was applied to Chesham from 1 April 2021 and it will also be applied when the sustainability reductions planned for AMP7 are implemented.

Some of the sources assessed for AIM are in the same catchment and were grouped as shown in Table 4 and Table 5. The groupings were used as the baseline was calculated based on the performance of AIM sources under historic droughts and this does not necessarily reflect the current operational regime. An example is the Bricketwood and Netherwild sources. These are both baseload sources of the Clay Lane group and usually abstract at a higher rate than the AIM baseline. In the event of an operational outage at either of the sources, there is a need for the flexibility to increase abstraction at the other, to compensate the lost output. Without the grouping, we would not be able to recoup the lost volume if an outage occurred during a low flow period.

This is also important when calculating the normalised AIM score. The relative size of different abstractions means that if output from one source was increased in response to an outage at a baseload source during a low flow period, without the grouping, the normalised AIM score of the two sources would not balance and the AIM assessment would be inaccurate. Where sources are grouped, the same trigger point was used. This is downstream of both sources in the grouping, such that the benefit of their combined operation can be realised.

Based on the methodology explained in section 2, the calculated or adopted AIM triggers are presented in Table 2.

The abstraction baseline values were calculated as the average historic abstraction, based on the period April 1995 to March 2015 when the AIM trigger would have been reached, as set out in Table 2. Where sustainability reductions have not reduced DO to zero Ml/d, the AIM baseline was set as the post reduction annual licence limit, to discourage use of the peak licences (which remain available) under low flow conditions. This methodology will also apply to the sustainability reductions planned in AMP7.

The AIM trigger for our Slip End source varies, depending on flow at Ashwell gauging station on the Rhee and the permitted abstraction rate specified in the licence. To allow for headroom, we usually abstract slightly less than we are entitled to under most of our abstraction licences. With this in mind, the AIM baseline for Slip End was set at the 95th percentile of the licensed abstraction at the site at any time, assuming that the flow is below 2.55 Ml/d (the first step on the table) (see Table 3), so that a benefit can be claimed for any abstraction lower than usual operation during a drought.

Table 2. AIM Triggers for Groundwater Sources

Source	Trigger Location	Monitoring Record	Q95 or bespoke trigger (Ml/d)	Comments
Bricketwood	R. Colne at Berrygrove GS	April 1995 – March 2015	13.00	Bespoke trigger based on minimum flows derived from AMP5 Options Appraisal Work
Netherwild				
Well Head	R. Hiz at Hitchin GS	August 1980 – to date	0.26	Trigger based on Q95 adopted from CEH[1]
Oughton Head				
Offley Bottom				
Digswell (aggregated with Fulling Mill)	R. Mimram at Panshanger GS	December 1952 – to date	18.66	Trigger based on Q95 adopted from CEH[1]
Holywell	R. Ver at Colney Street GS	April 1995 – March 2015	7.44	Trigger based on Q95 adopted from CEH[1]
Mud Lane				
Marlowes	R. Gade at Croxley Green GS	October 1970 – to date	32.00	Trigger based on Hunton Bridge Licence condition for flows at Croxley Green
Piccotts End				
Amersham	R. Misbourne at Denham Lodge GS	July 1984 – to date	5.53	Trigger based on Q95 adopted from CEH[1]
Whitehall	R. Beane at Hartham Park GS	August 1979 – to date	15.47	Trigger based on Q95 adopted from CEH[1]
Periwinkle Lane	R. Lee at Luton Hoo/East Hyde GS	October 1959 – to date	7.34	Trigger based on Q70 adopted from CEH[1]
Runleywood Chalk				
Slip End	R. Rhee at Ashwell GS	November 1965 – to date	Dependent on licensed flow condition	Trigger based on Operating Agreement for Ashwell BH Augmentation
Primrose	R. Dour at Crabble Mill GS	August 1966 – to date	18.06	Trigger based on minimum flows at Crabble Mill as per Buckland Mill Licence condition
Buckland Mill				
Denge Gravels	Denge Tubewell 19	October 2000 – March 2015	1.78 mAOD	Bespoke trigger based on minimum levels for the nearby wetlands (at 1.35 mAOD in TW33)

Table 3. Moving Baseline at Slip End Source

Flow at Ashwell Gauging Station at National Grid Reference TL 267 401 in litres per second	Maximum Daily Abstraction rate in Ml/d	Proposed AIM trigger (95 % of Licensed volume) in Ml/d
Flows above 29.46 l/s (2.55 Ml/d)	Up to 6.82	
Between 28.95 and 29.46	5.46	5.18
Between 28.41 and 28.94	5.00	4.75
Between 27.90 and 28.40	4.55	4.32
Between 27.36 and 27.89	4.09	3.89
Between 26.83 and 27.35	3.64	3.46
Between 26.32 and 26.82	3.18	3.02
Between 25.78 and 26.31	2.73	2.59
Between 25.27 and 25.77	2.27	2.16
Between 24.74 and 25.26	1.82	1.73
Between 24.20 and 24.73	1.36	1.30
Between 23.69 and 24.19	0.91	0.86
Between 23.15 and 23.68	0.46	0.43
Less than 23.15	0.00	0.00

Netherwild and Bricketwood sources operate under AIM at a combined daily abstraction of 37.16 Ml/d. The Hitchin sources (Well Head, Oughton Head and Offley Bottom) have augmentation schemes in place, based on level trigger points at Charlton Mill Pond (for Well Head) and Oughton Springs (for both Oughton Head and Offley Bottom). For all sites that are assessed under AIM where there is river support, AIM only applies to the abstracted water for public water supply and not for augmentation, as augmentation is in place to mitigate the abstraction impacts and augmentation should reduce the frequency of the AIM trigger being breached. The EA also operates an augmentation scheme from Bath Springs borehole to the River Hiz downstream of Charlton Mill Pond and upstream of their gauging station. Despite the low augmentation volumes, if this is considered to skew the gauge readings when in operation, then a groundwater level trigger could apply based on the EA observation borehole at Lilley Bottom. The equivalent trigger for flows at Q95 (0.26 Ml/d) at Hitchin Gauging station, would be set at 92.4 mAOD based on the relationship between the groundwater level hydrograph and the river gauge as shown in Figure 1.

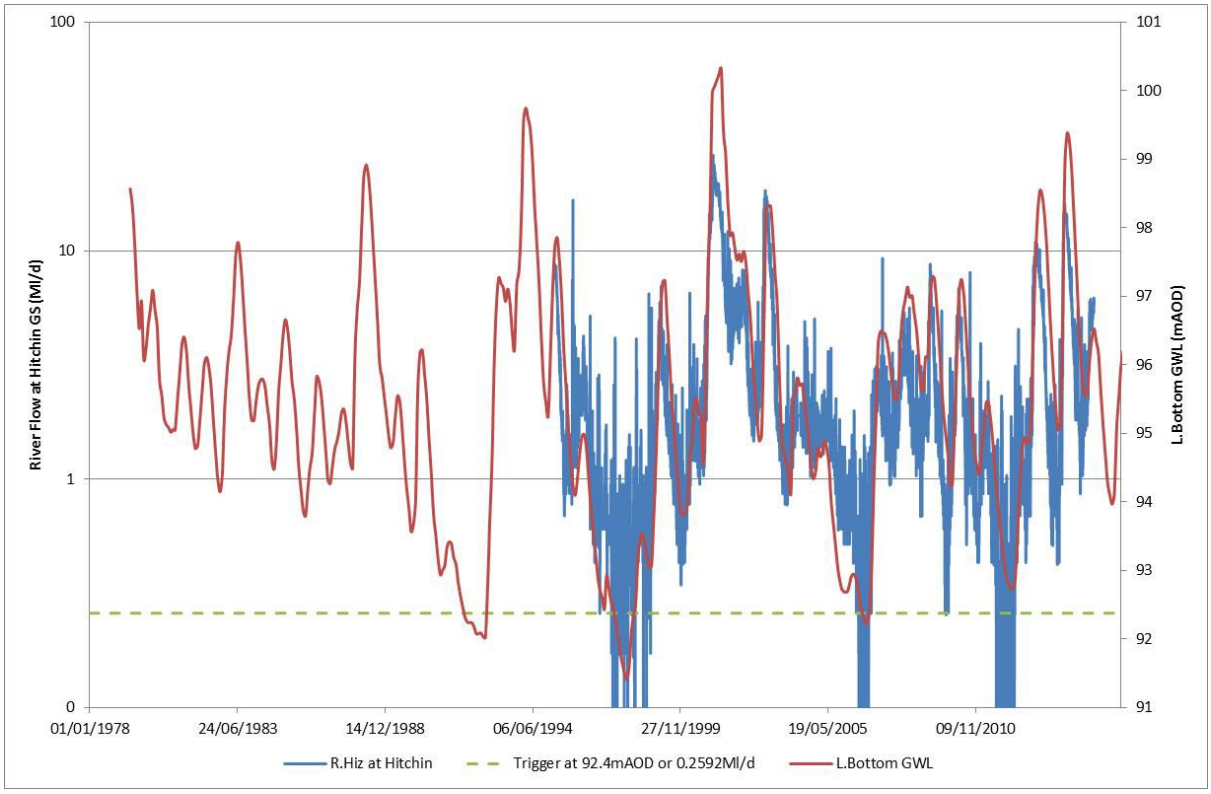

Figure 1 . Relationship between River Flows at Hitchin Gauging Station and Groundwater Levels at Lilley Bottom Observation Borehole

The Mimram source (Digswell) operates under AIM at the baseline abstraction of 7.53 Ml/d, based on the Q95 trigger flow at Panshanger Gauging Station. Since September 2017, Fulling Mill (also in the Mimram catchment) has been permitted to abstract a small volume of water (<2 Ml/d), under low groundwater level conditions for flood management purposes. During such periods, the licence is aggregated with Digswell, to ensure that the 9.09 Ml/d sustainability reduction in the Mimram catchment abstraction remains. As a result, the aggregated abstraction for the two sources is reported on for AIM. A sustainability reduction is planned at Digswell in late AMP7. It is proposed that the AIM baseline will remain at 7.53 Ml/d until the reduction is implemented.

The Ver sources (Holywell and Mud Lane) operate under AIM at the combined output of 17.72 Ml/d. Since Mud Lane is considered operationally as an additional borehole for Holywell and due to their close proximity, the combined AIM baseline is applied instead of the individual baseline values, in order to allow operational flexibility during low flow periods. Sustainability reductions are planned at Holywell and Mud Lane in AMP7. It is proposed that the combined AIM baseline will remain at 17.72 Ml/d until the reduction is implemented. As discussed earlier, AIM does not apply for Bow Bridge since the source had its licence revoked due to sustainability reductions as of the 1 April 2016.

The Gade sources (Marlowes and Piccotts End) previously operated under AIM at the combined output of 20.14 Ml/d. Following the April 2018 sustainability reduction, the

combined AIM baseline for the two sources is 14.06 Ml/d, equivalent to the combined post-reduction annual licensed rates at the two sources. As the combined permitted peak abstraction at the two sources is 19.06 Ml/d, the AIM baseline serves to discourage peak abstraction if low flows coincide with a high demand period.

Following the 2018 sustainability reduction, Amersham operates under AIM at the baseline abstraction of 4 Ml/d. This is equivalent to the post-reduction permitted rate. A further sustainability reduction is planned for late AMP7 at Amersham. It is proposed that the AIM baseline will remain at 4 Ml/d until the further reduction is implemented. Chalfont St Giles was previously included in the AIM assessment for the Misbourne catchment but has been removed following discussions with the EA.

Whitehall source is included in AIM with a baseline of 2 Ml/d. This is equal to the post-sustainability reduction annual licensed rate and similar to the Gade sources, the considerable difference between peak and average permitted abstraction serves to discourage peak use during low flow periods.

Chesham source operated under AIM at the abstraction baseline of 4.08 Ml/d as calculated by the AIM methodology for flow in the Chess reaching Q95 values at the Rickmansworth gauge. A sustainability reduction planned at the source in AMP7 has been implemented on a voluntary basis as of September 2020. As such AIM has ceased to apply from April 2021 onwards.

Hughenden source had a sustainability reduction imposed on the 1 April 2017 (full closure). As such, AIM has ceased to apply.

Sustainability reductions are planned in AMP7 for the Upper Lea sources (Runleywood Chalk and Periwinkle Lane). It is proposed that the combined AIM baseline of the two sources will be 9.94 Ml/d until the reductions are implemented.

Buckland Mill source has a licence condition that requires augmentation to the River Dour during low flow periods. However, since both this and Primrose are located in the same part of the catchment, both sources operate under AIM at the combined abstraction of 6.50 Ml/d when the triggered is reached at Crabble Mill gauge. This volume is still lower than the combined DO for the two sources by 0.5 Ml/d. It needs to be noted that as mentioned above, for sources that have river support schemes, the AIM baseline applies to the volume of water into supply and not the augmentation volume. This only applies to Buckland Mill as there is no augmentation capability from Primrose.

Denge source operates at the AIM baseline of 6 Ml/d as per the average licence volume implemented on the 1 April 2015. This was a voluntary licence reduction by 3 Ml/d at average (previous licence at 9 Ml/d average), so the AIM baseline was adjusted to reflect the new operational pattern.

All triggers and AIM abstraction baseline values for the AIM sources are shown in Table 4. It should be noted that both the triggers and the baseline values are subject to consultation and may need to be reviewed in the future. At present, they are thought to be robust based on the current knowledge of the catchments and the historic and future use of the sources under low flow conditions. Periodic reviews of the AIM sites

are undertaken in order to validate both the triggers and the abstraction values. The review of the AIM sites for the financial year of 2021-22 is discussed in Section 4.

Table 4. AIM Baseline Abstraction versus Triggers

Source	Catchment	Combined AIM baseline (Ml/d)	AIM baseline (Ml/d)	Average Deployable Output based on 1 in 10 year drought (Ml/d)
Bricketwood	Colne	37.16	18.65	14.00
Netherwild			18.51	28.00
Well Head	Hiz	0.84	0.84	1.15
Oughton Head		5.03	4.43	4.10
Offley Bottom			0.60	0.00
Digswell (aggregated with Fulling Mill)	Mimram	7.53	7.53	7.88
Holywell	Ver	17.72	10.29	8.20
Mud Lane			7.43	10.03
Marlowes	Gade	14.06	8.34	8.34
Piccotts End			5.72	5.72
Amersham	Misbourne	4.00	4.00	4.00
Whitehall	Beane	2.00	2.00	2.00
Periwinkle Lane	Upper Lee	9.94	3.36	4.19
Runleywood Chalk			6.58	6.30
Slip End	Rhee	95% of licensed abstraction	95% of licensed abstraction	0.00
Primrose	Dour	6.50	2.50	3.00
Buckland Mill			4.00	4.00
Denge Gravels	Denge	6.00	6.00	4.65

4. Abstraction in 2021-22 vs AIM Baseline

A periodic review of the AIM triggers and baseline abstraction is undertaken on a monthly and annual basis in order to validate the selected values. Table 5 below shows the actual abstraction figures for 2021-22 against the AIM baseline values.

Table 5. AIM baseline Abstraction versus Actual Abstraction in 2021-22

Source	Catchment	Combined AIM baseline (Ml/d)	AIM baseline (Ml/d)	Actual Abstraction (2021/22) (Ml/d)		AIM Performance (Ml)	Normalised AIM Performance	Number of days flow below the trigger
Bricket Wood	Colne	37.16	18.65	15.36	34.51	NA	NA	0
Netherwild			18.51	19.15				
Well Head	Hiz	0.84	0.84	1.61 (excludes augmentation)		NA	NA	0
Oughton Head		5.03	4.43	0	1.03	NA	NA	
Offley Bottom			0.60	1.03				
Digswell plus Fulling Mill	Mimram	7.53	7.53	9.84		NA	NA	0
Whitehall	Beane	2.00	2.00	1.97		NA	NA	0
Holywell	Ver	17.72	10.29	7.88	12.55	NA	NA	0
Mud Lane			7.43	4.67				
Marlowes	Gade	14.06	8.34	0.04	12.44	NA	NA	0
Piccotts End			5.72	12.40				
Amersham	Misbourne	4.00	4.00	4		NA	NA	0
Periwinkle Lane	Upper Lea	9.94	3.36	3.44	7.94	-429.63	-0.20	214
Runleywood Chalk			6.58	4.5				
Slip End	Rhee	95% of licensed abstraction	95% of licensed abstraction	5.32 (excludes augmentation)		N/A	N/A	0
Primrose	Dour	6.50	2.50	1.17	5.03	NA	NA	0
Buckland Mill			4.00	3.86				
Denge Gravels	Denge	6.00	6.00	5.36		NA	NA	0
				TOTALS		**-429.63**	**-0.20**	

Background groundwater levels generally exceeded the long-term average (LTA) from April 2021 to March 2022 but dropped below the LTA from January to March 2022 following below average winter rainfall (Figure 2). The groundwater levels showed a declining trend from April 2021 to December 2021, followed by slight recovery through to March, although levels remained below the LTA. Due to above average groundwater levels, only two AIM triggers in one catchment were active in the 2021-22 reporting period, similar to 2020-21, representing a significant reduction from the ten catchments that were active in 2019-20, a below average groundwater level period.

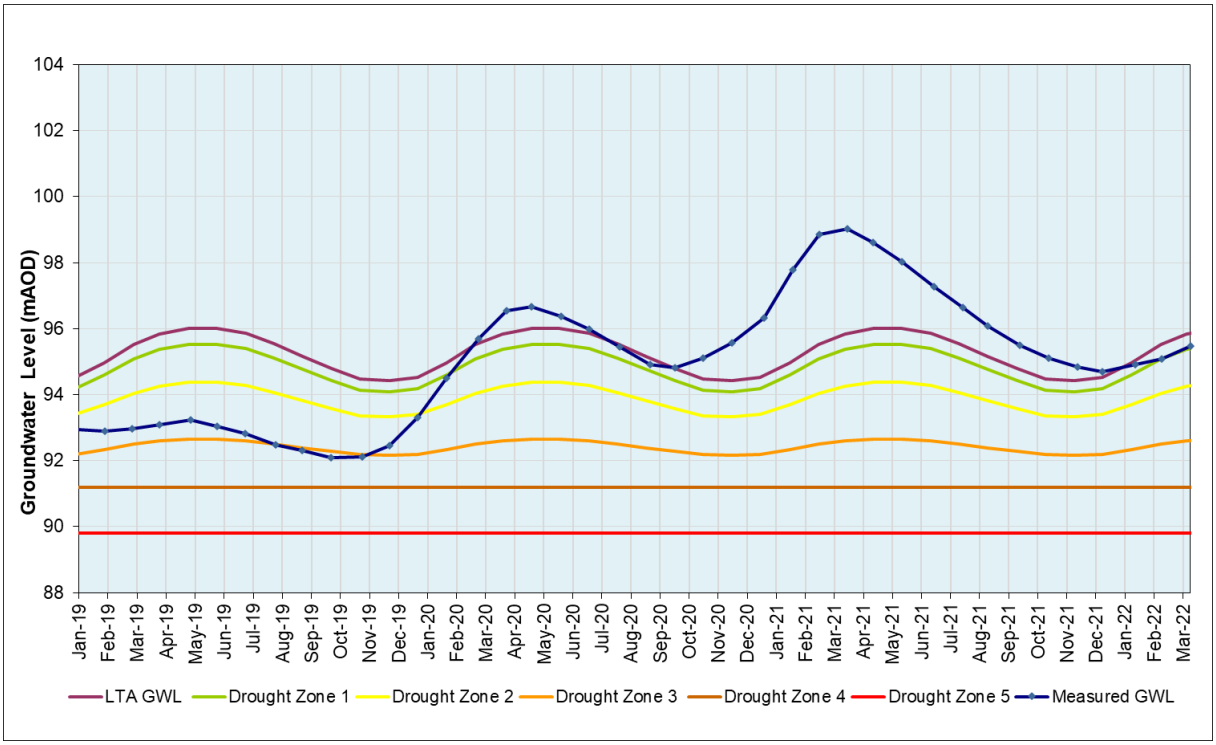

Figure 2. Background groundwater level fluctuations measured at the EA observation borehole at Lilley Bottom

Table 5 states the number of days in 2021-22 that each AIM trigger was active. This can be used to assess how sensitive each trigger is to drought and how spatially variable a drought is. The Upper Lea trigger was active for the reporting period (2021-22) for 214 days. No other triggers were activated in 2021-22.

As specified in the AIM guidelines document from Ofwat, the AIM performance is measured based on the difference between the actual and the baseline abstraction, multiplied by the number of days when flows were at or below the trigger threshold (see equation below).

> AIM performance in Ml = (average daily abstraction during period when flows are at or below the trigger threshold - baseline average daily abstraction during period when flows are at or below the trigger threshold) x length of period when flows are at or below the trigger threshold.

In order to allow for comparison of the AIM performance between abstraction sites, either within the company or between water companies, the performance on the AIM is normalised by the baseline average daily abstraction and the length of time for which flows were at or below the trigger threshold. This is because the guidelines suggest that a performance of -1Ml is better if the AIM baseline is smaller or if the period for which flows are at or below the trigger threshold is shorter. The equation for the Normalised AIM performance is given below.

$$\frac{\text{AIM performance}}{\text{Baseline average daily abstraction x length of period when river flows are at or below the trigger threshold}}$$

As such, when applying the two equations above to measure the AIM performance and the normalised AIM performance for Runleywood Chalk and Periwinkle Lane for 2021-22, the AIM performance was -429.63 Ml and the normalised performance was -0.20. The negative figure signifies an improved performance as average abstraction was lower than the baseline, over the 214 days that AIM was in effect, equating to a daily outperformance of 2 Ml/d compared to historic drought periods. Both Runleywood Chalk and Periwinkle Lane sources are situated in the Upper Lea catchment. The under-abstraction compared to the AIM baseline is mainly attributed to regular abstraction below the baseline at the two sources combined, in addition to good operational management.

In 2021-22, the trigger for 16 of the sources was not activated (Table 5). This is the highest number of sources that were not activated since AIM came into effect in April 2016. This is a reflection of the hydrological conditions experienced in 2021/22 (i.e. above average groundwater levels). In summary, for the two AIM sources that the trigger was reached during 2021-22, the global AIM performance was -429.63 Ml and the global normalised AIM performance was -0.20. This suggests that the company met and exceeded the AIM performance figures for this period. Following the monthly and annual review of the AIM triggers and baseline abstractions, it appears that they are robust and representative of the catchment status. The validity of the triggers and baseline abstraction is constantly monitored. Since the start of AMP7 in April 2020, the global AIM score has been reported internally.

5. References

[1]: http://nrfa.ceh.ac.uk/data/search