Summary of the
Current Research Programme

This Annex contains a summary of the programme of research that is being carried out by [redacted] Bracken Briefings and Research reports are available from the BCG website. Bracken Briefing No.18 includes a summary of recently completed research.

1 Amidosulfuron – Timing of Application

Period	2021-2022
Location	Lowna, North York Moors
Description	Amidosulfuron is known to be absorbed largely by true root systems of plants, rather than foliar - application earlier in the bracken growth cycle was tested. Amidosulfuron (45gm ai /ha) was applied from a helicopter boom fitted with Pencil Jet nozzles.
Results	Amidosulfuron has a higher level of efficacy when applied to the soil. The impact of amidosulfuron is greatest when the root hairs on the bracken rhizome are extensive. Application by helicopter, which achieves less canopy penetration, is not effective in controlling bracken - ground-based application is more effective under the right circumstances. Application when the canopy is fully extended (the best time for foliar treatment with Asulam) is not the most effective time for application of amidosulfuron. Greater efficacy using amidosulfuron is achieved if it is applied earlier in the season when a higher proportion of the active ingredient (ai) will reach the soil and the root-hairs. Earlier application will enhance the negative impacts of the unintended consequences associated with amidosulfuron, in particular the impact on non-target species.
Reporting	Further details are in the National Bracken Chemical Control Trials 2022 Summary Report

2 Asulam Mix

Period	2021 -
Location	North York Moors
Description	In 2021, an initial assessment was made of the aerial / ground-based application of half-rate asulam (5.5 lit/ha) with the drift-retardant Validate. As this was successful, a trial was established in 2022. If the results of this trial demonstrate effective control of bracken, this mix will offer effective control while applying less active substance.
Results	Results will be available after survey of emergent bracken in 2022.
Reporting	A report from the trial will be drafted after survey of the trial site in summer 2023. Bracken Briefing No.22 provides more details.

3 Aerial Spray Drift Trials (Phase 4)

Period	August 2022
Location	Harland Moor, North York Moors
Description	Objective was to provide two additional data sets to provide evidence for determining effective and safe buffer zone when applying Asulox from the air.
Results	The weather conditions for both applications were good with dry weather and medium to strong wind. The additional data sets confirm that there was minimal drift detected at 30m and no drift at 40m downwind of the helicopter. This reinforces the findings of the 2021 trials and adds strong support for the reduction of the current buffer zone for aerial application from 90m.
Reporting	A draft report was forwarded to CRD for comment in September. It was finalised and published on the Research page of the BCG website in October 2022. Bracken Briefing No.21 provides a summary of the details.

4 National Bracken Chemical Control Trials – Extension 2

Period	2020 - 2022
Location	Site at Dumfries (from NBCCT)
Description	Trials established to confirm relative efficacies and safety in early and later part of the spraying season. Multiple replicates of *Asulox, Squire Ultra* (at maximum authorised and at half strength). First year surveys complete, 2022 interim surveys to June.
Results	Full 1st survey September 2021, final 2nd annual survey August 2022
Reporting	Initial report produced December 2021, 2nd year report in draft.

5 Aerial Application of Asulox and Squire Ultra (Amidosulfuron product)

Period	2021-2023
Location	North York Moors
Description	Assess relative efficacy and safety of aerial application *Asulox* and *Squire Ultra*. *Asulox* also applied with drift retardant, *Validate*. Separate ground-based trial carried out – see below.
Results	Standard pre-spray, 24 hour, 7 day and monthly (to June 2022) surveys have been completed. Full annual assessment in August 2022, and a possible two-year check in 2023.
Reporting	Set up report, September 2021. Interim report is in draft.

6 Ground-Based Application of *Asulox, Squire Ultra* and *Genoxone*[1]

Period	2021 - 2023
Location	North York Moors
Description	Treatment carried out on 2nd August 2021. Assess efficacy, non-target plant species impact, selected soil/surface invertebrate fauna group response, and soil residues.
Results	All pre-treatment and interim year 1 surveys, final year 1 survey late July.
Reporting	Initial set up report October 2021. Year 1 interim report is in draft

7 Adjuvant Ground-Based Treatments

Period	2021 - 2023
Location	North York Moors
Description	Treatment carried out on 2nd August 2021 Multiple replicates of 5 additives + *Asulox, Asulox* alone and control
Results	All pre-treatment and interim year 1 surveys, final year 1 survey late July.
Reporting	Initial set up report October 2021. Year 1 interim report November 2022

8 Further Research Opportunities

8.1 Alternative ground-based chemical application methodologies.

8.2 The potential to use of physical and chemical control techniques in combination.

8.3 The use of drones to survey bracken beds and/or apply plant protection products.

8.4 Effects of regular follow-up and variations in the specific actives used in primary and multiple follow up control.

8.5 More details of adjuvant effects, including potential use with reduced levels of active ingredients (Asulam v Amidosulfuron initially).

8.6 Further investigation into comparative efficacy of application methods, including aerial (Pencil Jet) plus ground-based techniques.

8.7 Post-treatments, change in overall habitat structure, species composition, cover balance and direction of development.

8.8 Outstanding Vertebrate and Invertebrate population and residue/metabolic disruption in relation to Asulam (Amidosulfuron post-2024).

8.9 Impacts of management changes, including grazing practice, post primary bracken control.

8.10 Quantification of bracken response to changing climate gradients. Issues, such as encroachment into 'deep peat' areas and implications of control methods on the habitat.

8.11 Review of application method developments actually being trialled nationally and internationally.

8.12 General Disease issue review. Roy Brown is currently involved with the Health Security Agency (formerly Public Health England) and two National Park 'Farming in Protected Landscapes' (FiPL) partnerships researching the associations and palliative management of bracken encroached hill land, Sheep Ticks, Tick Borne Disease and Tick Hosts.

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[1] *Genoxone* is approved for use on scrub in grassland, but very good bracken control results have been obtained under confined 'garden' conditions. It was included in this trial to provide an efficacy and safety assessment on bracken in a field situation.

8.13 Independent reviews commissioned by conservation agencies into (a) comparative risks associated with amidosulfuron and asulam to certain environmental features; (b) literature search to underpin bird survey work and to supplement information on avian food selection.

8.14 Uses for bracken as a commercial crop. For example, as bedding, a source of bioethanol, material for composting, wood burner fuel.

AREAS TREATED WITH ASULAM

1 Aerial Spraying Permits

1.1 The number of aerial permits issued since 2012 has been reported through the Pesticides Forum; CRD provided the 2022 figure. The number of aerial permits issued from 2013-2022 is shown in Figure 1.

1.2 Although the records show the number of permits issued each year, this does not mean that the treatment authorised by the permits was carried out.

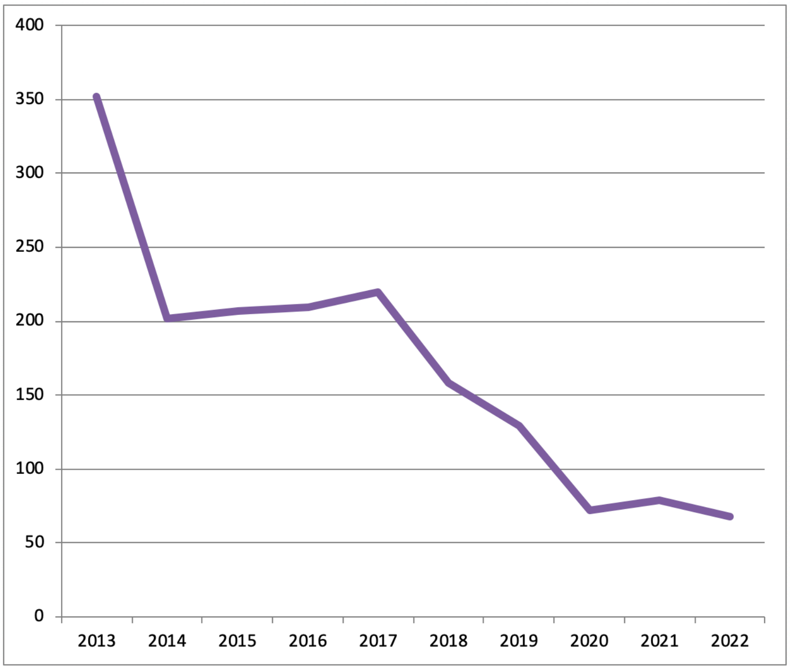
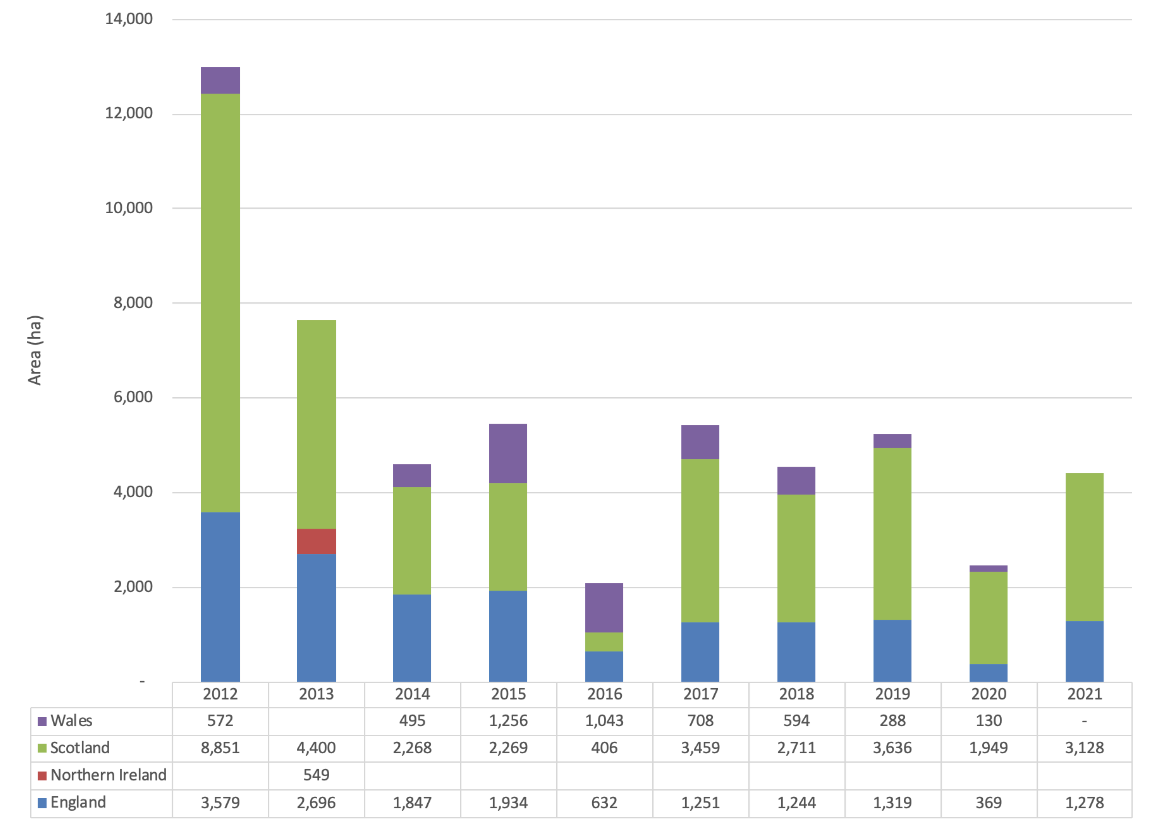


Figure 1: Spraying Permits Issued
Source: Pesticides Forum & CRD

1.3 As for 2021, in 2022 all the aerial spraying was carried out by one company. Two other companies had hoped to carry out some work, but the uncertainty around the availability of Asulam and the late approval of the emergency authorisation left them without enough orders to justify providing a service. All three companies hope to provide an aerial spraying service in 2023.

2 Area of Bracken Treated with Asulam

2.1 Figure 2 provides a breakdown of the official data of all bracken treated with Asulam (aerial and ground-based application) by part of the UK, in the period 2012-2021. This information was obtained from Fera Science Limited.



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
🟪 Wales	572		495	1,256	1,043	708	594	288	130	-
🟩 Scotland	8,851	4,400	2,268	2,269	406	3,459	2,711	3,636	1,949	3,128
🟥 Northern Ireland		549								
🟦 England	3,579	2,696	1,847	1,934	632	1,251	1,244	1,319	369	1,278

Figure 2: Area of Aerially treated Bracken by UK country

2.2 Figure 3 provides a breakdown of Fera’s data by region of the UK of the area of bracken treated, by aerial and ground-based application, in the period 2012-2021.

2.3 There has been an overall decline in the area of bracken controlled, during the period covered by these data. There has been very little bracken treated in Wales, and no control has been recorded in Northern Ireland since 2013.

2.4 There appears to have been very little ground-based control in Scotland and therefore, although more aerial spraying takes place in Scotland, the data collected by the BCG in 2002 indicates that more bracken has been controlled in England than Scotland. See Annex I, Appendix 1.

3 Asulam Application Records – 2022 Season

3.1 Users of Asulam were required to submit details of where Asulam was applied during the 2022 bracken control season. An online Google Form was made available, and this was backed-up by a printed form to collect the same data that was circulated with each purchase of Asulam. A copy of the paper form used to collect data is at Appendix 2.

3.2 A summary of the data collected is included in Annex I Appendix 1. The separate sections provide the breakdown of information requested in the Stewardship Conditions report (Annex H).

4 Area of bracken treated with Asulam in 2022.

(figures in brackets are comparisons for 2021).

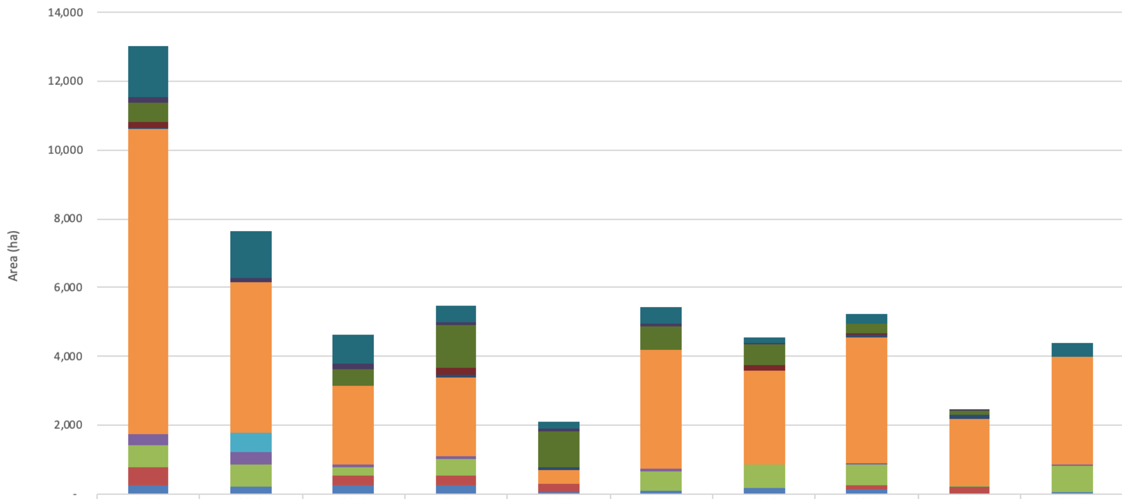
4.1 It is estimated that the total area sprayed by helicopter and ground-based equipment during 2022 was 7,608ha (8,103ha).

4.2 Reports were received from all areas sprayed by helicopter. There is more work to be done to obtain full details from ground-based application – the return rate was about 60%.

4.3 62% (61%) of this area is in England, 34% (38%) in Scotland, 1% (1%) in Wales and 3% (0%) in Northern Ireland

4.4 56% (55%) of the area was treated by helicopter, 44% (45%) from ground-based equipment.

4.5 The total volume of Asulam applied was 78,800 Litres (87,684 litres). 24% (15%) of this was applied to grassland; (58%) (82%) to heathland and 18% (3%) to woodland and pre-establishment in forestry.



	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
■ Yorkshire & Humber	1,457	1,360	830	473	193	483	175	293	-	416
■ West Midlands	163	126	157	57	53	51	36	12	12	-
■ Wales	572		495	1,256	1,043	708	594	288	130	-
■ South West	177			211		3	162	24	12	-
■ South East	40			78	80			93	97	-
■ Scotland	8,851	4,400	2,268	2,269	406	3,459	2,711	3,636	1,949	3,128
■ Northern Ireland		549								
■ North West	337	350	103	93		69	8	30	-	38
■ North East	616	639	226	488		542	674	610	23	755
■ Eastern	542		299	287	270			125	225	-
■ East Midlands	247	221	232	247	36	103	189	132		69

Figure 3: Area of Aerially treated Bracken by UK region

ANNEX I
Appendix 1

ASULAM APPLICATION RECORDS - 2022

Tables and Charts to summarise the Application Records

1 UK Location – treated area by country

2 Aerial-Ground Area – areas treated by aerial and ground -based equipment.

3 Aerial-Ground Area by Country – sub-division of chart 1, to show the same split by country.

4 Designation Type – and Undesignated Area

5 Habitat location – split by Upland, Lowland and Woodland

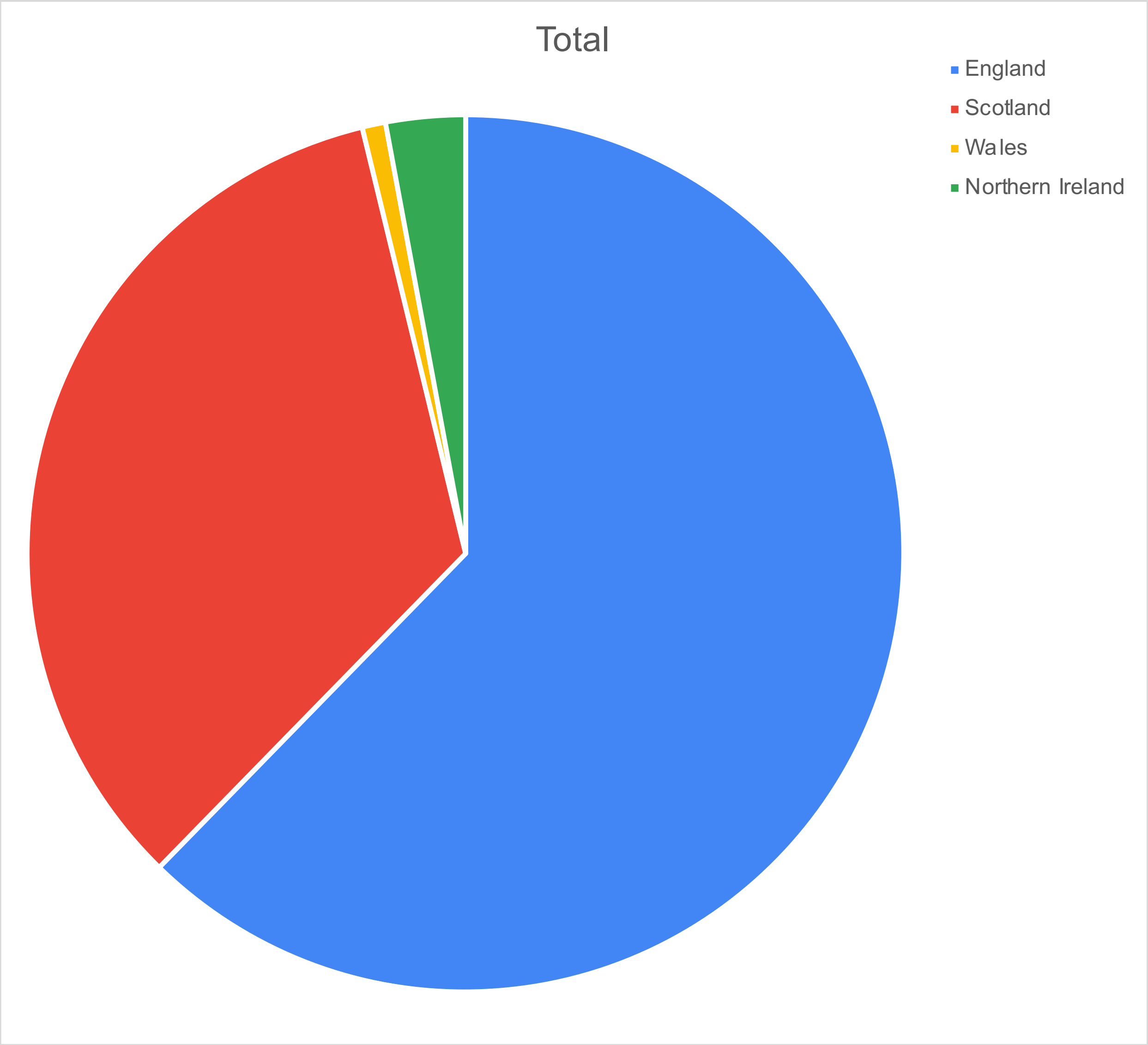
6 Habitat Category – split by Grassland, Heathland and Woodland

7 Asulam by Habitat Category – Area Treated

8 Application Technique by Area

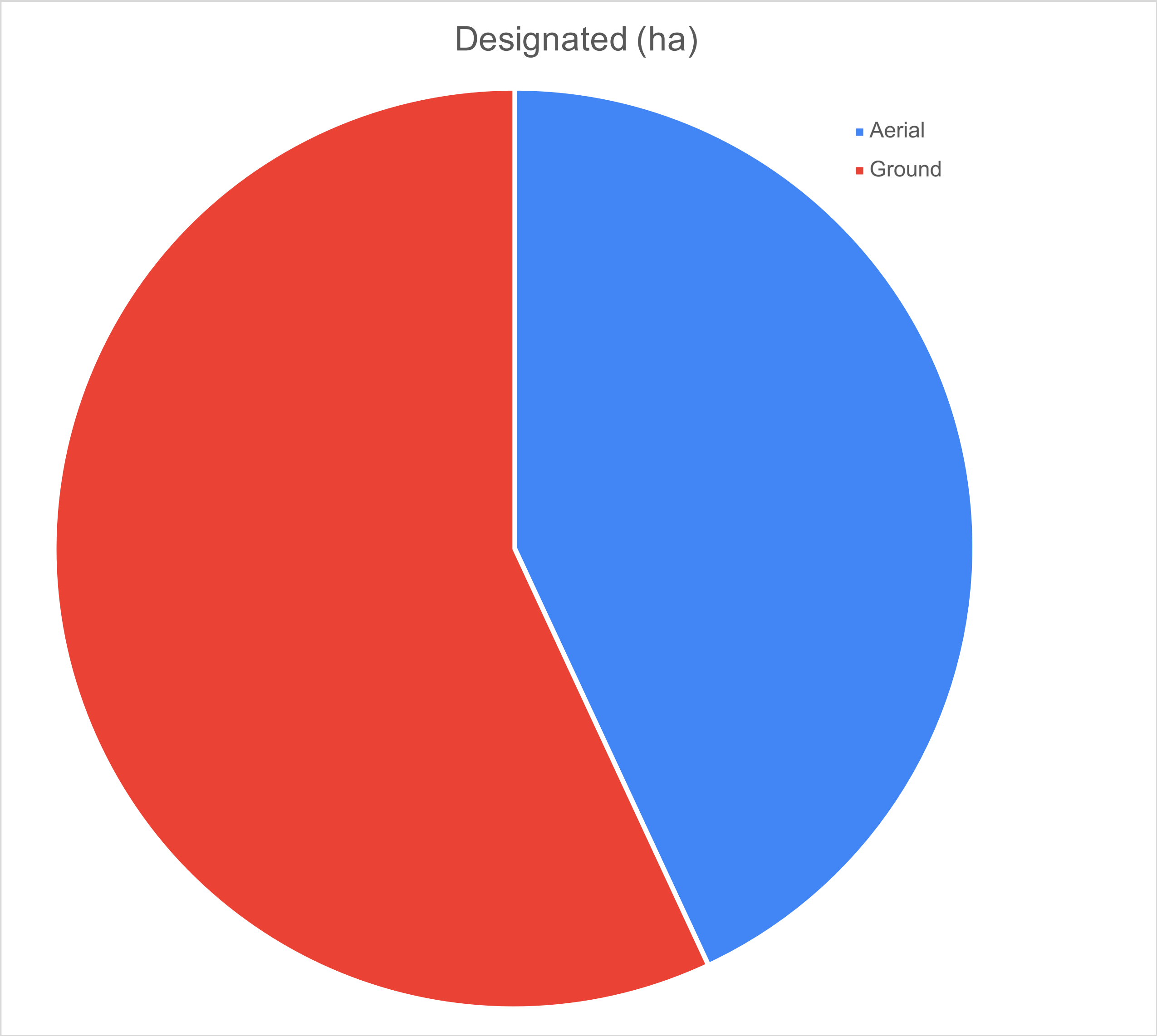
UK Location

Asulam 2022	Area (ha)	%
England	4,741	62%
Scotland	2,578	34%
Wales	66	1%
Northern Ireland	223	3%
Grand Total	**7,608**	**100%**



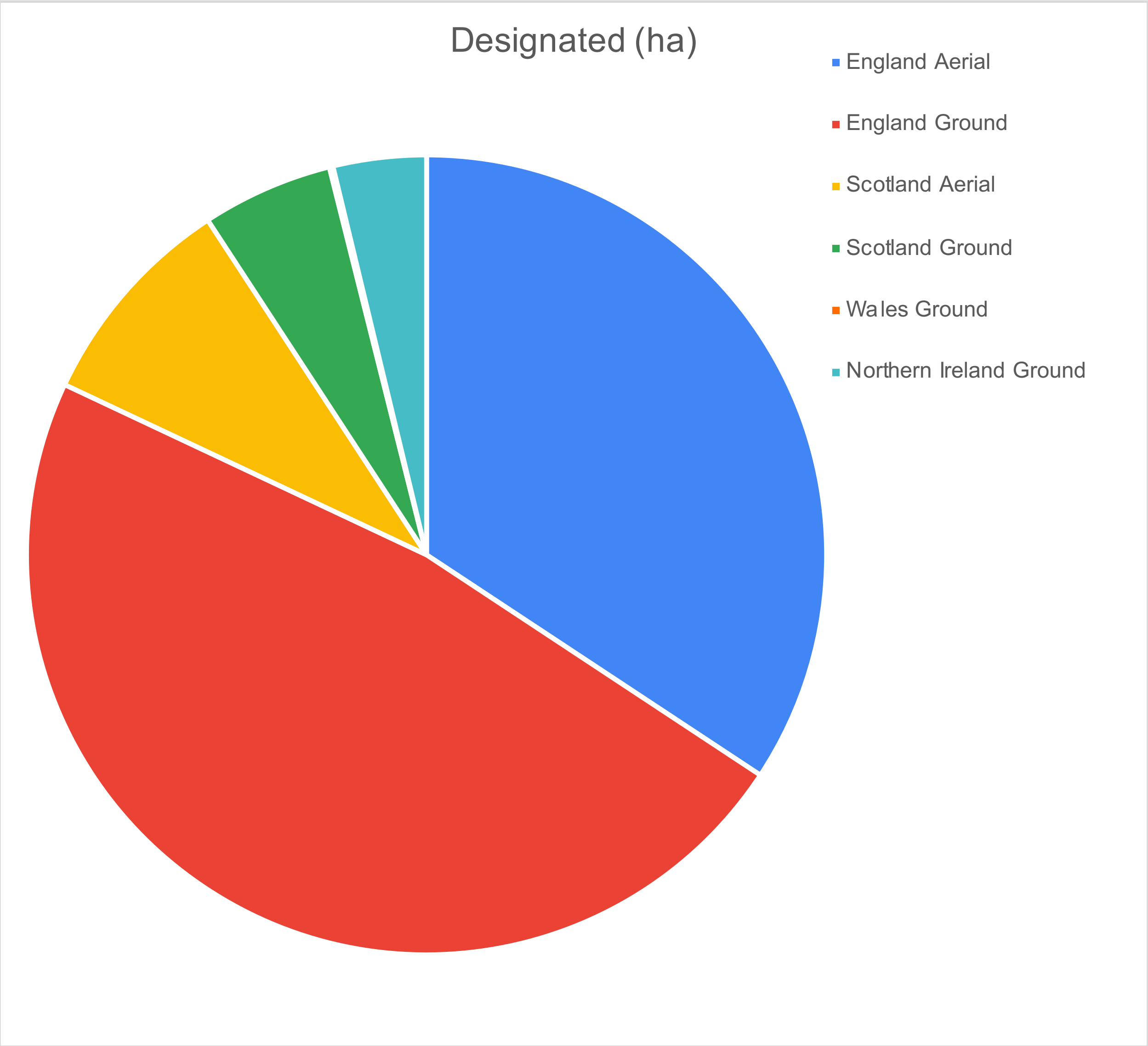
Aerial-Ground Area

Asulam 2022	Designated (ha)	Undesignated (ha)	Totals	%
Aerial	2,404	1,868	4,273	56%
Ground	3,177	158	3,335	44%
Grand Total	**5,581**	**2,026**	**7,608**	**100%**



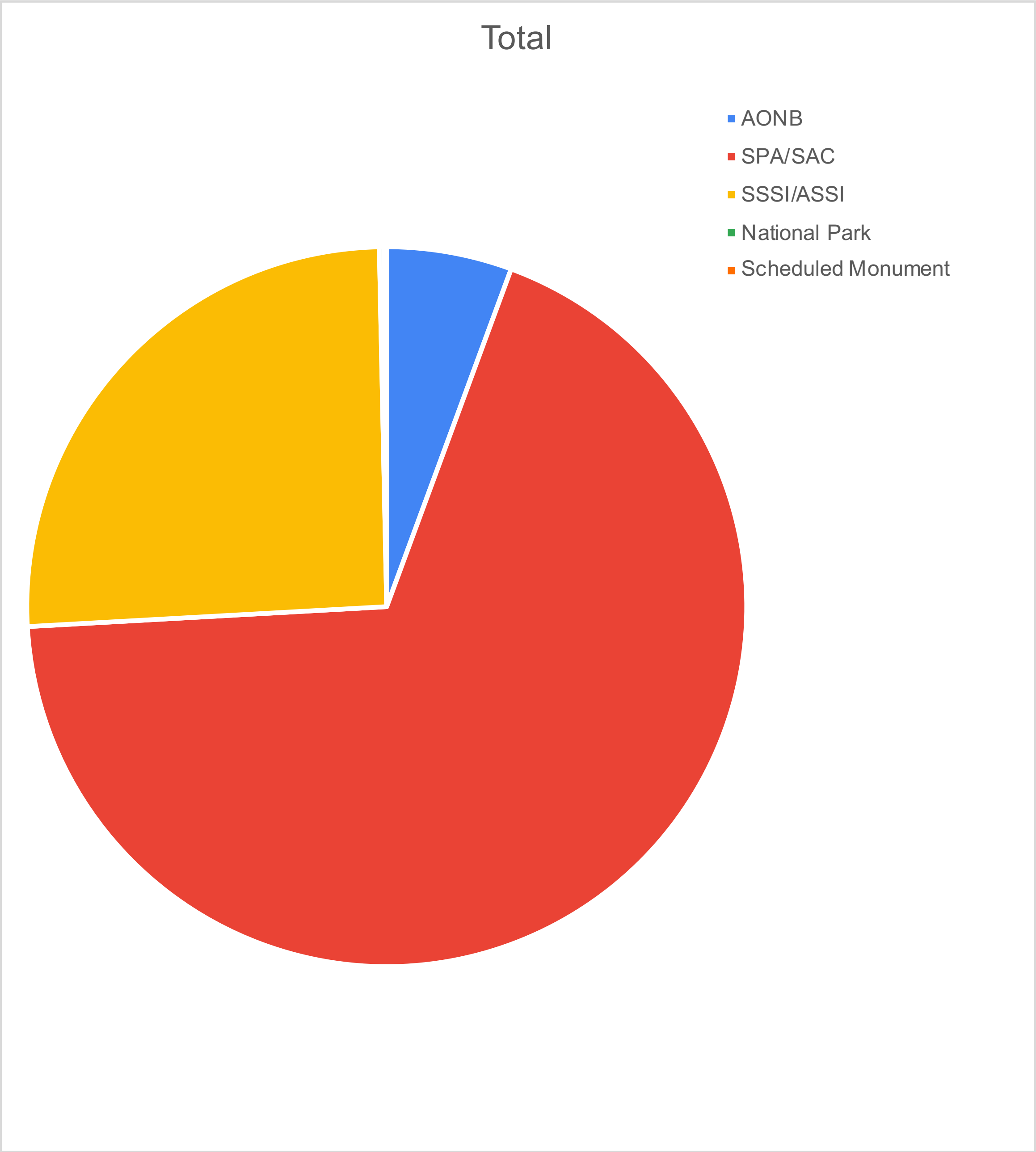
Aerial-Ground Area by Country

Asulam 2021	Designated (ha)	Undesignated (ha)
England	**4,577**	**164**
Aerial	1,914	84
Ground	2,663	79
Scotland	**786**	**1,792**
Aerial	490	1,784
Ground	296	8
Wales	**8**	**57**
Ground	8	57
Northern Ireland	**210**	**13**
Ground	210	13
Grand Total	**5,581**	**2,026**



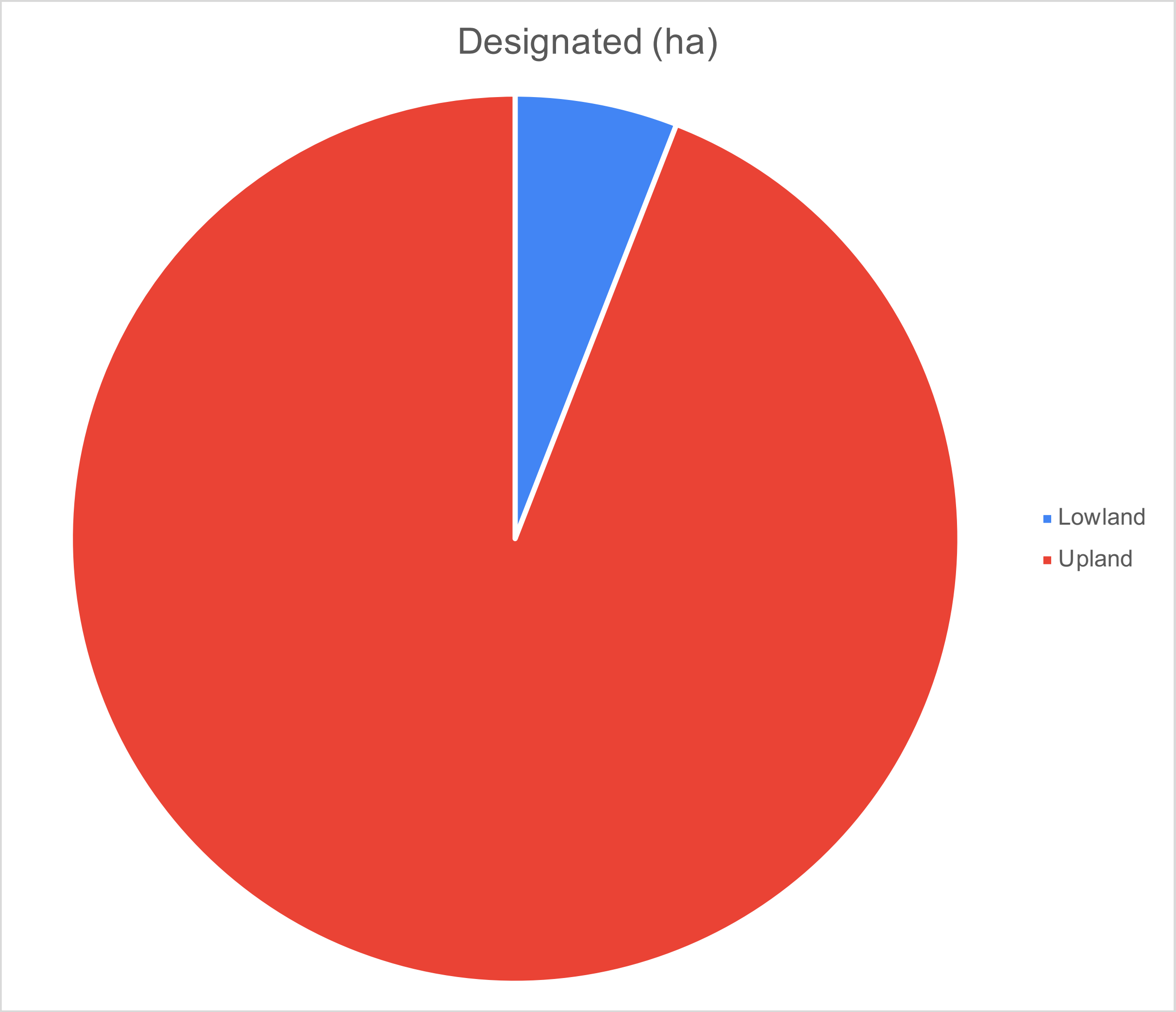
Designation Type

Asulam 2022	**Area (ha)**	**%**
AONB	175	6%
SPA/SAC	2,133	68%
SSSI/ASSI	796	26%
National Park	7	0%
Scheduled Monument	3	0%
Grand Total	**3,114**	**100%**



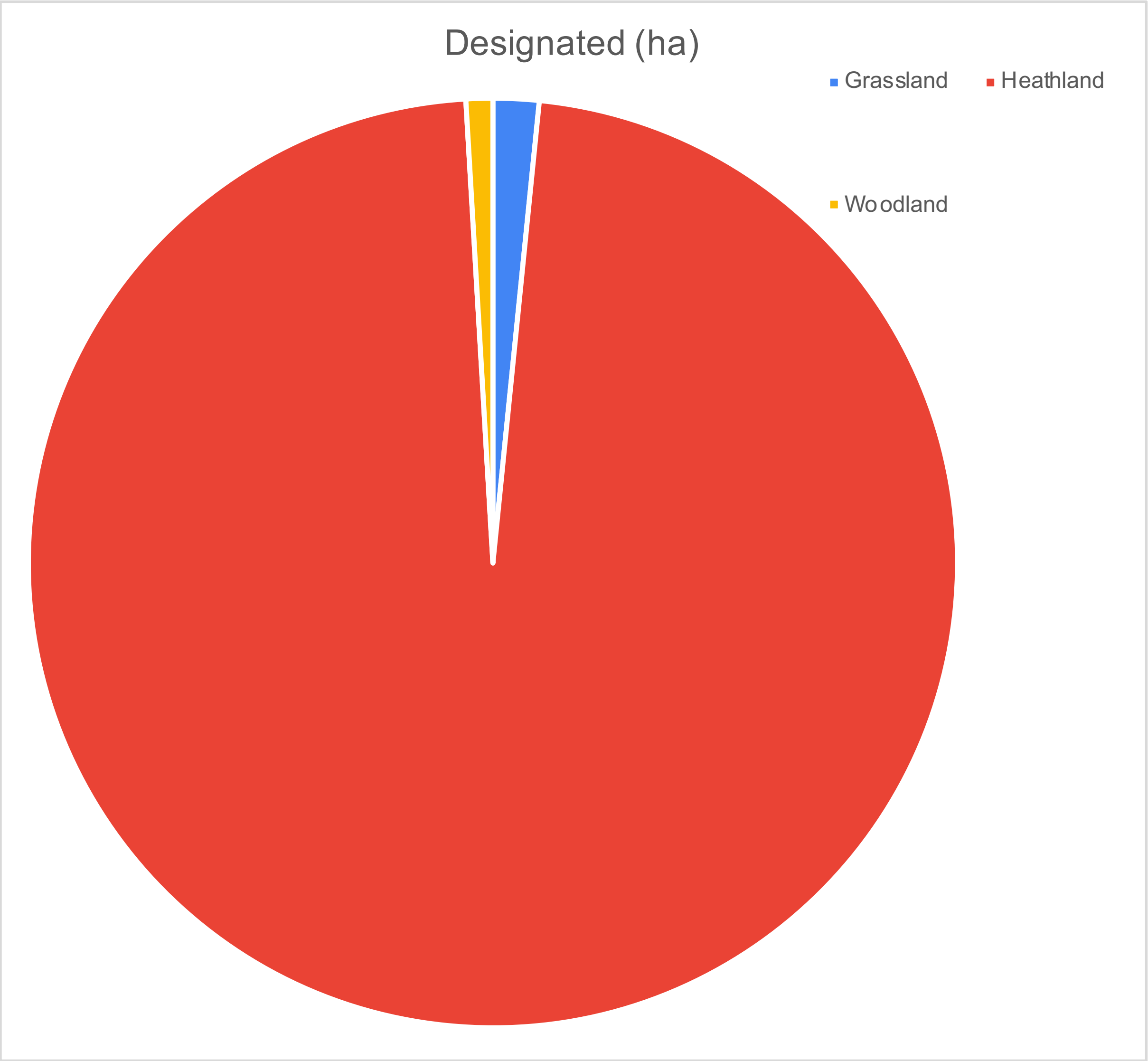
Habitat Location

Asulam 2022	Designated (ha)	Undesignated (ha)	Total	%
Lowland	241	193	434	7%
Upland	3,839	1,833	5,672	93%
Grand Total	**4,080**	**2,026**	**6,107**	**100%**

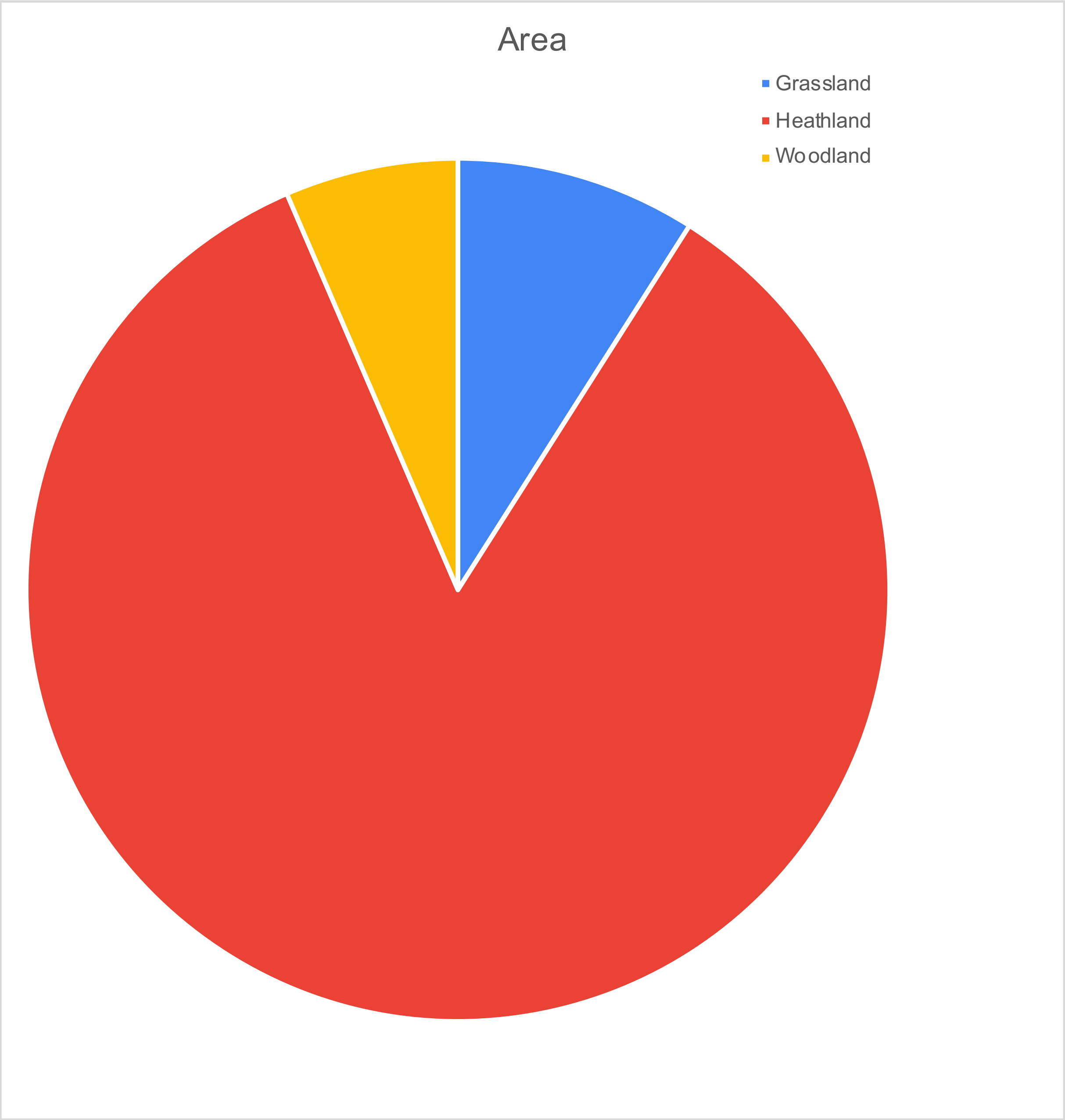


Habitat Category

Asulam 2022	Designated (ha)	Undesignated (ha)
Grassland	65	485
Heathland	3,977	1,183
Woodland	38	358
Grand Total	**4,080**	**2,026**

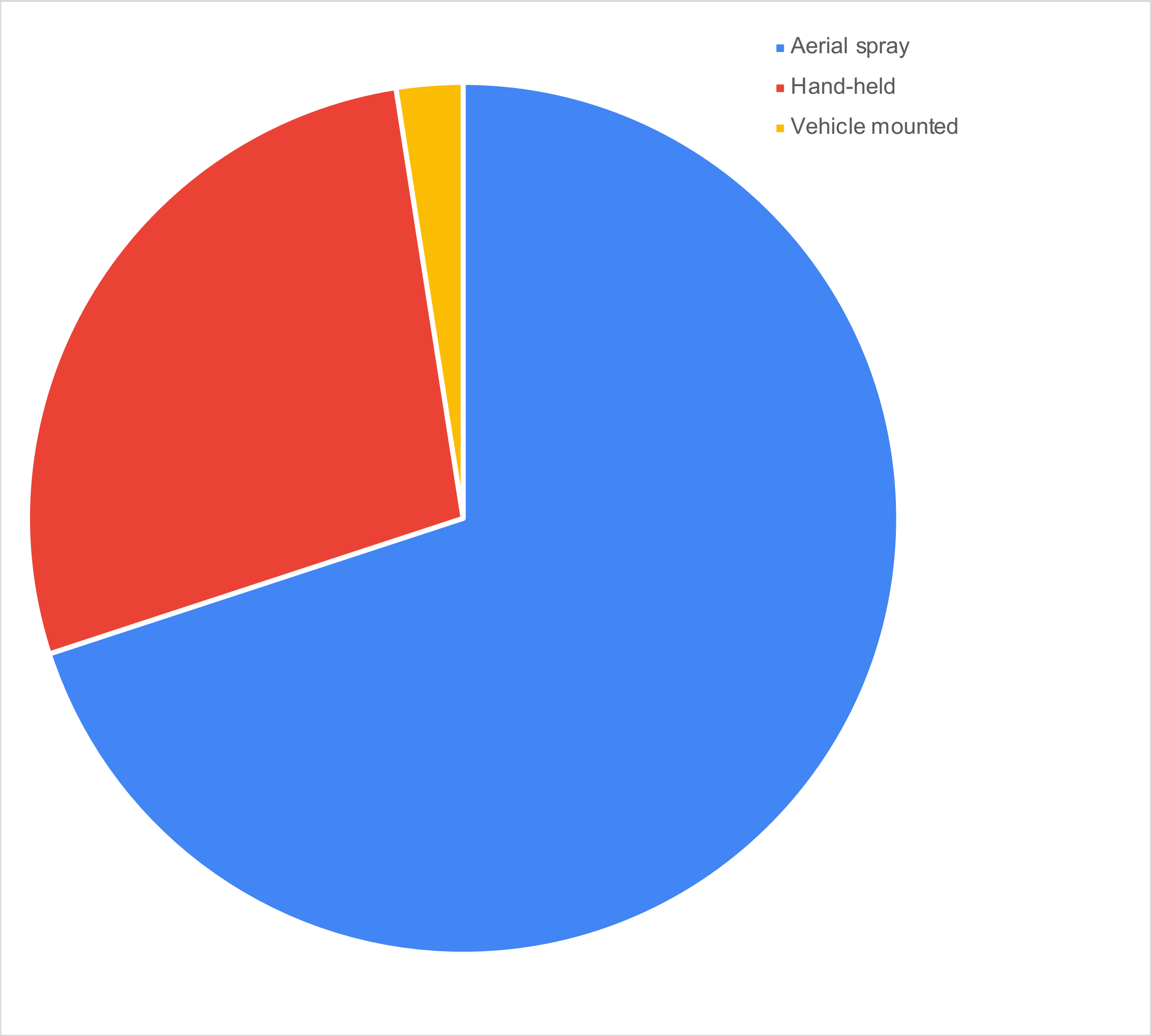


Asulam 2022	Area (ha)	%
Grassland	550	9%
Heathland	5,160	85%
Woodland	396	6%
Grand Total	**6,107**	**94%**



Application Technique

Asulam 2022	Sum of Adjusted area	%
Aerial spray	4,273	70%
Hand-held	1,683	28%
Vehicle mounted	151	2%
Grand Total	**6,107**	**100%**



National Bracken Chemical Control Trials

2022 Summary of recent findings on application and efficacy issues relating to Amidosulfuron (as Squire Ultra) and comparison with Asulam (as Asulox) as a bracken control agent

[redacted]

24th October 2022

1 Introduction

1.1 As part of a programme to consider potential alternative herbicides for bracken control, the National Bracken Chemical Control Trials (NBCCT) compared the efficacy and impact of a range of herbicide products. The reports from these trials can be viewed on the Bracken Control Group's Research Reports webpage[1].

1.2 The comparison between products containing asulam (Asulox) and amidosulfuron (Squire Ultra) was of particular interest. Asulam is currently the favoured herbicide and has approval for aerial application. Amidosulfuron has approval for ground-based use only on grassland weeds. It has been indicated that an application for an Extension of Authorisation for Minor Use (EAMU) is likely to be accepted and this could extend the use of amidosulfuron to include bracken control.

1.3 During the NBCCT, three concerns about the impact of amidosulfuron were identified: high level of impact on non-target species (NTS), effect on soil invertebrates and persistence in the soil.

1.4 In the light of these concerns, further work has taken place to investigate the impacts and efficacy of amidosulfuron in comparison with asulam.

1.5 The additional work has identified features of amidosulfuron that had not been presented clearly previously:

1.5.1 Amidosulfuron has a higher level of efficacy on bracken when applied to the soil, not the foliage.

1.5.2 The impact of amidosulfuron is greatest when the root hairs of the bracken plant are most developed.

1.5.3 As a result of the above two features, foliar application of amidosulfuron has much less impact than when applied to the soil. Therefore:

- Application by helicopter, which achieves less canopy penetration, has less impact than ground-based application.
- Application when the canopy is fully extended (the best time for foliar treatment with asulam) is not the most effective time for application of amidosulfuron.

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[1] https://www.brackencontrol.co.uk/research1/research-reports

- Greater efficacy using amidosulfuron is achieved if it is applied earlier in the season when a higher proportion of the active ingredient (ai) will reach the soil and the root-hairs.
- However, earlier application will enhance the negative impacts of the three concerns set out in para 1.3, in particular the impact on NTS.

1.6 From the information presented in this paper, it is proposed that amidosulfuron is an effective bracken control agent, but it must be applied at the correct time of year and its negative impacts must be considered and deemed to be acceptable for the intended use. For example:

1.6.1 Application of amidosulfuron, early in the bracken growth season, could be a good way to control bracken on specialist sites, such as those with an archaeological interest.
1.6.2 On such sites, attributes that have negative impact on more sensitive, natural heritage sites could be seen as advantages.
1.6.3 For such use to be viable, specialist survey techniques, to assess the root-hair condition before spraying, need to be available.

1.7 It is recommended that Amidosulfuron should be available for bracken control, but only in specialised circumstances when its attributes and negative impacts can be taken into account. Amidosulfuron should not be made available for general treatment of bracken by aerial or ground-based equipment.

2 Trials History

2.1 Extensive trials with amidosulfuron, as a ground applied herbicide, have been carried out since 2012 at varying strengths of active ingredient (ai), ranging from 22.5gm/ha to 120gm/ha.

2.2 One set of trials of aerial application was carried out in 2012, but there were problems with the spraying process and equipment. No further aerial trials were carried out until the trials at Lowna on the North York Moors, in 2021.

2.3 The maximum label strength for amidosulfuron is 45gm/ha. Reasons for higher ai levels in the early trials are explained in the NBCCT report for 2018.

2.4 More recent trials at Dumfries, Fawdon (Northumberland) and Challacombe (Devon) between 2015 and 2020, focussed on ground-based applications of Amidosulfuron at 45gm/ha. Early and late applications (mid/late June and end July / early August) were built into these trials for the reason explained in 3.1 below.

3 Trial results: Amidosulfuron Impact

3.1 Amidosulfuron is known[2] to be absorbed largely by true root systems of plants, rather than foliar, so application earlier in the bracken growth cycle when the canopy was not fully closed was postulated as likely to give the best levels of control.

3.2 Part of the assessment of chemical treatment efficacy has been to examine the condition of the bracken rhizome in relation to its mass and general viability but also examine the numbers and structure of the true ‘root hairs’. This was carried out immediately prior to spraying, then again about 4 weeks post-spraying and at the anniversary date each year post-spraying.

3.3 The condition of the root hair system is an indicator of both the plant’s ability to draw moisture and nutrients from the soil.

3.4 The root hair system is also part of the plant’s defence system: toxic exudates, such as the carcinogen *Ptaquiloside*, are released. These also pose a risk to human and animal health, especially in water collection areas. Image 1 (end of document) illustrates a well-developed root hair system and Image 2 a poor/non-receptive system.

3.5 Data collected from the trial sites have confirmed that 12 months after spraying the bracken in plots treated with Amidosulfuron has rhizomes with very poor, if any, root hair systems.

3.6 Other parameters, such as dry weight, overall extent of live rhizome and live budding points indicate a high level of damage to the mass and viability of the rhizomes in general.

3.7 Initially, this was regarded as a positive result, but subsequent analysis reveals that the loss of rhizome vitality and root hair activity, means that the capacity of the rhizome system to absorb chemicals during subsequent treatment is greatly reduced. Therefore, follow-up treatment with amidosulfuron after primary treatment will not be effective. This effect occurs for an unknown period of time, but evidence from existing long-term trials shows that there is little recovery in a 7-8 yr period (see also discussion in paras 3.18-3.20)

3.8 There is also the issue that the damage to the rhizome / root hair system results in increased release of *Ptaquiloside* into an acid soil environment, which keeps this naturally occurring carcinogen viable for many months[3].

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[2] Pesticide Properties Data Base - last updated 11.08.22 http://sitem.herts.ac.uk/aeru/ppdb/en/Reports/28.htm

[3] ‘Does the natural carcinogen ptaquiloside degrade readily in groundwater’. Wu, J.S et al in Environment Science Europe 33, Article number 24 [2021]

3.9 It has been recorded[4] that there is wide variation in the efficacy of amidosulfuron by any of the ground-based methods (mainly lances with various large droplet nozzle attachments) measured by frond response at the first anniversary post spraying. Frequently, plots in the same trial area, apparently under identical soil, aspect and management history profiles showed a very large range of recovery.

3.10 At Fawdon, for instance, where there are two blocks of trials <50m apart apparently on identical edaphic (soil) and environmental conditions with identical management history responses range from very poor to excellent. The plots were all sprayed at the same time in 2015 with no subsequent follow-up, or other intervention.

3.10.1 Plots on area A had an excellent clearance with 100% frond reduction in 2016 and still less than 5% recovery in 2020 at the end of the trial. During post-trial monitoring in August 2022, the canopy cover was still less than 9%.

3.10.2 On area B frond cover was at 28% at 1-year post-spraying, increasing to 63% at the 2-year point and 95% by year three. The plots cannot be detected on the ground now.

3.11 The bespoke aerial trials at Lowna, in 2021, applied amidosulfuron at 45gm/ha from a helicopter boom fitted with Pencil Jet nozzles. The results of this work were fully assessed in August 2022.

3.11.1 Rhizome samples collected from the 100m x 7.5m plots showed uniform simplified root hair systems over the whole area.

3.11.2 Again, uniformly, the mean canopy cover was at 38% in June 2022 with strong recovery of stipe (frond stem) and overall height of the bracken stand.

3.11.3 By August 2022, the mean canopy cover was 66%, frond height was at >80% of pre-spray and stipe density was >85% of pre-spray.

3.11.4 It is now very difficult to differentiate the plot from surrounding unsprayed beds apart from its overall height, which is still about 15% lower than unsprayed bracken.

3.11.5 This is in sharp contrast to the two adjacent aerial plots treated with 11l/ha Asulox and sprayed at the same time (Image 3).

3.12 Although amidosulfuron had shown some promise in the corrupted 2012 aerial spray plots at Goathland on the North York Moors, the treatment was carried out at ai concentrations 2.66 times greater than the permitted label maximum. The 2021 trial has demonstrated very clearly that aerial application of amidosulfuron at maximum label strength is not effective in controlling bracken, either as a short-term, one-off check or as part of a long-term control strategy. This is discussed further below.

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[4] NBCCT final summary report of Phase 1 2020

3.13 The viability in efficacy of amidosulfuron as a ground-based product was initially evaluated in relation to openness of canopy / timing of application in the early part of the growing season as this facilitated better uptake of amidosulfuron via the soil through the true root hairs. Acropetal uptake (from the base of the plant upwards) is the key, but for slightly different reasons.

3.14 As there is a pattern of highly variable response to ground applied amidosulfuron, further investigation of the pre-spray rhizome condition has been carried out. In late August / early September 2022, 62 paired plots, where asulam and amidosulfuron have been applied since the start of Phase 2 of the NBCCT in 2020, were carefully assessed against baseline data.

3.14.1 The assumption was that asulam as a systemic herbicide is primarily absorbed and translocated basipetally (from the foliage to the base of the plant). Ground absorption via root hairs is a secondary pathway.

3.14.2 By contrast, amidosulfuron is absorbed primarily through root hairs in the soil with only secondary uptake through foliage in the growing stage. Therefore, primary translocation is acropetal (from the base up).

3.15 When the pre-spray root hair data was analysed there was considerable variation. Of the 62 asulam plots, 26 had complex, extensive systems and 36 had simple, weak systems.

3.15.1 A year after spraying there was little change in the basic structure of the root hairs although other parameters in the rhizomes themselves did show change / damage.

3.15.2 The frond 'kill' was uniformly good on all 62 plots with a 4 to 5% frond cover the overall mean (down from 100% pre-spray).

3.15.3 There was no obvious link to the pre-spray root hair patterns with any specific variations due to local conditions, e.g. large boulders with rhizomes growing beneath them tending to very locally reduce efficacy of the kill.

3.16 The pre-spray assessment of the 62 amidosulfuron sites recorded 30 with extensive root hair systems and 32 with poor systems. Lumping all 62 sites together, the mean canopy cover was 27% one year after treatment with a very high SD of 16.8 (by contrast asulam was 2.4). The SD reflects the range in results around the mean and the greater it is, the greater overlap from different data sets is likely to be. This reduces the significance of differences between mean values calculated for different datasets.

3.17 However, if the poor root hair plots are considered separately, the mean frond cover at one-year post spray was 43% with an SD of 32.1. The complex root plots grouped together had a mean canopy cover of 6% with an SD of 2.8.

3.18 The much higher rate of control with amidosulfuron at 40gm/ha on plots with well-developed root hairs is a direct result of the absorption capability from the soil.

3.19 The negative side of this process is that once amidosulfuron has been used, all rhizome / root hair systems are simplified and will not be receptive to further use of amidosulfuron until / if the structures regenerate (an unknown). Therefore, a control strategy based on repeated use of amidosulfuron is not viable, even if the level of initial control is high.

3.20 A further restriction is that, without detailed rhizome / root assessment pre-spray, it is not possible to predict where initial control will be successful. It might be possible if sensing technology develops, but currently there are no known consistent indicators of where complex / extensive root hair rhizome systems exist without very detailed multiple sampling. Further, there is no clear picture of the cause or scale of variation. In practical terms control outcomes over large areas are impossible to predict.

4 Canopy Penetration

4.1 There are more extensive discussions in the report from the Canopy Penetration Trials (available on the BCG Research Reports webpage), but it is useful here to summarise findings on the distribution of spray from different application platforms, the ratios between canopy v ground interception and the impact this has on the efficacy of amidosulfuron and asulam. Some of these results have an impact on the soil v foliar uptake discussion, irrespective of the active ingredient involved.

4.2 In general terms, spray delivered by airborne (helicopter) pencil jet booms to a given area is about a fifth of that from a ground-based application, depending on the exact nozzle/application equipment characteristics.

4.3 The penetration profiles showed marked differences (Table 1).

Application / Equipment		**Interception by:**		**Ratio**
		Canopy	**Ground surface**	
Aerial Application				
A.	Pencil Jet	94%	6%	19:1
B.	Delavan D Raindrop	88%	12%	9:1
Ground Based Lance				
C.	150l Fantail nozzle	81%	19%	4:1
D.	300l Fantail nozzle	75%	25%	3:1

Table 1. Canopy Penetration Characteristics –
(bracken canopy cover was at least 90% on all trial plots)

4.4 The canopy cover determines how much of the spray is intercepted. Once the cover drops to 60% or less the ratio of canopy to ground based interception reaches 50:50, or even lower. This has a direct bearing on the contribution of foliar and root absorption and the most effective method of chemical application, e.g. blanket as opposed to targeted or even spot spray.

5 Conclusions

5.1 Amidosulfuron at 45gm/ha applied from the air does not give an acceptable level of initial control, but still limits future root uptake.

5.2 Where a single 'check' treatment is required, and root hair systems are receptive, amidosulfuron has a limited role to play.

5.3 Amidosulfuron at 45gm/ha applied from the ground can be highly effective depending on the pre-spray condition of the rhizome/root hair system and, to a lesser extent, the timing of the application.

5.4 Because there is no practical way of determining the extent of 'receptive' root hair / rhizome on a wide scale prior to spraying it is not possible to base any bracken control strategy on amidosulfuron as an active ingredient.

Images

Image 1. Good Root Hair system pre-spray, characteristic of Asulox 11lit/ha post-spray (Fawdon site)


Image 2. Poor Root Hair system, characteristic of Amidosulfuron 45gm/ha post-spray (Fawdon site)


Image 3. Lowna 2021 trials. Ground based in foreground, aerial in distance. Taken 28th June 2022. On aerial plot, Amidosulfuron control is almost undetectable one year on. By contrast, some of the best ground plots in the foreground are Amidosulfuron. Despite good root hair systems on parts of the aerial plot, control is extremely poor due to the lower exposure to active ingredient (ai) from aerial application and much lower ai penetration to the ground.

[redacted]

Sample Point Name	Date Sample Taken	Analysis	Result In Text	Sample Reason Name
Bamford Raw Line 1	21/12/2022 09:41	Asulam (ug/l)	0.014	Routine Program
Bamford Raw Line 1	20/10/2022 11:17	Asulam (ug/l)	0.025	Routine Program
Little Eaton River Derwent Raw	18/10/2022 08:57	Asulam (ug/l)	0.014	Routine Program
Shugborough Raw BH1	17/10/2022 08:18	Asulam (ug/l)	0.043	Routine Program
Shugborough Raw BH1	12/10/2022 09:02	Asulam (ug/l)	0.041	Routine Program
[redacted]	[redacted]		[redacted]	
Clipstone Forest Raw BH4	28/09/2022 10:14	Asulam (ug/l)	0.13	Routine Program
[redacted]	[redacted]		[redacted]	
[redacted]	[redacted]		[redacted]	
Lee Brockhurst Raw BH2	21/09/2022 13:21	Asulam (ug/l)	0.017	Routine Program
Little Eaton River Derwent Raw	13/09/2022 07:38	Asulam (ug/l)	0.025	Routine Program
Shugborough Raw BH2	05/09/2022 08:27	Asulam (ug/l)	0.047	Routine Program
Clipstone Forest Raw BH1	25/08/2022 11:13	Asulam (ug/l)	0.355	DW Investigational
Clipstone Forest Raw BH4	25/08/2022 11:07	Asulam (ug/l)	0.136	DW Investigational
Clipstone Forest Raw BH2	25/08/2022 11:00	Asulam (ug/l)	0.142	DW Investigational
[redacted]	[redacted]		[redacted]	
[redacted]	[redacted]		[redacted]	
Shugborough Raw BH1	12/08/2022 08:15	Asulam (ug/l)	0.049	Routine Program
Clipstone Forest Raw BH4	03/08/2022 09:06	Asulam (ug/l)	0.288	Unrepresentative Sample
Clipstone Forest Raw BH1	03/08/2022 08:57	Asulam (ug/l)	0.297	Routine Program
Clipstone Forest Raw BH3	03/08/2022 08:47	Asulam (ug/l)	0.277	Routine Program
Shugborough Raw BH2	20/07/2022 08:53	Asulam (ug/l)	0.052	Routine Program
Shugborough Raw BH1	11/07/2022 09:02	Asulam (ug/l)	0.042	Routine Program
Shugborough Raw BH1	05/07/2022 10:55	Asulam (ug/l)	0.046	Routine Program
Clipstone Forest Raw BH1	30/06/2022 11:00	Asulam (ug/l)	0.342	Routine Program
Clipstone Forest Raw BH2	30/06/2022 10:30	Asulam (ug/l)	0.129	Routine Program
Clipstone Forest Raw BH4	24/06/2022 10:50	Asulam (ug/l)	0.127	Routine Program
Shugborough Raw BH2	14/06/2022 08:53	Asulam (ug/l)	0.047	Routine Program
Shugborough Raw BH1	06/06/2022 09:35	Asulam (ug/l)	0.045	Routine Program
Clipstone Forest Raw BH4	26/05/2022 11:17	Asulam (ug/l)	0.14	Routine Program

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Clipstone Forest Raw BH1	26/05/2022 11:04	Asulam (ug/l)	0.32	Routine Program
Clipstone Forest Raw BH2	26/05/2022 10:49	Asulam (ug/l)	0.119	Routine Program
Clipstone Forest Raw BH4	16/05/2022 08:51	Asulam (ug/l)	0.14	Routine Program
Clipstone Forest Raw BH1	16/05/2022 08:38	Asulam (ug/l)	0.334	Routine Program
Clipstone Forest Raw BH2	04/05/2022 09:08	Asulam (ug/l)	0.135	Routine Program
Clipstone Forest Raw BH1	04/05/2022 08:43	Asulam (ug/l)	0.299	Routine Program
Peckforton Raw BH2	12/04/2022 08:11	Asulam (ug/l)	0.031	Routine Program
Shugborough Raw BH2	25/03/2022 09:06	Asulam (ug/l)	0.052	Routine Program
Rufford Raw BH4	18/03/2022 07:30	Asulam (ug/l)	0.014	DW Investigational
Clipstone Forest Raw BH2	11/03/2022 07:50	Asulam (ug/l)	0.125	Routine Program
Shugborough Raw BH2	09/03/2022 09:51	Asulam (ug/l)	0.051	Routine Program
Rufford Raw BH4	09/03/2022 08:36	Asulam (ug/l)	0.019	DW Investigational
Shugborough Raw BH2	18/02/2022 10:17	Asulam (ug/l)	0.06	Routine Program
Peckforton Raw BH2	15/02/2022 08:56	Asulam (ug/l)	0.038	Routine Program
Peckforton Raw BH1	09/02/2022 09:32	Asulam (ug/l)	0.015	Routine Program
Clipstone Forest Raw BH2	25/01/2022 11:34	Asulam (ug/l)	0.107	Routine Program
Clipstone Forest Raw BH4	25/01/2022 11:10	Asulam (ug/l)	0.127	Routine Program
Clipstone Forest Raw BH1	25/01/2022 10:48	Asulam (ug/l)	0.308	Routine Program
Shugborough Raw BH1	14/01/2022 08:28	Asulam (ug/l)	0.051	Routine Program
Rufford Raw BH4	29/12/2021 07:10	Asulam (ug/l)	0.013	Routine Program
Clipstone Forest Raw BH1	09/12/2021 09:05	Asulam (ug/l)	0.306	Routine Program
Clipstone Forest Raw BH4	09/12/2021 08:55	Asulam (ug/l)	0.127	Routine Program
Clipstone Forest Raw BH2	09/12/2021 08:35	Asulam (ug/l)	0.113	Routine Program
Shugborough Raw BH1	07/12/2021 08:01	Asulam (ug/l)	0.05	Routine Program
Shugborough Raw BH1	29/11/2021 08:21	Asulam (ug/l)	0.059	Routine Program
Peckforton Raw BH2	26/11/2021 08:50	Asulam (ug/l)	0.04	Routine Program
Shugborough Raw BH1	23/11/2021 08:10	Asulam (ug/l)	0.052	Routine Program
Shugborough Raw BH1	10/11/2021 09:13	Asulam (ug/l)	0.045	Routine Program
Shugborough Raw BH1	04/11/2021 08:50	Asulam (ug/l)	0.044	Routine Program
Shugborough Raw BH1	02/11/2021 08:46	Asulam (ug/l)	0.049	Routine Program
Peckforton Raw BH1	20/10/2021 10:37	Asulam (ug/l)	0.021	Routine Program
Peckforton Raw BH2	08/10/2021 10:15	Asulam (ug/l)	0.031	Routine Program
Shugborough Raw BH1	08/10/2021 08:20	Asulam (ug/l)	0.046	Routine Program

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Shugborough Raw BH1	07/10/2021 08:35	Asulam (ug/l)	0.056	Routine Program
Shugborough Raw BH2	06/10/2021 08:07	Asulam (ug/l)	0.061	Routine Program
Shugborough Raw BH2	07/09/2021 08:19	Asulam (ug/l)	0.054	Routine Program
Clipstone Forest Raw BH4	06/09/2021 09:54	Asulam (ug/l)	0.147	Routine Program
Clipstone Forest Raw BH1	06/09/2021 09:45	Asulam (ug/l)	0.3427	Routine Program
Clipstone Forest Raw BH2	06/09/2021 09:15	Asulam (ug/l)	0.111	Routine Program
Trimpley WTW River Severn Raw	19/08/2021 09:11	Asulam (ug/l)	0.032	DW Investigational
Mitcheldean Raw into works	19/08/2021 02:25	Asulam (ug/l)	0.014	DWI Undertaking
Ladybower Res Surface	12/08/2021 20:34	Asulam (ug/l)	0.024	Catchment
Shugborough Raw BH2	05/08/2021 08:47	Asulam (ug/l)	0.054	Routine Program
Clipstone Forest Raw BH2	27/07/2021 12:08	Asulam (ug/l)	0.109	Routine Program
Clipstone Forest Raw BH4	27/07/2021 12:02	Asulam (ug/l)	0.167	Routine Program
Clipstone Forest Raw BH1	27/07/2021 11:58	Asulam (ug/l)	0.272	Routine Program
Shelton River Severn Raw	15/07/2021 08:13	Asulam (ug/l)	0.018	Routine Program
Shugborough Raw BH1	09/07/2021 08:39	Asulam (ug/l)	0.052	Routine Program
Peckforton Raw BH2	07/07/2021 10:14	Asulam (ug/l)	0.03	Routine Program
Shugborough Raw BH1	06/07/2021 09:05	Asulam (ug/l)	0.052	Routine Program
Shugborough Raw BH2	18/06/2021 08:09	Asulam (ug/l)	0.051	Routine Program
Clipstone Forest Raw BH1	09/06/2021 10:50	Asulam (ug/l)	0.242	Routine Program
Clipstone Forest Raw BH4	09/06/2021 10:41	Asulam (ug/l)	0.173	Routine Program
Clipstone Forest Raw BH2	09/06/2021 10:20	Asulam (ug/l)	0.092	Routine Program
Clipstone Forest Raw BH1	05/05/2021 12:47	Asulam (ug/l)	0.215	Routine Program
Clipstone Forest Raw BH4	05/05/2021 12:26	Asulam (ug/l)	0.161	Routine Program
Clipstone Forest Raw BH2	05/05/2021 11:56	Asulam (ug/l)	0.093	Routine Program
Shugborough Raw BH2	05/05/2021 10:10	Asulam (ug/l)	0.056	Routine Program
Clipstone Forest Raw BH1	30/04/2021 09:25	Asulam (ug/l)	0.172	Routine Program
Clipstone Forest Raw BH1	26/04/2021 09:12	Asulam (ug/l)	0.213	Routine Program
Clipstone Forest Raw BH4	15/04/2021 08:23	Asulam (ug/l)	0.178	Routine Program
Clipstone Forest Raw BH2	15/04/2021 08:09	Asulam (ug/l)	0.092	Routine Program
Clipstone Forest Raw BH4	14/04/2021 08:42	Asulam (ug/l)	0.177	Routine Program
Shugborough Raw BH2	06/04/2021 08:30	Asulam (ug/l)	0.041	Routine Program
Clipstone Forest Raw BH4	12/03/2021 08:05	Asulam (ug/l)	0.17	Routine Program

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Clipstone Forest Raw BH2	12/03/2021 07:40	Asulam (ug/l)	0.089	Routine Program
Shugborough Raw BH2	10/03/2021 08:07	Asulam (ug/l)	0.06	Routine Program
Shugborough Raw BH2	05/03/2021 08:01	Asulam (ug/l)	0.06	Routine Program
Clipstone Forest Raw BH1	02/03/2021 10:27	Asulam (ug/l)	0.221	Routine Program
Clipstone Forest Raw BH2	23/02/2021 08:57	Asulam (ug/l)	0.093	Routine Program
Peckforton Raw BH2	17/02/2021 08:32	Asulam (ug/l)	0.039	Routine Program
Shugborough Raw BH1	03/02/2021 08:06	Asulam (ug/l)	0.061	Routine Program
Clipstone Forest Raw BH4	26/01/2021 08:11	Asulam (ug/l)	0.157	Routine Program
Clipstone Forest Raw BH1	26/01/2021 08:03	Asulam (ug/l)	0.199	Routine Program
Clipstone Forest Raw BH2	26/01/2021 07:44	Asulam (ug/l)	0.086	Routine Program
Shugborough Raw BH2	07/01/2021 09:17	Asulam (ug/l)	0.063	Routine Program
Peckforton Raw BH2	05/01/2021 09:22	Asulam (ug/l)	0.04	Routine Program
Shugborough Raw BH1	16/12/2020 08:00	Asulam (ug/l)	0.067	Routine Program
Clipstone Forest Raw BH4	10/12/2020 08:08	Asulam (ug/l)	0.162	Routine Program
Clipstone Forest Raw BH1	10/12/2020 08:03	Asulam (ug/l)	0.212	Routine Program
Clipstone Forest Raw BH2	10/12/2020 07:53	Asulam (ug/l)	0.088	Routine Program
Shugborough Raw BH2	09/12/2020 08:07	Asulam (ug/l)	0.062	Routine Program
Peckforton Raw BH2	18/11/2020 09:49	Asulam (ug/l)	0.029	Routine Program
Clipstone Forest Raw BH2	17/11/2020 07:42	Asulam (ug/l)	0.083	Routine Program
Clipstone Forest Raw BH1	16/11/2020 09:46	Asulam (ug/l)	0.187	Routine Program
Clipstone Forest Raw BH4	16/11/2020 09:38	Asulam (ug/l)	0.15	Routine Program
Clipstone Forest Raw BH2	16/11/2020 09:13	Asulam (ug/l)	0.072	Routine Program
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Shugborough Raw BH2	11/11/2020 07:38	Asulam (ug/l)	0.058	Routine Program
Shugborough Raw BH1	08/11/2020 07:58	Asulam (ug/l)	0.06	Routine Program
Peckforton Raw BH2	23/10/2020 07:18	Asulam (ug/l)	0.026	Routine Program
Shugborough Raw BH2	15/10/2020 08:05	Asulam (ug/l)	0.061	Routine Program
Clipstone Forest Raw BH1	09/10/2020 08:20	Asulam (ug/l)	0.079	Routine Program
Clipstone Forest Raw BH4	09/10/2020 08:05	Asulam (ug/l)	0.164	Routine Program
Clipstone Forest Raw BH2	09/10/2020 07:55	Asulam (ug/l)	0.199	Routine Program
Shugborough Raw BH1	07/10/2020 08:45	Asulam (ug/l)	0.065	Routine Program
Shugborough Raw BH2	02/10/2020 08:48	Asulam (ug/l)	0.07	Routine Program
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

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Shugborough Raw BH1	10/09/2020 08:36	Asulam (ug/l)	0.078	Routine Program
Clipstone Forest Raw BH4	08/09/2020 08:22	Asulam (ug/l)	0.148	Routine Program
Clipstone Forest Raw BH1	08/09/2020 08:11	Asulam (ug/l)	0.19	Routine Program
Clipstone Forest Raw BH4	07/09/2020 09:52	Asulam (ug/l)	0.137	Routine Program
Clipstone Forest Raw BH1	07/09/2020 09:43	Asulam (ug/l)	0.218	Routine Program
Clipstone Forest Raw BH2	07/09/2020 09:26	Asulam (ug/l)	0.084	Routine Program
Peckforton Raw BH2	21/08/2020 09:49	Asulam (ug/l)	0.037	Unrepresentative Sample
Shugborough Raw BH1	17/08/2020 07:41	Asulam (ug/l)	0.071	Routine Program
Clipstone Forest Raw BH2	13/08/2020 09:04	Asulam (ug/l)	0.079	Routine Program
Clipstone Forest Raw BH4	13/08/2020 08:57	Asulam (ug/l)	0.158	Routine Program
Clipstone Forest Raw BH1	13/08/2020 08:50	Asulam (ug/l)	0.181	Routine Program
Shugborough Raw BH2	06/08/2020 07:51	Asulam (ug/l)	0.066	Routine Program
Peckforton Raw BH1	22/07/2020 12:05	Asulam (ug/l)	0.015	Routine Program
Shugborough Raw BH1	22/07/2020 07:35	Asulam (ug/l)	0.074	Routine Program
Peckforton Raw BH2	11/07/2020 09:12	Asulam (ug/l)	0.043	Routine Program
Shugborough Raw BH1	02/07/2020 07:58	Asulam (ug/l)	0.073	Routine Program
Trimpley WTW River Severn Raw	01/07/2020 11:26	Asulam (ug/l)	0.013	DW Investigational
Webheath Raw BH2	26/06/2020 11:18	Asulam (ug/l)	0.015	DW Recommissioning
Clipstone Forest Raw BH1	23/06/2020 08:07	Asulam (ug/l)	0.135	Routine Program
Clipstone Forest Raw BH2	23/06/2020 08:01	Asulam (ug/l)	0.065	Routine Program
Strensham Raw into Works	11/06/2020 11:41	Asulam (ug/l)	0.016	Routine Program
Clipstone Forest Raw BH1	11/06/2020 08:17	Asulam (ug/l)	0.145	Routine Program
Clipstone Forest Raw BH4	11/06/2020 08:06	Asulam (ug/l)	0.186	Routine Program
Clipstone Forest Raw BH2	11/06/2020 07:55	Asulam (ug/l)	0.071	Routine Program
Shugborough Raw BH2	05/06/2020 08:04	Asulam (ug/l)	0.067	Routine Program
Shugborough Raw BH2	12/05/2020 07:58	Asulam (ug/l)	0.079	Routine Program
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Shugborough Raw BH1	02/05/2020 08:45	Asulam (ug/l)	0.086	Routine Program
Peckforton Raw BH1	22/04/2020 06:56	Asulam (ug/l)	0.019	Routine Program
Clipstone Forest Raw BH4	16/04/2020 08:12	Asulam (ug/l)	0.15	Routine Program
Clipstone Forest Raw BH1	16/04/2020 08:01	Asulam (ug/l)	0.148	Routine Program
Clipstone Forest Raw BH2	16/04/2020 07:44	Asulam (ug/l)	0.074	Routine Program

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Shugborough Raw BH1	15/04/2020 07:51	Asulam (ug/l)	0.08	Routine Program
Clipstone Forest Raw BH2	09/04/2020 08:06	Asulam (ug/l)	0.078	Routine Program
Clipstone Forest Raw BH4	09/04/2020 07:54	Asulam (ug/l)	0.142	Routine Program
Clipstone Forest Raw BH1	09/04/2020 07:45	Asulam (ug/l)	0.156	Routine Program
Peckforton Raw BH2	08/04/2020 06:24	Asulam (ug/l)	0.044	Routine Program
Shugborough Raw BH2	07/04/2020 08:14	Asulam (ug/l)	0.076	Routine Program
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Shugborough Raw BH1	26/03/2020 07:55	Asulam (ug/l)	0.078	Routine Program
Shugborough Raw BH1	21/02/2020 07:14	Asulam (ug/l)	0.079	Routine Program
Peckforton Raw BH2	20/02/2020 08:00	Asulam (ug/l)	0.035	Routine Program
Clipstone Forest Raw BH2	14/02/2020 09:02	Asulam (ug/l)	0.071	Routine Program
Clipstone Forest Raw BH4	14/02/2020 08:49	Asulam (ug/l)	0.132	Routine Program
Clipstone Forest Raw BH1	14/02/2020 08:38	Asulam (ug/l)	0.105	Routine Program
Shugborough Raw BH1	13/02/2020 12:06	Asulam (ug/l)	0.077	Routine Program
Peckforton Raw BH2	12/02/2020 09:20	Asulam (ug/l)	0.036	Routine Program
Shugborough Raw BH2	05/02/2020 08:44	Asulam (ug/l)	0.078	Routine Program
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Shugborough Raw BH2	23/01/2020 08:02	Asulam (ug/l)	0.095	Routine Program
Clipstone Forest Raw BH4	16/01/2020 10:08	Asulam (ug/l)	0.157	Routine Program
Clipstone Forest Raw BH1	16/01/2020 09:58	Asulam (ug/l)	0.105	Routine Program
Clipstone Forest Raw BH2	16/01/2020 09:47	Asulam (ug/l)	0.07	Routine Program
Clipstone Forest Raw BH1	12/12/2019 08:30	Asulam (ug/l)	0.107	Routine Program
Clipstone Forest Raw BH4	12/12/2019 08:25	Asulam (ug/l)	0.059	Routine Program
Clipstone Forest Raw BH3	12/12/2019 08:19	Asulam (ug/l)	0.012	Routine Program
Clipstone Forest Raw BH2	12/12/2019 08:13	Asulam (ug/l)	0.064	Routine Program
Clipstone Forest Raw BH1	04/12/2019 09:06	Asulam (ug/l)	0.115	Routine Program
Clipstone Forest Raw BH4	04/12/2019 08:59	Asulam (ug/l)	0.139	Routine Program
Clipstone Forest Raw BH3	04/12/2019 08:50	Asulam (ug/l)	0.013	Routine Program
Clipstone Forest Raw BH2	04/12/2019 08:42	Asulam (ug/l)	0.071	Routine Program
August Hill Raw	02/12/2019 11:39	Asulam (ug/l)	0.009	Routine Program
Clipstone Forest Raw BH4	29/11/2019 08:13	Asulam (ug/l)	0.161	Routine Program
Clipstone Forest Raw BH1	29/11/2019 07:57	Asulam (ug/l)	0.106	Routine Program

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Clipstone Forest Raw BH3	29/11/2019 07:47	Asulam (ug/l)	0.011	Routine Program
Clipstone Forest Raw BH2	29/11/2019 07:34	Asulam (ug/l)	0.067	Routine Program
Clipstone Forest Raw BH1	28/11/2019 08:15	Asulam (ug/l)	0.094	Routine Program
Clipstone Forest Raw BH4	28/11/2019 08:06	Asulam (ug/l)	0.144	Routine Program
Clipstone Forest Raw BH3	28/11/2019 07:56	Asulam (ug/l)	0.014	Routine Program
Clipstone Forest Raw BH2	28/11/2019 07:48	Asulam (ug/l)	0.058	Routine Program
Shugborough Raw BH1	27/11/2019 07:34	Asulam (ug/l)	0.083	Routine Program
Bigwell Raw	22/11/2019 13:30	Asulam (ug/l)	0.008	Routine Program
Shugborough Raw BH2	15/10/2019 09:36	Asulam (ug/l)	0.077	Routine Program
Clipstone Forest Raw BH1	11/10/2019 09:28	Asulam (ug/l)	0.083	Routine Program
Clipstone Forest Raw BH4	11/10/2019 09:18	Asulam (ug/l)	0.155	Routine Program
Clipstone Forest Raw BH3	11/10/2019 09:07	Asulam (ug/l)	0.018	Routine Program
Clipstone Forest Raw BH2	11/10/2019 08:57	Asulam (ug/l)	0.068	Routine Program
Strensham Raw into Works	08/10/2019 08:31	Asulam (ug/l)	0.01	Routine Program
Stanford Res Surface	02/10/2019 15:54	Asulam (ug/l)	0.015	Catchment
Llwyn Onn Raw into works	01/10/2019 08:21	Asulam (ug/l)	0.009	Routine Program
LLWYN ONN WTW [redacted]	20/09/2019 08:14	Asulam (ug/l)	0.012	Routine Program
Clipstone Forest Raw BH1	13/09/2019 10:31	Asulam (ug/l)	0.085	Routine Program
Clipstone Forest Raw BH4	13/09/2019 10:22	Asulam (ug/l)	0.134	Routine Program
Clipstone Forest Raw BH3	13/09/2019 10:10	Asulam (ug/l)	0.014	Routine Program
Clipstone Forest Raw BH2	13/09/2019 09:56	Asulam (ug/l)	0.068	Routine Program
Whitacre WTW River Blythe Intake	30/08/2019 07:30	Asulam (ug/l)	0.009	Catchment
Draycote Raw into Works	22/08/2019 10:15	Asulam (ug/l)	0.01	Routine Program
Stanford Res Surface	22/08/2019 07:30	Asulam (ug/l)	0.008	Catchment
Mythe Raw into Works	21/08/2019 14:07	Asulam (ug/l)	0.009	Routine Program
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Campion Hills Raw into Works	19/08/2019 10:30	Asulam (ug/l)	0.008	Routine Program
Shelton River Severn Raw	16/08/2019 09:07	Asulam (ug/l)	0.016	Routine Program
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

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Melbourne Raw into works	06/08/2019 08:39	Asulam (ug/l)	0.011	Routine Program
Boughton Chester Raw into works	02/08/2019 09:16	Asulam (ug/l)	0.01	Routine Program
Stanford Res Surface	01/08/2019 07:30	Asulam (ug/l)	0.014	Catchment
Llwyn Onn Raw into works	31/07/2019 07:55	Asulam (ug/l)	0.016	Routine Program
Shugborough Raw BH1	26/07/2019 08:38	Asulam (ug/l)	0.08	Routine Program
Strensham Raw into Works	26/07/2019 07:30	Asulam (ug/l)	0.011	Routine Program
Mythe Raw into Works	25/07/2019 08:28	Asulam (ug/l)	0.01	Routine Program
Thornton Reservoir Surface Raw	22/07/2019 14:50	Asulam (ug/l)	0.009	DWI Undertaking
Strensham Raw into Works	22/07/2019 07:50	Asulam (ug/l)	0.008	Routine Program
Stanford Res Surface	19/07/2019 15:04	Asulam (ug/l)	0.009	DWI Undertaking
River Leam at Eathorpe	19/07/2019 15:02	Asulam (ug/l)	0.021	DWI Undertaking
Clipstone Forest Raw BH1	17/07/2019 09:52	Asulam (ug/l)	0.075	Routine Program
Clipstone Forest Raw BH4	17/07/2019 09:43	Asulam (ug/l)	0.117	Routine Program
Clipstone Forest Raw BH3	17/07/2019 09:32	Asulam (ug/l)	0.013	Routine Program
Clipstone Forest Raw BH2	17/07/2019 09:24	Asulam (ug/l)	0.068	Routine Program
Campion Hills Raw into Works	15/07/2019 10:35	Asulam (ug/l)	0.012	Routine Program
Staunton Harold Reservoir Surface Raw	12/07/2019 10:45	Asulam (ug/l)	0.012	Catchment
Whitacre Raw into works	08/07/2019 08:00	Asulam (ug/l)	0.01	Routine Program
Church Wilne Raw into Works	28/06/2019 10:35	Asulam (ug/l)	0.009	Routine Program
Trimpley WTW Raw Resevoir Surface	27/06/2019 10:03	Asulam (ug/l)	0.008	DW Investigational
Whitacre Raw into works	27/06/2019 09:23	Asulam (ug/l)	0.008	Routine Program
Stanford Res Surface	21/06/2019 13:26	Asulam (ug/l)	0.02	DWI Undertaking
Church Wilne WTW River Derwent (Draycott) Raw	21/06/2019 11:15	Asulam (ug/l)	0.011	Catchment
Draycote Raw into Works	21/06/2019 08:14	Asulam (ug/l)	0.011	Routine Program
Cropston Raw into Works	21/06/2019 07:55	Asulam (ug/l)	0.016	Routine Program
Cropston Raw into Works	05/06/2019 08:26	Asulam (ug/l)	0.014	Routine Program

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Clipstone Forest Raw BH1	04/06/2019 09:12	Asulam (ug/l)	0.074	Routine Program
Clipstone Forest Raw BH4	04/06/2019 09:01	Asulam (ug/l)	0.121	Routine Program
Clipstone Forest Raw BH3	04/06/2019 08:50	Asulam (ug/l)	0.019	Routine Program
Clipstone Forest Raw BH2	04/06/2019 08:40	Asulam (ug/l)	0.08	Routine Program
Campion Hills Raw into Works	14/05/2019 09:23	Asulam (ug/l)	0.008	Routine Program
Clipstone Forest Raw BH1	08/05/2019 10:02	Asulam (ug/l)	0.078	Routine Program
Clipstone Forest Raw BH4	08/05/2019 09:47	Asulam (ug/l)	0.135	Routine Program
Clipstone Forest Raw BH3	08/05/2019 09:35	Asulam (ug/l)	0.011	Routine Program
Clipstone Forest Raw BH2	08/05/2019 09:20	Asulam (ug/l)	0.087	Routine Program
Clipstone Forest Raw BH1	02/05/2019 09:40	Asulam (ug/l)	0.076	Routine Program
Clipstone Forest Raw BH4	02/05/2019 09:32	Asulam (ug/l)	0.121	Routine Program
Clipstone Forest Raw BH3	02/05/2019 09:19	Asulam (ug/l)	0.013	Routine Program
Clipstone Forest Raw BH2	02/05/2019 09:10	Asulam (ug/l)	0.083	Routine Program
Shugborough Raw BH2	01/05/2019 08:20	Asulam (ug/l)	0.118	Routine Program
Whitacre Raw into works	26/04/2019 08:00	Asulam (ug/l)	0.009	Routine Program
Shugborough Raw BH2	15/04/2019 11:50	Asulam (ug/l)	0.117	Routine Program
Clipstone Forest Raw BH1	11/04/2019 09:26	Asulam (ug/l)	0.079	Routine Program
Clipstone Forest Raw BH4	11/04/2019 09:12	Asulam (ug/l)	0.129	Routine Program
Clipstone Forest Raw BH3	11/04/2019 09:00	Asulam (ug/l)	0.019	Routine Program
Clipstone Forest Raw BH2	11/04/2019 08:50	Asulam (ug/l)	0.085	Routine Program
Clipstone Forest Raw BH1	26/03/2019 09:00	Asulam (ug/l)	0.062	Routine Program
Clipstone Forest Raw BH4	26/03/2019 08:50	Asulam (ug/l)	0.112	Routine Program
Clipstone Forest Raw BH3	26/03/2019 08:42	Asulam (ug/l)	0.014	Routine Program
Clipstone Forest Raw BH2	26/03/2019 08:31	Asulam (ug/l)	0.076	Routine Program
Clipstone Forest Raw BH4	07/03/2019 09:09	Asulam (ug/l)	0.115	DW Investigational
Clipstone Forest Raw BH1	27/02/2019 09:11	Asulam (ug/l)	0.068	Routine Program
Clipstone Forest Raw BH4	27/02/2019 09:02	Asulam (ug/l)	0.116	Routine Program
Clipstone Forest Raw BH3	27/02/2019 08:53	Asulam (ug/l)	0.015	Routine Program
Clipstone Forest Raw BH2	27/02/2019 08:45	Asulam (ug/l)	0.089	Routine Program
Peckforton Raw BH2	21/02/2019 10:13	Asulam (ug/l)	0.046	Routine Program
Ogston New Works Raw	21/02/2019 07:43	Asulam (ug/l)	0.008	Routine Program
Peckforton Raw BH1	15/02/2019 09:47	Asulam (ug/l)	0.016	Routine Program

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Clipstone Forest Raw BH1	15/02/2019 08:30	Asulam (ug/l)	0.072	Routine Program
Clipstone Forest Raw BH4	15/02/2019 08:15	Asulam (ug/l)	0.11	Routine Program
Clipstone Forest Raw BH3	15/02/2019 08:04	Asulam (ug/l)	0.016	Routine Program
Clipstone Forest Raw BH2	15/02/2019 07:54	Asulam (ug/l)	0.095	Routine Program
Campion Hills WTW River Leam at Willes Meadow	14/02/2019 10:30	Asulam (ug/l)	0.009	Routine Program
Clipstone Forest Raw BH1	13/02/2019 09:36	Asulam (ug/l)	0.069	Routine Program
Oerog Spring Raw	12/02/2019 10:12	Asulam (ug/l)	0.008	Routine Program
Clipstone Forest Raw BH4	31/01/2019 10:10	Asulam (ug/l)	0.112	Routine Program
Clipstone Forest Raw BH3	31/01/2019 09:55	Asulam (ug/l)	0.017	Routine Program
Clipstone Forest Raw BH2	31/01/2019 09:35	Asulam (ug/l)	0.102	Routine Program
Whitacre Raw into works	30/01/2019 08:20	Asulam (ug/l)	0.01	Routine Program
Ogston New Works Raw	25/01/2019 09:48	Asulam (ug/l)	0.009	Routine Program
Church Wilne Raw into Works	23/01/2019 07:27	Asulam (ug/l)	0.016	Routine Program
Swithland Reservoir Surface Raw	21/01/2019 13:14	Asulam (ug/l)	0.008	DWI Undertaking
Thornton Reservoir Surface Raw	21/01/2019 13:08	Asulam (ug/l)	0.009	DWI Undertaking
Stanford Res Surface	16/01/2019 10:52	Asulam (ug/l)	0.027	DWI Undertaking
Ogston Old Works Raw	14/01/2019 09:27	Asulam (ug/l)	0.008	Routine Program
Peckforton Raw BH2	11/01/2019 08:56	Asulam (ug/l)	0.051	Routine Program
Draycote Raw into Works	08/01/2019 07:54	Asulam (ug/l)	0.008	Routine Program
Boughton Chester Raw into works	04/01/2019 09:21	Asulam (ug/l)	0.009	Routine Program

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Sample Point Name	Date Sample Taken	Analysis	Result In Text	Sample Reason Name	Sample Number	Site Code
Teme to R Avon d/s Bushley Longdon Bk	29/09/2022 15:23	Asulam (ug/l)	<0.013	Catchment	4397652	1SEVE
R.Severn nr Kempsey	29/09/2022 14:34	Asulam (ug/l)	<0.013	Catchment	4397657	1SEVE
River Wye @ Kerne Bridge	29/09/2022 13:25	Asulam (ug/l)	0.025	Catchment	4397667	2WYE
River Wye @ King caple foot Bridge	29/09/2022 12:50	Asulam (ug/l)	<0.013	Catchment	4397666	2WYE
River Wye @ Hampton Bishop	29/09/2022 12:15	Asulam (ug/l)	0.013	Catchment	4397674	2WYE
River Lugg @ Mordiford Bridge	29/09/2022 12:00	Asulam (ug/l)	<0.013	Catchment	4397665	2LUGG
Stourport (DS R.Stour)	29/09/2022 11:45	Asulam (ug/l)	<0.013	Catchment	4397656	1SEVE
River Frome at Larport Lane Bridge	29/09/2022 11:40	Asulam (ug/l)	<0.013	Catchment	4397673	2FROMA
Stour to River Teme u/s Shrawley Bk	29/09/2022 11:15	Asulam (ug/l)	<0.013	Catchment	4397655	1SEVE
River Lugg upstream Bridge	29/09/2022 11:10	Asulam (ug/l)	<0.013	Catchment	4397671	2LUGG
Stour to River Teme d/s Salwarpe	29/09/2022 10:59	Asulam (ug/l)	<0.013	Catchment	4397654	1SEVE
WS13 Severn - R Teme to R Avon u/s	29/09/2022 10:23	Asulam (ug/l)	<0.013	Catchment	4397653	1SEVE
River Teme downstream	29/09/2022 10:08	Asulam (ug/l)	<0.013	Catchment	4397651	2TEMEA
R.Severn nr Upton Marina	29/09/2022 09:11	Asulam (ug/l)	<0.013	Catchment	4397658	1SEVE
BORROWASH	22/09/2022 12:45	Asulam (ug/l)	<0.013	Catchment	4397599	6DERWC
Markeaton Brook @ Quarndon	22/09/2022 12:20	Asulam (ug/l)	<0.013	Catchment	4397596	6MARK0
Derwent Met Nether Lane Hazelwood	22/09/2022 12:05	Asulam (ug/l)	<0.013	Catchment	4397595	6DERW7
River Derwent at Ambergate NEW	22/09/2022 11:47	Asulam (ug/l)	0.015	Catchment	4397597	6DERW7

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Mill Drive West Houses	22/09/2022 11:25	Asulam (ug/l)	0.042	Catchment	4397598	6DERW7
Hodgelane Brook	22/09/2022 10:36	Asulam (ug/l)	<0.013	Catchment	4397572	6HODG0
Smalley Brook	22/09/2022 10:36	Asulam (ug/l)	<0.013	Catchment	4397571	6SMAL1
River Amber outside Milltown	22/09/2022 10:34	Asulam (ug/l)	<0.013	Catchment	4397570	6AMBE2
Carr Brook footbridge	22/09/2022 10:26	Asulam (ug/l)	<0.013	Catchment	4397573	6CARR0
River Derwent at Yorkshire Bridge	21/09/2022 10:45	Asulam (ug/l)	0.016	Catchment	4406931	6DERW7
R.Blythe - Blythe Bridge SP211898	15/09/2022 13:44	Asulam (ug/l)	<0.013	Catchment	4397641	8SBLY0
Bourne Brook	15/09/2022 13:43	Asulam (ug/l)	<0.013	Catchment	4397642	8SBOU1
Didgeley Brook	15/09/2022 13:43	Asulam (ug/l)	<0.013	Catchment	4397643	8SBOU1
R.Blythe - Bradnocks Marsh SP216793	15/09/2022 12:53	Asulam (ug/l)	<0.013	Catchment	4397639	8SBLY0
R.Blythe - Packington SP218852	15/09/2022 12:52	Asulam (ug/l)	<0.013	Catchment	4397640	8SBLY0
R.Blythe - Solihull SP164789	15/09/2022 12:42	Asulam (ug/l)	<0.013	Catchment	4397644	8SBLY0
R.Blythe - Temple Balsall SP208763	15/09/2022 12:30	Asulam (ug/l)	<0.013	Catchment	4397638	8SBLY0
R.Severn nr Upton Magna	14/09/2022 11:48	Asulam (ug/l)	<0.013	Catchment	4397659	1SEVE
Cound Brook from bridge	14/09/2022 11:25	Asulam (ug/l)	0.081	Catchment	4397663	1COUN
River Tern d/s at Tern Bridge	14/09/2022 11:06	Asulam (ug/l)	<0.013	Catchment	4397664	1SEVE
R.Severn nr Broseley	14/09/2022 10:39	Asulam (ug/l)	<0.013	Catchment	4397660	1SEVE
R.Severn nr Bridgnorth	14/09/2022 10:04	Asulam (ug/l)	<0.013	Catchment	4397661	1SEVE
R.Stour upstream Hampton Loade	14/09/2022 09:40	Asulam (ug/l)	<0.013	Catchment	4397662	1SEVE
Heath End Brook	13/09/2022 15:09	Asulam (ug/l)	<0.013	Catchment	4396896	4HEATB

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Staunton Harold Brook	13/09/2022 15:08	Asulam (ug/l)	<0.013	Catchment	4396897	4STAUB
Jubilee Brook	13/09/2022 13:49	Asulam (ug/l)	<0.013	Catchment	4396898	4JUBIB
Scotts Brook	13/09/2022 13:01	Asulam (ug/l)	<0.013	Catchment	4396899	4SCOTB
Lane at Ulverscroft Wood	13/09/2022 11:56	Asulam (ug/l)	<0.013	Catchment	4396900	4QUORB
7b - Bradgate Chapel, Cropston Reservoir	13/09/2022 11:38	Asulam (ug/l)	<0.013	Catchment	4396906	4QUORB
Newtown Linford T - junction	13/09/2022 10:40	Asulam (ug/l)	<0.013	Catchment	4396904	4QUORB
Swithland Village opp St Leonards Church	13/09/2022 10:23	Asulam (ug/l)	<0.013	Catchment	4396902	4QUORB
Swithland feed adj railway	13/09/2022 10:07	Asulam (ug/l)	<0.013	Catchment	4396901	4QUORB
Bradgate Road, Cropston under	13/09/2022 09:31	Asulam (ug/l)	<0.013	Catchment	4396903	4QUORB
Cropston Res car park	13/09/2022 09:19	Asulam (ug/l)	<0.013	Catchment	4396905	4QUORB
Brailsford Brook at Longford	08/09/2022 15:18	Asulam (ug/l)	<0.013	Catchment	4397626	6BRAI1
Shirley Brook at Longford	08/09/2022 15:18	Asulam (ug/l)	<0.013	Catchment	4397627	6SHIR3
Cubley Brook @ Little Cubley	08/09/2022 13:20	Asulam (ug/l)	<0.013	Catchment	4397632	6FOST1
Cubley Brook at Boylestone	08/09/2022 13:20	Asulam (ug/l)	<0.013	Catchment	4397631	6FOST1
Rolleston Brook upstream	08/09/2022 13:17	Asulam (ug/l)	<0.013	Catchment	4397622	7ROLL1
Foston Brook 8 - Foston Upstream	08/09/2022 13:16	Asulam (ug/l)	<0.013	Catchment	4397629	6FOST1
downstream before confluence River	08/09/2022 13:16	Asulam (ug/l)	<0.013	Catchment	4397628	6FOST1
Rains Bk to R Itchen u/s	08/09/2022 13:00	Asulam (ug/l)	<0.013	Catchment	4388359	3LEAM
R Stowe source to conf R Leam	08/09/2022 12:58	Asulam (ug/l)	<0.013	Catchment	4388349	3STOW
to conf R Avon - Willes Meadow Foot	08/09/2022 12:05	Asulam (ug/l)	<0.013	Catchment	4388353	3LEAM

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Radford Brook source to conf R Leam	08/09/2022 12:04	Asulam (ug/l)	<0.013	Catchment	4388356	3RADF
River Dove Upstream	08/09/2022 11:47	Asulam (ug/l)	<0.013	Catchment	4397630	6DOVE2
Sutton Brook at Sutton on the Hill	08/09/2022 11:45	Asulam (ug/l)	<0.013	Catchment	4397625	6HILT1
Hilton Brook downstream	08/09/2022 11:40	Asulam (ug/l)	<0.013	Catchment	4397624	6HILT1
River Dove at Egginton Raw	08/09/2022 11:40	Asulam (ug/l)	<0.013	Catchment	4397623	4MELBN
Rolleston Brook downstream	08/09/2022 11:39	Asulam (ug/l)	<0.013	Catchment	4397620	7ROLL1
confluence Rolleston Brook	08/09/2022 11:35	Asulam (ug/l)	<0.013	Catchment	4397637	7ROLL1
AL8 Leam - conf R Itchen to R Avon u/s	08/09/2022 10:27	Asulam (ug/l)	<0.013	Catchment	4388358	3LEAM
Brook to conf R Itchen	08/09/2022 09:44	Asulam (ug/l)	<0.013	Catchment	4388355	3LEAM
Stowe to conf. R Leam - Marton	08/09/2022 09:34	Asulam (ug/l)	<0.013	Catchment	4388351	3ITCH
conf. R Stowe - Thorpe Bridge Ufton	08/09/2022 09:33	Asulam (ug/l)	<0.013	Catchment	4388352	3ITCH
R.Avon - Welford Bridge	07/09/2022 15:24	Asulam (ug/l)	0.019	Catchment	4388350	3AVOU
R.Avon Station Road	07/09/2022 14:41	Asulam (ug/l)	<0.013	Catchment	4388357	3AVOU
Didgeley Brook	24/08/2022 12:54	Asulam (ug/l)	<0.013	Catchment	4365146	8SBOU1
R.Blythe - Bradnocks Marsh SP216793	24/08/2022 12:54	Asulam (ug/l)	<0.013	Catchment	4365150	8SBLY0
Bourne Brook	24/08/2022 12:53	Asulam (ug/l)	0.014	Catchment	4365147	8SBOU1
R.Blythe - Packington SP218852	24/08/2022 12:53	Asulam (ug/l)	<0.013	Catchment	4365149	8SBLY0
R.Blythe - Solihull SP164789	24/08/2022 12:52	Asulam (ug/l)	<0.013	Catchment	4365145	8SBLY0
R.Blythe - Temple Balsall SP208763	24/08/2022 12:52	Asulam (ug/l)	<0.013	Catchment	4365151	8SBLY0
R.Blythe - Blythe Bridge SP211898	24/08/2022 12:51	Asulam (ug/l)	<0.013	Catchment	4365148	8SBLY0

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Teme to R Avon d/s Bushley Longdon Bk	23/08/2022 14:47	Asulam (ug/l)	<0.013	Catchment	4357616	1SEVE
Stourport (DS R.Stour)	23/08/2022 12:48	Asulam (ug/l)	<0.013	Catchment	4357612	1SEVE
R.Severn nr Upton Magna	23/08/2022 12:19	Asulam (ug/l)	<0.013	Catchment	4357635	1SEVE
Cound Brook from bridge	23/08/2022 11:55	Asulam (ug/l)	<0.013	Catchment	4357631	1COUN
Stour to River Teme u/s Shrawley Bk	23/08/2022 11:47	Asulam (ug/l)	<0.013	Catchment	4357613	1SEVE
River Tern d/s at Tern Bridge	23/08/2022 11:37	Asulam (ug/l)	<0.013	Catchment	4357630	1SEVE
Stour to River Teme d/s Salwarpe	23/08/2022 11:26	Asulam (ug/l)	<0.013	Catchment	4357614	1SEVE
R.Severn nr Broseley	23/08/2022 11:14	Asulam (ug/l)	<0.013	Catchment	4357634	1SEVE
WS13 Severn - R Teme to R Avon u/s	23/08/2022 10:43	Asulam (ug/l)	<0.013	Catchment	4357615	1SEVE
R.Severn nr Bridgnorth	23/08/2022 10:29	Asulam (ug/l)	<0.013	Catchment	4357633	1SEVE
River Teme downstream	23/08/2022 10:25	Asulam (ug/l)	<0.013	Catchment	4357617	2TEMEA
R.Severn nr Kempsey	23/08/2022 10:05	Asulam (ug/l)	<0.013	Catchment	4357611	1SEVE
R.Stour upstream Hampton Loade	23/08/2022 09:44	Asulam (ug/l)	<0.013	Catchment	4357632	1SEVE
R.Severn nr Upton Marina	23/08/2022 09:42	Asulam (ug/l)	<0.013	Catchment	4357610	1SEVE
BORROWASH	19/08/2022 12:49	Asulam (ug/l)	<0.013	Catchment	4365457	6DERWC
Markeaton Brook @ Quarndon	19/08/2022 12:10	Asulam (ug/l)	<0.013	Catchment	4365460	6MARK0
Derwent Met Nether Lane Hazelwood	19/08/2022 12:09	Asulam (ug/l)	<0.013	Catchment	4365461	6DERW7
River Derwent at Ambergate NEW	19/08/2022 12:09	Asulam (ug/l)	<0.013	Catchment	4365459	6DERW7
Mill Drive West Houses	19/08/2022 12:08	Asulam (ug/l)	<0.013	Catchment	4365458	6DERW7
Hodgelane Brook	19/08/2022 11:04	Asulam (ug/l)	<0.013	Catchment	4365132	6HODG0

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Smalley Brook	19/08/2022 11:03	Asulam (ug/l)	<0.013	Catchment	4365133	6SMAL1
Carr Brook footbridge	19/08/2022 10:59	Asulam (ug/l)	<0.013	Catchment	4365131	6CARR0
to conf R Avon - Willes Meadow Foot	15/08/2022 15:34	Asulam (ug/l)	<0.013	Catchment	4365452	3LEAM
Stowe to conf. R Leam - Marton	15/08/2022 15:32	Asulam (ug/l)	<0.013	Catchment	4365454	3ITCH
Brook to conf R Itchen	15/08/2022 15:31	Asulam (ug/l)	<0.013	Catchment	4365450	3LEAM
AL8 Leam - conf R Itchen to R Avon u/s	15/08/2022 15:30	Asulam (ug/l)	<0.013	Catchment	4365447	3LEAM
Radford Brook source to conf R Leam	15/08/2022 15:29	Asulam (ug/l)	<0.013	Catchment	4365449	3RADF
conf. R Stowe - Thorpe Bridge Ufton	15/08/2022 15:27	Asulam (ug/l)	<0.013	Catchment	4365453	3ITCH
Rains Bk to R Itchen u/s	15/08/2022 15:26	Asulam (ug/l)	<0.013	Catchment	4365446	3LEAM
R Stowe source to conf R Leam	15/08/2022 15:26	Asulam (ug/l)	<0.013	Catchment	4365456	3STOW
R Leam source to conf Rains Brook	15/08/2022 15:25	Asulam (ug/l)	<0.013	Catchment	4365451	3LEAM
R.Avon Station Road	15/08/2022 15:24	Asulam (ug/l)	<0.013	Catchment	4365448	3AVOU
R.Avon - Welford Bridge	15/08/2022 15:23	Asulam (ug/l)	<0.013	Catchment	4365455	3AVOU
Swithland Village opp St Leonards Church	11/08/2022 11:53	Asulam (ug/l)	<0.013	Catchment	4371683	4QUORB
Swithland feed adj railway	11/08/2022 11:42	Asulam (ug/l)	<0.013	Catchment	4371684	4QUORB
Bradgate Road, Cropston under	11/08/2022 10:59	Asulam (ug/l)	<0.013	Catchment	4371682	4QUORB
7b - Bradgate Chapel, Cropston Reservoir	11/08/2022 10:43	Asulam (ug/l)	<0.013	Catchment	4371679	4QUORB
Cropston Res car park	11/08/2022 09:49	Asulam (ug/l)	<0.013	Catchment	4371680	4QUORB
Newtown Linford T - junction	10/08/2022 14:34	Asulam (ug/l)	<0.013	Catchment	4371681	4QUORB
Lane at Ulverscroft Wood	10/08/2022 14:13	Asulam (ug/l)	<0.013	Catchment	4371685	4QUORB

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Jubilee Brook	10/08/2022 13:19	Asulam (ug/l)	<0.013	Catchment	4371676	4JUBIB
Scotts Brook	10/08/2022 13:08	Asulam (ug/l)	<0.013	Catchment	4371675	4SCOTB
Heath End Brook	10/08/2022 11:49	Asulam (ug/l)	<0.013	Catchment	4371678	4HEATB
Staunton Harold Brook	10/08/2022 11:27	Asulam (ug/l)	<0.013	Catchment	4371677	4STAUB
Cubley Brook at Boylestone	04/08/2022 14:22	Asulam (ug/l)	<0.013	Catchment	4357643	6FOST1
Brailsford Brook at Longford	04/08/2022 14:16	Asulam (ug/l)	<0.013	Catchment	4357648	6BRAI1
Shirley Brook at Longford	04/08/2022 14:16	Asulam (ug/l)	<0.013	Catchment	4357647	6SHIR3
Cubley Brook @ Little Cubley	04/08/2022 14:15	Asulam (ug/l)	<0.013	Catchment	4357642	6FOST1
Rolleston Brook upstream	04/08/2022 11:19	Asulam (ug/l)	<0.013	Catchment	4357652	7ROLL1
Foston Brook 8 - Foston Upstream	04/08/2022 11:18	Asulam (ug/l)	<0.013	Catchment	4357645	6FOST1
downstream before confluence River	04/08/2022 11:18	Asulam (ug/l)	<0.013	Catchment	4357646	6FOST1
Sutton Brook at Sutton on the Hill	04/08/2022 11:17	Asulam (ug/l)	<0.013	Catchment	4357649	6HILT1
confluence Rolleston Brook	04/08/2022 11:16	Asulam (ug/l)	<0.013	Catchment	4357637	7ROLL1
River Dove Upstream	04/08/2022 11:16	Asulam (ug/l)	<0.013	Catchment	4357644	6DOVE2
Hilton Brook downstream	04/08/2022 11:15	Asulam (ug/l)	<0.013	Catchment	4357650	6HILT1
Rolleston Brook downstream	04/08/2022 11:15	Asulam (ug/l)	<0.013	Catchment	4357654	7ROLL1
River Dove at Egginton Raw	04/08/2022 11:14	Asulam (ug/l)	<0.013	Catchment	4357651	4MELBN
R.Severn nr Upton Magna	29/07/2022 11:01	Asulam (ug/l)	<0.013	Catchment	4330402	1SEVE
Cound Brook from bridge	29/07/2022 10:37	Asulam (ug/l)	<0.013	Catchment	4330408	1COUN
River Tern d/s at Tern Bridge	29/07/2022 10:19	Asulam (ug/l)	<0.013	Catchment	4330409	1SEVE

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R.Severn nr Broseley	29/07/2022 09:56	Asulam (ug/l)	<0.013	Catchment	4330404	1SEVE
R.Severn nr Bridgnorth	29/07/2022 09:27	Asulam (ug/l)	<0.013	Catchment	4330406	1SEVE
R.Stour upstream Hampton Loade	29/07/2022 09:04	Asulam (ug/l)	<0.013	Catchment	4330407	1SEVE
Didgeley Brook	28/07/2022 11:18	Asulam (ug/l)	<0.013	Catchment	4365129	8SBOU1
Bourne Brook	28/07/2022 11:17	Asulam (ug/l)	<0.013	Catchment	4365128	8SBOU1
R.Blythe - Blythe Bridge SP211898	28/07/2022 11:17	Asulam (ug/l)	<0.013	Catchment	4365127	8SBLY0
R.Blythe - Packington SP218852	28/07/2022 10:05	Asulam (ug/l)	<0.013	Catchment	4365126	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	28/07/2022 10:04	Asulam (ug/l)	<0.013	Catchment	4365125	8SBLY0
R.Blythe - Temple Balsall SP208763	28/07/2022 10:04	Asulam (ug/l)	<0.013	Catchment	4365124	8SBLY0
R.Blythe - Solihull SP164789	28/07/2022 10:03	Asulam (ug/l)	<0.013	Catchment	4365130	8SBLY0
River Wye @ Kerne Bridge	26/07/2022 14:53	Asulam (ug/l)	0.024	Catchment	4330413	2WYE
River Wye @ King caple foot Bridge	26/07/2022 14:01	Asulam (ug/l)	0.02	Catchment	4330412	2WYE
River Wye @ Hampton Bishop	26/07/2022 13:12	Asulam (ug/l)	<0.013	Catchment	4330417	2WYE
River Lugg @ Mordiford Bridge	26/07/2022 12:51	Asulam (ug/l)	<0.013	Catchment	4330410	2LUGG
River Frome at Larport Lane Bridge	26/07/2022 12:41	Asulam (ug/l)	<0.013	Catchment	4330415	2FROMA
River Lugg upstream Bridge	26/07/2022 12:09	Asulam (ug/l)	<0.013	Catchment	4330414	2LUGG
Teme to R Avon d/s Bushley Longdon Bk	22/07/2022 14:19	Asulam (ug/l)	<0.013	Catchment	4330392	1SEVE
BORROWASH	22/07/2022 13:46	Asulam (ug/l)	<0.013	Catchment	4365080	6DERWC
Stour to River Teme d/s Salwarpe	22/07/2022 13:24	Asulam (ug/l)	<0.013	Catchment	4330394	1SEVE
Markeaton Brook @ Quarndon	22/07/2022 13:15	Asulam (ug/l)	<0.013	Catchment	4365077	6MARK0

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Derwent Met Nether Lane Hazelwood	22/07/2022 13:03	Asulam (ug/l)	<0.013	Catchment	4365076	6DERW7
River Derwent at Ambergate NEW	22/07/2022 13:02	Asulam (ug/l)	<0.013	Catchment	4365078	6DERW7
Stour to River Teme u/s Shrawley Bk	22/07/2022 12:48	Asulam (ug/l)	<0.013	Catchment	4330396	1SEVE
Stourport (DS R.Stour)	22/07/2022 11:51	Asulam (ug/l)	<0.013	Catchment	4330397	1SEVE
Mill Drive West Houses	22/07/2022 11:48	Asulam (ug/l)	<0.013	Catchment	4365079	6DERW7
Cubley Brook @ Little Cubley	22/07/2022 11:28	Asulam (ug/l)	<0.013	Catchment	4365093	6FOST1
Cubley Brook at Boylestone	22/07/2022 11:27	Asulam (ug/l)	<0.013	Catchment	4365092	6FOST1
Shirley Brook at Longford	22/07/2022 11:13	Asulam (ug/l)	<0.013	Catchment	4365088	6SHIR3
Brailsford Brook at Longford	22/07/2022 11:12	Asulam (ug/l)	<0.013	Catchment	4365087	6BRAI1
Smalley Brook	22/07/2022 10:41	Asulam (ug/l)	<0.013	Catchment	4365061	6SMAL1
Unamed tributary Woolley Moor	22/07/2022 10:41	Asulam (ug/l)	<0.013	Catchment	4365059	6AMBE2
Hodgelane Brook	22/07/2022 10:40	Asulam (ug/l)	<0.013	Catchment	4365062	6HODG0
River Amber outside Milltown	22/07/2022 10:39	Asulam (ug/l)	<0.013	Catchment	4365060	6AMBE2
Carr Brook footbridge	22/07/2022 10:35	Asulam (ug/l)	<0.013	Catchment	4365063	6CARR0
WS13 Severn - R Teme to R Avon u/s	22/07/2022 10:35	Asulam (ug/l)	<0.013	Catchment	4330393	1SEVE
River Teme downstream	22/07/2022 10:09	Asulam (ug/l)	<0.013	Catchment	4330391	2TEMEA
R.Severn nr Kempsey	22/07/2022 09:56	Asulam (ug/l)	<0.013	Catchment	4330400	1SEVE
R.Severn nr Upton Marina	22/07/2022 09:26	Asulam (ug/l)	<0.013	Catchment	4330401	1SEVE
Rolleston Brook upstream	21/07/2022 15:17	Asulam (ug/l)	<0.013	Catchment	4365083	7ROLL1
downstream before confluence River	21/07/2022 14:25	Asulam (ug/l)	<0.013	Catchment	4365089	6FOST1

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Sutton Brook at Sutton on the Hill	21/07/2022 14:25	Asulam (ug/l)	<0.013	Catchment	4365086	6HILT1
Foston Brook 8 - Foston Upstream	21/07/2022 14:24	Asulam (ug/l)	<0.013	Catchment	4365090	6FOST1
River Dove Upstream	21/07/2022 13:01	Asulam (ug/l)	<0.013	Catchment	4365091	6DOVE2
Hilton Brook downstream	21/07/2022 13:00	Asulam (ug/l)	<0.013	Catchment	4365085	6HILT1
confluence Rolleston Brook	21/07/2022 12:59	Asulam (ug/l)	<0.013	Catchment	4365098	7ROLL1
R Stowe source to conf R Leam	21/07/2022 12:59	Asulam (ug/l)	<0.013	Catchment	4365048	3STOW
R.Avon - Welford Bridge	21/07/2022 12:59	Asulam (ug/l)	<0.013	Catchment	4365049	3AVOU
Stowe to conf. R Leam - Marton	21/07/2022 12:58	Asulam (ug/l)	<0.013	Catchment	4365050	3ITCH
Rolleston Brook downstream	21/07/2022 12:58	Asulam (ug/l)	<0.013	Catchment	4365081	7ROLL1
conf. R Stowe - Thorpe Bridge Ufton	21/07/2022 12:57	Asulam (ug/l)	<0.013	Catchment	4365051	3ITCH
to conf R Avon - Willes Meadow Foot	21/07/2022 12:57	Asulam (ug/l)	<0.013	Catchment	4365052	3LEAM
Brook to conf R Itchen	21/07/2022 12:55	Asulam (ug/l)	<0.013	Catchment	4365054	3LEAM
R.Avon Station Road	21/07/2022 12:54	Asulam (ug/l)	<0.013	Catchment	4365056	3AVOU
Radford Brook source to conf R Leam	21/07/2022 12:54	Asulam (ug/l)	<0.013	Catchment	4365055	3RADF
Rains Bk to R Itchen u/s	21/07/2022 12:53	Asulam (ug/l)	<0.013	Catchment	4365058	3LEAM
AL8 Leam - conf R Itchen to R Avon u/s	21/07/2022 12:53	Asulam (ug/l)	<0.013	Catchment	4365057	3LEAM
River Dove at Egginton Raw	21/07/2022 12:52	Asulam (ug/l)	<0.013	Catchment	4365084	4MELBN
Newtown Linford T - junction	06/07/2022 10:54	Asulam (ug/l)	<0.013	Catchment	4344119	4QUORB
Heath End Brook	05/07/2022 17:10	Asulam (ug/l)	<0.013	Catchment	4344111	4HEATB
Staunton Harold Brook	05/07/2022 17:09	Asulam (ug/l)	<0.013	Catchment	4344112	4STAUB

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Jubilee Brook	05/07/2022 13:22	Asulam (ug/l)	<0.013	Catchment	4344113	4JUBIB
Scotts Brook	05/07/2022 13:13	Asulam (ug/l)	<0.013	Catchment	4344114	4SCOTB
Swithland Village opp St Leonards Church	05/07/2022 11:46	Asulam (ug/l)	<0.013	Catchment	4344117	4QUORB
Swithland feed adj railway	05/07/2022 10:58	Asulam (ug/l)	<0.013	Catchment	4344116	4QUORB
Bradgate Road, Cropston under	05/07/2022 10:51	Asulam (ug/l)	<0.013	Catchment	4344118	4QUORB
7b - Bradgate Chapel, Cropston Reservoir	05/07/2022 09:46	Asulam (ug/l)	<0.013	Catchment	4344121	4QUORB
Cropston Res car park	05/07/2022 09:38	Asulam (ug/l)	<0.013	Catchment	4344120	4QUORB
River Wye @ Kerne Bridge	30/06/2022 12:17	Asulam (ug/l)	<0.013	Catchment	4292326	2WYE
River Wye @ King caple foot Bridge	30/06/2022 11:36	Asulam (ug/l)	<0.013	Catchment	4292327	2WYE
River Wye @ Hampton Bishop	30/06/2022 11:02	Asulam (ug/l)	<0.013	Catchment	4292323	2WYE
River Lugg @ Mordiford Bridge	30/06/2022 10:49	Asulam (ug/l)	<0.013	Catchment	4292328	2LUGG
River Frome at Larport Lane Bridge	30/06/2022 10:38	Asulam (ug/l)	<0.013	Catchment	4292324	2FROMA
River Lugg upstream Bridge	30/06/2022 10:10	Asulam (ug/l)	<0.013	Catchment	4292325	2LUGG
R.Severn nr Upton Magna	29/06/2022 12:13	Asulam (ug/l)	<0.013	Catchment	4292334	1SEVE
Cound Brook from bridge	29/06/2022 11:43	Asulam (ug/l)	<0.013	Catchment	4292330	1COUN
River Tern d/s at Tern Bridge	29/06/2022 11:19	Asulam (ug/l)	<0.013	Catchment	4292329	1SEVE
R.Severn nr Broseley	29/06/2022 10:52	Asulam (ug/l)	<0.013	Catchment	4292333	1SEVE
R.Severn nr Bridgnorth	29/06/2022 10:20	Asulam (ug/l)	<0.013	Catchment	4292332	1SEVE
R.Stour upstream Hampton Loade	29/06/2022 09:54	Asulam (ug/l)	<0.013	Catchment	4292331	1SEVE
BORROWASH	23/06/2022 14:49	Asulam (ug/l)	<0.013	Catchment	4299465	6DERWC

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Markeaton Brook @ Quarndon	23/06/2022 14:37	Asulam (ug/l)	<0.013	Catchment	4299468	6MARK0
Derwent Met Nether Lane Hazelwood	23/06/2022 14:32	Asulam (ug/l)	<0.013	Catchment	4299469	6DERW7
River Derwent at Ambergate NEW	23/06/2022 13:54	Asulam (ug/l)	<0.013	Catchment	4299467	6DERW7
Mill Drive West Houses	23/06/2022 13:25	Asulam (ug/l)	<0.013	Catchment	4299466	6DERW7
Smalley Brook	23/06/2022 12:47	Asulam (ug/l)	<0.013	Catchment	4299453	6SMAL1
Unamed tributary Woolley Moor	23/06/2022 12:47	Asulam (ug/l)	<0.013	Catchment	4299455	6AMBE2
Hodgelane Brook	23/06/2022 12:42	Asulam (ug/l)	<0.013	Catchment	4299452	6HODG0
River Amber outside Milltown	23/06/2022 12:29	Asulam (ug/l)	<0.013	Catchment	4299454	6AMBE2
Carr Brook footbridge	23/06/2022 12:21	Asulam (ug/l)	<0.013	Catchment	4299451	6CARR0
Teme to R Avon d/s Bushley Longdon Bk	21/06/2022 14:24	Asulam (ug/l)	<0.013	Catchment	4292341	1SEVE
R.Severn nr Kempsey	21/06/2022 13:21	Asulam (ug/l)	<0.013	Catchment	4292336	1SEVE
Stour to River Teme d/s Salwarpe	21/06/2022 12:38	Asulam (ug/l)	<0.013	Catchment	4292339	1SEVE
Stour to River Teme u/s Shrawley Bk	21/06/2022 12:15	Asulam (ug/l)	<0.013	Catchment	4292338	1SEVE
Stourport (DS R.Stour)	21/06/2022 11:51	Asulam (ug/l)	<0.013	Catchment	4292337	1SEVE
WS13 Severn - R Teme to R Avon u/s	21/06/2022 10:27	Asulam (ug/l)	<0.013	Catchment	4292340	1SEVE
River Teme downstream	21/06/2022 10:10	Asulam (ug/l)	<0.013	Catchment	4292342	2TEMEA
R.Severn nr Upton Marina	21/06/2022 09:21	Asulam (ug/l)	<0.013	Catchment	4292335	1SEVE
Hilton Brook downstream	15/06/2022 10:43	Asulam (ug/l)	<0.013	Catchment	4299495	6HILT1
Sutton Brook at Sutton on the Hill	15/06/2022 10:43	Asulam (ug/l)	<0.013	Catchment	4299494	6HILT1
Rolleston Brook downstream	15/06/2022 10:41	Asulam (ug/l)	<0.013	Catchment	4299507	7ROLL1

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confluence Rolleston Brook	15/06/2022 10:40	Asulam (ug/l)	<0.013	Catchment	4299482	7ROLL1
River Dove Upstream	15/06/2022 10:40	Asulam (ug/l)	<0.013	Catchment	4299489	6DOVE2
Brailsford Brook at Longford	15/06/2022 10:38	Asulam (ug/l)	<0.013	Catchment	4299493	6BRAI1
River Dove at Egginton Raw	15/06/2022 10:38	Asulam (ug/l)	<0.013	Catchment	4299496	4MELBN
Shirley Brook at Longford	15/06/2022 10:37	Asulam (ug/l)	<0.013	Catchment	4299492	6SHIR3
Cubley Brook at Boylestone	15/06/2022 10:35	Asulam (ug/l)	<0.013	Catchment	4299488	6FOST1
Foston Brook 8 - Foston Upstream	15/06/2022 10:35	Asulam (ug/l)	<0.013	Catchment	4299490	6FOST1
downstream before confluence River	15/06/2022 10:34	Asulam (ug/l)	<0.013	Catchment	4299491	6FOST1
Rolleston Brook upstream	15/06/2022 10:32	Asulam (ug/l)	<0.013	Catchment	4299497	7ROLL1
Cubley Brook @ Little Cubley	15/06/2022 10:30	Asulam (ug/l)	<0.013	Catchment	4299487	6FOST1
R.Blythe - Blythe Bridge SP211898	14/06/2022 14:33	Asulam (ug/l)	<0.013	Catchment	4299447	8SBLY0
Bourne Brook	14/06/2022 14:21	Asulam (ug/l)	<0.013	Catchment	4299446	8SBOU1
Didgeley Brook	14/06/2022 14:20	Asulam (ug/l)	<0.013	Catchment	4299445	8SBOU1
R.Blythe - Bradnocks Marsh SP216793	14/06/2022 13:50	Asulam (ug/l)	<0.013	Catchment	4299449	8SBLY0
R.Blythe - Packington SP218852	14/06/2022 13:50	Asulam (ug/l)	<0.013	Catchment	4299448	8SBLY0
R.Blythe - Solihull SP164789	14/06/2022 13:11	Asulam (ug/l)	<0.013	Catchment	4299444	8SBLY0
R.Blythe - Temple Balsall SP208763	14/06/2022 12:41	Asulam (ug/l)	<0.013	Catchment	4299450	8SBLY0
R.Avon Station Road	13/06/2022 13:56	Asulam (ug/l)	<0.013	Catchment	4304472	3AVOU
R.Avon - Welford Bridge	13/06/2022 13:55	Asulam (ug/l)	0.018	Catchment	4304479	3AVOU
Rains Bk to R Itchen u/s	13/06/2022 13:53	Asulam (ug/l)	<0.013	Catchment	4304470	3LEAM

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R Stowe source to conf R Leam	13/06/2022 13:15	Asulam (ug/l)	<0.013	Catchment	4304480	3STOW
conf. R Stowe - Thorpe Bridge Ufton	13/06/2022 12:51	Asulam (ug/l)	<0.013	Catchment	4304477	3ITCH
to conf R Avon - Willes Meadow Foot	13/06/2022 12:43	Asulam (ug/l)	<0.013	Catchment	4304476	3LEAM
AL8 Leam - conf R Itchen to R Avon u/s	13/06/2022 11:19	Asulam (ug/l)	<0.013	Catchment	4304471	3LEAM
Radford Brook source to conf R Leam	13/06/2022 11:18	Asulam (ug/l)	<0.013	Catchment	4304473	3RADF
Stowe to conf. R Leam - Marton	13/06/2022 11:08	Asulam (ug/l)	<0.013	Catchment	4304478	3ITCH
Brook to conf R Itchen	13/06/2022 11:06	Asulam (ug/l)	<0.013	Catchment	4304474	3LEAM
Swithland feed adj railway	08/06/2022 13:45	Asulam (ug/l)	<0.013	Catchment	4330387	4QUORB
Swithland Village opp St Leonards Church	08/06/2022 13:24	Asulam (ug/l)	<0.013	Catchment	4330386	4QUORB
Jubilee Brook	08/06/2022 11:45	Asulam (ug/l)	<0.013	Catchment	4338779	4JUBIB
Scotts Brook	08/06/2022 11:44	Asulam (ug/l)	<0.013	Catchment	4338778	4SCOTB
Heath End Brook	08/06/2022 11:05	Asulam (ug/l)	<0.013	Catchment	4338781	4HEATB
Staunton Harold Brook	08/06/2022 11:05	Asulam (ug/l)	<0.013	Catchment	4338780	4STAUB
Bradgate Road, Cropston under	07/06/2022 17:07	Asulam (ug/l)	<0.013	Catchment	4330385	4QUORB
Cropston Res car park	07/06/2022 16:53	Asulam (ug/l)	<0.013	Catchment	4330381	4QUORB
Lane at Ulverscroft Wood	07/06/2022 16:32	Asulam (ug/l)	<0.013	Catchment	4330388	4QUORB
Newtown Linford T - junction	07/06/2022 16:17	Asulam (ug/l)	<0.013	Catchment	4330384	4QUORB
7b - Bradgate Chapel, Cropston Reservoir	07/06/2022 16:04	Asulam (ug/l)	<0.013	Catchment	4330379	4QUORB
River Wye @ Kerne Bridge	30/05/2022 13:11	Asulam (ug/l)	<0.013	Catchment	4274979	2WYE
River Wye @ King caple foot Bridge	30/05/2022 11:57	Asulam (ug/l)	<0.013	Catchment	4274978	2WYE

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River Wye @ Hampton Bishop	30/05/2022 11:24	Asulam (ug/l)	<0.013	Catchment	4274982	2WYE
River Lugg @ Mordiford Bridge	30/05/2022 11:07	Asulam (ug/l)	<0.013	Catchment	4274977	2LUGG
River Frome at Larport Lane Bridge	30/05/2022 10:53	Asulam (ug/l)	<0.013	Catchment	4274981	2FROMA
River Lugg upstream Bridge	30/05/2022 10:21	Asulam (ug/l)	<0.013	Catchment	4274980	2LUGG
R.Severn nr Broseley	26/05/2022 16:22	Asulam (ug/l)	<0.013	Catchment	4274984	1SEVE
Cound Brook from bridge	26/05/2022 16:21	Asulam (ug/l)	<0.013	Catchment	4274987	1COUN
R.Stour upstream Hampton Loade	26/05/2022 16:21	Asulam (ug/l)	<0.013	Catchment	4274986	1SEVE
R.Severn nr Upton Magna	26/05/2022 16:20	Asulam (ug/l)	<0.013	Catchment	4274983	1SEVE
R.Severn nr Bridgnorth	26/05/2022 16:19	Asulam (ug/l)	<0.013	Catchment	4274985	1SEVE
River Tern d/s at Tern Bridge	26/05/2022 16:19	Asulam (ug/l)	<0.013	Catchment	4274988	1SEVE
BORROWASH	26/05/2022 12:35	Asulam (ug/l)	<0.013	Catchment	4290534	6DERWC
Markeaton Brook @ Quarndon	26/05/2022 12:21	Asulam (ug/l)	<0.013	Catchment	4290531	6MARK0
R.Avon - Welford Bridge	26/05/2022 12:21	Asulam (ug/l)	<0.013	Catchment	4286940	3AVOU
R.Avon Station Road	26/05/2022 12:21	Asulam (ug/l)	<0.013	Catchment	4286947	3AVOU
Derwent Met Nether Lane Hazelwood	26/05/2022 12:16	Asulam (ug/l)	<0.013	Catchment	4290530	6DERW7
River Derwent at Ambergate NEW	26/05/2022 11:39	Asulam (ug/l)	<0.013	Catchment	4290532	6DERW7
Mill Drive West Houses	26/05/2022 11:38	Asulam (ug/l)	<0.013	Catchment	4290533	6DERW7
Rains Bk to R Itchen u/s	26/05/2022 11:17	Asulam (ug/l)	<0.013	Catchment	4286949	3LEAM
Stowe to conf. R Leam - Marton	26/05/2022 11:16	Asulam (ug/l)	<0.013	Catchment	4286941	3ITCH
Brook to conf R Itchen	26/05/2022 10:45	Asulam (ug/l)	<0.013	Catchment	4286945	3LEAM

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AL8 Leam - conf R Itchen to R Avon u/s	26/05/2022 10:42	Asulam (ug/l)	<0.013	Catchment	4286948	3LEAM
Radford Brook source to conf R Leam	25/05/2022 14:13	Asulam (ug/l)	<0.013	Catchment	4286946	3RADF
to conf R Avon - Willes Meadow Foot	25/05/2022 13:57	Asulam (ug/l)	<0.013	Catchment	4286943	3LEAM
conf. R Stowe - Thorpe Bridge Ufton	25/05/2022 13:32	Asulam (ug/l)	<0.013	Catchment	4286942	3ITCH
R Stowe source to conf R Leam	25/05/2022 13:17	Asulam (ug/l)	<0.013	Catchment	4286939	3STOW
Jubilee Brook	19/05/2022 15:34	Asulam (ug/l)	<0.013	Catchment	4292314	4JUBIB
Scotts Brook	19/05/2022 15:32	Asulam (ug/l)	<0.013	Catchment	4292315	4SCOTB
Heath End Brook	19/05/2022 15:31	Asulam (ug/l)	<0.013	Catchment	4292312	4HEATB
Staunton Harold Brook	19/05/2022 15:30	Asulam (ug/l)	<0.013	Catchment	4292313	4STAUB
Lane at Ulverscroft Wood	19/05/2022 15:28	Asulam (ug/l)	<0.013	Catchment	4292316	4QUORB
Teme to R Avon d/s Bushley Longdon Bk	19/05/2022 15:09	Asulam (ug/l)	<0.013	Catchment	4274990	1SEVE
7b - Bradgate Chapel, Cropston Reservoir	19/05/2022 14:46	Asulam (ug/l)	<0.013	Catchment	4292322	4QUORB
Stour to River Teme d/s Salwarpe	19/05/2022 14:07	Asulam (ug/l)	<0.013	Catchment	4274992	1SEVE
Newtown Linford T - junction	19/05/2022 14:01	Asulam (ug/l)	<0.013	Catchment	4292320	4QUORB
Stour to River Teme u/s Shrawley Bk	19/05/2022 13:48	Asulam (ug/l)	<0.013	Catchment	4274993	1SEVE
Brailsford Brook at Longford	19/05/2022 13:18	Asulam (ug/l)	<0.013	Catchment	4290554	6BRAI1
Shirley Brook at Longford	19/05/2022 13:17	Asulam (ug/l)	<0.013	Catchment	4290555	6SHIR3
Bradgate Road, Cropston under	19/05/2022 13:16	Asulam (ug/l)	<0.013	Catchment	4292319	4QUORB
Stourport (DS R.Stour)	19/05/2022 13:16	Asulam (ug/l)	<0.013	Catchment	4274994	1SEVE
Swithland Village opp St Leonards Church	19/05/2022 12:48	Asulam (ug/l)	<0.013	Catchment	4292318	4QUORB

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Swithland feed adj railway	19/05/2022 12:24	Asulam (ug/l)	<0.013	Catchment	4292317	4QUORB
Cropston Res car park	19/05/2022 12:20	Asulam (ug/l)	<0.013	Catchment	4292321	4QUORB
Hilton Brook downstream	19/05/2022 12:17	Asulam (ug/l)	<0.013	Catchment	4290546	6HILT1
confluence Rolleston Brook	19/05/2022 12:17	Asulam (ug/l)	<0.013	Catchment	4290574	7ROLL1
Rolleston Brook downstream	19/05/2022 12:17	Asulam (ug/l)	<0.013	Catchment	4290575	7ROLL1
River Dove at Egginton Raw	19/05/2022 12:16	Asulam (ug/l)	<0.013	Catchment	4290545	4MELBN
Sutton Brook at Sutton on the Hill	19/05/2022 12:16	Asulam (ug/l)	<0.013	Catchment	4290553	6HILT1
River Dove Upstream	19/05/2022 12:15	Asulam (ug/l)	<0.013	Catchment	4290565	6DOVE2
WS13 Severn - R Teme to R Avon u/s	19/05/2022 11:08	Asulam (ug/l)	<0.013	Catchment	4274991	1SEVE
River Teme downstream	19/05/2022 10:46	Asulam (ug/l)	<0.013	Catchment	4274989	2TEMEA
R.Severn nr Kempsey	19/05/2022 10:21	Asulam (ug/l)	<0.013	Catchment	4274995	1SEVE
R.Severn nr Upton Marina	19/05/2022 09:48	Asulam (ug/l)	<0.013	Catchment	4274996	1SEVE
Cubley Brook @ Little Cubley	18/05/2022 16:57	Asulam (ug/l)	<0.013	Catchment	4290568	6FOST1
Cubley Brook at Boylestone	18/05/2022 16:56	Asulam (ug/l)	<0.013	Catchment	4290566	6FOST1
Foston Brook 8 - Foston Upstream	18/05/2022 16:16	Asulam (ug/l)	<0.013	Catchment	4290564	6FOST1
downstream before confluence River	18/05/2022 16:16	Asulam (ug/l)	<0.013	Catchment	4290560	6FOST1
Rolleston Brook upstream	18/05/2022 16:13	Asulam (ug/l)	<0.013	Catchment	4290544	7ROLL1
Bourne Brook	13/05/2022 16:48	Asulam (ug/l)	<0.013	Catchment	4304467	8SBOU1
Didgeley Brook	13/05/2022 16:48	Asulam (ug/l)	<0.013	Catchment	4304468	8SBOU1
R.Blythe - Solihull SP164789	13/05/2022 13:43	Asulam (ug/l)	<0.013	Catchment	4304469	8SBLY0

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Carr Brook footbridge	13/05/2022 13:28	Asulam (ug/l)	<0.013	Catchment	4290519	6CARR0
Hodgelane Brook	13/05/2022 13:27	Asulam (ug/l)	<0.013	Catchment	4290518	6HODG0
River Amber outside Milltown	13/05/2022 13:26	Asulam (ug/l)	<0.013	Catchment	4290516	6AMBE2
Smalley Brook	13/05/2022 13:25	Asulam (ug/l)	<0.013	Catchment	4290517	6SMAL1
Unamed tributary Woolley Moor	13/05/2022 13:24	Asulam (ug/l)	<0.013	Catchment	4290515	6AMBE2
R.Blythe - Packington SP218852	13/05/2022 12:51	Asulam (ug/l)	<0.013	Catchment	4304465	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	13/05/2022 12:50	Asulam (ug/l)	<0.013	Catchment	4304464	8SBLY0
R.Blythe - Temple Balsall SP208763	13/05/2022 12:50	Asulam (ug/l)	<0.013	Catchment	4304463	8SBLY0
Jubilee Brook	28/04/2022 14:06	Asulam (ug/l)	<0.013	Catchment	4274998	4JUBIB
Scotts Brook	28/04/2022 13:58	Asulam (ug/l)	<0.013	Catchment	4274997	4SCOTB
Cound Brook from bridge	28/04/2022 13:50	Asulam (ug/l)	<0.013	Catchment	4239642	1COUN
R.Severn nr Upton Magna	28/04/2022 13:35	Asulam (ug/l)	<0.013	Catchment	4239646	1SEVE
River Tern d/s at Tern Bridge	28/04/2022 13:25	Asulam (ug/l)	<0.013	Catchment	4239641	1SEVE
Heath End Brook	28/04/2022 13:15	Asulam (ug/l)	<0.013	Catchment	4275000	4HEATB
Staunton Harold Brook	28/04/2022 13:14	Asulam (ug/l)	<0.013	Catchment	4274999	4STAUB
R.Severn nr Broseley	28/04/2022 13:04	Asulam (ug/l)	<0.013	Catchment	4239645	1SEVE
River Wye @ Kerne Bridge	28/04/2022 12:47	Asulam (ug/l)	<0.013	Catchment	4239620	2WYE
R.Severn nr Bridgnorth	28/04/2022 12:38	Asulam (ug/l)	<0.013	Catchment	4239644	1SEVE
R.Stour upstream Hampton Loade	28/04/2022 12:13	Asulam (ug/l)	<0.013	Catchment	4239643	1SEVE
River Wye @ King caple foot Bridge	28/04/2022 12:09	Asulam (ug/l)	<0.013	Catchment	4239621	2WYE

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Lane at Ulverscroft Wood	28/04/2022 11:53	Asulam (ug/l)	<0.013	Catchment	4275007	4QUORB
River Wye @ Hampton Bishop	28/04/2022 11:34	Asulam (ug/l)	<0.013	Catchment	4239617	2WYE
7b - Bradgate Chapel, Cropston Reservoir	28/04/2022 11:17	Asulam (ug/l)	<0.013	Catchment	4275001	4QUORB
River Lugg @ Mordiford Bridge	28/04/2022 11:10	Asulam (ug/l)	<0.013	Catchment	4239622	2LUGG
Newtown Linford T - junction	28/04/2022 11:04	Asulam (ug/l)	<0.013	Catchment	4275003	4QUORB
River Frome at Larport Lane Bridge	28/04/2022 10:58	Asulam (ug/l)	<0.013	Catchment	4239618	2FROMA
Swithland Village opp St Leonards Church	28/04/2022 10:35	Asulam (ug/l)	<0.013	Catchment	4275005	4QUORB
Swithland feed adj railway	28/04/2022 10:09	Asulam (ug/l)	<0.013	Catchment	4275006	4QUORB
River Lugg upstream Bridge	28/04/2022 09:58	Asulam (ug/l)	<0.013	Catchment	4239619	2LUGG
Bradgate Road, Cropston under	28/04/2022 09:49	Asulam (ug/l)	<0.013	Catchment	4275004	4QUORB
Cropston Res car park	28/04/2022 09:46	Asulam (ug/l)	<0.013	Catchment	4275002	4QUORB
Teme to R Avon d/s Bushley Longdon Bk	21/04/2022 15:53	Asulam (ug/l)	<0.013	Catchment	4239653	1SEVE
Stowe to conf. R Leam - Marton	21/04/2022 15:51	Asulam (ug/l)	<0.013	Catchment	4275141	3ITCH
Brook to conf R Itchen	21/04/2022 15:50	Asulam (ug/l)	<0.013	Catchment	4275137	3LEAM
AL8 Leam - conf R Itchen to R Avon u/s	21/04/2022 15:48	Asulam (ug/l)	<0.013	Catchment	4275134	3LEAM
Radford Brook source to conf R Leam	21/04/2022 15:31	Asulam (ug/l)	<0.013	Catchment	4275136	3RADF
to conf R Avon - Willes Meadow Foot	21/04/2022 15:00	Asulam (ug/l)	<0.013	Catchment	4275139	3LEAM
conf. R Stowe - Thorpe Bridge Ufton	21/04/2022 14:47	Asulam (ug/l)	<0.013	Catchment	4275140	3ITCH
Shirley Brook at Longford	21/04/2022 14:33	Asulam (ug/l)	<0.013	Catchment	4276320	6SHIR3
Brailsford Brook at Longford	21/04/2022 14:32	Asulam (ug/l)	<0.013	Catchment	4276321	6BRAI1

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Cubley Brook @ Little Cubley	21/04/2022 14:31	Asulam (ug/l)	<0.013	Catchment	4276315	6FOST1
Cubley Brook at Boylestone	21/04/2022 13:57	Asulam (ug/l)	<0.013	Catchment	4276316	6FOST1
Foston Brook 8 - Foston Upstream	21/04/2022 13:57	Asulam (ug/l)	<0.013	Catchment	4276318	6FOST1
downstream before confluence River	21/04/2022 13:49	Asulam (ug/l)	<0.013	Catchment	4276319	6FOST1
R Stowe source to conf R Leam	21/04/2022 13:41	Asulam (ug/l)	<0.013	Catchment	4275143	3STOW
Rolleston Brook upstream	21/04/2022 13:02	Asulam (ug/l)	<0.013	Catchment	4276338	7ROLL1
Sutton Brook at Sutton on the Hill	21/04/2022 12:46	Asulam (ug/l)	<0.013	Catchment	4276335	6HILT1
Hilton Brook downstream	21/04/2022 12:45	Asulam (ug/l)	<0.013	Catchment	4276336	6HILT1
Stourport (DS R.Stour)	21/04/2022 12:34	Asulam (ug/l)	<0.013	Catchment	4239649	1SEVE
confluence Rolleston Brook	21/04/2022 12:18	Asulam (ug/l)	<0.013	Catchment	4276310	7ROLL1
Rolleston Brook downstream	21/04/2022 12:18	Asulam (ug/l)	<0.013	Catchment	4276309	7ROLL1
River Dove Upstream	21/04/2022 12:16	Asulam (ug/l)	<0.013	Catchment	4276317	6DOVE2
Rains Bk to R Itchen u/s	21/04/2022 12:15	Asulam (ug/l)	<0.013	Catchment	4275133	3LEAM
R Leam source to conf Rains Brook	21/04/2022 12:09	Asulam (ug/l)	<0.013	Catchment	4275138	3LEAM
Stour to River Teme u/s Shrawley Bk	21/04/2022 12:09	Asulam (ug/l)	<0.013	Catchment	4239650	1SEVE
Stour to River Teme d/s Salwarpe	21/04/2022 11:51	Asulam (ug/l)	<0.013	Catchment	4239651	1SEVE
R.Avon - Welford Bridge	21/04/2022 11:35	Asulam (ug/l)	<0.013	Catchment	4275142	3AVOU
R.Avon Station Road	21/04/2022 11:32	Asulam (ug/l)	<0.013	Catchment	4275135	3AVOU
River Dove at Egginton Raw	21/04/2022 11:19	Asulam (ug/l)	<0.013	Catchment	4276337	4MELBN
WS13 Severn - R Teme to R Avon u/s	21/04/2022 10:35	Asulam (ug/l)	<0.013	Catchment	4239652	1SEVE

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River Teme downstream	21/04/2022 10:11	Asulam (ug/l)	<0.013	Catchment	4239654	2TEMEA
R.Severn nr Kempsey	21/04/2022 09:56	Asulam (ug/l)	<0.013	Catchment	4239648	1SEVE
R.Severn nr Upton Marina	21/04/2022 09:29	Asulam (ug/l)	<0.013	Catchment	4239647	1SEVE
Mill Drive West Houses	13/04/2022 13:27	Asulam (ug/l)	<0.013	Catchment	4276350	6DERW7
BORROWASH	13/04/2022 13:26	Asulam (ug/l)	<0.013	Catchment	4276349	6DERWC
Derwent Met Nether Lane Hazelwood	13/04/2022 13:25	Asulam (ug/l)	<0.013	Catchment	4276353	6DERW7
Markeaton Brook @ Quarndon	13/04/2022 13:25	Asulam (ug/l)	<0.013	Catchment	4276352	6MARK0
Carr Brook footbridge	13/04/2022 13:22	Asulam (ug/l)	<0.013	Catchment	4276330	6CARR0
Hodgelane Brook	13/04/2022 13:22	Asulam (ug/l)	<0.013	Catchment	4276331	6HODG0
Smalley Brook	13/04/2022 13:21	Asulam (ug/l)	<0.013	Catchment	4276332	6SMAL1
Unamed tributary Woolley Moor	13/04/2022 13:20	Asulam (ug/l)	<0.026	Catchment	4276334	6AMBE2
River Amber outside Milltown	13/04/2022 13:19	Asulam (ug/l)	<0.013	Catchment	4276333	6AMBE2
R.Blythe - Blythe Bridge SP211898	08/04/2022 15:10	Asulam (ug/l)	<0.013	Catchment	4276357	8SBLY0
Bourne Brook	08/04/2022 14:18	Asulam (ug/l)	<0.013	Catchment	4276356	8SBOU1
Didgeley Brook	08/04/2022 14:17	Asulam (ug/l)	<0.013	Catchment	4276355	8SBOU1
R.Blythe - Packington SP218852	08/04/2022 13:28	Asulam (ug/l)	<0.013	Catchment	4276358	8SBLY0
R.Blythe - Solihull SP164789	08/04/2022 13:27	Asulam (ug/l)	<0.013	Catchment	4276354	8SBLY0
R.Blythe - Temple Balsall SP208763	08/04/2022 13:26	Asulam (ug/l)	<0.013	Catchment	4276360	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	08/04/2022 13:25	Asulam (ug/l)	<0.013	Catchment	4276359	8SBLY0
River Wye @ Kerne Bridge	31/03/2022 12:55	Asulam (ug/l)	<0.013	Catchment	4218186	2WYE

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River Wye @ King caple foot Bridge	31/03/2022 12:10	Asulam (ug/l)	<0.013	Catchment	4218185	2WYE
River Wye @ Hampton Bishop	31/03/2022 11:33	Asulam (ug/l)	<0.013	Catchment	4218189	2WYE
River Lugg @ Mordiford Bridge	31/03/2022 11:10	Asulam (ug/l)	<0.013	Catchment	4218184	2LUGG
River Frome at Larport Lane Bridge	31/03/2022 10:56	Asulam (ug/l)	<0.013	Catchment	4218188	2FROMA
River Lugg upstream Bridge	31/03/2022 09:57	Asulam (ug/l)	<0.013	Catchment	4218187	2LUGG
R Leam source to conf Rains Brook	30/03/2022 14:49	Asulam (ug/l)	<0.013	Catchment	4252216	3LEAM
Rains Bk to R Itchen u/s	30/03/2022 14:48	Asulam (ug/l)	<0.013	Catchment	4252221	3LEAM
R Stowe source to conf R Leam	30/03/2022 13:32	Asulam (ug/l)	<0.013	Catchment	4252211	3STOW
conf. R Stowe - Thorpe Bridge Ufton	30/03/2022 13:19	Asulam (ug/l)	<0.013	Catchment	4252214	3ITCH
to conf R Avon - Willes Meadow Foot	30/03/2022 12:39	Asulam (ug/l)	<0.013	Catchment	4252215	3LEAM
Radford Brook source to conf R Leam	30/03/2022 11:32	Asulam (ug/l)	<0.013	Catchment	4252218	3RADF
AL8 Leam - conf R Itchen to R Avon u/s	30/03/2022 10:40	Asulam (ug/l)	<0.013	Catchment	4252220	3LEAM
Brook to conf R Itchen	30/03/2022 10:13	Asulam (ug/l)	<0.013	Catchment	4252217	3LEAM
Stowe to conf. R Leam - Marton	30/03/2022 10:12	Asulam (ug/l)	<0.013	Catchment	4252213	3ITCH
R.Avon - Welford Bridge	30/03/2022 10:10	Asulam (ug/l)	<0.013	Catchment	4252212	3AVOU
R.Avon Station Road	30/03/2022 10:09	Asulam (ug/l)	<0.013	Catchment	4252219	3AVOU
Foston Brook 8 - Foston Upstream	29/03/2022 13:45	Asulam (ug/l)	<0.013	Catchment	4244928	6FOST1
downstream before confluence River	29/03/2022 13:45	Asulam (ug/l)	<0.013	Catchment	4244927	6FOST1
BORROWASH	29/03/2022 13:44	Asulam (ug/l)	<0.013	Catchment	4252210	6DERWC
Rolleston Brook upstream	29/03/2022 13:26	Asulam (ug/l)	<0.013	Catchment	4244921	7ROLL1

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Markeaton Brook @ Quarndon	29/03/2022 13:14	Asulam (ug/l)	<0.013	Catchment	4252207	6MARK0
Cubley Brook @ Little Cubley	29/03/2022 13:01	Asulam (ug/l)	<0.013	Catchment	4244931	6FOST1
Derwent Met Nether Lane Hazelwood	29/03/2022 13:01	Asulam (ug/l)	<0.013	Catchment	4252206	6DERW7
Cubley Brook at Boylestone	29/03/2022 13:00	Asulam (ug/l)	<0.013	Catchment	4244930	6FOST1
River Derwent at Ambergate NEW	29/03/2022 12:42	Asulam (ug/l)	<0.013	Catchment	4252208	6DERW7
Brailsford Brook at Longford	29/03/2022 12:29	Asulam (ug/l)	<0.013	Catchment	4244925	6BRAI1
Shirley Brook at Longford	29/03/2022 12:29	Asulam (ug/l)	<0.013	Catchment	4244926	6SHIR3
Mill Drive West Houses	29/03/2022 12:16	Asulam (ug/l)	<0.013	Catchment	4252209	6DERW7
River Dove Upstream	29/03/2022 11:38	Asulam (ug/l)	<0.013	Catchment	4244929	6DOVE2
Sutton Brook at Sutton on the Hill	29/03/2022 11:37	Asulam (ug/l)	<0.013	Catchment	4244924	6HILT1
Hodgelane Brook	29/03/2022 11:17	Asulam (ug/l)	<0.013	Catchment	4252204	6HODG0
Smalley Brook	29/03/2022 11:04	Asulam (ug/l)	<0.013	Catchment	4252203	6SMAL1
River Amber outside Milltown	29/03/2022 11:01	Asulam (ug/l)	<0.013	Catchment	4252202	6AMBE2
Carr Brook footbridge	29/03/2022 10:48	Asulam (ug/l)	<0.013	Catchment	4252205	6CARR0
Hilton Brook downstream	29/03/2022 10:41	Asulam (ug/l)	<0.013	Catchment	4244923	6HILT1
confluence Rolleston Brook	29/03/2022 10:40	Asulam (ug/l)	<0.013	Catchment	4244943	7ROLL1
River Dove at Egginton Raw	29/03/2022 10:39	Asulam (ug/l)	<0.013	Catchment	4244922	4MELBN
Rolleston Brook downstream	29/03/2022 10:39	Asulam (ug/l)	<0.013	Catchment	4244944	7ROLL1
R.Severn nr Upton Magna	22/03/2022 11:42	Asulam (ug/l)	<0.013	Catchment	4218193	1SEVE
River Tern d/s at Tern Bridge	22/03/2022 11:41	Asulam (ug/l)	<0.013	Catchment	4218198	1SEVE

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Cound Brook from bridge	22/03/2022 11:24	Asulam (ug/l)	<0.013	Catchment	4218197	1COUN
R.Stour upstream Hampton Loade	22/03/2022 11:15	Asulam (ug/l)	<0.013	Catchment	4218196	1SEVE
R.Severn nr Bridgnorth	22/03/2022 11:00	Asulam (ug/l)	<0.013	Catchment	4218195	1SEVE
R.Severn nr Broseley	22/03/2022 10:58	Asulam (ug/l)	<0.013	Catchment	4218194	1SEVE
Teme to R Avon d/s Bushley Longdon Bk	17/03/2022 14:19	Asulam (ug/l)	<0.013	Catchment	4218200	1SEVE
Stour to River Teme d/s Salwarpe	17/03/2022 12:47	Asulam (ug/l)	<0.013	Catchment	4218202	1SEVE
Stour to River Teme u/s Shrawley Bk	17/03/2022 12:29	Asulam (ug/l)	<0.013	Catchment	4218203	1SEVE
Stourport (DS R.Stour)	17/03/2022 11:47	Asulam (ug/l)	<0.013	Catchment	4218204	1SEVE
WS13 Severn - R Teme to R Avon u/s	17/03/2022 10:40	Asulam (ug/l)	<0.013	Catchment	4218201	1SEVE
River Teme downstream	17/03/2022 10:22	Asulam (ug/l)	<0.013	Catchment	4218199	2TEMEA
R.Severn nr Kempsey	17/03/2022 09:57	Asulam (ug/l)	<0.013	Catchment	4218205	1SEVE
R.Severn nr Upton Marina	17/03/2022 09:39	Asulam (ug/l)	<0.013	Catchment	4218206	1SEVE
Didgeley Brook	14/03/2022 14:40	Asulam (ug/l)	<0.013	Catchment	4244941	8SBOU1
Bourne Brook	14/03/2022 14:39	Asulam (ug/l)	<0.013	Catchment	4244940	8SBOU1
R.Blythe - Blythe Bridge SP211898	14/03/2022 14:38	Asulam (ug/l)	<0.013	Catchment	4244939	8SBLY0
R.Blythe - Packington SP218852	14/03/2022 13:31	Asulam (ug/l)	<0.013	Catchment	4244938	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	14/03/2022 13:30	Asulam (ug/l)	<0.013	Catchment	4244937	8SBLY0
R.Blythe - Solihull SP164789	14/03/2022 13:29	Asulam (ug/l)	<0.013	Catchment	4244942	8SBLY0
R.Blythe - Temple Balsall SP208763	14/03/2022 13:29	Asulam (ug/l)	<0.013	Catchment	4244936	8SBLY0
7b - Bradgate Chapel, Cropston Reservoir	11/03/2022 09:48	Asulam (ug/l)	<0.013	Catchment	4239665	4QUORB

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Cropston Res car park	11/03/2022 09:42	Asulam (ug/l)	<0.013	Catchment	4239664	4QUORB
Swithland Village opp St Leonards Church	10/03/2022 16:49	Asulam (ug/l)	<0.013	Catchment	4239661	4QUORB
Swithland feed adj railway	10/03/2022 16:28	Asulam (ug/l)	<0.013	Catchment	4239660	4QUORB
Bradgate Road, Cropston under	10/03/2022 15:43	Asulam (ug/l)	<0.013	Catchment	4239662	4QUORB
Newtown Linford T - junction	10/03/2022 15:13	Asulam (ug/l)	<0.013	Catchment	4239663	4QUORB
Jubilee Brook	10/03/2022 15:08	Asulam (ug/l)	<0.013	Catchment	4239657	4JUBIB
Lane at Ulverscroft Wood	10/03/2022 15:08	Asulam (ug/l)	<0.013	Catchment	4239659	4QUORB
Scotts Brook	10/03/2022 15:06	Asulam (ug/l)	<0.013	Catchment	4239658	4SCOTB
Heath End Brook	10/03/2022 15:05	Asulam (ug/l)	<0.013	Catchment	4239655	4HEATB
Staunton Harold Brook	10/03/2022 15:04	Asulam (ug/l)	<0.013	Catchment	4239656	4STAUB
Didgeley Brook	01/03/2022 14:02	Asulam (ug/l)	<0.013	Catchment	4224157	8SBOU1
Bourne Brook	01/03/2022 14:01	Asulam (ug/l)	<0.013	Catchment	4224158	8SBOU1
R.Blythe - Blythe Bridge SP211898	01/03/2022 14:01	Asulam (ug/l)	<0.013	Catchment	4224159	8SBLY0
R.Blythe - Solihull SP164789	01/03/2022 12:46	Asulam (ug/l)	<0.013	Catchment	4224156	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	01/03/2022 12:45	Asulam (ug/l)	<0.013	Catchment	4224161	8SBLY0
R.Blythe - Packington SP218852	01/03/2022 12:45	Asulam (ug/l)	<0.013	Catchment	4224160	8SBLY0
R.Blythe - Temple Balsall SP208763	01/03/2022 12:44	Asulam (ug/l)	<0.013	Catchment	4224162	8SBLY0
Shirley Brook at Longford	28/02/2022 14:31	Asulam (ug/l)	<0.013	Catchment	4224147	6SHIR3
Brailsford Brook at Longford	28/02/2022 14:30	Asulam (ug/l)	<0.013	Catchment	4224148	6BRAI1
Rolleston Brook upstream	28/02/2022 13:27	Asulam (ug/l)	<0.013	Catchment	4224152	7ROLL1

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Mill Fleam upstream	28/02/2022 13:26	Asulam (ug/l)	<0.013	Catchment	4224153	7ROLL1
Cubley Brook @ Little Cubley	28/02/2022 13:22	Asulam (ug/l)	<0.013	Catchment	4224142	6FOST1
Cubley Brook at Boylestone	28/02/2022 13:22	Asulam (ug/l)	<0.013	Catchment	4224143	6FOST1
Foston Brook 8 - Foston Upstream	28/02/2022 12:01	Asulam (ug/l)	<0.013	Catchment	4224145	6FOST1
downstream before confluence River	28/02/2022 12:01	Asulam (ug/l)	<0.013	Catchment	4224146	6FOST1
Sutton Brook at Sutton on the Hill	28/02/2022 12:00	Asulam (ug/l)	<0.013	Catchment	4224149	6HILT1
R.Severn nr Upton Magna	28/02/2022 11:48	Asulam (ug/l)	<0.013	Catchment	4217937	1SEVE
River Tern d/s at Tern Bridge	28/02/2022 11:18	Asulam (ug/l)	<0.013	Catchment	4217932	1SEVE
River Dove Upstream	28/02/2022 11:11	Asulam (ug/l)	<0.013	Catchment	4224144	6DOVE2
Rolleston Brook downstream	28/02/2022 11:10	Asulam (ug/l)	<0.013	Catchment	4224154	7ROLL1
Hilton Brook downstream	28/02/2022 11:09	Asulam (ug/l)	<0.013	Catchment	4224150	6HILT1
River Dove at Egginton Raw	28/02/2022 11:09	Asulam (ug/l)	<0.013	Catchment	4224151	4MELBN
Cound Brook from bridge	28/02/2022 11:02	Asulam (ug/l)	<0.013	Catchment	4217933	1COUN
R.Severn nr Broseley	28/02/2022 10:43	Asulam (ug/l)	<0.013	Catchment	4217936	1SEVE
R.Severn nr Bridgnorth	28/02/2022 10:06	Asulam (ug/l)	<0.013	Catchment	4217935	1SEVE
R.Stour upstream Hampton Loade	28/02/2022 09:46	Asulam (ug/l)	<0.013	Catchment	4217934	1SEVE
River Wye @ Kerne Bridge	28/02/2022 09:32	Asulam (ug/l)	<0.013	Catchment	4217929	2WYE
River Wye @ King caple foot Bridge	28/02/2022 08:59	Asulam (ug/l)	<0.013	Catchment	4217930	2WYE
River Wye @ Hampton Bishop	28/02/2022 08:22	Asulam (ug/l)	<0.013	Catchment	4217926	2WYE
River Lugg @ Mordiford Bridge	28/02/2022 07:59	Asulam (ug/l)	<0.013	Catchment	4217931	2LUGG

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River Frome at Larport Lane Bridge	28/02/2022 07:48	Asulam (ug/l)	<0.013	Catchment	4217927	2FROMA
River Lugg upstream Bridge	28/02/2022 07:18	Asulam (ug/l)	<0.013	Catchment	4217928	2LUGG
BORROWASH	25/02/2022 12:51	Asulam (ug/l)	<0.013	Catchment	4224171	6DERWC
River Amber outside Milltown	25/02/2022 12:50	Asulam (ug/l)	<0.013	Catchment	4224177	6AMBE2
Hodgelane Brook	25/02/2022 12:04	Asulam (ug/l)	<0.013	Catchment	4224125	6HODG0
Smalley Brook	25/02/2022 12:03	Asulam (ug/l)	<0.013	Catchment	4224176	6SMAL1
Unamed tributary Woolley Moor	25/02/2022 12:02	Asulam (ug/l)	<0.013	Catchment	4224178	6AMBE2
Carr Brook footbridge	25/02/2022 12:01	Asulam (ug/l)	<0.013	Catchment	4224124	6CARR0
River Derwent at Ambergate NEW	25/02/2022 11:59	Asulam (ug/l)	<0.013	Catchment	4224173	6DERW7
Mill Drive West Houses	25/02/2022 11:58	Asulam (ug/l)	<0.013	Catchment	4224172	6DERW7
Derwent Met Nether Lane Hazelwood	25/02/2022 11:57	Asulam (ug/l)	<0.013	Catchment	4224175	6DERW7
Markeaton Brook @ Quarndon	25/02/2022 11:56	Asulam (ug/l)	<0.013	Catchment	4224174	6MARK0
Teme to R Avon d/s Bushley Longdon Bk	17/02/2022 14:01	Asulam (ug/l)	<0.013	Catchment	4217944	1SEVE
Stour to River Teme d/s Salwarpe	17/02/2022 13:02	Asulam (ug/l)	<0.013	Catchment	4217942	1SEVE
Stour to River Teme u/s Shrawley Bk	17/02/2022 12:44	Asulam (ug/l)	<0.013	Catchment	4217941	1SEVE
Lane at Ulverscroft Wood	17/02/2022 12:05	Asulam (ug/l)	<0.013	Catchment	4218218	4QUORB
Stourport (DS R.Stour)	17/02/2022 11:59	Asulam (ug/l)	<0.013	Catchment	4217940	1SEVE
Newtown Linford T - junction	17/02/2022 11:47	Asulam (ug/l)	<0.013	Catchment	4218214	4QUORB
Swithland Village opp St Leonards Church	17/02/2022 11:35	Asulam (ug/l)	<0.013	Catchment	4218216	4QUORB
WS13 Severn - R Teme to R Avon u/s	17/02/2022 11:15	Asulam (ug/l)	<0.013	Catchment	4217943	1SEVE

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Swithland feed adj railway	17/02/2022 11:10	Asulam (ug/l)	<0.013	Catchment	4218217	4QUORB
Bradgate Road, Cropston under	17/02/2022 10:56	Asulam (ug/l)	<0.013	Catchment	4218215	4QUORB
River Teme downstream	17/02/2022 10:56	Asulam (ug/l)	<0.013	Catchment	4217945	2TEMEA
R.Severn nr Kempsey	17/02/2022 10:39	Asulam (ug/l)	<0.013	Catchment	4217939	1SEVE
7b - Bradgate Chapel, Cropston Reservoir	17/02/2022 10:15	Asulam (ug/l)	<0.013	Catchment	4218212	4QUORB
R.Severn nr Upton Marina	17/02/2022 10:08	Asulam (ug/l)	<0.013	Catchment	4217938	1SEVE
Cropston Res car park	17/02/2022 09:44	Asulam (ug/l)	<0.013	Catchment	4218213	4QUORB
Jubilee Brook	16/02/2022 14:52	Asulam (ug/l)	<0.013	Catchment	4218209	4JUBIB
Scotts Brook	16/02/2022 14:51	Asulam (ug/l)	<0.013	Catchment	4218208	4SCOTB
Heath End Brook	16/02/2022 14:03	Asulam (ug/l)	<0.013	Catchment	4218211	4HEATB
Staunton Harold Brook	16/02/2022 14:01	Asulam (ug/l)	<0.013	Catchment	4218210	4STAUB
Brook to conf R Itchen	04/02/2022 13:00	Asulam (ug/l)	<0.013	Catchment	4226847	3LEAM
AL8 Leam - conf R Itchen to R Avon u/s	03/02/2022 14:29	Asulam (ug/l)	<0.013	Catchment	4226844	3LEAM
to conf R Avon - Willes Meadow Foot	03/02/2022 14:02	Asulam (ug/l)	<0.013	Catchment	4226849	3LEAM
Radford Brook source to conf R Leam	03/02/2022 13:48	Asulam (ug/l)	<0.013	Catchment	4226846	3RADF
conf. R Stowe - Thorpe Bridge Ufton	03/02/2022 13:26	Asulam (ug/l)	<0.013	Catchment	4226850	3ITCH
R Stowe source to conf R Leam	03/02/2022 13:16	Asulam (ug/l)	<0.013	Catchment	4226853	3STOW
R.Avon Station Road	03/02/2022 12:08	Asulam (ug/l)	<0.013	Catchment	4226845	3AVOU
R.Avon - Welford Bridge	03/02/2022 11:47	Asulam (ug/l)	<0.013	Catchment	4226852	3AVOU
R Leam source to conf Rains Brook	03/02/2022 09:45	Asulam (ug/l)	<0.013	Catchment	4226848	3LEAM

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Rains Bk to R Itchen u/s	03/02/2022 09:31	Asulam (ug/l)	<0.013	Catchment	4226843	3LEAM
River Wye @ Kerne Bridge	31/01/2022 10:25	Asulam (ug/l)	<0.013	Catchment	4172329	2WYE
River Wye @ King caple foot Bridge	31/01/2022 09:46	Asulam (ug/l)	<0.013	Catchment	4172330	2WYE
River Wye @ Hampton Bishop	31/01/2022 09:11	Asulam (ug/l)	<0.013	Catchment	4172326	2WYE
River Lugg @ Mordiford Bridge	31/01/2022 08:49	Asulam (ug/l)	<0.013	Catchment	4172331	2LUGG
River Frome at Larport Lane Bridge	31/01/2022 08:37	Asulam (ug/l)	<0.013	Catchment	4172327	2FROMA
River Lugg upstream Bridge	31/01/2022 07:54	Asulam (ug/l)	<0.013	Catchment	4172328	2LUGG
Smalley Brook	21/01/2022 13:41	Asulam (ug/l)	<0.013	Catchment	4206247	6SMAL1
Unamed tributary Woolley Moor	21/01/2022 13:41	Asulam (ug/l)	<0.013	Catchment	4206245	6AMBE2
River Amber outside Milltown	21/01/2022 13:40	Asulam (ug/l)	<0.013	Catchment	4206246	6AMBE2
Hodgelane Brook	21/01/2022 13:39	Asulam (ug/l)	<0.013	Catchment	4206243	6HODG0
Carr Brook footbridge	21/01/2022 13:38	Asulam (ug/l)	<0.013	Catchment	4206244	6CARR0
Derwent Met Nether Lane Hazelwood	21/01/2022 13:14	Asulam (ug/l)	<0.013	Catchment	4206238	6DERW7
Markeaton Brook @ Quarndon	21/01/2022 13:14	Asulam (ug/l)	<0.013	Catchment	4206239	6MARK0
River Derwent at Ambergate NEW	21/01/2022 13:13	Asulam (ug/l)	<0.013	Catchment	4206240	6DERW7
BORROWASH	21/01/2022 13:12	Asulam (ug/l)	<0.013	Catchment	4206242	6DERWC
Mill Drive West Houses	21/01/2022 13:11	Asulam (ug/l)	<0.013	Catchment	4206241	6DERW7
Stour to River Teme d/s Salwarpe	20/01/2022 13:26	Asulam (ug/l)	<0.013	Catchment	4172342	1SEVE
Stour to River Teme u/s Shrawley Bk	20/01/2022 13:08	Asulam (ug/l)	<0.013	Catchment	4172341	1SEVE
Stourport (DS R.Stour)	20/01/2022 12:38	Asulam (ug/l)	<0.013	Catchment	4172340	1SEVE

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WS13 Severn - R Teme to R Avon u/s	20/01/2022 11:46	Asulam (ug/l)	<0.013	Catchment	4172343	1SEVE
River Teme downstream	20/01/2022 11:25	Asulam (ug/l)	<0.013	Catchment	4172345	2TEMEA
R.Severn nr Kempsey	20/01/2022 11:10	Asulam (ug/l)	<0.013	Catchment	4172339	1SEVE
R.Severn nr Upton Marina	20/01/2022 10:26	Asulam (ug/l)	<0.013	Catchment	4172338	1SEVE
Teme to R Avon d/s Bushley Longdon Bk	20/01/2022 10:02	Asulam (ug/l)	<0.013	Catchment	4172344	1SEVE
confluence Rolleston Brook	18/01/2022 15:26	Asulam (ug/l)	<0.013	Catchment	4206205	7ROLL1
River Dove at Egginton Raw	18/01/2022 15:25	Asulam (ug/l)	<0.013	Catchment	4206209	4MELBN
Rolleston Brook downstream	18/01/2022 15:25	Asulam (ug/l)	<0.013	Catchment	4206206	7ROLL1
Jubilee Brook	18/01/2022 15:00	Asulam (ug/l)	<0.013	Catchment	4206196	4JUBIB
Scotts Brook	18/01/2022 14:51	Asulam (ug/l)	<0.013	Catchment	4206197	4SCOTB
Heath End Brook	18/01/2022 14:13	Asulam (ug/l)	<0.013	Catchment	4206194	4HEATB
Staunton Harold Brook	18/01/2022 14:12	Asulam (ug/l)	<0.013	Catchment	4206195	4STAUB
Mill Fleam upstream	18/01/2022 14:11	Asulam (ug/l)	<0.013	Catchment	4206207	7ROLL1
Rolleston Brook upstream	18/01/2022 14:11	Asulam (ug/l)	<0.013	Catchment	4206208	7ROLL1
Lane at Ulverscroft Wood	18/01/2022 13:43	Asulam (ug/l)	<0.013	Catchment	4206198	4QUORB
Newtown Linford T - junction	18/01/2022 13:19	Asulam (ug/l)	<0.013	Catchment	4206202	4QUORB
Hilton Brook downstream	18/01/2022 13:05	Asulam (ug/l)	<0.013	Catchment	4206210	6HILT1
Sutton Brook at Sutton on the Hill	18/01/2022 13:04	Asulam (ug/l)	<0.013	Catchment	4206211	6HILT1
downstream before confluence River	18/01/2022 13:02	Asulam (ug/l)	<0.013	Catchment	4206214	6FOST1
Foston Brook 8 - Foston Upstream	18/01/2022 13:01	Asulam (ug/l)	<0.013	Catchment	4206215	6FOST1

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River Dove Upstream	18/01/2022 12:52	Asulam (ug/l)	<0.013	Catchment	4206216	6DOVE2
Cubley Brook at Boylestone	18/01/2022 12:51	Asulam (ug/l)	<0.013	Catchment	4206217	6FOST1
Cubley Brook @ Little Cubley	18/01/2022 12:30	Asulam (ug/l)	<0.013	Catchment	4206218	6FOST1
Brailsford Brook at Longford	18/01/2022 11:43	Asulam (ug/l)	<0.013	Catchment	4206212	6BRAI1
Shirley Brook at Longford	18/01/2022 11:43	Asulam (ug/l)	<0.013	Catchment	4206213	6SHIR3
River Tern d/s at Tern Bridge	18/01/2022 11:39	Asulam (ug/l)	<0.013	Catchment	4172332	1SEVE
Swithland Village opp St Leonards Church	18/01/2022 11:37	Asulam (ug/l)	<0.013	Catchment	4206200	4QUORB
Cound Brook from bridge	18/01/2022 11:17	Asulam (ug/l)	<0.013	Catchment	4172333	1COUN
Swithland feed adj railway	18/01/2022 11:09	Asulam (ug/l)	<0.013	Catchment	4206199	4QUORB
R.Severn nr Upton Magna	18/01/2022 10:56	Asulam (ug/l)	<0.013	Catchment	4172337	1SEVE
Bradgate Road, Cropston under	18/01/2022 10:46	Asulam (ug/l)	<0.013	Catchment	4206201	4QUORB
R.Severn nr Broseley	18/01/2022 10:34	Asulam (ug/l)	<0.013	Catchment	4172336	1SEVE
7b - Bradgate Chapel, Cropston Reservoir	18/01/2022 10:08	Asulam (ug/l)	<0.013	Catchment	4206204	4QUORB
R.Severn nr Bridgnorth	18/01/2022 10:08	Asulam (ug/l)	<0.013	Catchment	4172335	1SEVE
R.Stour upstream Hampton Loade	18/01/2022 09:45	Asulam (ug/l)	<0.013	Catchment	4172334	1SEVE
Cropston Res car park	18/01/2022 09:38	Asulam (ug/l)	<0.013	Catchment	4206203	4QUORB
R.Blythe - Bradnocks Marsh SP216793	14/01/2022 12:26	Asulam (ug/l)	<0.013	Catchment	4206224	8SBLY0
R.Blythe - Packington SP218852	14/01/2022 12:25	Asulam (ug/l)	<0.013	Catchment	4206225	8SBLY0
Bourne Brook	14/01/2022 12:23	Asulam (ug/l)	<0.013	Catchment	4206227	8SBOU1
Didgeley Brook	14/01/2022 12:23	Asulam (ug/l)	<0.013	Catchment	4206228	8SBOU1

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R.Blythe - Solihull SP164789	14/01/2022 12:19	Asulam (ug/l)	<0.013	Catchment	4206229	8SBLY0
R.Blythe - Temple Balsall SP208763	14/01/2022 12:04	Asulam (ug/l)	<0.013	Catchment	4206223	8SBLY0
to conf R Avon - Willes Meadow Foot	06/01/2022 12:50	Asulam (ug/l)	<0.013	Catchment	4206252	3LEAM
Radford Brook source to conf R Leam	06/01/2022 12:50	Asulam (ug/l)	<0.013	Catchment	4206255	3RADF
conf. R Stowe - Thorpe Bridge Ufton	06/01/2022 12:25	Asulam (ug/l)	<0.013	Catchment	4206251	3ITCH
R Stowe source to conf R Leam	06/01/2022 12:24	Asulam (ug/l)	<0.013	Catchment	4206248	3STOW
Stowe to conf. R Leam - Marton	06/01/2022 11:40	Asulam (ug/l)	<0.013	Catchment	4206250	3ITCH
Brook to conf R Itchen	06/01/2022 11:39	Asulam (ug/l)	<0.013	Catchment	4206254	3LEAM
AL8 Leam - conf R Itchen to R Avon u/s	06/01/2022 11:38	Asulam (ug/l)	<0.013	Catchment	4206257	3LEAM
R Leam source to conf Rains Brook	06/01/2022 11:00	Asulam (ug/l)	<0.013	Catchment	4206253	3LEAM
Rains Bk to R Itchen u/s	06/01/2022 10:58	Asulam (ug/l)	<0.013	Catchment	4206258	3LEAM
R.Avon - Welford Bridge	05/01/2022 16:03	Asulam (ug/l)	<0.013	Catchment	4206249	3AVOU
R.Avon Station Road	05/01/2022 15:19	Asulam (ug/l)	<0.013	Catchment	4206256	3AVOU
7b - Bradgate Chapel, Cropston Reservoir	30/12/2021 12:16	Asulam (ug/l)	<0.013	Catchment	4164151	4QUORB
River Wye @ Kerne Bridge	30/12/2021 12:14	Asulam (ug/l)	<0.013	Catchment	4156420	2WYE
River Wye @ King caple foot Bridge	30/12/2021 11:33	Asulam (ug/l)	<0.013	Catchment	4156419	2WYE
River Wye @ Hampton Bishop	30/12/2021 10:57	Asulam (ug/l)	<0.013	Catchment	4156423	2WYE
Lane at Ulverscroft Wood	30/12/2021 10:53	Asulam (ug/l)	<0.013	Catchment	4164157	4QUORB
River Lugg @ Mordiford Bridge	30/12/2021 10:38	Asulam (ug/l)	<0.013	Catchment	4156418	2LUGG
River Frome at Larport Lane Bridge	30/12/2021 10:26	Asulam (ug/l)	<0.013	Catchment	4156422	2FROMA

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Newtown Linford T - junction	30/12/2021 10:21	Asulam (ug/l)	<0.013	Catchment	4164153	4QUORB
Swithland Village opp St Leonards Church	30/12/2021 10:07	Asulam (ug/l)	<0.013	Catchment	4164155	4QUORB
Swithland feed adj railway	30/12/2021 10:04	Asulam (ug/l)	<0.013	Catchment	4164156	4QUORB
River Lugg upstream Bridge	30/12/2021 09:52	Asulam (ug/l)	<0.013	Catchment	4156421	2LUGG
Bradgate Road, Cropston under	30/12/2021 09:41	Asulam (ug/l)	<0.013	Catchment	4164154	4QUORB
Cropston Res car park	30/12/2021 09:22	Asulam (ug/l)	<0.013	Catchment	4164152	4QUORB
Jubilee Brook	29/12/2021 14:34	Asulam (ug/l)	<0.013	Catchment	4164159	4JUBIB
Scotts Brook	29/12/2021 14:22	Asulam (ug/l)	<0.013	Catchment	4164158	4SCOTB
Heath End Brook	29/12/2021 13:01	Asulam (ug/l)	<0.013	Catchment	4164161	4HEATB
Staunton Harold Brook	29/12/2021 13:01	Asulam (ug/l)	<0.013	Catchment	4164160	4STAUB
BORROWASH	22/12/2021 12:30	Asulam (ug/l)	<0.013	Catchment	4175366	6DERWC
Markeaton Brook @ Quarndon	22/12/2021 12:29	Asulam (ug/l)	<0.013	Catchment	4175369	6MARK0
Derwent Met Nether Lane Hazelwood	22/12/2021 12:28	Asulam (ug/l)	<0.013	Catchment	4175370	6DERW7
River Derwent at Ambergate NEW	22/12/2021 12:27	Asulam (ug/l)	<0.013	Catchment	4175368	6DERW7
Hodgelane Brook	22/12/2021 11:42	Asulam (ug/l)	<0.013	Catchment	4175384	6HODG0
Smalley Brook	22/12/2021 11:41	Asulam (ug/l)	<0.013	Catchment	4175380	6SMAL1
Carr Brook footbridge	22/12/2021 11:25	Asulam (ug/l)	<0.013	Catchment	4175383	6CARR0
River Amber outside Milltown	22/12/2021 11:24	Asulam (ug/l)	<0.013	Catchment	4175381	6AMBE2
Unamed tributary Woolley Moor	22/12/2021 11:24	Asulam (ug/l)	<0.013	Catchment	4175382	6AMBE2
Mill Drive West Houses	22/12/2021 10:34	Asulam (ug/l)	<0.013	Catchment	4175367	6DERW7

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Cound Brook from bridge	20/12/2021 14:49	Asulam (ug/l)	<0.013	Catchment	4160520	1COUN
R.Stour upstream Hampton Loade	20/12/2021 14:48	Asulam (ug/l)	<0.013	Catchment	4160519	1SEVE
R.Severn nr Broseley	20/12/2021 14:47	Asulam (ug/l)	<0.013	Catchment	4160517	1SEVE
R.Severn nr Upton Magna	20/12/2021 14:46	Asulam (ug/l)	<0.013	Catchment	4160516	1SEVE
R.Severn nr Bridgnorth	20/12/2021 14:45	Asulam (ug/l)	<0.013	Catchment	4160518	1SEVE
River Tern d/s at Tern Bridge	20/12/2021 14:44	Asulam (ug/l)	<0.013	Catchment	4160521	1SEVE
Teme to R Avon d/s Bushley Longdon Bk	17/12/2021 13:19	Asulam (ug/l)	<0.013	Catchment	4156425	1SEVE
R.Severn nr Upton Marina	17/12/2021 08:44	Asulam (ug/l)	<0.013	Catchment	4156431	1SEVE
Stour to River Teme d/s Salwarpe	16/12/2021 14:27	Asulam (ug/l)	<0.013	Catchment	4156427	1SEVE
Stour to River Teme u/s Shrawley Bk	16/12/2021 13:41	Asulam (ug/l)	<0.013	Catchment	4156428	1SEVE
Stourport (DS R.Stour)	16/12/2021 12:52	Asulam (ug/l)	<0.013	Catchment	4156429	1SEVE
WS13 Severn - R Teme to R Avon u/s	16/12/2021 11:03	Asulam (ug/l)	<0.013	Catchment	4156426	1SEVE
River Teme downstream	16/12/2021 10:38	Asulam (ug/l)	<0.013	Catchment	4156424	2TEMEA
R.Severn nr Kempsey	16/12/2021 10:13	Asulam (ug/l)	<0.013	Catchment	4156430	1SEVE
Hilton Brook downstream	14/12/2021 12:33	Asulam (ug/l)	<0.013	Catchment	4175313	6HILT1
Brailsford Brook at Longford	14/12/2021 12:32	Asulam (ug/l)	<0.013	Catchment	4175311	6BRAI1
Sutton Brook at Sutton on the Hill	14/12/2021 12:32	Asulam (ug/l)	<0.013	Catchment	4175312	6HILT1
Cubley Brook @ Little Cubley	14/12/2021 12:31	Asulam (ug/l)	<0.013	Catchment	4175305	6FOST1
Cubley Brook at Boylestone	14/12/2021 12:31	Asulam (ug/l)	<0.013	Catchment	4175306	6FOST1
Shirley Brook at Longford	14/12/2021 12:31	Asulam (ug/l)	<0.013	Catchment	4175310	6SHIR3

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downstream before confluence River	14/12/2021 12:26	Asulam (ug/l)	<0.013	Catchment	4175309	6FOST1
River Dove at Egginton Raw	14/12/2021 12:24	Asulam (ug/l)	<0.013	Catchment	4175314	4MELBN
Rolleston Brook upstream	14/12/2021 12:24	Asulam (ug/l)	<0.013	Catchment	4175315	7ROLL1
Rolleston Brook downstream	14/12/2021 12:22	Asulam (ug/l)	<0.013	Catchment	4175317	7ROLL1
confluence Rolleston Brook	14/12/2021 12:14	Asulam (ug/l)	<0.013	Catchment	4175318	7ROLL1
Foston Brook 8 - Foston Upstream	14/12/2021 12:13	Asulam (ug/l)	<0.013	Catchment	4175308	6FOST1
River Dove Upstream	14/12/2021 12:13	Asulam (ug/l)	<0.013	Catchment	4175307	6DOVE2
R.Blythe - Blythe Bridge SP211898	08/12/2021 13:58	Asulam (ug/l)	<0.013	Catchment	4175340	8SBLY0
Didgeley Brook	08/12/2021 13:57	Asulam (ug/l)	<0.013	Catchment	4175338	8SBOU1
Bourne Brook	08/12/2021 13:56	Asulam (ug/l)	<0.013	Catchment	4175339	8SBOU1
R.Blythe - Bradnocks Marsh SP216793	08/12/2021 13:54	Asulam (ug/l)	<0.013	Catchment	4175342	8SBLY0
R.Blythe - Solihull SP164789	08/12/2021 12:56	Asulam (ug/l)	<0.013	Catchment	4175337	8SBLY0
R.Blythe - Packington SP218852	08/12/2021 12:54	Asulam (ug/l)	<0.013	Catchment	4175341	8SBLY0
R.Blythe - Temple Balsall SP208763	08/12/2021 12:48	Asulam (ug/l)	<0.013	Catchment	4175343	8SBLY0
R.Avon - Welford Bridge	01/12/2021 13:34	Asulam (ug/l)	<0.013	Catchment	4169603	3AVOU
R.Avon Station Road	01/12/2021 13:34	Asulam (ug/l)	<0.013	Catchment	4169596	3AVOU
R Leam source to conf Rains Brook	01/12/2021 13:08	Asulam (ug/l)	<0.013	Catchment	4169599	3LEAM
Rains Bk to R Itchen u/s	01/12/2021 12:44	Asulam (ug/l)	<0.013	Catchment	4169594	3LEAM
Stowe to conf. R Leam - Marton	01/12/2021 12:13	Asulam (ug/l)	<0.013	Catchment	4169602	3ITCH
Brook to conf R Itchen	01/12/2021 12:12	Asulam (ug/l)	<0.013	Catchment	4169598	3LEAM

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AL8 Leam - conf R Itchen to R Avon u/s	01/12/2021 12:09	Asulam (ug/l)	<0.013	Catchment	4169595	3LEAM
Radford Brook source to conf R Leam	01/12/2021 11:23	Asulam (ug/l)	<0.013	Catchment	4169597	3RADF
to conf R Avon - Willes Meadow Foot	01/12/2021 11:22	Asulam (ug/l)	<0.013	Catchment	4169600	3LEAM
conf. R Stowe - Thorpe Bridge Ufton	01/12/2021 10:13	Asulam (ug/l)	<0.013	Catchment	4169601	3ITCH
R Stowe source to conf R Leam	01/12/2021 09:58	Asulam (ug/l)	<0.013	Catchment	4169604	3STOW
River Wye @ Kerne Bridge	29/11/2021 12:20	Asulam (ug/l)	<0.013	Catchment	4127633	2WYE
River Wye @ King caple foot Bridge	29/11/2021 11:42	Asulam (ug/l)	<0.013	Catchment	4127634	2WYE
River Wye @ Hampton Bishop	29/11/2021 11:02	Asulam (ug/l)	<0.013	Catchment	4127630	2WYE
River Lugg @ Mordiford Bridge	29/11/2021 10:42	Asulam (ug/l)	<0.013	Catchment	4127635	2LUGG
River Frome at Larport Lane Bridge	29/11/2021 10:29	Asulam (ug/l)	<0.013	Catchment	4127631	2FROMA
River Lugg upstream Bridge	29/11/2021 09:56	Asulam (ug/l)	<0.013	Catchment	4127632	2LUGG
confluence Rolleston Brook	26/11/2021 15:35	Asulam (ug/l)	<0.013	Catchment	4135512	7ROLL1
Rolleston Brook downstream	26/11/2021 15:32	Asulam (ug/l)	<0.013	Catchment	4135513	7ROLL1
River Dove at Egginton Raw	26/11/2021 15:30	Asulam (ug/l)	<0.013	Catchment	4135516	4MELBN
Rolleston Brook upstream	26/11/2021 15:30	Asulam (ug/l)	<0.013	Catchment	4135515	7ROLL1
Hilton Brook downstream	26/11/2021 15:29	Asulam (ug/l)	<0.013	Catchment	4135517	6HILT1
Sutton Brook at Sutton on the Hill	26/11/2021 15:28	Asulam (ug/l)	<0.013	Catchment	4135518	6HILT1
Brailsford Brook at Longford	26/11/2021 15:27	Asulam (ug/l)	<0.013	Catchment	4135519	6BRAI1
Shirley Brook at Longford	26/11/2021 15:25	Asulam (ug/l)	<0.013	Catchment	4135520	6SHIR3
Foston Brook 8 - Foston Upstream	26/11/2021 15:24	Asulam (ug/l)	<0.013	Catchment	4135522	6FOST1

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downstream before confluence River	26/11/2021 15:24	Asulam (ug/l)	<0.013	Catchment	4135521	6FOST1
Cubley Brook at Boylestone	26/11/2021 15:23	Asulam (ug/l)	<0.013	Catchment	4135524	6FOST1
River Dove Upstream	26/11/2021 15:23	Asulam (ug/l)	<0.013	Catchment	4135523	6DOVE2
Cubley Brook @ Little Cubley	26/11/2021 15:18	Asulam (ug/l)	<0.013	Catchment	4135525	6FOST1
BORROWASH	26/11/2021 14:15	Asulam (ug/l)	<0.013	Catchment	4135496	6DERWC
Markeaton Brook @ Quarndon	26/11/2021 13:45	Asulam (ug/l)	<0.013	Catchment	4135493	6MARK0
Derwent Met Nether Lane Hazelwood	26/11/2021 13:33	Asulam (ug/l)	<0.013	Catchment	4135492	6DERW7
River Derwent at Ambergate NEW	26/11/2021 13:15	Asulam (ug/l)	<0.013	Catchment	4135494	6DERW7
Hodgelane Brook	26/11/2021 12:40	Asulam (ug/l)	<0.013	Catchment	4135323	6HODG0
River Amber outside Milltown	26/11/2021 12:22	Asulam (ug/l)	<0.013	Catchment	4135326	6AMBE2
Smalley Brook	26/11/2021 12:21	Asulam (ug/l)	<0.013	Catchment	4135327	6SMAL1
Carr Brook footbridge	26/11/2021 12:18	Asulam (ug/l)	<0.013	Catchment	4135324	6CARR0
Unamed tributary Woolley Moor	26/11/2021 12:12	Asulam (ug/l)	<0.013	Catchment	4135325	6AMBE2
R.Severn nr Upton Magna	25/11/2021 13:35	Asulam (ug/l)	<0.013	Catchment	4127592	1SEVE
River Tern d/s at Tern Bridge	25/11/2021 12:54	Asulam (ug/l)	<0.013	Catchment	4127587	1SEVE
Swithland Village opp St Leonards Church	25/11/2021 12:17	Asulam (ug/l)	<0.013	Catchment	4139899	4QUORB
R.Severn nr Broseley	25/11/2021 11:45	Asulam (ug/l)	<0.013	Catchment	4127591	1SEVE
R.Stour upstream Hampton Loade	25/11/2021 11:44	Asulam (ug/l)	<0.013	Catchment	4127589	1SEVE
R.Severn nr Bridgnorth	25/11/2021 11:43	Asulam (ug/l)	<0.013	Catchment	4127590	1SEVE
Swithland feed adj railway	25/11/2021 11:31	Asulam (ug/l)	<0.013	Catchment	4139898	4QUORB

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Cound Brook from bridge	25/11/2021 10:44	Asulam (ug/l)	<0.013	Catchment	4127588	1COUN
7b - Bradgate Chapel, Cropston Reservoir	25/11/2021 09:49	Asulam (ug/l)	<0.013	Catchment	4139903	4QUORB
Cropston Res car park	25/11/2021 09:23	Asulam (ug/l)	<0.013	Catchment	4139902	4QUORB
Bradgate Road, Cropston under	24/11/2021 15:20	Asulam (ug/l)	<0.013	Catchment	4139900	4QUORB
Newtown Linford T - junction	24/11/2021 14:50	Asulam (ug/l)	<0.013	Catchment	4139901	4QUORB
Lane at Ulverscroft Wood	24/11/2021 14:43	Asulam (ug/l)	<0.013	Catchment	4139897	4QUORB
Jubilee Brook	24/11/2021 11:22	Asulam (ug/l)	<0.013	Catchment	4139891	4JUBIB
Scotts Brook	24/11/2021 11:14	Asulam (ug/l)	<0.013	Catchment	4139892	4SCOTB
Heath End Brook	24/11/2021 10:36	Asulam (ug/l)	<0.013	Catchment	4139889	4HEATB
Staunton Harold Brook	24/11/2021 10:34	Asulam (ug/l)	<0.013	Catchment	4139890	4STAUB
Teme to R Avon d/s Bushley Longdon Bk	19/11/2021 10:37	Asulam (ug/l)	<0.013	Catchment	4127555	1SEVE
R.Severn nr Upton Marina	19/11/2021 08:53	Asulam (ug/l)	<0.013	Catchment	4127549	1SEVE
Stour to River Teme d/s Salwarpe	18/11/2021 15:21	Asulam (ug/l)	<0.013	Catchment	4127553	1SEVE
Stour to River Teme u/s Shrawley Bk	18/11/2021 14:11	Asulam (ug/l)	<0.013	Catchment	4127552	1SEVE
Stourport (DS R.Stour)	18/11/2021 13:25	Asulam (ug/l)	<0.013	Catchment	4127551	1SEVE
WS13 Severn - R Teme to R Avon u/s	18/11/2021 11:23	Asulam (ug/l)	<0.013	Catchment	4127554	1SEVE
River Teme downstream	18/11/2021 11:01	Asulam (ug/l)	<0.013	Catchment	4127556	2TEMEA
R.Severn nr Kempsey	18/11/2021 10:37	Asulam (ug/l)	<0.013	Catchment	4127550	1SEVE
R.Blythe - Blythe Bridge SP211898	08/11/2021 16:30	Asulam (ug/l)	<0.013	Catchment	4135508	8SBLY0
Bourne Brook	08/11/2021 16:29	Asulam (ug/l)	<0.013	Catchment	4135509	8SBOU1

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Didgeley Brook	08/11/2021 16:28	Asulam (ug/l)	<0.013	Catchment	4135510	8SBOU1
R.Blythe - Bradnocks Marsh SP216793	08/11/2021 16:26	Asulam (ug/l)	<0.013	Catchment	4135506	8SBLY0
R.Blythe - Solihull SP164789	08/11/2021 16:25	Asulam (ug/l)	<0.013	Catchment	4135511	8SBLY0
R.Blythe - Temple Balsall SP208763	08/11/2021 16:24	Asulam (ug/l)	<0.013	Catchment	4135505	8SBLY0
R Leam source to conf Rains Brook	08/11/2021 15:16	Asulam (ug/l)	<0.013	Catchment	4135305	3LEAM
Rains Bk to R Itchen u/s	08/11/2021 14:39	Asulam (ug/l)	<0.013	Catchment	4135310	3LEAM
Brook to conf R Itchen	08/11/2021 14:18	Asulam (ug/l)	<0.013	Catchment	4135306	3LEAM
Stowe to conf. R Leam - Marton	08/11/2021 14:04	Asulam (ug/l)	<0.013	Catchment	4135302	3ITCH
AL8 Leam - conf R Itchen to R Avon u/s	08/11/2021 13:45	Asulam (ug/l)	<0.013	Catchment	4135309	3LEAM
to conf R Avon - Willes Meadow Foot	08/11/2021 11:48	Asulam (ug/l)	<0.013	Catchment	4135304	3LEAM
Radford Brook source to conf R Leam	08/11/2021 11:06	Asulam (ug/l)	<0.013	Catchment	4135307	3RADF
conf. R Stowe - Thorpe Bridge Ufton	08/11/2021 11:03	Asulam (ug/l)	<0.013	Catchment	4135303	3ITCH
R.Avon - Welford Bridge	08/11/2021 10:46	Asulam (ug/l)	<0.013	Catchment	4135301	3AVOU
R.Avon Station Road	08/11/2021 10:45	Asulam (ug/l)	<0.013	Catchment	4135308	3AVOU
R Stowe source to conf R Leam	08/11/2021 10:38	Asulam (ug/l)	<0.013	Catchment	4135300	3STOW
River Wye @ Kerne Bridge	29/10/2021 11:45	Asulam (ug/l)	<0.013	Catchment	4111110	2WYE
River Wye @ King caple foot Bridge	29/10/2021 11:04	Asulam (ug/l)	<0.013	Catchment	4111109	2WYE
River Wye @ Hampton Bishop	29/10/2021 10:16	Asulam (ug/l)	<0.013	Catchment	4111113	2WYE
River Lugg @ Mordiford Bridge	29/10/2021 09:59	Asulam (ug/l)	<0.013	Catchment	4111108	2LUGG
River Frome at Larport Lane Bridge	29/10/2021 09:37	Asulam (ug/l)	<0.013	Catchment	4111112	2FROMA

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River Lugg upstream Bridge	29/10/2021 08:45	Asulam (ug/l)	<0.013	Catchment	4111111	2LUGG
7b - Bradgate Chapel, Cropston Reservoir	28/10/2021 13:19	Asulam (ug/l)	<0.013	Catchment	4120776	4QUORB
Newtown Linford T - junction	28/10/2021 13:16	Asulam (ug/l)	<0.013	Catchment	4120778	4QUORB
Swithland feed adj railway	28/10/2021 12:17	Asulam (ug/l)	<0.013	Catchment	4120781	4QUORB
Swithland Village opp St Leonards Church	28/10/2021 12:15	Asulam (ug/l)	<0.013	Catchment	4120780	4QUORB
Bradgate Road, Cropston under	28/10/2021 09:50	Asulam (ug/l)	<0.013	Catchment	4120779	4QUORB
Cropston Res car park	28/10/2021 09:49	Asulam (ug/l)	<0.013	Catchment	4120777	4QUORB
Lane at Ulverscroft Wood	27/10/2021 15:05	Asulam (ug/l)	<0.013	Catchment	4120782	4QUORB
Heath End Brook	27/10/2021 14:11	Asulam (ug/l)	<0.013	Catchment	4120786	4HEATB
Staunton Harold Brook	27/10/2021 14:11	Asulam (ug/l)	<0.013	Catchment	4120785	4STAUB
Jubilee Brook	27/10/2021 13:44	Asulam (ug/l)	<0.013	Catchment	4120784	4JUBIB
Scotts Brook	27/10/2021 13:32	Asulam (ug/l)	<0.013	Catchment	4120783	4SCOTB
BORROWASH	26/10/2021 12:42	Asulam (ug/l)	<0.013	Catchment	4110671	6DERWC
Markeaton Brook @ Quarndon	26/10/2021 12:31	Asulam (ug/l)	<0.013	Catchment	4110674	6MARK0
Derwent Met Nether Lane Hazelwood	26/10/2021 12:26	Asulam (ug/l)	<0.013	Catchment	4110675	6DERW7
River Derwent at Ambergate NEW	26/10/2021 12:08	Asulam (ug/l)	<0.013	Catchment	4110673	6DERW7
River Tern d/s at Tern Bridge	26/10/2021 11:30	Asulam (ug/l)	<0.013	Catchment	4111070	1SEVE
Hodgelane Brook	26/10/2021 11:18	Asulam (ug/l)	<0.013	Catchment	4110710	6HODG0
Smalley Brook	26/10/2021 11:17	Asulam (ug/l)	<0.013	Catchment	4110706	6SMAL1
R.Severn nr Upton Magna	26/10/2021 11:14	Asulam (ug/l)	<0.013	Catchment	4111065	1SEVE

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Unamed tributary Woolley Moor	26/10/2021 11:08	Asulam (ug/l)	<0.013	Catchment	4110708	6AMBE2
R.Stour upstream Hampton Loade	26/10/2021 11:00	Asulam (ug/l)	<0.013	Catchment	4111068	1SEVE
Carr Brook footbridge	26/10/2021 10:59	Asulam (ug/l)	<0.013	Catchment	4110709	6CARR0
Cound Brook from bridge	26/10/2021 10:59	Asulam (ug/l)	<0.013	Catchment	4111069	1COUN
River Amber outside Milltown	26/10/2021 10:58	Asulam (ug/l)	<0.013	Catchment	4110707	6AMBE2
R.Severn nr Broseley	26/10/2021 10:50	Asulam (ug/l)	<0.013	Catchment	4111066	1SEVE
R.Severn nr Bridgnorth	26/10/2021 10:00	Asulam (ug/l)	<0.013	Catchment	4111067	1SEVE
Teme to R Avon d/s Bushley Longdon Bk	22/10/2021 10:32	Asulam (ug/l)	<0.013	Catchment	4111028	1SEVE
R.Severn nr Upton Marina	22/10/2021 10:15	Asulam (ug/l)	<0.013	Catchment	4111034	1SEVE
Stour to River Teme d/s Salwarpe	21/10/2021 15:58	Asulam (ug/l)	<0.013	Catchment	4111030	1SEVE
Stour to River Teme u/s Shrawley Bk	21/10/2021 15:04	Asulam (ug/l)	<0.013	Catchment	4111031	1SEVE
Stourport (DS R.Stour)	21/10/2021 14:31	Asulam (ug/l)	<0.013	Catchment	4111032	1SEVE
WS13 Severn - R Teme to R Avon u/s	21/10/2021 11:59	Asulam (ug/l)	<0.013	Catchment	4111029	1SEVE
River Teme downstream	21/10/2021 11:36	Asulam (ug/l)	<0.013	Catchment	4111027	2TEMEA
R.Severn nr Kempsey	21/10/2021 10:55	Asulam (ug/l)	<0.013	Catchment	4111033	1SEVE
Cubley Brook @ Little Cubley	12/10/2021 15:10	Asulam (ug/l)	<0.013	Catchment	4111005	6FOST1
Cubley Brook at Boylestone	12/10/2021 15:10	Asulam (ug/l)	<0.013	Catchment	4111006	6FOST1
Foston Brook 8 - Foston Upstream	12/10/2021 15:09	Asulam (ug/l)	<0.013	Catchment	4111008	6FOST1
River Dove Upstream	12/10/2021 15:09	Asulam (ug/l)	<0.013	Catchment	4111007	6DOVE2
downstream before confluence River	12/10/2021 15:08	Asulam (ug/l)	<0.013	Catchment	4111009	6FOST1

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Shirley Brook at Longford	12/10/2021 15:08	Asulam (ug/l)	<0.013	Catchment	4111010	6SHIR3
Brailsford Brook at Longford	12/10/2021 15:07	Asulam (ug/l)	<0.013	Catchment	4111011	6BRAI1
Sutton Brook at Sutton on the Hill	12/10/2021 15:07	Asulam (ug/l)	<0.013	Catchment	4111012	6HILT1
Hilton Brook downstream	12/10/2021 15:06	Asulam (ug/l)	<0.013	Catchment	4111013	6HILT1
River Dove at Egginton Raw	12/10/2021 15:06	Asulam (ug/l)	<0.013	Catchment	4111014	4MELBN
Rolleston Brook upstream	12/10/2021 15:06	Asulam (ug/l)	<0.013	Catchment	4111015	7ROLL1
Rolleston Brook downstream	12/10/2021 15:05	Asulam (ug/l)	<0.013	Catchment	4111017	7ROLL1
confluence Rolleston Brook	12/10/2021 15:04	Asulam (ug/l)	<0.013	Catchment	4111018	7ROLL1
Didgeley Brook	07/10/2021 15:28	Asulam (ug/l)	<0.013	Catchment	4110761	8SBOU1
Bourne Brook	07/10/2021 15:26	Asulam (ug/l)	<0.013	Catchment	4110762	8SBOU1
R.Blythe - Blythe Bridge SP211898	07/10/2021 15:25	Asulam (ug/l)	<0.013	Catchment	4110763	8SBLY0
R.Blythe - Packington SP218852	07/10/2021 15:17	Asulam (ug/l)	<0.013	Catchment	4110764	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	07/10/2021 15:04	Asulam (ug/l)	<0.013	Catchment	4110765	8SBLY0
R.Blythe - Solihull SP164789	07/10/2021 15:01	Asulam (ug/l)	<0.013	Catchment	4110760	8SBLY0
R.Blythe - Temple Balsall SP208763	07/10/2021 14:28	Asulam (ug/l)	<0.013	Catchment	4110766	8SBLY0
Radford Brook source to conf R Leam	06/10/2021 14:50	Asulam (ug/l)	<0.013	Catchment	4104494	3RADF
conf. R Stowe - Thorpe Bridge Ufton	06/10/2021 14:30	Asulam (ug/l)	<0.013	Catchment	4104498	3ITCH
R Stowe source to conf R Leam	06/10/2021 14:11	Asulam (ug/l)	<0.013	Catchment	4104501	3STOW
AL8 Leam - conf R Itchen to R Avon u/s	06/10/2021 13:46	Asulam (ug/l)	<0.013	Catchment	4104492	3LEAM
Brook to conf R Itchen	06/10/2021 13:29	Asulam (ug/l)	<0.013	Catchment	4104495	3LEAM

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Stowe to conf. R Leam - Marton	06/10/2021 13:14	Asulam (ug/l)	<0.013	Catchment	4104499	3ITCH
Rains Bk to R Itchen u/s	06/10/2021 12:32	Asulam (ug/l)	<0.013	Catchment	4104491	3LEAM
R Leam source to conf Rains Brook	06/10/2021 11:51	Asulam (ug/l)	<0.013	Catchment	4104496	3LEAM
R.Avon - Welford Bridge	06/10/2021 11:02	Asulam (ug/l)	<0.013	Catchment	4104500	3AVOU
R.Avon Station Road	06/10/2021 10:07	Asulam (ug/l)	<0.013	Catchment	4104493	3AVOU
R.Stour upstream Hampton Loade	30/09/2021 12:07	Asulam (ug/l)	<0.013	Catchment	4066269	1SEVE
R.Severn nr Upton Magna	30/09/2021 12:07	Asulam (ug/l)	<0.013	Catchment	4066272	1SEVE
Cound Brook from bridge	30/09/2021 12:05	Asulam (ug/l)	<0.013	Catchment	4066268	1COUN
R.Severn nr Bridgnorth	30/09/2021 12:02	Asulam (ug/l)	<0.013	Catchment	4066270	1SEVE
River Tern d/s at Tern Bridge	30/09/2021 12:01	Asulam (ug/l)	<0.013	Catchment	4066267	1SEVE
BORROWASH	28/09/2021 12:39	Asulam (ug/l)	<0.013	Catchment	4081656	6DERWC
Markeaton Brook @ Quarndon	28/09/2021 12:25	Asulam (ug/l)	<0.013	Catchment	4081653	6MARK0
Derwent Met Nether Lane Hazelwood	28/09/2021 12:21	Asulam (ug/l)	<0.013	Catchment	4081652	6DERW7
River Derwent at Ambergate NEW	28/09/2021 12:02	Asulam (ug/l)	<0.013	Catchment	4081654	6DERW7
Mill Drive West Houses	28/09/2021 11:41	Asulam (ug/l)	<0.013	Catchment	4081655	6DERW7
Hodgelane Brook	28/09/2021 10:46	Asulam (ug/l)	0.018	Catchment	4081647	6HODG0
Smalley Brook	28/09/2021 10:45	Asulam (ug/l)	<0.013	Catchment	4081651	6SMAL1
River Amber outside Milltown	28/09/2021 10:31	Asulam (ug/l)	<0.013	Catchment	4081650	6AMBE2
Carr Brook footbridge	28/09/2021 10:30	Asulam (ug/l)	<0.013	Catchment	4081648	6CARR0
Unamed tributary Woolley Moor	28/09/2021 10:25	Asulam (ug/l)	<0.013	Catchment	4081649	6AMBE2

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River Wye @ Kerne Bridge	27/09/2021 12:43	Asulam (ug/l)	<0.013	Catchment	4060581	2WYE
River Wye @ King caple foot Bridge	27/09/2021 12:11	Asulam (ug/l)	<0.013	Catchment	4060582	2WYE
River Wye @ Hampton Bishop	27/09/2021 11:33	Asulam (ug/l)	<0.013	Catchment	4060578	2WYE
River Lugg @ Mordiford Bridge	27/09/2021 11:06	Asulam (ug/l)	<0.013	Catchment	4060583	2LUGG
River Frome at Larport Lane Bridge	27/09/2021 10:54	Asulam (ug/l)	<0.013	Catchment	4060579	2FROMA
River Lugg upstream Bridge	27/09/2021 10:20	Asulam (ug/l)	<0.013	Catchment	4060580	2LUGG
Teme to R Avon d/s Bushley Longdon Bk	22/09/2021 10:04	Asulam (ug/l)	<0.013	Catchment	4066279	1SEVE
R.Severn nr Upton Marina	22/09/2021 09:00	Asulam (ug/l)	<0.013	Catchment	4066273	1SEVE
Stour to River Teme d/s Salwarpe	21/09/2021 15:36	Asulam (ug/l)	<0.013	Catchment	4066277	1SEVE
Stour to River Teme u/s Shrawley Bk	21/09/2021 14:56	Asulam (ug/l)	<0.013	Catchment	4066276	1SEVE
Stourport (DS R.Stour)	21/09/2021 14:25	Asulam (ug/l)	<0.013	Catchment	4066275	1SEVE
WS13 Severn - R Teme to R Avon u/s	21/09/2021 11:44	Asulam (ug/l)	<0.013	Catchment	4066278	1SEVE
River Teme downstream	21/09/2021 11:21	Asulam (ug/l)	<0.013	Catchment	4066280	2TEMEA
R.Severn nr Kempsey	21/09/2021 10:55	Asulam (ug/l)	<0.013	Catchment	4066274	1SEVE
Jubilee Brook	17/09/2021 12:12	Asulam (ug/l)	<0.013	Catchment	4089474	4JUBIB
Scotts Brook	17/09/2021 12:05	Asulam (ug/l)	<0.013	Catchment	4089475	4SCOTB
Heath End Brook	17/09/2021 10:41	Asulam (ug/l)	<0.013	Catchment	4089472	4HEATB
Staunton Harold Brook	17/09/2021 10:39	Asulam (ug/l)	<0.013	Catchment	4089473	4STAUB
7b - Bradgate Chapel, Cropston Reservoir	17/09/2021 09:53	Asulam (ug/l)	<0.013	Catchment	4089481	4QUORB
Lane at Ulverscroft Wood	17/09/2021 09:51	Asulam (ug/l)	<0.013	Catchment	4089487	4QUORB

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Swithland feed adj railway	17/09/2021 09:41	Asulam (ug/l)	<0.013	Catchment	4089486	4QUORB
Bradgate Road, Cropston under	17/09/2021 09:39	Asulam (ug/l)	<0.013	Catchment	4089484	4QUORB
Newtown Linford T - junction	17/09/2021 09:37	Asulam (ug/l)	<0.013	Catchment	4089483	4QUORB
Cropston Res car park	17/09/2021 09:35	Asulam (ug/l)	<0.013	Catchment	4089482	4QUORB
Swithland Village opp St Leonards Church	17/09/2021 09:32	Asulam (ug/l)	<0.013	Catchment	4089485	4QUORB
R.Avon Station Road	16/09/2021 12:26	Asulam (ug/l)	<0.013	Catchment	4082515	3AVOU
R.Avon - Welford Bridge	16/09/2021 12:24	Asulam (ug/l)	<0.013	Catchment	4082508	3AVOU
Rains Bk to R Itchen u/s	16/09/2021 12:21	Asulam (ug/l)	<0.013	Catchment	4082517	3LEAM
R Leam source to conf Rains Brook	16/09/2021 12:18	Asulam (ug/l)	<0.013	Catchment	4082512	3LEAM
conf. R Stowe - Thorpe Bridge Ufton	16/09/2021 11:22	Asulam (ug/l)	<0.013	Catchment	4082510	3ITCH
R Stowe source to conf R Leam	16/09/2021 10:58	Asulam (ug/l)	<0.013	Catchment	4082504	3STOW
Brook to conf R Itchen	16/09/2021 10:28	Asulam (ug/l)	<0.013	Catchment	4082513	3LEAM
Stowe to conf. R Leam - Marton	16/09/2021 10:21	Asulam (ug/l)	<0.013	Catchment	4082509	3ITCH
AL8 Leam - conf R Itchen to R Avon u/s	16/09/2021 10:17	Asulam (ug/l)	<0.013	Catchment	4082516	3LEAM
Brailsford Brook at Longford	16/09/2021 10:00	Asulam (ug/l)	<0.013	Catchment	4082482	6BRAI1
Cubley Brook @ Little Cubley	16/09/2021 10:00	Asulam (ug/l)	<0.013	Catchment	4082488	6FOST1
Cubley Brook at Boylestone	16/09/2021 10:00	Asulam (ug/l)	<0.013	Catchment	4082487	6FOST1
Foston Brook 8 - Foston Upstream	16/09/2021 10:00	Asulam (ug/l)	<0.013	Catchment	4082485	6FOST1
downstream before confluence River	16/09/2021 10:00	Asulam (ug/l)	<0.013	Catchment	4082484	6FOST1
Hilton Brook downstream	16/09/2021 10:00	Asulam (ug/l)	<0.013	Catchment	4082480	6HILT1

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River Dove at Egginton Raw	16/09/2021 10:00	Asulam (ug/l)	<0.013	Catchment	4082479	4MELBN
confluence Rolleston Brook	16/09/2021 10:00	Asulam (ug/l)	<0.013	Catchment	4082475	7ROLL1
River Dove Upstream	16/09/2021 10:00	Asulam (ug/l)	<0.013	Catchment	4082486	6DOVE2
Rolleston Brook downstream	16/09/2021 10:00	Asulam (ug/l)	<0.013	Catchment	4082476	7ROLL1
Rolleston Brook upstream	16/09/2021 10:00	Asulam (ug/l)	<0.013	Catchment	4082478	7ROLL1
Shirley Brook at Longford	16/09/2021 10:00	Asulam (ug/l)	<0.013	Catchment	4082483	6SHIR3
Sutton Brook at Sutton on the Hill	16/09/2021 10:00	Asulam (ug/l)	<0.013	Catchment	4082481	6HILT1
Radford Brook source to conf R Leam	16/09/2021 09:35	Asulam (ug/l)	<0.013	Catchment	4082514	3RADF
to conf R Avon - Willes Meadow Foot	16/09/2021 09:19	Asulam (ug/l)	<0.013	Catchment	4082511	3LEAM
R.Blythe - Blythe Bridge SP211898	07/09/2021 10:31	Asulam (ug/l)	<0.013	Catchment	4082498	8SBLY0
R.Blythe - Packington SP218852	07/09/2021 00:00	Asulam (ug/l)	0.023	Catchment	4082497	8SBLY0
Bourne Brook	07/09/2021 00:00	Asulam (ug/l)	0.025	Catchment	4082500	8SBOU1
Didgeley Brook	07/09/2021 00:00	Asulam (ug/l)	<0.013	Catchment	4082501	8SBOU1
R.Blythe - Solihull SP164789	07/09/2021 00:00	Asulam (ug/l)	<0.013	Catchment	4082502	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	07/09/2021 00:00	Asulam (ug/l)	<0.013	Catchment	4082496	8SBLY0
R.Blythe - Temple Balsall SP208763	07/09/2021 00:00	Asulam (ug/l)	<0.013	Catchment	4082495	8SBLY0
River Wye @ Kerne Bridge	31/08/2021 15:39	Asulam (ug/l)	<0.013	Catchment	4039289	2WYE
River Wye @ King caple foot Bridge	31/08/2021 14:53	Asulam (ug/l)	0.02	Catchment	4039288	2WYE
River Wye @ Hampton Bishop	31/08/2021 14:22	Asulam (ug/l)	0.017	Catchment	4039292	2WYE
River Lugg @ Mordiford Bridge	31/08/2021 14:16	Asulam (ug/l)	<0.013	Catchment	4039287	2LUGG

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River Frome at Larport Lane Bridge	31/08/2021 14:07	Asulam (ug/l)	<0.013	Catchment	4039291	2FROMA
River Lugg upstream Bridge	31/08/2021 13:29	Asulam (ug/l)	<0.013	Catchment	4039290	2LUGG
BORROWASH	24/08/2021 12:19	Asulam (ug/l)	<0.013	Catchment	4062001	6DERWC
Markeaton Brook @ Quarndon	24/08/2021 12:03	Asulam (ug/l)	<0.013	Catchment	4062004	6MARK0
Derwent Met Nether Lane Hazelwood	24/08/2021 12:02	Asulam (ug/l)	<0.013	Catchment	4062005	6DERW7
River Derwent at Ambergate NEW	24/08/2021 11:17	Asulam (ug/l)	<0.013	Catchment	4062003	6DERW7
Carr Brook footbridge	24/08/2021 11:05	Asulam (ug/l)	<0.013	Catchment	4061998	6CARR0
Unamed tributary Woolley Moor	24/08/2021 11:05	Asulam (ug/l)	<0.013	Catchment	4061997	6AMBE2
Mill Drive West Houses	24/08/2021 10:56	Asulam (ug/l)	<0.013	Catchment	4062002	6DERW7
Smalley Brook	24/08/2021 10:52	Asulam (ug/l)	<0.013	Catchment	4061995	6SMAL1
Hodgelane Brook	24/08/2021 10:51	Asulam (ug/l)	<0.013	Catchment	4061999	6HODG0
River Amber outside Milltown	24/08/2021 10:50	Asulam (ug/l)	<0.013	Catchment	4061996	6AMBE2
Teme to R Avon d/s Bushley Longdon Bk	19/08/2021 14:19	Asulam (ug/l)	<0.013	Catchment	4039300	1SEVE
R.Severn nr Kempsey	19/08/2021 13:40	Asulam (ug/l)	<0.013	Catchment	4039305	1SEVE
River Teme downstream	19/08/2021 13:00	Asulam (ug/l)	<0.013	Catchment	4039299	2TEMEA
WS13 Severn - R Teme to R Avon u/s	19/08/2021 12:29	Asulam (ug/l)	<0.013	Catchment	4039301	1SEVE
Didgeley Brook	19/08/2021 12:17	Asulam (ug/l)	<0.013	Catchment	4062049	8SBOU1
Bourne Brook	19/08/2021 12:16	Asulam (ug/l)	0.02	Catchment	4062050	8SBOU1
R.Blythe - Blythe Bridge SP211898	19/08/2021 12:15	Asulam (ug/l)	<0.013	Catchment	4062051	8SBLY0
R.Blythe - Packington SP218852	19/08/2021 12:15	Asulam (ug/l)	<0.013	Catchment	4062052	8SBLY0

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R.Blythe - Bradnocks Marsh SP216793	19/08/2021 12:14	Asulam (ug/l)	<0.013	Catchment	4062053	8SBLY0
R.Blythe - Solihull SP164789	19/08/2021 12:13	Asulam (ug/l)	<0.013	Catchment	4062048	8SBLY0
R.Blythe - Temple Balsall SP208763	19/08/2021 12:13	Asulam (ug/l)	<0.013	Catchment	4062054	8SBLY0
Stour to River Teme d/s Salwarpe	19/08/2021 11:18	Asulam (ug/l)	<0.013	Catchment	4039302	1SEVE
Stour to River Teme u/s Shrawley Bk	19/08/2021 10:58	Asulam (ug/l)	<0.013	Catchment	4039303	1SEVE
Stourport (DS R.Stour)	19/08/2021 10:26	Asulam (ug/l)	<0.013	Catchment	4039304	1SEVE
R.Severn nr Upton Marina	19/08/2021 09:38	Asulam (ug/l)	<0.013	Catchment	4039306	1SEVE
Heath End Brook	17/08/2021 16:07	Asulam (ug/l)	<0.013	Catchment	4066291	4HEATB
Staunton Harold Brook	17/08/2021 16:06	Asulam (ug/l)	<0.013	Catchment	4066290	4STAUB
Jubilee Brook	17/08/2021 15:05	Asulam (ug/l)	<0.013	Catchment	4066289	4JUBIB
Scotts Brook	17/08/2021 14:57	Asulam (ug/l)	<0.013	Catchment	4066288	4SCOTB
Lane at Ulverscroft Wood	17/08/2021 13:02	Asulam (ug/l)	<0.013	Catchment	4066287	4QUORB
7b - Bradgate Chapel, Cropston Reservoir	17/08/2021 12:27	Asulam (ug/l)	<0.013	Catchment	4066281	4QUORB
Newtown Linford T - junction	17/08/2021 12:05	Asulam (ug/l)	<0.013	Catchment	4066283	4QUORB
Swithland Village opp St Leonards Church	17/08/2021 11:50	Asulam (ug/l)	<0.013	Catchment	4066285	4QUORB
Swithland feed adj railway	17/08/2021 11:25	Asulam (ug/l)	<0.013	Catchment	4066286	4QUORB
Bradgate Road, Cropston under	17/08/2021 11:06	Asulam (ug/l)	<0.013	Catchment	4066284	4QUORB
Cropston Res car park	17/08/2021 11:04	Asulam (ug/l)	<0.013	Catchment	4066282	4QUORB
R.Severn nr Upton Magna	17/08/2021 10:58	Asulam (ug/l)	<0.013	Catchment	4039293	1SEVE
Cound Brook from bridge	17/08/2021 10:37	Asulam (ug/l)	<0.013	Catchment	4039297	1COUN

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River Tern d/s at Tern Bridge	17/08/2021 10:21	Asulam (ug/l)	<0.013	Catchment	4039298	1SEVE
R.Severn nr Broseley	17/08/2021 09:58	Asulam (ug/l)	<0.013	Catchment	4039294	1SEVE
R.Severn nr Bridgnorth	17/08/2021 09:32	Asulam (ug/l)	<0.013	Catchment	4039295	1SEVE
R.Stour upstream Hampton Loade	17/08/2021 09:14	Asulam (ug/l)	<0.013	Catchment	4039296	1SEVE
Brailsford Brook at Longford	16/08/2021 16:46	Asulam (ug/l)	<0.013	Catchment	4062039	6BRAI1
Cubley Brook @ Little Cubley	16/08/2021 16:45	Asulam (ug/l)	<0.013	Catchment	4062031	6FOST1
Cubley Brook at Boylestone	16/08/2021 16:44	Asulam (ug/l)	<0.013	Catchment	4062032	6FOST1
Foston Brook 8 - Foston Upstream	16/08/2021 14:52	Asulam (ug/l)	<0.013	Catchment	4062035	6FOST1
downstream before confluence River	16/08/2021 14:51	Asulam (ug/l)	<0.013	Catchment	4062036	6FOST1
Rolleston Brook upstream	16/08/2021 14:51	Asulam (ug/l)	<0.013	Catchment	4062044	7ROLL1
River Dove Upstream	16/08/2021 13:05	Asulam (ug/l)	<0.013	Catchment	4062033	6DOVE2
Sutton Brook at Sutton on the Hill	16/08/2021 13:05	Asulam (ug/l)	<0.013	Catchment	4062040	6HILT1
Hilton Brook downstream	16/08/2021 13:04	Asulam (ug/l)	<0.013	Catchment	4062041	6HILT1
River Dove at Egginton Raw	16/08/2021 13:04	Asulam (ug/l)	<0.013	Catchment	4062042	4MELBN
confluence Rolleston Brook	16/08/2021 13:03	Asulam (ug/l)	<0.013	Catchment	4062047	7ROLL1
Rolleston Brook downstream	16/08/2021 13:03	Asulam (ug/l)	<0.013	Catchment	4062046	7ROLL1
Ladybower Res Surface	12/08/2021 20:34	Asulam (ug/l)	0.024	Catchment	4046978	6BAMF5
Ladybower Brook nr Ladybower Wood	12/08/2021 20:34	Asulam (ug/l)	1.127	Catchment	4046976	6DERW7
River Derwent at Yorkshire Bridge	12/08/2021 20:33	Asulam (ug/l)	<0.013	Catchment	4046974	6DERW7
R.Avon Station Road	10/08/2021 13:40	Asulam (ug/l)	<0.013	Catchment	4060586	3AVOU

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R.Avon - Welford Bridge	10/08/2021 13:17	Asulam (ug/l)	<0.013	Catchment	4060593	3AVOU
R Leam source to conf Rains Brook	10/08/2021 12:34	Asulam (ug/l)	<0.013	Catchment	4060589	3LEAM
R Stowe source to conf R Leam	10/08/2021 11:43	Asulam (ug/l)	<0.013	Catchment	4060594	3STOW
conf. R Stowe - Thorpe Bridge Ufton	10/08/2021 11:30	Asulam (ug/l)	<0.013	Catchment	4060591	3ITCH
to conf R Avon - Willes Meadow Foot	10/08/2021 11:02	Asulam (ug/l)	<0.013	Catchment	4060590	3LEAM
Radford Brook source to conf R Leam	10/08/2021 10:47	Asulam (ug/l)	<0.013	Catchment	4060587	3RADF
AL8 Leam - conf R Itchen to R Avon u/s	10/08/2021 10:26	Asulam (ug/l)	<0.013	Catchment	4060585	3LEAM
Stowe to conf. R Leam - Marton	10/08/2021 10:13	Asulam (ug/l)	<0.013	Catchment	4060592	3ITCH
Brook to conf R Itchen	10/08/2021 10:01	Asulam (ug/l)	<0.013	Catchment	4060588	3LEAM
Rains Bk to R Itchen u/s	10/08/2021 09:38	Asulam (ug/l)	<0.013	Catchment	4060584	3LEAM
Ladybower Brook nr Ladybower Wood	06/08/2021 09:20	Asulam (ug/l)	0.286	Catchment	4046977	6DERW7
River Wye @ King caple foot Bridge	30/07/2021 13:56	Asulam (ug/l)	<0.013	Catchment	4012950	2WYE
River Lugg @ Mordiford Bridge	30/07/2021 13:16	Asulam (ug/l)	<0.013	Catchment	4012951	2LUGG
River Lugg upstream Bridge	30/07/2021 12:20	Asulam (ug/l)	<0.013	Catchment	4012948	2LUGG
Heath End Brook	29/07/2021 14:39	Asulam (ug/l)	<0.013	Catchment	4039307	4HEATB
Staunton Harold Brook	29/07/2021 14:38	Asulam (ug/l)	<0.013	Catchment	4039308	4STAUB
Jubilee Brook	29/07/2021 13:45	Asulam (ug/l)	<0.013	Catchment	4039309	4JUBIB
Scotts Brook	29/07/2021 13:35	Asulam (ug/l)	<0.013	Catchment	4039310	4SCOTB
Markeaton Brook @ Quarndon	29/07/2021 12:17	Asulam (ug/l)	<0.013	Catchment	4042322	6MARK0
Derwent Met Nether Lane Hazelwood	29/07/2021 12:15	Asulam (ug/l)	<0.013	Catchment	4042321	6DERW7

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Mill Drive West Houses	29/07/2021 12:14	Asulam (ug/l)	<0.013	Catchment	4042324	6DERW7
River Derwent at Ambergate NEW	29/07/2021 12:14	Asulam (ug/l)	<0.013	Catchment	4042323	6DERW7
BORROWASH	29/07/2021 12:13	Asulam (ug/l)	<0.013	Catchment	4042325	6DERWC
Smalley Brook	29/07/2021 12:12	Asulam (ug/l)	<0.013	Catchment	4042330	6SMAL1
Hodgelane Brook	29/07/2021 12:10	Asulam (ug/l)	<0.013	Catchment	4042326	6HODG0
River Amber outside Milltown	29/07/2021 12:10	Asulam (ug/l)	<0.013	Catchment	4042329	6AMBE2
Carr Brook footbridge	29/07/2021 12:08	Asulam (ug/l)	<0.013	Catchment	4042327	6CARR0
Swithland feed adj railway	29/07/2021 11:58	Asulam (ug/l)	<0.013	Catchment	4039312	4QUORB
Swithland Village opp St Leonards Church	29/07/2021 10:42	Asulam (ug/l)	<0.013	Catchment	4039313	4QUORB
7b - Bradgate Chapel, Cropston Reservoir	29/07/2021 10:13	Asulam (ug/l)	<0.013	Catchment	4039317	4QUORB
Cropston Res car park	29/07/2021 09:41	Asulam (ug/l)	<0.013	Catchment	4039316	4QUORB
Bradgate Road, Cropston under	29/07/2021 09:22	Asulam (ug/l)	<0.013	Catchment	4039314	4QUORB
Lane at Ulverscroft Wood	28/07/2021 16:56	Asulam (ug/l)	<0.013	Catchment	4039311	4QUORB
Newtown Linford T - junction	28/07/2021 16:55	Asulam (ug/l)	<0.013	Catchment	4039315	4QUORB
conf. R Stowe - Thorpe Bridge Ufton	28/07/2021 14:20	Asulam (ug/l)	<0.013	Catchment	4022903	3ITCH
R Stowe source to conf R Leam	28/07/2021 14:20	Asulam (ug/l)	<0.013	Catchment	4022900	3STOW
to conf R Avon - Willes Meadow Foot	28/07/2021 12:15	Asulam (ug/l)	<0.013	Catchment	4022904	3LEAM
Radford Brook source to conf R Leam	28/07/2021 12:11	Asulam (ug/l)	<0.013	Catchment	4022907	3RADF
AL8 Leam - conf R Itchen to R Avon u/s	28/07/2021 11:07	Asulam (ug/l)	<0.013	Catchment	4022909	3LEAM
Rains Bk to R Itchen u/s	28/07/2021 11:06	Asulam (ug/l)	<0.013	Catchment	4022910	3LEAM

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Stowe to conf. R Leam - Marton	28/07/2021 11:02	Asulam (ug/l)	<0.013	Catchment	4022902	3ITCH
R Leam source to conf Rains Brook	28/07/2021 10:32	Asulam (ug/l)	<0.013	Catchment	4022905	3LEAM
Brook to conf R Itchen	28/07/2021 10:13	Asulam (ug/l)	<0.013	Catchment	4022906	3LEAM
R.Avon Station Road	27/07/2021 15:50	Asulam (ug/l)	<0.013	Catchment	4022908	3AVOU
R.Avon - Welford Bridge	27/07/2021 15:47	Asulam (ug/l)	<0.013	Catchment	4022901	3AVOU
Teme to R Avon d/s Bushley Longdon Bk	22/07/2021 17:32	Asulam (ug/l)	<0.013	Catchment	4012938	1SEVE
R.Severn nr Kempsey	22/07/2021 16:55	Asulam (ug/l)	<0.013	Catchment	4012933	1SEVE
WS13 Severn - R Teme to R Avon u/s	22/07/2021 16:35	Asulam (ug/l)	<0.013	Catchment	4012937	1SEVE
Stour to River Teme d/s Salwarpe	22/07/2021 15:38	Asulam (ug/l)	<0.013	Catchment	4012936	1SEVE
Stour to River Teme u/s Shrawley Bk	22/07/2021 15:24	Asulam (ug/l)	<0.013	Catchment	4012935	1SEVE
Stourport (DS R.Stour)	22/07/2021 15:00	Asulam (ug/l)	<0.013	Catchment	4012934	1SEVE
River Teme downstream	22/07/2021 10:25	Asulam (ug/l)	<0.013	Catchment	4012939	2TEMEA
R.Severn nr Upton Marina	22/07/2021 09:51	Asulam (ug/l)	<0.013	Catchment	4012932	1SEVE
Brailsford Brook at Longford	20/07/2021 15:18	Asulam (ug/l)	<0.013	Catchment	4039325	6BRAI1
Cubley Brook @ Little Cubley	20/07/2021 12:58	Asulam (ug/l)	<0.013	Catchment	4039331	6FOST1
Cubley Brook at Boylestone	20/07/2021 12:57	Asulam (ug/l)	<0.013	Catchment	4039330	6FOST1
Foston Brook 8 - Foston Upstream	20/07/2021 12:57	Asulam (ug/l)	<0.013	Catchment	4039328	6FOST1
downstream before confluence River	20/07/2021 12:56	Asulam (ug/l)	<0.013	Catchment	4039327	6FOST1
Rolleston Brook upstream	20/07/2021 12:55	Asulam (ug/l)	<0.013	Catchment	4039321	7ROLL1
River Dove Upstream	20/07/2021 11:18	Asulam (ug/l)	<0.013	Catchment	4039329	6DOVE2

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Hilton Brook downstream	20/07/2021 11:17	Asulam (ug/l)	<0.013	Catchment	4039323	6HILT1
Sutton Brook at Sutton on the Hill	20/07/2021 11:17	Asulam (ug/l)	<0.013	Catchment	4039324	6HILT1
confluence Rolleston Brook	20/07/2021 11:16	Asulam (ug/l)	<0.013	Catchment	4039318	7ROLL1
Rolleston Brook downstream	20/07/2021 11:16	Asulam (ug/l)	<0.013	Catchment	4039319	7ROLL1
River Dove at Egginton Raw	20/07/2021 11:15	Asulam (ug/l)	<0.013	Catchment	4039322	4MELBN
R.Severn nr Upton Magna	19/07/2021 11:33	Asulam (ug/l)	<0.013	Catchment	4012942	1SEVE
Cound Brook from bridge	19/07/2021 10:58	Asulam (ug/l)	<0.013	Catchment	4012944	1COUN
River Tern d/s at Tern Bridge	19/07/2021 10:40	Asulam (ug/l)	<0.013	Catchment	4012943	1SEVE
R.Severn nr Broseley	19/07/2021 09:44	Asulam (ug/l)	<0.013	Catchment	4012941	1SEVE
R.Severn nr Bridgnorth	19/07/2021 09:13	Asulam (ug/l)	<0.013	Catchment	4012940	1SEVE
R.Stour upstream Hampton Loade	19/07/2021 08:53	Asulam (ug/l)	<0.013	Catchment	4012945	1SEVE
Didgeley Brook	13/07/2021 16:28	Asulam (ug/l)	<0.013	Catchment	4039353	8SBOU1
Bourne Brook	13/07/2021 16:27	Asulam (ug/l)	<0.013	Catchment	4039352	8SBOU1
R.Blythe - Blythe Bridge SP211898	13/07/2021 16:27	Asulam (ug/l)	<0.013	Catchment	4039351	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	13/07/2021 16:25	Asulam (ug/l)	<0.013	Catchment	4039349	8SBLY0
R.Blythe - Packington SP218852	13/07/2021 16:25	Asulam (ug/l)	<0.013	Catchment	4039350	8SBLY0
R.Blythe - Temple Balsall SP208763	13/07/2021 16:18	Asulam (ug/l)	<0.013	Catchment	4039348	8SBLY0
R.Blythe - Solihull SP164789	13/07/2021 15:55	Asulam (ug/l)	<0.013	Catchment	4039354	8SBLY0
River Wye @ Kerne Bridge	23/06/2021 13:40	Asulam (ug/l)	<0.013	Catchment	3991603	2WYE
River Wye @ King caple foot Bridge	23/06/2021 12:18	Asulam (ug/l)	<0.013	Catchment	3991602	2WYE

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River Wye @ Hampton Bishop	23/06/2021 11:46	Asulam (ug/l)	<0.013	Catchment	3991606	2WYE
River Lugg @ Mordiford Bridge	23/06/2021 11:34	Asulam (ug/l)	<0.013	Catchment	3991601	2LUGG
River Frome at Larport Lane Bridge	23/06/2021 11:20	Asulam (ug/l)	<0.013	Catchment	3991605	2FROMA
River Lugg upstream Bridge	23/06/2021 10:40	Asulam (ug/l)	<0.013	Catchment	3991604	2LUGG
Heath End Brook	17/06/2021 15:13	Asulam (ug/l)	<0.013	Catchment	4012931	4HEATB
Staunton Harold Brook	17/06/2021 15:12	Asulam (ug/l)	<0.013	Catchment	4012930	4STAUB
Jubilee Brook	17/06/2021 14:29	Asulam (ug/l)	<0.013	Catchment	4012929	4JUBIB
Scotts Brook	17/06/2021 14:20	Asulam (ug/l)	<0.013	Catchment	4012928	4SCOTB
Teme to R Avon d/s Bushley Longdon Bk	17/06/2021 13:07	Asulam (ug/l)	<0.013	Catchment	3991577	1SEVE
R.Severn nr Upton Marina	17/06/2021 12:43	Asulam (ug/l)	<0.013	Catchment	3991583	1SEVE
Lane at Ulverscroft Wood	17/06/2021 12:18	Asulam (ug/l)	<0.013	Catchment	4012927	4QUORB
Newtown Linford T - junction	17/06/2021 12:12	Asulam (ug/l)	<0.013	Catchment	4012923	4QUORB
R.Severn nr Kempsey	17/06/2021 12:11	Asulam (ug/l)	<0.013	Catchment	3991582	1SEVE
WS13 Severn - R Teme to R Avon u/s	17/06/2021 11:48	Asulam (ug/l)	<0.013	Catchment	3991578	1SEVE
Swithland Village opp St Leonards Church	17/06/2021 11:37	Asulam (ug/l)	<0.013	Catchment	4012925	4QUORB
River Teme downstream	17/06/2021 11:16	Asulam (ug/l)	<0.013	Catchment	3991576	2TEMEA
Swithland feed adj railway	17/06/2021 11:11	Asulam (ug/l)	<0.013	Catchment	4012926	4QUORB
Stour to River Teme d/s Salwarpe	17/06/2021 10:53	Asulam (ug/l)	<0.013	Catchment	3991579	1SEVE
Bradgate Road, Cropston under	17/06/2021 10:38	Asulam (ug/l)	<0.013	Catchment	4012924	4QUORB
Stour to River Teme u/s Shrawley Bk	17/06/2021 10:24	Asulam (ug/l)	<0.013	Catchment	3991580	1SEVE

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7b - Bradgate Chapel, Cropston Reservoir	17/06/2021 10:05	Asulam (ug/l)	<0.013	Catchment	4012921	4QUORB
Stourport (DS R.Stour)	17/06/2021 09:50	Asulam (ug/l)	<0.013	Catchment	3991581	1SEVE
Cropston Res car park	17/06/2021 09:41	Asulam (ug/l)	<0.013	Catchment	4012922	4QUORB
Rains Bk to R Itchen u/s	16/06/2021 18:14	Asulam (ug/l)	<0.013	Catchment	4011773	3LEAM
to conf R Avon - Willes Meadow Foot	16/06/2021 18:12	Asulam (ug/l)	<0.013	Catchment	4011767	3LEAM
Radford Brook source to conf R Leam	16/06/2021 18:11	Asulam (ug/l)	<0.013	Catchment	4011770	3RADF
conf. R Stowe - Thorpe Bridge Ufton	16/06/2021 18:09	Asulam (ug/l)	<0.013	Catchment	4011766	3ITCH
R Stowe source to conf R Leam	16/06/2021 18:08	Asulam (ug/l)	<0.013	Catchment	4011763	3STOW
Stowe to conf. R Leam - Marton	15/06/2021 18:11	Asulam (ug/l)	<0.013	Catchment	4011765	3ITCH
Brook to conf R Itchen	15/06/2021 17:39	Asulam (ug/l)	<0.013	Catchment	4011769	3LEAM
R Leam source to conf Rains Brook	15/06/2021 17:17	Asulam (ug/l)	<0.013	Catchment	4011768	3LEAM
R.Avon Station Road	15/06/2021 16:09	Asulam (ug/l)	<0.013	Catchment	4011771	3AVOU
R.Avon - Welford Bridge	15/06/2021 16:06	Asulam (ug/l)	<0.013	Catchment	4011764	3AVOU
AL8 Leam - conf R Itchen to R Avon u/s	15/06/2021 14:17	Asulam (ug/l)	<0.013	Catchment	4011772	3LEAM
R.Severn nr Upton Magna	15/06/2021 13:51	Asulam (ug/l)	<0.013	Catchment	3991610	1SEVE
Cound Brook from bridge	15/06/2021 13:29	Asulam (ug/l)	<0.013	Catchment	3991608	1COUN
River Tern d/s at Tern Bridge	15/06/2021 13:09	Asulam (ug/l)	<0.013	Catchment	3991609	1SEVE
R.Severn nr Broseley	15/06/2021 12:23	Asulam (ug/l)	<0.013	Catchment	3991611	1SEVE
Brailsford Brook at Longford	15/06/2021 10:57	Asulam (ug/l)	<0.013	Catchment	4011813	6BRAI1
Shirley Brook at Longford	15/06/2021 10:57	Asulam (ug/l)	<0.013	Catchment	4011812	6SHIR3

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Cubley Brook @ Little Cubley	15/06/2021 10:56	Asulam (ug/l)	<0.013	Catchment	4011807	6FOST1
Cubley Brook at Boylestone	15/06/2021 10:55	Asulam (ug/l)	<0.013	Catchment	4011808	6FOST1
River Dove Upstream	15/06/2021 10:55	Asulam (ug/l)	<0.013	Catchment	4011809	6DOVE2
Rolleston Brook upstream	15/06/2021 10:54	Asulam (ug/l)	<0.013	Catchment	4011844	7ROLL1
downstream before confluence River	15/06/2021 10:53	Asulam (ug/l)	<0.013	Catchment	4011811	6FOST1
Foston Brook 8 - Foston Upstream	15/06/2021 10:52	Asulam (ug/l)	<0.013	Catchment	4011810	6FOST1
Sutton Brook at Sutton on the Hill	15/06/2021 10:52	Asulam (ug/l)	<0.013	Catchment	4011814	6HILT1
Hilton Brook downstream	15/06/2021 10:50	Asulam (ug/l)	<0.013	Catchment	4011842	6HILT1
confluence Rolleston Brook	15/06/2021 10:50	Asulam (ug/l)	<0.013	Catchment	4011847	7ROLL1
Rolleston Brook downstream	15/06/2021 10:50	Asulam (ug/l)	<0.013	Catchment	4011846	7ROLL1
River Dove at Egginton Raw	15/06/2021 10:49	Asulam (ug/l)	<0.013	Catchment	4011843	4MELBN
R.Severn nr Bridgnorth	15/06/2021 09:38	Asulam (ug/l)	<0.013	Catchment	3991612	1SEVE
R.Stour upstream Hampton Loade	15/06/2021 09:12	Asulam (ug/l)	<0.013	Catchment	3991607	1SEVE
Bourne Brook	10/06/2021 14:45	Asulam (ug/l)	<0.013	Catchment	4011834	8SBOU1
Didgeley Brook	10/06/2021 14:44	Asulam (ug/l)	<0.013	Catchment	4011833	8SBOU1
R.Blythe - Blythe Bridge SP211898	10/06/2021 14:19	Asulam (ug/l)	<0.013	Catchment	4011835	8SBLY0
R.Blythe - Packington SP218852	10/06/2021 14:11	Asulam (ug/l)	<0.013	Catchment	4011836	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	10/06/2021 14:08	Asulam (ug/l)	<0.013	Catchment	4011838	8SBLY0
R.Blythe - Temple Balsall SP208763	10/06/2021 13:21	Asulam (ug/l)	<0.013	Catchment	4011841	8SBLY0
R.Blythe - Solihull SP164789	10/06/2021 13:12	Asulam (ug/l)	<0.013	Catchment	4011832	8SBLY0

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BORROWASH	08/06/2021 12:10	Asulam (ug/l)	<0.013	Catchment	4011815	6DERWC
Markeaton Brook @ Quarndon	08/06/2021 11:30	Asulam (ug/l)	<0.013	Catchment	4011822	6MARK0
Derwent Met Nether Lane Hazelwood	08/06/2021 11:10	Asulam (ug/l)	<0.013	Catchment	4011823	6DERW7
River Derwent at Ambergate NEW	08/06/2021 10:50	Asulam (ug/l)	<0.013	Catchment	4011821	6DERW7
Mill Drive West Houses	08/06/2021 10:25	Asulam (ug/l)	<0.013	Catchment	4011820	6DERW7
River Amber outside Milltown	08/06/2021 10:15	Asulam (ug/l)	<0.013	Catchment	4011787	6AMBE2
Hodgelane Brook	08/06/2021 09:50	Asulam (ug/l)	<0.013	Catchment	4011790	6HODG0
Smalley Brook	08/06/2021 09:40	Asulam (ug/l)	<0.013	Catchment	4011786	6SMAL1
Carr Brook footbridge	08/06/2021 09:20	Asulam (ug/l)	<0.013	Catchment	4011789	6CARR0
BORROWASH	28/05/2021 15:09	Asulam (ug/l)	<0.013	Catchment	3986015	6DERWC
Markeaton Brook @ Quarndon	28/05/2021 15:09	Asulam (ug/l)	<0.013	Catchment	3986012	6MARK0
Derwent Met Nether Lane Hazelwood	28/05/2021 14:52	Asulam (ug/l)	<0.013	Catchment	3986011	6DERW7
River Derwent at Ambergate NEW	28/05/2021 14:35	Asulam (ug/l)	<0.013	Catchment	3986013	6DERW7
Mill Drive West Houses	28/05/2021 14:11	Asulam (ug/l)	<0.013	Catchment	3986014	6DERW7
River Amber outside Milltown	28/05/2021 14:07	Asulam (ug/l)	<0.013	Catchment	3986033	6AMBE2
Smalley Brook	28/05/2021 14:05	Asulam (ug/l)	<0.013	Catchment	3986034	6SMAL1
Hodgelane Brook	28/05/2021 14:04	Asulam (ug/l)	<0.013	Catchment	3986030	6HODG0
Carr Brook footbridge	28/05/2021 12:57	Asulam (ug/l)	<0.013	Catchment	3986031	6CARR0
River Wye @ Kerne Bridge	28/05/2021 12:56	Asulam (ug/l)	<0.013	Catchment	3968961	2WYE
Unamed tributary Woolley Moor	28/05/2021 12:56	Asulam (ug/l)	<0.013	Catchment	3986032	6AMBE2

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River Wye @ King caple foot Bridge	28/05/2021 12:23	Asulam (ug/l)	<0.013	Catchment	3968962	2WYE
River Wye @ Hampton Bishop	28/05/2021 11:53	Asulam (ug/l)	<0.013	Catchment	3968958	2WYE
River Lugg @ Mordiford Bridge	28/05/2021 11:44	Asulam (ug/l)	<0.013	Catchment	3968963	2LUGG
River Frome at Larport Lane Bridge	28/05/2021 11:33	Asulam (ug/l)	<0.013	Catchment	3968959	2FROMA
River Lugg upstream Bridge	28/05/2021 11:00	Asulam (ug/l)	<0.013	Catchment	3968960	2LUGG
R.Severn nr Upton Magna	26/05/2021 11:56	Asulam (ug/l)	<0.013	Catchment	3968953	1SEVE
River Tern d/s at Tern Bridge	26/05/2021 11:15	Asulam (ug/l)	<0.013	Catchment	3968955	1SEVE
R.Severn nr Broseley	26/05/2021 10:49	Asulam (ug/l)	<0.013	Catchment	3968952	1SEVE
Cound Brook from bridge	26/05/2021 10:30	Asulam (ug/l)	<0.013	Catchment	3968956	1COUN
R.Severn nr Bridgnorth	26/05/2021 10:17	Asulam (ug/l)	<0.013	Catchment	3968951	1SEVE
R.Severn nr Upton Marina	20/05/2021 16:12	Asulam (ug/l)	<0.013	Catchment	3968943	1SEVE
R.Severn nr Kempsey	20/05/2021 15:45	Asulam (ug/l)	<0.013	Catchment	3968944	1SEVE
WS13 Severn - R Teme to R Avon u/s	20/05/2021 15:25	Asulam (ug/l)	<0.013	Catchment	3968948	1SEVE
River Teme downstream	20/05/2021 14:57	Asulam (ug/l)	<0.013	Catchment	3968950	2TEMEA
Lane at Ulverscroft Wood	20/05/2021 13:59	Asulam (ug/l)	<0.013	Catchment	3991588	4QUORB
Newtown Linford T - junction	20/05/2021 13:53	Asulam (ug/l)	<0.013	Catchment	3991592	4QUORB
Stour to River Teme d/s Salwarpe	20/05/2021 13:23	Asulam (ug/l)	<0.013	Catchment	3968947	1SEVE
Stour to River Teme u/s Shrawley Bk	20/05/2021 13:06	Asulam (ug/l)	<0.013	Catchment	3968946	1SEVE
Stourport (DS R.Stour)	20/05/2021 12:46	Asulam (ug/l)	<0.013	Catchment	3968945	1SEVE
Swithland Village opp St Leonards Church	20/05/2021 12:11	Asulam (ug/l)	<0.013	Catchment	3991590	4QUORB

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Swithland feed adj railway	20/05/2021 11:32	Asulam (ug/l)	<0.013	Catchment	3991589	4QUORB
Bradgate Road, Cropston under	20/05/2021 11:25	Asulam (ug/l)	<0.013	Catchment	3991591	4QUORB
Teme to R Avon d/s Bushley Longdon Bk	20/05/2021 10:37	Asulam (ug/l)	<0.013	Catchment	3968949	1SEVE
7b - Bradgate Chapel, Cropston Reservoir	20/05/2021 10:09	Asulam (ug/l)	<0.013	Catchment	3991594	4QUORB
Cropston Res car park	20/05/2021 09:39	Asulam (ug/l)	<0.013	Catchment	3991593	4QUORB
Staunton Harold Brook	19/05/2021 16:09	Asulam (ug/l)	<0.013	Catchment	3991585	4STAUB
Heath End Brook	19/05/2021 16:08	Asulam (ug/l)	<0.013	Catchment	3991584	4HEATB
Jubilee Brook	19/05/2021 15:25	Asulam (ug/l)	<0.013	Catchment	3991586	4JUBIB
Scotts Brook	19/05/2021 15:24	Asulam (ug/l)	<0.013	Catchment	3991587	4SCOTB
R.Avon Station Road	18/05/2021 15:44	Asulam (ug/l)	<0.013	Catchment	3981038	3AVOU
R.Avon - Welford Bridge	18/05/2021 15:20	Asulam (ug/l)	<0.013	Catchment	3981045	3AVOU
R Leam source to conf Rains Brook	18/05/2021 14:33	Asulam (ug/l)	<0.013	Catchment	3981041	3LEAM
R Stowe source to conf R Leam	18/05/2021 14:12	Asulam (ug/l)	<0.013	Catchment	3981046	3STOW
Radford Brook source to conf R Leam	18/05/2021 12:54	Asulam (ug/l)	<0.013	Catchment	3981039	3RADF
to conf R Avon - Willes Meadow Foot	18/05/2021 12:16	Asulam (ug/l)	<0.013	Catchment	3981042	3LEAM
conf. R Stowe - Thorpe Bridge Ufton	18/05/2021 11:54	Asulam (ug/l)	<0.013	Catchment	3981043	3ITCH
confluence Rolleston Brook	18/05/2021 11:29	Asulam (ug/l)	<0.013	Catchment	3986047	7ROLL1
Rolleston Brook downstream	18/05/2021 11:28	Asulam (ug/l)	<0.013	Catchment	3986048	7ROLL1
Foston Brook 8 - Foston Upstream	18/05/2021 11:27	Asulam (ug/l)	<0.013	Catchment	3986039	6FOST1
downstream before confluence River	18/05/2021 11:26	Asulam (ug/l)	<0.013	Catchment	3986038	6FOST1

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AL8 Leam - conf R Itchen to R Avon u/s	18/05/2021 11:25	Asulam (ug/l)	<0.013	Catchment	3981037	3LEAM
River Dove Upstream	18/05/2021 11:25	Asulam (ug/l)	<0.013	Catchment	3986040	6DOVE2
Rolleston Brook upstream	18/05/2021 11:24	Asulam (ug/l)	<0.013	Catchment	3986050	7ROLL1
Hilton Brook downstream	18/05/2021 11:23	Asulam (ug/l)	<0.013	Catchment	3986052	6HILT1
River Dove at Egginton Raw	18/05/2021 11:22	Asulam (ug/l)	<0.013	Catchment	3986051	4MELBN
Rains Bk to R Itchen u/s	18/05/2021 11:12	Asulam (ug/l)	<0.013	Catchment	3981036	3LEAM
Stowe to conf. R Leam - Marton	18/05/2021 10:45	Asulam (ug/l)	<0.013	Catchment	3981044	3ITCH
Brook to conf R Itchen	18/05/2021 10:18	Asulam (ug/l)	<0.013	Catchment	3981040	3LEAM
Sutton Brook at Sutton on the Hill	17/05/2021 16:35	Asulam (ug/l)	<0.013	Catchment	3986035	6HILT1
Cubley Brook at Boylestone	17/05/2021 15:51	Asulam (ug/l)	<0.013	Catchment	3986041	6FOST1
Brailsford Brook at Longford	17/05/2021 15:16	Asulam (ug/l)	<0.013	Catchment	3986036	6BRAI1
Shirley Brook at Longford	17/05/2021 15:16	Asulam (ug/l)	<0.013	Catchment	3986037	6SHIR3
Cubley Brook @ Little Cubley	17/05/2021 14:36	Asulam (ug/l)	<0.013	Catchment	3986042	6FOST1
R.Blythe - Temple Balsall SP208763	17/05/2021 11:03	Asulam (ug/l)	<0.013	Catchment	3986053	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	17/05/2021 10:59	Asulam (ug/l)	<0.013	Catchment	3986054	8SBLY0
R.Blythe - Packington SP218852	17/05/2021 10:59	Asulam (ug/l)	<0.013	Catchment	3986055	8SBLY0
Bourne Brook	17/05/2021 10:58	Asulam (ug/l)	<0.013	Catchment	3986057	8SBOU1
R.Blythe - Blythe Bridge SP211898	17/05/2021 10:58	Asulam (ug/l)	<0.013	Catchment	3986056	8SBLY0
Didgeley Brook	17/05/2021 10:57	Asulam (ug/l)	<0.013	Catchment	3986058	8SBOU1
R.Blythe - Solihull SP164789	17/05/2021 10:53	Asulam (ug/l)	<0.013	Catchment	3986059	8SBLY0

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River Wye @ Kerne Bridge	27/04/2021 12:24	Asulam (ug/l)	<0.013	Catchment	3949943	2WYE
River Wye @ King caple foot Bridge	27/04/2021 11:50	Asulam (ug/l)	<0.013	Catchment	3949942	2WYE
River Wye @ Hampton Bishop	27/04/2021 11:22	Asulam (ug/l)	<0.013	Catchment	3949946	2WYE
River Lugg @ Mordiford Bridge	27/04/2021 11:13	Asulam (ug/l)	<0.013	Catchment	3949941	2LUGG
River Frome at Larport Lane Bridge	27/04/2021 11:04	Asulam (ug/l)	<0.013	Catchment	3949945	2FROMA
R Leam source to conf Rains Brook	27/04/2021 11:03	Asulam (ug/l)	<0.013	Catchment	3958286	3LEAM
Radford Brook source to conf R Leam	27/04/2021 11:02	Asulam (ug/l)	<0.013	Catchment	3958288	3RADF
to conf R Avon - Willes Meadow Foot	27/04/2021 11:01	Asulam (ug/l)	<0.013	Catchment	3958285	3LEAM
conf. R Stowe - Thorpe Bridge Ufton	27/04/2021 10:44	Asulam (ug/l)	<0.013	Catchment	3958284	3ITCH
R Stowe source to conf R Leam	27/04/2021 10:41	Asulam (ug/l)	<0.013	Catchment	3958275	3STOW
River Lugg upstream Bridge	27/04/2021 10:37	Asulam (ug/l)	<0.013	Catchment	3949944	2LUGG
Rains Bk to R Itchen u/s	27/04/2021 10:10	Asulam (ug/l)	<0.013	Catchment	3958291	3LEAM
AL8 Leam - conf R Itchen to R Avon u/s	26/04/2021 13:33	Asulam (ug/l)	<0.013	Catchment	3958290	3LEAM
Stowe to conf. R Leam - Marton	26/04/2021 13:16	Asulam (ug/l)	<0.013	Catchment	3958283	3ITCH
Brook to conf R Itchen	26/04/2021 12:59	Asulam (ug/l)	<0.013	Catchment	3958287	3LEAM
R.Avon - Welford Bridge	26/04/2021 10:54	Asulam (ug/l)	0.016	Catchment	3958281	3AVOU
R.Avon Station Road	26/04/2021 10:40	Asulam (ug/l)	<0.013	Catchment	3958289	3AVOU
BORROWASH	23/04/2021 12:51	Asulam (ug/l)	<0.013	Catchment	3968380	6DERWC
Markeaton Brook @ Quarndon	23/04/2021 11:55	Asulam (ug/l)	<0.013	Catchment	3968383	6MARK0
Derwent Met Nether Lane Hazelwood	23/04/2021 11:54	Asulam (ug/l)	<0.013	Catchment	3968384	6DERW7

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River Derwent at Ambergate NEW	23/04/2021 10:47	Asulam (ug/l)	<0.013	Catchment	3968382	6DERW7
Mill Drive West Houses	23/04/2021 10:46	Asulam (ug/l)	<0.013	Catchment	3968381	6DERW7
Unamed tributary Woolley Moor	23/04/2021 10:24	Asulam (ug/l)	<0.013	Catchment	3968352	6AMBE2
Hodgelane Brook	23/04/2021 09:45	Asulam (ug/l)	<0.013	Catchment	3968354	6HODG0
Smalley Brook	23/04/2021 09:45	Asulam (ug/l)	<0.013	Catchment	3968350	6SMAL1
River Amber outside Milltown	23/04/2021 09:43	Asulam (ug/l)	<0.013	Catchment	3968351	6AMBE2
Carr Brook footbridge	23/04/2021 09:42	Asulam (ug/l)	<0.013	Catchment	3968353	6CARR0
Teme to R Avon d/s Bushley Longdon Bk	22/04/2021 15:46	Asulam (ug/l)	<0.013	Catchment	3910115	1SEVE
R.Severn nr Upton Marina	22/04/2021 15:44	Asulam (ug/l)	<0.013	Catchment	3910108	1SEVE
R.Severn nr Kempsey	22/04/2021 14:41	Asulam (ug/l)	<0.013	Catchment	3910109	1SEVE
WS13 Severn - R Teme to R Avon u/s	22/04/2021 14:20	Asulam (ug/l)	<0.013	Catchment	3910114	1SEVE
River Teme downstream	22/04/2021 13:47	Asulam (ug/l)	<0.013	Catchment	3910116	2TEMEA
Stour to River Teme d/s Salwarpe	22/04/2021 12:38	Asulam (ug/l)	<0.013	Catchment	3910113	1SEVE
Stour to River Teme u/s Shrawley Bk	22/04/2021 12:22	Asulam (ug/l)	<0.013	Catchment	3910112	1SEVE
Stourport (DS R.Stour)	22/04/2021 10:24	Asulam (ug/l)	<0.013	Catchment	3910111	1SEVE
R.Severn nr Broseley	20/04/2021 12:02	Asulam (ug/l)	<0.013	Catchment	3949951	1SEVE
River Tern d/s at Tern Bridge	20/04/2021 12:02	Asulam (ug/l)	<0.013	Catchment	3949949	1SEVE
R.Stour upstream Hampton Loade	20/04/2021 12:00	Asulam (ug/l)	<0.013	Catchment	3949947	1SEVE
R.Severn nr Bridgnorth	20/04/2021 12:00	Asulam (ug/l)	<0.013	Catchment	3949952	1SEVE
R.Severn nr Upton Magna	20/04/2021 11:59	Asulam (ug/l)	<0.013	Catchment	3949950	1SEVE

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Cound Brook from bridge	20/04/2021 11:56	Asulam (ug/l)	<0.013	Catchment	3949948	1COUN
Brailsford Brook at Longford	19/04/2021 16:08	Asulam (ug/l)	<0.013	Catchment	3968378	6BRAI1
Shirley Brook at Longford	19/04/2021 16:07	Asulam (ug/l)	<0.013	Catchment	3968377	6SHIR3
Cubley Brook @ Little Cubley	19/04/2021 14:37	Asulam (ug/l)	<0.013	Catchment	3968372	6FOST1
Cubley Brook at Boylestone	19/04/2021 14:37	Asulam (ug/l)	<0.013	Catchment	3968373	6FOST1
Rolleston Brook upstream	19/04/2021 14:36	Asulam (ug/l)	<0.013	Catchment	3968357	7ROLL1
Mill Fleam upstream	19/04/2021 14:35	Asulam (ug/l)	<0.013	Catchment	3968358	7ROLL1
Foston Brook 8 - Foston Upstream	19/04/2021 13:05	Asulam (ug/l)	<0.013	Catchment	3968375	6FOST1
downstream before confluence River	19/04/2021 13:02	Asulam (ug/l)	<0.013	Catchment	3968376	6FOST1
Hilton Brook downstream	19/04/2021 13:01	Asulam (ug/l)	<0.013	Catchment	3968355	6HILT1
Sutton Brook at Sutton on the Hill	19/04/2021 13:01	Asulam (ug/l)	<0.013	Catchment	3968379	6HILT1
confluence Rolleston Brook	19/04/2021 11:52	Asulam (ug/l)	<0.013	Catchment	3968360	7ROLL1
River Dove Upstream	19/04/2021 11:52	Asulam (ug/l)	<0.013	Catchment	3968374	6DOVE2
Rolleston Brook downstream	19/04/2021 11:51	Asulam (ug/l)	<0.013	Catchment	3968359	7ROLL1
River Dove at Egginton Raw	19/04/2021 11:44	Asulam (ug/l)	<0.013	Catchment	3968356	4MELBN
Swithland Village opp St Leonards Church	15/04/2021 11:33	Asulam (ug/l)	<0.013	Catchment	3968933	4QUORB
Swithland feed adj railway	15/04/2021 10:59	Asulam (ug/l)	<0.013	Catchment	3968934	4QUORB
Bradgate Road, Cropston under	15/04/2021 10:42	Asulam (ug/l)	<0.013	Catchment	3968932	4QUORB
7b - Bradgate Chapel, Cropston Reservoir	15/04/2021 09:36	Asulam (ug/l)	<0.013	Catchment	3968929	4QUORB
Cropston Res car park	15/04/2021 09:35	Asulam (ug/l)	<0.013	Catchment	3968930	4QUORB

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Lane at Ulverscroft Wood	14/04/2021 14:50	Asulam (ug/l)	<0.013	Catchment	3968935	4QUORB
Newtown Linford T - junction	14/04/2021 14:48	Asulam (ug/l)	<0.013	Catchment	3968931	4QUORB
Jubilee Brook	14/04/2021 12:53	Asulam (ug/l)	<0.013	Catchment	3968939	4JUBIB
Scotts Brook	14/04/2021 12:34	Asulam (ug/l)	<0.013	Catchment	3968938	4SCOTB
Heath End Brook	14/04/2021 12:23	Asulam (ug/l)	<0.013	Catchment	3968942	4HEATB
Staunton Harold Brook	14/04/2021 12:16	Asulam (ug/l)	<0.013	Catchment	3968941	4STAUB
R.Blythe - Temple Balsall SP208763	09/04/2021 12:04	Asulam (ug/l)	<0.013	Catchment	3968367	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	09/04/2021 12:00	Asulam (ug/l)	<0.013	Catchment	3968366	8SBLY0
R.Blythe - Blythe Bridge SP211898	09/04/2021 11:59	Asulam (ug/l)	<0.013	Catchment	3968364	8SBLY0
R.Blythe - Packington SP218852	09/04/2021 11:58	Asulam (ug/l)	<0.013	Catchment	3968365	8SBLY0
R.Blythe - Solihull SP164789	09/04/2021 11:54	Asulam (ug/l)	<0.013	Catchment	3968361	8SBLY0
Bourne Brook	09/04/2021 11:53	Asulam (ug/l)	<0.013	Catchment	3968363	8SBOU1
Didgeley Brook	09/04/2021 11:52	Asulam (ug/l)	<0.013	Catchment	3968362	8SBOU1
River Wye @ Kerne Bridge	31/03/2021 14:00	Asulam (ug/l)	<0.013	Catchment	3910095	2WYE
River Wye @ King caple foot Bridge	31/03/2021 13:23	Asulam (ug/l)	<0.013	Catchment	3910096	2WYE
River Wye @ Hampton Bishop	31/03/2021 12:50	Asulam (ug/l)	<0.013	Catchment	3910092	2WYE
River Frome at Larport Lane Bridge	31/03/2021 12:20	Asulam (ug/l)	<0.013	Catchment	3910093	2FROMA
River Lugg upstream Bridge	31/03/2021 11:42	Asulam (ug/l)	<0.013	Catchment	3910094	2LUGG
7b - Bradgate Chapel, Cropston Reservoir	25/03/2021 10:01	Asulam (ug/l)	<0.013	Catchment	3949963	4QUORB
Cropston Res car park	25/03/2021 09:36	Asulam (ug/l)	<0.013	Catchment	3949962	4QUORB

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Jubilee Brook	24/03/2021 15:44	Asulam (ug/l)	<0.013	Catchment	3949955	4JUBIB
R.Avon - Welford Bridge	24/03/2021 14:13	Asulam (ug/l)	<0.013	Catchment	3934680	3AVOU
Scotts Brook	24/03/2021 14:12	Asulam (ug/l)	<0.013	Catchment	3949956	4SCOTB
Staunton Harold Brook	24/03/2021 13:48	Asulam (ug/l)	<0.013	Catchment	3949954	4STAUB
Heath End Brook	24/03/2021 13:47	Asulam (ug/l)	<0.013	Catchment	3949953	4HEATB
R.Avon Station Road	24/03/2021 13:40	Asulam (ug/l)	<0.013	Catchment	3934673	3AVOU
R Leam source to conf Rains Brook	24/03/2021 13:02	Asulam (ug/l)	<0.013	Catchment	3934676	3LEAM
Lane at Ulverscroft Wood	24/03/2021 12:33	Asulam (ug/l)	<0.013	Catchment	3949957	4QUORB
BORROWASH	24/03/2021 12:25	Asulam (ug/l)	<0.013	Catchment	3938741	6DERWC
Newtown Linford T - junction	24/03/2021 11:50	Asulam (ug/l)	<0.013	Catchment	3949961	4QUORB
Markeaton Brook @ Quarndon	24/03/2021 11:45	Asulam (ug/l)	<0.013	Catchment	3938738	6MARK0
Bradgate Road, Cropston under	24/03/2021 11:33	Asulam (ug/l)	<0.013	Catchment	3949960	4QUORB
Derwent Met Nether Lane Hazelwood	24/03/2021 11:30	Asulam (ug/l)	<0.013	Catchment	3938737	6DERW7
Radford Brook source to conf R Leam	24/03/2021 11:28	Asulam (ug/l)	<0.013	Catchment	3934674	3RADF
River Derwent at Ambergate NEW	24/03/2021 11:15	Asulam (ug/l)	<0.013	Catchment	3938739	6DERW7
Swithland feed adj railway	24/03/2021 11:02	Asulam (ug/l)	<0.013	Catchment	3949958	4QUORB
to conf R Avon - Willes Meadow Foot	24/03/2021 11:02	Asulam (ug/l)	<0.013	Catchment	3934677	3LEAM
Mill Drive West Houses	24/03/2021 10:50	Asulam (ug/l)	<0.013	Catchment	3938740	6DERW7
R Stowe source to conf R Leam	24/03/2021 10:34	Asulam (ug/l)	<0.013	Catchment	3934681	3STOW
conf. R Stowe - Thorpe Bridge Ufton	24/03/2021 10:21	Asulam (ug/l)	<0.013	Catchment	3934678	3ITCH

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Unamed tributary Woolley Moor	24/03/2021 10:10	Asulam (ug/l)	<0.013	Catchment	3938727	6AMBE2
AL8 Leam - conf R Itchen to R Avon u/s	24/03/2021 09:53	Asulam (ug/l)	<0.013	Catchment	3934672	3LEAM
Hodgelane Brook	24/03/2021 09:49	Asulam (ug/l)	<0.013	Catchment	3938725	6HODG0
Smalley Brook	24/03/2021 09:48	Asulam (ug/l)	<0.013	Catchment	3938729	6SMAL1
Stowe to conf. R Leam - Marton	24/03/2021 09:40	Asulam (ug/l)	<0.013	Catchment	3934679	3ITCH
River Amber outside Milltown	24/03/2021 09:35	Asulam (ug/l)	<0.013	Catchment	3938728	6AMBE2
Brook to conf R Itchen	24/03/2021 09:30	Asulam (ug/l)	<0.013	Catchment	3934675	3LEAM
Swithland Village opp St Leonards Church	24/03/2021 09:20	Asulam (ug/l)	<0.013	Catchment	3949959	4QUORB
Rains Bk to R Itchen u/s	24/03/2021 09:11	Asulam (ug/l)	0.04	Catchment	3934671	3LEAM
confluence Rolleston Brook	23/03/2021 13:34	Asulam (ug/l)	<0.013	Catchment	3938689	7ROLL1
Rolleston Brook downstream	23/03/2021 13:34	Asulam (ug/l)	<0.013	Catchment	3938690	7ROLL1
Rolleston Brook upstream	23/03/2021 13:33	Asulam (ug/l)	<0.013	Catchment	3938692	7ROLL1
Hilton Brook downstream	23/03/2021 13:32	Asulam (ug/l)	<0.013	Catchment	3938694	6HILT1
River Dove at Egginton Raw	23/03/2021 13:32	Asulam (ug/l)	<0.013	Catchment	3938693	4MELBN
Sutton Brook at Sutton on the Hill	23/03/2021 13:31	Asulam (ug/l)	<0.013	Catchment	3938695	6HILT1
downstream before confluence River	23/03/2021 13:30	Asulam (ug/l)	<0.013	Catchment	3938698	6FOST1
Shirley Brook at Longford	23/03/2021 13:30	Asulam (ug/l)	<0.013	Catchment	3938697	6SHIR3
Foston Brook 8 - Foston Upstream	23/03/2021 13:29	Asulam (ug/l)	<0.013	Catchment	3938699	6FOST1
River Dove Upstream	23/03/2021 13:29	Asulam (ug/l)	<0.013	Catchment	3938700	6DOVE2
Cubley Brook @ Little Cubley	23/03/2021 13:28	Asulam (ug/l)	<0.013	Catchment	3938702	6FOST1

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Cubley Brook at Boylestone	23/03/2021 13:28	Asulam (ug/l)	<0.013	Catchment	3938701	6FOST1
River Teme downstream	18/03/2021 14:59	Asulam (ug/l)	<0.013	Catchment	3910100	2TEMEA
Teme to R Avon d/s Bushley Longdon Bk	18/03/2021 14:58	Asulam (ug/l)	<0.013	Catchment	3910101	1SEVE
WS13 Severn - R Teme to R Avon u/s	18/03/2021 14:57	Asulam (ug/l)	<0.013	Catchment	3910102	1SEVE
Stour to River Teme d/s Salwarpe	18/03/2021 14:56	Asulam (ug/l)	<0.013	Catchment	3910103	1SEVE
Stour to River Teme u/s Shrawley Bk	18/03/2021 14:55	Asulam (ug/l)	<0.013	Catchment	3910104	1SEVE
Stourport (DS R.Stour)	18/03/2021 14:54	Asulam (ug/l)	<0.013	Catchment	3910105	1SEVE
R.Severn nr Kempsey	18/03/2021 14:53	Asulam (ug/l)	<0.013	Catchment	3910106	1SEVE
R.Severn nr Upton Marina	18/03/2021 14:52	Asulam (ug/l)	<0.013	Catchment	3910107	1SEVE
R.Severn nr Upton Magna	16/03/2021 13:46	Asulam (ug/l)	<0.013	Catchment	3910086	1SEVE
River Tern d/s at Tern Bridge	16/03/2021 13:20	Asulam (ug/l)	<0.013	Catchment	3910087	1SEVE
Cound Brook from bridge	16/03/2021 12:57	Asulam (ug/l)	<0.013	Catchment	3910088	1COUN
R.Severn nr Broseley	16/03/2021 12:02	Asulam (ug/l)	<0.013	Catchment	3910085	1SEVE
R.Stour upstream Hampton Loade	16/03/2021 11:32	Asulam (ug/l)	<0.013	Catchment	3910089	1SEVE
R.Severn nr Bridgnorth	16/03/2021 11:30	Asulam (ug/l)	<0.013	Catchment	3910082	1SEVE
R.Blythe - Blythe Bridge SP211898	12/03/2021 17:48	Asulam (ug/l)	<0.013	Catchment	3938733	8SBLY0
Bourne Brook	12/03/2021 17:47	Asulam (ug/l)	<0.013	Catchment	3938734	8SBOU1
Didgeley Brook	12/03/2021 17:47	Asulam (ug/l)	<0.013	Catchment	3938735	8SBOU1
R.Blythe - Packington SP218852	12/03/2021 17:45	Asulam (ug/l)	<0.013	Catchment	3938732	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	12/03/2021 17:43	Asulam (ug/l)	<0.013	Catchment	3938731	8SBLY0

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R.Blythe - Temple Balsall SP208763	12/03/2021 17:42	Asulam (ug/l)	<0.013	Catchment	3938730	8SBLY0
R.Blythe - Solihull SP164789	12/03/2021 17:40	Asulam (ug/l)	<0.013	Catchment	3938736	8SBLY0
Staunton Harold Brook	25/02/2021 15:27	Asulam (ug/l)	<0.013	Catchment	3910072	4STAUB
Jubilee Brook	25/02/2021 14:58	Asulam (ug/l)	<0.013	Catchment	3910071	4JUBIB
Scotts Brook	25/02/2021 14:34	Asulam (ug/l)	<0.013	Catchment	3910070	4SCOTB
Cubley Brook @ Little Cubley	25/02/2021 13:14	Asulam (ug/l)	<0.013	Catchment	3905617	6FOST1
Foston Brook 8 - Foston Upstream	25/02/2021 13:13	Asulam (ug/l)	<0.013	Catchment	3905620	6FOST1
River Dove Upstream	25/02/2021 13:13	Asulam (ug/l)	<0.013	Catchment	3905619	6DOVE2
downstream before confluence River	25/02/2021 13:12	Asulam (ug/l)	<0.013	Catchment	3905621	6FOST1
Shirley Brook at Longford	25/02/2021 13:12	Asulam (ug/l)	<0.013	Catchment	3905622	6SHIR3
Brailsford Brook at Longford	25/02/2021 13:11	Asulam (ug/l)	<0.013	Catchment	3905623	6BRAI1
Hilton Brook downstream	25/02/2021 13:10	Asulam (ug/l)	<0.013	Catchment	3905625	6HILT1
Sutton Brook at Sutton on the Hill	25/02/2021 13:10	Asulam (ug/l)	<0.013	Catchment	3905624	6HILT1
River Dove at Egginton Raw	25/02/2021 13:09	Asulam (ug/l)	<0.013	Catchment	3905626	4MELBN
confluence Rolleston Brook	25/02/2021 13:07	Asulam (ug/l)	<0.013	Catchment	3905630	7ROLL1
Rolleston Brook downstream	25/02/2021 13:07	Asulam (ug/l)	<0.013	Catchment	3905629	7ROLL1
Newtown Linford T - junction	25/02/2021 13:04	Asulam (ug/l)	<0.013	Catchment	3910062	4QUORB
Lane at Ulverscroft Wood	25/02/2021 12:45	Asulam (ug/l)	<0.013	Catchment	3910069	4QUORB
Swithland feed adj railway	25/02/2021 11:31	Asulam (ug/l)	<0.013	Catchment	3910068	4QUORB
Swithland Village opp St Leonards Church	25/02/2021 11:03	Asulam (ug/l)	<0.013	Catchment	3910064	4QUORB

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Bradgate Road, Cropston under	25/02/2021 10:42	Asulam (ug/l)	<0.013	Catchment	3910063	4QUORB
7b - Bradgate Chapel, Cropston Reservoir	25/02/2021 09:48	Asulam (ug/l)	<0.013	Catchment	3910060	4QUORB
Cropston Res car park	25/02/2021 09:18	Asulam (ug/l)	<0.013	Catchment	3910061	4QUORB
R.Avon - Welford Bridge	24/02/2021 13:24	Asulam (ug/l)	<0.013	Catchment	3903243	3AVOU
Radford Brook source to conf R Leam	24/02/2021 11:34	Asulam (ug/l)	<0.013	Catchment	3903249	3RADF
to conf R Avon - Willes Meadow Foot	24/02/2021 11:13	Asulam (ug/l)	<0.013	Catchment	3903246	3LEAM
R Stowe source to conf R Leam	24/02/2021 10:40	Asulam (ug/l)	<0.013	Catchment	3903242	3STOW
River Wye @ Kerne Bridge	23/02/2021 12:32	Asulam (ug/l)	<0.013	Catchment	3903237	2WYE
River Wye @ King caple foot Bridge	23/02/2021 12:03	Asulam (ug/l)	<0.013	Catchment	3903236	2WYE
River Amber outside Milltown	23/02/2021 11:33	Asulam (ug/l)	<0.013	Catchment	3906846	6AMBE2
River Wye @ Hampton Bishop	23/02/2021 11:33	Asulam (ug/l)	<0.013	Catchment	3903240	2WYE
Hodgelane Brook	23/02/2021 11:31	Asulam (ug/l)	<0.013	Catchment	3906849	6HODG0
Unamed tributary Woolley Moor	23/02/2021 11:29	Asulam (ug/l)	<0.013	Catchment	3906847	6AMBE2
Carr Brook footbridge	23/02/2021 11:28	Asulam (ug/l)	<0.013	Catchment	3906848	6CARR0
Smalley Brook	23/02/2021 11:27	Asulam (ug/l)	<0.013	Catchment	3906845	6SMAL1
River Lugg @ Mordiford Bridge	23/02/2021 11:25	Asulam (ug/l)	<0.013	Catchment	3903235	2LUGG
River Frome at Larport Lane Bridge	23/02/2021 11:16	Asulam (ug/l)	<0.013	Catchment	3903239	2FROMA
BORROWASH	23/02/2021 11:09	Asulam (ug/l)	<0.013	Catchment	3906850	6DERWC
River Lugg upstream Bridge	23/02/2021 10:42	Asulam (ug/l)	<0.013	Catchment	3903238	2LUGG
Markeaton Brook @ Quarndon	23/02/2021 10:41	Asulam (ug/l)	<0.013	Catchment	3906853	6MARK0

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Derwent Met Nether Lane Hazelwood	23/02/2021 10:28	Asulam (ug/l)	<0.013	Catchment	3906854	6DERW7
River Derwent at Ambergate NEW	23/02/2021 10:15	Asulam (ug/l)	<0.013	Catchment	3906852	6DERW7
Mill Drive West Houses	23/02/2021 09:50	Asulam (ug/l)	<0.013	Catchment	3906851	6DERW7
R.Severn nr Kempsey	18/02/2021 14:41	Asulam (ug/l)	<0.013	Catchment	3910080	1SEVE
River Teme downstream	18/02/2021 14:10	Asulam (ug/l)	<0.013	Catchment	3910074	2TEMEA
WS13 Severn - R Teme to R Avon u/s	18/02/2021 13:51	Asulam (ug/l)	<0.013	Catchment	3910076	1SEVE
Stour to River Teme d/s Salwarpe	18/02/2021 13:08	Asulam (ug/l)	<0.013	Catchment	3910077	1SEVE
Stour to River Teme u/s Shrawley Bk	18/02/2021 12:35	Asulam (ug/l)	<0.013	Catchment	3910078	1SEVE
Stourport (DS R.Stour)	18/02/2021 11:53	Asulam (ug/l)	<0.013	Catchment	3910079	1SEVE
Teme to R Avon d/s Bushley Longdon Bk	18/02/2021 10:51	Asulam (ug/l)	<0.013	Catchment	3910075	1SEVE
R.Severn nr Upton Marina	18/02/2021 10:25	Asulam (ug/l)	<0.013	Catchment	3910081	1SEVE
Bourne Brook	17/02/2021 16:00	Asulam (ug/l)	<0.013	Catchment	3905701	8SBOU1
Didgeley Brook	17/02/2021 16:00	Asulam (ug/l)	<0.013	Catchment	3905700	8SBOU1
R.Blythe - Blythe Bridge SP211898	17/02/2021 16:00	Asulam (ug/l)	<0.013	Catchment	3905702	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	17/02/2021 16:00	Asulam (ug/l)	<0.013	Catchment	3905704	8SBLY0
R.Blythe - Packington SP218852	17/02/2021 16:00	Asulam (ug/l)	<0.013	Catchment	3905703	8SBLY0
R.Blythe - Temple Balsall SP208763	17/02/2021 14:16	Asulam (ug/l)	<0.013	Catchment	3905705	8SBLY0
R.Blythe - Solihull SP164789	17/02/2021 13:59	Asulam (ug/l)	<0.013	Catchment	3905699	8SBLY0
R.Severn nr Upton Magna	16/02/2021 12:01	Asulam (ug/l)	<0.013	Catchment	3903256	1SEVE
River Tern d/s at Tern Bridge	16/02/2021 11:38	Asulam (ug/l)	<0.013	Catchment	3903255	1SEVE

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Cound Brook from bridge	16/02/2021 11:12	Asulam (ug/l)	<0.013	Catchment	3903254	1COUN
R.Severn nr Broseley	16/02/2021 10:47	Asulam (ug/l)	<0.013	Catchment	3903257	1SEVE
R.Severn nr Bridgnorth	16/02/2021 10:15	Asulam (ug/l)	<0.013	Catchment	3903258	1SEVE
R.Stour upstream Hampton Loade	16/02/2021 08:47	Asulam (ug/l)	<0.013	Catchment	3903253	1SEVE
R.Severn nr Upton Magna	01/02/2021 12:55	Asulam (ug/l)	<0.013	Catchment	3862028	1SEVE
Cound Brook from bridge	01/02/2021 12:47	Asulam (ug/l)	<0.013	Catchment	3862030	1COUN
River Tern d/s at Tern Bridge	01/02/2021 12:33	Asulam (ug/l)	<0.013	Catchment	3862029	1SEVE
R.Severn nr Broseley	01/02/2021 12:12	Asulam (ug/l)	<0.013	Catchment	3862027	1SEVE
R.Severn nr Bridgnorth	01/02/2021 11:41	Asulam (ug/l)	<0.013	Catchment	3862026	1SEVE
Mill Fleam upstream	28/01/2021 13:19	Asulam (ug/l)	<0.013	Catchment	3884182	7ROLL1
confluence Rolleston Brook	28/01/2021 13:18	Asulam (ug/l)	<0.013	Catchment	3884180	7ROLL1
Mill Drive West Houses	28/01/2021 12:05	Asulam (ug/l)	<0.013	Catchment	3884285	6DERW7
Derwent Met Nether Lane Hazelwood	28/01/2021 12:03	Asulam (ug/l)	<0.013	Catchment	3884282	6DERW7
Markeaton Brook @ Quarndon	28/01/2021 12:02	Asulam (ug/l)	<0.013	Catchment	3884283	6MARK0
River Derwent at Ambergate NEW	28/01/2021 11:56	Asulam (ug/l)	<0.013	Catchment	3884284	6DERW7
Hodgelane Brook	28/01/2021 08:30	Asulam (ug/l)	<0.013	Catchment	3884287	6HODG0
River Amber outside Milltown	28/01/2021 08:30	Asulam (ug/l)	<0.013	Catchment	3884290	6AMBE2
Smalley Brook	28/01/2021 08:30	Asulam (ug/l)	<0.013	Catchment	3884291	6SMAL1
Unamed tributary Woolley Moor	28/01/2021 08:30	Asulam (ug/l)	<0.013	Catchment	3884289	6AMBE2
Carr Brook footbridge	28/01/2021 07:21	Asulam (ug/l)	<0.013	Catchment	3884288	6CARR0

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Brailsford Brook at Longford	27/01/2021 15:06	Asulam (ug/l)	<0.013	Catchment	3884187	6BRAI1
Cubley Brook @ Little Cubley	27/01/2021 14:36	Asulam (ug/l)	<0.013	Catchment	3884193	6FOST1
downstream before confluence River	27/01/2021 14:23	Asulam (ug/l)	<0.013	Catchment	3884189	6FOST1
River Dove Upstream	27/01/2021 14:17	Asulam (ug/l)	<0.013	Catchment	3884191	6DOVE2
Rolleston Brook upstream	27/01/2021 14:16	Asulam (ug/l)	<0.013	Catchment	3884183	7ROLL1
R.Avon Station Road	27/01/2021 14:07	Asulam (ug/l)	<0.013	Catchment	3884164	3AVOU
R.Avon - Welford Bridge	27/01/2021 13:42	Asulam (ug/l)	<0.013	Catchment	3884171	3AVOU
R Leam source to conf Rains Brook	27/01/2021 12:57	Asulam (ug/l)	<0.013	Catchment	3884167	3LEAM
Radford Brook source to conf R Leam	27/01/2021 11:49	Asulam (ug/l)	<0.013	Catchment	3884165	3RADF
to conf R Avon - Willes Meadow Foot	27/01/2021 11:27	Asulam (ug/l)	<0.013	Catchment	3884168	3LEAM
conf. R Stowe - Thorpe Bridge Ufton	27/01/2021 11:03	Asulam (ug/l)	<0.013	Catchment	3884169	3ITCH
R Stowe source to conf R Leam	27/01/2021 10:51	Asulam (ug/l)	<0.013	Catchment	3884172	3STOW
AL8 Leam - conf R Itchen to R Avon u/s	27/01/2021 10:29	Asulam (ug/l)	<0.013	Catchment	3884163	3LEAM
River Dove at Egginton Raw	27/01/2021 10:17	Asulam (ug/l)	<0.013	Catchment	3884184	4MELBN
Stowe to conf. R Leam - Marton	27/01/2021 10:10	Asulam (ug/l)	<0.013	Catchment	3884170	3ITCH
Brook to conf R Itchen	27/01/2021 09:58	Asulam (ug/l)	<0.013	Catchment	3884166	3LEAM
Rains Bk to R Itchen u/s	27/01/2021 09:40	Asulam (ug/l)	<0.013	Catchment	3884162	3LEAM
River Wye @ Hampton Bishop	22/01/2021 12:50	Asulam (ug/l)	<0.013	Catchment	3862024	2WYE
River Lugg @ Mordiford Bridge	22/01/2021 12:40	Asulam (ug/l)	<0.013	Catchment	3862023	2LUGG
River Frome at Larport Lane Bridge	22/01/2021 12:28	Asulam (ug/l)	<0.013	Catchment	3862025	2FROMA

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River Lugg upstream Bridge	22/01/2021 11:57	Asulam (ug/l)	<0.013	Catchment	3862020	2LUGG
Teme to R Avon d/s Bushley Longdon Bk	21/01/2021 15:32	Asulam (ug/l)	<0.013	Catchment	3884477	1SEVE
Staunton Harold Brook	21/01/2021 15:03	Asulam (ug/l)	<0.013	Catchment	3884413	4STAUB
Heath End Brook	21/01/2021 15:02	Asulam (ug/l)	<0.013	Catchment	3884405	4HEATB
Jubilee Brook	21/01/2021 14:43	Asulam (ug/l)	<0.013	Catchment	3884414	4JUBIB
Scotts Brook	21/01/2021 14:36	Asulam (ug/l)	<0.013	Catchment	3884416	4SCOTB
R.Severn nr Upton Marina	21/01/2021 14:17	Asulam (ug/l)	<0.013	Catchment	3884456	1SEVE
R.Severn nr Kempsey	21/01/2021 13:31	Asulam (ug/l)	<0.013	Catchment	3884458	1SEVE
WS13 Severn - R Teme to R Avon u/s	21/01/2021 13:09	Asulam (ug/l)	<0.013	Catchment	3884474	1SEVE
River Teme downstream	21/01/2021 12:44	Asulam (ug/l)	<0.013	Catchment	3884480	2TEMEA
Lane at Ulverscroft Wood	21/01/2021 12:20	Asulam (ug/l)	<0.013	Catchment	3884427	4QUORB
Newtown Linford T - junction	21/01/2021 12:03	Asulam (ug/l)	<0.013	Catchment	3884450	4QUORB
Swithland Village opp St Leonards Church	21/01/2021 11:37	Asulam (ug/l)	<0.013	Catchment	3884442	4QUORB
Stour to River Teme d/s Salwarpe	21/01/2021 11:35	Asulam (ug/l)	<0.013	Catchment	3884468	1SEVE
Stour to River Teme u/s Shrawley Bk	21/01/2021 11:13	Asulam (ug/l)	<0.013	Catchment	3884464	1SEVE
Swithland feed adj railway	21/01/2021 11:11	Asulam (ug/l)	<0.013	Catchment	3884432	4QUORB
Stourport (DS R.Stour)	21/01/2021 10:54	Asulam (ug/l)	<0.013	Catchment	3884461	1SEVE
Bradgate Road, Cropston under	21/01/2021 10:41	Asulam (ug/l)	<0.013	Catchment	3884444	4QUORB
7b - Bradgate Chapel, Cropston Reservoir	21/01/2021 10:06	Asulam (ug/l)	<0.013	Catchment	3884454	4QUORB
Cropston Res car park	21/01/2021 09:33	Asulam (ug/l)	<0.013	Catchment	3884452	4QUORB

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Didgeley Brook	12/01/2021 13:40	Asulam (ug/l)	<0.013	Catchment	3884178	8SBOU1
Bourne Brook	12/01/2021 13:39	Asulam (ug/l)	<0.013	Catchment	3884177	8SBOU1
R.Blythe - Blythe Bridge SP211898	12/01/2021 13:39	Asulam (ug/l)	<0.013	Catchment	3884176	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	12/01/2021 12:56	Asulam (ug/l)	<0.013	Catchment	3884174	8SBLY0
R.Blythe - Temple Balsall SP208763	12/01/2021 12:40	Asulam (ug/l)	<0.013	Catchment	3884173	8SBLY0
R.Blythe - Solihull SP164789	12/01/2021 10:20	Asulam (ug/l)	<0.013	Catchment	3884179	8SBLY0
BORROWASH	22/12/2020 13:45	Asulam (ug/l)	<0.013	Catchment	3843707	6DERWC
Mill Drive West Houses	22/12/2020 13:44	Asulam (ug/l)	<0.013	Catchment	3843708	6DERW7
Markeaton Brook @ Quarndon	22/12/2020 13:42	Asulam (ug/l)	<0.013	Catchment	3843710	6MARK0
Derwent Met Nether Lane Hazelwood	22/12/2020 13:41	Asulam (ug/l)	<0.013	Catchment	3843711	6DERW7
River Derwent at Ambergate NEW	22/12/2020 13:38	Asulam (ug/l)	<0.013	Catchment	3843709	6DERW7
Hodgelane Brook	22/12/2020 10:30	Asulam (ug/l)	<0.013	Catchment	3843706	6HODG0
Smalley Brook	22/12/2020 09:36	Asulam (ug/l)	<0.013	Catchment	3843702	6SMAL1
Unamed tributary Woolley Moor	22/12/2020 09:36	Asulam (ug/l)	<0.013	Catchment	3843704	6AMBE2
Carr Brook footbridge	22/12/2020 09:04	Asulam (ug/l)	<0.013	Catchment	3843705	6CARR0
River Amber outside Milltown	22/12/2020 09:03	Asulam (ug/l)	<0.013	Catchment	3843703	6AMBE2
Cropston Res car park	21/12/2020 09:43	Asulam (ug/l)	<0.013	Catchment	3865521	4QUORB
7b - Bradgate Chapel, Cropston Reservoir	20/12/2020 13:34	Asulam (ug/l)	<0.013	Catchment	3865520	4QUORB
Bradgate Road, Cropston under	20/12/2020 13:02	Asulam (ug/l)	<0.013	Catchment	3865523	4QUORB
Swithland Village opp St Leonards Church	20/12/2020 12:45	Asulam (ug/l)	<0.013	Catchment	3865524	4QUORB

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Swithland feed adj railway	20/12/2020 12:19	Asulam (ug/l)	<0.013	Catchment	3865525	4QUORB
Newtown Linford T - junction	20/12/2020 11:51	Asulam (ug/l)	<0.013	Catchment	3865522	4QUORB
Lane at Ulverscroft Wood	20/12/2020 11:31	Asulam (ug/l)	<0.013	Catchment	3865526	4QUORB
Staunton Harold Brook	20/12/2020 10:25	Asulam (ug/l)	<0.013	Catchment	3865529	4STAUB
Heath End Brook	20/12/2020 10:23	Asulam (ug/l)	<0.013	Catchment	3865530	4HEATB
Jubilee Brook	20/12/2020 10:08	Asulam (ug/l)	<0.013	Catchment	3865528	4JUBIB
Scotts Brook	20/12/2020 09:57	Asulam (ug/l)	<0.013	Catchment	3865527	4SCOTB
Teme to R Avon d/s Bushley Longdon Bk	18/12/2020 14:57	Asulam (ug/l)	<0.013	Catchment	3862040	1SEVE
River Teme downstream	18/12/2020 11:28	Asulam (ug/l)	<0.013	Catchment	3862039	2TEMEA
R.Severn nr Upton Marina	18/12/2020 11:06	Asulam (ug/l)	<0.013	Catchment	3862046	1SEVE
WS13 Severn - R Teme to R Avon u/s	18/12/2020 10:59	Asulam (ug/l)	<0.013	Catchment	3862041	1SEVE
Stour to River Teme d/s Salwarpe	17/12/2020 15:00	Asulam (ug/l)	<0.013	Catchment	3862042	1SEVE
Foston Brook 8 - Foston Upstream	17/12/2020 14:29	Asulam (ug/l)	<0.013	Catchment	3861936	6FOST1
downstream before confluence River	17/12/2020 14:28	Asulam (ug/l)	<0.013	Catchment	3861937	6FOST1
Sutton Brook at Sutton on the Hill	17/12/2020 14:26	Asulam (ug/l)	<0.013	Catchment	3861940	6HILT1
Hilton Brook downstream	17/12/2020 14:25	Asulam (ug/l)	<0.013	Catchment	3861941	6HILT1
confluence Rolleston Brook	17/12/2020 14:23	Asulam (ug/l)	<0.013	Catchment	3861976	7ROLL1
Rolleston Brook downstream	17/12/2020 14:21	Asulam (ug/l)	<0.013	Catchment	3861945	7ROLL1
River Dove Upstream	17/12/2020 14:19	Asulam (ug/l)	<0.013	Catchment	3861935	6DOVE2
River Dove at Egginton Raw	17/12/2020 14:16	Asulam (ug/l)	<0.013	Catchment	3861942	4MELBN

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Rolleston Brook upstream	17/12/2020 14:14	Asulam (ug/l)	<0.013	Catchment	3861943	7ROLL1
Stour to River Teme u/s Shrawley Bk	17/12/2020 14:06	Asulam (ug/l)	<0.013	Catchment	3862043	1SEVE
Stourport (DS R.Stour)	17/12/2020 13:25	Asulam (ug/l)	<0.013	Catchment	3862044	1SEVE
River Wye @ Kerne Bridge	17/12/2020 13:16	Asulam (ug/l)	<0.013	Catchment	3862011	2WYE
River Wye @ King caple foot Bridge	17/12/2020 12:44	Asulam (ug/l)	<0.013	Catchment	3862010	2WYE
River Wye @ Hampton Bishop	17/12/2020 12:05	Asulam (ug/l)	<0.013	Catchment	3862008	2WYE
River Lugg @ Mordiford Bridge	17/12/2020 12:01	Asulam (ug/l)	<0.013	Catchment	3862009	2LUGG
River Frome at Larport Lane Bridge	17/12/2020 11:51	Asulam (ug/l)	<0.013	Catchment	3862007	2FROMA
River Lugg upstream Bridge	17/12/2020 11:20	Asulam (ug/l)	<0.013	Catchment	3862012	2LUGG
R.Severn nr Kempsey	17/12/2020 11:13	Asulam (ug/l)	<0.013	Catchment	3862045	1SEVE
Cubley Brook @ Little Cubley	16/12/2020 15:07	Asulam (ug/l)	<0.013	Catchment	3861933	6FOST1
Brailsford Brook at Longford	16/12/2020 15:03	Asulam (ug/l)	<0.013	Catchment	3861939	6BRAI1
Shirley Brook at Longford	16/12/2020 15:01	Asulam (ug/l)	<0.013	Catchment	3861938	6SHIR3
Cubley Brook at Boylestone	16/12/2020 14:57	Asulam (ug/l)	<0.013	Catchment	3861934	6FOST1
R.Avon Station Road	15/12/2020 14:31	Asulam (ug/l)	<0.013	Catchment	3844231	3AVOU
R.Avon - Welford Bridge	15/12/2020 14:07	Asulam (ug/l)	<0.013	Catchment	3844224	3AVOU
R Leam source to conf Rains Brook	15/12/2020 13:26	Asulam (ug/l)	<0.013	Catchment	3844228	3LEAM
Radford Brook source to conf R Leam	15/12/2020 12:15	Asulam (ug/l)	<0.013	Catchment	3844230	3RADF
to conf R Avon - Willes Meadow Foot	15/12/2020 11:55	Asulam (ug/l)	<0.013	Catchment	3844227	3LEAM
R.Severn nr Bridgnorth	15/12/2020 11:44	Asulam (ug/l)	<0.013	Catchment	3844026	1SEVE

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R.Stour upstream Hampton Loade	15/12/2020 10:50	Asulam (ug/l)	<0.013	Catchment	3844021	1SEVE
conf. R Stowe - Thorpe Bridge Ufton	15/12/2020 10:49	Asulam (ug/l)	<0.013	Catchment	3844226	3ITCH
R Stowe source to conf R Leam	15/12/2020 10:38	Asulam (ug/l)	<0.013	Catchment	3844223	3STOW
AL8 Leam - conf R Itchen to R Avon u/s	15/12/2020 10:15	Asulam (ug/l)	<0.013	Catchment	3844232	3LEAM
Stowe to conf. R Leam - Marton	15/12/2020 10:03	Asulam (ug/l)	<0.013	Catchment	3844225	3ITCH
Brook to conf R Itchen	15/12/2020 09:50	Asulam (ug/l)	<0.013	Catchment	3844229	3LEAM
Rains Bk to R Itchen u/s	15/12/2020 09:31	Asulam (ug/l)	<0.013	Catchment	3844233	3LEAM
R.Severn nr Upton Magna	14/12/2020 14:25	Asulam (ug/l)	<0.013	Catchment	3844024	1SEVE
River Tern d/s at Tern Bridge	14/12/2020 12:41	Asulam (ug/l)	<0.013	Catchment	3844023	1SEVE
R.Severn nr Broseley	14/12/2020 11:24	Asulam (ug/l)	<0.013	Catchment	3844025	1SEVE
Cound Brook from bridge	14/12/2020 10:42	Asulam (ug/l)	<0.013	Catchment	3844022	1COUN
R.Blythe - Bradnocks Marsh SP216793	10/12/2020 14:11	Asulam (ug/l)	<0.013	Catchment	3861982	8SBLY0
Didgeley Brook	10/12/2020 14:09	Asulam (ug/l)	<0.013	Catchment	3861978	8SBOU1
Bourne Brook	10/12/2020 14:08	Asulam (ug/l)	<0.013	Catchment	3861979	8SBOU1
R.Blythe - Blythe Bridge SP211898	10/12/2020 14:07	Asulam (ug/l)	<0.013	Catchment	3861980	8SBLY0
R.Blythe - Temple Balsall SP208763	10/12/2020 13:30	Asulam (ug/l)	<0.013	Catchment	3861983	8SBLY0
R.Blythe - Solihull SP164789	10/12/2020 13:10	Asulam (ug/l)	<0.013	Catchment	3861977	8SBLY0
River Wye @ Kerne Bridge	23/10/2020 11:29	Asulam (ug/l)	<0.013	Catchment	3801974	2WYE
River Wye @ King caple foot Bridge	23/10/2020 10:51	Asulam (ug/l)	<0.013	Catchment	3801975	2WYE
River Wye @ Hampton Bishop	23/10/2020 10:15	Asulam (ug/l)	<0.013	Catchment	3801977	2WYE

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River Lugg @ Mordiford Bridge	23/10/2020 10:06	Asulam (ug/l)	<0.013	Catchment	3801976	2LUGG
River Frome at Larport Lane Bridge	23/10/2020 09:57	Asulam (ug/l)	<0.013	Catchment	3801978	2FROMA
River Lugg upstream Bridge	23/10/2020 09:38	Asulam (ug/l)	<0.013	Catchment	3801973	2LUGG
R.Avon Station Road	20/10/2020 14:56	Asulam (ug/l)	<0.013	Catchment	3801964	3AVOU
R.Avon - Welford Bridge	20/10/2020 14:29	Asulam (ug/l)	<0.013	Catchment	3801971	3AVOU
R Leam source to conf Rains Brook	20/10/2020 13:49	Asulam (ug/l)	<0.013	Catchment	3801967	3LEAM
Radford Brook source to conf R Leam	20/10/2020 12:30	Asulam (ug/l)	<0.013	Catchment	3801965	3RADF
to conf R Avon - Willes Meadow Foot	20/10/2020 12:07	Asulam (ug/l)	<0.013	Catchment	3801968	3LEAM
R.Severn nr Bridgnorth	20/10/2020 11:37	Asulam (ug/l)	<0.013	Catchment	3791353	1SEVE
conf. R Stowe - Thorpe Bridge Ufton	20/10/2020 10:58	Asulam (ug/l)	<0.013	Catchment	3801969	3ITCH
R Stowe source to conf R Leam	20/10/2020 10:48	Asulam (ug/l)	<0.013	Catchment	3801972	3STOW
R.Stour upstream Hampton Loade	20/10/2020 10:26	Asulam (ug/l)	<0.013	Catchment	3791348	1SEVE
AL8 Leam - conf R Itchen to R Avon u/s	20/10/2020 10:22	Asulam (ug/l)	<0.013	Catchment	3801963	3LEAM
Stowe to conf. R Leam - Marton	20/10/2020 10:08	Asulam (ug/l)	<0.013	Catchment	3801970	3ITCH
Brook to conf R Itchen	20/10/2020 09:53	Asulam (ug/l)	<0.013	Catchment	3801966	3LEAM
Rains Bk to R Itchen u/s	20/10/2020 09:33	Asulam (ug/l)	<0.013	Catchment	3801962	3LEAM
R.Severn nr Upton Magna	19/10/2020 13:29	Asulam (ug/l)	<0.013	Catchment	3791351	1SEVE
River Tern d/s at Tern Bridge	19/10/2020 13:08	Asulam (ug/l)	<0.013	Catchment	3791350	1SEVE
R.Severn nr Broseley	19/10/2020 11:34	Asulam (ug/l)	<0.013	Catchment	3791352	1SEVE
Cound Brook from bridge	19/10/2020 10:52	Asulam (ug/l)	<0.013	Catchment	3791349	1COUN

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BORROWASH	14/10/2020 13:50	Asulam (ug/l)	<0.013	Catchment	3777026	6DERWC
Unamed tributary Woolley Moor	14/10/2020 12:51	Asulam (ug/l)	<0.013	Catchment	3777065	6AMBE2
River Amber outside Milltown	14/10/2020 12:31	Asulam (ug/l)	<0.013	Catchment	3777064	6AMBE2
Hodgelane Brook	14/10/2020 11:55	Asulam (ug/l)	<0.013	Catchment	3777067	6HODG0
Smalley Brook	14/10/2020 11:54	Asulam (ug/l)	<0.013	Catchment	3777063	6SMAL1
Mill Drive West Houses	14/10/2020 11:30	Asulam (ug/l)	<0.013	Catchment	3777029	6DERW7
Markeaton Brook @ Quarndon	14/10/2020 10:42	Asulam (ug/l)	<0.013	Catchment	3777034	6MARK0
Ecclesbourne Meadows	14/10/2020 09:59	Asulam (ug/l)	<0.013	Catchment	3777028	6DERW7
Cubley Brook at Boylestone	07/10/2020 16:02	Asulam (ug/l)	<0.013	Catchment	3791053	6FOST1
River Dove Upstream	07/10/2020 15:33	Asulam (ug/l)	<0.013	Catchment	3791052	6DOVE2
Rolleston Brook upstream	07/10/2020 15:23	Asulam (ug/l)	<0.013	Catchment	3791042	7ROLL1
Mill Fleam upstream	07/10/2020 14:48	Asulam (ug/l)	<0.013	Catchment	3791040	7ROLL1
downstream before confluence River	07/10/2020 14:45	Asulam (ug/l)	<0.013	Catchment	3791050	6FOST1
Sutton Brook at Sutton on the Hill	07/10/2020 13:57	Asulam (ug/l)	<0.013	Catchment	3791047	6HILT1
Hilton Brook downstream	07/10/2020 13:33	Asulam (ug/l)	<0.013	Catchment	3791046	6HILT1
confluence Rolleston Brook	07/10/2020 13:11	Asulam (ug/l)	<0.013	Catchment	3791038	7ROLL1
Rolleston Brook downstream	07/10/2020 13:05	Asulam (ug/l)	<0.013	Catchment	3791039	7ROLL1
River Dove at Egginton Raw	07/10/2020 12:45	Asulam (ug/l)	<0.013	Catchment	3791045	4MELBN
Didgeley Brook	28/09/2020 16:31	Asulam (ug/l)	<0.013	Catchment	3791032	8SBOU1
Bourne Brook	28/09/2020 16:23	Asulam (ug/l)	<0.013	Catchment	3791033	8SBOU1

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R.Blythe - Blythe Bridge SP211898	28/09/2020 15:33	Asulam (ug/l)	<0.013	Catchment	3791034	8SBLY0
R.Blythe - Packington SP218852	28/09/2020 15:22	Asulam (ug/l)	<0.013	Catchment	3791035	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	28/09/2020 14:30	Asulam (ug/l)	<0.013	Catchment	3791036	8SBLY0
R.Blythe - Temple Balsall SP208763	28/09/2020 13:53	Asulam (ug/l)	<0.013	Catchment	3791037	8SBLY0
R.Blythe - Solihull SP164789	28/09/2020 13:25	Asulam (ug/l)	<0.013	Catchment	3791031	8SBLY0
River Wye @ Kerne Bridge	25/09/2020 15:13	Asulam (ug/l)	<0.013	Catchment	3777072	2WYE
River Wye @ King caple foot Bridge	25/09/2020 14:37	Asulam (ug/l)	<0.013	Catchment	3777071	2WYE
River Wye @ Hampton Bishop	25/09/2020 14:06	Asulam (ug/l)	<0.013	Catchment	3777069	2WYE
Stour to River Teme d/s Salwarpe	25/09/2020 13:59	Asulam (ug/l)	<0.013	Catchment	3777098	1SEVE
River Lugg @ Mordiford Bridge	25/09/2020 13:51	Asulam (ug/l)	<0.013	Catchment	3777070	2LUGG
River Frome at Larport Lane Bridge	25/09/2020 13:40	Asulam (ug/l)	<0.013	Catchment	3777068	2FROMA
River Lugg upstream Bridge	25/09/2020 13:05	Asulam (ug/l)	<0.013	Catchment	3777076	2LUGG
Stour to River Teme u/s Shrawley Bk	25/09/2020 12:58	Asulam (ug/l)	<0.013	Catchment	3777097	1SEVE
Stourport (DS R.Stour)	25/09/2020 12:10	Asulam (ug/l)	<0.013	Catchment	3777096	1SEVE
Teme to R Avon d/s Bushley Longdon Bk	24/09/2020 18:22	Asulam (ug/l)	<0.013	Catchment	3777100	1SEVE
R.Severn nr Upton Marina	24/09/2020 17:04	Asulam (ug/l)	<0.013	Catchment	3777094	1SEVE
R.Severn nr Kempsey	24/09/2020 15:05	Asulam (ug/l)	<0.013	Catchment	3777095	1SEVE
WS13 Severn - R Teme to R Avon u/s	24/09/2020 14:38	Asulam (ug/l)	<0.013	Catchment	3777099	1SEVE
Newtown Linford T - junction	23/09/2020 14:26	Asulam (ug/l)	<0.013	Catchment	3777082	4QUORB
Lane at Ulverscroft Wood	23/09/2020 14:09	Asulam (ug/l)	<0.013	Catchment	3777086	4QUORB

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River Tern d/s at Tern Bridge	23/09/2020 13:48	Asulam (ug/l)	<0.013	Catchment	3777091	1SEVE
R.Severn nr Broseley	23/09/2020 13:47	Asulam (ug/l)	<0.013	Catchment	3777089	1SEVE
Cound Brook from bridge	23/09/2020 13:46	Asulam (ug/l)	<0.013	Catchment	3777092	1COUN
Swithland Village opp St Leonards Church	23/09/2020 13:43	Asulam (ug/l)	<0.013	Catchment	3777084	4QUORB
Swithland feed adj railway	23/09/2020 13:09	Asulam (ug/l)	<0.013	Catchment	3777085	4QUORB
Bradgate Road, Cropston under	23/09/2020 12:10	Asulam (ug/l)	<0.013	Catchment	3777083	4QUORB
R.Severn nr Bridgnorth	23/09/2020 12:01	Asulam (ug/l)	<0.013	Catchment	3777088	1SEVE
Cropston Reservoir feed, Deer Barn	23/09/2020 11:10	Asulam (ug/l)	<0.013	Catchment	3777087	4QUORB
R.Stour upstream Hampton Loade	23/09/2020 10:42	Asulam (ug/l)	<0.013	Catchment	3777093	1SEVE
Cropston Res car park	23/09/2020 10:04	Asulam (ug/l)	<0.013	Catchment	3777081	4QUORB
R.Avon Station Road	22/09/2020 15:42	Asulam (ug/l)	<0.013	Catchment	3774938	3AVOU
R.Avon - Welford Bridge	22/09/2020 15:12	Asulam (ug/l)	0.021	Catchment	3774930	3AVOU
R Leam source to conf Rains Brook	22/09/2020 14:26	Asulam (ug/l)	<0.013	Catchment	3774935	3LEAM
R.Severn nr Upton Magna	22/09/2020 14:22	Asulam (ug/l)	<0.013	Catchment	3777090	1SEVE
Radford Brook source to conf R Leam	22/09/2020 13:33	Asulam (ug/l)	<0.013	Catchment	3774937	3RADF
to conf R Avon - Willes Meadow Foot	22/09/2020 12:59	Asulam (ug/l)	<0.013	Catchment	3774934	3LEAM
Staunton Harold Brook	22/09/2020 12:33	Asulam (ug/l)	<0.013	Catchment	3777079	4STAUB
Heath End Brook	22/09/2020 12:11	Asulam (ug/l)	<0.013	Catchment	3777080	4HEATB
conf. R Stowe - Thorpe Bridge Ufton	22/09/2020 11:49	Asulam (ug/l)	<0.013	Catchment	3774933	3ITCH
Jubilee Brook	22/09/2020 11:42	Asulam (ug/l)	<0.013	Catchment	3777078	4JUBIB

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R Stowe source to conf R Leam	22/09/2020 11:39	Asulam (ug/l)	<0.013	Catchment	3774929	3STOW
AL8 Leam - conf R Itchen to R Avon u/s	22/09/2020 11:13	Asulam (ug/l)	<0.013	Catchment	3774939	3LEAM
Scotts Brook	22/09/2020 11:02	Asulam (ug/l)	<0.013	Catchment	3777077	4SCOTB
Stowe to conf. R Leam - Marton	22/09/2020 10:59	Asulam (ug/l)	<0.013	Catchment	3774932	3ITCH
Brook to conf R Itchen	22/09/2020 10:45	Asulam (ug/l)	<0.013	Catchment	3774936	3LEAM
Rains Bk to R Itchen u/s	22/09/2020 10:04	Asulam (ug/l)	<0.013	Catchment	3774940	3LEAM
River Wye @ Wilton Bridge	17/03/2020 10:50	Asulam (ug/l)	<0.025	Catchment	3602125	2WYE
River Wye @ Foy Foot Bridge	17/03/2020 10:35	Asulam (ug/l)	<0.025	Catchment	3602126	2WYE
River Wye @ King caple foot Bridge	17/03/2020 10:20	Asulam (ug/l)	<0.025	Catchment	3602127	2WYE
River Wye @ Bridge Road Bridge	17/03/2020 10:00	Asulam (ug/l)	<0.025	Catchment	3602128	2WYE
River Lugg @ Mordiford Bridge	17/03/2020 09:40	Asulam (ug/l)	<0.025	Catchment	3602129	2LUGG
River Wye @ Hampton Bishop	17/03/2020 09:20	Asulam (ug/l)	<0.013	Catchment	3602130	2WYE
River Frome at Larport Lane Bridge	17/03/2020 09:00	Asulam (ug/l)	<0.013	Catchment	3602131	2FROMA
River Wye @ Kerne Bridge	17/03/2020 08:45	Asulam (ug/l)	<0.025	Catchment	3602124	2WYE
River Arrow at Bridge on B4361	17/03/2020 08:30	Asulam (ug/l)	<0.025	Catchment	3602122	2LUGG
Hilton Brook downstream	13/03/2020 12:40	Asulam (ug/l)	<0.013	Catchment	3601999	6HILT1
Rolleston Brook downstream	13/03/2020 12:20	Asulam (ug/l)	<0.013	Catchment	3602004	7ROLL1
Foston Brook and Rolleston Brook	13/03/2020 12:00	Asulam (ug/l)	<0.013	Catchment	3602001	6DOVE2
confluence Rolleston Brook	13/03/2020 11:40	Asulam (ug/l)	<0.013	Catchment	3602005	7ROLL1
Rolleston Brook upstream	13/03/2020 11:20	Asulam (ug/l)	<0.013	Catchment	3602002	7ROLL1

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Mill Fleam upstream	13/03/2020 11:00	Asulam (ug/l)	<0.013	Catchment	3602003	7ROLL1
to conf R Avon - Willes Meadow Foot	13/03/2020 10:40	Asulam (ug/l)	<0.013	Catchment	3601973	3LEAM
downstream before confluence River	13/03/2020 10:30	Asulam (ug/l)	<0.013	Catchment	3601995	6FOST1
Radford Brook source to conf R Leam	13/03/2020 10:20	Asulam (ug/l)	<0.013	Catchment	3601970	3RADF
Foston Brook 8 - Foston Upstream	13/03/2020 10:15	Asulam (ug/l)	<0.013	Catchment	3601994	6FOST1
River Leam @ EATHORPE	13/03/2020 10:10	Asulam (ug/l)	<0.013	Catchment	3601965	3LEAM
Dale Brook tributory to Foston Brook	13/03/2020 10:00	Asulam (ug/l)	<0.013	Catchment	3601993	6FOST1
Stowe to conf. R Leam - Marton	13/03/2020 10:00	Asulam (ug/l)	<0.013	Catchment	3601975	3ITCH
Brook to conf R Itchen	13/03/2020 09:45	Asulam (ug/l)	<0.013	Catchment	3601971	3LEAM
River Dove Upstream	13/03/2020 09:45	Asulam (ug/l)	<0.013	Catchment	3601992	6DOVE2
Cubley Brook at Boylestone	13/03/2020 09:30	Asulam (ug/l)	<0.013	Catchment	3601991	6FOST1
conf. R Stowe - Thorpe Bridge Ufton	13/03/2020 09:30	Asulam (ug/l)	<0.013	Catchment	3601974	3ITCH
R Stowe source to conf R Leam	13/03/2020 09:20	Asulam (ug/l)	<0.013	Catchment	3601977	3STOW
Cubley Brook @ Little Cubley	13/03/2020 09:15	Asulam (ug/l)	<0.013	Catchment	3601990	6FOST1
R Leam source to conf Rains Brook	13/03/2020 09:00	Asulam (ug/l)	<0.013	Catchment	3601972	3LEAM
Shirley Brook at Longford	13/03/2020 09:00	Asulam (ug/l)	<0.013	Catchment	3601996	6SHIR3
Brailsford Brook at Longford	13/03/2020 08:45	Asulam (ug/l)	<0.013	Catchment	3601997	6BRAI1
Rains Brook	13/03/2020 08:45	Asulam (ug/l)	<0.013	Catchment	3601969	3RAIN
Sutton Brook at Sutton on the Hill	13/03/2020 08:30	Asulam (ug/l)	<0.013	Catchment	3601998	6HILT1
River Avon at Brownsover	13/03/2020 08:20	Asulam (ug/l)	<0.013	Catchment	3601966	3DRATS

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R.Avon Station Road	13/03/2020 08:00	Asulam (ug/l)	<0.013	Catchment	3601968	3AVOU
Stanford Res Surface	13/03/2020 07:45	Asulam (ug/l)	<0.013	Catchment	3601967	3DRATS
R.Avon - Welford Bridge	13/03/2020 07:30	Asulam (ug/l)	<0.013	Catchment	3601976	3AVOU
R.Severn nr Bredon School	12/03/2020 10:20	Asulam (ug/l)	<0.013	Catchment	3602121	1SEVE
R.Severn nr Buryend Farm	12/03/2020 10:05	Asulam (ug/l)	<0.013	Catchment	3602120	1SEVE
R.Severn nr Upton Marina	12/03/2020 09:55	Asulam (ug/l)	<0.013	Catchment	3602119	1SEVE
R.Severn nr Kempsey	12/03/2020 09:40	Asulam (ug/l)	<0.013	Catchment	3602118	1SEVE
R.Severn nr Clerkenleap Farm	12/03/2020 09:20	Asulam (ug/l)	<0.013	Catchment	3602117	1SEVE
R.Severn nr Diglis	12/03/2020 09:00	Asulam (ug/l)	<0.013	Catchment	3602116	1SEVE
R.Severn nr Bevere Island	12/03/2020 08:45	Asulam (ug/l)	<0.013	Catchment	3602115	1SEVE
R.Severn nr Grimley	12/03/2020 08:30	Asulam (ug/l)	<0.013	Catchment	3602114	1SEVE
R.Severn nr Holt Fleet	12/03/2020 08:15	Asulam (ug/l)	<0.013	Catchment	3602113	1SEVE
R.Severn nr Lineholt	12/03/2020 08:00	Asulam (ug/l)	<0.013	Catchment	3602112	1SEVE
R.Severn nr Lincomb Hall	12/03/2020 07:45	Asulam (ug/l)	<0.013	Catchment	3602111	1SEVE
Stourport (DS R.Stour)	12/03/2020 07:30	Asulam (ug/l)	<0.013	Catchment	3602110	1SEVE
Stourport (US R.Stour)	12/03/2020 07:15	Asulam (ug/l)	<0.013	Catchment	3602109	1SEVE
R.Severn nr Ribbesford Wood	12/03/2020 07:00	Asulam (ug/l)	<0.013	Catchment	3602108	1SEVE
R.Severn nr Dowles	12/03/2020 06:50	Asulam (ug/l)	<0.013	Catchment	3602107	1SEVE
R.Severn nr Arley	11/03/2020 10:10	Asulam (ug/l)	<0.013	Catchment	3602106	1SEVE
R.Severn nr Hampton	11/03/2020 09:50	Asulam (ug/l)	<0.013	Catchment	3602105	1SEVE

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R.Severn nr Bridgnorth	11/03/2020 09:30	Asulam (ug/l)	<0.013	Catchment	3602104	1SEVE
R.Severn nr Broseley	11/03/2020 09:10	Asulam (ug/l)	<0.013	Catchment	3602103	1SEVE
R.Severn nr Cressage	11/03/2020 08:50	Asulam (ug/l)	<0.013	Catchment	3602102	1SEVE
R.Severn nr Atcham	11/03/2020 08:20	Asulam (ug/l)	<0.013	Catchment	3602101	1SEVE
R.Severn nr Upton Magna	11/03/2020 08:00	Asulam (ug/l)	<0.013	Catchment	3602100	1SEVE
R.Severn nr Shrewsbury	11/03/2020 07:30	Asulam (ug/l)	<0.013	Catchment	3602099	1SEVE
Foremark Reservoir Surface Raw	10/03/2020 11:10	Asulam (ug/l)	<0.013	Catchment	3602017	4MELBN
Reservoir Surface Raw	10/03/2020 10:50	Asulam (ug/l)	<0.013	Catchment	3602016	4MELBN
Heath End Brook	10/03/2020 09:40	Asulam (ug/l)	<0.013	Catchment	3602012	4HEATB
Jubilee Brook	10/03/2020 09:20	Asulam (ug/l)	<0.013	Catchment	3602014	4JUBIB
Scotts Brook	10/03/2020 08:40	Asulam (ug/l)	<0.013	Catchment	3602015	4SCOTB
Ogston Reservoir Surface Raw	09/03/2020 11:40	Asulam (ug/l)	<0.013	Catchment	3602173	6OGST0
Hodgelane Brook	09/03/2020 11:10	Asulam (ug/l)	<0.013	Catchment	3602180	6HODG0
Smalley Brook	09/03/2020 10:45	Asulam (ug/l)	<0.013	Catchment	3602179	6SMAL1
Marsh Brook	09/03/2020 10:00	Asulam (ug/l)	<0.013	Catchment	3602178	6AMBE2
between Ashover and Fallgate(Butts)	09/03/2020 09:30	Asulam (ug/l)	<0.013	Catchment	3602177	6AMBE2
River Amber outside Milltown	09/03/2020 09:00	Asulam (ug/l)	<0.013	Catchment	3602176	6AMBE2
Carr Brook footbridge	09/03/2020 08:30	Asulam (ug/l)	<0.013	Catchment	3602174	6CARR0
Unamed tributary Woolley Moor	09/03/2020 08:00	Asulam (ug/l)	<0.013	Catchment	3602175	6AMBE2
River Derwent (Draycott) Raw	05/03/2020 12:00	Asulam (ug/l)	<0.013	Catchment	3602032	5CWILW

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BORROWASH	05/03/2020 11:30	Asulam (ug/l)	<0.013	Catchment	3602033	6DERWC
ALLESTREE FORD	05/03/2020 11:00	Asulam (ug/l)	<0.013	Catchment	3602034	6DERWB
R.Blythe - Solihull SP164789	05/03/2020 11:00	Asulam (ug/l)	<0.013	Catchment	3602011	8SBLY0
R.Blythe - Temple Balsall SP208763	05/03/2020 10:50	Asulam (ug/l)	<0.013	Catchment	3601961	8SBLY0
Mackworth Brook @ Markeaton Stones	05/03/2020 10:35	Asulam (ug/l)	<0.013	Catchment	3602028	6MACK2
R.Blythe - Bradnocks Marsh SP216793	05/03/2020 10:35	Asulam (ug/l)	<0.013	Catchment	3601962	8SBLY0
R.Blythe - Packington SP218852	05/03/2020 10:20	Asulam (ug/l)	<0.013	Catchment	3601963	8SBLY0
Kedleston Park Brook	05/03/2020 10:05	Asulam (ug/l)	<0.013	Catchment	3602029	6MARK0
Didgeley Brook	05/03/2020 10:00	Asulam (ug/l)	<0.013	Catchment	3602010	8SBOU1
Markeaton Brook @ Kedleston	05/03/2020 09:50	Asulam (ug/l)	<0.013	Catchment	3602030	6MARK0
Bourne Brook	05/03/2020 09:45	Asulam (ug/l)	<0.013	Catchment	3602008	8SBOU1
Markeaton Brook @ Mercaston	05/03/2020 09:30	Asulam (ug/l)	<0.013	Catchment	3602031	6MARK0
River Bourne	05/03/2020 09:20	Asulam (ug/l)	<0.013	Catchment	3602009	8SBOU1
Whitacre WTW River Blythe Intake	05/03/2020 09:00	Asulam (ug/l)	<0.013	Catchment	3602007	3WHITS
R.Blythe - Blythe Bridge SP211898	05/03/2020 08:45	Asulam (ug/l)	<0.013	Catchment	3601964	8SBLY0
Whitacre WTW River Cole Intake	05/03/2020 08:30	Asulam (ug/l)	<0.013	Catchment	3602006	3WHITS
Newtown Linford T - junction	02/03/2020 12:40	Asulam (ug/l)	<0.025	Catchment	3601984	4QUORB
Cropston Reservoir feed, Deer Barn	02/03/2020 12:10	Asulam (ug/l)	<0.025	Catchment	3601980	4QUORB
Cropston Tributary 2 - Polly Botts Lane	02/03/2020 11:50	Asulam (ug/l)	<0.025	Catchment	3601985	4QUORB
Swithland, Brands Hill House security	02/03/2020 11:00	Asulam (ug/l)	<0.025	Catchment	3601986	4QUORB

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Swithland feed adj railway	02/03/2020 10:30	Asulam (ug/l)	<0.025	Catchment	3601981	4QUORB
Swithland Village opp St Leonards Church	02/03/2020 10:10	Asulam (ug/l)	<0.025	Catchment	3601982	4QUORB
Bradgate Road, Cropston under	02/03/2020 09:50	Asulam (ug/l)	<0.025	Catchment	3601983	4QUORB
Swithland Reservoir Surface Raw	02/03/2020 09:30	Asulam (ug/l)	<0.013	Catchment	3601989	4CROP
Cropston Reservoir Surface Raw	02/03/2020 09:10	Asulam (ug/l)	<0.013	Catchment	3601988	4CROP
Cropston Res car park	02/03/2020 08:50	Asulam (ug/l)	<0.025	Catchment	3601987	4QUORB
Rothley Brook - Anstey Lane	02/03/2020 08:30	Asulam (ug/l)	<0.025	Catchment	3601979	4ROTBR
Staunton Harold Brook	01/03/2020 00:00	Asulam (ug/l)	<0.013	Catchment	3602013	4STAUB
to conf R Avon - Willes Meadow Foot	26/02/2020 11:20	Asulam (ug/l)	<0.025	Catchment	3582315	3LEAM
Radford Brook source to conf R Leam	26/02/2020 11:00	Asulam (ug/l)	<0.025	Catchment	3582318	3RADF
River Leam @ EATHORPE	26/02/2020 10:45	Asulam (ug/l)	<0.025	Catchment	3582323	3LEAM
Stowe to conf. R Leam - Marton	26/02/2020 10:30	Asulam (ug/l)	<0.025	Catchment	3582313	3ITCH
Brook to conf R Itchen	26/02/2020 10:15	Asulam (ug/l)	<0.025	Catchment	3582317	3LEAM
conf. R Stowe - Thorpe Bridge Ufton	26/02/2020 10:00	Asulam (ug/l)	<0.025	Catchment	3582314	3ITCH
R Stowe source to conf R Leam	26/02/2020 09:50	Asulam (ug/l)	<0.025	Catchment	3582311	3STOW
R Leam source to conf Rains Brook	26/02/2020 09:30	Asulam (ug/l)	<0.025	Catchment	3582316	3LEAM
Rains Brook	26/02/2020 09:15	Asulam (ug/l)	<0.025	Catchment	3582319	3RAIN
River Avon at Brownsover	26/02/2020 08:45	Asulam (ug/l)	<0.025	Catchment	3582322	3DRATS
R.Avon Station Road	26/02/2020 08:30	Asulam (ug/l)	<0.025	Catchment	3582320	3AVOU
Stanford Res Surface	26/02/2020 08:00	Asulam (ug/l)	<0.025	Catchment	3582321	3DRATS

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R.Avon - Welford Bridge	26/02/2020 07:40	Asulam (ug/l)	<0.025	Catchment	3582312	3AVOU
R.Severn nr Bredon School	24/02/2020 13:40	Asulam (ug/l)	<0.025	Catchment	3584683	1SEVE
R.Severn nr Buryend Farm	24/02/2020 13:39	Asulam (ug/l)	<0.025	Catchment	3584684	1SEVE
R.Severn nr Upton Marina	24/02/2020 13:38	Asulam (ug/l)	<0.025	Catchment	3584685	1SEVE
R.Severn nr Kempsey	24/02/2020 13:37	Asulam (ug/l)	<0.025	Catchment	3584686	1SEVE
R.Severn nr Clerkenleap Farm	24/02/2020 13:36	Asulam (ug/l)	<0.025	Catchment	3584687	1SEVE
R.Severn nr Diglis	24/02/2020 13:36	Asulam (ug/l)	<0.025	Catchment	3584688	1SEVE
R.Severn nr Bevere Island	24/02/2020 13:35	Asulam (ug/l)	<0.025	Catchment	3584689	1SEVE
R.Severn nr Grimley	24/02/2020 13:34	Asulam (ug/l)	<0.025	Catchment	3584690	1SEVE
R.Severn nr Holt Fleet	24/02/2020 13:34	Asulam (ug/l)	<0.025	Catchment	3584691	1SEVE
R.Severn nr Lineholt	24/02/2020 13:33	Asulam (ug/l)	<0.025	Catchment	3584692	1SEVE
R.Severn nr Lincomb Hall	24/02/2020 13:32	Asulam (ug/l)	<0.025	Catchment	3584693	1SEVE
Stourport (DS R.Stour)	24/02/2020 13:31	Asulam (ug/l)	<0.025	Catchment	3584694	1SEVE
Stourport (US R.Stour)	24/02/2020 13:30	Asulam (ug/l)	<0.025	Catchment	3584695	1SEVE
R.Severn nr Ribbesford Wood	24/02/2020 13:29	Asulam (ug/l)	<0.025	Catchment	3584696	1SEVE
R.Severn nr Dowles	24/02/2020 13:28	Asulam (ug/l)	<0.025	Catchment	3584697	1SEVE
River Wye @ Kerne Bridge	24/02/2020 10:51	Asulam (ug/l)	<0.025	Catchment	3582265	2WYE
River Wye @ Foy Foot Bridge	24/02/2020 10:34	Asulam (ug/l)	<0.025	Catchment	3582263	2WYE
River Wye @ King caple foot Bridge	24/02/2020 10:33	Asulam (ug/l)	<0.025	Catchment	3582262	2WYE
River Wye @ Wilton Bridge	24/02/2020 10:31	Asulam (ug/l)	<0.025	Catchment	3582264	2WYE

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River Wye @ Bridge Road Bridge	24/02/2020 10:30	Asulam (ug/l)	<0.025	Catchment	3582261	2WYE
River Lugg @ Mordiford Bridge	24/02/2020 10:26	Asulam (ug/l)	<0.025	Catchment	3582260	2LUGG
River Wye @ Hampton Bishop	24/02/2020 10:25	Asulam (ug/l)	<0.025	Catchment	3582259	2WYE
River Frome at Larport Lane Bridge	24/02/2020 09:52	Asulam (ug/l)	<0.025	Catchment	3582258	2FROMA
River Lugg @ Marden	24/02/2020 09:51	Asulam (ug/l)	<0.025	Catchment	3582266	2LUGG
River Arrow at Bridge on B4361	24/02/2020 09:08	Asulam (ug/l)	<0.025	Catchment	3582267	2LUGG
R.Blythe - Solihull SP164789	20/02/2020 10:27	Asulam (ug/l)	<0.025	Catchment	3582305	8SBLY0
R.Blythe - Temple Balsall SP208763	20/02/2020 10:05	Asulam (ug/l)	<0.025	Catchment	3582304	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	20/02/2020 09:53	Asulam (ug/l)	<0.025	Catchment	3582303	8SBLY0
R.Blythe - Packington SP218852	20/02/2020 09:33	Asulam (ug/l)	<0.025	Catchment	3582302	8SBLY0
Didgeley Brook	20/02/2020 09:10	Asulam (ug/l)	<0.025	Catchment	3582306	8SBOU1
Bourne Brook	20/02/2020 08:57	Asulam (ug/l)	<0.025	Catchment	3582308	8SBOU1
River Bourne	20/02/2020 08:24	Asulam (ug/l)	<0.025	Catchment	3582307	8SBOU1
Whitacre WTW River Blythe Intake	20/02/2020 08:12	Asulam (ug/l)	<0.025	Catchment	3582309	3WHITS
R.Blythe - Blythe Bridge SP211898	20/02/2020 07:57	Asulam (ug/l)	<0.025	Catchment	3582301	8SBLY0
Whitacre WTW River Cole Intake	20/02/2020 07:45	Asulam (ug/l)	<0.025	Catchment	3582310	3WHITS
R.Severn nr Arley	17/02/2020 10:44	Asulam (ug/l)	<0.025	Catchment	3582268	1SEVE
R.Severn nr Hampton	17/02/2020 10:15	Asulam (ug/l)	<0.025	Catchment	3582269	1SEVE
R.Severn nr Bridgnorth	17/02/2020 09:53	Asulam (ug/l)	<0.025	Catchment	3582270	1SEVE
R.Severn nr Broseley	17/02/2020 09:26	Asulam (ug/l)	<0.025	Catchment	3582271	1SEVE

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R.Severn nr Cressage	17/02/2020 09:03	Asulam (ug/l)	<0.025	Catchment	3582272	1SEVE
R.Severn nr Atcham	17/02/2020 08:44	Asulam (ug/l)	<0.025	Catchment	3582273	1SEVE
R.Severn nr Upton Magna	17/02/2020 08:26	Asulam (ug/l)	<0.025	Catchment	3582274	1SEVE
R.Severn nr Shrewsbury	17/02/2020 08:08	Asulam (ug/l)	<0.025	Catchment	3582275	1SEVE
Hilton Brook downstream	13/02/2020 16:06	Asulam (ug/l)	<0.025	Catchment	3582330	6HILT1
Rolleston Brook downstream	13/02/2020 16:04	Asulam (ug/l)	<0.025	Catchment	3582325	7ROLL1
Foston Brook and Rolleston Brook	13/02/2020 16:02	Asulam (ug/l)	<0.025	Catchment	3582328	6DOVE2
confluence Rolleston Brook	13/02/2020 16:01	Asulam (ug/l)	<0.025	Catchment	3582324	7ROLL1
Rolleston Brook upstream	13/02/2020 16:00	Asulam (ug/l)	<0.025	Catchment	3582327	7ROLL1
Mill Fleam upstream	13/02/2020 15:58	Asulam (ug/l)	<0.025	Catchment	3582326	7ROLL1
downstream before confluence River	13/02/2020 15:57	Asulam (ug/l)	<0.025	Catchment	3582334	6FOST1
Foston Brook 8 - Foston Upstream	13/02/2020 15:56	Asulam (ug/l)	<0.025	Catchment	3582335	6FOST1
Dale Brook tributory to Foston Brook	13/02/2020 15:54	Asulam (ug/l)	<0.025	Catchment	3582336	6FOST1
River Dove Upstream	13/02/2020 15:53	Asulam (ug/l)	<0.025	Catchment	3582337	6DOVE2
Cubley Brook at Boylestone	13/02/2020 15:49	Asulam (ug/l)	<0.025	Catchment	3582338	6FOST1
Cubley Brook @ Little Cubley	13/02/2020 15:47	Asulam (ug/l)	<0.025	Catchment	3582339	6FOST1
Shirley Brook at Longford	13/02/2020 15:46	Asulam (ug/l)	<0.025	Catchment	3582333	6SHIR3
Brailsford Brook at Longford	13/02/2020 15:44	Asulam (ug/l)	<0.025	Catchment	3582332	6BRAI1
Sutton Brook at Sutton on the Hill	13/02/2020 15:42	Asulam (ug/l)	<0.025	Catchment	3582331	6HILT1
Reservoir Surface Raw	13/02/2020 09:06	Asulam (ug/l)	<0.025	Catchment	3582284	4MELBN

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Foremark Reservoir Surface Raw	13/02/2020 09:05	Asulam (ug/l)	<0.025	Catchment	3582283	4MELBN
Heath End Brook	13/02/2020 09:04	Asulam (ug/l)	<0.025	Catchment	3582288	4HEATB
Staunton Harold Brook	13/02/2020 09:03	Asulam (ug/l)	<0.025	Catchment	3582287	4STAUB
Jubilee Brook	13/02/2020 09:02	Asulam (ug/l)	<0.025	Catchment	3582286	4JUBIB
Scotts Brook	13/02/2020 09:01	Asulam (ug/l)	<0.025	Catchment	3582285	4SCOTB
Ogston Reservoir Surface Raw	06/02/2020 07:55	Asulam (ug/l)	<0.025	Catchment	3582347	6OGST0
Hodgelane Brook	06/02/2020 07:54	Asulam (ug/l)	<0.025	Catchment	3582340	6HODG0
Smalley Brook	06/02/2020 07:54	Asulam (ug/l)	<0.025	Catchment	3582341	6SMAL1
Marsh Brook	06/02/2020 07:53	Asulam (ug/l)	<0.025	Catchment	3582342	6AMBE2
between Ashover and Fallgate(Butts)	06/02/2020 07:52	Asulam (ug/l)	<0.025	Catchment	3582343	6AMBE2
River Amber outside Milltown	06/02/2020 07:51	Asulam (ug/l)	<0.025	Catchment	3582344	6AMBE2
Carr Brook footbridge	06/02/2020 07:50	Asulam (ug/l)	<0.025	Catchment	3582346	6CARR0
Unamed tributary Woolley Moor	06/02/2020 07:49	Asulam (ug/l)	<0.025	Catchment	3582345	6AMBE2
River Derwent (Draycott) Raw	04/02/2020 15:04	Asulam (ug/l)	<0.025	Catchment	3582278	5CWILW
BORROWASH	04/02/2020 15:03	Asulam (ug/l)	<0.025	Catchment	3582277	6DERWC
ALLESTREE FORD	04/02/2020 15:02	Asulam (ug/l)	<0.025	Catchment	3582276	6DERWB
Mackworth Brook @ Markeaton Stones	04/02/2020 15:01	Asulam (ug/l)	<0.025	Catchment	3582282	6MACK2
Kedleston Park Brook	04/02/2020 15:00	Asulam (ug/l)	<0.025	Catchment	3582281	6MARK0
Markeaton Brook @ Kedleston	04/02/2020 14:57	Asulam (ug/l)	<0.025	Catchment	3582280	6MARK0
Markeaton Brook @ Mercaston	04/02/2020 14:54	Asulam (ug/l)	<0.025	Catchment	3582279	6MARK0

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Cropston Reservoir feed, Deer Barn	02/02/2020 18:46	Asulam (ug/l)	<0.025	Catchment	3582298	4QUORB
Newtown Linford T - junction	02/02/2020 18:43	Asulam (ug/l)	<0.025	Catchment	3582294	4QUORB
Cropston Tributary 2 - Polly Botts Lane	02/02/2020 18:41	Asulam (ug/l)	<0.025	Catchment	3582293	4QUORB
Cropston Tributary - Nowell Spring Wood	02/02/2020 18:39	Asulam (ug/l)	<0.025	Catchment	3582300	4QUORB
Swithland, Brands Hill House security	02/02/2020 18:37	Asulam (ug/l)	<0.025	Catchment	3582292	4QUORB
Swithland feed adj railway	02/02/2020 18:35	Asulam (ug/l)	<0.025	Catchment	3582297	4QUORB
Swithland Village opp St Leonards Church	02/02/2020 18:33	Asulam (ug/l)	<0.025	Catchment	3582296	4QUORB
Bradgate Road, Cropston under	02/02/2020 18:31	Asulam (ug/l)	<0.025	Catchment	3582295	4QUORB
Swithland Reservoir Surface Raw	02/02/2020 18:28	Asulam (ug/l)	<0.025	Catchment	3582289	4CROP
Cropston Reservoir Surface Raw	02/02/2020 18:26	Asulam (ug/l)	<0.025	Catchment	3582290	4CROP
Cropston Res car park	02/02/2020 18:23	Asulam (ug/l)	<0.025	Catchment	3582291	4QUORB
Rothley Brook - Anstey Lane	02/02/2020 18:20	Asulam (ug/l)	<0.025	Catchment	3582299	4ROTBR
River Wye @ Kerne Bridge	24/01/2020 10:35	Asulam (ug/l)	<0.025	Catchment	3555598	2WYE
River Wye @ Wilton Bridge	24/01/2020 10:20	Asulam (ug/l)	<0.025	Catchment	3555597	2WYE
River Wye @ Foy Foot Bridge	24/01/2020 10:04	Asulam (ug/l)	<0.025	Catchment	3555596	2WYE
River Wye @ King caple foot Bridge	24/01/2020 09:37	Asulam (ug/l)	<0.025	Catchment	3555595	2WYE
River Wye @ Bridge Road Bridge	24/01/2020 09:20	Asulam (ug/l)	<0.025	Catchment	3555594	2WYE
River Wye @ Hampton Bishop	24/01/2020 09:09	Asulam (ug/l)	<0.025	Catchment	3555592	2WYE
River Lugg @ Mordiford Bridge	24/01/2020 09:02	Asulam (ug/l)	<0.025	Catchment	3555593	2LUGG
River Frome at Larport Lane Bridge	24/01/2020 08:53	Asulam (ug/l)	<0.025	Catchment	3555591	2FROMA

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River Lugg @ Marden	24/01/2020 08:31	Asulam (ug/l)	<0.025	Catchment	3555599	2LUGG
River Arrow at Bridge on B4361	24/01/2020 08:12	Asulam (ug/l)	<0.025	Catchment	3555600	2LUGG
to conf R Avon - Willes Meadow Foot	23/01/2020 11:16	Asulam (ug/l)	<0.025	Catchment	3551816	3LEAM
Radford Brook source to conf R Leam	23/01/2020 11:08	Asulam (ug/l)	<0.025	Catchment	3551819	3RADF
River Leam @ EATHORPE	23/01/2020 10:53	Asulam (ug/l)	<0.025	Catchment	3551824	3LEAM
Stowe to conf. R Leam - Marton	23/01/2020 10:39	Asulam (ug/l)	<0.025	Catchment	3551814	3ITCH
Brook to conf R Itchen	23/01/2020 10:29	Asulam (ug/l)	<0.025	Catchment	3551818	3LEAM
conf. R Stowe - Thorpe Bridge Ufton	23/01/2020 10:10	Asulam (ug/l)	<0.025	Catchment	3551815	3ITCH
R Stowe source to conf R Leam	23/01/2020 10:02	Asulam (ug/l)	<0.025	Catchment	3551812	3STOW
R Leam source to conf Rains Brook	23/01/2020 09:35	Asulam (ug/l)	<0.025	Catchment	3551817	3LEAM
Rains Brook	23/01/2020 09:20	Asulam (ug/l)	<0.025	Catchment	3551820	3RAIN
River Avon at Brownsover	23/01/2020 08:57	Asulam (ug/l)	<0.025	Catchment	3551823	3DRATS
R.Avon Station Road	23/01/2020 08:38	Asulam (ug/l)	<0.025	Catchment	3551821	3AVOU
Stanford Res Surface	23/01/2020 08:17	Asulam (ug/l)	<0.025	Catchment	3551822	3DRATS
R.Severn nr Bredon School	13/01/2020 17:28	Asulam (ug/l)	<0.025	Catchment	3551878	1SEVE
R.Severn nr Buryend Farm	13/01/2020 17:27	Asulam (ug/l)	<0.025	Catchment	3551879	1SEVE
R.Severn nr Upton Marina	13/01/2020 17:26	Asulam (ug/l)	<0.025	Catchment	3551880	1SEVE
R.Severn nr Kempsey	13/01/2020 17:25	Asulam (ug/l)	<0.025	Catchment	3551881	1SEVE
R.Severn nr Clerkenleap Farm	13/01/2020 17:24	Asulam (ug/l)	<0.025	Catchment	3551882	1SEVE
R.Severn nr Bevere Island	13/01/2020 17:23	Asulam (ug/l)	<0.025	Catchment	3551884	1SEVE

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R.Severn nr Diglis	13/01/2020 17:23	Asulam (ug/l)	<0.025	Catchment	3551883	1SEVE
R.Severn nr Grimley	13/01/2020 17:21	Asulam (ug/l)	<0.025	Catchment	3551885	1SEVE
R.Severn nr Holt Fleet	13/01/2020 17:21	Asulam (ug/l)	<0.025	Catchment	3551886	1SEVE
R.Severn nr Lincomb Hall	13/01/2020 17:20	Asulam (ug/l)	<0.025	Catchment	3551888	1SEVE
R.Severn nr Lineholt	13/01/2020 17:20	Asulam (ug/l)	<0.025	Catchment	3551887	1SEVE
Stourport (DS R.Stour)	13/01/2020 17:18	Asulam (ug/l)	<0.025	Catchment	3551889	1SEVE
Stourport (US R.Stour)	13/01/2020 17:17	Asulam (ug/l)	<0.025	Catchment	3551890	1SEVE
R.Severn nr Ribbesford Wood	13/01/2020 17:17	Asulam (ug/l)	<0.025	Catchment	3551891	1SEVE
R.Severn nr Dowles	13/01/2020 17:16	Asulam (ug/l)	<0.025	Catchment	3551892	1SEVE
R.Severn nr Arley	13/01/2020 11:18	Asulam (ug/l)	<0.025	Catchment	3551870	1SEVE
R.Severn nr Hampton	13/01/2020 11:01	Asulam (ug/l)	<0.025	Catchment	3551871	1SEVE
R.Severn nr Bridgnorth	13/01/2020 10:34	Asulam (ug/l)	<0.025	Catchment	3551872	1SEVE
R.Severn nr Broseley	13/01/2020 10:10	Asulam (ug/l)	<0.025	Catchment	3551873	1SEVE
R.Severn nr Cressage	13/01/2020 09:51	Asulam (ug/l)	<0.025	Catchment	3551874	1SEVE
R.Severn nr Atcham	13/01/2020 09:33	Asulam (ug/l)	<0.025	Catchment	3551875	1SEVE
R.Severn nr Upton Magna	13/01/2020 09:17	Asulam (ug/l)	<0.025	Catchment	3551876	1SEVE
R.Severn nr Shrewsbury	13/01/2020 08:59	Asulam (ug/l)	<0.025	Catchment	3551877	1SEVE
Mackworth Brook @ Markeaton Stones	10/01/2020 10:50	Asulam (ug/l)	<0.025	Catchment	3551869	6MACK2
River Derwent (Draycott) Raw	09/01/2020 12:05	Asulam (ug/l)	<0.025	Catchment	3551865	5CWILW
BORROWASH	09/01/2020 11:40	Asulam (ug/l)	<0.025	Catchment	3551864	6DERWC

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ALLESTREE FORD	09/01/2020 11:20	Asulam (ug/l)	<0.025	Catchment	3551863	6DERWB
Kedleston Park Brook	09/01/2020 10:20	Asulam (ug/l)	<0.025	Catchment	3551868	6MARK0
Markeaton Brook @ Kedleston	09/01/2020 10:00	Asulam (ug/l)	<0.025	Catchment	3551867	6MARK0
Markeaton Brook @ Mercaston	09/01/2020 09:25	Asulam (ug/l)	<0.025	Catchment	3551866	6MARK0
Hilton Brook downstream	08/01/2020 13:30	Asulam (ug/l)	<0.025	Catchment	3551758	6HILT1
Rolleston Brook downstream	08/01/2020 13:10	Asulam (ug/l)	<0.025	Catchment	3551753	7ROLL1
Foston Brook and Rolleston Brook	08/01/2020 12:40	Asulam (ug/l)	<0.025	Catchment	3551756	6DOVE2
confluence Rolleston Brook	08/01/2020 12:20	Asulam (ug/l)	<0.025	Catchment	3551811	7ROLL1
Rolleston Brook upstream	08/01/2020 11:50	Asulam (ug/l)	<0.025	Catchment	3551755	7ROLL1
Mill Fleam upstream	08/01/2020 11:30	Asulam (ug/l)	<0.025	Catchment	3551754	7ROLL1
downstream before confluence River	08/01/2020 11:10	Asulam (ug/l)	<0.025	Catchment	3551762	6FOST1
Foston Brook 8 - Foston Upstream	08/01/2020 10:50	Asulam (ug/l)	<0.025	Catchment	3551763	6FOST1
Dale Brook tributory to Foston Brook	08/01/2020 10:30	Asulam (ug/l)	<0.025	Catchment	3551764	6FOST1
River Dove Upstream	08/01/2020 10:10	Asulam (ug/l)	<0.025	Catchment	3551765	6DOVE2
Cubley Brook @ Little Cubley	08/01/2020 09:40	Asulam (ug/l)	<0.025	Catchment	3551767	6FOST1
Cubley Brook at Boylestone	08/01/2020 09:20	Asulam (ug/l)	<0.025	Catchment	3551766	6FOST1
Shirley Brook at Longford	08/01/2020 08:50	Asulam (ug/l)	<0.025	Catchment	3551761	6SHIR3
Brailsford Brook at Longford	08/01/2020 08:30	Asulam (ug/l)	<0.025	Catchment	3551760	6BRAI1
Sutton Brook at Sutton on the Hill	08/01/2020 08:10	Asulam (ug/l)	<0.025	Catchment	3551759	6HILT1
Cropston Reservoir feed, Deer Barn	07/01/2020 13:30	Asulam (ug/l)	<0.025	Catchment	3551834	4QUORB

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Newtown Linford T - junction	07/01/2020 12:50	Asulam (ug/l)	<0.025	Catchment	3551830	4QUORB
Cropston Tributary 2 - Polly Botts Lane	07/01/2020 12:20	Asulam (ug/l)	<0.025	Catchment	3551829	4QUORB
Cropston Tributary - Nowell Spring Wood	07/01/2020 12:00	Asulam (ug/l)	<0.025	Catchment	3551836	4QUORB
R.Blythe - Solihull SP164789	07/01/2020 11:32	Asulam (ug/l)	<0.025	Catchment	3551845	8SBLY0
Swithland, Brands Hill House security	07/01/2020 11:30	Asulam (ug/l)	<0.025	Catchment	3551828	4QUORB
R.Blythe - Temple Balsall SP208763	07/01/2020 11:10	Asulam (ug/l)	<0.025	Catchment	3551844	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	07/01/2020 10:58	Asulam (ug/l)	<0.025	Catchment	3551843	8SBLY0
Swithland feed adj railway	07/01/2020 10:55	Asulam (ug/l)	<0.025	Catchment	3551833	4QUORB
R.Blythe - Packington SP218852	07/01/2020 10:41	Asulam (ug/l)	<0.025	Catchment	3551842	8SBLY0
Swithland Village opp St Leonards Church	07/01/2020 10:30	Asulam (ug/l)	<0.025	Catchment	3551832	4QUORB
Didgeley Brook	07/01/2020 10:17	Asulam (ug/l)	<0.025	Catchment	3551846	8SBOU1
Bourne Brook	07/01/2020 10:09	Asulam (ug/l)	<0.025	Catchment	3551848	8SBOU1
Bradgate Road, Cropston under	07/01/2020 10:00	Asulam (ug/l)	<0.025	Catchment	3551831	4QUORB
River Bourne	07/01/2020 09:59	Asulam (ug/l)	<0.025	Catchment	3551847	8SBOU1
Whitacre WTW River Blythe Intake	07/01/2020 09:43	Asulam (ug/l)	<0.025	Catchment	3551849	3WHITS
Swithland Reservoir Surface Raw	07/01/2020 09:35	Asulam (ug/l)	<0.025	Catchment	3551825	4CROP
R.Blythe - Blythe Bridge SP211898	07/01/2020 09:34	Asulam (ug/l)	<0.025	Catchment	3551841	8SBLY0
Cropston Reservoir Surface Raw	07/01/2020 09:20	Asulam (ug/l)	<0.025	Catchment	3551826	4CROP
Whitacre WTW River Cole Intake	07/01/2020 09:19	Asulam (ug/l)	<0.025	Catchment	3551850	3WHITS
Cropston Res car park	07/01/2020 09:00	Asulam (ug/l)	<0.025	Catchment	3551827	4QUORB

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Rothley Brook - Anstey Lane	07/01/2020 08:30	Asulam (ug/l)	<0.025	Catchment	3551835	4ROTBR
Foremark Reservoir Surface Raw	06/01/2020 11:25	Asulam (ug/l)	<0.025	Catchment	3551837	4MELBN
Reservoir Surface Raw	06/01/2020 11:00	Asulam (ug/l)	<0.025	Catchment	3551838	4MELBN
Heath End Brook	06/01/2020 10:10	Asulam (ug/l)	<0.025	Catchment	3551852	4HEATB
Staunton Harold Brook	06/01/2020 09:45	Asulam (ug/l)	<0.025	Catchment	3551851	4STAUB
Jubilee Brook	06/01/2020 09:10	Asulam (ug/l)	<0.025	Catchment	3551840	4JUBIB
Scotts Brook	06/01/2020 08:40	Asulam (ug/l)	<0.025	Catchment	3551839	4SCOTB
Ogston Reservoir Surface Raw	03/01/2020 11:30	Asulam (ug/l)	<0.025	Catchment	3551810	6OGST0
Hodgelane Brook	03/01/2020 10:45	Asulam (ug/l)	<0.025	Catchment	3551803	6HODG0
Smalley Brook	03/01/2020 10:20	Asulam (ug/l)	<0.025	Catchment	3551804	6SMAL1
Marsh Brook	03/01/2020 09:50	Asulam (ug/l)	<0.025	Catchment	3551805	6AMBE2
between Ashover and Fallgate(Butts)	03/01/2020 09:35	Asulam (ug/l)	<0.025	Catchment	3551806	6AMBE2
River Amber outside Milltown	03/01/2020 09:10	Asulam (ug/l)	<0.025	Catchment	3551807	6AMBE2
Carr Brook footbridge	03/01/2020 08:45	Asulam (ug/l)	<0.025	Catchment	3551809	6CARR0
Unamed tributary Woolley Moor	03/01/2020 08:30	Asulam (ug/l)	<0.025	Catchment	3551808	6AMBE2
River Wye @ Kerne Bridge	19/12/2019 10:41	Asulam (ug/l)	<0.025	Catchment	3530266	2WYE
River Wye @ Wilton Bridge	19/12/2019 10:28	Asulam (ug/l)	<0.025	Catchment	3530257	2WYE
River Wye @ Foy Foot Bridge	19/12/2019 10:10	Asulam (ug/l)	<0.025	Catchment	3530258	2WYE
River Wye @ King caple foot Bridge	19/12/2019 09:48	Asulam (ug/l)	<0.025	Catchment	3530259	2WYE
River Wye @ Bridge Road Bridge	19/12/2019 09:26	Asulam (ug/l)	<0.025	Catchment	3530260	2WYE

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River Lugg @ Mordiford Bridge	19/12/2019 09:18	Asulam (ug/l)	<0.025	Catchment	3530261	2LUGG
River Wye @ Hampton Bishop	19/12/2019 09:11	Asulam (ug/l)	<0.025	Catchment	3530262	2WYE
River Frome at Larport Lane Bridge	19/12/2019 09:02	Asulam (ug/l)	<0.025	Catchment	3530263	2FROMA
River Lugg @ Marden	19/12/2019 08:39	Asulam (ug/l)	<0.025	Catchment	3530265	2LUGG
River Arrow at Bridge on B4361	19/12/2019 08:15	Asulam (ug/l)	<0.025	Catchment	3530264	2LUGG
to conf R Avon - Willes Meadow Foot	18/12/2019 11:02	Asulam (ug/l)	<0.025	Catchment	3530344	3LEAM
Radford Brook source to conf R Leam	18/12/2019 10:55	Asulam (ug/l)	<0.025	Catchment	3530341	3RADF
River Leam @ EATHORPE	18/12/2019 10:39	Asulam (ug/l)	<0.008	Catchment	3530336	3LEAM
Stowe to conf. R Leam - Marton	18/12/2019 10:27	Asulam (ug/l)	<0.025	Catchment	3530346	3ITCH
Brook to conf R Itchen	18/12/2019 10:16	Asulam (ug/l)	<0.025	Catchment	3530342	3LEAM
conf. R Stowe - Thorpe Bridge Ufton	18/12/2019 09:57	Asulam (ug/l)	<0.025	Catchment	3530345	3ITCH
R Stowe source to conf R Leam	18/12/2019 09:48	Asulam (ug/l)	<0.025	Catchment	3530349	3STOW
R Leam source to conf Rains Brook	18/12/2019 09:21	Asulam (ug/l)	<0.025	Catchment	3530343	3LEAM
Rains Brook	18/12/2019 09:05	Asulam (ug/l)	<0.025	Catchment	3530340	3RAIN
River Avon at Brownsover	18/12/2019 08:36	Asulam (ug/l)	<0.008	Catchment	3530337	3DRATS
R.Avon Station Road	18/12/2019 08:20	Asulam (ug/l)	<0.025	Catchment	3530339	3AVOU
Stanford Res Surface	18/12/2019 07:56	Asulam (ug/l)	<0.025	Catchment	3530338	3DRATS
R.Avon - Welford Bridge	18/12/2019 07:44	Asulam (ug/l)	<0.025	Catchment	3530348	3AVOU
R.Severn nr Bredon School	12/12/2019 17:32	Asulam (ug/l)	<0.025	Catchment	3530297	1SEVE
R.Severn nr Buryend Farm	12/12/2019 17:31	Asulam (ug/l)	<0.025	Catchment	3530296	1SEVE

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R.Severn nr Kempsey	12/12/2019 17:11	Asulam (ug/l)	<0.025	Catchment	3530294	1SEVE
R.Severn nr Upton Marina	12/12/2019 17:11	Asulam (ug/l)	<0.025	Catchment	3530295	1SEVE
R.Severn nr Clerkenleap Farm	12/12/2019 17:10	Asulam (ug/l)	<0.025	Catchment	3530293	1SEVE
R.Severn nr Diglis	12/12/2019 17:09	Asulam (ug/l)	<0.025	Catchment	3530292	1SEVE
R.Severn nr Bevere Island	12/12/2019 17:08	Asulam (ug/l)	<0.025	Catchment	3530291	1SEVE
R.Severn nr Grimley	12/12/2019 17:07	Asulam (ug/l)	<0.025	Catchment	3530290	1SEVE
R.Severn nr Holt Fleet	12/12/2019 17:06	Asulam (ug/l)	<0.025	Catchment	3530289	1SEVE
R.Severn nr Lineholt	12/12/2019 17:05	Asulam (ug/l)	<0.025	Catchment	3530288	1SEVE
R.Severn nr Lincomb Hall	12/12/2019 17:04	Asulam (ug/l)	<0.025	Catchment	3530287	1SEVE
Stourport (DS R.Stour)	12/12/2019 17:03	Asulam (ug/l)	<0.025	Catchment	3530286	1SEVE
Stourport (US R.Stour)	12/12/2019 17:02	Asulam (ug/l)	<0.025	Catchment	3530285	1SEVE
R.Severn nr Dowles	12/12/2019 17:01	Asulam (ug/l)	<0.025	Catchment	3530283	1SEVE
R.Severn nr Ribbesford Wood	12/12/2019 17:01	Asulam (ug/l)	<0.025	Catchment	3530284	1SEVE
River Derwent (Draycott) Raw	12/12/2019 11:10	Asulam (ug/l)	<0.025	Catchment	3530280	5CWILW
R.Severn nr Arley	12/12/2019 11:10	Asulam (ug/l)	<0.025	Catchment	3530275	1SEVE
R.Severn nr Hampton	12/12/2019 10:53	Asulam (ug/l)	<0.025	Catchment	3530274	1SEVE
BORROWASH	12/12/2019 10:40	Asulam (ug/l)	<0.025	Catchment	3530281	6DERWC
R.Severn nr Bridgnorth	12/12/2019 10:29	Asulam (ug/l)	<0.025	Catchment	3530273	1SEVE
ALLESTREE FORD	12/12/2019 10:15	Asulam (ug/l)	<0.025	Catchment	3530282	6DERWB
R.Severn nr Broseley	12/12/2019 10:05	Asulam (ug/l)	<0.025	Catchment	3530272	1SEVE

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R.Severn nr Cressage	12/12/2019 09:47	Asulam (ug/l)	<0.025	Catchment	3530271	1SEVE
Mackworth Brook @ Markeaton Stones	12/12/2019 09:45	Asulam (ug/l)	<0.025	Catchment	3530276	6MACK2
R.Severn nr Atcham	12/12/2019 09:29	Asulam (ug/l)	<0.025	Catchment	3530270	1SEVE
Kedleston Park Brook	12/12/2019 09:15	Asulam (ug/l)	<0.025	Catchment	3530277	6MARK0
R.Severn nr Upton Magna	12/12/2019 09:11	Asulam (ug/l)	<0.025	Catchment	3530269	1SEVE
Markeaton Brook @ Kedleston	12/12/2019 09:00	Asulam (ug/l)	<0.025	Catchment	3530278	6MARK0
R.Severn nr Shrewsbury	12/12/2019 08:46	Asulam (ug/l)	<0.025	Catchment	3530268	1SEVE
Markeaton Brook @ Mercaston	12/12/2019 08:30	Asulam (ug/l)	<0.025	Catchment	3530279	6MARK0
Foremark Reservoir Surface Raw	10/12/2019 10:50	Asulam (ug/l)	<0.008	Catchment	3530313	4MELBN
Reservoir Surface Raw	10/12/2019 10:20	Asulam (ug/l)	<0.008	Catchment	3530312	4MELBN
Heath End Brook	10/12/2019 09:40	Asulam (ug/l)	<0.025	Catchment	3530308	4HEATB
Staunton Harold Brook	10/12/2019 09:00	Asulam (ug/l)	<0.025	Catchment	3530309	4STAUB
Jubilee Brook	10/12/2019 08:30	Asulam (ug/l)	<0.025	Catchment	3530310	4JUBIB
Scotts Brook	10/12/2019 08:00	Asulam (ug/l)	<0.025	Catchment	3530311	4SCOTB
Rolleston Brook downstream	09/12/2019 12:40	Asulam (ug/l)	<0.025	Catchment	3530364	7ROLL1
Foston Brook and Rolleston Brook	09/12/2019 12:20	Asulam (ug/l)	<0.025	Catchment	3530361	6DOVE2
confluence Rolleston Brook	09/12/2019 12:00	Asulam (ug/l)	<0.025	Catchment	3530365	7ROLL1
Rolleston Brook upstream	09/12/2019 11:30	Asulam (ug/l)	<0.025	Catchment	3530362	7ROLL1
Mill Fleam upstream	09/12/2019 11:10	Asulam (ug/l)	<0.025	Catchment	3530363	7ROLL1
downstream before confluence River	09/12/2019 10:50	Asulam (ug/l)	<0.025	Catchment	3530355	6FOST1

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Foston Brook 8 - Foston Upstream	09/12/2019 10:20	Asulam (ug/l)	<0.025	Catchment	3530354	6FOST1
Dale Brook tributory to Foston Brook	09/12/2019 10:00	Asulam (ug/l)	<0.025	Catchment	3530353	6FOST1
River Dove Upstream	09/12/2019 09:40	Asulam (ug/l)	<0.025	Catchment	3530352	6DOVE2
Cubley Brook at Boylestone	09/12/2019 09:10	Asulam (ug/l)	<0.025	Catchment	3530351	6FOST1
Cubley Brook @ Little Cubley	09/12/2019 08:50	Asulam (ug/l)	<0.025	Catchment	3530350	6FOST1
Shirley Brook at Longford	09/12/2019 08:30	Asulam (ug/l)	<0.025	Catchment	3530356	6SHIR3
Brailsford Brook at Longford	09/12/2019 08:10	Asulam (ug/l)	<0.025	Catchment	3530357	6BRAI1
Sutton Brook at Sutton on the Hill	09/12/2019 07:50	Asulam (ug/l)	<0.025	Catchment	3530358	6HILT1
R.Blythe - Solihull SP164789	06/12/2019 10:33	Asulam (ug/l)	<0.025	Catchment	3530331	8SBLY0
R.Blythe - Temple Balsall SP208763	06/12/2019 10:16	Asulam (ug/l)	<0.025	Catchment	3530332	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	06/12/2019 10:02	Asulam (ug/l)	<0.025	Catchment	3530333	8SBLY0
R.Blythe - Packington SP218852	06/12/2019 09:39	Asulam (ug/l)	<0.025	Catchment	3530334	8SBLY0
Didgeley Brook	06/12/2019 09:18	Asulam (ug/l)	<0.025	Catchment	3530330	8SBOU1
Bourne Brook	06/12/2019 09:10	Asulam (ug/l)	<0.025	Catchment	3530328	8SBOU1
River Bourne	06/12/2019 08:58	Asulam (ug/l)	<0.025	Catchment	3530329	8SBOU1
Whitacre WTW River Blythe Intake	06/12/2019 08:40	Asulam (ug/l)	<0.008	Catchment	3530327	3WHITS
R.Blythe - Blythe Bridge SP211898	06/12/2019 08:29	Asulam (ug/l)	<0.025	Catchment	3530335	8SBLY0
Whitacre WTW River Cole Intake	06/12/2019 08:14	Asulam (ug/l)	<0.008	Catchment	3530326	3WHITS
Newtown Linford T - junction	05/12/2019 12:20	Asulam (ug/l)	<0.025	Catchment	3530320	4QUORB
Cropston Reservoir feed, Deer Barn	05/12/2019 12:00	Asulam (ug/l)	<0.025	Catchment	3530316	4QUORB

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Cropston Tributary 2 - Polly Botts Lane	05/12/2019 11:40	Asulam (ug/l)	<0.025	Catchment	3530321	4QUORB
Cropston Tributary - Nowell Spring Wood	05/12/2019 11:30	Asulam (ug/l)	<0.025	Catchment	3530314	4QUORB
Swithland, Brands Hill House security	05/12/2019 11:10	Asulam (ug/l)	<0.025	Catchment	3530322	4QUORB
Swithland Village opp St Leonards Church	05/12/2019 10:50	Asulam (ug/l)	<0.025	Catchment	3530318	4QUORB
Swithland feed adj railway	05/12/2019 10:35	Asulam (ug/l)	<0.025	Catchment	3530317	4QUORB
Bradgate Road, Cropston under	05/12/2019 10:10	Asulam (ug/l)	<0.025	Catchment	3530319	4QUORB
Swithland Reservoir Surface Raw	05/12/2019 10:05	Asulam (ug/l)	<0.008	Catchment	3530325	4CROP
Cropston Reservoir Surface Raw	05/12/2019 09:50	Asulam (ug/l)	<0.008	Catchment	3530324	4CROP
Cropston Res car park	05/12/2019 09:25	Asulam (ug/l)	<0.025	Catchment	3530323	4QUORB
Rothley Brook - Anstey Lane	05/12/2019 09:00	Asulam (ug/l)	<0.025	Catchment	3530315	4ROTBR
Ogston Reservoir Surface Raw	03/12/2019 11:45	Asulam (ug/l)	<0.008	Catchment	3530366	6OGST0
Hodgelane Brook	03/12/2019 11:15	Asulam (ug/l)	<0.025	Catchment	3530373	6HODG0
Smalley Brook	03/12/2019 10:40	Asulam (ug/l)	<0.025	Catchment	3530372	6SMAL1
Marsh Brook	03/12/2019 10:00	Asulam (ug/l)	<0.025	Catchment	3530371	6AMBE2
between Ashover and Fallgate(Butts)	03/12/2019 09:20	Asulam (ug/l)	<0.025	Catchment	3530370	6AMBE2
River Amber outside Milltown	03/12/2019 08:45	Asulam (ug/l)	<0.025	Catchment	3530369	6AMBE2
Carr Brook footbridge	03/12/2019 08:20	Asulam (ug/l)	<0.025	Catchment	3530367	6CARR0
Unamed tributary Woolley Moor	03/12/2019 07:50	Asulam (ug/l)	<0.025	Catchment	3530368	6AMBE2
Hilton Brook downstream	01/12/2019 00:00	Asulam (ug/l)	<0.025	Catchment	3530359	6HILT1
River Wye @ Kerne Bridge	26/11/2019 11:13	Asulam (ug/l)	<0.025	Catchment	3491143	2WYE

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River Wye @ Wilton Bridge	26/11/2019 10:58	Asulam (ug/l)	<0.025	Catchment	3491142	2WYE
River Wye @ Foy Foot Bridge	26/11/2019 10:42	Asulam (ug/l)	<0.025	Catchment	3491141	2WYE
River Wye @ King caple foot Bridge	26/11/2019 10:12	Asulam (ug/l)	<0.025	Catchment	3491140	2WYE
River Wye @ Bridge Road Bridge	26/11/2019 10:04	Asulam (ug/l)	<0.025	Catchment	3491139	2WYE
River Lugg @ Mordiford Bridge	26/11/2019 09:35	Asulam (ug/l)	<0.025	Catchment	3491138	2LUGG
River Wye @ Hampton Bishop	26/11/2019 09:28	Asulam (ug/l)	<0.025	Catchment	3491137	2WYE
River Frome at Larport Lane Bridge	26/11/2019 09:16	Asulam (ug/l)	<0.025	Catchment	3491136	2FROMA
River Lugg @ Marden	26/11/2019 08:53	Asulam (ug/l)	<0.025	Catchment	3491144	2LUGG
River Arrow at Bridge on B4361	26/11/2019 08:26	Asulam (ug/l)	<0.025	Catchment	3491145	2LUGG
to conf R Avon - Willes Meadow Foot	25/11/2019 11:37	Asulam (ug/l)	<0.025	Catchment	3491028	3LEAM
Radford Brook source to conf R Leam	25/11/2019 11:32	Asulam (ug/l)	<0.025	Catchment	3491031	3RADF
River Leam @ EATHORPE	25/11/2019 11:12	Asulam (ug/l)	<0.008	Catchment	3491036	3LEAM
Stowe to conf. R Leam - Marton	25/11/2019 11:02	Asulam (ug/l)	<0.025	Catchment	3491026	3ITCH
Brook to conf R Itchen	25/11/2019 10:55	Asulam (ug/l)	<0.025	Catchment	3491030	3LEAM
conf. R Stowe - Thorpe Bridge Ufton	25/11/2019 10:37	Asulam (ug/l)	<0.025	Catchment	3491027	3ITCH
R Leam source to conf Rains Brook	25/11/2019 10:28	Asulam (ug/l)	<0.025	Catchment	3491029	3LEAM
R Stowe source to conf R Leam	25/11/2019 09:58	Asulam (ug/l)	<0.025	Catchment	3491024	3STOW
Rains Brook	25/11/2019 09:42	Asulam (ug/l)	<0.025	Catchment	3491032	3RAIN
River Avon at Brownsover	25/11/2019 09:11	Asulam (ug/l)	<0.008	Catchment	3491035	3DRATS
R.Avon Station Road	25/11/2019 09:05	Asulam (ug/l)	<0.025	Catchment	3491033	3AVOU

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Stanford Res Surface	25/11/2019 08:44	Asulam (ug/l)	<0.008	Catchment	3491034	3DRATS
R.Avon - Welford Bridge	25/11/2019 08:37	Asulam (ug/l)	<0.025	Catchment	3491025	3AVOU
R.Severn nr Dowles	21/11/2019 18:52	Asulam (ug/l)	<0.025	Catchment	3491195	1SEVE
R.Severn nr Ribbesford Wood	21/11/2019 18:51	Asulam (ug/l)	<0.025	Catchment	3491194	1SEVE
R.Severn nr Upton Marina	21/11/2019 18:48	Asulam (ug/l)	<0.025	Catchment	3491183	1SEVE
R.Severn nr Buryend Farm	21/11/2019 18:47	Asulam (ug/l)	<0.025	Catchment	3491147	1SEVE
Stourport (DS R.Stour)	21/11/2019 18:43	Asulam (ug/l)	<0.025	Catchment	3491192	1SEVE
R.Severn nr Holt Fleet	21/11/2019 18:40	Asulam (ug/l)	<0.025	Catchment	3491189	1SEVE
R.Severn nr Grimley	21/11/2019 18:39	Asulam (ug/l)	<0.025	Catchment	3491188	1SEVE
R.Severn nr Bevere Island	21/11/2019 18:37	Asulam (ug/l)	<0.025	Catchment	3491187	1SEVE
R.Severn nr Lincomb Hall	21/11/2019 18:33	Asulam (ug/l)	<0.025	Catchment	3491191	1SEVE
R.Severn nr Lineholt	21/11/2019 18:32	Asulam (ug/l)	<0.025	Catchment	3491190	1SEVE
R.Severn nr Clerkenleap Farm	21/11/2019 18:29	Asulam (ug/l)	<0.025	Catchment	3491185	1SEVE
R.Severn nr Kempsey	21/11/2019 18:28	Asulam (ug/l)	<0.025	Catchment	3491184	1SEVE
R.Severn nr Bredon School	21/11/2019 18:25	Asulam (ug/l)	<0.025	Catchment	3491146	1SEVE
Newtown Linford T - junction	21/11/2019 12:25	Asulam (ug/l)	<0.025	Catchment	3491006	4QUORB
Cropston Reservoir feed, Deer Barn	21/11/2019 12:10	Asulam (ug/l)	<0.025	Catchment	3491010	4QUORB
Cropston Tributary 2 - Polly Botts Lane	21/11/2019 11:55	Asulam (ug/l)	<0.025	Catchment	3491005	4QUORB
Cropston Tributary - Nowell Spring Wood	21/11/2019 11:40	Asulam (ug/l)	<0.025	Catchment	3491012	4QUORB
Swithland, Brands Hill House security	21/11/2019 11:20	Asulam (ug/l)	<0.025	Catchment	3491004	4QUORB

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Swithland feed adj railway	21/11/2019 11:05	Asulam (ug/l)	<0.025	Catchment	3491009	4QUORB
Swithland Village opp St Leonards Church	21/11/2019 10:45	Asulam (ug/l)	<0.025	Catchment	3491008	4QUORB
Bradgate Road, Cropston under	21/11/2019 10:25	Asulam (ug/l)	<0.025	Catchment	3491007	4QUORB
Cropston Res car park	21/11/2019 09:35	Asulam (ug/l)	<0.025	Catchment	3491003	4QUORB
Rothley Brook - Anstey Lane	21/11/2019 09:10	Asulam (ug/l)	<0.025	Catchment	3491011	4ROTBR
R.Blythe - Solihull SP164789	19/11/2019 10:55	Asulam (ug/l)	<0.025	Catchment	3491017	8SBLY0
R.Blythe - Temple Balsall SP208763	19/11/2019 10:39	Asulam (ug/l)	<0.025	Catchment	3491016	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	19/11/2019 10:26	Asulam (ug/l)	<0.025	Catchment	3491015	8SBLY0
R.Blythe - Packington SP218852	19/11/2019 10:08	Asulam (ug/l)	<0.025	Catchment	3491014	8SBLY0
Didgeley Brook	19/11/2019 09:49	Asulam (ug/l)	<0.025	Catchment	3491019	8SBOU1
Bourne Brook	19/11/2019 09:41	Asulam (ug/l)	<0.025	Catchment	3491021	8SBOU1
River Bourne	19/11/2019 09:25	Asulam (ug/l)	<0.025	Catchment	3491020	8SBOU1
R.Blythe - Blythe Bridge SP211898	19/11/2019 08:53	Asulam (ug/l)	<0.025	Catchment	3491013	8SBLY0
Hilton Brook downstream	18/11/2019 13:00	Asulam (ug/l)	<0.025	Catchment	3491043	6HILT1
Rolleston Brook downstream	18/11/2019 13:00	Asulam (ug/l)	<0.025	Catchment	3491038	7ROLL1
Foston Brook and Rolleston Brook	18/11/2019 12:45	Asulam (ug/l)	<0.025	Catchment	3491041	6DOVE2
confluence Rolleston Brook	18/11/2019 12:25	Asulam (ug/l)	<0.025	Catchment	3491037	7ROLL1
Rolleston Brook upstream	18/11/2019 12:10	Asulam (ug/l)	<0.025	Catchment	3491040	7ROLL1
Mill Fleam upstream	18/11/2019 11:40	Asulam (ug/l)	<0.025	Catchment	3491039	7ROLL1
R.Severn nr Arley	18/11/2019 11:28	Asulam (ug/l)	<0.025	Catchment	3491196	1SEVE

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downstream before confluence River	18/11/2019 11:10	Asulam (ug/l)	<0.025	Catchment	3491047	6FOST1
R.Severn nr Hampton	18/11/2019 11:09	Asulam (ug/l)	<0.025	Catchment	3491197	1SEVE
Foston Brook 8 - Foston Upstream	18/11/2019 10:45	Asulam (ug/l)	<0.025	Catchment	3491048	6FOST1
R.Severn nr Bridgnorth	18/11/2019 10:45	Asulam (ug/l)	<0.025	Catchment	3491198	1SEVE
Dale Brook tributory to Foston Brook	18/11/2019 10:20	Asulam (ug/l)	<0.025	Catchment	3491049	6FOST1
R.Severn nr Broseley	18/11/2019 10:17	Asulam (ug/l)	<0.025	Catchment	3491199	1SEVE
R.Severn nr Cressage	18/11/2019 09:57	Asulam (ug/l)	<0.025	Catchment	3491200	1SEVE
River Dove Upstream	18/11/2019 09:55	Asulam (ug/l)	<0.025	Catchment	3491050	6DOVE2
R.Severn nr Atcham	18/11/2019 09:36	Asulam (ug/l)	<0.025	Catchment	3491201	1SEVE
Cubley Brook at Boylestone	18/11/2019 09:25	Asulam (ug/l)	<0.025	Catchment	3491051	6FOST1
R.Severn nr Upton Magna	18/11/2019 09:20	Asulam (ug/l)	<0.025	Catchment	3490971	1SEVE
Cubley Brook @ Little Cubley	18/11/2019 09:00	Asulam (ug/l)	<0.025	Catchment	3491052	6FOST1
R.Severn nr Shrewsbury	18/11/2019 08:55	Asulam (ug/l)	<0.025	Catchment	3490977	1SEVE
Shirley Brook at Longford	18/11/2019 08:30	Asulam (ug/l)	<0.025	Catchment	3491046	6SHIR3
Brailsford Brook at Longford	18/11/2019 08:10	Asulam (ug/l)	<0.025	Catchment	3491045	6BRAI1
Sutton Brook at Sutton on the Hill	18/11/2019 07:40	Asulam (ug/l)	<0.025	Catchment	3491044	6HILT1
River Derwent (Draycott) Raw	07/11/2019 12:45	Asulam (ug/l)	<0.008	Catchment	3490980	5CWILW
BORROWASH	07/11/2019 12:10	Asulam (ug/l)	<0.008	Catchment	3490979	6DERWC
ALLESTREE FORD	07/11/2019 11:40	Asulam (ug/l)	<0.008	Catchment	3490978	6DERWB
Mackworth Brook @ Markeaton Stones	07/11/2019 11:15	Asulam (ug/l)	<0.008	Catchment	3490984	6MACK2

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Markeaton Brook @ Kedleston	07/11/2019 10:45	Asulam (ug/l)	<0.008	Catchment	3490982	6MARK0
Kedleston Park Brook	07/11/2019 10:20	Asulam (ug/l)	<0.008	Catchment	3490983	6MARK0
Markeaton Brook @ Mercaston	07/11/2019 09:50	Asulam (ug/l)	<0.008	Catchment	3490981	6MARK0
Ogston Reservoir Surface Raw	04/11/2019 12:25	Asulam (ug/l)	<0.008	Catchment	3490831	6OGST0
Hodgelane Brook	04/11/2019 11:45	Asulam (ug/l)	<0.008	Catchment	3490824	6HODG0
Smalley Brook	04/11/2019 11:15	Asulam (ug/l)	<0.008	Catchment	3490825	6SMAL1
Marsh Brook	04/11/2019 10:40	Asulam (ug/l)	<0.008	Catchment	3490826	6AMBE2
between Ashover and Fallgate(Butts)	04/11/2019 10:05	Asulam (ug/l)	<0.008	Catchment	3490827	6AMBE2
River Amber outside Milltown	04/11/2019 09:20	Asulam (ug/l)	<0.008	Catchment	3490828	6AMBE2
Carr Brook footbridge	04/11/2019 08:45	Asulam (ug/l)	<0.008	Catchment	3490830	6CARR0
Unamed tributary Woolley Moor	04/11/2019 08:10	Asulam (ug/l)	<0.008	Catchment	3490829	6AMBE2
Foremark Reservoir Surface Raw	01/11/2019 11:30	Asulam (ug/l)	<0.008	Catchment	3490995	4MELBN
Reservoir Surface Raw	01/11/2019 11:10	Asulam (ug/l)	<0.008	Catchment	3490996	4MELBN
Staunton Harold Brook	01/11/2019 10:40	Asulam (ug/l)	<0.008	Catchment	3490999	4STAUB
Heath End Brook	01/11/2019 10:10	Asulam (ug/l)	<0.008	Catchment	3491000	4HEATB
Jubilee Brook	01/11/2019 09:45	Asulam (ug/l)	<0.008	Catchment	3490998	4JUBIB
Scotts Brook	01/11/2019 09:20	Asulam (ug/l)	<0.008	Catchment	3490997	4SCOTB
Newtown Linford T - junction	10/10/2019 13:35	Asulam (ug/l)	<0.008	Catchment	3465609	4QUORB
Cropston Reservoir feed, Deer Barn	10/10/2019 13:15	Asulam (ug/l)	<0.008	Catchment	3465605	4QUORB
Cropston Tributary 2 - Polly Botts Lane	10/10/2019 12:50	Asulam (ug/l)	<0.008	Catchment	3465610	4QUORB

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Cropston Tributary - Nowell Spring Wood	10/10/2019 12:35	Asulam (ug/l)	<0.008	Catchment	3465603	4QUORB
Swithland, Brands Hill House security	10/10/2019 12:20	Asulam (ug/l)	<0.008	Catchment	3465611	4QUORB
Swithland feed adj railway	10/10/2019 12:00	Asulam (ug/l)	<0.008	Catchment	3465606	4QUORB
Swithland Village opp St Leonards Church	10/10/2019 11:35	Asulam (ug/l)	<0.008	Catchment	3465607	4QUORB
Bradgate Road, Cropston under	10/10/2019 11:15	Asulam (ug/l)	<0.008	Catchment	3465608	4QUORB
Cropston Reservoir Surface Raw	10/10/2019 11:05	Asulam (ug/l)	<0.008	Catchment	3465613	4CROP
Swithland Reservoir Surface Raw	10/10/2019 10:40	Asulam (ug/l)	<0.008	Catchment	3465614	4CROP
Cropston Res car park	10/10/2019 10:20	Asulam (ug/l)	<0.008	Catchment	3465612	4QUORB
Rothley Brook - Anstey Lane	10/10/2019 10:00	Asulam (ug/l)	<0.008	Catchment	3465604	4ROTBR
Hilton Brook downstream	09/10/2019 14:30	Asulam (ug/l)	<0.008	Catchment	3465525	6HILT1
confluence Rolleston Brook	09/10/2019 13:25	Asulam (ug/l)	<0.008	Catchment	3465531	7ROLL1
Rolleston Brook upstream	09/10/2019 13:00	Asulam (ug/l)	<0.008	Catchment	3465528	7ROLL1
downstream before confluence River	09/10/2019 12:05	Asulam (ug/l)	<0.008	Catchment	3465521	6FOST1
Foston Brook 8 - Foston Upstream	09/10/2019 11:35	Asulam (ug/l)	<0.008	Catchment	3465520	6FOST1
Dale Brook tributory to Foston Brook	09/10/2019 11:10	Asulam (ug/l)	<0.008	Catchment	3465519	6FOST1
River Dove Upstream	09/10/2019 10:35	Asulam (ug/l)	<0.008	Catchment	3465518	6DOVE2
Cubley Brook at Boylestone	09/10/2019 10:10	Asulam (ug/l)	<0.008	Catchment	3465517	6FOST1
Cubley Brook @ Little Cubley	09/10/2019 09:40	Asulam (ug/l)	<0.008	Catchment	3465516	6FOST1
Shirley Brook at Longford	09/10/2019 09:15	Asulam (ug/l)	<0.008	Catchment	3465522	6SHIR3
Brailsford Brook at Longford	09/10/2019 08:45	Asulam (ug/l)	<0.008	Catchment	3465523	6BRAI1

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Sutton Brook at Sutton on the Hill	09/10/2019 08:20	Asulam (ug/l)	<0.008	Catchment	3465524	6HILT1
Bourne Brook	08/10/2019 19:23	Asulam (ug/l)	<0.008	Catchment	3465587	8SBOU1
River Bourne	08/10/2019 19:21	Asulam (ug/l)	<0.008	Catchment	3465588	8SBOU1
Whitacre WTW River Cole Intake	08/10/2019 19:19	Asulam (ug/l)	<0.008	Catchment	3465585	3WHITS
Whitacre WTW River Blythe Intake	08/10/2019 19:17	Asulam (ug/l)	<0.008	Catchment	3465586	3WHITS
R.Blythe - Temple Balsall SP208763	08/10/2019 19:15	Asulam (ug/l)	<0.008	Catchment	3465591	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	08/10/2019 19:14	Asulam (ug/l)	<0.008	Catchment	3465592	8SBLY0
Didgeley Brook	08/10/2019 19:12	Asulam (ug/l)	<0.008	Catchment	3465589	8SBOU1
R.Blythe - Solihull SP164789	08/10/2019 19:10	Asulam (ug/l)	<0.008	Catchment	3465590	8SBLY0
R.Blythe - Packington SP218852	08/10/2019 19:09	Asulam (ug/l)	<0.008	Catchment	3465593	8SBLY0
R.Blythe - Blythe Bridge SP211898	08/10/2019 19:07	Asulam (ug/l)	<0.008	Catchment	3465594	8SBLY0
Hodgelane Brook	04/10/2019 12:00	Asulam (ug/l)	<0.008	Catchment	3465602	6HODG0
Smalley Brook	04/10/2019 11:35	Asulam (ug/l)	<0.008	Catchment	3465601	6SMAL1
Marsh Brook	04/10/2019 11:15	Asulam (ug/l)	<0.008	Catchment	3465600	6AMBE2
between Ashover and Fallgate(Butts)	04/10/2019 10:50	Asulam (ug/l)	0.009	Catchment	3465599	6AMBE2
River Amber outside Milltown	04/10/2019 10:30	Asulam (ug/l)	0.015	Catchment	3465598	6AMBE2
Carr Brook footbridge	04/10/2019 10:10	Asulam (ug/l)	<0.008	Catchment	3465596	6CARR0
Unamed tributary Woolley Moor	04/10/2019 09:40	Asulam (ug/l)	<0.008	Catchment	3465597	6AMBE2
Ogston Reservoir Surface Raw	04/10/2019 09:25	Asulam (ug/l)	<0.008	Catchment	3465595	6OGST0
River Wye @ Kerne Bridge	03/10/2019 16:21	Asulam (ug/l)	<0.008	Catchment	3465569	2WYE

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River Wye @ Wilton Bridge	03/10/2019 16:20	Asulam (ug/l)	<0.008	Catchment	3465570	2WYE
River Wye @ Foy Foot Bridge	03/10/2019 16:18	Asulam (ug/l)	0.009	Catchment	3465571	2WYE
River Wye @ King caple foot Bridge	03/10/2019 16:17	Asulam (ug/l)	<0.008	Catchment	3465572	2WYE
River Wye @ Bridge Road Bridge	03/10/2019 16:15	Asulam (ug/l)	<0.008	Catchment	3465573	2WYE
River Lugg @ Mordiford Bridge	03/10/2019 16:14	Asulam (ug/l)	<0.008	Catchment	3465574	2LUGG
River Wye @ Hampton Bishop	03/10/2019 16:12	Asulam (ug/l)	0.008	Catchment	3465575	2WYE
River Frome at Larport Lane Bridge	03/10/2019 16:10	Asulam (ug/l)	0.048	Catchment	3465576	2FROMA
River Lugg @ Marden	03/10/2019 16:08	Asulam (ug/l)	<0.008	Catchment	3465568	2LUGG
River Arrow at Bridge on B4361	03/10/2019 16:06	Asulam (ug/l)	<0.008	Catchment	3465567	2LUGG
River Derwent (Draycott) Raw	03/10/2019 12:20	Asulam (ug/l)	<0.008	Catchment	3465549	5CWILW
BORROWASH	03/10/2019 11:45	Asulam (ug/l)	<0.008	Catchment	3465550	6DERWC
ALLESTREE FORD	03/10/2019 11:15	Asulam (ug/l)	<0.008	Catchment	3465551	6DERWB
Mackworth Brook @ Markeaton Stones	03/10/2019 10:45	Asulam (ug/l)	<0.008	Catchment	3465545	6MACK2
Kedleston Park Brook	03/10/2019 10:20	Asulam (ug/l)	<0.008	Catchment	3465546	6MARK0
Markeaton Brook @ Kedleston	03/10/2019 10:00	Asulam (ug/l)	<0.008	Catchment	3465547	6MARK0
Markeaton Brook @ Mercaston	03/10/2019 09:30	Asulam (ug/l)	<0.008	Catchment	3465548	6MARK0
R Stowe source to conf R Leam	02/10/2019 16:12	Asulam (ug/l)	<0.008	Catchment	3465515	3STOW
R.Avon - Welford Bridge	02/10/2019 16:10	Asulam (ug/l)	<0.008	Catchment	3465514	3AVOU
Brook to conf R Itchen	02/10/2019 16:09	Asulam (ug/l)	<0.008	Catchment	3465509	3LEAM
Radford Brook source to conf R Leam	02/10/2019 16:07	Asulam (ug/l)	<0.008	Catchment	3465508	3RADF

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to conf R Avon - Willes Meadow Foot	02/10/2019 16:04	Asulam (ug/l)	<0.008	Catchment	3465511	3LEAM
R Leam source to conf Rains Brook	02/10/2019 16:02	Asulam (ug/l)	<0.008	Catchment	3465510	3LEAM
River Leam @ EATHORPE	02/10/2019 15:59	Asulam (ug/l)	<0.008	Catchment	3465503	3LEAM
Rains Brook	02/10/2019 15:58	Asulam (ug/l)	<0.008	Catchment	3465507	3RAIN
R.Avon Station Road	02/10/2019 15:56	Asulam (ug/l)	<0.008	Catchment	3465506	3AVOU
Stanford Res Surface	02/10/2019 15:54	Asulam (ug/l)	0.015	Catchment	3465505	3DRATS
River Avon at Brownsover	02/10/2019 15:52	Asulam (ug/l)	<0.008	Catchment	3465504	3DRATS
Stowe to conf. R Leam - Marton	02/10/2019 15:50	Asulam (ug/l)	<0.008	Catchment	3465513	3ITCH
conf. R Stowe - Thorpe Bridge Ufton	02/10/2019 15:48	Asulam (ug/l)	<0.008	Catchment	3465512	3ITCH
R.Severn nr Bredon School	01/10/2019 19:18	Asulam (ug/l)	<0.008	Catchment	3465566	1SEVE
R.Severn nr Buryend Farm	01/10/2019 19:17	Asulam (ug/l)	<0.008	Catchment	3465565	1SEVE
R.Severn nr Clerkenleap Farm	01/10/2019 19:15	Asulam (ug/l)	<0.008	Catchment	3465562	1SEVE
R.Severn nr Diglis	01/10/2019 19:13	Asulam (ug/l)	<0.008	Catchment	3465561	1SEVE
R.Severn nr Lincomb Hall	01/10/2019 19:12	Asulam (ug/l)	<0.008	Catchment	3465556	1SEVE
Stourport (DS R.Stour)	01/10/2019 19:10	Asulam (ug/l)	<0.008	Catchment	3465555	1SEVE
Stourport (US R.Stour)	01/10/2019 19:08	Asulam (ug/l)	<0.008	Catchment	3465554	1SEVE
R.Severn nr Ribbesford Wood	01/10/2019 19:07	Asulam (ug/l)	<0.008	Catchment	3465553	1SEVE
R.Severn nr Bevere Island	01/10/2019 19:05	Asulam (ug/l)	<0.008	Catchment	3465560	1SEVE
R.Severn nr Grimley	01/10/2019 19:03	Asulam (ug/l)	<0.008	Catchment	3465559	1SEVE
R.Severn nr Dowles	01/10/2019 19:01	Asulam (ug/l)	<0.008	Catchment	3465552	1SEVE

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R.Severn nr Holt Fleet	01/10/2019 18:58	Asulam (ug/l)	<0.008	Catchment	3465558	1SEVE
R.Severn nr Lineholt	01/10/2019 18:56	Asulam (ug/l)	<0.008	Catchment	3465557	1SEVE
R.Severn nr Upton Marina	01/10/2019 18:54	Asulam (ug/l)	<0.008	Catchment	3465564	1SEVE
R.Severn nr Kempsey	01/10/2019 18:52	Asulam (ug/l)	<0.008	Catchment	3465563	1SEVE
Foremark Reservoir Surface Raw	01/10/2019 12:40	Asulam (ug/l)	<0.008	Catchment	3465534	4MELBN
Reservoir Surface Raw	01/10/2019 12:20	Asulam (ug/l)	<0.008	Catchment	3465533	4MELBN
Staunton Harold Brook	01/10/2019 11:35	Asulam (ug/l)	<0.008	Catchment	3465616	4STAUB
Heath End Brook	01/10/2019 11:10	Asulam (ug/l)	<0.008	Catchment	3465615	4HEATB
Jubilee Brook	01/10/2019 10:20	Asulam (ug/l)	<0.008	Catchment	3465617	4JUBIB
Scotts Brook	01/10/2019 09:45	Asulam (ug/l)	<0.008	Catchment	3465532	4SCOTB
R.Severn nr Upton Magna	30/09/2019 18:11	Asulam (ug/l)	<0.008	Catchment	3465578	1SEVE
R.Severn nr Shrewsbury	30/09/2019 18:09	Asulam (ug/l)	<0.008	Catchment	3465577	1SEVE
R.Severn nr Arley	30/09/2019 18:08	Asulam (ug/l)	<0.008	Catchment	3465584	1SEVE
R.Severn nr Hampton	30/09/2019 18:06	Asulam (ug/l)	<0.008	Catchment	3465583	1SEVE
R.Severn nr Cressage	30/09/2019 18:04	Asulam (ug/l)	<0.008	Catchment	3465580	1SEVE
R.Severn nr Atcham	30/09/2019 18:02	Asulam (ug/l)	<0.008	Catchment	3465579	1SEVE
R.Severn nr Broseley	30/09/2019 18:00	Asulam (ug/l)	<0.008	Catchment	3465581	1SEVE
R.Severn nr Bridgnorth	30/09/2019 17:58	Asulam (ug/l)	<0.008	Catchment	3465582	1SEVE
downstream before confluence River	27/09/2019 12:05	Asulam (ug/l)	<0.008	Catchment	3430890	6FOST1
Foston Brook 8 - Foston Upstream	27/09/2019 11:50	Asulam (ug/l)	<0.008	Catchment	3430891	6FOST1

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Ogston Reservoir Surface Raw	26/09/2019 12:00	Asulam (ug/l)	<0.008	Catchment	3430870	6OGST0
Smalley Brook	26/09/2019 11:40	Asulam (ug/l)	0.008	Catchment	3430864	6SMAL1
Hodgelane Brook	26/09/2019 11:20	Asulam (ug/l)	0.015	Catchment	3430863	6HODG0
Marsh Brook	26/09/2019 10:45	Asulam (ug/l)	<0.008	Catchment	3430865	6AMBE2
between Ashover and Fallgate(Butts)	26/09/2019 10:25	Asulam (ug/l)	0.035	Catchment	3430866	6AMBE2
River Amber outside Milltown	26/09/2019 10:05	Asulam (ug/l)	0.033	Catchment	3430867	6AMBE2
Unamed tributary Woolley Moor	26/09/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3430868	6AMBE2
Hilton Brook downstream	24/09/2019 13:40	Asulam (ug/l)	<0.008	Catchment	3430886	6HILT1
Rolleston Brook upstream	24/09/2019 12:55	Asulam (ug/l)	<0.008	Catchment	3430883	7ROLL1
Foston Brook and Rolleston Brook	24/09/2019 12:30	Asulam (ug/l)	<0.008	Catchment	3430884	6DOVE2
confluence Rolleston Brook	24/09/2019 12:05	Asulam (ug/l)	<0.008	Catchment	3430880	7ROLL1
Rolleston Brook downstream	24/09/2019 11:30	Asulam (ug/l)	<0.008	Catchment	3430881	7ROLL1
Mill Fleam upstream	24/09/2019 11:10	Asulam (ug/l)	<0.008	Catchment	3430882	7ROLL1
River Dove Upstream	24/09/2019 10:15	Asulam (ug/l)	<0.008	Catchment	3430893	6DOVE2
Cubley Brook at Boylestone	24/09/2019 09:45	Asulam (ug/l)	<0.008	Catchment	3430894	6FOST1
Cubley Brook @ Little Cubley	24/09/2019 09:20	Asulam (ug/l)	<0.008	Catchment	3430895	6FOST1
Shirley Brook at Longford	24/09/2019 08:55	Asulam (ug/l)	<0.008	Catchment	3430889	6SHIR3
Brailsford Brook at Longford	24/09/2019 08:30	Asulam (ug/l)	<0.008	Catchment	3430888	6BRAI1
Sutton Brook at Sutton on the Hill	24/09/2019 08:10	Asulam (ug/l)	<0.008	Catchment	3430887	6HILT1
Dale Brook tributory to Foston Brook	24/09/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3430892	6FOST1

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Newtown Linford T - junction	20/09/2019 12:45	Asulam (ug/l)	<0.008	Catchment	3430936	4QUORB
Cropston Reservoir feed, Deer Barn	20/09/2019 12:30	Asulam (ug/l)	<0.008	Catchment	3430940	4QUORB
Cropston Tributary 2 - Polly Botts Lane	20/09/2019 12:15	Asulam (ug/l)	<0.008	Catchment	3430935	4QUORB
Cropston Tributary - Nowell Spring Wood	20/09/2019 12:00	Asulam (ug/l)	<0.008	Catchment	3430942	4QUORB
Swithland, Brands Hill House security	20/09/2019 11:45	Asulam (ug/l)	<0.008	Catchment	3430934	4QUORB
Swithland feed adj railway	20/09/2019 11:25	Asulam (ug/l)	<0.008	Catchment	3430939	4QUORB
Swithland Village opp St Leonards Church	20/09/2019 11:00	Asulam (ug/l)	<0.008	Catchment	3430938	4QUORB
Bradgate Road, Cropston under	20/09/2019 10:45	Asulam (ug/l)	<0.008	Catchment	3430937	4QUORB
Swithland Reservoir Surface Raw	20/09/2019 10:25	Asulam (ug/l)	<0.008	Catchment	3430931	4CROP
Cropston Reservoir Surface Raw	20/09/2019 10:00	Asulam (ug/l)	<0.008	Catchment	3430932	4CROP
Cropston Res car park	20/09/2019 09:40	Asulam (ug/l)	<0.008	Catchment	3430933	4QUORB
Rothley Brook - Anstey Lane	20/09/2019 09:20	Asulam (ug/l)	<0.008	Catchment	3430941	4ROTBR
R.Blythe - Solihull SP164789	18/09/2019 20:12	Asulam (ug/l)	<0.008	Catchment	3430913	8SBLY0
R.Blythe - Temple Balsall SP208763	18/09/2019 20:10	Asulam (ug/l)	<0.008	Catchment	3430912	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	18/09/2019 20:08	Asulam (ug/l)	<0.008	Catchment	3430911	8SBLY0
R.Blythe - Packington SP218852	18/09/2019 20:06	Asulam (ug/l)	<0.008	Catchment	3430910	8SBLY0
Didgeley Brook	18/09/2019 20:03	Asulam (ug/l)	<0.008	Catchment	3430914	8SBOU1
Bourne Brook	18/09/2019 20:00	Asulam (ug/l)	<0.008	Catchment	3430916	8SBOU1
River Bourne	18/09/2019 19:57	Asulam (ug/l)	<0.008	Catchment	3430915	8SBOU1
Whitacre WTW River Blythe Intake	18/09/2019 19:55	Asulam (ug/l)	<0.008	Catchment	3430925	3WHITS

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R.Blythe - Blythe Bridge SP211898	18/09/2019 19:53	Asulam (ug/l)	<0.008	Catchment	3430907	8SBLY0
Whitacre WTW River Cole Intake	18/09/2019 19:50	Asulam (ug/l)	<0.008	Catchment	3430930	3WHITS
River Wye @ Wilton Bridge	17/09/2019 19:47	Asulam (ug/l)	0.009	Catchment	3430997	2WYE
River Wye @ Kerne Bridge	17/09/2019 19:45	Asulam (ug/l)	<0.008	Catchment	3430998	2WYE
River Wye @ King caple foot Bridge	17/09/2019 19:43	Asulam (ug/l)	<0.008	Catchment	3430995	2WYE
River Wye @ Foy Foot Bridge	17/09/2019 19:40	Asulam (ug/l)	<0.008	Catchment	3430996	2WYE
River Lugg @ Mordiford Bridge	17/09/2019 19:38	Asulam (ug/l)	<0.008	Catchment	3430993	2LUGG
River Wye @ Bridge Road Bridge	17/09/2019 19:36	Asulam (ug/l)	<0.008	Catchment	3430994	2WYE
River Frome at Larport Lane Bridge	17/09/2019 19:34	Asulam (ug/l)	<0.008	Catchment	3430991	2FROMA
River Wye @ Hampton Bishop	17/09/2019 19:32	Asulam (ug/l)	<0.008	Catchment	3430992	2WYE
River Lugg @ Marden	17/09/2019 19:30	Asulam (ug/l)	<0.008	Catchment	3430999	2LUGG
River Arrow at Bridge on B4361	17/09/2019 19:27	Asulam (ug/l)	<0.008	Catchment	3431000	2LUGG
Ladybower Brook nr Ladybower Wood	17/09/2019 11:37	Asulam (ug/l)	0.016	Catchment	3464031	6DERW7
River Derwent at Yorkshire Bridge	17/09/2019 11:36	Asulam (ug/l)	<0.008	Catchment	3464025	6DERW7
Stowe to conf. R Leam - Marton	16/09/2019 19:31	Asulam (ug/l)	0.017	Catchment	3430918	3ITCH
Brook to conf R Itchen	16/09/2019 19:30	Asulam (ug/l)	<0.008	Catchment	3430922	3LEAM
Radford Brook source to conf R Leam	16/09/2019 19:28	Asulam (ug/l)	<0.008	Catchment	3430923	3RADF
River Leam @ EATHORPE	16/09/2019 19:26	Asulam (ug/l)	0.017	Catchment	3430929	3LEAM
to conf R Avon - Willes Meadow Foot	16/09/2019 19:24	Asulam (ug/l)	<0.008	Catchment	3430920	3LEAM
conf. R Stowe - Thorpe Bridge Ufton	16/09/2019 19:22	Asulam (ug/l)	<0.008	Catchment	3430919	3ITCH

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R Stowe source to conf R Leam	16/09/2019 19:20	Asulam (ug/l)	<0.008	Catchment	3430906	3STOW
R Leam source to conf Rains Brook	16/09/2019 19:19	Asulam (ug/l)	<0.008	Catchment	3430921	3LEAM
Rains Brook	16/09/2019 19:17	Asulam (ug/l)	<0.008	Catchment	3430924	3RAIN
River Avon at Brownsover	16/09/2019 19:15	Asulam (ug/l)	<0.008	Catchment	3430928	3DRATS
R.Avon Station Road	16/09/2019 19:13	Asulam (ug/l)	<0.008	Catchment	3430926	3AVOU
Stanford Res Surface	16/09/2019 19:09	Asulam (ug/l)	<0.008	Catchment	3430927	3DRATS
R.Avon - Welford Bridge	16/09/2019 18:53	Asulam (ug/l)	<0.008	Catchment	3430917	3AVOU
River Derwent (Draycott) Raw	13/09/2019 11:00	Asulam (ug/l)	<0.008	Catchment	3430956	5CWILW
BORROWASH	13/09/2019 10:30	Asulam (ug/l)	<0.008	Catchment	3430955	6DERWC
ALLESTREE FORD	13/09/2019 09:50	Asulam (ug/l)	<0.008	Catchment	3430954	6DERWB
Mackworth Brook @ Markeaton Stones	13/09/2019 09:20	Asulam (ug/l)	<0.008	Catchment	3430960	6MACK2
Kedleston Park Brook	13/09/2019 08:50	Asulam (ug/l)	<0.008	Catchment	3430959	6MARK0
Markeaton Brook @ Kedleston	13/09/2019 08:25	Asulam (ug/l)	<0.008	Catchment	3430958	6MARK0
Markeaton Brook @ Mercaston	13/09/2019 08:00	Asulam (ug/l)	<0.008	Catchment	3430957	6MARK0
Reservoir Surface Raw	11/09/2019 13:15	Asulam (ug/l)	<0.008	Catchment	3430949	4MELBN
Foremark Reservoir Surface Raw	11/09/2019 13:10	Asulam (ug/l)	<0.008	Catchment	3430969	4MELBN
Heath End Brook	11/09/2019 12:50	Asulam (ug/l)	<0.008	Catchment	3430953	4HEATB
Jubilee Brook	11/09/2019 12:50	Asulam (ug/l)	<0.008	Catchment	3430951	4JUBIB
Staunton Harold Brook	11/09/2019 12:50	Asulam (ug/l)	<0.008	Catchment	3430952	4STAUB
Scotts Brook	11/09/2019 12:15	Asulam (ug/l)	<0.008	Catchment	3430950	4SCOTB

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Hilton Brook downstream	11/09/2019 11:55	Asulam (ug/l)	<0.008	Catchment	3409437	6HILT1
Rolleston Brook downstream	11/09/2019 11:25	Asulam (ug/l)	<0.008	Catchment	3409442	7ROLL1
Foston Brook and Rolleston Brook	11/09/2019 11:10	Asulam (ug/l)	<0.008	Catchment	3409439	6DOVE2
confluence Rolleston Brook	11/09/2019 11:00	Asulam (ug/l)	<0.008	Catchment	3409443	7ROLL1
Rolleston Brook upstream	11/09/2019 10:45	Asulam (ug/l)	<0.008	Catchment	3409440	7ROLL1
Mill Fleam upstream	11/09/2019 10:30	Asulam (ug/l)	<0.008	Catchment	3409441	7ROLL1
downstream before confluence River	11/09/2019 10:20	Asulam (ug/l)	<0.008	Catchment	3409433	6FOST1
Foston Brook 8 - Foston Upstream	11/09/2019 10:10	Asulam (ug/l)	<0.008	Catchment	3409432	6FOST1
Dale Brook tributory to Foston Brook	11/09/2019 09:55	Asulam (ug/l)	<0.008	Catchment	3409431	6FOST1
River Dove Upstream	11/09/2019 09:45	Asulam (ug/l)	<0.008	Catchment	3409430	6DOVE2
Cubley Brook at Boylestone	11/09/2019 09:20	Asulam (ug/l)	<0.008	Catchment	3409429	6FOST1
Cubley Brook @ Little Cubley	11/09/2019 09:00	Asulam (ug/l)	<0.008	Catchment	3409428	6FOST1
Shirley Brook at Longford	11/09/2019 08:45	Asulam (ug/l)	<0.008	Catchment	3409434	6SHIR3
Brailsford Brook at Longford	11/09/2019 08:30	Asulam (ug/l)	<0.008	Catchment	3409435	6BRAI1
Rothley Brook - Anstey Lane	06/09/2019 13:25	Asulam (ug/l)	<0.008	Catchment	3409445	4ROTBR
Swithland feed adj railway	06/09/2019 13:05	Asulam (ug/l)	<0.008	Catchment	3409447	4QUORB
Cropston Reservoir feed, Deer Barn	06/09/2019 13:05	Asulam (ug/l)	<0.008	Catchment	3409446	4QUORB
Swithland Village opp St Leonards Church	06/09/2019 12:40	Asulam (ug/l)	<0.008	Catchment	3409448	4QUORB
Bradgate Road, Cropston under	06/09/2019 12:25	Asulam (ug/l)	<0.008	Catchment	3409449	4QUORB
Swithland Reservoir Surface Raw	06/09/2019 12:10	Asulam (ug/l)	<0.008	Catchment	3409455	4CROP

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Cropston Reservoir Surface Raw	06/09/2019 11:45	Asulam (ug/l)	<0.008	Catchment	3409454	4CROP
Cropston Res car park	06/09/2019 11:30	Asulam (ug/l)	<0.008	Catchment	3409453	4QUORB
R.Severn nr Bredon School	06/09/2019 11:00	Asulam (ug/l)	<0.008	Catchment	3430970	1SEVE
Newtown Linford T - junction	06/09/2019 10:45	Asulam (ug/l)	<0.008	Catchment	3409450	4QUORB
R.Severn nr Buryend Farm	06/09/2019 10:45	Asulam (ug/l)	<0.008	Catchment	3430971	1SEVE
Cropston Tributary 2 - Polly Botts Lane	06/09/2019 10:30	Asulam (ug/l)	<0.008	Catchment	3409451	4QUORB
R.Severn nr Upton Marina	06/09/2019 10:30	Asulam (ug/l)	<0.008	Catchment	3430972	1SEVE
R.Severn nr Kempsey	06/09/2019 10:10	Asulam (ug/l)	<0.008	Catchment	3430973	1SEVE
Cropston Tributary - Nowell Spring Wood	06/09/2019 10:05	Asulam (ug/l)	<0.008	Catchment	3409444	4QUORB
R.Severn nr Clerkenleap Farm	06/09/2019 09:50	Asulam (ug/l)	0.008	Catchment	3430974	1SEVE
Swithland, Brands Hill House security	06/09/2019 09:50	Asulam (ug/l)	<0.008	Catchment	3409452	4QUORB
R.Severn nr Diglis	06/09/2019 09:35	Asulam (ug/l)	<0.008	Catchment	3430975	1SEVE
R.Severn nr Bevere Island	06/09/2019 09:15	Asulam (ug/l)	<0.008	Catchment	3430976	1SEVE
R.Severn nr Grimley	06/09/2019 09:00	Asulam (ug/l)	<0.008	Catchment	3430977	1SEVE
R.Severn nr Holt Fleet	06/09/2019 08:40	Asulam (ug/l)	<0.008	Catchment	3430978	1SEVE
R.Severn nr Lineholt	06/09/2019 08:15	Asulam (ug/l)	<0.008	Catchment	3430979	1SEVE
R.Severn nr Lincomb Hall	06/09/2019 08:00	Asulam (ug/l)	<0.008	Catchment	3430980	1SEVE
Stourport (DS R.Stour)	06/09/2019 07:40	Asulam (ug/l)	<0.008	Catchment	3430981	1SEVE
Stourport (US R.Stour)	06/09/2019 07:20	Asulam (ug/l)	<0.008	Catchment	3430982	1SEVE
R.Severn nr Ribbesford Wood	06/09/2019 07:00	Asulam (ug/l)	<0.008	Catchment	3430983	1SEVE

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R.Severn nr Dowles	06/09/2019 06:45	Asulam (ug/l)	<0.008	Catchment	3430984	1SEVE
Ogston Reservoir Surface Raw	05/09/2019 13:00	Asulam (ug/l)	<0.008	Catchment	3409456	6OGST0
Hodgelane Brook	05/09/2019 12:25	Asulam (ug/l)	0.014	Catchment	3409463	6HODG0
R.Severn nr Arley	05/09/2019 12:00	Asulam (ug/l)	<0.008	Catchment	3430961	1SEVE
Smalley Brook	05/09/2019 12:00	Asulam (ug/l)	<0.008	Catchment	3409462	6SMAL1
Marsh Brook	05/09/2019 11:40	Asulam (ug/l)	<0.008	Catchment	3409461	6AMBE2
R.Severn nr Hampton	05/09/2019 11:30	Asulam (ug/l)	<0.008	Catchment	3430962	1SEVE
between Ashover and Fallgate(Butts)	05/09/2019 11:15	Asulam (ug/l)	<0.008	Catchment	3409460	6AMBE2
R.Severn nr Bridgnorth	05/09/2019 11:00	Asulam (ug/l)	<0.008	Catchment	3430963	1SEVE
River Amber outside Milltown	05/09/2019 10:50	Asulam (ug/l)	<0.008	Catchment	3409459	6AMBE2
Carr Brook footbridge	05/09/2019 10:35	Asulam (ug/l)	<0.008	Catchment	3409457	6CARR0
R.Severn nr Broseley	05/09/2019 10:30	Asulam (ug/l)	<0.008	Catchment	3430964	1SEVE
Unamed tributary Woolley Moor	05/09/2019 10:10	Asulam (ug/l)	<0.008	Catchment	3409458	6AMBE2
R.Severn nr Cressage	05/09/2019 10:00	Asulam (ug/l)	<0.008	Catchment	3430965	1SEVE
R.Severn nr Atcham	05/09/2019 09:30	Asulam (ug/l)	<0.008	Catchment	3430966	1SEVE
R.Severn nr Upton Magna	05/09/2019 09:00	Asulam (ug/l)	<0.008	Catchment	3430967	1SEVE
R.Severn nr Shrewsbury	05/09/2019 08:30	Asulam (ug/l)	<0.008	Catchment	3430968	1SEVE
R.Blythe - Solihull SP164789	30/08/2019 10:00	Asulam (ug/l)	<0.008	Catchment	3409408	8SBLY0
R.Blythe - Temple Balsall SP208763	30/08/2019 09:30	Asulam (ug/l)	<0.008	Catchment	3409409	8SBLY0
R.Blythe - Packington SP218852	30/08/2019 09:00	Asulam (ug/l)	<0.008	Catchment	3409411	8SBLY0

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Didgeley Brook	30/08/2019 08:30	Asulam (ug/l)	<0.008	Catchment	3409407	8SBOU1
Bourne Brook	30/08/2019 08:15	Asulam (ug/l)	0.01	Catchment	3409405	8SBOU1
River Bourne	30/08/2019 07:50	Asulam (ug/l)	<0.008	Catchment	3409406	8SBOU1
Whitacre WTW River Blythe Intake	30/08/2019 07:30	Asulam (ug/l)	0.009	Catchment	3409396	3WHITS
Whitacre WTW River Cole Intake	30/08/2019 07:00	Asulam (ug/l)	<0.008	Catchment	3409391	3WHITS
River Wye @ Kerne Bridge	29/08/2019 10:40	Asulam (ug/l)	<0.008	Catchment	3409301	2WYE
River Wye @ Wilton Bridge	29/08/2019 10:10	Asulam (ug/l)	<0.008	Catchment	3409302	2WYE
River Wye @ Foy Foot Bridge	29/08/2019 09:45	Asulam (ug/l)	<0.008	Catchment	3409303	2WYE
River Wye @ King caple foot Bridge	29/08/2019 09:15	Asulam (ug/l)	<0.008	Catchment	3409304	2WYE
River Wye @ Bridge Road Bridge	29/08/2019 08:45	Asulam (ug/l)	<0.008	Catchment	3409305	2WYE
River Wye @ Hampton Bishop	29/08/2019 08:20	Asulam (ug/l)	<0.008	Catchment	3409307	2WYE
River Lugg @ Mordiford Bridge	29/08/2019 08:00	Asulam (ug/l)	<0.008	Catchment	3409306	2LUGG
River Frome at Larport Lane Bridge	29/08/2019 07:45	Asulam (ug/l)	<0.008	Catchment	3409308	2FROMA
River Lugg @ Marden	29/08/2019 07:30	Asulam (ug/l)	<0.008	Catchment	3409300	2LUGG
River Arrow at Bridge on B4361	29/08/2019 07:00	Asulam (ug/l)	<0.008	Catchment	3409299	2LUGG
Foremark Reservoir Surface Raw	23/08/2019 10:30	Asulam (ug/l)	<0.008	Catchment	3409427	4MELBN
Reservoir Surface Raw	23/08/2019 10:20	Asulam (ug/l)	<0.008	Catchment	3409426	4MELBN
Staunton Harold Brook	23/08/2019 09:45	Asulam (ug/l)	<0.008	Catchment	3409423	4STAUB
Heath End Brook	23/08/2019 09:00	Asulam (ug/l)	<0.008	Catchment	3409422	4HEATB
Jubilee Brook	23/08/2019 08:35	Asulam (ug/l)	<0.008	Catchment	3409424	4JUBIB

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Scotts Brook	23/08/2019 08:10	Asulam (ug/l)	<0.008	Catchment	3409425	4SCOTB
Radford Brook source to conf R Leam	22/08/2019 10:20	Asulam (ug/l)	<0.008	Catchment	3409398	3RADF
River Leam @ EATHORPE	22/08/2019 10:10	Asulam (ug/l)	<0.008	Catchment	3409392	3LEAM
to conf R Avon - Willes Meadow Foot	22/08/2019 10:00	Asulam (ug/l)	0.01	Catchment	3409401	3LEAM
Stowe to conf. R Leam - Marton	22/08/2019 10:00	Asulam (ug/l)	0.02	Catchment	3409403	3ITCH
Brook to conf R Itchen	22/08/2019 09:45	Asulam (ug/l)	0.008	Catchment	3409399	3LEAM
conf. R Stowe - Thorpe Bridge Ufton	22/08/2019 09:30	Asulam (ug/l)	<0.008	Catchment	3409402	3ITCH
R Stowe source to conf R Leam	22/08/2019 09:20	Asulam (ug/l)	<0.008	Catchment	3409413	3STOW
R Leam source to conf Rains Brook	22/08/2019 09:00	Asulam (ug/l)	<0.008	Catchment	3409400	3LEAM
Rains Brook	22/08/2019 08:30	Asulam (ug/l)	<0.008	Catchment	3409397	3RAIN
River Avon at Brownsover	22/08/2019 08:00	Asulam (ug/l)	<0.008	Catchment	3409393	3DRATS
R.Avon Station Road	22/08/2019 07:45	Asulam (ug/l)	<0.008	Catchment	3409395	3AVOU
Stanford Res Surface	22/08/2019 07:30	Asulam (ug/l)	0.008	Catchment	3409394	3DRATS
R.Avon - Welford Bridge	22/08/2019 07:00	Asulam (ug/l)	<0.008	Catchment	3409404	3AVOU
ALLESTREE FORD	22/08/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3409390	6DERWB
BORROWASH	22/08/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3409389	6DERWC
River Derwent (Draycott) Raw	22/08/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3409388	5CWILW
Kedleston Park Brook	22/08/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3409384	6MARK0
Markeaton Brook @ Kedleston	22/08/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3409385	6MARK0
Markeaton Brook @ Mercaston	22/08/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3409386	6MARK0

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River Wye @ Kerne Bridge	16/08/2019 10:50	Asulam (ug/l)	<0.008	Catchment	3383258	2WYE
River Wye @ Wilton Bridge	16/08/2019 10:30	Asulam (ug/l)	<0.008	Catchment	3383257	2WYE
River Wye @ Foy Foot Bridge	16/08/2019 10:00	Asulam (ug/l)	<0.008	Catchment	3383256	2WYE
River Wye @ King caple foot Bridge	16/08/2019 09:30	Asulam (ug/l)	<0.008	Catchment	3383255	2WYE
River Wye @ Bridge Road Bridge	16/08/2019 09:00	Asulam (ug/l)	<0.008	Catchment	3383254	2WYE
River Lugg @ Mordiford Bridge	16/08/2019 08:45	Asulam (ug/l)	<0.008	Catchment	3383253	2LUGG
River Wye @ Hampton Bishop	16/08/2019 08:20	Asulam (ug/l)	<0.008	Catchment	3383252	2WYE
River Frome at Larport Lane Bridge	16/08/2019 08:00	Asulam (ug/l)	<0.008	Catchment	3383251	2FROMA
River Lugg @ Marden	16/08/2019 07:30	Asulam (ug/l)	<0.008	Catchment	3383259	2LUGG
River Arrow at Bridge on B4361	16/08/2019 07:00	Asulam (ug/l)	0.009	Catchment	3383260	2LUGG
R.Severn nr Bredon School	15/08/2019 11:15	Asulam (ug/l)	<0.008	Catchment	3409482	1SEVE
R.Severn nr Buryend Farm	15/08/2019 11:00	Asulam (ug/l)	<0.008	Catchment	3409481	1SEVE
R.Severn nr Upton Marina	15/08/2019 10:45	Asulam (ug/l)	0.009	Catchment	3409480	1SEVE
R.Severn nr Kempsey	15/08/2019 10:20	Asulam (ug/l)	<0.008	Catchment	3409479	1SEVE
R.Severn nr Clerkenleap Farm	15/08/2019 10:00	Asulam (ug/l)	<0.008	Catchment	3409478	1SEVE
R.Severn nr Diglis	15/08/2019 09:45	Asulam (ug/l)	<0.008	Catchment	3409477	1SEVE
R.Severn nr Bevere Island	15/08/2019 09:15	Asulam (ug/l)	<0.008	Catchment	3409476	1SEVE
R.Severn nr Grimley	15/08/2019 09:00	Asulam (ug/l)	0.01	Catchment	3409475	1SEVE
R.Severn nr Holt Fleet	15/08/2019 08:45	Asulam (ug/l)	0.009	Catchment	3409474	1SEVE
R.Severn nr Lineholt	15/08/2019 08:30	Asulam (ug/l)	0.011	Catchment	3409473	1SEVE

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R.Severn nr Lincomb Hall	15/08/2019 08:10	Asulam (ug/l)	0.008	Catchment	3409472	1SEVE
Stourport (US R.Stour)	15/08/2019 07:30	Asulam (ug/l)	<0.008	Catchment	3409470	1SEVE
R.Severn nr Ribbesford Wood	15/08/2019 07:15	Asulam (ug/l)	<0.008	Catchment	3409469	1SEVE
R.Severn nr Dowles	15/08/2019 07:00	Asulam (ug/l)	0.01	Catchment	3409468	1SEVE
Newtown Linford T - junction	10/08/2019 12:40	Asulam (ug/l)	<0.008	Catchment	3383327	4QUORB
Cropston Reservoir feed, Deer Barn	10/08/2019 12:25	Asulam (ug/l)	<0.008	Catchment	3383331	4QUORB
Cropston Tributary 2 - Polly Botts Lane	10/08/2019 12:10	Asulam (ug/l)	<0.008	Catchment	3383326	4QUORB
Cropston Tributary - Nowell Spring Wood	10/08/2019 12:00	Asulam (ug/l)	<0.008	Catchment	3383333	4QUORB
Swithland, Brands Hill House security	10/08/2019 11:35	Asulam (ug/l)	<0.008	Catchment	3383325	4QUORB
Swithland feed adj railway	10/08/2019 11:20	Asulam (ug/l)	<0.008	Catchment	3383330	4QUORB
Swithland Village opp St Leonards Church	10/08/2019 11:05	Asulam (ug/l)	<0.008	Catchment	3383329	4QUORB
Bradgate Road, Cropston under	10/08/2019 10:55	Asulam (ug/l)	<0.008	Catchment	3383328	4QUORB
Swithland Reservoir Surface Raw	10/08/2019 10:40	Asulam (ug/l)	<0.008	Catchment	3383322	4CROP
Cropston Reservoir Surface Raw	10/08/2019 10:00	Asulam (ug/l)	<0.008	Catchment	3383323	4CROP
Cropston Res car park	10/08/2019 09:45	Asulam (ug/l)	<0.008	Catchment	3383324	4QUORB
Rothley Brook - Anstey Lane	10/08/2019 09:15	Asulam (ug/l)	<0.008	Catchment	3383332	4ROTBR
Ladybower Brook nr Ladybower Wood	09/08/2019 14:54	Asulam (ug/l)	0.779	Catchment	3415803	6DERW7
RIVER DERWENT @ AMBERGATE	09/08/2019 14:54	Asulam (ug/l)	<0.008	Catchment	3415812	6DERW7
Ladybower Brook nr Ladybower Wood	09/08/2019 14:53	Asulam (ug/l)	0.821	Catchment	3415805	6DERW7
River Derwent at Yorkshire Bridge	09/08/2019 14:52	Asulam (ug/l)	0.008	Catchment	3415807	6DERW7

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RIVER DERWENT @ AMBERGATE	09/08/2019 14:52	Asulam (ug/l)	0.01	Catchment	3415810	6DERW7
Ladybower Brook nr Ladybower Wood	09/08/2019 14:51	Asulam (ug/l)	0.027	Catchment	3415801	6DERW7
R.Blythe - Solihull SP164789	09/08/2019 10:30	Asulam (ug/l)	<0.008	Catchment	3383289	8SBLY0
R.Blythe - Temple Balsall SP208763	09/08/2019 10:10	Asulam (ug/l)	<0.008	Catchment	3383288	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	09/08/2019 09:50	Asulam (ug/l)	<0.008	Catchment	3383287	8SBLY0
R.Blythe - Packington SP218852	09/08/2019 09:30	Asulam (ug/l)	<0.008	Catchment	3383286	8SBLY0
Didgeley Brook	09/08/2019 09:00	Asulam (ug/l)	<0.008	Catchment	3383290	8SBOU1
Bourne Brook	09/08/2019 08:40	Asulam (ug/l)	<0.008	Catchment	3383292	8SBOU1
River Bourne	09/08/2019 08:15	Asulam (ug/l)	<0.008	Catchment	3383291	8SBOU1
R.Blythe - Blythe Bridge SP211898	09/08/2019 07:20	Asulam (ug/l)	<0.008	Catchment	3383285	8SBLY0
Whitacre WTW River Cole Intake	09/08/2019 07:00	Asulam (ug/l)	<0.008	Catchment	3383306	3WHITS
Hilton Brook downstream	02/08/2019 12:45	Asulam (ug/l)	<0.008	Catchment	3383340	6HILT1
Rolleston Brook downstream	02/08/2019 12:15	Asulam (ug/l)	0.011	Catchment	3383335	7ROLL1
Foston Brook and Rolleston Brook	02/08/2019 12:00	Asulam (ug/l)	<0.008	Catchment	3383338	6DOVE2
confluence Rolleston Brook	02/08/2019 11:40	Asulam (ug/l)	<0.008	Catchment	3383334	7ROLL1
Rolleston Brook upstream	02/08/2019 11:25	Asulam (ug/l)	0.009	Catchment	3383337	7ROLL1
R.Severn nr Arley	02/08/2019 11:20	Asulam (ug/l)	<0.008	Catchment	3409421	1SEVE
Mill Fleam upstream	02/08/2019 11:05	Asulam (ug/l)	<0.008	Catchment	3383336	7ROLL1
downstream before confluence River	02/08/2019 10:55	Asulam (ug/l)	<0.008	Catchment	3383344	6FOST1
R.Severn nr Hampton	02/08/2019 10:50	Asulam (ug/l)	<0.008	Catchment	3409420	1SEVE

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Foston Brook 8 - Foston Upstream	02/08/2019 10:45	Asulam (ug/l)	<0.008	Catchment	3383352	6FOST1
Dale Brook tributory to Foston Brook	02/08/2019 10:35	Asulam (ug/l)	<0.008	Catchment	3383353	6FOST1
R.Severn nr Bridgnorth	02/08/2019 10:30	Asulam (ug/l)	<0.008	Catchment	3409419	1SEVE
River Dove Upstream	02/08/2019 10:20	Asulam (ug/l)	0.012	Catchment	3383354	6DOVE2
R.Severn nr Broseley	02/08/2019 10:00	Asulam (ug/l)	<0.008	Catchment	3409418	1SEVE
Cubley Brook at Boylestone	02/08/2019 09:45	Asulam (ug/l)	<0.008	Catchment	3383355	6FOST1
Cubley Brook @ Little Cubley	02/08/2019 09:30	Asulam (ug/l)	<0.008	Catchment	3383356	6FOST1
R.Severn nr Cressage	02/08/2019 09:20	Asulam (ug/l)	0.02	Catchment	3409417	1SEVE
Shirley Brook at Longford	02/08/2019 09:10	Asulam (ug/l)	<0.008	Catchment	3383343	6SHIR3
R.Severn nr Atcham	02/08/2019 09:00	Asulam (ug/l)	<0.008	Catchment	3409416	1SEVE
R.Severn nr Upton Magna	02/08/2019 08:30	Asulam (ug/l)	<0.008	Catchment	3409415	1SEVE
Sutton Brook at Sutton on the Hill	02/08/2019 08:25	Asulam (ug/l)	<0.008	Catchment	3383341	6HILT1
R.Severn nr Shrewsbury	02/08/2019 08:00	Asulam (ug/l)	<0.008	Catchment	3409414	1SEVE
to conf R Avon - Willes Meadow Foot	01/08/2019 11:15	Asulam (ug/l)	<0.008	Catchment	3383296	3LEAM
Radford Brook source to conf R Leam	01/08/2019 10:45	Asulam (ug/l)	<0.008	Catchment	3383299	3RADF
River Leam @ EATHORPE	01/08/2019 10:30	Asulam (ug/l)	<0.008	Catchment	3383305	3LEAM
Stowe to conf. R Leam - Marton	01/08/2019 10:15	Asulam (ug/l)	<0.008	Catchment	3383294	3ITCH
Brook to conf R Itchen	01/08/2019 10:00	Asulam (ug/l)	<0.008	Catchment	3383298	3LEAM
conf. R Stowe - Thorpe Bridge Ufton	01/08/2019 09:45	Asulam (ug/l)	<0.008	Catchment	3383295	3ITCH
R Stowe source to conf R Leam	01/08/2019 09:30	Asulam (ug/l)	<0.008	Catchment	3383284	3STOW

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R Leam source to conf Rains Brook	01/08/2019 09:00	Asulam (ug/l)	<0.008	Catchment	3383297	3LEAM
Rains Brook	01/08/2019 08:45	Asulam (ug/l)	<0.008	Catchment	3383300	3RAIN
River Avon at Brownsover	01/08/2019 08:20	Asulam (ug/l)	<0.008	Catchment	3383304	3DRATS
R.Avon Station Road	01/08/2019 08:00	Asulam (ug/l)	<0.008	Catchment	3383302	3AVOU
Stanford Res Surface	01/08/2019 07:30	Asulam (ug/l)	0.014	Catchment	3383303	3DRATS
R.Avon - Welford Bridge	01/08/2019 07:00	Asulam (ug/l)	<0.008	Catchment	3383293	3AVOU
Mackworth Brook @ Markeaton Stones	01/08/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3409383	6MACK2
R.Severn nr Bredon School	26/07/2019 11:00	Asulam (ug/l)	<0.008	Catchment	3383261	1SEVE
R.Severn nr Buryend Farm	26/07/2019 10:35	Asulam (ug/l)	0.01	Catchment	3383262	1SEVE
R.Severn nr Upton Marina	26/07/2019 10:15	Asulam (ug/l)	<0.008	Catchment	3383263	1SEVE
R.Severn nr Kempsey	26/07/2019 09:45	Asulam (ug/l)	<0.008	Catchment	3383264	1SEVE
R.Severn nr Clerkenleap Farm	26/07/2019 09:30	Asulam (ug/l)	<0.008	Catchment	3383265	1SEVE
R.Severn nr Diglis	26/07/2019 09:15	Asulam (ug/l)	0.009	Catchment	3383266	1SEVE
R.Severn nr Bevere Island	26/07/2019 08:45	Asulam (ug/l)	0.008	Catchment	3383267	1SEVE
R.Severn nr Grimley	26/07/2019 08:30	Asulam (ug/l)	<0.008	Catchment	3383268	1SEVE
R.Severn nr Holt Fleet	26/07/2019 08:15	Asulam (ug/l)	<0.008	Catchment	3383269	1SEVE
R.Severn nr Lineholt	26/07/2019 08:00	Asulam (ug/l)	<0.008	Catchment	3383270	1SEVE
R.Severn nr Lincomb Hall	26/07/2019 07:45	Asulam (ug/l)	<0.008	Catchment	3383271	1SEVE
Stourport (DS R.Stour)	26/07/2019 07:20	Asulam (ug/l)	<0.008	Catchment	3383272	1SEVE
Stourport (US R.Stour)	26/07/2019 07:00	Asulam (ug/l)	<0.008	Catchment	3383273	1SEVE

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R.Severn nr Ribbesford Wood	26/07/2019 06:45	Asulam (ug/l)	<0.008	Catchment	3383274	1SEVE
R.Severn nr Dowles	26/07/2019 06:30	Asulam (ug/l)	<0.008	Catchment	3383275	1SEVE
Ogston Reservoir Surface Raw	25/07/2019 10:50	Asulam (ug/l)	<0.008	Catchment	3383321	6OGST0
Hodgelane Brook	25/07/2019 10:20	Asulam (ug/l)	<0.008	Catchment	3383307	6HODG0
Smalley Brook	25/07/2019 09:55	Asulam (ug/l)	<0.008	Catchment	3383308	6SMAL1
Marsh Brook	25/07/2019 09:15	Asulam (ug/l)	<0.008	Catchment	3383309	6AMBE2
between Ashover and Fallgate(Butts)	25/07/2019 08:35	Asulam (ug/l)	<0.008	Catchment	3383310	6AMBE2
River Amber outside Milltown	25/07/2019 08:00	Asulam (ug/l)	<0.008	Catchment	3383311	6AMBE2
Carr Brook footbridge	25/07/2019 07:30	Asulam (ug/l)	<0.008	Catchment	3383320	6CARR0
Unamed tributary Woolley Moor	25/07/2019 07:15	Asulam (ug/l)	<0.008	Catchment	3383312	6AMBE2
Mackworth Brook @ Markeaton Stones	19/07/2019 10:20	Asulam (ug/l)	<0.008	Catchment	3383369	6MACK2
Markeaton Brook @ Kedleston	19/07/2019 09:55	Asulam (ug/l)	<0.008	Catchment	3383367	6MARK0
Kedleston Park Brook	19/07/2019 09:25	Asulam (ug/l)	<0.008	Catchment	3383368	6MARK0
ALLESTREE FORD	19/07/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3383363	6DERWB
BORROWASH	19/07/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3383364	6DERWC
River Derwent (Draycott) Raw	19/07/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3383365	5CWILW
Markeaton Brook @ Mercaston	19/07/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3383366	6MARK0
R.Blythe - Solihull SP164789	15/07/2019 11:00	Asulam (ug/l)	<0.008	Catchment	3362898	8SBLY0
R.Blythe - Temple Balsall SP208763	15/07/2019 10:45	Asulam (ug/l)	<0.008	Catchment	3362899	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	15/07/2019 10:20	Asulam (ug/l)	<0.008	Catchment	3362900	8SBLY0

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R.Blythe - Packington SP218852	15/07/2019 10:00	Asulam (ug/l)	0.024	Catchment	3362901	8SBLY0
Didgeley Brook	15/07/2019 09:45	Asulam (ug/l)	<0.008	Catchment	3362897	8SBOU1
Bourne Brook	15/07/2019 09:20	Asulam (ug/l)	<0.008	Catchment	3362895	8SBOU1
River Bourne	15/07/2019 09:00	Asulam (ug/l)	<0.008	Catchment	3362896	8SBOU1
Whitacre WTW River Blythe Intake	15/07/2019 08:45	Asulam (ug/l)	<0.008	Catchment	3362886	3WHITS
R.Blythe - Blythe Bridge SP211898	15/07/2019 08:20	Asulam (ug/l)	0.017	Catchment	3362902	8SBLY0
Whitacre WTW River Cole Intake	15/07/2019 08:00	Asulam (ug/l)	<0.008	Catchment	3362881	3WHITS
Foremark Reservoir Surface Raw	12/07/2019 11:05	Asulam (ug/l)	<0.008	Catchment	3383357	4MELBN
to conf R Avon - Willes Meadow Foot	12/07/2019 11:00	Asulam (ug/l)	<0.008	Catchment	3362891	3LEAM
Reservoir Surface Raw	12/07/2019 10:45	Asulam (ug/l)	0.012	Catchment	3383358	4MELBN
Radford Brook source to conf R Leam	12/07/2019 10:35	Asulam (ug/l)	<0.008	Catchment	3362888	3RADF
Staunton Harold Brook	12/07/2019 10:30	Asulam (ug/l)	0.016	Catchment	3383361	4STAUB
River Leam @ EATHORPE	12/07/2019 10:20	Asulam (ug/l)	0.021	Catchment	3362882	3LEAM
Heath End Brook	12/07/2019 10:10	Asulam (ug/l)	<0.008	Catchment	3383362	4HEATB
Stowe to conf. R Leam - Marton	12/07/2019 10:00	Asulam (ug/l)	0.023	Catchment	3362893	3ITCH
Brook to conf R Itchen	12/07/2019 09:45	Asulam (ug/l)	0.018	Catchment	3362889	3LEAM
Jubilee Brook	12/07/2019 09:40	Asulam (ug/l)	<0.008	Catchment	3383360	4JUBIB
conf. R Stowe - Thorpe Bridge Ufton	12/07/2019 09:30	Asulam (ug/l)	<0.008	Catchment	3362892	3ITCH
Scotts Brook	12/07/2019 09:20	Asulam (ug/l)	0.009	Catchment	3383359	4SCOTB
R Stowe source to conf R Leam	12/07/2019 09:15	Asulam (ug/l)	0.018	Catchment	3362903	3STOW

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R Leam source to conf Rains Brook	12/07/2019 08:45	Asulam (ug/l)	<0.008	Catchment	3362890	3LEAM
Rains Brook	12/07/2019 08:30	Asulam (ug/l)	0.014	Catchment	3362887	3RAIN
River Avon at Brownsover	12/07/2019 08:00	Asulam (ug/l)	<0.008	Catchment	3362883	3DRATS
R.Avon Station Road	12/07/2019 07:45	Asulam (ug/l)	0.012	Catchment	3362885	3AVOU
Stanford Res Surface	12/07/2019 07:30	Asulam (ug/l)	<0.008	Catchment	3362884	3DRATS
R.Avon - Welford Bridge	12/07/2019 07:00	Asulam (ug/l)	0.017	Catchment	3362894	3AVOU
R.Severn nr Arley	11/07/2019 12:00	Asulam (ug/l)	<0.008	Catchment	3383276	1SEVE
R.Severn nr Hampton	11/07/2019 11:30	Asulam (ug/l)	<0.008	Catchment	3383277	1SEVE
R.Severn nr Bridgnorth	11/07/2019 10:45	Asulam (ug/l)	<0.008	Catchment	3383278	1SEVE
R.Severn nr Broseley	11/07/2019 10:20	Asulam (ug/l)	<0.008	Catchment	3383279	1SEVE
R.Severn nr Cressage	11/07/2019 10:00	Asulam (ug/l)	0.008	Catchment	3383280	1SEVE
R.Severn nr Atcham	11/07/2019 09:30	Asulam (ug/l)	<0.008	Catchment	3383281	1SEVE
R.Severn nr Upton Magna	11/07/2019 09:00	Asulam (ug/l)	<0.008	Catchment	3383282	1SEVE
R.Severn nr Shrewsbury	11/07/2019 08:30	Asulam (ug/l)	<0.008	Catchment	3383283	1SEVE
Brailsford Brook at Longford	01/07/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3383342	6BRAI1
Cropston Reservoir feed, Deer Barn	28/06/2019 12:50	Asulam (ug/l)	<0.008	Catchment	3360827	4QUORB
Newtown Linford T - junction	28/06/2019 12:25	Asulam (ug/l)	<0.008	Catchment	3360831	4QUORB
Cropston Tributary 2 - Polly Botts Lane	28/06/2019 12:05	Asulam (ug/l)	<0.008	Catchment	3360832	4QUORB
Cropston Tributary - Nowell Spring Wood	28/06/2019 11:55	Asulam (ug/l)	<0.008	Catchment	3360825	4QUORB
Swithland, Brands Hill House security	28/06/2019 11:35	Asulam (ug/l)	<0.008	Catchment	3360833	4QUORB

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Swithland Village opp St Leonards Church	28/06/2019 11:10	Asulam (ug/l)	<0.008	Catchment	3360829	4QUORB
Bradgate Road, Cropston under	28/06/2019 10:50	Asulam (ug/l)	<0.008	Catchment	3360830	4QUORB
Swithland Reservoir Surface Raw	28/06/2019 10:38	Asulam (ug/l)	<0.008	Catchment	3360836	4CROP
River Wye @ Kerne Bridge	28/06/2019 10:20	Asulam (ug/l)	<0.008	Catchment	3362850	2WYE
River Wye @ Wilton Bridge	28/06/2019 09:45	Asulam (ug/l)	<0.008	Catchment	3362851	2WYE
Cropston Reservoir Surface Raw	28/06/2019 09:40	Asulam (ug/l)	<0.008	Catchment	3360835	4CROP
River Wye @ Foy Foot Bridge	28/06/2019 09:30	Asulam (ug/l)	<0.008	Catchment	3362852	2WYE
Cropston Res car park	28/06/2019 09:25	Asulam (ug/l)	<0.008	Catchment	3360834	4QUORB
River Wye @ King caple foot Bridge	28/06/2019 09:00	Asulam (ug/l)	<0.008	Catchment	3362853	2WYE
Rothley Brook - Anstey Lane	28/06/2019 08:50	Asulam (ug/l)	<0.008	Catchment	3360826	4ROTBR
River Wye @ Bridge Road Bridge	28/06/2019 08:30	Asulam (ug/l)	<0.008	Catchment	3362854	2WYE
River Wye @ Hampton Bishop	28/06/2019 08:15	Asulam (ug/l)	<0.008	Catchment	3362856	2WYE
River Lugg @ Mordiford Bridge	28/06/2019 08:00	Asulam (ug/l)	<0.008	Catchment	3362855	2LUGG
River Frome at Larport Lane Bridge	28/06/2019 07:45	Asulam (ug/l)	<0.008	Catchment	3362857	2FROMA
River Lugg @ Marden	28/06/2019 07:15	Asulam (ug/l)	<0.008	Catchment	3362849	2LUGG
River Arrow at Bridge on B4361	28/06/2019 06:50	Asulam (ug/l)	<0.008	Catchment	3362848	2LUGG
Hilton Brook downstream	27/06/2019 15:05	Asulam (ug/l)	<0.008	Catchment	3362935	6HILT1
River Dove at Egginton Raw	27/06/2019 14:30	Asulam (ug/l)	<0.008	Catchment	3362948	4MELBN
Rolleston Brook downstream	27/06/2019 13:50	Asulam (ug/l)	<0.008	Catchment	3363001	7ROLL1
Foston Brook and Rolleston Brook	27/06/2019 13:40	Asulam (ug/l)	<0.008	Catchment	3362961	6DOVE2

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confluence Rolleston Brook	27/06/2019 13:10	Asulam (ug/l)	<0.008	Catchment	3363013	7ROLL1
Rolleston Brook upstream	27/06/2019 12:50	Asulam (ug/l)	0.012	Catchment	3362974	7ROLL1
Mill Fleam upstream	27/06/2019 12:25	Asulam (ug/l)	<0.008	Catchment	3362987	7ROLL1
downstream before confluence River	27/06/2019 12:15	Asulam (ug/l)	<0.008	Catchment	3362917	6FOST1
Foston Brook 8 - Foston Upstream	27/06/2019 12:00	Asulam (ug/l)	<0.008	Catchment	3362916	6FOST1
Dale Brook tributory to Foston Brook	27/06/2019 11:48	Asulam (ug/l)	<0.008	Catchment	3362915	6FOST1
River Dove Upstream	27/06/2019 11:35	Asulam (ug/l)	<0.008	Catchment	3362914	6DOVE2
Cubley Brook at Boylestone	27/06/2019 11:12	Asulam (ug/l)	<0.008	Catchment	3362913	6FOST1
Cubley Brook @ Little Cubley	27/06/2019 10:55	Asulam (ug/l)	<0.008	Catchment	3362912	6FOST1
Shirley Brook at Longford	27/06/2019 10:30	Asulam (ug/l)	<0.008	Catchment	3362918	6SHIR3
Brailsford Brook at Longford	27/06/2019 10:15	Asulam (ug/l)	<0.008	Catchment	3362919	6BRAI1
Sutton Brook at Sutton on the Hill	27/06/2019 09:45	Asulam (ug/l)	<0.008	Catchment	3362922	6HILT1
River Derwent (Draycott) Raw	21/06/2019 11:15	Asulam (ug/l)	0.011	Catchment	3363048	5CWILW
BORROWASH	21/06/2019 10:40	Asulam (ug/l)	0.008	Catchment	3363049	6DERWC
Reservoir Surface Raw	21/06/2019 10:25	Asulam (ug/l)	<0.008	Catchment	3363032	4MELBN
ALLESTREE FORD	21/06/2019 10:20	Asulam (ug/l)	<0.008	Catchment	3363050	6DERWB
Foremark Reservoir Surface Raw	21/06/2019 10:00	Asulam (ug/l)	<0.008	Catchment	3363033	4MELBN
Mackworth Brook @ Markeaton Stones	21/06/2019 10:00	Asulam (ug/l)	<0.008	Catchment	3363058	6MACK2
Heath End Brook	21/06/2019 09:30	Asulam (ug/l)	<0.008	Catchment	3363027	4HEATB
Kedleston Park Brook	21/06/2019 09:30	Asulam (ug/l)	<0.008	Catchment	3363059	6MARK0

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Staunton Harold Brook	21/06/2019 09:20	Asulam (ug/l)	<0.008	Catchment	3363029	4STAUB
Markeaton Brook @ Kedleston	21/06/2019 09:10	Asulam (ug/l)	<0.008	Catchment	3363060	6MARK0
Jubilee Brook	21/06/2019 08:55	Asulam (ug/l)	<0.008	Catchment	3363030	4JUBIB
Markeaton Brook @ Mercaston	21/06/2019 08:50	Asulam (ug/l)	<0.008	Catchment	3363061	6MARK0
Scotts Brook	21/06/2019 08:20	Asulam (ug/l)	<0.008	Catchment	3363031	4SCOTB
Hodgelane Brook	20/06/2019 12:15	Asulam (ug/l)	<0.008	Catchment	3362911	6HODG0
Carr Brook footbridge	20/06/2019 12:05	Asulam (ug/l)	<0.008	Catchment	3362905	6CARR0
Smalley Brook	20/06/2019 12:05	Asulam (ug/l)	<0.008	Catchment	3362910	6SMAL1
R.Severn nr Buryend Farm	20/06/2019 11:45	Asulam (ug/l)	<0.008	Catchment	3362871	1SEVE
Marsh Brook	20/06/2019 11:05	Asulam (ug/l)	<0.008	Catchment	3362909	6AMBE2
R.Severn nr Bredon School	20/06/2019 11:00	Asulam (ug/l)	<0.008	Catchment	3362872	1SEVE
between Ashover and Fallgate(Butts)	20/06/2019 10:58	Asulam (ug/l)	0.009	Catchment	3362908	6AMBE2
R.Severn nr Upton Marina	20/06/2019 10:30	Asulam (ug/l)	<0.008	Catchment	3362870	1SEVE
River Amber outside Milltown	20/06/2019 10:30	Asulam (ug/l)	<0.008	Catchment	3362907	6AMBE2
R.Severn nr Kempsey	20/06/2019 10:15	Asulam (ug/l)	<0.008	Catchment	3362869	1SEVE
Unamed tributary Woolley Moor	20/06/2019 09:50	Asulam (ug/l)	0.009	Catchment	3362906	6AMBE2
R.Severn nr Clerkenleap Farm	20/06/2019 09:40	Asulam (ug/l)	<0.008	Catchment	3362868	1SEVE
Ogston Reservoir Surface Raw	20/06/2019 09:30	Asulam (ug/l)	<0.008	Catchment	3362904	6OGST0
R.Severn nr Diglis	20/06/2019 09:20	Asulam (ug/l)	<0.008	Catchment	3362867	1SEVE
R.Severn nr Bevere Island	20/06/2019 08:50	Asulam (ug/l)	<0.008	Catchment	3362866	1SEVE

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R.Severn nr Grimley	20/06/2019 08:35	Asulam (ug/l)	<0.008	Catchment	3362865	1SEVE
R.Severn nr Holt Fleet	20/06/2019 08:20	Asulam (ug/l)	<0.008	Catchment	3362864	1SEVE
R.Severn nr Lineholt	20/06/2019 08:00	Asulam (ug/l)	<0.008	Catchment	3362863	1SEVE
R.Severn nr Lincomb Hall	20/06/2019 07:50	Asulam (ug/l)	<0.008	Catchment	3362862	1SEVE
Stourport (DS R.Stour)	20/06/2019 07:30	Asulam (ug/l)	0.009	Catchment	3362861	1SEVE
Stourport (US R.Stour)	20/06/2019 07:15	Asulam (ug/l)	<0.008	Catchment	3362860	1SEVE
R.Severn nr Ribbesford Wood	20/06/2019 07:00	Asulam (ug/l)	<0.008	Catchment	3362859	1SEVE
R.Severn nr Dowles	20/06/2019 06:45	Asulam (ug/l)	<0.008	Catchment	3362858	1SEVE
R.Severn nr Arley	14/06/2019 11:30	Asulam (ug/l)	<0.008	Catchment	3363047	1SEVE
R.Severn nr Hampton	14/06/2019 11:00	Asulam (ug/l)	<0.008	Catchment	3363046	1SEVE
R.Severn nr Bridgnorth	14/06/2019 10:30	Asulam (ug/l)	<0.008	Catchment	3363045	1SEVE
R.Severn nr Broseley	14/06/2019 10:00	Asulam (ug/l)	<0.008	Catchment	3363044	1SEVE
R.Severn nr Cressage	14/06/2019 09:30	Asulam (ug/l)	<0.008	Catchment	3363043	1SEVE
R.Severn nr Atcham	14/06/2019 09:10	Asulam (ug/l)	<0.008	Catchment	3363042	1SEVE
R.Severn nr Upton Magna	14/06/2019 08:45	Asulam (ug/l)	<0.008	Catchment	3363041	1SEVE
R.Severn nr Shrewsbury	14/06/2019 08:15	Asulam (ug/l)	<0.008	Catchment	3363034	1SEVE
R.Avon Station Road	12/06/2019 12:00	Asulam (ug/l)	0.01	Catchment	3312742	3AVOU
R.Avon - Welford Bridge	12/06/2019 11:30	Asulam (ug/l)	0.018	Catchment	3312731	3AVOU
Rains Brook	12/06/2019 10:00	Asulam (ug/l)	<0.008	Catchment	3312739	3RAIN
R Leam source to conf Rains Brook	12/06/2019 09:30	Asulam (ug/l)	0.008	Catchment	3312736	3LEAM

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R Stowe source to conf R Leam	12/06/2019 08:40	Asulam (ug/l)	0.015	Catchment	3312717	3STOW
conf. R Stowe - Thorpe Bridge Ufton	12/06/2019 08:30	Asulam (ug/l)	<0.008	Catchment	3312733	3ITCH
Brook to conf R Itchen	12/06/2019 08:00	Asulam (ug/l)	0.009	Catchment	3312737	3LEAM
Stowe to conf. R Leam - Marton	12/06/2019 07:50	Asulam (ug/l)	0.017	Catchment	3312732	3ITCH
River Leam @ EATHORPE	12/06/2019 07:30	Asulam (ug/l)	0.015	Catchment	3312746	3LEAM
Radford Brook source to conf R Leam	12/06/2019 07:15	Asulam (ug/l)	<0.008	Catchment	3312738	3RADF
to conf R Avon - Willes Meadow Foot	12/06/2019 07:00	Asulam (ug/l)	0.011	Catchment	3312735	3LEAM
Cropston Tributary 2 - Polly Botts Lane	12/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312707	4QUORB
Newtown Linford T - junction	12/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312706	4QUORB
Bradgate Road, Cropston under	12/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312705	4QUORB
Swithland Village opp St Leonards Church	12/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312704	4QUORB
Swithland feed adj railway	12/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312702	4QUORB
Cropston Reservoir feed, Deer Barn	12/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312701	4QUORB
Cropston Res car park	12/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312709	4QUORB
Rothley Brook - Anstey Lane	12/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312700	4ROTBR
Swithland Reservoir Surface Raw	12/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312711	4CROP
River Wye @ Kerne Bridge	10/06/2019 11:15	Asulam (ug/l)	<0.008	Catchment	3312196	2WYE
River Wye @ Wilton Bridge	10/06/2019 10:40	Asulam (ug/l)	<0.008	Catchment	3312195	2WYE
River Wye @ Foy Foot Bridge	10/06/2019 10:15	Asulam (ug/l)	<0.008	Catchment	3312194	2WYE
River Wye @ King caple foot Bridge	10/06/2019 09:50	Asulam (ug/l)	<0.008	Catchment	3312193	2WYE

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River Wye @ Bridge Road Bridge	10/06/2019 09:25	Asulam (ug/l)	<0.008	Catchment	3312192	2WYE
River Lugg @ Mordiford Bridge	10/06/2019 09:10	Asulam (ug/l)	<0.008	Catchment	3312191	2LUGG
River Wye @ Hampton Bishop	10/06/2019 08:50	Asulam (ug/l)	<0.008	Catchment	3312190	2WYE
River Lugg @ Marden	10/06/2019 08:15	Asulam (ug/l)	<0.008	Catchment	3312197	2LUGG
River Arrow at Bridge on B4361	10/06/2019 07:50	Asulam (ug/l)	<0.008	Catchment	3312198	2LUGG
R.Blythe - Solihull SP164789	07/06/2019 10:50	Asulam (ug/l)	<0.008	Catchment	3312726	8SBLY0
R.Blythe - Temple Balsall SP208763	07/06/2019 10:00	Asulam (ug/l)	<0.008	Catchment	3312725	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	07/06/2019 09:45	Asulam (ug/l)	<0.008	Catchment	3312723	8SBLY0
R.Blythe - Blythe Bridge SP211898	07/06/2019 09:20	Asulam (ug/l)	<0.008	Catchment	3312719	8SBLY0
R.Blythe - Packington SP218852	07/06/2019 09:15	Asulam (ug/l)	<0.008	Catchment	3312720	8SBLY0
Didgeley Brook	07/06/2019 08:45	Asulam (ug/l)	<0.008	Catchment	3312727	8SBOU1
Bourne Brook	07/06/2019 08:20	Asulam (ug/l)	<0.008	Catchment	3312729	8SBOU1
River Bourne	07/06/2019 08:05	Asulam (ug/l)	<0.008	Catchment	3312728	8SBOU1
Brailsford Brook at Longford	07/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3311922	6BRAI1
Cubley Brook @ Little Cubley	07/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3311915	6FOST1
Cubley Brook at Boylestone	07/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3311916	6FOST1
Dale Brook tributory to Foston Brook	07/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3311918	6FOST1
Foston Brook 8 - Foston Upstream	07/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3311919	6FOST1
downstream before confluence River	07/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3311920	6FOST1
confluence Rolleston Brook	07/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3311930	7ROLL1

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Mill Fleam upstream	07/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3311928	7ROLL1
River Dove Upstream	07/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3311917	6DOVE2
Foston Brook and Rolleston Brook	07/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3311926	6DOVE2
Rolleston Brook downstream	07/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3311929	7ROLL1
Rolleston Brook upstream	07/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3311927	7ROLL1
Shirley Brook at Longford	07/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3311921	6SHIR3
Sutton Brook at Sutton on the Hill	07/06/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3311923	6HILT1
River Derwent (Draycott) Raw	31/05/2019 11:00	Asulam (ug/l)	<0.008	Catchment	3312680	5CWILW
BORROWASH	31/05/2019 10:30	Asulam (ug/l)	<0.008	Catchment	3312681	6DERWC
ALLESTREE FORD	31/05/2019 10:00	Asulam (ug/l)	<0.008	Catchment	3312682	6DERWB
Mackworth Brook @ Markeaton Stones	31/05/2019 09:30	Asulam (ug/l)	<0.008	Catchment	3312676	6MACK2
Markeaton Brook @ Kedleston	31/05/2019 08:40	Asulam (ug/l)	<0.008	Catchment	3312678	6MARK0
Kedleston Park Brook	31/05/2019 08:30	Asulam (ug/l)	<0.008	Catchment	3312677	6MARK0
Markeaton Brook @ Mercaston	31/05/2019 08:00	Asulam (ug/l)	<0.008	Catchment	3312679	6MARK0
Staunton Harold Brook	24/05/2019 15:20	Asulam (ug/l)	0.01	Catchment	3312810	4STAUB
Foremark Reservoir Surface Raw	24/05/2019 15:20	Asulam (ug/l)	<0.008	Catchment	3312814	4MELBN
Heath End Brook	24/05/2019 15:20	Asulam (ug/l)	<0.008	Catchment	3312809	4HEATB
Jubilee Brook	24/05/2019 15:20	Asulam (ug/l)	<0.008	Catchment	3312811	4JUBIB
Scotts Brook	24/05/2019 15:20	Asulam (ug/l)	<0.008	Catchment	3312812	4SCOTB
Reservoir Surface Raw	24/05/2019 15:20	Asulam (ug/l)	<0.008	Catchment	3312813	4MELBN

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R.Severn nr Diglis	24/05/2019 00:00	Asulam (ug/l)	0.009	Catchment	3312655	1SEVE
Stourport (DS R.Stour)	24/05/2019 00:00	Asulam (ug/l)	0.026	Catchment	3312661	1SEVE
Stourport (US R.Stour)	24/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312662	1SEVE
R.Severn nr Bevere Island	24/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312656	1SEVE
R.Severn nr Bredon School	24/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312649	1SEVE
R.Severn nr Buryend Farm	24/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312651	1SEVE
R.Severn nr Clerkenleap Farm	24/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312654	1SEVE
R.Severn nr Dowles	24/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312665	1SEVE
R.Severn nr Grimley	24/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312657	1SEVE
R.Severn nr Holt Fleet	24/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312658	1SEVE
R.Severn nr Kempsey	24/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312653	1SEVE
R.Severn nr Lincomb Hall	24/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312660	1SEVE
R.Severn nr Lineholt	24/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312659	1SEVE
R.Severn nr Ribbesford Wood	24/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312663	1SEVE
R.Severn nr Upton Marina	24/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312652	1SEVE
Carr Brook footbridge	17/05/2019 16:35	Asulam (ug/l)	<0.008	Catchment	3312637	6CARR0
Hodgelane Brook	17/05/2019 16:35	Asulam (ug/l)	<0.008	Catchment	3312643	6HODG0
Marsh Brook	17/05/2019 16:35	Asulam (ug/l)	<0.008	Catchment	3312641	6AMBE2
Ogston Reservoir Surface Raw	17/05/2019 16:35	Asulam (ug/l)	<0.008	Catchment	3312636	6OGST0
between Ashover and Fallgate(Butts)	17/05/2019 16:35	Asulam (ug/l)	<0.008	Catchment	3312640	6AMBE2

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River Amber outside Milltown	17/05/2019 16:35	Asulam (ug/l)	<0.008	Catchment	3312639	6AMBE2
Smalley Brook	17/05/2019 16:35	Asulam (ug/l)	<0.008	Catchment	3312642	6SMAL1
Unamed tributary Woolley Moor	17/05/2019 16:35	Asulam (ug/l)	<0.008	Catchment	3312638	6AMBE2
R.Severn nr Cressage	17/05/2019 00:00	Asulam (ug/l)	0.019	Catchment	3312670	1SEVE
R.Severn nr Arley	17/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312666	1SEVE
R.Severn nr Atcham	17/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312671	1SEVE
R.Severn nr Bridgnorth	17/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312668	1SEVE
R.Severn nr Broseley	17/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312669	1SEVE
R.Severn nr Hampton	17/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312667	1SEVE
R.Severn nr Shrewsbury	17/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312674	1SEVE
R.Severn nr Upton Magna	17/05/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3312673	1SEVE
River Derwent (Draycott) Raw	09/04/2019 19:40	Asulam (ug/l)	<0.008	Catchment	3260526	5CWILW
BORROWASH	09/04/2019 19:30	Asulam (ug/l)	<0.008	Catchment	3260525	6DERWC
R.Derwent - Pipe Bridge	09/04/2019 19:15	Asulam (ug/l)	<0.008	Catchment	3260524	6DERW7
R.Derwent - Holms Bridge	09/04/2019 19:00	Asulam (ug/l)	<0.008	Catchment	3260527	6DERW7
Markeaton Brook @ Ford Street Weir	09/04/2019 18:50	Asulam (ug/l)	<0.008	Catchment	3260528	6MARK0
ALLESTREE FORD	09/04/2019 18:40	Asulam (ug/l)	<0.008	Catchment	3260523	6DERWB
Mackworth Brook @ Markeaton Stones	09/04/2019 18:30	Asulam (ug/l)	<0.008	Catchment	3260535	6MACK2
Markeaton Brook @ Mundy Park	09/04/2019 18:20	Asulam (ug/l)	<0.008	Catchment	3260529	6MARK0
Mackworth Brook @ Baldwin Wood	09/04/2019 18:00	Asulam (ug/l)	<0.008	Catchment	3260531	6MACK2

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Mackworth Brook @ South Lodge	09/04/2019 17:50	Asulam (ug/l)	<0.008	Catchment	3260530	6MACK2
Markeaton Brook @ Kedleston	09/04/2019 17:40	Asulam (ug/l)	<0.008	Catchment	3260533	6MARK0
Kedleston Park Brook	09/04/2019 17:35	Asulam (ug/l)	<0.008	Catchment	3260534	6MARK0
Markeaton Brook @ Mercaston	09/04/2019 17:28	Asulam (ug/l)	<0.008	Catchment	3260532	6MARK0
Swithland, Brands Hill House security	27/03/2019 13:45	Asulam (ug/l)	<0.008	Catchment	3260476	4QUORB
Swithland Village opp St Leonards Church	27/03/2019 13:30	Asulam (ug/l)	<0.008	Catchment	3260480	4QUORB
Swithland feed adj railway	27/03/2019 13:20	Asulam (ug/l)	<0.008	Catchment	3260481	4QUORB
Bradgate Road, Cropston under	27/03/2019 13:05	Asulam (ug/l)	<0.008	Catchment	3260479	4QUORB
Cropston Tributary 2 - Polly Botts Lane	27/03/2019 12:50	Asulam (ug/l)	<0.008	Catchment	3260477	4QUORB
Newtown Linford T - junction	27/03/2019 12:45	Asulam (ug/l)	<0.008	Catchment	3260478	4QUORB
Cropston Reservoir feed, Deer Barn	27/03/2019 12:35	Asulam (ug/l)	<0.008	Catchment	3260482	4QUORB
Rothley Brook - Anstey Lane	27/03/2019 12:20	Asulam (ug/l)	<0.008	Catchment	3260485	4ROTBR
Rothley Brook - Leicester Road	27/03/2019 12:10	Asulam (ug/l)	<0.008	Catchment	3260488	4ROTBR
Rothley Brook - Kirby Road	27/03/2019 11:55	Asulam (ug/l)	<0.008	Catchment	3260486	4ROTBR
Rothley Brook - Lindridge Lane	27/03/2019 11:40	Asulam (ug/l)	<0.008	Catchment	3260484	4ROTBR
Rothley Brook - Markfield Lane	27/03/2019 11:30	Asulam (ug/l)	<0.008	Catchment	3260483	4ROTBR
Staunton Harold Brook	27/03/2019 10:23	Asulam (ug/l)	<0.008	Catchment	3260491	4STAUB
Heath End Brook	27/03/2019 10:20	Asulam (ug/l)	<0.008	Catchment	3260492	4HEATB
Jubilee Brook	27/03/2019 10:10	Asulam (ug/l)	<0.008	Catchment	3260490	4JUBIB
Scotts Brook	27/03/2019 09:45	Asulam (ug/l)	<0.008	Catchment	3260489	4SCOTB

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River Wye @ Hampton Bishop	20/03/2019 11:30	Asulam (ug/l)	<0.008	Catchment	3260580	2WYE
River Lugg @ Mordiford Bridge	20/03/2019 11:20	Asulam (ug/l)	<0.008	Catchment	3260579	2LUGG
River Wye @ Bridge Road Bridge	20/03/2019 11:10	Asulam (ug/l)	<0.008	Catchment	3260578	2WYE
River Wye @ King caple foot Bridge	20/03/2019 10:45	Asulam (ug/l)	<0.008	Catchment	3260577	2WYE
River Wye @ Foy Foot Bridge	20/03/2019 10:25	Asulam (ug/l)	<0.008	Catchment	3260576	2WYE
River Wye @ Wilton Bridge	20/03/2019 10:10	Asulam (ug/l)	<0.008	Catchment	3260575	2WYE
River Wye @ Kerne Bridge	20/03/2019 09:50	Asulam (ug/l)	<0.008	Catchment	3260574	2WYE
R.Severn nr Bredon School	19/03/2019 18:15	Asulam (ug/l)	<0.008	Catchment	3260558	1SEVE
R.Severn nr Buryend Farm	19/03/2019 18:00	Asulam (ug/l)	<0.008	Catchment	3260557	1SEVE
R.Severn nr Upton Marina	19/03/2019 17:45	Asulam (ug/l)	<0.008	Catchment	3260556	1SEVE
R.Severn nr Kempsey	19/03/2019 17:30	Asulam (ug/l)	<0.008	Catchment	3260555	1SEVE
R.Severn nr Clerkenleap Farm	19/03/2019 17:15	Asulam (ug/l)	<0.008	Catchment	3260554	1SEVE
R.Severn nr Diglis	19/03/2019 17:00	Asulam (ug/l)	<0.008	Catchment	3260553	1SEVE
R.Severn nr Bevere Island	19/03/2019 16:30	Asulam (ug/l)	<0.008	Catchment	3260552	1SEVE
R.Severn nr Grimley	19/03/2019 16:20	Asulam (ug/l)	<0.008	Catchment	3260551	1SEVE
R.Severn nr Holt Fleet	19/03/2019 16:05	Asulam (ug/l)	<0.008	Catchment	3260550	1SEVE
R.Severn nr Lineholt	19/03/2019 15:55	Asulam (ug/l)	<0.008	Catchment	3260549	1SEVE
R.Severn nr Lincomb Hall	19/03/2019 15:30	Asulam (ug/l)	<0.008	Catchment	3260548	1SEVE
Stourport (DS R.Stour)	19/03/2019 15:15	Asulam (ug/l)	<0.008	Catchment	3260547	1SEVE
Stourport (US R.Stour)	19/03/2019 14:55	Asulam (ug/l)	<0.008	Catchment	3260546	1SEVE

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R.Severn nr Ribbesford Wood	19/03/2019 14:45	Asulam (ug/l)	<0.008	Catchment	3260545	1SEVE
R.Severn nr Dowles	19/03/2019 14:30	Asulam (ug/l)	<0.008	Catchment	3260544	1SEVE
R.Severn nr Arley	19/03/2019 14:15	Asulam (ug/l)	<0.008	Catchment	3260543	1SEVE
R.Severn nr Hampton	19/03/2019 13:55	Asulam (ug/l)	<0.008	Catchment	3260542	1SEVE
R.Severn nr Bridgnorth	19/03/2019 13:30	Asulam (ug/l)	<0.008	Catchment	3260541	1SEVE
R.Severn nr Broseley	19/03/2019 13:05	Asulam (ug/l)	<0.008	Catchment	3260540	1SEVE
R.Severn nr Cressage	19/03/2019 12:40	Asulam (ug/l)	<0.008	Catchment	3260539	1SEVE
R.Severn nr Atcham	19/03/2019 12:15	Asulam (ug/l)	<0.008	Catchment	3260538	1SEVE
R.Severn nr Upton Magna	19/03/2019 12:05	Asulam (ug/l)	<0.008	Catchment	3260537	1SEVE
R.Severn nr Shrewsbury	19/03/2019 11:30	Asulam (ug/l)	<0.008	Catchment	3260536	1SEVE
R.Severn nr Bicton	19/03/2019 11:20	Asulam (ug/l)	<0.008	Catchment	3260565	1SEVE
R.Severn nr Ford	19/03/2019 11:00	Asulam (ug/l)	<0.008	Catchment	3260564	1SEVE
R.Severn nr Wilcott	19/03/2019 10:40	Asulam (ug/l)	<0.008	Catchment	3260563	1SEVE
R.Severn nr Melverley	19/03/2019 10:15	Asulam (ug/l)	<0.008	Catchment	3260562	1SEVE
R.Severn nr Llandrinio	19/03/2019 10:00	Asulam (ug/l)	<0.008	Catchment	3260561	1SEVE
R.Severn nr Forden	19/03/2019 09:25	Asulam (ug/l)	<0.008	Catchment	3260560	1SEVE
R.Severn nr Caersws	19/03/2019 08:45	Asulam (ug/l)	<0.008	Catchment	3260559	1SEVE
to conf R Avon - Willes Meadow Foot	12/03/2019 15:25	Asulam (ug/l)	<0.008	Catchment	3260497	3LEAM
Radford Brook source to conf R Leam	12/03/2019 15:15	Asulam (ug/l)	<0.008	Catchment	3260494	3RADF
R Stowe source to conf R Leam	12/03/2019 14:55	Asulam (ug/l)	<0.008	Catchment	3260512	3STOW

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Stowe to conf. R Leam - Marton	12/03/2019 14:40	Asulam (ug/l)	<0.008	Catchment	3260499	3ITCH
R.Blythe - Blythe Bridge SP211898	12/03/2019 14:40	Asulam (ug/l)	<0.008	Catchment	3260511	8SBLY0
conf. R Stowe - Thorpe Bridge Ufton	12/03/2019 14:25	Asulam (ug/l)	<0.008	Catchment	3260498	3ITCH
Brook to conf R Itchen	12/03/2019 14:25	Asulam (ug/l)	<0.008	Catchment	3260495	3LEAM
Rains Brook	12/03/2019 14:10	Asulam (ug/l)	<0.008	Catchment	3260493	3RAIN
R Leam source to conf Rains Brook	12/03/2019 14:05	Asulam (ug/l)	<0.008	Catchment	3260496	3LEAM
R.Avon conf. North Kilworth	12/03/2019 13:25	Asulam (ug/l)	0.014	Catchment	3260501	3AVOU
R.Avon - North Kilworth	12/03/2019 13:15	Asulam (ug/l)	<0.008	Catchment	3260500	3AVOU
R.Avon - Welford Bridge	12/03/2019 13:10	Asulam (ug/l)	<0.008	Catchment	3260502	3AVOU
R. Avon - South Kilworth	12/03/2019 13:00	Asulam (ug/l)	<0.008	Catchment	3260503	3AVOU
Didgeley Brook	12/03/2019 12:10	Asulam (ug/l)	<0.008	Catchment	3260506	8SBOU1
Bourne Brook	12/03/2019 12:00	Asulam (ug/l)	<0.008	Catchment	3260504	8SBOU1
River Bourne	12/03/2019 11:50	Asulam (ug/l)	<0.008	Catchment	3260505	8SBOU1
R.Blythe - Packington SP218852	12/03/2019 11:25	Asulam (ug/l)	<0.008	Catchment	3260510	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	12/03/2019 11:10	Asulam (ug/l)	<0.008	Catchment	3260509	8SBLY0
R.Blythe - Temple Balsall SP208763	12/03/2019 11:00	Asulam (ug/l)	<0.008	Catchment	3260508	8SBLY0
R.Blythe - Solihull SP164789	12/03/2019 10:40	Asulam (ug/l)	<0.008	Catchment	3260507	8SBLY0
River Derwent (Draycott) Raw	07/03/2019 18:15	Asulam (ug/l)	<0.008	Catchment	3235493	5CWILW
BORROWASH	07/03/2019 18:00	Asulam (ug/l)	<0.008	Catchment	3235495	6DERWC
R.Derwent - Pipe Bridge	07/03/2019 17:15	Asulam (ug/l)	<0.008	Catchment	3235497	6DERW7

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R.Derwent - Holms Bridge	07/03/2019 16:20	Asulam (ug/l)	<0.008	Catchment	3235491	6DERW7
Markeaton Brook @ Ford Street Weir	07/03/2019 16:10	Asulam (ug/l)	<0.008	Catchment	3235489	6MARK0
ALLESTREE FORD	07/03/2019 15:55	Asulam (ug/l)	<0.008	Catchment	3235499	6DERWB
Mackworth Brook @ Markeaton Stones	07/03/2019 15:35	Asulam (ug/l)	<0.008	Catchment	3235475	6MACK2
Markeaton Brook @ Mundy Park	07/03/2019 15:25	Asulam (ug/l)	<0.008	Catchment	3235487	6MARK0
Mackworth Brook @ Baldwin Wood	07/03/2019 15:10	Asulam (ug/l)	<0.008	Catchment	3235483	6MACK2
Mackworth Brook @ South Lodge	07/03/2019 15:00	Asulam (ug/l)	<0.008	Catchment	3235485	6MACK2
Markeaton Brook @ Kedleston	07/03/2019 14:50	Asulam (ug/l)	<0.008	Catchment	3235479	6MARK0
Kedleston Park Brook	07/03/2019 14:40	Asulam (ug/l)	<0.008	Catchment	3235477	6MARK0
Markeaton Brook @ Mercaston	07/03/2019 14:30	Asulam (ug/l)	<0.008	Catchment	3235481	6MARK0
Swithland, Brands Hill House security	21/02/2019 16:15	Asulam (ug/l)	<0.008	Catchment	3234935	4QUORB
Swithland Village opp St Leonards Church	21/02/2019 16:00	Asulam (ug/l)	<0.008	Catchment	3234927	4QUORB
Swithland feed adj railway	21/02/2019 15:55	Asulam (ug/l)	<0.008	Catchment	3234925	4QUORB
Bradgate Road, Cropston under	21/02/2019 15:45	Asulam (ug/l)	<0.008	Catchment	3234929	4QUORB
Cropston Tributary 2 - Polly Botts Lane	21/02/2019 15:35	Asulam (ug/l)	<0.008	Catchment	3234933	4QUORB
Newtown Linford T - junction	21/02/2019 15:30	Asulam (ug/l)	<0.008	Catchment	3234931	4QUORB
Cropston Reservoir feed, Deer Barn	21/02/2019 15:20	Asulam (ug/l)	<0.008	Catchment	3234923	4QUORB
Rothley Brook - Anstey Lane	21/02/2019 15:05	Asulam (ug/l)	<0.008	Catchment	3234918	4ROTBR
Rothley Brook - Leicester Road	21/02/2019 14:55	Asulam (ug/l)	<0.008	Catchment	3234916	4ROTBR
Rothley Brook - Kirby Road	21/02/2019 14:40	Asulam (ug/l)	<0.008	Catchment	3234917	4ROTBR

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Rothley Brook - Lindridge Lane	21/02/2019 14:25	Asulam (ug/l)	0.011	Catchment	3234919	4ROTBR
Rothley Brook - Markfield Lane	21/02/2019 14:10	Asulam (ug/l)	<0.008	Catchment	3234921	4ROTBR
Staunton Harold Brook	21/02/2019 13:15	Asulam (ug/l)	<0.008	Catchment	3234913	4STAUB
Heath End Brook	21/02/2019 13:05	Asulam (ug/l)	<0.008	Catchment	3234912	4HEATB
Jubilee Brook	21/02/2019 12:55	Asulam (ug/l)	<0.008	Catchment	3234914	4JUBIB
Scotts Brook	21/02/2019 12:30	Asulam (ug/l)	<0.008	Catchment	3234915	4SCOTB
to conf R Avon - Willes Meadow Foot	15/02/2019 14:40	Asulam (ug/l)	<0.008	Catchment	3235126	3LEAM
Radford Brook source to conf R Leam	15/02/2019 14:30	Asulam (ug/l)	<0.008	Catchment	3235143	3RADF
conf. R Stowe - Thorpe Bridge Ufton	15/02/2019 14:10	Asulam (ug/l)	<0.008	Catchment	3235121	3ITCH
R Stowe source to conf R Leam	15/02/2019 14:00	Asulam (ug/l)	<0.008	Catchment	3235094	3STOW
Stowe to conf. R Leam - Marton	15/02/2019 13:30	Asulam (ug/l)	<0.008	Catchment	3235119	3ITCH
Brook to conf R Itchen	15/02/2019 13:10	Asulam (ug/l)	<0.008	Catchment	3235137	3LEAM
Rains Brook	15/02/2019 12:40	Asulam (ug/l)	<0.008	Catchment	3235148	3RAIN
R Leam source to conf Rains Brook	15/02/2019 12:30	Asulam (ug/l)	<0.008	Catchment	3235131	3LEAM
R.Avon - North Kilworth	15/02/2019 11:50	Asulam (ug/l)	<0.008	Catchment	3235112	3AVOU
R.Avon conf. North Kilworth	15/02/2019 11:40	Asulam (ug/l)	0.024	Catchment	3235111	3AVOU
R.Avon - Welford Bridge	15/02/2019 11:25	Asulam (ug/l)	0.009	Catchment	3235109	3AVOU
R. Avon - South Kilworth	15/02/2019 11:15	Asulam (ug/l)	<0.008	Catchment	3235107	3AVOU
Didgeley Brook	15/02/2019 10:30	Asulam (ug/l)	<0.008	Catchment	3235101	8SBOU1
Bourne Brook	15/02/2019 10:20	Asulam (ug/l)	<0.008	Catchment	3235105	8SBOU1

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River Bourne	15/02/2019 10:05	Asulam (ug/l)	<0.008	Catchment	3235103	8SBOU1
R.Blythe - Blythe Bridge SP211898	15/02/2019 09:55	Asulam (ug/l)	<0.008	Catchment	3235095	8SBLY0
R.Blythe - Packington SP218852	15/02/2019 09:40	Asulam (ug/l)	<0.008	Catchment	3235096	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	15/02/2019 09:20	Asulam (ug/l)	<0.008	Catchment	3235097	8SBLY0
R.Blythe - Temple Balsall SP208763	15/02/2019 09:10	Asulam (ug/l)	<0.008	Catchment	3235098	8SBLY0
R.Blythe - Solihull SP164789	15/02/2019 08:50	Asulam (ug/l)	<0.008	Catchment	3235099	8SBLY0
River Wye @ Hampton Bishop	11/02/2019 13:40	Asulam (ug/l)	<0.008	Catchment	3235474	2WYE
River Lugg @ Mordiford Bridge	11/02/2019 13:30	Asulam (ug/l)	<0.008	Catchment	3235512	2LUGG
River Wye @ Bridge Road Bridge	11/02/2019 13:25	Asulam (ug/l)	<0.008	Catchment	3235514	2WYE
River Wye @ King caple foot Bridge	11/02/2019 12:55	Asulam (ug/l)	<0.008	Catchment	3235516	2WYE
River Wye @ Foy Foot Bridge	11/02/2019 12:35	Asulam (ug/l)	<0.008	Catchment	3235518	2WYE
River Wye @ Wilton Bridge	11/02/2019 12:20	Asulam (ug/l)	<0.008	Catchment	3235520	2WYE
River Wye @ Kerne Bridge	11/02/2019 12:00	Asulam (ug/l)	<0.008	Catchment	3235522	2WYE
R.Severn nr Bredon School	10/02/2019 18:10	Asulam (ug/l)	<0.008	Catchment	3235538	1SEVE
R.Severn nr Buryend Farm	10/02/2019 18:00	Asulam (ug/l)	<0.008	Catchment	3235540	1SEVE
R.Severn nr Upton Marina	10/02/2019 17:50	Asulam (ug/l)	<0.008	Catchment	3235542	1SEVE
R.Severn nr Kempsey	10/02/2019 17:40	Asulam (ug/l)	<0.008	Catchment	3235544	1SEVE
R.Severn nr Clerkenleap Farm	10/02/2019 17:25	Asulam (ug/l)	<0.008	Catchment	3235546	1SEVE
R.Severn nr Diglis	10/02/2019 17:10	Asulam (ug/l)	<0.008	Catchment	3235548	1SEVE
R.Severn nr Bevere Island	10/02/2019 16:45	Asulam (ug/l)	<0.008	Catchment	3235550	1SEVE

[redacted]

R.Severn nr Grimley	10/02/2019 16:30	Asulam (ug/l)	<0.008	Catchment	3235551	1SEVE
R.Severn nr Holt Fleet	10/02/2019 16:20	Asulam (ug/l)	<0.008	Catchment	3235552	1SEVE
R.Severn nr Lineholt	10/02/2019 16:10	Asulam (ug/l)	<0.008	Catchment	3235553	1SEVE
R.Severn nr Lincomb Hall	10/02/2019 16:00	Asulam (ug/l)	<0.008	Catchment	3235554	1SEVE
Stourport (DS R.Stour)	10/02/2019 15:45	Asulam (ug/l)	<0.008	Catchment	3235555	1SEVE
Stourport (US R.Stour)	10/02/2019 15:30	Asulam (ug/l)	<0.008	Catchment	3235556	1SEVE
R.Severn nr Ribbesford Wood	10/02/2019 14:55	Asulam (ug/l)	<0.008	Catchment	3235557	1SEVE
R.Severn nr Dowles	10/02/2019 14:45	Asulam (ug/l)	<0.008	Catchment	3235558	1SEVE
R.Severn nr Arley	10/02/2019 14:35	Asulam (ug/l)	<0.008	Catchment	3235559	1SEVE
R.Severn nr Hampton	10/02/2019 14:20	Asulam (ug/l)	<0.008	Catchment	3235560	1SEVE
R.Severn nr Bridgnorth	10/02/2019 13:55	Asulam (ug/l)	<0.008	Catchment	3235561	1SEVE
R.Severn nr Broseley	10/02/2019 13:25	Asulam (ug/l)	<0.008	Catchment	3235562	1SEVE
R.Severn nr Cressage	10/02/2019 13:05	Asulam (ug/l)	<0.008	Catchment	3235563	1SEVE
R.Severn nr Atcham	10/02/2019 12:45	Asulam (ug/l)	<0.008	Catchment	3235471	1SEVE
R.Severn nr Upton Magna	10/02/2019 12:30	Asulam (ug/l)	<0.008	Catchment	3235472	1SEVE
R.Severn nr Shrewsbury	10/02/2019 12:00	Asulam (ug/l)	<0.008	Catchment	3235473	1SEVE
R.Severn nr Bicton	10/02/2019 11:40	Asulam (ug/l)	<0.008	Catchment	3235524	1SEVE
R.Severn nr Ford	10/02/2019 11:25	Asulam (ug/l)	<0.008	Catchment	3235526	1SEVE
R.Severn nr Wilcott	10/02/2019 11:05	Asulam (ug/l)	<0.008	Catchment	3235528	1SEVE
R.Severn nr Melverley	10/02/2019 10:55	Asulam (ug/l)	<0.008	Catchment	3235530	1SEVE

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R.Severn nr Llandrinio	10/02/2019 10:45	Asulam (ug/l)	<0.008	Catchment	3235532	1SEVE
R.Severn nr Forden	10/02/2019 10:20	Asulam (ug/l)	0.012	Catchment	3235534	1SEVE
R.Severn nr Caersws	10/02/2019 09:40	Asulam (ug/l)	<0.008	Catchment	3235536	1SEVE
River Derwent (Draycott) Raw	05/02/2019 15:30	Asulam (ug/l)	<0.008	Catchment	3208837	5CWILW
BORROWASH	05/02/2019 15:15	Asulam (ug/l)	<0.008	Catchment	3208835	6DERWC
R.Derwent - Pipe Bridge	05/02/2019 14:45	Asulam (ug/l)	<0.008	Catchment	3208833	6DERW7
R.Derwent - Holms Bridge	05/02/2019 14:35	Asulam (ug/l)	<0.008	Catchment	3208839	6DERW7
Markeaton Brook @ Ford Street Weir	05/02/2019 14:20	Asulam (ug/l)	<0.008	Catchment	3208842	6MARK0
ALLESTREE FORD	05/02/2019 14:10	Asulam (ug/l)	<0.008	Catchment	3208830	6DERWB
Mackworth Brook @ Markeaton Stones	05/02/2019 14:00	Asulam (ug/l)	<0.008	Catchment	3208811	6MACK2
Markeaton Brook @ Mundy Park	05/02/2019 13:55	Asulam (ug/l)	<0.008	Catchment	3208845	6MARK0
Mackworth Brook @ Baldwin Wood	05/02/2019 13:45	Asulam (ug/l)	<0.008	Catchment	3208802	6MACK2
Mackworth Brook @ South Lodge	05/02/2019 13:35	Asulam (ug/l)	<0.008	Catchment	3208847	6MACK2
Markeaton Brook @ Kedleston	05/02/2019 13:25	Asulam (ug/l)	<0.008	Catchment	3208806	6MARK0
Kedleston Park Brook	05/02/2019 13:20	Asulam (ug/l)	<0.008	Catchment	3208809	6MARK0
Markeaton Brook @ Mercaston	05/02/2019 13:00	Asulam (ug/l)	<0.008	Catchment	3208804	6MARK0
Swithland, Brands Hill House security	22/01/2019 14:00	Asulam (ug/l)	<0.008	Catchment	3208740	4QUORB
Swithland Village opp St Leonards Church	22/01/2019 13:50	Asulam (ug/l)	<0.008	Catchment	3208749	4QUORB
Swithland feed adj railway	22/01/2019 13:45	Asulam (ug/l)	<0.008	Catchment	3208751	4QUORB
Bradgate Road, Cropston under	22/01/2019 13:40	Asulam (ug/l)	<0.008	Catchment	3208747	4QUORB

[redacted]

Cropston Tributary 2 - Polly Botts Lane	22/01/2019 13:25	Asulam (ug/l)	<0.008	Catchment	3208743	4QUORB
Newtown Linford T - junction	22/01/2019 13:20	Asulam (ug/l)	<0.008	Catchment	3208745	4QUORB
Cropston Reservoir feed, Deer Barn	22/01/2019 13:10	Asulam (ug/l)	<0.008	Catchment	3208753	4QUORB
Rothley Brook - Leicester Road	22/01/2019 12:50	Asulam (ug/l)	<0.008	Catchment	3208764	4ROTBR
Rothley Brook - Anstey Lane	22/01/2019 12:40	Asulam (ug/l)	<0.008	Catchment	3208760	4ROTBR
Rothley Brook - Kirby Road	22/01/2019 12:40	Asulam (ug/l)	<0.008	Catchment	3208762	4ROTBR
Rothley Brook - Lindridge Lane	22/01/2019 12:25	Asulam (ug/l)	<0.008	Catchment	3208757	4ROTBR
Rothley Brook - Markfield Lane	22/01/2019 12:25	Asulam (ug/l)	<0.008	Catchment	3208755	4ROTBR
Staunton Harold Brook	22/01/2019 11:30	Asulam (ug/l)	<0.008	Catchment	3208771	4STAUB
Heath End Brook	22/01/2019 11:20	Asulam (ug/l)	<0.008	Catchment	3208773	4HEATB
Jubilee Brook	22/01/2019 11:05	Asulam (ug/l)	<0.008	Catchment	3208769	4JUBIB
Scotts Brook	22/01/2019 10:45	Asulam (ug/l)	<0.008	Catchment	3208766	4SCOTB
to conf R Avon - Willes Meadow Foot	15/01/2019 14:50	Asulam (ug/l)	<0.008	Catchment	3208877	3LEAM
Radford Brook source to conf R Leam	15/01/2019 14:40	Asulam (ug/l)	<0.008	Catchment	3208872	3RADF
conf. R Stowe - Thorpe Bridge Ufton	15/01/2019 14:30	Asulam (ug/l)	<0.008	Catchment	3208878	3ITCH
R Stowe source to conf R Leam	15/01/2019 14:20	Asulam (ug/l)	<0.008	Catchment	3208892	3STOW
Stowe to conf. R Leam - Marton	15/01/2019 14:10	Asulam (ug/l)	0.009	Catchment	3208879	3ITCH
Brook to conf R Itchen	15/01/2019 14:00	Asulam (ug/l)	<0.008	Catchment	3208874	3LEAM
Rains Brook	15/01/2019 13:50	Asulam (ug/l)	<0.008	Catchment	3208870	3RAIN
R Leam source to conf Rains Brook	15/01/2019 13:40	Asulam (ug/l)	0.009	Catchment	3208876	3LEAM

[redacted]

R.Avon conf. North Kilworth	15/01/2019 13:00	Asulam (ug/l)	0.038	Catchment	3208881	3AVOU
R.Avon - North Kilworth	15/01/2019 12:45	Asulam (ug/l)	<0.008	Catchment	3208880	3AVOU
R.Avon - Welford Bridge	15/01/2019 12:35	Asulam (ug/l)	0.022	Catchment	3208882	3AVOU
R. Avon - South Kilworth	15/01/2019 12:20	Asulam (ug/l)	<0.008	Catchment	3208883	3AVOU
Bourne Brook	15/01/2019 11:20	Asulam (ug/l)	0.009	Catchment	3208884	8SBOU1
River Bourne	15/01/2019 11:05	Asulam (ug/l)	<0.008	Catchment	3208885	8SBOU1
R.Blythe - Blythe Bridge SP211898	15/01/2019 10:55	Asulam (ug/l)	<0.008	Catchment	3208891	8SBLY0
R.Blythe - Packington SP218852	15/01/2019 10:40	Asulam (ug/l)	0.009	Catchment	3208890	8SBLY0
R.Blythe - Bradnocks Marsh SP216793	15/01/2019 10:25	Asulam (ug/l)	<0.008	Catchment	3208889	8SBLY0
R.Blythe - Temple Balsall SP208763	15/01/2019 10:10	Asulam (ug/l)	<0.008	Catchment	3208888	8SBLY0
R.Blythe - Solihull SP164789	15/01/2019 09:50	Asulam (ug/l)	<0.008	Catchment	3208887	8SBLY0
Didgeley Brook	15/01/2019 00:00	Asulam (ug/l)	<0.008	Catchment	3208886	8SBOU1
River Lugg @ Mordiford Bridge	09/01/2019 16:00	Asulam (ug/l)	<0.008	Catchment	3208721	2LUGG
River Wye @ Hampton Bishop	09/01/2019 15:50	Asulam (ug/l)	<0.008	Catchment	3208723	2WYE
River Wye @ Bridge Road Bridge	09/01/2019 15:40	Asulam (ug/l)	<0.008	Catchment	3208720	2WYE
River Wye @ King caple foot Bridge	09/01/2019 15:10	Asulam (ug/l)	<0.008	Catchment	3208719	2WYE
River Wye @ Foy Foot Bridge	09/01/2019 14:50	Asulam (ug/l)	<0.008	Catchment	3208718	2WYE
River Wye @ Wilton Bridge	09/01/2019 14:35	Asulam (ug/l)	<0.008	Catchment	3208717	2WYE
River Wye @ Kerne Bridge	09/01/2019 14:20	Asulam (ug/l)	<0.008	Catchment	3208716	2WYE
R.Severn nr Buryend Farm	09/01/2019 13:30	Asulam (ug/l)	<0.008	Catchment	3208799	1SEVE

[redacted]

R.Severn nr Upton Marina	09/01/2019 13:05	Asulam (ug/l)	<0.008	Catchment	3208796	1SEVE
R.Severn nr Kempsey	09/01/2019 12:45	Asulam (ug/l)	<0.008	Catchment	3208794	1SEVE
R.Severn nr Clerkenleap Farm	09/01/2019 12:30	Asulam (ug/l)	<0.008	Catchment	3208792	1SEVE
R.Severn nr Diglis	09/01/2019 12:20	Asulam (ug/l)	<0.008	Catchment	3208789	1SEVE
R.Severn nr Bevere Island	09/01/2019 11:50	Asulam (ug/l)	0.008	Catchment	3208786	1SEVE
R.Severn nr Grimley	09/01/2019 11:40	Asulam (ug/l)	<0.008	Catchment	3208784	1SEVE
R.Severn nr Holt Fleet	09/01/2019 11:30	Asulam (ug/l)	<0.008	Catchment	3208783	1SEVE
R.Severn nr Lineholt	09/01/2019 11:20	Asulam (ug/l)	0.009	Catchment	3208782	1SEVE
R.Severn nr Lincomb Hall	09/01/2019 11:00	Asulam (ug/l)	0.009	Catchment	3208780	1SEVE
Stourport (DS R.Stour)	09/01/2019 10:40	Asulam (ug/l)	<0.008	Catchment	3208778	1SEVE
R.Severn nr Bredon School	09/01/2019 10:40	Asulam (ug/l)	<0.008	Catchment	3208801	1SEVE
Stourport (US R.Stour)	09/01/2019 09:40	Asulam (ug/l)	<0.008	Catchment	3208776	1SEVE
R.Severn nr Ribbesford Wood	08/01/2019 17:10	Asulam (ug/l)	<0.008	Catchment	3208736	1SEVE
R.Severn nr Dowles	08/01/2019 17:00	Asulam (ug/l)	<0.008	Catchment	3208735	1SEVE
R.Severn nr Arley	08/01/2019 16:50	Asulam (ug/l)	<0.008	Catchment	3208734	1SEVE
R.Severn nr Hampton	08/01/2019 16:30	Asulam (ug/l)	<0.008	Catchment	3208733	1SEVE
R.Severn nr Bridgnorth	08/01/2019 16:05	Asulam (ug/l)	<0.008	Catchment	3208731	1SEVE
R.Severn nr Broseley	08/01/2019 15:40	Asulam (ug/l)	<0.008	Catchment	3208730	1SEVE
R.Severn nr Cressage	08/01/2019 15:20	Asulam (ug/l)	0.013	Catchment	3208728	1SEVE
R.Severn nr Atcham	08/01/2019 15:00	Asulam (ug/l)	<0.008	Catchment	3208727	1SEVE

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R.Severn nr Upton Magna	08/01/2019 12:35	Asulam (ug/l)	<0.008	Catchment	3208726	1SEVE
R.Severn nr Shrewsbury	08/01/2019 12:15	Asulam (ug/l)	<0.008	Catchment	3208725	1SEVE
R.Severn nr Bicton	08/01/2019 12:00	Asulam (ug/l)	<0.008	Catchment	3208828	1SEVE
R.Severn nr Ford	08/01/2019 11:50	Asulam (ug/l)	<0.008	Catchment	3208825	1SEVE
R.Severn nr Wilcott	08/01/2019 11:20	Asulam (ug/l)	<0.008	Catchment	3208813	1SEVE
R.Severn nr Melverley	08/01/2019 11:00	Asulam (ug/l)	<0.008	Catchment	3208810	1SEVE
R.Severn nr Llandrinio	08/01/2019 10:40	Asulam (ug/l)	<0.008	Catchment	3208807	1SEVE
R.Severn nr Forden	08/01/2019 10:15	Asulam (ug/l)	<0.008	Catchment	3208805	1SEVE
R.Severn nr Caersws	08/01/2019 09:35	Asulam (ug/l)	<0.008	Catchment	3208803	1SEVE

EMERGENCY REGISTRATION REPORT

Product name: Asulox
Active substance: Asulam 400g/l

United Kingdom

Applicant: The Bracken Control Group
Submission date: 31 October 2022
Finalisation date: March 2023
HSE Ref Number: COP 2022/02174

Version history

When	What
March 2023	ERR finalised by HSE

EVALUATION, SUMMARY AND CONCLUSION BY REGULATORY AUTHORITY	
Name of authority	**Health and Safety Executive.**
Reviewer's comments	HSE consideration is contained within green boxes.

Table of Contents

1 Details of the application

EVALUATION, SUMMARY AND CONCLUSION BY REGULATORY AUTHORITY	
Name of authority	**Health and Safety Executive (CRD), UK**
Reviewer's comments	This Emergency registration report (eRR) is for the evaluation of an application for emergency authorisation for the use of the plant protection product Asulox in the UK. An emergency authorisation may be granted under Article 53 of Regulation 1107/2009 (the Regulation) in special circumstances, for limited and controlled use, where the authorisation appears necessary because of a danger which cannot be contained by any other reasonable means. This eRR has been prepared by the Health and Safety Executive (HSE) based on the information provided by the applicant and the product manufacturer. Data from Severn Trent Water on levels in drinking water has also been submitted. It includes an assessment of risk in accordance with the standard criteria and uniform principles applicable for a commercial authorisation as well as considering the various elements of the derogation from the standard requirements, set out in Article 53 of the Regulation. These article 53 requirements are; 'special circumstances', 'danger', 'any other reasonable means', 'limited and controlled use' and 'is necessary'. A judgement on whether an authorisation appears necessary to address the danger involves consideration of whether the likely benefits of granting the authorisation to address the identified danger outweigh the potential adverse impacts of granting it. The eRR may be presented to members of the Expert Committee on Pesticides (ECP) who will be asked questions relating to the HSE assessment for the endocrine disruption potential and the long-term risk to birds. The ECP will produce independent scientific advice to Government which will be presented to Defra and the Devolved Administrations in Scotland, Wales and Northern Ireland. Should HSE issue an authorisation under Article 53, it will permit the product to be placed on the market for a maximum of 120 days. Users of the product must only apply the product in line with the conditions laid out in the authorisation notice as published on the HSE website. A draft is presented at Appendix 1 of this eRR. Failure to comply with these conditions may result in enforcement action being taken. The applicant and users must monitor and record any use of the product under this Article 53 authorisation. HSE may request additional information to be generated during the period/season of use.

1.1 Background of Application

EVALUATION, SUMMARY AND CONCLUSION BY REGULATORY AUTHORITY

Name of authority	**Health and Safety Executive.**

Status of product in the UK

‘Asulox’ has no current authorisation and its active substance asulam is not currently approved either. Asulam was an existing active substance which had previously been in use since the 1960s. Approval expired in December 2008 after the applicant UPL Europe Limited withdrew the application to renew this active substance (a.s.). UPL then resubmitted the application with additional data to address data gaps which again resulted in a non-approval decision in 2010. They applied again in 2013 and an EFSA conclusion was published in March 2018 which identified numerous data gaps. In particular, thyroid toxicity was observed in test species raising the potential for asulam as an endocrine disruptor and the long-term risk to birds and mammals was identified as an area of critical concern.

EFSA have made additional data requirements relating to new requirements around endocrine disruption. The EFSA 2018 conclusion is available here. It should be noted that, due to EU Exit, any EU decisions will no longer apply to Great Britain (GB), only in Northern Ireland (NI)

The updated peer review for the EFSA conclusion (2021) is available here and it concludes that asulam-sodium is considered to meet the criteria for endocrine disruption for humans for the thyroid (T) modality and a conclusion on the endocrine-disrupting properties of asulam-sodium for non-target organisms could not be made based on the information available.

[redacted]

Situation

This is the 11th application for emergency use Asulox to control bracken, in upland moorland/grassland areas and forestry, via both ground and aerial application. The situation is largely the same as in previous years. Use is requested UK wide. In 2021 it was used on approx. 8000 ha (up from approx. 4000ha in 2020 down from 6000-6500 Ha in 2018 and 2019). Use in 2022 is confirmed as roughly 7600ha and projected use in 2023 is the same. Asulox continues to be the only pesticide with an aerial permit.

Bracken is an invasive plant species characteristic of moorland which outcompetes other ground cover plants (moor grasses, cowberry, bilberry and heathers). The applicant estimates that it covers over 1.5M ha, though it is not known if it is expanding. It is thus a threat to biodiversity and takes over grazing areas in remote and hilly rural areas. The use in forest is for pre-planting and during the two to five-year establishment phase.

The applicant states that Bracken is toxic to cattle, dogs, sheep, pigs and horses and that they will not graze in it, even if cover is 50%. The applicant also states that bracken is linked to cancers in humans and other mammals and that there is also a human and animal health threat as it is known to harbour disease bearing ticks.

Chemical intervention using systemic actives is needed to control the subterranean rhizomes from which bracken fronds grow and spread. Asulam is a carbamate herbicide which is absorbed by leaves, shoots and roots and translocated throughout the plant. It acts through inhibition of dihydropterate synthase. Due to this, bracken control programs last 5 to 10 years, so the applicant states that continuity of supply is important for effective use, hence requiring multiple requests for emergency use.

Bracken control is largely needed in upland areas, often categorised as Less Favourable Areas. According to Natural England, approximately 2.2 million hectares of land are classified as Less Favoured Area (LFA) in England, with 1.6 million hectares classified as Severely Disadvantaged Area (SDA). Extensive sheep and beef cattle farms account for the predominance of farm types in the LFA (46%). Most of the SDA land is suitable only for grazing. Currently only 7.2% of farms in the SDA are classified as dairy, accounting for 9% of English dairy cows. According to the National Farmers Union, the uplands are home to 44 per cent of breeding ewes and 40 per cent of beef cows in England, 85 per cent of beef cows and 75 per cent of breeding ewes in Wales (where 80% or 1.1 million hectares is upland) and produce a quarter of England's and Wales' milk. According to the Scottish National Heritage, Scotland's mountains, moors, hills and heaths cover more than 50% of the land area and 55% of Scotland's agricultural land is dedicated to upland sheep farming and mixed sheep and beef cattle farming.

55-70% of the proposed usage is grant-funded and targeted at uses for conservation purposes (grants under stewardship programmes/ for maintenance of SSSIs (Sites of Special Scientific Interest), etc).

Proposed use is identical to previous applications, except for the requested amendments below:

The applicant wishes the aquatic buffer zone for aerial use via helicopters to be reviewed and reduced from 90m. Spray drift data is submitted to support this.

The applicant requests that the ground-based uses restriction to conservation or agri-environment scheme areas should be removed on the basis that amidosulfuron is now shown to be unviable as an alternative, as well as an ADAS report on the effects on non-targets.

Application History

This Art. 53 use was first given in 2013 and every year since, until it was partially refused (removal of ground-based uses) in December 2019. These uses were subsequently granted in limited form (conservation / agri-environment scheme areas only) due to concerns about phytotoxicity to certain non-target plants and soil macro-organisms in sensitive areas. The aquatic buffer zone was increased to 90m due to new Ecotoxicology endpoints. A 1-month livestock exclusion period was imposed as a result of the residues evaluation in order to protect consumers.

Response to data requirements or request for supporting information

The applicant has provided extensive data on the areas and habitat where Asulox was used in 2021. They have also provided evidence of that landowners have been informed of and have stated they have adhered to the 1-month livestock exclusion restriction. Further research is ongoing, evidenced by the trials data provided and the trials permits applied for in 2020. Aerial spray drift trials have been provided to show that damage to non-targets is more limited.

[redacted]

[redacted]

[redacted]

ADAS on behalf of Natural England have submitted a “Comparative assessment of risks to non-target plants and soil invertebrates and soil persistence of two bracken herbicides: asulam and amidosulfuron”.

1.2 The Requirements of Article 53

Special Circumstances
See Annex G to the application – Supporting Information

More details are included within the cover letter and supporting documents. Brief highlights are included in the response to the questions in this section.

Asulam has been the preferred option for chemical bracken control since the late 1960s. It offers a high level of selectivity and it is the only bracken control chemical authorised for application from a helicopter.

Authorisation for the use of ground-based application techniques, typically using hand-held equipment, is required to provide secondary control of the next generation of plants. Due to the nature of the plant, it is not possible to achieve a 100% in one application of pesticide.

Alternative pesticides have been under investigation for many years, and work is continuing, but currently asulam remains the safest, most effective option.

- Why is the situation exceptional?
  - o Bracken control is required to mitigate the threats highlighted in this annex and within other parts of the application.
  - o Asulam offers a high degree of selectivity and an approval for aerial application.
  - o Currently, there are no other pesticides authorised for application by helicopter. Aerial application is essential to provide control effort on a large scale in areas where access by vehicles is unsafe or impossible.
  - o The disease risks associated with bracken are a cause of increasing concern (Annex F – Impacts on Human and Animal Health and Habitat).

o Concerns have been expressed about the unintended consequences associated with the use of alternative products (Covering Letter, and Annex C - Research Programme).
- There are long term plans in place to achieve full GB regulatory approval for Asulam, but the recent raising of concerns about the endocrine disruption status of asulam is delaying the application process; it has been agreed with CRD that the ED issues will be addressed first.
- There is cross-sector support for the view that safe and effective control of bracken is important to mitigate the threats associated with the plant.
- The BCG is aware that the series of emergency authorisation approvals that have been granted for asulam is exceptional. Every effort is being made to find a permanent solution
- While asulam remains the safest and most effective herbicide for bracken control, if effective control of bracken is to be maintained while waiting for the application for full regulatory approval, currently the EA process is the only option.
- By considering all the issues associated with bracken and its control, the proposed review of bracken is viewed as offering the best opportunity to identify an alternative, longer-term solution that will have cross-sector support.

Danger
Loss of biodiversity, reduction in grazing, host for sheep ticks – increasing impact of tick-borne diseases on humans, livestock and wildlife, impact on landscape, increasing concerns about bracken poisoning in livestock, encroachment into higher value habitats (e.g. peatland).
There are many examples of land that have been cleared of bracken using a control programme based on a primary treatment with asulam (aerial / ground-based application), followed by secondary treatment with hand-held equipment to control emergent fronds several years after the initial treatment.

The North York Moors provide many examples. Biodiversity has been increased, access and landscape has become more open, the risk of tick-borne diseases has been reduced and there is less risk of loss of sensitive habitats, such as peatland.

- The threats associated with bracken include negative impacts on: biodiversity; encroachment of other habitats, in particular peatland; health of humans from carcinogenic properties of exudates; through tick-borne diseases, the health of humans, wildlife and domestic stock (Annex F - Impacts on Human and Animal Health and Habitat).
- In many parts of the UK, where there is no effective control, bracken expands to form a monoculture and thus reduces the area of other upland habitats of greater ecological and botanical value. There many examples of this in areas such as the Lake District.
- There are concerns that if asulam is not available then landowners or managers may resort to herbicides which are deemed to be unsafe, ineffective or likely to cause widespread damage. Examples are glyphosate or amidosulfuron products.
- Currently, there is no clear evidence to support the firmly-believed anecdotal view that the area of bracken is increasing in many areas. A project to establish the current extent of bracken cover and its trend has been suggested as part of the proposed review of bracken and its control.
- Many landowners and managers have entered into agri-environment schemes which specify that bracken must be controlled using asulam over a period of many years. If asulam is no longer available the landowners and managers will be forced to breach their agreements, as they will be unable to complete their bracken control programmes. This could lead to claims being made against payments already received.
- The economic impact of the current and future extent of bracken is linked to the loss of grazing and the associated income, increased livestock rearing costs associated with tick-borne diseases, a value that can be attributed to a loss of diversity, negative impact on the income from sporting enterprises (e.g. grouse shooting, deer stalking), and increased costs when establishing new woodland.
- Income is only generated on a small scale in a very few parts of the country. Sources of

income are from cutting bracken for livestock bedding, and occasional uses of harvested bracken as: a compost material (e.g. Lakeland Gold), a source of fuel (e.g. Brackenburn Brackettes), a bio-filtration medium and proposals have been made after transport to a specialist plant to use harvested bracken for processing into bio-ethanol.

- The economic impact of bracken is most severe on smaller hill farms that lack financial resilience to absorb the loss of income and increased costs.
- The dangers associated with the threats from bracken are already evident in many parts of the UK.
- If asulam is no longer available the risk of damage to sensitive habitats is assessed as significant and increasing.

Other Reasonable Means of Control

Physical control methods (such as: cutting, bashing, bruising, ploughing) have an important role to play in controlling bracken, but they rely on vehicular access. Bracken is dominant in many areas that are inaccessible for vehicles, and there are more areas where operator safety is concern if vehicles are used. Frequently, the use of a helicopter is the only safe and effective option.

The trials of alternative pesticides are reported on in the supporting documents.

Research is ongoing into alternative aerial application techniques to reduce the risk of drift, and the use of chemical mixes that could reduce the amount of pesticide active substance required.

- The BCG promotes all alternative bracken control techniques.
- Physical control methods such as: cutting, bruising, bashing, pulling of fronds and even ploughing can be effective in the right location. However, physical control techniques are not usually safe, effective or possible on steep slopes, on rocky ground or in areas where vehicle access is not possible.
- The development of an Integrated Pest Management type of approach to planning bracken control options is under consideration as part of the review of bracken and its control. The aim would be to make sure that practitioners consider all bracken control options before deciding on the best one for their land.
- Extensive trials have been completed and are continuing into the suitability and availability of alternative active ingredients (ai) to asulam (Annex C – Research). At present it is believed that asulam is the safest and most effective ai.

Limited and Controlled Use

- The BCG is issuing information about the emergency authorisation (see the Asulam page of the BCG website) and provides details of other restrictions such as the protection for the Hazel Dormouse.
- Monitoring the use: the BCG also collects and collates records from the users of asulam (Annex I – Areas Treated).
- A more formal stewardship programme has been proposed for consideration as part of the proposed review of bracken and its control (Annex D). It is possible that further conditions and restrictions could be agreed as part of the review process, if this contributes to a long-term agreement for the use of asulam.
- The target species for the authorisation is bracken only and the area treated currently in the UK is of the order of 7,500ha out of a total estimated area of 1.5m ha.
- If approved, bracken control will only take place after full extension of the fronds, during the period 1 st July – 11 th September 2023.

Potential adverse effects and mitigations

- Asulam has been in use for bracken control since the 1960s and the techniques for its effective use are well-developed and continue to evolve.
- The main adverse effects associated with bracken relate to human and animal health and in particular to tick-borne diseases. The risks have been set out in Annex F – Health and

Habitat.
- The risks associated with the application of asulam are under close scrutiny as part of the ongoing research programme (Covering Letter, Annex C – Research Programme).
- To mitigate the risks, the BCG is coordinating the information passed to users of asulam at the point of sale about the restrictions and conditions included in the EA approval and making appropriate information available on the website.
- A network of sector representatives has been established to assist with communication to all users of asulam and others with an interest in bracken control.
- If required, safety assessments will be requested from UPL Europe Ltd.

Non-dietary Human Exposure
Operator exposure – PPE
Residues and Consumer Exposure
Livestock exclusion – restrict entry to foods
Environmental Fate and Behaviour
Short term decay – several days
Ecotoxicology
UPL Europe Ltd have had extensive discussions with CRD and provided data on impact on birds & mammals.

Natural England commissioned a report from ADAS to assess the data that has been provided from various sources about the impact of asulam on birds, mammals and insects.

Development of Long-Term Solutions
The aim is to achieve full registration of asulam under Regulation (EC) No 1107/2009, as adopted into UK legislation.

Before registration under UK regulations can be applied for, concerns that have been raised about the impact of asulam need to be addressed. In particular, UPL is commissioning work to establish the status of asulam as a potential endocrine disruptor. See the Statement provided by UPL Europe Ltd, the authorisation holder (Enclosure 1).

The BCG is supporting the development of a longer-term solution that could be based on achievement of annual milestones within a longer-term trajectory. This would provide an annual opportunity to confirm that no new information has come to light that would influence the decision to allow the continued use of asulam. The BCG's proposal that there should be a UK-wide review of bracken and its control was discussed during a meeting organised by Defra in August 2022. Further discussion is anticipated. The review process could be used to create a bracken control framework that could establish the trajectory for the annual assessment of the use of asulam. More details about the review proposals are in Annex D to the application.

EVALUATION, SUMMARY AND CONCLUSION BY REGULATORY AUTHORITY	
Name of Authority	**Health and Safety Executive.**
Special Circumstances	The applicant's case for 'special circumstances' include firstly the fact that asulam offers a high degree of efficacy, secondly that there are no other pesticides authorised for application by helicopter, thirdly that the disease risks associated with bracken are a cause of increasing concern and finally that concerns have been expressed about the unintended consequences associated with the use of alternative products, particularly amidosulfuron. Bracken control does present specific problems, unlike some other weed control scenarios, in that the areas to be treated are often large and inaccessible to conventional application machinery. In such situations this requires an initial aerial application of a suitable plant protection product

followed by a programme of follow up treatments, either chemical, mechanical or cultural. Such programmes are long running over many years if bracken populations are to be contained and much of the control/work is grant funded. In addition, there are a wide range of stakeholders, not restricted to farmers but also other Government Departments and public bodies (Natural England; Natural Resources Wales (NRW); NatureScot and the Department of Agriculture, Environment and Rural Affairs (DAERA), Northern Ireland).

Finally, the key herbicide for bracken control over the last 30 years or so, around which control programmes have been based, has been asulam which is no longer available, although the authorisation holder is seeking re-approval. Seeking alternatives, particularly for aerial application, is a long-term objective with replacements needing to be both efficacious and with minimal impact on non-targets as bracken control is often required in conservation areas. Evidence for the latter is considered again under this application.
Annex E of the application provides a summary of the nature conservation perspective outlining the necessity for the control of bracken in certain situations. Bracken can provide an important habitat for specific wildlife species. However, where it predominates it can have significant negative impacts in some habitats. It may also have an adverse effect on the conservation status of those areas if the vegetation communities, which often form the basis for designation of an area, are invaded and outcompeted by bracken.

However, these agencies recognise the unresolved chronic risks to birds and mammals identified in previous assessments (as presented in the 2022 application) and consider that the conditions applied to the 2022 authorisation (see section 7.5 of Annex E) should remain to mitigate these as far as possible. In addition, these bodies support, and are initiating, a review of bracken management practices (section 6) to ensure a sustainable, strategic framework for bracken management is followed across the UK.

In addition to designated areas, bracken control may also be necessary in the preparation of ground for the establishment of woodland for forestry and also for the protection of trees in the establishment phase. Woodland establishment can also help shade out bracken, subject to eventual tree cover, but initial control of bracken is often necessary to aid tree establishment (ref: Enclosure 17).

Furthermore, bracken control becomes necessary where it encroaches into grazing land. This is particularly important in upland areas, often categorised as Less Favoured Areas (LFA). Extensive sheep and beef cattle farms account for the predominance of farm types in the LFA. Most of the SDA (Severely Disadvantaged Area) land is suitable only for grazing. The National Sheep Association has provided a letter of support for this application (ref: Enclosure 5) as well as NFU Cymru (ref: Enclosure 7), the latter requesting removal of the restriction of use only to designated areas.

Therefore, this application for ‘Asulox’ under Article 53 is firstly a means of mitigating against the loss of habitat and secondly there are concerns about the use of alternative herbicides in these situations due to their potential negative impacts on those habitats.

	Finally, in many cases the geographic location of bracken requires the initial application of a herbicide aerially and if authorised 'Asulox' would be the only such product which has an aerial permit, although work is ongoing on amidosulfuron applied aerially. This is the 11th successive application for an authorisation for 'Asulox' under Article 53. Measures planned by the Bracken Control Group to obviate the need for future applications under Article 53 are described below and in Annex C of the application.
The Danger	Bracken (*Pteridium aquilinum*, EPPO Code: PTEAQ) is a fern belonging to the family Dennstaedtiaceae. It generally spreads through underground rhizomes which, if not controlled, allow the area of bracken to increase. The rhizomes have active and dormant buds. The active buds are normally produced from the rhizomes lying above or just below the surface of the soil, these produce the fronds. The dormant buds produce the fronds in subsequent years. Fronds typically appear from May. Bracken can provide an important habitat for specific wildlife species. However, unless controlled, bracken can rapidly expand its range to dominate sensitive habitats and land that would otherwise be productive as grazing land for livestock. As well as reducing productive grazing land bracken is also toxic to livestock. Therefore, key drivers for control are as follows. • Loss of grazing land • Bracken monocultures can negatively impact habitat biodiversity The applicant also cited the following additional drivers for control. • Restricts public access • Provides habitat for sheep ticks which pose a risk to human health through the transmission of Lymes Disease. (Annex F - Impacts on Human and Animal Health and Habitat). • Bracken can have direct livestock/human health effects either from ingesting/inhaling spores or consumption of the plant itself. • Landscape impact • Preservation of historic sites. Note that the key drivers for 'danger' in the context of this application under Article 53 are loss of grazing land and impact on habitat biodiversity arising from bracken encroachment. Bracken control programmes are long-term with initial herbicide applications, often made by helicopter, requiring follow up ground-based applications over many years. If follow-up management is not carried out then bracken can regenerate swiftly and, five years after primary treatment, full bracken cover can be reinstated. The applicant's case that bracken presents a danger is accepted based on the evidence provided.

Other Reasonable Means of Control	Much of the literature was reviewed previously to produce Natural England Technical Information Note TIN048 published in 2008. The most recent publication on the control of bracken is Akpınar & Alday et al (2022). A useful summary of approaches was published in February 2022 and is available at <u>Battling Bracken: Control and alleviation strategies | Farming Connect (gov.wales)</u> Bracken control programmes are long-term. Initial herbicide applications, often made by helicopter, require follow up ground-based applications over many years. If follow-up management is not carried out then bracken can regenerate swiftly and, five years after initial treatment, full bracken cover can be reinstated. <u>Physical methods</u> The applicant has stated that 'Physical control methods such as: cutting, bruising, bashing, pulling of fronds and even ploughing can be effective in the right location. However, physical control techniques are not usually safe, effective or possible on steep slopes, on rocky ground or in areas where vehicle access is not possible. The development of an Integrated Pest Management type of approach to planning bracken control options is under consideration as part of the review of bracken and its control. The aim would be to make sure that practitioners consider all bracken control options before deciding on the best one for their land.' A summary of the other reasonable physical means of control is below; • Ploughing – only possible in agricultural, forestry and horticultural areas. Disadvantages include habitat and soil structure damage, including possible effects on nesting birds and increased risk of soil erosion. • Cutting, swiping and whipping – where possible cutting 2 to 3 times/year can achieve control within 6 to 12 years. However, this may cause damage to other plant species and ground nesting birds. Mechanised cutting is not always possible in inaccessible locations and ground impacts can be significant. Removal of cuttings can lead to habitat depletion although if left uncollected litter can build up rapidly, inhibiting re-colonisation by other plants. • Rolling and bruising- heavy rollers require vehicle access and more frequent treatment, leading to physical damage, litter accumulation, damage to understory and possible impacts on ground nesting birds. • Burning – can be useful as a technique to remove litter, prior to chemical control, but bracken is a fire adapted species with burning favouring bracken spore germination and survival. • Grazing and trampling – cattle more effective than sheep but young bracken is toxic to stock. Pigs can have a significant impact on bracken stands but soil and habitat damage can also be significant. Pig diets may need to be supplemented with vitamin B12 to prevent internal bleeding. • Felling and planting (forestry) – dense tree cover can shade bracken but felling can allow bracken re-colonisation, especially in the absence of rapid tree cover.

These approaches, or a combination of them, can be effective. For example, repeated annual mechanical treatments can be effective if they are undertaken as a long-term programme. For bracken control it is often necessary to cut/roll/flail bracken at least twice in the first year (in May/June and again in July/August) followed by at least one cut each year for the next five years. For bracken eradication, or where bracken is dense and vigorous, it may be necessary to cut/roll/flail up to three times per year. There are numerous publications on these approaches, for example Grange and Swallow, 2018[1].

Overall, therefore, there are several physical methods available as part of a bracken management programme. However, using only physical methods to tackle large bracken beds may not be possible on all sites due to site topography which restricts access by vehicles and therefore there are potential risks to any labour conducting such operations. In addition, many of the physical methods can lead to non-target effects. Livestock grazing and trampling can be a useful additional method of control but there are issues of bracken toxicity to livestock if consumed, and corresponding animal welfare concerns, and potential non-target effects.

Biological control

Some approaches have been previously explored with limited success. For example, the noctuid moths *Conservula cinisigna* and *Panotima nr. Angularis* native to South Africa were potential candidates for biological control. The moths were imported into quarantine in the UK, screened and found to be host specific (Fowler et al., 1989)[2]. However, the programme was abandoned because of the costs of field testing and doubts over the wisdom of using biological control to manage a native weed (Cruttwell McFadyen, 1998)[3]. In addition, Defra previously funded work on a potential mycoherbicide using the indigenous fungal pathogen *Ascochyta pteridis.* However again this was not progressed further.

Chemical control

a) Asulam

Asulam has been used for the control of bracken since 1972 with aerial applications first used in 1974. Asulam is the only active substance that has had an aerial application for the control of bracken, important for initial applications in situations which preclude the use of machinery.

The quantitative effects of asulam on bracken have been well documented (Pakeman and Marrs, 1994)[4]. A further review of the effectiveness of different strategies was published in 2005 - Stewart, G.B., Tyler, C. & Pullin, A.S. (2005). Effectiveness of current methods for the Control of Bracken (Pteridium aquilinum) Systematic Review No. 3. Centre for Evidence Based Conservation,

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[1] Grange, I D, Swallow K 2018. Bracken control in the first year is as good as it gets! *Aspects of Applied Biology* **139**

[2] Fowler SV, Lawton JH, Speed C, 1989. Biocontrol of bracken, Pteridium aquilinum in the UK; prospects and progress. Proceedings of the Brighton Crop Protection Conference, Weeds., Vol. 3:997-1004.

[3] Cruttwell McFadyen RE, 1998. Biological control of weeds. Annual Review of Entomology, 43:369-393.

[4] Pakeman R J, Marrs RH 1994. The effects of control on the biomass, carbohydrate content and bud reserves of bracken P*teridium aquilinum* L.Kuhn, and an evaluation of a bracken growth model *Annals of Applied Biology* **124:**479-493

University of Birmingham, UK. There is an online version of this at http://cebc.bangor.ac.uk/Documents/CEBC%20SR3%20Bracken%20control.pdf

Where ground-based herbicide application or the use of physical methods is precluded then an application must be made aerially. *There are currently no other reasonable means of control except asulam, in the absence of an aerial permit for any other active substance.*

Asulam, applied aerially or as a ground-based application as a follow-up treatment where re-growth occurs, has been used extensively and there is evidence of the effectiveness of asulam in these circumstances.

b) Amidosulfuron

Amidosulfuron has shown the most potential as an alternative to asulam and the Bracken Control Group has conducted research on its suitability applied as a ground-based application and more recently as an aerial application.

Under the previous applications (COP 2020/01796 & COP 2021/02343) the authorisation holder and the applicant have provided data which indicates that amidosulfuron gives acceptable levels of control of bracken, although control is not as high or as prolonged as the control from asulam. This work also indicated that the optimum timing of amidosulfuron is early in the season (May-June), compared to July-August for asulam and that at the optimum timing and at the authorised dose amidosulfuron does have the potential to achieve moderate to good control of bracken over a three-year period when applied as a ground applied spray.

In the previous 2022 application under Article 53 work was ongoing on the aerial application of amidosulfuron, with further ground-based application trials sites and one large aerial trial site started in the summer of 2021.

Under this application the applicant has summarised the results of this work. The summary report concludes that:

- Amidosulfuron has a higher level of efficacy on bracken when applied to the soil, not the foliage.
- The impact of amidosulfuron is greatest when the root hairs of the bracken plant are most developed.
- As a result of the above two features, foliar application of amidosulfuron has much less impact than when applied to the soil. Therefore:
- Application by helicopter, which achieves less canopy penetration, has less impact than ground-based application.
- Application when the canopy is fully extended (the best time for foliar treatment with asulam) is not the most effective time for application of amidosulfuron.
- Greater efficacy using amidosulfuron is achieved if it is applied earlier in the season when a higher proportion of the active ingredient (ai) will reach the soil and the root-hairs.

The trials at Lowna on the North York Moors, in 2021, included aerial sprays of amidosulfuron at 45g a.s./ha and asulam at 4.4 kg a.s./ha as well as ground based sprays. Trials at Dumfries, Fawdon (Northumberland) and Challacombe (Devon) between 2015 and 2020, focussed on ground-based applications of amidosulfuron at 45g a.s./ha with early and late applications (mid/late June and end July / early August).

The bespoke aerial trials at Lowna, in 2021, applied amidosulfuron at 45 g a.s./ha from a helicopter boom fitted with Pencil Jet nozzles. The results of this work were fully assessed in August 2022.

The applicant has stated that the mean canopy cover of amidosulfuron treated plots was 38% in June 2022 and by August 2022 the mean canopy cover was 66%, frond height was at >80% of pre-spray and stipe density was >85% of pre-spray, stating that it is now very difficult to differentiate the amidosulfuron treated plots from surrounding unsprayed beds apart from its overall height, which is still about 15% lower than the unsprayed bracken. This is in contrast to the two adjacent aerial plots treated with 11l/ha Asulox (4.4kg a.s./ha) and sprayed at the same time. This is shown visually in Image 3 in the summary of the trials conducted. The applicant has concluded that this has demonstrated that aerial application of amidosulfuron at the maximum authorised dose is not effective in controlling bracken, either as a short-term, one off application or as part of a long-term control strategy.

In terms of ground based application it has been recorded that there is wide variation in the efficacy of amidosulfuron by any of the ground-based methods (mainly lances with various large droplet nozzle attachments) measured by frond response 12 months post spraying. Frequently, plots in the same trial area, apparently under identical soil, aspect and management history profiles showed a very large range of recovery.

For example at Fawdon, where there are two blocks of trials <50m apart apparently on identical edaphic (soil) and environmental conditions with identical management history, responses range from very poor to excellent. The plots were all sprayed at the same time in 2015 with no subsequent follow-up or other intervention.

Plots on area A had a clearance with 100% frond reduction in 2016 and less than 5% recovery in 2020 at the end of the trial. During post-trial monitoring in August 2022, the canopy cover was still less than 9%.

On area B frond cover was at 28% at 1-year post-spraying, increasing to 63% at the 2-year point and 95% by year three. The plots cannot be detected on the ground now.

This variability was initially evaluated based on the openness of canopy / timing of application in the early part of the growing season.

Further investigation of the pre-spray rhizome condition has been carried out. In late August / early September 2022, 62 paired plots, where asulam and amidosulfuron have been applied since the start of Phase 2 of the NBCCT in 2020, were assessed against baseline data.

The assumption of the applicant was that asulam as a systemic herbicide is primarily absorbed and translocated basipetally (from the foliage to the base of the plant). Ground absorption via root hairs is a secondary pathway. By contrast, amidosulfuron is absorbed primarily through root hairs in the soil with only secondary uptake through foliage in the growing stage. Therefore, primary translocation is acropetal (from the base up).

This is not supported by the evidence on the mode of action of amidosulfuron when the active substance was first approved (ACP paper, 1993) where it states that amidosulfuron is taken up by the leaves and roots with both acropetal and basipetal translocation.

The factors affecting the variability in control from amidosulfuron are therefore likely to be a combination of both the uptake by leaves and by roots and the efficacy of amidosulfuron may be more affected by these factors than asulam.

The paper by Le Duc, Pakeman and Marrs (2003)[5] does, however, suggest that 'it is essential to take into account the rhizome system within a control strategy' and that 'it appears that a small amount of effort is needed for control if the bracken is in a low productivity state' and 'more vigorous treatment might be counterproductive, inducing a damage-response mechanism.' By contrast 'Highly productive bracken appears to be resilient to damage at any level of treatment and requires a great amount of effort to reduce its productivity'. The paper does indicate that this hypothesis remains to be tested.

In the summary of trials reports the applicant did give a summary of pre-spray root hair data and there was considerable variation.

Of the 62 asulam plots, 26 had complex, extensive systems and 36 had simple, weak systems. A year after spraying there was little change in the basic structure of the root hairs although other parameters in the rhizomes themselves did show change / damage. The frond 'kill' was uniformly good on all 62 plots with an overall mean of 4 to 5% frond cover the (from 100% pre-spray). There was no obvious link to the pre-spray root hair patterns with any specific variations due to local conditions. The pre-spray assessment of the 62 amidosulfuron sites recorded 30 with extensive root hair systems and 32 with poor systems. Taking all sites together the mean canopy cover was 27% one year after treatment with a very high SD of 16.8 (by contrast asulam was 2.4). However, if the poor root hair plots are considered separately, the mean frond cover at one-year post spray was 43% with an SD of 32.1. The complex root plots grouped together had a mean canopy cover of 6% with an SD of 2.8.

The applicant has concluded that the much higher rate of control with amidosulfuron on plots with well-developed root hairs is a direct result of the absorption capability from the soil. However in reality it may be more complex in that those sites with low numbers of root hairs may also be growing less actively, therefore also affecting leaf uptake.

The applicant has also stated that once amidosulfuron has been used, all rhizome / root hair systems become simplified and therefore will not be receptive to further use of amidosulfuron until / if the structures regenerate (an unknown). This is based on the presumption of predominantly uptake by the roots.

Many of the trials reports summarised in Annex C are in draft and have not been submitted to CRD. In the absence of the detailed trials reports it is not possible to consider the full range of trials conditions, and the factors which may be affecting the efficacy of amidosulfuron, when applied aerially.

It is noted in the ADAS Report on 'Comparative assessment of risks to non-target plants and soil invertebrates and soil persistence of two bracken herbicides: asulam and amidosulfuron' that the 'data from the National Bracken Chemical Control Trials is extensive, and a valuable asset, and the authors would recommend a full assessment of the raw data by an independent source.'

This is supported.

Under the previous Article 53 application, concerns were raised about the impact of amidosulfuron on non-target species. It is this that led to the restriction of use of 'Asulox' only to nature conservation areas for the ground-based use. The applicant has requested under this application that the ground-based use restriction to conservation or agri-environment scheme areas should be removed, including in forestry. The applicant continues to argue that

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[5] Duc, M.G.L., Pakeman, R.J. and Marrs, R.H. (2003), Changes in the rhizome system of bracken subjected to long-term experimental treatment. Journal of Applied Ecology, 40: 508-522.

amidosulfuron is substantially worse for non-targets than asulam, and that on this basis ground-based use of asulam should be authorised under all situations, not just in conservation areas. The ADAS report does note that 'When used in Norway, amidosulfuron treatment was withdrawn due to its failure to control bracken'.

A review of alternative herbicides for bracken control was commissioned by Natural England in 2022 (ADAS 2022) – this focussed on asulam and amidosulfuron but referred to results from the National Bracken Chemical Control Trials (NBCCT) commenced in 2012. The trials compared the bracken control effectiveness and other impacts of a range of chemicals that included: amidosulfuron, asulam, metsulfuron-methyl (both ground and aerial application) and glyphosate (ground only). These assessments covered frond and rhizome biometrics, non-target plant species, soil invertebrates and soil residues.

This review considered the:

1) available evidence for selectivity against non-target plants / spectrum of weed control efficacy for the two herbicides (amidosulfuron and asulam)

2) evidence on the comparative toxicity of asulam and amidosulfuron to soil micro and mesofauna and

3) available evidence for soil persistence of the two herbicides.

Conclusions were that:

- Asulam gave more consistent, longer-term control of bracken – amidosulfuron was more efficient if applied earlier in the growth season, with associated greater impacts on non-target species.
- Asulam was less persistent in the environment than amidosulfuron (though there is little evidence on the latter), with amidosulfuron having a much longer half-life in the soil than asulam (moisture and temperature dependent).
- In the field, bryophytes were more sensitive to amidosulfuron than asulam. Non-target pteridophytes were sensitive to both herbicides.
- Coarse grasses (not generally desirable in conservation sites) were better controlled by asulam than amidosulfuron and some species of trees appeared more sensitive to asulam than amidosulfuron, dependent on the time of application. Broad-leaved non-target species were generally more sensitive to amidosulfuron. However, in all cases, data was limited, and in amidosulfuron largely limited to consideration of arable crops rather than native ecosystems.
- Soil meso-fauna was significantly reduced in soil treated with amidosulfuron, with no significant reduction in soils treated with asulam.

This would appear to support the SNCBs current view that amidosulfuron would not be consented for use on designated sites (SSSIs/ SACs/SPAs/ Ramsar sites) for bracken control except on geological sites where there are no biological features of interest. The SNCBs are also concerned that if asulam were not available for use in the UK, land managers would choose to use glyphosate. It is clear that glyphosate is being promoted for bracken control (see point c) below).

c) Glyphosate

There is only one other chemical based approach and that is the use of glyphosate. This can be used successfully in a weed wiper, where access allows. It can also be used as an overall spray to treat a dense stand of bracken where there is little chance of impact on non-target species but use in this way is only possible in very limited circumstances. It is not suitable for use by aerial application, due to the potential non-target effects. However, there is evidence that glyphosate decreases the total carbohydrate content of the bracken storage rhizomes. Bayer do promote the use of glyphosate for the control of bracken as a ground based application (22-bracken-control-technical-bulletin-final-email (1).pdf).

d) Other herbicides

It is noted that in Annex C that the product ‘Genoxone’ is being studied as a ground based application. This product contains 2,4-D and triclopyr and is authorised in grassland for the control of Brambles (*Rubus sp.),* Nettle (*Urtica dioica*), Docks (*Rumex sp*.) and Creeping thistle (*Cirsium arvense*). The applicant states that ‘very good bracken control results have been obtained under confined ‘garden’ conditions. It was included in this trial to provide an efficacy and safety assessment on bracken in a field situation.’ Note, however, that there is little published evidence to support these active substances for bracken control, despite them being on the market for many years and any references there are suggest that they are not effective with ‘triclopyr and fluroxypyr caused epinasty of fronds initially but there was healthy regeneration the following year.’ Although not on the label Corteva indicate that Forefront T (aminopyralid) gives useful suppression of bracken.

However, all of these ‘hormone type’ herbicides are expected to have even greater non-target impacts than amidosulfuron.

Summary

Overall, in terms of ‘reasonable means’ there are a number of physical means of control and these can be highly effective. Many published papers indicate that these can be the most effective means of control, where this is possible.

However, using only physical methods to tackle large bracken beds may not be possible on all sites due to site topography which can restrict access by vehicles and the associated potential risks to any labour conducting such operations. In addition, many of the physical methods can lead to substantial non-target effects. Livestock grazing and trampling can also be a useful additional method of control but there are issues of bracken toxicity to livestock if consumed, and again non-target effects. The physical control methods also require long term commitment in terms of labour etc. of many years.

In terms of herbicides where bracken stands are extensive, and location precludes access, then initial aerial applications are required. Currently no alternative herbicides are authorised for use by aerial application.

The Bracken Control Group suggests that, based on its most recent work, application of amidosulfuron by helicopter, which achieves less canopy penetration, has less impact than ground-based application; and that amidosulfuron at the maximum authorised dose is not effective in controlling bracken, either as a short-term, one off application or as part of a long-term control strategy.

They have also noted that there is a wide variation in the efficacy of amidosulfuron when applied as a ground based application. The ADAS report notes that ‘When used in Norway, amidosulfuron treatment was withdrawn due to its failure to control bracken’.

There is some evidence to suggest that amidosulfuron at the authorised dose causes some effects on certain tree species, particularly broad-leaved species, although the studies submitted to date by the applicant, and evaluated previously, have been in forest nurseries and not in the final planting position. However, research by Stokes and Willoughby (2007[6]) and Dixon, Clay and Willoughby (2006[7]) does suggest that there may be impacts on certain tree species, particularly at flushing in May. This may correspond to the optimum time of application for bracken control. Under the previous application further research on the tree species sensitivity to amidosulfuron to support a permanent solution was being conducted by Forest Research. The final data are available and will be analysed early in 2023 although it may be summer 2023 before the full report is available. This data was not submitted for consideration in the this application.

As noted above, a review of alternative herbicides for bracken control was commissioned by Natural England in 2022 (ADAS 2022) – this focussed on asulam and amidosulfuron but referred to results from the National Bracken Chemical Control Trials (NBCCT) commenced in 2012. This review considered the

1) available evidence for selectivity against non-target plants / spectrum of weed control efficacy for the two herbicides (amidosulfuron and asulam)

2) evidence on the comparative toxicity of asulam and amidosulfuron to soil micro and mesofauna and

3) available evidence for soil persistence of the two herbicides.

Conclusions were that;

- Asulam gave more consistent, longer-term control of bracken – amidosulfuron was more efficient if applied earlier in the growth season, with associated greater impacts on non-target species.
- Asulam was less persistent in the environment than amidosulfuron (though there is little evidence on the latter), with amidosulfuron having a much longer half-life in the soil than asulam (moisture and temperature dependent).
- In the field, bryophytes were more sensitive to amidosulfuron than asulam. Non-target pteridophytes were sensitive to both herbicides.
- Coarse grasses (not generally desirable in conservation sites) were better controlled by asulam than amidosulfuron and some species of trees appeared more sensitive to asulam than amidosulfuron, dependent on the time of application. Broad-leaved non-target species were generally more sensitive to amidosulfuron. However, in all cases, data was limited, and in amidosulfuron largely limited to consideration of arable crops rather than native ecosystems.
- Soil meso-fauna was significantly reduced in soil treated with amidosulfuron, with no significant reduction in soils treated with asulam.

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[6] Tolerance of young trees to foliar acting herbicides, Aspects of Applied Biology 82, 2007 Vegetation Management

[7] Evaluation of the selectivity of herbicides as potential replacements for atrazine in forestry, Scottish Forestry, Vol 60, No 3, 2006 (https://www.forestresearch.gov.uk/documents/253/vegetation_mgt_2006_atrazine_9HWGyaA.pdf)

	In summary, where it is possible to do so, cutting is an effective control measure, although it is expensive and labour intensive. Where access precludes this some form of herbicide application is required, typically an aerial application, followed up with a ground based application. Glyphosate is effective but is not authorised for use by aerial application. It does, however, remain an option for ground-based application although where used the effects on non-target flora are likely to be significant. Amidosulfuron remains the most promising herbicide for bracken control both by aerial application and ground application. However based on all of the work conducted, optimising its effectiveness may require additional refinement, particularly if the results of the submitted trials are validated. It is also the case that where it has been used elsewhere, e.g. Norway, its use has been withdrawn on the basis of inadequate effectiveness. Nonetheless it is still the only viable alternative. **ADAS has recommended an independent review of all of the NBCCT control data and this recommendation should be pursued. However, the ADAS Report commissioned by Natural England also appears to confirm the view that amidosulfuron will have higher non-target effects than asulam.** Overall, there are insufficient other reasonable means of control.
Limited Use	A more formal stewardship programme has been proposed for consideration as part of the proposed review of bracken and its control (Annex D). It is possible that further conditions and restrictions could be agreed as part of the review process, if this contributes to a long-term agreement for the use of asulam. The applicant has estimated that the treated area in 2023 will be approximately 7500 ha. Use is monitored by the Bracken Control Group who collect and collate records from the users of asulam (Annex I – Areas Treated). A total area of 7608 ha was treated in 2022, compared to 8103 ha in 2021. This comprises applications made by helicopter (56%, 4273 ha) and ground-based equipment (44%, 3335 ha). In line with previous Article 53 applications, end-users were asked to submit details of where asulam was applied during the 2022 bracken control season. Reports were received from all areas sprayed by helicopter. There is more work to be done to obtain full details from ground-based application – the return rate was about 60%. This is lower than that reported in 2021. 93% of the treated area was in the uplands, 7% in lowland areas and although not stated separately 396 ha of woodland were sprayed. The majority of applications were made to heathland areas. 73% of the total treated land was within a conservation designated site. In 2020 75% of the treated land was within a designated site and in 2021 this was 67%. This means that most of the use will be restricted to those sites that are designated under the schemes highlighted above, averaging over the last 3 years to approximately 70%. Use will be further limited geographically to predominantly those areas at the margins between upland and lowland moorland/heathland and other land.

	Limitation will also be temporally as the use of asulam is between 1st July and 11th September with the optimum timing after full frond expansion, but before tip die-back. Guidance is provided to users advising the optimum timings for application to maximise product effectiveness. **The applicant has provided sufficient evidence to demonstrate that use will be limited.**
Controlled Use	Aerial application accounted for 56% of applications in 2022, 55% of applications in 2021 and 61% of applications in 2020. In 2022 all aerial spraying was carried out by one company. All aerial applications must be conducted in line with an Application Plan and must be permitted in accordance with the guidance at Aerial spraying permitting arrangements (hse.gov.uk). In addition, use of a professional pesticide requires the user to have gained qualifications in its use, e.g., PA1 to PA6 and PA7 (for aerial spraying operators). As a statutory consultee for aerial spraying operations near SSSIs, the Conservation Agencies advise on mitigation in such areas from specific risks to protected habitats and sensitive species. Furthermore there were specific restrictions on the Article 53 authorisation in 2022, including the following “to protect mammals, application is not allowed where the hazel dormouse is known to breed”. This restriction applied to asulam application from the air and ground. Agri-environment scheme options continue to be important to facilitate bracken control both within and outside SSSIs. The Conservation Agencies have supported the inclusion of bracken control options within existing agri-environment schemes and provide advice on those under development. Use will also be controlled through the stewardship programme operated by the Bracken Control Group. This includes a communication plan outlining the nature of the authorisation and its conditions of use. There are plans for an updated stewardship plan as part of a wider bracken control strategy. In addition, monitoring is in place through an Asulam Application Records form which is circulated to all distributors to issue to purchasers of Asulox. The printed form was also available as a download from the BCG website and an online version was also set up to facilitate returns. As part of this Applications Record Form, purchasers were required to provide details of their use of Asulam to the Bracken Control Group. Distributors and contractors have been assisting with accounting for sales and the return of forms. In 2022 the response rate was around 60%. The records have been collated and are included at Annex H (Areas Treated) of the application. The Bracken Control Group are also planning to promote an Integrated Pest Management approach to the development of a bracken control plan or strategy. This will aim to ensure that pesticide control is only used where other techniques are not possible or appropriate.

<table>
<tr><td></td><td>The applicant has provided sufficient evidence to demonstrate that use will be controlled.</td></tr>
<tr><td>Repeat Applications</td><td>Following the previous application the following requirements were put in place;

<u>Residues</u>:

• Further data to address the consumer risk assessment are required from UPL Europe Ltd and must be submitted to enable the consideration of a further application for this use. The applicant must liaise with UPL to ensure that these data are submitted with the next application for this use.

<u>Residue field trials for grassland and storage stability of residues</u>
Either:
a. Sufficient justification of the above available grassland trials, by addressing whether residues are sufficiently stable in these trials, for the trials data to be able to be relied upon quantitatively. Currently this situation is uncertain based on the data available. The currently available grassland freezer storage stability data indicate that asulam-related residues are not stable in the samples and therefore there is uncertainty in the assessment of the available grassland residues trials. It is likely that new adequate storage stability data tailored to freezer storage of whole plant samples (prior to homogenisation) using an appropriate time series relevant to the storage conditions in the grassland residues trials would be needed to support use of the existing grassland trials, and the success of this avenue depends on the results obtained (due to the issue of instability that has been observed to date in grassland residue samples).
Or:

b. New residue trials conducted at the proposed GAP on grassland, where residues are extracted and analysed immediately/as quickly as possible after sampling. These trials must be conducted in accordance with the guidance document SANCO 7525/VI/95 - rev.10.3 (13 June 2017) and the relevant OECD guidelines and guidance documents as listed in Commission Communication 2013/C 95/01. All relevant crop samples must be analysed and residue levels determined using the correct residue definitions (for risk assessment and monitoring, as advised in EFSA Conclusion of asulam, 2018 (addressing pentose as well as hexose conjugates as asulam for ‘sugar conjugates of asulam’)) using a validated method of analysis. The validation data should be generated in accordance with SANTE 2020/12830 rev. 1 and the OECD guidance document on “Pesticide Residue Analytical Methods” (OECD, 2007).

• <u>Ruminant feeding studies:</u>

Ruminant feeding studies should be submitted on the magnitude of residue levels of asulam and acetyl sulphanilamide in ruminant animal products in accordance with the relevant OECD guidelines and guidance documents as</td></tr>
</table>

	listed in Commission Communication 2013/C 95/01. Consideration should be given to the substances that the animals should be dosed with in the feeding studies (asulam or asulam plus other feed item residues of asulam to address the potential exposure to animals). All relevant samples must be analysed using a validated method of analysis; the validation data should be generated in accordance with SANTE 2020/12830 rev. 1 and the OECD guidance document on “Pesticide Residue Analytical Methods” (OECD, 2007); it would be preferable for residues to be extracted and analysed immediately/as quickly as possible after sampling; if samples are stored prior to analysis, supporting freezer storage stability data will also be needed. It should be noted that for standard authorisation, an MRL application would be required (to raise the MRLs in animal products) and then MRLs guidance must be followed. Further information is available on the HSE website for when a new GB MRL is required [MRLs and import tolerances]. An MRL application form must be submitted and when relevant an ER/RO must be completed. For NI, residue trials must take into account the EU guidance document SANTE/2019/12752. If a new MRL is required for NI, then an application will need to be submitted to an EU MS. Information on the EU process for MRL setting is available here: Maximum Residue Levels | Food Safety (europa.eu). **These residues data requirements have not been met.** **<u>Toxicology</u>** • Further data to address the endocrine disruption potential of asulam regarding the T-modality are required from UPL Europe Ltd and must be submitted to enable the consideration of a further application for this use. The applicant must liaise with UPL to ensure that these data are submitted with the next application for this use. In order to reach some assurance regarding the ED potential of asulam regarding the T-modality, the applicant should provide data investigating the proposed MoA (TPO assay) as well as excluding other potential ED modes of action (i.e., NIS and deiodinase assays). Further investigations to exclude human relevance of the proposed MoA should then be conducted and finally potential developmental neurotoxicity should be addressed. This would allow a conclusion to be reached on the thyroid modality; the E, A and S modalities of the ED assessment should be addressed separately once the T-modality has been excluded. **Toxicology specialist 19/12/2022 (W002072523):** **To perform the full investigations to exclude ED potential for the T modality and the EAS modalities of asulam, it may take possibly another 5-6 years. The company should perform a TPO assay with asulam and submit it as soon as possible. If this is negative, there may be much less work. If this is positive, we may have to conclude that it is an ED and**

maybe see whether the EA is still viable until they generate all sorts of other data to exclude human relevance, developmental neurotoxicity and the EAS modalities.

Stewardship and Monitoring Requirements:

- Records to show ground-based use has occurred only on areas with a statutory conservation designation (such as Sites of Special Scientific Interest or Areas of Special Scientific Interest) or Agri-Environment scheme agreement land, including:
  - Countryside Stewardship
  - Environmental Stewardship
  - Environmental Farming Scheme (Northern Ireland)
  - Agri-Environment Climate Scheme (Scotland)
  - Section 16 of the Environment (Wales) Act 2016 and Welsh Agri-Environment and Rural Development Programme grant schemes where specific agreement for bracken control including the use of 'Asulox' has been made with Natural England, Scottish Natural Heritage, Natural Resources Wales or the Northern Ireland Environment Agency.

It appears from Annex I that ground-based use of asulam was applied predominantly to areas with a statutory conservation designation, except 158 ha (4% of total ground based use).

- Records that land owners have been informed of and have adhered to the 1-month livestock exclusion restriction after the product has been sprayed, and that they have been advised that this is necessary to avoid potential MRL exceedances when placing produce into the supply chain.

- Details of the annual quantity/volume of sales of Asulox from UPL Europe Ltd and their distributors, adjusted for any product that is returned unused. This must be presented separately for aerial use and use in SSSIs/agri-environment areas and forest.

UPL has provided details - see Annex I (Areas Treated), para 4.5.
The same Annex provides a split of the usage between aerial and ground based (SSSIs/agri-environment areas and forest) application.

- Information on an annual basis on the habitats and environments where 'Asulox' is sprayed, and estimations of the quantity/volume of product applied to each habitat/environment.

The Application Records form includes a question about type of habitat; three options are offered: grassland, heathland, woodland. This has allowed a breakdown of the usage by habitat to be assessed. Details are included in Annex I (Areas Treated), Appendix 1.

- Further research on the alternatives to 'Asulox'. In particular, further data on aerial application and efficacy of such applications should be generated to support future applications for authorisation for aerial use of alternative plant protection products and use in conservation areas.

	Amidosulfuron / Asulam product comparison trials that started in July / August 2021 are continuing on the North York Moors. An initial report from this work is available as Bracken Briefing No.18 from the BCG website. A final report will be published after a 12-month survey takes place in summer 2022 but a detailed report is not available at the time of this application. Further reports from the National Bracken Chemical Control Trials are being generated. The 2022 Summary report provides information about the role of bracken root hairs (see above). A trial is in progress to assess the effectiveness for bracken control of a mix of Asulox at half-rate in combination with the drift retardant Validate. Early indications are this there is no loss of effectiveness when compared with full rate Asulox. Further information is available at Annex C. • Further research on non-target species sensitive to amidosulfuron to support a permanent solution. ***ADAS on behalf of Natural England have submitted a "Comparative assessment of risks to non-target plants and soil invertebrates and soil persistence of two bracken herbicides: asulam and amidosulfuron".***
Development of Long-Term Solutions	The Bracken Control Group has presented their research programme. However this application is the 11th of its kind for the control of bracken with asulam. The control of bracken requires a long-term programme and therefore in some ways it might be expected that the development of a long-term solution may also take time, noting the concerns also from the Conservation Agencies (Natural England; Natural Resources Wales, NatureScot and the Department of Agriculture, Environment and Rural Affairs (DAERA), Northern Ireland) regarding supporting any widespread use of alternative products on designated sites. The Agencies want to be satisfied that they do not pose an unacceptable threat to non-target species or soil invertebrates and that these products do not persist in the soil to affect re-establishment of flora. Work is ongoing by the Conservation Agencies to pursue alternative approaches with the Bracken Control Group. The bodies support and are initiating a review of bracken management practices (section 6 of Annex E), to ensure a sustainable, strategic framework for bracken management is followed across the UK. The necessity in some situations to use aerial applications requires an authorisation for any alternative product and that an application by these means is likely to be effective. There is some evidence that this is the case for amidosulfuron but there is also evidence that control is more variable than asulam and that the optimum time of application is earlier in the season, with associated greater impacts on non-target species. The factors affecting the variability in control do not appear to be clear cut. **The ADAS report**

	recommends an independent review of all of the research undertaken as part of the NBCCT and this recommendation is supported by HSE CRD. Finally there is a commitment from UPL to pursue an approval for asulam. The updated peer review for the EFSA conclusion (2021) is available here and it concludes that asulam-sodium is considered to meet the criteria for endocrine disruption for humans for the thyroid (T) modality and a conclusion on the endocrine-disrupting properties of asulam-sodium for non-target organisms could not be made based on the information available. [redacted] Overall, a plan is in place and some progress has been made since the last emergency authorisation. However, as outlined above, the timeframe for this is over 5-6 years for ED alone. HSE considers such a period is unacceptable in the context of the Special Circumstances for an emergency authorisation.
Any Further Consideration	
Resistance	Globally there are no recorded cases of resistance in bracken to herbicides according to the International Survey of Herbicide Resistant Weeds. This may of course be an artefact of the extent to which bracken is a target for herbicide application across the world. However annual weed species have evolved resistance much more often and more quickly than biennial or perennial weed species and cross-pollination appears to be more effective in enabling resistant gene recombination and accumulation, especially for metabolism-based herbicide resistance, compared to self-pollination which can limit the speed and spread of resistance evolution. Overall, therefore the inherent risk of bracken developing resistance is low. However, where other weed species are present these may present a higher risk of resistance development and amidosulfuron, as an ALS inhibitor, would present a higher resistance risk compared to asulam where globally there have been no reported cases of resistance in any weed species. However previous efficacy related phrases continue to be relevant i.e. • Total reliance on one pesticide will hasten the development of resistance. Pesticides of different chemical types or alternative control measures should be included in the planned programme. Alternating with different modes of action is a recognised anti resistance strategy. • Some forestry trees may be susceptible to damage at high rate of asulam. It is not possible to predict the tolerance of all forestry plants to asulam.

1.3 Proposed uses

Crop and/ or situation	**Pests or Group of pests controlled**	**Situation**	**Application method**	**Timing / Growth stage of crop or season**	**Maximum individual dose**	**Water Volume**	**Maximum number of treatments**	**Latest time of application:**	**Buffer Zone**
Grassland, Moorland, Amenity Grassland	bracken (Pteridium aquilinum).	Outdoor	Aerial via helicopter only, Vehicle mounted sprayer, Hand-held sprayer	July to September when rhizomes are in uptake mode.	11 litres product / ha (4.4 kg ai / ha)	Aerial: 44 L/ha Vehicle mounted: 400 - 500 L/ha Hand-Held: 1 part Asulox to 4 parts water	1	12 September in the season of use.	Aquatic and non-target plant: Aerial: 90m DRT only Boom Sprayer: 5m
Forest (pre-planting and in first five years after planting)	bracken (Pteridium aquilinum).	Outdoor	Aerial via helicopter only, Vehicle mounted sprayer, Hand-held sprayer	July to September when rhizomes are in uptake mode.	10 litres product / ha (4.0 kg ai / ha)	Aerial: 44 L/ha Vehicle mounted sprayers: 400 - 500 L/ha Hand-Held: 1 part Asulox with 4 parts water	1	12 September in the season of use.	Aquatic and non-target plant: Aerial: 90m DRT only Boom Sprayer: 5m

Operator protection:
Operators must wear suitable protective clothing (coveralls) and suitable protective gloves when handling the concentrate.
Environmental protection

- To protect aquatic organisms, respect an unsprayed horizontal buffer zone distance to surface water bodies of 90m when spraying from aircraft using low drift nozzles such as RD1000 Pencil Jets or Delavan RD 'Raindrop' type nozzles.
- To protect non-target plants, respect an untreated buffer zone of 5m to non-target environment. HORIZONTAL BOOM SPRAYERS MUST BE FITTED WITH THREE STAR DRIFT REDUCTION TECHNOLOGY. Low drift spraying equipment must be operated according to the specific conditions stated in the official three-star rating for that equipment as published on HSE Chemicals Regulation Directorate’s website.
- To protect non-target terrestrial plants, respect an unsprayed horizontal buffer zone distance to non-target environment of 90m when spraying from aircraft using low drift nozzles such as RD1000 Pencil Jets or Delavan RD 'Raindrop' type nozzles.
- To protect birds, application before 1st July in the season of use is not allowed.
- There is a potentially significant risk to ground nesting birds towards the end of the breeding season.
- Where there is a risk to rare or sensitive species, or where spraying is to take place near a Site of Specific Scientific Interest then advice must be sought from the appropriate conservation agency - Natural England, Scottish Natural Heritage, Natural Resources Wales or the Northern Ireland Environment Agency.
- Spray from a horizontal boom sprayer must not fall within 5m of the top of the bank of any static or flowing waterbody or within 1m of a ditch which is dry at the time of application. Spray from hand-held sprayers must not be allowed to fall within 1 m of the top of the bank of a static or flowing waterbody. Spray must be aimed away from water.

Other specific restrictions

- If applied aerially, it must be by helicopter, and must only be applied using low drift nozzles.
- No person may carry out aerial spraying or cause or permit another person to carry out aerial spraying unless such spraying is authorised by an aerial spraying permit issued by the Chemicals Regulation Division.
- Livestock must be removed from areas to be treated and must not be allowed to return until at least 1 month after treatment.

-When this product is used with adjuvants, it must only be with adjuvants that have a List Entry that permits aerial application in mixture with asulam, and all conditions of the List Entry must be followed.

-If applied aerially by helicopter, this product must only be applied to dense bracken in continuous stands covering a minimum of 80% of the area to be treated.

-A maximum concentration of 1 part product to 4 parts water must not be exceeded when applied as a hand-held spray treatment or aerially by helicopter.

-Application of the product via vehicle mounted and hand-held sprayers must only be carried out on Sites of Special Scientific Interest (SSSI) or other designated conservation areas, areas subject to agri-environment stewardship schemes. Such treatment must only be on the advice, requirements and under the supervision of Natural England, Scottish Natural Heritage, Natural Resources Wales or the Environment & Heritage Service in Northern Ireland. Or in the case of agri-environment areas by direction of the grant paying organisation e.g. the Rural Payments Agency.

Notes	
1	For ornamental plant production give details of whether all ornamentals or specific types e.g. pot grown, soil grown, cut flowers, shrubs etc List individual crops. Do not list crop groups. Use the basic crop terms as set out in the current crop definitions list. Do not use the parent or primary group terms. For renewal and re-registration applications update the crop terms to those currently in the crop definitions list.' crop definitions list.
2	For protected crops describe whether permanent protection, grown in soil or substrate, pots on hard surfaces, bench systems etc. Further information on crop situations can be found on the crop definitions list.
3	This may be a specific number e.g. 1 or a range such as 1-3
4	Individual crops and pests are given an EPPO code for harmonised identification. Please use the following link to obtain the required EPPO code https://gd.eppo.int/
5	The growth stages of crops are categorised using a scale. The following link provides a PDF document containing the growth stages for multiple crops BBCH scale.
6	Novel methods of application must be described in full and include pictures of how they are filled and operated (this can be provided in a separate document).

2 Risk Assessment

2.1 Physical and chemical properties

EVALUATION, SUMMARY AND CONCLUSION BY REGULATORY AUTHORITY	
Name of authority	**Health and Safety Executive**
Reviewer's comments	[redacted] [redacted] It is noted that the active substance is manufactured as a technical concentrate therefore a range for the minimum and maximum asulam-sodium content needs to be proposed as well as the minimum purity on a dry weight basis. Asulam-sodium is not currently an approved active substance in GB or the EU. [redacted] [redacted] [redacted] It is noted that a new submission for asulam-sodium is currently under consideration in the EU. [redacted]

2.2 Mammalian Toxicology

EVALUATION, SUMMARY AND CONCLUSION BY REGULATORY AUTHORITY	
Name of authority	**Health and Safety Executive**
Reviewer's comments	The updated EFSA conclusion (2021) is available here and it concludes that asulam-sodium is considered to meet the criteria for endocrine disruption for humans for the thyroid (T) modality whilst a conclusion on the endocrine-disrupting properties of asulam-sodium for non-target organisms could not be made based on the information available. To aid the decision as to whether the ED potential of asulam-sodium should be a factor in the decision-making process for this Art 53 (Emergency Authorisation) application, the EFSA conclusion, the applicant (UPL)'s response, and the conclusion of HSE are summarized below. **EFSA Conclusion** The updated peer-review of the pesticide risk assessment of the active substance asulam (asulam-sodium) was finalised by EFSA on 13th October 2021. With regard to the endocrine-disrupting potential of asulam-sodium in humans, EFSA considered that the database for the T-modality was complete and concluded that a T-mediated pattern of adversity was seen in both rats and dogs at doses at or below the MTD (Maximum Tolerated Dose), including thyroid follicular cell hypertrophy/hyperplasia (seen in the rat in the 90-day and chronic/carcinogenicity studies and in the 1-year dog study), thyroid epithelial cell whorls (seen in the rat carcinogenicity study) and increased thyroid weight (seen in the rat 90-day study and the dog 90-day and 1-year studies). In a mode of action (MoA) analysis, EFSA postulated thyroid peroxidase (TPO) inhibition as the molecular initiating event, based solely on two in vitro tests from ToxCast. However, in addition, EFSA noted that arylamides and sulphonamides are known TPO inhibitors ([redacted] 1994) and that sulfanilamide is a significant metabolite of asulam in rats. Based on this MoA analysis, EFSA concluded that the ED criteria for the T-modality were met for asulam. There was no indication of EAS (Estrogen-Androgen-Steroidogenesis)-mediated adversity; however, the database was considered incomplete. As EFSA had concluded that asulam-sodium met the ED criteria for the T-modality, further information to address the E, A or S modalities was not required or requested by EFSA. **UPL response to EFSA conclusion** A response to the EFSA conclusion was provided by the applicant (UPL) to HSE on 21st January 2022. UPL disagreed with the conclusions of EFSA and was of the opinion that the conclusion of EFSA (i.e., the ED criteria for the T-modality for humans are met), was not supported owing to an incomplete database. UPL argued that the basis for the EFSA conclusion (i.e., adversity in the thyroid following TPO inhibition) was not valid as it was based solely on mechanistic data from ToxCast, with insufficient details for an independent assessment. EFSA have summarised 6 sets of data from ToxCast that are relevant to the thyroid modality, 3 of which were positive. UPL identified a further 8 negative thyroid related studies in ToxCast). UPL further reported that the 3 positive studies (2 in vitro TPO inhibition tests and 1 in vitro monooxygenase inhibition assay) were conducted with asulam of only 50% purity and that no study on

	asulam sodium or pure asulam are available. UPL has proposed that an in vitro TPO inhibition study should be conducted on pure asulam (accompanied by further work on absorption to contextualise the in vitro concentrations) before a MoA can be fully elucidated. UPL has accepted that it may be possible that asulam is a TPO inhibitor, owing to its close structural similarity to other sulphonamides (known TPO inhibitors); however, UPL also considers that information on human relevance should be further considered, owing to the widespread use of sulphonamides in various human pharmaceuticals. UPL has proposed that further work on human relevance could be provided. **Conclusion of HSE** HSE considers that the database for the T-modality is incomplete and that a decision on the ED-potential of asulam cannot currently be made. On evaluating the available data, HSE considers that the effects in rats are mostly at or above the MTD and are therefore not of concern. HSE considers that only the effects in dogs (hyperplasia/hypertrophy and increased weight observed below the MTD) are of concern. In order to fully elucidate a MoA for the observed effects in dogs, an in vitro TPO inhibition study should be conducted with asulam-sodium. In addition, work to exclude other potential MoAs (e.g., NIS, deiodinase) should be provided. The human relevance of the proposed mode of action should also be investigated. Finally, developmental neurotoxicity should be addressed. Furthermore, if a non-endocrine or non-human relevant MoA can be demonstrated, then the EAS modalities should also be addressed. Endocrine disruption is a hazard-based exclusion criterion under Reg 1107/2009 as it applies in GB. However, when considering risks of thyroid endocrine disruption, HSE notes that the observed thyroid effects (hyperplasia/hypertrophy and increased weight) occur at relatively high doses in rats (from 1327/1651 in M/F after 90-days exposure and from 180/243 in M/F after 2-years' exposure) and dogs (from 300 mg/kg bw/d in M/F after 26-weeks and 1-year' exposure), clearly above the NOAELs driving the reference values (ADI = 0.36 mg/kg bw/d based on the 2-year rat study with an uncertainty factor of 100). Therefore, HSE considers that if risks (rather than pure hazards) were to be taken into account, the present reference values set for asulam-sodium would be highly protective for these effects, whilst the ED potential of asulam is being further investigated. <u>Data requirements</u> In order to reach some assurance regarding the ED potential of asulam regarding the T-modality, the applicant should provide data investigating the proposed MoA (TPO assay) as well as excluding other potential ED modes of action (i.e., NIS and deiodinase assays). Further investigations to exclude human relevance of the proposed MoA should then be conducted and finally potential developmental neurotoxicity should be addressed. This would allow a conclusion to be reached on the thyroid modality; the E, A and S modalities of the ED assessment should be addressed separately once the T-modality has been excluded. **Overall, HSE considers that no conclusion on the ED potential of asulam-sodium can be made at present and is not in agreement with the**

	conclusion of EFSA that asulam is an ED for the T-modality, without performing further investigations. **Toxicology specialist 19/12/2022 (W002072523):** **To perform the full investigations to exclude ED potential for the T modality and the EAS modalities of asulam, it may take possibly another 5-6 years. The company should perform a TPO assay with asulam and submit it as soon as possible. If this is negative, there may be much less work. If this is positive, we may have to conclude that it is an ED and maybe see whether the EA is still viable until they generate all sorts of other data to exclude human relevance, developmental neurotoxicity and the EAS modalities.**

2.3 Non-Dietary Exposure (Operator/Worker/Bystander and Resident)

Evaluation, Summary and Conclusion by The Health and Safety Executive (Chemicals Regulation Division).	
Requirement	**Reviewer's comments**
Conclusion	See assessment under HSE Ref.: COP 2019/01678 (considered by correspondence in October 2019 by the ECP) where the proposed uses were considered to be acceptable. This assessment is copied below. Based on this evaluation, 120-day Emergency use under Regulation 1107/2009 can be recommended for the uses of 'Asulox' proposed by the applicant. The following Operator Protection phrase is required: • Operators must wear suitable protective clothing (coveralls) and suitable protective gloves when handling the concentrate. The maximum concentration for use through hand-held equipment (which under previous emergency authorisations was restricted to 1 part of product to 100 parts of water) can be brought into line with the maximum concentration specified for aerial use (1 part of product in 4 parts of spray solution).
Details of 'Asulox' pertinent to this evaluation	**'Asulox'** **Formulation type**: SL containing 400 g/l asulam (as 438 g/l asulam sodium) **Use**: Herbicide for bracken control in grassland and forestry (aerial and ground-based use) **Application method**: Aerial application (helicopter) using Delavan RD 'Raindrop' nozzles or equivalent Boom sprayer Hand-held sprayer

Maximum individual dose	Grassland: 11 litres of product/ha (4.4 kg/ha asulam) Forestry: 10 litres of product/ha (4.0 kg/ha asulam)
Application volume	Aerial application grassland: 44 litres of spray solution/ha Aerial application forestry: 55 litres of spray solution/ha Boom sprayer grassland: 400-500 litres of spray solution/ha Boom sprayer forestry: 200-300 litres of spray solution/ha Hand-held sprayer: 1 part Asulox:100 parts water (equivalent to a water volume of 1100 litres of spray solution/ha at the maximum dose of 11 litres of product/ha)
Max spray concentration	Aerial application grassland: 100 g asulam/litre of spray solution Aerial application forestry: 73 g asulam/litre of spray solution Boom sprayer grassland: 11 g asulam/litre of spray solution Boom sprayer forestry: 20 g asulam/litre of spray solution Hand-held sprayer grassland and forestry: 4 g asulam/litre of spray solution
Max total dose	One application/year: • Grassland: 11 litres of product/ha (4.4 kg/ha asulam) • Forestry: 10 litres of product/ha (4 kg/ha asulam)
Interval between applications	Not applicable
Time of application	July to September.
Other specific restrictions	From previous authorisation: Applications made via hand-held equipment must be made in a maximum concentration of 1 part product to 100 parts water. From this evaluation: Subject to agreement with other specialists, the maximum concentration for use through hand-held equipment (which under previous emergency authorisations was restricted to 1 part of product to 100 parts of water) can be brought into line with the maximum concentration specified for aerial use (1 part of product in 4 parts of spray solution).
Packaging	From previous authorisations: • 5 to 20 litre HDPE container • 1000 litre HDPE refillable container for use with a closed transfer system
Classification	EU NAS evaluation March 2018: Skin sensitiser (category 1B) Signal word ‘Warning’ with hazard statement H317 ‘May cause an allergic skin reaction’.

<table>
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<tr><td>PPE</td><td>From previous authorisation:
Operators must wear suitable protective clothing (coveralls) and suitable protective gloves when handling the concentrate.
From this evaluation:
Operators must wear suitable protective clothing (coveralls) and suitable protective gloves when handling the concentrate.</td></tr>
<tr><td>Systemic AOEL</td><td>EFSA Conclusion March 2018 (NAS evaluation):
0.46 mg/kg bw/day based on the NOAEL of 46 mg/kg bw/day from the rat multigeneration study based on reduced litter size and using an assessment factor of 100. No correction for oral absorption is necessary as asulam is extensively absorbed from the gastro-intestinal tract (>80% excreted in urine).</td></tr>
<tr><td>Dermal absorption</td><td>EFSA Conclusion March 2018 (NAS evaluation):
0.5% for ‘Asulox’ as the concentrate and 3% for the spray solution based on <i>in vitro</i> data using human skin. The value of 3% for the dilution may be a precautionary value as many of the uses considered in this evaluation involve a more concentrated spray solution (up to 100 g a.s. per litre of spray solution) than that considered in the EU NAS evaluation (ranging from 4 to 12 g a.s. per litre of spray solution).</td></tr>
<tr><td>Vapour pressure</td><td><5 x 10^{-7} Pa at 45˚C</td></tr>
</table>
<p><u>Classification</u></p>
<p>Based on data evaluated in the active substance DAR (EAS and NAS evaluations), both asulam and ‘Asulox’ demonstrate sensitisation potential when tested at high concentrations (50% w/w or undiluted, respectively). Within the positive groups not all animals responded and there was a range of severity of response (grades 1 or 2). No sensitisation studies were carried out on dilutions of the formulated product and the test protocols for asulam and ‘Asulox’ do not permit direct comparisons. When asulam was diluted to 10% for challenge in a maximisation study, the results were below the classification trigger. Based on this finding, the previous evaluation for emergency authorisation (HSE application Ref.:COP 2012/02227) concluded that spray solutions containing 10% w/w or less of the active substance would be unlikely to result in a risk of skin sensitisation.</p>
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<td>Operator exposure</td>
<td><p><u>Vehicle-mounted or trailed boom sprayers.</u></p>
<p>In the previous Article 53 evaluation (under HSE Ref.: COP 2012/02227) the levels of operator exposure resulting from the proposed uses of ‘Asulox’ through vehicle-mounted or trailed boom sprayers were estimated using the UK Predictive Operator Exposure Model (UK POEM). Following the publication of the EFSA ‘Guidance of the assessment of exposure of operators, workers, residents and bystanders in risk assessment for plant protection products’ in April 2015 and its implementation from January 2016, the UK POEM is no longer used for regulatory purposes. Revised operator exposure estimates using the EFSA calculator are summarised</p></td>
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</table>

below and the calculations are presented in the appendix. These estimates are likely to be precautionary because the standard work rate in the EFSA calculator of 50 ha/day is based on field crop spraying and a lower work rate would be expected for the use of boom sprayers in grassland/moorland and forestry situations.

Model data	**Level of PPE**	**Asulam**	
		Total absorbed dose (mg/kg/day)	**% of systemic AOEL**
EFSA calculator: field crop (boom) sprayer application outdoors to low crops (50 ha/day treated)			
Application rate:		4.4 kg a.s./ha (worst case)	
Spray application (AOEM**;** 75th percentile values) Body weight: 60 kg	Work wear mixing/loading and application	0.0445	10%

The EFSA calculator predicts an acceptable level of exposure to asulam for an operator applying ‘Asulox’ through a field crop (boom) sprayer without PPE.

<u>Knapsack and hand-held sprayers</u>.

As for boom sprayers, previous operator exposure estimates for the use of ‘Asulox’ through hand-held equipment were based on the non-harmonised national approaches used before the 2016 implementation date for the EFSA calculator.

Operator exposure estimates using the EFSA calculator for the proposed use of ‘Asulox’ through knapsack and hand-held sprayers are summarised below and the calculations are presented in the appendix.

Model data	**Level of PPE**	**Asulam**	
		Total absorbed dose (mg/kg/day)	**% of systemic AOEL**
EFSA calculator: knapsack sprayer application outdoors to low crops (1 ha/day treated)			
Application rate:		4.4 kg a.s./ha (worst case)	
Spray application (AOEM**;** 75th percentile values) Body weight: 60 kg	Work wear mixing/loading and application	0.0202	4%

Model data	**Level of PPE**	**Asulam**	
		Total absorbed dose (mg/kg/day)	**% of systemic AOEL**
EFSA calculator: hand-held sprayer application outdoors to low crops (4 ha/day treated)			

Application rate:		4.4 kg a.s./ha (worst case)	
Spray application (AOEM**;** 75th percentile values) Body weight: 60 kg	Work wear mixing/loading and application	0.0704	15%

The EFSA calculator predicts an acceptable level of exposure to asulam for an operator applying ‘Asulox’ through hand-held equipment (including knapsack sprayers) without PPE.

Unlike the previous UK POEM estimates (which provided the basis for restricting the maximum in-use concentration for hand-held use), the above EFSA calculator estimates are not influenced by the application volume of the spray solution. In the past, the applicant has argued that the restriction regarding the maximum spray concentration for hand-held uses is impractical, making follow-up control tasks slow and laborious. Based on the updated operator exposure calculations, it is possible to reduce the application volume for hand-held use to achieve the same in-use concentration as specified for aerial use (10% w/v of the active substance which is equivalent to 25% v/v of the product).

Although the applicant has not requested use through hand-held CDA (Controlled Droplet Applicator) equipment and this application method cannot be evaluated using the EFSA calculator, the original evaluation using UK POEM predicted that this application method would result in an unacceptable level of exposure for operators with PPE.

Aerial use.

The only available model for estimating levels of operator exposure resulting from the aerial application of pesticides is the US Pesticide Handlers Exposure Database (PHED). The US EPA has published a list of the relevant exposure values from the PHED (https://www.epa.gov/sites/production/files/2018-06/documents/opp-hed-pesticide-handler-surrogate-unit-exposure-table-june-2018.pdf).

Because HSE does not consider the modelled output of PHED to be sufficiently precautionary for regulatory decision making, the original evaluation under HSE application Ref.: COP 2012/02227 used the PHED values in a comparative risk assessment in combination with UK POEM. To update the evaluation, the comparative risk assessment has been based on the EFSA calculator.

The relevant published surrogate exposure values from PHED are summarised below.

Dataset: Mixer / Loader, Liquids				
Exposure route	Protection	Statistic	Unit exposure (µg/ US lb a.s.)	Unit exposure (µg/ kg a.s.)*
Dermal	Single layer No gloves	Mean	220.0	485.012
Inhalation	No RPE	Mean	0.219	0.483

* 1 kg = 2.2046 US lbs

Dataset: Applicator, Aerial, Fixed-wing, Liquids*				
Exposure route	Protection	Statistic	Unit exposure (µg/ US lb a.s.)	Unit exposure (µg/ kg a.s.)**

Dermal	Closed cockpit	‘Best fit’	5.0	11.023
Inhalation	Closed cockpit	‘Best fit’	0.068	0.150

*Although the aerial application contractors operating in the UK all use helicopters, PHED surrogate exposure values are published only for fixed-wing aircraft.
** 1 kg = 2.2046 US lbs

Dataset: Applicator, Ground boom				
Exposure route	Protection	Statistic	Unit exposure (µg/ US lb a.s.)	Unit exposure (µg/ kg a.s.)**
Dermal	Closed cab*	‘Best fit’	5.1	11.243
Inhalation	Closed cab*	‘Best fit’	0.043	0.095

*Considering the various options for field crop sprayers in the PHED database, these data for closed cab situations provide the lowest surrogate exposure values. The use of these values in a comparative exposure assessment will therefore be precautionary.
** 1 kg = 2.2046 US lbs

These surrogate exposure values indicate that, when the same amount of active substance is applied, aerial spraying will result in similar exposure levels to those resulting from ground-based boom spraying (aerial use is predicted to result in slightly lower levels of dermal exposure but slightly higher levels of inhalation exposure than boom spraying).

The original evaluation assumed comparative work rates of 50 ha/day for a field crop sprayer (UK POEM standard assumption which is the same value used in the EFSA calculator) and 500 ha/day for aerial sprayers (i.e. 10x higher than that for boom sprayers). However, based on data submitted in support of permit applications for the aerial application of ‘Asulox’, work rates for aerial use appear to be not as high as the 500 ha/day anticipated for aerial sprayers.

The number of permits issued in recent years from 2019-2022 vary between 68-128 permits for treatment of between 4000-8000 hectares (see table below). Based on these figures and the assumption that one permit is equivalent to one working day, theoretical work rates vary from 47 to 112 ha/day. It should be noted that these figures are not exact, as spraying events may not proceed even when a permit is issued.

Year	**Total permits issued**	**Hectarage**	**Theoretical work rate ha/day**
2017	212	~5000	24
2018	158	6000-6500	38-41
2019	128	6000-6500	47-51
2020	73	4000	55
2021	80	8000	100
2022	68	7600	112

As the PHED exposure values for aerial use are similar to the corresponding values for ground-based boom sprayers, the operator exposure estimates for field crop sprayers presented above are likely to also cover aerial use. Taking a conservative estimate of a 100 ha/day work rate, twice the comparative work rate of 50 ha/day for a field crop boom sprayer, this would result in twice the estimated dermal and inhalation exposure. Based on the PHED exposure values presented above and the EFSA calculator estimates for field crop boom sprayer, the exposure values for dermal and inhalation exposure will still be within acceptable limits.

This comparative risk assessment is precautionary because, for aerial uses, the mix/load and application tasks are always undertaken by different individuals (ground crew and pilots, respectively) whereas the EFSA calculator assumes that a single operator handles the concentrate and applied the spray solution.

Operator exposure conclusion

The proposed uses of ‘Asulox’ through aerial, ground-based and hand-held sprayers are predicted to result in an acceptable risk to operators.

Subject to agreement risk assessment areas, the maximum concentration for use through hand-held equipment (which under previous emergency notices was restricted to 1 part of product to 100 parts of water) can be brought into line with the maximum concentration specified for aerial use (1 part of product in 4 parts of spray solution).

Based on the exposure calculations and considering the classification of ‘Asulox’ with respect to human health effects, the following operator protection phrase is required.

- ‘Wear suitable protective clothing (coveralls) and suitable protective gloves when handling the concentrate’

Bystander and resident exposure

Previous bystander and resident exposure estimates for ‘Asulox’ were based on the non-harmonised national approaches used before the 2016 implementation date for the EFSA calculator.

An acute (bystander) risk assessment is not required for plant protection products that do not have significant acute toxicity or the potential to exert toxic effects after a single exposure. For non-acutely toxic compounds, the average exposure over a longer duration will take into account the higher exposures on some days, which will be offset by lower exposures on other days, and, therefore, the exposure assessment for residents also covers bystander exposure.

Ground-based spraying.

Resident exposure estimates using the EFSA calculator for the proposed use of ‘Asulox’ are summarised below and the calculations are presented in the appendix.

Estimated resident exposure (longer term exposure)

Model data		**Asulam**	
		Total absorbed dose (mg/kg bw/day)	**% of systemic AOEL**
EFSA calculator: field crop (boom) sprayer application outdoors to low crops Buffer zone: 2-3 m Drift reduction technology: no DT_{50}: 30 days DFR: 3 µg/cm^2/kg a.s./ha Interval between treatments: 365 days			
Number of applications and application rate:		1 x 4.4 kg a.s./ha (worst case)	
Resident child Body weight: 10 kg	Drift (75th percentile)	0.0181	4%
	Vapour (75th percentile)	0.0011	0.2%
	Deposits (75th percentile)	0.0055	2%

	Re-entry (75th percentile)	0.0315	7%
	Sum (mean)	0.0195	4%
Resident adult Body weight: 60 kg	Drift (75th percentile)	0.0043	1%
	Vapour (75th percentile)	0.0002	0.05%
	Deposits (75th percentile)	0.0009	0.2%
	Re-entry (75th percentile)	0.0020	0.4%
	Sum (mean)	0.0023	1%

The EFSA calculator predicts an acceptable level of resident exposure to asulam from the proposed ground-based uses of ‘Asulox’.

Bystander exposure to spray drift - aerial application

The ‘Asulox’ label referred to for previous Article 53 use under HSE application Ref.:COP 2018/01816, states that aerial application should be made using helicopters equipped with Delavan RD ‘Raindrop’ nozzles or their equivalent. Large-scale trials carried out by the manufacturers of ‘Asulox’ in 1997 indicated that the use of these nozzles when applying ‘Asulox’ by helicopter resulted in a significantly lower level of spray drift than that measured when using conventional nozzles. Based on this information, general guidance on aerial application produced by the Environment Agency (EA) / Scottish Environment Protection Agency (SEPA) specifies buffer zones to protect drinking water of 160 m for conventional nozzles and 50 m for the Delavan RD ‘Raindrop’ nozzle. The same buffer zones are also specified by Natural England (NE), Scottish Natural Heritage (SNH), CCW (water consumers independent representative) to protect sensitive habitats and conservation areas. Based on this information it is likely that the level of bystander exposure to spray drift will also be reduced using these nozzles in comparison to conventional nozzles.

As a precautionary approach, bystander exposure to spray drift resulting from the proposed aerial use of ‘Asulox’ has been estimated using:

- The ‘flagger’ (ground marker) data from PHED
- Bystander exposure data (ECPA calculator) relating to the use of broadcast air-assisted (orchard) sprayers

The surrogate exposure values for ground markers from PHED are summarised below.

Dataset: Flagger, Liquids				
Exposure route	Protection	Statistic	Unit exposure (µg/ US lb a.s.)	Unit exposure (µg/ kg a.s.)*
Dermal	Single layer No gloves	‘Best fit’	11.0	24.251
Inhalation	No RPE	‘Best fit’	0.35	0.772

* 1 kg = 2.2046 US lbs

Assuming a standard (and precautionary) work rate of 50 ha/day, the proposed aerial use of ‘Asulox’ will involve the application of 220 kg of asulam. On this basis, ground marker exposure is calculated to be as follows.

Active substance	Asulam
Dermal exposure	5.335 mg/kg bw/day
Inhalation exposure	0.170 mg/kg bw/day

Systemic exposure*	0.0055 mg/kg bw/day
AOEL	0.46 mg/kg bw/day
% of AOEL	1%

*Assuming a dermal absorption of 3% for asulam in the spray solution and a body weight of 60 kg.

As an alternative approach, resident exposure can be estimated using the EFSA calculator for broadcast air-assisted (orchard) sprayers and assuming, as a worst case, minimal crop interception (early crop without leaves) and a 5m buffer zone. In reality, aerial application is not permitted in close proximity to residential property. This estimate is summarized below and the calculations are presented in the appendix.

Estimated resident exposure (longer term exposure)

Model data		**Asulam**	
		Total absorbed dose (mg/kg bw/day)	**% of systemic AOEL**
EFSA calculator: broadcast air-assisted (orchard) sprayer application outdoors to high crops Buffer zone: 5 m Drift reduction technology: no DT_{50}: 30 days DFR: 3 μg/cm^2/kg a.s./ha Interval between treatments: 365 days			
Number of applications and application rate:		1 x 4.4 kg a.s./ha (worst case)	
Resident child Body weight: 10 kg	Drift (75th percentile)	0.4319	94%
	Vapour (75th percentile)	0.0011	0.2%
	Deposits (75th percentile)	0.0155	3%
	Re-entry (75th percentile)	0.0223	5%
	Sum (mean)	0.3166	69%
Resident adult Body weight: 60 kg	Drift (75th percentile)	0.2343	51%
	Vapour (75th percentile)	0.0002	0.05%
	Deposits (75th percentile)	0.0025	0.6%
	Re-entry (75th percentile)	0.0124	3%
	Sum (mean)	0.1657	36%

The PHED and EFSA calculator estimates predict an acceptable level of resident exposure to asulam from the proposed aerial use of ‘Asulox’.

Worker exposure

Although no re-entry tasks are required involving contact with treated bracken, it is possible that members of the public could walk through treated areas. Exposure in this situation has been estimated above using the EFSA calculator (resident re-entry exposure).

This estimate (which, for the re-entry aspect, covers all application methods) predicts that the proposed use of ‘Asulox’ will result in acceptable levels of systemic exposure to asulam for an unprotected member of the public entering a treated area.

2.4 Residues and consumer exposure

EVALUATION, SUMMARY AND CONCLUSION BY REGULATORY AUTHORITY	
Name of authority	**Health and Safety Executive**
Reviewer's comments	This is the 11th application for emergency use of Asulox to control bracken, in upland moorland/grassland areas and forestry, via both ground and aerial application. The applicant requests that the ground-based uses restriction to conservation or agri-environment scheme areas should be removed and requests removal of the 1-month livestock exclusion period previously set on residues grounds. The last three residues assessments for emergency use of Asulox to control bracken are available at HSE internal reference W001918642 (COP 2019/01678), W001983515 (COP 2020/01796), and W002028448 (COP 2021/02343). Under COP 2019/01678 the residues assessment proposed data requirements to ensure that the residues assessment could be concluded with reduced uncertainty. Data were submitted under COP 2020/01796, however these data were deemed to not alter the conclusions of the previous assessment and the data requirements remained in place as follows: 1. Residue field trials for grassland and storage stability of residues Either: a. Sufficient justification of the available grassland trials (submitted under COP201901678), by addressing whether residues are sufficiently stable in these trials, for the trials data to be able to be relied upon quantitatively. Currently this situation is uncertain based on the data available. The currently available grassland freezer storage stability data indicate that asulam-related residues are not stable in the samples and therefore there is uncertainty in the assessment of the available grassland residue trials. It is likely that new adequate storage stability data tailored to freezer storage of whole plant samples (prior to homogenisation) using an appropriate time series relevant to the storage conditions in the grassland residues trials would be needed to support use of the existing grassland trials, and the success of this avenue depends on the results obtained (due to the issue of instability that has been observed to date in grassland residue samples). Or: b. New residue trials conducted at the proposed GAP on grassland, where residues are extracted and analysed immediately/as quickly as possible after sampling. These trials must be conducted in accordance with the EU guidance document SANCO 7525/VI/95 - rev.10.3 (13 June 2017) and the relevant OECD guidelines and guidance documents as listed in Commission Communication 2013/C 95/01. All relevant crop samples must be analysed and residue levels determined using the correct residue definitions (for risk assessment and monitoring, as advised in EFSA Conclusion of asulam, 2018 (addressing pentose as well as hexose conjugates as asulam for 'sugar conguates of asulam')) using a validated method

of analysis. The validation data should be generated in accordance with SANCO 3029/99 rev.4 and the OECD guidance document on "Pesticide Residue Analytical Methods" (OECD, 2007).

2. Ruminant feeding studies

   Ruminant feeding studies should be submitted on the magnitude of residue levels of asulam and acetyl sulphanilamide in ruminant animal products in accordance with the relevant OECD guidelines and guidance documents as listed in Commission Communication 2013/C 95/01. Consideration should be given to the substances that the animals should be dosed with in the feeding studies (asulam or asulam plus other feed item residues of asulam to address the potential exposure to animals). All relevant samples must be analysed using a validated method of analysis; the validation data should be generated in accordance with SANCO 3029/99 rev.4 and the OECD guidance document on "Pesticide Residue Analytical Methods" (OECD, 2007); it would be preferable for residues to be extracted and analysed immediately/as quickly as possible after sampling; if samples are stored prior to analysis, supporting freezer storage stability data will also be needed.

The previous application (COP 202102343) evaluated submitted storage stability data on grass, grass silage, monocots and dicots. These studies are listed below:

[redacted] (2021), Acceptability of Asulam Storage Studies in Grass and Their Relevance for a Field Residues Study in Grassland, UPL Europe Ltd., 10 September 2021.
[redacted]. (2021a), Storage Stability of Asulam in Monocot and Dicot Matrices, Battelle UK Ltd. Study Number NZ/19/004, 25 January 2021.
[redacted]. (2021b), Storage Stability of Asulam in Grass and Grass Silage Matrices, Battelle UK Ltd. Study Number NZ/19/006, 25 May 2021.

The summaries of these studies were presented in COP 202102343 and have been copied below for reference.

Storage stability in grass (NZ 15/004 and NZ 19/006)

The data from both storage stability studies in grass show that asulam residues have declined by ≥30% after 6 days. Earlier timepoints are determined in NZ/19006 which suggest that for both 0.1 and 1 mg/kg fortification levels evidence of instability (≥30%) is shown at the earliest measured timepoint (1 day). There is evidence that samples are more stable in silage (for up to 10 days). With such a limited dataset it is not possible to conclude if the decline in residues only occurs at lower spiking levels; the applicant has not proposed a mechanism for this (procedural recoveries are acceptable at low spiking levels). The new study NZ 19006 provides additional evidence of a significant decline in residues over storage and that the decline can exceed 30% over as little as 1 days storage. The reasons for this are not clear and compounds formed during degradation of asulam have not been tested in the studies submitted (EFSA, 2021 has suggested that asulam residues may degrade to asulam glucosides).

Storage stability in monocots and dicots (NZ 19/004)

There is evidence of asulam instability over the frozen storage period tested (7 days), however when procedural recoveries are considered the decline does not exceed 30%. It is unexpected that the decline in residues is less pronounced in monocots than in fresh grass matrix. Limited details are provided of the botanical constitution of the matrices but as the monocot and dicot matrix tested in NZ 19/004 seem to match the matrix analysed in ecotoxicology studies R1640114 and R1640115 there is no evidence instability is expected to affect the ecotoxicology studies considerably.

It was determined that this data did not alter the premise of the previous assessments and no data requirements concerning the residue field trials on grass have been fully addressed.

No further data has been submitted with this evaluation to address these outstanding data requirements.

Based on this assessment, as per COP 2021/02343, 120-day Emergency use under Regulation 1107/2009 can be recommended now for HSE application Ref: COP 2022/02174 for the uses of ‘Asulox’ proposed by the applicant. See also toxicology assessment and note that no changes to the ADI or ARfD have been proposed (the ADI and ARfD used in COP 2019/01678 have been concluded by toxicology to be highly precautionary) and the ED status of the active substance cannot be concluded upon. It is noted that if ED status was concluded upon and a negligible exposure assessment became warranted the proposed use (due to potential residues in products of animal origin) would not be considered a negligible exposure situation.

In the current application, as with the previous application, the applicant has requested reconsideration/removal of the 1 month grazing restriction (1 month exclusion period for livestock after application). This cannot be removed due to MRL considerations (see section 4.2.1 below).

It is noted that for this evaluation (COP 2022/02174), evidence has been submitted that landowners are aware of and have adhered to this 1 month grazing restriction. While this notification is reassuring in that it does indicate that landowners are making some effort where possible to restrict grazing, the livestock restriction is not typically a measure that is put in place for standard authorisations and was granted in this case on a temporary basis. If the article 53 authorisation is granted it is therefore recommended that the previous requirement on record keeping to show compliance with the livestock exclusion restriction has been adhered to is re-set. While in the context of an Article 53 emergency authorisation residues evaluation these data gaps are judged to not directly impact consumer risk, the data gaps would need to be fully addressed before removing any restrictions.

The data requirements that remain outstanding are now as follows (these data requirements are also included in section 3.3 of this emergency Registration Report (eRR)):

1. Residue field trials for grassland and storage stability of residues

   Either:

   a. Sufficient justification of the available grassland trials, by addressing whether residues are sufficiently stable in these trials, for the trials data to be able to be relied upon quantitatively. Currently this situation is uncertain based on the data available. The currently available grassland freezer storage stability data indicate that asulam-related residues are not stable in the samples and therefore there is uncertainty in the assessment of the available grassland residue trials. It is likely that new adequate storage stability data tailored to freezer storage of whole plant samples (prior to homogenisation) using an appropriate time series relevant to the storage conditions in the grassland residues trials would be needed to support use of the existing grassland trials, and the success of this avenue depends on the results obtained (due to the issue of instability that has been observed to date in grassland residue samples).

Or:

   b. New residue trials conducted at the proposed GAP on grassland, where residues are extracted and analysed immediately/as quickly as possible after sampling. These trials must be conducted in accordance with the EU guidance document SANCO 7525/VI/95 - rev.10.3 (13 June 2017) and the relevant OECD guidelines and guidance documents as listed in Commission Communication 2013/C 95/01. All relevant crop samples must be analysed and residue levels determined using the correct residue definitions (for risk assessment and monitoring, as advised in EFSA Conclusion of asulam, 2018 (addressing pentose as well as hexose conjugates as asulam for ‘sugar conguates of asulam’)) using a validated method of analysis. The validation data should be generated in accordance with SANTE 2020/12830 rev. 1 and the OECD guidance document on “Pesticide Residue Analytical Methods” (OECD, 2007).

2. Ruminant feeding studies

   Ruminant feeding studies should be submitted on the magnitude of residue levels of asulam and acetyl sulphanilamide in ruminant animal products in accordance with the relevant OECD guidelines and guidance documents as listed in Commission Communication 2013/C 95/01. Consideration should be given to the substances that the animals should be dosed with in the feeding studies (asulam or asulam plus other feed item residues of asulam to address the potential exposure to animals). All relevant samples must be analysed using a validated method of analysis; the validation data should be generated in accordance with SANCO 3029/99 rev.4 and the OECD guidance document on “Pesticide Residue Analytical Methods” (OECD, 2007); it would be preferable for residues to be extracted and analysed immediately/as quickly as possible after sampling; if samples are stored prior to analysis, supporting freezer storage stability data will also be needed.

	It should be noted that for standard authorisation, an MRL application would be required (to raise the MRLs in animal products) and then MRLs guidance must be followed. Further information is available on the HSE website for when a new GB MRL is required [MRLs and import tolerances]. An MRL application form must be submitted and when relevant an ER/RO must be completed. For NI, residue trials must take into account the EU guidance document SANTE/2019/12752. If a new MRL is required for NI, then an application will need to be submitted to an EU MS. Information on the EU process for MRL setting is available here: Maximum Residue Levels | Food Safety (europa.eu).

2.4.1 Maximum Residue Levels

EVALUATION, SUMMARY AND CONCLUSION BY REGULATORY AUTHORITY	
Name of authority	**Health and Safety Executive**
Reviewer's comments	No new MRLs are considered as part of this evaluation. MRLs are not set for grassland. The GB and EU MRLs in products of animal origin are as follows: Ruminant products of animal origin, including milk: 0.02 * mg/kg The above mentioned grazing restriction (that livestock must be kept out of the treated area for a period of one month following application) is needed to prevent the breach of the above MRLs (0.02* mg/kg). The applicant has requested the removal of this restriction, however it must remain. The data requirements above for residues indicate that animal feeding studies would need to be generated to support a potential raised MRL level, should the applicant and/or data holder wish to pursue the opportunity to remove the restriction by enabling suitable MRLs (without such a grazing restriction) to be set.

2.5 Environmental Fate and Behaviour

EVALUATION, SUMMARY AND CONCLUSION BY REGULATORY AUTHORITY	
Name of authority	**Health and Safety Executive**
Predicted environmental concentrations in soil (PECsoil)	
To calculate the PECsoil value the following assumptions have been made:- • 1 application to bracken of 4.4 kg a.s./ha (highest proposed dose) • 90% crop interception (appropriate for grassland) • soil bulk density of 1.5 g/cm^3 dry weight • even distribution in the top 5 cm soil layer.	

On this basis the maximum PECsoil for asulam would be **0.587 mg/kg**.

Predicted environmental concentrations in groundwater (PECgw)

The Predicted Environmental Concentrations in groundwater (PECgw) values were calculated based on the endpoints used in the asulam Additional Report (2009) and the proposed application rate of 4.4 kg as/ha to grassland.

The calculations were based on the following assumptions

- Asulam, molecular mass: 230.24
- Sulphanilamide, molecular mass: 172.2
- Vapour pressure: 10^{-20} (value approaching zero for asulam and sulphanilamide conservative approach)
- Water solubility asulam: 962000 mg/L
- Water solubility sulphanilamide: 7500 mg/L
- Single applications of 4.4 kg a.s./ha to grassland (mid July to end August)
- Degradation rates in soil: 3.2 d for asulam and 28.3 d for sulphanilamide.
- Moisture and temperature correction routines were activated in the model, using the default parameters recommended by FOCUS (2000).
- Asulam was assumed to degrade 100% to sulphanilamide as a worst case.
- K_{foc} for asulam was selected as 20 mL/g and 1/n as 0.75 (arithmetic means of four soils).
- K_{foc} for metabolite sulphanilamide was selected as 145 mL/g and 1/n as 0.711 (arithmetic means of four soils).

Table 2.5-1: 80th percentile PECgw values at 1m depth for grassland FOCUS PELMO v.5.5.3 and PEARL v.4.4.4

	PECgw (µg L^{-1})	
Scenario	Asulam (µg/L)	Sulphanilamide (µg/L)
Châteaudun	<0.001	<0.001
Hamburg	<0.001	<0.001
Kremsmünster	<0.001	<0.001
Okehampton	<0.001	<0.001

Predicted environmental concentrations in surface water (PECsw)

Spraydrift - Vehicle mounted application

The PECsw values at the proposed rate when applied by vehicle mounted sprayer are detailed below (Table 1). Values have been calculated using the highest proposed dose, assuming a static water body 30 cm depth and Rautmann drift values as used for UK field crops. The PECsw values for the photolytic metabolites were calculated as follows using the molecular weight and percentage formation values detailed below:

PECsw = Asulam PECsw x max occurrence % x molecular mass conversion value

	Asulam	Sulfanilic acid	AP formamide	MCAPAP carbamic acid
Molecular mass	230.24	173.2	136.2	301.3
Molecular mass conversion value		0.752	0.592	1.309
Max occurrence %*	x	55.5	24.2	11.9

*maximum % in photolysis study

Table 2.5-2: PECsw values from 1 x 4400 g a.s./ha on grassland/forest

Buffer (m)	PECsw (µg/l)			
	Asulam	Sulfanilic acid	AP formamide	MCAPAP carbamic acid
1	40.63	16.96	5.82	6.33
5	8.36	3.49	1.20	1.30
10	4.253	1.78	0.61	0.66

The critical RAC considering all available data is 14.6 µg a.s./L, which is based on toxicity to aquatic plants. Therefore, an acceptable risk for vehicle mounted boom spray application is achieved with a buffer zone of 5 m.

Spraydrift – aerial application

In previous considerations of this emergency use, exposures to surface water from spraydrift, following application to bracken via aerial spray application, have been determined using the spray drift data taken from the FOCUS SWASH v 2.1 drift calculator for aerial spray i.e. 27.3% drift representing the 90th percentile drift value at 5m from treated edge of field. Values have been calculated assuming a static water body 30 cm depth.

In the 2012 assessment risk mitigation options in the form of nozzle technology were considered by the Advisory Committee on Pesticides for aerial use of ‘Asulox’ to control bracken. An Environment Agency (EA) scoping study which included drift data from helicopter application using ‘RD Raindrop’ nozzles was considered (Robinson 1998, HSE internal ref: W001575805). The source drift data referenced in the EA study was not available to HSE at the time of consideration, but the report indicated that the use of ‘RD Raindrop’ nozzles gave a 68.7% reduction in spray drift.

Application of this drift reduction mitigation to the 90th percentile drift values for aerial application, as referenced in FOCUS SWASH v 2.1 drift calculator for aerial spray, results in the PECsw values as detailed in Table 2.5-3. The critical RAC considering all available data is 14.6 µg a.s./L, which is based on toxicity to aquatic plants. Therefore, an acceptable risk is achieved with a buffer zone of 90 m for aerial spray when spraying from aircraft using low drift nozzles such as RD1000 Pencil Jets or Delavan RD 'Raindrop' type nozzles and with 5 m for vehicle mounted boom spray.

Table 2.5-3: PECsw values expected from aerial spraying of 1 x 4400 g a.s./ha to grassland/forest using low drift nozzles such as RD1000 Pencil Jets or Delavan RD 'Raindrop' type nozzles
“

Buffer (m)	% Drift (90th percentile, assuming 68.7% reduction	PECsw (µg/l)			
		Asulam	Sulfanilic acid	AP formamide	MCAPAP carbamic acid
5	8.55	125.4	52.30	17.95	19.52
40	2.21	32.4	13.52	4.64	5.05

50	1.77	25.9	10.81	3.71	4.03
80	1.1	16.1	6.76	2.32	2.52
90	0.98	14.4	6.01	2.06	2.24
100	0.89	13.1	5.41	1.86	2.02
160	0.55	8.1	3.38	1.16	1.26
175	0.51	7.5	3.09	1.06	1.15

The applicant wishes to reduce the statutory 90 m aquatic buffer zone to 40 m and in support of this has submitted two further spray drift trials (full evaluation at Appendix 9), in addition to a single drift study that was evaluated under the previous consideration of this emergency use under COP2021/02343 (previous evaluation at Appendix 10). The applicant considers that the two new trials, along with the results from the previous study, in which analysis was made of deposits of spray solution containing Preema red food dye (COP2021/02343), provide evidence that there would be minimal drift at 30m and no drift at 40m. Therefore, they are requesting a reduction in the current 90m aquatic buffer zone restriction.

The spray drift data considered in this assessment is provided from two separate drift passes using aerial application via helicopter with pencil jet nozzles. The application was made at 8 m height above ground and in good conditions to test drift with a wind speed across the plot of 7.5 – 11 mph (12-18 km/h). The drift site was 7.5 x 250m and water sensitive paper (WSP) collectors of 6.2 cm^2 were placed 0, 10, 20, 30, 40m downwind. Papers were stapled to the adaxial (upper) leaf surface at top (T) and bottom (B) positions of the frond as well as top or bottom of the leaf giving a total of 42 samples per trial divided into 6 transects. The full details of the study evaluation are at Appendix 9.

In consideration of the new trials data assessed in this application there are still questions to be answered regarding the validation and set up of the methodology in relation to the water sensitive paper and the accuracy of this method in relation to the formulation in spray solution and droplet size in relation to sensitivity of the analysis in terms of dpi resolution. The absence of this and confidence in the flight path and point of application in either trial does not enable any analysis in relation to a target application rate. The new data do enable an indication of the likely reduction in drift on a comparative basis.

Put into the context of the risk assessment a maximum of 1% drift exposure needs to be met, i.e. 99% reduction, which is the current value used to ascertain an acceptable exposure assessment with a 90m buffer zone. Based upon the new drift trials the reduction in exposures is not sufficient to meet the required reduction at 30-40m (depending upon the application point) and therefore in the absence of field analysis at any further distance it cannot be determined at which point the 1% exposure would be likely to occur. The current assessment is based upon the standard FOCUS SW drift values, covering distances up to 175m downwind of the target site, with a 68.7% drift reduction applied for application via the pencil jet nozzles.

The HSE assessor would therefore conclude that the 2021 assessment is still appropriate and the 90m aquatic buffer zone be maintained.

Drainflow

The applicant has indicated that Asulox is to be applied from 1st July to 15th September with aerial application taking place in June and July. This is outside the recognised drainflow period of October to April. As the DT50 in soil for asulam is relatively short (3.2 d). It is considered that levels available in the soil will be minimal at the onset of the drainflow period in October and therefore a drainflow assessment is not considered necessary. In the absence of an agreed exposure model to assess runoff exposure in upland situations, HSE has followed current regulatory procedures and performed a first tier drainflow assessment as a surrogate for runoff. A Tier 1 assessment outside the drainflow period, assuming the latest application on 15 September gives a PECsw of 2.01 µg/L (assuming an application of 4400 g/ha, 90% crop interception, Koc 20, DT50 soil 3.2 d). It is also noted that based on the spray drift assessment a 90m aquatic buffer zone is proposed to be maintained. Qualitatively a no spray buffer zone of this size is also likely to have a significant impact on reducing any runoff exposures to water bodies 90m from the treated area.

Predicted environmental concentrations in air (PECair)

The fate and behaviour of asulam in air resulting from the use of Asulox at the proposed use was considered during the EU review process. Based upon a short DT50 of 0.372 days in air based upon the Atkinson model (AOPWIN v1.88), the vapour pressure (<5 x 10^{-7} Pa at 45°C) and information on volatilisation from plants and soil. It was concluded that PECair exposures would be negligible.

2.6 Ecotoxicology

Evaluation, Summary and Conclusion by The Health and Safety Executive (Chemicals Regulation Division).

New consideration – COP 2022/02174

This is an Article 53 emergency use application for use of the product Asulox to control bracken. ‘Asulox’ (M 13175) is a soluble concentrate formulation containing (400 g asulam/L). Asulam is not an approved active substance following a non-approval decision. The current owner, UPL Ltd, has re-submitted as a new active substance for approval in the EU, but not yet in the UK. The reasons for non-approval of asulam included concerns over risks to birds and terrestrial non-target plants.

The requested use of Asulox is as a foliar spray via manned aerial application (helicopter), via vehicle mounted boom sprayer and via handheld sprayer. This is the 11th repeat application for authorisation of this proposed use under Article 53 of 1107/2009. The proposed uses of Asulox are the same as those evaluated most recently under COP 2021/02343, and are described in the following table.

Table 2.6-1: Proposed emergency uses of Asulox

Situations:	Maximum individual dose (litres product / ha):	Maximum number of treatments (per year):	Earliest Time of Application:	Latest Time of Application:
Grassland, Moorland, Amenity Grassland	11 (4.4 kg a.s./ha	1	1 July in the season of use.	11 September in the season of use.
Forest (pre-planting and in first five years after planting)	10 (4.0 kg a.s./ha)	1	1 July in the season of use.	11 September in the season of use.

Authorisation of Asulox under COP 2021/02343 specified the following risk mitigation measures, which are relevant for the ecotoxicology consideration:

- A 5 m untreated buffer zone to surface water for application via tractor mounted boom sprayer was required to protect aquatic organisms.
- A 5 m untreated buffer zone to non-target environment and use of 3-star drift reducing technology for application via tractor mounted boom sprayer was required to protect terrestrial non-target plants.
- A 90 m untreated buffer zone to surface water and use of low drift nozzles for aerial application was required to protect aquatic organisms.
- A 90 m untreated buffer zone to non-target environment and use of low drift nozzles for aerial application was required to protect terrestrial non-target plants.
- Extreme care must be taken to avoid spray drift onto non-crop plants outside of the target area.
- To protect ground nesting birds, use before 1 July in the season of use is not allowed.
- Operators must take into account ground nesting birds. There is a potentially significant risk to ground nesting birds towards the end of the breeding season.
- To protect mammals, application is not allowed where the hazel dormouse is known to breed.
- Where there is a risk to rare or sensitive species, or where spraying is to take place near a Site of Specific Scientific Interest then advice must be sought from the appropriate conservation agency - Natural England, Scottish Natural Heritage, Natural Resources Wales or the Northern Ireland Environment Agency.

While the proposed uses of Asulox are the same as those assessed under 2021/02343, the applicant has requested that the buffer zone distance for aerial application be reduced from 90 m to 40 m. This is on the basis of new drift data from two additional field trials. These data are reviewed in section 2.5 of this dRR and at HSE ref: 002067640. In these trials the maximum distance at which drift was assessed was 40 m, and at this distance the percentage drift was >1% of the nominal application rate (approximately 5%). A reduction of drift to ≤ 1% of the nominal application rate would be required in order for the PECsw not to exceed the critical Regulatory Acceptable Concentration of 14.6 µg a.s./L (derived from a laboratory study data with an aquatic macrophyte species). On this basis an acceptable risk to aquatic organisms would not be demonstrated at a distance of 40 m, hence the HSE environmental fate specialist concluded that the 2021/02343 evaluation is still appropriate and the 90 m aquatic buffer zone should be maintained.

ADAS, on behalf of Natural England, have submitted a “Comparative assessment of risks to non-target plants and soil invertebrates and soil persistence of two bracken herbicides: asulam and amidosulfuron” ([redacted] 2022). This report is reviewed below. It is considered that the report does not contain any new information on the toxicity of asulam to non-target organisms that should be incorporated into the HSE risk assessment (i.e. the referenced data do not appear to be adverse).

Since the previous HSE evaluation of Asulox was conducted under COP 2021/02343, there have been no changes to the agreed toxicity endpoints for asulam and no changes in guidance or data requirements for non-target organisms. Therefore, there is no need to update the risk assessment for this Article 53 application and the previous evaluation under COP 2021/02343 remains valid. The conclusions of the previous HSE evaluation for Asulox are summarised below, with the full evaluation from COP 2021/02343 reproduced in subsequent green boxes.

Summary of the risks to non-target organisms from use of Asulox for bracken control

Risks to birds:

Risks were assessed in accordance with EFSA (2009) guidance. It was demonstrated at first tier that there would be no unacceptable acute risk to birds via diet for all generic focal species. Long-term/reproductive risks via diet were unacceptable at first tier for all generic focal species, with TERs ranging from 0.84-2.47 (acceptability criterion is ≥ 5). The quantitative long-term/reproductive risk assessment was refined using an interception factor specific for bracken control use. While this resulted in an increased TER for the generic focal species ‘small insectivorous bird’, the TER value remained below the acceptability trigger (TER = 0.95). Data on the decline of residues asulam from relevant food items are available and were considered. While these data provide some evidence that residue decline of asulam from food items is shorter than considered in the first tier risk assessment, they are insufficient to estimate with confidence the rate of decline for use in the quantitative risk assessment.

Following receipt of additional information from Natural England, the potential bird species that could be at risk from exposure to asulam following bracken control use have been considered. Based on the available ecological and breeding data, the HSE evaluation identified concerns for the following birds species, in particular:

- Linnet
- Twite
- Yellowhammer
- Tree pipit
- Meadow pipit
- Whinchat
- Stonechat
- Nightjar

There was a lack of data to further refine the long-term/reproductive risk assessment for these specific potential focal species, e.g. no information was available on the proportion of foraging time they would spend in treated areas (PT), and there was no information on the proportion of different food items they may consume in treated areas (PD). Therefore, it was not possible to demonstrate that there would be no unacceptable long-term/reproductive risk to these species from the proposed use of Asulox.

In order to mitigate the risk to breeding birds, it was considered that application could be limited to 1st August to 12th September. In the final approval of the Article 53 use under 2021/02343, the following was specified on the authorisation notice:

> ‘*To protect birds, application before 1 July and after 12 September in the season of use is not allowed. Where reasonably practical, application should be made after 1 August, or as late in July as possible.*
>
> *Operators must take into account ground nesting birds. There is a potentially significant risk to ground nesting birds towards the end of the breeding season.*’

It is noted that while the above mitigation measures will help protect birds, they do not entirely prohibit application in July, where breeding birds can be at risk. Therefore it has not been robustly demonstrated that the timing restriction from the 2021/02343 application is sufficient to conclude with high certainty that there will be no unacceptable impact on birds from the proposed use of Asulox.

Risks via drinking water were also assessed. It has not been clearly demonstrated that there will be no unacceptable long-term/reproductive risk to birds via consumption of drinking water (TER = 4.69), though it is noted that margin of failure is small and the risk via this route is considered less critical than the risk via diet. No secondary poisoning assessment was required, given the low log Pow value of asulam (log Pow = 0.15 at pH 7 and 25 °C).

Risks to mammals:

Risks were assessed in accordance with EFSA (2009) guidance. It was demonstrated at first tier that there would be no unacceptable acute risk to mammals via diet for all generic focal species. Long-term/reproductive risks via diet were unacceptable at first tier for the ‘small herbivorous mammal’ generic focal species (TER = 0.91), but were acceptable for the 'small omnivore' (TER = 8.58) and 'small insectivore' (TER = 10.38). Refinement of the interception factor, using a specific value for bracken control, was insufficient to move the 'small herbivorous mammal' TER above the acceptability trigger of ≥ 5 (TER = 2.7). As discussed for birds, the available residue decline data indicates that exposure may be lower than estimated but does not allow for quantitative refinement of the risk assessment.

The relevance of the 'small herbivorous mammal' scenario for the proposed UK Article 53 uses was considered further. While the representative species for this scenario, the common vole, is not relevant in mainland UK, this scenario will also cover the risk to larger herbivores (e.g. lagomorphs) and specific concern was flagged regarding the hazel dormouse, which is of potential conservation concern in that it can occur in stands of bracken and may be exposed during breeding periods. On this basis, it was concluded to mitigate the risk so that applications are not made if hazel dormice are known to nest in the area to be treated.

In the final approval of the Article 53 use under 2021/02343, the following was specified on the authorisation notice:

> '*To protect mammals, application is not allowed where the hazel dormouse is known to breed..*'

While this requirement is considered sufficient to mitigate risks to the hazel dormouse, it is noted that it has not been clearly demonstrated that there will be no unacceptable impact on larger herbivorous mammals (such as rabbits or other lagomorphs), which may be foraging in bracken during the application window and hence could also be at risk.

Risks via drinking water were also assessed. It has been demonstrated that there will be no unacceptable risks to mammals via consumption of drinking water. No secondary poisoning assessment was required, given the low log Pow value of asulam (log Pow = 0.15 at pH 7 and 25 °C).

Risks to aquatic organisms:

Risks were assessed in accordance with EFSA (2013) guidance. The critical Regulatory Acceptable Concentration (RAC) for asulam used in the assessment was 14.6 µg a.s./L for aquatic macrophytes, derived from a standard laboratory study using *Lemna gibba*. Mitigation measures were necessary in order for exposure levels to be below the critical RAC. For aerial application a 90 m untreated buffer zone to surface water is required, when spraying using low-drift nozzles. For tractor mounted boom sprayer application a 5 m untreated buffer zone is required to surface water. Low risks were also demonstrated for the metabolites via spray-drift. It was considered that no drainflow assessment was needed, given application occurs outside the recognised drainflow period, and a low risk via runoff was also concluded (see section 2.5 of this dRR).

Risks to bees:

Risks were assessed in accordance with SANCO (2002) guidance. In a first tier assessment it was demonstrated that the proposed use would not result in an unacceptable acute risk to honeybees. No further consideration was required and no risk mitigation measures were needed.

Risks to other non-target arthropods:

Risks were assessed in accordance with SANCO (2002) guidance and proceedings from the ESCORT 2 workshop (SETAC, 2002). At first tier it was demonstrated that there was not an unacceptable off-field risk to non-target arthropods for either the aerial spraying or tractor mounted boom sprayer application methods. It was also concluded that there was not an unacceptable risk to in-field population of non-target arthropods, based on results from extended laboratory studies. No further consideration was required and no risk mitigation measures were needed.

Risks to soil macro- and micro-organisms:

Risks were assessed in accordance with SANCO (2002) guidance. Predicted exposure levels were not considered to pose unacceptable risks to earthworms, other soil macro-organisms or soil micro-organisms, when comparing to toxicity endpoints derived from laboratory studies. No further consideration was required.

Risks to non-target terrestrial plants:

Risks were assessed in accordance with SANCO (2002) guidance. The critical toxicity endpoint for asulam used in the risk assessment was the vegetative vigour HC5 ER50 value of 13.82 g a.s./ha, which was derived from a Species Sensitivity Distribution using laboratory study data. Comparing this value to predicted exposure levels, for aerial application a 90 m untreated buffer zone to non-target environment, with use of low drift nozzles, was required in order to conclude there would be no unacceptable impact. For tractor mounted application it was determined that a 5 m buffer was required, when using 3-star drift reducing nozzles, to mitigate risks to terrestrial non-target plants.

Endocrine disruption:

Under the 2021/02343 application it was previously considered that no conclusion could be reached regarding whether asulam has endocrine disrupting properties for non-target organisms, in the absence of suitable data to assess this point. The Expert Committee on Pesticides agreed with this interpretation. No additional data are available for this new application, therefore, it remains the case that the endocrine disruption status of asulam for non-target organisms cannot be concluded.

Risk mitigation required:

Aerial application:

> *To protect aquatic organisms, respect an unsprayed horizontal buffer zone distance to surface water bodies of 90 m when spraying from aircraft using low drift nozzles such as RD1000 Pencil Jets or Delavan RD 'Raindrop' type nozzles.*
>
> *To protect non-target terrestrial plants, respect an unsprayed horizontal buffer zone distance to non-target environment of 90 m when spraying from aircraft using low drift nozzles such as RD1000 Pencil Jets or Delavan RD 'Raindrop' type nozzles.*

Tractor-mounted boom sprayer application:

> *DO NOT ALLOW DIRECT SPRAY from horizontal boom sprayers to fall within 5 m of the top of the bank of a static or flowing water body, unless a Local Environment Risk Assessment for Pesticides (LERAP) permits a narrower buffer zone, or within 1 m of the top of a ditch which is dry at the time of application. DO NOT ALLOW DIRECT SPRAY from hand-held sprayers to fall within 1 m of the top of the bank of a static or flowing water body. Aim spray away from water.*
>
> *This product qualifies for inclusion within the Local Environment Risk Assessment for Pesticides (LERAP) scheme. Before each spraying operation from a horizontal boom sprayer, either a LERAP must be carried out in accordance with CRD's published guidance or the statutory buffer zone must be maintained. The results of the LERAP must be recorded and kept available for three years.'*

To protect non-target plants respect an untreated buffer zone of 5 metres to non-target environment. HORIZONTAL BOOM SPRAYERS MUST BE FITTED WITH THREE STAR DRIFT REDUCTION TECHNOLOGY. Low drift spraying equipment must be operated according to the specific conditions stated in the official three-star rating for that equipment as published on HSE Chemicals Regulation Directorate's website.

Measures to protect terrestrial vertebrates*:

- *To protect ground nesting birds, use before 1 July in the season of use is not allowed.*
- *Operators must take into account ground nesting birds. There is a potentially significant risk to ground nesting birds towards the end of the breeding season.*
- *To protect mammals, application is not allowed where the hazel dormouse is known to breed.*

**Please note that these measures were stipulated on the previous authorisation for this use, however, it has not been clearly demonstrated that they are sufficient to mitigate risks to birds and mammals to a sufficient effect that there is no unacceptable impact on populations of all relevant species.*

Overall conclusion

The new information provided (additional drift trial data and comparative assessment) does not change the previous HSE evaluation of the risks to non-target organisms from use of Asulox for bracken control, as assessed under COP 2021/02343. On this basis, it can be concluded that the proposed use of Asulox does not result in unacceptable risks to bees, other non-target arthropods or soil-dwelling organisms. Risks to aquatic organisms (particularly aquatic macrophytes) and terrestrial non-target plants are potentially much higher but can be sufficiently mitigated through the stipulation of no-spray buffer zones. Risks to birds and mammals are also an area of concern. The proposed mitigation phrases reduce the likelihood that birds and/or mammals will experience unacceptable impacts as a result of exposure to asulam from this use, however, they do not clearly establish that there will be no unacceptable impact on all species which could be exposed.

New information for comparative risk assessment – [redacted]. (2022)

ADAS on behalf of Natural England have submitted a "*Comparative assessment of risks to non-target plants and soil invertebrates and soil persistence of two bracken herbicides: asulam and amidosulfuron*" ([redacted] 2022). This report can be found at HSE reference: W002067755. This report has been considered by the HSE assessor, since it potentially informs on risks from use of an alternative active substance for bracken control (amidosulfuron), relative to risks from use of Asulox. Additionally, it has been checked whether it contains additional information on the toxicity of asulam to non-target organisms that should be considered in the HSE risk assessment. In this section only data on the toxicity of these active substances to non-target organisms are considered, i.e. information on persistence and efficacy have not been considered.

Comparative assessment of regulatory toxicity data referenced in [redacted]. (2022):

[redacted] (2022) includes comparison of regulatory toxicity studies with asulam and amidosulfuron for non-target plants (aquatic and terrestrial) and soil invertebrates. These studies have been evaluated for reliability during the EU review of the pesticide active substances. To enable a fuller comparison of the toxicity of asulam and amidosulfuron to standard regulatory test species for pesticides, the HSE assessor has included all non-target organism groups in the following table. Where available, studies conducted with the same species have been compared.

Table 2.6-2: Comparison of toxicity of asulam and amidosulfuron

Organism group	Asulam[8]	Amidosulfuron[9]	Endpoint ratio*	Endpoint ratio – adjusted for app. rate#	Endpoint ratio – adjusted for app. rate x 2#
Avian acute toxicity	LD50 > 1825.6 mg a.s./kg bw	LD50 > 2000 mg a.s./kg bw	0.91	0.01	0.02
Avian reproductive toxicity	NOEL = 19 mg a.s./kg bw/d	NOEL = 100 mg a.s./kg bw/d	0.19	0.00	0.00
Mammalian acute toxicity	LD50 > 4564 mg a.s./kg bw	LD50 > 5000 mg a.s./kg bw	0.91	0.01	0.02
Mammalian reproductive toxicity	NOEL = 46 mg a.s./kg bw/d	NOEL = 22.5 mg a.s./kg bw/d	2.04	0.02	0.04
Fish acute toxicity	LC50 > 91.3 mg a.s./L	LC50 > 100 mg a.s./L	0.91	0.01	0.02
Fish chronic toxicity	NOEC = 119.1 mg a.s./L	NOEC = 6.41 mg a.s./L	18.58	0.19	0.38
Aquatic invertebrate acute toxicity	EC50 = 57.87 mg a.s./L	EC50 = 36 mg a.s./L	1.61	0.02	0.03
Aquatic invertebrate chronic toxicity	NOEC = 6.4 mg a.s./L	NOEC = 1 mg a.s./L	6.40	0.07	0.13
Algal toxicity	ErC50 > 0.66 mg a.s./L	EbC50 = 47 mg a.s./L	0.01	0.00	0.00
Aquatic macrophyte toxicity	ErC50 = 0.146 mg a.s./L	ErC50 = 0.0092 mg a.s./L	15.87	0.16	0.32
Honey bee acute oral toxicity	LD50 > 123.7 µg a.s./bee	LD50 > 101 µg a.s./bee	1.22	0.01	0.03
Honey bee acute contact toxicity	LD50 > 100 µg a.s./bee	LD50 > 100 µg a.s./bee	1.00	0.01	0.02
Non-target arthropod (glass plate) – *T. pyri*	LR50 = 3026 g a.s./ha	LR50 > 45 g a.s./ha	67.24	0.69	1.38
Non-target arthropod (glass plate) – *A. rhopalosiphi*	LR50 = 1235 g a.s./ha	LR50 > 45 g a.s./ha	27.44	0.28	0.56
Earthworm acute toxicity	LC50 = 1004 mg a.s./kg soil	LC50 > 1000 mg a.s./kg soil	1.00	0.01	0.02
Nitrogen transformation	EC25 > 16 mg a.s./kg soil	EC25 > 0.8 mg a.s./kg soil	20.00	0.20	0.41
Non-target plants – vegetative vigour	ER50 = 11 g a.s./ha	ER50 = 67 g a.s./ha	0.16	0.00	0.00

*Endpoint ratio is the toxicity endpoint for asulam divided by the endpoint for amidosuluron

#Endpoint ratio adjusted to reflect different application rates for asulam (4400 g a.s./ha) and amidosulfuron (45 or 90 g a.s./ha), i.e. endpoint ratio x 45/4400 or endpoint ratio x 90/4400

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[8] EFSA (European Food Safety Authority), 2021. Updated peer review of the pesticide risk assessment of the active substance asulam (variant evaluated asulam-sodium). EFSA Journal 2021;19(11):6921, 74 pp. doi:10.2903/j.efsa.2021.6921. Asulam_sodium_DAR_01_LOEP_2018-01-31 (wiley.com)

[9] EFSA (European Food Safety Authority), 2008. Conclusion regarding the peer review of the pesticide risk assessment of the active substance amidosulfuron. https://www.efsa.europa.eu/en/efsajournal/pub/rn-116

Where the comparison of toxicity endpoints for asulam and amidosulfuron indicates that amidosulfuron is more toxic by a factor of more than 3, the relevant cell is shaded. A factor of 3 is considered to provide a reasonable range of interstudy variability[10]. It is noted that where one or other toxicity endpoint is an unbound value, this comparison is of limited use.

There are a few organism groups where amidosulfuron is significantly more toxic than asulam, e.g. chronic toxicity to fish and invertebrates, toxicity to aquatic macrophytes. However, this comparison does not take into account differences in the application rate for the two active substances, with the amidosulfuron application rate being much lower. Therefore endpoint ratios have also been calculated adjusted for the difference in application rates. The maximum proposed application rate of 4400 g a.s./ha asulam has been used, along with two different application rates for amidosulfuron (45 and 90 g a.s./ha), as considered in [redacted] (2022). The lower 45 g a.s./ha rate for amidosulfuron is the currently authorised application rate for the product ‘Squire Ultra’ on grassland. Taking into account the adjustment for application rate, amidosulfuron is generally less toxic than asulam, based on the standard regulatory toxicity studies for non-target organisms, and in no cases is more toxic than asulam by a factor of 3 or more. It is noted that this approach of adjusting the ratio based on the difference in application rate is crude, in that it does not consider differences in the properties of the active substances, which may influence exposure (e.g. persistence in soil, water and vegetation).

Comparative assessment of non-regulatory toxicity data referenced in [redacted] (2022):

The comparative assessment by [redacted] (2022) also includes sources of data other than regulatory studies, including published literature, unpublished but peer reviewed grey literature and data provided by the Bracken Control Group. Underlying data sources have not been provided to HSE, so the reliability of the data used is unknown. From an initial consideration of the comparative assessment provided, the HSE evaluator does not consider it necessary to request the underlying data or the literature search procedures followed, since the provision of this information would be unlikely to impact the regulatory risk assessment (as summarised above). Based on the information provided in [redacted] (2022), the following points are noted, regarding effects on non-target plant species.

Organism group	**HSE comments**
Macrophytes	
Bryophytes (mosses, liverworts and hornworts)	Studies by [redacted] (2003) and S[redacted] (2003) indicate that bryophytes can be sensitive to asulam under laboratory and field conditions, however, exposure concentrations used in the studies cannot be compared to field application rates. In field trials a negative effect on a moss species was observed in [redacted]2008) when exposed to 4400 g as./ha but there were minimal effects on bryophytes in [redacted] (2022), and no effects on the bryophyte layer when exposed to low doses (representative of drift) in [redacted] (2004). These study results do not suggest evidence of asulam having unacceptable impacts on bryophytes outside the treated area via drift, though some effects on this group within treated areas are possible. Equivalent data are not available for amidosulfuron. Bracken control group data suggests that amidosulfuron may have a greater impact than asulam on *Drepenocladus* spp. and *Sphagnum pulchrum*, however, it is not possible to separate the potential impacts of direct toxicity from indirect effects due to varying levels of bracken control in this dataset.

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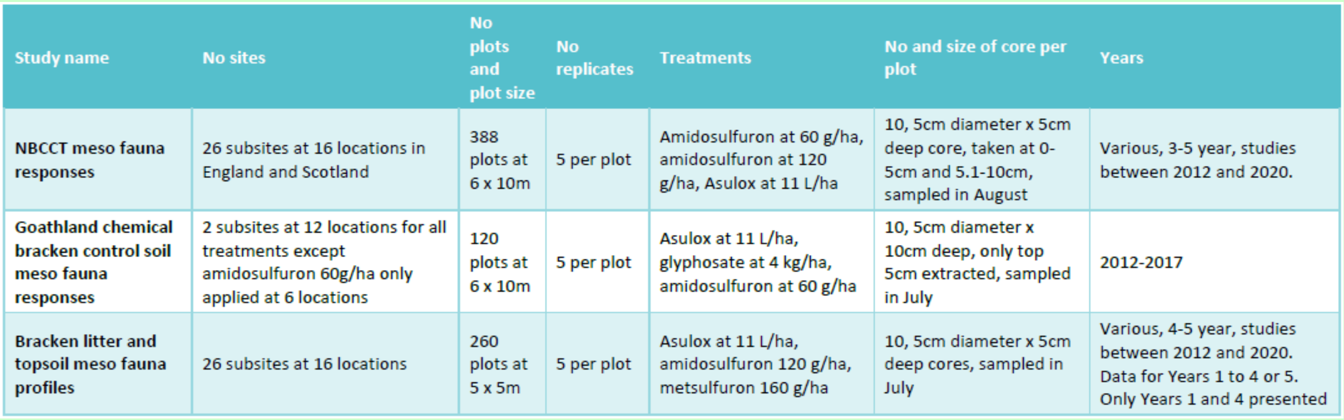
[10] GUIDANCE DOCUMENT ON THE ASSESSMENT OF THE EQUIVALENCE OF TECHNICAL MATERIALS OF SUBSTANCES REGULATED UNDER Regulation (EC) No 1107/2009. SANCO/10597/2003 -rev10.1 (2012). https://food.ec.europa.eu/system/files/2016-10/pesticides_guidance_equivalence-chem-substances_en.pdf

Pteridophytes (non-target ferns)	Effects of asulam on ferns were observed in a number of studies, including [redacted] (1973), [redacted] (2004) and [redacted] (2000), and [redacted] (2003). However, exposure concentrations tested cannot be compared to field application rates. In [redacted] (2003) effects on ferns were observed at a rate of 4400 g a.s./ha but not at a lower rate (20 g a.s./ha), selected to be representative of drift exposure at 50 m (application via helicopter). It is noted that a lower ER50 value of 13.82 g a.s./ha has been used in the HSE risk assessment. Results from field studies by [redacted] (2005) and [redacted] (2022) indicate that ferns are affected when exposed to an in-field application rate of 4400 g a.s./ha. As would be expected, these study results indicate that effects on ferns present in fields treated with asulam are likely, however, the results for lower application rates are consistent with the HSE off-field risk assessment. Equivalent data are not available for amidosulfuron and Bracken control group data indicate that both active substances have effects on non-target ferns. Therefore, meaningful comparison of the sensitivity of Pteridophytes from exposure to asulam and amidosulfuron is not possible based on the data referenced.
Other non-target higher plants (trees, grasses, broad-leaved species)	Data in [redacted] (2003) indicates tree species are not sensitive to asulam, though some effects were seen in grasses (e.g. *A. capillaris* and *R. acetosa*). [redacted] (2008) field data suggested that the majority of non-target plant species were positively affected by asulam applied at the field rate, though this was likely an indirect effect of the removal of bracken and most species were negatively affected where bracken was not present. [redacted] (2022) found that rushes were not reduced in diversity or density in the sprayed area, though some individual species were sensitive to asulam (e.g. *Holcus lanatus, Plantago lanceolata* and *Potamogeton polygonifolius*). Regarding amidosulfuron, [redacted] (2006) found the tree species Cherry (*Prunus avium*), sycamore (*Acer pseudoplatanus*) and Douglas fir (*Pseudotsuga menziesii*), to be affected by amidosulfuron applied at 60 g a.s./ha. Studies by [redacted]2003), [redacted] (2004), [redacted]. (2002) and [redacted] (2005) found that a wide range of weed species were susceptible to amidosulfuron at rates of 15-60 g a.s./ha. Bracken control group data ([redacted] 2020) found 3/78 non-target plant species were severely impacted by asulam exposure (400 g a.s./ha), while amidosulfuron severely impacted 7/78 species (120 g a.s./ha) and 5/78 (60 g a.s./ha).However, it is not clear whether this data distinguishes between effects due to direct exposure to the active substance and indirect effect due to bracken control. Additional data from [redacted] (2022) followed a similar pattern, with 12 non-target plant species damaged by asulam (4400 g a.s./ha), compared to 29 species for amidosulfuron (60 g a.s./ha). Recovery from damage also appeared to take longer following amidosulfuron treatment, with recovery not occurring within the 3-year study period for some species. Overall, the referenced data appears to indicate that a wider range of non-target plant species can be sensitive to amidosulfuron than asulam. However, the reliability of the underlying data and applicability

	for drift rates relevant for bracken use at different distances would need to be established before concluding on whether this finding would lead to a meaningful difference in the risk to non-target plants from use of asulam or amidosulfuron for bracken control. Additionally, any comparison of sensitivity based on field use data is potentially confounded by the indirect effect of bracken removal, given the efficacy of the two active substances may differ.

While the underlying non-target plant study data has not been reviewed, it seems likely that the reliability of the studies and their relevance for the risk assessment question will be limited (i.e. for determining whether there are unacceptable impacts on non-target plants in off-field areas following use of asulam for bracken control). Taken at face value, the results from these studies do not contradict the previous risk assessment conducted by HSE, though they do highlight that effects on non-target plants within the treated area are likely, albeit for a limited duration. There is some indication that amidosulfuron impacts a wider range of plant species than asulam and that effects may last longer. However, whether this results in a meaningful difference in risk to non-target plants in off-field areas would need to be further established. The risk to non-target plants in off-field areas from use of amidosulfuron for bracken control has not been assessed as part of this application.

The report by [redacted] (2022) also includes information on the effects of asulam and amidosulfuron on soil and surface-dwelling invertebrates. Primarily this comes from work conducted by the Bracken control group, with results from 3 studies reported. This appears to be additional data collected alongside efficacy trials during 2012-2020 in England and Scotland. The methodology is reported only very briefly. Therefore, the robustness of the datasets cannot be established from the information available, though it is apparent that the data should not be considered to be as robust as an equivalent field study conducted to GLP, for regulatory purposes. A brief overview of study details is contained in the following table, reproduced from [redacted] (2022).



Study name	No sites	No plots and plot size	No replicates	Treatments	No and size of core per plot	Years
NBCCT meso fauna responses	26 subsites at 16 locations in England and Scotland	388 plots at 6 x 10m	5 per plot	Amidosulfuron at 60 g/ha, amidosulfuron at 120 g/ha, Asulox at 11 L/ha	10, 5cm diameter x 5cm deep core, taken at 0-5cm and 5.1-10cm, sampled in August	Various, 3-5 year, studies between 2012 and 2020.
Goathland chemical bracken control soil meso fauna responses	2 subsites at 12 locations for all treatments except amidosulfuron 60g/ha only applied at 6 locations	120 plots at 6 x 10m	5 per plot	Asulox at 11 L/ha, glyphosate at 4 kg/ha, amidosulfuron at 60 g/ha	10, 5cm diameter x 10cm deep, only top 5cm extracted, sampled in July	2012-2017
Bracken litter and topsoil meso fauna profiles	26 subsites at 16 locations	260 plots at 5 x 5m	5 per plot	Asulox at 11 L/ha, amidosulfuron 120 g/ha, metsulfuron 160 g/ha	10, 5cm diameter x 5cm deep cores, sampled in July	Various, 4-5 year, studies between 2012 and 2020. Data for Years 1 to 4 or 5. Only Years 1 and 4 presented

Results from these studies are briefly discussed in the table below

Study	**HSE comments**
NBCCT meso fauna responses	No statistical analysis of the data has been presented. Therefore, the following is based on visual interpretation of the abundance data, without any confirmation that differences are statistically significant. Collembola *Isotoma viridis* – Compared to control plots there is no indication of an effect of asulam on the abundance of this species. There is some indication of a trend of decreasing abundance across the 5-year study period in both the amidosulfuron treatment rates.

	Isotoma notabilis – No clear difference in abundance is apparent between control and asulam treated plots. There is some indication of a decrease in abundance in the higher rate amidosulfuron plots compared to the control in both litter and soil samples. Folsomia spp. - No clear difference in abundance is apparent between control and asulam treated plots. There is indication of decreasing abundance in litter and soil samples across the five-year period in both of the amidosulfuron treatments relative to the control. Acari *Cryptostigmata* – No difference in abundance in litter or soil samples is apparent between control and asulam plots. Reduced abundance was found in amidosulfuron plots treated at both rates, compared to the control. *Prostigmata* – No differences in abundance in litter and soil samples are apparent between the control plots and any of the treatment plots. *Enchytraeidae* - No clear difference in abundance in litter or soil samples is apparent between control and asulam plots. Reduced abundance was found in amidosulfuron plots treated at both rates, compared to the control. Carabid beetles – Adult numbers were generally low, making interpretation of the data uncertain. There is no indication of a difference between asulam and control plots but some indication of a decrease in amidosulfuron plots compared to the control.
Goathland chemical bracken control soil meso fauna responses	Data are available from 2 locations. No statistical analysis of the data has been presented. Therefore, the following is based on visual interpretation of the abundance data, without any confirmation that differences are statistically significant. No control plots were included, so interpretation is based on comparison with pre-treatment levels and trends across the 5-year period. Collembola *Isotomidae* – For asulam plots there is a decrease in abundance up to year 3, with subsequent recovery, which is seen at both locations. However, abundance is generally low and therefore it is very uncertain whether this reflects a true effect of asulam. Amidosulfruon had no effect at one location, with some indication of a small effect in year one, with subsequent recovery at the other location (noting high uncertainty due to low abundance). *Poduridae* – For asulam there is some indication of a decrease in abundance across the first 2-3 years, with subsequent recovery. A similar pattern is also seen for amidosulfuron at one of the locations, though no effect is apparent at the other. Given the lack of control data it cannot be confirmed whether other factors, e.g. differences in weather, could be responsible for the trends seen. *Sminthuridae* – No clear differences in abundance over time are apparent for either asulam or amidosulfuron treated plots, noting that numbers were relatively low. Acari Cryptostigmata - No clear differences in abundance over time are apparent for either asulam or amidosulfuron treated plots at one location (Alan Tofts). At the other location (Mill Moor) there is some

	indication of declining abundance across the first 3 years, with subsequent recovery in asulam and amidosulfuron. However, the magnitude of differences was relatively small and without control group data, the temporal trend could be due to other factors. *Prostigmata* – Abundance was relatively low at both locations but clear trends over time were not apparent in either the asulam or amidosulfuron plots. *Enchytraeidae* – At the Alan Tofts location there were no clear differences in abundance over time for both asulam and amidosulfuron plots. At the other location (Mill Moor) abundance decreased year-on-year across the 5-year period in asulam and amidosulfuron plots. However, without control group data, the temporal trend at this location could be due to other factors. Carabid beetles *Carabidae* – Abundance is considered too low to allow study results to be interpreted with any confidence.
Bracken and topsoil meso fauna responses	No statistical analysis of the data has been conducted. Therefore, the following is based on visual interpretation of the abundance data. Data are available for year 1 and year 4 following treatment. It is noted that in the control invertebrates were only recorded in Year 1 in the unsprayed control and not in Year 4. It is not clear whether this means that they were sampled for and not found in Year 4 or whether they were not sampled at all in Year 4. Acari – No mites were recorded in plots treated with asulam or amidosulfuron in years 1 and 4. Mites were present in the unsprayed control in year 1 but at low abundance and were not found in year 4. Due to the low control abundance, meaningful comparison is not considered possible. Aranae - No spiders were recorded in plots treated with asulam or amidosulfuron in years 1 and 4. Spiders were present in the unsprayed control in year 1 but at low abundance and were not found in year 4. Due to the low control abundance, meaningful comparison is not considered possible. Coleoptera – Abundance was higher in asulam and amidosulfuron treated plots compared to the control in both years 1 and 4. No negative impact of the test substances on beetles was apparent. Collembola – In year 1 abundance was lower in asulam and amidosulfuron plots compared to the control. In year 4 collembola were not found in the control plot but present in asulam and amidosulfuron plots, in higher abundance than in year 1. However, given the low abundance and inconsistent results, meaningful interpretation of the data is questionable. Diptera – A similar pattern was observed as that described for Collembola. Abundance was generally low. Hymenoptera – A similar pattern was observed as that described for Collembola. Abundance was generally low. Myriapoda – A similar pattern was observed as that described for Collembola. Abundance was generally low. Opiliones - Abundance was similar in control, asulam and amidosulfuron plots in year 1. In year 4 abundance had slightly

	increased in asulam and amidosulfuron plots but was zero in the control. No negative treatment effect was therefore apparent. Abundance was generally low. All invertebrates - Abundance was similar in control, asulam and amidosulfuron plots in year 1. In year 4 abundance had increased in asulam and amidosulfuron plots but was zero in the control. No negative treatment effect was therefore apparent.

Of the three Bracken control group datasets presented, the ‘NBCCT meso fauna responses’ are considered the more useful. However, it must be noted that the reliability of this dataset has not been established. No treatment related effects of asulam, when applied at 4400 g a.s./ha, are evident in collembola, acari or carabid beetles populations. The ‘Goathland chemical bracken control soil meso fauna responses’ dataset appears less useful due to the absence of a control group. This makes interpretation of any temporal trends in the data highly uncertain, as background variability in abundance is unknown and could be influenced by other factors, including weather. The ‘Bracken and topsoil meso fauna responses’ dataset is also considered less useful than the NBCCT data. This is due to high temporal variability in abundance and the apparent lack of control group data for year 4. Overall, it is considered that the Bracken control group datasets referenced do not indicate any clear effects of asulam applied at 4400 g a.s./ha on soil and surface-dwelling invertebrates. Therefore, these data do not contradict the outcomes of the previous HSE risk assessment.

In the ‘NBCCT meso fauna responses’ data there is some indication of effects of amidosulfuron on collembola, acari and carabid beetle populations. However, these results should be treated with caution since the reliability of the data has not been established and due to the lack of statistical analysis of the results. It is also not possible to determine if any effects were due to direct effects of the active substance or indirect effects due to reduction in plant cover. Assessment of the risk to soil invertebrates from application of amidosulfuron is beyond the scope of this application and comparison of the relative toxicity of asulam and amidosulfuron to soil invertebrates based on these data should be treated with caution.

Evaluation, Summary and Conclusion by The Health and Safety Executive (Chemicals Regulation Division).

The following text is reproduced from the HSE evaluation of the Article 53 emergency use application for Asulox under 2021/02343. Since no new information on toxicity has been provided, there are no changes in relevant guidance or data requirements, and since refined surface water exposure values have not been accepted (see section 2.5), this text has not been updated for this application and represents the HSE risk assessment for non-target organisms.

Previous ecotoxicology evaluation under COP 2021/02343

Background

Please note that the assessment presented below is a combination of what was previously considered and presented for HSE application Ref.: COP 2019/01678, 2020/00646 and 2020/01796 as well as what has been presented for the current application (i.e., HSE application Ref COP 2021/02343). It should also be noted that, where relevant, the previous assessment has been modified in light of new information. New information and new assessments have been indicated via the use of blue highlight.

This application is for the emergency use of ‘Asulox’ as a means of bracken control. The proposed use is on grassland (including amenity grassland, rough grazing and moorland) and forest.

The proposed GAP is as in previous assessments (i.e., HSE application Ref.: COP 2019/01678, 2020/00646 and 2020/01796) however in those previous assessments, restrictions were imposed (see Table 0). The Applicant wishes to remove these restrictions with this application.

Presented below is the previous assessment carried out under COP 2020/001796, along with a consideration of additional data submitted to address previously highlighted concerns.

In addition, there is a consideration of the data submitted to address the following data requirement i.e.,

> *Data on the types and numbers of bird and mammal wildlife that nests and/or feeds in and adjacent to the areas to be treated during the treatment period from 1 July to 14 September*.

Finally, there is a consideration of whether asulam is an endocrine disrupting compound.

Table 0: Proposed application rate and times for Asulox

Situations:	**Maximum individual dose (g a.s. / ha):**	**Maximum number of treatments (per year):**	**Latest Time of Application:**
Rough Grazing, Moorland, Amenity Grassland (ground-based use is permitted only on areas with a statutory conservation designation or agri-environment scheme areas)	4400	1	End of September in the season of use.
Forest (establishment phase only)	4000	1	End of September in the season of use.

It should be noted that the Applicant wishes to remove the restrictions highlighted in yellow with this application. This is not an ecotoxicological restriction and is related to the availability of alternatives for ground-based application, as a result it will not be considered further. (There is some consideration of the potential effects of asulam on non-target plants below, along with that of alternatives, but for the reasons outlined below nothing conclusive can be drawn from this dataset.)

Asulam is not an approved active substance following a non-approval decision taken under COMMISSION IMPLEMENTING REGULATION (EU) No 1045/2011 of 19 October 2011.

The active substance was submitted as a new active substance and reconsidered by the EU review process (see EFSA (2018)[11]). Further to EFSA (2018), EFSA has published an updated conclusion (EFSA (2021)[12]), the key part of this update is the endocrine disruption assessment, and this is

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[11] European Food Safety Authority (EFSA), Arena M, Auteri D, Barmaz S, Brancato A, Brocca D, Bura L, Chiusolo A, Court Marques D, Crivellente F, De Lentdecker C, Egsmose M, Fait G, Ferreira L, Goumenou M, Greco L, Ippolito A, Istace F, Jarrah S, Kardassi D, Leuschner R, Lythgo C, Magrans JO, Medina P, Miron I, Molnar T, Nougadere A, Padovani L, Parra Morte JM, Pedersen R, Reich H, Sacchi A, Santos M, Serafimova R, Sharp R, Stanek A, Streissl F, Sturma J, Szentes C, Tarazona J, Terron A, Theobald A, Vagenende B and Villamar-Bouza L, 2018. Conclusion on the peer review of the pesticide risk assessment of the active substance asulam (variant evaluated asulam-sodium). EFSA Journal 2018; 16(4):5251, 23 pp. https://doi.org/10.2903/j.efsa.2018.5251

[12] EFSA (European Food Safety Authority), Alvarez F, Arena M, Auteri D, Borroto J, Brancato A, Carrasco Cabrera L, Castoldi AF, Chiusolo A, Colagiorgi A, Colas M, Crivellente F, De Lentdecker C, Egsmose M, Fait G, Gouliarmou V, Ferilli F, Greco L, Ippolito A, Istace F, Jarrah S, Kardassi D, Kienzler A, Leuschner R, Lava R, Linguadoca A, Lythgo C, Magrans O, Mangas I, Miron I, Molnar T, Padovani L, Parra Morte JM, Pedersen R, Reich H, Santos M, Sharp R, Szentes C, Terron A, Tiramani M, Vagenende B and Villamar-Bouza L, 2021. Updated peer review of the pesticide

considered below. It should be noted that, apart for the endocrine disruption assessment, there were no new data submitted and hence the toxicity endpoints used in the following risk assessment are taken from EFSA (2018).

Given that EFSA (2018 and 2021) contains a detailed consideration of the available ecotoxicological data as well as a list of ecotoxicological endpoints that have been agreed by Member States, it is proposed to use these documents and the associated list of endpoints for this emergency use.

(Normally HSE would only use the latest list of endpoints once an active substance has been approved, however in this situation it is considered appropriate to use the latest endpoints as, for certain aspects, they are lower and indicate a potentially greater level of concern than the original data (see EFSA (2010)[13]).)

Table 1: Proposed UK emergency use of 'Asulox'

Situations:	Maximum individual dose (litres product / ha):	Maximum total dose (litres product / ha):	Maximum number of treatments:
Grassland, Moorland, Amenity Grassland	11	11	1 per season
Forest	10	10	1 per season

Period of use: 1st July to 14th September

Table 2: Proposed application method of 'Asulox'

Method of Application	Water Volumes
HELICOPTER - AERIAL application NB. Fixed wing aircraft are not recommended for the application of ASULOX to bracken.	Apply ASULOX at 11 L/ha with an adjuvant (0.1%) in a total spray volume, including water, of 44 L/ha.
TRACTOR MOUNTED SPRAYER (& other vehicle mounted sprayers) - OVERALL treatment	Apply ASULOX at 11 L/ha in 400 - 500 L/ha of water as a MEDIUM or COARSE spray (BCPC category). Adjust boom height to give uniform coverage at the top of the bracken fronds.
KNAPSACK SPRAYER or HAND LANCE (Hand-operated) - SPOT and OVERALL spray treatment	Mix 1part ASULOX with 100 parts water (see Guide to Dilution Rates) and an adjuvant (0.1%). Avoid spraying to run-off. The knapsack lance should be fitted with a nozzle to apply a MEDIUM or COARSE spray (BCPC category). A red food-stuffs dye may be mixed with the spray to help identify treated fronds.

A list of abbreviations used in this assessment is provided at the end of the assessment.

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risk assessment of the active substance asulam (variant evaluated asulam-sodium). EFSA Journal 2021;19 (11):6921, 31 pp. https://doi.org/10.2903/j.efsa.2021.6921 ISSN: 1831-4732

[13] European Food Safety Authority; Conclusion on the peer review of the pesticide risk assessment of the active substance asulam, EFSA Journal 2010;8(12):1822. [71 pp.]. doi:10.2903/j.efsa.2010.1822

Effects on terrestrial vertebrates

Birds and mammals

As a result of previous assessments, the following data requirement was set:

> *Data on the types and numbers of bird and mammal wildlife that nests and/or feeds in and adjacent to the areas to be treated during the treatment period from 1 July to 13 September*[14].

Presented below is the original assessment, along with a consideration of the data submitted to address this point, highlighted in blue.

EFSA (2018 and 2021) indicated that that the reproductive/long-term risk to birds and mammals was a "critical area of concern" due to identified high risks. It should be noted that these concerns were highlighted at a less critical use pattern than that proposed; the proposed GAP in the EU review was for use in pre- and post-emergent spinach and post-emergent flower bulbs at a rate of 1x 6 L product/ha (2.4 kg a.s./ha). In contrast however, the GAP for the proposed emergency use for grassland, moorland, amenity grassland is 1 x 4.4 kg a.s./ha whilst that for forest is at a maximum rate of 4.0 kg a.s./ha.

Presented below is the risk assessment for birds and mammals. This assessment has used the toxicity endpoints from EFSA (2018) as well as the EFSA (2009)[15] guidance document for birds and mammals.

Use on bracken is not considered in EFSA (2009), therefore HSE has assessed the risk to various feeding guilds of birds and mammals that may occur in bracken at the time of the proposed applications of the product. In the absence of specific information for bracken HSE has chosen to retain all potentially relevant feeding guilds, noting that these will be protective of the possible range of actual species of that guild.

The reproductive/long-term toxicity endpoints from the EFSA (2018) conclusion for asulam have been considered in the risk assessments below, noting that the bird reproductive/long-term endpoint has been revised from that set in the previous EU review of 2010 (see EFSA (2010)[16]).

It should also be noted that the reproductive/long-term endpoint for birds was revised from 65 mg/kg bw/d as stated in EFSA (2010) to 19 mg/kg bw/d in EFSA (2018). This was due to the provision by the notifier of additional 'adverse' data which showed effects on eggshell thinning in two additional species of bird tested, which was occurring to extents that could not be dismissed as of no ecological relevance (i.e., the extent of egg thinning caused by asulam was judged to possibly compromise successful hatching and thus risk to populations exposed). As such experts at the EU peer review meeting agreed to set a lower endpoint in order to safeguard against eggshell thinning. The holder of the product UPL has challenged the selection of this endpoint, and this is considered below.

The standard methodology for bird and mammal risk assessment under current regulatory guidance is that feeding guild scenarios expected to occur in the crop are considered for their anticipated extent of exposure. However, in the case of applications to bracken, this is not the crop; rather it is the target pest for this emergency use application. Although this is the case, it is judged by the HSE ecotoxicology team that bird and mammal feeding guilds present would likely be dictated by the presence of bracken, it being the dominant plant cover. There is no bracken scenario in current regulatory guidance so an appropriate surrogate scenario must be selected, and the risks considered. The following risk assessments for birds and mammals have therefore been conducted using late growth stage bird and mammal feeding scenarios for leafy vegetables, as described from Appendix A of the EFSA (2009) regulatory guidance document. These scenarios have been considered as a suitable surrogate for a bracken habitat, representing plant height and dense vegetation cover.

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[14] See HSE internal ref: WIS002005186

[15] European Food Safety Authority; Guidance Document on Risk Assessment for Birds & Mammals on request from EFSA. EFSA Journal 2009; 7(12):1438. doi:10.2903/j.efsa.2009.1438.

[16] European Food Safety Authority; Conclusion on the peer review of the pesticide risk assessment of the active substance asulam, EFSA Journal 2010;8(12):1822. [71 pp.]. doi:10.2903/j.efsa.2010.1822

It should be noted that the following risk assessment covers the application of 'Asulox' via aerial, tractor-mounted and knapsack spray or hand-lance applications.

Risk assessment for birds

The main feeding guilds for birds from EFSA (2009) are considered below (small granivorous, small omnivorous and small insectivorous birds) as all are potentially present in bracken and use of small body size scenarios in risk assessment will be protective of larger individuals of the same or similar diet due to the higher food intake rate associated with a smaller body size (hence higher residues intake via contaminated food items). Available evidence shows a range of bird species (albeit arable data) can be breeding (and so potentially egg-laying) during the proposed July-Sept applications – See Buxton *et al.* (1998[17])

The acute risk assessment is presented in Table 3; a low acute risk to birds is demonstrated.

Table 3: Acute bird risk assessment for 'Asulox' applied at a rate of 11 L product/ha (equivalent to 4.4 kg a.s./ha) to bracken. The risk assessment was conducted using default values for appropriate feeding guilds from Appendix A of EFSA (2009) for surrogate crop scenario 'leafy vegetables' at the latest BBCH stages.

Intended use	**Grassland/moorland 11 L product/ha**				
Active substance/product	Asulox				
Application rate (kg a.s./ha)	4.4				
Acute toxicity (mg a.s. g/kg bw)	> 1825.6				
TER criterion	10				
Crop scenario Growth stage	**Tier 1 indicator species**	**SV_{90}**	**MAF_{90}**	**DDD_{90} (mg/kg bw/d)**	**TER_a**
Leafy vegetables at BBCH ≥50	Small granivorous bird	8.2	1.0	36.08	50.60
	Small omnivorous bird	7.2	1.0	31.68	57.63
Leafy vegetables at BBCH ≥20	Small insectivorous bird	25.2	1.0	110.88	16.46

There is an acceptable acute risk to birds for all scenarios considered in the above table (i.e., the TER is greater than the trigger value of 10). It should be noted that only the higher rate of 4.4 kg a.s./ha has been assessed, however as this results in an acceptable risk, then the risk from the lower rate of 4.0 kg a.s./ha will also result in an acceptable risk, i.e., TERa >10. No further consideration of the acute risk to birds is necessary.

Presented in Table 4 below is the reproductive/long-term risk assessment. It should be noted that only the higher rate of 4.4 kg a.s./ha has been assessed, this results in an unacceptable risk, i.e., TERlt <5 and given the margin of failure, the lower rate of 4.0 kg a.s./ha will also result in an unacceptable risk.

Table 4: Reproductive/long-term bird risk assessment for 'Asulox' applied at a rate of 11 L product/ha (equivalent to 4.4 kg a.s./ha) to bracken. The risk assessment was conducted using default values for appropriate feeding guilds from Appendix A of EFSA (2009) for surrogate crop scenario 'leafy vegetables' at the latest BBCH stages.

Intended use	**Grassland/moorland 11 L product/ha**
Active substance/product	Asulox
Application rate (kg a.s./ha)	4.4

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[17] Buxton J.M., Crocker D.R., and Pascual [redacted]A. (1998) . Birds and farming: information for risk assessment. 1998 Update Contract PN0919 Milestone Report FERA Project No M37

Long-term toxicity (mg a.s./kg bw)/d	19				
TER criterion	5				
Crop scenario Growth stage	**Tier 1 generic focal species**	**SV_m**	**MAF_m x TWA**	**DDD_m (mg/kg bw/d)**	**TER_{LT}**
Leafy vegetables at BBCH ≥50	Small granivorous bird	3.8	0.53	8.86	**2.14**
	Small omnivorous bird	3.3	0.53	7.70	**2.47**
Leafy vegetables at BBCH ≥20	Small insectivorous bird	9.7	0.53	22.62	**0.84**

Values in **bold** are below the trigger value

There is an **unacceptable** reproductive/long-term risk to birds for all feeding guilds considered in the above table (TER < the trigger value of 5). Further consideration of the reproductive/long-term risk to birds is necessary. This has been considered below.

Refinement of the bird risk assessment considering deposition values from FOCUS GW 2.2 (2014)

Refinement of the deposition factor (DF) has been considered using more recent values for DF from FOCUS GW 2.2 (2014) Table 1.5[18]. Values for cabbage (the only distinct 'leafy vegetable' for which deposition values are detailed) at BBCH 40 – 89 (flowering) were considered representative for the proposed use in bracken; values at BBCH 90 – 99 (fruiting/senescence) were not considered appropriate for bracken as no such life cycle event occurs. For the small granivorous and small omnivorous bird, the DF was the same as that in Appendix A of EFSA (2009) at 0.3, so does not offer any refinement over that considered at tier 1 assessment in Table 4 above.

For the small insectivorous bird, according to EFSA (2009), the DF is 1, therefore refinement is possible but only for the ground arthropod proportion of the diet (50%); for the foliar arthropod proportion of the diet (50%), no refinement is possible as no interception of the spray will occur prior to contact with the food item. It should be noted that the small insectivorous bird scenario considered is at BBCH ≥20 and Appendix E of EFSA (2009) states that for leafy vegetables, the DF can only be refined at BBCH stages ≥50; however as it is being assumed that dense bracken is being treated, it is considered appropriate to refine the deposition factor using values at BBCH 40 – 89 for cabbage from FOCUS GW 2.2 (2014) The DF at BBCH 40 – 89 for cabbage is 0.3, therefore this has been considered for the ground arthropod proportion of the diet for the small insectivorous bird scenario below.

Table 5: Refined reproductive/long-term small insectivorous bird risk assessment for 'Asulox' applied at a rate of 11 L product/ha (equivalent to 4.4 kg a.s./ha) to bracken. Deposition factor was refined for the ground arthropod proportion of the diet using values for cabbage at BBCH 40 – 89 from table 1.5 of FOCUS GW (2014). The risk assessment was conducted using default values for appropriate feeding guilds from Appendix A of EFSA (2009) for surrogate crop scenario 'leafy vegetables' at the latest BBCH stages.

Intended use	**Grassland/moorland 11 L product/ha**
Active substance/product	Asulox
Application rate (kg a.s./ha)	4.4
Long-term toxicity (mg a.s./kg bw)/d	19
TER criterion	5

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[18] Generic Guidance for Tier 1 FOCUS Ground Water Assessments (version 2.2, May 2014)

Crop scenario Growth stage	**Tier 1 focal species**	**FIR/ bw**	**Diet**	**DF**	**RUD**	**MAF_m x TWA**	**DDD_m (mg/kg bw/d)**	**DDD_m total (mg/ kg bw/d)**	**TER_{LT}**
Leafy vegetables at BBCH ≥20	Small insectivorous bird	0.79	50% Ground arthropods	0.3[1]	7.5	0.53	2.1[2]	21.4	**0.9**
			50% Foliar arthropods	1	21.0		19.3[3]		

[1] – Deposition factor of 0.3 applied to the default RUD of 7.5 from Appendix F in EFSA (2009).
[2] – This is obtained by multiplying the application rate (4.4) by the RUD (7.5), incorporating a deposition value of 0.3 and a TWA of 0.53 and finally by 0.5 to take account of 50% of the diet.
[3] – This is obtained by multiplying the application rate (4.4) by the RUD (21), incorporating a deposition value of 1 and a TWA of 0.53 and finally by 0.5 to take account of 50% of the diet.

Values in **bold** are below the trigger value.

There is an unacceptable reproductive/long-term risk to small insectivorous birds even with the refinement to DF considered in the above table (TER < the trigger value of 5). It was not possible to offer any refinement using DF for the small omnivorous and small granivorous bird scenarios. It should be noted that only the higher rate of 4.4 kg a.s./ha has been assessed, this results in an unacceptable risk, i.e., TERlt <5 and given the margin of failure, the lower rate of 4.0 kg a.s./ha will also result in an unacceptable risk. Therefore, further consideration of the reproductive/long-term risk to birds in all identified feeding guild scenarios is necessary.

With the latest submission, data on interception by bracken has been submitted[19] and whilst not to GLP it does provide some useful information. This is evaluated in Section 2.5 and detailed in Appendix 9. This study indicates that the deposition value is 0.1, this has been incorporated in the above risk assessment and the results are presented below. It is seen that the risk is still unacceptable.

Intended use	**Grassland/moorland 11 L product/ha**
Active substance/product	Asulox
Application rate (kg a.s./ha)	4.4
Long-term toxicity (mg a.s./kg bw)/d	19
TER criterion	5

Crop scenario Growth stage	**Tier 1 focal species**	**FIR/ bw**	**Diet**	**DF**	**Mean RUD**	**MAF_m x TWA**	**DDD_m (mg/kg bw/d)**	**DDD_m total (mg/ kg bw/d)**	**TER_{LT}**
Leafy vegetables at BBCH ≥20	Small insectivorous bird	0.79	50% Ground arthropods	0.1[1]	7.5	0.53	0.69[2]	20.0	**0.95**
			50% Foliar arthropods	1	21.0		19.3[3]		

[1] – Deposition factor of 0.1 applied to the default RUD of 7.5 from Appendix F in EFSA (2009).
[2] – This is obtained by multiplying the application rate (4.4) by the RUD (7.5), incorporating a deposition value of 0.1 and a TWA of 0.53 and finally by 0.5 to take account of 50% of the diet.

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[19] Author: [redacted] 2021 Title: An evaluation of the Penetration of Ground Applied Asulox through a Dense (90% plus cover) Bracken Canopy Report No.: BG03 (Version 4), 15 September 2021 Data Owner: R&D Applied Biology Guideline(s): NA, Not to GLP

[3] – This is obtained by multiplying the application rate (4.4) by the RUD (21), incorporating a deposition value of 1 and a TWA of 0.53 and finally by 0.5 to take account of 50% of the diet.

Further consideration of the dietary risk to birds:

Residue decline

During the 2011 EU review of asulam, data to refine the residue decline rate of the substance was submitted by the applicant and considered. In a regulatory risk assessment context, a starting assumption for the reproductive/long-term bird and mammal risk assessment is that residues of a substance on food items decline to 50% of initial levels (aka a ‘DT50’) after a 10-day period. In the case of asulam data were submitted to try to support a shorter DT50 on plant material. This was accepted for the representative uses of the substance under the 2011 review (noting that bracken use was not considered then) although uncertainties were noted[20]. In the subsequent 2018 EU review these same data were considered by experts in a modern context and use of it in a quantitative manner to refine the risk assessment for birds and mammals was rejected on the basis of:

- Data only generated with spinach, whereas the primary plant food item is monocot weeds.
- Only one replicate per residue trial used to generate data to define DT50
- Small number of trials in a geographically limited location range

As such the proposal of the HSE ecotoxicology evaluator is that on the basis of the data considered during the EU reviews, there is some evidence that residue decline of asulam on food items is shorter than considered in the above risk assessments which used the default value (hence exposure and risk would be lower than shown), there is insufficient confidence to say to what extent. Therefore, this line of further evidence alone should not be used to indicate an acceptably low risk to bird and mammal feeding guilds identified above as at risk.

Further residue decline data have been submitted and these are considered below.

Ecological aspects

Following questions raised by the ECP in 2019, one stakeholder involved in the application – Natural England (NE) – provided some further information/argumentation as to why the reproductive/long-term risks to birds foraging in bracken to be treated with asulox could be lower than indicated via the above regulatory risk assessments. This is presented below in *blue font italics*, with HSE regulatory discussion of its merits presented afterwards.

We (Natural England, or “NE”) considered the following questions:

- *What birds species use dense bracken for breeding and are therefore potentially exposed? There are several bird species in England likely to be breeding in heathland and moorland habitats which may have eggs/dependent young during July and, possibly, also into August – they include Stonechat, Meadow Pipit, Linnet, Skylark, Tree Pipit, Whinchat, Nightjar, Hobby, Snipe, Golden Plover, Redshank, Curlew, Ring Ouzel, Wheatear, Merlin, Yellow Wagtail and Twite. However, the extent to which these species will be exposed to or affected by aerial spraying will depend on several factors, including their diet, habitat use, foraging behaviour and potentially other aspects of their ecology.*
- *At what time of year do these species breed – i.e. does breeding (in particular egg formation – we are using egg laying period as a reasonably precautionary proxy) coincide with asulam application? There are 5 species showing as potentially having eggs in July: Linnet, Skylark, Nightjar, Hobby, Twite. Skylark (incubation = 13 - 14 days) and Twite (incubation = 13 days) eggs would very likely to have been laid*

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[20] According to the original assessment, see HSE internal ref WIS: 001953780, a foliar DT50 of 1.44 days (r2 > 0.97) was calculated by the RMS, using a simple first order kinetic model (this was equal to the value quoted by the Notifier). Using this DT50 value a ftwa of 0.0989 (window time = 21 days) was calculated.

before any spraying could occur, so the food consumed prior to/during egg formation is unlikely to be affected by aerial application of asulam in July or later.

- *What do potentially exposed species feed on, and where do they get their food (ie what's the likely exposure to asulam residues) given the repro tox effect is via food exposure? The table below has been constructed for the other three species. It attempts to capture the key information on habitat, diet and foraging ecology to enable the likely risk of exposure to be assessed:*

Species	***Nesting habitat in areas potentially treated with Asulox***	***Diet***	***Foraging ecology***	***Foraging habitat***	***Likely risk of exposure***
Linnet	*Mainly hedges and scrub, including gorse on heathland. Will nest amongst heather and, sometimes, in bracken on lower hill slopes in the Pennines*	*Granivorous, mostly small weed seeds (and oil seed rape on lowland farmland). Nestlings fed on regurgitated seeds.*	*Seeds are usually taken off plants (but also from the ground e.g., in crop stubbles)*	*Forage widely across landscape in search of seed-rich locations (up to c. 3km from nesting 'colonies'). Lightly grazed in-bye pastures and hay meadows important in upland landscapes*	*Incubation period is 13 - 14 days, so potential for latest broods to be affected. However, areas of dense bracken are very unlikely to be used for foraging as do not contain key seed-bearing plants, so risk of food being contaminated is low. Only concern may be those few birds that actually nest in bracken, if they have access to and fed on seed sources near to sprayed (i.e., affected by spray drift?)*
Nightjar	*Nests on bare/sparsely vegetated ground in open heathland or in scattered scrub, and in young conifer plantations. Open areas bordered by trees are favoured*	*Airborne insects, notably moths and beetles, plus other invertebrates*	*Largely taken in flight, but also by gleaning from vegetation*	*Birds forage widely (regularly >3km from breeding territories) over deciduous, mixed and conifer woodland, heathland orchards, gardens, riparian and other wetland habitats*	*Average incubation period is 18 days, so only the very latest nests have a risk of being affected. Also, diet and foraging locations mean that the risk of food being contaminated is low, unless birds are feeding largely in heathland areas.*
Hobby	*Woodland and hedgerow trees, often in old corvid nests.*	*Small birds and large insects (especially dragonflies, moths, butterflies and beetles). Small birds (notably hirundines and swifts) tend to be taken when there are young in the nest.*	*Taken in flight*	*Any open country, but often over or near water where typical prey concentrates.*	*Average incubation period is 29 days, so only the very latest nests have a risk of being affected. Also, diet and foraging locations mean that the risk of food being contaminated is low.*

On this basis, the risks of exposure at a critical time for egg formation seem relatively limited to few species, and for those species exposure via food intake in bracken seems relatively low.

This analysis is based on the tables in Breeding Birds by Habitat (attached) and the underlying BTO study is also attached. NB the breeding periods in habitat tables capture 90% of all the breeding attempts (ie we have only disregarded the 5 and 95 percentiles), so is reasonably precautionary. The information was used by NE to advise on the risks of nests/eggs/dependent young being [redacted] *by management activities (such as hedge cutting) and, hence, a potential offence being committed under Part 1 of the W&CA (Wildlife and Countryside Act).*

Alongside this discussion from NE they also provided supporting papers:

- BTO Research Report No. 352: Breeding periods for selected bird species in England (A. C. Joys & H. Q. P. Crick, March 2004)
- Untitled document detailing collated bird breeding periods in UK habitats

This information was submitted during the consideration of this use in 2019; at the time HSE ecotoxicology were not able to evaluate and comment on the relevance and reliability of these papers in detail. However, their content and its use to support the above NE discussion can be confirmed as commented upon. This case was not resubmitted and hence has not been reconsidered for this application.

The first point of NE discussion is aiming to establish which bird species would be expected to be breeding in bracken habitat. This is proposed as the reasoning for exposure potentially occurring, however it does not necessarily consider species which may nest/breed in proximity to bracken areas but would use the bracken itself for foraging activity and hence would still be exposed to residues. As such there is a potential limitation to the comprehensiveness of the species raised by NE. In a conventional regulatory risk assessment such establishment of relevant 'focal' species to consider further is usually determined by targeted monitoring of the foraging habitat in question in order to establish the most frequently occurring species for each feeding guild of concern. Whilst the NE information obviously does not follow this approach it is nonetheless of relevance to bird feeding guilds which could be expected in bracken. The exact species listed are confirmed as coming from the provided untitled paper of breeding bird periods in woodland, heathland, moorland and grassland – all areas expected to be treated for bracken control, although not necessarily having bracken in presence when the information was collected (based on the information provided). Included in the list of potential breeding bird species are representatives of the three feeding guilds considered in the earlier regulatory risk assessment.

NE then go on to discuss whether each of these species would be expected to be in an early breeding phase (i.e., egg formation) during the months proposed for aerial applications of 'Asulox'. This has been used to discount all species except for Linnet (a small granivore), Skylark (a small omnivore), Nightjar (a medium-sized insectivore, mostly flighted insects), Hobby (a larger insectivore or predator of other birds) and Twite (another small granivore). Based on the submitted papers from NE this is supported, again noting that the relevance and reliability of this information has not been fully evaluated by HSE[21]. The skylark and twite (omnivore representative and small granivore representative) are further discounted due to their short egg incubation time, making exposure of birds during the egg formation period more unlikely. Based on the provided paper of Joys (2004) this would appear to be supported, based on the 95th percentile of first egg-laying being reported as 'day 187' – equivalent to 6 July – for the skylark and day 188 – 7 July – for Twite. Use of the 95th percentile sits with historical HSE approaches to such data. Notably this approach from NE means that the regulatory risk assessment-considered guilds of small omnivore and small insectivore are proposed as irrelevant for bracken for the time of application, noting HSE comments on the relevance and reliability of the papers underpinning this conclusion.

Based on this approach NE have identified 3 relevant species of reproductive concern in bracken to be treated with 'Asulox' (July – Sept): The small granivorous linnet, the medium-sized insectivorous nightjar and the insectivorous/bird-eating hobby. There is then justification as to why each would be of limited exposure to 'Asulox', based on provided detail of diet, manner of foraging, foraging range and incubation time:

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[21] This case was submitted with the 2019 application and were not resubmitted with the 2020 application. Given the time available these cases have not been considered further for this, the 2020 application.

- Linnet (granivore) is proposed as of limited exposure due to the wide foraging area (up to ca. 3 km from nest location), limited availability of seed food items in bracken, short incubation period meaning only latest broods would be at risk of exposure. Of these factors only the statement on brood timing is supported within the information provided by NE, and the paper of Joys (2004) indicates a 95th percentile first egg laying date of 'day 194' – 13 July.
- Nightjar (medium insectivore) is proposed as of limited exposure due to the fact most foraging is taken in-flight, so prey items may not have even been exposed to asulam residues, a wide home range (> 3km stated) and the incubation time being 18 days on average. Of these only the incubation time argument can be verified from the information submitted. HSE further notes the questionable relevance of this species as representing insectivorous birds in bracken due to the large home-range and tendency to take food 'on the wing' meaning that other insectivores of relevance which also forage on ground arthropods in bracken would potentially be of higher risk than indicated for nightjars.
- Hobby (insectivore/bird of prey) is considered of lower relevance by HSE as it is only partially insectivorous and is larger in size than the nightjar, so would be covered by that species conclusion.

Overall, the additional information provided by NE has merit in indicating that exposure (hence risk) to breeding birds which would be foraging in treated bracken is lower than predicted based on the regulatory risk assessment. Additionally, although not robust there is an indication from the data that residue exposure over a long-term timescale associated with this risk assessment would be lower than considered due to the degradation profile of the active substance asulam.

Considering these qualitative factors against the regulatory risk assessment for birds is difficult; the resulting TERlt presented above is below the regulatory trigger value of 5, hence neither the surrogate nor actual protection goal will be met. The additional qualitative data provides an indication that the risk will be less than that initially predicted, however the data are not particularly robust and, as a result, there are many uncertainties. Due to these factors, it is not possible to say how much less and hence whether the protection goals will be met.

For submission COP2020/0646, the Applicant submitted some additional information. This is presented and discussed in Appendix 1 of this section. This additional information did not change the above assessment.

Further refinement of ecological data

Presented in Appendix 5 is a refined risk assessment by the Applicant. HSE has considered this assessment and outlined below is their consideration of it:

The Applicant outlines the rationale regarding focusing on key species, conventionally this would be done via the use of focal species studies (see Appendix M of EFSA (2009), however due to bracken growing in a wide range of habitats, such conventional data are not available. The Applicant has therefore relied on available knowledge to identify key species. This approach is considered, for the purposes of this application, to be appropriate. It should, however, be noted that there are associated uncertainties with this approach, especially as the sources have not be substantiated. One way to partially address this uncertainty is to ensure that there are suitable species representing a range of feeding guilds. Having identified a range of potential species, the Applicant has further considered those species where there is an overlap of spraying and breeding. This approach is as outlined in Appendix J of EFSA (2009). In addition, the Applicant has highlighted that as the key avian reproductive endpoint is eggshell thickness, that exposure during egg-formation is key.

As a result of the approach outlined in Appendix 5, the following species have been highlighted:

Potential exposure during egg formation:

Yes

Linnet
Skylark
Whinchat
Stonechat

Yellowhammer
Nightjar
Hobby
Twite
Bullfinch
Tree sparrow
Spotted flycatcher
Dartford warbler
Grasshopper warbler
Reed bunting
Woodcock
Stock dove
Coal tit

Possible

Yellow wagtail
Pied flycatcher

It should be noted that HSE has not been able to verify the assessment presented by the Applicant due to the lack of availability of Joys and Crick (2004) and other references. It should, however, be noted that Joys and Crick was used, along with the BTO database in the development of PS2364[22].

HSE has checked the breeding times of key species against those presented in the Defra report PS2364. HSE has not checked all the species, only those considered relevant on the basis of where the species may feed – see below. Of the key species identified below, data are available in PS2364 on the linnet, yellowhammer, and reed bunting; other species highlighted, i.e., twite, whinchat, stonechat and nightjar tend not to occur in agricultural/horticultural habitats and hence were not considered when the Bird Bible[23] was produced.

Eggshell thickness is the parameter that was used to set the endpoint, and hence HSE considers that key period of exposure is pair formation. The Applicant appears from the above table to have considered the time taken for pair formation and egg formation. As the latter is key, it would be preferable to consider when this starts, as a result when HSE used the spreadsheet associated with PS2364, the dates differ, i.e., HSE dates are earlier, however what is important is that these species all undergo pair formation within the spray period, i.e., 1st July to 13th September.

One reason for determining potential focal species, then considering their breeding period was to determine if there was any overlap between breeding and spray application, or whether any appropriate restrictions could be imposed to mitigate the risk. HSE has considered this issue and the only time, according to PS2364, when these three species were unlikely to be exposed during breeding would be if applications were made between 1st September and 13th September, it is unknown whether this restriction reduces the usefulness of the product to such an extent to make it unusable; in addition, it should be noted that there has not be a comparable assessment for the remaining species.

It should be noted that Step (vii) in Appendix 5, i.e., determination of whether the species feeds in stands of bracken, would normally have been considered as part of a focal species study rather than at a later stage and it could be argued that it could have been done prior to considering the egglaying times etc. However, the data are still relevant and are considered below.

The assessment, presented in Table 2 of Appendix 5, is useful in trying to determine appropriate focal species. Whilst some of the information is taken from the HSE 'Bird Bible', most is unreferenced and where referenced,

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[22] PS2364, Literature review of bird and mammal breeding phenologies and the factors affecting them. see http://randd.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=17615#Description).

[23] See Birdbible1.DOC (hse.gov.uk)

the references have not been submitted. This does introduce an element of uncertainty in to the assessment. However, HSE has checked some of the information against the Bird Bible as well as general bird watching publications. As a result of this step, the following species were considered to be of very low risk of exposure and hence were not considered further:

Skylark
Hobby
Dartford Warbler
Bullfinch
Tree Sparrow
Spotted Flycatcher
Pied Flycatcher
Woodcock
Stock dove
Coal tit

For those remaining species, an assessment was made of the significance for populations of the period of breeding cycle where an overlap was found. This assessment was a qualitative judgement, based on expert judgement by NE and NatureScot ornithologists. The Applicant highlights that this area could benefit from further work.

As can be seen in the table presented below point (viii) of Appendix 5, the Applicant has proposed the following focal species:

Granivore: Lowland heathland / grassland habitats: **Linnet,**
Granivore: Upland moorland: **twite**
Omnivore**: yellowhammer, reed bunting,**
Insectivore**: whinchat, stonechat, nightjar**

As regards the woodland environment, there is no additional species with overlapping feeding requirements or breeding periods other than those above.

The consideration by the Applicant of feeding guild and habitat seems appropriate, hence, whilst noting the uncertainty, the above species are considered by HSE to be *potential* focal species and hence relevant for a refined risk assessment in that if the risk to these species were addressed, then it could be considered that other species with similar feeding and breeding strategies would also be addressed.

Normally, once focal species have been established, the risk assessment presented above is re-run using appropriate food intake rate (i.e., FIR/Bw) data as well as any other data, for example residue decline, ecological data (i.e., proportion of diet obtained from the treated area (PT) and/or the proportion of food types obtained from the treated area (PD)). Neither PT nor PD data are available. In the absence of such data, it is possible to refine the FIR/bw on the basis of available information in the HSE Bird Bible, however these data will be from predominantly agricultural environments and not environments where bracken is being controlled. Whilst it could be argued that the diet for a specific species is likely to be constant in terms of proportions of vegetation, invertebrates, etc, regardless of habitat, not having appropriate PD data does introduce a further uncertainty.

HSE has determined FIR/bw for the range of possible focal species and these are presented below. The diet between July and September has been considered:

Species	**Bw**	**Diet**			**FIR/bw**
		Seed	Veg	Inverts	
Linnet	15.3	100%			0.28
Yellowhammer	26.5	75%		25%	0.28 - assuming wet 0.35 - assuming dry Relevant seasonal data used, crop/scenario unknown.

Please note that the HSE Bird Bible has been used to derive the above diets and associated FIR/bw. No information are presented in the Bird Bible on Twite, Whinchat, Stonechat or Nightjar.

Residue decline data have been referenced and whilst the final reports have been submitted they have not been evaluated under this application.

The Applicant has referenced the potential for interception to reduce the exposure and hence risk further. It should be noted that the accepted refinements have been factored in to the above refinement and it is not considered appropriate to quantitatively factor in further refinements. The Applicant acknowledges that the work should be considered with caution and in fact the work supplied is a summary of work and not the actual studies themselves. The Applicant also highlights that further work is potentially planned for 2021. HSE considers that in order for this to be factored in quantitatively in to the risk assessment, submission of the original reports and/or the new work planned for 2021, is required.

On the basis of the above, there is more clarity regarding the possible bird species that could potentially be at risk from the use of 'Asulox' to control bracken, however it is currently not possible to advance the risk assessment further and hence remove the previous restrictions.

The data on potential focal species and associated breeding times does provide an indication of possible mitigation for three species of bird, however, the restriction is such, i.e., applying only between 1st September and 13th September, that it is unknown whether this restriction reduces the usefulness of the product to such an extent to make it unusable. In addition, it should be noted that there has not be a comparable assessment for the remaining species

The data on residue decline and/or interception may aid the risk assessment. It should, however, be noted that due to the lack of suitable dietary data on the all of the above species, refinement will only occur at the generic focal species level.

Consideration of new information aimed at refining the risk to birds, submitted in support of the 2022 application (i.e., COP 2021/02343)

Residue decline data

Author [redacted] (2021)

Title: Residues of asulam in arthropods, seeds and ground vegetation after late summer (August/September) spray application of Asulox in an upland bracken area in UK – magnitude of residues and time course of residue decline. UPL Europe Ltd.; unpubl. RIFCON GmbH report No. R1640115, 27 January 2021

Aim: The study intended to record asulam (and its metabolites malonyl asulam, sulfanilamide and asulam glucosides) specific residue decline data on potential bird and mammal diets to calculate DT_{50} values for the use in wildlife risk assessments.

Material and Methods

Study site

The field study was conducted in an upland bracken area (study field, approximately 7.9 ha) situated approximately 2 km north of Gillamoor, North Yorkshire, UK. The study field was completely surrounded by moorland. A road passed through the eastern part of the study field. Nearby the southern and the eastern part of the study field was a track. Within the study field three study plots were established. Study plot 1, 2 and 3 had a size of approximately 2.9 ha, 2.5 ha and 2.5 ha, respectively. All arthropods, ground vegetation and seeds were collected within these three study plots.

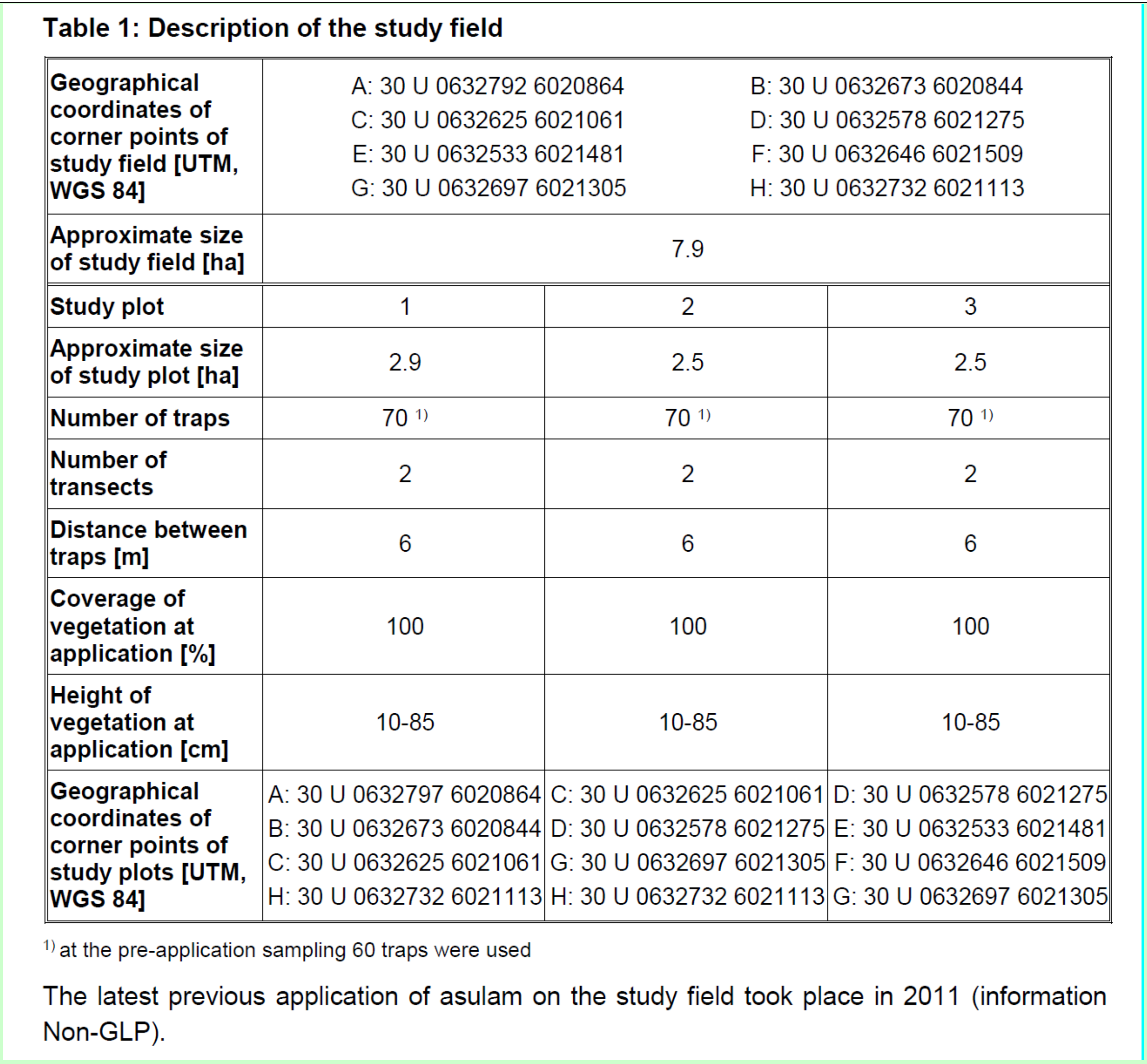


Table 1: Description of the study field

Geographical coordinates of corner points of study field [UTM, WGS 84]	A: 30 U 0632792 6020864 C: 30 U 0632625 6021061 E: 30 U 0632533 6021481 G: 30 U 0632697 6021305	B: 30 U 0632673 6020844 D: 30 U 0632578 6021275 F: 30 U 0632646 6021509 H: 30 U 0632732 6021113	
Approximate size of study field [ha]	7.9		
Study plot	1	2	3
Approximate size of study plot [ha]	2.9	2.5	2.5
Number of traps	70 [1)]	70 [1)]	70 [1)]
Number of transects	2	2	2
Distance between traps [m]	6	6	6
Coverage of vegetation at application [%]	100	100	100
Height of vegetation at application [cm]	10-85	10-85	10-85
Geographical coordinates of corner points of study plots [UTM, WGS 84]	A: 30 U 0632797 6020864 B: 30 U 0632673 6020844 C: 30 U 0632625 6021061 H: 30 U 0632732 6021113	C: 30 U 0632625 6021061 D: 30 U 0632578 6021275 G: 30 U 0632697 6021305 H: 30 U 0632732 6021113	D: 30 U 0632578 6021275 E: 30 U 0632533 6021481 F: 30 U 0632646 6021509 G: 30 U 0632697 6021305

[1)] at the pre-application sampling 60 traps were used

The latest previous application of asulam on the study field took place in 2011 (information Non-GLP).

Test item and application

Product code: HBM01
Batch ID.: 1705-30002

The test item Asulox synonym Asulam 400 g/L SL (containing nominal 400 g/L of the active substance asulam) was applied on 04 September 2017 at a nominal application rate of 11 L product/ha (corresponding to a nominal a.s. content of 4.4 kg asulam) in a spray volume of 44 L water /ha (corresponding to 55 L spray solution/ha). The actual nominal application rate of the application was 4.4 kg a.s./ha (analysed 4.35 kg a.s./ha) in a spray volume of 55.01 L/ha.

A helicopter mounted boom sprayer was used. The sprayer was equipped with 109 nozzles.

The latest previous application of asulam on the study field took place in 2011 (information Non-GLP).

Arthropod sampling

Samples of natural populations of ground-dwelling arthropods were collected for residue analysis by pitfall trapping, whereas foliage-dwelling arthropods were collected by inventory spraying.

The pitfall traps were activated (opened) approximately 24 h before sampling. Over a period of 16 days, altogether eight sampling events took place for ground-dwelling arthropods with samples taken on each of the three study plots separately. A pre-sampling was conducted one day before application (DAT -1), thereafter further samples were collected at DAT 1, 2, 3, 5, 7, 10 and 14. At each sampling event arthropods were collected from all individual pitfall traps per study plot and pooled to provide a single sample per study plot.

A defined area of 10 m² was treated with AquaPy® to obtain the foliage-dwelling arthropod matrix. All foliage-dwellers recovered from the gutters (positioned under the vegetation) at each sampling event and study plot were pooled to obtain a single sample per study plot. Inventory spraying, hence sampling of foliage-dwelling arthropods was done eight times. A pre-sampling was conducted one day before application (DAT -1), thereafter further samples were collected at DAT 1, 2, 3, 5, 7, 10 and 13. Due to bad weather forecast, the sampling of foliage-dwelling arthropods was shifted from DAT 14 to DAT 13. **Due to an unforeseen rain event on DAT 0, the sampling could not be conducted due to wet vegetation.**

After determination of the main taxonomic orders the arthropod samples were weighed and stored at a temperature of ≤-18°C until handing over to the Analytical Test Site.

Vegetation and seed sampling

Samples of dicotyledons (heather-blueberry-mix as complete plants without roots) and monocotyledons were sampled by cutting with scissors just above the soil.

Monocotyledons

For sampling of monocotyledons (without roots) the vegetation was cut with scissors just above the ground in a defined area. Afterwards, the monocotyledons were divided in two parts (1st part: from the ground up to approximately 15 cm; 2nd part: the remaining upper part from > 15 cm from the ground).

Dicotyledons

For sampling of dicotyledons (without roots) heather and blueberry were cut with scissors just above the ground in a defined area (in shape of a square, 50 x 50 cm). After sampling heather and blueberry were pooled in a weight ratio of approximately 50% heather and 50% blueberry. The matrix mass per sample was ≥ 100 g. Sampling was conducted at comparable sites within the study plots (similar composition of ground vegetation). The samples were taken in randomly selected areas within each study plot.

Over a period of 16 days, altogether 9 monocotyledons, dicotyledons and seeds sampling events took place with samples taken on each of the three study plots separately. A pre-sampling was conducted as well one day before application (DAT -1), and thereafter further samples were collected at DAT 0 (approximately 1 hour after application, Deviation 1), 1, 2, 3, 5, 7, 10 and 14.

Following each sampling event, the collected vegetation and seeds were weighed and stored at a temperature of ≤ -18 °C until handing over to the Analytical Test Site.

Weather data

Precipitation was measured with a rain logger (Non-GLP) in the study field. Precipitation data of 2015 and 2016 were obtained from the nearest precipitation recording weather recording station, approximately 6 km from the study field, at Church Houses and were provided by MetOffice.

Temperature was measured with a datalogger in the study field. Temperature data of 2015 and 2016 were obtained from the nearest temperature recording weather recording station, approximately 22 km from the study field, at Carlton-In-Cleveland and were provided by MetOffice. No historical temperature data were available from the weather station at Church Houses where only historical precipitation was recorded.

Residue analysis

Asulam residues and residues of its metabolites asulam glucosides, malonyl asulam and sulfanilimide were analysed with LC-MS/MS.

The Limit of Quantification (LOQ) and the <30%LOQ level for asulam as well as for the metabolites malonyl asulam, sulfanilamide and asulam glucosides were stated to be 0.05 mg a.s./kg f.w. and 0.015 mg a.s./kg f.w., respectively.

A detailed consideration of the methods of analysis is presented in Appendix 11. This assessment indicates that there are concerns with the methods used, however it is concluded that the methods for asulam used are considered to be sufficiently validated:

- Seed
- Monocot
- Dicot
- Bracken
- Arthropod
- Asulam determinations for monocots and dicots are only considered validated between 0.01 and 0.1 mg/kg.

In addition, it is noted that there are concerns regarding the storage stability data, especially for fresh grass samples, however overall, the Chemistry expert considers that on balance the studies suitably supported (see Appendix 13 and Section 2.4).

(It should be noted that for the ecotoxicological risk assessment there has been no consideration of the metabolites.)

Data evaluation and statistics

The daily, initial and maximum mean concentrations of asulam and its metabolites in ground and foliage-dwelling arthropods, monocotyledons, dicotyledons and seeds, as well as the 90th percentiles, were calculated based on the arithmetic mean of three replicates.

Residues per Unit Dose (RUD) on the basis of an application rate of 1.0 kg a.s./ha for daily, initial and maximum mean residue values, as well as for the maximum 90th percentile were calculated.

The DT_{50} of asulam and its metabolites was calculated using Single First Order (SFO) kinetic up to a Chi^2 error value of 25%, t-test $p < 0.1$ and acceptable visual fit. If the triggers for SFO were not met, best fit kinetics were used or, if still not possible, only the time weighted average residue concentration (TWA) based on the area under the curve (AUC) was reported.

TWA residue concentrations were calculated by interpolating concentrations for days for which no experimental data were available (linear interpolation) and by calculating the mean over a given time period.

Results

Presented below are the key findings from the above work in terms of residues over time on ground dwelling arthropods, foliar dwelling arthropods, monocotyledons, dicotyledons and seeds. Data are also presented for malonyl asulam.

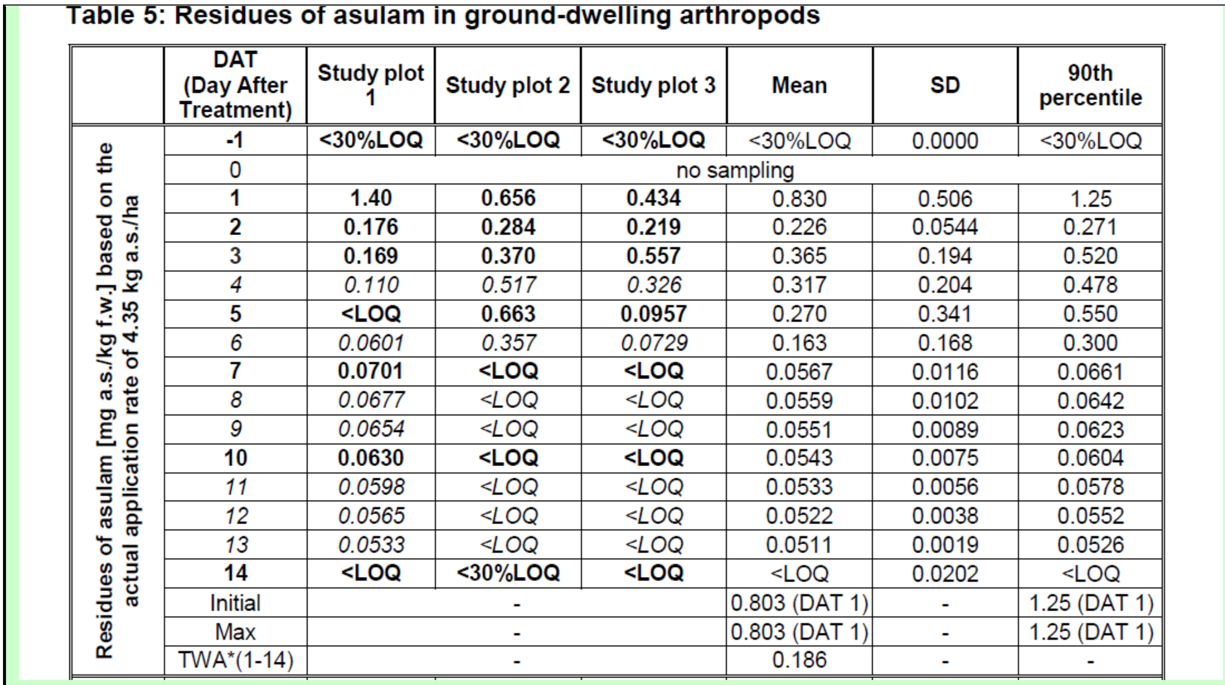


Table 5: Residues of asulam in ground-dwelling arthropods

	DAT (Day After Treatment)	**Study plot 1**	**Study plot 2**	**Study plot 3**	**Mean**	**SD**	**90th percentile**
Residues of asulam [mg a.s./kg f.w.] based on the actual application rate of 4.35 kg a.s./ha	**-1**	**<30%LOQ**	**<30%LOQ**	**<30%LOQ**	<30%LOQ	0.0000	<30%LOQ
	0	no sampling					
	1	**1.40**	**0.656**	**0.434**	0.830	0.506	1.25
	2	**0.176**	**0.284**	**0.219**	0.226	0.0544	0.271
	3	**0.169**	**0.370**	**0.557**	0.365	0.194	0.520
	4	*0.110*	*0.517*	*0.326*	0.317	0.204	0.478
	5	**<LOQ**	**0.663**	**0.0957**	0.270	0.341	0.550
	6	*0.0601*	*0.357*	*0.0729*	0.163	0.168	0.300
	7	**0.0701**	**<LOQ**	**<LOQ**	0.0567	0.0116	0.0661
	8	*0.0677*	*<LOQ*	*<LOQ*	0.0559	0.0102	0.0642
	9	*0.0654*	*<LOQ*	*<LOQ*	0.0551	0.0089	0.0623
	10	**0.0630**	**<LOQ**	**<LOQ**	0.0543	0.0075	0.0604
	11	*0.0598*	*<LOQ*	*<LOQ*	0.0533	0.0056	0.0578
	12	*0.0565*	*<LOQ*	*<LOQ*	0.0522	0.0038	0.0552
	13	*0.0533*	*<LOQ*	*<LOQ*	0.0511	0.0019	0.0526
	14	**<LOQ**	**<30%LOQ**	**<LOQ**	<LOQ	0.0202	<LOQ
	Initial	-			0.803 (DAT 1)	-	1.25 (DAT 1)
	Max	-			0.803 (DAT 1)	-	1.25 (DAT 1)
	TWA*(1-14)	-			0.186	-	-

Bold residues: measured values,
Italics: interpolated values

Due to the lack of ground-dwelling arthropods on DAT3 on study plot 1, not enough ground-dwelling arthropods could be sampled on DAT3 (0.64g). All other samples were > 1g.

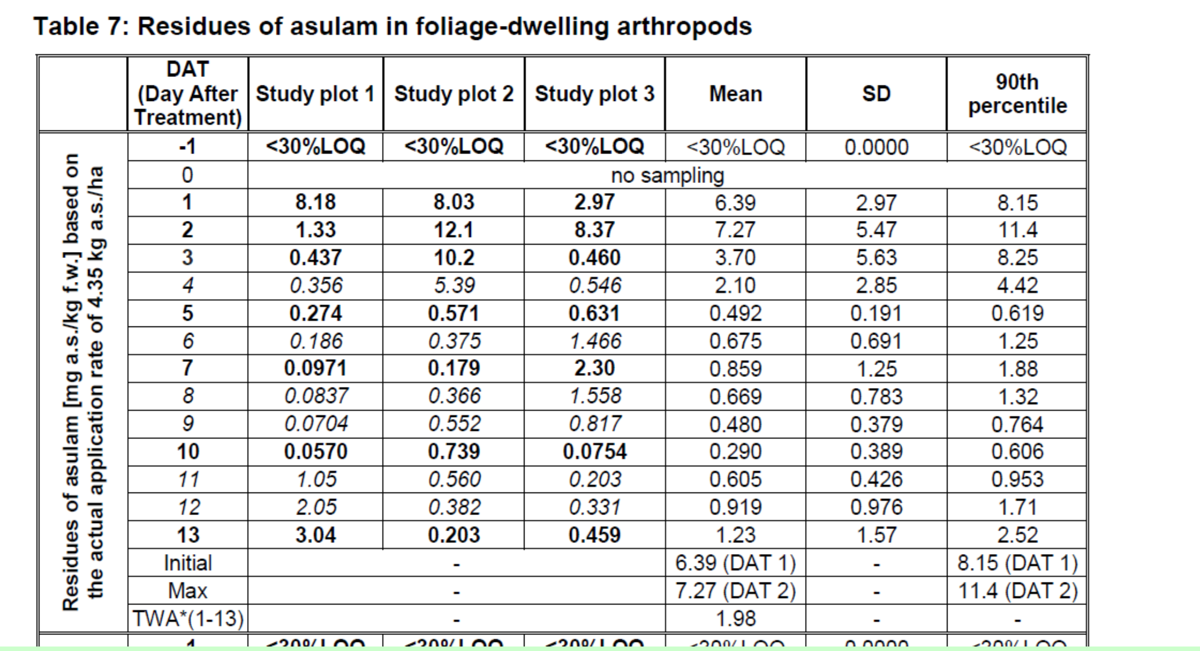


Table 7: Residues of asulam in foliage-dwelling arthropods

	DAT (Day After Treatment)	**Study plot 1**	**Study plot 2**	**Study plot 3**	**Mean**	**SD**	**90th percentile**
Residues of asulam [mg a.s./kg f.w.] based on the actual application rate of 4.35 kg a.s./ha	**-1**	**<30%LOQ**	**<30%LOQ**	**<30%LOQ**	<30%LOQ	0.0000	<30%LOQ
	0	no sampling					
	1	**8.18**	**8.03**	**2.97**	6.39	2.97	8.15
	2	**1.33**	**12.1**	**8.37**	7.27	5.47	11.4
	3	**0.437**	**10.2**	**0.460**	3.70	5.63	8.25
	4	*0.356*	*5.39*	*0.546*	2.10	2.85	4.42
	5	**0.274**	**0.571**	**0.631**	0.492	0.191	0.619
	6	*0.186*	*0.375*	*1.466*	0.675	0.691	1.25
	7	**0.0971**	**0.179**	**2.30**	0.859	1.25	1.88
	8	*0.0837*	*0.366*	*1.558*	0.669	0.783	1.32
	9	*0.0704*	*0.552*	*0.817*	0.480	0.379	0.764
	10	**0.0570**	**0.739**	**0.0754**	0.290	0.389	0.606
	11	*1.05*	*0.560*	*0.203*	0.605	0.426	0.953
	12	*2.05*	*0.382*	*0.331*	0.919	0.976	1.71
	13	**3.04**	**0.203**	**0.459**	1.23	1.57	2.52
	Initial	-			6.39 (DAT 1)	-	8.15 (DAT 1)
	Max	-			7.27 (DAT 2)	-	11.4 (DAT 2)
	TWA*(1-13)	-			1.98	-	-

Bold residues: measured values,
Italics: interpolated values

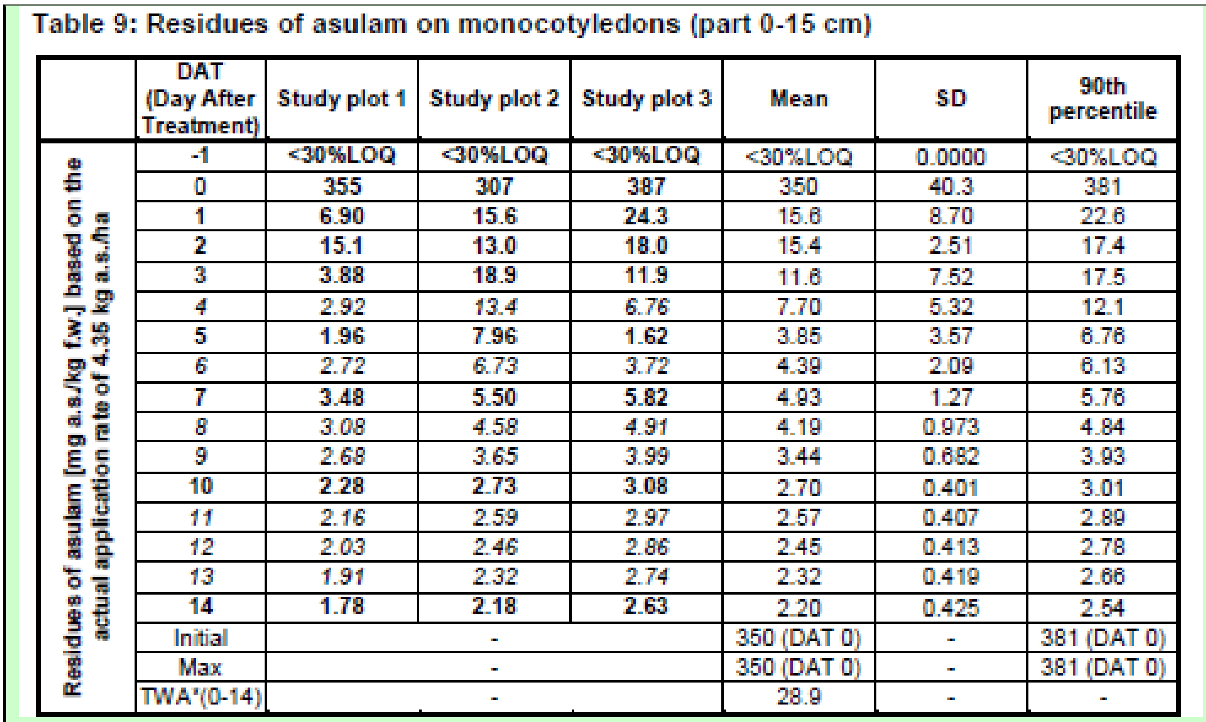


Table 9: Residues of asulam on monocotyledons (part 0-15 cm)

	DAT (Day After Treatment)	Study plot 1	Study plot 2	Study plot 3	Mean	SD	90th percentile
Residues of asulam [mg a.s./kg f.w.] based on the actual application rate of 4.35 kg a.s./ha	**-1**	**<30%LOQ**	**<30%LOQ**	**<30%LOQ**	<30%LOQ	0.0000	<30%LOQ
	0	**355**	**307**	**387**	350	40.3	381
	1	**6.90**	**15.6**	**24.3**	15.6	8.70	22.6
	2	**15.1**	**13.0**	**18.0**	15.4	2.51	17.4
	3	**3.88**	**18.9**	**11.9**	11.6	7.52	17.5
	4	*2.92*	*13.4*	*6.76*	7.70	5.32	12.1
	5	**1.96**	**7.96**	**1.62**	3.85	3.57	6.76
	6	*2.72*	*6.73*	*3.72*	4.39	2.09	6.13
	7	**3.48**	**5.50**	**5.82**	4.93	1.27	5.76
	8	*3.08*	*4.58*	*4.91*	4.19	0.973	4.84
	9	*2.68*	*3.65*	*3.99*	3.44	0.682	3.93
	10	**2.28**	**2.73**	**3.08**	2.70	0.401	3.01
	11	*2.16*	*2.59*	*2.97*	2.57	0.407	2.89
	12	*2.03*	*2.46*	*2.86*	2.45	0.413	2.78
	13	*1.91*	*2.32*	*2.74*	2.32	0.419	2.66
	14	**1.78**	**2.18**	**2.63**	2.20	0.425	2.54
	Initial		-		350 (DAT 0)	-	381 (DAT 0)
	Max		-		350 (DAT 0)	-	381 (DAT 0)
	TWA*(0-14)		-		28.9	-	-

Bold residues: measured values,
Italics: interpolated values

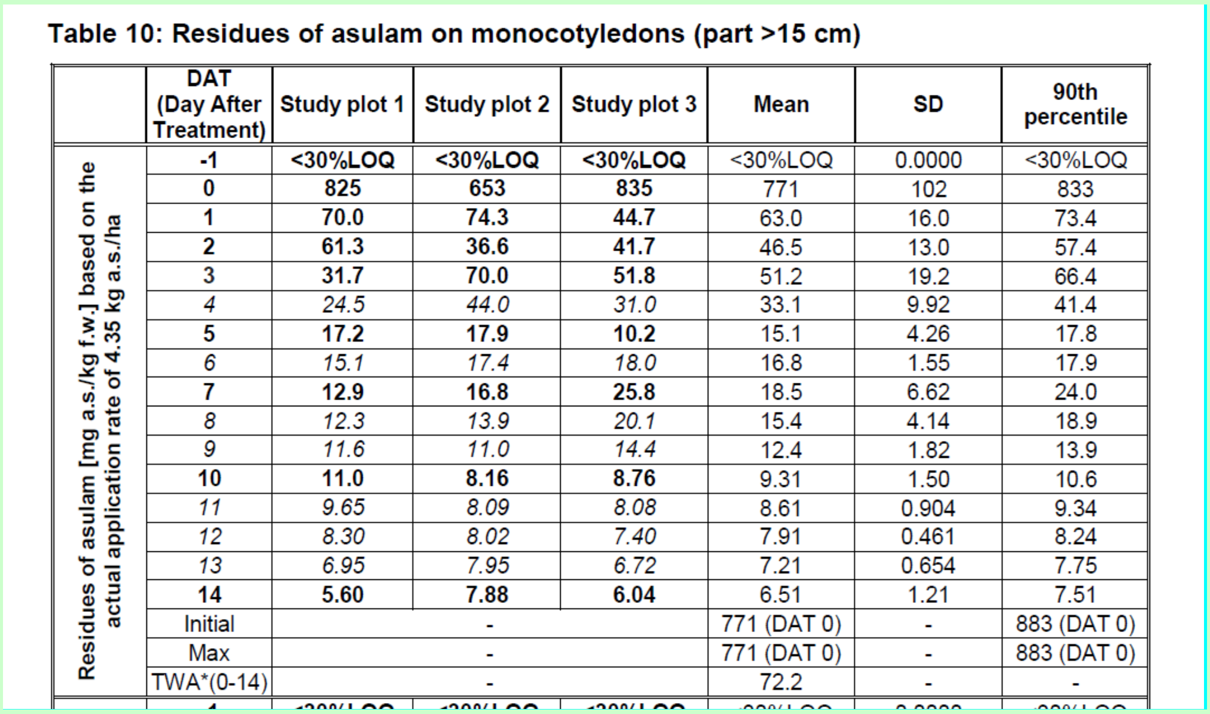


Table 10: Residues of asulam on monocotyledons (part >15 cm)

	DAT (Day After Treatment)	Study plot 1	Study plot 2	Study plot 3	Mean	SD	90th percentile
Residues of asulam [mg a.s./kg f.w.] based on the actual application rate of 4.35 kg a.s./ha	**-1**	**<30%LOQ**	**<30%LOQ**	**<30%LOQ**	<30%LOQ	0.0000	<30%LOQ
	0	**825**	**653**	**835**	771	102	833
	1	**70.0**	**74.3**	**44.7**	63.0	16.0	73.4
	2	**61.3**	**36.6**	**41.7**	46.5	13.0	57.4
	3	**31.7**	**70.0**	**51.8**	51.2	19.2	66.4
	4	*24.5*	*44.0*	*31.0*	33.1	9.92	41.4
	5	**17.2**	**17.9**	**10.2**	15.1	4.26	17.8
	6	*15.1*	*17.4*	*18.0*	16.8	1.55	17.9
	7	**12.9**	**16.8**	**25.8**	18.5	6.62	24.0
	8	*12.3*	*13.9*	*20.1*	15.4	4.14	18.9
	9	*11.6*	*11.0*	*14.4*	12.4	1.82	13.9
	10	**11.0**	**8.16**	**8.76**	9.31	1.50	10.6
	11	*9.65*	*8.09*	*8.08*	8.61	0.904	9.34
	12	*8.30*	*8.02*	*7.40*	7.91	0.461	8.24
	13	*6.95*	*7.95*	*6.72*	7.21	0.654	7.75
	14	**5.60**	**7.88**	**6.04**	6.51	1.21	7.51
	Initial		-		771 (DAT 0)	-	883 (DAT 0)
	Max		-		771 (DAT 0)	-	883 (DAT 0)
	TWA*(0-14)		-		72.2	-	-

Bold residues: measured values,
Italics: interpolated values

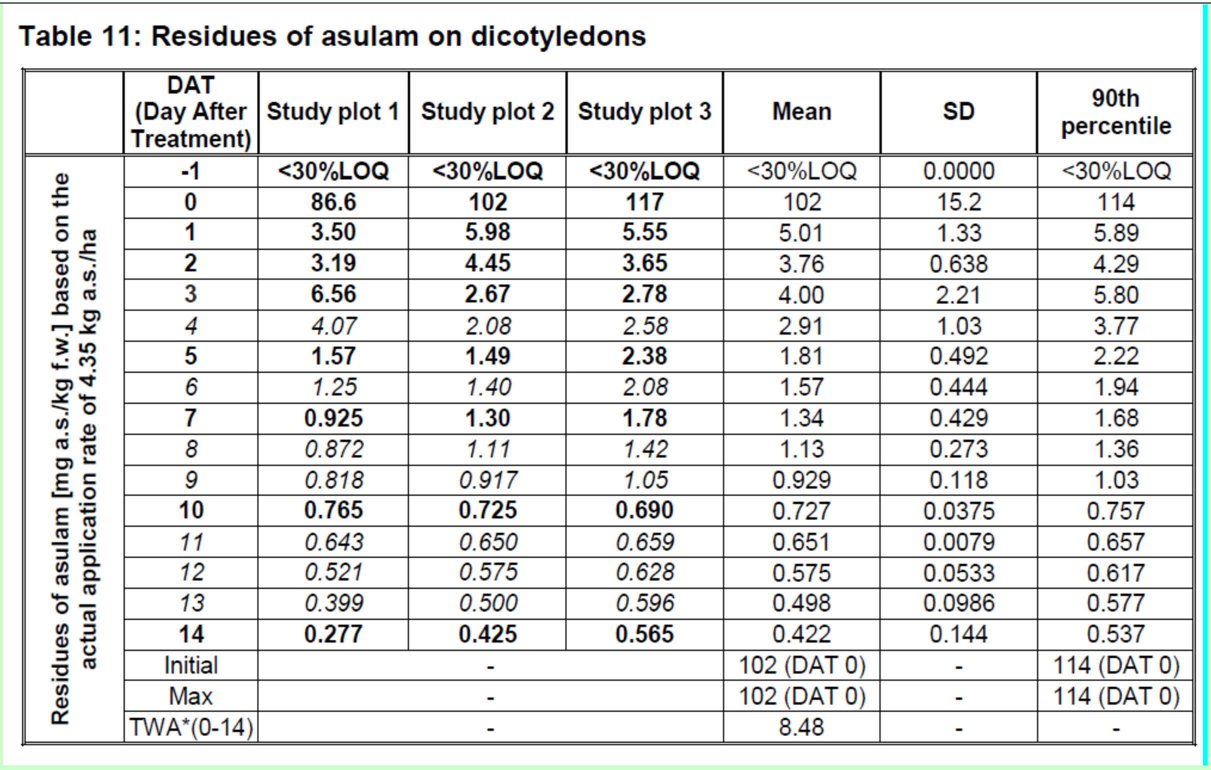


Table 11: Residues of asulam on dicotyledons

	DAT (Day After Treatment)	**Study plot 1**	**Study plot 2**	**Study plot 3**	**Mean**	**SD**	**90th percentile**
Residues of asulam [mg a.s./kg f.w.] based on the actual application rate of 4.35 kg a.s./ha	**-1**	**<30%LOQ**	**<30%LOQ**	**<30%LOQ**	<30%LOQ	0.0000	<30%LOQ
	0	**86.6**	**102**	**117**	102	15.2	114
	1	**3.50**	**5.98**	**5.55**	5.01	1.33	5.89
	2	**3.19**	**4.45**	**3.65**	3.76	0.638	4.29
	3	**6.56**	**2.67**	**2.78**	4.00	2.21	5.80
	4	*4.07*	*2.08*	*2.58*	2.91	1.03	3.77
	5	**1.57**	**1.49**	**2.38**	1.81	0.492	2.22
	6	*1.25*	*1.40*	*2.08*	1.57	0.444	1.94
	7	**0.925**	**1.30**	**1.78**	1.34	0.429	1.68
	8	*0.872*	*1.11*	*1.42*	1.13	0.273	1.36
	9	*0.818*	*0.917*	*1.05*	0.929	0.118	1.03
	10	**0.765**	**0.725**	**0.690**	0.727	0.0375	0.757
	11	*0.643*	*0.650*	*0.659*	0.651	0.0079	0.657
	12	*0.521*	*0.575*	*0.628*	0.575	0.0533	0.617
	13	*0.399*	*0.500*	*0.596*	0.498	0.0986	0.577
	14	**0.277**	**0.425**	**0.565**	0.422	0.144	0.537
	Initial	-			102 (DAT 0)	-	114 (DAT 0)
	Max	-			102 (DAT 0)	-	114 (DAT 0)
	TWA*(0-14)	-			8.48	-	-

Bold residues: measured values,
Italics: interpolated values

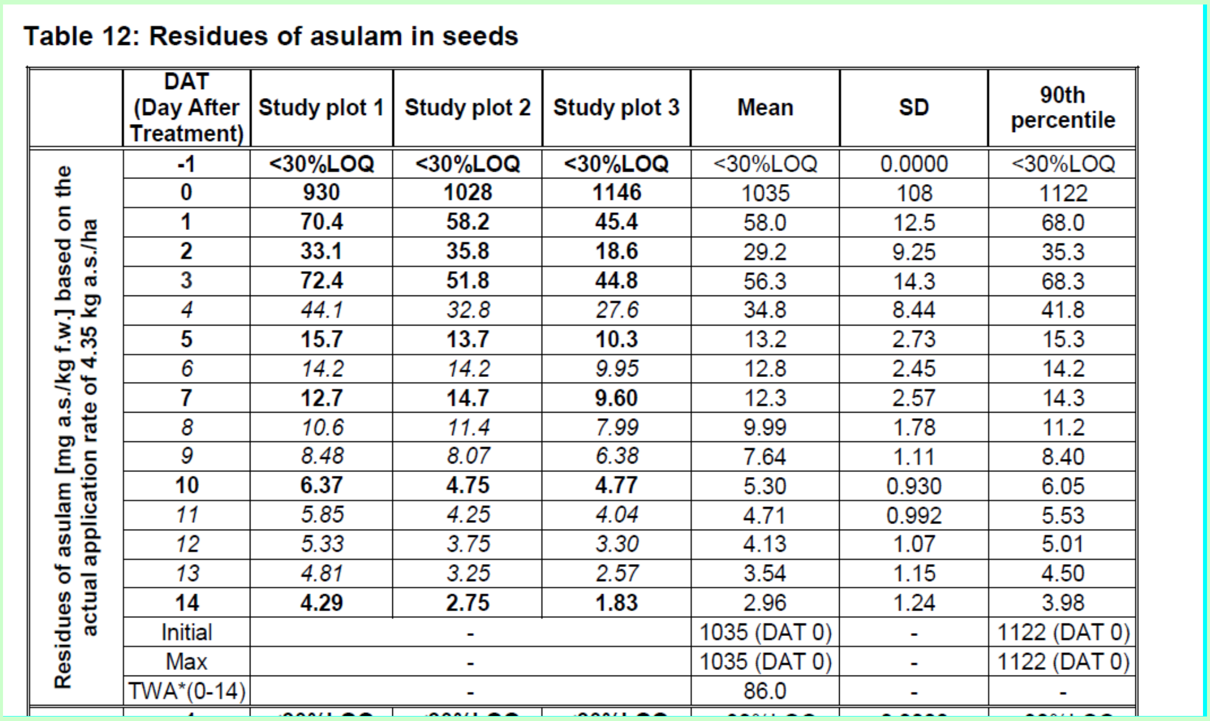


Table 12: Residues of asulam in seeds

	DAT (Day After Treatment)	**Study plot 1**	**Study plot 2**	**Study plot 3**	**Mean**	**SD**	**90th percentile**
Residues of asulam [mg a.s./kg f.w.] based on the actual application rate of 4.35 kg a.s./ha	**-1**	**<30%LOQ**	**<30%LOQ**	**<30%LOQ**	<30%LOQ	0.0000	<30%LOQ
	0	**930**	**1028**	**1146**	1035	108	1122
	1	**70.4**	**58.2**	**45.4**	58.0	12.5	68.0
	2	**33.1**	**35.8**	**18.6**	29.2	9.25	35.3
	3	**72.4**	**51.8**	**44.8**	56.3	14.3	68.3
	4	*44.1*	*32.8*	*27.6*	34.8	8.44	41.8
	5	**15.7**	**13.7**	**10.3**	13.2	2.73	15.3
	6	*14.2*	*14.2*	*9.95*	12.8	2.45	14.2
	7	**12.7**	**14.7**	**9.60**	12.3	2.57	14.3
	8	*10.6*	*11.4*	*7.99*	9.99	1.78	11.2
	9	*8.48*	*8.07*	*6.38*	7.64	1.11	8.40
	10	**6.37**	**4.75**	**4.77**	5.30	0.930	6.05
	11	*5.85*	*4.25*	*4.04*	4.71	0.992	5.53
	12	*5.33*	*3.75*	*3.30*	4.13	1.07	5.01
	13	*4.81*	*3.25*	*2.57*	3.54	1.15	4.50
	14	**4.29**	**2.75**	**1.83**	2.96	1.24	3.98
	Initial	-			1035 (DAT 0)	-	1122 (DAT 0)
	Max	-			1035 (DAT 0)	-	1122 (DAT 0)
	TWA*(0-14)	-			86.0	-	-

Bold residues: measured values,
Italics: interpolated values

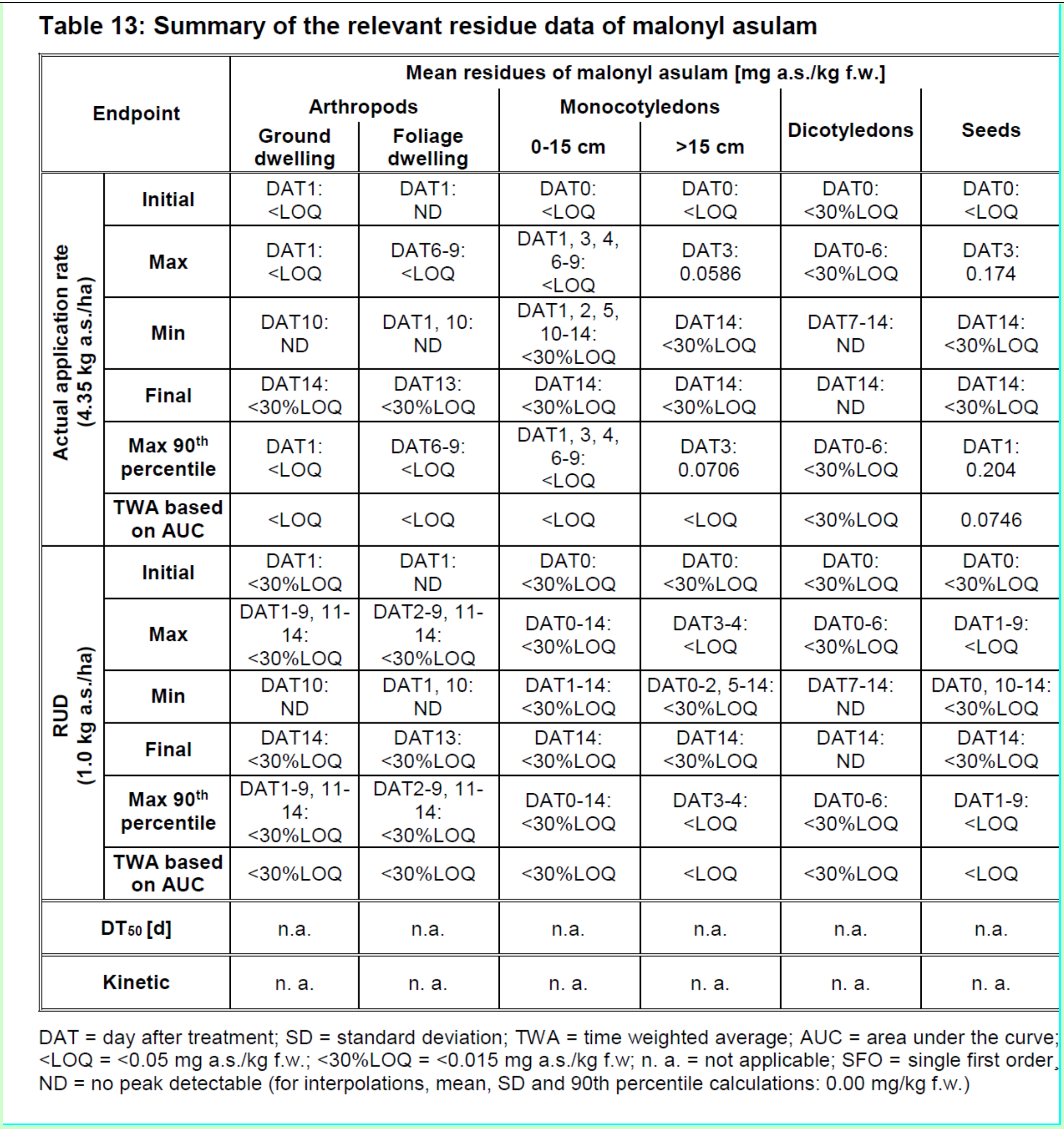


Table 13: Summary of the relevant residue data of malonyl asulam

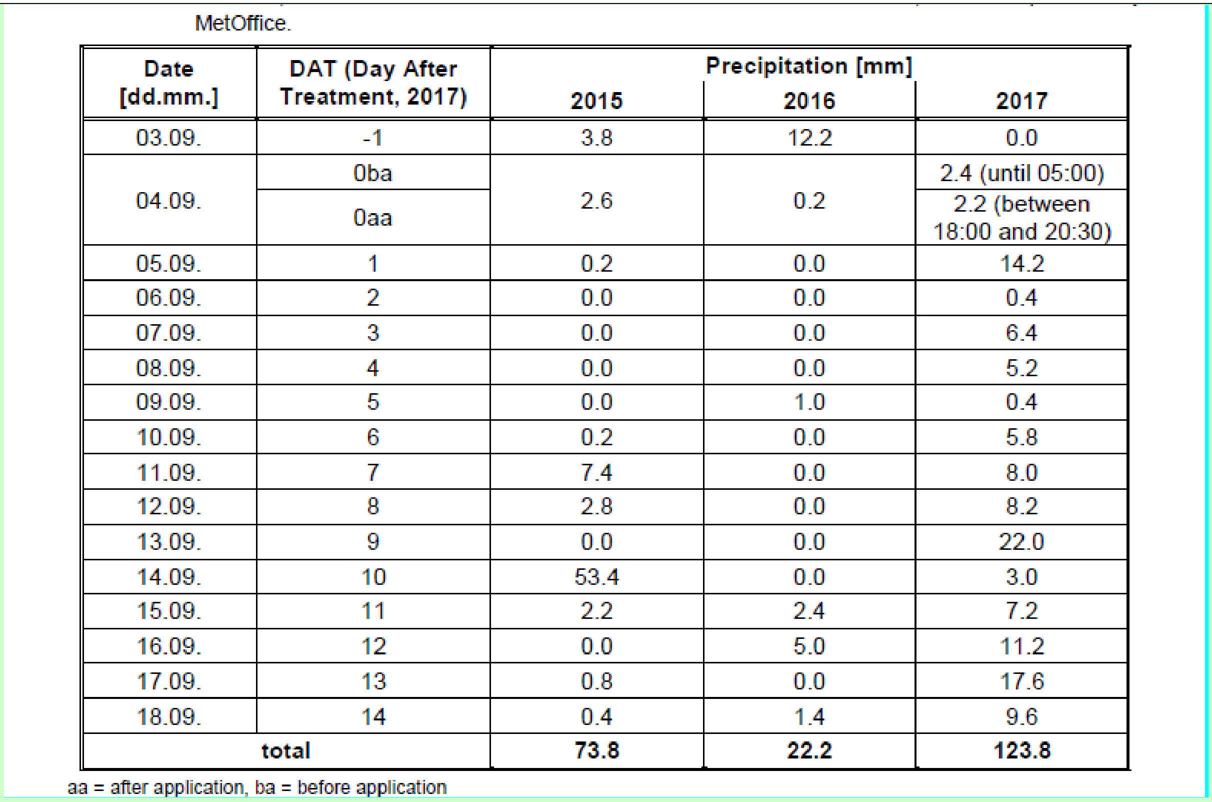
Endpoint		Mean residues of malonyl asulam [mg a.s./kg f.w.]					
		Arthropods		Monocotyledons		Dicotyledons	Seeds
		Ground dwelling	Foliage dwelling	0-15 cm	>15 cm		
Actual application rate (4.35 kg a.s./ha)	Initial	DAT1: <LOQ	DAT1: ND	DAT0: <LOQ	DAT0: <LOQ	DAT0: <30%LOQ	DAT0: <LOQ
	Max	DAT1: <LOQ	DAT6-9: <LOQ	DAT1, 3, 4, 6-9: <LOQ	DAT3: 0.0586	DAT0-6: <30%LOQ	DAT3: 0.174
	Min	DAT10: ND	DAT1, 10: ND	DAT1, 2, 5, 10-14: <30%LOQ	DAT14: <30%LOQ	DAT7-14: ND	DAT14: <30%LOQ
	Final	DAT14: <30%LOQ	DAT13: <30%LOQ	DAT14: <30%LOQ	DAT14: <30%LOQ	DAT14: ND	DAT14: <30%LOQ
	Max 90th percentile	DAT1: <LOQ	DAT6-9: <LOQ	DAT1, 3, 4, 6-9: <LOQ	DAT3: 0.0706	DAT0-6: <30%LOQ	DAT1: 0.204
	TWA based on AUC	<LOQ	<LOQ	<LOQ	<LOQ	<30%LOQ	0.0746
RUD (1.0 kg a.s./ha)	Initial	DAT1: <30%LOQ	DAT1: ND	DAT0: <30%LOQ	DAT0: <30%LOQ	DAT0: <30%LOQ	DAT0: <30%LOQ
	Max	DAT1-9, 11-14: <30%LOQ	DAT2-9, 11-14: <30%LOQ	DAT0-14: <30%LOQ	DAT3-4: <LOQ	DAT0-6: <30%LOQ	DAT1-9: <LOQ
	Min	DAT10: ND	DAT1, 10: ND	DAT1-14: <30%LOQ	DAT0-2, 5-14: <30%LOQ	DAT7-14: ND	DAT0, 10-14: <30%LOQ
	Final	DAT14: <30%LOQ	DAT13: <30%LOQ	DAT14: <30%LOQ	DAT14: <30%LOQ	DAT14: ND	DAT14: <30%LOQ
	Max 90th percentile	DAT1-9, 11-14: <30%LOQ	DAT2-9, 11-14: <30%LOQ	DAT0-14: <30%LOQ	DAT3-4: <LOQ	DAT0-6: <30%LOQ	DAT1-9: <LOQ
	TWA based on AUC	<30%LOQ	<30%LOQ	<30%LOQ	<LOQ	<30%LOQ	<LOQ
DT$_{50}$ [d]		n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Kinetic		n. a.	n. a.	n. a.	n. a.	n. a.	n. a.

DAT = day after treatment; SD = standard deviation; TWA = time weighted average; AUC = area under the curve; <LOQ = <0.05 mg a.s./kg f.w.; <30%LOQ = <0.015 mg a.s./kg f.w; n. a. = not applicable; SFO = single first order, ND = no peak detectable (for interpolations, mean, SD and 90th percentile calculations: 0.00 mg/kg f.w.)

Due to the very low residue levels with not quantifiable values no DT$_{50}$ kinetics were calculated for arthropods, monocotyledons and dicotyledons. For panicle seeds, the Chi^2 values were >38.0% for all kinetics and therefore not in an acceptable range.

Weather data

Rainfall



MetOffice.

Date [dd.mm.]	DAT (Day After Treatment, 2017)	Precipitation [mm] 2015	2016	2017
03.09.	-1	3.8	12.2	0.0
04.09.	0ba	2.6	0.2	2.4 (until 05:00)
	0aa			2.2 (between 18:00 and 20:30)
05.09.	1	0.2	0.0	14.2
06.09.	2	0.0	0.0	0.4
07.09.	3	0.0	0.0	6.4
08.09.	4	0.0	0.0	5.2
09.09.	5	0.0	1.0	0.4
10.09.	6	0.2	0.0	5.8
11.09.	7	7.4	0.0	8.0
12.09.	8	2.8	0.0	8.2
13.09.	9	0.0	0.0	22.0
14.09.	10	53.4	0.0	3.0
15.09.	11	2.2	2.4	7.2
16.09.	12	0.0	5.0	11.2
17.09.	13	0.8	0.0	17.6
18.09.	14	0.4	1.4	9.6
total		**73.8**	**22.2**	**123.8**

aa = after application, ba = before application

The first light rainfall occurred approximately 100 minutes after the application (2.2 mm within 2.5 hours) and significant rainfall occurred on DAT1. The total amount of rainfall of 123.8 mm recorded at the study field from 03 September to 18 September 2017 was higher than the total amount of rainfall recorded at the closest weather station in 2016 (22.2 mm) and in 2015 (73.8 mm) for the same calendar time span.

The mean temperatures during the field phase recorded at the study field 2017 ranged from 9.5 °C (DAT 6) to 15.3 °C (DAT 1). The overall mean temperature (DAT -1 to DAT 14) was 12.0 °C. The lowest temperature was measured on DAT -1 with 3.4 °C, the highest temperature was recorded on DAT 5 with 23.1 °C.

Kinetics

Presented below are the study author's DT50 values for asulam, and associated method of determination.

KinGUII Version 2.1 was used for the kinetic fitting.

Substrate	**Method**	**DT50 (days)**	**Chi^2 error**	**t-test**
Ground-dwelling arthropods	-	-	-	-
Foliage-dwelling arthropods	-	-	-	-
Monocotyledons (0-15 cm)	SFO	0.230	11.7%	P<0.001
Monocotyledons (>15 cm)	SFO	0.292	16.12%	P<0.001
Dicotyledons	SFO	0.236	11.04%	P<0.001
Seeds	SFO	0.246	12.02%	P<0.001

The following kinetic fitting for asulam residues and vegetation was performed by HSE using CAKE version 3.2:

No fitting was attempted with the arthropod data given the variation/disparity in residues between plots and different time points – in terms of when maximum residues were reached.

<table>
<tr><th>Kinetic fit</th><th>Visual</th><th>Chi^2</th><th>t-test (value < 0.05 = pass)</th><th>DT50</th><th>DT90/3.32</th></tr>
<tr><td colspan="6">Monocots 0-15cm</td></tr>
<tr><td>SFO</td><td>Poor – especially after DAT1, underestimating residues at all time points after DAT1.</td><td>11.1</td><td>1.88E-006 pass</td><td>0.23</td><td></td></tr>
<tr><td>FOMC</td><td>Poor at DAT0, but good over remaining time points.</td><td>3.61</td><td><table><tr><th>Parameter</th><th>Value</th><th>□</th></tr><tr><td>alpha</td><td>0.6299</td><td>0.4331</td></tr><tr><td>beta</td><td>0.008913</td><td>0.03309</td></tr></table>Alpha -pass
Beta - fails</td><td></td><td>0.101</td></tr>
<tr><td>DFOP</td><td>No improvement over FOMC</td><td>2.7</td><td>K1 = 0.4983 fail
K2 = 0.1294 fail</td><td></td><td></td></tr>
<tr><td>HS</td><td>Appears to be best visual fit. However problem with fitting in CAKE</td><td>2.65</td><td>Errors and T-test values could not be calculated because the covariance matrix could not be created.</td><td></td><td></td></tr>
<tr><td colspan="6">Monocots >15cm</td></tr>
<tr><td>SFO</td><td>Poor – especially after DAT1, underestimating residues at all time points after DAT1.</td><td>16.1</td><td>1.46E-007</td><td>0.292</td><td></td></tr>
<tr><td>FOMC</td><td>Poor at DAT0, but good over remaining time points.</td><td>5.45</td><td><table><tr><th>Parameter</th><th>Value</th><th>□</th></tr><tr><td>alpha</td><td>0.6639</td><td>0.3131</td></tr><tr><td>beta</td><td>0.02665</td><td>0.05458</td></tr></table>Alpha -pass
Beta - fails</td><td></td><td>0.249</td></tr>
<tr><td>DFOP</td><td>No improvement over FOMC</td><td>4.31</td><td>K1 = 0.4955 fail
K2 = 0.04897 pass</td><td></td><td></td></tr>
<tr><td>HS</td><td>No fit obtained with CAKE</td><td></td><td>Errors and T-test values could not be calculated because the covariance matrix could not be created.</td><td></td><td></td></tr>
<tr><td colspan="6">Dicots</td></tr>
<tr><td>SFO</td><td>Poor – especially after DAT1, underestimating residues at all time points after DAT1.</td><td>11</td><td>1.04E-005</td><td>0.236</td><td></td></tr>
<tr><td>FOMC</td><td></td><td>3.28</td><td><table><tr><th>Parameter</th><th>Value</th><th>□</th></tr></table></td><td></td><td>0.111</td></tr>
</table>

			alpha 0.6383 0.5215 beta 0.01029 0.04418 Alpha -pass Beta - fails		
DFOP	No improvement over FOMC	1.95	K1 = 0.4979 fail K2 = 0.164 fail		
HS	No fit obtained with CAKE		Note: Errors and T-test values could not be calculated because the covariance matrix could not be created.		
Seeds					
SFO	Poor – especially after DAT1, underestimating residues at all time points after DAT1.	12	1.06E-007	0.246	
FOMC	Poor at DAT0, but generally good over remaining time points.	6.3	**Parameter** **Value** **□** alpha 0.7083 0.392 beta 0.01861 0.04766 Alpha -pass Beta - fails		0.139
DFOP	No improvement over FOMC	5.92	K1 = 0.2195 fail K2 = 0.1243 fail		
HS	No fit obtained with CAKE		Note: Errors and T-test values could not be calculated because the covariance matrix could not be created.		

HSE comment

See below for detailed consideration of this study.

Author [redacted] (2021)

Title: Residues of asulam in arthropods, seeds and ground vegetation early summer (July) spray application of Asulox in an upland bracken area in UK – magnitude of residues and time course of residue decline. UPL Europe Ltd.; unpubl. RIFCON GmbH report No. R1640114, 21 June 2021

Aim

The study intended to record asulam (and its metabolites malonyl asulam, sulfanilamide and asulam glucosides) specific residue decline data after early summer spray application on potential bird and mammal diets to calculate DT50 values for the use in wildlife risk assessments.

Material and Methods

Study site

The study was conducted near Gillamoor in an upland bracken area in the North York Moors in the UK. The study field was selected to represent the basic structure of an upland bracken area. Within the study field three study plots were established, to the south the study field was bordered by a track and a meadow. To the east, the study field was bordered by a road, moorland and forest. To the north, the study field was bordered by a track and moorland. To the west, the study field was bordered by grazing land and a forest. A track separated study plot 2 and study plot 3. The selected area was stated to be typical for upland bracken areas in the region in terms of basic structure. Within the study field three study plots were established, Study plot 1, 2 and 3 had a size of approximately 2.3 ha, 2.3 ha and 3.2 ha, respectively. All arthropods, ground vegetation and seeds were collected within these three study plots.

Test item and application

The test item Asulox (synonym Asulam 400 g/L SL, containing nominal 400 g/L of the active substance asulam) was applied with a helicopter (Non-GLP) on 05 July 2017 at a nominal application rate of 11 L product/ha (corresponding to a nominal a.s. content of 4.4 kg asulam) in a spray volume of 44 L water /ha (corresponding to 55 L spray solution/ha). The actual application rate was 4.28 kg a.s./ha (analysed 4.28 kg a.s./ha) in a spray volume of 54.76 L/ha.

Arthropod sampling

Samples of natural populations of ground-dwelling arthropods were collected for residue analysis by pitfall trapping, whereas foliage-dwelling arthropods were collected by inventory spraying.

For **ground-dwelling arthropods**, pitfall traps were activated (opened) approximately 24 h before sampling, details were provided regarding location of pitfall traps but no details regarding proximity to boundary. Over a period of 18 days, altogether 8 sampling events took place for ground-dwelling arthropods with samples taken on each of the three study plots separately. A pre-sampling was conducted three days before application (DAT1 -3), thereafter further samples were collected on DAT 1, 2, 3, 5, 7, 10 and 14. At each sampling event arthropods were collected from all individual pitfall traps per study plot and pooled to provide a single sample per study plot. A total of 24 samples containing ground-dwelling arthropods were collected.

For **foliage-dwelling arthropods**, 50 gutters covering an area of approximately 10 m² were installed in each study plot in such a way that arthropods falling from the foliage dropped onto the gutters. Inventory spraying was used to capture and quantify foliage-dwelling arthropods inhabiting the foliage of plant occurring in the study field and to follow the residue decline of asulam and its metabolites. A defined area of approximately 10 m² was treated with AquaPy (natural pyrethrum, 30 g/L and piperonyl butoxid, 150 g/L) to obtain the foliage-dwelling arthropod matrix. All foliage-dwellers recovered from the gutters (positioned under the vegetation) at each sampling event and study plot were pooled to obtain a single sample per study plot. Sampling of foliage-dwelling arthropods was done 9 times. A pre-sampling was conducted three days before application (DAT -3), thereafter further samples were collected on DAT 0 (approximately 4 hours after application), 1, 2, 3, 5, 7, 9 and 14. Due to bad weather forecast, the sampling of foliage-dwelling arthropods was shifted from DAT 10 to DAT 9.

In addition to the above, any arthropod caught alive was killed immediately after sampling with ethyl acetate vapour. It was stated that this fuming process did not interfere with the chosen residue detection method. For this purpose, an ethyl acetate-soaked tampon was attached inside the polyethylene sampling bottles. The ethyl acetate was stated not come into contact with the sampled arthropods or drop onto them. Following each sampling event, the collected arthropods were directly transported to the Test Site for further processing. The taxonomic composition of each sample was determined to order (e.g., Coleoptera, Arachnida, Isopoda, Dermaptera, Diptera, Hymenoptera) or family level (e.g., Formicidae) and subdivided into adults and larval stages (the latter only for holometobolous insects). The number of individuals per taxonomic group was counted. Finally, all arthropods of one study plot were re-pooled into one sample. The total fresh weight of the whole sample (which can deviate from the sum of the single weights) was determined by means of a balance. Afterwards the arthropods of the respective sample were transferred into a glass vessel. The vessels were stored in the freezer at ≤ -18°C until packing the samples on dry ice in the shipment box which was equipped with a data logger.

Vegetation sampling

Samples of **dicotyledons** (heather-blueberry-mix as complete plants without roots), **monocotyledons** and **bracken** were collected by cutting with scissors just above the soil. The monocotyledons were separated into a lower (0-15 cm without roots) and an upper (>15 cm) part, no reason was provided for the sampling undertaken. Furthermore, samples of panicle seeds were taken by striping them off the stem. The samples were taken in randomly selected areas within each study plot.

Over a period of 18 days, altogether nine monocotyledons, nine dicotyledons, nine seeds and 8 bracken sampling events took place with samples taken on each of the three study plots separately. A pre-sampling was conducted three days before application (DAT -3), thereafter further samples were collected at DAT 0 (approx. 4 hours after application), 1, 2, 3, 6, 7, 9 and 14. Bracken was not sampled on DAT 3.

Following each sampling event, the collected vegetation and seeds were weighed and stored at a temperature of ≤ -18 °C until handing over to the Analytical Test Site.

Weather data

Precipitation was measured with a rain logger in the study field. Precipitation data of 2015 and 2016 were obtained from the nearest precipitation recording weather recording station, approximately 5 km from the study field, at Church Houses and were provided by MetOffice. Temperature was measured with a datalogger in the study field. Temperature data of 2015 and 2016 were obtained from the nearest temperature recording weather recording station, approximately 20 km from the study field, at Carlton-in-Cleveland and were provided by MetOffice (Non-GLP). These data are presented below.

Residue analysis

Asulam residues and residues of its metabolites asulam glucosides, malonyl asulam and sulfanilamide were analysed with LC-MS/MS. As the SANCO (2000) validity criteria were not met for some sulfanilamidematrix combinations, the analysed residue levels were corrected with mean batch recovery efficiency value (%). Both uncorrected and corrected sample results for sulfanilamide are reported for the respective sulfanilamide-matrix-combinations.

A detailed consideration of the methods of analysis is presented in Appendix 12. This assessment indicates that there are concerns with the methods used, however it is concluded that the methods for asulam used are considered to be sufficiently validated:

- Seed
- Monocot
- Dicot
- Arthropods

In addition, it is noted that there are concerns regarding the storage stability data, especially for fresh grass samples, however overall, the Chemistry expert considers that on balance the studies suitably supported (see Appendix 13 and Section 2.4)

(It should be noted that for the ecotoxicological risk assessment there has been no consideration of the metabolites.)

Data evaluation and statistics

The daily, initial and maximum mean concentrations of asulam and its metabolites in ground and foliage-dwelling arthropods, monocotyledons, dicotyledons, bracken and seeds, as well as the 90th percentiles, were calculated based on the arithmetic mean of three replicates. Residues per Unit Dose (RUD) on the basis of an application rate of 1.0 kg a.s./ha for daily, initial and maximum mean residue values, as well as for the maximum 90th percentile were calculated.

The DT50 of asulam and its metabolites was calculated by the study authors using Single First Order (SFO) kinetic up to a Chi² error value of 25%, t-test $p < 0.1$ and acceptable visual fit. If the triggers for SFO were not met, best fit kinetics were used or, if still not possible, only the time weighted average residue concentration

(TWA) based on the area under the curve (AUC) was reported. The reason that in some cases the DT50 could not be calculated was that the highest residue levels were not detected on the day of application (DAT 0, initial residue values) but on one of the following days. In that case, to show the rapid residue decline, a hypothetical DT50 was calculated, starting on the day where the maximum residue level was detected.

TWA residue concentrations were calculated by interpolating concentrations for days for which no experimental data were available (linear interpolation) and by calculating the mean over a given time period.

Results

Presented below are the key findings from the above work in terms of residues over time on ground dwelling arthropods, foliar dwelling arthropods, monocotyledons, dicotyledons and seeds. Data are also presented for malonyl asulam.

Please note that in the following tables, bold residues: measured values,
Italics: interpolated values

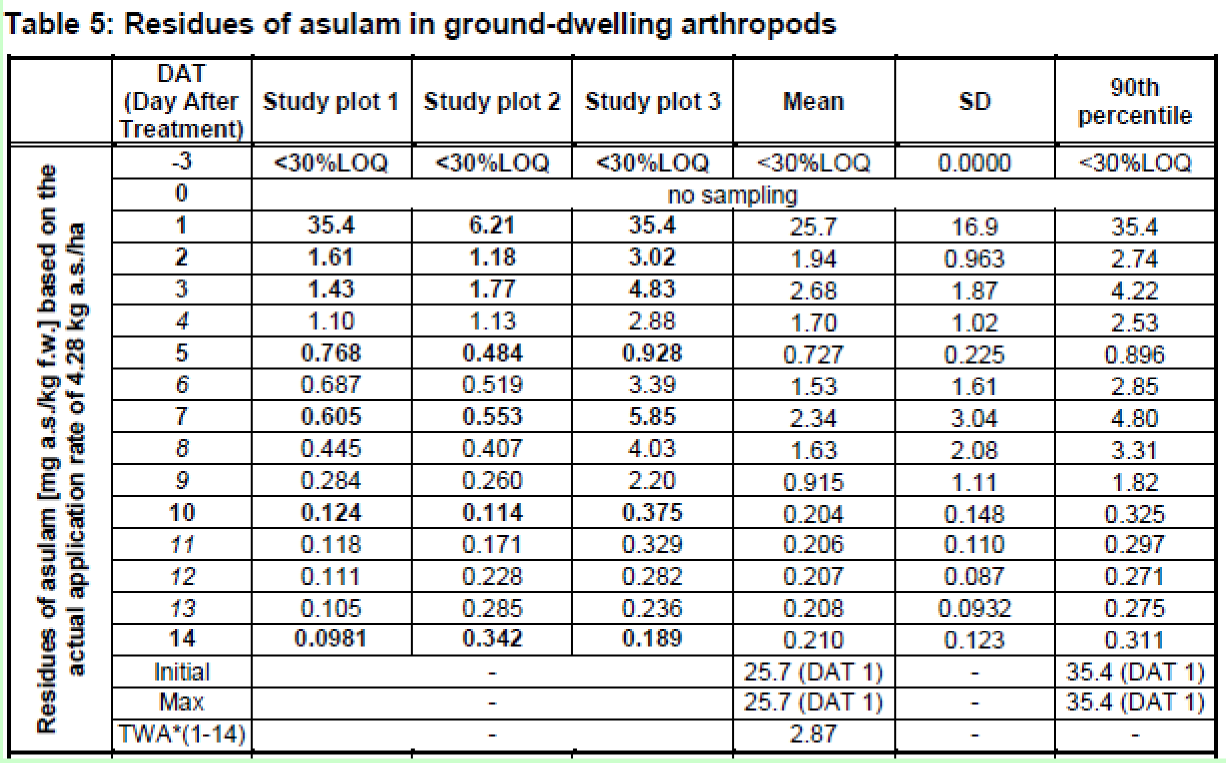


Table 5: Residues of asulam in ground-dwelling arthropods

	DAT (Day After Treatment)	Study plot 1	Study plot 2	Study plot 3	Mean	SD	90th percentile
Residues of asulam [mg a.s./kg f.w.] based on the actual application rate of 4.28 kg a.s./ha	-3	<30%LOQ	<30%LOQ	<30%LOQ	<30%LOQ	0.0000	<30%LOQ
	0	no sampling					
	1	**35.4**	**6.21**	**35.4**	25.7	16.9	35.4
	2	**1.61**	**1.18**	**3.02**	1.94	0.963	2.74
	3	**1.43**	**1.77**	**4.83**	2.68	1.87	4.22
	4	1.10	1.13	2.88	1.70	1.02	2.53
	5	**0.768**	**0.484**	**0.928**	0.727	0.225	0.896
	6	0.687	0.519	3.39	1.53	1.61	2.85
	7	**0.605**	**0.553**	**5.85**	2.34	3.04	4.80
	8	0.445	0.407	4.03	1.63	2.08	3.31
	9	0.284	0.260	2.20	0.915	1.11	1.82
	10	**0.124**	**0.114**	**0.375**	0.204	0.148	0.325
	11	0.118	0.171	0.329	0.206	0.110	0.297
	12	0.111	0.228	0.282	0.207	0.087	0.271
	13	0.105	0.285	0.236	0.208	0.0932	0.275
	14	**0.0981**	**0.342**	**0.189**	0.210	0.123	0.311
	Initial	-			25.7 (DAT 1)	-	35.4 (DAT 1)
	Max	-			25.7 (DAT 1)	-	35.4 (DAT 1)
	TWA*(1-14)	-			2.87	-	-

Table 6: Residues of asulam in foliage-dwelling arthropods

	DAT (Day After Treatment)	Study plot 1	Study plot 2	Study plot 3	Mean	SD	90th percentile
Residues of asulam [mg a.s./kg f.w.] based on the actual application rate of 4.28 kg a.s./ha	-3	**ND**	**ND**	**ND**	ND	0.0000	ND
	0	**65.1**	**35.2**	**46.3**	48.9	15.1	61.3
	1	**82.2**	**27.4**	**48.1**	52.6	27.7	75.4
	2	**14.8**	**7.18**	**16.7**	12.9	5.04	16.3
	3	**2.42**	**3.21**	**4.32**	3.32	0.954	4.10
	4	*3.60*	*3.62*	*4.52*	3.91	0.525	4.34
	5	**4.77**	**4.02**	**4.71**	4.50	0.417	4.76
	6	*3.03*	*3.71*	*2.69*	3.14	0.519	3.57
	7	**1.28**	**3.39**	**0.660**	1.78	1.43	2.97
	8	*2.09*	*1.95*	*0.900*	1.65	0.649	2.06
	9	**2.89**	**0.510**	**1.14**	1.51	1.23	2.54
	10	*2.55*	*0.532*	*1.00*	1.36	1.05	2.24
	11	*2.21*	*0.554*	*0.863*	1.21	0.878	1.94
	12	*1.86*	*0.575*	*0.724*	1.05	0.705	1.64
	13	*1.52*	*0.597*	*0.586*	0.902	0.537	1.34
	14	**1.18**	**0.619**	**0.447**	0.749	0.383	1.07
	Initial	-			48.9 (DAT 0)	-	61.3 (DAT 0)
	Max	-			52.6 (DAT 1)	-	75.4 (DAT 1)
	TWA*(1-14)	-			9.29	-	-

Table 8: Residues of asulam on monocotyledons (part 0-15 cm)

	DAT (Day After Treatment)	Study plot 1	Study plot 2	Study plot 3	Mean	SD	90th percentile
Residues of asulam [mg a.s./kg f.w.] based on the actual application rate of 4.28 kg a.s./ha	-3	**ND**	**ND**	**ND**	ND	0.0000	ND
	0	**114**	**68.2**	**93.0**	91.7	22.9	110
	1	**36.3**	**57.7**	**56.4**	50.1	12.0	57.4
	2	**10.3**	**39.3**	**8.47**	19.4	17.3	33.5
	3	**17.3**	**11.9**	**8.68**	12.6	4.36	16.2
	4	*13.4*	*9.38*	*6.81*	9.86	3.31	12.6
	5	*9.47*	*6.87*	*4.93*	7.09	2.27	8.95
	6	**5.55**	**4.35**	**3.06**	4.32	1.25	5.31
	7	**1.09**	**9.00**	**0.978**	3.69	4.60	7.42
	8	*5.23*	*7.73*	*1.07*	4.68	3.37	7.23
	9	*9.36*	*6.47*	*1.15*	5.66	4.16	8.78
	10	**13.5**	**5.20**	**1.24**	6.65	6.26	11.8
	11	*11.4*	*4.59*	*1.32*	5.76	5.13	10.0
	12	*9.25*	*3.98*	*1.40*	4.87	4.00	8.20
	13	*7.13*	*3.36*	*1.47*	3.99	2.88	6.37
	14	**5.00**	**2.75**	**1.55**	3.10	1.75	4.55
	Initial	-			91.7 (DAT 0)	-	110 (DAT 0)
	Max	-			91.7 (DAT 0)	-	110 (DAT 0)
	TWA*(0-14)	-			15.6	-	-

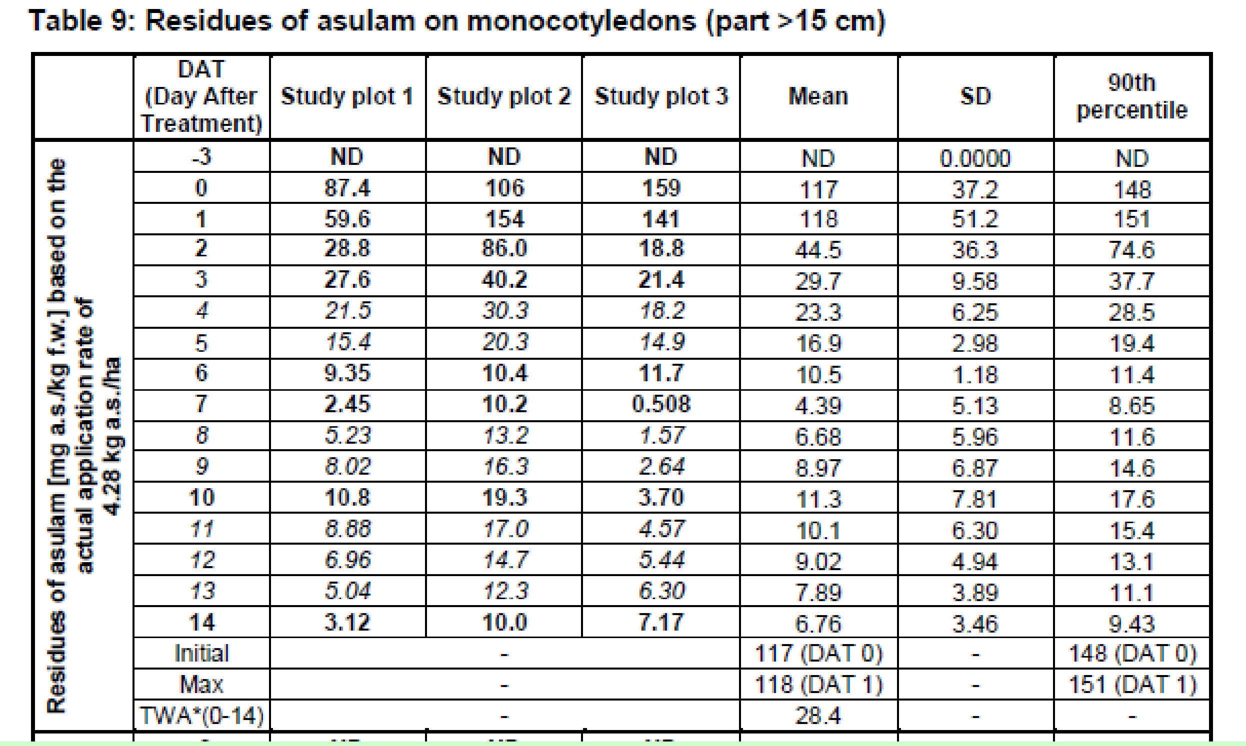


Table 9: Residues of asulam on monocotyledons (part >15 cm)

	DAT (Day After Treatment)	Study plot 1	Study plot 2	Study plot 3	Mean	SD	90th percentile
Residues of asulam [mg a.s./kg f.w.] based on the actual application rate of 4.28 kg a.s./ha	-3	ND	ND	ND	ND	0.0000	ND
	0	87.4	106	159	117	37.2	148
	1	59.6	154	141	118	51.2	151
	2	28.8	86.0	18.8	44.5	36.3	74.6
	3	27.6	40.2	21.4	29.7	9.58	37.7
	4	*21.5*	*30.3*	*18.2*	23.3	6.25	28.5
	5	*15.4*	*20.3*	*14.9*	16.9	2.98	19.4
	6	9.35	10.4	11.7	10.5	1.18	11.4
	7	2.45	10.2	0.508	4.39	5.13	8.65
	8	*5.23*	*13.2*	*1.57*	6.68	5.96	11.6
	9	*8.02*	*16.3*	*2.64*	8.97	6.87	14.6
	10	10.8	19.3	3.70	11.3	7.81	17.6
	11	*8.88*	*17.0*	*4.57*	10.1	6.30	15.4
	12	*6.96*	*14.7*	*5.44*	9.02	4.94	13.1
	13	*5.04*	*12.3*	*6.30*	7.89	3.89	11.1
	14	3.12	10.0	7.17	6.76	3.46	9.43
	Initial	-			117 (DAT 0)	-	148 (DAT 0)
	Max	-			118 (DAT 1)	-	151 (DAT 1)
	TWA*(0-14)	-			28.4	-	-

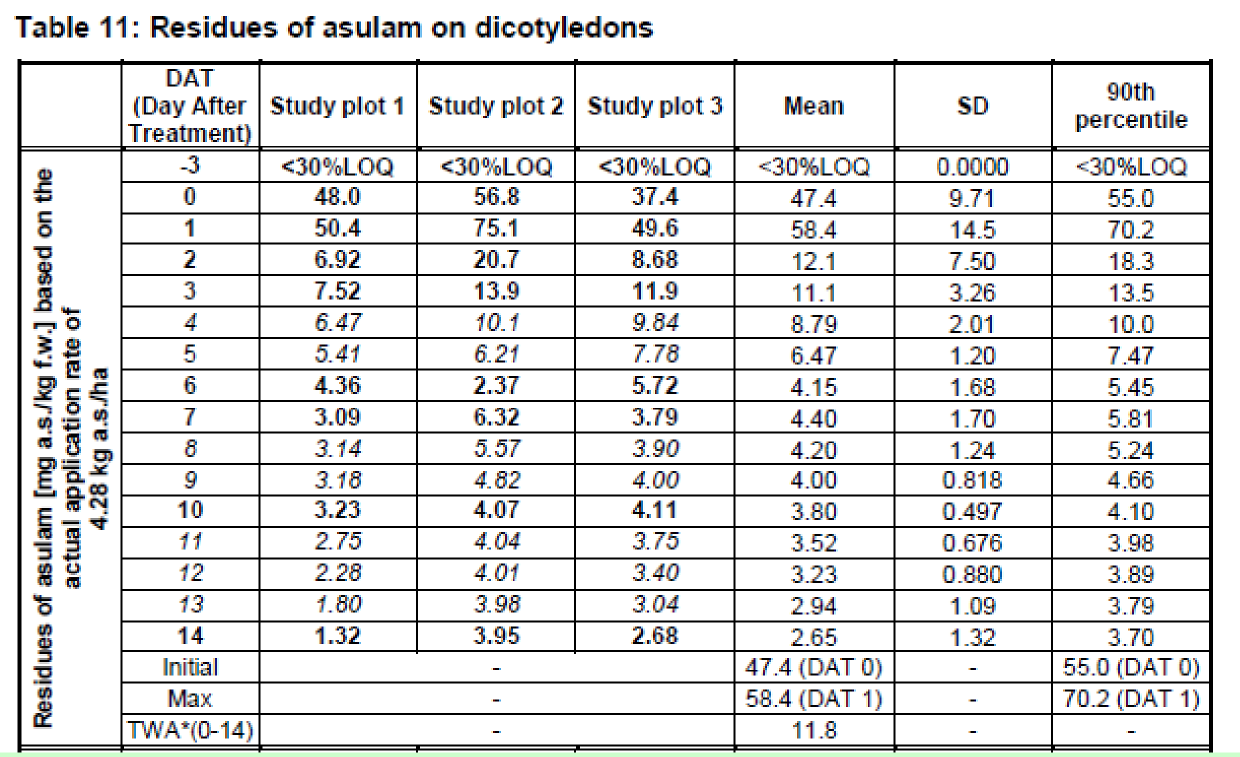


Table 11: Residues of asulam on dicotyledons

	DAT (Day After Treatment)	Study plot 1	Study plot 2	Study plot 3	Mean	SD	90th percentile
Residues of asulam [mg a.s./kg f.w.] based on the actual application rate of 4.28 kg a.s./ha	-3	<30%LOQ	<30%LOQ	<30%LOQ	<30%LOQ	0.0000	<30%LOQ
	0	48.0	56.8	37.4	47.4	9.71	55.0
	1	50.4	75.1	49.6	58.4	14.5	70.2
	2	6.92	20.7	8.68	12.1	7.50	18.3
	3	7.52	13.9	11.9	11.1	3.26	13.5
	4	*6.47*	*10.1*	*9.84*	8.79	2.01	10.0
	5	*5.41*	*6.21*	*7.78*	6.47	1.20	7.47
	6	4.36	2.37	5.72	4.15	1.68	5.45
	7	3.09	6.32	3.79	4.40	1.70	5.81
	8	*3.14*	*5.57*	*3.90*	4.20	1.24	5.24
	9	*3.18*	*4.82*	*4.00*	4.00	0.818	4.66
	10	3.23	4.07	4.11	3.80	0.497	4.10
	11	*2.75*	*4.04*	*3.75*	3.52	0.676	3.98
	12	*2.28*	*4.01*	*3.40*	3.23	0.880	3.89
	13	*1.80*	*3.98*	*3.04*	2.94	1.09	3.79
	14	1.32	3.95	2.68	2.65	1.32	3.70
	Initial	-			47.4 (DAT 0)	-	55.0 (DAT 0)
	Max	-			58.4 (DAT 1)	-	70.2 (DAT 1)
	TWA*(0-14)	-			11.8	-	-

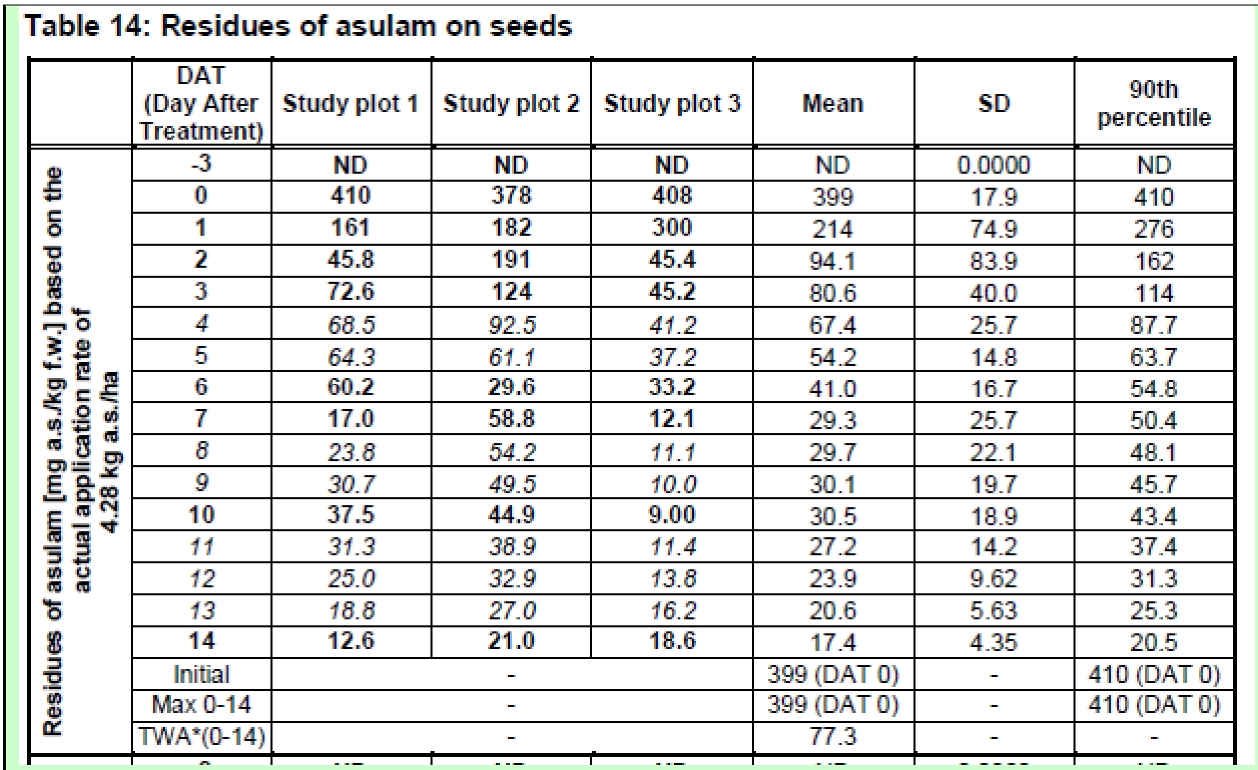


Table 14: Residues of asulam on seeds

	DAT (Day After Treatment)	Study plot 1	Study plot 2	Study plot 3	Mean	SD	90th percentile
Residues of asulam [mg a.s./kg f.w.] based on the actual application rate of 4.28 kg a.s./ha	-3	**ND**	**ND**	**ND**	ND	0.0000	ND
	0	**410**	**378**	**408**	399	17.9	410
	1	**161**	**182**	**300**	214	74.9	276
	2	**45.8**	**191**	**45.4**	94.1	83.9	162
	3	**72.6**	**124**	**45.2**	80.6	40.0	114
	4	*68.5*	*92.5*	*41.2*	67.4	25.7	87.7
	5	*64.3*	*61.1*	*37.2*	54.2	14.8	63.7
	6	**60.2**	**29.6**	**33.2**	41.0	16.7	54.8
	7	**17.0**	**58.8**	**12.1**	29.3	25.7	50.4
	8	*23.8*	*54.2*	*11.1*	29.7	22.1	48.1
	9	*30.7*	*49.5*	*10.0*	30.1	19.7	45.7
	10	**37.5**	**44.9**	**9.00**	30.5	18.9	43.4
	11	*31.3*	*38.9*	*11.4*	27.2	14.2	37.4
	12	*25.0*	*32.9*	*13.8*	23.9	9.62	31.3
	13	*18.8*	*27.0*	*16.2*	20.6	5.63	25.3
	14	**12.6**	**21.0**	**18.6**	17.4	4.35	20.5
	Initial	-			399 (DAT 0)	-	410 (DAT 0)
	Max 0-14	-			399 (DAT 0)	-	410 (DAT 0)
	TWA*(0-14)	-			77.3	-	-

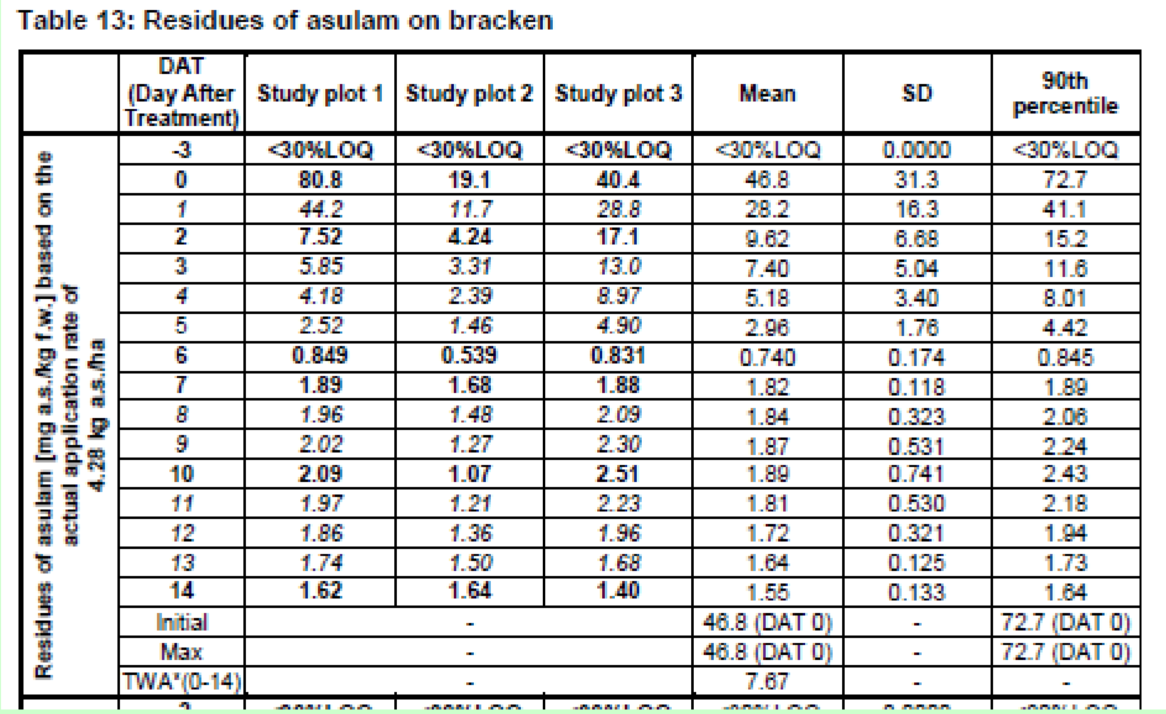


Table 13: Residues of asulam on bracken

	DAT (Day After Treatment)	Study plot 1	Study plot 2	Study plot 3	Mean	SD	90th percentile
Residues of asulam [mg a.s./kg f.w.] based on the actual application rate of 4.28 kg a.s./ha	-3	<30%LOQ	<30%LOQ	<30%LOQ	<30%LOQ	0.0000	<30%LOQ
	0	**80.8**	**19.1**	**40.4**	46.8	31.3	72.7
	1	*44.2*	*11.7*	*28.8*	28.2	16.3	41.1
	2	**7.52**	**4.24**	**17.1**	9.62	6.68	15.2
	3	*5.85*	*3.31*	*13.0*	7.40	5.04	11.6
	4	*4.18*	*2.39*	*8.97*	5.18	3.40	8.01
	5	*2.52*	*1.46*	*4.90*	2.96	1.76	4.42
	6	**0.849**	**0.539**	**0.831**	0.740	0.174	0.845
	7	**1.89**	**1.68**	**1.88**	1.82	0.118	1.89
	8	*1.96*	*1.48*	*2.09*	1.84	0.323	2.06
	9	*2.02*	*1.27*	*2.30*	1.87	0.531	2.24
	10	**2.09**	**1.07**	**2.51**	1.89	0.741	2.43
	11	*1.97*	*1.21*	*2.23*	1.81	0.530	2.18
	12	*1.86*	*1.36*	*1.96*	1.72	0.321	1.94
	13	*1.74*	*1.50*	*1.68*	1.64	0.125	1.73
	14	**1.62**	**1.64**	**1.40**	1.55	0.133	1.64
	Initial	-			46.8 (DAT 0)	-	72.7 (DAT 0)
	Max	-			46.8 (DAT 0)	-	72.7 (DAT 0)
	TWA*(0-14)	-			7.67	-	-

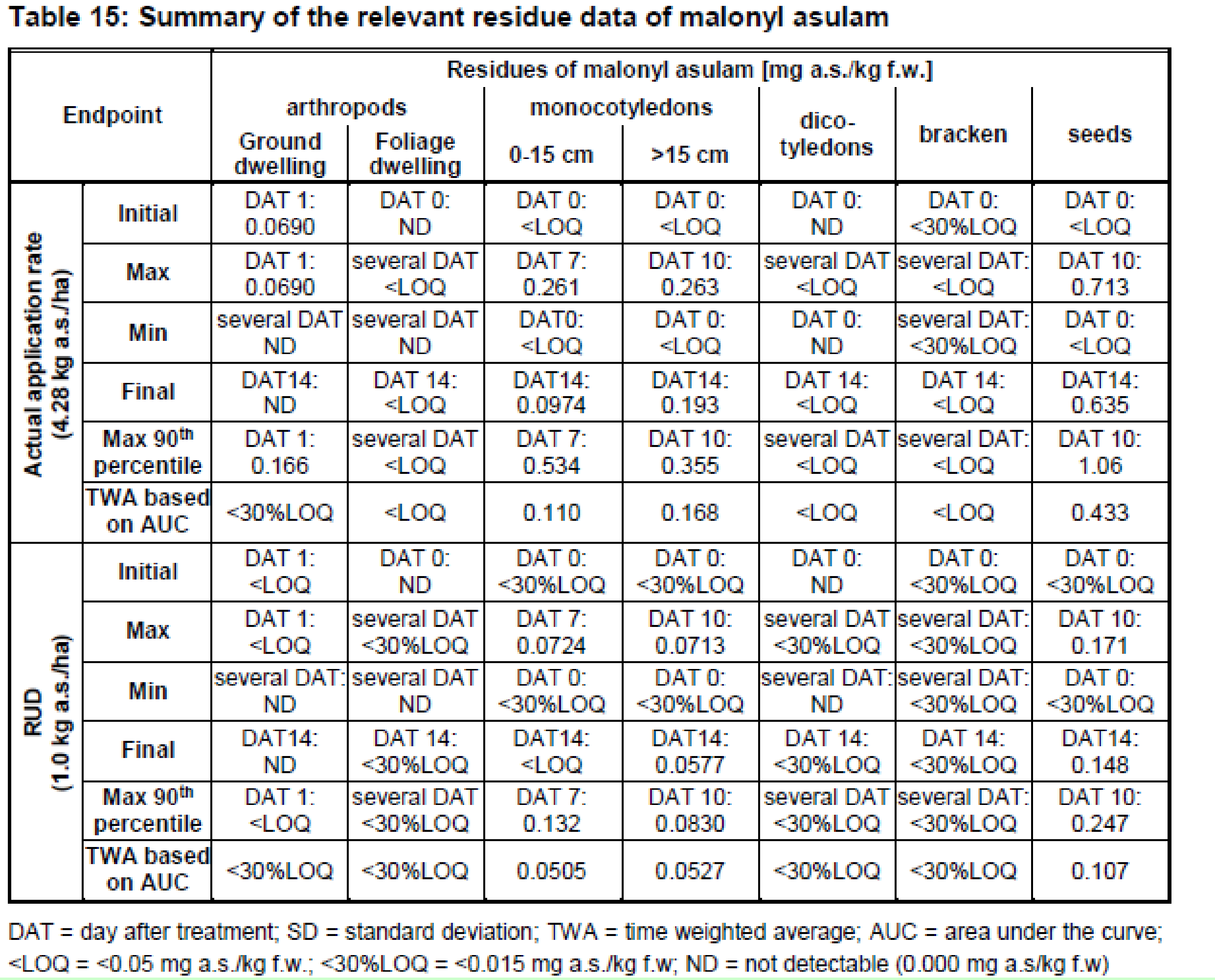


Table 15: Summary of the relevant residue data of malonyl asulam

Endpoint		Residues of malonyl asulam [mg a.s./kg f.w.]						
		arthropods		monocotyledons		dico-tyledons	bracken	seeds
		Ground dwelling	Foliage dwelling	0-15 cm	>15 cm			
Actual application rate (4.28 kg a.s./ha)	Initial	DAT 1: 0.0690	DAT 0: ND	DAT 0: <LOQ	DAT 0: <LOQ	DAT 0: ND	DAT 0: <30%LOQ	DAT 0: <LOQ
	Max	DAT 1: 0.0690	several DAT <LOQ	DAT 7: 0.261	DAT 10: 0.263	several DAT <LOQ	several DAT: <LOQ	DAT 10: 0.713
	Min	several DAT ND	several DAT ND	DAT0: <LOQ	DAT 0: <LOQ	DAT 0: ND	several DAT: <30%LOQ	DAT 0: <LOQ
	Final	DAT14: ND	DAT 14: <LOQ	DAT14: 0.0974	DAT14: 0.193	DAT 14: <LOQ	DAT 14: <LOQ	DAT14: 0.635
	Max 90th percentile	DAT 1: 0.166	several DAT <LOQ	DAT 7: 0.534	DAT 10: 0.355	several DAT <LOQ	several DAT: <LOQ	DAT 10: 1.06
	TWA based on AUC	<30%LOQ	<LOQ	0.110	0.168	<LOQ	<LOQ	0.433
RUD (1.0 kg a.s./ha)	Initial	DAT 1: <LOQ	DAT 0: ND	DAT 0: <30%LOQ	DAT 0: <30%LOQ	DAT 0: ND	DAT 0: <30%LOQ	DAT 0: <30%LOQ
	Max	DAT 1: <LOQ	several DAT <30%LOQ	DAT 7: 0.0724	DAT 10: 0.0713	several DAT <30%LOQ	several DAT: <30%LOQ	DAT 10: 0.171
	Min	several DAT: ND	several DAT ND	DAT 0: <30%LOQ	DAT 0: <30%LOQ	several DAT: ND	several DAT: <30%LOQ	DAT 0: <30%LOQ
	Final	DAT14: ND	DAT 14: <30%LOQ	DAT14: <LOQ	DAT14: 0.0577	DAT 14: <30%LOQ	DAT 14: <30%LOQ	DAT14: 0.148
	Max 90th percentile	DAT 1: <LOQ	several DAT <30%LOQ	DAT 7: 0.132	DAT 10: 0.0830	several DAT <30%LOQ	several DAT: <30%LOQ	DAT 10: 0.247
	TWA based on AUC	<30%LOQ	<30%LOQ	0.0505	0.0527	<30%LOQ	<30%LOQ	0.107

DAT = day after treatment; SD = standard deviation; TWA = time weighted average; AUC = area under the curve; <LOQ = <0.05 mg a.s./kg f.w.; <30%LOQ = <0.015 mg a.s./kg f.w; ND = not detectable (0.000 mg a.s/kg f.w)

Weather

A total of eight rainy days were recorded with a data logger inside the study field during the sampling period from 02 July to 19 July 2017 with a total precipitation of 16.4 mm. No precipitation was measured on the day of application. The first rainfall occurred between 10:00 and 12:00 on the day after application with an amount of 1.4 mm (2.0 mm in total on DAT 1). No rainfall occurred between DAT 2 and DAT 4. The following days (DAT 5 to DAT 10) were unsettled with little rainfall. No rainfall occurred from DAT 11 until the end of the Field Phase (DAT 14).

The mean temperatures during the Field Phase recorded 2017 at the study field (DAT -3 to DAT 14) ranged from 12.2 °C (DAT 6) to 19.1 °C (DAT 11). The overall mean temperature was 15.7 °C. The lowest temperature during the Field Phase of the study was measured on DAT 12 with 2.3 °C, the highest temperature was recorded on DAT 1 with 31.3 °C.

DT50

Presented below are the study author’s DT50 values for asulam, and associated method of determination.

Substrate	Method	DT50 (days)	Chi^2 error	t-test
Ground-dwelling arthropods	SFO	0.2925	21.85%	p<0.1
Foliage-dwelling arthropods	SFO	n.c.	41.58%	p<0.001

Foliage-dwelling arthropods	FOMC	n.c.	44.34%	-
Monocotyledons (0-15 cm)	SFO	1.025	11.72%	p<0.001
Monocotyledons (>15 cm)	SFO	n.c.	25.77%	p<0.001
Monocotyledons (>15 cm)	FOMC	n.c.	27.48%	-
Dicotyledons	SFO	n.c.	42.1%	p<0.001
Dicotyledons	FOMC	n.c.	44.93%	
Bracken	SFO	0.887	9.19%	p<0.1
Seeds	SFO	1.155	14.73%	p<0.001

The following kinetic fitting for asulam residues was performed by HSE using CAKE version 3.2:

<table>
<tr><th>Kinetic fit</th><th>Visual</th><th>Chi2</th><th>t-test
(value < 0.05 = pass)</th><th>DT50</th><th>DT90/3.32</th></tr>
<tr><td colspan="6">Ground arthropods</td></tr>
<tr><td>SFO</td><td>Poor</td><td>21.9</td><td>0.05011</td><td>0.293</td><td></td></tr>
<tr><td>FOMC</td><td>No fit obtained with CAKE</td><td></td><td>Note: Errors and T-test values could not be calculated because the covariance matrix could not be created.</td><td></td><td></td></tr>
<tr><td colspan="6">Monocots 0-15cm</td></tr>
<tr><td>SFO</td><td>Better at earlier time points, underestimating residues at later time points</td><td>11.7</td><td>6.03E-006 pass</td><td>1.03</td><td></td></tr>
<tr><td>FOMC</td><td>Better visual fit than SFO. Still potentially underestimating residues at later 2 points.</td><td>12.1</td><td><table><tr><th>Parameter</th><th>Value</th><th>□</th></tr><tr><td>alpha</td><td>5.005</td><td>8.442</td></tr><tr><td>beta</td><td>6.543</td><td>12.68</td></tr></table>Alpha – fail
Beta - fail</td><td></td><td>1.15</td></tr>
<tr><td colspan="6">Monocots >15cm</td></tr>
<tr><td>SFO</td><td>Wide variance between plots makes fitting difficult, underestimating at later time points</td><td>25.8</td><td>9.67E-005 pass</td><td>1.74</td><td></td></tr>
<tr><td>FOMC</td><td>No improvement over SFO</td><td>27.5</td><td><table><tr><th>Parameter</th><th>Value</th><th>□</th></tr><tr><td>alpha</td><td>1.42E+003</td><td>1.92E+004</td></tr><tr><td>beta</td><td>3.02E+003</td><td>4.82E+004</td></tr></table></td><td></td><td>1.47</td></tr>
<tr><td colspan="6">Seeds</td></tr>
<tr><td>SFO</td><td>Wide variance between plots makes fitting difficult, underestimating at later time points</td><td>14.7</td><td>3.49E-008 - pass</td><td>1.16</td><td></td></tr>
<tr><td>FOMC</td><td>Good</td><td>9.06</td><td><table><tr><th>Parameter</th><th>Value</th><th>□</th></tr></table></td><td></td><td>1.7</td></tr>
</table>

			alpha 1.622 0.8115 beta 1.798 1.36 Alpha-pass Beta - pass		
Bracken					
SFO	Better at earlier time points, underestimating at later time points Not many early time points DAT0, 2 , 6, 7, 10, 14.	9.19	0.0175 - pass	0.887	
FOMC	Reasonable – potentially underestimating at last time point	6.91	**Parameter** **Value** □ alpha 1.954 4.93 beta 1.574 6.315 Alpha – fail Beta - fail		0.139

Malonyl asulam residue contents were very low in all matrices or increased during the course of the Field Phase. Due to the very low, often non-quantifiable or increasing residue levels no DT_{50} was calculated.

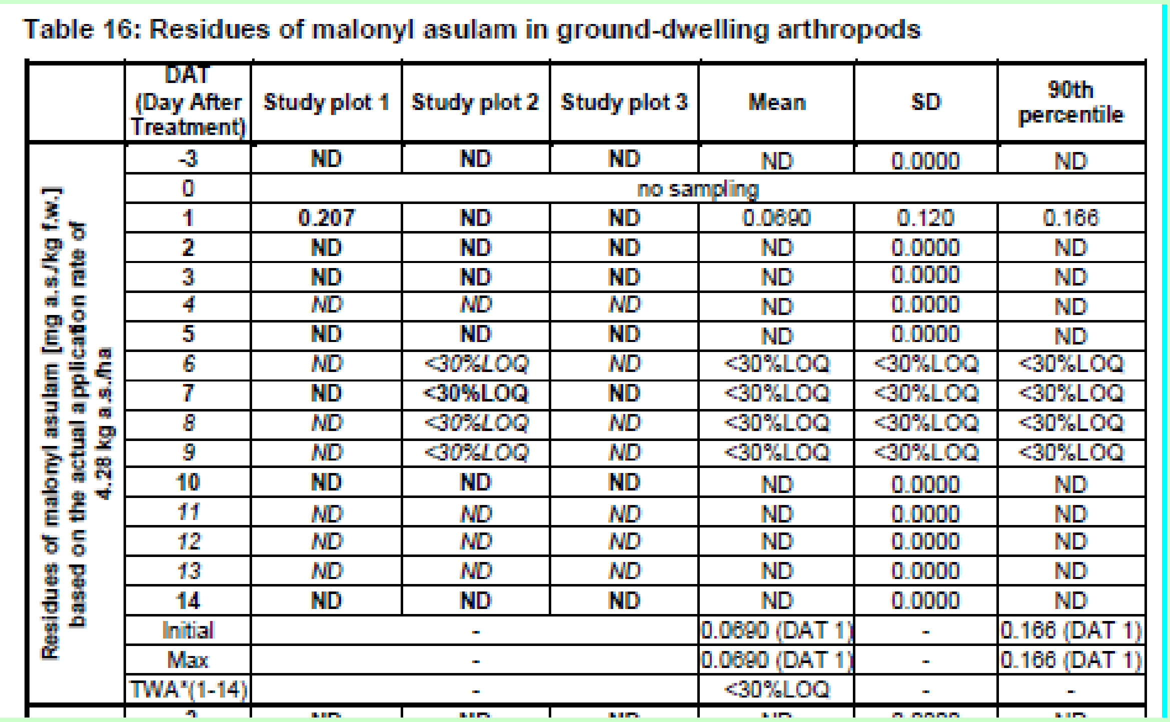


Table 16: Residues of malonyl asulam in ground-dwelling arthropods

	DAT (Day After Treatment)	Study plot 1	Study plot 2	Study plot 3	Mean	SD	90th percentile
Residues of malonyl asulam [mg a.s./kg f.w.] based on the actual application rate of 4.28 kg a.s./ha	-3	ND	ND	ND	ND	0.0000	ND
	0	no sampling					
	1	0.207	ND	ND	0.0690	0.120	0.166
	2	ND	ND	ND	ND	0.0000	ND
	3	ND	ND	ND	ND	0.0000	ND
	4	*ND*	*ND*	*ND*	ND	0.0000	ND
	5	ND	ND	ND	ND	0.0000	ND
	6	*ND*	*<30%LOQ*	*ND*	<30%LOQ	<30%LOQ	<30%LOQ
	7	ND	<30%LOQ	ND	<30%LOQ	<30%LOQ	<30%LOQ
	8	*ND*	*<30%LOQ*	*ND*	<30%LOQ	<30%LOQ	<30%LOQ
	9	*ND*	*<30%LOQ*	*ND*	<30%LOQ	<30%LOQ	<30%LOQ
	10	ND	ND	ND	ND	0.0000	ND
	11	*ND*	*ND*	*ND*	ND	0.0000	ND
	12	*ND*	*ND*	*ND*	ND	0.0000	ND
	13	*ND*	*ND*	*ND*	ND	0.0000	ND
	14	ND	ND	ND	ND	0.0000	ND
	Initial	-			0.0690 (DAT 1)	-	0.166 (DAT 1)
	Max	-			0.0690 (DAT 1)	-	0.166 (DAT 1)
	TWA*(1-14)	-			<30%LOQ	-	-

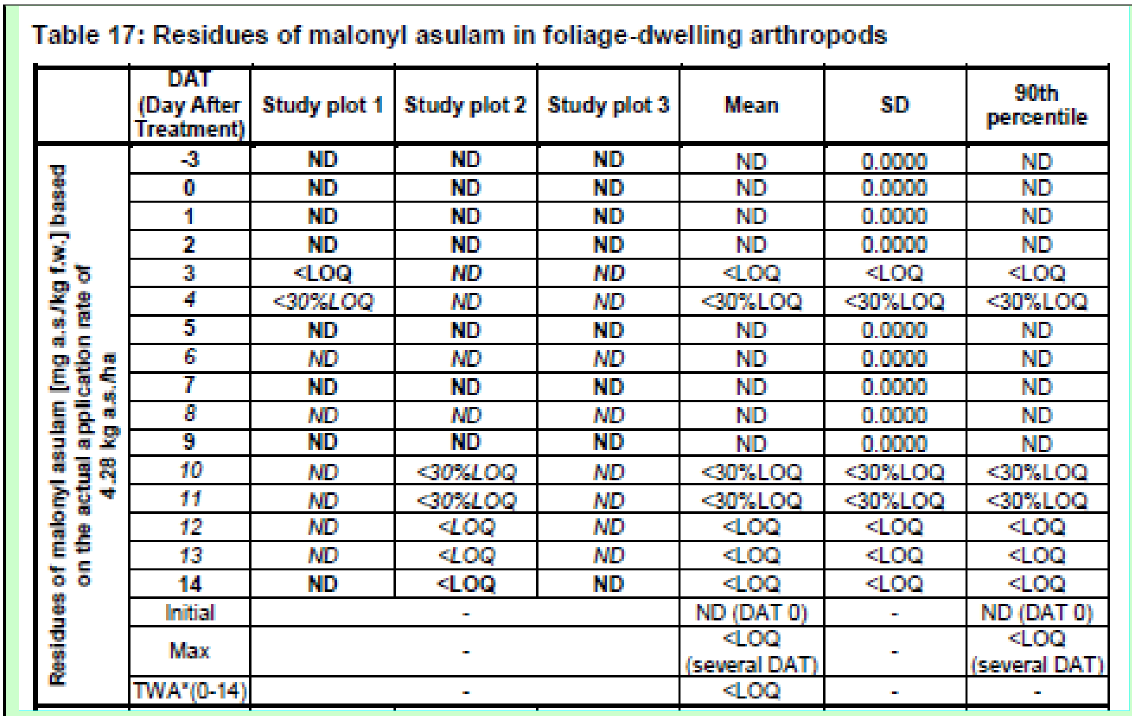


Table 17: Residues of malonyl asulam in foliage-dwelling arthropods

	DAT (Day After Treatment)	Study plot 1	Study plot 2	Study plot 3	Mean	SD	90th percentile
Residues of malonyl asulam [mg a.s./kg f.w.] based on the actual application rate of 4.28 kg a.s./ha	**-3**	**ND**	**ND**	**ND**	ND	0.0000	ND
	0	**ND**	**ND**	**ND**	ND	0.0000	ND
	1	**ND**	**ND**	**ND**	ND	0.0000	ND
	2	**ND**	**ND**	**ND**	ND	0.0000	ND
	3	**<LOQ**	*ND*	*ND*	<LOQ	<LOQ	<LOQ
	4	*<30%LOQ*	*ND*	*ND*	<30%LOQ	<30%LOQ	<30%LOQ
	5	**ND**	**ND**	**ND**	ND	0.0000	ND
	6	*ND*	*ND*	*ND*	ND	0.0000	ND
	7	**ND**	**ND**	**ND**	ND	0.0000	ND
	8	*ND*	*ND*	*ND*	ND	0.0000	ND
	9	**ND**	**ND**	**ND**	ND	0.0000	ND
	10	*ND*	*<30%LOQ*	*ND*	<30%LOQ	<30%LOQ	<30%LOQ
	11	*ND*	*<30%LOQ*	*ND*	<30%LOQ	<30%LOQ	<30%LOQ
	12	*ND*	*<LOQ*	*ND*	<LOQ	<LOQ	<LOQ
	13	*ND*	*<LOQ*	*ND*	<LOQ	<LOQ	<LOQ
	14	**ND**	**<LOQ**	**ND**	<LOQ	<LOQ	<LOQ
	Initial	-			ND (DAT 0)	-	ND (DAT 0)
	Max	-			<LOQ (several DAT)	-	<LOQ (several DAT)
	TWA*(0-14)	-			<LOQ	-	-

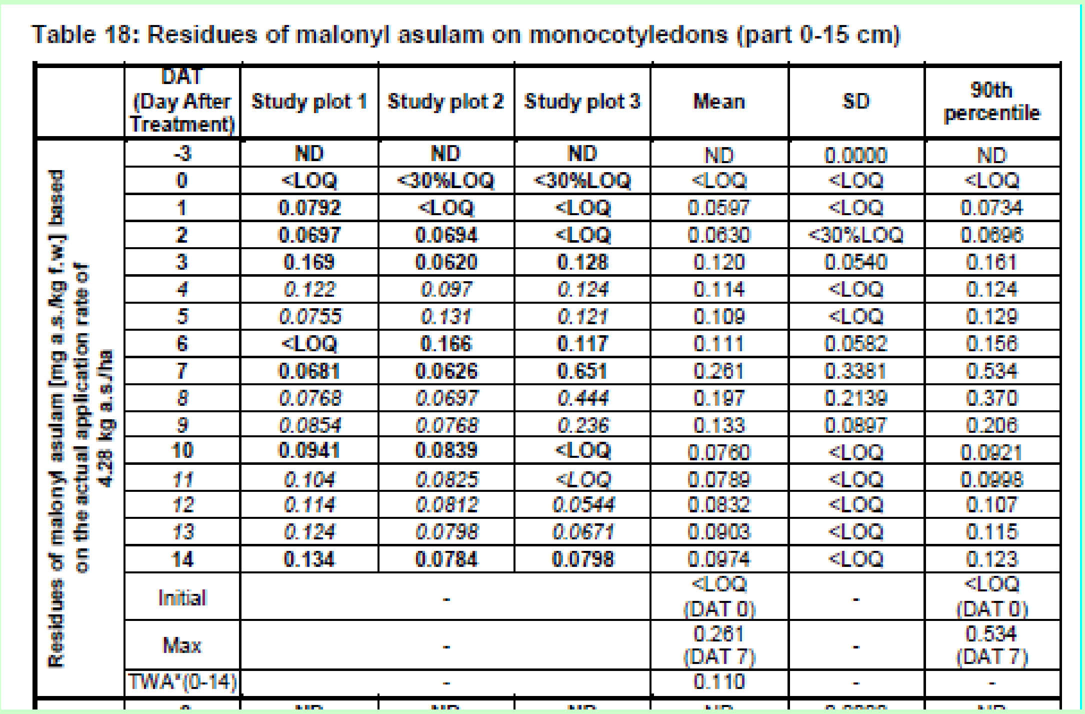


Table 18: Residues of malonyl asulam on monocotyledons (part 0-15 cm)

	DAT (Day After Treatment)	Study plot 1	Study plot 2	Study plot 3	Mean	SD	90th percentile
Residues of malonyl asulam [mg a.s./kg f.w.] based on the actual application rate of 4.28 kg a.s./ha	**-3**	**ND**	**ND**	**ND**	ND	0.0000	ND
	0	**<LOQ**	**<30%LOQ**	**<30%LOQ**	<LOQ	<LOQ	<LOQ
	1	**0.0792**	**<LOQ**	**<LOQ**	0.0597	<LOQ	0.0734
	2	**0.0697**	**0.0694**	**<LOQ**	0.0630	<30%LOQ	0.0696
	3	**0.169**	**0.0620**	**0.128**	0.120	0.0540	0.161
	4	*0.122*	*0.097*	*0.124*	0.114	<LOQ	0.124
	5	*0.0755*	*0.131*	*0.121*	0.109	<LOQ	0.129
	6	**<LOQ**	**0.166**	**0.117**	0.111	0.0582	0.156
	7	**0.0681**	**0.0626**	**0.651**	0.261	0.3381	0.534
	8	*0.0768*	*0.0697*	*0.444*	0.197	0.2139	0.370
	9	*0.0854*	*0.0768*	*0.236*	0.133	0.0897	0.206
	10	**0.0941**	**0.0839**	**<LOQ**	0.0760	<LOQ	0.0921
	11	*0.104*	*0.0825*	*<LOQ*	0.0789	<LOQ	0.0998
	12	*0.114*	*0.0812*	*0.0544*	0.0832	<LOQ	0.107
	13	*0.124*	*0.0798*	*0.0671*	0.0903	<LOQ	0.115
	14	**0.134**	**0.0784**	**0.0798**	0.0974	<LOQ	0.123
	Initial	-			<LOQ (DAT 0)	-	<LOQ (DAT 0)
	Max	-			0.261 (DAT 7)	-	0.534 (DAT 7)
	TWA*(0-14)	-			0.110	-	-

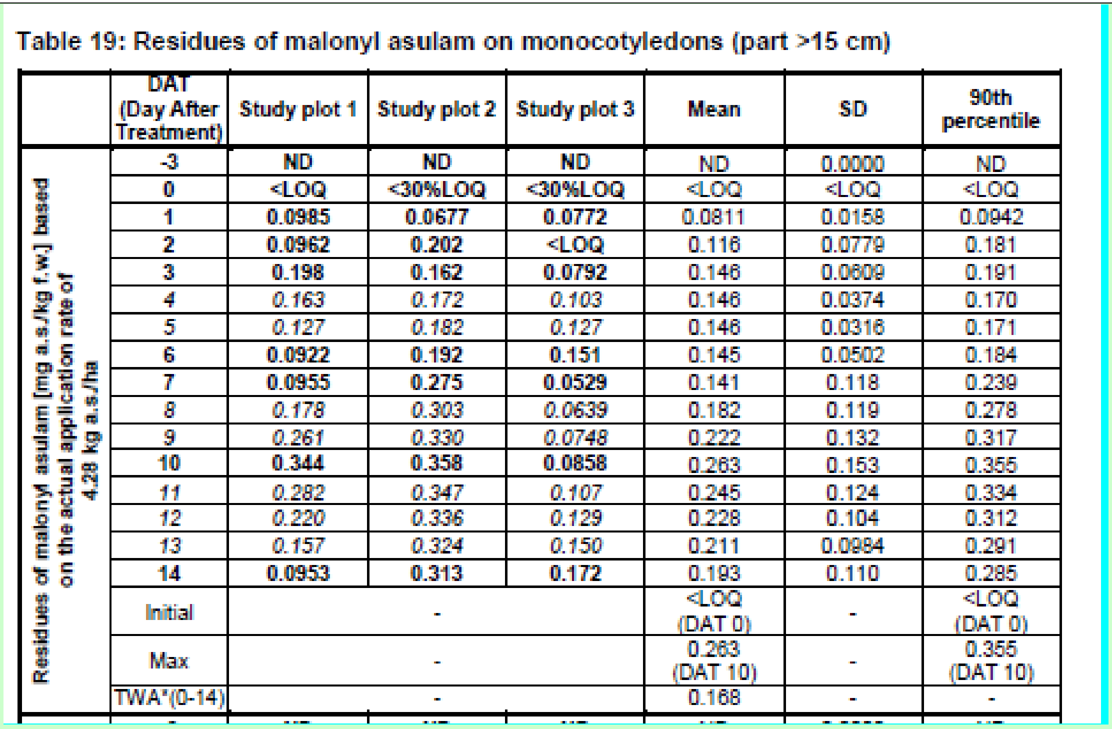


Table 19: Residues of malonyl asulam on monocotyledons (part >15 cm)

	DAT (Day After Treatment)	Study plot 1	Study plot 2	Study plot 3	Mean	SD	90th percentile
Residues of malonyl asulam [mg a.s./kg f.w.] based on the actual application rate of 4.28 kg a.s./ha	-3	**ND**	**ND**	**ND**	ND	0.0000	ND
	0	**<LOQ**	**<30%LOQ**	**<30%LOQ**	<LOQ	<LOQ	<LOQ
	1	**0.0985**	**0.0677**	**0.0772**	0.0811	0.0158	0.0942
	2	**0.0962**	**0.202**	**<LOQ**	0.116	0.0779	0.181
	3	**0.198**	**0.162**	**0.0792**	0.146	0.0609	0.191
	4	*0.163*	*0.172*	*0.103*	0.146	0.0374	0.170
	5	*0.127*	*0.182*	*0.127*	0.146	0.0316	0.171
	6	**0.0922**	**0.192**	**0.151**	0.145	0.0502	0.184
	7	**0.0955**	**0.275**	**0.0529**	0.141	0.118	0.239
	8	*0.178*	*0.303*	*0.0639*	0.182	0.119	0.278
	9	*0.261*	*0.330*	*0.0748*	0.222	0.132	0.317
	10	**0.344**	**0.358**	**0.0858**	0.263	0.153	0.355
	11	*0.282*	*0.347*	*0.107*	0.245	0.124	0.334
	12	*0.220*	*0.336*	*0.129*	0.228	0.104	0.312
	13	*0.157*	*0.324*	*0.150*	0.211	0.0984	0.291
	14	**0.0953**	**0.313**	**0.172**	0.193	0.110	0.285
	Initial	-			<LOQ (DAT 0)	-	<LOQ (DAT 0)
	Max	-			0.263 (DAT 10)	-	0.355 (DAT 10)
	TWA*(0-14)	-			0.168	-	-

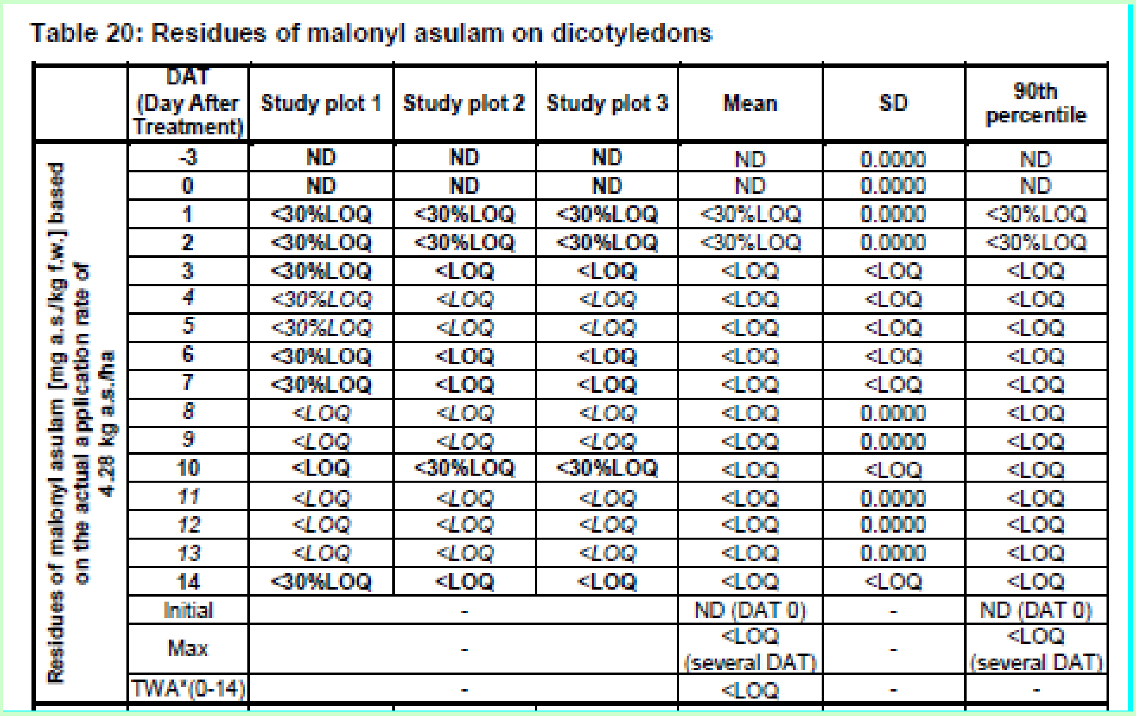


Table 20: Residues of malonyl asulam on dicotyledons

	DAT (Day After Treatment)	Study plot 1	Study plot 2	Study plot 3	Mean	SD	90th percentile
Residues of malonyl asulam [mg a.s./kg f.w.] based on the actual application rate of 4.28 kg a.s./ha	-3	**ND**	**ND**	**ND**	ND	0.0000	ND
	0	**ND**	**ND**	**ND**	ND	0.0000	ND
	1	**<30%LOQ**	**<30%LOQ**	**<30%LOQ**	<30%LOQ	0.0000	<30%LOQ
	2	**<30%LOQ**	**<30%LOQ**	**<30%LOQ**	<30%LOQ	0.0000	<30%LOQ
	3	**<30%LOQ**	**<LOQ**	**<LOQ**	<LOQ	<LOQ	<LOQ
	4	*<30%LOQ*	*<LOQ*	*<LOQ*	<LOQ	<LOQ	<LOQ
	5	*<30%LOQ*	*<LOQ*	*<LOQ*	<LOQ	<LOQ	<LOQ
	6	**<30%LOQ**	**<LOQ**	**<LOQ**	<LOQ	<LOQ	<LOQ
	7	**<30%LOQ**	**<LOQ**	**<LOQ**	<LOQ	<LOQ	<LOQ
	8	*<LOQ*	*<LOQ*	*<LOQ*	<LOQ	0.0000	<LOQ
	9	*<LOQ*	*<LOQ*	*<LOQ*	<LOQ	0.0000	<LOQ
	10	**<LOQ**	**<30%LOQ**	**<30%LOQ**	<LOQ	<LOQ	<LOQ
	11	*<LOQ*	*<LOQ*	*<LOQ*	<LOQ	0.0000	<LOQ
	12	*<LOQ*	*<LOQ*	*<LOQ*	<LOQ	0.0000	<LOQ
	13	*<LOQ*	*<LOQ*	*<LOQ*	<LOQ	0.0000	<LOQ
	14	**<30%LOQ**	**<LOQ**	**<LOQ**	<LOQ	<LOQ	<LOQ
	Initial	-			ND (DAT 0)	-	ND (DAT 0)
	Max	-			<LOQ (several DAT)	-	<LOQ (several DAT)
	TWA*(0-14)	-			<LOQ	-	-

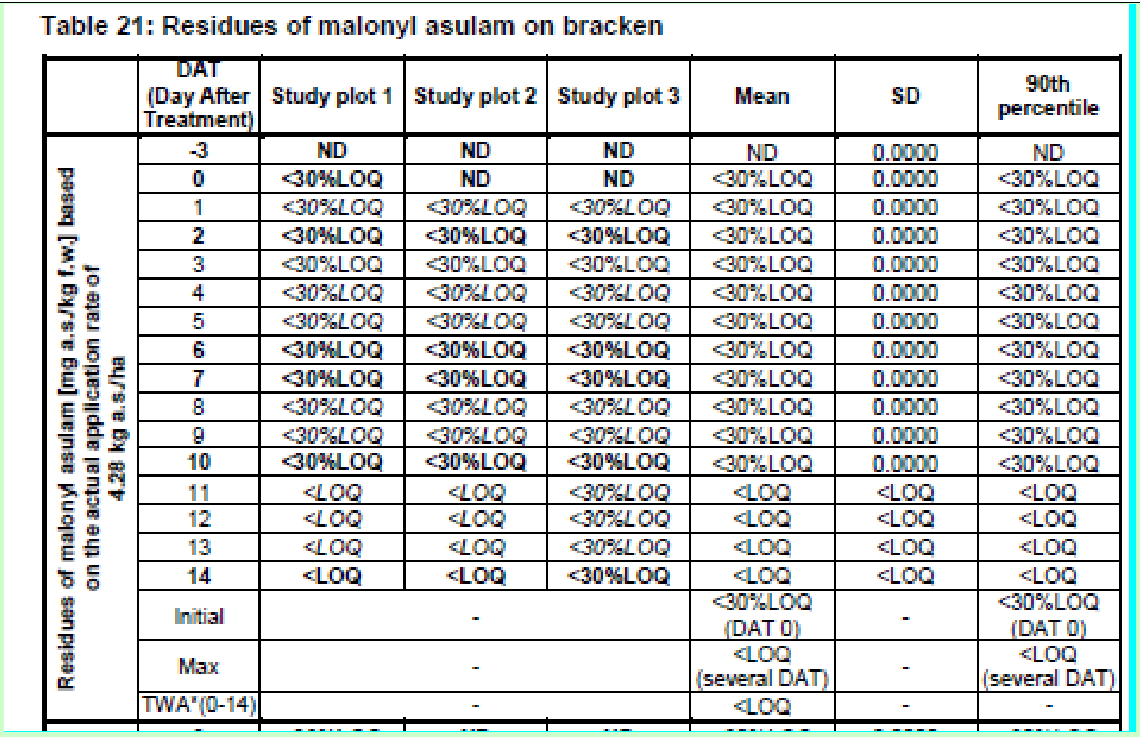


Table 21: Residues of malonyl asulam on bracken

	DAT (Day After Treatment)	Study plot 1	Study plot 2	Study plot 3	Mean	SD	90th percentile
Residues of malonyl asulam [mg a.s./kg f.w.] based on the actual application rate of 4.28 kg a.s./ha	-3	ND	ND	ND	ND	0.0000	ND
	0	<30%LOQ	ND	ND	<30%LOQ	0.0000	<30%LOQ
	1	<30%LOQ	<30%LOQ	<30%LOQ	<30%LOQ	0.0000	<30%LOQ
	2	<30%LOQ	<30%LOQ	<30%LOQ	<30%LOQ	0.0000	<30%LOQ
	3	<30%LOQ	<30%LOQ	<30%LOQ	<30%LOQ	0.0000	<30%LOQ
	4	<30%LOQ	<30%LOQ	<30%LOQ	<30%LOQ	0.0000	<30%LOQ
	5	<30%LOQ	<30%LOQ	<30%LOQ	<30%LOQ	0.0000	<30%LOQ
	6	<30%LOQ	<30%LOQ	<30%LOQ	<30%LOQ	0.0000	<30%LOQ
	7	<30%LOQ	<30%LOQ	<30%LOQ	<30%LOQ	0.0000	<30%LOQ
	8	<30%LOQ	<30%LOQ	<30%LOQ	<30%LOQ	0.0000	<30%LOQ
	9	<30%LOQ	<30%LOQ	<30%LOQ	<30%LOQ	0.0000	<30%LOQ
	10	<30%LOQ	<30%LOQ	<30%LOQ	<30%LOQ	0.0000	<30%LOQ
	11	<LOQ	<LOQ	<30%LOQ	<LOQ	<LOQ	<LOQ
	12	<LOQ	<LOQ	<30%LOQ	<LOQ	<LOQ	<LOQ
	13	<LOQ	<LOQ	<30%LOQ	<LOQ	<LOQ	<LOQ
	14	<LOQ	<LOQ	<30%LOQ	<LOQ	<LOQ	<LOQ
	Initial	-			<30%LOQ (DAT 0)	-	<30%LOQ (DAT 0)
	Max	-			<LOQ (several DAT)	-	<LOQ (several DAT)
	TWA*(0-14)	-			<LOQ	-	-

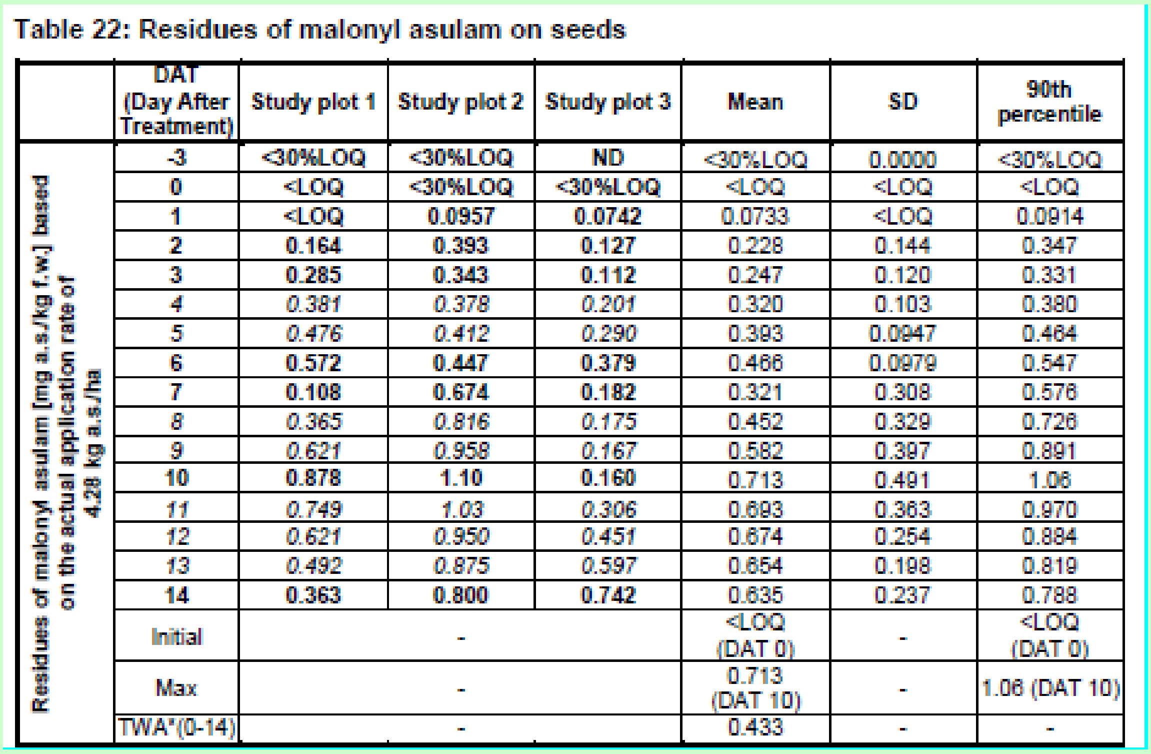


Table 22: Residues of malonyl asulam on seeds

	DAT (Day After Treatment)	Study plot 1	Study plot 2	Study plot 3	Mean	SD	90th percentile
Residues of malonyl asulam [mg a.s./kg f.w.] based on the actual application rate of 4.28 kg a.s./ha	-3	<30%LOQ	<30%LOQ	ND	<30%LOQ	0.0000	<30%LOQ
	0	<LOQ	<30%LOQ	<30%LOQ	<LOQ	<LOQ	<LOQ
	1	<LOQ	0.0957	0.0742	0.0733	<LOQ	0.0914
	2	0.164	0.393	0.127	0.228	0.144	0.347
	3	0.285	0.343	0.112	0.247	0.120	0.331
	4	0.381	0.378	0.201	0.320	0.103	0.380
	5	0.476	0.412	0.290	0.393	0.0947	0.464
	6	0.572	0.447	0.379	0.466	0.0979	0.547
	7	0.108	0.674	0.182	0.321	0.308	0.576
	8	0.365	0.816	0.175	0.452	0.329	0.726
	9	0.621	0.958	0.167	0.582	0.397	0.891
	10	0.878	1.10	0.160	0.713	0.491	1.06
	11	0.749	1.03	0.306	0.693	0.363	0.970
	12	0.621	0.950	0.451	0.674	0.254	0.884
	13	0.492	0.875	0.597	0.654	0.198	0.819
	14	0.363	0.800	0.742	0.635	0.237	0.788
	Initial	-			<LOQ (DAT 0)	-	<LOQ (DAT 0)
	Max	-			0.713 (DAT 10)	-	1.06 (DAT 10)
	TWA*(0-14)	-			0.433	-	-

HSE comment

See below for detailed consideration of this study.

Discussion regarding the residue studies

In order to refine the default residue decline DT50 of 10 days, it is standard practice to have data from more than one site (see EFSA (2019)[24]), the above studies represent one site each, albeit with multiple plots at each site. In addition, studies should represent the proposed GAP in terms of when the pesticide is likely to be applied. With these two issues in mind, it is clear that both studies match the proposed GAP regarding the relevant time of year, however both studies were conducted in the same geographical location, hence do not address the issue of data from 4 sites that is required to refine the DT50 on vegetative matter. Therefore, on this basis alone, the data in these studies would not normally be sufficient to refine the default DT50, however, given that this is an emergency application, is considered appropriate to try to determine if there is useful information in these studies that could help refine the risk to both birds and mammals.

The design and conduct of the studies seem appropriate, and whilst there is uncertainty regarding the relevance of the vegetation sampled and in particular whether it was potential food for birds and mammals, the data are considered to indicate the potential persistency of the active substance on plant matter.

As regards the sampling times for the **vegetative matter** studies, it is noted that there were sufficient sampling points, however there was only sampling on the day of application for some substrates. It is further noted that most degradation/dissipation had occurred within the first day and hence between two sampling points for the study conducted in September. This may have been due to the rainfall events on the day of application and the following day. In the study conducted in July when minimal rainfall occurred around the time of application, a decline was noted and although rapid was not as quick as in the September study. The rapid decline observed in the September study inevitably leads to uncertainty when trying to derive a suitable DT50, it would have been preferable to have more sampling points between the day of application and three days afterwards to ensure that a suitable curve could be fitted. In light of this, the data from the study carried out in September is of limited value. As regards the study carried out in July, as indicated above, there was no rainfall event at the time of application, however rapid decline was still observed. As regards the reliability of the decline data and the associated DT50, on the basis of the study author’s kinetic assessment, it is clear that reliable DT50 values were only obtained for monocotyledons (0-15 cm), bracken and seeds. These DT50 were all around 1 day in duration (see above). This is comparable to the previous residue decline data considered in the original renewal (see HSE internal ref WIS: 001953780) where a foliar DT50 of 1.44 days was calculated.

The residue decline data for the **arthropod samples** were considered too variable from the study conducted in September. The data from the July study were less variable, however, the study author determined a DT50 for ground-dwelling arthropods of 0.2925 days. It should however, be noted that the maximum residues were not reached until 5 days after treatment in one of the plots in the September study.

In addition to the above concerns, various uncertainties have been highlighted with the MoA and storage stability. These uncertainties further question the robustness of the studies and associated endpoints, however overall, there they are considered sufficiently reliable for use in a *qualitative* assessment only.

On the basis of the above assessment, it is clear that the studies are not sufficient to permit a quantitative reduction in the DT50 for either plant material or arthropods. However, as this is an emergency application, it is necessary to consider whether these studies provide any information that could be used in some way to progress the risk assessment, whilst acknowledging the shortcomings. Whilst noting that the data are limited to one location and two time periods, and that there was a significant rainfall event in one study, thereby potentially hastening any decline, it is clear that the degradation or dissipation of the active substance, asulam, is *likely* to be shorter than the default of 10 days. However, due to the issues highlighted above, it is not possible to say quantitatively how much less. Considering Tables 4 and 5, a reduction in the DT50 from 10 days to approximately 3 days would be required to demonstrate an acceptable risk for herbivorous birds, whereas for insectivorous birds a reduction to a DT50 of 1 day is required. Based on all the data provided (including that previously considered in HSE Internal ref WIS 001953780), it is feasible that the vegetative DT50 is less than 10 days; however as stated above, the arthropod data is too variable to draw anything reliable from, especially as the residues seem to decline, but then plateau and that there was a delay before the maximum residues were

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[24] EFSA (European Food Safety Authority), 2019. Technical report on the outcome of the Pesticides Peer Review Meeting on general recurring issues in ecotoxicology. EFSA supporting publication 2019:EN-1673. 117 pp. doi:10.2903/sp.efsa.2019.EN-1673

reached. On this basis, it is feasible that the risk to herbivorous birds (and mammals) is less than predicted. This is discussed further below.

Consideration of new ecological data submitted under COP2021/02343

As part of this application, the Natural England (NE) submitted further ecological data, comprising:

- site survey work carried out at a sample of eight sites of special scientific interest (SSSI) representative of upland and lowland habitats in NW[25] and SE[26] England during the bracken spray season in 2021[27].
- additional work by British Trust for Ornithology (BTO)[28] that further developed the information on focal bird species and the potential for exposure at critical stages of the breeding cycle.

In the first instance the site survey work, along with additional work by NE on what birds occur on SSSI, was aimed at clarifying key focal species that occurred in or around bracken at the time of application of asulam, as Asulox.

HSE has reviewed the site survey work as well as the work done by the BTO. The former are survey reports detailing habitat and the occurrence of birds on those plots. The study conducted in SE England was an observational study conducted in August and involved scan surveying lasting between 2 and 3 hours. The study conducted in NW England involved more detailed observation work in that it identified those birds considered to be breeding in the habitat. This survey was conducted in late August. Neither study was conducted to GLP. Whilst the methodology for both studies was not in line with Appendix M of EFSA (2009), is considered sufficient to indicate what species could potentially occur in and around bracken.

The aim of the BTO work primarily was focused on addressing the following objectives:

- To review literature and readily available data on food items used by adult birds in the focal species during the breeding period from July 1 up to mid-September, to inform assessment of exposure to herbicide residues. Where possible this has used information from relevant (bracken associated) habitats.
- To review literature and readily available data to identify the co-occurrence between the critical phases of egg-development and bracken spray period for the focal species and to assess the importance of eggs laid in the relevant period for species' populations.

In addressing these objectives, further potential focal species were identified. As regards the reviews, these were well reported and referenced, although the underlying data or papers were not presented. Whilst normally this would be a key issue, in this instance the dietary data, whilst of interest, is not of use in a quantitative risk assessment. The reason for this is that the species ultimately fell in to either insectivorous or herbivorous/granivorous and due to the nature of the data, it is not possible to use it quantitatively.

Overall, the above focal species orientated work has identified a total of **16 potential focal species**. From an initial assessment of overlap between nesting period and bracken spraying period 9 species were identified as being at potential risk by the BTO based on phenological and/or habitat usage overlaps, i.e., the 95th percentile of first egg laying date fell within the bracken spraying period (post 1st July).

The BTO and NE reports indicated that whilst, Chiffchaff, Dunnock, Robin, Reed Bunting, Wren, Whitethroat and Willow Warbler were initially also included due to their length of breeding season and/or potential use of bracken

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[25] Survey of late-breeding birds at sprayed bracken sites, 2021 Report Number 0921 South Lakes Ecology Survey and Habitat Management

[26] Bird surveys of bracken for various lowland heathland SSSI sites December 2021. The landscape partnership.

[27] This work also addressed the data requirement set under COP2020/01796, i.e., Data on the types and numbers of bird and mammal wildlife that nests and/or feeds in and adjacent to the areas to be treated during the treatment period from 1 July to 14 September.

[28] Hanmer H and Conway G (2022) Assessment of exposure risks to asulam during egg formation in focal species. BTO report to Natural England. Work was supported with accompanying spreadsheets summarising literature used and potential diets.

associated habitats they were subsequently dropped from the detailed examination of diet due to the following reasons:

- Limited phenological overlap for Willow Warbler, Chiffchaff and Common Whitethroat
- Limited overall importance of bracken related habitats to Dunnock, Robin and Wren as habitat generalists
- Bracken is not considered an important habitat to Reed Bunting who are more associated with wetland, scrub and farmland edges.

Nine focal species is a much greater range of species than normally considered for agricultural use of pesticides, however for this situation it is not possible to adopt a risk envelope approach as whilst one species may be at lower risk in terms of consumption of treated food the potential overlap may be greater. It is considered that the range of species considered and subsequently assessed in terms of usage of bracken either for feeding and/or nesting, is appropriate.

The key work presented in the BTO document is that related to the co-occurrence of critical phases of egg-development and bracken spraying for the focal species identified. The summary of this work is presented in Table 6. Whilst it has not been possible to verify the BTO Nest Record Scheme or NRS data, it is considered appropriate to accept them as they are; similarly, the data regarding the proportion of sites potentially containing bracken.

One point to note is that on the basis of the effects data (see above), the key endpoint was based on eggshell thickness which is considered to be relevant to pair formation. This stage is not one that is measured or recorded in the BTO survey; however the report states the following:

> *First egg dates are here used as a robust proxy for the critical period of egg formation. Although no specific studies on egg formation appear to have been carried out on any of the focal species and the majority of the literature focuses on Domestic Chickens (Gallus gallus), avian egg formation following ovulation takes approximately 24 hours immediately prior to laying [4,5] of which eggshell formation forms the largest proportion (c 18 – 19 hours in chickens). Approximately one egg is then laid every 24 hours in passerines (36 hours in Nightjar; BWP) until the complete of the clutch with typically 3-5 eggs laid per clutch in the study species (2 in Nightjar; BWP). Therefore, first egg date provides a robust and relatively precautionary estimate of this variable period.*

It is considered that whilst not necessarily as precautionary as indicated as egg formation is before the first egg date, it is considered a suitable date to consider.

The analysis indicates that there is potential overlap for the following species:

Dartford warbler
Tree pipit
Nightjar
Twite
Stonechat
Whinchat
Meadow pipit
Linnet
Yellowhammer

On the basis of the work carried out and the data provided, HSE considers that this selection of species and the rejection of other is appropriate.

Of the above species, there was less than 1% overlap of the surveyed population with the spray window for the tree pipit and whinchat; it should however be noted that whilst the data for the tree pipit were relevant in that 78.4% of the survey data were from sites with bracken that for the linnet was potentially less relevant with only 19%. The lower percentage could mean that the habitat is less attractive to linnets, or that linnets prefer other habitats to those containing bracken, or that there simply a lack of data from habitats containing bracken. For

Dartford Warbler there was no consideration of the overlap due to the lack of information, however the BTO report stated that this species was “generally negatively associated with bracken and bracken rarely used for feeding with gorse preferred” and that whilst there could be an impact from spraying bracken, it was “more likely to benefit”. This species was not considered further.

All other species showed higher levels of overlap, and varying degrees of relevance as above. It currently is not possible to use this information quantitatively in a risk assessment to indicate what the potential impact at the population level could be.

In addition to the site work done to identified potential focal species, further desk-based work was done by NE, this work involved correlating data on the site (SSSI) specific asulam use and the presence of selected focal species that are potentially in the reproductive cycle when asulam use is permitted. Whilst this last piece of work was not aimed at identifying focal species it does provide some evidence that those potentially at risk species do occur in locations where asulam could be used. In addition, this information indicates that knowledge of what is occurring on SSSI is known and hence could, if needs be, incorporated in to risk mitigation measures, see below in the discussion for further consideration.

Table 6: Summary of key focal species, habitat, feeding guild and phenology.

Species	**Nesting and foraging habitat**	**Overall bracken population importance**	**Overall NRS first egg phenology (bold indicates a date during the spraying period – starting at day182=1st July) –see Figure 1 and Table 2**			**Overall Percentage estimated NRS First egg dates in spray period, sample size (N)**	**Potentially bracken containing habitats only, Percentage and sample size (N) NRS records**	**Overall bracken and spraying period importance to population**
			95th %	**100th %**	**Sample size (N)**			
Dartford Warbler	Lowland heath especially gorse [12–14]. Bracken present in habitat [15].	Generally negatively associated with bracken and bracken rarely used for feeding with gorse preferred [16–19].	NA	NA	NA	NA	NA	Could be impacted but more likely to benefit from bracken spraying [13,14].
Tree Pipit	Scattered trees in open habitat such as alpine meadow, clearfell/young plantation including bracken in the UK [22–25]. Forages along tracks away from bracken [26].	Strongly associated with bracken in UK breeding habitat [26–28].	170	**188**	929	0.8% (N=7)	78.4% (N=728)	Only potentially affecting a very small proportion of the breeding population due to low phenological overlap.
Nightjar	Nests on bare/sparse ground in open heathland or in scattered scrub including in clear fell/young planation and commonly in/adjacent to	Majority of UK population breeding in habitats potentially containing bracken but also forages in other habitats (see species account; [36–38].	**200**	**216**	1001	29.2% (N=292)	77.4% (N=775)	Could affect a significant proportion of breeding attempts depending on if foraging habitat is also sprayed [36,37,40].

	bracken [35]. Frequently forages well away from nest over other habitats such as grazed grassland [36–38].							
Twite	Upland specialist [8,12] mostly nesting on ground [9,45–47] and sometimes in bracken (Raine 2006).	Primarily associated with bracken containing habitats (eg uplands [8,12]) although bracken not a significant proportion of upland [8].	**193**	**208**	292	11.0% (N=32)	76.0% (N=222)	Could affect a minority of the breeding population.
Stonechat	Scattered scrub in open habitat, uses bracken but prefers heather [52–55]. Bracken nested in less layer in season [56].	Strongly associated with bracken containing habitat [8,27,57,58]although generally not specifically with bracken [52–55].	170	**210**	2306	3.4% (N=78)	46.4% (N=1069)	Only potentially affecting a small proportion of the breeding population due to low phenological overlap and lower late brood importance [62].
Whinchat	Part (majority?) of UK population strongly associated with bracken containing habitats for nesting [8,12,58,68]. In these habitats nests in bracken [54,55,57,69–71] but forages in mosaics of structurally diverse habitats including bracken [72,73].	Apart from Wiltshire population where bracken is rare [11,74] primarily breeds in bracken eg Pennies, Cumbria and Scottish [54,55,57,69–71].	170	**184**	1223	0.7% (N=9)	39.2% (N=479)	Only potentially affecting a very small proportion of the breeding population due to low phenological overlap despite high importance of habitat.
Meadow Pipit	Mix of vegetation heights required but especially heather and grassland which they prefer to forage [55,78].	Often associated with bracken containing habitats (eg uplands) although bracken tends to be unimportant [54,55,69,70,79,80] or even negative [28,81].	170	**184**	1422	1.4% (N=20)	32.4% (N=461)	Only potentially affecting a very small proportion of the breeding population due to low phenological overlap, low survival rates of late broods [82] and limited/negative importance of bracken [28,54,55,69,70,79–81].
Linnet	Mostly hedges and scrub	Likely to be limited as primarily	**185**	**218**	4034	9.8% (N=394)	19.0% (N=765)	Only expected to affect a small

	in/near lowland farmland but sometimes in bracken and upland edge [27,53,91].	associated with farmland in the UK [92,93] although does breed in clear fell and other bracken containing habitat [27,53,91].						proportion of population and breeding attempts due to habitat preferences [92,93] and phenological overlap.
Yellowhammer	Nest in hedges and scrub, including gorse on heathland (BWP). Forages in short vegetation along tracks etc in bracken habitats [26,94].	Primarily associated with farmland in the UK [92,93,95,96] although does breed in clear fell and other bracken containing habitat [26,94] although densities may be reduced [91,97] but see [98,99].	**192**	**202**	721	21.2% (N=153)	9.8% (N=71)	Likely to be limited due to habitat preferences although a significant minority of birds breeding in bracken habitat could be affected.

Risk assessment for mammals

Presented below is the assessment done for COP2020/01796 and updated where appropriate.

A similar approach was taken as above regarding the risk to mammals. The main small sized feeding guilds for mammals from EFSA (2009) were considered (small herbivorous, small omnivorous and small insectivorous mammals) as all are expected to be present in bracken and use of the small body size scenarios will be protective of larger individuals of the same or similar diet.

Table 6: Acute mammal risk assessment for 'Asulox' applied at a rate of 11 L product/ha (equivalent to 4.4 kg a.s./ha) to bracken. The risk assessment was conducted using surrogate values for appropriate feeding guilds from Appendix A of EFSA (2009) for leafy vegetables at the latest BBCH stages.

Intended use	**Grassland/moorland 11 L product/ha**				
Active substance/product	Asulox				
Application rate (kg a.s./ha)	4.4				
Acute toxicity (mg a.s. g/kg bw)	> 4564				
TER criterion	10				
Crop scenario Growth stage	**Tier 1 indicator species**	**SV_{90}**	**MAF_{90}**	**DDD_{90} (mg/kg bw/d)**	**TER_a**
Leafy vegetables at BBCH ≥50	Small herbivorous mammal	40.9	1.0	179.96	25.36
	Small omnivorous mammal	5.2	1.0	22.88	199.48
Leafy vegetables at BBCH ≥20	Small insectivorous mammal	5.4	1.0	23.76	192.09

There is an acceptable acute risk to mammals for all scenarios considered in the above table (i.e., TER greater than the trigger value of 10). It should be noted that only the higher rate of 4.4 kg a.s./ha has been assessed, however as this results in an acceptable risk, then the risk from the lower rate of 4.0 kg a.s./ha will also result in an acceptable risk, i.e., TERa >10. Therefore, no further consideration is necessary.

Presented in Table 7 below is the reproductive/long-term risk assessment. It should be noted that only the higher rate of 4.4 kg a.s./ha has been assessed, this results in an unacceptable risk, i.e., TERlt <5 and given the margin of failure, the lower rate of 4.0 kg a.s./ha will also result in an unacceptable risk.

Table 7: Long-term/reproductive mammal risk assessment for ‘Asulox’ applied at a rate of 11 L product/ha (equivalent to 4.4 kg a.s./ha) to bracken. The risk assessment was conducted using surrogate values for appropriate feeding guilds from Appendix A of EFSA (2009) for leafy vegetables at the latest BBCH stages.

Intended use	**Grassland/moorland 11 L product/ha**				
Active substance/product	Asulox				
Application rate (kg a.s./ha)	4.4				
Long-term toxicity (mg a.s./kg bw)/d	46				
TER criterion	5				
Crop scenario Growth stage	**Tier 1 generic focal species**	**SV_m**	**MAF_m x TWA**	**DDD_m (mg/kg bw/d)**	**TER_{LT}**
Leafy vegetables at BBCH ≥50	Small herbivorous mammal	21.7	0.53	50.60	**0.91**
	Small omnivorous mammal	2.3	0.53	5.36	8.58
Leafy vegetables at BBCH ≥20	Small insectivorous mammal	1.9	0.53	4.43	10.38

Values in **bold** are below the trigger value

The long-term risk to small omnivorous and small insectivorous mammals is resolved at tier 1 as the TER values are > the trigger value of 5. However, there is an unresolved long-term risk to small herbivorous mammals (TER < the trigger value of 5). Therefore, further consideration of the long-term risk to small herbivorous mammals is necessary.

Refinement of the mammal risk assessment considering deposition values from FOCUS GW 2.2 (2014)

No refinement of DF is possible for the small herbivorous mammal scenario as the value for DF is 0.3 in both EFSA (2009) and FOCUS GW 2.2 (2014) for leafy vegetables. Therefore, there is still an unresolved risk to small herbivorous mammals and further consideration is necessary.

As was stated above, interception data have been submitted and evaluated with this assessment (see Section 2.5), this indicates that the deposition value is 0.1 and not as previously used 0.3, hence if this value is used, then the DDDm becomes 16.8 mg a.s./kg bw/day[29]. Comparing this to the above toxicity value of 46 mg a.s./kg bw/day, would give a TERlt of 2.7, this is still less than the regulatory trigger of 5 and hence the risk is still unacceptable.

Further consideration of the risk to small herbivorous mammals in bracken

The small herbivorous mammal scenario is contentious within the regulatory risk assessment scheme, being often considered in the context of the common vole as a ‘real’ species representing this feeding guild. In the mainland UK the common vole does not occur, but there are two UK-relevant species of vole:

- The bank vole (*Clethrionomus glareolus*) is considered omnivorous in nature and the risk typically covered by that assessed for the small omnivorous mammal (represented by wood mouse) scenario.
- The field vole (*Microtus agrestis*) is more herbivorous in nature and so would require consideration in habitats where it would be expected to occur. Internal HSE records state that preferred habitats for foraging are *“rough, often damp, grazed grassland including young forestry plantation with lush growth of grass’. Sparse populations occur in marginal habitats such as woodlands and hedgerows”*. Notably this is typical habitat of good over-cover such as would be provided by bracken, and also noting that the

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[29] Based on multiplying the application rate of 4.4 kg a.s./ha by the FIR/bw of 1.33, but the deposition value of 0.1, by the RUD of 54.2 and then by the TWA factor of 0.53, giving a DDDm of 16.8 mg a.s./kg bw/day

proposed aerial control of bracken using ‘Asulox’ includes grassland. As such, based on available information HSE would conclude that the assessment of risk to small herbivorous mammals is relevant for this proposed use of ‘Asulox’, and a high risk is identified at present.

It should further be noted that other, larger herbivorous mammals (such as rabbits or other lagomorphs) may be foraging in bracken during the application window and hence may also be at risk. However, as the small herbivore scenario is currently unacceptable, this would cover the risk to other herbivores; this has not been further considered.

Consideration of data submitted under COP2020/01796

No further data was submitted to refine the risk to small mammals under this application. The Applicant has argued that the species are not of a conservation concern and hence this along with the small areas that are likely to be treated in relation to their natural range, magnitude of natural population fluctuations and rapid recolonization suggests that this is unlikely to be of significant conservation concern. Whilst HSE notes these points, it also notes that it is not able to determine whether these points would result in an acceptable risk and in particular whether the protection goals/surrogate protections goals being met.

The Applicant has indicated that the dormouse is of potential conservation concern in that it can occur in stands of bracken. Due to this, the Applicant is proposing that, should the risk to small mammals, not be addressed, then the risk to dormice should be assessed at a local level as per the ‘Dormouse Protocol’ (see Annex 5). The ‘Dormouse Protocol’ is designed for woodland or forestry work; hence it is not immediately obvious how it relates to bracken control. On page 8, it is noted under weed control, that depending on the nature of the woodland, that the users should:

> *Avoid carrying out mechanical operations. If using herbicides only, treat one third or less of gross marginal or favourable habitat area.*
>
> *Avoid carrying out mechanical operations. If using herbicides only, treat 25% or less of gross marginal or favourable habitat area.*

It is assumed that if this use is permitted, that the end-user would follow similar advice when applying’ Asulox’, i.e., limit treatment rather than spray the whole stand of bracken.

The residue decline and/or the interception data mentioned above would be of relevance to the risk assessment for small mammals

Whilst the new argument has potentially advanced the discussion slightly, the notification of the dormouse has raised concerns. On the basis of this is it not possible to remove the previously stipulated restrictions.

Consideration of new data submitted under COP2021/02343

As part of the initial risk assessment, concern was raised regarding the risk to herbivorous mammals. No data have previous been submitted to refine the risk assessment, however under this application the Applicant has submitted a brief summary of some mammal trapping, along with the associated recording spreadsheets. There is a general lack of information regarding how these studies were conducted, however they do indicate that the predominate feeding guild present is an omnivorous small mammal, in the form of the woodmouse of the bank vole. The risk to this feeding guild is considered to be acceptable at the first-tier, see above, however this work does indicate that the field vole can occur in some habitats, albeit in situations with sparse bracken. In addition, it was flagged under the previous application that the hazel dormouse can occur in bracken. Information has been submitted with the application that the breeding cycle of the dormouse is coincident with the spray operation, see Table 7 below.

Table 7: Number of litters per 50 boxes recorded at NDMP[30] sites in England and Wales in 2019 and 2020. Table shows monthly average (2020 data was reduced due to the pandemic).

Month	**2019**	**2020**
Jan	0	0
Feb	0	0
Mar	0	0
Apr	0	0
May	0.02	0.02
Jun	0.06	0.05
Jul	0.21	0.27
Aug	0.48	0.34
Sep	0.4	0.36
Oct	0.15	0.13
Nov	0.02	0
Dec	0	0

No additional data have been submitted to refine the above risk assessment. It is noted that residue decline data above may result in lower exposure due to a lower than predicted DT50, however due to the concerns with the residue studies, it is not possible to incorporate this quantitatively, see below for further detailed consideration.

In addition, to the above, the Applicant supplied information that indicated that the presence of dormice on SSSI was potentially known, therefore it is feasible to use this information in some form of risk mitigation, see below for further consideration.

Drinking water assessment for birds and mammals

Due to the proposed use only a puddle assessment is required. The proposed maximum rate of use is 4400 g a.s./ha and Kfoc of asulam is 27.3 mL/g. Since the ratio of the long-term endpoints for both birds and mammals is >50, the trigger for less sorptive substances, an assessment of the risk from drinking water is required. The following risk assessment is undertaken:

Table 8: Drinking water assessment for birds and mammals

Toxicity:			
	Birds	**Mammals**	
Reproductive NOEC: mg kg bw/d	19	46	
Application information:			
Application rate	4400		g/ha
Number of applications	1		
DWR bird	0.46		L/kg bw/day
DWR mammal	0.24		L/kg bw/day
Puddle scenario			
w	0.02		Pore water term
s	0.0015		soil term
MAF	1.000		
Rate g a.s./ha	4400		
PEC puddle	8.8		

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[30] National Dormouse Monitoring Programme. Source:

	Bird	Mammal	
Exposure	4.048	2.112	
TER reproductive	**4.69**	21.8	
Annex VI trigger value	5	5	

The assessment done for previous applications is presented above, it should be noted that there is a failure for the avian scenario, i.e., the TER is 4.69 which is below the trigger value of 5. There are no refinements available for this assessment.

Overall conclusion regarding the risk to birds and mammals

Discussion regarding the risk to birds

At the first tier, the acute risk to birds was considered to be acceptable with all TERa above the regulatory threshold of 10. For the long-term/reproductive risk assessment, the risk was considered to be unacceptable on the basis of the first-tier assessment for the small granivorous bird (TERlt of 2.14), small omnivorous bird (TERlt of 2.47) and small insectivorous bird (TERlt of 0.84).

An initial refinement regarding the **deposition value** was considered, however this refinement step was only relevant to the small insectivorous bird and the resulting refined TERlt was revised to 0.9.

Residue decline data were considered, initially data on the residue decline on spinach was considered. This was originally deemed to be acceptable in the 2011 review of asulam, however due to the limitations it was rejected in the subsequent 2018 review. This study gave a DT50 of 1.44 days, and a corresponding 21-day ftwa of 0.0989. Subsequent to that data have been submitted on the residue decline on plant matter as well as non-target arthropods. Two separate studies were submitted, both were conducted in the same area of North Yorkshire, however one was conducted in July, whilst the other was in September. As indicated above, there were various issues with these studies, and it was not possible to derive a robust DT50 for residues on vegetative matter.

On the basis of the above consideration, it is clear that the studies are not sufficient to permit a quantitative reduction in the DT50 for either plant material or arthropods. However, as this is an emergency application, it is necessary to consider whether these studies provide any information that could be used in some way to progress the risk assessment, whilst acknowledging the shortcomings.

Whilst noting that the data are limited to one location and two time periods, and that there was a significant rainfall event in one study, thereby potentially hastening any decline, it is clear that the degradation or dissipation of the active substance, asulam, is likely to be shorter than the default of 10 days. However, it is not possible to say quantitatively how much less. Considering Tables 4 and 5, and in particular the TERlt for the small granivorous bird of 2.14 and the TERlt for the small omnivorous bird of 2.47, the DT50 would need to be reduced from 10 days to approximately 3 days in order to demonstrate an acceptable risk, i.e., a TERlt of 5 or more. Based on the all the data provided (including that previously considered in HSE Internal ref WIS 001953780), it is clear that the vegetative DT50 is less than the default of 10 days and probably around 2 days at most, therefore, it is feasible that the risk to herbivorous birds is less than predicted, and probably acceptable, however it is currently not possible to state with confidence whether the risk is acceptable. As regards the risk to insectivorous birds, although it is likely that the DT50 value will be less than the default of 10 days the data are not sufficiently reliable to reach any clear conclusion.

Ecological refinements have been considered several times and in the latest submission the Applicant has built on this by carrying out site survey work as well as consulting expert knowledge to propose a range of focal species that could occur in bracken at or around the time of spraying, i.e., 1st July to 12th September. This work indicates that a total of nine species were associated with bracken and there was breeding phenology overlap. These nine species were:

Dartford warbler
Tree pipit

Nightjar
Twite
Stonechat
Whinchat
Meadow pipit
Linnet
Yellowhammer

Whilst listed, it is concluded that on the basis of what is presented in Table 6 that the risk to the Dartford warbler is low, and it will not be discussed further.

On the basis of the dietary work carried out, these species can be classified crudely as:

Granivorous	**Insectivorous**
Twite	Stonechat
Yellowhammer (adults)	Tree pipit
Linnet	Whinchat
	Yellowhammer (nestlings)
	Nightjar

Considering the information above regarding residue decline, no further refinement can be made regarding the insectivorous birds, however the risk to granivorous birds is lower that assumed due to more rapid residue decline than previously considered, i.e., on the basis of the data it is assumed that the residue decline is less than 10 days.

Turning to the data on phenology, it is clear that there is some degree of overlap for the species listed, the ecological relevance of the overlap is unknown, however it is clear that if the spray date is delayed the overlap and hence the risk is lower. Currently the application window is 1st July to 12th September, if say applications were made 1st August (or day 213), then on the basis of the figures below, the overlap would be negligible, i.e., the red vertical line moves to day 213.

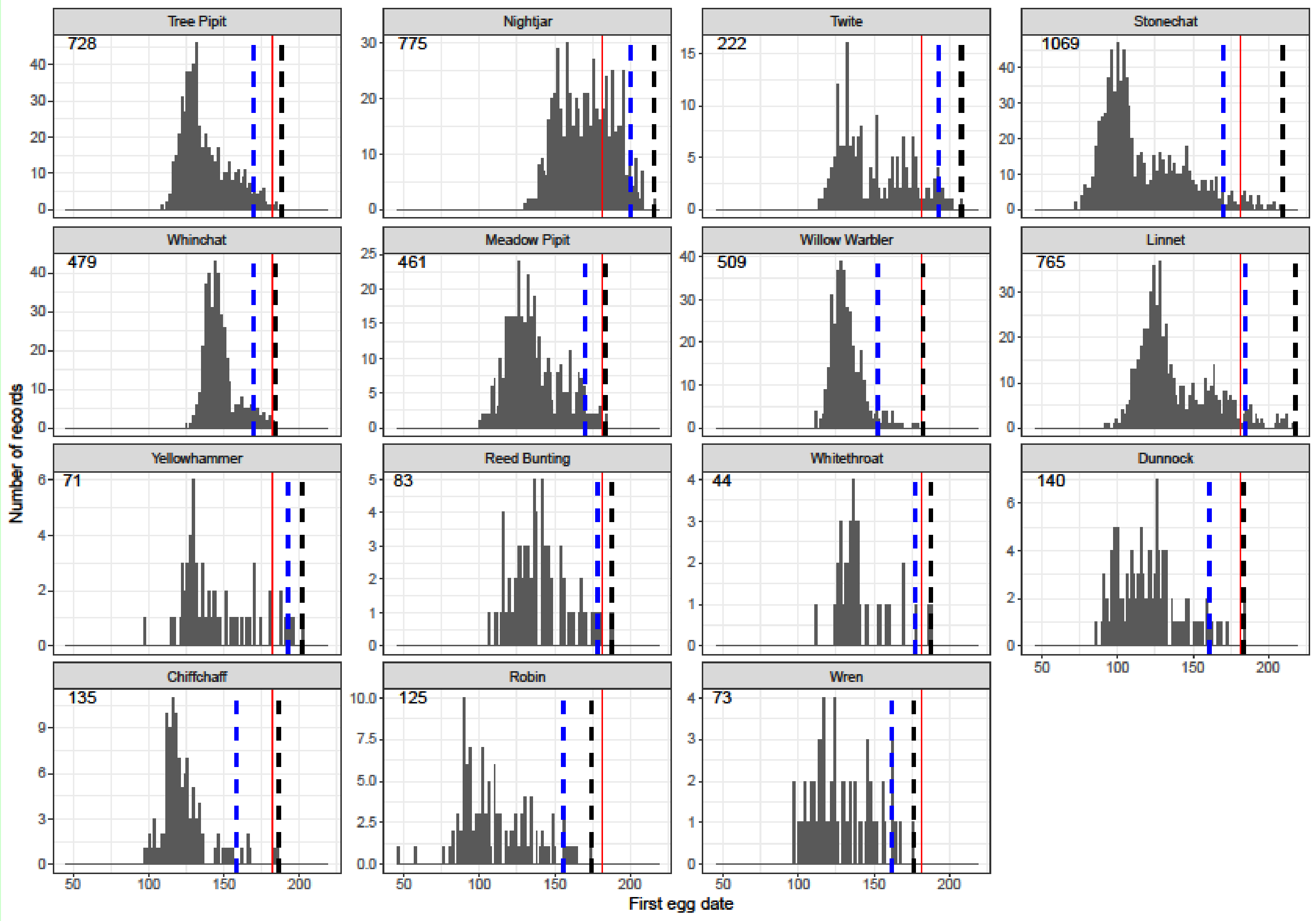

Figure 1. The distribution of first egg dates for potential target species from all valid BTO nest records from potential bracken containing habitats between 1990 and 2019. The solid red vertical line indicates July 1st (day 182) the start of the spraying period. The dashed blue and black vertical lines indicate the 95th and 100th percentile for first egg dates for that species. The number in the top left corner of each species facet indicates the total number of samples. Facets ordered descending by the percentage of nest records associated with potentially bracken containing habitats.

The **reproductive endpoint** has not been previously reconsidered as it is an agreed endpoint that came from the EU review programme (EFSA (2018)). For this application, UPL has submitted 5 documents to HSE aimed at addressing the ED issue (see below for further consideration). Of these 5 documents, 4 are related to the issue of eggshell thickness, one of which discusses eggshell thickness in birds[31], its natural variation and effects on reproduction. One of the key conclusions from this work was that:

> *"The effects upon eggshell thickness measures were slight and approximately equivalent to levels that would not be expected to impact reproductive success in the wild."*

This conclusion is, in part based on literature sources, which it is stated:

> *"…revealed that in wild bird populations, eggshell thinning of 10% or above could lead to serious impacts on embryo survival."*

However, the report outlines that eggshell thinning of up to 6.4% was observed and it is the view of the authors that this is in the:

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[31] Final Report – Asulam Eggshell Thickness in Birds – Natural Variation and Effects of Eggshell Thinning on reproduction. [redacted] 19 February 2018

> *“range where it would not be possible to distinguish any mortality due to thinning from normal background mortality”*

This report has not been assessed by HSE for two key reasons, firstly, it was submitted late in the assessment timeframe and as a result there was insufficient time available to evaluate it, and secondly the supporting literature was not submitted with it, hence it would not be possible to verify the conclusions drawn. EFSA do appear to have considered this work in relation to a potential mode of action for possible thyroid effects, and they concluded the following:

> *A report on eggshell thickness in birds was submitted where information on natural variation on eggshell thickness, comparison with HCD and the influence of a reduction on eggshell thickness on the reproductive performance were analysed ([redacted] 2018). However, it was noted that although data were collected from a literature survey, data on eggshell thickness were mainly extracted from a single paper ([redacted] ~~et al.,~~ 2012). In that paper, eggs for the measurement of eggshell thickness were borrowed from a museum (NHM Class II collection, Section for Ornithology, Tring, UK). In particular, for the eggs used no information was available on the exact provenance (date and location) and hence are it was not possible to understand whether the eggs may be exposed to any stressors, including pesticides. Furthermore, data on some species included that paper were excluded by the analysis in [redacted] (2018) without a proper justification. The report by [redacted] (2018) further considered the expert opinion and the literature review, on the consequence of the reduction on eggshell thickness for the population maintenance, by [redacted] (2004)*
> .

On the basis of the available data, and in particular the fact that it has not be evaluated in full by HSE (due to the lack of supporting documentation and the time provided), it is proposed to keep the endpoint as previously agreed in EFSA (2018).

In **conclusion**, the risk to granivorous birds and in particular, twite, yellowhammer (adults) and linnet is potentially lower than previously considered, however it is not possible to quantify the risk due to the quality of the residue decline data. As regards insectivorous birds, namely, stonechat, tree pipit, whinchat, yellowhammer (nestlings), meadow pipit, nightjar, it is not possible to refine the exposure on the basis of residue decline. A potential way to mitigate the risk would be to amend the application window from 1st July to 12th September to 1st August to 12th September. This risk mitigation measure could be further refined to restricting as proposed if the above insectivorous species are known to nest in or near to the site to be treated.

Discussion regarding the risk to mammals

At the first-tier, the acute risk to small herbivorous, omnivorous and insectivorous mammals was acceptable. The long-term/reproductive risk was also acceptable for omnivorous and insectivorous mammal, the risk to the herbivorous mammal was not acceptable with a TERlt of 0.91.

The **deposition value** could not be refined, however as with the birds, it is likely that the residue decline is more rapid than initial considered. On the basis of the discuss above for the birds, it is not possible to quantitatively refine the **residue decline** (DT50), however it is also noted that due to the size of the initial TERlt, a reduction in DT50 to 1 day would be required; on the basis of the currently available data, the DT50 is likely to be greater than 1 day, hence refinement of this parameter is unlikely to resolve the risk completely. Turning to **ecological refinements**, as indicated above whilst new information has been submitted, it does not aid the refinement of risk and in fact highlights the overlap of the breeding times of hazel dormouse with the application window. Due to the lack of information, it is not possible to refine the risk further

In light of the above, it is proposed to mitigate the risk so that applications are not made if hazel dormice are known to nest in the area to be treated.

The risk from the consumption of contaminated drinking water for both birds and mammals is considered to be acceptable.

Effects on aquatic life

The HSE Environmental Fate and Behaviour evaluator confirmed that as the active substance is yet to be refused or approved, exposure values previously relied upon for the assessment for the 2012 emergency application (HSE Ref.: COP2012/002227) are still considered to be acceptable.

Whilst new spray drift data have been submitted to HSE, it has not been evaluated under this application.

There is a consideration of the risk from ecotoxicologically relevant metabolites below.

Aquatic risk assessment for aerial applications

Whilst spray drift data have been submitted (see Section 2.5) these are not sufficient to change the following exposure estimates, therefore the assessment from previous application is presented below.

As for the birds and mammal assessment above, use has been made of EFSA conclusion (2018). It should be noted that the most recent conclusion had a new endpoint for *Lemna gibba* of 146 µg a.s./L, which is lower than the endpoint considered under the previous conclusion of 270 µg a.s./L (see Appendix 2 of this section for further details as well as EFSA (2010)). The former endpoint has been used in the following assessment. (The Applicant has raised concerns regarding the choice of endpoint, and this is considered further below – see Appendix 2.)

Presented in Table 9 is the risk assessment for aerial applications.

Table 9: Aquatic risk assessment for aerial applications of Asulox considering the endpoints from the 2018 EFSA conclusion of asulam

Group		**Fish acute**	**Fish prolonged**	**Inverteb. acute**	**Inverteb. prolonged**	**Algae**	**Higher-Plant**	**Sed. dwell. prolonged**
Test species		***L.macrochirus***	***O.mykiss***	***D. magna***	***D. magna***	***A. flosaquae***	***L. gibba***	***C. riparius***
Endpoint **(µg/L)**		LC$_{50}$ >91300	NOEC 119100	EC$_{50}$ 57870	EC$_{10}$ 6400	E$_r$C$_{50}$ >660	E$_r$C$_{50}$ 146	NOEC 103100
AF		100	10	100	10	10	10	10
Regulatory Acceptable Concentration (RAC) (µg/L)		>913	1191	578.7	640	>66	14.6	10310
Entry pathway / Buffer zone [m] / season	**PEC $_{gl-sw\ max}$ (µg/L)***	**PEC/RAC (= ETR)**						
5	400.34	0.438487	0.336137	0.69179	0.62553	**6.07**	**27.42**	0.03952
10	307.23	-	-	-	-	**4.66**	**21.04**	-
15	263.16	-	-	-	-	**3.99**	**18.02**	-
20	206.79	-	-	-	-	**3.13**	**14.16**	-
30	137.92	-	-	-	-	**2.09**	**9.45**	-
40	103.47	-	-	-	-	**1.57**	**7.09**	-

50	82.8	-	-	-	-	**1.25**	**5.67**	-
60	69.014	-	-	-	-	**1.05**	**4.73**	-
70	59.165	-	-	-	-	0.90	**4.05**	-
80	51.777	-	-	-	-	-	**3.55**	-
90	46.03	-	-	-	-	-	**3.15**	-
100	41.431	-	-	-	-	-	**2.84**	-
160	25.908	-	-	-	-	-	**1.77**	-
175	23.69	-	-	-	-	-	**1.62**	-
180	23.032	-	-	-	-	-	**1.58**	-
185	22.411	-	-	-	-	-	**1.54**	-
190	21.821	-	-	-	-	-	**1.49**	-
200	20.732	-	-	-	-	-	**1.42**	-
250	16.589	-	-	-	-	-	**1.14**	-

Values in **bold** are above the trigger value of 1
*PEC values from the emergency application at HSE Ref.: w001524857

From the above, it is clear that on the basis of the agreed endpoint of 146 µg a.s./L, that a buffer zone of greater than 250 m is required. For the 2019 consideration, it was noted that risk mitigation options in the form of drift reducing nozzle technology was previously considered for aerial use of ‘Asulox’ to control bracken; an acceptable risk had been identified assuming the toxicity endpoint of 270 µg a.s./L and a 50m aerial buffer zone. The source drift data underpinning this conclusion is not currently available to HSE. It is noted that using the standard spray drift data (as above) and the previous toxicity endpoint of 270 µg a.s./L, an initial buffer zone of 160 m was recommended. Therefore, if the difference in exposure at a 50 m distance versus that at the (acceptable with conventional nozzles) distance of 160m is a reduced exposure by 68.7%, then this may be assumed to be the extent of reduced drift offered by aerial nozzle technology authorised previously.

Applying this knowledge to the modern aquatic risk assessment (see above table 9), the critical regulatory acceptable concentration or RAC considering all available data is 14.6 µg a.s./L. Therefore, a risk mitigation distance creating drift exposure which, when further reduced by 68.7%, would be below this RAC, would be supportable of a low risk to aquatic life, so long as the previously considered low drift nozzles were used for aerial application events. At a 90m distance the PECsw for spray drift from aerial application and conventional nozzle design is 46.03 µg a.s./L. Reduced by 68.7% this would give a drift exposure concentration in surface water of 14.4 µg a.s./L, which is below the modern RAC.

Therefore, it can be concluded that there is a low risk to aquatic life from the aerial application of ‘Asulox’ as proposed, providing that risk mitigation is used. In line with previous assessments, the following risk mitigation is proposed:

> *To protect aquatic organisms, respect an unsprayed horizontal buffer zone distance to surface water bodies of 90 m when spraying from aircraft using low drift nozzles such as RD1000 Pencil Jets or Delavan RD 'Raindrop' type nozzles.*

Aquatic risk assessment for tractor mounted and hand-held applications

In the Fate and Behaviour assessment for HSE Ref.: COP2012/02227, PECsw values have been determined at varying distances for the proposed use of asulam via a vehicle mounted boom sprayer. Spray-drift PECsw values are summarised in Table 10.

Table 10: PECsw values from 1 x 4400 g a.s./ha on grassland/forest

Buffer (m)	% Drift (90th percentile)	PECsw (µg/L)
		Asulam
1	2.77	40.63
5	0.57	8.36

Given the RAC of 14.6 µg a.s./L identified above for the active substance, an acceptable risk to aquatic organisms via spray-drift is demonstrated at 5m. Exposure via drainflow is not considered a relevant exposure route for 'Asulox', given the proposed timing of application.

Therefore, it can be concluded that there is a low risk to aquatic life from the tractor-mounted and hand-held applications of 'Asulox' as proposed, providing that risk mitigation is used. In line with previous assessments, the following risk mitigation is proposed

> For tractor mounted and hand-held applications:
>
> *DO NOT ALLOW DIRECT SPRAY from horizontal boom sprayers to fall within 5 m of the top of the bank of a static or flowing water body, unless a Local Environment Risk Assessment for Pesticides (LERAP) permits a narrower buffer zone, or within 1 m of the top of a ditch which is dry at the time of application. DO NOT ALLOW DIRECT SPRAY from hand-held sprayers to fall within 1 m of the top of the bank of a static or flowing water body. Aim spray away from water.*
>
> *This product qualifies for inclusion within the Local Environment Risk Assessment for Pesticides (LERAP) scheme. Before each spraying operation from a horizontal boom sprayer, either a LERAP must be carried out in accordance with CRD's published guidance or the statutory buffer zone must be maintained. The results of the LERAP must be recorded and kept available for three years.'*

For this submission, the Applicant has submitted some additional information (see Appendix 2 of this section). This has been considered and the resulting discussion is presented in that Appendix. This additional information does not change the above assessment.

According to the original 2012 assessment, exposure via drainflow is not considered a relevant exposure route for 'Asulox', given the proposed timing of application.

Metabolites

According to EFSA (2018) three ecotoxicologically relevant metabolites were considered regarding their potential risk to aquatic like. The metabolites and their associated endpoints are presented below. Whilst the endpoint of 66 µg/l and 100000 µg/l are presented in the list of endpoints in EFSA (2018), the value for *Lemna* of 27 µg/l is less clear; however, it is used in the associated risk assessment presented in EFSA (2018).

Ground based applications

	Endpoint	Endpoint ErC50 µg/L (see LoEP (EFSA (2018))	PEC µg/L*	PEC/RAC**	Acceptable
	Algae	66	3.49	0.5	Yes

Sulfanilic acid	(assumed)				
	Lemna	>100000	3.49	<0.0003	Yes
AP formamide	*Algae* (assumed)	66	1.20	0.2	Yes
	Lemna (assumed)	27	1.20	0.42	Yes
MCAPAP carbamic acid	*Algae* (assumed)	66	1.30	0.2	Yes
	Lemna (assumed)	27	1.30	0.5	Yes

* PECsw values for sulfanilic acid, AP formamide and MCAPAP based upon 5 m aquatic buffer zone and application via conventional boom sprayer with 3* DRT nozzles. See Section 2.5.

** RAC = endpoint/assessment factor of 10 (see EFSA (2013)[32] for details)

Aerial applications

	Endpoint	Endpoint µg/L ErC50 (see LoEP (EFSA (2018))	PEC*	PEC**	PEC/ RAC***	PEC/ RAC****	Acceptable
Sulfanilic acid	*Algae* (assumed)	66	10.8	6.0	1.6	0.9	Yes
	Lemna	>100000	10.8	6.0	<0.001	<0.001	Yes
AP formamide	*Algae* (assumed)	66	3.7	2.06	0.6	0.3	Yes
	Lemna (assumed)	27	3.7	2.06	1.4	0.8	Yes
MCAPAP carbamic acid	*Algae* (assumed)	66	4.03	2.24	0.6	0.3	Yes
	Lemna (assumed)	27	4.03	2.24	1.5	0.8	Yes

* PEC at 50 m

** PEC at 90 m

Overall Conclusion

The risk to aquatic life is considered to be acceptable providing the following risk mitigation measures are used on the product label:

For aerial applications:

To protect aquatic organisms, respect an unsprayed horizontal buffer zone distance to surface water bodies of 90 m when spraying from aircraft using low drift nozzles such as RD1000 Pencil Jets or Delavan RD 'Raindrop' type nozzles.

For tractor mounted and hand-held applications:

DO NOT ALLOW DIRECT SPRAY from horizontal boom sprayers to fall within 5 m of the top of the bank of a static or flowing water body, unless a Local Environment Risk Assessment for Pesticides (LERAP) permits a narrower buffer zone, or within 1 m of the top of a ditch which is dry at the time of application. DO NOT ALLOW DIRECT SPRAY from hand-held sprayers to fall within 1 m of the top of the bank of a static or flowing water body. Aim spray away from water.

This product qualifies for inclusion within the Local Environment Risk Assessment for Pesticides (LERAP) scheme. Before each spraying operation from a horizontal boom sprayer, either a LERAP must be

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[32] EFSA PPR Panel (EFSA Panel on Plant Protection Products and their Residues), 2013. Guidance on tiered risk assessment for plant protection products for aquatic organisms in edge-of-field surface waters. EFSA Journal 2013;11(7):3290, 268 pp. doi:10.2903/j.efsa.2013.329

carried out in accordance with CRD's published guidance or the statutory buffer zone must be maintained. The results of the LERAP must be recorded and kept available for three years.'

Effects on honey bees

According to EFSA (2018), the acute oral and contact toxicity to honey bees us >123.7 and >100 µg a.s./bee respectively.

The maximum proposed application rate for 'Asulox' is for a single application of 4.4 kg a.s./ha.

Based on this application rate and the EFSA conclusion endpoints for asulam, the resulting acute oral and contact hazard quotients are < 35.6 and < 44. Given that both these values are below the regulatory acceptable trigger value of 50, an acceptable risk to bees is indicated for the proposed use in the first-tier risk assessment without the need for any risk mitigation measures.

Overall Conclusion

A low acute risk to honeybees is concluded without the need for risk mitigation.

Effects on other arthropod species other than bees

The first-tier endpoints according to EFSA (2018) for *Typhlodromus pyri* and *Aphidius rhopalosiphi* are LR50 of 7.566 L 'Asulox'/ha and 3.088 L 'Asulox'/ha respectively. An assessment of the in-field and off-field risk to non-target arthropods has been conducted according to ESCORT 2[33] guidance. The maximum proposed application rate for 'Asulox' is 4. 4 kg a.s./ha. Since only a single application is proposed, no multiple application factor is required.

For the off-field assessment the standard correction factor of 10 and vegetation distribution factor of 10 have been used (essentially cancelling each other out). A drift value of 27.3 % for aerial spray at 5 m has been used, in line with the aquatic and non-target plant risk assessments, whilst the standard value of 2.77% has been used

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[33] Candolfi MP, Barrettt KL, Campbell PJ, Forster R, Grandy N, Huet MC, Lewis G, Oomen PA, Schmuck R and Vogt H (2000) Guidance document on regulatory testing and risk assessment procedures for plant protection products with non-target arthropods. From the ESCORT 2 workshop (European standard characteristics of non-target arthropod regulatory testing). SETAC publication. ISBN 1-880611-52-x.

for the tractor-mounted applications. The in-field risk assessment is summarised in Table 11, the off-field risk assessment in Table 12.

Table 11: First tier in-field risk assessment for non-target arthropods

Species	LR50	Maximum application rate	In-field HQ	Trigger value
T. pyri	7.566 L/ha	11 L/ha	1.45	2
A. rhopalosiphi	3.088 L/ha	11 L/ha	**3.56**	2

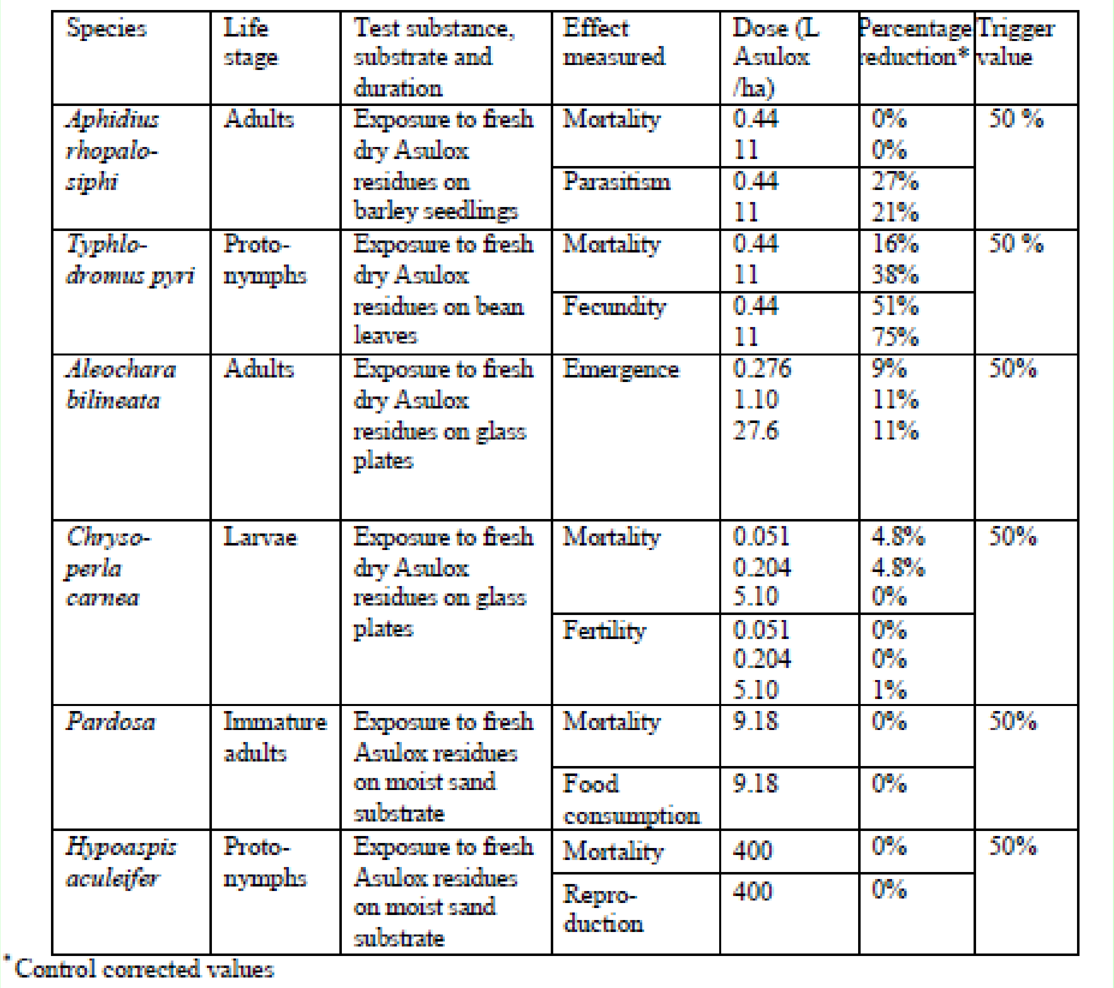
Table 12: First tier off-field risk assessment for non-target arthropods (aerial spray)*

Species	LR50	Maximum application rate	Drift factor	Off-field HQ	Trigger value
Aerial					
T. pyri	7.566 L/ha	11 L/ha	0.273 (5 m)	0.397	2
A. rhopalosiphi	3.088 L/ha	11 L/ha	0.273 (5 m)	0.972	2
Tractor-mounted					
T. pyri	7.566 L/ha	11 L/ha	0.0277 (1 m)	0.04	2
A. rhopalosiphi	3.088 L/ha	11 L/ha	0.0277 (1 m)	0.1	2

The off-field risk to non-target arthropods is resolved for the aerial use at 5 m for both first tier test species and a 1 m the tractor-mounted applications.

An acceptable in-field risk is also indicated for *T. pyri* but not for *A. rhopalosiphi,* i.e. the hazard quotient is above the trigger value. Extended laboratory studies for asulam were also considered as part of the EU assessment (see EFSA (2018)) and are summarised in Table 13.

Table 13: Extended lab toxicity data for non-target arthropods from the EFSA conclusion for asulam (see EFSA (2018) and EFSA (2010))



Species	Life stage	Test substance, substrate and duration	Effect measured	Dose (L Asulox /ha)	Percentage reduction*	Trigger value
Aphidius rhopalo-siphi	Adults	Exposure to fresh dry Asulox residues on barley seedlings	Mortality	0.44 11	0% 0%	50 %
			Parasitism	0.44 11	27% 21%	
Typhlo-dromus pyri	Proto-nymphs	Exposure to fresh dry Asulox residues on bean leaves	Mortality	0.44 11	16% 38%	50 %
			Fecundity	0.44 11	51% 75%	
Aleochara bilineata	Adults	Exposure to fresh dry Asulox residues on glass plates	Emergence	0.276 1.10 27.6	9% 11% 11%	50%
Chryso-perla carnea	Larvae	Exposure to fresh dry Asulox residues on glass plates	Mortality	0.051 0.204 5.10	4.8% 4.8% 0%	50%
			Fertility	0.051 0.204 5.10	0% 0% 1%	
Pardosa	Immature adults	Exposure to fresh Asulox residues on moist sand substrate	Mortality	9.18	0%	50%
			Food consumption	9.18	0%	
Hypoaspis aculeifer	Proto-nymphs	Exposure to fresh Asulox residues on moist sand substrate	Mortality	400	0%	50%
			Repro-duction	400	0%	

* Control corrected values

In the extended lab studies, effects on mortality and reproduction were less than 50 % at 11 L/ha for *A. rhopalosiphi* and *T. Pyri*, at 27.6 L/ha on *Aleochara bilineata* and at 400 L/ha on *Hypoaspis aculeifer*. Given that less than 50 % effects were observed at the maximum application rate, an acceptable in-field risk is indicated for these species. In the studies on *Chyrosoperla carnea* and *Pardosa* spp., effects on mortality/fertility/food consumption were less than 50 % but the maximum rates tested were less than 11 L/ha (5.10 and 9.18 L/ha respectively). It is considered that the results for *Chyrosoperla carnea* and *Pardosa* spp indicate the 50 % effects values for these species are likely to be in excess of 11 L/ha. On balance, it is considered that the data indicate the potential for recovery or recolonisation of in-field populations between seasons as well as an acceptable off-field risk.

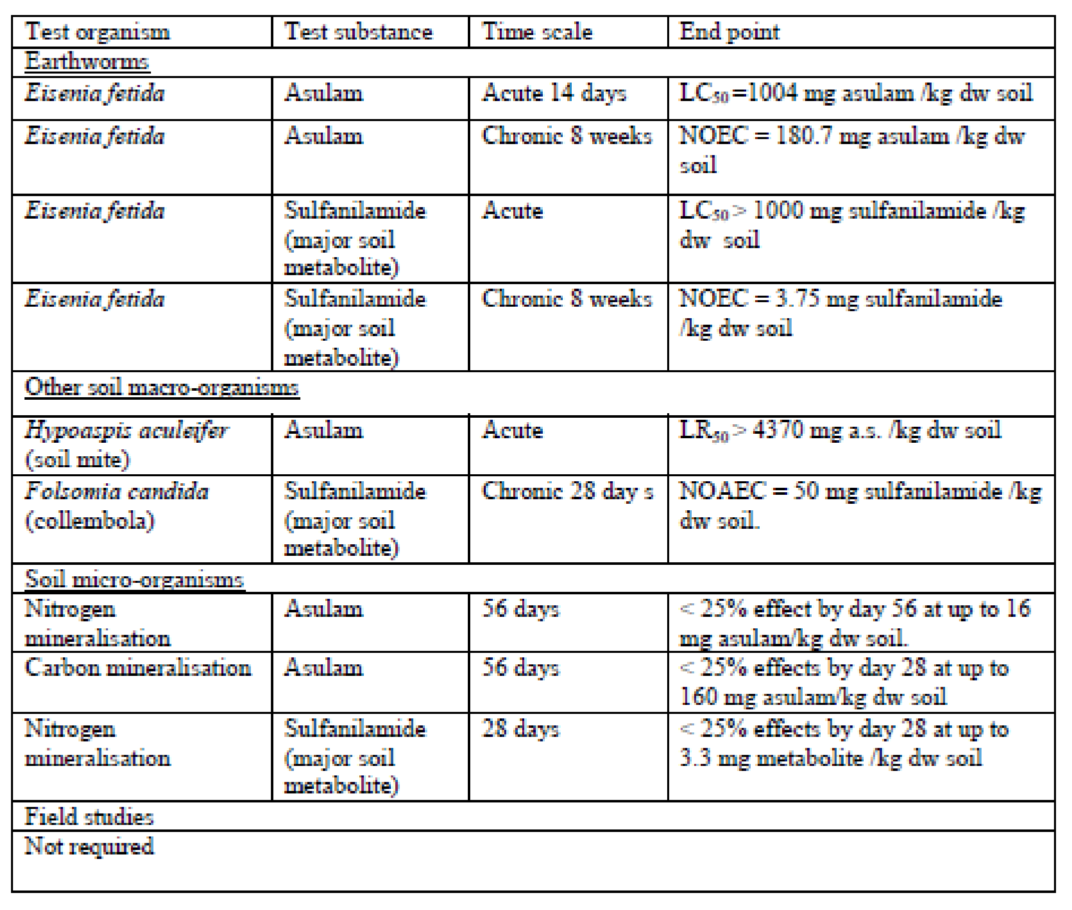
Overall Conclusion

The risk to non-target arthropods is considered to be acceptable for both aerial and tractor-mounted uses.

Effects on soil organisms

Presented below are the agreed list of endpoints from EFSA (2018) for soil organisms.

Table 14: Agreed list of endpoints for soil organisms from EFSA (2018).



Test organism	Test substance	Time scale	End point
Earthworms			
Eisenia fetida	Asulam	Acute 14 days	LC$_{50}$=1004 mg asulam /kg dw soil
Eisenia fetida	Asulam	Chronic 8 weeks	NOEC = 180.7 mg asulam /kg dw soil
Eisenia fetida	Sulfanilamide (major soil metabolite)	Acute	LC$_{50}$ > 1000 mg sulfanilamide /kg dw soil
Eisenia fetida	Sulfanilamide (major soil metabolite)	Chronic 8 weeks	NOEC = 3.75 mg sulfanilamide /kg dw soil
Other soil macro-organisms			
Hypoaspis aculeifer (soil mite)	Asulam	Acute	LR$_{50}$ > 4370 mg a.s. /kg dw soil
Folsomia candida (collembola)	Sulfanilamide (major soil metabolite)	Chronic 28 day s	NOAEC = 50 mg sulfanilamide /kg dw soil.
Soil micro-organisms			
Nitrogen mineralisation	Asulam	56 days	< 25% effect by day 56 at up to 16 mg asulam/kg dw soil.
Carbon mineralisation	Asulam	56 days	< 25% effects by day 28 at up to 160 mg asulam/kg dw soil
Nitrogen mineralisation	Sulfanilamide (major soil metabolite)	28 days	< 25% effects by day 28 at up to 3.3 mg metabolite /kg dw soil
Field studies			
Not required			

In the Fate and Behaviour assessment for HSE Ref.: COP2012/02227, the maximum PECsoil of 0.587 mg a.s./kg soil dw was determined for the active substance. This PECsoil value covers both the proposed uses via aerial and tractor-mounted application methods. These have been compared to the endpoints from the EFSA conclusion above and the resulting TERs are presented in Table 14. (It should be noted that the LogPow is less than 2, hence the endpoints do not need adjusting.)

Table 14: Risk to soil organisms from proposed use of asulam

Organism	Test substance	Endpoint	Value (mg/kg soil)	PECsoil (mg/kg soil)	TER	Trigger value
Eisenia fetida	Asulam	Chronic NOEC	180.7	0.587	308	5
Hypoaspis aculeifer	Asulam	Chronic NOEC	4370	0.587	7445	5

The resulting TER values are greater than the relevant trigger values, indicating low risks to earthworms and other soil macro-organisms from the proposed use of ‘Asulox’. Given that < 25 % effects on nitrogen transformation were observed in the soil micro-organism studies at 16 mg a.s./kg soil, a low risk to soil micro-organisms can also be concluded.

Additional information has been submitted by the Applicant and this is presented in Appendix 3 of this section. This does not add any additional information to the above regulatory risk assessment.

Metabolites

In EFSA (2018) there was a consideration of the risk to soil organisms from the soil metabolite sulfanilamide, as part of that assessment it was considered not to be ecotoxicologically relevant, hence no further assessment is required.

Overall conclusion

The risk to soil macro-invertebrates and soil nitrification is considered to be acceptable.

Effects on non-target terrestrial plants

According to EFSA (2018), the first-tier endpoints for non-target plant risk assessment is an ER50 of 11 g a.s./ha for effects on vegetative vigour in cucumber. A refined endpoint from a probabilistic risk assessment for a vegetative vigour HC5 value of 13.82 g asulam/ha is also presented in EFSA (2018).

For the current application two reports[34], along with summary tables and associated information were submitted. Whilst of interest in terms of the spectrum of effects of a range of compounds, the following points should be noted:

Lack of clarity as to the application rates used, i.e., they are quoted as Asulox 11 l/ha and Squire Ultra 60 gm/ha, it is assumed that these relate to the formulation, however in the preceding paragraph there is reference to a “concentration” of 120 gm/ha which it is stated to be 2.7 times higher than the maximum approved strength”. The authorised rate of Squire Ultra in 60 g product/ha. The reference to “strength” is unclear and it is assumed to refer to the rate.

It is noted that the work is ongoing so nothing conclusive can be drawn from this work, however it does indicate a wider spectrum of activity for amidosulfuron than for asulam on non-target plant species. It would be useful to have more details regarding the sites treated and their comparability in terms of diversity of non-target plant species (e.g., range of species, age/size of species, location) to try to determine if the effects seen are purely down to the difference in compounds used or sites selected. It will also be useful to see if any effects on non-target plant species are long lasting in terms of what species replace bracken in subsequent years

It should also be noted that all this work is related to effects in the treated area and does not consider the risk off-field.

Risk assessment for non-target terrestrial plants from aerial application

Whilst spray drift data have been submitted (see Section 2.5) these are not sufficient to change the following exposure estimates, therefore the assessment from previous application is presented below.

In Table 15 the higher tier endpoint of 13.82 g asulam/ha has been compared to exposure values, based on a single application of 4.4 kg a.s./ha with aerial drift values as used in the aquatic spray-drift risk assessment, to derive TER values at different distances.

Table 15: Risk to non-target plants via spray-drift from 1 x 4.4 kg asulam/ha for aerial application

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[34] BCG Briefing No.14 The Bracken Control Group 1 rev: 13th December 2021 NATIONAL BRACKEN CHEMICAL CONTROL TRIALS Asulox (Asulam) versus Squire Ultra (Amidosulfuron) Investigations Interim Findings Update December 2021 by P[redacted] [redacted] [redacted] and National Bracken Chemical Control Trials 2012 – 2020 Final Summary Report [redacted] [redacted] [redacted]

Distance (m)	% Drift (90th percentile)	Drift rate (g a.s./ha)	Toxicity (g a.s./ha)	TER
5	27.30	1201.20	13.82	**0.01**
10	20.95	921.80		**0.01**
15	17.94	789.36		**0.02**
20	14.10	620.40		**0.02**
30	9.40	413.60		**0.03**
40	7.06	310.64		**0.04**
50	5.65	248.60		**0.06**
60	4.71	207.24		**0.07**
70	4.03	177.32		**0.08**
80	3.53	155.32		**0.09**
90	3.14	138.16		**0.10**
100	2.82	124.08		**0.11**
175	1.62	71.28		**0.19**
180	1.57	69.08		**0.20**
185	1.53	67.32		**0.21**
190	1.49	65.56		**0.21**
200	1.41	62.04		**0.22**
250	1.13	49.72		**0.28**

The resulting TER values are below the trigger value of 5 even at a maximum of 250 m distance. Therefore, an acceptable risk has not been demonstrated at any distance. If the risk mitigation measures proposed to protect the aquatic environment are considered, then the deposition at 90 m is 15.6 g a.s./ha (i.e., 49.72 g a.s./ha reduced by 68.7%), this is still greater than the higher tier endpoint above. No additional data are available. In order to be protective (noting that the risk is not fully addressed), it is proposed that a 90 m buffer, in line with the one required to protect aquatic life, is implemented.

For aerial applications:

To protect non-target terrestrial plants, respect an unsprayed horizontal buffer zone distance to non-target environment of 90 m when spraying from aircraft using low drift nozzles such as RD1000 Pencil Jets or Delavan RD 'Raindrop' type nozzles.

Risk assessment for non-target terrestrial plants from tractor-mounted application

In Table 16 the higher tier endpoint of 13.82 g a.s./ha has been compared to exposure values, based on a single application of 4400 g a.s./ha with standard Ganzelmeier/Rautmann drift values for tractor-mounted applications, to derive TER values at different distances. This assessment indicates that a 50 m buffer zone is required to mitigate the risk; this distance is in excess of that permitted for tractor-mounted application, therefore it is proposed to implement drift reduction technology for this Article 53 application. In order to demonstrate an acceptable risk a 5 m buffer zone with 75% drift reduction technology is required (i.e., 25.08 g a.s./ha * 25% = 6.27 g a.s./ha). In light of this, the following risk mitigation phrase is proposed:

For tractor-mounted applications:

To protect non-target plants respect an untreated buffer zone of 5 metres to non-crop land. HORIZONTAL BOOM SPRAYERS MUST BE FITTED WITH THREE STAR DRIFT REDUCTION TECHNOLOGY. Low drift spraying equipment must be operated according to the specific conditions *stated in the official three-star rating for that equipment as published on HSE Chemicals Regulation Directorate's website.*

Table 16: Risk to non-target plants via spray-drift from 1 x 4.4 kg asulam/ha via tractor mounted applications

Distance (m)	% Drift (90th percentile)	Drift rate (g a.s./ha	Toxicity (g a.s./ha)	TER
1	2.77	121.88	13.82	**0.1**
5	0.57	25.08		**0.6**
10	0.29	12.76		**1.1**
15	0.2	8.8		**1.6**
20	0.15	6.6		**2.1**
30	0.1	4.4		**3.1**
40	0.07	3.08		**4.5**
50	0.06	2.64		5.2

Risk mitigation

Given the high risks identified for the aerial and tractor mounted boom sprayer applications, it is considered that risk mitigation is required to manage the risk to non-target terrestrial plants. The following non-standard risk mitigation phrases are proposed:

For aerial applications:

To protect non-target terrestrial plants, respect an unsprayed horizontal buffer zone distance to non-target environment of 90 m when spraying from aircraft using low drift nozzles such as RD1000 Pencil Jets or Delavan RD 'Raindrop' type nozzles.

For tractor-mounted applications:

To protect non-target plants respect an untreated buffer zone of 5 metres to non-target environment. HORIZONTAL BOOM SPRAYERS MUST BE FITTED WITH THREE STAR DRIFT REDUCTION TECHNOLOGY. Low drift spraying equipment must be operated according to the specific conditions stated in the official three-star rating for that equipment as published on HSE Chemicals Regulation Directorate's website.

Overall Conclusion

The risk to non-target terrestrial plants has been determined to be high and a large buffer zone is required. The UK does not currently mitigate the risk to non-target terrestrial plants via the use of buffer zones and resorts to advisory labelling.

Assessment of whether asulam is an endocrine disruptor

When the UK was RMS for asulam, there was no consideration of whether asulam was an endocrine disrupting substance, this was due to the lack of agreed criteria and associated guidance. Since that original assessment, guidance was noted and as a result the EU has considered this issue in detail.

According to EFSA (2021)[35]:

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[35] EFSA (European Food Safety Authority), Alvarez F, Arena M, Auteri D, Borroto J, Brancato A, Carrasco Cabrera L, Castoldi AF, Chiusolo A, Colagiorgi A, Colas M, Crivellente F, De Lentdecker C, Egsmose M, Fait G, Gouliarmou V, Ferilli F, Greco L, Ippolito A, Istace F, Jarrah S, Kardassi D, Kienzler A, Leuschner R, Lava R, Linguadoca A, Lythgo C, Magrans O, Mangas I, Miron I, Molnar T, Padovani L,

> *“Asulam-sodium is considered to meet the criteria for endocrine disruption for humans for the thyroid (T) modality according to point 3.6.5 of Annex II of Regulation No 1107/2009, as amended by Commission Regulation (EU) 2018/605, leading to a critical area of concern. A conclusion on the endocrine-disrupting properties of asulam-sodium for non-target organisms according to point 3.8.2 of Annex II to Regulation (EC) No 1107/2009, as amended by Commission Regulation (EU) 2018/605 could not be made based on the information available.”*

It is further stated that the:

> *The T-mediated adverse effects observed in mammals are not considered to be relevant for wild mammal populations and terefore the outcome of the assessment reported … for humans does not apply to wild mammals as non-target organisms regarding the T-modality.*
>
> *Regarding EAS modalities, the available dataset was not considered as sufficiently investigated both for wild mammals, in line with the conclusions for humans, and non-mammalian species.*

Overall, it was concluded that from an ecotoxicological perspective:

> *“…further data would be needed to draw a conclusion on the ED properties of asulam on non-target organisms for both T- and EAS-modalities, i.e. in the first instance a test according to OECD Test Guideline 231 (Amphibian Metamorphosis Assay) and a test according to OECD TG 229 (Fish Short-Term Reproduction Assay). Moreover, information should be generated to further substantiate the postulated non-EATS MoA, i.e. to elucidate the potential endocrine activity.*
>
> *Based on the above considerations, the assessment of the ED properties of asulam for non-target organisms according to point 3.8.2 of Annex II to Regulation (EC) No 1107/2009, as amended by Commission Regulation (EU) 2018/605 could not be concluded, leading to an issue not finalised.”*

HSE is in agreement with the following statement in EFSA (2021):

> *However, further data were not requested taking into account that asulam was considered to meet the criteria for endocrine disruption for humans for the T-modality according to point 3.6.5 of Annex II of Regulation No 1107/2009, as amended by Commission Regulation (EU) 2018/605.*

EFSA (2021), also highlighted the issue of eggshell thickness, and stated that:

> *In the suitable reproductive study with quail, this effect[36] was coupled with an increase in the number of cracked eggs and a decrease in hatchling/maximum set[37] and 14-day-old survivors/maximum set[38]. A non-EATS MoA was postulated (cyclooxygenase inhibition leading to reproductive failure) for the reduction in birds’ eggs shell thickness. However, for the postulated MoA, data were only available in relation to a later key event (KE) and the adverse outcome. Therefore, the available information was insufficient to support the postulated MoA.*

HSE is in agreement, that there is currently insufficient evidence on which to draw a conclusion regarding whether asulam is an endocrine disrupting substance for non-target organisms.

The Applicant has submitted further data on:

- An Evaluation of the Impact of Asulam Sodium Salt on Eggshell Thickness from Two Avian Reproduction Studies Performed by EAG, Inc. (formerly Wildlife International)
- Comparison of eggshell thickness for the treatment groups to historical negative controls for both the northern Bobwhite -quail and the mallard duck
- Asulam Eggshell Thickness in Birds – Natural Variation and Effects of Eggshell Thinning on Reproduction

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Parra Morte JM, Pedersen R, Reich H, Santos M, Sharp R, Szentes C, Terron A, Tiramani M, Vagenende B and Villamar-Bouza L, 2021. Updated peer review of the pesticide risk assessment of the active substance asulam (variant evaluated asulam-sodium). EFSA Journal 2021;19 (11):6921, 31 pp. https://doi.org/10.2903/j.efsa.2021.6921

[36] a reduction in eggshell thickness

[37] The number of hatchlings per female divided by the largest number of eggs set from any female.

[38] The number of 14-day-old survivors per pen divided by the largest number of eggs set.

It is unclear whether these documents were considered by the RMS, EFSA and MS. These documents have not been assessed for this application as it is considered that on their own, they will not provide sufficient information to address the issue of whether asulam is an endocrine disrupting compound.

Additional issues considered as part of previous assessment under COP2020/06464.

Amidosulfuron significantly worse for certain non-targets?

The Applicant has submitted a brief paper outlining potential differences between amidosulfuron and asulam. This is presented in full in Appendices 3 and 4 of this section. Due to the lack of detail regarding what was done, as well as the brevity of the document, it is not possible to draw any conclusion from this work.

HSE has further considered this point by considering the risk from both amidosulfuron and asulam. This has been done by comparing the outcomes from the above risk assessment with endpoints for amidosulfuron. Amidosulfuron is currently undergoing renewal through the EU process and whilst there is an assessment done by Finland and Croatia, there is not, as yet, an agreed list of endpoints. In light of this, data from the previous assessment will be used (see EFSA (2007)[39]) as well as information from the UK assessment of ‘Squire Ultra’ (see HSE Ref.: W001578890).

From the comparison presented below, it should be noted that this is not a comprehensive comparative risk assessment. It should further be noted that one is using endpoints agreed in 2018, whilst for amidosulfuron, this is reliant on endpoints agreed in 2007. From the comparison below, there are potentially clear differences in the level of concern raised in that amidosulfuron potentially poses a lower risk in several key areas, it should be noted that issues such as drainflow have not been assessed for the use on bracken and it is unclear without a detailed consideration whether this would be acceptable. Furthermore, there was no consideration of aerial applications for amidosulfuron either in EFSA (2007) or the associated products.

Area	Amidosulfuron	Asulam
Birds	Low acute and reproductive/long-term risk to birds.	Low acute risk. Unacceptable reproductive/long-term risk to birds.
Mammals	Low acute and reproductive/long-term risk to mammals.	Low acute risk. Unacceptable reproductive/long-term risk to mammals
Aquatic life	An acceptable risk from tractor-mounted applications without the need for risk mitigation. Higher tier drainflow risk assessment was required for the use on grassland in order to demonstrate an acceptable risk. Aerial applications were not considered.	Acceptable risk providing that a 5 m and 90 m with drift reduction technology buffer zones are used for tractor-mounted and aerial applications respectively.
Bees	Low risk	Low risk
Non-target arthropods	Low risk	Low risk
Soil organisms	Low risk	Low risk
Non-target terrestrial plants	According to EFSA (2007) the endpoint is an ErC50 of 67 g a.s./ha for Glycine max, the exposure assuming an application rate of 45 g a.s./ha	High risk, 50 m and >250 m buffer zone required for tractor and aerial applications respectively. Risk mitigated via a label phrase.

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[39] EFSA (2007) EFSA Scientific Report (2007) 116, 1-86, Conclusion on the peer review of amidosulfuron

	and spray drift 2.77% is 1.247 g a.s./ha at 1 m, this results in a TER of 53.7, against a trigger value of 5. This indicates a low risk without the need for risk mitigation. However, further data were presented for the product that indicated that a 5 m buffer zone was required for tractor-mounted applications. The risk is mitigated via a label phrase.
Can the buffer zone be revised down?	Please see aquatic risk assessment above as well as consideration of argument from Applicant in Appendix 2 of this section.
Application concentration of 1:4 was acceptable for hand-held?	The above risk assessment has been conducted on an kg of a.s./ha basis and not on a concentration basis, therefore the proposal will not impact the outcome of the ecotoxicological risk assessment.

Evaluation, Summary and Conclusion by The Health and Safety Executive (Chemicals Regulation Division).

Appendix 1 of Ecotoxicology assessment

Presented below is a statement from UPL [in blue] regarding the long-term risk assessment for birds and mammals. This statement is presented in full with HSE comments at the end.

Asulam

Status of the long-term risk assessment for birds and mammals

March 2020

BACKGROUND

Under COP 2019/01678, The Bracken Control Group applied for emergency authorisation of the UPL Europe Ltd product ASULOX (asulam 400 g/l, SL) in accordance with Article 53 Regulation (EC) No 1107/2009. The Chemicals Regulation Division (CRD) have confirmed their intention to only authorise aerial application of the product as a result of submission COP 2019/01678.

The Bracken Control Group now intend to make a follow up submission to CRD requesting authorisation for ground-based application of ASULOX. While long-term risks to birds and mammals from ground-based application of asulam lie within the risk envelope established by aerial application, noting the outcomes of CRD’s previous evaluation under COP 2019/01678, The Bracken Control Group have asked UPL to provide a statement on the status of the bird and mammal risk assessment for asulam for inclusion with the new submission.

In the sections below an overview of the status of the long-term risk assessment for birds and mammals for asulam is presented along with plans and possibilities to address this critical assessment for future submissions for product authorisation in accordance with Article 33 of Regulation (EC) No 1107/2009.

STATUS OF BIRD AND MAMMAL LONG TERM RISK ASSESSMENT

The information on asulam bird and mammal refinements currently available and in progress can be divided into three categories:

1) Endpoint interpretation from all bird reproductions studies:

   a) Taking into account historical control data: in the 2017 version of the Draft Assessment Report (DAR) for asulam, the applicant was advised to provide historical control data to allow a better interpretation of the endpoint, consequently UPL gathered this data.
   b) Taking into account the eggshell thinning effect: background: the endpoint (NOAEL) of all asulam bird reproduction studies is related to an eggshell thinning effect. This effect is not a reproductive effect as such (it is even given as example in the EFSA guidance1 as an effect that can be 'not biologically relevant'). However, the percentage eggshell thinning from which there is an actual effect on reproduction (e.g. cracked eggs) is a point of discussion. Following the advice in the DAR of 2017, UPL generated data on eggshell thinning/thickness in laboratory and wildlife conditions to identify from which percentage eggshell thinning an effect on reproduction will be caused. Literature data on effects of eggshell thinning for several bird species in laboratory and wildlife conditions demonstrate acceptable/no adverse effects on reproduction up to 10 % eggshell thinning.
   c) The conclusion that can be drawn from the above-mentioned information is that for asulam the bird reproduction NOAEC is 500 ppm corresponding to a NOAEL of 38.1 mg asulam/kg bw/day, compared to the bird reproduction NOAEC of 100 ppm corresponding to a NOAEL of 19 mg asulam/kg bw/day in the EFSA Conclusion.
2) The risk assessments for the uses in the Annex 1 inclusion application, specifically that at least one of the three uses in this application is safe in terms of the bird and mammal long term risk assessment.
3) The future refinements that can be introduced to the bird and mammal long term risk assessment, for any Art. 33 applications: the use of specific DT50 values for the bird and mammal food items (plants, seeds and arthropods).

For this Art. 53 application in UK only points 1 and 3 play a role since point 2 relates to uses in spinach and flower bulbs at 2400 g asulam/ha whereas for the UK bracken control the application rate is 4400 g asulam/ha.

The information described above in point 1, in the form of expert opinions based on available data or interim results, was provided to the Rapporteur Member State (RMS) during the EFSA peer review for asulam but was not transferred to EFSA and therefore not considered in the current EFSA conclusion and asulam DAR.

To support our conclusions on the reproductive risk to birds outlined in point 1, we wish to highlight that the Netherlands have accepted our arguments on the endpoint interpretation and our risk assessment for preemergence use in spinach (which corrects the assessment incorrectly presented in the EFSA conclusion) and use in flower bulbs. Based on these assessments and inclusion of the revised endpoint, Art 53 authorisation has been granted for Asulam 400 SL in the Netherlands in 2019 and also this year. Given that the Netherlands are regarded as a Member State that apply a very high level of scrutiny to refinement of bird and mammal risk assessments, UPL believes the acceptance of our arguments and assessments in the Netherlands emphasizes that the data and arguments available but not included in the EFSA conclusion or DAR for asulam are very strong.

To date, all refined bird risk assessments for asulam used at EU Commission level to support the approval process for the active substance, and also at Member State level to support Art. 53 submissions, are based on the default DT50 value of 10 days for all food items. UPL has been generating an extensive data package to establish specific DT50 values on food items for birds and mammals (plants= monocots and dicots/seeds/arthropods). The outcome of these studies is that in most food items this specific DT50 value is less than two days (sometimes even less than one day). Therefore, even further refinements to the bird and mammal risk assessment will be possible in case of a later submissions at Member State level. This is crucial for the long-term bird and mammal risk assessments in UK for bracken control. Presently, not all these studies are available in the form of final reports but UPL Europe hope to have these available by the time an ASULOX derogation application is submitted for the 2021 season of use.

HSE Comment

As regard biological relevance, EFSA (2009) stated the following should be considered:

- Because of high variability in inter-pair performance, the avian reproduction test is not a statistically robust test. The likelihood of false positives typically is not high.

- Interspecies differences mean that a mild effect in one of the two test species may be much more pronounced in a wild exposed species. Knowledge that a mechanism of toxicity exists should not be dismissed without consideration of this possible variation in sensitivity. An example of this variation is DDE-induced eggshell thinning, which is known to vary across bird orders by orders of magnitude (see Cooke (1973)[40] and Blus (2003) for reviews).

- An effect may be higher in the field than in the laboratory. Again, with eggshell thickness, a shortage of readily available calcium in the wild would exacerbate toxic effects on eggshell thickness.

From the above, it is clear that EFSA (2009) does not state that eggshell thinning is not biologically relevant. The endpoint used in the current risk assessment was the one agreed during the EU peer review process, the additional historical control data referenced by the Applicant has not been assessed by the UK, noting that it is stated to be “interim”. To HSE’s knowledge no further work has been submitted and/or evaluated to address these points[41]. It is therefore, not considered appropriate to incorporate it into this emergency application. As regards the reference to the Dutch authority, this has not been checked.

Evaluation, Summary and Conclusion by The Health and Safety Executive (Chemicals Regulation Division).

Appendix 2 of the ecotoxicology assessment

Presented below is a statement from UPL [in blue] regarding the selection of the aquatic endpoint. This statement is presented in full with HSE comments at the end.

ASULOX
UK authorisation in accordance with Article 53 of Regulation (EC) No 1107/2009
Statement supporting revision of proposed aquatic buffer zone
March 2020

BACKGROUND

Under COP 2019/01678, The Bracken Control Group (BCG) applied for emergency authorisation of the UPL Europe Ltd product ASULOX (asulam 400 g/l, SL) in accordance with Article 53 of Regulation (EC) No 1107/2009. The Chemicals Regulation Division (CRD) have confirmed their intention to apply the following mitigation measure to the product for the protection of aquatic:

TO PROTECT AQUATIC ORGANISMS, respect an unsprayed horizontal buffer zone distance to surface water bodies of 90 m when spraying from helicopters using low drift nozzles such RD1000 Pencil Jets or Delavan RD 'Raindrop' type nozzles.

The proposed buffer of 90 m is less favourable than for the previous ASULOX authorisations under Article 53 in the UK which had a 50 m aquatic buffer required. Therefore, the BCG have asked UPL Europe Ltd to consider whether there are any available data to help reduce this buffer zone. In this document, consideration is given to the choice of aquatic endpoint used for the evaluation of ASULOX and a

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[40] Cooke, A.S., 1973. Shell thinning in avian eggs by environmental pollutants. Environmental Pollution, 4, 85-152.

[41] The DAR stated the following as regards what could be done to address this issue:

- Further, focused analysis of the historical control data for laboratory testing of each species. This should consider parallel control results from a ±2 year period, and investigate in more detail the ‘overlap’ of effects seen in the lowest dose groups versus this historical control range.
- Further investigation into available literature could be made to better link egg shell thickness to subsequent ‘secondary’ toxic reproductive effects (i.e. strength indices, cracking, embryo failure). In particular a closer relevance to the tested species and relevance of thinning to wild populations would offer the greater confidence that the effects seen at 500 ppm in each study were not ecologically relevant.

justification is presented for supporting use of an alternative endpoint based on the conservative nature of the endpoint used by CRD under COP 2019/01678.

SUMMARY

CRD have provided a copy of the ecotoxicology evaluation conducted under COP 2019/01678 to UPL (refer to Barry Neill's email dated 10 March 2020). From this assessment, it is clear aquatic macrophytes drive the aquatic risk assessment for the ASULOX. The resulting 90 m buffer zone for aerial application of ASULOX is related to use of an ErC50 (14 d) of 146 µg asulam/L as a new endpoint, whereas previously an ErC50 (14 d) of 270 µg asulam/L was used resulting in a buffer zone of 50 m.

UPL proposes that both the previous and new endpoints are very conservative and a reduction in the buffer zone can be supported. Full details of the conservatism built into the endpoints is detailed in the section below; however, for ease of reference, the conclusions that can be drawn from the available aquatic macrophyte studies are discussed below:

- The [redacted] 1992 *Lemna gibba* study from which the new endpoint is derived has serious shortcomings in terms of endpoint determination considering the EU recommended guideline for *Lemna* studies OECD 221:
    - A different guideline was used, the study duration was 14 days instead of 7 days.
    - Due to strong degradation of the test item (probably caused by the acidic pH) the mean measured value was determined but this was very inaccurate as test item concentrations were only measured on day 0 and day 14.
    - Estimated mean measured ErC50 values show decrease of the endpoint over time: on top of the inaccuracy of the calculations the 14-day endpoint ErC50 of 146 µg asulam/L is not relevant.
- The [redacted] 2007 *Lemna* study should be considered the representative study as it is conducted according to the recommended EU guideline (OECD 221) and has the required accuracy in endpoint determination especially considering the stability of the test item. This study shows much less sensitivity than the [redacted] 1992 study with an ErC50 (7d) endpoint of 845 µg asulam/L instead of the ErC50 (14 d) of 146 µg asulam/L according to [redacted] 1992.
- The study on another aquatic macrophyte species, *Myriophyllum spicatum*: [redacted] (2014), shows an endpoint that is even less sensitive than the OECD 221 *Lemna gibba* study: ErC50 (14d) > 2560 µg asulam/L.

Considering the above-mentioned arguments, it is very clear that the previously used *Lemna* endpoint of ErC50 (14d) of 270 µg asulam/L can already be considered overconservative. The actual ErC50 for *Lemna* species will be around of 845 µg asulam/L and, taking into account *Lemna* and rooted macrophyte species, even higher. Given the conservative nature of the previously used ErC50 (14d) of 270 µg asulam/L it is proposed that the previously authorised 50 m buffer for aerial application is sufficiently protective and can be supported for the authorisation of ASULOX in 2020 in accordance with Article 53 of Regulation (EC) No 1107/2009.

DISCUSSION OF AVAILABLE AQUATIC

For aquatic risk assessments in EU the ErC50 endpoint needs to be used. Under COP 2019/01678, CRD have used an ErC50 (14d) of 146 µg asulam/L which agrees with the EFSA peer review for asulam from (EFSA Journal 2018;16(4):5251, March 2018).

Both the new endpoint (ErC50 (14d) of 146 µg asulam/L) and the previous endpoint (ErC50 (14d) of 270 µg asulam/L) are derived from the same study: Toxicity to the duckweed (*Lemna gibba*) [redacted] (1992) – see study in **red** frame below. This old study was not done according to the current guideline in

EU for testing *Lemna gibba*: OECD 221, this is a 7-day study. The 1992 Hobert study was done in accordance with USEPA 122-2 &123- 2 (1982) and had a study duration of 14 days. The previous endpoint (ErC50 (14d) 270 µg asulam/L) was based on the nominal concentration value and the new endpoint (ErC50 (14d) of 146 µg asulam/L) is based on the mean measured concentration value. At study start, the mean analysed concentrations were 99 % of nominal and at study end the mean analysed concentrations were 15 % of nominal. On this basis, use of the mean measured value can be considered justified but it needs to be stressed that the mean measured calculation is based on serious inaccuracies: a concentration determination was only done at study start and study end, giving only two determinations over a time span of 14 days. In addition, given that according to the correct EU guideline the study should be of 7 days duration rather than 14 days, the fact that only two measurements were done creates an extra element of inaccuracy in the endpoint setting in the EU risk assessment since this should be based on the concentration left after 7 days not 14 days. For asulam sodium hazard classification purposes, the following 'mean measured' endpoints were calculated:

- 6 days: ErC50: 0.205 mg asulam sodium /L= 0.187 mg asulam/L
- 9 days: ErC50: 0.186 mg asulam sodium /L= 0.169 mg asulam/L
- 14 days: ErC50: 0.160 mg asulam sodium/L=0.146 mg asulam/L

The 6 days estimate is the closest to the guideline 7 days but again the uncertainty on the correctness of this calculation remains due to the limited concentration measurements. Further adding to the uncertainty and inaccuracy in the calculation of mean measured concentrations, it is noted that in the Asulam CLH report that the two lowest test concentrations were below the LOD and an estimate was used to calculated mean measured values. Overall, from the estimated mean measured values the endpoint decreases over time and the 14-day endpoint is therefore not relevant. In addition to the [redacted] (1992) study mentioned above, there is also a recent study on *Lemna gibba* (2007) that was done in accordance with OECD 221: 'Toxicity of Asulam 400g/L SL to the Aquatic Plant *Lemna gibba* in a Static Growth Inhibition Test' [redacted] (2007) - see study in **blue** frame below. In this study hardly any degradation of the test item was observed: at study start the mean analysed concentrations were 97 % of nominal and at study end the mean analysed concentrations were 90 % of nominal. The difference in degradation of the test item when the Hobert 1992 study is compared with the [redacted] 2007 study is probably related to the test medium used in the studies: Hobert 1992 uses M-type Hoagland's medium which is acidic (pH ranged from 5.1-5.2 at test initiation, increasing to 6.0-6.5 at test termination) and V[redacted] 2007 uses 20X AAP-Growth Medium which has a pH of ca. 7.5.

The [redacted] 2007 study gives a very different endpoint from [redacted]t 1992: ErC50 of 845 µg Asulam/L. **Considering the guidance used, the correct study duration and in particular the absence of inaccuracies in the endpoint determination this study should be the leading study.**

Although another aquatic macrophyte, the study with *Myriophyllum spicatum*: [redacted] (2014) 'Toxicity of Asulam 400 g/L SL to the Aquatic Plant *Myriophyllum spicatum* in a Static Growth Inhibition Test with a Prior Rooting Phase' also needs to be mentioned - see study in **green** frame below. This study was done following Draft OECD Guideline for a Proposed Test Method for the Rooted Aquatic Macrophyte which is also a 14-day study. The test medium for this study had pH values at test start: 7.8 – 8.0, on day 7: 8.8 – 9.3, at the end of the test: 8.6 – 9.8. At the start of the test 104% of the nominal test concentration was found in the analysed water phase (average of all test concentrations). After 14 days test duration, 80% of the nominal value was determined (average of all test concentrations). During the test the plants were exposed to a mean of 92% of nominal. Therefore, all reported results refer to nominal concentrations. The ErC50 endpoint of this study is >2560 µg asulam/L. Although this is a different species this ErC50 endpoint clearly shows much less sensitivity than the endpoint of the [redacted] 1992 study.

CONCLUSION

The following conclusions

- The [redacted] 1992 *Lemna gibba* study from which the new endpoint is derived has serious shortcomings in terms of endpoint determination considering the EU recommended guideline for *Lemna* studies OECD 221:
    - A different guideline was used, the study duration was 14 days instead of 7 days.
    - Due to degradation of the test item (probably caused by the acidic pH) the mean measured value was determined but this was very inaccurate as test item concentrations were only measured on day 0 and day 14.
    - Estimated mean measured ErC50 values show decrease of the endpoint over time: on top of the inaccuracy of the calculations the 14-day endpoint ErC50 of 146 µg asulam/L is not relevant.

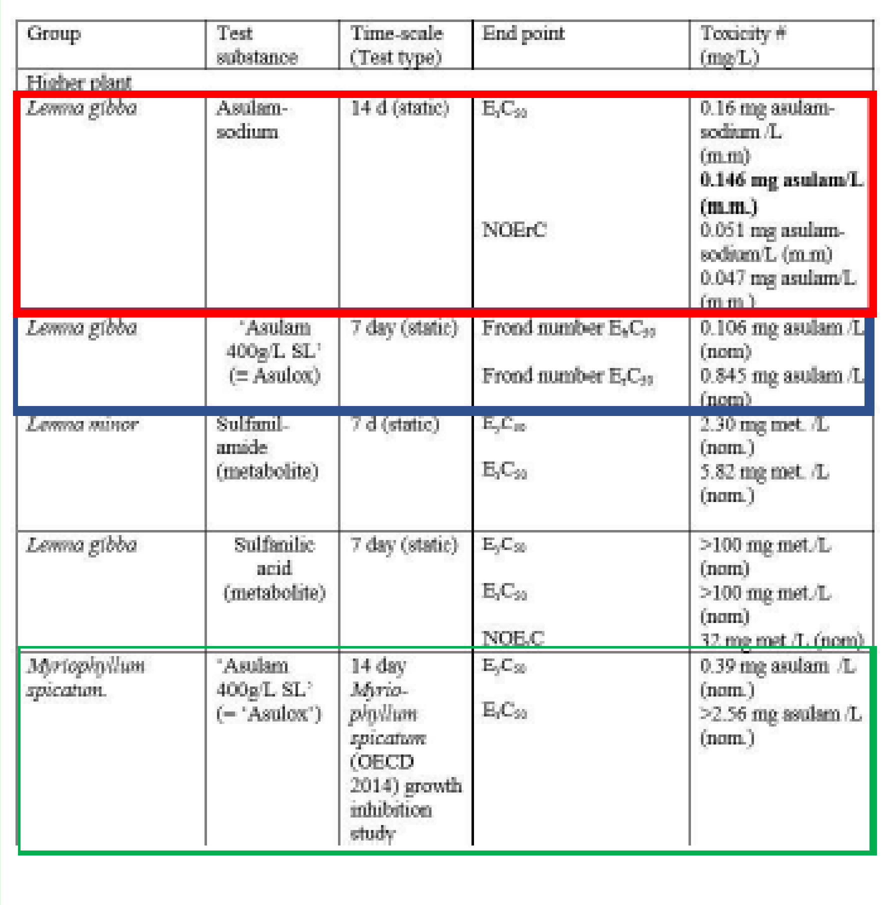
- The [redacted] 2007 *Lemna* study should be considered the representative study as it is conducted according to the recommended EU guideline (OECD 221) and has the required accuracy in endpoint determination especially considering the stability of the test item. This study shows much less sensitivity than the [redacted] 1992 study with an ErC50 (7d) endpoint of 845 µg asulam/L instead of the ErC50 (14 d) of 146 µg asulam/L according to [redacted] 1992.

- The study on another aquatic macrophyte species, *Myriophyllum spicatum*: [redacted] (2014), shows an endpoint that is even less sensitive than the OECD 221 *Lemna gibba* study: ErC50 (14d) > 2560 µg asulam/L.

Considering the above-mentioned arguments, it is very clear that the *Lemna* endpoint of ErC50 of 270 µg asulam/L can already be considered overconservative. The actual ErC50 (7d) for Lemna species will be around of 845 µg asulam/L and, taking into account *Lemna* and rooted macrophyte species, even higher.

REFERENCES

The following table is copied from Appendix A to EFSA's Conclusion on the peer review of the pesticide risk assessment of the active substance asulam (EFSA Journal 2018;16(4):5251, March 2018). The three studies referred to in this document are framed in **red** **(**[redacted] (1992)), **blue** ([redacted] (2007)) and **green** ([redacted] (2014)).



Group	Test substance	Time-scale (Test type)	End point	Toxicity # (mg/L)
Higher plant				
Lemna gibba	Asulam-sodium	14 d (static)	E_rC_{50} NOErC	0.16 mg asulam-sodium /L (m.m) **0.146 mg asulam/L (m.m.)** 0.051 mg asulam-sodium/L (m.m) 0.047 mg asulam/L (m.m.)
Lemna gibba	'Asulam 400g/L SL' (= Asulox)	7 day (static)	Frond number E_bC_{50} Frond number E_rC_{50}	0.106 mg asulam /L (nom) 0.845 mg asulam /L (nom)
Lemna minor	Sulfanil-amide (metabolite)	7 d (static)	E_rC_{50} E_bC_{50}	2.30 mg met. /L (nom.) 5.82 mg met. /L (nom.)
Lemna gibba	Sulfanilic acid (metabolite)	7 day (static)	E_yC_{50} E_rC_{50} NOE_rC	>100 mg met./L (nom) >100 mg met./L (nom) 32 mg met./L (nom)
Myriophyllum spicatum.	'Asulam 400g/L SL' (= 'Asulox')	14 day *Myrio-phyllum spicatum* (OECD 2014) growth inhibition study	E_yC_{50} E_rC_{50}	0.39 mg asulam /L (nom.) >2.56 mg asulam /L (nom.)

HSE Comments

The [redacted] study was considered during the initial review of asulam as well as the most recent one. The study evaluation from the latest consideration is presented below; along with the RMS comments (Note the UK was RMS). It can be seen from these comments that the concerns raised above were considered, it should further be noted that this study was considered during the EU review process and furthermore, used to derive the endpoint for *Lemna*.

The reference to the formulation study is noted and the study summary is presented below.

Both studies referenced by UPL were considered during the EU review and both are included in the list of endpoints, hence indicating that they were considered acceptable for use in regulatory risk assessments. The report from the peer review meeting (see HSE Ref.: W001884650) states that "the experts agreed to base the RA on the *Lemna* study from [redacted] 1992 by using the ErC50 expressed as mean measured concentration", hence the approach taken above.

It is accepted that the main route of entry being considered for this emergency application is spray drift and hence this would indicate that the formulation study is potentially more relevant. It is noted that there is approximately a factor of 6 difference between the endpoint from the study conducted with the active substance compared to the one conducted with the formulation. Whilst the study design and in particular the duration of the two studies is different, given that the formulation is simple, i.e. it is stated to be a simple solution in water, with the only 'relevant component' in 'Asulam 400g /L SL' being asulam sodium, it is unclear why there is such a difference in the endpoint. Due to this difference, it is not considered appropriate to discount the lower endpoint.

Report: [redacted] (1992e) Asulam sodium - Toxicity to the duckweed (*Lemna gibba*). United Phosphorus Limited, Unpublished report No.: R003653; CA 8.6/01.

This study has previously been evaluated at EU level. Additional derivation of mean measured study endpoints was provided by the notifier (UPL) during the peer review process.

Guidelines:

USEPA (= EPA) 122-2 &123-2, 1982

Deviations: pH ranged from 5.1-5.2 at test initiation, increasing to 6.0-6.5 at test termination. This pH change is due to respiration and photosynthesis of the plants and is common in static *Lemna* cultures. This is not considered to have any impact on the outcome of the study

GLP: Yes

Executive Summary:

Based on initial measured concentrations, the 14-day EC_{50} (95% confidence limit) for *Lemna gibba* with asulam sodium based on frond density was calculated to be 0.30 (0.020-0.61) mg/L, equivalent to 0.27 mg asulam/L. The 14-day No Observed Effect Concentration (NOEC) was determined to be 0.12 mg/L. The 14-day EC_{50} (95% confidence limit) based on biomass was calculated to be 0.32 (0.12-0.54) mg/L, equivalent to 0.29 mg asulam/L. The corresponding NOEC was determined to be 0.12 mg/L (initial measured concentration).

Recalculated endpoints for growth rate based on mean measured values and frond number:

- 6 days: ErC_{50}: 0.205 mg asulam sodium /L
- 9 days: ErC_{50}: 0.186 mg asulam sodium /L
- 14 days: ErC_{50}: 0.160 mg asulam sodium/L
- NOErC for all time points: 0.051 mg asulam sodium/L

Materials and Methods

Test Material:

Asulam sodium, [redacted] Batch no.: EN50005

Test Design:

The test organism was the duckweed *Lemna gibba*. Groups of 15 plants (3 replicates of 5 plants per test group) of 3 fronds each were exposed to a control and nominal concentrations of 0.031, 0.063, 0.13, 0.25 and 0.50 mg/L under 'static exposure' laboratory conditions (24 ± 2°C, continuous illumination) over a period of 14 days. M-type Hoagland's medium was used as dilution water and as control. The number of fronds present in each replicate was counted and observations were recorded at each 3-day interval (day 3, 6, 9 and 12) and at test termination (day14). At test termination, *Lemna* plants were dried for determination of dry weight. Temperature was measured continuously. pH values were determined in each treatment at test initiation and test termination.

Results and Discussion:

During the test, the temperature was recorded to be 24 to 25°C. The pH ranged from 5.1 to 5.2 at test initiation, increasing to 6.0 to 6.5 at test termination. Concentrations of asulam averaged 99% of nominal at test initiation and decreasing to 15% of nominal at test termination. Therefore, concentrations used for EC_{50} calculations were firstly based on initial measured concentrations. Initial measured concentrations were found to be 0.035, 0.065, 0.12, 0.26 and 0.44 mg/L. The two lowest test concentrations are assumed as they could not be verified. They were below the Limit Of Detection (LOD). Therefore, for the concentration 0.063 mg/L the value 0.018 mg/L was used. For the lowest concentration 0.031 mg/L the LOD/2 was used = 0.009 mg/L.

Following mean measured concentration range was used for the assessment of the endpoints:

0.169, 0.099, 0.051, 0.034, 0.017 mg/L

The key biological information is summarised in Table B.9.2.10.

Table B.9.2.10 Effects of asulam sodium on the growth of *Lemna gibba*

Mean measured concentrations (mg/L)	Initial measured concentrations (mg/L)	Frond production after mean of 3 replicates (standard deviation)					Biomass (dry weight) at 14-days mean (SD)
		day 3	day 6	day 9	day 12	day 14	
Control	Control	43 (2)	100 (22)	206 (46)	328 (70)	406 (81)	0.0711 (0.0194)
0.017	0.035	40 (1)	96 (4)	198 (14)	312 (33)	403 (54)	0.0801 (0.0055)
0.034	0.065	42 (6)	93 (16)	191 (33)	310 (42)	393 (67)	0.0722 (0.0127)
0.051	0.12	45 (1)	103 (16)	207 (46)	301 (93)	410 (189) [A]	0.0702 (0.0254)
0.099	0.26	42 (5)	67 (8)	124 (20)	200 (43)	236 (52) *, [B]	0.0413 (0.0167) *
0.169	0.44	35 (2)	43 (3)	59 (2)	64 (3)	59 (5) *, [B]	0.0178 (0.0009) *
14-day EC_{50} (mg/L)		0.30 (I.M.), 0.16 (M.M.)					0.32
95% confidence limits		0.020-0.61, (N.C.)					0.12-0.54

A: all fronds in one replicate observed to be slightly chlorotic, with less root formation in comparison to control fronds.
B: all fronds observed to be chlorotic, with very little root formation in comparison to control fronds.
* significantly reduced ($p \leq 0.05$) when compared to control, according to Williams' Test.
I.M. = Initial Measured, M.M. = Mean Measured, N.C. = Not Calculated

Conclusions:

Based on mean measured concentrations (utilising LOD/2 where detectable levels did not exist at terminal sampling), endpoints for growth rate based on mean measured values and frond number:

- 6 days: ErC50: 0.205 mg asulam sodium /L
- 9 days: ErC50: 0.186 mg asulam sodium /L
- 14 days: ErC50: 0.160 mg asulam sodium/L
- NOErC for all time points: 0.051 mg asulam sodium/L.

RMS comment:

This laboratory static exposure study has previously been evaluated at EU level with no significant concerns regarding the scientific validity of the study (details in Volume 3 B.9 DAR dated March 2006 and EFSA Conclusion report dated 2010). However, in this current (2015) re-evaluation the RMS notes some issues with the study which are discussed below, although none of these are considered sufficient to invalidate the derived endpoints.

The design of the study is in line with the current standard OECD 221 (2006) guideline except for the 14-day duration of the study – which compares with a 7-day duration recommended in the current OECD guideline.

A reduction in the rate of (frond number) growth in the study over the last 6 days of the study (equivalent to a doubling time of 5 days) is noted by the RMS – with rates below the minimum doubling time of 2.5 days specified as a 'validity requirement' in the current OECD 221 (2006) test guideline. However, taking into account that growth rates in the first 9 days of the study were in excess of this minimum rate (0- and 9-day frond numbers per replicate of 15 and 206 respectively) this is not considered sufficient reason to invalidate the study.

The RMS also notes that the test concentrations were not maintained over the duration of the study (measured concentrations 99% of nominal at study start and 15% of nominal on day 14 at study end). Because of this lack of maintenance of exposure concentrations, the Notifier has expressed the derived endpoints in terms of 'initial measured concentrations.' This is in line with the previous Annex I evaluation of asulam, with the EFSA 'Conclusion on Pesticide Peer Review' (2010) report specifying the regulatory endpoint from this study to be a frond number (biomass) EC50 = 0.27mg asulam /L (based on initial measured concentrations).

For risk assessment purposes and for asulam sodium hazard classification purposes growth rate ErC50 and NOErC values were provided based on mean measured concentrations – in relation to which the following calculated 'mean measured' endpoints were subsequently provided (ref. Notifier's email of 21st September 2015 and response to EFSA peer review comment 5(24)):

- 6 days: ErC50: 0.205 mg asulam sodium /L
- 9 days: ErC50: 0.186 mg asulam sodium /L
- 14 days: ErC50: 0.160 mg asulam sodium/L (0.146 mg asulam/L)
- 6, 9 and 14-day NOErC: 0.051 mg asulam sodium/L (0.047 mg asulam/L)

It should be noted that in derivation of mean measured concentrations achieved during the study there were no quantifiable asulam residues in the lowest two tested concentrations at study end, therefore the notifier proposed to utilise ½ the Limit of Detection (LOD) as a value for calculating mean measured concentrations. The RMS can agree to this approach, it being a conservative variation of the advice given in OECD No.23 GUIDANCE DOCUMENT ON AQUATIC TOXICITY TESTING OF DIFFICULT SUBSTANCES AND MIXTURES. It is further considered that at the two lowest tested concentrations (with LOD recoveries on day 7) there were no/only very minimal adverse effects on measured parameters.

Report: R. Vinken, V. Wydra (2007) Final Report IBACON Project 33533240 Toxicity of Asulam 400g/L SL to the Aquatic Plant *Lemna gibba* in a Static Growth Inhibition Test

This study was not included in the Notifier's (UPL) original submission but became available to the RMS (as a PDF document) at a late stage in the evaluation process. The study summary included below has been taken directly from the full study report (which has been evaluated), followed by comments from the RMS regarding the study's acceptability for regulatory use:

1. Summary

Title:

Toxicity of Asulam 400 g/L SL to the Aquatic Plant *Lemna gibba* in a Static Growth Inhibition Test

Guidelines/Recommendations:

- OECD Guideline 221: "*Lemna* sp. Growth Inhibition Test", adopted March 23, 2006.

Purpose:

The purpose of this test was to determine the inhibitory effect of the test item Asulam 400 g/L SL on the growth of the freshwater aquatic plant *Lemna gibba*. Cultures of *Lemna gibba* were exposed to various concentrations of the test item under defined conditions. The inhibition of growth in relation to control cultures was determined over a test period of 7 days.

The test method of application and the test system are recommended by the test guidelines and *Lemna gibba* is one of the recommended test species.

The purpose of the analytical part of this study was to verify the concentration of the active ingredient of the test item in the test medium.

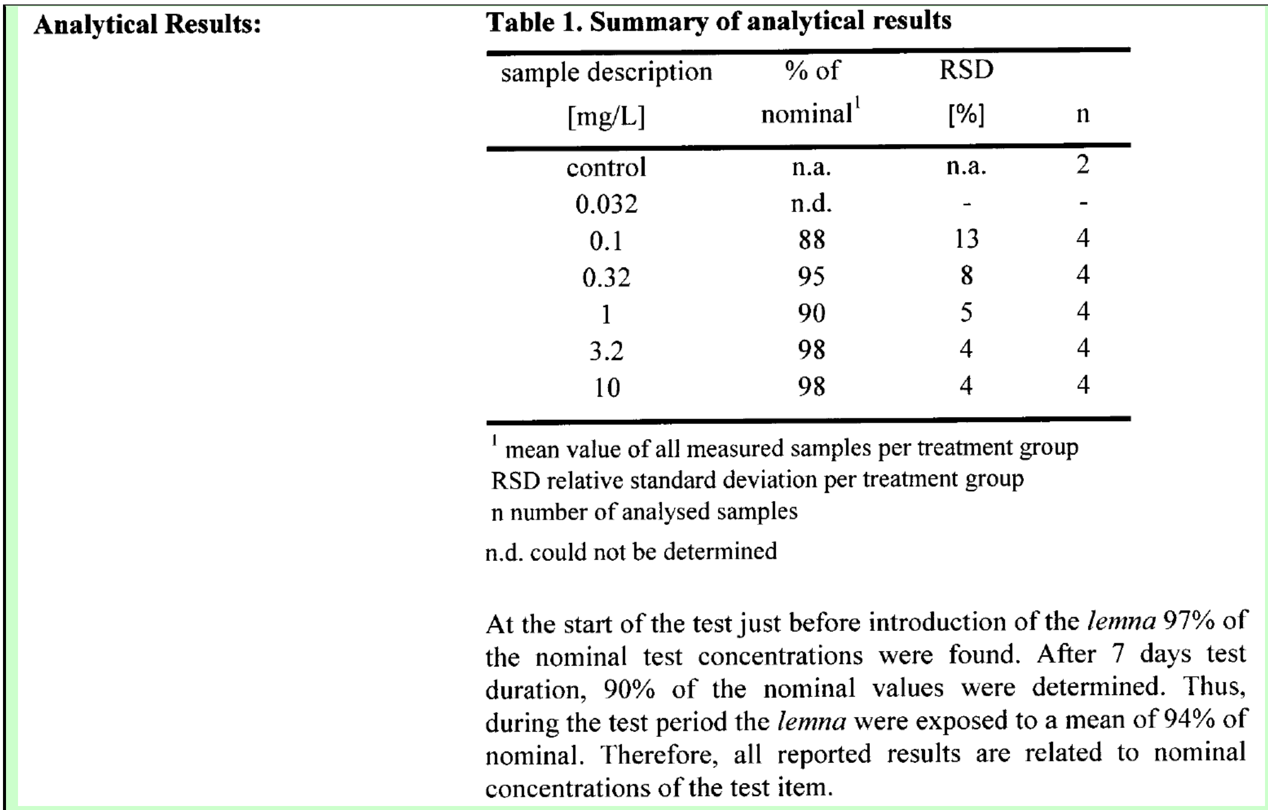
Test Concentrations:

10, 3.2, 1.0, 0.32, 0.10 and 0.032 mg test item/L and a control.

Biological Results:

Parameter	Growth rate (frond number) [mg/L]	Yield (frond number) [mg/L]	Growth rate (dry weight) [mg/L]	Yield (dry weight) [mg/L]
EC_{50} (7-day)	2.56	0.32	>10	1.83
95% conf. limits	0.39 – >10	0.02 – 1.25	2.85 - >10	0.34 - >10
7-day NOEC	0.10	0.10	0.32	0.32
7-day LOEC	0.32	0.32	1.0	1.0

n.d.: could not be determined



Analytical Results:

Table 1. Summary of analytical results

sample description [mg/L]	% of nominal[1]	RSD [%]	n
control	n.a.	n.a.	2
0.032	n.d.	-	-
0.1	88	13	4
0.32	95	8	4
1	90	5	4
3.2	98	4	4
10	98	4	4

[1] mean value of all measured samples per treatment group
RSD relative standard deviation per treatment group
n number of analysed samples

n.d. could not be determined

At the start of the test just before introduction of the *lemna* 97% of the nominal test concentrations were found. After 7 days test duration, 90% of the nominal values were determined. Thus, during the test period the *lemna* were exposed to a mean of 94% of nominal. Therefore, all reported results are related to nominal concentrations of the test item.

RMS comment:

This study has not previously been evaluated at EU level. The study is GLP compliant and has been conducted in line with the current OECD 221 (2006) test guideline (with no significant deviations). Additionally, the validity criteria for this guideline is satisfied, with the frond number doubling time in the control of 1.7 days (corresponding to a 16 fold increase over the 7 day study duration) being faster than the minimum specified as required of 2.5 days. Therefore, the study is considered scientifically valid and suitable for consideration in the regulatory risk assessment. Given that the analysed concentrations over the study duration were within 90% of the nominal test concentrations, the RMS agrees that (as calculated) the determination of endpoints may be based on use of nominal test concentrations. The specific growth rate ErC50 of 2.56 mg ‘Asulam 400g/L SC’ /L (based on changed in frond number) is considered to be the most relevant regulatory endpoint – which is equivalent (based on the reported analytical concentration of 389.9g asulam /L and density of 1.181 kg /L) to 0.845 mg asulam /L. The reported frond number EbC50 of 0.32 mg product /L and NOEC of 0.1 mg product /L are equivalent (assuming toxicity relates to the asulam content) to 0.106 mg asulam /L and 0.033 mg asulam /L

Evaluation, Summary and Conclusion by The Health and Safety Executive (Chemicals Regulation Division).

Appendix 3 of Ecotoxicology assessment

The following was submitted by the Applicant [in purple] and is presented in full.

IMPACT OF DIFFERENT PESTICIDES ON SOIL MESOFAUNA

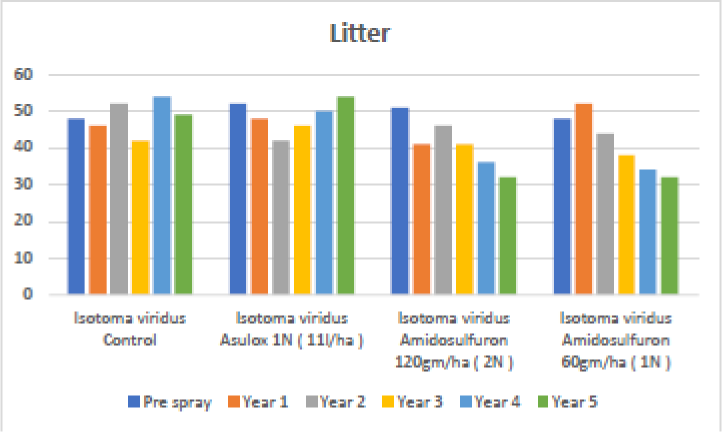
This document summarises the information collected by [redacted] [redacted] [redacted] as part of the National Bracken Trials, about the impact of the application of Asulam and Amidosulfuron (at two strengths) on various species of soil mesofauna. The graphs show the data collected in two layers: the litter layer (0-5cm) and the Soil layer (5-10cm).

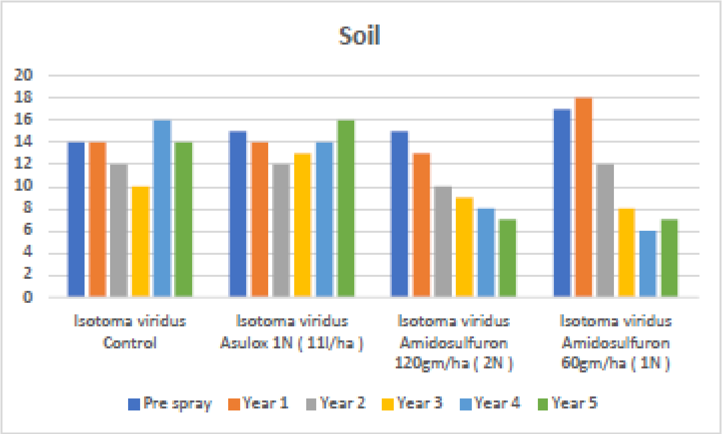
Note: In contrast to the other information provided in support of this Emergency Authorisation application, the references in this report to 1N and 2N Amidosulfuron are reported elsewhere as 1N and 0.5N respectively.

SPRINGTAILS

Isotoma viridus

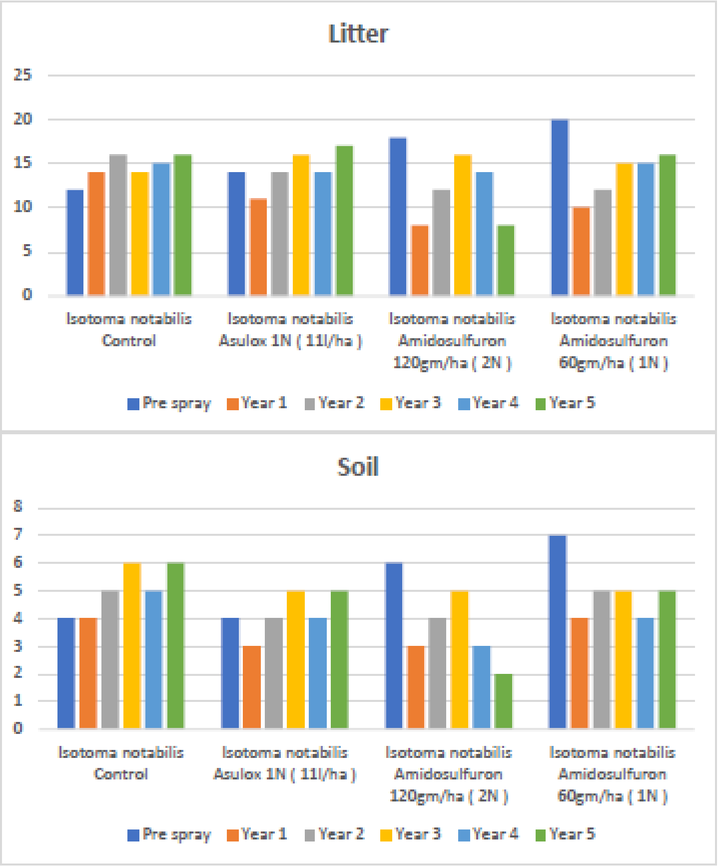
- Moderate overall density, and densities were higher in the upper 5cm Litter layer.
- The Control and Asulam plots showed similar values and variations over the 5 years.
- Both 1N and 2N Amidosulfuron started with similar pre-spray densities but then a marked decline in both layers with 1N showing a slight, but not statistically significant, recovery by year 5.
- Summary: There are indications that Amidosulfuron values were lower than the Control and Asulam plots in year 5.





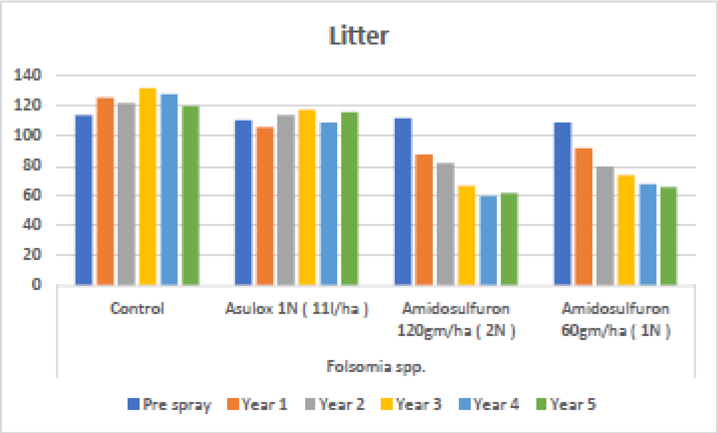
Isotoma notabilis

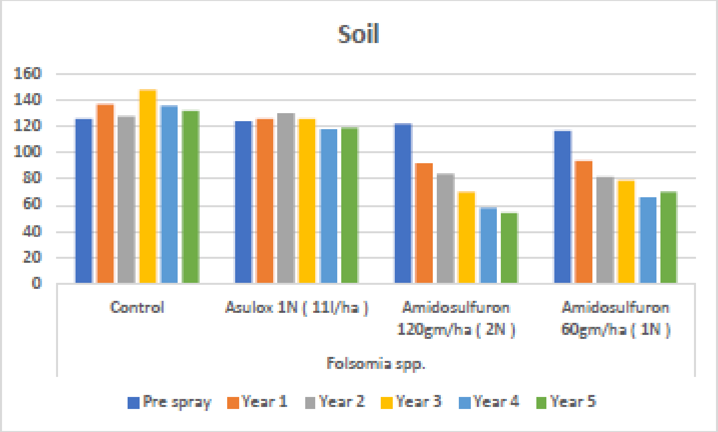
- Low densities overall.
- Densities were generally greater in the 0 to 5cm Litter layer than in the 5.1 to 10cm Soil layer. Possibly slightly greater decline in Amidosulfuron in years 1 and 2.
- Summary: The indications are that there were no differences in the species response between the control and three chemical treatment plots.



Folsomia spp.

- High densities, with greater numbers in 5.1-10cm Soil layer than 0 – 5cm Litter layer in all cases.
- Overall, profiles were very similar in Control and Asulam plots with no discernible downward trends.
- Both Amidosulfuron 1N and 2N showed distinct downward trends in both layers with the 1N tending to be slightly <2N (not statistically significant) and again signs of slight recovery in year 5 in the 0-5cm Litter layer of the 2N plots and 5.1–10cm Soil layer in the 1N, but not significant.
- Summary: Asulam - no discernible downward trends. Amidosulfuron 1N and 2N
- showed distinct downward trends in both layers

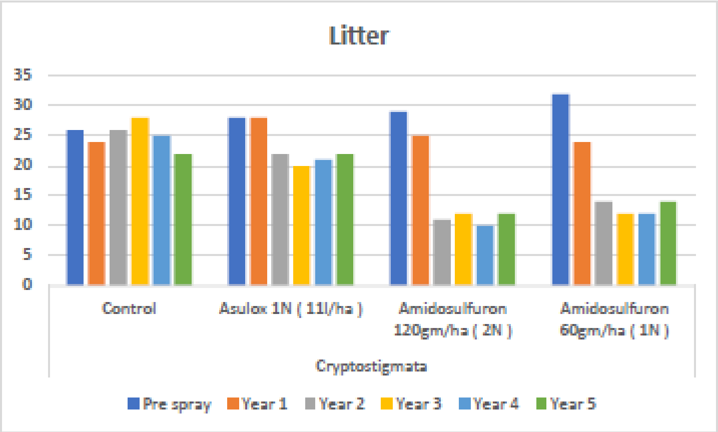


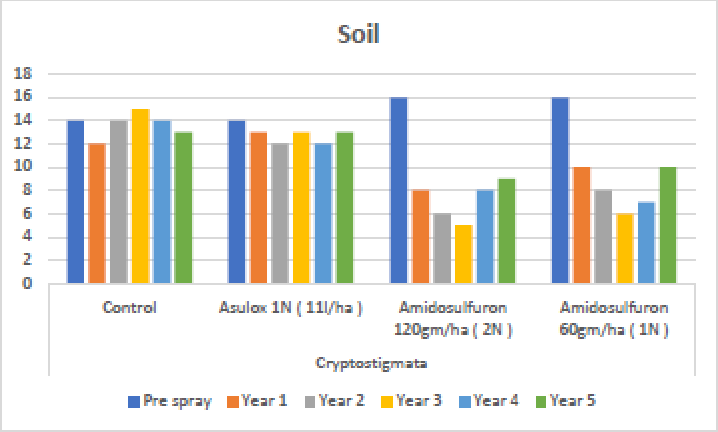


ACARI

Cryptostigmatid mites

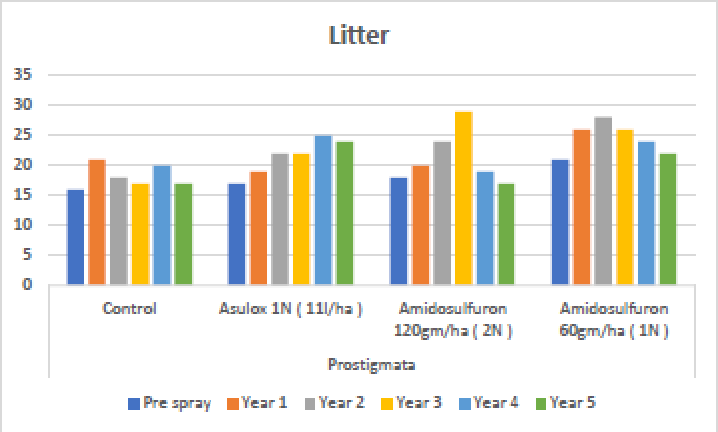
- Relatively low densities, with the highest density in the 0 – 5cm Litter layer.
- Slight decline in the 0-5cm Litter layer of the Asulam plots (litter loss) with 5.1 – 10cm Soil layer stable and similar to the Control.
- Both Amidosulfuron 1N and 2N showed marked declines in both layers with slight recoveries in years 4 and 5 in both layers, especially in the 1N treatment. However, the negative impact of both 1N and 2N against Asulam and Control treatments is marked.
- Summary: Asulam slight decline; Amidosulfuron 1N and 2N marked declines.

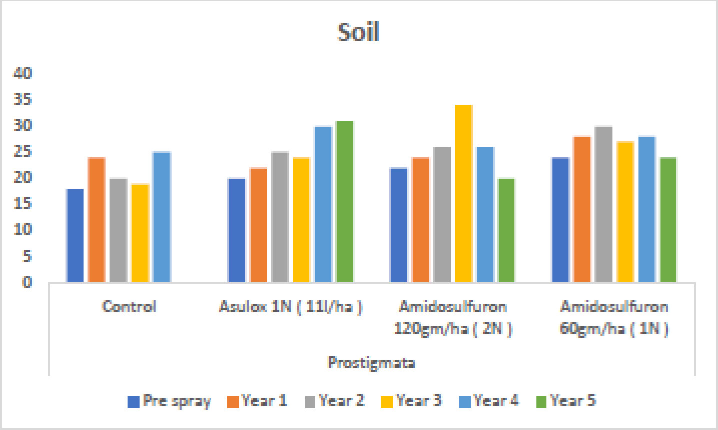




Prostigmatid mites

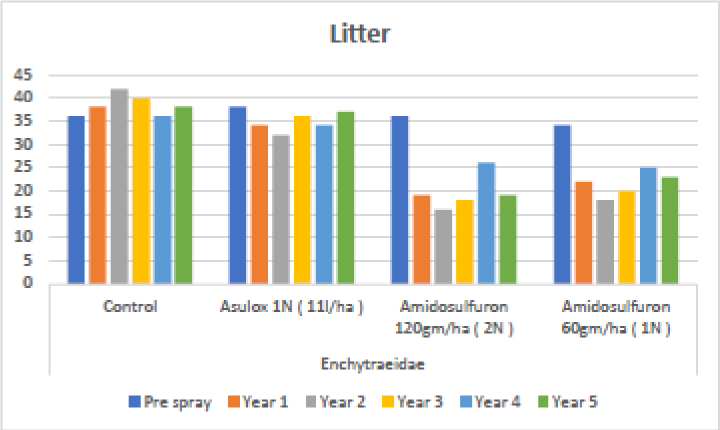
- Higher densities; in general higher density in the 5.1 – 10cm Soil layer.
- Control and Asulam showed similar, non-declining profiles.
- Overall values remained high in both layers of Amidosulfuron 1N and 2N treatments, with a peak around years 2 and 3, but then a decline in years 4 and 5.
- Summary: Asulam no different to Control; Amidosulfuron 1N and 2N indications of a decline later in the trial.

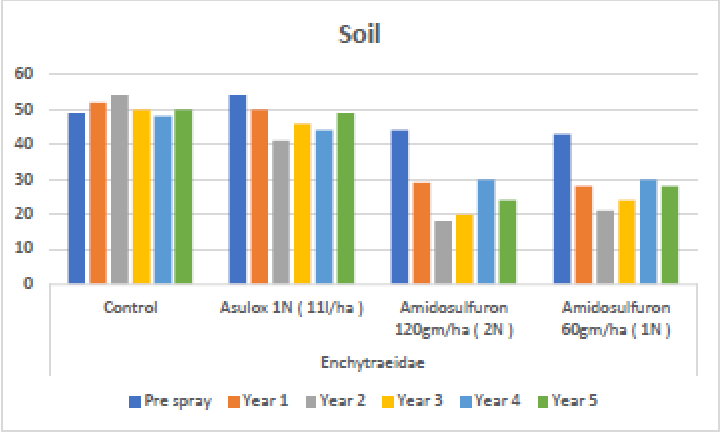




ENCHYTRAIEDAE

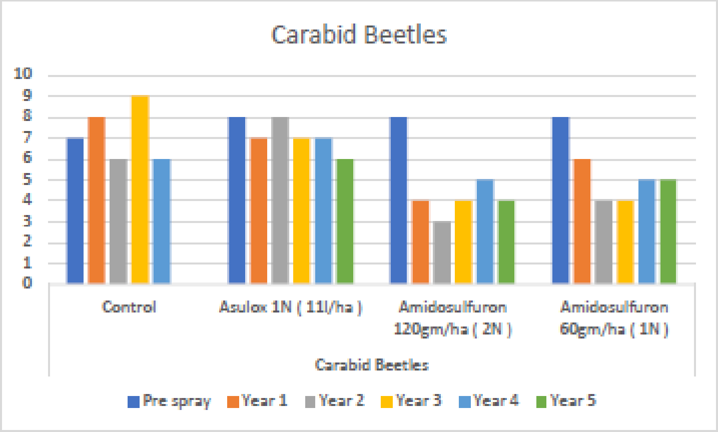
- Moderate to high densities, generally greater in the 5.1 – 10cm Soil layer than in the 0 – 5cm Litter layer, as this is a soil dwelling group.
- Control and Asulam plots had similar profiles and densities.
- Amidosulfuron 1N and 2N indicated a decline, which persisted in the 2N but showed some recovery by year 5 in both layers in 1N plots. Other than in the pre-spray year, indications were that all values in the 1N and 2N plots were less than values for Control and Asulam.
- **Summary:** Asulam no different to Control; Amidosulfuron 1N and 2N values
- significantly less than Control.





CARABID BEETLES

- There was little variation in the Asulam and Control plots.
- Both the Amidosulfuron 1N and 2N indicated a decline from year 1, slightly less marked in 1N and with signs of recovery but still lower than the Control / Asulam by year 5.
- **Summary:** Asulam no different to Control; indications of a decline for
- Amidosulfuron 1N and 2N, later in the trial.



CONCLUSIONS

- Amidosulfuron 2N appeared to cause damage over more than one year to affected species and groups. 1N was similar, but with some recovery in year 4/5.

- Apart from one temporary decline in years 1 and 2, the results for Asulam were very similar to the Control. Overall Asulam did not impact negatively on the medium to long term performance of the soil fauna.
- Nine other species/groups were analysed in detail and the analysis confirmed the overall trends identified above.

AMIDOSULFURON V ASULOX IN BRACKEN CONTROL. UPDATE 22.04.20

[redacted]

Whilst there is clear evidence that Amidosulfuron is effective in bracken control there are some reservations and the current perception that 'Amidosulfuron has been approved for ground-based application this summer' is dangerous and premature, especially in sensitive habitats. As colleagues will be aware I am currently proposing to do a fourth year of observations on the four sites in the UK (Dumfries, Fawdon in Northumberland, Sandscale in Cumbria and Challacombe in Devon) where there are trials with 120gm/ha and 60gm/ha Amidosulfuron applied early and late season and Asulox 11l/ha applied late season only. This will give us sufficient data to sensibly assess the efficacy and longer term environmental impact of 60gm/ha (which is the current maximum rate of application of Squire Ultra for any use and equates with what I have called 0.5N in the 2012 - 19 trials.

2CV19, funding, health and logistics permitting a one-year trial running from mid- June 2020 to mid - August 2021 is planned at Dumfries and possibly Challacombe. The trial design will be based on the following ground (quad and hand) applied treatments.

1. Single 1N (120gm/ha) Amidosulfuron application in late June.
2. Single 11l/ha Asulox application in late June.
3. Single 0.5N (60gm/ha) Amidosulfuron application late June.
4. Single 0.25N (30gm/ha) Amidosulfuron application late June.
5. Control.
6. Single 1N (120gm/ha) Amidosulfuron application in late July/early August.
7. Single 11l/ha Asulox application in late July/early August.
8. Single 0.5N (60gm) Amidosulfuron late July/early August
9. Single 0.25N (30gm/ha) Amidosulfuron late July/early August
10. Control
11. 0.5N (60gm/ha) Amidosulfuron late June + 0.5N (60gm/ha) in late July/early August.
12. 0.25N (30gm/ha) Amidosulfuron late June + 0.25N (30gm/ha) in late July/early August.

Monitoring will focus on efficacy in relation frond control, non-target attributes and selected groups of soil mesofauna, bacteria and fungi. The details of this proposal and full rationale will be produced at the beginning of May.

An important update on soil fauna. In 1983/84 I did a lot of work with Finesse (a fairly unselective SU from which Amidosulfuron was derived) on bracken control/soil impact. I recorded then that there was a depressing effect on some soil mesofauna and also mycelium producing bacteria. I have seen this effect several times in various assays I have been involved with over the years and of course in the most recent trials work the soil Collembolan *Folsomia* spp showed dramatic decline on Amidosulfuron 1N (120gm/ha) treatments after a few days. On Sunday, by chance, I read an article by one of my ex-students, Professor Klas Flardh at Lund University in Sweden. He is a specialist microbiologist working with the Streptomycete bacteria, which are the source of many current and historic antibiotics because of the specialised metabolites produced. It was lighthearted, focussing on the cause of 'petrichor' the sweet earthy smell you get from a healthy soil when there is a light shower in summer. It is caused by geosmin, an organic compound, which Streptomycete bacteria have the gene to generate. Normally Streptomycetes simply extend by proliferating the mycelium. When nutrients are locally exhausted, these start to decay and spore generating mode cuts in. In Klas's team study they identified that as this happens *Folsomia candida* (I have been working with both *F. candida* and *F.quadrioculata*) are attracted by the geosmin, which generally repels other detritus feeding soil meso inverts. Folsomia is a true soil dweller and is pristine white as soil matter is normally repelled by specially adapted cuticle, but the Strep. spores stick and the insects also ingest spores which are deposited in faeces, hence regenerating the bacterium in a slightly different location.

Klas and his team were not concerned with chemicals or bracken control, but for me the penny dropped for me. The loss of the Streptomycetes (which are 'good' soil bacteria) following Amidosulfuron (at 120gm/ha) deprives the collembola of their food source and after a few days the population declined and appeared to stay low or continue declining for a long time. This same effect has not been observed with Asulox. I am sure you will see the possible significance of this.

I established what is literally a home airing cupboard trial by using some soil which has a well -established bacterial load to create mycelium cultures on Agar plates on Monday morning. Fortunately, the Streptomycetes are very distinctive. Yesterday evening I applied equivalent 1N and 0.5N Amidosulfuron treatments, Asulox 11l/ha and kept a control set. At 17.00 tonight the Amidosulfuron treatments both showed very heavy decline in mycelium cover whilst the Asulox treatment showed only marginal reduction against the control.

This may not be important in the context of grassland or crop areas, but it does need further investigation under directly comparable field conditions – hopefully this will be achived in the extended trials phase over the next 15 months.

I will keep you posted.

[redacted] 22.04.20

HSE comment

Due to the lack of detail in the above, it is not possible to draw any conclusion. Please see the HSE consideration in the box above "Is amidosulfuron significantly worse for certain non-targets?" for a comparison of EFSA agreed endpoints and risk assessments for each active.

Evaluation, Summary and Conclusion by The Health and Safety Executive (Chemicals Regulation Division).

Appendix 4 of the Ecotoxicology assessment

As provided by the applicant [in purple]

Asulam for Bracken control

Comparison of Negative Impacts from Application of Amidosulfuron and Asulam

1 Introduction

1.1 The potential significance for nature conservation interests of the relative importance of the plant species that [redacted] has provided data on Amidosulfuron and Asulam effects.

1.2 This is based on comments from Natural England and Scottish Natural Heritage. There are some inherent imitations in the data which, have been highlighted.

1.3 Attached is a short analysis of the comparative importance for semi natural habitats of the plant species for which we have information on susceptibility to Amidosulfuron from trials conducted by [redacted].

1.4 Although the reports for the trials show some promising selectivity in Amidosulfuron in terms of overall habitat quality, data on the sensitivity of particular plant species suggests that Amidosulfuron may be more damaging to some plant species than asulam, with a higher proportion of non-target species affected.

1.5 At the request of CRD, we have looked at the relative significance of those species and the results are presented below.

2 Limits to the analysis.

2.1 Aside of the lack of statistical analysis, data on all those species that did not show any effects in the trials have not been analysed.

2.2 This analysis is needed to better interpret the significance of the findings in the context of the overall study results.

2.3 In the time available, we have not been able to scrutinise other information on Amidosulfuron spectrum of activity that may be available, or the literature (mostly grey) on asulam species selectivity, which would make this a more complete piece of work.

3 Results of the Comparison

3.1 Table 1 shows species that demonstrate negative impacts to the two herbicides (NB the 2 Amidosulfuron treatment levels (double and half rate) are combined).

4 Explanatory notes for the Table:

4.1 Amido. impact/tot (or asulam impact / tot) = number of occasions where an adverse effect was recorded / total number of records for that species. Darker shading (from amber to red) indicates a face value assessment of the relative impact of Asulam or Amidosulfuron. Brown shading suggests an Amidosulfuron effect, but species was not present in asulam treated plots

4.2 CSM indicator = the species is important as an indicator for Lowland Heath (LH) or Uplands (U) in conservation agency monitoring.

4.3 An overall assessment of the relevance or concern for each species is given in the right-hand column. Darker green shading indicating greater concern / relevance.

Species	Amido impact/tot.	Asulam impact/tot.	Common Species	Characteristic of semi-natural habitat	CSM indicator (LH, U)	Relevant/ of concern
Agrostis capillaris	2/4	-	Y	Y?	LH	Y
Agrostis stolonifera	3/11	1/6	Y	N	LH?	N
Alopecurus pratensis	1/1	1/1	Y	N		N
Briza media	1/6	1/1	Y	Y		N
Bromus mollis (hordeus)	1/1	1/1	Y	N		N
Cynosurus cristatus	2/6	1/4	Y	N		N
Holcus mollis	1/4	1/2	Y	N		N
Molinia caerulea	1/10	1/8	Y	Y	LH	Y
Nardus stricta	3/7	1/8	Y	Y	LH	Y
Phleum pratense	1/3	-	Y	N		N
Poa annua	1/1	1/1	Y	N		N?
Poa pratensis	2/2	2/2	Y	N		N?
Schoenus nigra (nigricans)	1/2	0/1	N	Y		Y
Cirsium arvense	1/4	0/3	Y	N		N
Clematis vitalba	1/1	0/1	Y	Y		N
Erica cinerea	1/3	0/2	Y	Y	U	Y
Euphrasia officinalis	1/4	0/2	Y	Y		Y
Filipendula ulmaria	1/2	1/1	Y	Y		N
Rubus spp.	2/5	0/4	Y	N		N?
Rumex acetosella	2/7	1/6	Y	Y	LH	Y
Stellaria media	2/7	0/4	Y	N		N
Succisa pratensis	1/1	0/1	Y	Y		Y
Crataegus monogyna	1/2	0/2	Y	Y		N
Drepanocladus spp.	2/7	0/6	Y	Y		?
Pohlia spp.	1/6	0/7	Y	?		Y?
Polytrichum commune	1/4	-	Y	?		Y?

Table 1 - Comparison of the Negative Impacts from Application of Amidosulfuron and Asulam

5 Conclusions

5.1 27 non-target spp are listed as showing negative effects.

5.2 Overall, there were 47 incidences where a negative impact was recorded, of which:

5.2.1 18 (38% of impacts) were ‘type 1’ (reduction),

5.2.2 24 (51%) ‘type 2’ (loss), and

5.2.3 5 (11%) ‘type 3’ (increase leading to negative competition).

5.3 Of these incidences, 76% were in response to Amidosulfuron (0.5 and 1N combined) and 23% Asulam.

5.4 There were 11 spp which showed a response to Amidosulfuron but not Asulam (red in table), eight ‘forbs’, one graminoid and two bryophytes. There are a further three species where an Amidosulfuron effect was recorded but the spp was not present in the Asulam treatments.

5.5 There were a further four spp which showed a greater proportion of incidences with Amidosulfuron than Asulam, but also four where Asulam showed the greater effect (all but one grasses). There were 6 species where the proportion showing an effect was the same.

5.6 There are plainly limitations in the strength of conclusions we can draw from this dataset. Many key species are not represented here across the range of dwarf shrubs, sedges, forbs and bryophytes likely to have been present. As a result, the effect recorded for *Erica cinerea* may be of particular concern as it might suggest a sensitivity by Ericaceous species more generally (heather, other heath species, blueberry, cranberry etc) but we cannot draw this conclusion from this dataset.

6 Conservation significance

6.1 Of the spp affected, one (*Schoenus nigra*) is an uncommon species and at least 11 (42%) are important because they are more characteristic of semi-natural habitats of conservation importance rather than 'improved' or disturbed habitats. Species characteristic of both lowland heathland (at least 7, 27%) and upland heath/bog/fen (at least 6, 23%) habitats are included.

6.2 At least eight spp in the sample, which are associated with lowland heath and upland habitats, would appear to be of concern in relation to non-target effects, particularly from Amidosulfuron. Their conservation importance for higher trophic levels can be important, for example *Succisa pratensis* is an important food plant for Marsh Fritillary butterfly, identified as a Vulnerable Priority Species in Scotland and so is targeted in agri-environment funding.

6.3 Whilst it has not been possible to take into account the relative importance / vulnerability of other species not included in the Table 1, it appears from the data provided that Amidosulfuron may pose a greater risk of non-target effects than Asulam on some species, particularly forbs, associated with lowland heath, upland, and potentially other semi-natural habitats, e.g. grassland.

HSE comment

Due to the lack of detail in the above, it is not possible to draw any conclusion from the above summary. Please see the HSE consideration in the box above "Is amidosulfuron significantly worse for certain non-targets?" for a comparison of EFSA agreed endpoints and risk assessments for each active.

In addition to the above, the following [in purple] was also submitted:

SOIL RESIDUE RESULTS

This information is drawn to the unpublished results from the National Bracken Trials carried out by [redacted] on Goathland Moor in the North York Moors National Park. The National Bracken Trials programme was established to assess the effectiveness of six chemical Bracken control treatments, including Asulam. As part of the trial, blocks were established at four locations in the Goathland area in August 2012. These trial blocks have involved monitoring both bracken control efficacy and impact on plant and animal non-target species (NTS) as well as habitat disruption (e.g. increase in bare ground and increased biotic activity).

The trials were originally intended to run for 3 years with no further intervention but were extended to a 5th year (2017) because of the longer term dynamics of some treatments and were fully checked again in the summer of 2018 (year 6) before being finally abandoned. No new data were collected in year 6, but most trends had been clearly identified by the collection and analysis in year 5, but comments have been added from the information collected for Asulam and Amidosulfuron 1N on four additional ground-based sites set up and treated in 2014/15 and sampled until 2018/19.

METHODOLOGY

Measurements were made using a leachate extraction process with liquid chromatography and mass spectrometry (LC/MS) to determine concentrations. As explained in the Introduction, the non-standard nature of the assays meant that whilst Asulam could be determined using standard methodologies (results presented as ppm) and glyphosate the same (results recorded as gm/kg) the Sulphonyl Ureas (SUs) had to be determined using experimental processes which measured total Uron1 content generically in micrograms/Kg. This has at least enabled relative residue concentrations to be assessed in relation to the Active Ingredient (AI) content of the different SUs applied. The methodologies were extended to 4 other sites in England and Scotland in the 2014/15 second phase of this project. Although recording of all other parameters at Goathland and the other 17 sites took place in summer 2018 (and on the Scottish and 2016 joint Historic England sites in the Summer of 2019) the residue work ceased for Goathland in 2017, but was carried out to GEP standards on the 2014/2015 treated sites until 2018/2019 respectively.

It is hoped that methodologies may be refined in future studies (both water companies and the Environment Agencies were interested in the future need to assess SUs if they are likely to be more widely used) but this is now in the hands of the laboratories. As indicated above, current sampling practices were only maintained to 2017 on Goathland and the other four selected locations. General acknowledgement has been made of the work done by the analytical laboratories, but the ‘outside the box’ nature of the current trials could not have been resolved without the help and input of Anthony Wilson from Northumberland Water Scientific Services at Wallsend and Joanne Hawes and the team at the National Laboratory Service (Environment Agency).

The results of the sampling runs for Goathland are summarised in Tables 98 to 103 and the accompanying graphs. The first samples were collected 24 hours after spraying, at 7 days, approximately 30 days, 3 months, 6 months, 9 months, 11 months and 13 months in the first sampling period from late August 2012 to early October 2013. In year 2 (2014) samples were collected in April and again in August. In year 3 (2015) they were collected in August only as the AI / metabolite levels were becoming very low or non-existent in many cases. All plots were sampled in August 2016 and August 2017 (year 5) for the final time. The mean values and standard deviations have been calculated and presented chronologically for each chemical within the subdivisions of ground applied and aerially applied treatments, each of which is further subdivided into plots where spraying was done over a dense bracken canopy and where it was applied to NTS on vegetation assessment sites where there was little or no bracken canopy cover. Glyphosate was applied only from the ground so there is no aerial comparison and the washout zone was only covered from the air and had a dense bracken canopy, so there is no ground based equivalent.

In the following notes, only the entries for Asulox (Asulam) and Amidosulfuron 1N (120gm/ha) have been updated to include the additional four site results as none of the other AI strengths or combinations (other than Amidosulfuron 0.5N at 60gm/ha which is the current approved maximum and there were not sufficient replicates of this treatment available within the 2014 – 18 time frame) are being considered for bracken control in the longer term. Each treatment is discussed in the context of the individual tables/graphs, and there are a number of key points/trends summarised in the final summary of conclusions.

RESULTS

Asulox showed a rapid decline after moderate levels in the first 7 days and by month three all values were below 2ppm. Initially there was a lower residue level in the aerially treated plots, which was statistically significant at the 7-day and 1-month points only. There was also a lower level on the ground sprayed bracken plots. The canopy clearly had an interception effect. Overall reduction was very rapid and by month 9 there was a very low trace on all sample plots. The levels continued to decline through year 2 (2014) and year 3. By August 2015 all readings were < 0.006ppm and by August 2016 < 0.001. In 2017 there were virtually undetectable residues on the bracken control areas, both ground and aerial. There was little evidence of continuing chemical activity in either 2016 or 2017 on the Goathland sites. This result was mirrored on the additional 2014 to 2019 data from the ground-based sites at Sandscale (Roanhead), Crichton Glen, Dumfries 2 and Stanta (Thetford). There was no evidence of ongoing chemical residue activity on any sites after year 2 and in most cases after year 1. Amidosulfuron 1N showed a residue peak in all four application profiles at 3 months, although the AI levels are <30% of those recorded for

Metsulfuron 1N at all sample points in the first two years, but have a similar presence in August 2015. Overall the residues were low and there was a more step-like build up and decline than in the Metsulfuron 1N profiles which continued into year 3. There was a wide variation between the Non-Target Species (NTS) ground based application and aerially treated bracken canopy sites. The differences were statistically significant at all sampling points up to year 3, by which time both aerially treated plots returned almost 0 residues, but both ground-based plots had low (but detectable) residues at 0.06 and 0.08. In 2016, only ground treated sites recorded any detectable residue (<0.04). At 11 to 13 months the residue levels on NTS ground application and bracken canopy ground application declined less slowly than both aerial applications and the differences were again statistically significant. There were no measurable residues in 2017 at Goathland (year 5).

Despite persistent chemical residues to year 4, the impact of this treatment on NTS appeared limited at initial analysis and it was recorded that this 1N treatment showed considerable potential for ground-based bracken control where rhizome control was a priority. However, more detailed, subsequent analysis of specific ‘indicator’ non-target plant species and groups of soil mesofauna, as well as ongoing deformity in frond regrowth has raised concerns of persistent chemical activity. The four 2014-2019 sites reinforced a pattern of ongoing AI presence and persistent non-target damage with very small quantities of AI being recorded in year 3 in all cases. Regrettably it was not possible to collect residue data from the additional early v late application and 1N v 0.5N plots on the 2016 sprayed Devon and Northumberland sites, as there were no resources available.

CONCLUSIONS

Both Asulox (11l/ha) and Amidosulfuron 1N (120gm/ha) showed different rates of decline in AI and AI breakdown residues in the monitored plots. Asulox residues followed an exponential decline curve from the application point over the first few months and was virtually undetectable by year 3. By contrast Amidosulfuron 1N residues increased from application point building to a peak after 5 months and then declined in a step like pattern to low, but still just detectable, levels by year 3 post application.

Evidence from soil mesofauna (Appendix 4) and Non-Target (NTS) Plant Species response (Appendix 3) indicated little, if any, immediate or ongoing negative impact on the Asulox plots by year 2. Although Amidosulfuron appeared to have limited impacts on much of the NTS, ongoing AI activity was still causing negative responses on some key habitat plant indicator species and some soil mesofauna groups/ species, which were not seen in the Asulox plots. Year 4 data from a wider range of trial sites is due to be collected in the summer of 2020 and will hopefully give a clearer picture of the longer-term impact of the two products. Deformed bracken frond regrowth and ongoing impact on some non-target habitat characteristics have made it clear that there is a longer term (3 years +) residue activity with Amidosulfuron but this was not the case with Asulox, although there were some negative effects on a limited number of biological indicators in the first year after application. This short-term response was still less marked in Asulam than Amidosulfuron plots.

HSE comment

Details are brief and hence without more information on the underlying trials, specifically covering the analytical method, sampling strategy etc it is not possible to use the information. A leachate extraction process was used to determine asulam in soil, again without more details it is difficult to interpret what this really means and how it relates to standard PEC values for example. The initial concentrations do however appear high; however, this might be an artefact of the method. In terms of behaviour, the rapid decline of asulam seems consistent with the wider fate and behaviour, i.e. asulam is not a persistent substance, amidosulfuron, however is more persistent. It is also feasible that active substance and some metabolites of amidosulfuron may have been determined with the method used. Given these concerns, it is proposed that the standard regulatory approach should continue to be used.

Appendix 5 of the Ecotoxicology assessment

As provided by the applicant

Presented below – verbatim – is the assessment presented by the Applicant in January 2021.

Birds and mammals analysis – asulam ecotox risk assessment refinement

Natural England, January 2021

1. Avian risk refinement

This work builds on the preliminary assessment by Natural England in October 2019. It first identifies key focal species on which to base further exposure assessments. Then aims to refine the likely exposure based on breeding period overlap with spray period and likelihood of prey items being taken from treated areas. Proposals are made for use of preliminary data provided by UPL on measured residues and residue decline in food items and canopy penetration data from [redacted] in further refining the risk assessment.

The rationale for our suggested refinement is as follows:

i) In contrast to risk assessments for other types of pesticide application in eg arable or grassland situations, bracken management takes place within or near areas that are important for wildlife and often in order to enhance habitat quality to enable species of conservation importance to thrive. As a result, ecotoxicology concerns lie both in relation to species which may occur more frequently within areas treated for bracken management and also those less frequently occurring species for which the habitat management is intended to maintain or enhance populations. It is important therefore to consider the full range of species that may occur in areas identified as needing management. Since alternative management approaches such as rolling and crushing bracken also carry risks to such species (especially ground nesting birds and small mammals) conservation agencies will use existing knowledge about habitat use by such species in making conservation management decisions. Conventionally, applicants for pesticide approval would carry out field studies to determine which species turn up in terms of frequency of occurrence. This is less feasible for bracken because of the wide range of habitats concerned and the practicalities of deriving location-specific information on species occurrence from field survey across the entire habitat resource that is subject to ongoing bracken management.

ii) Because the Tier 1 studies have shown a potential risk to reproductive success through chronic exposure, in particular via egg shell thinning, we have considered that the risk here is through exposure during egg formation. We therefore need to know which species are likely to be present, including rarer species, feeding in or near areas being treated during egg formation.

iii) The distribution of bracken treatment areas covers a wide range of habitat types (broadly considered here as upland habitat mosaics (moorland fringe), lowland heath and grassland, and forestry plantation). Fig 1 shows the distribution of countryside stewardship schemes in England that involve herbicide management for bracken and the equivalent in Scotland (Fig 2). Actual treatment distribution in any given year will be wider still, since there are ongoing HLS schemes (Fig 3) is indicative for these in England) as well as management taking place by bodies such as MoD, Forestry authorities etc that are not eligible for agrienvironment schemes.

iv) In making decisions about vulnerability of nesting bird species to habitat management or other interventions (including pesticide applications) conservation agencies use information on breeding periods to determine risk, based on the information on breeding periods in Joys and Crick 2004. This information is based on nest record scheme data, but the data is only available for species sufficiently abundant or recorded, for statistically valid analysis to be possible. As a result, the list of species in each habitat guild in Joys and Crick is incomplete for the present purpose. To ensure that the current assessment considers all potentially vulnerable species, senior ornithologists in NE and Nature Scot have reviewed the species lists in Joys and Crick against the breeding distribution of other species known to occur in the relevant habitats that occur in the geographical range of treatment areas (based on Fig 1 and 2) in Balmer et al 2013 (BTO Breeding Bird Atlas 2007 - 11). These additional species are then assessed separately for risks of overlap between egg formation and spray application (see section (v) below). The full list of species considered is in Annex I setting out the initial assessment of likely occurrence of bird species within the treatment areas, split by habitat type: upland mosaic; lowland heath / grassland; lowland woodland.

Fig 1 Map showing locations of bracken control options under Countryside Stewardship in England as at December 2020.

SB4 - Chemical Bracken Control	849.3 ha	69 sites
SP3 - Bracken control supplement	889.6 ha	118 sites

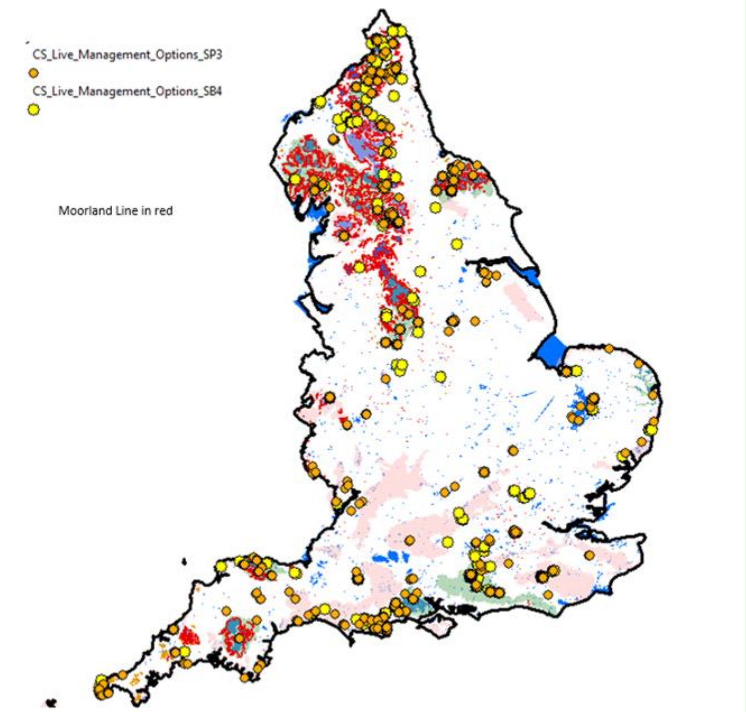


Fig 2 : Map of spraying areas in Scotland

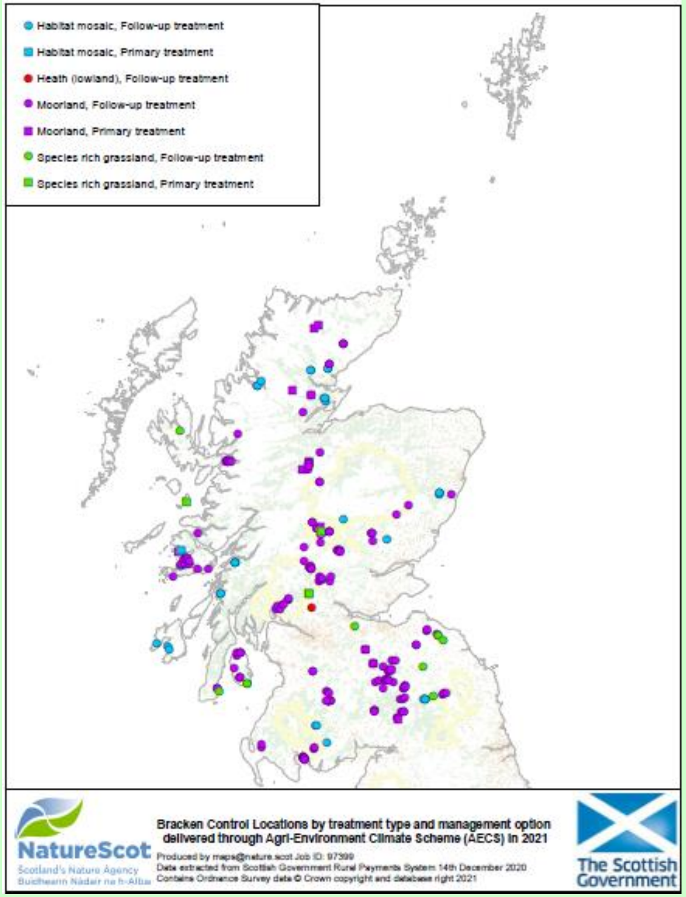
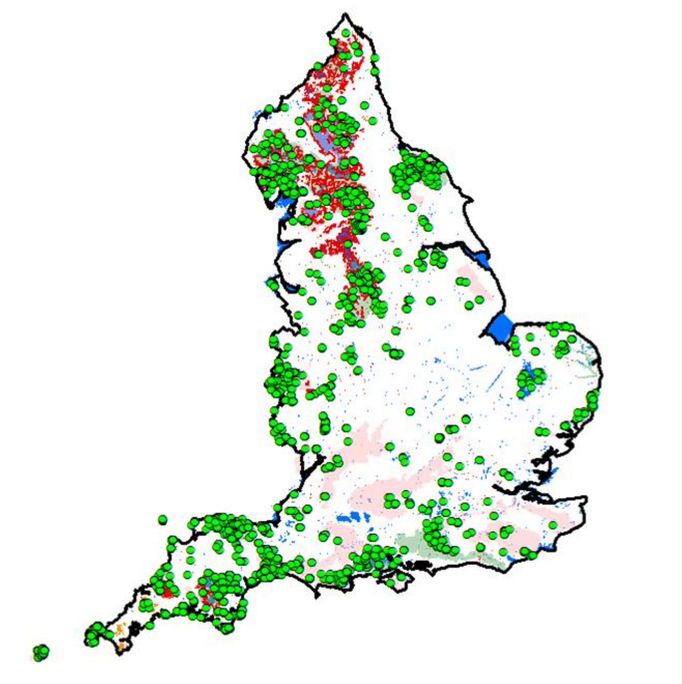


Fig 3: HLS bracken control schemes in England (2013-14 – many will now have expired)



v) The next step in our assessment involves identification of those species that have breeding periods that overlap with bracken spray period (currently approval is applied for only during the period 1 July – 14 Sept when bracken is at an optimum growth phase for treatment) at critical periods for egg development. This assumes that all other species, even if exposed to herbicide use, would not be adversely affected since the only known mode of adverse effect is during egg formation. This analysis results in a short list of species in a range of feeding guilds that should be considered further for risk assessment. Ideally, we would use information on last egg in a brood from latest egg laying period for each species. This information is not readily collected during the nest record scheme and is not available for the full range of species. Therefore we have used 95%ile egg laying period and duration of eggs+egg and chicks from Joys and Crick 2004 (see Table 1 below). Any instance of an overlap with bracken spray period is used to determine whether a species goes forward to next stage in our assessment. We are here making the assumption that no eggs are laid during the subsequent breeding phase set out in Joys and Crick (Annex 2 – dark shaded boxes) and that critical exposure may take place up to that point. On this basis, all species with zero overlap were confidently assumed not to be exposed at any critical stage during egg development. Those with any overlaps of the critical phase of the breeding period went forward for further risk assessment. It should be noted that this approach is in line with a similar assessment that would be made by conservation agencies about other types of intervention that may affect the relevant species in sites of nature conservation importance. It is also worth noting that the data in Joys and Crick were gathered in early 2000's. We do know that since then for some species breeding periods have shifted earlier in the season in response to climate change species (especially resident species). This is unlikely to have caused the risk to change adversely since earlier breeding may lead to earlier completion of egg laying, but does point to a need to update the analysis in Joys and Crick 2004.

Table 1: species with potential for overlapping breeding period and bracken spray areas
These species include representatives of different feeding guilds (insectivore, seedeater, omnivore and bird of prey) to go forward for further assessment.

A	B	D	E	F	G
Broad habitat	**Species**	**Expected occurrence in areas for treatment 2021 (based on BB Atlas)**	**First egg laying date** **95%ile**	**Latest dates for eggs and chicks (from Joy and Crick 2004)**	**Incubation period**
Lowland heath / grassland / moorland fringe	Linnet	Potentially present in most lowland spray areas. Low frequency upland areas. Scotland: Restricted to lower ground in Scotland. AECS data indicate there a few bracken spraying applications in lowland Scotland.	13 July	July Q2	13 - 14 days, so po for latest broods to affected.
	Skylark	Likely to be present in most spray areas, upland and lowland	6 July	July Q1/ Q2	13-14 days
	Yellow Wagtail	Absent from upland moorland, but occur rarely on inbye pastures. Low probability occurrence in lowland: Brecks, coastal heaths, Thorne moors. Majority of yellow wagtail now occur in arable fields and in lowland wet grassland, with low numbers on inbye meadows.	3 July	June Q4	
	whinchat	In northern uplands favours nesting in bracken in lower parts of valleys within mosaics of grassland and scattered scrub for	16 June	June Q3. Other studies	

		nesting and foraging . Mean bracken cover in territories from RSPB work = 35%. Avoids foraging in patches with a greater cover of bracken and tall non-bracken vegetation (Murray et al. 2016).		show risk of overlap in later broods			
	stonechat	Nests lower than 122m, c 10% nests in bracken – Fuller and Glue 2009. In Scotland a larger percentage of the population appears to nest on moorland between 150m & 250m asl.	26 June	Other studies show risk of overlap in later broods (mid July: Fuller and Glue 1977)			yes
	yellowhammer	Absent uplands. High probability occurrence lowland. Scotland: Absent from much of the country due to altitude. Rarely breed in the Western or Northern Isles and only small isolated populations on the Western seaboard. AECS data indicate there a few bracken spraying applications in lowland Scotland.	22 July	July Q3	13 - 14 days		yes
	Nightjar	Present in most lowland heath spray sites in England: Surry, Hants, Dorset, Devon, Brecks, Thorne. Locally upland fringes NYM. Scotland: Rare breeding bird (<50 churring males) with virtually whole population in conifer plantations in Dumfries & Galloway, particularly the Galloway Forest Park.	23 July	July Q3	Average incubation period is 18 days, so only the very latest nests have a risk of being affected.		yes
	Hobby	Absent from upland areas. Coincident breeding areas include: Brecks, New Forest, Dorset heaths, Thorne moors, Welsh Borders	2 July	August Q1	Average incubation period is 29 days, so only the very latest nests have a risk of being affected.		yes
Upland moorland	Twite	In England only likely to coincide in S Pennines and Peak Dist. Small areas in Cheviots. No coincidence in any areas S England and S Wales. In England only likely to coincide in S	7 July	July Q1	13 days		yes

		Pennines and Peak Dist. Small areas in Cheviots. No coincidence in any areas S England and S Wales. Scotland: The bulk of the population occur in the Northern Isles and along the western seaboard. The highest densities are in Shetland, Orkney, Caithness and on the Hebrides and the adjacent coastline of the Mainland. There are smaller numbers in the uplands in the Highlands. Based on the AECS data there appears to be few applications for spraying in the areas with largest/densest populations in N & W Scotland					
Woodland	Bullfinch	Limited overlap in few lowland locations	11 July	July Q2	14 - 16 days		yes
	Tree sparrow	Absent from uplands. Absent from most S lowland locations s of Thames/ Bristol channel. Likely occurrence lowland fringe NYM	16 July	July Q2	12 - 13 days		yes
	Spotted flycatcher		15 July	July Q2	13 - 15 days		yes
		Species below are not in Joy and Crick, but Atlas records coincide with bracken treatment areas in Fig 1					
	Dartford warbler		April – mid July (Brown and Grice 2005)				yes
	Grasshopper warbler		April – Aug (Brown and Grice 2005)				yes

	Pied flycatcher		Single brood. Breed from May into July.				pos
	Reed bunting		Breeds June – July (Bird Bible)				yes
	woodcock		Early to mid March sometimes into July (Brown and Grice 2005)				yes
	Stock dove		Breeds May – Oct (Bird Bible)				yes
	Coal tit		Breeds May – July (Bird Bible				yes

vi) In further refining the assessment we have considered two factors – refinement of exposure based on knowledge of feeding behaviour and significance of the period of spray overlap with breeding period for the populations of the species of concern. The latter is a pragmatic approach to the balance needed between potential adverse effects on populations, and the need for management of the habitat to prevent its deterioration for the same or different species of conservation concern.

vii) Further refinement was carried out first on the basis of the proportion of prey collected from treated areas, ie, whether the species under consideration actually feeds in stands of bracken. Table 2 provides a qualitative assessment of risk of significant proportion of prey items being collected from bracken treatment areas. On this basis the species highlighted in yellow are considered at very low risk of exposure and did not go on to further assessment.

Table 2: Suitability of bracken as forging habitat for species with overlapping breeding periods and spray application

Broad habitat	Species	Foraging ecology and foraging habitat
Lowland heath / grassland / moorland fringe	Linnet	Seeds are usually taken off plants (but also from the ground) areas of dense bracken are very unlikely to b as do not contain key seed-bearing plants. Forage widely across landscape in search of seed-rich location In-bye pastures and hay meadows important in upland landscapes. Forages on bushes < 1m from ground HSE Bird Bible)
	Skylark	Forages in short vegetation/bare/sparsely vegetated ground (Bird Bible), therefore unlikely to take prey iter bracken.
	Yellow Wagtail	Forages in low, dense herbage. Bird Bible. And on bare, sparsely vegetated, open ground (NE ornithologis
	whinchat	On the ground and vegetation within habitat mosaics that contain bracken. Ground nesting and forages on the surfaces of low growing vegetation. Avoids foraging in patches with a greater cover of bracken and tall vegetation (Murray et al. 2016).
	stonechat	Ground nesting and forages on the ground and on low growing vegetative but preferred habitats more scru
	yellowhammer	Requires shorter vegetation for foraging in order to access food and adopt predator vigilance behaviour. Ju between short and long grass can be important, as birds take invertebrate prey (eg orthoptera) in open are longer vegetation.
	Nightjar	Largely taken in flight, but also by gleaning from vegetation Birds forage widely (regularly >3km from territories) over woodland, heathland, wetland habitats. Risk of food being contaminated is low, unless bird largely in heathland areas
	Hobby	Taken in flight. Any open country, but often over or near water where typical prey concentrates Diet and fo mean that the risk of food being contaminated is extremely low.
	Dartford warbler	Gorse. Unlikely to forage in dense bracken (Brown and Grice 2005)
	Grasshopper warbler	Dense low ground cover, esp coarse grasses and brambles Breeding habitat across a variety of landscape characterized by four key attributes: the presence of more dense, dead vegetation and tussock- forming sp level; less dense vegetation at or above 2 m; softer soil; and potential song posts (Gilbert 2012). Nests are

		and attached to more rigid-stemmed plants such as soft rush Juncus effusus, greater tussock sedge Carex paniculate a purple moor grass Molinia caerulea (Glue 1990). So no particular association with bracken.	
	Reed bunting	Feeds on ground. Invertebrates and seeds	
Upland moorland	Twite	Taken mainly from the ground Flower-rich pastures, hay meadow and other weedy areas	
Woodland	Bullfinch	Principally arboreal feeder in summer. Very unlikely to take plant or invertebrate material from dense bracken stands Fe trees, shrubs and on nearly herbaceous plants. Rarely feeds on ground or > 10m from cover (Bird Bible)	
	Tree sparrow	Low risk due to habitat mis-match	
	Spotted flycatcher	Very unlikely to take flying insects from dense bracken stands Low risk due to habitat mis-match	
	Pied flycatcher	Open canopy woodland with sparse shrub layer. (Brown and Grice 2005). Feeding locations unlikely to include de bracken stands, avoids areas with high bracken cover (Goodenough, 2014).	
	woodcock	Almost exclusively within woodland during breeding season (Brown and Grice 2005). Feeding unlikely in bracken stand during egg formation (may move there with chicks later).	
	Stock dove	Lightly vegetated areas. (Brown and Grice 2005) Not dense bracken Low risk due to feeding locations	
	Coal tit	Feeds in canopy of conifer, on ground in deciduous woods (Brown and Grice 2005) Low risk due to feeding location	

viii) For those species that were not eliminated from further consideration on the basis of feeding habits / habitats (ie there is some degree of food collection from bracken dominated habitats), an assessment was made of the significance for populations of the period of breeding cycle where an overlap was found. For example, for single brooded species how significant is the period of breeding activity likely to be, for multi brooded species how significant is the final brood? A qualitative judgement has been made of the likely significance, based on expert judgement by NE and NatureScot ornithologists. But this is an area that would benefit from further refinement for risk assessment and this will be considered for the field season 2021 subject to Covid restrictions permitting these studies.

Broad habitat	Species	Significance of later breeding period for population ecology
Lowland heath / grassland / moorland fringe	Linnet	Multi-brooded – usually 2 and sometimes 3 broods. Early broods are generally more productive but are insufficient t maintain population stability: Moorcroft, D. & Wilson, J.D. (2000).
	Yellow Wagtail	Most eggs laid by end May. Replacement clutches found to the end of July (Brown and Grice 2005). Given low association with dense bracken as a feeding habitat, this is unlikely to a be a species at risk of exposure to a signific degree. Unlikely significant risk due to feeding location preferences Risk is considered low by NE ornithologists, esp as they do not select bracken as a nesting (usually in tussocky grass) or feeding (open ground).
	whinchat	Declining migrant species, wintering in sub-Saharan Africa. Second broods are considered likely to be important in maintaining population. Fuller and Glue (2009) report that all whinchat breeding activity is complete by mid July, c 1 nests are in dense bracken, and >60% nests are above 122m. Other studies (unpublished) in Skiddaw Forest, Wyth and Blengdale (Cumbria), where bracken is the chosen plant type found that although genuine second broods are unusual, replacement ones go late into July. Eg data from Geltsdale RSPB, (where nests are still active in July) out c300 one was still active in August. RSPB report that main driver of population decline in Europe is low breeding productivity (See review here: https://zslpublications.onlinelibrary.wiley.com/doi/epdf/10.1111/acv.12594). In 2016, RSPB visited 200 UK places w whinchat territories and unoccupied reference points: 87% of occupied points had bracken but the mean cover was 35%, suggesting the birds avoid the dense stands. One study has compared fine-scale vegetation structure in patch chosen for foraging by Whinchats in contrasting grazing management regimes. Whinchats were less likely to forag patches with a greater cover of bracken and tall non-bracken vegetation, regardless of grazing regime (Murray et a 2016).
	stonechat	Fuller and Glue (2009) report that stonechat nesting extends to end July, first week of August as extreme date. In th study c10% nests in bracken, and >90% below 122m. Other observations report bracken as a nesting habitat is not important, most nests found in bracken are first broods when the nest is built in last year's dead vegetation, subseq nests tend not to be, as it seems the plant is too tall, dense and luxuriant. Stonechats may be triple brooded with ne into August.
	yellowhammer	Typically 2, but up to 3 broods. Joys and Crick note breeding into 3rd week July. Later broods of yellowhammer are more productive than early season ones, so that a substantial proportion of their offspring are reared at this time. Th related to reduced corvid predation and better chick food availability in the second half of the breeding season (Brac et al 2000)
	Nightjar	1-2 broods. Second broods only where first nesting attempt/brood is early. Evidence that laying is linked to lunar cyc Which could affect timing of late broods? Low risk in Scotland due to breeding distribution.

	Grasshopper warbler	Potentially up to three broods. Eggs laid between end April and beginning August (Brown and Grice 2005). Low association of bracken as a feeding habitat. Unlikely significant risk due to feeding location preferences
	Reed bunting	Joy and Crick indicate breeding finished by end June, but Brown and Grice 2005 quote last eggs may be laid in ear August. Low coincidence with bracken habitat generally, so yellowhammer is a reasonable surrogate
Upland moorland	Twite	1-2 broods (rarely 3). Critically small English breeding population. Second broods are likely to be important in maint population. Highly localised breeding area in England in area of overlap with spraying could be avoided.

ix) On the basis of foregoing, proposed focal species are:
Granivore: Lowland heathland / grassland habitats: **Linnet,**
Granivore: Upland moorland: **twite**
Omnivore**: yellowhammer, reed bunting,**
Insectivore**: whinchat, stonechat, nightjar**
Woodland: **no evident additional spp with overlapping feeding requirements or breeding periods other than those above.**
We have differentiated on the basis of habitat type as well as feeding guild because in practice bracken control operations (and requirements) vary between these habitats. Based on Joys and Crick no upland moorland species has a breeding period extending beyond week 1 of the spray period, lowland species have breeding periods extending into week 3. Other studies suggest that some species may have breeding periods beyond this, although the significance of this in population terms is likely to be low. Where risks are considered significant, it may be possible to consider different management approaches in these situations that take into account regional and seasonal factors.

x) At this stage there is inadequate fully analysed and peer reviewed residues data for prey items in bracken situations and for residue decline to further refine these risk assessments. UPL has commissioned field trials on Asulam residues in the UK to assess the decline of residues on monocotyledons, dicotyledons and seeds. Residues are also being recorded in arthropods on leaves and on soil. The work has been carried out in support of the use of asulam in bracken control. CRD is aware that this work is in progress but the fully analysed dataset will not be available until March 2021. Draft reports are with the UPL QA department and it is likely that the final report for one of two studies will be ready in mid-February. To allow the outcome of this work to be considered as part of the EA application, UPL has agreed to provide a draft version of the report, before the QA process is complete.

xi) Interim data on residue levels in potential prey items and rates of decline in residues have been provided in confidence to Natural England by manufacturers UPL. Two field studies were carried out (under GLP) in 2020 in 2 sites at two periods during the spray season: July and September. UPL has provided data that can help refine the DT50 for plants only (not possible to calculate for arthropods) and has provided residues data for arthropods (foliar and ground dwelling) and for plant material (at different heights for monocots and for dicots and seeds). Two field trials were carried out in 2017 (but reviews were delayed until recently), we have seen data for one of these (later trial) only. The data for the September trial have been through internal QA in UPL, but we are able to share headline conclusions only at this stage. We understand that UPL expects to make the package available to CRD in late February / early March; the first of the two reports can be shared earlier with the CRD to begin review.

xii) The provisional key relevant findings at this stage are:
Avian risk assessment: herbivore and granivore: The TERs in 2020 assessment (avian long term risk assessment) lie between 2.14 – 2.47 for small granivorous and omnivorous birds. This is determined using the default DT50 value 10d in absence of information from an appropriate crop. UPL has shared preliminary results from helicopter field applications (4.35kg/ha) that indicate a DT50 ranging from 0.15 – 0.25d for plant material (based on a SFO kinetic). These findings are based on a single trial which we understand has now been through internal review, but do provide some reassurance to NE that, if these data are typical and are substantiated through the additional trial, actual exposure rates for granivorous and omnivorous species during the critical breeding period may be considerably lower than the default value used in the 2020 risk assessment. It may be possible to consider using a reasonably precautionary default value of 1d on this basis which, given the TERs above, may lead to a more favourable TER. For example, considering worse-case assumption of a DT50 – 1 d (instead of 10d default), the ftwa is refined to 0.1 instead of 0.53 (default) (no MAF as there is only 1 application / season). To illustrate that the risk is actually lower, ftwa for granivore/omnivore/herbivore with single diet could be refined based on field data:

Table ##: Long-term dietary first tier assessment

Scenario	Focal spp.	Shortcut value RUD	MAF	TWA	DDD (mg a.s./kg bw)	Endpoint (mg a.s./kg bw)	TER	Trigger value
Application rate:		**4.4**	**kg a.s./ha**					
	small gran or herb/omni with single diet	3.8	1.0	0.1	1.7	19	11.36	5

xiii) **Avian risk assessment: small insectivore**: We acknowledge that determining DT50 for residues on arthropod prey items is very difficult if based on field studies (eg Bird and Mammal Guidance Appendix N) due to food web interactions mobility etc, and as a result residues may show peaks some days after initial application. NE has been provided with summary preliminary data by UPL to assist with our interpretation of risk to potentially exposed birds and mammals within sites managed for wildlife. The risk assessment carried out for the EA in 2020 had TER 0.84 for small insectivorous birds, indicating high risk at Tier 1. This is based on DDD 22.62mg/kg/d. When adjusted for interception using a value of 0.3 (based on Bird and mammal Guidance) for ground dwelling arthropods TER is not appreciably improved. Higher interception rates may further refine this. Some highly caveated data from [redacted] (Annex 3) suggest that in situations of high bracken cover (greater than 70% cover for aerial application where raindrop or pencil jet nozzles are used and for boom spray application, and greater than 80% cover for knapsack), penetration at ground level is less than 10% of applied volume. We do not think that this can be used in any quantitative assessment at present, but we understand that field trials to determine canopy penetration more precisely are planned for 2021 field season.

xiv) The measured residues data for arthropods provided by UPL (which will represent a field situation with respect to canopy penetration) may be used to refine actual exposure assessments for insectivores. Provisional results suggest TWA estimated for ground dwelling arthropods = 0.186, TWA for foliar arthropods = 1.98 mg/kg fw. If we make an assumption of mean daily intake of 20g fw arthropod material for a representative omnivore such as yellowhammer (Crocker et al CSL Report PN0908, 2002) then daily intake rate when feeding exclusively on foliar arthropods = 0.04mg/d, which for a representative 26.5g bird = 1.49mg/kgbw/d DDD. The TER would then become 12.7, suggesting that if further QA and additional data from trials become available, the risk may be sufficiently refined to become acceptable.

xv) **Mammal risk assessment**:
The key small mammal species for potential consideration (bank vole, wood mouse and field vole) are widespread and likely to occur frequently in bracken treatment areas, with breeding periods that extend across the proposed spray period (1 July -14 September). We have been given access to a summary of an unpublished study ([redacted] *The Impact of Bracken Control on Moorland Small Mammal Populations 1983-4*– attached at Annex 1 ,) that indicates dominance by Wood Mouse and Bank Voles in bracken or bilberry dominated upland moorland habitats. In that study area of N York Moors Wood Mice accounted for 83% of the total population trapped, with Bank Vole accounting for 16%, though the focal species used by CRD in the 2020 assessment (Field Vole) is also reported and is a reasonably representative focal species. In all cases, these species show large natural population fluctuations and rapid recolonization rates (Harris and Yalden 2008.).

xvi) The relatively small treatment area in relation to the total natural range, magnitude of natural population fluctuations and rapid recolonization by such mammal species suggests that there is unlikely to be significant nature conservation concern. However we would like to draw attention to the potential for coincidence of spray areas with occurrence of Hazel Dormouse, a species of conservation concern.

xvii) Dormouse is traditionally associated with early successional stages of woodland and coppice but recent studies have shown that it occurs in a range of wooded habitats including scrub, coniferous plantations and hedges (Matthews et al 2018). Dormouse can occur in or around bracken treatment areas (Goodwin et al 2018) within its relatively restricted range in England (see Annex 6). Taken together with the breeding period (May to mid-September is the core breeding season) this indicates potential risk of relevant exposure during the spray period. In the UK, this species is at the north western edge of its range and it currently has a predominantly southern distribution, extending into the west midlands, southern East Anglia, with scattered populations throughout

Wales and one known natural population as far north as Cumbria; it is not recorded in Scotland (Annex 6). Since, 1993, 27 re-introductions have taken place in 12 English counties, where the species was formerly present. The furthest North of these is the Yorkshire Dales.

xviii) Since it is a less mobile species than the focal species used by CRD, as well as being a species of conservation concern, we think that risks from asulam applications need to be considered further in relation to this species. This is a difficult species to survey and whilst considerations of population recovery, density and ubiquity are reasonable in assessing population level risks to the focal species above, further consideration is needed where dormouse is likely to occur. Natural England would suggest local advice based on the Dormouse Protocol (Annex 7) to assess risks and any risk management needed in those cases if it is not possible to refine risks further on the basis of new residues and DT50 data (see comment in xix below - since Dormouse has a mixed diet the arthropod RUD as well as plant DT50 may also be used to reduce DDDtotal (Mammal Bible from CRD). The Dormouse Protocol is already followed by the Forestry Commission in woodland management.

xix) **Potential to further refine mammal risk assessment**: Further refinement of the mammal risk assessment might be expected from further analysis of the preliminary residues and DT50 data we have been provided by UPL. The 2020 assessment fails at Tier 1 for small herbivorous mammals with a TER of 0.91 using a default DT50 of 10 days. UPL has shared preliminary results from helicopter field applications (4.35kg/ha) that indicate a DT50 ranging from 0.15 – 0.25d for plant material (based on a SFO kinetic). The DT50 data for plant food items reported by UPL above may be helpful in refining the generic small mammal risk assessment. This, together with the relatively small area of the total natural range subject to treatment (see Ha quoted for CS areas in Fig 1 for example), great natural fluctuations and rapid recolonization by such mammal species suggests that there is unlikely to be significant nature conservation concern for the focal species used in CSD assessment.

xx) **<u>Conclusion</u>:** The potential risk for exposure during egg-formation during part of the asulam spray period is not ruled out for the focal species in the three avian feeding guilds identified above. We have not been able to carry out a quantitative assessment of amount of time spent feeding within treated areas, though for one species, whinchat, available evidence is that birds are less likely to forage in patches with a high cover of bracken. The preliminary data we have seen for DT50 in vegetation and residues levels in arthropods provides some reassurance that such refined residue data will support a more favourable TER. We understand that these data have now been QA'd . NB we have seen the results from one study only.

Where bracken management is part of a habitat management requirement for nature conservation the ecological risks of herbicide use need to be weighed against the risks of loss of habitat or key nature conservation features from failing to manage the bracken. Risks may be further reduced by applying conditions to spray operations either in location (for localised focal spp like twite and potentially nightjar) or timing to avoid sensitive final brood periods in multivoltine species.

xxi) **<u>Further work</u>**:

In outline, several areas of study are possible or planned to refine risk assessments. All involve fieldwork and will be possible only if restrictions under Covid can be complied with:

1. Refinement of avian distribution data during breeding season. Given the highly dispersed and widespread nature of spray areas this is not considered to be a practicable approach, and refinement would be better based on more refined assessments of exposure.
2. Refinement of avian feeding patterns. To demonstrate that actual use of bracken habitats is less than 100% of feeding area. These would have limited value due to the highly variable nature of the habitats used but may be possible to refine this for certain key focal species at least. NE has received funding for further field study and collation & reanalysis of existing data on key species (eg whinchat) in 2021.
3. Refinement of canopy penetration studies. These have been proposed for 2021 season by [redacted] see Annex 4.
4. Refinement of invertebrate and plant residues levels. May be considered in parallel with penetration studies in 3. Above – requirement for further residues collection will depend on conclusions from UPL studies carried out last year.

References:

Joys A. C. & Crick H. Q. P. 2004. Breeding periods for selected bird species in England. *BTO Research Report No. 352*. Thetford, BTO.

Fuller RJ and Glue DE (1977) The breeding biology of the stonechat and whinchat. *Bird Study* 25. 215-228.

Brown A and Grice P (2005) Birds in England. Poyser

Bird Bible (1998). *Birds and farming: information for risk assessment*. Report to CSD (Hart et al 1994, updated by Buxton Crocker and Pascual 1998)

Balmer, D, Gillings S., Caffrey B., Swann R., Downiie I., Fuller. R (2013) Bird Atlas 2007-11. The breeding and wintering birds of Britain and Ireland. BTO.

Gilbert G. (2012). Grasshopper Warbler *Locustella naevia* breeding habitat in Britain. *Bird Study* 59, 303-314

Glue DE 1(990). Breeding biology of the grasshopper warbler in Britain . *British Birds* 83. 131 -145

Moorcroft, D. & Wilson, J.D. (2000) The ecology of Linnets *Carduelis cannabina* on lowland farmland. In N.J. Aebischer, A.D. Evans, P.V. Grice & J.A. Vickery (eds) *Ecology and Conservation of Lowland Farmland Birds*, pp.173-181. British Ornithologists' Union, Tring.

Fay R, M. Schaub M. V. Banik J. A. Border I. G. Henderson G. Fahl J. Feulner P. Horch F. Korner M. Müller V. Michel H. Rebstock D. Shitikov D. Tome M. Vögeli M. U. Grüebler (2020). Whinchat survival estimates across Europe: can excessive adult mortality explain population *declines*? Animal Conservation https://zslpublications.onlinelibrary.wiley.com/doi/epdf/10.1111/acv.12594).

Bradbury, R.B., Kyrkos, A., Morris, A.J., Clark, S.C., Perkins, A.J. & Wilson, J.D. (2000) Habitat associations and breeding success of yellowhammers on lowland farmland. *Journal of Applied Ecology*, 37, 789-805.

Murray C, Minderman J, Allison J, Calladine J (2016) Vegetation structure influences foraging decisions in a declining grassland bird: the importance of fine-scale habitat and grazing regime. *Bird Study* 63:223-232)

Crocker et al CSL Report PN0908, 2002

Bird and mammal Guidance, EFSA (2009): Risk Assessment for Birds and Mammals

R Harris, S and Yalden, D.2008. Mammals of the British Isles: Handbook, 4th Edition, Southampton. The Mammal Society).

Mathews F.,Kubasiewicz L. M.,Gurnell J.,Harrower C. A.,McDonald R. A., Shore R. F. (2018) NE Report: *A Review of the Population and Conservation Status of British Mammals*.

Goodwin, C.E.D., D.J. Hodgson., S.Bailey., J. Bennie and R.A. McDonald (2018). Habitat preferences of hazel dormice Muscardinus avellanarius and the effects of tree felling on their movement*. Forest Ecology and Management*, 427: 190-199

Goodenough AE (2014) Effects of habitat on breeding success of a declining migrant songbird the Pied Flycatcher *Ficedula hypoleuca*. *Acta Ornithologica* Vol. 49 (2014) No. 2

Annex 1: Table 2: Data on types and numbers of birds nesting and feeding in areas to be treated.

A	B	C	D	J	L
Broad habitat	**Species**	**Nesting and feeding habitat in areas potentially treated with Asulox**	**Expected occurrence in areas for treatment 2021 (based on BB Atlas)**	**Diet**	**Foraging habitat**
Lowland heath / grassland / moorland fringe	Cuckoo	Moorland/upland fringe and lowland heathland; main hosts in these areas likely to be the meadow pipit and dunnock, respectively	Partial overlap	Insects, esp. large, hairy caterpillars avoided by other species, and beetles. Chick food will reflect preferred diet of host species.	

	Linnet	Mainly hedges and scrub, including gorse on heathland. Sometimes, in bracken on lower hill slopes in the Pennines	Potentially present in most lowland spray areas. Low frequency upland areas	Granivorous, mostly small weed seeds	Forage widely across landscape in search of seed-rich locations (up to c. 3km). In-bye pastures and hay meadows important in upland landscapes
	Skylark	Open habitat. Rarely nests in bracken – most nests in vegetation 10-40cm high. Most foraging within 150m of nest, in short vegetation/bare/sparsely vegetated ground. Rarely feeds in dense foliage eg bracken.	Likely to be present in most spray areas, upland and lowland	Adults mainly feed on seeds and green plant material, but young are fed on invertebrates	Anywhere where preferred foods occur and are accessible
	Yellow Wagtail	Open habitat	Absent from upland moorland, but occur rarely on inbye pastures. Low probability occurrence in lowland: Brecks, coastal heaths, Thorne moors	insectivorous	
	Tree pipit	Scattered trees in open habitat	In northern areas commonly found in scrub dominated moorland-edge communities, often with scattered bracken.	insectivorous	Areas of open scrub with low vegetation and bare ground
	Wren	Mixed	Significant overlap	insectivorous	
	whinchat	Scattered scrub in open habitat	In northern uplands favours bracken dominated moorland edge communities with scattered scrub for nesting and foraging.	insectivorous	On the ground and vegetation
	stonechat	Scattered scrub in open habitat		insectivorous	On the ground and vegetation
	yellowhammer	Nest in hedges and scrub, including gorse on heathland.	Absent uplands. High probability occurrence lowland	Adults are mainly seed-eaters, especially grass seeds and cereal grain, but invertebrates are fed to chicks	Requires shorter vegetation for foraging in order to access food and adopt predator vigilance behaviour. Juxtaposition between short and long grass can be important, as birds take invertebrate prey (eg orthoptera) in open areas as they leave longer vegetation.
	Nightjar	Nests on bare/sparsely vegetated ground in open heathland or in scattered scrub	Present in most lowland heath spray sites: Surry, Hants, Dorset, Devon, Brecks, Thorne. Locally upland fringes NYM	Airborne insects, notably moths and beetles, plus other invertebrates	Birds forage widely (regularly >3km from breeding territories) over woodland, heathland, wetland habitats
	Hobby	Woodland and hedgerow trees, often in old corvid nests.	Absent from upland areas. Coincident breeding areas include: Brecks, New Forest,	Small birds and large insects (esp dragonflies)	Any open country, but often over or near water where typical prey concentrates

			Dorset heaths, Thorne moors, Welsh Borders		
	Grey partridge	Lowland farmland, but also small poplations on the upland fringe and lowland heathland	Infrequent overlap with relevant habitat	omnivorous	
	Redshank	Grazing marsh	Limited overlap	invertebrates	
Upland moorland	Twite	Open habitat. In South Pennines, typically nest on moorland edge but feed on in-bye pastures/meadows	In England only likely to coincide in S Pennines and Peak Dist. Small areas in Cheviots. No coincidence in any areas S England and S Wales	Small weed seeds	Flower-rich pastures, hay meadow and other weedy areas
	Meadow pipit	Open habitat, usually grass dominated	Significant widespread overlap	invertebrates	
	Wheatear	Open habitat usually grass dominated often with thin soils and bare rock/.scree	Partial overlap	invertebrates	
	Ring ouzel	Open habitat usually with rocky outcrops and grass lawns	Restricted overlap	invertebrates	
	Red Grouse	Open habitat	Lake District, Northumberland,North and South Pennines, NYM, Staffordshire Moors, Peak District	Adults and chicks young heather,cotton grass, bilberry, cereals; chicks invertebrates	Open moor, not bracken
	Black grouse	Open habitat, but also uses areas of scrub/woodland (the later particularly during the winter when feeding on buds)	Population now very localised due to population decline but numbers starting to increase/spread slowly following recovery action	In spring adults feed on cotton grass flower buds, clover, buttercups, sorrel, marsh marigold and other herbs. Chicks feed on inverts (especially sawfly larvae)	Adults live in blanket bog and in-bye land in spring. After hatching, chicks are taken to invertebrate-rich wet flushes
	Golden plover	Open habitat	Limited overlap	Soil invertebrates	
	snipe	Open wetland grassland habitat	Very limited overlap	Soil invertebrates	
	curlew	Open habitat	Partial overlap	Soil invertebrates	
	merlin	Open habitat with low shrub	Partial overlap	Small passerines	
Woodland	Bullfinch	Scrub, open woodland, woodland edge	Limited overlap in few lowland locations	Adults - plant material. Young are fed a mix of seeds and inverts	Feeds in trees, shrubs and on nearly herbaceous plants
	Tree sparrow	Woodland / scrub fringe, hedgerows	Absent from uplands. Absent from most S lowland locations s of Thames/ Bristol channel. Likely occurrence lowland fringe NYM	Granivorous, mostly small weed seeds. Insectivorous in breeding season	
	Spotted flycatcher	Scrub, open woodland, hedgerows	Limited overlap	insectivorous	

	Tree pipit		Partial overlap	invertebrates	
	robin		Significant overlap	omnivorous	
	Blackbird		Significant overlap	omnivorous	
	Song thrush		Significant overlap	omnivorous	
	Dunnock		Significant overlap	omnivorous	
	Redstart	Open woodland s and scrub. Requires holes for nesting but forages in open areas	Limited overlap	insectivorous	
	Wood warbler		Limited overlap	invertebrates	
	Pied Flycatcher	Open woodland. Requires holes for nesting but forages in open areas	Some overlap in northern and western parts of range	invertebrates	
	Species below are not in Joys and Crick, but Atlas records coincide with bracken treatment areas in Fig 1				
	Dartford warbler		Significant overlap	invertebrates	Gorse. Unlikely to forage in dense bracken (Brown and Grice 2005)
	Grasshopper warbler		Limited overlap	invertebrates	Dense low ground cover, esp coarse grasses and brambles
	Lesser redpoll		Potentially significant overlap	omnivorous	Birch seeds from July; flowers and seeds of sallow & bud dwelling insects
	Short eared owl		Potentially significant overlap	Bird of prey	
	Pied flycatcher		Limited overlap	invertebrates	Open canopy woodland with sparse shrub layer
	Reed bunting		Significant overlap	omnivorous	Feeds on ground. Invertebrates and seeds
	woodcock		Potentially significant overlap	invertebrates	Almost exclusively within woodland during breeding season (Brown and Grice 2005)
	Stock dove		Limited overlap		Lightly vegetated areas. Not dense bracken
	Coal tit		Limited overlap	omnivorous	Feeds in canopy of conifer, on ground in deciduous woods

Annex 2: Main breeding periods for birds in selected habitats which coincide with bracken spray areas indicated in Fig 1 (Joys and Crick 2004) and where there is a plausible link to feeding in such areas. These have been separated into different habitat types because subsequent risk management may apply differently to these areas. NB the list includes only those species for which nest records have provided sufficient data.

Additional species are included in Table nn below. The latest period under columns “eggs” and “Eggs and chicks” were used to determine risk of overlap with spray applications. The period “chicks” was considered too late to affect egg shell formation.

KEY:				Eggs			Eggs and chicks									Chicks										
Species					░	░	░	░	▒	▒	▒	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓					

Main breeding periods for selected lowland heathland birds

	Feb		March				April				May				June				July				Aug			
Woodlark					░	░	░	░	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓	▓							
Stonechat						░	░	░	░	▒	▒	▒	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓	▓			
Meadow Pipit									░	░	░	░	▒	▒	▒	▒	▓	▓	▓	▓	▓					
Linnet									░	░	░	░	▒	▒	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓		
Skylark									░	░	░	░	▒	▒	▒	▒	▒	▒	▒	▓	▓	▓				
Tree Pipit											░	░	░	░	▒	▒	▓	▓	▓	▓	▓					
Whinchat													░	░	░	░	░	▓	▓	▓	▓					
Nightjar														░	░	░	░	░	░	▒	▒	▓	▓	▓	▓	▓
Hobby															░	░	░	░	░	▒	▒	▒	▒	▓	▓	▓

Main breeding periods for selected upland moorland birds

	Feb		March				April				May				June				July				Aug			
Lapwing						░	░	░	░	░	░	░	░	*												
Snipe							░	░	░	░	░	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓	▓	▓			
Golden Plover							░	░	░	░	░	░	░	░	░	▓	▓	▓	▓	▓	▓	▓	▓			
Redshank									░	░	░	░	░	░	░	▓	▓	▓	▓	▓	▓					
Curlew									░	░	░	░	░	░	▒	▒	▒	▓	▓	▓	▓	▓				
Meadow Pipit									░	░	░	░	▒	▒	▒	▒	▓	▓	▓	▓	▓					
Ring Ouzel									░	░	░	░	▒	▒	▒	▒	▓	▓	▓	▓						
Skylark									░	░	░	░	▒	▒	▒	▒	▒	▒	▒	▓	▓	▓				
Wheatear										░	░	░	░	▒	▒	▒	▓	▓	▓							
Yellow Wagtail												░	░	░	░	▒	▒	▒	▓	▓	▓	▓				
Twite												░	░	░	░	░	▒	▒	▒	▓	▓	▓	▓	▓		
Whinchat													░	░	░	░	▓	▓	▓	▓	▓					

* Insufficient data to define period

Main breeding periods of selected grassland birds

	Feb		March				April				May				June				July				Aug			
Lapwing						░	░	░	░	░	░	░	░	*												
Snipe							░	░	░	░	░	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓	▓	▓			
Redshank									░	░	░	░	░	░	░	▓	▓	▓	▓	▓	▓					
Curlew									░	░	░	░	░	░	▒	▒	▒	▓	▓	▓	▓	▓				
Meadow Pipit									░	░	░	░	▒	▒	▒	▒	▓	▓	▓	▓	▓					
Skylark									░	░	░	░	▒	▒	▒	▒	▒	▒	▒	▓	▓	▓				
Yellow Wagtail												░	░	░	░	▒	▒	▒	▓	▓	▓	▓				

* Insufficient data to define period

Main breeding periods of selected lowland farmland / hedgerow / woodland edge birds that may occur within or adjacent to bracken dominated areas

	Feb		March				April				May				June				July				Aug			
Robin					░	░	░	░	░	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓	▓						
Song Thrush					░	░	░	░	░	▒	▒	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓					
Blackbird						░	░	░	░	▒	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓	▓					
Long-tailed Tit						░	░	░	░	░	▓	▓	▓	▓												
Dunnock							░	░	░	░	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓	▓	▓				
Marsh Tit								░	░	░	░	▒	▒	▓	▓	▓										
Chaffinch								░	░	░	░	▒	▒	▒	▓	▓	▓	▓								
Blue Tit								░	░	░	░	▒	▒	▓	▓	▓	▓									
Wren									░	░	░	░	▒	▓	▓	▓	▓	▓								
Willow Tit									░	░	░	░	▒	▓	▓	▓	▓									
Chiffchaff									░	░	░	░	░	▒	▒	▒	▓	▓	▓	▓						
Blackcap										░	░	░	░	▒	▒	▒	▒	▓	▓	▓						
Bullfinch											░	░	░	░	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓	▓	
Willow Warbler											░	░	░	░	▒	▒	▓	▓	▓	▓						
Redstart											░	░	░	░	▓	▓	▓	▓	▓	▓						
Nightingale												░	░	░	░	▓	▓	▓	▓							
Garden Warbler												░	░	░	░	▒	▒	▓	▓	▓						

Wood Warbler												░	░	░	░	▒	▓	▓	▓	▓						
Spotted Flycatcher														░	░	░	░	▒	▒	▒	▓	▓	▓	▓		
Hobby															░	░	░	░	▒	▒	▒	▒	▓	▓	▓	▓

Greenfinch							░	░	░	░	▒	▒	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓	▓	▓		
Chaffinch								░	░	░	░	▒	▒	▒	▓	▓	▓	▓								
Linnet									░	░	░	░	▒	▒	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓		
Skylark									░	░	░	░	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓				
Tree Sparrow										░	░	░	░	▒	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓		
Reed Bunting										░	░	░	░	▒	▒	▒	▒	▒	▓	▓	▓					
Goldfinch											░	░	░	░	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓	▓	
Bullfinch											░	░	░	░	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓	▓	
Yellowhammer											░	░	░	░	▒	▒	▒	▒	▒	▒	▒	▓	▓	▓		
Whitethroat											░	░	░	░	▒	▒	▒	▒	▒	▓	▓	▓				
Cirl Bunting												░	░	░	░	▒	▒	▒	▒	▒	▒	▒	▓	▓	▓	▓
Lesser Whitethroat												░	░	░	░	▒	▓	▓	▓	▓	▓					
Yellow Wagtail												░	░	░	░	▒	▒	▒	▓	▓	▓	▓				
Turtle Dove													░	░	░	░	░	▒	▒	▒	▒	▒	▓	▓	▓	▓

* Insufficient data to define period

KEY
Notes: Summarised from a BTO report (Joys & Crick 2004) commissioned by JNCC on behalf of the statutory nature conservation agencies. The aim of the report was to review the breeding periods of selected bird species across a range of habitats in England, based on the records submitted to the BTO’s Nest Record Scheme (see http://www.bto.org/survey/nest_records/index.htm for an introduction to the scheme). For each species, 5, 50, 95 and 100 percentiles for first egg laying dates and fledging dates were used to identify the breeding periods. Where sufficient records were available (ie >100), only records post 1990 were used to take full account of possible changes in the timing of breeding as a consequence of climate change. The breeding periods given in the tables above are based on the 5 and 95 percentiles, ie 90% of all the breeding attempts are included within the shaded areas.

Annex 3: Summary of bracken canopy penetration studies trials carried out by [redacted] – 1991 -2006

Bracken Control. Canopy Penetration of Asulox Applied by Tractor and boom at 11l/ha equivalent ai.

Aisholt Common, Quantock Hills 27.07.1992

Table 1

	Bracken canopy cover at frond top level						
	100%+	90-99%	80-89%	70-79%	60-69%	40 -59%	<40%
% interception*							
Canopy Top (x = 155cm)	96%	96%	94%	96%	96%	96%	94%
SD	0.9	1	1.1	0.9	0.8	1	0.8
100cm	6%	8%	12%	24%	52%	64%	78%
SD	0.6	0.6	0.5	1.2	3.4	3.7	4
50cm	0%	trace	4%	10%	24%	40%	46%
SD	0	0	0.3	0.7	0.9	1.4	1.7
Ground Surface	0%	0%	0%	trace	3%	19%	29%
SD	0	0	0	0	0.2	0.7	1

*measured by the area of the recording card showing dye covering

Bracken Control. Canopy Penetration of Asulox applied by knapsack at 11l/ equivalent ai.

Crowcombe Park, Quantock Hills 02.08.1995

Table 2

	Bracken canopy cover at frond top level						
	100%	90 - 99%	80 - 89%	70 - 79%	60 - 69%	40 -59%	< 40%
% interception*							

Canopy Top (x = 155cm)	88%	90%	90%	92%	86%	88%	90%
SD	1.9	2.1	2.3	1.8	2.4	2.7	1.9
100cm	10%	12%	16%	19%	58%	70%	90%
SD	0.9	0.8	1.1	1.2	2.7	1.3	0.9
50cm	4%	6%	8%	10%	36%	48%	76%
SD	0.2	0.3	0.4	0.4	1	1.1	1.8
Ground surface	6%	7%	10%	12%	14%	29%	48%
SD	0.3	0.4	0.6	0.7	0.6	1	1.6

*measured by the area of the card showing dye covering

Bracken Control. Canopy Penetration of Asulox Aerial Application at 11l/ha.

Bicknoller, Quantock Hills 06.08.2004

Table 3

		Bracken canopy cover at frond top level					
	100%	90 - 99%	80 - 89%	70 - 79%	60 - 69%	40 - 59%	< 40%
% interception*							
Canopy Top (x = 155cm)	92%	86%	84%	86%	86%	88%	90%
SD	0.9	0.9	1.1	0.8	1	1.2	1.4
100cm	12%	18%	26%	32%	68%	86%	85%
SD	0.7	0.9	1.1	1.3	1.8	1.9	1.8
50cm	6%	10%	14%	21%	32%	42%	48%
SD	0.5	0.6	0.9	1	1.2	1.3	1.5

Ground Surface	2%	3%	3%	6%	18%	29%	38%
SD	0.1	0.2	0.2	0.4	0.7	0.8	0.9

*measured by the area of the card showing dye covering

Annex 4: description of field studies for bracken spray canopy penetration data in Annex 3

QUANTOCK HILLS BRACKEN (*Pteridium aquilinum*) CONTROL 1991 to 2005

A note on canopy penetration trials and monitoring using two ground based and one aerial application technique to inform new trials scheduled for 2021 as part of the current National Bracken Chemical Control Programme Trials.

[redacted]

December 2020

Background

This note has been produced as a summary of partially reworked and updated trials carried out to varying standards of GEP and GLP between 1992 and 2005. The observations on canopy penetration were incidental to commercial bracken control work rather than a central objective. Nevertheless, the output provides some useful indication of the role canopy penetration may play in residues in food items and will help with the more precise work currently planned for the summer of 2021

The Quantocks Surveys

The three trials discussed below are not intended as a formal study but were observations undertaken as part of bracken control activities for different management reasons over a period of time within the Quantock Hills AONB.

Summary of methodology:

The location of the three trial sites, are summarised in the attached tables (Annex 3). All three of the stands had bracken canopies with broadly similar height (between 150 and 160cm) at the time of spraying and frond/stipe density m2 (24 to 30m2) was comparable. All of the sites selected were on west-south west facing slopes of 5 to 12 degrees and large enough to cover a range of percentages of canopy cover (Tables 1 to 3). The same red vegetable marker dye was mixed in the sprayed solutions, although a more stable alternative was used on another part of the Quantocks and showed some variation against the dye also used in 1992and 1995. Asulox application rate was at the equivalent of 11l/ha ai Asulox, irrespective of dilution and total volume rates dictated by the method of application. The same semi pervious matt sensitive 15 x 15cm cards were used and all figures were derived from 10 profiles in each of the canopy categories within each of the three treatment sites (a total of 7 canopy sites x 3 treatment sites/times with 10 replicates in each of the 7 canopy types, each replicate consisting of ne card at 155cm, 100cm, 50cm and ground surface, so 7x10x4x3 = 840 cards). All of the ‘interception’ data relates to the % cover of staining of the total card area and does not necessarily reflect the actual quantities of ai involved. In each card profile within the canopy (canopy, 100cm, 50cm and ground surface) the cards were offset from each other to avoid 'dribble' contamination from the card above. No specific fixed quadrats were established in a one-off sampling exercise on each of the three locations and all sites were easily accessible on the ground.

Protocols were different on the three locations:
The tractor based application on **Aisholt Common** (table 1) was carried out by the local farmer in collaboration with the Quantocks AONB authority. The bracken was sprayed on 28.07.1992 using a standard 40' boom and tractor spray rig. There was no choice involved in selecting the location for trial purposes, but it was possible to mark up sample areas of the key canopy categories ahead of the spraying and to locate 10 replicate profile samples in each of the categories. It is likely that the variable angles of the booms, motion over the ground, variation in flow (individual nozzles not calibrated and standardised), possible inconsistent asulox, water and vegetable dye mixture and variable ground speed/volume application reduced data reliability, but the variation in data between replicates in the same category was very limited (data are available). The booms were at least 30cm above the canopy top, so there was no perturbation of the fronds, but there were tractor wheel tramlines and sample points were located at least 1m away from the lines.

The knapsack/hand held lance application at **Crowcombe** (table 2) took place on 02.08.1995 as part of a planned control programme by two local graziers, again mainly using tractor and boom, over an area of approximately 0.8ha. Two operatives, each with a 12l back pack and a hand- held lance, walked three 100m long and 10m apart paths with one spraying a swath 2.5m wide to the left of the path and the other spraying a 2.5m swath to the right. The various replicate points were located 1m away from the path. Volumes were correctly calibrated, and the Asulox, water and dye mix was consistent.
The operators were spraying laterally over the vegetation and had to hold the lances at almost shoulder height, which caused some canopy perturbation on an irregular basis and resulted in more chemical reaching the lower sample points directly rather than percolating down from an undisturbed canopy, as at Aisholt.

The aerial application at **Bicknoller** (table 3) was part of an AONB wide multi-partner sponsored bracken control programme based on the assessments made by the author in the previous 14 years. Spraying was carried out from a bespoke 7.5m boom and tank kit fitted to a Robinson R44 Raven helicopter on 06.08.2004. There was no integrated visual spraying GPS at that time and sampling was carried out on a random basis within different canopy categories along the 6 x 300m spaying runs involved in this specific trial.
Mixing, nozzle calibration/application rate and meteorological conditions were suitable (warm, dry and a cross wind of 4knots) for the application. The aircraft flew 4m above the ground with an airspeed of 42knots to give exact delivery.
The uniform motion of the aircraft gave a consistent and uniform delivery and the canopy perturbation caused by the rotor downdraft was also uniform across the whole surface being sprayed, an advantage for uniform penetration of the spray mix.

Summary of Results:
The **tractor based application** (Table 1) recorded that at canopy height in all 7 of the canopy %cover categories there was a high level of interception irrespective of the frond density, with the range being from 94 to 96%. This was due to the lack of physical disturbance to the

canopy. At 100cm, which tends to be around the centre point of the frond whorls in a mature bracken plant, good exposure and uptake are desirable for chemical absorption. In the canopy categories with > 80% cover the interception was < 12%, rising to 24% in the 70% cover range and then jumping to over 50% up to 78% interception in the 60% to <40% canopy cover range. Again, in the 80% + canopy cover range low exposure was recorded at either 50cm or ground level, with < 3% reaching the ground layer. Below 60% cover exposure is much greater at 20%+ at ground level due to the low canopy cover and direct travel of chemical mix to ground level.

The **knapsack and lance application** (Table 2) results indicate a slightly more variable interception and significantly lower interception rate at the canopy top level. At the 100cm level absorption is generally higher than tractor/boom especially on the very sparse canopy cover. This pattern is also repeated in the 50cm and especially the ground level data, even under moderate to dense canopy cover. Under the canopy cover <60% the 50cm and ground level exposures are very high, again partly reflecting the open nature but also the lateral input of chemical in parts of the bracken stands with knapsack application, especially in larger, higher and denser stands.

In the **aerial application** (Table 2) canopy level interception was recorded as significantly lower than the tractor/boom application and slightly lower than knapsack spraying. The exposure at 100cm, with the exception of the very sparse canopy, was higher than in both of the other methods. This occurred as a result of the constant level of chemical application coupled with the down draft and resulting uniform perturbation of the canopy giving, overall, the highest levels of canopy penetration and therefore potentially the greatest chemical absorption and highest efficacy and longevity of bracken control. Although higher than the tractor/boom application at the 50cm and ground level samples, penetration is generally lower than the knapsack applications, especially on the sparse canopy (< 40% cover) areas.

General comments

All methods recorded high penetration levels at ground level and sub canopy level where the % canopy cover was less than high 60% especially in habitats where there is a sensitive understory or there are other vulnerable environmental attributes. The canopy penetration profiles of the different application methods, based on this limited and very provisional data, suggest the break point for blanket chemical application of bracken control chemicals as 65%, with anything below that level potentially having more significant penetration below the canopy.

The programme of bespoke trials being undertaken by the author in the summer of 2021 involves three bracken control chemicals, applied from the air and also from horizontal lances of various scales used by hand and from various vehicles for ground based application. This will refine the comments in this note in relation to both efficacy and non- target impact which will report on plants and ground/top soil living invertebrates as well as collecting information on chemical residues at the soil surface. In parallel, other methods of application are being investigated as are a number of adjuvants.

Annex 5: **The Impact of Bracken Control on Moorland Small Mammal Populations**

Introduction

This note summarises unpublished data from research [42] carried out in 1983 & 1984 (the 1983-84 Study)

This summary has been provided by [redacted], who directed this work while working at the North York Moors National Park.

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[42] "The Impact of Bracken Control on Moorland Small Mammal Populations on the North York Moors 1983 and 1984". Directed by Dr Roy Brown (Head of Policy, Research, Resources and Advisory Services North York Moors National Park), in collaboration with Martin Auld (North York Moors NP), Joe Johnson et all (ADAS), the Game Conservancy, Ruth Weaver (MSc/PhD student, University of Durham) and Helen Johnson (BSc student, University of Leeds).

Background

The 1983-84 Study was part of a programme of research into moorland restoration and conservation in the North York Moors, which ran from 1977 to 1990. The purpose of this study was to evaluate the efficacy and wider impact of chemical bracken control on the moorland ecology.

The study area was located on the moorland vegetation at the head of the valley in Glaisdale and out onto the open moorland at Glaisdale Head; it ran from July 1983 to September 1984. It included plots of mixed habitat as well as continuous area of bracken. Sampling carried out by Longworth trapping.

Summary of the 1983-84 Study Results

- The study confirmed the 'drift' of both Wood Mice and Bank Voles during the autumn onto the Bracken and Bilberry habitats on the moor. This was much less marked in the heather and acid grassland.
- Wood Mice accounted for 83% of the total population trapped, with Bank Vole accounting for 16% and 'other small mammals' less than 1% over the project as a whole.
- In 1983, the year of spraying, there was some evidence that the density of the small mammal populations was lower in the bracken beds that had been sprayed and also that the ratio of juvenile to adult animals, especially in the Wood Mice, was lower in the treated bracken areas than in the untreated areas.
- In 1984, one year after spraying, there were very few relative differences[43] and the juvenile to adult ratio (irrespective of actual numbers) showed little, if any variation between all of the habitats in both August and October including sprayed vs unsprayed bracken.

Output from the Study

The output from this work was largely in the form of North York Moors NPA internal reports, between 1984 and 1986, most of the information mentioned has survived only in annual summary documents.

Planned Work

Large scale aerial and ground-based spraying and assessment trials of both Asulox (Asulam) and Squire Ultra (Amidosulfuron) are planned to take place in Northumberland, in the summer of 2021. This programme of research is being undertaken by the author, on behalf of UPL Europe, as the owners of the Asulam Molecule, and in close liaison with the Bracken Control Group that represents a wide range of stakeholders. Bayer, as the owner of the Amidosulfuron molecule, is becoming increasingly involved.

Adjuvant trials are also planned, and in combination with the spraying and assessment trials, the overall objective of this work is to improve efficacy and habitat safety in chemical bracken control.

The Northumberland trial sites could provide a location for further trials to assess the impact of the use of bracken control herbicides on small mammals.

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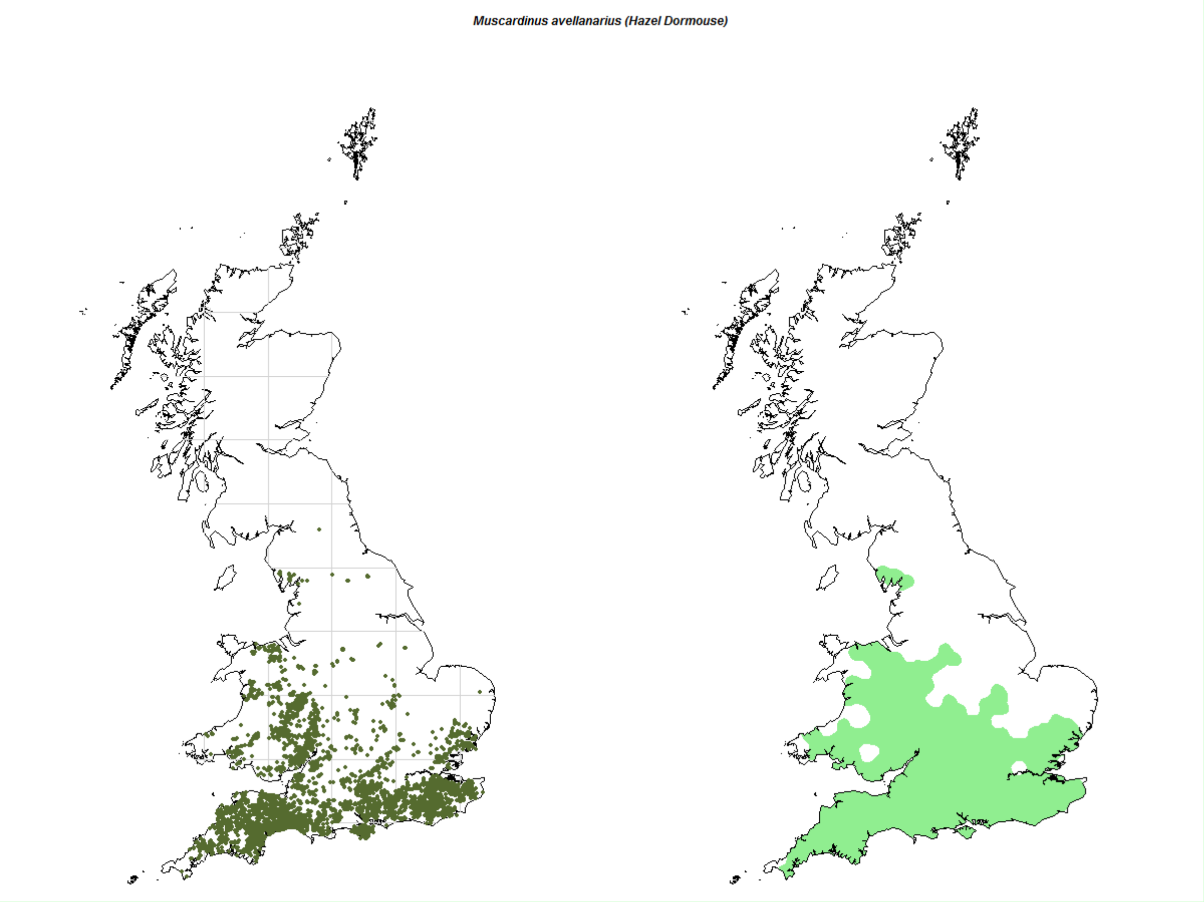
[43] This ignores the expected lower population densities on bare bracken litter areas where the Asulox had over a 99% control efficacy on the bracken

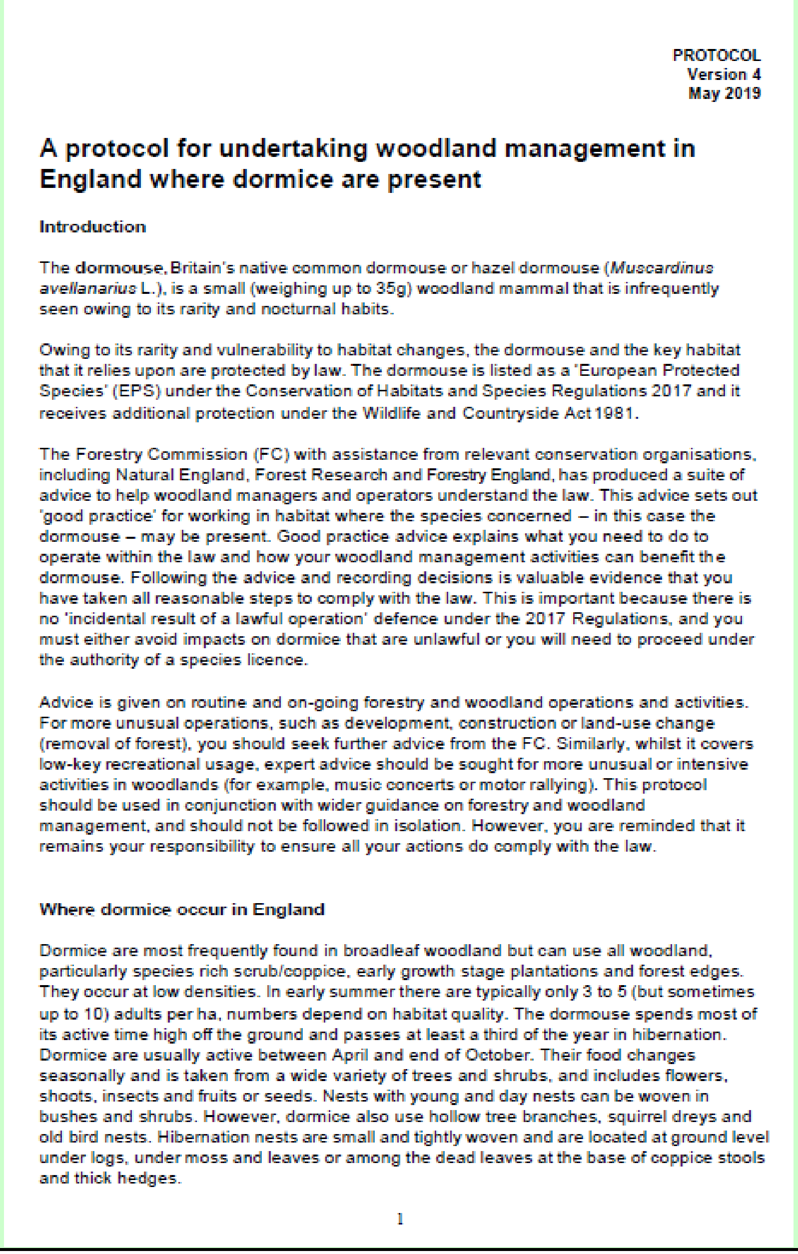
- This work could also investigate the metabolism / health of the small mammals, including the impact of Sheep Tick (*Ixodes Ricinus*).
- During the 1983-84 study, it was noticed on all the bracken areas, treated or untreated, that the adult female engorging burden on Wood Mice was much greater than in any of the other habitats, with Bilberry in a distant second place.

[redacted] 03 January 2021

Annex 6: Dormouse Records and map used for 2018 Review of British Mammals



Annex 3 Dormouse protocol



PROTOCOL
Version 4
May 2019

A protocol for undertaking woodland management in England where dormice are present

Introduction

The **dormouse**, Britain's native common dormouse or hazel dormouse (*Muscardinus avellanarius* L.), is a small (weighing up to 35g) woodland mammal that is infrequently seen owing to its rarity and nocturnal habits.

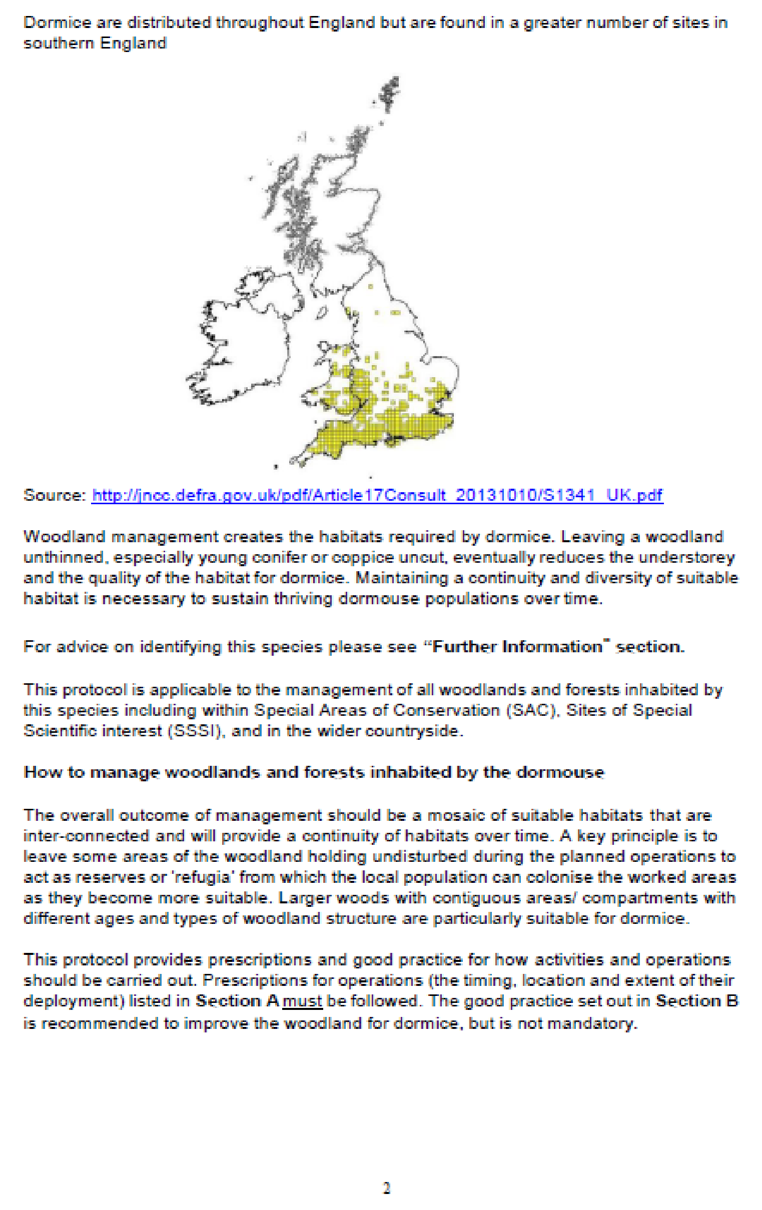
Owing to its rarity and vulnerability to habitat changes, the dormouse and the key habitat that it relies upon are protected by law. The dormouse is listed as a 'European Protected Species' (EPS) under the Conservation of Habitats and Species Regulations 2017 and it receives additional protection under the Wildlife and Countryside Act 1981.

The Forestry Commission (FC) with assistance from relevant conservation organisations, including Natural England, Forest Research and Forestry England, has produced a suite of advice to help woodland managers and operators understand the law. This advice sets out 'good practice' for working in habitat where the species concerned – in this case the dormouse – may be present. Good practice advice explains what you need to do to operate within the law and how your woodland management activities can benefit the dormouse. Following the advice and recording decisions is valuable evidence that you have taken all reasonable steps to comply with the law. This is important because there is no 'incidental result of a lawful operation' defence under the 2017 Regulations, and you must either avoid impacts on dormice that are unlawful or you will need to proceed under the authority of a species licence.

Advice is given on routine and on-going forestry and woodland operations and activities. For more unusual operations, such as development, construction or land-use change (removal of forest), you should seek further advice from the FC. Similarly, whilst it covers low-key recreational usage, expert advice should be sought for more unusual or intensive activities in woodlands (for example, music concerts or motor rallying). This protocol should be used in conjunction with wider guidance on forestry and woodland management, and should not be followed in isolation. However, you are reminded that it remains your responsibility to ensure all your actions do comply with the law.

Where dormice occur in England

Dormice are most frequently found in broadleaf woodland but can use all woodland, particularly species rich scrub/coppice, early growth stage plantations and forest edges. They occur at low densities. In early summer there are typically only 3 to 5 (but sometimes up to 10) adults per ha, numbers depend on habitat quality. The dormouse spends most of its active time high off the ground and passes at least a third of the year in hibernation. Dormice are usually active between April and end of October. Their food changes seasonally and is taken from a wide variety of trees and shrubs, and includes flowers, shoots, insects and fruits or seeds. Nests with young and day nests can be woven in bushes and shrubs. However, dormice also use hollow tree branches, squirrel dreys and old bird nests. Hibernation nests are small and tightly woven and are located at ground level under logs, under moss and leaves or among the dead leaves at the base of coppice stools and thick hedges.



Dormice are distributed throughout England but are found in a greater number of sites in southern England

Source: http://jncc.defra.gov.uk/pdf/Article17Consult_20131010/S1341_UK.pdf

Woodland management creates the habitats required by dormice. Leaving a woodland unthinned, especially young conifer or coppice uncut, eventually reduces the understorey and the quality of the habitat for dormice. Maintaining a continuity and diversity of suitable habitat is necessary to sustain thriving dormouse populations over time.

For advice on identifying this species please see "**Further Information**" **section.**

This protocol is applicable to the management of all woodlands and forests inhabited by this species including within Special Areas of Conservation (SAC), Sites of Special Scientific interest (SSSI), and in the wider countryside.

How to manage woodlands and forests inhabited by the dormouse

The overall outcome of management should be a mosaic of suitable habitats that are inter-connected and will provide a continuity of habitats over time. A key principle is to leave some areas of the woodland holding undisturbed during the planned operations to act as reserves or 'refugia' from which the local population can colonise the worked areas as they become more suitable. Larger woods with contiguous areas/ compartments with different ages and types of woodland structure are particularly suitable for dormice.

This protocol provides prescriptions and good practice for how activities and operations should be carried out. Prescriptions for operations (the timing, location and extent of their deployment) listed in **Section A** must be followed. The good practice set out in **Section B** is recommended to improve the woodland for dormice, but is not mandatory.

Applying the prescriptions and best practice requires a consideration of the following 3 questions:

- What is the size and landscape context of the woodland holding to be managed?
- What is the quality of the habitat for dormice and where is it located within the woodland holding?
- At what time of the 'dormouse year' is the woodland activity or operation to take place?

Size and landscape context of the woodland holding to be managed?

For the purposes of this protocol a 'woodland holding' refers to all the wooded area the owner/manager has under their control and which lies close together and not separated by more than 500 m.

- A small and isolated woodland holding is defined as being <20 ha in size and >500 m from adjacent woodlands or hedgerows.
- A large woodland holding is either a single woodland >20 ha in size or a series of connected woodlands (non-isolated woodlands covering at least this area)

The size ('small and isolated' or 'large') of the woodland holding containing the areas to be managed needs to be determined.

What is the quality of the habitat for dormice and where is it located within the woodland holding?

The main habitat for dormice is broadleaved woodland, with either a thicket coppice structure or mature woodland with a good understorey. However, they are sometimes found in mixed conifer plantations, especially those on ancient woodland sites. They may also be present in ride edges and shrubby glades, in scrub and thick hedgerows connected to woodland, and temporarily open areas within plantations.

The 'within woodland' habitat features listed in Table 1 are used to define dormouse habitat as: 'favourable' (habitat with many of the favourable features), or 'unfavourable' (habitat with a majority of unfavourable features). This protocol also refers to 'marginal' (habitat having only a few of the favourable features). Woods with an abundance of the favourable features are more likely to contain dormice, and are also likely to have higher populations and densities.

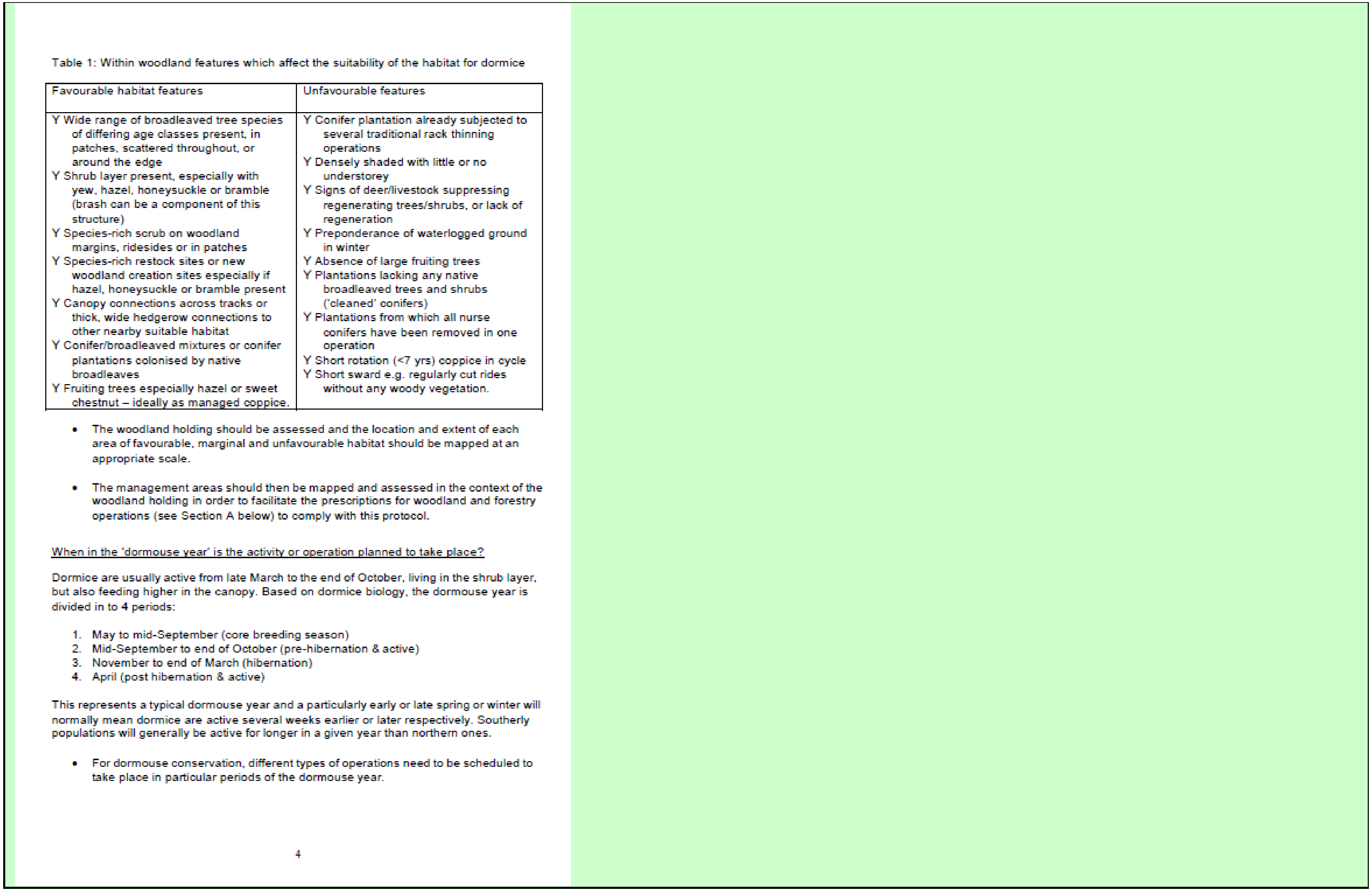


Table 1: Within woodland features which affect the suitability of the habitat for dormice

Favourable habitat features	Unfavourable features
Y Wide range of broadleaved tree species of differing age classes present, in patches, scattered throughout, or around the edge Y Shrub layer present, especially with yew, hazel, honeysuckle or bramble (brash can be a component of this structure) Y Species-rich scrub on woodland margins, ridesides or in patches Y Species-rich restock sites or new woodland creation sites especially if hazel, honeysuckle or bramble present Y Canopy connections across tracks or thick, wide hedgerow connections to other nearby suitable habitat Y Conifer/broadleaved mixtures or conifer plantations colonised by native broadleaves Y Fruiting trees especially hazel or sweet chestnut – ideally as managed coppice.	Y Conifer plantation already subjected to several traditional rack thinning operations Y Densely shaded with little or no understorey Y Signs of deer/livestock suppressing regenerating trees/shrubs, or lack of regeneration Y Preponderance of waterlogged ground in winter Y Absence of large fruiting trees Y Plantations lacking any native broadleaved trees and shrubs ('cleaned' conifers) Y Plantations from which all nurse conifers have been removed in one operation Y Short rotation (<7 yrs) coppice in cycle Y Short sward e.g. regularly cut rides without any woody vegetation.

- The woodland holding should be assessed and the location and extent of each area of favourable, marginal and unfavourable habitat should be mapped at an appropriate scale.

- The management areas should then be mapped and assessed in the context of the woodland holding in order to facilitate the prescriptions for woodland and forestry operations (see Section A below) to comply with this protocol.

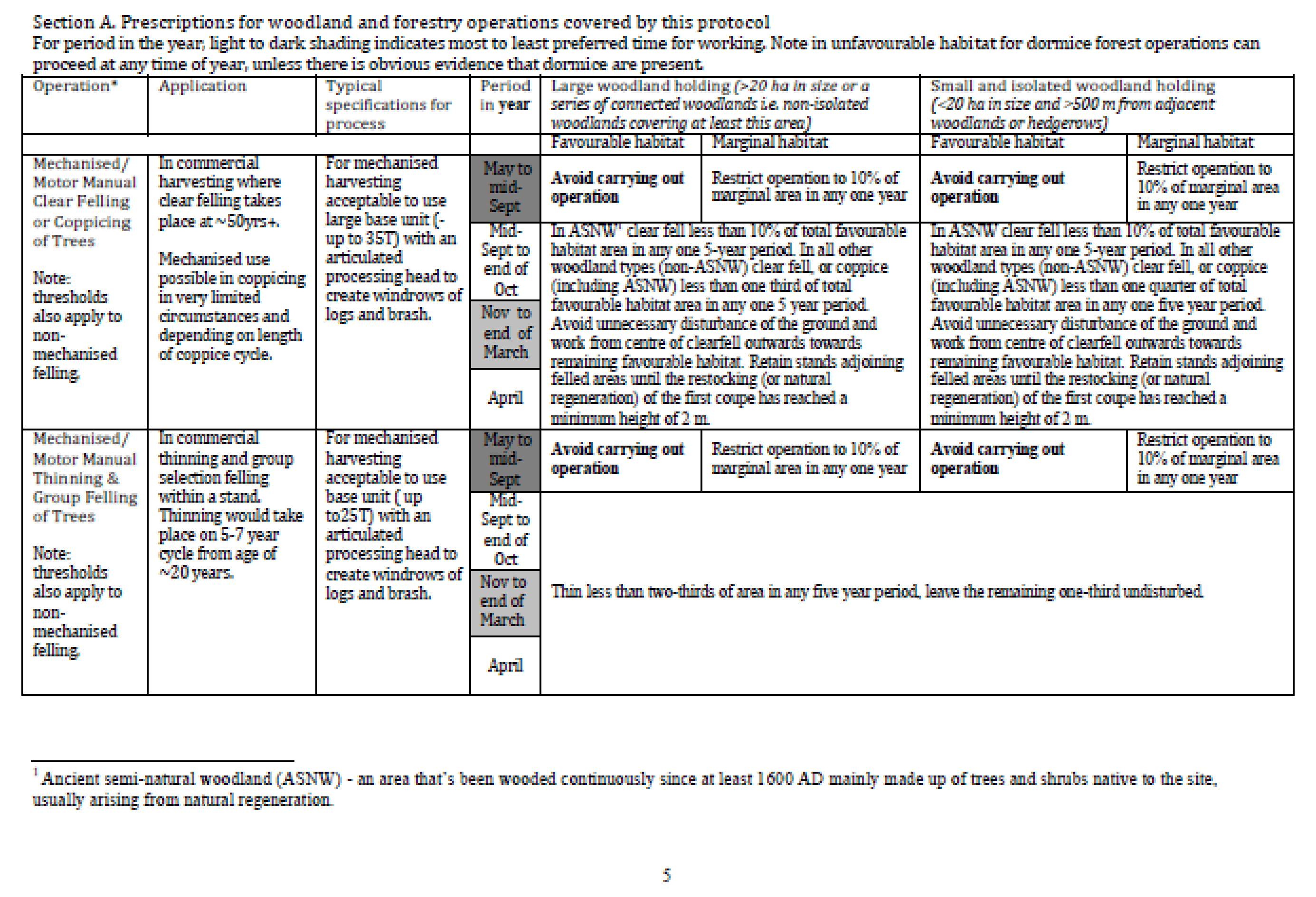
When in the 'dormouse year' is the activity or operation planned to take place?

Dormice are usually active from late March to the end of October, living in the shrub layer, but also feeding higher in the canopy. Based on dormice biology, the dormouse year is divided in to 4 periods:

1. May to mid-September (core breeding season)
2. Mid-September to end of October (pre-hibernation & active)
3. November to end of March (hibernation)
4. April (post hibernation & active)

This represents a typical dormouse year and a particularly early or late spring or winter will normally mean dormice are active several weeks earlier or later respectively. Southerly populations will generally be active for longer in a given year than northern ones.

- For dormouse conservation, different types of operations need to be scheduled to take place in particular periods of the dormouse year.



Section A. Prescriptions for woodland and forestry operations covered by this protocol

For period in the year, light to dark shading indicates most to least preferred time for working. Note in unfavourable habitat for dormice forest operations can proceed at any time of year, unless there is obvious evidence that dormice are present.

Operation*	Application	Typical specifications for process	Period in year	Large woodland holding *(>20 ha in size or a series of connected woodlands i.e. non-isolated woodlands covering at least this area)*		Small and isolated woodland holding *(<20 ha in size and >500 m from adjacent woodlands or hedgerows)*	
				Favourable habitat	Marginal habitat	Favourable habitat	Marginal habitat
Mechanised/ Motor Manual Clear Felling or Coppicing of Trees Note: thresholds also apply to non-mechanised felling.	In commercial harvesting where clear felling takes place at ~50yrs+. Mechanised use possible in coppicing in very limited circumstances and depending on length of coppice cycle.	For mechanised harvesting acceptable to use large base unit (- up to 35T) with an articulated processing head to create windrows of logs and brash.	May to mid-Sept	**Avoid carrying out operation**	Restrict operation to 10% of marginal area in any one year	**Avoid carrying out operation**	Restrict operation to 10% of marginal area in any one year
			Mid-Sept to end of Oct	In ASNW[1] clear fell less than 10% of total favourable habitat area in any one 5-year period. In all other woodland types (non-ASNW) clear fell, or coppice (including ASNW) less than one third of total favourable habitat area in any one 5 year period. Avoid unnecessary disturbance of the ground and work from centre of clearfell outwards towards remaining favourable habitat. Retain stands adjoining felled areas until the restocking (or natural regeneration) of the first coupe has reached a minimum height of 2 m.		In ASNW clear fell less than 10% of total favourable habitat area in any one 5-year period. In all other woodland types (non-ASNW) clear fell, or coppice (including ASNW) less than one quarter of total favourable habitat area in any one five year period. Avoid unnecessary disturbance of the ground and work from centre of clearfell outwards towards remaining favourable habitat. Retain stands adjoining felled areas until the restocking (or natural regeneration) of the first coupe has reached a minimum height of 2 m.	
			Nov to end of March				
			April				
Mechanised/ Motor Manual Thinning & Group Felling of Trees Note: thresholds also apply to non-mechanised felling.	In commercial thinning and group selection felling within a stand. Thinning would take place on 5-7 year cycle from age of ~20 years.	For mechanised harvesting acceptable to use base unit (up to25T) with an articulated processing head to create windrows of logs and brash.	May to mid-Sept	**Avoid carrying out operation**	Restrict operation to 10% of marginal area in any one year	**Avoid carrying out operation**	Restrict operation to 10% of marginal area in any one year
			Mid-Sept to end of Oct	Thin less than two-thirds of area in any five year period, leave the remaining one-third undisturbed.			
			Nov to end of March				
			April				

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[1] Ancient semi-natural woodland (ASNW) - an area that's been wooded continuously since at least 1600 AD mainly made up of trees and shrubs native to the site, usually arising from natural regeneration.

5

Operation*	Application	Typical specifications for process	Period in year	Large woodland holding		Small and isolated woodland holding	
				Favourable habitat	Marginal habitat	Favourable habitat	Marginal habitat
Extraction	Post-felling/coppicing/thinning removal of timber (logs) from the felling site to a stacking/loading point.	Acceptable to use self-loading forwarder. Typically a tractor based multi-wheeled vehicle (up to30T) which loads timber onto the carrying bed with a self-propelled grab. Note: Care should be taken to avoid causing permanent damage to ancient woodland soils. See Practice Guide[2] *Managing ancient and native woodland in England* for further advice.	May to mid-Sept	Where possible extract material using a forwarder rather than a skidder and minimize extraction routes. On steep slopes where skidding or high leading is the only practical option avoid extraction during winter months in favourable habitat. Place timber stacks where there is a hard standing or where vegetation is short. Where there is shrubby vegetation adjacent, remove stacks promptly following felling between November and March.			
			Mid-Sept to end of Oct				
			Nov to end of March				
			April				

Operation*	Application	Typical specifications for process	Period in year	Large woodland holding		Small and isolated woodland holding	
				Favourable habitat	Marginal habitat	Favourable habitat	Marginal habitat
Stacking	Sorting and temporary storage of timber produce on or adjacent to hard surface loading bay or road/track within the woodland.	Acceptable for a forwarder using the self-propelled grab to place and sort timber prior to loading and dispatch by a road-going haulage vehicle (for example, timber lorry).	May to mid-Sept	Place timber stacks where there is a hard standing or where vegetation is short. Where there is shrubby vegetation adjacent, remove stacks promptly following felling between November and March.			
			Mid-Sept to end of Oct				
			Nov to end of March				
			April				

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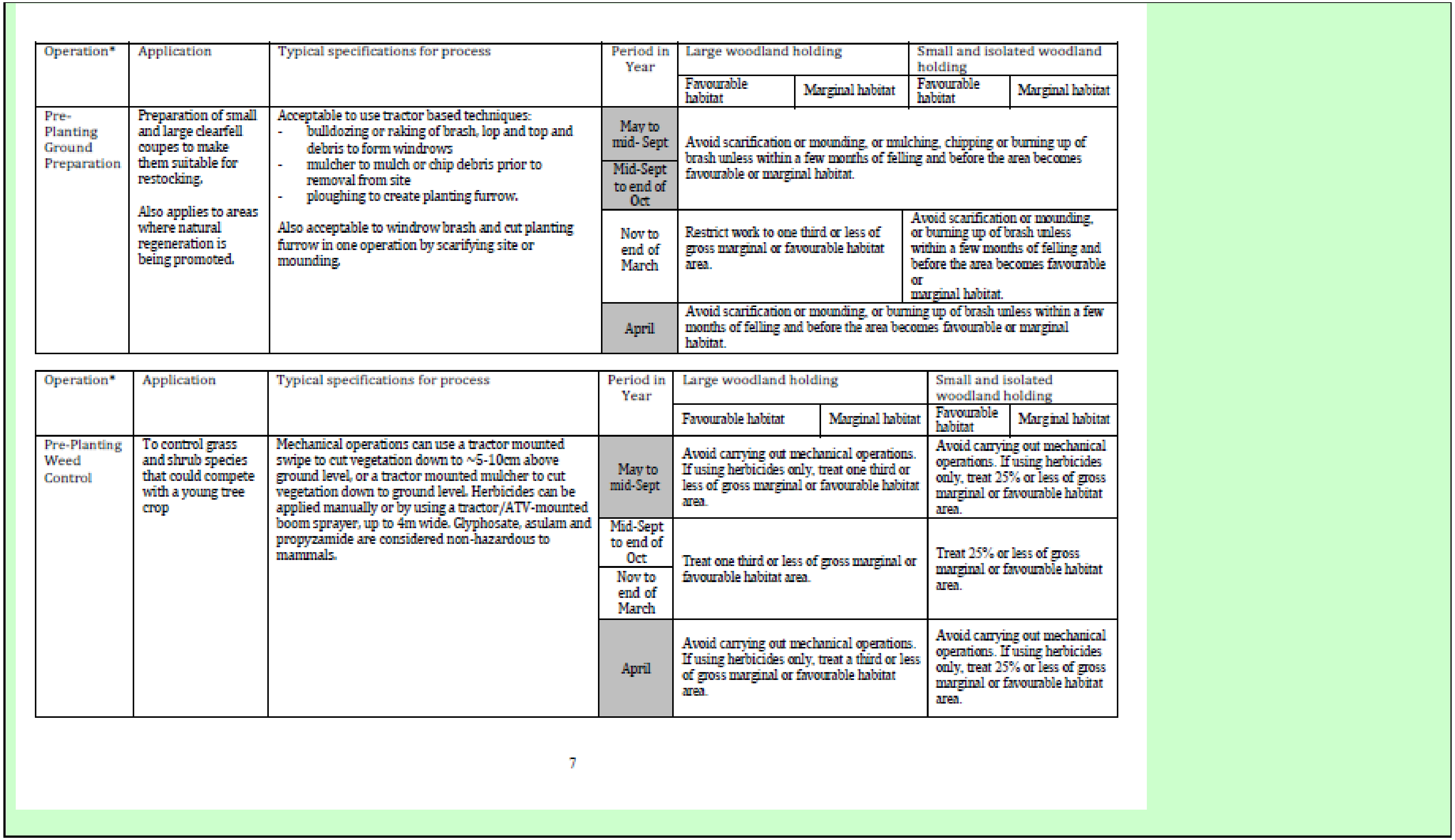
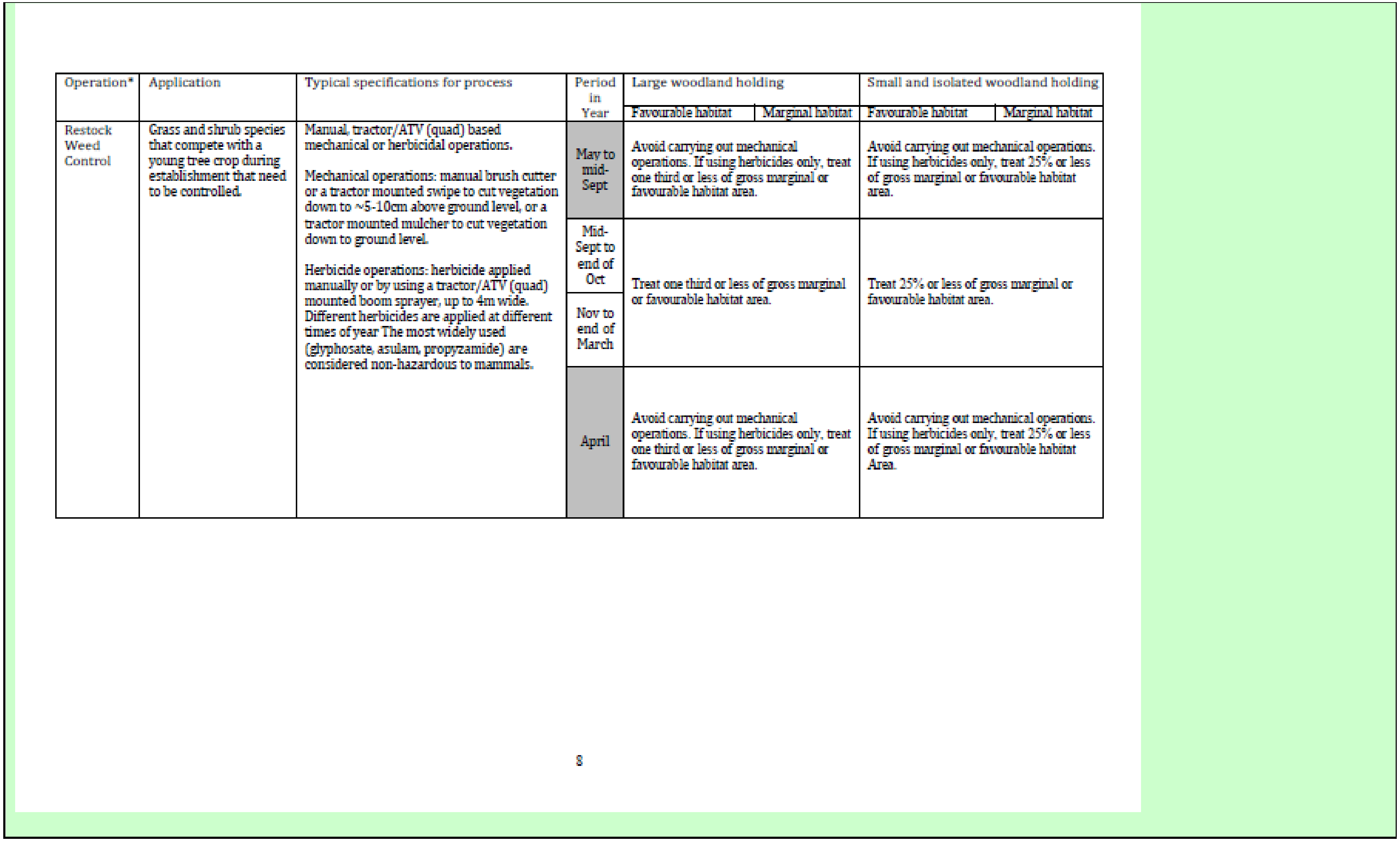
[2] https://www.gov.uk/government/publications/managing-ancient-and-native-woodland-in-england

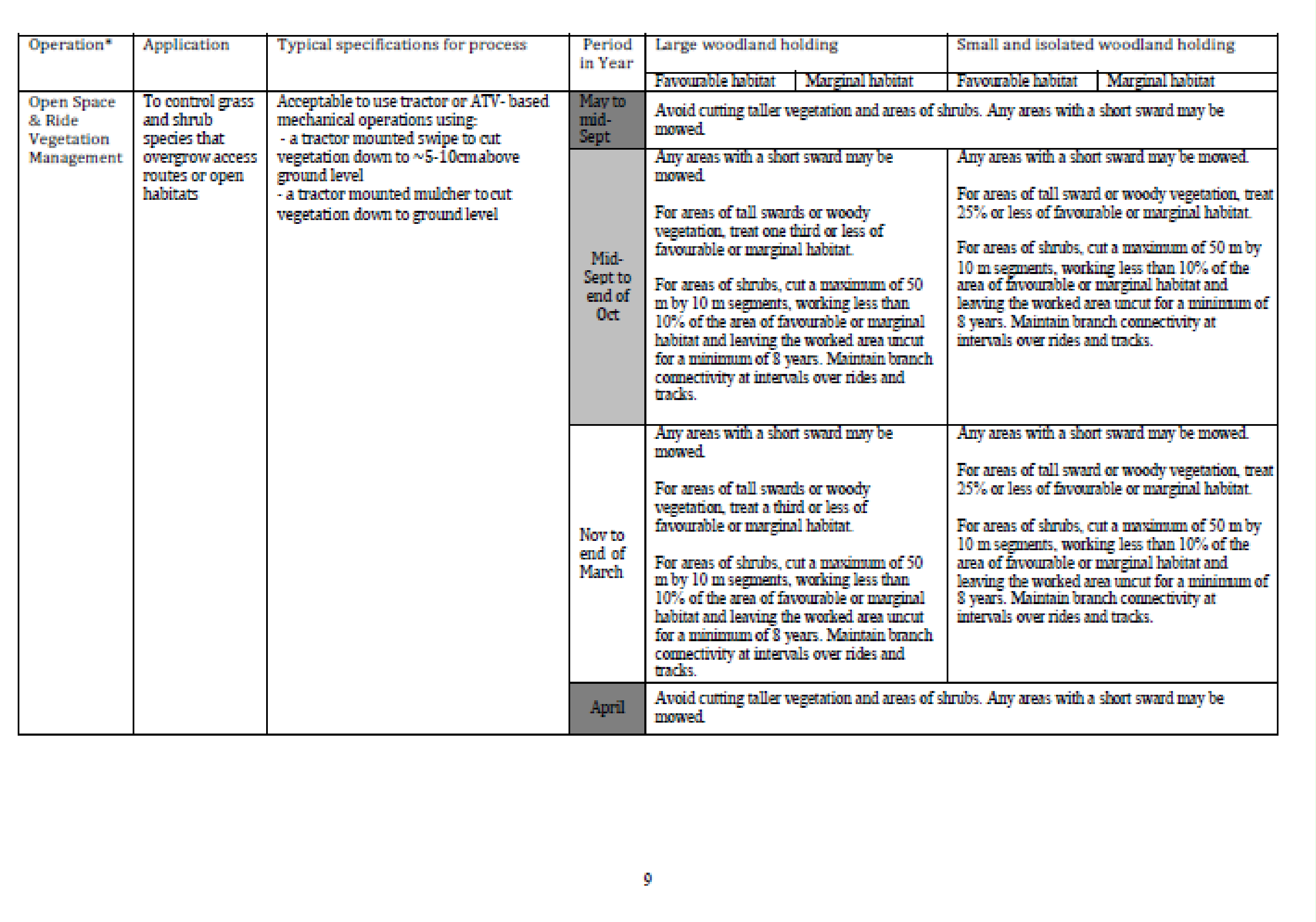


Operation*	Application	Typical specifications for process	Period in Year	Large woodland holding		Small and isolated woodland holding	
				Favourable habitat	Marginal habitat	Favourable habitat	Marginal habitat
Pre-Planting Ground Preparation	Preparation of small and large clearfell coupes to make them suitable for restocking. Also applies to areas where natural regeneration is being promoted.	Acceptable to use tractor based techniques: - bulldozing or raking of brash, lop and top and debris to form windrows - mulcher to mulch or chip debris prior to removal from site - ploughing to create planting furrow. Also acceptable to windrow brash and cut planting furrow in one operation by scarifying site or mounding.	May to mid-Sept	Avoid scarification or mounding, or mulching, chipping or burning up of brash unless within a few months of felling and before the area becomes favourable or marginal habitat.			
			Mid-Sept to end of Oct				
			Nov to end of March	Restrict work to one third or less of gross marginal or favourable habitat area.		Avoid scarification or mounding, or burning up of brash unless within a few months of felling and before the area becomes favourable or marginal habitat.	
			April	Avoid scarification or mounding, or burning up of brash unless within a few months of felling and before the area becomes favourable or marginal habitat.			

Operation*	Application	Typical specifications for process	Period in Year	Large woodland holding		Small and isolated woodland holding	
				Favourable habitat	Marginal habitat	Favourable habitat	Marginal habitat
Pre-Planting Weed Control	To control grass and shrub species that could compete with a young tree crop	Mechanical operations can use a tractor mounted swipe to cut vegetation down to ~5-10cm above ground level, or a tractor mounted mulcher to cut vegetation down to ground level. Herbicides can be applied manually or by using a tractor/ATV-mounted boom sprayer, up to 4m wide. Glyphosate, asulam and propyzamide are considered non-hazardous to mammals.	May to mid-Sept	Avoid carrying out mechanical operations. If using herbicides only, treat one third or less of gross marginal or favourable habitat area.		Avoid carrying out mechanical operations. If using herbicides only, treat 25% or less of gross marginal or favourable habitat area.	
			Mid-Sept to end of Oct	Treat one third or less of gross marginal or favourable habitat area.		Treat 25% or less of gross marginal or favourable habitat area.	
			Nov to end of March				
			April	Avoid carrying out mechanical operations. If using herbicides only, treat a third or less of gross marginal or favourable habitat area.		Avoid carrying out mechanical operations. If using herbicides only, treat 25% or less of gross marginal or favourable habitat area.	



Operation*	Application	Typical specifications for process	Period in Year	Large woodland holding		Small and isolated woodland holding	
				Favourable habitat	Marginal habitat	Favourable habitat	Marginal habitat
Restock Weed Control	Grass and shrub species that compete with a young tree crop during establishment that need to be controlled.	Manual, tractor/ATV (quad) based mechanical or herbicidal operations. Mechanical operations: manual brush cutter or a tractor mounted swipe to cut vegetation down to ~5-10cm above ground level, or a tractor mounted mulcher to cut vegetation down to ground level. Herbicide operations: herbicide applied manually or by using a tractor/ATV (quad) mounted boom sprayer, up to 4m wide. Different herbicides are applied at different times of year The most widely used (glyphosate, asulam, propyzamide) are considered non-hazardous to mammals.	May to mid-Sept	Avoid carrying out mechanical operations. If using herbicides only, treat one third or less of gross marginal or favourable habitat area.		Avoid carrying out mechanical operations. If using herbicides only, treat 25% or less of gross marginal or favourable habitat area.	
			Mid-Sept to end of Oct	Treat one third or less of gross marginal or favourable habitat area.		Treat 25% or less of gross marginal or favourable habitat area.	
			Nov to end of March				
			April	Avoid carrying out mechanical operations. If using herbicides only, treat one third or less of gross marginal or favourable habitat area.		Avoid carrying out mechanical operations. If using herbicides only, treat 25% or less of gross marginal or favourable habitat Area.	



Operation*	Application	Typical specifications for process	Period in Year	Large woodland holding		Small and isolated woodland holding	
				Favourable habitat	Marginal habitat	Favourable habitat	Marginal habitat
Open Space & Ride Vegetation Management	To control grass and shrub species that overgrow access routes or open habitats	Acceptable to use tractor or ATV- based mechanical operations using: - a tractor mounted swipe to cut vegetation down to ~5-10cm above ground level - a tractor mounted mulcher to cut vegetation down to ground level	May to mid-Sept	Avoid cutting taller vegetation and areas of shrubs. Any areas with a short sward may be mowed.			
			Mid-Sept to end of Oct	Any areas with a short sward may be mowed. For areas of tall swards or woody vegetation, treat one third or less of favourable or marginal habitat. For areas of shrubs, cut a maximum of 50 m by 10 m segments, working less than 10% of the area of favourable or marginal habitat and leaving the worked area uncut for a minimum of 8 years. Maintain branch connectivity at intervals over rides and tracks.		Any areas with a short sward may be mowed. For areas of tall sward or woody vegetation, treat 25% or less of favourable or marginal habitat. For areas of shrubs, cut a maximum of 50 m by 10 m segments, working less than 10% of the area of favourable or marginal habitat and leaving the worked area uncut for a minimum of 8 years. Maintain branch connectivity at intervals over rides and tracks.	
			Nov to end of March	Any areas with a short sward may be mowed. For areas of tall swards or woody vegetation, treat a third or less of favourable or marginal habitat. For areas of shrubs, cut a maximum of 50 m by 10 m segments, working less than 10% of the area of favourable or marginal habitat and leaving the worked area uncut for a minimum of 8 years. Maintain branch connectivity at intervals over rides and tracks.		Any areas with a short sward may be mowed. For areas of tall sward or woody vegetation, treat 25% or less of favourable or marginal habitat. For areas of shrubs, cut a maximum of 50 m by 10 m segments, working less than 10% of the area of favourable or marginal habitat and leaving the worked area uncut for a minimum of 8 years. Maintain branch connectivity at intervals over rides and tracks.	
			April	Avoid cutting taller vegetation and areas of shrubs. Any areas with a short sward may be mowed.			

EPS Checklist/ Woodland Management Plan

A checklist - **European Protected Species and woodland operations – version 4** has been developed to guide woodland owners and managers through the decision-making process of seeking grant or felling permission approvals.

Immediately prior to woodland management operations taking place an **Operational Site Assessment Form** should be filled in. This has also been developed to help woodland owners and managers consider the potential impacts of operations on site features including EPS and identify the measures required to follow good practice.

For more information on EPS (including access to the above checklists) and the steps land managers should take to safeguard them, please see our EPS web page. https://www.gov.uk/guidance/manage-and-protect-woodland-wildlife

The Woodland Management Plan must be approved by the Forestry Commission, before operations that could impact dormice begin, and it must be implemented as approved. The Woodland Management Plan and EPS Checklist must specify how a network of sufficient, suitable, high quality habitat will be maintained or improved to maintain favourable conservation status for dormice within the woodland area.

Section B. Good practice for woodland and forestry operations to help conserve dormice

The following operations should improve your woodland for dormice:

- Work to improve connections between areas of habitat within the woodland unit by developing a network of connecting strips or belts of scrub, or retaining and promoting canopy contact ('pinch-points' or 'bridges') over rides
- Creating a network of woodland habitat across the landscape, linking isolated woodland by creating new woodland and dense hedges
- Enhance the shrub layer and understorey by coppicing, thinning or group felling to open up canopy gaps and promote woodland regeneration
- Control or exclude livestock or deer to ensure adequate understorey and ground vegetation
- Favouring broadleaves when thinning stands of conifer

Specific advice should be sought from Natural England if particularly significant or important populations of dormice are present in proposed work areas, to ensure operations are appropriate.

What about other protected species which might be present in the woodland?

This guidance should be used in conjunction with wider guidance on forestry and woodland management, and should not be followed in isolation. Managers should be aware that there is the potential for more than one protected species in their woodland, which for example may support bats and dormice, and will need to follow the approved guidance for each of the species present.

Sources of further information

Forestry Commission England European Protected Species web pages: https://www.gov.uk/guidance/manage-and-protect-woodland-wildlife

Bright, P., Morris, P. & Mitchell-Jones, T. (2006) *The dormouse conservation handbook*. Second edition. pp74. English Nature, Peterborough. (NB Pre 2007 legislative changes).

Strachan, R., Miller, H. (2014) European Protected Species in Woodlands – A Field Guide. Forestry Commission England. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/717302/v.6_EPSW_A6_booklet_2018.pdf

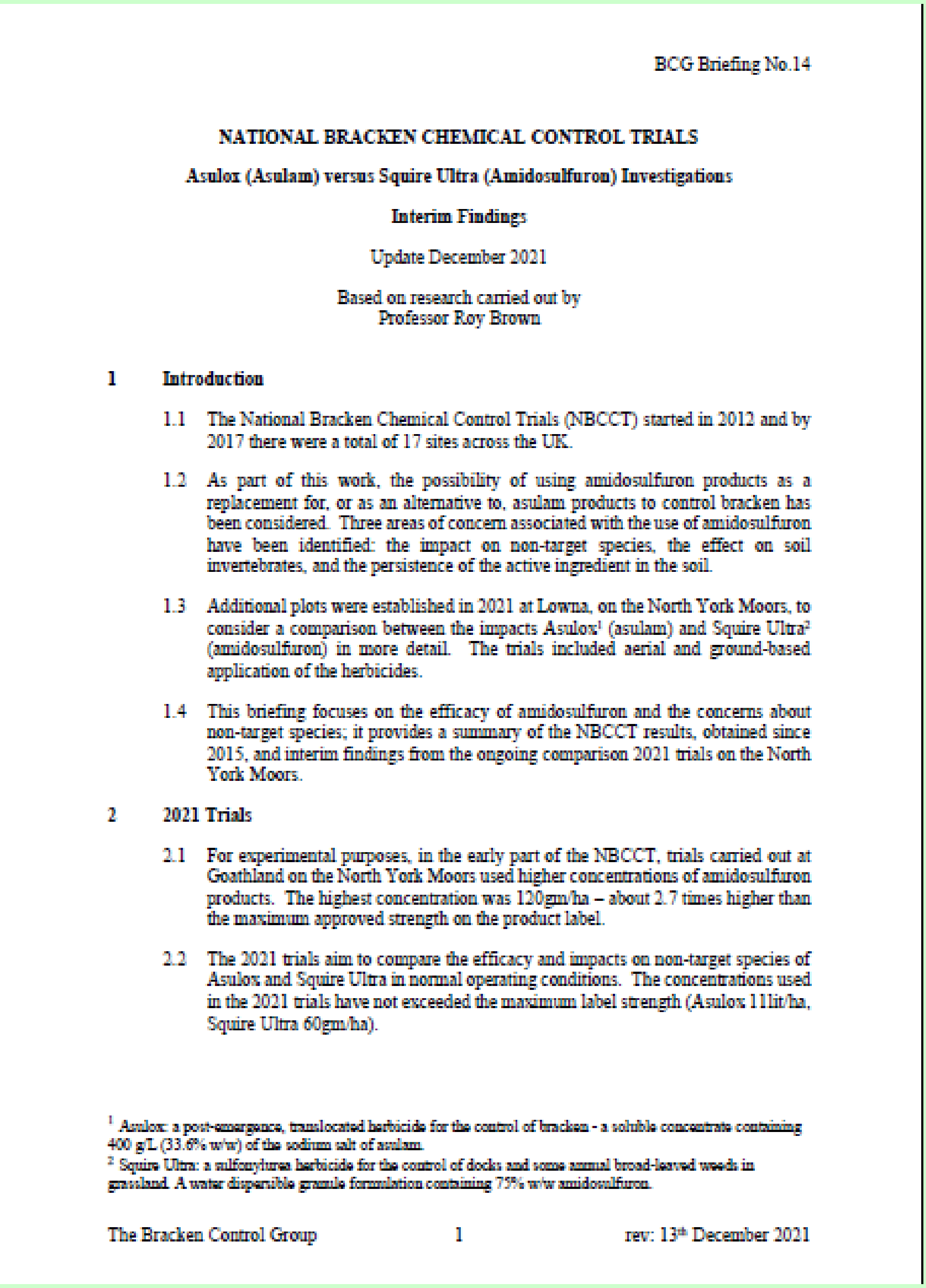
FC Bulletin 123 'Managing rides, roadsides and edge habitats in lowland forests.

https://www.forestresearch.gov.uk/research/archive-managing-rides-roadsides-and-edge-habitats-in-lowland-forests/

Forestry Commission Practice Guide 'Managing ancient and native woodland in England' https://www.gov.uk/government/publications/managing-ancient-and-native-woodland-in-england

Appendix 6

Document provided on the latest research regarding the potential impact of Asulox (asulam) and Squire Ultra (amidosulfuron)



BCG Briefing No.14

NATIONAL BRACKEN CHEMICAL CONTROL TRIALS

Asulox (Asulam) versus Squire Ultra (Amidosulfuron) Investigations

Interim Findings

Update December 2021

Based on research carried out by
Professor Roy Brown

1 Introduction

1.1 The National Bracken Chemical Control Trials (NBCCT) started in 2012 and by 2017 there were a total of 17 sites across the UK.

1.2 As part of this work, the possibility of using amidosulfuron products as a replacement for, or as an alternative to, asulam products to control bracken has been considered. Three areas of concern associated with the use of amidosulfuron have been identified: the impact on non-target species, the effect on soil invertebrates, and the persistence of the active ingredient in the soil.

1.3 Additional plots were established in 2021 at Lowna, on the North York Moors, to consider a comparison between the impacts Asulox[1] (asulam) and Squire Ultra[2] (amidosulfuron) in more detail. The trials included aerial and ground-based application of the herbicides.

1.4 This briefing focuses on the efficacy of amidosulfuron and the concerns about non-target species; it provides a summary of the NBCCT results, obtained since 2015, and interim findings from the ongoing comparison 2021 trials on the North York Moors.

2 2021 Trials

2.1 For experimental purposes, in the early part of the NBCCT, trials carried out at Goathland on the North York Moors used higher concentrations of amidosulfuron products. The highest concentration was 120gm/ha – about 2.7 times higher than the maximum approved strength on the product label.

2.2 The 2021 trials aim to compare the efficacy and impacts on non-target species of Asulox and Squire Ultra in normal operating conditions. The concentrations used in the 2021 trials have not exceeded the maximum label strength (Asulox 11lit/ha, Squire Ultra 60gm/ha).

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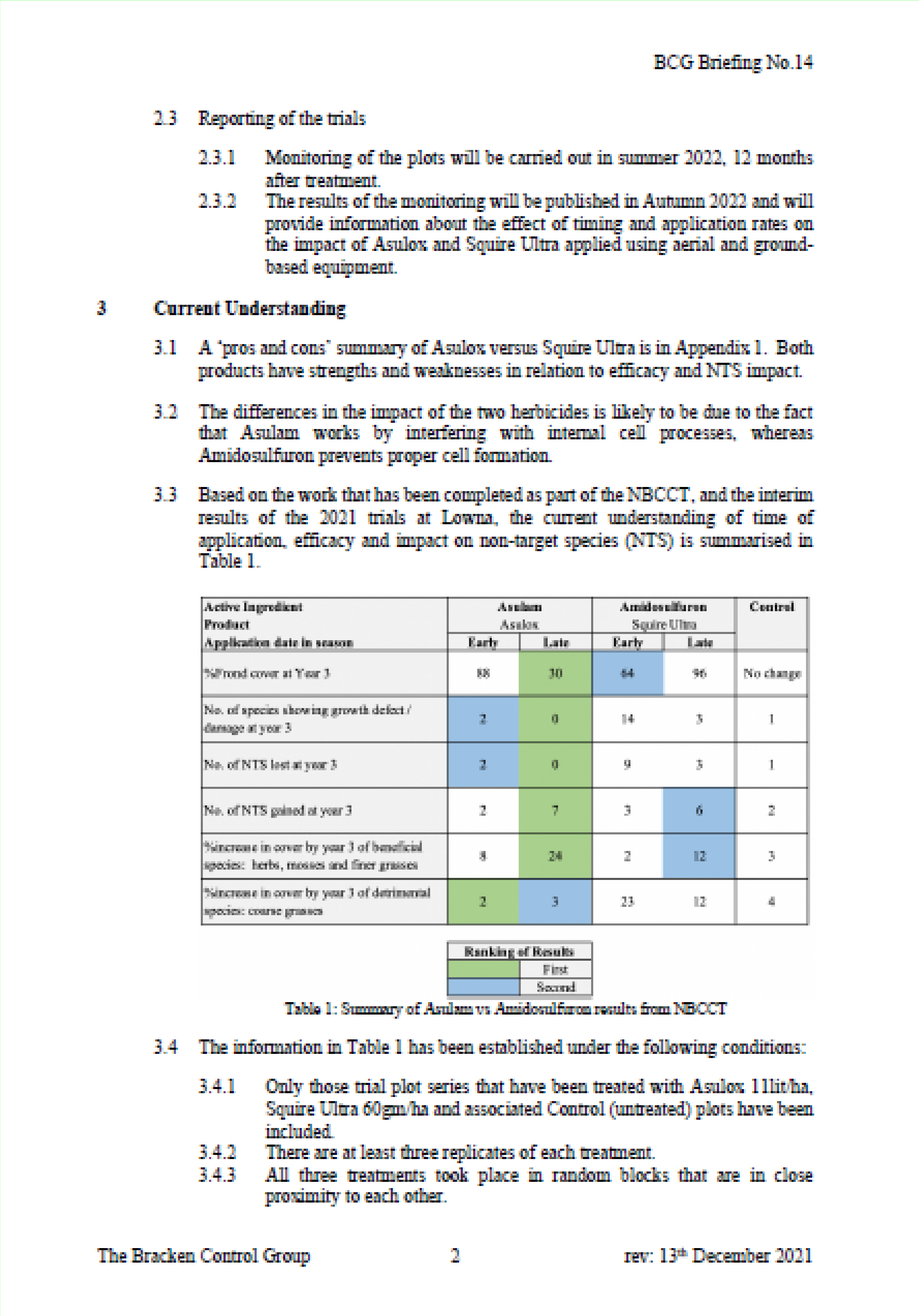
[1] Asulox: a post-emergence, translocated herbicide for the control of bracken - a soluble concentrate containing 400 g/L (33.6% w/w) of the sodium salt of asulam.

[2] Squire Ultra: a sulfonylurea herbicide for the control of docks and some annual broad-leaved weeds in grassland. A water dispersible granule formulation containing 75% w/w amidosulfuron.

The Bracken Control Group 1 rev: 13th December 2021



2.3 Reporting of the trials

2.3.1 Monitoring of the plots will be carried out in summer 2022, 12 months after treatment.

2.3.2 The results of the monitoring will be published in Autumn 2022 and will provide information about the effect of timing and application rates on the impact of Asulox and Squire Ultra applied using aerial and ground-based equipment.

3 Current Understanding

3.1 A 'pros and cons' summary of Asulox versus Squire Ultra is in Appendix 1. Both products have strengths and weaknesses in relation to efficacy and NTS impact.

3.2 The differences in the impact of the two herbicides is likely to be due to the fact that Asulam works by interfering with internal cell processes, whereas Amidosulfuron prevents proper cell formation.

3.3 Based on the work that has been completed as part of the NBCCT, and the interim results of the 2021 trials at Lowna, the current understanding of time of application, efficacy and impact on non-target species (NTS) is summarised in Table 1.

Active Ingredient **Product** **Application date in season**	**Asulam** Asulox **Early**	 **Late**	**Amidosulfuron** Squire Ultra **Early**	 **Late**	**Control**
%Frond cover at Year 3	88	🟩 30	🟦 64	96	No change
No. of species showing growth defect / damage at year 3	🟦 2	🟩 0	14	3	1
No. of NTS lost at year 3	🟦 2	🟩 0	9	3	1
No. of NTS gained at year 3	2	🟩 7	3	🟦 6	2
%increase in cover by year 3 of beneficial species: herbs, mosses and finer grasses	8	🟩 24	2	🟦 12	3
%increase in cover by year 3 of detrimental species: coarse grasses	🟩 2	🟦 3	23	12	4

Ranking of Results	
🟩	First
🟦	Second

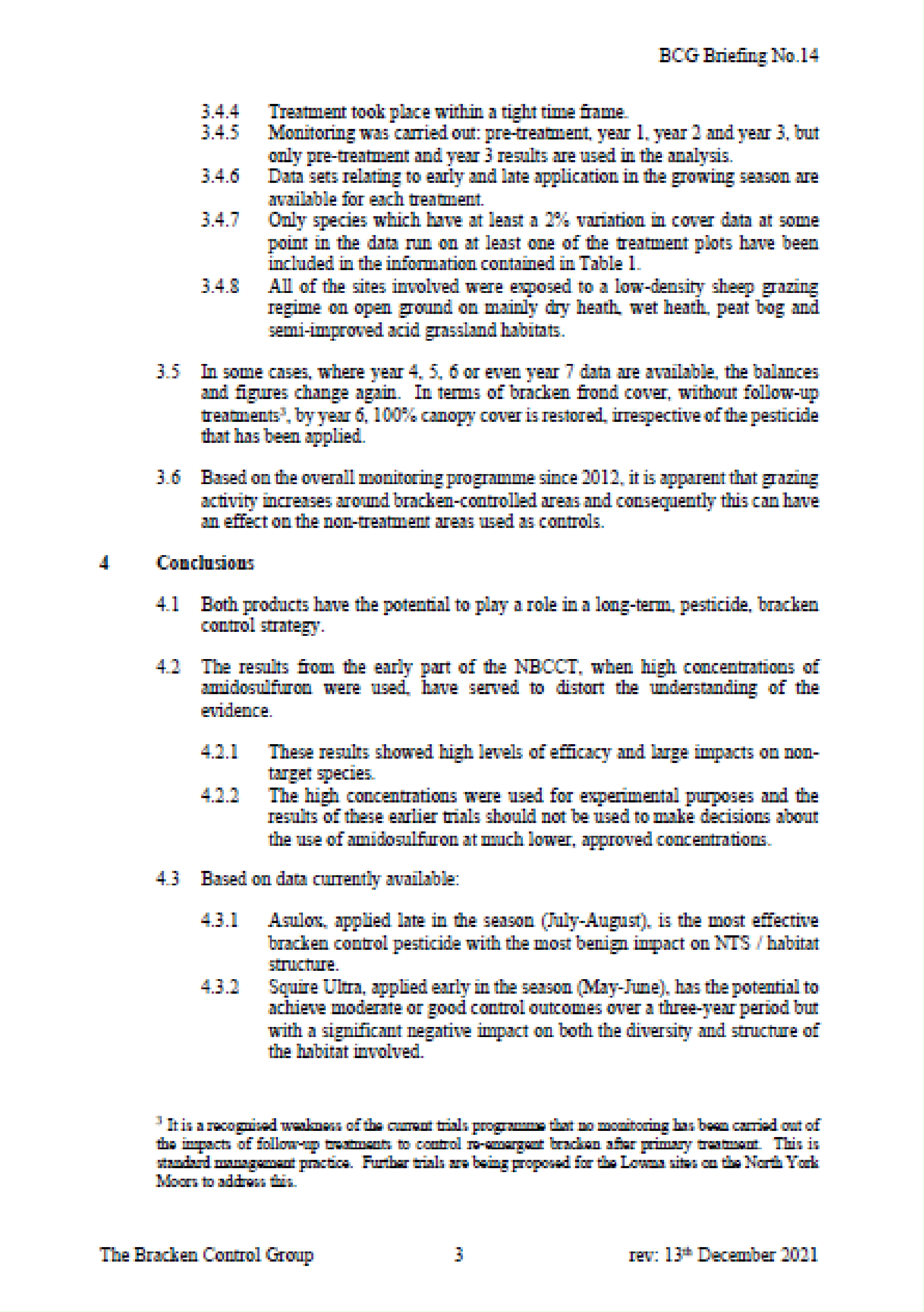
Table 1: Summary of Asulam vs Amidosulfuron results from NBCCT

3.4 The information in Table 1 has been established under the following conditions:

3.4.1 Only those trial plot series that have been treated with Asulox 11lit/ha, Squire Ultra 60gm/ha and associated Control (untreated) plots have been included.

3.4.2 There are at least three replicates of each treatment.

3.4.3 All three treatments took place in random blocks that are in close proximity to each other.



3.4.4 Treatment took place within a tight time frame.

3.4.5 Monitoring was carried out: pre-treatment, year 1, year 2 and year 3, but only pre-treatment and year 3 results are used in the analysis.

3.4.6 Data sets relating to early and late application in the growing season are available for each treatment.

3.4.7 Only species which have at least a 2% variation in cover data at some point in the data run on at least one of the treatment plots have been included in the information contained in Table 1.

3.4.8 All of the sites involved were exposed to a low-density sheep grazing regime on open ground on mainly dry heath, wet heath, peat bog and semi-improved acid grassland habitats.

3.5 In some cases, where year 4, 5, 6 or even year 7 data are available, the balances and figures change again. In terms of bracken frond cover, without follow-up treatments[3], by year 6, 100% canopy cover is restored, irrespective of the pesticide that has been applied.

3.6 Based on the overall monitoring programme since 2012, it is apparent that grazing activity increases around bracken-controlled areas and consequently this can have an effect on the non-treatment areas used as controls.

4 Conclusions

4.1 Both products have the potential to play a role in a long-term, pesticide, bracken control strategy.

4.2 The results from the early part of the NBCCT, when high concentrations of amidosulfuron were used, have served to distort the understanding of the evidence.

4.2.1 These results showed high levels of efficacy and large impacts on non-target species.

4.2.2 The high concentrations were used for experimental purposes and the results of these earlier trials should not be used to make decisions about the use of amidosulfuron at much lower, approved concentrations.

4.3 Based on data currently available:

4.3.1 Asulox, applied late in the season (July-August), is the most effective bracken control pesticide with the most benign impact on NTS / habitat structure.

4.3.2 Squire Ultra, applied early in the season (May-June), has the potential to achieve moderate or good control outcomes over a three-year period but with a significant negative impact on both the diversity and structure of the habitat involved.

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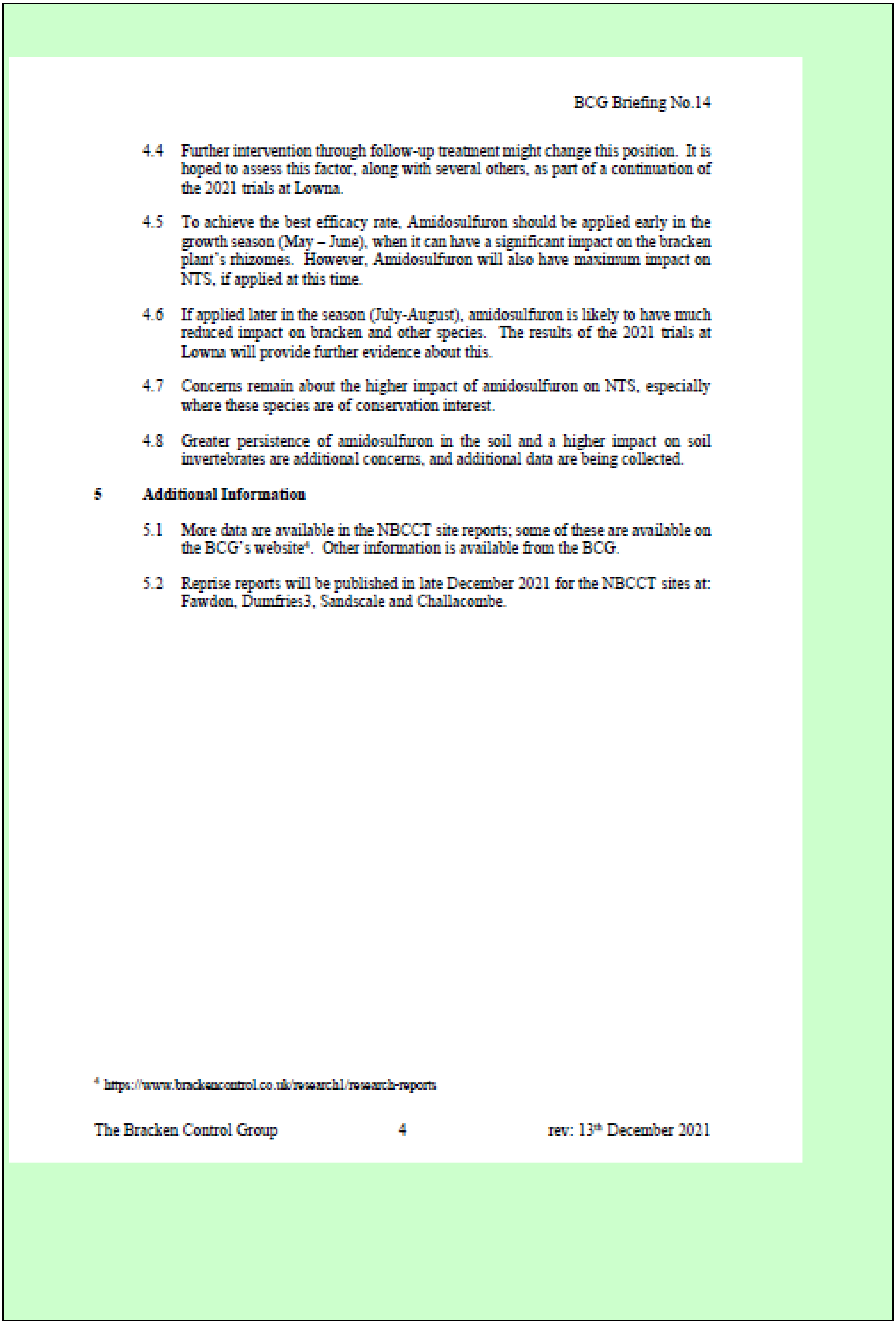
[3] It is a recognised weakness of the current trials programme that no monitoring has been carried out of the impacts of follow-up treatments to control re-emergent bracken after primary treatment. This is standard management practice. Further trials are being proposed for the Lowna sites on the North York Moors to address this.



4.4 Further intervention through follow-up treatment might change this position. It is hoped to assess this factor, along with several others, as part of a continuation of the 2021 trials at Lowna.

4.5 To achieve the best efficacy rate, Amidosulfuron should be applied early in the growth season (May – June), when it can have a significant impact on the bracken plant's rhizomes. However, Amidosulfuron will also have maximum impact on NTS, if applied at this time.

4.6 If applied later in the season (July-August), amidosulfuron is likely to have much reduced impact on bracken and other species. The results of the 2021 trials at Lowna will provide further evidence about this.

4.7 Concerns remain about the higher impact of amidosulfuron on NTS, especially where these species are of conservation interest.

4.8 Greater persistence of amidosulfuron in the soil and a higher impact on soil invertebrates are additional concerns, and additional data are being collected.

5 Additional Information

5.1 More data are available in the NBCCT site reports; some of these are available on the BCG's website[4]. Other information is available from the BCG.

5.2 Reprise reports will be published in late December 2021 for the NBCCT sites at: Fawdon, Dumfries3, Sandscale and Challacombe.

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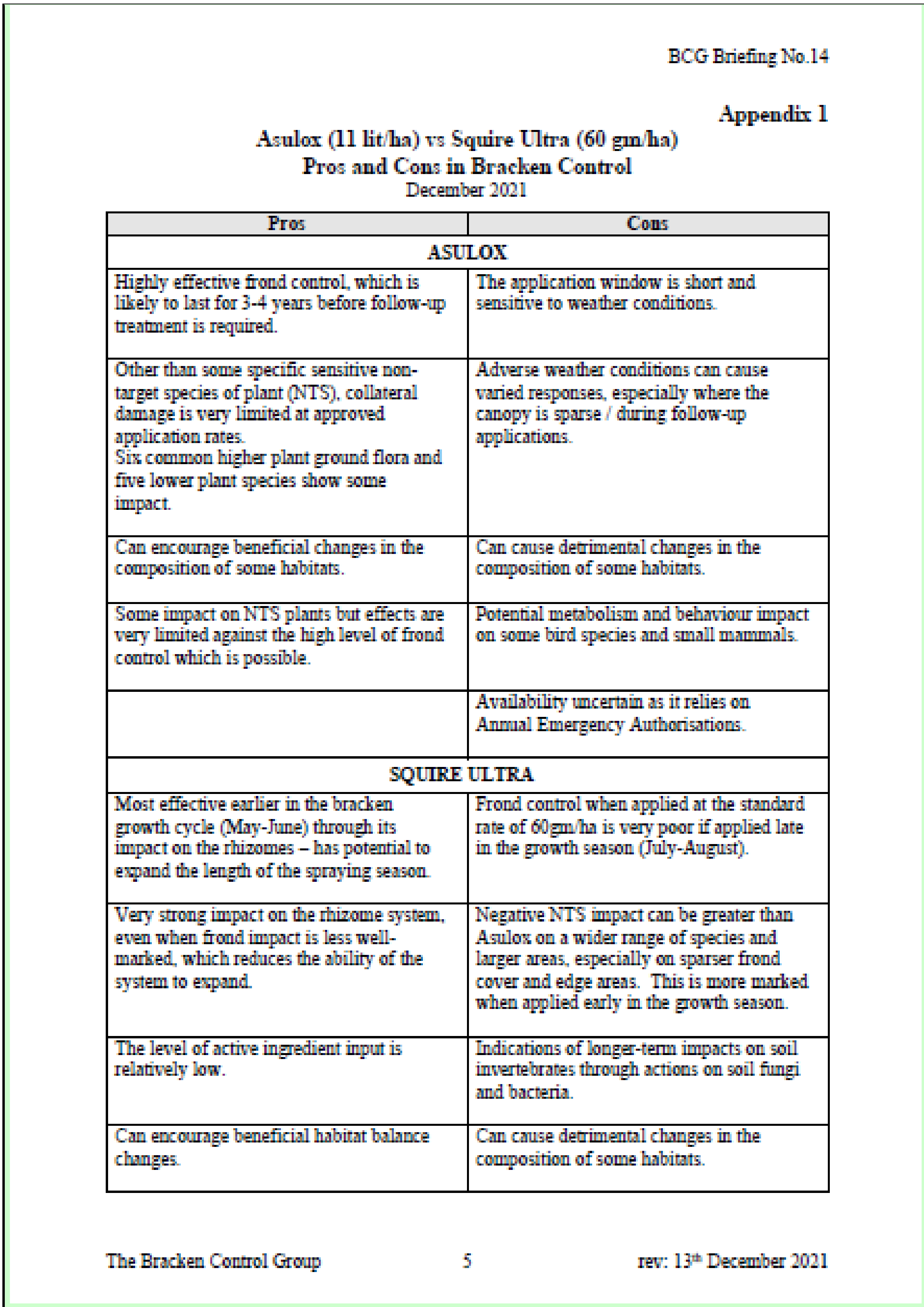
[4] https://www.brackencontrol.co.uk/research1/research-reports



BCG Briefing No.14

Appendix 1

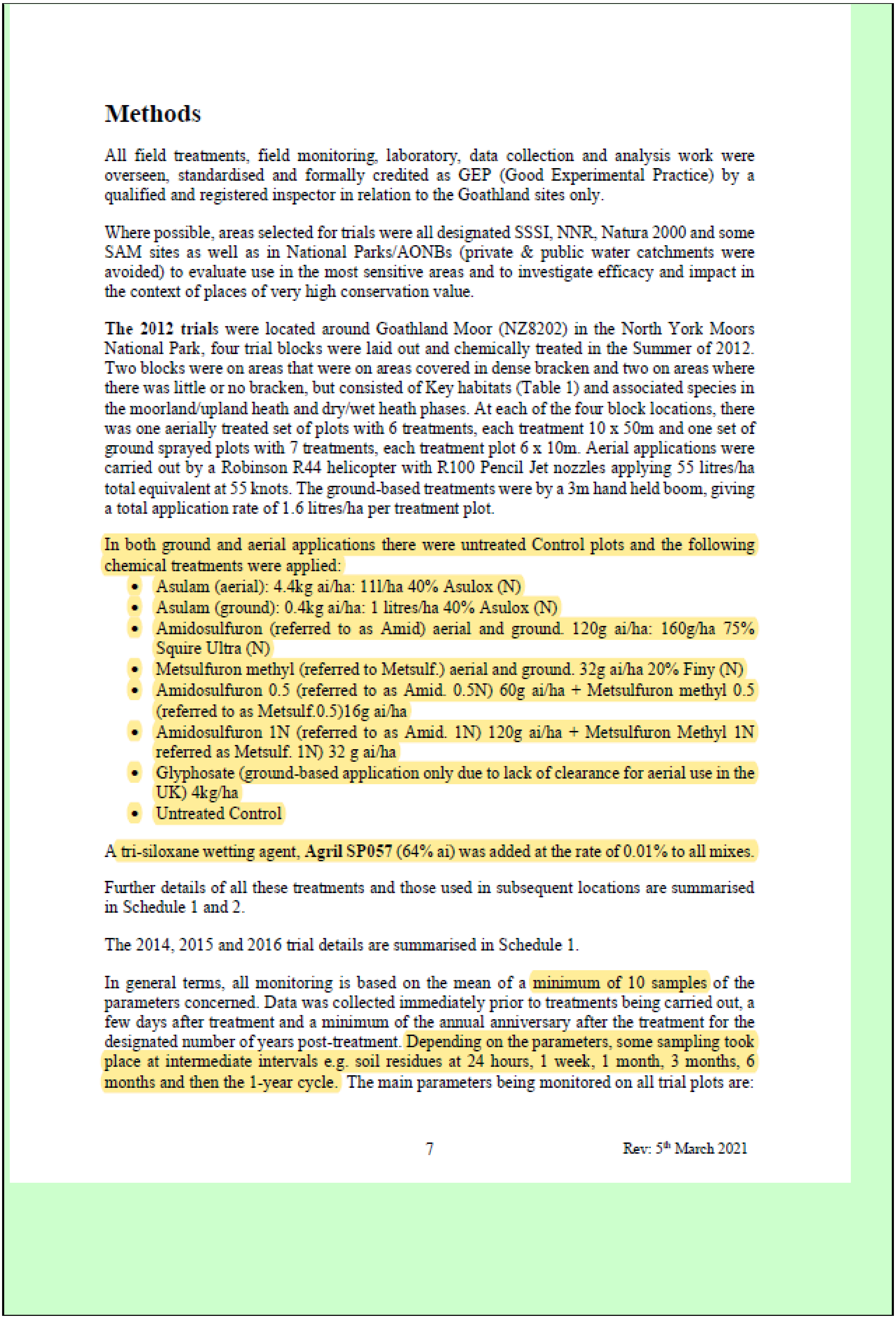
Asulox (11 lit/ha) vs Squire Ultra (60 gm/ha) Pros and Cons in Bracken Control

December 2021

Pros	Cons
ASULOX	
Highly effective frond control, which is likely to last for 3-4 years before follow-up treatment is required.	The application window is short and sensitive to weather conditions.
Other than some specific sensitive non-target species of plant (NTS), collateral damage is very limited at approved application rates. Six common higher plant ground flora and five lower plant species show some impact.	Adverse weather conditions can cause varied responses, especially where the canopy is sparse / during follow-up applications.
Can encourage beneficial changes in the composition of some habitats.	Can cause detrimental changes in the composition of some habitats.
Some impact on NTS plants but effects are very limited against the high level of frond control which is possible.	Potential metabolism and behaviour impact on some bird species and small mammals.
	Availability uncertain as it relies on Annual Emergency Authorisations.
SQUIRE ULTRA	
Most effective earlier in the bracken growth cycle (May-June) through its impact on the rhizomes – has potential to expand the length of the spraying season.	Frond control when applied at the standard rate of 60gm/ha is very poor if applied late in the growth season (July-August).
Very strong impact on the rhizome system, even when frond impact is less well-marked, which reduces the ability of the system to expand.	Negative NTS impact can be greater than Asulox on a wider range of species and larger areas, especially on sparser frond cover and edge areas. This is more marked when applied early in the growth season.
The level of active ingredient input is relatively low.	Indications of longer-term impacts on soil invertebrates through actions on soil fungi and bacteria.
Can encourage beneficial habitat balance changes.	Can cause detrimental changes in the composition of some habitats.

The Bracken Control Group 5 rev: 13th December 2021

Presented below are the key parts of the Final Summary Report from 2012-2020 from National Bracken Chemical Control Trials.



Methods

All field treatments, field monitoring, laboratory, data collection and analysis work were overseen, standardised and formally credited as GEP (Good Experimental Practice) by a qualified and registered inspector in relation to the Goathland sites only.

Where possible, areas selected for trials were all designated SSSI, NNR, Natura 2000 and some SAM sites as well as in National Parks/AONBs (private & public water catchments were avoided) to evaluate use in the most sensitive areas and to investigate efficacy and impact in the context of places of very high conservation value.

The 2012 trials were located around Goathland Moor (NZ8202) in the North York Moors National Park, four trial blocks were laid out and chemically treated in the Summer of 2012. Two blocks were on areas that were on areas covered in dense bracken and two on areas where there was little or no bracken, but consisted of Key habitats (Table 1) and associated species in the moorland/upland heath and dry/wet heath phases. At each of the four block locations, there was one aerially treated set of plots with 6 treatments, each treatment 10 x 50m and one set of ground sprayed plots with 7 treatments, each treatment plot 6 x 10m. Aerial applications were carried out by a Robinson R44 helicopter with R100 Pencil Jet nozzles applying 55 litres/ha total equivalent at 55 knots. The ground-based treatments were by a 3m hand held boom, giving a total application rate of 1.6 litres/ha per treatment plot.

In both ground and aerial applications there were untreated Control plots and the following chemical treatments were applied:

- Asulam (aerial): 4.4kg ai/ha: 11l/ha 40% Asulox (N)
- Asulam (ground): 0.4kg ai/ha: 1 litres/ha 40% Asulox (N)
- Amidosulfuron (referred to as Amid) aerial and ground. 120g ai/ha: 160g/ha 75% Squire Ultra (N)
- Metsulfuron methyl (referred to Metsulf.) aerial and ground. 32g ai/ha 20% Finy (N)
- Amidosulfuron 0.5 (referred to as Amid. 0.5N) 60g ai/ha + Metsulfuron methyl 0.5 (referred to as Metsulf.0.5)16g ai/ha
- Amidosulfuron 1N (referred to as Amid. 1N) 120g ai/ha + Metsulfuron Methyl 1N referred as Metsulf. 1N) 32 g ai/ha
- Glyphosate (ground-based application only due to lack of clearance for aerial use in the UK) 4kg/ha
- Untreated Control

A tri-siloxane wetting agent, **Agril SP057** (64% ai) was added at the rate of 0.01% to all mixes.

Further details of all these treatments and those used in subsequent locations are summarised in Schedule 1 and 2.

The 2014, 2015 and 2016 trial details are summarised in Schedule 1.

In general terms, all monitoring is based on the mean of a minimum of 10 samples of the parameters concerned. Data was collected immediately prior to treatments being carried out, a few days after treatment and a minimum of the annual anniversary after the treatment for the designated number of years post-treatment. Depending on the parameters, some sampling took place at intermediate intervals e.g. soil residues at 24 hours, 1 week, 1 month, 3 months, 6 months and then the 1-year cycle. The main parameters being monitored on all trial plots are:

- Frond biometrics, including % canopy cover, length of basal pinnae, stipe (stem to first whorl of fronds) length, fond height and density of stipes (fronds). Summary Data are in Tables 2 and 3
- Rhizome biometrics, including dormant and active buds, short, intermediate and long shoots, dry weight and ratio of dead to living rhizome. Summary Data are in Tables 2 and 3.
- Non-target plant species (NTS) response, including cover, morphology, reproductive status and general condition. Diversity (number of species) was recorded by site and treatment and summarised in a list for all of the sites involved (available from the BCG). Data are in Schedule 2.
- Soil invertebrate response in the litter; 0-5cm and 5.1-10cm soil layers, including mites and collembola extracted using a modified Tullgren Funnel Unit (Brown 1972) and beetles from surface dry traps. Summary Data and interpretation are in Schedules 3A and 3B.
- Chemical Residues in the soil. Summary Data and interpretation are in Schedule 4.

Results

As indicated above, the data summaries, some with additional interpretation, are presented in Tables 2 and 3 and Schedules 2, 3 and 4. Table 1 and Schedule 1 summarise the habitats affected by Bracken encroachment as a general rule and confirm that data have been, and are being, collected from 22 of the 29 categories listed in **Table 1**.

There are various ways of discussing the data and the results are going to be focussed on the various themes in this section and, in the Discussion, on individual treatments.

1 NTS recorded from all trial sites. 145 Dicotyledons, excluding trees (11), 42 Monocotyledons, 8 Bryophytes and 19 mosses, liverworts etc were recorded.

2 Habitats impacted by Bracken encroachment (Table 1). The trials have been able to focus on four of the sensitive habitat/feature groups which are most seriously at threat, including degraded lowland raised bogs, sand dune systems, heathland and heritage features. The accumulating knowledge about the processes of change and the most favourable bracken control methods is being carried forward into the next phase of trials.

3 **Table 2** brings together the summary information on frond control and rhizome control efficacy over a 5-year period (the total number of sampling points at the 1 and 3 year points was 224, but because some trials only ran for 3-4 years was down to 128 by the year 4 point). The Table also assesses the non- target damage and the index of residual effects* over the same period. Where aerial application took place, the data are identified separately. As the Sulphonyl Urea combination treatments were discarded early on (apart from the Goathland sites), only results for Asulox (11l/h equivalent), Amidosulfuron 1N (60gm/ha, Amidosulfuron 0.5N (30gm/ha), Metsulfuron 1N (32g/ha) – also now discarded and Glyphosate (4kg/ha), which was only ever going to be used as a worst-case scenario treatment on the Goathland sites.

Frond control efficacy was above 90% for all primary treatments in year 1. On the three aerial blocks (Asulox, Amidosulfuron 1N and Metsulfuron 1N) knock down was slightly less. As reported in the individual trail site report, there were concerns that the methods used for the aerial application on this site were substandard; consequently, the results do not reflect true performance.

By year 5, both plots treated with ground applied (ga) Asulox and early ga Amidosulfuron 1N were still above 65% control of bracken cover and the plot treated with aerially applied (aa) Asulox was at 52% cover control (with adjuvant) but down to 8% control on Amidosulfuron 1N. 0.5 Amidosulfuron (ga only) applied early in the season was at 54% control whilst late application was at 38% control, the reason investigation into using label strength Amidosulfuron started to be explored and, also, the difference between early and late application was flagged. Canopy cover control >50% by year 5 is a very strong result. Metsulfuron 1N was poor (aerial application very poor for the same application problems) but even here there was a difference between early and late application. Glyphosate (ga) was very poor showing a 96% frond cover recovery.

Rhizome Control efficacy shows a different story with Asulox in the high 40 to low 50% range in year 1, but with Amido. 1N in the 70%s and even 0.5N in the 60%s. Metsulfuron 1N and Glyphosate showed a similar response to Asulox. By year 5 Asulox, Metsulfuron 1N and Glyphosate were all below 20% control whereas Amido. 1N early applied was at 46% and late applied at 32%. Even Amido 0.5% was at 29% on the early sites but < 20% on the late sites. Although early applied Metsulf. 1N was significantly better than late applied both it and Glyphosate were poor at the 5-year line.

NTS Attribute/Habitat Damage was at 4 to 5% in Asulox, 3% in Amido. 1N, 2% in Amido 0.5%, 15 to 22% in Metsulfuron and 42% with Glyphosate. By year 5, Asulox and both Amido. ai concentrations were virtually back to zero but Metsulfuron was between 2 and 6% and Glyphosate at 6%. At the one-year time line any value >10% and by year 5 anything >2% is unacceptable.

Index of Residual Effects* is a complex quantification of various factors, which along with the category of 'Impact Weighting' in Table 3 is derived from a combination of factors explained below*. Any values above 2.5/3 at any stage reflect an unacceptable level of damage. In Year 1, Asulox scored 1 to 1.5, whilst Amido.1N scored 2 to 3.2, Amido. 0.5N scored 1 to 2, Metsulfuron 1N 4 to 6 (aerial application) and Glyphosate 7. By year 5 Asulox was at 0 to 0.6 (aerial), Amido 1N at 0.9 to 1.1 (aerial), Amido 0.5N 0.1, Metsulf. 1N 0.9 (aerial) to 1.5 and Glyphosate at 4. So, aerial 'damage' generally slightly more than ground-based but only Glyphosate of severe concern by year 5.

4 **Table 3** to some extent repackages some of the Table 2 data, but focuses on year 3 and 5 results and compares the overall control efficacy rating and the impact rating*, the later giving figures both including and excluding soil meso fauna weighting. This Table also includes the treatments excluded from table 2 and contrasts optimum with sub optimum application conditions. The data is largely self-explanatory but indicates that at both the 3- and 5-year points, Asulox gives good efficacy, as does Amido. 1N, late and early, and to a lesser extent Metsulfuron 1N but the Impact Rating is high. By year 5, Asulox has the lowest Impact Rating, apart from Amido. 0.5N (which has a lower efficacy). Amido. 0.25 has a short live efficacy, but also a very low Impact Rating.

On the basis of Tables 2 and 3, based on the realities of maximum ai levels which can and should be deployed, the preferred ranking for the herbicides on current information is:

1. Asulox ground based
2. Asulox aerial
3. Amidosulfuron 0.5N ground based early
4. Amidosulfuron 0.5N ground based late
5. Amidosulfuron 0.25 ground based late

This will be explored further in subsequent trials.

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*The factors built into the impact scoring procedure are:

- The extent of bare ground
- The number of NTS present
- The reproductive status and general condition of NTS present
- Canopy cover values
- Physical structure of the vegetation
- Biotic factors including stock grazing, trampling and rabbit activity
- Levels of damage to individual species (using the codes for level of damage, namely UNDAMAGED, DAMAGED (%), DEAD as defined in the Year 4 Goathland Report)
- External factors, such as severe weather events (e.g. freezing or drought conditions), Heather Beetle, Winter Moth and other infestations or wild fire.

5 Schedule 2 summarises the NTS responses in terms of diversity and cover over a 4-year recording period and the specific points have been fed into the summary efficacy and impact data discussed above.

6 Schedule 3 summarises and interprets specific soil meso fauna responses and these have again been fed into the summary tables discussed above.

7 Soil Residue Effects have been summarised and discussed in Schedule 4. This has again been incorporated into the general discussion but it is interesting to note that there are some signs of lingering residual effects in soil meso fauna species/groups in some of the SU treatments despite residue levels being undetectable. It is intended to explore this further in upcoming trials.

Discussion and Recommendations

The trials have been carried out to support the long-term ability to maintain chemical control of bracken, a major environmental, health and economic threat, both as a conservation tool and a production aide in agriculture and forestry. Work will continue into the future, as already indicated but some specific points are covered below:

Glyphosate (standard application rate).
This was always intended as the 'toxic standard', and it appears to have had the lowest level of control on both fronds and rhizome systems. It has had the greatest and longest negative impact on the 'non-target' habitat attributes. Apart from use in special circumstances, it is assessed that the role of glyphosate in bracken control is restricted to use in weed wipers.

Asulox (standard application rates)
Although specific aerial trials in this programme were disappointing, results from hundreds of other commercial sites were good. Along with ground-based trials in this programme, there is a high and sustained level of frond and rhizome control, accompanied by low impact on non-target species and other attributes. Its aerial efficacy, although slightly less than ground-based application, is still very good and it is well to remember that ground-based control using Asulox involves a peak tractor output of 2.1ug/l ai, whereas aerial peak output via Raindrop or Pencil Jet nozzles does not exceed 0.8ug/l. These figures also apply to other chemicals.

Asulox still retains pole position as the chemical control agent if used in the right way and at the right point in the life of the bracken plant. It is important to maintain and secure its use for the long term if a chemical bracken control programme is going to survive.

Amidosulfuron 1N (x 2 maximum label application rate)
Again, this has proved to be a highly effective bracken control ai and to have a very limited impact on NTS. The only aerial data available at the moment is poor due to substandard application, but even then, first year control was excellent and ground based efficacy is long lived. In general, relatively benign in terms of 'collateral damage', but at an unacceptably high ai rate. As there are suggestions of soil longevity, impact on soil meso fauna and possibly some long-term plant impacts, further investigation is needed but this will have to be at the 0.5 N level. This is a very useful potential alternative/back up ai.

Metsulfuron Methyl 1N (x 2 maximum label rate)
Despite a good level of initial control from both the air and ground based application, recovery is relatively rapid and impact on non-target attributes under dense bracken and on open vegetation has been moderate to high. There appears to be specific biotic problems with cattle and ponies and potential soil residue longevity which preclude further consideration of this ai concentration, if not the molecule as an ai.

Amidosulfuron 1N + Metsulfuron methyl 1N
(x 4 maximum label values) and Amido 0.5N + Metsulf. 0.5N (twice maximum label use).

Both of these treatments produced some good efficacy results and variable, although mainly negative, non-target responses. Although the results have been included in the individual reports on all sites where these particular treatments were used, there is no intention of considering these high ai treatments for use in the future.

Amidosulfuron 0.5N (maximum label use)

There have been some encouraging efficacy results, especially in 'early applied' plots, with very limited collateral negative impact of any kind. The number of sites is limited at the moment (one new one started in 2020), but further ground based and one large aerial trial site are scheduled for the summer of 2021. This is showing signs of being a possible second option in both open ground and forestry related bracken control.

Control Plots

These untreated plots built into all blocks of treatments have proved important to calibrate the impacts of unexpected, extreme, environmental variables (e.g. the 'beast from the east' in the winter of 2012/13) but also to reflect the annual variation of the bracken crop, which occurs in various parts of the country and in different local environments.

Future Work

A fourth Dumfries site was added in 2020 to provide additional data about ground-based applications of Amidosulfuron and Asulam products. Two applications were made, early and late in the season, and at different ai concentrations. The results of this work will be assessed in 2021.

Extension of the NBCT

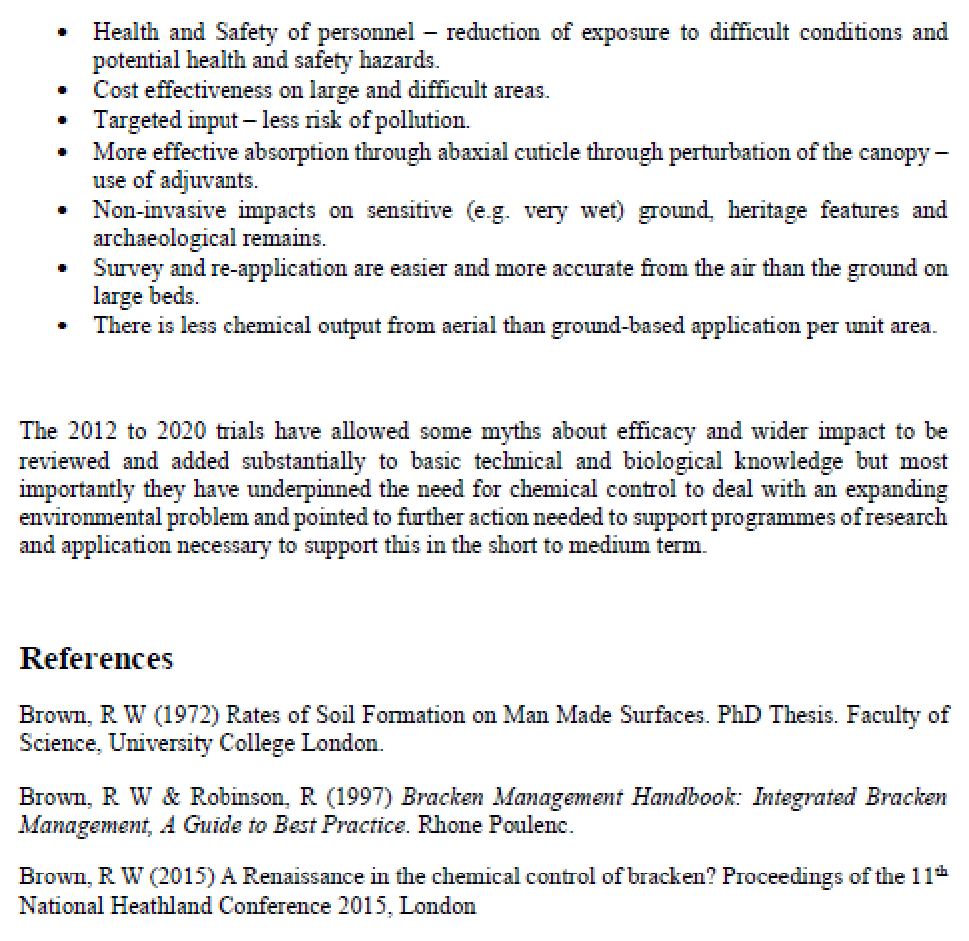
- Additional work will take place in Northumberland in 2021.
- This will consider the control efficacy and habitat impacts from the application of Amidosulfuron and Asulam products to bracken using ground and aerial techniques at two different times of the year.
- This work will also be used as an opportunity to further assess the drift associated with the aerial application of active ingredients in a field setting.

Conclusions

In conclusion, for the moment, a lot has been learned from the 2012 – 20 trials but much remains to be done. Moving forward, the UK Government must invest in bracken control, as a necessary conservation and land use improvement tool through its existing and upcoming agri-environment schemes. The Scottish Government is currently investigating the use of herbicides in general as tools in conservation. To deliver the required level of control, it is essential that both the chemicals used and the methods of application are optimal and with the restrictions on Asulox and on some ground-based application methods this is not the case.

Both ground-based and 'gold standard' aerial application standards will be needed in the future. The trials so far have raised various principles and key points, for instance:

- Aerial application is the only realistic approach over large areas, especially if these are isolated and physically difficult to access.
- They are the key to sheep tick 'hotspot' management.
- As a result of using low drift nozzles (raindrop/pencil jets) and GPS, aerial application has a very level of precision, which reduces the risk of collateral damage to non-target species, habitats and features to a very low level.



- Health and Safety of personnel – reduction of exposure to difficult conditions and potential health and safety hazards.
- Cost effectiveness on large and difficult areas.
- Targeted input – less risk of pollution.
- More effective absorption through abaxial cuticle through perturbation of the canopy – use of adjuvants.
- Non-invasive impacts on sensitive (e.g. very wet) ground, heritage features and archaeological remains.
- Survey and re-application are easier and more accurate from the air than the ground on large beds.
- There is less chemical output from aerial than ground-based application per unit area.

The 2012 to 2020 trials have allowed some myths about efficacy and wider impact to be reviewed and added substantially to basic technical and biological knowledge but most importantly they have underpinned the need for chemical control to deal with an expanding environmental problem and pointed to further action needed to support programmes of research and application necessary to support this in the short to medium term.

References

Brown, R W (1972) Rates of Soil Formation on Man Made Surfaces. PhD Thesis. Faculty of Science, University College London.

Brown, R W & Robinson, R (1997) *Bracken Management Handbook: Integrated Bracken Management, A Guide to Best Practice*. Rhone Poulenc.

Brown, R W (2015) A Renaissance in the chemical control of bracken? Proceedings of the 11th National Heathland Conference 2015, London

2.7 Relevance of metabolites

EVALUATION, SUMMARY AND CONCLUSION BY REGULATORY AUTHORITY	
Name of authority	**Health and Safety Executive**
Reviewer's comments	

3 Conclusion of Emergency Authorisation

3.1 Regulatory Approach

Evaluation, Summary and Conclusion by The Health and Safety Executive.
Reviewer's comments
Asulox is not authorised in the UK, and the active substance asulam is not approved in the UK. The risk assessment has been made based on the available data, the end points determined in the latest ESFA conclusion in the EU consideration of asulam as a new active substance, the current guidance for risk assessment and new information submitted by the applicant and data holder.

3.2 Conclusion

Evaluation, Summary and Conclusion by The Health and Safety Executive.
Conclusion
Where the conclusion indicates that the risk is either acceptable or unacceptable, this conclusion is reached within the framework of the standard criteria for a commercial authorisation based on assessment to uniform principles. Article 53 allows a derogation from the standard criteria providing specific tests are met. Therefore, whilst (for example) reference to unacceptable risks in the conclusion may highlight the areas of greatest concern, this is not the test under Article 53 and does not necessarily reflect the conclusions for this emergency authorisation application. **Physical Chemistry:** [redacted] **Toxicology:** The database for T-modality is incomplete and a decision on the ED-potential of asulam-sodium cannot currently be made. However, when considering risks of thyroid endocrine disruption, the observed thyroid effects (hyperplasia/hypertrophy and increased weight) in rats and dogs occur at relatively high doses, clearly above the NOAELs driving the reference values. Therefore, if risks (rather than pure hazards) were to be taken into account, the present reference values set for asulam-sodium would be highly protective for these effects. Data requirements are set on the ED status. To perform the full investigations to exclude ED potential for the T modality and the EAS modalities of asulam, it may take possibly another 5-6 years. The company should perform a TPO assay with asulam and submit it as soon as possible. If this is negative, there may be much less work. If this is positive, HSE may have to conclude that it is an ED and maybe see whether the EA is still viable until they generate all sorts of other data to exclude human relevance, developmental neurotoxicity and the EAS modalities. **Non-dietary human exposure (operator/ worker/ bystander and resident):** An acceptable risk was demonstrated with appropriate PPE.

Residues and consumer exposure:

Provided a minimum 1-month withholding period is adhered to (i.e. a statutory restriction to prevent animal grazing for at least 1 month after application), there are no effects on consumer health anticipated arising from the use of 'Asulox' on grassland as proposed (for animal products that enter the human food chain) and there is confidence that MRL exceedances are unlikely. Data requirements remain outstanding for residues for grassland and storage stability, as well as ruminant feeding. It is noted that if the ED status was concluded upon and a negligible exposure assessment became warranted the proposed use (due to potential residues in products of animal origin) would not be considered a negligible exposure situation.

Livestock restriction is not typically a measure that is put in place for standard authorisations and was granted in this emergency case on a temporary basis. This mitigation is impractical in upland and moorland areas as there is no fencing and the areas involved are large

For standard authorisation, an MRL application would be required (to raise the MRLs in animal products).

Environmental fate and behaviour:

Exposure values following standard methodologies were provided to ecotoxicology for use in risk assessment. An acceptable risk to aquatic organisms was demonstrated with appropriate buffer zones and DRT. The monitored levels provided from catchment monitoring following use of the product are well below the predicted exposure levels which would support that the exposure modelling approach is sufficient to assess the risk to aquatic organisms. A review of spray drift data resulted in the conclusion that current buffer zones must remain in place.

Ecotoxicology:

The acute and long-term risks to bees are acceptable. The acute and long-term risks to non-target arthropods are acceptable. The acute and long-term risks to soil organisms and processes are acceptable [Note from the EFSA conclusion: a data gap was identified to address the long-term risk to soil organisms from non-extractable soil residues.].

A high risk to non-target terrestrial plants is predicted. A warning phrase is required but is unlikely to be sufficiently protective and so a 5m habitat protection zone with 3* Drift Reduction Technology is proposed for ground-based use and 90m for aerial applications.

A 5m habitat protection zone is required to protect aquatic life from vehicle mounted applications, whilst a 90m habitat protection zone with low drift nozzles is required to protect aquatic life from aerial applications.

The acute risk to birds and mammals is acceptable. However, there is an unacceptable and high reproductive/ long-term risk to birds unless application is restricted to after 1 Aug to 12 September. There is an unacceptable and high reproductive/ long-term risk to mammals unless application is restricted where the hazel dormouse is known to breed.

The status of whether the a.s. is an endocrine disruptor for non-target organisms is unknown.

The available regulatory laboratory studies do not indicate that amidosulfuron is more toxic than asulam. Bracken Control Group and published field data indicates that amidosulfuron may impact a broader range of non-target plant species than asulam, but the reliability of the data and the relevance of this finding for the risk assessment have not been established. Bracken control group field data suggest that some soil invertebrate species may be more sensitive to amidosulfuron than asulam, but this finding should be treated with caution as the reliability of the data has not been established. The ADAS comparative assessment report has been briefly considered and does not reference any information that would change the previous HSE risk assessment outcomes (i.e. there is no adverse data referenced).

Assessment against the requirements of article 53	**Is the requirement met?**	**Summary of HSE's assessment**
Are there Special circumstances supporting the proposed use?	N	This is the 11th application for emergency use of asulam, meaning that to date, the number of EAs given for the use of asulam is equal to what would have been given as an approval of the active substance: 10 years. While there is no firm time point when a repeat application loses its special

		circumstances, the longer a repeat goes on the greater the challenge to the integrity of the regular authorisation system. It is recognised that we should consider each application on a case by case basis, but this application is reaching the point where it is no longer considered exceptional. An additional point of consideration is that a number of new areas of concern have arisen in this application and that the prognosis for a regular authorisation has become clearer. The only routes out of ongoing Article 53 applications is to either refuse this application now or continue to support for potentially 7 years more (subject to reporting of ongoing ED tests). The applicant's case also demonstrates that there are large areas of untreated and untreatable bracken, where the highlighted dangers will continue to be present. Overall, the new information presented and considered in this application no longer support a case that special circumstances exist, such that exceptionally we should not follow the standard approach. The prognosis for a regular approval and the issues highlighted by other tests for an Article 53 authorisation, now demonstrate an elevated risk that ongoing emergency authorisations of asulam would jeopardise the integrity and purpose of the regulation, which places a high level of protection of both human and animal health and the environment	
If a repeat, are there measures in place to develop long term solutions?	N	The applicant has stated that amidosulfuron is not a viable alternative (though Efficacy believe it still cannot be ruled out) so further work on this is unlikely. No other alternatives have been suggested as viable, and no work on alternatives is known to be taking place. Residues data reqs for Asulox are not met again. While a plan is given for addressing the ED status, the timelines are extended, potentially requiring 5-6 years for this aspect alone. The long term plan is now stated to be approving asulam and authorisation of Asulox in GB. This adds the application process for a new active substance to be considered, and that evaluation will include	

		addressing a data gap for the long-term risk to soil organisms, the long-term risk to birds and wild mammals (a critical area of concern) and a high risk to aquatic organisms. [redacted] A conservative estimate of the time to do this would take us to 2030.	
Is there a ‘danger’?	Y	Loss of grazing land Bracken monocultures can negatively impact habitat biodiversity The applicant also cited the following additional drivers for control. Restricts public access Provides habitat for sheep ticks which pose a risk to human health through the transmission of Lymes Disease. (Annex F - Impacts on Human and Animal Health and Habitat). Bracken can have direct livestock/human health effects either from ingesting/inhaling spores or consumption of the plant itself. Landscape impact Preservation of historic sites.	
Are there insufficient alternative means?	Y	Where it is possible to do so, cutting is an effective control measure, although it is expensive and labour intensive. Where access precludes this some form of herbicide application is required, typically an aerial application, followed up with a ground based application. Glyphosate is effective but is not authorised for use by aerial application. It does, however, remain an option for ground-based application although where used the effects on non-target flora are likely to be significant. Amidosulfuron remains the most promising herbicide for bracken control both by aerial application and ground application. However based on all of the work conducted, optimising its effectiveness may require additional refinement, particularly if the results of the submitted trials are validated. It is also the case that where it has been used elsewhere, e.g. Norway, its use has been withdrawn on the basis of inadequate effectiveness. Currently no alternative herbicides are authorised for use by aerial application.	

		The Bracken Control Group suggests that, based on its most recent work, application of amidosulfuron by helicopter, which achieves less canopy penetration, has less impact than ground-based application; and that amidosulfuron at the maximum authorised dose is not effective in controlling bracken, either as a short-term, one off application or as part of a long-term control strategy. The BCG also have concerns about the effects of amidosulfuron on soil micro and mesofauna, however, data have not been submitted to support this, and amidosulfuron is currently approved, having passed the risk assessment in these areas.
Will the proposed use be limited?	Y	The applicant has estimated that the treated area in 2023 will be approximately 7500 ha. A total area of 7608 ha was treated in 2022, compared to 8103 ha in 2021. Use will be further limited geographically to predominantly those areas at the margins between upland and lowland moorland/heathland and other land. Limitation will also be temporally as the use of asulam is between 1st July and 11th September with the optimum timing after full frond expansion, but before tip die-back. The applicant has provided sufficient evidence to support the limited nature of the use.
Will the proposed use be controlled?	Y	All aerial applications must be conducted in line with an Application Plan and must be permitted in accordance with the guidance at Aerial spraying permitting arrangements. Monitoring is in place through an Asulam Application Records form which is circulated to all distributors to issue to purchasers of Asulox. End-users were asked to submit details of where asulam was applied during the 2022 bracken control season. Reports were received from all areas sprayed by helicopter. There is more work to be done to obtain full details from ground-based application – **the return rate was about 60%.** This is lower than that reported in 2021. Agri-environment scheme options continue to be important to facilitate bracken control both within and outside SSSIs. The Conservation Agencies have supported the inclusion of bracken

		control options within existing agri-environment schemes and provide advice on those under development. Use will also be controlled through the stewardship programme operated by the Bracken Control Group. This includes a communication plan outlining the nature of the authorisation and its conditions of use. There are plans for an updated stewardship plan as part of a wider bracken control strategy. It appears from Annex I that ground-based use of asulam was applied predominantly to areas with a statutory conservation designation, **except 158 ha** (4% of total ground based use). The applicant has provided sufficient evidence to demonstrate that use will be controlled.

Regulatory Specialist conclusion

The evaluation of the application for Asulox emergency use to control bracken in the 2023 season has resulted in the recommendation **not** to grant an emergency authorisation.

There are a number of new considerations for the proposed use in 2023:

- [redacted]
- water sampling data submitted to us by Severn Trent water,
- the change in the applicant view of amidosulfuron as an alternative,
- the approach and timelines outlined by the owner of Asulox for addressing the endocrine disrupter status, in effect meaning that the long-term plan to remove the need for Emergency authorisations will conceivably extend to 17 years since the original application.

It is accepted that bracken is a danger and there is a benefit in controlling it. The use is limited, and the applicant demonstrates good levels of control, though it is noted that ground-based use may require improvement in this regard with only a 60% return.

It is also accepted that for aerial use, there is currently no alternative to Asulox, though it should be noted that the aerial permit it has is unusual in that the product itself has been withdrawn for over 20 years. For ground-based uses, there are alternatives which are circumstance specific. HSE does not accept that amidosulfuron can be removed from consideration as a reasonable means, but it does seem that the applicant has shown that its effectiveness is highly variable, and a refinement of its use may resolve the issues. HSE does not accept that amidosulfuron is significantly more toxic than asulam. But it seems unlikely that further work will be done on it by the applicant.

[redacted]

The applicant and the product owner, UPL Ltd, have given as a long term solution only the approval of the active substance asulam followed by standard authorisation of the product Asulox. [redacted]

[redacted] In addition to this, all other outstanding issues with asulam, including:

a) the residues data requirements which remain unaddressed for the third year now with no indication of when they will be met,
b) the data gap identified to address the long-term risk to soil organisms from non-extractable soil residues,
c) the long-term risk to birds and wild mammals (an area critical area of concern),
d) a high risk to aquatic organisms [redacted]

The timelines are, therefore, uncertain, but a conservative estimate of the time needed to achieve the above would take us to 2030, and possibly beyond. This is on the assumption that the generated data supports approval; it could confirm the ED status, for example, or that there is no acceptable risk in one or more of the areas listed above, resulting in no approval.

Following the emergency use given in 2022, some water companies contacted HSE to raise concerns about the issuing of aerial permits. HSE advised that their concerns should be addressed in the risk assessment itself and so Severn Trent submitted data on asulam levels in water to demonstrate instances where they are above their safety limit of 0.1 ug/l. While they are below the limits set by HSE, the assessments done and limits set are for different purposes, and so the water companies' limit is nonetheless an indicator of further potential risk. They also pointed out in relation to the aquatic buffer zone of 90m that in upland and moorland areas which are covered by a bracken canopy, it is not practical to always know if there is a water body present because there are often small streams which feed the water catchment area and these may well be invisible, meaning that the buffer zone might be unintentionally breached. The point has also been made that for the sorts of reservoirs present in upland and moorland areas, water companies do not expect pesticide usage. Therefore, the treatment facilities there do not have any capacity to remove such substances from the water. This must be considered in the context that the water companies are testing only for asulam, and not its metabolites, and these may also be present (for example, sulfanilamide). Bearing in mind [redacted] and the potential ED status, the risk here is difficult to quantify, but given it is to drinking water, it is sensible to presume it is potentially high.

The residues data requirements continue to be unmet for the 3rd year. Due to continued uncertainties in the residues data, a livestock exclusion period of 1 month was required in previous EAs. For standard authorisation, such a restriction would not be allowed because excluding livestock in upland and moorland areas is impractical given there are no fences and such areas are very large and difficult to access, and the applicant has already confirmed this difficulty to us, and hence requested in the previous EAs and this application that we remove the restriction. For Article 53s, allowing such mitigation is done on the assumption that it will be temporary, but given the timelines above and the lack of prospect of an end to EAs for Asulox, this mitigation approach becomes harder to justify.

1 July is the earliest date of application requested, however, for the protection of birds in previous EAs, the risk assessment indicates 1 August as the earliest start date. In previous EAs, an advisory phrase is added that where possible, application should be after 1 Aug, or as late in July as possible, where it is at all practical. This reduces the risk, but does not mitigate it. Again, mitigations of this sort under an EA are meant to be temporary (a standard authorisation would not allow this), and with no end in sight, the approach risks becoming routine and harder to justify.

The ground based exposures to surface water have been assessed using standard methodologies which are based on drainflow models parameterised for soils and climatic conditions more likely to be found in lowland agricultural areas. It is recognised that these may not be representative of the upland areas where asulam will be used and surface run off would likely be a primary route of exposure in these conditions. However, the data provided by the water company Severn Trent, sampled from a moorland catchment following previous use of the product on bracken, suggests that the models are at least protective given the monitored levels are well below what we would predict.

The product itself has been withdrawn for over 20 years. This emergency application has been granted for 10 years now; this is the length of time an active substance receives approval for under the Regulation. Bracken control programmes can last for 5 or so years, so the EAs up to now have allowed for such programmes to be completed. Nonetheless, it is not evident that meaningful progress has been made in the overall control of bracken; indeed, the applicant confirms that the area of bracken has been increasing year on year during the period that EAs have been granted. In this time, no meaningful progress has been made on alternatives, though it is clear some exist, with varying trade-offs, and no progress on issues which have been known for a long time, such as the ED status which has been known by UPL since 2017.

Although we have an aerial permit system, aerial application is intended to be a rare event, permitted only under exceptional circumstances (especially for pesticides which have lost approval). Yet, aerial application of Asulox has become a regular occurrence in the last decade. Furthermore, given the information from the applicant and UPL, it is anticipated that it will remain so for the foreseeable future.

While the benefits of controlling bracken are clear, the applicant has indicated that bracken covers over 1.5m ha in the UK, but proposes to treat 7,500, meaning that the danger remains in the vast majority untreated areas. Even in periods prior to the emergency authorisations, the maximum area treated aerially was 15,000ha. Therefore, the extent of the reduction of the danger is unclear, and may be low. In addition, the increasing uncertainties around the potential adverse risks mean that it is not apparent that those benefits outweigh the potential harm, and there are no further, feasible mitigations available to reduce those risks.

In this context, the circumstances cannot be justified as ‘special’ as required under Article 53. The longer a particular situation lasts, the more difficult it becomes to characterise it as an emergency situation. Furthermore, there is a requirement to uphold the integrity of the regular authorisation system so as not to jeopardise the purpose of the Regulation.

Post ECP further consideration and conclusion

There are no scientific questions arising on which HSE CRD wishes to seek ECP advice, and as such, it is considered that the ECP advice from 2022 still applies (this has been included in Appendix 8 below). This advice was that the ECP did not support an emergency authorisation of asulam.

HSE Decision Panel Conclusion:

The tests for special circumstances and necessity are not met.
Outcome: REFUSAL

Having taken into account all the evidence presented, does HSE consider that the necessity of the case supports derogation from Article 28 of Regulation 1107/2009, whereby the benefit of addressing the danger outweighs the potential for harm taking into account any potential mitigations	**No**

HSE Ref W002080376: [redacted] Sign Off

HSE Ref W002080375: [redacted] Sign Off

HSE Ref W002080376: [redacted] Sign Off

HSE formal request to the DAs for sign off on HSE decision
Northern Ireland: HSE Ref W?
Scotland: HSE Ref W?

Wales: HSE Ref W?
England: HSE Ref W?

3.2.1 Assessed GAP

Crop and/ or situation	**Pests or Group of pests controlled**	**Situation**	**Application method**	**Timing / Growth stage of crop or season**	**Maximum individual dose**	**Water Volume**	**Maximum number of treatments**	**Latest time of application:**	**Buffer Zone**
Grassland, Moorland, Amenity Grassland	bracken (Pteridium aquilinum).	Outdoor	Aerial via helicopter only, Vehicle mounted sprayer, Hand-held sprayer	July to September when rhizomes are in uptake mode.	11 litres product / ha (4.4 kg ai / ha)	Aerial: 44 L/ha Vehicle mounted: 400 - 500 L/ha Hand-Held: 1 part Asulox to 4 parts water	1	12 September in the season of use.	Aquatic and non-target plant: Aerial: 90m DRT only Boom Sprayer: 5m
Forest (pre-planting and in first five years after planting)	bracken (Pteridium aquilinum).	Outdoor	Aerial via helicopter only, Vehicle mounted sprayer, Hand-held sprayer	July to September when rhizomes are in uptake mode.	10 litres product / ha (4.0 kg ai / ha)	Aerial: 44 L/ha Vehicle mounted sprayers: 400 - 500 L/ha Hand-Held: 1 part Asulox with 4 parts water	1	12 September in the season of use.	Aquatic and non-target plant: Aerial: 90m DRT only Boom Sprayer: 5m

3.2.2 Risk Mitigation Measures

Those restrictions considered necessary following the evaluation by HSE of the requested use.

Operator protection:

Operators must wear suitable protective clothing (coveralls) and suitable protective gloves when handling the concentrate.

Environmental protection

- To protect aquatic organisms, respect an unsprayed horizontal buffer zone distance to surface water bodies of 90m when spraying from aircraft using low drift nozzles such as RD1000 Pencil Jets or Delavan RD 'Raindrop' type nozzles.
- To protect non-target plants, respect an untreated buffer zone of 5m to non-target environment. HORIZONTAL BOOM SPRAYERS MUST BE FITTED WITH THREE STAR DRIFT REDUCTION TECHNOLOGY. Low drift spraying equipment must be operated according to the specific conditions stated in the official three-star rating for that equipment as published on HSE Chemicals Regulation Directorate's website.
- To protect non-target terrestrial plants, respect an unsprayed horizontal buffer zone distance to non-target environment of 90m when spraying from aircraft using low drift nozzles such as RD1000 Pencil Jets or Delavan RD 'Raindrop' type nozzles.
- To protect birds, application before 1st July and after 12 September in the season of use is not allowed. Where at all feasible, application should be made after 1 Aug, or as late in July as possible.
- To protect mammals, application is not allowed where the hazel dormouse is known to breed.
- There is a potentially significant risk to ground nesting birds towards the end of the breeding season.
- Where there is a risk to rare or sensitive species, or where spraying is to take place near a Site of Specific Scientific Interest then advice must be sought from the appropriate conservation agency - Natural England, NatureScot, Natural Resources Wales or the Northern Ireland Environment Agency.
- Spray from a horizontal boom sprayer must not fall within 5m of the top of the bank of any static or flowing waterbody or within 1m of a ditch which is dry at the time of application. Spray from hand-held sprayers must not be allowed to fall within 1 m of the top of the bank of a static or flowing waterbody. Spray must be aimed away from water.

Other specific restrictions

- If applied aerially, it must be by helicopter, and must only be applied using low drift nozzles.
- No person may carry out aerial spraying or cause or permit another person to carry out aerial spraying unless such spraying is authorised by an aerial spraying permit issued by the Chemicals Regulation Division.
- Livestock must be removed from areas to be treated and must not be allowed to return until at least 1 month after treatment.

-When this product is used with adjuvants, it must only be with adjuvants that have a List Entry that permits aerial application in mixture with asulam, and all conditions of the List Entry must be followed.

-If applied aerially by helicopter, this product must only be applied to dense bracken in continuous stands covering a minimum of 80% of the area to be treated.

-A maximum concentration of 1 part product to 4 parts water must not be exceeded when applied as a hand-held spray treatment or aerially by helicopter.

-Application of the product via vehicle mounted and hand-held sprayers must only be carried out on Sites of Special Scientific Interest (SSSI) or other designated conservation areas, areas subject to agri-environment stewardship schemes. Such treatment must only be on the advice,

requirements and under the supervision of Natural England, NatureScot, Natural Resources Wales or the Environment & Heritage Service in Northern Ireland. Or in the case of agri-environment areas by direction of the grant paying organisation e.g. the Rural Payments Agency.

3.3 Data Requirements for Repeat Applications

Evaluation, Summary and Conclusion by The Health and Safety Executive.

Data required supporting a returning application.

(i) Residue field trials for grassland and storage stability of residues

Either:

a. Sufficient justification of the above available grassland trials, by addressing whether residues are sufficiently stable in these trials, for the trials data to be able to be relied upon quantitatively. Currently this situation is uncertain based on the data available. The currently available grassland freezer storage stability data indicate that asulam-related residues are not stable in the samples and therefore there is uncertainty in the assessment of the available grassland residues trials. It is likely that new adequate storage stability data tailored to freezer storage of whole plant samples (prior to homogenisation) using an appropriate time series relevant to the storage conditions in the grassland residues trials would be needed to support use of the existing grassland trials, and the success of this avenue depends on the results obtained (due to the issue of instability that has been observed to date in grassland residue samples).

Or:

b. New residue trials conducted at the proposed GAP on grassland, where residues are extracted and analysed immediately/as quickly as possible after sampling. These trials must be conducted in accordance with the guidance document SANCO 7525/VI/95 - rev.10.3 (13 June 2017) and the relevant OECD guidelines and guidance documents as listed in Commission Communication 2013/C 95/01. All relevant crop samples must be analysed and residue levels determined using the correct residue definitions (for risk assessment and monitoring, as advised in EFSA Conclusion of asulam, 2018 (addressing pentose as well as hexose conjugates as asulam for ‘sugar conjugates of asulam’)) using a validated method of analysis. The validation data should be generated in accordance with SANTE 2020/12830 rev. 1 and the OECD guidance document on “Pesticide Residue Analytical Methods” (OECD, 2007).

(ii) Ruminant feeding studies:

Ruminant feeding studies should be submitted on the magnitude of residue levels of asulam and acetyl sulphanilamide in ruminant animal products in accordance with the relevant OECD guidelines and guidance documents as listed in Commission Communication 2013/C 95/01. Consideration should be given to the substances that the animals should be dosed with in the feeding studies (asulam or asulam plus other feed item residues of asulam to address the potential exposure to animals). All relevant samples must be analysed using a validated method of analysis; the validation data should be generated in accordance with SANTE 2020/12830 rev. 1 and the OECD guidance document on “Pesticide Residue Analytical Methods” (OECD, 2007); it would be preferable for residues to be extracted and analysed immediately/as quickly as possible after sampling; if samples are stored prior to analysis, supporting freezer storage stability data will also be needed.

It should be noted that for standard authorisation, an MRL application would be required (to raise the MRLs in animal products) and then MRLs guidance must be followed.

Further information is available on the HSE website for when a new GB MRL is required [MRLs and import tolerances]. An MRL application form must be submitted and when relevant an ER/RO must be completed.

For NI, residue trials must take into account the EU guidance document SANTE/2019/12752. If a new MRL is required for NI, then an application will need to be submitted to an EU MS. Information on the EU process for MRL setting is available here: Maximum Residue Levels | Food Safety (europa.eu).

Tox Data requirements

i) In order to reach some assurance regarding the ED potential of asulam regarding the T-modality, the applicant should provide data investigating the proposed MoA (TPO assay) as well as excluding other potential ED modes of action (i.e., NIS and deiodinase assays). Further investigations to exclude human relevance of the proposed MoA should then be conducted and finally potential developmental neurotoxicity should be addressed. This would allow a conclusion to be reached on the thyroid modality; the E, A and S modalities of the ED assessment should be addressed separately once the T-modality has been excluded.

Stewardship and Monitoring Requirements:

(i) Records to show ground-based use has occurred only on areas with a statutory conservation designation (such as Sites of Special Scientific Interest or Areas of Special Scientific Interest) or Agri-Environment scheme agreement land, including:

- Countryside Stewardship
- Environmental Stewardship
- Environmental Farming Scheme (Northern Ireland)
- Agri-Environment Climate Scheme (Scotland)
- Section 16 of the Environment (Wales) Act 2016 and Welsh Agri-Environment and Rural Development Programme grant schemes

where specific agreement for bracken control including the use of ‘Asulox’ has been made with Natural England, NatureScot, Natural Resources Wales or the Northern Ireland Environment Agency.

(ii) Records that land owners have been informed of and have adhered to the 1-month livestock exclusion restriction after the product has been sprayed, and that they have been advised that this is necessary to avoid potential MRL exceedances when placing produce into the supply chain.

(iii) Details of the annual quantity/volume of sales of Asulox from UPL Europe Ltd and their distributors, adjusted for any product that is returned unused. This must be presented separately for aerial use and use in SSSIs/agri-environment areas and forest.

(iv) Information on an annual basis on the habitats and environments where ‘Asulox’ is sprayed, and estimations of the quantity/volume of product applied to each habitat/environment.

(v) Further research on the alternatives to ‘Asulox’. In particular, further data on aerial application and efficacy of such applications should be generated to support future applications for authorisation for aerial use of alternative plant protection products and use in conservation areas.

(vi) Further research on non-target species sensitive to amidosulfuron to support a permanent solution.

(vii) Further data to address the consumer risk assessment are required from UPL Europe Ltd and must be submitted to enable the consideration of a further application for this use. The applicant must liaise with UPL to ensure that these data are submitted with the next application for this use.

(viii) Further data to address the endocrine disruption potential of asulam regarding the T-modality are required from UPL Europe Ltd and must be submitted to enable the consideration of a further application for this use. The applicant must liaise with UPL to ensure that these data are submitted with the next application for this use.

Appendix 1: ***DRAFT*** Authorisation Notice (if needed)

Authorisation Number: xxxx of 2023

EMERGENCY AUTHORISATION OF A PLANT PROTECTION PRODUCT

PLANT PROTECTION PRODUCTS REGULATION (EC) No. 1107/2009

Extent of Emergency Authorisation:	Great Britain and Northern Ireland
Product name*:*	Asulox
Active ingredient*:*	400 g/L asulam (a soluble concentrate formulation as detailed in the application form dated 25 July 2005 (HSE Ref.: W001036977))
Product owner*:*	UPL Europe Ltd, The Engine Rooms, 1st Floor, Birchwood Park, Warrington, Cheshire, WA3 6YN. (Registered company number: 2844616)
Emergency authorisation holder*:*	The Bracken Control Group, c/o Vallum House, Burgh by Sands, CARLISLE CA5 6AQ

This Emergency Authorisation starts: 1 July 2022

This Emergency Authorisation ends:

(a) for placing on the market and use: 11 September 2022

(b) for storage and disposal of stocks: 27 October 2022

This Emergency Authorisation can be withdrawn or amended before its end date if the requirements of authorisation under Regulation 1107/2009 are no longer met. The requirements may no longer be met as a result of, for example, new information brought to the attention of the competent authority on the danger necessitating the use of the PPP, the effects of the PPP, or whether use of the PPP is limited and controlled. These examples are not exhaustive.

HSE Digital Signature

This and the attached Appendices 1 and 2 are signed by the Health and Safety Executive ("HSE") for and on behalf of the Secretary of State, the Welsh Ministers, the Scottish Ministers and the Department of Agriculture, Environment and Rural Affairs in Northern Ireland.

Date of issue: dd May 2023

EXPLANATORY NOTES

1. This is Emergency Authorisation number xxxx of 2023.

2. This Emergency Authorisation will be published on the website of the Chemicals Regulation Division of HSE.

3. Application reference number: COP 2022/02174.

4. Persons using the product to which this Emergency Authorisation applies should acquaint themselves with and observe all requirements contained in the Regulation (EC) No 1107/2009.

5. Neither the efficacy nor the phytotoxicity of the product for which this Emergency Authorisation has been granted has been assessed and, as such, the user bears the risk in respect of failures concerning its efficacy and phytotoxicity.

6. In this notice Regulation (EC) 1107/2009 means:
   In relation to Great Britain, Regulation (EC) 1107/2009 as it has effect in Great Britain

   In relation to Northern Ireland, Regulation (EC) 1107/2009 as it has effect by virtue of the Protocol on Ireland/Northern Ireland in the EU withdrawal agreement

ADVISORY INFORMATION

This Emergency Authorisation relates to the aerial and ground-based use of ‘Asulox’ on rough grazing areas, moorland, amenity grassland and forestry (pre-planting and in first five years after planting) for control of bracken only. For ground-based application, use of ‘Asulox’ is restricted to conservation areas only, as defined in requirement (ii) below. The use in conservation areas must be under the direction of the relevant conservation body as listed below. It will be necessary for you to record the agreement to apply ‘Asulox’ and make the record available in line with requirement (ii) below.

Applications are to be made either aerially by helicopter only in a water volume of 1 part ‘Asulox’ to 4 parts water per hectare or by vehicle mounted horizontal boom sprayer in a water volume of 400 to 500 litres per hectare or by hand held applicators in a maximum concentration of 1 part ‘Asulox’ to 4 parts water.

IMPORTANT: When applying this product under the terms of this Authorisation of Use Notice, comply with any resistance guidance or restrictions stated on the product label.

Total reliance on one pesticide will hasten the development of resistance. Pesticides of different chemical types or alternative control measures should be included in the planned programme. Alternating with different modes of action is a recognised anti- resistance strategy.

Some forestry trees may be susceptible to damage at high rate of asulam. It is not possible to predict the tolerance of all forestry plants to asulam.

Bracken fronds should not be damaged by livestock, frost (bronzed and stunted fronds) or by cutting before treatment.

Do not apply during or immediately after drought periods or in conditions of high temperature and low humidity.

Do not cut bracken for at least 4 weeks after spraying to permit movement of ‘Asulox’ to rhizome buds; preferably leave undisturbed until late autumn. No outward signs of the effects of ‘Asulox’ on bracken will be observed during the current season following application. The effects only become apparent the following spring when normal frond emergence in treated bracken fails to occur.

At least 6 weeks should elapse between applying ‘Asulox’ and sowing or planting any subsequent crop.

The following is required for any future emergency application:

(ix) Records to show ground-based use has occurred only on areas with a statutory conservation designation (such as Sites of Special Scientific Interest or Areas of Special Scientific Interest) or Agri-Environment scheme agreement land, including:

- Countryside Stewardship
- Environmental Stewardship
- Environmental Farming Scheme (Northern Ireland)
- Agri-Environment Climate Scheme (Scotland)
- Section 16 of the Environment (Wales) Act 2016 and Welsh Agri-Environment and Rural Development Programme grant schemes

where specific agreement for bracken control including the use of ‘Asulox’ has been made with Natural England, Scottish Natural Heritage, Natural Resources Wales or the Northern Ireland Environment Agency.

(x) Records that land owners have been informed of and have adhered to the 1-month livestock exclusion restriction after the product has been sprayed, and that they have been advised that this is necessary to avoid potential MRL exceedances when placing produce into the supply chain.

(xi) Details of the annual quantity/volume of sales of Asulox from UPL Europe Ltd and their distributors, adjusted for any product that is returned unused. This must be presented for use in SSSIs/Agri-environment areas and forest.

(xii) Information on an annual basis on the habitats and environments where ‘Asulox’ is sprayed, and estimations of the quantity/volume of product applied to each habitat/environment, including details of the conservation area treated and the conservation body which agreed its use.

(xiii) Further research on the alternatives to ‘Asulox’. In particular, further data on the efficacy of such applications should be generated to support future applications for authorisation for use of alternative plant protection products in conservation areas.

(xiv) Further research on the non-target species sensitive to amidosulfuron to support a permanent solution.

(xv) Further data confidential to UPL Europe Ltd are required to address the consumer risk assessment and must be submitted to enable the consideration of a further application for this use. The applicant must liaise with UPL to ensure that these data are submitted with the next application for this use.

(xvi) Further data to address the endocrine disruption potential of asulam regarding the T-modality are required from UPL Europe Ltd and must be submitted to enable the consideration of a further application for this use. The applicant must liaise with UPL to ensure that these data are submitted with the next application for this use.

APPENDIX 1: CONDITIONS OF EMERGENCY AUTHORISATION

The conditions below are obligatory. They must be complied with when the product is placed on the market and used pursuant to this Emergency authorisation. Failure to comply with the following conditions is likely to result in the withdrawal or amendment of the emergency authorisation under Regulation (EC) No 1107/2009 and may result in other enforcement action, including prosecution.

Sale and supply:

Packaging: The product may only be placed on the market in the following containers:

i) 5 to 20 litre high density polyethylene container.

ii) 1000 litre high density polyethylene container with a top-mounted discharge valve for use with a closed transfer system (the container must not be fitted with any other type of outlet).

Label: The product may only be sold or supplied with the agreed label, which is the label agreed with UPL Ltd on 25 November 2022 (HSE ref.: W002067717).

Use:

Field of use: **ONLY AS A HERBICIDE**

User: Professional

Situations:	Maximum individual dose (litres product / ha):	Maximum number of treatments (per year):	Latest Time of Application:
Rough Grazing, Moorland, Amenity Grassland (SEE Other Specific Restriction 11)	11	1	12 September in the season of use.
Forest (pre-planting and in first five years after planting)	10	1	12 September in the season of use.

Operator Protection:

(1) Engineering control of operator exposure must be used where reasonably practicable in addition to the following personal protective equipment:

Operators must wear suitable protective clothing (coveralls) and suitable protective gloves when handling the concentrate.

(2) However, engineering controls may replace personal protective equipment if a COSHH assessment shows that they provide an equal or higher standard of protection.

Environmental protection:

(1) To protect non-target terrestrial plants respect an untreated buffer zone of **5m** to non-crop areas when using horizontal boom sprayers. HORIZONTAL BOOM SPRAYERS MUST BE FITTED WITH AT LEAST THREE STAR DRIFT REDUCTION TECHNOLOGY. Low drift spraying equipment must be operated according to the specific conditions stated in the official three-star rating for that equipment as published on HSE Chemicals Regulation Directorate’s website.

(2) To protect aquatic organisms, respect an untreated horizontal buffer zone distance to surface water bodies of **90m** when spraying from helicopters using low drift nozzles such as RD1000 Pencil Jets or Delavan RD 'Raindrop' type nozzles.

(3) To protect non-target terrestrial plants, respect an unsprayed horizontal buffer zone distance to non-target environment of **90m** when spraying from aircraft using low drift nozzles such as RD1000 Pencil Jets or Delavan RD 'Raindrop' type nozzles.

(4) Extreme care must be taken to avoid spray drift onto non-crop plants outside of the target area.

(5) To protect mammals, application is not allowed where the hazel dormouse is known to breed.

(6) To protect birds, application before 1 July and after 12 September in the season of use is not allowed. Where at all feasible, application should be made after 1 August, or as late in July as possible.

(7) Operators must take into account ground nesting birds. There is a potentially significant risk to ground nesting birds towards the end of the breeding season.

(8) Where there is a risk to rare or sensitive species, or where spraying is to take place near a Site of Specific Scientific Interest then advice must be sought from the appropriate conservation agency - Natural England, NatureScot, Natural Resources Wales or the Northern Ireland Environment Agency.

(9) Since there is a risk to aquatic life from use, users not applying the statutory buffer zone must either themselves carry out or ensure that someone else has carried out a Local Environment Risk

Assessment for Pesticides (LERAP) on their behalf before each spraying operation from a horizontal boom sprayer. Users must not allow direct spray from such sprayers to fall within **5m** of the top of the bank of any static or flowing waterbody or within 1m of a ditch which is dry at the time of application (these distances to be measured as set out in the booklet ‘Local Environment Risk Assessment for Pesticides - Horizontal Boom Sprayers’ and any amendments that are made to it) unless:

(a) The LERAP indicates that a narrower buffer zone will be sufficient; and

(b) Any measures indicated by the LERAP as justifying the narrower buffer zone are complied with in full and in accordance with any conditions applicable to them.

Spray must be aimed away from water.

Spray from hand-held sprayers must not be allowed to fall within 1m of the top of the bank of a static or flowing waterbody. Spray must be aimed away from water.

(10) The results of the LERAP must be recorded in written form and must be available for a period of three years for inspection to any person entitled to exercise enforcement powers under or in connection with the Plant Protection Products Regulations 2011 or the Plant Protection Products (Sustainable Use) Regulations 2012. (An electronic record will satisfy the requirement for a written record, providing it is similarly available for inspection and can be copied).

(11) Detailed guidance on LERAPs and how to conduct a LERAP are contained in the booklet ‘Local Environment Risk Assessment for Pesticides - Horizontal Boom Sprayers’, available from HSE Chemicals Regulation Division’s website. All LERAPs must be carried out in accordance with this Guidance and any amendments that are made to it.

Other specific restrictions:

(1) This product must only be applied in accordance with the terms of this Emergency Authorisation and the product label.

(2) This product must only be used for the control of bracken (*Pteridium aquilinum*).

(3) If applied aerially, it must only be by helicopter using low drift nozzles.

(4) No person may carry out aerial spraying or cause or permit another person to carry out aerial spraying unless such spraying is authorised by an aerial spraying permit issued by the HSE.

(5) If applied aerially, this product must only be applied to dense bracken in continuous stands covering a minimum of 80% of the area to be treated.

(6) Livestock must be removed from areas to be treated and must not be allowed to return until at least 1 month after treatment.

(7) Where ragwort is present users should consult the ‘Code of Practice on How to Prevent the Spread of Ragwort.’ Ragwort plants sprayed with this herbicide are more palatable and contain higher levels of toxins. Livestock must be excluded from treated areas until any ragwort has completely recovered or died and there is no visible sign of the dead weed. Do not include treated ragwort in hay or silage crops.

(8) Containers must not be re-used.

(9) A maximum concentration of 1 part product to 4 parts water must not be exceeded.

(10) When this product is applied via helicopter with adjuvants, it must only be with adjuvants that have a List Entry that permits aerial application in mixture with asulam and all conditions of the List Entry must be followed.

(11) Ground-based use is permitted only on areas with a statutory conservation designation (such as Sites of Special Scientific Interest or Areas of Special Scientific Interest) or Agri-Environment scheme agreement land, including:

- Countryside Stewardship
- Environmental Stewardship
- Environmental Farming Scheme (Northern Ireland)
- Agri-Environment Climate Scheme (Scotland)

- Section 16 of the Environment (Wales) Act 2016 and Welsh Agri-Environment and Rural Development Programme grant schemes

Where specific agreement for bracken control including the use of 'Asulox' has been made with Natural England, NatureScot, Natural Resources Wales or the Northern Ireland Environment Agency.

Records of this agreement must be kept and made available on request.

(12) This product qualifies for inclusion within the Local Environment Risk Assessment for Pesticides (LERAP) scheme. Before each spraying operation from a horizontal boom sprayer, either a LERAP must be carried out in accordance with the 'Local Environment Risk Assessment for Pesticides Horizontal Boom Sprayers' booklet available from the HSE Chemicals Regulation Division's website or the statutory buffer zone must be maintained. The results of the LERAP must be recorded and kept available for three years.

APPENDIX 2: GENERAL CONDITIONS FOR AN EMERGENCY AUTHORISATION

Failure to comply with the following conditions is likely to result in the withdrawal or amendment of the Emergency authorisation under Regulation (EC) No 1107/2009 and may result in other enforcement action, including prosecution**.**

Adverse effects:

The authorisation holder must immediately notify the Secretary of State, the Scottish Ministers and the Department of Agriculture, Environment and Rural Affairs (DAERA) (care of the Health and Safety Executive), if they have any new information on the potentially adverse effects of the authorised product, or of residues of an active substance in that product when used in accordance with the conditions of this Emergency Authorisation.

For those products authorised under Regulation (EC) No 1107/2009 as it has effect by virtue of the Protocol on Ireland/Northern Ireland in the EU withdrawal agreement, authorisation holders must also tell the other relevant competent authorities of the EC Member States (a list of which is available from the Health and Safety Executive) and the EC Commission. Failure to comply with this requirement is an offence.

Provision of information:

The authorisation holder must comply with all requests for information required by, or on behalf of, the Secretary of State, the Scottish Ministers or the Department of Agriculture, Environment and Rural Affairs (DAERA) in Northern Ireland in accordance with Regulation (EC) No 1107/2009.

Appendix 2: DRAFT Product Label (IF NEEDED)

To be supplied by the authorisation holder for products not authorised in the UK

EVALUATION, SUMMARY AND CONCLUSION BY REGULATORY AUTHORITY
Label amendments
n/a given the refusal.

ASULOX

A post-emergence translocated herbicide for the control of bracken under the conditions of the emergency authorisation issued by Chemicals Regulation Division of the Health and Safety Executive.

A soluble concentrate containing 400 g/L (33.6% w/w) of the sodium salt of asulam

ASULOX

A soluble concentrate containing 400 g/L (33.6% w/w) of the sodium salt of asulam

WARNING

May cause an allergic skin reaction.
Very toxic to aquatic life with long lasting effects.
Wear protective gloves/protective clothing.
IF ON SKIN: Wash with plenty of water.
Avoid release into the environment.
Collect spillage.

Do not contaminate water with the product or its container (Do not clean application equipment near surface water/Avoid contamination via drains from farmyards and roads).

To avoid risks to human health and the environment, comply with the instructions for use.

SAFETY PRECAUTIONS

Operator Protection

Engineering control of operator exposure must be used where reasonably practicable in addition to the following personal protective equipment:
OPERATORS MUST WEAR SUITABLE PROTECTIVE CLOTHING (COVERALLS) AND SUITABLE PROTECTIVE GLOVES WHEN HANDLING THE CONCENTRATE.
However, engineering controls may replace personal protective equipment if a COSHH assessment shows they provide an equal or higher standard of protection.

DO NOT BREATHE SPRAY.
WASH HANDS AND EXPOSED SKIN before meals and after work.
WHEN USING do not eat drink or smoke

Environmental Protection

TO PROTECT AQUATIC ORGANISMS, respect an unsprayed horizontal buffer zone distance to surface water bodies of 90 m when spraying from helicopters using low drift nozzles such RD1000 Pencil Jets or Delavan RD 'Raindrop' type nozzles.

SINCE THERE IS A RISK TO AQUATIC LIFE from use, users not applying the statutory buffer zone must either themselves carry out or ensure that someone else has carried out a Local Environment Risk Assessment for Pesticides (LERAP) on their behalf before each spraying operation from a horizontal boom sprayer. Users must not allow direct spray from such sprayers to fall within 5 m of the top of the bank of any static or flowing waterbody or within 1 m of a ditch which is dry at the time of application (these distances to be measured as set out in the booklet ‘Local Environment Risk Assessment for Pesticides - Horizontal Boom Sprayers’ and any amendments that are made to it) unless:

(a) The LERAP indicates that a narrower buffer zone will be sufficient; and
(b) Any measures indicated by the LERAP as justifying the narrower buffer zone are complied with in full and in accordance with any conditions applicable to them.

Spray must be aimed away from water.

Spray from hand-held sprayers must not be allowed to fall within 1 m of the top of the bank of a static or flowing waterbody. Spray must be aimed away from water.

The results of the LERAP must be recorded in written form and must be available for a period of three years for inspection to any person entitled to exercise enforcement powers under or in connection with the Plant Protection Products Regulations 2011 or the Plant Protection Products (Sustainable Use) Regulations 2012. (An electronic record will satisfy the requirement for a written record, providing it is similarly available for inspection and can be copied).

Detailed guidance on LERAPs and how to conduct a LERAP are contained in the booklet ‘Local Environment Risk Assessment for Pesticides - Horizontal Boom Sprayers’, available from HSE Chemicals Regulation Division’s website. All LERAPs must be carried out in accordance with this Guidance and any amendments that are made to it.

TO PROTECT NON-TARGET PLANTS respect an untreated buffer zone of 5 metres to non-crop areas. HORIZONTAL BOOM SPRAYERS MUST BE FITTED WITH AT LEAST THREE STAR DRIFT REDUCTION TECHNOLOGY. Low drift spraying equipment must be operated according to the specific conditions stated in the official three-star rating for that equipment as published on HSE Chemicals Regulation Directorate’s website.

TO PROTECT NON-TARGET TERRESTRIAL PLANTS, respect an unsprayed horizontal buffer zone distance to non-target environment of 90 m when spraying from aircraft using low drift nozzles such as RD1000 Pnecil Jets or Delavan RD 'Raindrop' type nozzles.

EXTREME CARE MUST BE TAKEN to avoid spray drift onto non-crop plants outside of the target area.

TO PROTECT GROUND NESTING BIRDS, use before 1 July in the season of use is not allowed.

Operators must take into account ground nesting birds. There is a potentially significant risk to ground nesting birds towards the end of the breeding season.

WHERE THERE IS A RISK TO RARE OR SENSITIVE SPECIES, or where spraying is to take place near a Site of Specific Scientific Interest then advice must be sought from the appropriate conservation agency - Natural England, NatureScot, Natural Resources Wales or the Northern Ireland Environment Agency.

Storage and Disposal
KEEP AWAY from food drink and animal feedingstuffs.
KEEP OUT OF REACH of children.
KEEP IN ORIGINAL CONTAINER, tightly closed, in a safe place.
WASH OUT CONTAINER THOROUGHLY and dispose of safely.
CONTAINERS MUST NOT be re-used.

<Quantity>

For Batch Number and Manufacturing Date see bottle.

The (COSHH) Control of Substances Hazardous to Health Regulations may apply to the use of this product at work.

UPL Europe Ltd.
Engine Rooms (1st Floor)
Birchwood Park
Warrington
WA3 6YN
Cheshire, UK
Tel: +44 (0) 1925 819999
Fax: +44 (0) 1925 856075

Emergency Telephone Number (CARECHEM 24): +44 (0) 1235 239670

IMPORTANT INFORMATION

FOR PROFESSIONAL USE ONLY AS A HERBICIDE TO CONTROL BRACKEN

Crops/Situations	Maximum individual dose (L product/ha)	Maximum number of treatments (per year)	Latest Time of Application
Rough Grazing, Moorland and Amenity Grassland (see Other Specific Restriction 11)	11.0	One	13 September in the season of use
Forest (pre-planting and in first five years after planting)	10.0	One	13 September in the season of use

OTHER SPECIFIC RESTRICTIONS:

1. This product must only be applied in accordance with the terms of this Emergency Authorisation, the product label and/or associated leaflet.
2. This product must only be used for the control of bracken (*Pteridium aquilinum*).
3. If applied aerially, it must only be by helicopter using low drift nozzles.
4. No person may carry out aerial spraying or cause or permit another person to carry out aerial spraying unless such spraying is authorised by an aerial spraying permit issued by the HSE
5. If applied aerially, this product must only be applied to dense bracken in continuous stands covering a minimum of 80% of the area to be treated
6. Livestock must be removed from areas to be treated and must not be allowed to return until at least 1 month after treatment.
7. Where ragwort is present users should consult the ‘Code of Practice on How to Prevent the Spread of Ragwort.’ Ragwort plants sprayed with this herbicide are more palatable and contain higher levels of toxins. Livestock must be excluded from treated areas until any ragwort has completely recovered or died and there is no visible sign of the dead weed. Do not include treated ragwort in hay or silage crops.
8. Containers must not be re-used.
9. A maximum concentration of 1 part product to 4 parts water must not be exceeded.
10. When this product is applied via helicopter with adjuvants, it must only be with adjuvants that have a List Entry that permits aerial application in mixture with asulam and all conditions of the List Entry must be followed.
11. Ground-based use is permitted only on areas with a statutory conservation designation (such as Sites of Special Scientific Interest or Areas of Special Scientific Interest) or Agri-Environment scheme agreement land, including:
    - Countryside Stewardship
    - Environmental Stewardship
    - Environmental Farming Scheme (Northern Ireland)
    - Agri-Environment Climate Scheme (Scotland)
    - Section 16 of the Environment (Wales) Act 2016 and Welsh Agri-Environment and Rural Development Programme grant schemes

    where specific agreement for bracken control including the use of ‘Asulox’ has been made with Natural England, Scottish Natural Heritage, Natural Resources Wales or the Northern Ireland Environment Agency.

    Records of this agreement must be kept and made available on request.

DIRECTIONS FOR USE

IMPORTANT: This information is approved as part of the Product Label. All instructions within this section must be read carefully in order to obtain safe and successful use of this product.

BRACKEN CONTROL

FRONDS MUST NOT be damaged by stock, frost (bronzed and stunted fronds) or by cutting before treatment.
DO NOT apply during or immediately after drought periods or in conditions of high temperature and low humidity.
DO NOT cut bracken for at least 4 weeks after spraying to permit movement of ASULOX to rhizome buds; preferably leave undisturbed until late autumn.
AT LEAST 6 WEEKS should elapse between applying ASULOX and sowing or planting any subsequent crop.
DO NOT admit livestock for at least 1 month after treatment to avoid trampling of treated fronds.

NOTE: No outward signs of the effects of ASULOX on bracken will be observed during the current season following application. The effects only become apparent the following spring when normal frond emergence in treated bracken fails to occur.
Apply ASULOX on a dry day. Ideally, there should be 24 hours without rain to allow for adequate uptake of ASULOX into the bracken plant. Light rain after 6 hours should not adversely affect activity.

Primary clearance treatments and containment

Bracken should be treated in full frond (all fronds fully expanded) but before yellowing (start of senescence). Normally this will be within the period mid July to late August.

Follow up treatments for bracken clearance

Because of dormant buds on the rhizome system of bracken, complete control will not be achieved by a single application. Re-growth tends to be stunted but should be treated at the same timing as primary applications, irrespective of the state of frond development.
IF NO FOLLOW-UP TREATMENT OR LAND IMPROVEMENT PROGRAMME IS CARRIED OUT, THE LAND IS LIKELY TO BE RE-INFESTED WITH BRACKEN WITHIN 5 YEARS OF A PRIMARY APPLICATION.

MIXING

ASULOX can be applied in a water-based system. If you wish to use it with an adjuvant, see the Chemicals Regulation Division Official List for details of approved adjuvants . Adjuvants must NOT be used in forestry situations when overspraying trees or other situations where selectivity of the applied spray may be critical.

Half fill the spray tank or container with water and then pour in the required amount of ASULOX and top up with water. When ASULOX is used with an adjuvants, all conditions of the List Entry must be followed. Ensure thorough mixing before commencing spraying.

CROP SPECIFIC INFORMATION

Only one application should be made per year.

No bracken spraying should be attempted along stream banks, wet gulleys, screes and other locations where rare or unusual plants are often to be found.

Grassland species tolerance to ASULOX

Some grasses and herbs may be damaged by ASULOX. In practice, a dense bracken canopy protects the underlying vegetation and any check to these species is usually only temporary. The more sensitive species include Yorkshire-fog, Timothy, Cock's-foot, bents, annual meadow-grass, daisy, docks, plantains, saxifrage and all other ferns.

Tree species tolerance to ASULOX
Most species are unaffected. However, young specimens of the following may exhibit chlorosis and a slight check in growth if directly sprayed whilst actively growing:

- Beech
- Birch
- Corsican pine
- Douglas fir
- Elm
- Grand fir
- Japanese larch
- Norway spruce
- Poplar
- Sitka spruce
- Scots pine
- Bilberry
- Gorse
- Heathers

Mature specimens of the above, as well as hawthorn, holly and rowan will be unharmed. Western hemlock and willows are more susceptible and spraying of these species should be avoided.

Some forestry trees may be susceptible to damage at high rates of asulam. It is not possible to predict the tolerance of all forestry plants to asulam.

A. BRACKEN CONTROL IN ROUGH GRAZING, MOORLAND AND AMENITY GRASSLAND

AERIAL application by HELICOPTER only	Apply ASULOX at 11 L/ha in a total spray volume, including water, of 44 L/ha.
TRACTOR MOUNTED SPRAYER **(& other vehicle mounted sprayers) - OVERALL treatment**	Apply ASULOX at 11 L/ha in 400 - 500 L/ha of water as a MEDIUM or COARSE spray (BCPC category). Adjust boom height to give uniform coverage at the top of the bracken fronds.
KNAPSACK SPRAYER or HAND LANCE (Hand-operated) **- SPOT and OVERALL spray treatment**	Mix 1 part ASULOX with minimum 4 parts water. Avoid spraying to run-off. The knapsack lance should be fitted with a nozzle to apply a MEDIUM or COARSE spray (BCPC category). A red food-stuffs dye may be mixed with the spray to help identify treated fronds.

B. BRACKEN CONTROL IN FORESTRY AREAS

AERIAL application by HELICOPTER only	Apply ASULOX at 5-10 L/ha in a total spray volume, including water, of 55 L/ha.
TRACTOR MOUNTED SPRAYER (& other vehicle mounted sprayers) - OVERALL treatment	Apply ASULOX at 10 L/ha in 400 - 500 L/ha of water as a MEDIUM or COARSE spray (BCPC category). Adjust boom height to give uniform coverage at the top of the bracken fronds.
KNAPSACK SPRAYER or HAND LANCE (Hand-operated) - SPOT and OVERALL spray treatment	Mix 1 part ASULOX with minimum 4 parts water. Avoid spraying to run-off. The knapsack lance should be fitted with a nozzle to apply a MEDIUM or COARSE spray (BCPC category). A red food-stuffs dye may be mixed with the spray to help identify treated fronds.

Releasing treatments in forestry and habitat management

Apply ASULOX at 5-10 L/ha as an aerial overspray to saplings for the control of bracken as a releasing treatment. The higher rate (10 L/ha) will provide a longer period of bracken suppression and “release”. Do not use adjuvants with ASULOX in forestry situations when overspraying young trees.

Bracken control for tree planting programmes in forestry

New planting:

Treat mature bracken only after 1 July and before the end of August pre-planting. Leave bracken undisturbed until it dies back, then plant up in accordance with normal forestry practice. DO NOT re-plant for at least 4 weeks after spraying. Allow at least 4 weeks between application and cutting or clearing bracken from small trees to permit movement of ASULOX to the rhizome.

Re-planting:

After spring & early summer felling: treat mature bracken re-growth in late summer before the end of August and before re-planting.

Mid-summer felling conflicts with the timing of ASULOX applications as the bracken is immature before felling and bracken re-growth has no time to mature after felling.

Late summer / autumn felling: treat area before felling (treatment after felling may show reduced efficacy where felling has damaged bracken stands). Leave at least 4 weeks between treatment and felling to allow translocation of ASULOX to the rhizomes.

RESISTANCE

Total reliance on one pesticide will hasten the development of resistance. Pesticides of different chemical types or alternative control measures should be included in the planned programme. Alternating with different modes of action is a recognised anti resistance strategy.

COMPANY ADVISORY INFORMATION

CONDITIONS OF SUPPLY

All goods supplied by the company are of good quality and we believe them to be fit for purpose.

However, as we cannot exercise control over their storage, handling, mixing or use or the weather conditions before, during or after application, which may affect the performance of the goods, all conditions and warranties, statutory or otherwise, as to the quality or fitness for any purpose of our goods are excluded, and no responsibility will be accepted by us or re-sellers for any failure in performance, damage or injury whatsoever arising from their storage, handling, application or use.

These conditions cannot be varied by our staff or agents whether or not they supervise or assist in the use of such goods. Brand names used in this label may be registered trademarks of UPL Europe Ltd, or other manufacturers in which propriety rights may exist.

Appendix 3: Lists of Data Considered

List of data submitted by the applicant

Author(s)	Year	Title Owner, Report No. Source (where different from owner) GLP or GEP status Published or not	Vertebrate study Y/N	Data protection claimed Y/N	Justification if data protection is claimed	Owner
[redacted]	2022	To Evaluate the Drift from Aerial Applications of Asulox in North Yorkshire Study Number BG03 R&D Applied Biology GLP: no Published: no	No	Outwith	-	R&D Applied Biology

Appendix 4: Glossary

Specialists to update if terms additional to those below used

Non-dietary Human Exposure

AOEL	Acceptable Operator Exposure Level
AAOEL	Acute Acceptable Operator Exposure Level
AOEM	Agricultural Operator Exposure Model
DFR	Dislodgeable Foliar Residues
DT50	Half-life of active substance
PPE	Personal Protective Equipment
RPE	Respiratory Protective Equipment
SRSU	Splash Resistant Single Use (gloves)
TC	Transfer Coefficient

Residues

EFSA	European Food Safety Authority
DAR	Draft assessment report
TTC	Threshold of toxicological concern
NEDI	National estimate of dietary intake
IEDI	International estimated daily intake
ADI	Acceptable daily intake
EC	European Commission
ARfD	Acute reference dose
MRL	Maximum residue level
EU	European Union
MS	Member state
RO	EFSA Reasoned Opinion

Environmental Fate and Behaviour

PEC	Predicted Environmental Concentration
PECSOIL	Predicted Environmental Concentration in soil
EFSA	European Food Standards Agency
DT50 /DT90	Degradation time for 50 % or 90 % of substance to degrade.
GAP	Good Agricultural Practice
PECSW	Predicted Environmental Concentration in surface water
PECSED	Predicted Environmental Concentration in sediment
PECGW	Predicted Environmental Concentration in ground water
KOC/KFOC	Sorption coefficient
Pa	Pascal
1/n	Freundlich exponent
LogPow	Octanol/water partition coefficient
DFOP	Double first-order in parallel model

Ecotoxicology

°C	degree Celsius (centigrade)
µg	microgram
µm	micrometer (micron)
a.i.	active ingredient
a.s.	active substance
BBCH	Biologische Bundesanstalt, Bundessortenamt and CHemical industry; BBCH used as shorthand for reference to crop growth-stages (GS) defined under this scheme
BCF	Bioconcentration factor

BMD	benchmark dose
BMF	Biomagnification factor
bw	body weight
CA	Chemical Abstract
CAS	Chemical Abstract Service
d	day
DAR	draft assessment report
DAT	Days after treatment/application
DDD	Daily Dietary Dose
DFOP	double first-order in parallel model
DM	dry matter
dRR	Draft Registration Report
dw (d.w.)	Dry weight
DT50	period required for 50 percent dissipation (define method of estimation)
DT90	period required for 90 percent dissipation (define method of estimation)
EC50	Median concentration that causes a 50% effect on the test population (†)
EbC50	Median concentration that causes a 50% effect (biomass) on the test population
ErC50	Median concentration that causes a 50% effect (growth) on the test population
EyC50	Median concentration that causes a 50% effect (yield) on the test population
EEC	European Economic Community
EFSA	European Food Safety Authority
ER50	Median rate that causes a 50% effect on the test population
ERO	Ecological Recovery Option
ETO	Ecological Threshold Option
ETR	Exposure Toxicity Ratio
EU	European Union
FC	field capacity
FOMC	First Order Multi Compartment
FS	Focal species
FOCUS	Forum for the Co-ordination of Pesticide Fate Models and their Use
g	gram
GAP	good agricultural practice
GLP	good laboratory practice
GS	growth stage
h	hour(s)
ha	hectare
HCx	Hazardous concentration for x % of the species of a SSD
hL	hectolitre
HPLC	high pressure liquid chromatography or high-performance liquid chromatography
HS	Hockey stick
HQ	hazard quotient
ISO	International Organisation for Standardisation
kg	kilogram
Koc	organic carbon adsorption coefficient
Kow	Octanol-water partition coefficient
L	litre
LC	liquid chromatography
LC-MS	liquid chromatography-mass spectrometry

LC-MS-MS	liquid chromatography with tandem mass spectrometry
LC50	Median concentration to cause 50% mortality in the test population
LD50	Median dose to cause 50% mortality in the test population
LOAEL	lowest observable adverse effect level
LOD	limit of detection
LOQ	limit of quantification (determination)
LR50	Median rate that causes a 50% mortality in the test population
µg	microgram
MAF	Multiple application factor
MDD	Minimum Detectable Difference
MDR	Model Deviation Ratio
mg	milligram
mL	millilitre
mm	millimetre
MRL	maximum residue limit or level
MS	mass spectrometry
MWHC	maximum water holding capacity
nm	nanometer
NOAEL	no observed adverse effect level
NOEC	no observed effect concentration
NOEL	no observed effect level
OC	organic carbon
OECD	Organisation for Economic Co-operation and Development
PEC	predicted environmental concentration
PEC_A/PEC_{air}	predicted environmental concentration in air
PEC_S/PEC_{soil}	predicted environmental concentration in soil
PEC_{sed}	predicted environmental concentration in sediment
PEC_{SW}	predicted environmental concentration in surface water
PEC_{GW}	predicted environmental concentration in ground water
PHI	pre-harvest interval
pKa	negative logarithm (to the base 10) of the dissociation constant
ppb	parts per billion
ppm	parts per million
ppp	plant protection product
PRAPeR	Pesticide Risk Assessment Peer Review
PD	proportion of food types obtained from the treated area
PT	proportion of time spent feeding in the treated area
r2	coefficient of determination
RAC	Regulatory Acceptable Concentration
RAR	Renewal Assessment Report
RMS/zRMS	rapporteur Member State (zRMS = zonal rapporteur Member State)
SFO	Single first order
SSD	Species Sensitivity Distribution
TER	toxicity exposure ratio
TRR	total radioactive residues
TWA	Time weighted average
UV	ultraviolet
WHO	World Health Organisation

ww (w.w.)	Wet weight
yr	year

Appendix 5: Areas Treated

09 EA23 AnnI Areas Treated.pdf

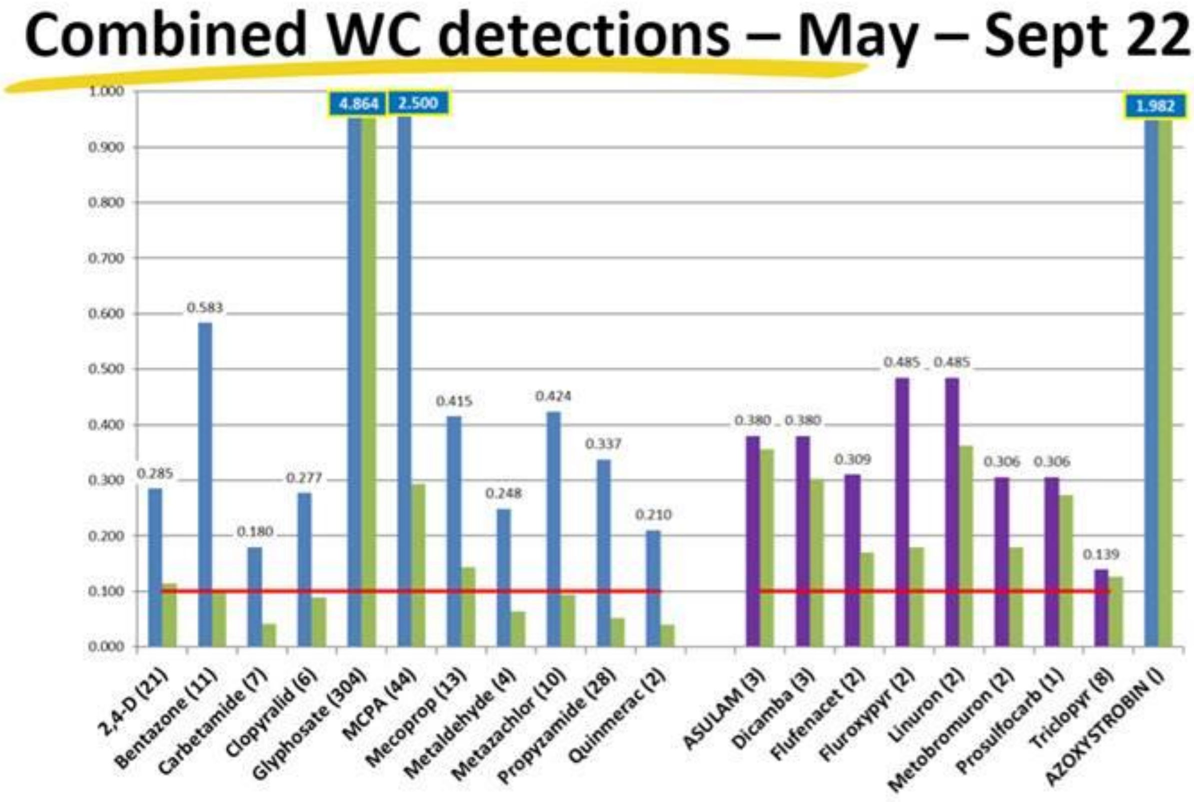
09.1 EA23 AnnI App1 Records Chart

Appendix 6: Research

03 EA23 AnnC Research Programm

221031-nbcct-2022-summary.pdf

Appendix 7: Water company detections



There were three detections of asulam above the 0.1µg/l limit in May-September last year. Two were in the Yorkshire Water region.

Severn Trent have had an issue with Asulox being sprayed by helicopter on land that drains to Ladybower reservoir. At Bamford WTW that treats Ladybower reservoir water we don't have pesticide removal in place so it's use is a concern, especially this summer when we had very low reservoir levels so dilution was less.

Ladybower asulam data 2019 to 2022.xl

all asulam data 2019 to 2023.xlsx

Source: Severn Trent Water
The reference to 'rawline' data is inflow to the WTW and 'final' is out flow post treatment.
When a values is preceded by '<' this indicates that it is the limit of the method that is analysing the water sample. So for example in row two of the dataset the sample measurement <0.008 would indicate a no detection at the limit of the analytical method used.
BH= borehole

The drinking water standard 0.1ug/l is set for all pesticides (with a few exceptions for more toxic ones) which is part of the drinking water standards regulated by the DWI. Not all treatment works have to have pesticide removal, it is only required if there is a risk from the catchment when the treatment works was built. It is therefore important to try and protect those catchments to prevent deterioration of the water.

For the majority of water treatment works that are supplied by upland catchments (like Ladybower) pesticide usage is very low/ does not happen with it being moorland and rough pasture and so the treatment works doesn't have removal capabilities. It is mainly treatment works that are supplied by large river sources which have the vast arable catchments resulting in GAC and ozone to be required to remove pesticides.

Appendix 8: Conclusions Meeting

EVALUATION, SUMMARY AND CONCLUSION BY REGULATORY AUTHORITY
This will be held if any level of authorisation is granted, but will not be necessary if a refusal.

Appendix 9: ECP Advice Note from 2022

ECP ADVICE TO GOVERNMENT: USE OF 'ASULOX' ON GRASSLAND AND FOREST TO CONTROL BRACKEN

Issue

1. The Government has received a further application for an emergency authorisation for the use of 'Asulox' (contains asulam) for use as a herbicide for the control of the bracken (*Pteridium aquilinum*).

Action required

2. Members were asked to advise on the following areas:

Mammalian Toxicology

- In light of the EFSA position and HSE's consideration, does the Committee consider that asulam has endocrine disrupting potential in humans?
- What is the Committee's view on the risk of thyroid endocrine disruption given that observed thyroid effects occur at relatively high does, clearly above the NOAELs driving the reference values?

Ecotoxicology

- HSE's current assessment indicates that it is not possible to conclude regarding whether asulam is a potential endocrine disrupting compound for non-target organisms. Is the Committee aware of any additional data available to enable a conclusion to be drawn on this issue?
- Is HSE's interpretation of the bird and mammal phenology data scientifically valid? What is the Committee's view on the increased level of the long-term/reproductive risk to birds and mammals if use were to be permitted from 1 July (as the applicant requests) relative to 1 August, which mitigates the risk?

Discussion

3. The Committee *noted* that:

- This was the tenth consecutive emergency application for this product and use under Article 53 of Regulation 1107/2009.
- The Bracken Control Group state on their website that 'the application for full regulatory approval of asulam under GB regulations has started'; however, no application has yet been received by Government.
- There is a need to control bracken and that there is no other active ingredient authorised for aerial application.
- The EFSA conclusion (2021) states that asulam-sodium is considered to meet the criteria for endocrine disruption (ED) for humans for the T-modality.

- The acute risk to birds and mammals, acute and long-term risks to bees, non-target arthropods, soil organisms and processes are all acceptable from the proposed use.

- A 5m habitat protection zone is required to protect aquatic life from vehicle mounted applications, whilst aerial applications require a 90m habitat protection zone and a delivery system equipped with low drift nozzles to protect aquatic life.

- A high risk to non-target terrestrial plants is predicted. A 5m habitat protection zone with 3* Drift Reduction Technology is proposed for ground-based use and 90m for aerial applications.

- For the long-term/reproductive risk to birds and mammals, additional data have been submitted which indicate that there is an acceptable risk if the time of application is restricted to 1 August to 12 September.

- The long-term/reproductive risk to small mammals can be mitigated by only applying to sites where the hazel dormouse is known not to occur. An agreed methodology is needed to enable this decision.

- There are no criteria in the application to determine when and where to spray, nor to decide when to stop spraying in a multi-year control programme.

4. The Committee *agreed* with HSE's evaluation that:

   - The present NOAEL reference values for asulam-sodium are highly protective for thyroid effects whilst the ED potential is being further investigated.

   - There is insufficient evidence to draw a conclusion regarding endocrine disruption in non-target organisms.

5. The Committee *advised* that:
   - There were insufficient data to draw any conclusions on the endocrine disrupting potential for the T-Modality. For all other end points no data were provided.

   - From the data provided to the Committee, the risk to human health is likely to be low given the low exposure to bracken. It was noted there were no data provided to conclude on hazard.

   - The Members were not aware of any further data to support an assessment to conclude whether asulam is a potential endocrine disrupting compound for non-target organisms.

   - Changing the use period from 1 July to 1 August would mitigate some risk, however, it was not possible to quantify how much the risk would be mitigated.

   - The difference in the efficacy of the product between July and August should be considered to ensure there is benefit from the use of the product. HSE should also consider the different conditions and timings across the UK where the product will be used.

- New spray drift data included in dossier was welcomed; however, not enough information was provided to allow the 90m no spray zone to be mitigated. Members noted the trial did not include specific data on the topography of the trial site or the orientation of the plot in relation to wind speed or direction, which are important parameters for a spray drift trial.

- In any field study utilising non-target behaviours, such as pit-fall trapping, data interpretation should always take into account the potential movement of individuals into and out of treated areas.

Conclusion

6. On the basis of the evidence brought before the ECP, the Committee expressed the view that it does not support an emergency authorisation under Article 53 of Regulation 1107/2009 for the aerial or land-based application of ‘Asulox’ to control bracken due to risks that cannot be mitigated.

Appendix 10: Assessment of spray drift study (2022)

Author:	[redacted] 2021
Title:	To Evaluate the Drift from Aerial Application of Asulox in North Yorkshire
Report No.:	BG03 22 August 2022
Data owner:	R&D Applied Biology
Guideline(s):	-
GLP/GEP:	No
Data location:	HSE ref w002064329

Two drift trial studies have been submitted in support of this application in Report BG03. This report details trials conducted in Lowna in the North Yorkshire Moors National Park on 07 and 08 August 2022. Below is the HSE assessment of the study.

Methods and trials set up

Application was via aerial application using a R44 helicopter which was manned with a 7.5m boom. 108 pencil jet nozzles were placed at 6 cm intervals along the boom and were operated at a pressure of 1.24 bar and calibrated to deliver 0.5 L/min spray solution, giving a boom flow rate of 54 L/min. The boom was operated at a height of 8 m during application and forward speed of 52 mph, providing an overall application rate of 54 L/ha.

The drift site was 7.5 x 250m and water sensitive paper (WSP) collectors of 6.2 cm^2 were placed 0, 10, 20, 30, 40m downwind. Papers were stapled to the adaxial (upper) leaf surface at top (T) and bottom (B) positions of the frond as well as top or bottom of the leaf giving a total of 42 samples per trial divided into 6 transects see Figure A2-1 for transect layout and Figure A2-2 for card positioning in canopy..

In addition, under the helicopter spray swath, sampling points were placed every 50m down the 250m plot and collected from the right and left side of the plot using the same technique. The applicant has indicated that "*the collectors under the planned boom location were attached either side of the centre line with a basal and frond top card as on the other locations along the transect lines to the east of the spray pass. This was disrupted by the slight repositioning of the line at the time of the actual spraying, but there were still two sets of collecting points under the boom at the start of each of the 6 transects*." As detailed in the results section the applicant considers that the helicopter flight path was at the 10m distance and not the 0 m point. This is discussed further in the results section.

The application took place on 7th and 8th August, no rain occurred during the trial, the wind speed and air temperature was recorded as 18 km/h and 15.8 ºC for Trial 1 and 12 km/h 25 ºC for Trial 2. The indicated flight speed of helicopter was 52 mph which would indicate an overall spray solution application rate of 55 L/ha.

There is no indication that samples were placed upwind of the treated plot or that any calibration of the DepositScan software and analysis was made for the treatment solution. The applicant has reported deposit on 'blank' samples but have stated that "*The blanks were not supplementary, they were field samples but were papers where no liquid contact of any kind* *was recorded and therefore represent the 'no spray detected' category*”. The location is therefore unclear, one of these samples has been excluded due to damage during handling.

Figure A1-1: Layout of site in Lowna field trial, with flight direction from sample 1 to 6

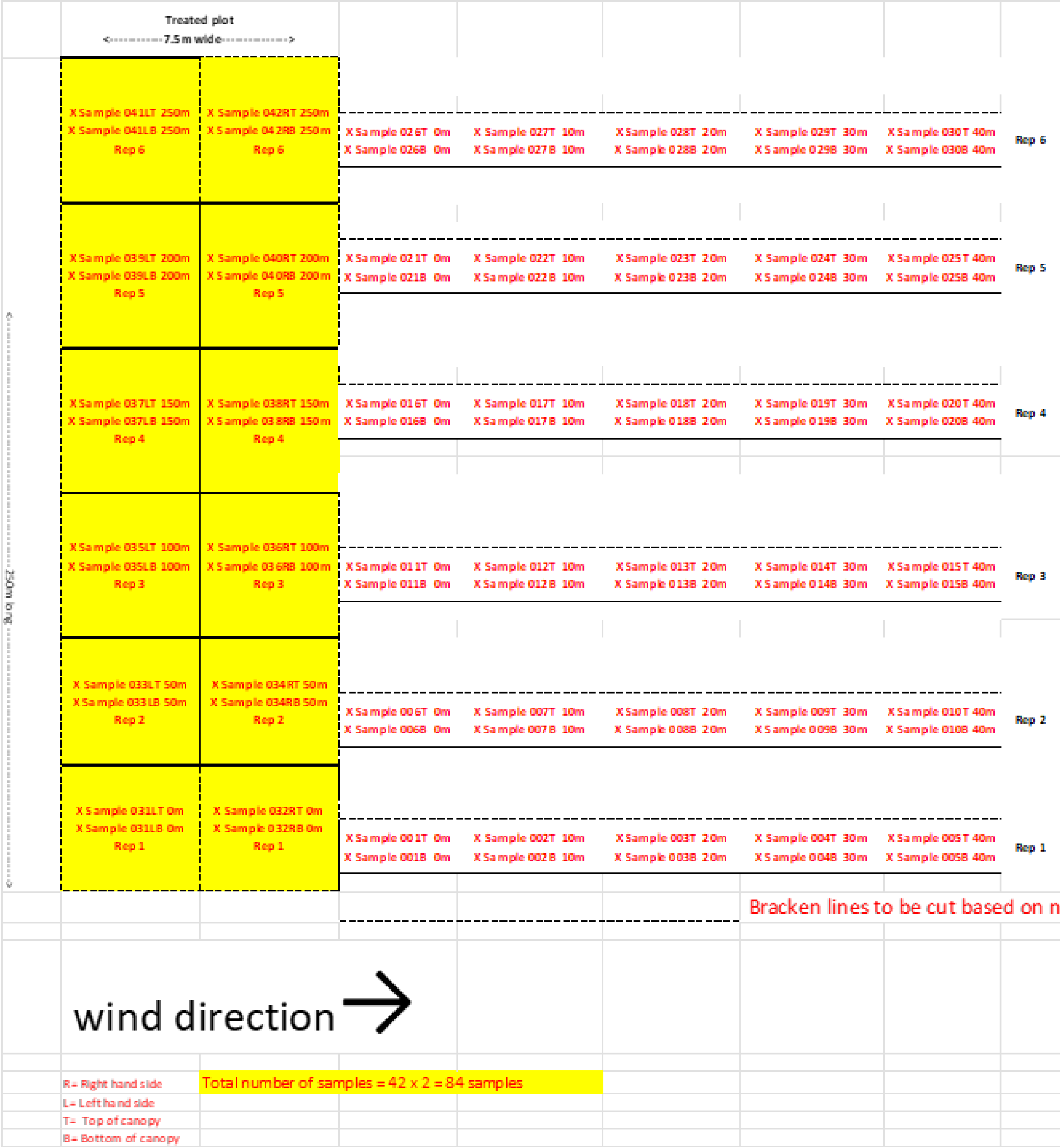


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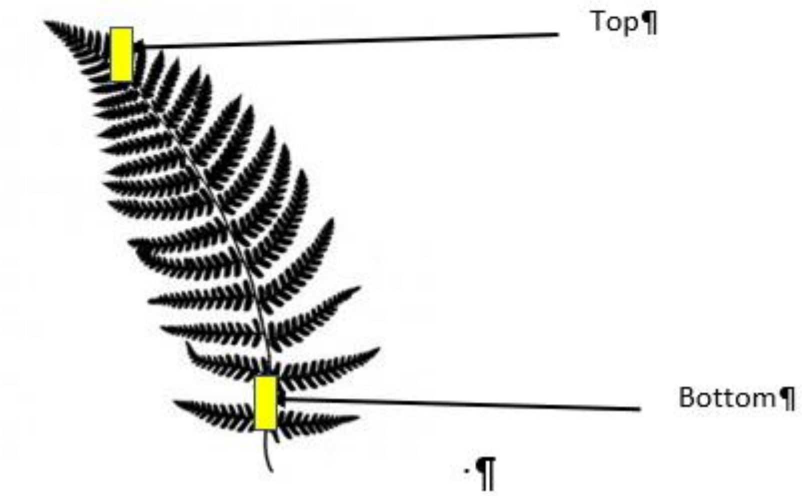
Figure A1-2: Water sensitive paper (WSP) position on canopy



Methodology

Following application the water sensitive papers were individually collected, placed into a brown envelope and sent for analysis, which occurred within 2-3 days of treatment.

The papers were scanned using a Canon Lide120 flatbed scanner. The analysis of collected images was evaluated using DepositScan® from USDA software. The applicant has provided details of the DepositScan software package and user manual for setup, stating that:

> "*The programme consists of a set of custom plugins that are used by an image processing programme to produce a number of measurements…. and parameters related to the droplet sizes, their distributions, the total number of droplets, and the percentage of area covered. DepositScan® converts each individual image spot area using the equation Dd = 1.06 As 0.455 DV.1, DV.5, and D V.9 represent the distribution of the droplet diameters such that droplets with a diameter smaller than DV.1, DV.5, and D V.9 compose 10%, 50% and 90% of the total liquid volume, respectively*."

No calibration of the DepositScan software in relation to droplet detection and spread of the spray liquid used was made. The image resolution used was 600 dots per inch (dpi) on grayscale and the automatic detection threshold was used. The images were cropped to the whole water sensitive paper, however areas analysed ranged from 3.2 – 6.2 cm^2. The applicant has noted three papers that were cropped to 3.2 cm^2 due to damage. The data are presented as %coverage values and µL/cm^2. The former has challenges in the absence of normalisation to a constant area e.g. cm^2, the latter is unclear as the spread and detection of the test liquid has not been calibrated. In addition there are some readings that appear to be uncertain for example low coverage and high DV.9 values for their distance downwind and in some cases possible repetition of WSP readings due to identical values being determined at some distances. There are some challenges with interpretation and validation of these data therefore the approach taken is a qualitative one where the deposition of µl/cm^2 on a relative basis has been assessed to give an indication of the proportion of drift with distance.

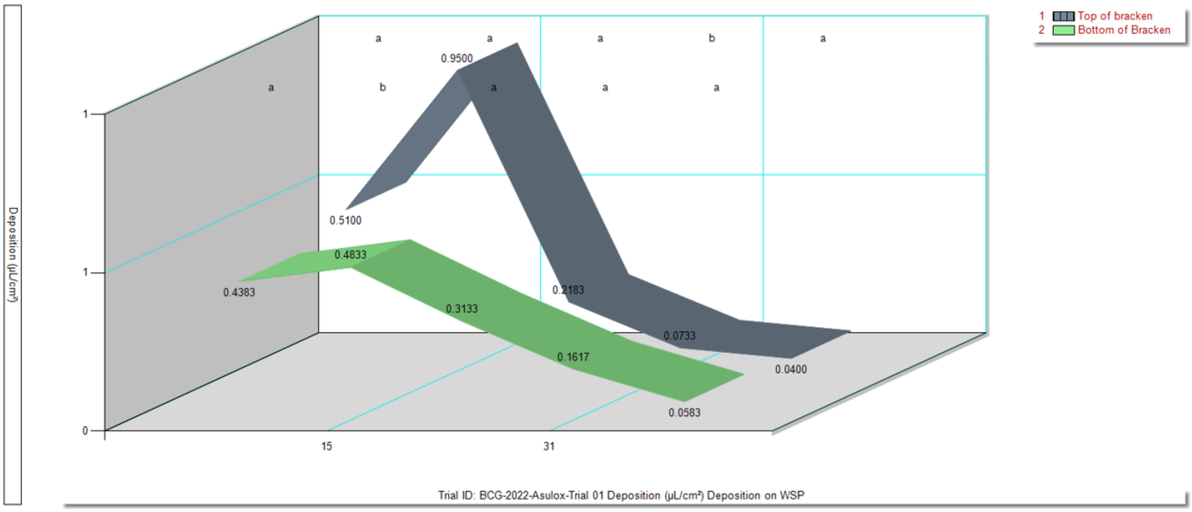
Results

The applicant has provided the print out from the DepositScan software analysis of the water sensitive papers. This includes details of the DV 1 (µm), DV 5 (µm), DV10 (µm), %

coverage, image area, deposits/cm^2 and deposition as µL/cm^2. They have also provided graphical presentation of the deposition on a % coverage and µL/cm^2 basis, the latter is detailed at Figure A1-3.

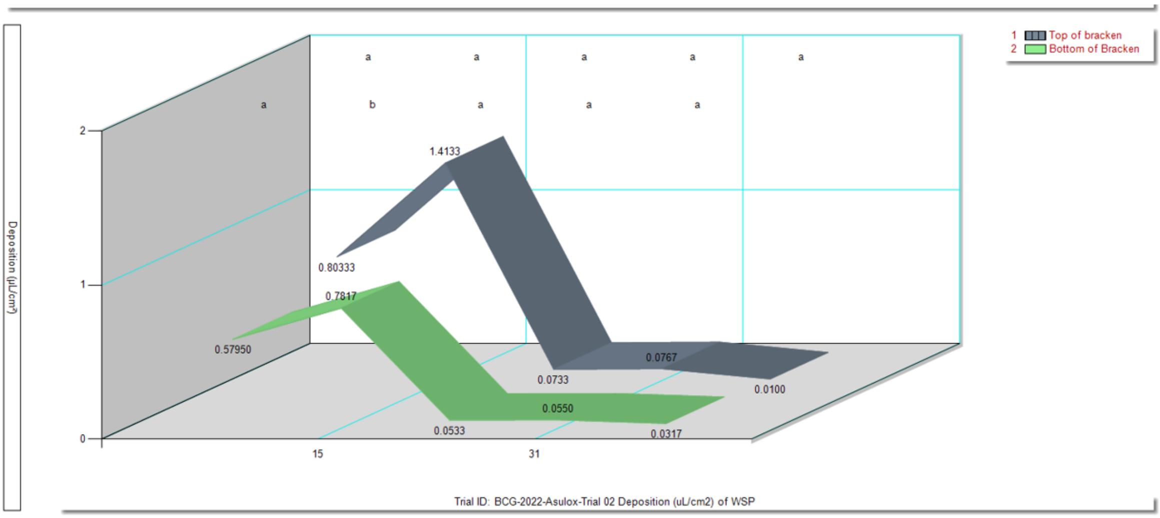
Figure A1-3: Applicant presentation of deposition (µL/cm^2) on Water /sensitive Cards from the Top and Bottom (mean values of 6 reps at each distance, not including the 'treated area'

Trial 1



:e·x·axis·=·0m,·10m,·20m,·30m·&·40m¶

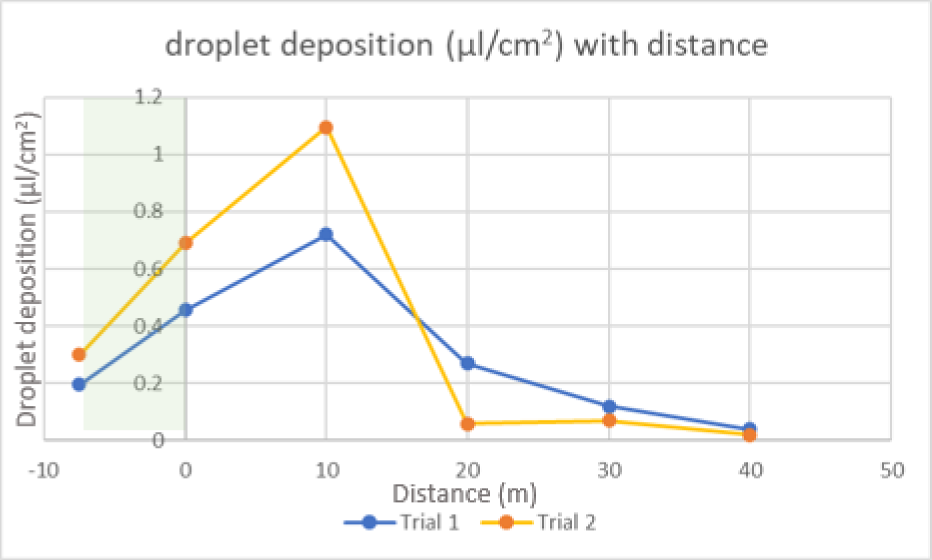
Trial 2:



Note·x·axis·=·0m,·10m,·20m,·30m·&·40m¶

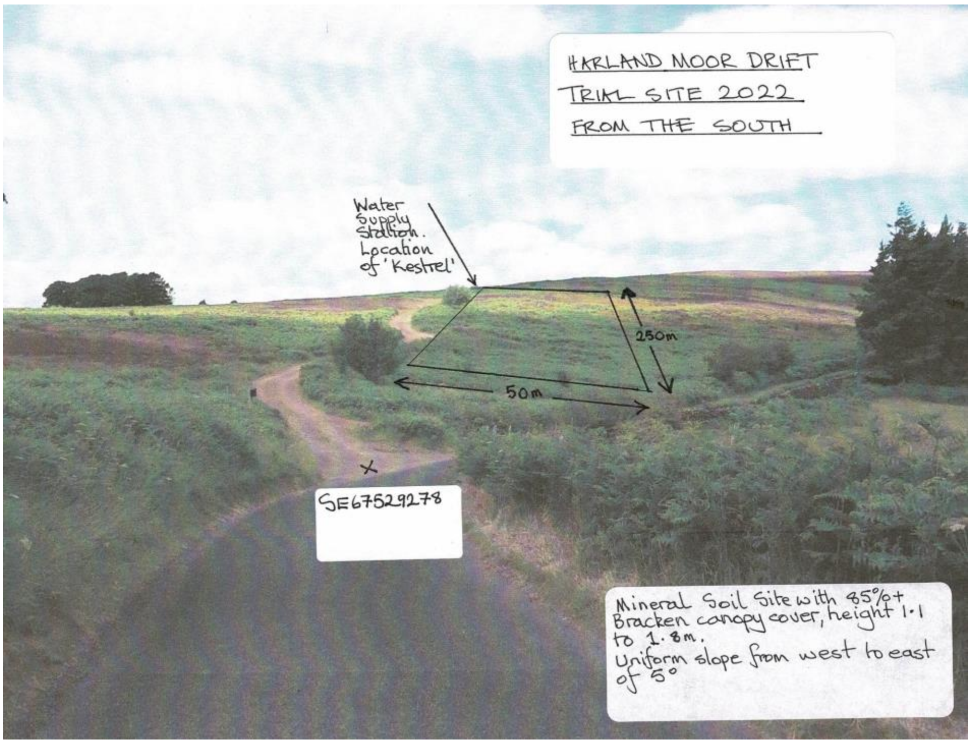
Based upon the data the applicant has indicated that "the path taken by the helicopter was centred around the 10 m rather than the 0 m marker", but this is not clear from the flight details provided. HSE has plotted the average deposition on each paper target with distance in terms of µl/cm^2 (Figure A1-4). The deposition along either side of the planned treated area (in green highlight) is also detailed.

Figure A1-4: HSE presentation of droplet deposition with distance, as µl/cm^2



It is noted that the deposition results in the spray swath beneath the boom i.e. the intended flight path, if assessed in the context of the target application volume, indicate 32.87 – 93.43% of the target application volume of 0.54 µl/cm^2 was recovered (Table A1-1). The applicant was asked to confirm flight path and the response included a photographic image of the trials site (Figure A1-1) and it was concluded that the GPS scan cannot confirm the flightpath but the applicants considers that the droplet values and an image of the helicopter (not provided) confirmed "*the boom centre point close to the 10m line as a centre point relative to the two large bushes on the trial block which the aircraft repositioned to avoid*."

Figure A1-1: Photographic image of trials site



Based upon the information provided it is unclear if the flight path was at the intended line laid out in the trials or closer to the 10m measuring point, the graphical output of results could indicate that the flight path was at 10m measuring point but this would not explain such high volumes ‘upwind’ (i.e. on the collectors at the planned flight path).

The wind speed recorded at the time of application was higher in trial 1 at 18 km/h compared to 12 km/h in trial 2. This also aligns with the level of deposition in the planned flight path which were lower in trial 1 as compared to trial 2. Therefore, the resulting high levels at the 10 m measuring point could also be a result swath displacement. The HSE evaluator has presented the impact of distance on drift deposition using both the ‘in swath’ values and the deposition at 10m in order to account for either option of boom position at application. The applicants claim that the boom was at the 10m distance would raise question over the ‘up-wind’ deposition noted at the under swath collection points, in addition as the boom is 7.5 cm in width when positioned the 10 m collection point there would only be one collector under the helicopter boom for sampling. It is concluded that the boom application could have been at some point between the planned treated area and the 10m measuring point and some swath displacement at the time of application could have occurred but this cannot be further resolved at this time.

Presentation of results

As detailed above a qualitative approach has been taken to the interpretation of the data and the deposition of µl/cm^2 on a relative basis has been assessed to give an indication of the proportion of drift with distance. The following tables show the values determined under the helicopter and downwind from the treated area.

Table A1-1: Deposition in the planned treated area under the boom (µl/cm^2). Samples were placed on the left and right side of the swath. Mean values along each side of the swath are also presented

Trial 1		**Trial 2**	
Left	right	left	right
0.22	0.165	0.298	0.163
0.325	0.278	0.155	0.186
0.076	0.271	0.197	1.583
0.286	0.045	0.314	1.113
0.117	0.078	0.114	0.305
0.11	0.173	0.332	0.148
0.356	0.254	0.243	0.156
0.236	0.075	0.249	0.335
0.287	0.24	0.816	0.948
0.022	0.113	0.816	0.743
0.16	0.156	0.059	0.265
0.282	0.282	0.119	0.109
mean value			
0.21	0.18	0.31	0.50
% of target volume (100% = 0.54µl/cm^2)			
38.23	32.87	57.28	93.43

Table A1-2: Trial 1: Deposition level in terms of µl/cm^2 with distance from the treated area and position on leaf

Distance	0m		10m		20m		30m		40m	
Position on leaf*	T	B	T	B	T	B	T	B	T	B
Trial 1: Individual results	1.23	1.05	1.24	0.85	0.36	0.18	0.08	0.11	0.01	0
	0.03	0.16	0.74	0.2	0.09	0.25	0.03	0.1	0.04	0.24
	0.11	0.26	1.22	1.1	0.23	0.59	0.06	0.26	0.12	0.02
	0.26	0.38	0.93	0.46	0.22	0.38	0.02	0.15	0	0.01
	0.4	0	0.62	0.02	0.09	0.12	0.04	0.05	0.01	0
	1.03	0.78	0.95	0.27	0.32	0.36	0.21	0.3	0.01	0
Mean values	0.51	0.44	0.95	0.48	0.22	0.31	0.07	0.16	0.03	0.05
Overall mean for distance	0.46		0.72		0.27		0.12		0.04	
% relative to deposition at 0 m	**100%**		156%		58.7%		26%		8.6%	
% relative to deposition at 10 m	64%		**100%**		37.5%		16%		5.5%	

*T= top, B=bottom

Table A1-3: Trial 2: Deposition level in terms of µl/cm^2 with distance from the treated area and position on leaf

Distance downwind	0m		10m		20m		30m		40m	
Position on leaf*	T	B	T	B	T	B	T	B	T	B
Trial 2 Individual results	0.6	0.117	0.27	0.26	0.02	0.03	0.06	0.11	0.02	0.03
	0.2	0.37	1.17	1.28	0.06	0.01	0.02	0	0	0
	0.22	2.31	3.13	1.67	0.19	0.08	0.23	0.02	0	0.1
	1.7	0.31	0.8	0.69	0.02	0.05	0.13	0.09	0	0.02
	1.99	0.21	2.05	0.09	0.15	0.09	0	0.08	0	0.04
	0.11	0.16	1.06	0.7	0	0.06	0.02	0.03	0.04	0
Mean value	0.80	0.58	1.41	0.78	0.07	0.05	0.08	0.06	0.01	0.03
Overall mean for distance	0.69		1.095		0.06		0.07		0.02	
%relative to deposition at 0 m	**100%**		158%		8.7%		10.1%		2.9%	
% relative to deposition at10 m	6.3%		**100%**		5.47%		6.34%		1.8%	

*T= top, B=bottom

The data summary in Tables A1-2 and A1-3 detail the levels determined at each measuring point on a µl/cm^2 basis. Based upon the levels observed in the planned treated area the relative deposition at the 40m measuring point is at 8.6% and 2.9% in trials 1 and 2 respectively indicating a 91.4% and 97.1% drift reduction for trials 1 and 2 respectively over the 40m distance assessed.

Based upon the levels observed at the 10m measuring point the relative deposition at the 40m measuring point is at 5.5% and 1.8% in trials 1 and 2 respectively indicating a 94.5% and 98.2% reduction in drift.

Overview of all trials submitted to CRD 2021-2022

For the 2022 submission the analysis of the trials output has not been conducted to GLP and the methodology not validated but in terms of in-field application the conduct is representative of application in practice. Therefore, they do give some indication of the behaviour of the spray drift from infield aerial application via pencil jet nozzles at 8m height.

Deposition level in terms of µl/cm^2 with distance from the planned treated area indicate an average value of 94% drift reduction with a 40m distance.

Deposition level in terms of µl/cm^2 with distance from the 10m marker indicate an average value of 96% drift reduction with a 30m distance.

The applicant has requested that the data from these two trials are combined with the previous study from Lowna Yorkshire (2021) in which samples of spray solution containing Preema red food dye were analysed at distance from the treated area. This study was evaluated as part of the previous emergency application (COP 2021/02343). A summary of the results from this previous trial are detailed in Table A1-4 below

Table A1-4: Average levels of food dye and asulam detected in the collector trays (n= 6) from treatment 1: Asulox + Preema Bright Red Food Colour Powder (at 1%).

	Distance of sample from treated area					
	Treated area	5m	10m	15m	20m	30m
Analyte	Levels of analyte detected (µg/ml)					
Preema dye	29.38*	ND	ND	ND	ND	ND
Asulam	148.24*	ND	ND	ND	ND	ND

*indicates 74% and 46% of the applied dye and asulam respectively
ND = not detected

Here it was concluded that no spray deposit was determined at 5m down wind of the treated area. Reflecting on these data in the context of the new trials data presented based upon analysis of water sensitive paper it is noted that the method of analysis used to determine the analysis of the Preema red food dye was validated to an LOQ of 2.5 µg/ml. The application volume captured in the tubs was estimated at 44.9 µg/ml therefore the method was able to determine a 95% reduction in drift. The absence of any detectable residue deposited at 5m could be due to the limitation of the methodology being able to analyse below 5% of the target application rate. This would still support a reduction in spray drift with distance, but does not give a clear indication of sufficient reduction to enable an acceptable exposure to be confirmed.

There are key differences in collector approaches not just in the methodology i.e. dye analysis compared to deposition on water sensitive papers, but also the placement with the former being static horizontal collectors and the latter being stapled to plant material that would be likely to move and not be maintained as a flat surface during the trial. It is considered that the trials can be used as supporting information to the reduction in drift with distance from the treated area but not necessarily used to quantitatively support a refined assessment to enable a reduction of the currently authorised buffer zone requirement.

Conclusion

The applicant concludes that this trial, along with the results from the previous study, in which analysis was made of deposits of spray solution containing Preema red food dye (COP2021/02343), provide evidence that there would be minimal drift at 30m and no drift at 40m. Therefore they are requesting a reduction in the current 90m aquatic buffer zone restriction.

The drift data presented from trials with application via Pencil Jet nozzles when sprayed at 6-8 m height indicate that drift does reduce with distance from the treated area.

In consideration of the new trials data assessed in this application there are still questions to be answered regarding the validation and set up of the methodology in relation to the water sensitive paper and the accuracy of this method in relation to the formulation in spray solution and droplet size in relation to sensitivity of the analysis in terms of dpi resolution. The absence of this and confidence in the flight path and point of application in either trial does not enable any analysis in relation to a target application rate. The new data do enable an indication of the likely reduction in drift on a comparative basis.

Put into the context of the risk assessment a maximum of 1% drift exposure needs to be met, i.e. 99% reduction, which is the current value used to ascertain an acceptable exposure assessment with a 90m buffer zone. Based upon the new drift trials the reduction in exposures is not sufficient to meet the required reduction at 30-40m (depending upon the application point) and therefore in the absence of field analysis at any further distance this cannot be determined at which point the 1% exposure would be likely to occur. The current assessment is based upon the standard FOCUS SW drift values, covering distances up to 175m downwind of the target site, with a 68.7% drift reduction applied for application via the pencil jet nozzles.

The HSE assessor would therefore conclude that the 2021 assessment is still appropriate and the 90m aquatic buffer zone be maintained.

Appendix 11: Assessment of spray drift study (2021)

Author:	[redacted]. 2021
Title:	To Evaluate the Drift from Aerial Application of Asulox
Report No.:	BG01 (Version 3) xx August 2021/19 September 2021
Data owner:	R&D Applied Biology
Guideline(s):	-
GLP/GEP:	No
Data location:	\\vyokfp02\applicant_data\AppSec\ASB Applicant Submissions\2021\202102343 Asulox\The Bracken Control Group\Drift Trials

Two drift trial studies have been submitted in support of this application. Report BG01-version 4 (date of issue 12 March 2021) contains the previous trials data that was submitted for the 2020/01796 application in which trials were conducted on 18-19th January 2020 in Errol, Scotland. These data were not relied upon and provided limited evidence to assess likely drift from aerial application of Asulox to bracken and have not been considered further.

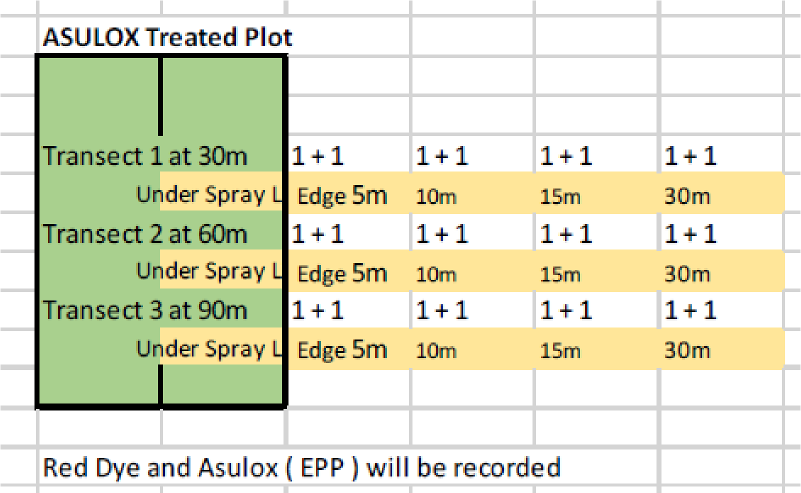
The additional study BG01 version 3, date of issue August 2021 (header dated R&D Biology 19/09/2021). This report indicates a trial was conducted in Lowna in the North Yorkshire Moors National Park on 26 July 2021. Below is the HSE assessment of the study.

Methods and trials set up

Application was via aerial application using a R44 helicopter which was manned with a 7.5m boom. Pencil jet nozzles were placed at 7 cm intervals along the boom and were operated at a pressure of 1.24 bar and calibrated to deliver 0.5 L/min spray solution, giving a boom flow rate of 54 L/min. The boom was operated at a height of 6 m during application and forward speed of 42.5 knots (78.5 kph), providing an overall application rate of 55 L/ha.

The drift site was 7.5 x 100m and drift collectors in the form of plastic containers (16.5 x 11 cm), containing 20 ml of water, were placed at 0, 5, 10, 15 and 30 m downwind of the spray site, in 3 transect lines within each plot, see Figure HSE A10-1. Two collection containers (a & b) were placed at each sampling point at approximately 1 m and 1.2 m respectively within the bracken canopy.

Figure HSE A10-1: Layout of water trap drift trays in Lowna field trial



ASULOX Treated Plot					
Transect 1 at 30m		1 + 1	1 + 1	1 + 1	1 + 1
	Under Spray L	Edge 5m	10m	15m	30m
Transect 2 at 60m		1 + 1	1 + 1	1 + 1	1 + 1
	Under Spray L	Edge 5m	10m	15m	30m
Transect 3 at 90m		1 + 1	1 + 1	1 + 1	1 + 1
	Under Spray L	Edge 5m	10m	15m	30m
Red Dye and Asulox (EPP) will be recorded					

Sample data collected following a single pass has been presented. The applicant refers to the values collected from each transect as replicate trials. It is considered that the positioning of three transects along the length of the spray swath are sufficient to consider variability of the drift along the run but are not considered to act as three sample replicates for the purpose of assessing spray drift.

Two separate spray treatments were used in the trial:

1. Asulox + Preema Bright Red Food Colour Powder (at 1%)
2. Asulox +Preema Bright Red Food Colour Powder (1%) + Validate + Squire Ultra.

The weather conditions at the time of application were measured using a Kestrel 3000 anemometer and compass. The following conditions are reported:

- Wind speed : 5-6 mph
- Air temperature 22 °C
- Humidity 64 %
- Wind direction – WNW

Following the spray application samples were sealed and stored overnight in ambient conditions prior to delivery to the analytical facility. Samples were analysed within 10 days of the of arrival at the facility.

Experimental spiked control samples were not included in the trial to consider stability of samples from the field site through to laboratory analysis. The applicant conducted a non-GLP 14 day ambient storage stability study that was generated with the Preema Bright Red Food Colour. Aqueous solutions of Preema Bright Red Food Colour were prepared at 2.5 and 40 µg/mL and analysed using HPLC methodology described below. Test solutions were assayed immediately, stored at ambient laboratory temperature for 14 days and then re-assayed by HPLC. Samples were quantified on each analytical occasion against a standard curve containing known amounts of synthetic food dye over a concentration range of ca 2.5 - 50 µg/mL. Analysis post storage indicated recoveries were at 101% and 95.5% for the 2.5 and 40 µg/mL samples respectively. Indicating stability of the Preema Bright Red Food Colour in aqueous samples when stored at ambient temperatures for up to 14 days. This study provides supporting information that the Preema Bright Red Food Colour is likely to be stable when kept under ambient conditions in the laboratory. It is noted that in all future field trials experimental spiked samples will be required to account for any potential degradation in storage and transit from field conditions through to the laboratory.

Method of analysis

Samples of the collected spray solution were transferred into volumetric flasks using distilled water. The samples and washings were made up to a final volume of 25ml. Analysis was by HPLC using an Agilent 1100 HPLC with a 50 µL sample being applied to a Nucleosil 100 5 C18 column. The mobile phase consisted of 45/55 (v/v) acetonitrile/10 mM Phosphate buffer (pH 4.2), containing 10 mM tertiary butyl ammonium bromide (TBAB) with a flow rate of 1 mL/min. UV Detection was at 450 nm for the Preema Bright Red Food colour and 310 nm for asulam.

Data supporting the validity of the analysis is detailed in table HSE A10-1. The data generation is not strictly in accordance with SANCO/3029/99 as recoveries have only been presented for 3 samples. However, the consistency of these data indicate that the addition of a further two sample analyses to meet standards for recovery would be unlikely to change the outcome of this analysis. It is therefore concluded that there is sufficient information provided to indicate reliability of the sample analysis.

Table HSE A10-1: Method of analysis validation data

Analyte	Recovery fortification level (µg/ml)	Recoveries % range (mean)	Repeatability % RSD (n)	Linearity	Specificity
Preema Bright Red Food colour	40	99.3 – 100.8 (100.3)	0.8 (3)	r^2 = 1.0 2.5 – 100 µg/ml n =8	Chromatograms have been provided demonstrating no interference was observed at the retention times of Preema Bright red food colour in the blank solution and the spray solution containing asulam.
asulam	194	103.7 – 105 (104.2)	0.7 (3)	r^2 = 0.999 11.9 – 476 µg/ml n =8	Chromatograms have been provided demonstrating no interference was observed at the retention time of asulam in the blank solution and the spray solution containing Preema Bright red food colour.

Results

Analysis of the samples within the collector trays for treatment 1 (Asulox + Preema Bright Red Food Colour Powder (at 1%)) indicated that levels of Preema Bright Red food colour and asulam were detected in the collector trays within the treated area. No levels of Preema Bright Red Food Colour or asulam were detected in the collector trays at 5 – 30 m outside the treated area (Table HSE A10-2).

Table HSE A10-2: Average levels of food dye and asulam detected in the collector trays (n= 6) from treatment 1: Asulox + Preema Bright Red Food Colour Powder (at 1%).

	Distance of sample from treated area					
	Treated area	5m	10m	15m	20m	30m
Analyte	Levels of analyte detected (µg/ml)					
Preema dye	29.38*	ND	ND	ND	ND	ND
Asulam	148.24*	ND	ND	ND	ND	ND

*indicates 74% and 46% of the applied dye and asulam respectively
ND = not detected

As the use of the drift retardant adjuvant has not been requested as part of this evaluation only the data for treatment 1 have been assessed in detail. In addition, as treatment 2 contained Validate as a drift retardant adjuvant these results cannot be considered further as a replicate drift trial alongside treatment 1. It is noted that in some samples from the transect 2 data with the Validate adjuvant positive drift deposition at 5 and 10 metres were recorded beyond the treated area. The applicant indicates this is due to inaccurate positioning of the sample collectors, aerial imagery from the time of spraying has been provided to support this claim.

The applicant has also referred to the results obtained from a previous study conducted at Errol airfield in Scotland and considered as part of the previous assessment for Asulox (2020/01796). However, the poor weather conditions at the time of application hindered this study such that it was not considered supportive data for the consideration of drift measurements in likely application conditions. It is concluded that the trial provides evidence that there would be no drift beyond 15 m in all conditions. In making this claim they also refer to the previous study conducted at Errol airfield in Scotland and the additional trial conducted with drift retardant adjuvant present. It is considered that the

Conclusion

The drift data presented would indicate that there is minimal drift occurring from the application via Pencil Jet nozzles when sprayed at 6 m height. The data presented detailed output from a single spray pass and the trial was conducted in good conditions for the measurement of drift. The applicant has concluded that this trial, along with the results from the previous study in Errol Scotland, provide evidence that there would be no drift beyond 15 m in all conditions. As a single drift measurement this study provides supportive information that indicates drift from the application of asulam with pencil jet nozzles is unlikely to result in any deposition of drift beyond 15 m. However, as a standalone study this is not sufficient to override the existing agreed assumptions on percentage of drift from aerial applications. The previous study in Errol Scotland was discounted for the reasons detailed above. The applicant is recommended to provide further information from additional replicate trials to support the claim of minimal drift beyond 15m.

Therefore, it is concluded that to support a reduction of the current aquatic buffer zone restriction additional trials data would be required generated from replicate applications of spray solution via the proposed aerial application.

Appendix 12: Assessment of method validation underpinning R1640114

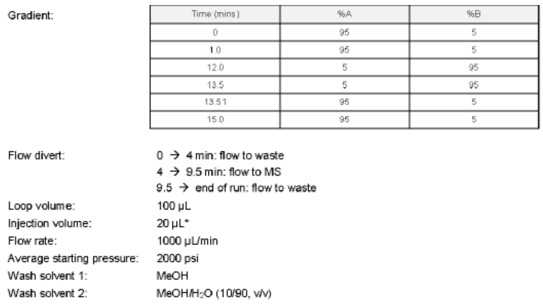
Author:	[redacted], 2020
Title:	Residues of asulam in arthropods, seeds and ground vegetation after early summer (July) spray application of Asulox in an upland bracken area in UK- magnitude of residues and time course of residue decline
Report No.:	NZ/17/007
Guideline(s):	SANCO 3029/99 rev/4 note application submitted 31st October 2021 so SANTE/2020/12830, rev 1 is not applicable. SANCO 825/00 rev. 8.1.
GLP	Yes
Data location:	[redacted]

Materials and methods

The following method details were supplied:

Table A 11.1: Method details for methods used in Report number R1640114

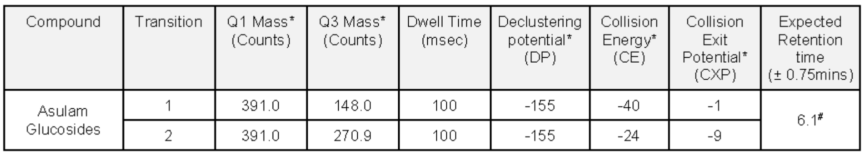
<table>
<tr><th>Matrix</th><th>Analytes</th><th>Method reference</th><th>Extraction</th><th>Analysis</th></tr>
<tr><td>Seed</td><td>Asulam glucosides</td><td>AM1</td><td>0.5 g homogenised sample in 5 ml of diluent B(Acetonitrile/10 mM Ammonium formate, ph4.5 (20/80, v/v)) Shaken for 30 mins, Centrifuged 5 mins. Filtered (0.45um syringe filter).

If study samples exceed calibration range – dilution as appropriate</td><td>LC- MS/MS
Column: Luna Phenyl-Hexyl, 5 µm, 150 x 4.6 mm i.d
Guard Column: Phenyl, 4 x 2.0 mm i.d, Phenomenex
Column oven temperature: 20°C

Gradient:
<table>
<tr><th>Time (mins)</th><th>%A</th><th>%B</th></tr>
<tr><td>0</td><td>95</td><td>5</td></tr>
<tr><td>1.0</td><td>95</td><td>5</td></tr>
<tr><td>12.0</td><td>5</td><td>95</td></tr>
<tr><td>13.5</td><td>5</td><td>95</td></tr>
<tr><td>13.51</td><td>95</td><td>5</td></tr>
<tr><td>15.0</td><td>95</td><td>5</td></tr>
</table>
Flow divert: 0 → 4 min: flow to waste
4 → 9.5 min: flow to MS
9.5 → end of run: flow to waste
Loop volume: 100 µL
Injection volume: 20 µL*
Flow rate: 1000 µL/min
Average starting pressure: 2000 psi
Wash solvent 1: MeOH
Wash solvent 2: MeOH/H_2O (10/90, v/v)</td></tr>
<tr><td>Seed</td><td>Asulam, Malonyl asulam, Sulphanilamide</td><td>AM1</td><td>As above</td><td rowspan="3">As above</td></tr>
<tr><td>Monocot,</td><td>Asulam and Asulam glucoside</td><td>AM2a</td><td>10 g homogenised sample in 100 ml of diluent B(Acetonitrile/10 mM Ammonium formate, ph4.5 (20/80, v/v)). Ultra turrax for 5 mins. Mechanically shaken for 30 mins, Centrifuged 5 mins. Filtered (0.45um syringe filter).

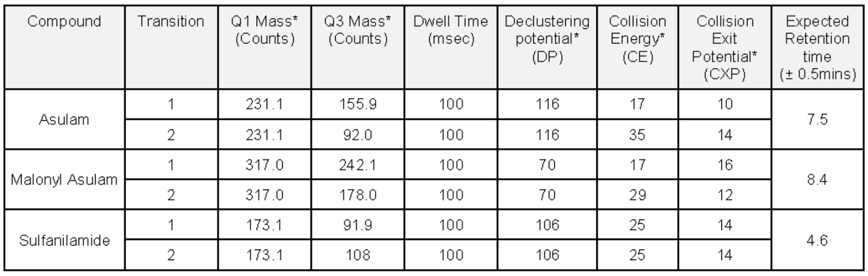
If study samples exceed calibration range – dilution as appropriate</td></tr>
<tr><td>Monocot</td><td>Malonyl asulam and</td><td>AM2a</td><td>See AM2a above</td></tr>
</table>

Matrix	Analytes	Method reference	Extraction	Analysis
	Sulphanilamide			
Dicot and Bracken	Asulam, Malonyl asulam, sulphanilamide and asulam glucosides	AM 2a	See AM2a above	
Arthropod	Asulam glucosides	AM3	See AM1	
	Asulam, Malonyl asulam, sulphanilamide,			

The following MS/MS transitions were used for method AM1 and AM2a:

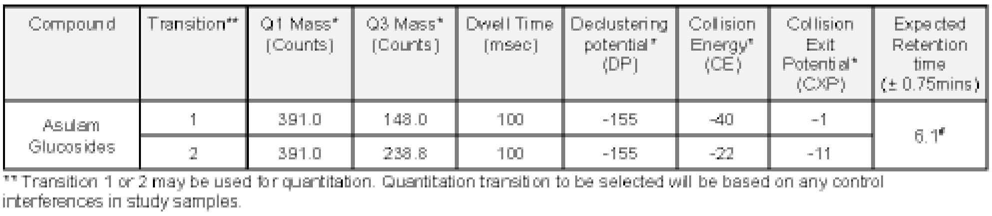


Compound	Transition	Q1 Mass* (Counts)	Q3 Mass* (Counts)	Dwell Time (msec)	Declustering potential* (DP)	Collision Energy* (CE)	Collision Exit Potential* (CXP)	Expected Retention time (± 0.75mins)
Asulam Glucosides	1	391.0	148.0	100	-155	-40	-1	6.1#
	2	391.0	270.9	100	-155	-24	-9	



Compound	Transition	Q1 Mass* (Counts)	Q3 Mass* (Counts)	Dwell Time (msec)	Declustering potential* (DP)	Collision Energy* (CE)	Collision Exit Potential* (CXP)	Expected Retention time (± 0.5mins)
Asulam	1	231.1	155.9	100	116	17	10	7.5
	2	231.1	92.0	100	116	35	14	
Malonyl Asulam	1	317.0	242.1	100	70	17	16	8.4
	2	317.0	178.0	100	70	29	12	
Sulfanilamide	1	173.1	91.9	100	106	25	14	4.6
	2	173.1	108	100	106	25	14	

For AM3 the transitions above were used for asulam, malonyl asulam and sulphanilamide but for asulam glucosides the following transitions were stated:



Compound	Transition**	Q1 Mass* (Counts)	Q3 Mass* (Counts)	Dwell Time (msec)	Declustering potential* (DP)	Collision Energy* (CE)	Collision Exit Potential* (CXP)	Expected Retention time (± 0.75mins)
Asulam Glucosides	1	391.0	148.0	100	-155	-40	-1	6.1#
	2	391.0	238.8	100	-155	-22	-11	

** Transition 1 or 2 may be used for quantitation. Quantitation transition to be selected will be based on any control interferences in study samples.

Double peak obtained, one at 6.1 mins and one at 6.5 mins, and to be integrated together as one peak

* Minor modifications are allowed to optimise instrument performance.

Results and discussion

The report submitted summarises procedural recovery data and references previous study reports (NZ 17/004 and NZ 17/005) for primary validation. In the absence of these primary validation data the procedural recovery has been considered (in lieu of primary validation) to determine if it is sufficient to support the methods used in study R1640114. The summarised (procedural) validation data for the methods outlined in Table A11.1 can be seen in Table A11.2 and Table A11.3. Results outside acceptable bounds are highlighted in yellow. Note insufficient recovery samples have been provided to consider the methods for arthropods fully validated.

Table A11.2: Recovery results from method validation of asulam, malonyl asulam, sulphanilamide, and asulam glucosides using the analytical methods detailed in Table A1.

Matrix	Analyte	Fortification level (mg/kg) (*n* = x)	Recovery (%) [Mean recovery]	RSD (%)	Comments	Re-injected and re-diluted recoveries
Monocot	Asulam	0.01 0.1 6 12 100	76, ~~246~~, 78, 78, 111, 72 [83] 88, 89, 98, 85, 87, 92 [90] 47 77 66, 51, 55, 51, 68, 62 [59]	17 5.1 12.7	Recovery of 246% excluded from 0.1 mg/kg fortification levels, considered an outlier.	 55, 68
	Malonyl asulam	0.05 0.5 30	93, 101, 78, 93, 92, 87, 83 [90] 96, 105, 81, 107, 100, 92, 78 [94] 99, 98, [98]	8.4 11.9 -		
	Sulphanilamide	0.05 0.5 30	66, 54, 42, 86, 46 [59] 51, 66, 60, 59, 49 [57] 97, 57, 59 [71]	30.2 12.2 31.7		 14
	Asulam glucosides	0.05 0.5 30	91, 99, 118, 89, 86, 83, 98, 93 [95] 98, 95, 107, 100, 99, 91, 92, 92 [97] 94, 107, 93, 102 [99]	11.5 5.6 6.8		 85, 86 103, 92, 94
Dicot	Asulam	0.01 0.1 6 12 40	71, 93, 69, 85, 57, 64 [73] 83, 81, 81, 81, 63, 79, 75, 70 [77] 76 81 63, 57, 65, 54, 60 [60]	18.3 9.0 7.4		 76 63,74
	Malonyl asulam	0.05 0.5 30	76, 107, 71, 108, 99, 98 [93] 93, 104, 73, 91, 95, 99 [93] 96	17.0 11.5		
	Sulphanilamide	0.05 0.5 5	57, 36, 39, 50 [46] 69, 47, 45, 43, 41, 49 [49] 109, 70, 68 [82]	21.4 20.8 28.1		<30, <30
	Asulam glucosides	0.05 0.5 30 50	96, 95, 78, 92, 95, 107, 93 [94] 99, 98, 95, 106, 96, 91, 92 [97] 93 98, 96, 102, 99 [99]	9.1 5.2 2.5		78 106 72

Matrix	Analyte	Fortification level (mg/kg) (*n* = x)	Recovery (%) [Mean recovery]	RSD (%)	Comments	Re-injected and re-diluted recoveries
		60	97			109,
Bracken	Asulam	0.01 0.1 6 40	92, 81, 80, 89, 103 [89] 90, 85, 91, 89, 101, 79 [89] 81 68, 72, 73, 65 [70]	10.5 8.2 5.3		75 81 79, 72
	Malonyl asulam	0.05 0.5 30	92, 96, 69, 101, 99, 97 [92] 91, 104, 72, 94, 96, 94 [92] 98	12.8 11.6 -		
	Sulphanilamide	0.05 0.5 5	64, 70, 62, 66 [66] 70, 73, 70, 61 [67] 119, 91, 77, 90[94]	5.2 7.6 18.8		 119
	Asulam glucosides	0.05 0.5 5 30	99, 105, 94, 94, 111, 82 [98] 90, 97, 99, 98, 106, 90 [97] 108, 97, 101, 95 [100] 92,	10.3 6.3 5.7		
Arthropod	Asulam	0.01 0.1 30	70, 70, 102, [81] 107, 85, 89 [94] 59, 55 [57]	22.9 12.5		77,112,83, 109, 107 76, 94, 79, 102, 107 61, 55, 105, 93,
	Malonyl asulam	0.05 0.5	87, 77 [82] 75, 86 [81]			
	Sulphanilamide	0.05 0.5 20	133, 74, 112 [106] 125, 88, 104 [106] 97, 87 [92]	28.1 17.5		77, 109, 83 91, 87, 94 110, 96
	Asulam glucosides	0.05 0.5 20	88, 102, 103 [98] 90, 88, 94 [91] 76, 75 [76]	8.6 3.4		101, 100, 109 100, 92, 101, 89, 87, 81, 82 83, 85

Table A11.3:Characteristics for the analytical method used for validation of asulam, malonylasulam, Sulphanilamide and asulam glucosides residues in pasture grass seed, monocot, dicot, bracken, arthropod and seed.

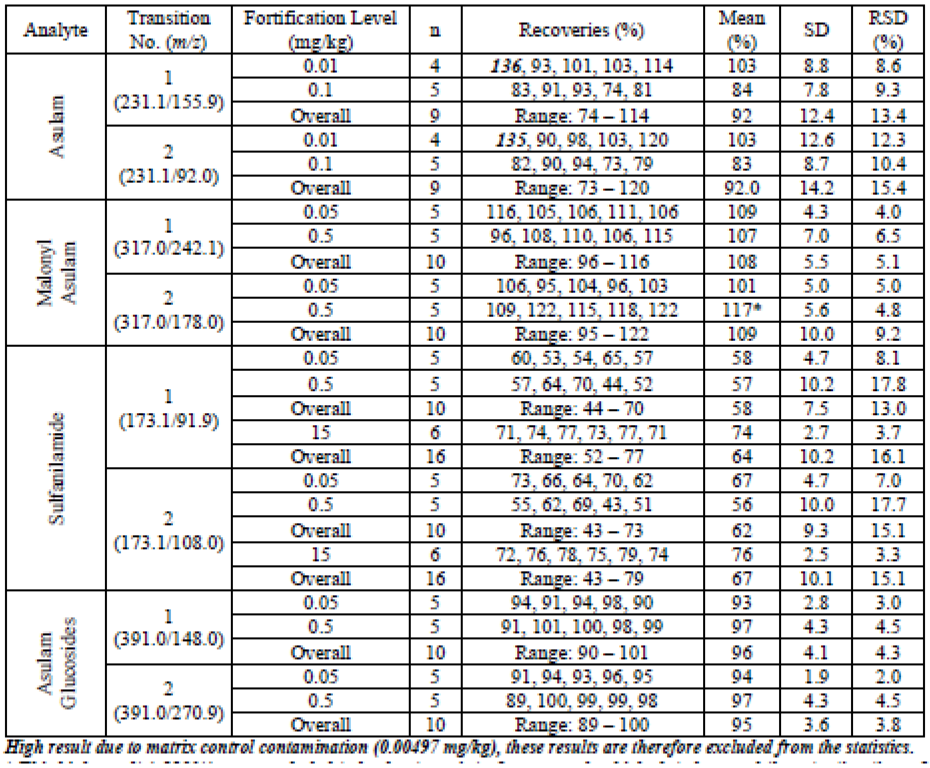
Matrix	Analyte	Specificity	Calibration and range	LOQ
Seed	Asulam	Control samples < 30% LOQ	8 calibration stds (matrix matched to counteract suppression)* from 0.003 to 0.2 mg/kg r ≥0.9942	0.01
	Malonyl asulam		8 calibration stds (matrix matched to counteract suppression) from 0.015 to 1 mg/kg r ≥0.9942	0.05
	Sulphanilamide		8 calibration stds (matrix matched to counteract suppression) from 0.015 to 1 mg/kg r ≥0.9942	0.05
	Asulam glucosides		8 calibration stds (matrix matched to counteract suppression) from 0.015 to 1 mg/kg r ≥0.9942	0.05

Matrix	Analyte	Specificity	Calibration and range	LOQ
Monocot	Asulam	Control samples < 30% LOQ	8 calibration stds (matrix matched to counteract suppression)* from 0.003 to 0.2 mg/kg r ≥0.9942	0.01
	Malonyl asulam		8 calibration stds (matrix matched to counteract suppression)* from 0.015 to 1 mg/kg r ≥0.9942	0.05
	Sulphanilamide		8 calibration stds (matrix matched to counteract suppression)* from 0.015 to 1 mg/kg r ≥0.9942	-
	Asulam glucosides		8 calibration stds (matrix matched to counteract suppression)* from 0.015 to 1 mg/kg r ≥0.9942	0.05
Dicot	Asulam	Control samples < 30% LOQ	8 calibration stds (matrix matched to counteract suppression)* from 0.003 to 0.2 mg/kg r ≥0.9942	0.01
	Malonyl asulam		8 calibration stds (matrix matched to counteract suppression)* from 0.015 to 1 mg/kg r ≥0.9942	0.05
	Sulphanilamide		8 calibration stds (matrix matched to counteract suppression)* from 0.015 to 1 mg/kg r ≥0.9942	-
	Asulam glucosides		8 calibration stds (matrix matched to counteract suppression)* from 0.015 to 1 mg/kg r ≥0.9942	0.05
Bracken	Asulam	Control samples < 30% LOQ	8 calibration stds (matrix matched to counteract suppression)* from 0.003 to 0.2 mg/kg r ≥0.9942	0.01
	Malonyl asulam		8 calibration stds (matrix matched to counteract suppression)* from 0.015 to 1 mg/kg r ≥0.9942	0.05
	Sulphanilamide		8 calibration stds (matrix matched to counteract suppression) from 0.015 to 1 mg/kg r ≥0.9942	-
	Asulam glucosides		8 calibration stds (matrix matched to counteract suppression)* from 0.015 to 1 mg/kg r ≥0.9942	0.05
Arthropod	Asulam	Control samples < 30% LOQ	8 calibration stds (matrix matched to counteract suppression)* from 0.003 to 0.2 mg/kg r ≥0.9942	-
	Malonyl asulam		8 calibration stds (matrix matched to counteract suppression) from 0.015 to 1 mg/kg r ≥0.9942	-
	Sulphanilamide		8 calibration stds (matrix matched to counteract suppression) from 0.015 to 1 mg/kg r ≥0.9942	-
	Asulam glucosides		8 calibration stds (matrix matched to counteract suppression)* from 0.015 to 1 mg/kg r ≥0.9942	-

*Some calibration data points excluded due to recovery issues – never more than 1 or 2 points excluded, mostly justified (carryover, contamination of control etc) and sufficient data points provided to show a clear linear relationship.

The procedural recovery and calibration data for seeds was generated using grass seed, but the determinations in the study were for panicle seed. The applicant states that it was not possible to re-validate an analytical method in panicle seed in time for the analytical phase of this study. The applicant states that the analysis of the panicle seed samples showed differences compared to pasture grass seeds (i.e., moisture content) therefore a cross validation comparing the two matrices was performed.
The cross validation mimics the residue panicle seed sample analysis by the preparation of recovery samples in panicle seed matrix and calibration against matrix matched standards in pasture grass seed matrix to evaluate any impact to the seed residue results.

Cross validation results are shown below and indicate acceptable recoveries and precision for all analytes except sulphanilamide.



Analyte	Transition No. (*m/z*)	Fortification Level (mg/kg)	n	Recoveries (%)	Mean (%)	SD	RSD (%)
Asulam	1 (231.1/155.9)	0.01	4	*136*, 93, 101, 103, 114	103	8.8	8.6
		0.1	5	83, 91, 93, 74, 81	84	7.8	9.3
		Overall	9	Range: 74 – 114	92	12.4	13.4
	2 (231.1/92.0)	0.01	4	*135*, 90, 98, 103, 120	103	12.6	12.3
		0.1	5	82, 90, 94, 73, 79	83	8.7	10.4
		Overall	9	Range: 73 – 120	92.0	14.2	15.4
Malonyl Asulam	1 (317.0/242.1)	0.05	5	116, 105, 106, 111, 106	109	4.3	4.0
		0.5	5	96, 108, 110, 106, 115	107	7.0	6.5
		Overall	10	Range: 96 – 116	108	5.5	5.1
	2 (317.0/178.0)	0.05	5	106, 95, 104, 96, 103	101	5.0	5.0
		0.5	5	109, 122, 115, 118, 122	117*	5.6	4.8
		Overall	10	Range: 95 – 122	109	10.0	9.2
Sulfanilamide	1 (173.1/91.9)	0.05	5	60, 53, 54, 65, 57	58	4.7	8.1
		0.5	5	57, 64, 70, 44, 52	57	10.2	17.8
		Overall	10	Range: 44 – 70	58	7.5	13.0
		15	6	71, 74, 77, 73, 77, 71	74	2.7	3.7
		Overall	16	Range: 52 – 77	64	10.2	16.1
	2 (173.1/108.0)	0.05	5	73, 66, 64, 70, 62	67	4.7	7.0
		0.5	5	55, 62, 69, 43, 51	56	10.0	17.7
		Overall	10	Range: 43 – 73	62	9.3	15.1
		15	6	72, 76, 78, 75, 79, 74	76	2.5	3.3
		Overall	16	Range: 43 – 79	67	10.1	15.1
Asulam Glucosides	1 (391.0/148.0)	0.05	5	94, 91, 94, 98, 90	93	2.8	3.0
		0.5	5	91, 101, 100, 98, 99	97	4.3	4.5
		Overall	10	Range: 90 – 101	96	4.1	4.3
	2 (391.0/270.9)	0.05	5	91, 94, 93, 96, 95	94	1.9	2.0
		0.5	5	89, 100, 99, 99, 98	97	4.3	4.5
		Overall	10	Range: 89 – 100	95	3.6	3.8

High result due to matrix control contamination (0.00497 mg/kg), these results are therefore excluded from the statistics.

Conclusion

The applicant has highlighted issues based on the procedural recoveries for particular batches of samples, however based on the data provided it is not clear if issues have arisen with particular batches or relate to low recoveries of the method for particular analyte/ matric combinations.

Procedural recovery data has been provided (no primary validation data has been submitted) for the above methods. For some analyte matrix combinations mean procedural recovery data were <70% and RSD were >20% (see yellow highlighting in Table A11.2 above).

Sulphanilamide has low or variable recoveries in the following matrices:

Panicle seed (0.05 mg/kg and 0.5 mg/kg)
Monocots (0.05 mg/kg, 0.5 mg/kg and 30 mg/kg fortification level)
Dicots (0.05 mg/kg, 0.5 mg/kg and 5 mg/kg fortification level)
Bracken (0.05 mg/kg and 0.5 mg/kg fortification level)

Insufficient procedural recovery data (n≤3) were available to confirm suitable recovery or precision for any of the analyte determinations in arthropods. However the methods used for determinations in arthropods from study R1640114 and R1640115 are sufficiently similar to consider that the validation data can be combined from both studies (see Table A 12.2). The combined data can be considered sufficient to demonstrate an acceptable method for the determination of asulam, malonyl asulam, sulphanilamide and asulam glucoside (LOQ 0.01 mg/kg for asulam and LOQ 0.05 mg/kg for other analytes) in arthropods.

Asulam determination in monocots and dicots shows evidence of unacceptable recoveries at higher fortifications (> 6 mg/kg and 40 mg/kg respectively). It is noted that the method recommends dilution for samples outside the calibrated linear range.

Therefore methods for only the following matrix/analyte combinations can be considered sufficiently validated:

Seed- asulam (LOQ 0.01 mg/kg), malonyl asulam and asulam glucoside (LOQ 0.05 mg/kg)
Monocot- asulam (LOQ 0.01 mg/kg), malonyl asulam and asulam glucoside (LOQ 0.05 mg/kg)
Dicot- asulam (LOQ 0.01 mg/kg), malonyl asulam and asulam glucoside (LOQ 0.05 mg/kg)
Bracken- asulam (LOQ 0.01 mg/kg), malonyl asulam and asulam glucoside (LOQ 0.05 mg/kg)
Arthropod- asulam (LOQ 0.01 mg/kg), malonyl asulam, sulphanilamide and asulam glucoside (LOQ 0.05 mg/kg)

Asulam determinations for monocots and dicots are only considered validated between 0.01 and 0.1 mg/kg.

Note Claßen, C. 2021, (Report number R1640114) has suggested correcting the levels of sulphanilamide using procedural recoveries. This is not considered a suitable approach to account for method recovery issues, especially given that there are both recovery and precision issues for determination of sulphanilamide in seeds, monocots, dicots and bracken.

Monocot, dicot, bracken, arthropod and seed samples were stored frozen for a maximum of 39, 5, 4, 17 and 6 days from sampling to extraction, respectively. Although the maximum storage period for monocot was 40 days this was namely for the malonyl asulam analyte, for the remaining analytes frozen storage was for a maximum of 3 days. There is some evidence of asulam instability during frozen storage (within 7 days), however declines in residues are not expected to exceed 30%.

Stability of the analytes in the sample extracts was addressed by corresponding procedural recovery stored under the same conditions. Re injected procedural recoveries are shown in Table A 11.2 and are consistent with primary recoveries (all acceptable except for sulphanilamide)

Appendix 13: Assessment of method validation underpinning R1640115

Author:	[redacted] 2020
Title:	Residues of asulam in arthropods, seeds and ground vegetation after late summer (August/September) spray application of Asulox in an upland bracken area in UK-magnitude of residues and time course of residue decline
Report No.:	NZ/17/008
Guideline(s):	SANCO 3029/99 rev/4 note application submitted 31st October 2021 so SANTE/2020/12830, rev 1 is not applicable. SANCO 825/00 rev. 8.1.
GLP	Yes (except certificates of analyses)
Data location:	[redacted]

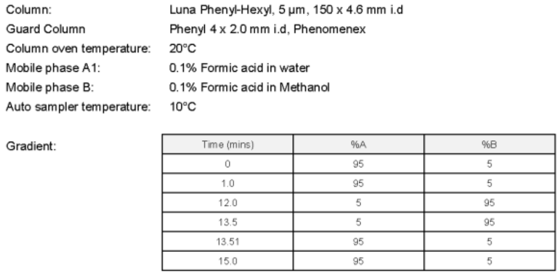
Materials and methods

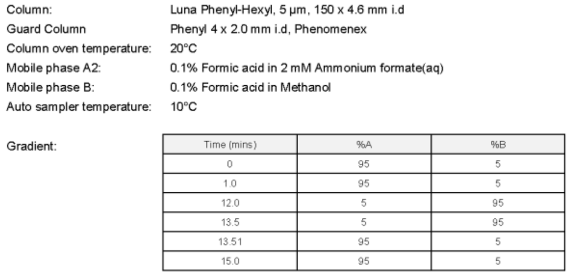
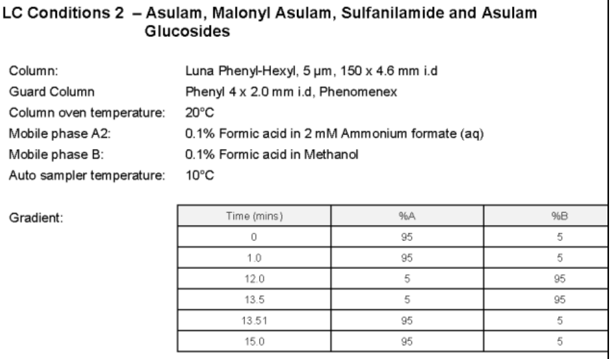
The following method details were supplied:

Table A 22.1: Method details for methods used in Report number R1640115

<table>
<tr><th>Matrix</th><th>Analytes</th><th>Method reference</th><th>Extraction</th><th>Analysis</th></tr>
<tr>
<td>Monocot</td>
<td>Asulam and asulam glucosides
Malonyl asulam and sulphanilamide</td>
<td>AM4</td>
<td>5 g homogenised sample in 50 ml of diluent B(Acetonitrile /10 mM Ammonium formate, ph4.5 (20/80, v/v))
Ultra turrax for 5 mins, Shaken for 60 mins, Centrifuged 5 mins.

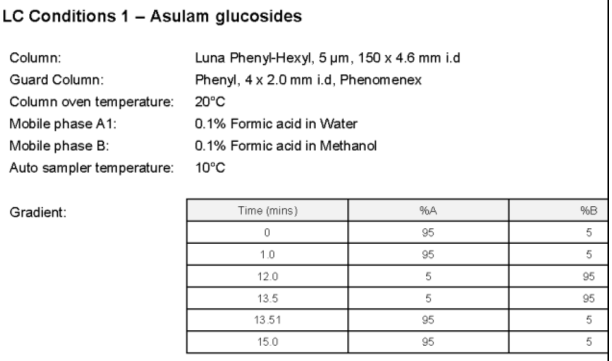
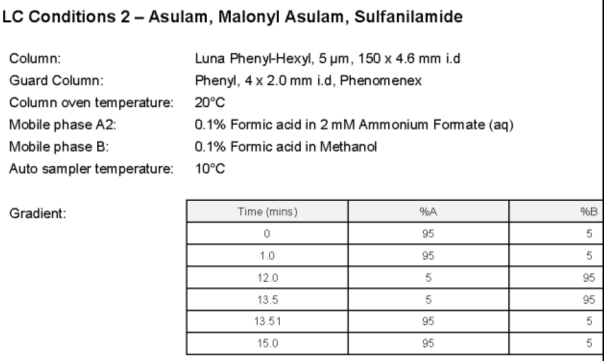
Extracted again as above but with 30 mins shaking. Extracts combined. Filtered (0.45um syringe filter).

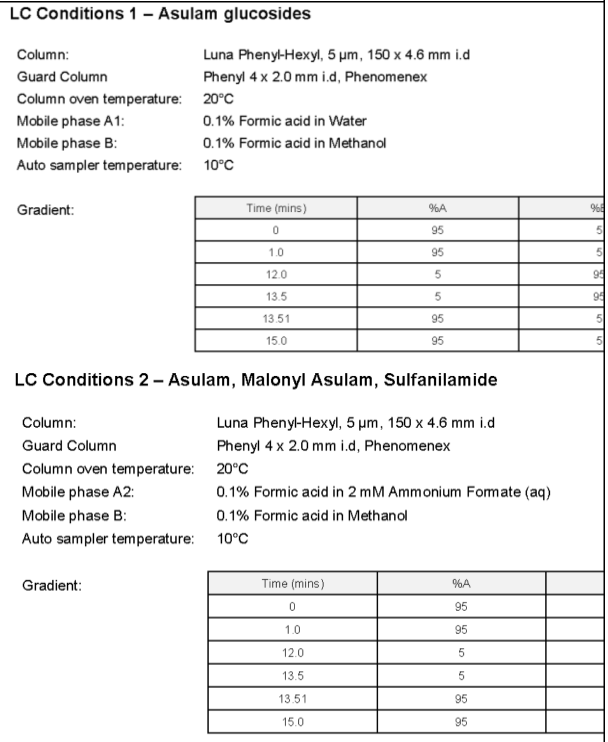
Samples >10 x LOQ or exceeding the calibration range were further diluted</td>
<td>LC MS/MS:
Asulam and asulam glucosides

Column: Luna Phenyl-Hexyl, 5 µm, 150 x 4.6 mm i.d
Guard Column Phenyl 4 x 2.0 mm i.d, Phenomenex
Column oven temperature: 20°C
Mobile phase A1: 0.1% Formic acid in water
Mobile phase B: 0.1% Formic acid in Methanol
Auto sampler temperature: 10°C
Gradient:
<table>
<tr><th>Time (mins)</th><th>%A</th><th>%B</th></tr>
<tr><td>0</td><td>95</td><td>5</td></tr>
<tr><td>1.0</td><td>95</td><td>5</td></tr>
<tr><td>12.0</td><td>5</td><td>95</td></tr>
<tr><td>13.5</td><td>5</td><td>95</td></tr>
<tr><td>13.51</td><td>95</td><td>5</td></tr>
<tr><td>15.0</td><td>95</td><td>5</td></tr>
</table>

Malonyl asulam and sulphanilamide

Column: Luna Phenyl-Hexyl, 5 µm, 150 x 4.6 mm i.d
Guard Column Phenyl 4 x 2.0 mm i.d, Phenomenex
Column oven temperature: 20°C
Mobile phase A2: 0.1% Formic acid in 2 mM Ammonium formate(aq)
Mobile phase B: 0.1% Formic acid in Methanol
Auto sampler temperature: 10°C
Gradient:
<table>
<tr><th>Time (mins)</th><th>%A</th><th>%B</th></tr>
<tr><td>0</td><td>95</td><td>5</td></tr>
<tr><td>1.0</td><td>95</td><td>5</td></tr>
<tr><td>12.0</td><td>5</td><td>95</td></tr>
<tr><td>13.5</td><td>5</td><td>95</td></tr>
<tr><td>13.51</td><td>95</td><td>5</td></tr>
<tr><td>15.0</td><td>95</td><td>5</td></tr>
</table>
</td>
</tr>
<tr>
<td>Dicot</td>
<td>Asulam and asulam glucosides
Malonyl asulam and sulphanilamide</td>
<td>AM2</td>
<td>10 g homogenised sample in 100 ml of diluent B(Acetonitrile /10 mM Ammonium formate, ph4.5 (20/80, v/v))
Ultra turrax for 5 mins,</td>
<td>LC MS/MS:

LC Conditions 2 – Asulam, Malonyl Asulam, Sulfanilamide and Asulam Glucosides
Column: Luna Phenyl-Hexyl, 5 µm, 150 x 4.6 mm i.d
Guard Column Phenyl 4 x 2.0 mm i.d, Phenomenex
Column oven temperature: 20°C
Mobile phase A2: 0.1% Formic acid in 2 mM Ammonium formate (aq)
Mobile phase B: 0.1% Formic acid in Methanol
Auto sampler temperature: 10°C
Gradient:
<table>
<tr><th>Time (mins)</th><th>%A</th><th>%B</th></tr>
<tr><td>0</td><td>95</td><td>5</td></tr>
<tr><td>1.0</td><td>95</td><td>5</td></tr>
<tr><td>12.0</td><td>5</td><td>95</td></tr>
<tr><td>13.5</td><td>5</td><td>95</td></tr>
<tr><td>13.51</td><td>95</td><td>5</td></tr>
<tr><td>15.0</td><td>95</td><td>5</td></tr>
</table>
</td>
</tr>
</table>

<table>
<tr><th>Matrix</th><th>Analytes</th><th>Method reference</th><th>Extraction</th><th>Analysis</th></tr>
<tr><td></td><td></td><td></td><td>Shaken for 30 mins, Centrifuged 5 mins. Filtered (0.45um syringe filter).

Samples exceeding the calibration range were further diluted</td><td></td></tr>
<tr><td>Seed</td><td>Asulam and asulam glucosides
Malonyl asulam and sulphanilamide</td><td>AM3</td><td>0.3 g homogenised sample in 6 ml of diluent B(Acetonitrile /10 mM Ammonium formate, ph4.5 (20/80, v/v))
Shaken for 30 mins, Centrifuged 5 mins. Decant supernatant, add 4ml diluent B to the residual . Shake and centrifuge again. Combine supernatants. Make up to 8ml with diluent. Filtered (0.45um syringe filter).

If study samples exceed calibration range – dilution as</td><td>LC- MS/MS

LC Conditions 1 – Asulam glucosides
Column: Luna Phenyl-Hexyl, 5 µm, 150 x 4.6 mm i.d
Guard Column: Phenyl, 4 x 2.0 mm i.d, Phenomenex
Column oven temperature: 20°C
Mobile phase A1: 0.1% Formic acid in Water
Mobile phase B: 0.1% Formic acid in Methanol
Auto sampler temperature: 10°C
Gradient:<table><tr><th>Time (mins)</th><th>%A</th><th>%B</th></tr><tr><td>0</td><td>95</td><td>5</td></tr><tr><td>1.0</td><td>95</td><td>5</td></tr><tr><td>12.0</td><td>5</td><td>95</td></tr><tr><td>13.5</td><td>5</td><td>95</td></tr><tr><td>13.51</td><td>95</td><td>5</td></tr><tr><td>15.0</td><td>95</td><td>5</td></tr></table>
LC Conditions 2 – Asulam, Malonyl Asulam, Sulfanilamide
Column: Luna Phenyl-Hexyl, 5 µm, 150 x 4.6 mm i.d
Guard Column: Phenyl, 4 x 2.0 mm i.d, Phenomenex
Column oven temperature: 20°C
Mobile phase A2: 0.1% Formic acid in 2 mM Ammonium Formate (aq)
Mobile phase B: 0.1% Formic acid in Methanol
Auto sampler temperature: 10°C
Gradient:<table><tr><th>Time (mins)</th><th>%A</th><th>%B</th></tr><tr><td>0</td><td>95</td><td>5</td></tr><tr><td>1.0</td><td>95</td><td>5</td></tr><tr><td>12.0</td><td>5</td><td>95</td></tr><tr><td>13.5</td><td>5</td><td>95</td></tr><tr><td>13.51</td><td>95</td><td>5</td></tr><tr><td>15.0</td><td>95</td><td>5</td></tr></table></td></tr>
</table>

Matrix	Analytes	Method reference	Extraction	Analysis
			appropriate	
Arthropod	Asulam and asulam glucosides Malonyl asulam and sulphanilamide	AM1	0.3 g homogenised sample in 3 ml of diluent B(Acetonitrile /10 mM Ammonium formate, ph4.5 (20/80, v/v)) Shaken for 30 mins, Centrifuged 5 mins. Filtered (0.45um syringe filter). Samples exceeding the calibration range were further diluted	

LC Conditions 1 – Asulam glucosides

Column:	Luna Phenyl-Hexyl, 5 µm, 150 x 4.6 mm i.d
Guard Column	Phenyl 4 x 2.0 mm i.d, Phenomenex
Column oven temperature:	20°C
Mobile phase A1:	0.1% Formic acid in Water
Mobile phase B:	0.1% Formic acid in Methanol
Auto sampler temperature:	10°C

Gradient:

Time (mins)	%A	%B
0	95	5
1.0	95	5
12.0	5	95
13.5	5	95
13.51	95	5
15.0	95	5

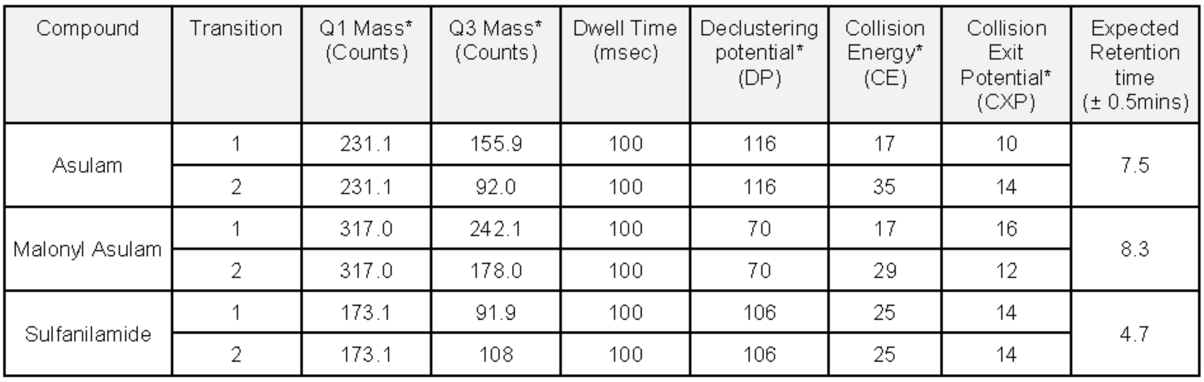
LC Conditions 2 – Asulam, Malonyl Asulam, Sulfanilamide

Column:	Luna Phenyl-Hexyl, 5 µm, 150 x 4.6 mm i.d
Guard Column	Phenyl 4 x 2.0 mm i.d, Phenomenex
Column oven temperature:	20°C
Mobile phase A2:	0.1% Formic acid in 2 mM Ammonium Formate (aq)
Mobile phase B:	0.1% Formic acid in Methanol
Auto sampler temperature:	10°C

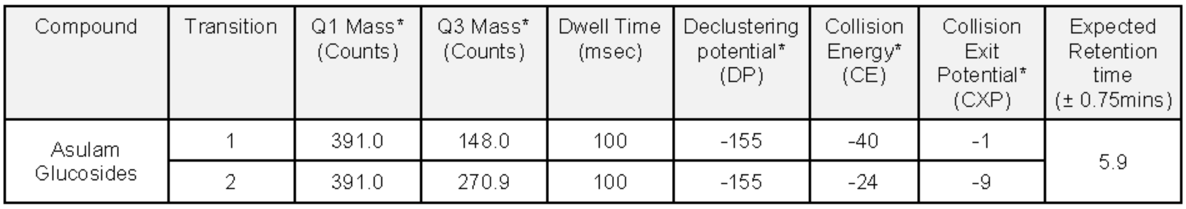
Gradient:

Time (mins)	%A	
0	95	
1.0	95	
12.0	5	
13.5	5	
13.51	95	
15.0	95	

The following MS/MS transitions were used for method AM4, AM2, AM3:

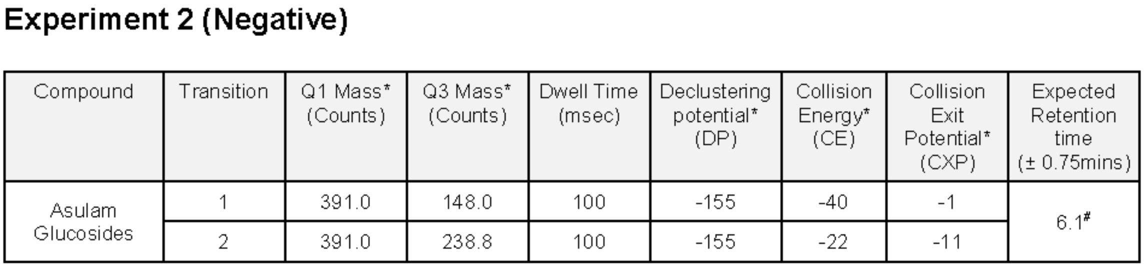


Compound	Transition	Q1 Mass* (Counts)	Q3 Mass* (Counts)	Dwell Time (msec)	Declustering potential* (DP)	Collision Energy* (CE)	Collision Exit Potential* (CXP)	Expected Retention time (± 0.5mins)
Asulam	1	231.1	155.9	100	116	17	10	7.5
	2	231.1	92.0	100	116	35	14	
Malonyl Asulam	1	317.0	242.1	100	70	17	16	8.3
	2	317.0	178.0	100	70	29	12	
Sulfanilamide	1	173.1	91.9	100	106	25	14	4.7
	2	173.1	108	100	106	25	14	



Compound	Transition	Q1 Mass* (Counts)	Q3 Mass* (Counts)	Dwell Time (msec)	Declustering potential* (DP)	Collision Energy* (CE)	Collision Exit Potential* (CXP)	Expected Retention time (± 0.75mins)
Asulam Glucosides	1	391.0	148.0	100	-155	-40	-1	5.9
	2	391.0	270.9	100	-155	-24	-9	

For AM1 the transitions above were used for asulam, malonyl asulam and sulphanilamide but for asulam glucosides the following transitions were stated:



Experiment 2 (Negative)

Compound	Transition	Q1 Mass* (Counts)	Q3 Mass* (Counts)	Dwell Time (msec)	Declustering potential* (DP)	Collision Energy* (CE)	Collision Exit Potential* (CXP)	Expected Retention time (± 0.75mins)
Asulam Glucosides	1	391.0	148.0	100	-155	-40	-1	6.1#
	2	391.0	238.8	100	-155	-22	-11	

Results and discussions

The report submitted summarises procedural recovery data and references previous study reports (NZ 17/004 and NZ 17/005) for primary validation. In the absence of these primary validation data the procedural recovery has been considered (in lieu of primary validation) to determine if it is sufficient to support the methods used in study R1640115. The summarised (procedural) validation data for the methods outlined in Table A12.1 can be seen in Table A12.2 and Table A12.3. Results outside acceptable bounds are highlighted in yellow. Note insufficient recovery samples have been provided to consider the methods for arthropods fully validated.

Table A12.2: Recovery results from method validation of asulam, malonyl asulam, sulphanilamide, and asulam glucosides using the analytical methods detailed in Table A12.1.

Matrix	**Analyte**	**Fortification level (mg/kg) (*n* = x)**	**Recovery (%) [Mean recovery]** ***Values in italics from study R1640114 and combined mean recovery when appropriate***	**RSD (%)** ***Italicised values combine data from R1640114 and R1640115***	**Re-injected and re-diluted recoveries**
Monocot	Asulam	0.05 0.5 10 200	89 88, 97, 62, 81, 89, 86 [84] 110, 111, 65, 93, 94, 96 [95] 109, 108, 93, 98, 98 [101]	- 14.2 17.6 6.9	
	Malonyl asulam	0.05 0.5	100, 105, 85, 91, 103, 106, 82 [96] 100, 105, 104, 96, 106, 104, 103 [103]	10.3 3.4	
	Sulphanilamide	0.05 0.5 10	51, 67, 54, 71, 40 [57] 60, 52,, 54, 49, 65, 50, 67, 54 [56] 60, 68,43, 59 [58]	22.1 12.1 18.2	
	Asulam glucosides	0.05 0.5 10 100	92, 91,106,106,73,101, 107, 110 [99] 107,109, 69, 106, 108, 118 [103] 107,112,94, 104, 109, 120 [108]]	- 13.2 16.7 8.0	 113 118 114
Dicot	Asulam	0.05 0.5 100	60, 70, 84, 69, 74, 65 [70] 61, 39, 88, 82, 64, 71, 71 [68] 102,94, 80, 71, 76, 74 [83]	11.7 23.4 14.9	 87
	Malonyl asulam	0.05 0.5	93, 96, 95, 94, 92, 91, 97 [94] 91, 95, 95, 93, 87, 90, 91 [92]	2.3 3.1	
	Sulphanilamide	0.05 0.5 10	36, 43, 53, 60, 55, 47, 37 [47] 42, 18, 52, 57, 47, 53, 44 [45] 80, 79, 72, 70, 78, 73 [75]	19.4 28.9 5.5	 66
	Asulam glucosides	0.05 0.5 50	90, 93, 88, 104, 99, 96, 96 [95] 88, 90, 95, 92, 92, 98, 96 [93] 96, 102, 96, 98, 99, 101 [99]	5.7 3.8 2.5	 104
Panicle seed	Asulam	0.05 0.5 400	80, 71, 37, 68, 68, 63, 75, 79 [68] 94, 85, 57, 66, 76, 64, 81, 78 [75] 89, 84, 83, 76, 85, 77, 79 [82]	20.2 16.2 5.7	 71
	Malonyl asulam	0.05 0.5	85, 68, 85, 83, 76, 85, 84, 87 [82] 97, 89, 66, 87, 90, 79, 89, 88 [86]	7.8 10.9	
	Sulphanilamide	0.05 0.5 50	49, 70, 50, 54, 40, 77, 49 [56] 74, 73, 39, 59, 43, 72, 56 [59] 95, 81, 83 [86]	23.6 24.3 8.8	
	Asulam glucosides	0.05 0.5 100	97, 77, 94, 90, 83, 79, 89, 94, 94 [89] 92, 85, 76, 86, 93, 88, 77, 91, 90 [86] 85, 85, 86, 76, 79, 88, 87 [84]	8.2 7.2 5.3	

Matrix	Analyte	Fortification level (mg/kg) (*n* = x)	Recovery (%) [Mean recovery] ***Values in italics from study R1640114 and combined mean recovery when appropriate***	RSD (%) ***Italicised values combine data from R1640114 and R1640115***	Re-injected and re-diluted recoveries
Arthropods	Asulam	*0.01* 0.05 *0.1* 0.5 *30* 50	*70, 70, 102 [81]* 102, 104, 130 [112] *107, 85, 89 [94]* 103, 105, 120 [109] *59, 55, [57]* 89, 92.80 [87]	 13.9 8.5 7.2	
	Malonyl asulam	0.05 0.5	91, 103, 100 [98] *88, 77* 92, 94, 97 [94] *75, 86*	6.4 2.7	
	Sulphanilamide	0.05 0.5 *20* 50	102, 88, 131 [107] *133, 74, 112* 92, 91, 106 [96] *125, 88, 104* *97, 87* 86, 84 [85]	20.5, *22.0** 8.7, *8.5* -	90, 95 89, 93
	Asulam glucosides	0.05 0.5 *20* 50	94, 106, 107 [102] *88, 102, 103* 93, 94, 98 [95] *90, 88, 94* *76, 75* 92, 92, 88 [91]	7.1, *7.5* 2.8, *3.8* 2.5	101, 104 97, 94

* RSD value slightly above acceptable range, however this is considered acceptable as recoveries are all above 70% in all cases

Table A 12.3: Characteristics for the analytical method used for validation of asulam, malonyl asulam, sulphanilamide and asulam glucosides residues in seed, monocot, dicot, arthropod and seed.

Matrix	Analyte	Specificity	Calibration and range	LOQ
Monocot	Asulam	Control samples < 30% LOQ	8 calibration stds (matrix matched to counteract suppression) from 0.015 mg/kg to 1 mg/kg and 0.03 to 2 mg/kg (2nd extraction) r ≥0.999 for both	0.05
	Malonyl asulam		8 calibration stds (matrix matched to counteract suppression) from 0.015 mg/kg to 1 mg/kg r ≥0.999	0.05
	Sulphanilamide		8 calibration stds (matrix matched to counteract suppression) from 0.015 mg/kg to 1 mg/kg and 0.03 to 2 mg/kg (2nd extraction) r ≥0.995	-
	Asulam glucosides		8 calibration stds (matrix matched to counteract suppression) from and 0.015 to 1 mg/kg and 0.03 to 2 mg/kg (2nd extraction) r ≥0.999	0.5
Dicot	Asulam	Control samples < 30% LOQ	8 calibration stds (matrix matched to counteract suppression) from and 0.015 to 1 mg/kg r ≥0.99	0.05

Matrix	Analyte	Specificity	Calibration and range	LOQ
	Malonyl asulam		8 calibration stds (matrix matched to counteract suppression) from and 0.015 to 1 mg/kg r ≥0.999make	0.05
	Sulphanilamide		8 calibration stds (matrix matched to counteract suppression) from and 0.015 to 1 mg/kg r ≥0.99	-
	Asulam glucosides		8 calibration stds (matrix matched to counteract suppression) from and 0.015 to 1 mg/kg r ≥0.99	0.05
Panicle seed	Asulam	Control samples < 30% LOQ	8 calibration stds (matrix matched to counteract suppression) from and 0.015 to 3 mg/kg r ≥0.99	0.05
	Malonyl asulam		8 calibration stds (matrix matched to counteract suppression) from and 0.015 to 3 mg/kg r ≥0.99	0.05
	Sulphanilamide		8 calibration stds (matrix matched to counteract suppression) from and 0.015 to 3 mg/kg r ≥0.99	-
	Asulam glucosides		8 calibration stds (matrix matched to counteract suppression) from and 0.015 to 3 mg/kg r ≥0.999	0.05
Arthropod	Asulam	Control samples < 30% LOQ	8 calibration stds (matrix matched to counteract suppression) from and 0.015 to 1 mg/kg r ≥0.99	-
	Malonyl asulam		8 calibration stds (matrix matched to counteract suppression) from and 0.015 to 1 mg/kg r ≥0.99	-
	Sulphanilamide		8 calibration stds (matrix matched to counteract suppression) from and 0.015 to 1 mg/kg r ≥0.99	-
	Asulam glucosides		8 calibration stds (matrix matched to counteract suppression) from and 0.015 to 1 mg/kg r ≥0.99	-

Conclusion

Procedural recovery data has been provided (no primary validation data has been submitted) for the above methods. For some analyte matrix combinations mean procedural recovery data were <70% and RSD were >20% (see yellow highlighting in Table A12.2 above).

Sulphanilamide has low or variable recoveries in the following matrices:

Panicle seed
Monocots
Dicots

Insufficient procedural recovery data (n≤3) were available in report R1640115 to confirm suitable recovery or precision for any of the analyte determinations in arthropods. However the methods used for determinations in arthropods from study R1640114 and R1640115 are sufficiently similar to consider that the validation data can be combined from both studies. The combined data (Table A12.2) can be considered sufficient to demonstrate an acceptably validated method for the determination of asulam, malonyl asulam, sulphanilamide and asulam glucoside (LOQ 0.01 mg/kg for asulam and LOQ 0.05 mg/kg for other analytes).

Asulam determination in monocots and panicle seed show individual very low recoveries but all other determination are within acceptable ranges so the method can be considered acceptable.

Therefore methods for only the following matrix/analyte combinations can be considered sufficiently validated:

Seed- asulam, malonyl asulam, asulam glucoside (LOQ 0.5 mg/kg for asulam glucoside, LOQ 0.05 mg/kg for other analytes)
Monocot- asulam, malonyl asulam, asulam glucoside (LOQ 0.05 mg/kg for all)
Dicot- asulam, malonyl asulam, asulam glucoside (LOQ 0.05 mg/kg for all)
Arthropods- asulam, malonyl asulam, sulphanilamide and asulam glucoside (LOQ 0.01 mg/kg for asulam and LOQ 0.05 mg/kg for other analytes)

Note Claßen, C. 2021, (Report number R1640115) has suggested correcting the levels of sulphanilamide using procedural recoveries. This is not considered a suitable approach to account for method recovery issues, especially given that there are both recovery and precision issues for determination of sulphanilamide in seeds, monocots and dicots

Monocot, dicot, seed and arthropod samples were stored frozen for a maximum of 6, 4, 6 and 11 days from sampling to extraction, respectively. There is some evidence of asulam instability over frozen storage (within 7 days), however declines in residues are not expected to exceed 30%.

The maximum storage period between extraction and analysis was 29 days. Stability of the analytes in the sample extracts was addressed by corresponding procedural recovery stored under the same conditions. Additionally older sample extracts were injected with calibration standards prepared on or before day of sample extractions. Re injected procedural recoveries are shown in Table A12.2 and are consistent with primary recoveries (all acceptable except for sulphanilamide)

Appendix 14: Assessment of storage stability data

Author:	[redacted] (2021a)
Title:	Storage Stability of Asulam in Monocot and Dicot Matrices, Battelle UK Ltd.
Report No.:	NZ/19/004
Guideline(s):	OECD 506
GLP	Yes
Data location:	[redacted]

Materials and Methods

The frozen storage of asulam was studied in monocot and dicot matrices for 7 days and 4 days respectively.

Untreated homogenate monocot sample matrices were fortified with asulam at a level of 1mg/kg, 7 mg/kg and 35 mg/kg.

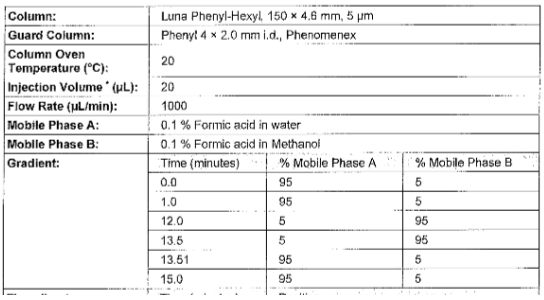
Untreated homogenate dicot sample matrices were fortified with asulam at a level of 0.2 mg/kg and 1mg/kg.

5 samples (2 fortified and 3 non-fortified (control plus two procedural recoveries)) per time interval and matrix were kept in Nalgene bottles at ≤-18°C in the dark for up to7 days (monocots) and 4 days (dicots). After the following time intervals:

2 and 4 days (monocot 1mg /kg)
4 and 7 days (monocot 7 mg/kg and 35 mg/kg)
1 and 2 days (dicot 0.2 mg/kg)
3 and 4 days (dicot 1 mg/kg)

samples were removed from storage and were analysed for asulam. Procedural (fresh) recoveries were fortified on the day of extraction.

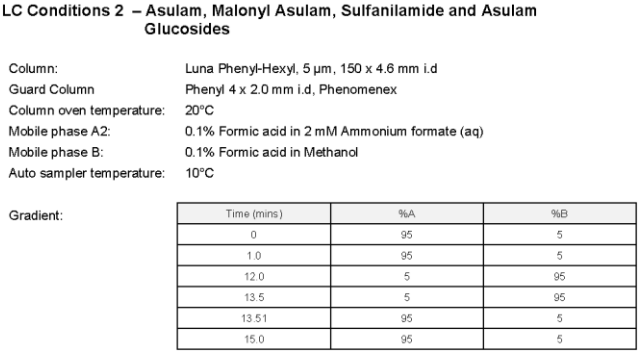
Asulam analysis in monocot was using LC-MS/MS method AM/NZ/0002 v 01 with analytical method supplement AMS 01 v 01. Asulam analysis in dicot was using LC-MS/MS method AM/NZ/0003 v 01 with analytical method supplement AMS 01 v 01. Details for this method are shown below:

Matrix	Analytes	Method reference	Extraction	Analysis
Monocot	Asulam	AM/NZ/0002 (equivalent to method AM4 used in study R1640115)	5 g homogenised sample in 50 ml of diluent B(Acetonitrile/10 mM Ammonium formate, ph4.5 (20/80, v/v)) Ultra turrax for 5 mins,	LC MS/MS: 

Column:	Luna Phenyl-Hexyl, 150 × 4.6 mm, 5 µm		
Guard Column:	Phenyl 4 × 2.0 mm i.d., Phenomenex		
Column Oven Temperature (°C):	20		
Injection Volume * (µL):	20		
Flow Rate (µL/min):	1000		
Mobile Phase A:	0.1 % Formic acid in water		
Mobile Phase B:	0.1 % Formic acid in Methanol		
Gradient:	Time (minutes)	% Mobile Phase A	% Mobile Phase B
	0.0	95	5
	1.0	95	5
	12.0	5	95
	13.5	5	95
	13.51	95	5
	15.0	95	5

<table>
<tr><th>Matrix</th><th>Analytes</th><th>Method reference</th><th>Extraction</th><th>Analysis</th></tr>
<tr><td></td><td></td><td></td><td>Shaken for 60 mins, Centrifuged 5 mins.

Second extraction as above but with mechanical shaking for 30 mins

Filtered (0.45um syringe filter).</td><td></td></tr>
<tr><td>Dicot</td><td>Asulam</td><td>AM/NZ/0003 (equivalent to method AM2 and AM2a used in studies R1640115 and R1640114 respectively)</td><td>10 g homogenised sample in 100 ml of diluent B(Acetonitrile/10 mM Ammonium formate, ph4.5 (20/80, v/v))
Ultra turrax for 5 mins, Shaken for 30 mins, Centrifuged 5 mins. Filtered (0.45um syringe filter).</td><td>LC MS/MS:

LC Conditions 2 – Asulam, Malonyl Asulam, Sulfanilamide and Asulam Glucosides

Column: Luna Phenyl-Hexyl, 5 µm, 150 x 4.6 mm i.d
Guard Column Phenyl 4 x 2.0 mm i.d, Phenomenex
Column oven temperature: 20°C
Mobile phase A2: 0.1% Formic acid in 2 mM Ammonium formate (aq)
Mobile phase B: 0.1% Formic acid in Methanol
Auto sampler temperature: 10°C

Gradient:
<table>
<tr><th>Time (mins)</th><th>%A</th><th>%B</th></tr>
<tr><td>0</td><td>95</td><td>5</td></tr>
<tr><td>1.0</td><td>95</td><td>5</td></tr>
<tr><td>12.0</td><td>5</td><td>95</td></tr>
<tr><td>13.5</td><td>5</td><td>95</td></tr>
<tr><td>13.51</td><td>95</td><td>5</td></tr>
<tr><td>15.0</td><td>95</td><td>5</td></tr>
</table></td></tr>
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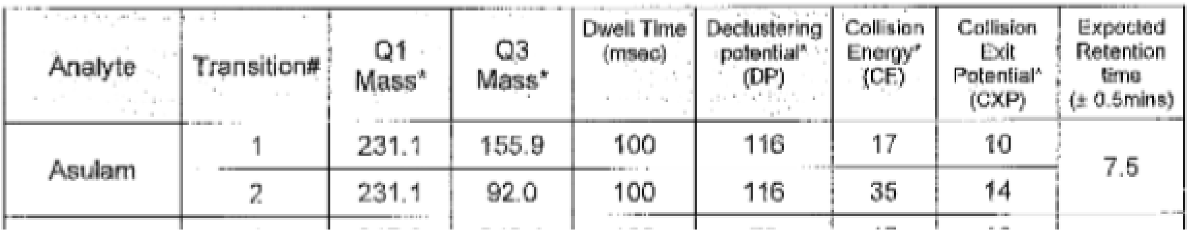


Analyte	Transition#	Q1 Mass*	Q3 Mass*	Dwell Time (msec)	Declustering potential* (DP)	Collision Energy* (CE)	Collision Exit Potential^ (CXP)	Expected Retention time (± 0.5mins)
Asulam	1	231.1	155.9	100	116	17	10	7.5
	2	231.1	92.0	100	116	35	14	

Results and discussion

The recoveries of asulam from monocot matrices after the various storage periods are summarized below.

Commodity	Spike level (mg/kg)	Storage Period (days)	Residue in Freezer Sample (mg/kg)	Residue in Freezer Sample as % of nominal spiking level (mean in brackets)	Procedural Recovery for Freshly Spiked Sample (%) (mean in brackets)
Asulam					
Monocot	1	0	0.756, 0.761	7 6, 76 (76)	90, 90 (90)
		2	0.538, 0.494	54, 49 (52)	80, 66 (73)
		4	0.714, 0.809	71, 81 (76)	107, 108 (108)
	7	0	5.10, 5.20	73, 74 (74)	91, 86 (89)
		4	4.35, 4.27	62, 61 (62)	75, 80 (78)
		7	4.89, 4.49	70, 64 (67)	84, 81 (83)
	35	0	27.3, 26.8	78, 77 (78)	87, 86 (87)
		4	23.3, 22.3	67, 64 (66)	84, 84 (84)
		7	24.2, 24.2	69, 69 (69)	90, 88 (89)
Dicot	0.2	0	0.158, 0.164	79, 82 (81)	74, 75 (75)
		1	0.134, 0.138	67, 69 (68)	81, 75 (78)
		2	0.138, 0.134	69, 67 (68)	82, 76 (79)
	1	0	0.781, 0.816	78, 82 (80)	73, 73 (73)
		3	0.678, 0.674	68, 67 (68)	89, 82 (86)
		4	0.628, 0.622	63, 62 (63)	80, 78 (79)

Blue shading some evidence of instability/change in levels compared to the fortified level but amount remaining probably does not represent a >30% loss (when you consider the procedural recoveries) -

Residues of asulam were variable over the storage period. The applicant has suggested that the recoveries can be considered acceptable based on correction for procedural recoveries. There seems to be evidence of some decline (recoveries in frozen samples at later time periods are consistently below procedural recoveries, which is not the case for time zero time points) however when procedural recoveries are considered the decline does not represent a 30% loss.

The analytical methods were considered sufficiently validated for the purposes of the regulatory process (see Appendix 11 and 12). The limit of quantitation (LOQ) of the method is 0.05 mg/kg in monocot and dicots. The procedural recoveries (freshly spiked samples at 1, 7 and 35 mg/kg in monocots and 0.2 and 1 mg/kg in dicots mg/kg) were in the acceptable range of 70 and 110%.

Conclusion

There is indication of asulam instability over short time periods (up to 7 days), however with correction for procedural recovery the losses are not considered to represent a more than 30% loss in residues. The study can be considered sufficient to support

Author:	[redacted] (2021b)
Title:	Storage Stability of Asulam in Grass and Grass silage matrices, Battelle UK Ltd.
Report No.:	NZ/19/006
Guideline(s):	OECD 506
GLP	Yes
Data location:	[redacted]

Materials and Methods

The frozen storage of asulam was studied in fresh grass and grass silage for 10 days and 30 days respectively.

Untreated homogenate grass/silage sample matrices (stored frozen prior to use) were fortified with asulam at a level of 0.1 or 1 mg/kg.

5 samples (2 fortified and 3 non-fortified (control plus two procedural recoveries)) per time interval and matrix were kept in centrifuge tubes at ≤-18°C in the dark for up to 10 days (fresh grass) and 30 days (silage). For each matrix and concentration level two additional spare sets of fortified stability samples were prepared at the start of the study to allow for any repeat analysis needed.

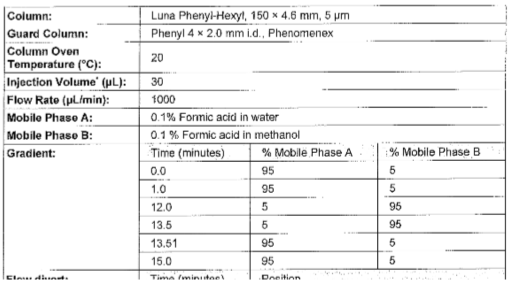
After the following time intervals:

After the following time intervals:

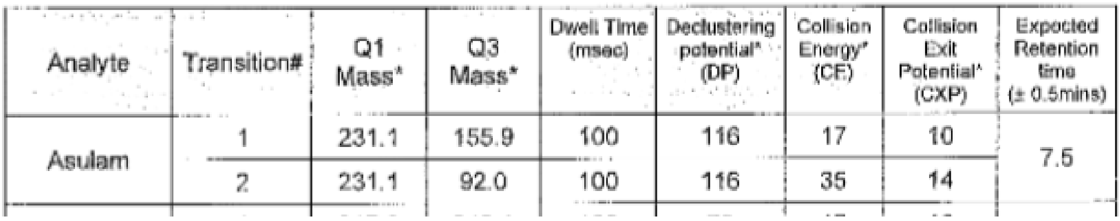
1, 2, 3, 4, 5, 6, 7, 8, 9, 10 days (fresh grass, 0.1 mg/kg)
4, 5, 7 and 9 days (fresh grass, 1 mg/kg)
10 and 31days (silage, 0.1 mg/kg)
3 and 4 days (dicot 1 mg/kg)

samples were removed from storage and were analysed for asulam. Procedural (fresh) recoveries were fortified on the day of extraction.

Asulam analysis in grass and silage was using LC-MS/MS method AM/NZ/0004 v 01 with analytical method supplement AMS 01 v 01. Details for this method are shown below:

Matrix	Analytes	Method reference	Extraction	Analysis
Fresh grass and grass silage	Asulam	AM/NZ/0004 (equivalent to method used in COP201901678)	5 g homogenised sample in 20 ml of diluent A(Acetonitrile: water (20:80, v/v) + 0.2% formic acid solvent) Vortexing for 30 seconds. Centrifuged 2 mins. Extraction repeated twice more. Extracts combined. Filtered (0.45um syringe filter).	LC MS/MS: 

Column:	Luna Phenyl-Hexyl, 150 × 4.6 mm, 5 µm		
Guard Column:	Phenyl 4 × 2.0 mm i.d., Phenomenex		
Column Oven Temperature (°C):	20		
Injection Volume' (µL):	30		
Flow Rate (µL/min):	1000		
Mobile Phase A:	0.1% Formic acid in water		
Mobile Phase B:	0.1 % Formic acid in methanol		
Gradient:	Time (minutes)	% Mobile Phase A	% Mobile Phase B
	0.0	95	5
	1.0	95	5
	12.0	5	95
	13.5	5	95
	13.51	95	5
	15.0	95	5
Flow divert:	Time (minutes)	Position	



Analyte	Transition#	Q1 Mass*	Q3 Mass*	Dwell Time (msec)	Declustering potential^ (DP)	Collision Energy* (CE)	Collision Exit Potential^ (CXP)	Expected Retention time (± 0.5mins)
Asulam	1	231.1	155.9	100	116	17	10	7.5
	2	231.1	92.0	100	116	35	14	

Results and discussion

The recoveries of asulam from grass and silage matrices after the various storage periods are summarized below.

Commodity	Spike level (mg/kg)	Storage Period (days)	Residue in Freezer Sample (mg/kg)		Residue in Freezer Sample as % of nominal spiking level			Procedural Recovery for Freshly Spiked Sample (%)		
			Sample 1	Sample 2	Sample 1	Sample 2	Mean	Recovery 1	Recovery 2	Mean
Fresh grass	0.1	0	0.0833	0.0885	83	89	86	94	93	94
		1	0.0476	0.0465	48	47	47	81	77	79
		2	0.0534	0.0542	53	54	54	81	83	82
		3	0.0561	0.0578	56	58	57	89	88	89
		4	0.0474	0.0478	47	48	48	83	86	85
		5	0.0561	0.0562	56	56	56	97	98	98
		6	0.0496	0.0502	50	50	50	95	93	94
		7	0.0432	0.0444	43	44	44	88	89	89
		8	0.0357	0.0405	36	41	38	96	97	97
		9	0.0411	0.0380	41	38	40	86	88	87
		10	0.0405	0.0366	41	37	39	88	91	90
	1	0	0.837	0.809	84	81	82	66	83	75
		4	0.712	0.673	71	67	69	93	94	94
		5	0.664	0.657	66	66	66	94	95	95
		7	0.642	0.629	64	63	64	93	94	94
		9	0.566	0.590	57	59	58	90	93	92
Grass silage	0.1	0	0.0850	0.0870	85	87	86	88	92	90
		10	0.0695	0.0740	70	74	72	92	85	89
		31	0.0570	0.0580	57	58	58	85	85	85

Blue shading some evidence of instability/change in levels compared to the fortified level but amount remaining probably does not represent a >30% loss (when you consider the procedural recoveries). Orange shading evidence of significant loss in the analyte, >30% loss (when you consider the procedural recoveries)

Residues of asulam were shown to decline significantly over the storage period. In grass silage they were only demonstrated to be stable for up to 10 days. Residues of asulam in fresh grass were not found to be stable at any time points.

The analytical method, were considered sufficiently validated for the purposes of the regulatory process (see Appendix 11 and 12). The limit of quantitation (LOQ) of the method is 0.05 mg/kg in monocot and dicots. The procedural recoveries (freshly spiked samples at 1, 7 and 35 mg/kg in monocots and 0.2 and 1 mg/kg in dicots mg/kg) were in the acceptable range of 70 and 110%.

The analytical method (AM/NZ/0004) was satisfactorily validated in accordance with SANCO 3029/99 rev. 4 (see previous evaluation of identical method under COP 201901678). The limit of quantitation (LOQ) of the method is 0.1 mg/kg. The procedural recoveries (freshly spiked samples at 0.1 and 1 mg/kg) were in the acceptable range of 70 and 110%.

Conclusion
Asulam was stable in silage for at least 10 days when stored at ≤-18°C in the dark. No acceptable storage period was demonstrated for asulam in grass.

Author:	[redacted]
Title:	Acceptability of asulam storage studies in Grass and their relevance for a field residues study in grassland. Battelle UK Ltd.
Report No.:	-
Guideline(s):	-
GLP	-
Data location:	[redacted]

The applicant has summarised the previous storage stability data from NZ/19/004, NZ/19/006 and NZ 15/004 (previously evaluated under COP201901678).

The applicant has suggested that the considerable instability seen in NZ 15/004 is due to the spiking level of 0.1 mg/kg and as residues were found at higher levels in the residue trials (closer to 1 mg/kg) and study NZ 19/004 and NZ/19006 showed reduced instability at higher asulam concentrations the samples from residue trials (stored for up to 8 days) can be considered acceptably supported by storage stability data.

The stability data from NZ 15/004 (as evaluated under COP201901678) is shown below:

Freezer Storage Stability of residues of asulam in grassland for samples individually fortified and analysed at different timepoints. [Since some instability has been observed the following colour shading has been used to depict the following: some evidence of instability/change in levels compared to the fortified level but amount remaining does probably not represent a >30% loss (when you consider the procedural recoveries) - blue shading; significant loss in the analyte >30% loss (when you consider the procedural recoveries) - red shading]

Compound	Storage Interval Days	Uncorrected Residue Results (%)			Procedural Recoveries for freshly fortified samples		Mean Procedural Result (%)
		Sample 1	Sample 2	Mean	Procedural Recovery 1 (%)	Procedural Recovery 2 (%)	
Asulam	6	15	11	13	69	75	72
	13	21	15	18	89	82	86
	25	32	32	32	70	69	70
	39	29	26	28	80	84	82
Acetyl Asulam	5	88	85	87	87	89	88
	13	62	65	64	85	82	84
	25	99	91	95	81	92	87
	39	80	81	81	87	84	85
Asulam Glucosides	5	84	80	82	82	86	84
	13	97	93	95	101	101	101
	25	91	89	90	112	103	107
	39	74	72	73	72	75	73
Acetyl Sulfanilamide	5	80	78	79	89	90	90
	13	68	66	67	75	72	73
	25	64	66	65	86	83	84
	41	56	56	56	100	96	98
Desamino Asulam	5	95	95	95	84	86	85
	13	64	64	64	86	81	84
	25	60	56	58	76	72	74
	39	72	70	71	79	72	75
Formyl Asulam	5	108	110	109	105	109	107
	13	74	71	73	70	70	70
	25	97	96	96	101	102	102

	39	*56*	*56*	*56*	*69*	*66*	*67*
	41	*74*	*69*	*71*	*83*	*89*	*86*
Malonyl Asulam	*5*	*113*	*107*	*110*	*109*	*112*	*111*
	13	*66*	*129*	*97*	*78*	*70*	*74*
	25	*53*	*51*	*52*	*72*	*65*	*68*
	41	*67*	*60*	*63*	*72*	*71*	*71*
Malonyl Sulfanilamide	*5*	*100*	*102*	*101*	*97*	*98*	*97*
	13	*57*	*63*	*60*	*75*	*66*	*71*
	25	*62*	*64*	*63*	*122*	*116*	*119*
	39	*63*	*59*	*61*	*67*	*69*	*68*
	41	*75*	*85*	*80*	*84*	*73*	*79*
Sulfanilamide	*5*	*84*	*77*	*81*	*97*	*109*	*101*
	14	*55*	*51*	*53*	*80*	*76*	*78*
	25	*30*	*29*	*30*	*77*	*74*	*76*
	39	*5*	*6*	*6*	*76*	*76*	*76*

The data from all storage stability studies in grass show that residues have declined by ≥30% after 6 days. Earlier timepoints are determined in NZ/19006 which suggest that for both 0.1 and 1 mg/kg fortification levels evidence of instability is shown at the earliest measured timepoint. There is evidence that samples are more stable in silage (for up to 10 days) and that asulam is more stable in monocot and dicot samples (up to 7 days).

The data provided are not sufficient to conclude that asulam residues in grass can be considered stable and indications of decline are seen from one days storage in NZ19006.

[redacted]

Sample Point Name	Date Sample Taken	Analysis	Result In Text	Sample Reason Name	Sample Number	Site Code
River Derwent at Ambergate NEW	22/07/2022 13:02	Asulam (ug/l)	<0.013	Catchment	4365078	6DERW7
River Derwent at Ambergate NEW	19/08/2022 12:09	Asulam (ug/l)	<0.013	Catchment	4365459	6DERW7
River Derwent at Yorkshire Bridge	21/09/2022 10:45	Asulam (ug/l)	0.016	Catchment	4406931	6DERW7
River Derwent at Ambergate NEW	22/09/2022 11:47	Asulam (ug/l)	0.015	Catchment	4397597	6DERW7

[redacted].

Sample Point Name	Date Sample Taken	Analysis	Result In Text	Sample Reason Name	comment
BAMFORD WTW	08/01/2019 12:17	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	24/01/2019 09:11	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	04/02/2019 08:39	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	20/02/2019 11:47	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	08/03/2019 07:27	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	19/03/2019 07:36	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	12/04/2019 07:30	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	23/04/2019 08:39	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	20/05/2019 07:22	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	27/05/2019 08:22	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	05/06/2019 07:36	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	21/06/2019 07:31	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	10/07/2019 07:27	Asulam (ug/l)	<0.008	Routine Program	
Ladybower Brook nr Ladybower Wood	26/07/2019 00:00	Asulam (ug/l)	0.027	Catchment	before helicopter spray took place
BAMFORD WTW	26/07/2019 07:28	Asulam (ug/l)	<0.008	Routine Program	
Ladybower Brook nr Ladybower Wood	02/08/2019 00:00	Asulam (ug/l)	0.779	Catchment	spraying too place in the morning and sample in the afternoon of 2nd
BAMFORD WTW	06/08/2019 07:22	Asulam (ug/l)	<0.008	Routine Program	
River Derwent at Yorkshire Bridge	09/08/2019 14:52	Asulam (ug/l)	0.008	Catchment	
Ladybower Brook nr Ladybower Wood	09/08/2019 14:53	Asulam (ug/l)	0.821	Catchment	still high a week later
BAMFORD WTW	22/08/2019 07:26	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	02/09/2019 07:29	Asulam (ug/l)	<0.008	Routine Program	
River Derwent at Yorkshire Bridge	17/09/2019 11:36	Asulam (ug/l)	<0.008	Catchment	
Ladybower Brook nr Ladybower Wood	17/09/2019 11:37	Asulam (ug/l)	0.016	Catchment	
BAMFORD WTW	18/09/2019 10:56	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	07/10/2019 07:36	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	23/10/2019 07:32	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	08/11/2019 07:52	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	05/12/2019 08:39	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	16/12/2019 07:32	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	17/12/2019 10:45	Asulam (ug/l)	<0.008	Routine Program	
BAMFORD WTW	19/12/2019 07:23	Asulam (ug/l)	<0.025	Routine Program	
BAMFORD WTW	07/01/2020 07:34	Asulam (ug/l)	<0.025	Routine Program	
Bamford Raw Line 1	15/01/2020 08:27	Asulam (ug/l)	<0.025	Routine Program	
BAMFORD WTW	23/01/2020 07:29	Asulam (ug/l)	<0.025	Routine Program	
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
BAMFORD WTW	03/02/2020 07:35	Asulam (ug/l)	<0.025	Routine Program	
Bamford WTW Mixed Raw	03/02/2020 08:15	Asulam (ug/l)	<0.025	DW Investigational	

Bamford Raw Line 1	11/02/2020 08:32	Asulam (ug/l)	<0.025	Routine Program	
BAMFORD WTW	19/02/2020 07:55	Asulam (ug/l)	<0.025	Routine Program	
BAMFORD WTW	04/03/2020 12:45	Asulam (ug/l)	<0.025	Routine Program	
BAMFORD WTW	17/03/2020 10:46	Asulam (ug/l)	<0.025	Routine Program	
BAMFORD WTW	10/04/2020 07:48	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	11/04/2020 08:33	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	21/04/2020 08:57	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	24/04/2020 13:03	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	05/05/2020 12:45	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	07/05/2020 09:59	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	15/05/2020 10:50	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	18/05/2020 07:24	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	25/05/2020 10:38	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	11/06/2020 08:58	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	19/06/2020 11:12	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	22/06/2020 10:47	Asulam (ug/l)	<0.013	Routine Program	
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
Bamford Raw Line 3	24/06/2020 11:28	Asulam (ug/l)	<0.013	DW Investigational	
Bamford WTW Mixed Raw	24/06/2020 11:34	Asulam (ug/l)	<0.013	DW Investigational	
BAMFORD WTW	08/07/2020 11:30	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	16/07/2020 09:02	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	24/07/2020 10:58	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	04/08/2020 11:04	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	12/08/2020 09:36	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	20/08/2020 10:36	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	08/09/2020 10:33	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	16/09/2020 11:41	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	24/09/2020 10:43	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	05/10/2020 09:18	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	13/10/2020 10:37	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	21/10/2020 09:40	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	06/11/2020 09:16	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	09/11/2020 10:24	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	17/11/2020 09:30	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	11/12/2020 09:48	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	14/12/2020 11:29	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	22/12/2020 10:03	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	08/01/2021 11:05	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	11/01/2021 11:21	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	19/01/2021 11:00	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	04/02/2021 11:29	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	12/02/2021 10:28	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	15/02/2021 10:14	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	16/02/2021 10:40	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	01/03/2021 09:54	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	11/03/2021 10:03	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	19/03/2021 11:35	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	22/03/2021 07:36	Asulam (ug/l)	<0.013	Routine Program	

BAMFORD WTW	07/04/2021 12:39	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	15/04/2021 10:50	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	23/04/2021 10:27	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	04/05/2021 10:30	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	12/05/2021 11:50	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	20/05/2021 10:51	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	08/06/2021 11:03	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	16/06/2021 11:11	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	24/06/2021 11:30	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	05/07/2021 14:51	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	13/07/2021 09:35	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	21/07/2021 08:55	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	06/08/2021 08:47	Asulam (ug/l)	<0.013	Routine Program	
Ladybower Brook nr Ladybower Wood	06/08/2021 09:20	Asulam (ug/l)	0.286	Catchment	helicopter spray took place 03/08/21
River Derwent at Yorkshire Bridge	12/08/2021 20:33	Asulam (ug/l)	<0.013	Catchment	
Ladybower Brook nr Ladybower Wood	12/08/2021 20:34	Asulam (ug/l)	1.127	Catchment	
Ladybower Res	12/08/2021 20:34	Asulam (ug/l)	0.024	Catchment	
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
Bamford WTW Mixed Raw	14/08/2021 08:37	Asulam (ug/l)	<0.013	DW Investigational	
Bamford WTW Mixed Raw	16/08/2021 10:07	Asulam (ug/l)	<0.013	DW Investigational	
BAMFORD WTW FINAL	16/08/2021 10:22	Asulam (ug/l)	<0.013	DW Investigational	
BAMFORD WTW	17/08/2021 10:18	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	21/08/2021 12:08	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	10/09/2021 11:47	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	13/09/2021 10:36	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	21/09/2021 12:21	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	07/10/2021 12:02	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	18/10/2021 11:30	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	11/11/2021 11:47	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	19/11/2021 10:35	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	22/11/2021 12:19	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	08/12/2021 11:49	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	16/12/2021 11:15	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	24/12/2021 08:38	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	30/12/2021 12:32	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	01/01/2022 09:08	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	18/01/2022 09:34	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	26/01/2022 10:41	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	03/02/2022 10:00	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	22/02/2022 12:40	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	18/03/2022 09:12	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	21/03/2022 12:42	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	29/03/2022 09:22	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	06/04/2022 10:41	Asulam (ug/l)	<0.013	Routine Program	

BAMFORD WTW	14/04/2022 09:30	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	22/04/2022 07:55	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	25/04/2022 11:10	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	27/05/2022 12:05	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	30/05/2022 11:29	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	31/05/2022 08:39	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	15/06/2022 07:58	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	23/06/2022 07:59	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	01/07/2022 08:10	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	12/07/2022 09:01	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	16/08/2022 08:03	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	01/09/2022 12:41	Asulam (ug/l)	<0.013	Routine Program	
Ladybower Res Surface	10/09/2022 11:35	Asulam (ug/l)	<0.013	DW Investigational	
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	
BAMFORD WTW	12/09/2022 10:52	Asulam (ug/l)	<0.013	Routine Program	
River Derwent at Yorkshire Bridge	21/09/2022 10:45	Asulam (ug/l)	0.016	Catchment	spray took place on 17th August, the notification was missed as the HSE notifier had typed my email incorrectly so I hadn't received it so no sampling close to the spray date
BAMFORD WTW	28/09/2022 07:31	Asulam (ug/l)	0.013	Routine Program	
BAMFORD WTW	03/10/2022 10:06	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	14/10/2022 07:31	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	20/10/2022 11:17	Asulam (ug/l)	0.025	Routine Program	
BAMFORD WTW	02/11/2022 07:55	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	22/11/2022 14:48	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	23/11/2022 12:24	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	29/11/2022 11:24	Asulam (ug/l)	<0.013	Routine Program	
BAMFORD WTW	15/12/2022 16:28	Asulam (ug/l)	<0.013	Routine Program	
Bamford Raw Line 1	21/12/2022 09:41	Asulam (ug/l)	0.014	Routine Program	
BAMFORD WTW	26/12/2022 09:08	Asulam (ug/l)	<0.013	Routine Program	

To: Defra: Pesticide Active Substances and Products, CPHW
Scottish Government: SASA Policy Team; Agriculture and Economy Directorate
Welsh Government: Plant Health and Environmental Protection Team; Land, Nature and Forestry Directorate
DAERA NI: Environmental Farming Branch; Regulatory and Natural Resources Policy Division; Environment, Marine and Fisheries Group

From: [redacted] CRD, HSE

Date: 20 March 2023

Formal request for agreement to HSE taking the decision on an application for emergency authorisation in the UK for the use of the herbicide product Asulox containing the active substance asulam for bracken control.

Issue Summary

1. This submission seeks the formal agreement of the Administrations to HSE exercising the decision-making function on an application for emergency authorisation under article 53 of retained Regulation 1107/2009 for the use of the plant protection product **Asulox** for the control of bracken.

2. **HSE does not consider that the requirement of article 53 is met and its proposed decision is to refuse the application.** While this is the 11th application for an emergency authorisation for this product and use, it is the first time that refusal is being proposed. This is based on the latest scientific evidence, including consideration of the potential endocrine disrupting properties of the active substance asulam in the product.

3. This decision falls under the novel or contentious criteria and is being submitted to Administrations in advance of the final decision in line with the provisions for novel or contentious outcomes as set out in the Departmental Agency Agreements on pesticides with HSE.

Timing

4. Written confirmation on whether the Administrations agree with HSE taking the decision on this emergency authorisation application is requested by **4 April**.

5. If Ministers wish to call in the decision and take it **themselves any Ministerial decision to grant the authorisation would be needed by the end of April** so that an authorisation could be issued in May. This would allow time for applications for permits to be made, processed (including consultation with environment regulators) and granted **in time for aerial spraying in July**.

Background

6. In November 2022 HSE accepted a UK-wide application from the Bracken Control Group Ltd (BCG) for emergency authorisation of their herbicide product Asulox, a soluble concentrate formulation containing the active substance asulam-sodium for use in rough grazing, upland / moorland areas, amenity grassland and forestry (establishment phase) via both aerial (helicopter) and ground-based application methods. This is the 11th application for emergency authorisation of this product; authorisation was first given in 2013 and then every year since. Projected use in 2023 is around 7500ha and previous annual usage figures are as follows:

Year	**Approx. Coverage Use (ha)**
2023	*Projected 7500*
2022	7600
2021	8000
2020	4000
2019	6500
2018	2500

7. Asulox has no current UK authorisation and its active substance asulam is not approved in the UK. Asulam was previously approved and had been in use since the 1960s. EU approval expired in December 2008 after the applicant UPL Europe Limited (UPL) withdrew the application to renew it. UPL then resubmitted the application which resulted in an EU non-approval decision in 2010.

8. UPL applied again for EU approval in 2013 and a European Food Safety Authority (EFSA) peer review report was published in March 2018 (see EFSA conclusion) which identified numerous data gaps. Thyroid toxicity was observed in test species raising the potential for asulam being an endocrine disruptor (ED) and the long-term risk to birds and mammals was identified as an area of critical concern. The updated peer review for the EFSA conclusion published in November 2021 concludes that asulam-sodium is considered to meet the criteria of an ED for humans for the thyroid (T) modality. It also states that a conclusion on the endocrine-disrupting properties for non-target organisms could not be made based on the information available.

9. Although asulam is not approved for use in the EU, New Zealand (which has similar bracken problems to the UK) has Asulox authorised for long term control of bracken by aerial or ground application in farmland, forestry and non-crop land situations and as a selective weedkiller for use in pasture and some other specified situations.

Discussion

The tests to be applied to an emergency authorisation application

10. In 2022, following Ministerial agreement, HSE guidance on the assessment of emergency authorisation applications was revised into a number of “tests":

- Are there special circumstances (including if a repeat, the measures in place to develop long term solutions);
- Is there a danger;
- Are there reasonable alternatives;
- Is the use limited and controlled; and
- Does the emergency authorisation appear necessary to address the danger.

11. Answers to these questions allows HSE to consider whether special circumstances exist for each application to support derogation from article 28 of retained Regulation 1107/2009. Article 53 of retained Regulation 1107/2009 permits such a derogation because of a danger, but the decision-maker needs to consider whether the benefit of addressing the danger outweighs the potential for harm considering any potential mitigations. The Emergency Registration Report in **Annex A** sets out HSE’s assessment in detail.

Test: the need for special circumstances to support the proposed use

12. **HSE considers that this test is not met**. Several new areas of concern have arisen in this application (see risk assessment section below) and the prognosis for a regular article 28 authorisation to replace annual emergency authorisations has become clearer – it is considered unlikely for approximately 7 years. HSE’s view is that the issues highlighted in other tests (below) demonstrate an elevated risk that continuing emergency authorisations of Asulox would jeopardise the integrity and purpose of the regulatory regime, given the increasing concerns on the endocrine disrupting properties of asulam and the impact on human and animal health and the environment.

13. This is the 11th application for emergency use of Asulox. While there is no firm point in time when a repeat application loses its special circumstances, the longer repeat requests go on the greater the challenge to the integrity of the regular authorisation system. HSE recognises the need to consider each application on a case-by-case basis, but in HSE’s view this application is reaching the point where it is no longer considered to be in special circumstances.

Test: if a repeat, are there measures in place to develop long term solutions?

14. **HSE considers that this test is not met**. The applicant now states that the long-term plan is to gain regular GB active substance approval for asulam and product authorisation of Asulox. A conservative estimate of when this might happen would be around 2030, taking account of the process timelines and the need for whoever seeks approval to gather and provide extensive data for HSE to evaluate, including addressing the endocrine disrupting status. This would likely

require a further 6-7 years of emergency authorisations, potentially totalling 17 years overall.

15. There is an alternative herbicide active substance, **amidosulfuron**, which has products authorised for the ground-based control of bracken. Whilst the applicant claims this is not a viable alternative (see below), HSE still believes it cannot be ruled out. No other alternatives have been suggested as viable, and no work on alternatives is known to be taking place.

Is there a 'danger'

16. **HSE considers that this test is met**. Bracken spreads quickly through underground rhizomes and unless controlled, can rapidly expand its range to dominate sensitive habitats and impact biodiversity and affect land that would otherwise be productive as grazing land for livestock. Bracken outcompetes other plants and monocultures impact habitat biodiversity.

17. The applicant also cites the following additional drivers for control as bracken:
    - restricts public access;
    - provides a habitat for sheep ticks which pose a risk to human health through the transmission of the bacteria responsible for Lyme Disease;
    - can have direct livestock/human health effects either from ingesting/inhaling spores or consumption of the plant itself;
    - has landscape impacts; and
    - affects the preservation of historic sites

18. However, while the benefits of controlling bracken are set out, the applicant has indicated that bracken covers over 1.5m ha in the UK, but proposes to treat only 7,500ha, meaning that the danger remains in 99.5% of the UK area affected. Even in periods prior to the emergency authorisations, the maximum area treated aerially was 15,000ha. Therefore, the extent of the reduction of the danger is unclear and may be low.

Test: are there reasonable alternatives?

19. **HSE considers this test is met**. Whilst there are several physical means of bracken control which can be effective, using only physical methods to tackle large bracken beds is not possible on all sites due to topography which restricts access by vehicles and there are risks to any labour conducting such operations. In addition, many of the physical methods may cause substantial non-target effects for example on other plant species or on ground nesting birds.

20. There is only one current potential alternative herbicide active substance, amidosulfuron, which has authorised products for ground-based use. The bracken control industry has carried out trials and concluded that it is not a suitable alternative, particularly when applied aerially as it has less canopy penetration. HSE does not accept that amidosulfuron can be removed from consideration as a reasonable alternative means, but it does seem that the applicant has shown that its effectiveness is highly variable, and a refinement of its use may resolve the issues. However, it seems unlikely that the applicant will invest further in it as an alternative.

21. Whilst separate concerns have been raised about the safety and acceptability of amidosulfuron it has passed the regulatory risk assessments and is approved with authorised products. HSE does not accept the BCG claim that amidosulfuron is significantly more toxic than asulam.

22. Where bracken stands are extensive, or where location precludes access, then initial aerial applications are required. Currently no alternative herbicides are permitted for use via aerial application. Half to two-thirds of all application of Asulox is via helicopter. Ground-based treatment is typically a follow-up to this in the following years.

23. Where it is possible to do so, cutting as a physical control can be followed up with a ground-based herbicide application. The active substance glyphosate is effective against bracken but is not authorised for use by aerial application and where used the effects on non-target flora are likely to be significant.

24. Currently Asulox provides the most effective control method for bracken.

Test: Is the use limited?

25. **HSE considers this test is met**. The applicant has estimated that the treated area in 2023 will be approximately 7500 ha, approximately 0.5% of the UK area affected by bracken. A similar area of 7608 ha was treated in 2022 and 8103 ha in 2021. Use will be limited geographically to predominantly those areas at the margins between upland and lowland moorland/heathland and other land. Limitation will also be temporal as the use will be between 1st July and 11th September with the optimum timing after full frond expansion, but before tip die-back in mid/late summer. The applicant has provided sufficient evidence to support the limited nature of the use.

Test: Is the use controlled?

26. **HSE considers this test is met**. All aerial applications must be conducted in line with an Application Plan and must be permitted in accordance with aerial spraying permitting arrangements. Monitoring is in place through an Application Records form which is circulated to all distributors to issue to purchasers of Asulox. End-users were asked to submit details of where Asulox was applied during the 2022 bracken control season. Reports were received from all areas sprayed by helicopter. There is more work to be done to obtain full details from ground-based applications – the return rate was about 60% (lower than in 2021).

27. Agri-environment scheme options continue to be important to facilitate bracken control both within and outside Sites of Special Scientific Interest. Conservation agencies have supported the inclusion of bracken control options within existing agri-environment schemes and provide advice on those under development. Use will also be controlled through the stewardship programme operated by the BCG. This includes a communication plan outlining the nature of the authorisation and its conditions of use. There are plans for an updated stewardship plan as part of a wider bracken control strategy. It appears from the application that ground-based use of Asulox was applied predominantly to areas with a statutory

conservation designation, except 158 ha (4% of total ground-based use). The applicant has provided sufficient evidence to demonstrate that use will be controlled.

Test**:** Does the emergency authorisation appear necessary to address the danger?

28. **HSE considers this test is not met.** This is explained below with a conclusion in paragraphs 39-43. As well as the tests assessed against above, HSE has outstanding concerns relating to the risks posed to human health, animal health and the environment.

Toxicological and Chemistry concerns

29. The EU has concluded that asulam is considered to meet the ED criteria for the thyroid (T) modality for humans, although a conclusion cannot be reached for non-target organisms. Any active substance shown by a GB assessment to be an ED would not be approved, and no standard product authorisations would be granted. The ongoing EU active substance approval application for asulam included requirements to show it was not an ED. The updated EFSA conclusion shows that UPL have failed to meet these requirements (set in 2018), resulting in no approval as yet.

30. UPL have proposed the GB approval of asulam followed by standard authorisation of Asulox as a long-term solution to GB emergency authorisations. [redacted]

31. [redacted]

Consumer and Ecotoxicology concerns

32. HSE set data requirements in 2020 onwards for the emergency use relating to residues and the consumer risk. This allowed time to generate the data but it has not been provided for the latest application.

33. An exclusion period of 1 month was set in previous emergency authorisations to restrict livestock from grazing on treated areas and to subsequently protect any consumers of products from that livestock. This was considered onerous and impractical in upland and moorland areas where there is no fencing and the applicant has requested that we remove the restriction in the latest application.

Livestock restrictions are not typically put in place for standard product authorisations where HSE has more confidence in the data supporting the risks to consumers.

34. The earliest date of aerial application requested in the latest application is 1 July. For the protection of birds, the risk assessment indicates a later date would be preferable, and previous emergency authorisations included an advisory phrase that where possible, application should be after 1 Aug, or as late in July as possible, where it is at all practical. Whilst this reduces the risk to birds, it does not remove it, particularly when spraying can again be expected in early July.

35. Asulam presents a high risk to aquatic organisms and a buffer zone of 90m was been set in previous emergency authorisations. Since last year's emergency authorisation was granted, some water companies have contacted HSE to raise concerns. Severn Trent Water submitted data showing asulam levels in water above the drinking water standard of 0.1 µg/l. While the levels are below the safety limits set by HSE, this is nonetheless an indicator of further potential risk. This may be in part due to the difficulty of those aerially spraying Asulox in identifying water bodies in upland and moorland areas covered by the bracken canopy. In such areas there are often small streams which feed the water catchment area and these may well be unseen, meaning no need for the 90m buffer zone would be identified.

36. Water companies have also made the point to HSE that for the sorts of reservoirs present in upland and moorland areas, they do not expect pesticide usage. Therefore, the associated treatment facilities do not have any capacity to remove such substances from the water. Given the uncertainties regarding impurities in the technical material, its secondary metabolites and the potential ED status, the risk here is difficult to quantify, but as it is to drinking water, it is sensible to presume it may be high.

Independent scientific advice

37. In 2022 the Expert Committee on Pesticides (ECP) expressed a view on the tenth application that emergency authorisation should not be granted (as it did on the ninth application in 2021). This view was based on ecotoxicological risks to birds and mammals, the number of emergency authorisations previously granted, the lack of an application from UPL for full regulatory approval of asulam under GB regulations and a lack of evidence of clear criteria in deciding where to spray.

38. HSE has not sought ECP advice on the 2023 application since no new scientific questions were identified for independent advice.

Conclusion on whether the Emergency Authorisation is 'Necessary' Because of the Danger Described

39. HSE considers that this long running repeat application has reached a stage where the latest application shows that:
    - the applicant has decided to stop research on an alternative,
    - new information on potential adverse effects has become available and,

- there is a likely prognosis of needing seven more years of emergency applications.

40. In HSE's view the ongoing nature of the repeat applications makes it harder to describe this as an emergency and demonstrating special circumstances becomes increasingly harder. Within this application the likely need for 7 more years of emergency authorisations, and the increasing issues raised against the standard risk assessment (which are mostly unaddressed) risk the integrity of the regulation and the high level of protection it places on human health, animal health and the environment.

41. HSEs view is that the list of potentially adverse effects now outweigh the potential benefits of controlling the danger posed by bracken. There are increasing uncertainties around the technical specification of the active substance, a lack of progress on ED testing and no progress on previously identified risk areas such as protecting livestock from treated areas and the risk to birds and mammals. In addition water companies are detecting low levels in reservoirs raising questions about the practicalities of the 90m aquatic buffer zones. Overall, these do not singularly represent critical issues, but taken together they present increasing risks with little prospect of early resolution.

42. HSE recognises that Asulox provides the most effective control method for bracken and understands the potential benefits of its use. But this is set against the very low area of use, leaving large areas of the landscape untreated and the dangers highlighted by the applicant persisting in these locations.

43. Taking all the information together, HSE considers that this year the increase in potential adverse effects outweigh the potential benefits of controlling the danger and therefore the test for necessity is not met.

Proposed decision

44. Administrations are asked to consider HSE's proposal to refuse emergency authorisation for this product and provide formal written confirmation if they are content for HSE to take this decision.

Annex A - The Emergency Registration Report

Asulox 202202174
Emergency Reg Rep

[redacted]