Appendix to:

EFSA (European Food Safety Authority), 2017. Conclusion on the peer review of the pesticide risk assessment of the active substance terbuthylazine. EFSA Journal 2019;17(9):5817, 58 pp. doi:10.2903/j.efsa.2019.5817

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**Appendix A – List of end points for the active substance and the representative formulation**

**Identity, Physical and Chemical Properties, Details of Uses, Further Information**

| Active substance (ISO Common Name) ‡ | Terbuthylazine (ISO 1750) |
|--------------------------------------|---------------------------|
| Function (e.g. fungicide)            | Herbicide                 |
| Rapporteur Member State              | United Kingdom (UK)       |

**Identity (Annex IIA, point 1)**

| Chemical name (IUPAC) ‡             | \(N^2\text{-}\text{tert}\)-butyl-6-chloro-N\(^d\)-ethyl-1,3,5-triazine-2,4-diamine |
|-------------------------------------|-------------------------------------------------------------------------------|
| Chemical name (CA) ‡               | 6-chloro-N-(1,1-dimethylethyl)-N\(^d\)-ethyl-1,3,5-triazine-2,4-diamine         |
| CIPAC No ‡                         | 234                                                                          |
| CAS No ‡                           | 5915-41-3                                                                    |
| EC No (EINECS or ELINCS) ‡         | 227-637-9                                                                    |
| FAO Specification (including year of publication) ‡ | Yes (1993) terbuthylazine content not less than 930 g/kg. (234/TC/S (1991)) |
| Minimum purity of the active substance as manufactured ‡ | Syngenta 960 g/kg Oxon 980 g/kg |

Identity of relevant impurities (of toxicological, ecotoxicological and/or environmental concern) in the active substance as manufactured

| Identity of relevant impurities (of toxicological, ecotoxicological and/or environmental concern) in the active substance as manufactured |  |
|-------------------------------------------------------------------------------|---|
| Propazine (SYN)                                                              | 10 g/kg       |
| Atrazine (Oxon)                                                              | 1 g/kg        |
| Simazine (SYN)                                                               | 30 g/kg       |
| Simazine (Oxon)                                                              | 5 g/kg        |

Molecular formula ‡

| Molecular formula ‡ | \(C_9H_{16}ClN_5\) |
|---------------------|-------------------|
| Molecular mass ‡    | 229.7 g/mol       |
Structural formula ‡
### Physical and chemical properties (Annex IIA, point 2)

| Property                                           | Syngenta                                                                 | Oxon                                                                 |
|----------------------------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------------------|
| Melting point (state purity) ‡                    | 175.5°C (99.4%)                                                           | 175.7°C (99.6%)                                                       |
| Boiling point (state purity) ‡                    | decomposition observed at 224°C (99.4%)                                   | decomposition after melting (99.6%)                                   |
| Temperature of decomposition (state purity)        | 224°C (99.4%)                                                            | 230°C (99.6%)                                                        |
| Appearance (state purity) ‡                       | White crystalline powder (99.4%)                                          | White powder (99.6%)                                                 |
| Vapour pressure (state temperature, state purity) ‡ | 9.0 x 10^-5 Pa at 25 °C (99.4%)                                           | 1.52 X 10^-4 Pa at 22 °C (>99%.)                                     |
| Henry’s law constant ‡                            | 2.3 X 10^-3 Pa m^3 mol^-1                                                | 4.18 X 10^-3 Pa m^3 mol^-1                                           |
| Solubility in water (state temperature, state purity and pH) ‡ | 9.0 mg/L at 25 °C (pH 7.4) (99.4%)                                       | 6.6 mg/L at 20 °C (pH 4-10) (>99%)                                   |
| Solubility in organic solvents ‡ (state temperature, state purity) | Syngenta: 0.41 hexane, 9.8 toluene, 51 dichloromethane, 18 methanol, 12 octanol, 41 acetone, 35 ethyl acetate | Oxon: 0.275 hexane, 7.17 toluene, 62.7 dichloromethane, 14.9 methanol, 32.8 acetone, 30.5 ethyl acetate |
| Surface tension ‡ (state concentration and temperature, state purity) | Syngenta: 71.8 mN/m at 20 °C (90 % saturated solution)(96.5%)               | Oxon: 70.9 mN/m at 20 °C (90 % saturated solution)(96.8%)            |
| Partition co-efficient ‡ (state temperature, pH and purity) | Syngenta: log P_{O/W} = 3.4 at 25 °C (not pH dependant (99.4%)             | Oxon: log P_{O/W} = 3.41 at 20 °C (not pH dependant (99.5%)         |
| Dissociation constant (state purity) ‡            | pKa1 = 1.95 (99.4%)                                                       | pKa1 = 1.84 (99.5%)                                                  |
UV/VIS absorption (max.) incl. \( \varepsilon \) ‡
(state purity, pH)

| Solution | \( \lambda \) (nm) | \( \varepsilon \) (l/mol cm) |
|----------|---------------------|-----------------------------|
|         | neutral             | 222                         | 38538          |
|         |                     | 263                         | 3444           |
|         | acidic              | 223                         | 30103          |
|         |                     | 263                         | 4468           |
|         | basic               | 223                         | 37426          |
|         |                     | 263                         | 3395           |

No absorption maximum observed between 290 and 750 nm in neutral and basic solution and between 310 nm and 750 nm in acidic solution.

Flammability ‡ (state purity)

| Solution | \( \varepsilon \) (state purity) |
|----------|----------------------------------|
|         | Syngenta: Not highly flammable (96.8%) |
|         | Oxon: Not highly flammable (96.5%) |
|         | Not classified.                   |

Explosive properties ‡ (state purity)

| Solution | \( \varepsilon \) (state purity) |
|----------|----------------------------------|
|         | Syngenta: Not explosive (96.8%) |
|         | Oxon: Not explosive (96.5%)    |

Oxidising properties ‡ (state purity)

| Solution | \( \varepsilon \) (state purity) |
|----------|----------------------------------|
|         | Syngenta: Not oxidising (96.8%) |
|         | Oxon: Not oxidising (96.5%)    |
**Summary of representative uses evaluated**

### a) Syngenta - Tradename: [GARDO® GOLD®]

#### Active Ingredients: [Terbuthylazine and S-metolachlor]

| Crop and/or situation | Member State or Country | Product name          | F G or I (b) | Pests or Group of pests controlled (c) | Formulation | Conc. of active ingredients (d-f) | Method kind (f-h) | growth stage & season (j) | Application | number interval between applications (min) | Application rate per treatment | PHI (days) | Remarks: |
|-----------------------|-------------------------|-----------------------|--------------|----------------------------------------|-------------|----------------------------------|------------------|--------------------------|-------------|------------------------------------------|-------------------------------|-----------|---------|
| Maize                 | S.EU.                   | GARDO® GOLD®          | F            | Dicot and monocot weeds                | SE          | 187.5 g/L Terbuthylazine e, 312.5 g/L S-metolachlor | Tractor-mounted sprayer | pre-emergence - 8 leaf | 1 | Not applicable | 0.168-0.422 Terbuthylazine 0.28-0.71 S-metolachlor | 200 500 | Max. 0.844 Terbuthylazine 1.415 S-metolachlor | Not applicable | [1] [2] [3] [4] [5] |
| Maize                 | N.EU.                   | GARDO® GOLD®          | F            | Dicot and monocot weeds                | SE          | 187.5 g/L Terbuthylazine e, 312.5 g/L S-metolachlor | Tractor-mounted sprayer | pre-emergence - 8 leaf | 1 | Not applicable | 0.15-0.375 Terbuthylazine 0.25-0.614 S-metolachlor | 200 500 | Max. 0.75 Terbuthylazine 1.228 S-metolachlor | Not applicable | [1] [2] [3] [4] [5] |
### b) Oxon - Tradename: [Terbuthylazine 500 g/L SC]  

| Crop and/or situation | Member State or Country | Product name | FG or I | Pests or Group of pests controlled | Preparation | Application | Application rate per treatment | PHI (days) | Remarks |
|-----------------------|-------------------------|--------------|---------|-----------------------------------|-------------|------------|--------------------------------|------------|---------|
| Corn                  | France (N)              | Terbuthylazine 500 g/L SC | F       | Annual and biennial and biennial broad leaved weeds | SC 500 g/l Spray | Pre-emergence Early post emergence (12-16) | 1-0.15-0.5 | 200-500 | 0.75-0.844 | n.r. [1] [3] [4] [5] |
| Sorghum               | Italy (S)              | Terbuthylazine 500 g/L SC | F       | Annual and perennial broad leaved weeds | SC 500 g/l Spray | Pre-emergence Early post emergence (14) | 1-0.2-0.5 | 200-500 | 0.844 | n.r. [1] [3] [4] [5] |

1. A critical area of concern is identified because a high long-term risk and a high risk from secondary poisoning were indicated for mammals in section 5 of EFSA (2011).
2. A high long-term risk to earthworms was indicated in the risk assessment for the representative uses of the formulation ‘Gardo® Gold®’ according to EFSA (2011).
3. Critical areas of concern were identified for groundwater contamination of metabolites (MT1, MT13, MT14 LM2, LM4 and LM5) for which the groundwater relevance was indicated due to intakes of toddlers and infants being calculated to be above the ADI and because a herbicidally relevant metabolite (MT1) occurs in groundwater, all over a wide range of geoclimatic conditions.
4. For the metabolites LM3, and LM6 the groundwater relevance assessment could not be finalised.
5. A high long-term risk to birds was indicated according to EFSA (2011).

(a) For crops, the EU and Codex classifications (both) should be taken into account; where relevant, the use situation should be described (e.g. fumigation of a structure)
(b) Outdoor or field use (F), greenhouse application (G) or indoor application (I)
(c) e.g. biting and sucking insects, soil born insects, foliar fungi, weeds
(d) e.g. wettable powder (WP), emulsifiable concentrate (EC), granule (GR)
(e) GCPF Codes - GIFAP Technical Monograph No 2, 1989
(f) All abbreviations used must be explained
(g) Method, e.g. high volume spraying, low volume spraying, spreading, dusting, dribble
(h) Kind, e.g. overall, broadcast, aerial spraying, row, individual plant, between the plant- type of equipment used must be indicated
(i) g/kg or g/L.
(j) Growth stage at last treatment (BBCH Monograph, Growth Stages of Plants, 1997, Blackwell. ISBN 3-8263-3152-4), including where relevant, information on season at time of application
(k) Include the minimum and maximum number of application possible under practical conditions of use
(l) The values should be given in g or kg whatever gives the more manageable number (e.g. 200 kg/ha instead of 0.02 kg/ha)
(m) PHI - minimum pre-harvest interval
(n,r) = not relevant, the pre-harvest interval is covered by the growing period remaining between the envisaged application and harvest

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Terbuthylazine is a herbicide used for the control of weeds in agricultural crops. It is effective against a wide range of weed species and can be used in various ways, such as broadcast application, aerial spraying, and row spraying. The active ingredient is a systemic herbicide that is taken up by the plant and moves through the sap, killing the target plants. It is important to use the product according to the label instructions to ensure effective weed control and to minimize environmental impact.
Methods of Analysis

Analytical methods for the active substance (Annex IIA, point 4.1)

| Type of Sample | Analytical Method |
|----------------|-------------------|
| Technical as (analytical technique) | Syngenta: Method AW52/3. GC-FID and internal calibration with prometryn. Oxon: HPLC-UV at 220nm and external calibration. |
| Impurities in technical as (analytical technique) | Syngenta: Relevant impurities: GC-FID and internal calibration with prometryn. Oxon: GC-FID and internal calibration with 0.02% solution dibutylphthalate in acetone. |
| Plant protection product (analytical technique) | Syngenta: Method AF-1301/3. Reverse phase HPLC-UV at 210nm and external calibration. Oxon: Method MAN/024/01. Reverse phase HPLC-UV at 254nm and external calibration. |

Analytical methods for residues (Annex IIA, point 4.2)

Residue definitions for monitoring purposes

| Type of Sample | Residue Definition |
|----------------|--------------------|
| Food of plant origin | Terbuthylazine (MT0) |
| Food of animal origin | Not necessary for the representative uses. |
| Soil | Terbuthylazine (MT0) plus desethyl-terbuthylazine (MT1) plus hydroxyl-terbuthylazine (MT13) |
| Water surface | Terbuthylazine (MT0) plus desethyl-terbuthylazine (MT1) plus hydroxyl-terbuthylazine (MT13) |
| Drinking/ground | Terbuthylazine (MT0), desethyl-terbuthylazine (MT1), hydroxy-terbuthylazine (MT13), desethyl-hydroxy-terbuthylazine (MT14). Open regarding LM2, LM3, LM4, LM5 and LM6 |
| Air | Terbuthylazine |

Monitoring/Enforcement methods

| Type of Sample | Analytical Method |
|----------------|-------------------|
| Food/feed of plant origin (analytical technique and LOQ for methods for monitoring purposes) | Syngenta: DFG S19. GC-NPD with LOQ of 0.02 mg/kg in grain (acceptable ILV). Terbuthylazine only. Oxon: Published method. GC-NPD with LOQ of 0.02 mg/kg in grain. Terbuthylazine only. |
| Food/feed of animal origin (analytical technique and LOQ for methods for monitoring purposes) | Not required |
### Soil (analytical technique and LOQ)

Syngenta: REM 148.05 GC-MS confirmation with target m/z of 214 and 3 qualifier ions (m/z 216, 229 and 173). LOQ was 0.02 mg/kg.

REM 148.11. HPLC-MS/MS parent ion m/z = 230 and daughter ion m/z was 174. MT1 m/z was 202 and daughter m/z 146. MT13 m/z was 212 and daughter m/z was 156. MT14 m/z was 184 and daughter m/z was 128. LOQ was 0.01 mg/kg for each.

Oxon: HPLC-MS/MS parent ion m/z = 230 and daughter ion m/z was 174. MT1 m/z was 202 and daughter m/z 146. MT13 m/z was 212 and daughter m/z was 156. LOQ was 0.01 mg/kg for each.

### Water (analytical technique and LOQ)

Syngenta: RAM 426/01 (validated in river, ground and drinking water). Reverse phase HPLC-MS/MS. Parent ion m/z = 230 and daughter ion m/z was 174. MT1 m/z was 202 and daughter m/z 146. MT13 m/z was 212 and daughter m/z was 156. MT14 m/z was 184 and daughter m/z was 128. LOQ was 0.1 μg/l for each.

Oxon: Reverse phase HPLC-MS/MS (validated in surface and drinking water). Parent ion m/z = 230 and daughter ion m/z was 174. MT1 m/z was 202 and daughter m/z 146. MT13 m/z was 212 and daughter m/z was 156. LOQ was 0.05 μg/l for each.

### Air (analytical technique and LOQ)

Syngenta: GC-NPD with confirmation by GC-MS with target m/z 214 and qualifier ions m/z 216, 229 and 173. LOQ was 1 μg/m³.

Oxon: GC-NPD with LOQ of 1 μg/m³.

### Body fluids and tissues (analytical technique and LOQ)

Syngenta: No data submitted or required.

Oxon: No data submitted or required.

### Classification and proposed labelling with regard to physical and chemical data (Annex IIA, point 10)

RMS/peer review proposal

Active substance

None
### Impact on Human and Animal Health

**Absorption, distribution, excretion and metabolism (toxicokinetics) (Annex IIA, point 5.1)**

| Toxicologically relevant compounds ‡ (animals and plants) | Terbuthylazine, desethyl-metabolite (MT1), MT13 and MT14 |
| Toxicologically relevant compounds ‡ (environment) | Terbuthylazine, desethyl-metabolite (MT1), MT13, MT14, LM1, LM2, LM4 and LM5 at Step 5 (refined risk assessment for consumers) | Data gap regarding LM3, and LM6 |

### Other toxicological studies (Annex IIA, point 5.8)

**Mechanism studies ‡**

| None submitted |

**Studies performed on metabolites or impurities ‡**

| MT14 | Acute oral LD₅₀ (rats): > 2000 mg/kg bw.  
90-day dietary rats: NOAEL and LOAEL of 10.3 and 45.7 mg/kg bw/day, based on increased mortality and water consumption, changes in haematology, clinical chemistry and urinalysis parameters and increased kidney weight, renal (histo)pathology secondary to chronic renal failure.  
Mutagenicity in bacterial cells: negative.  
Clastogenicity in CHO (Chinese Hamster Ovary) cells: negative.  
Mouse Lymphoma assay: negative |
| MT13 | Acute oral LD₅₀ (rats): > 2000 mg/kg bw.  
90-day dietary rats: NOAEL and LOAEL of 3.4 and 10.3 mg/kg bw/day based on changes in haematology and clinical chemistry parameters.  
Mutagenicity in bacterial cells: negative  
Mouse lymphoma assay in L5178Y cells: negative  
Clastogenicity in cultured human lymphocytes: negative |
| MT20 | Acute oral LD₅₀ (rats): > 5500 mg/kg bw  
90-day dietary rats:  
M: NOAEL and LOAEL of 16.7 and 34.1 mg/kg bw/day, based on decreased bodyweight, changes in clinical chemistry and urinalysis parameters and organ weight effects  
F: NOAEL and LOAEL of 0.7 and 7.6 mg/kg bw/day, based on altered oestrous cycle length and prolonged oestrus and/or dioestrus  
Mutagenicity in bacterial cells: negative  
Mouse micronucleus assay: negative |
**MT1**  
Acute oral LD$_{50}$ (rats): 236 mg/kg bw  
Acute oral LD$_{50}$ (rats): 300-500 mg/kg bw  
Mutagenicity in bacterial cells: negative  
Second Mutagenicity in bacterial cells: negative  
*In Vitro* Cytogenetic Assay in Human Lymphocytes: negative  
Gene Mutation Assay: weakly positive  
Mouse micronucleus assay: negative  
*in vivo* unscheduled DNA synthesis: negative  
90-day rat study Reduced bodyweight gain Total WBC (white blood cells) reduced no NOAEL

**LM1**  
Mutagenicity in bacterial cells: negative  
Mammalian cell Gene Mutation Assay: negative  
*In Vitro* Chromosome Aberration: negative

**LM2**  
Mutagenicity in bacterial cells: negative  
Mammalian cell Gene Mutation Assay: negative  
*In vitro* Chromosome Aberration: negative

**LM3**  
Mutagenicity in bacterial cells: negative  
Mammalian cell Gene Mutation Assay: negative  
*In vitro* Chromosome Aberration: negative  
TTC class III: 1.5 µg/kg bw per day (for all sources of LM3 and LM6) (EFSA PPR Panel, 2019)

**LM4**  
Mutagenicity in bacterial cells: negative  
Mammalian cell Gene Mutation Assay: negative  
*In vitro* Chromosome Aberration: negative

**LM5**  
Mutagenicity in bacterial cells: negative  
Mammalian cell Gene Mutation Assay: negative  
*In vitro* Chromosome Aberration: negative

**LM6**  
Mutagenicity in bacterial cells: negative  
Gene Mutation Assay: weakly positive  
*In Vitro* Chromosome Aberration: negative  
Mouse micronucleus assay: negative  
TTC class III: 1.5 µg/kg bw per day (for all sources of LM3 and LM6) (EFSA PPR Panel, 2019)
Peer review of the pesticide risk assessment of the active substance terbuthylazine

Summary (Annex IIA, point 5.10)

| Substance | Value (mg/kg bw (per day)) | Study | Uncertainty factor |
|-----------|----------------------------|-------|-------------------|
| ADI ‡     | 0.004                      | dog, 1-year & rat, 2-year | 100 |
| AOEL ‡    | 0.0032                     | dog, 1-year | Overall 126* (100 + 79 %*) |
| ARfD ‡    | 0.008                      | rabbit developmental study | 100 |

*correction for oral absorption (79 %)

Metabolites MT1, MT13, MT14

| Substance | Value (mg/kg bw (per day)) | Study | Uncertainty factor |
|-----------|----------------------------|-------|-------------------|
| ADI ‡     | 0.004                      | dog, 1-year & rat, 2-year | 100 |
| ARfD ‡    | 0.008                      | rabbit developmental study | 100 |

Metabolites LM2, LM4, LM5

| Substance | Value (mg/kg bw (per day)) | Study | Uncertainty factor |
|-----------|----------------------------|-------|-------------------|
| ADI ‡     | 0.004                      | Read across considerations | 100 |
| ARfD ‡    | 0.008                      | Read across considerations | 100 |

Classification and proposed labelling with regard to toxicological data (Annex IIA, point 10)

Substance : Terbuthylazine

Harmonised classification according to Regulation (EC) No 1272/2008 and its Adaptations to Technical Process [Table 3.1 of Annex VI of Regulation (EC) No 1272/2008 as amended]¹:

- **Acute Tox.4 - H302** “Harmful if swallowed”
- **STOT-RE-2 – H373** May cause damage to organs through prolonged or repeated exposure.

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1 Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006. OJ L 353, 31.12.2008, 1-1355.

2 Commission Regulation (EU) 2017/776 of 4 May 2017 amending, for the purposes of its adaptation to technical and scientific progress, Regulation (EC) No 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances and mixtures. OJ L 116, 5.5.2017, 1-19.
### Consumer risk assessment (Annex IIA, point 6.9, Annex IIIA, point 8.8)

| Parameter | Description | Value |
|-----------|-------------|-------|
| ADI       |             | 0.004 mg/kg bw/day |
| TMDI (%)  | ADI according to WHO European diet | Highest TMDI: 21.6 % ADI (WHO cluster B) considering as a worst case, the STMRs of 0.06 mg/kg (total residues) in maize, sorghum and in rotational oilseed crops, root crops, and cereals (rice, wheat/ rye, oat/ barley) |
| IEDI (%)  | ADI according to EFSA PRIMo rev2 model | Population groups (EFSA PRIMo) with profile similar to consumer group defaults for drinking water assessment (WHO, 2011) Adult: 12.6 % ADI (IE); Toddler: 9.1 % ADI (FR 1-1.5 yrs, 10.6 kg) Infant: 9.0% ADI (UK; 0.5-1 yr, 8.7 kg) Highest estimated potential total intake via food and drinking water: Adult (60 kg): 55 % ADI; Toddler (10 kg): 136 % ADI Infant (5 kg): 200% ADI |
| NEDI (%)  | ADI according to national diets (to be specified) | Factors included in IEDI and NEDI |
| ARfD      |             | 0.008 mg/kg bw |
| IESTI (%) | ARfD according to EFSA PRIMo rev2 model | Highest IESTI: 63% ARfD (Carrot as rotational crop, HR 0.08 mg/kg) |
| NESTI (%) | ARfD according to national (to be specified) | Factors included in IESTI and NESTI |

**Additional contribution to the consumer intakes through drinking water resulting from groundwater metabolite(s)**
### Concentration in groundwater [µg parent equivalents/L]

| FOCUS scenario | MT13 | MT1 | MT14 | LM2 | LM4 | LM5 | Sum | Adult | Toddler | Infant | Adult | Toddler | Infant |
|----------------|------|-----|------|-----|-----|-----|-----|-------|---------|---------|-------|---------|--------|
| Châteaudun     | 16.3 | 0.07| 2.72 | 2.77| 5.54| 3.18| 30.6| 0.0010| 0.0031  | 0.0046  | 25.5  | 76.5    | 114.7  |
| Hamburg        | 19.9 | 0.32| 4.31 | 4.95| 9.90| 5.01| 44.4| 0.0015| 0.0044  | 0.0067  | 37.0  | **111.0**| 166.5  |
| Kremsmünster   | 13.9 | 0.21| 2.87 | 2.44| 5.11| 2.96| 27.5| 0.0009| 0.0028  | 0.0041  | 22.9  | 68.8    | 103.1  |
| Okehampton     | 14.5 | 0.36| 3.62 | 2.44| 5.17| 2.96| 29.0| 0.0010| 0.0029  | 0.0044  | 24.2  | 72.5    | 108.8  |
| Piacenza       | 16.7 | 0.19| 2.82 | 1.57| 3.94| 2.84| 28.1| 0.0009| 0.0028  | 0.0042  | 23.4  | 70.3    | 105.4  |
| Porto          | 8.30 | 0.05| 1.57 | 1.33| 2.53| 1.78| 15.6| 0.0005| 0.0016  | 0.0023  | 13.0  | 38.9    | 58.3   |
| Sevilla        | 4.56 | 0.00| 0.24 | 0.69| 1.02| 0.91| 7.41| 0.0002| 0.0007  | 0.0011  | 6.2   | 18.5    | 27.8   |
| Thiva          | 22.8 | 0.01| 2.08 | 2.30| 4.55| 2.98| 34.8| 0.0012| 0.0035  | 0.0052  | 29.0  | 86.9    | **130.3**|

### Consumer intakes through drinking water [mg/kg bw per day]

**ADI (drinking water only)**

| FOCUS scenario | MT13 | MT1 | MT14 | LM2 | LM4 | LM5 | Sum | Adult | Toddler | Infant | Adult | Toddler | Infant |
|----------------|------|-----|------|-----|-----|-----|-----|-------|---------|---------|-------|---------|--------|
| Châteaudun     | 18.7 | 0.09| 3.15 | 3.16| 6.36| 3.64| 35.1| 0.0012| 0.0035  | 0.0053  | 29.2  | 87.7    | **131.6**|
| Hamburg        | 22.7 | 0.38| 4.98 | 5.59| 11.43| 5.76| 50.9| 0.0017| 0.0051  | 0.0076  | 42.4  | **127.2**| 190.7  |
| Kremsmünster   | 16.0 | 0.26| 3.32 | 2.76| 5.85| 3.38| 31.5| 0.0011| 0.0032  | 0.0047  | 26.3  | 78.9    | **118.3**|
| Okehampton     | 16.5 | 0.46| 4.18 | 2.76| 5.91| 3.37| 33.2| 0.0011| 0.0033  | 0.0050  | 27.7  | 83.0    | **124.5**|
| Piacenza       | 19.2 | 0.23| 3.26 | 2.30| 4.55| 3.25| 32.8| 0.0011| 0.0033  | 0.0049  | 27.4  | 82.1    | **123.1**|
| Porto          | 9.45 | 0.07| 1.81 | 1.50| 2.90| 2.06| 17.8| 0.0006| 0.0018  | 0.0027  | 14.8  | 44.4    | 66.7   |
| Sevilla        | 5.31 | 0.00| 0.28 | 0.78| 1.17| 1.05| 8.59| 0.0003| 0.0009  | 0.0013  | 7.2   | 21.5    | 32.2   |
| Thiva          | 26.2 | 0.01| 2.42 | 2.62| 5.23| 3.44| 39.9| 0.0013| 0.0040  | 0.0060  | 33.3  | 99.8    | **149.7**|

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3 Default assumptions from WHO Guidelines for drinking water quality (WHO, 2011) for (a) a 60 kg adult drinking 2 litres of water per day, (b) a 10 kg child drinking 1 litre of water per day and (c) a 5 kg bottle-fed infant drinking 0.75 litre of water per day have been used for the calculation.
### Route of degradation (aerobic) in soil (Annex IIA, point 7.1.1.1.1) – SYN and OXON

| Parameter                                                   | Description                                                                 |
|-------------------------------------------------------------|-----------------------------------------------------------------------------|
| Mineralisation after 100 days ‡                            | 0.4 – 10.35 % after 112 - 120 d at 20 °C, [14C-triazine ring]-label (n²= 17) |
|                                                            | 0.29 % after 118 d at 10 °C, [14C-triazine ring]-label (n= 1; SYN only)      |
| Non-extractable residues after 100 days ‡                  | 17.3 – 30.8 % after 112 - 120 d at 20 °C, [14C-triazine ring]-label (n= 17) |
|                                                            | 9.31 % after 118 d at 10 °C, , [14C-triazine ring]-label (n= 1; SYN only)    |
| Metabolites requiring further consideration ‡              | Max values from studies:                                                    |
| - name and/or code, % of applied (range and maximum)       | desethyl-terbuthylazine (MT1) – 3.0 – 25.1 % at 56 - 210 d at 20 °C (n= 17) |
|                                                            | 14.6 % at 118 d at 10 °C (n=1; SYN only)                                   |
|                                                            | hydroxy-terbuthylazine (MT13) – 4.2 – 34.5 % at 90 - 311 d at 20 °C (n= 17) |
|                                                            | 1.4 % at 98 d at 10 °C (n= 1; SYN only)                                   |
|                                                            | [14C-triazine ring]-label                                                   |

### Route of degradation in soil - Supplemental studies (Annex IIA, point 7.1.1.1.2) – SYN and OXON

**Anaerobic degradation ‡**

| Parameter                                                   | Description                                                                 |
|-------------------------------------------------------------|-----------------------------------------------------------------------------|
| Mineralisation after 100 days                               | ≤ 0.1 % after 100 - 118 d, [14C-triazine ring]-label (n= 2)                  |
| Non-extractable residues after 100 days                    | 30.1 – 39.43 % after 100 - 118 d, [14C-triazine ring]-label (n= 2)           |
| Metabolites that may require further consideration for risk assessment - name and/or code, % of applied (range and maximum) | Max values from studies:                                                    |
|                                                            | desethyl-terbuthylazine (MT1) – 0.3 – 4.5 % at 30 - 56 d (n= 2)             |
|                                                            | hydroxy-terbuthylazine (MT13) – 1.0 – 8.16 % at 91 - 100 d (n= 2)           |
|                                                            | [14C-triazine ring]-label                                                   |

**Soil photolysis ‡**

| Metabolites that may require further consideration for risk assessment - name and/or code, % of applied (range and maximum) | DT50 in light exposed samples = 52 d; DT50 in dark control = 117 d (DT50 via photolysis only = 93.6 d; SYN) |
|---------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|
| DT50 in light exposed samples = 28.2 d; DT50 in dark control = 126.6 d (DT50 via photolysis only = 36.3 d; OXON)         | Max values from studies (irradiated value                                                              |

³ n corresponds to the number of soils.
minus non-irradiated value):

| Compound                  | Effect | Conditions                                                                 |
|---------------------------|--------|-----------------------------------------------------------------------------|
| Desethyl-terbuthylazine (MT1) | 3.6%   | at 31 d exposure 12 hours irradiated at 550 W.m²/12 hours dark (n= 1; SYN) |
|                          | 12.59% | at 15 d – exposure 700 W.m² continuous (n= 1; OXON).                       |
| Hydroxy-terbuthylazine (MT13) | 5.49%  | at 15 d – exposure 700 W.m² continuous (n= 1; OXON)                         |
### Rate of degradation in soil (Annex IIA, point 7.1.1.2, Annex IIIA, point 9.1.1) – SYN and OXON

#### Laboratory studies 

| Terbutylazine                          | Aerobic conditions | % OM (KCl or CaCl₂) | pH | temp. °C / soil moisture for study (% w/w) | Soil moisture at pH 2 (% w/w) | DT₅₀, actual (d) | DT₅₀, ref 20 °C pF2 (d) | Min chi² error (%) | Method of calc. |
|----------------------------------------|--------------------|---------------------|----|------------------------------------------|------------------------------|-----------------|------------------------|-------------------|-----------------|
| Gartenacker Sandy Loam                 |                    | 3.79                | 7.25 | 20 °C / 26.73 %                          | 48.92                        | 78.7            | 51.6                   | 1.7               | SFO             |
| Pappelacker Loamy Sand                 |                    | 1.9                 | 7.6  | 20 °C / 15.8 %                           | 29.3                         | 93.1            | 60.4                   | 2.9               | SFO             |
| Weide Sandy Loam                      |                    | 2.24                | 7.5  | 20 °C / 18.96 %                          | 36.6                         | 65.0            | 41.0                   | 2.5               | SFO             |
| Speyer 2.2 Loamy Sand                 |                    | 3.91                | 6.1  | 20 °C / 19.2 %                           | 12.1                         | 167             | 167                    | 2.1               | SFO             |
| Borstel Loamy Sand                    |                    | 2.59                | 5.8  | 20 °C / 10.88 %                          | 14b                          | 143             | 120                    | 1.0               | SFO             |
| Lorsch Sandy Clay Loam                |                    | 3.1                 | 5.3  | 20 °C / 19.92 %                          | 22b                          | 110             | 103                    | 1.4               | SFO             |
| Gartenacker Silt Loam 1.57 kg/ha      |                    | 3.59                | 7.32 | 20 °C / 29.17 %                          | 48.61                        | 77.0            | 53.9                   | 4.4               | SFO             |
| Gartenacker Silt Loam 0.15 kg/ha      |                    | 3.59                | 7.32 | 20 °C / 29.17 %                          | 48.61                        | 59.7            | 41.8                   | 4.9               | SFO             |
| Collombey Sand                        |                    | 2.29                | 7.7  | 20 °C / 16.8 %                           | 25.31                        | 80.0            | 60.0                   | 5.9               | SFO             |
| Les Evouettes Silt Loam               |                    | 2.41                | 6.1  | 20 °C / 22.12 %                          | 40.21                        | 58.4            | 38.2                   | 7.7               | SFO             |
| Speyer 2.2 Loamy Sand                 |                    | 4.4                 | 6.0  | 20 °C / 16.16 %                          | 21.21                        | 122             | 101                    | 2.2               | SFO             |
| Speyer 2.3 Sandy Loam                 |                    | 1.28                | 6.6  | 20 °C / 12.56 %                          | 18.61                        | 112             | 85.2                   | 2.4               | SFO             |
| Les Evouettes Loam                    |                    | 6.4                 | 6.8  | 20 °C / 35.85 %                          | 47.8                         | 69.7            | 57.0                   | 4.3               | SFO             |
| Speyer 2.2 Loamy Sand                 |                    | 3.95                | 6.18 | 20 °C / 17.72 %                          | 14b                          | 136             | 138                    | 5.6               | SFO             |
| Sisseln Sandy Loam                    |                    | 2.71                | 7.16 | 20 °C / 20.96 %                          | 19b                          | 83.7            | 83.7                   | 4.1               | SFO             |
| Collombey Loamy Sand                  |                    | 2.02                | 7.45 | 20 °C / 16.12 %                          | 14b                          | 73.6            | 73.6                   | 4.2               | SFO             |
| Diegten Clay Loam                     |                    | 2.74                | 6.9  | 20 °C / 20.76 %                          | 28b                          | 117             | 94.9                   | 1.9               | SFO             |
| **Geometric mean**                    |                    |                     |      | **91.1**                                 | **72.0**                     |                 |                        |                   |                 |
| **Median**                            |                    |                     |      | **88.4**                                 | **75.1**                     |                 |                        |                   |                 |

- (a) Geometric mean for replicate soil values calculated first (excluding the two Les Evouettes soils that were considered to be substantially different from each other due to contrasting organic matter contents e.g. 2.41 and 6.4% organic matter)
- (b) FOCUS default moisture content based on soil texture
  
  Note that the t-test result was >99% for every soil
| Soil name and classification | % OM  | pH (KCl or CaCl₂) | temp. °C / soil moisture for study (% w/w) | Soil moisture at pF 2 (% w/w) | DT₅₀, actual (d) | DT₅₀, ref 20 °C pF2 (d) | Min chi² error (%) | Method of calc. |
|-----------------------------|-------|------------------|------------------------------------------|-----------------------------|-----------------|--------------------------|-------------------|----------------|
| Borstel – Loamy Sand         | 2.63  | 5.79             | 20 °C / 10.9 %                           | 14⁺                       | 83.9           | 70.3                     | 1.9               | SFO            |
| Gartenacker* - Loam          | 3.20  | 7.28             | 20 °C / 26.7 %                           | 25⁺                       | 61.8           | 61.8                     | 3.1               | SFO            |
| Lorsch – Sandy Clay Loam     | 3.16  | 5.25             | 20 °C / 19.9 %                           | 22⁺                       | 40.7           | 38.0                     | 3.3               | SFO            |
| Speyer 2.3 – Sandy Loam      | 2.1   | 6.4              | 20 °C / 15.6 %                           | 19⁺                       | 61.8           | 53.8                     | 6.7               | SFO            |
| Speyer 2.1 – Sand            | 1.07  | 5.9              | 20 °C / 12.4 %                           | 12⁺                       | 45.2           | 45.2                     | 4.9               | SFO            |
| Speyer 2.2 – Loamy Sand      | 4.00  | 5.6              | 20 °C / 19.2 %                           | 14⁺                       | 50.7           | 50.7                     | 4.1               | SFO            |
| Westmaas – Silt Loam         | 2.41  | 7.4              | 20 °C / 15.6 %                           | 26⁺                       | 93.8           | 65.6                     | 6.0               | SFO            |

**Geometric mean**

|               |       |      |     |      |      |       |
|---------------|-------|------|-----|------|------|-------|
|               | **60.0** | **54.0** |     |      |      |       |

**Median**

|               |       |      |     |      |      |       |
|---------------|-------|------|-----|------|------|-------|
|               | **61.8** | **53.8** |     |      |      |       |

* NB. Significant volatiles observed for Gartenacker soil
⁺ FOCUS default moisture content based on soil texture
⁻ t-test result was >99% for every soil
### Desethyl-terbuthylazine (MT1)

Aerobic conditions (where metabolite formed from parent terbuthylazine during the study)

| Soil name and classification | % OM | pH (KCl or CaCl₂) | temp. °C / soil moisture for study (% w/w) | Soil moisture at pF 2 (% w/w) | DT₅₀, actual (d) | Form. frac. (ffm) | DT₅₀, ref 20 °C pF2 (d) | Min chi² error (%) | Method of calc. |
|------------------------------|------|------------------|------------------------------------------|-------------------------------|----------------|-------------------|---------------------|-----------------------|------------------|
| Gartenacker Sandy Loam      | 3.79 | 7.25             | 20 °C / 26.73 %                          | 48.92                        | 66.0          | 0.606             | 43.2                | 5.8                   | SFO              |
| Pappelacker Loamy Sand       | 1.9  | 7.6              | 20 °C / 15.8 %                           | 29.3                         | 105.7         | 0.591             | 68.6                | 6.2                   | SFO              |
| Weide Sandy Loam             | 2.24 | 7.5              | 20 °C / 18.96 %                          | 36.6                         | 87.4          | 0.536             | 55.2                | 4.6                   | SFO              |
| Gartenacker Silt Loam 1.57 kg/ha | 3.59 | 7.32             | 20 °C / 29.17 %                          | 48.61                        | 112.8         | 0.430             | 78.9                | 11.3                  | SFO              |
| Gartenacker Silt Loam 0.15 kg/ha | 3.59 | 7.32             | 20 °C / 29.17 %                          | 48.61                        | 42.9          | 0.575             | 30.0                | 9.3                   | SFO              |
| Collombey Sand               | 2.29 | 7.7              | 20 °C / 16.8 %                           | 25.31                        | 26.9          | 0.498             | 20.2                | 18.1                  | SFO              |
| Les Evouettes Silt Loam      | 2.41 | 6.1              | 20 °C / 22.12 %                          | 40.21                        | 21.7          | 0.594             | 14.3                | 13.7                  | SFO              |
| Speyer 2.3 Sandy Loam        | 1.28 | 6.6              | 20 °C / 12.56 %                          | 18.61                        | 91.6          | 0.346             | 69.6                | 11.7                  | SFO              |
| Sisseln Sandy Loam           | 2.71 | 7.16             | 20 °C / 20.96 %                          | 19b                          | 76.6          | 0.536             | 76.6                | 6.0                   | SFO              |
| Collombey Loamy Sand         | 2.02 | 7.45             | 20 °C / 16.12 %                          | 14b                          | 60.4          | 0.580             | 60.4                | 3.5                   | SFO              |
| Diegten Clay Loam            | 2.74 | 6.9              | 20 °C / 20.76 %                          | 28b                          | 63.5          | 0.323             | 51.5                | 7.7                   | SFO              |

**Arithmetic mean**<sup>a</sup> - 0.484 - - -

**Geometric mean**<sup>a</sup> 61.8 - 46.9 - -

**Median**<sup>a</sup> 68.4 0.536 51.5 - -

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(a) Average formation fraction and geometric mean DT₅₀ for replicate soil values calculated first
(b) FOCUS default moisture content based on soil texture
Note that the t-test result was >99% for all soils except Collombey (>95%), Les Evouettes (>98%) and Speyer 2.3 (>92%)
### Hydroxy-terbuthylazine (MT13)

#### Aerobic conditions (where metabolite applied as starting material)

| Soil type            | % OM | pH (KCl) | temp. °C / soil moisture for study (% w/w) | Soil moisture at pH 2 (% w/w) | DT50, actual (d) | DT50, ref 20 °C pF2 (d) | Min chi² error (%) | Method of calc. |
|----------------------|------|----------|--------------------------------------------|-------------------------------|------------------|-------------------------|-------------------|-----------------|
| Borstel – Loamy Sand | 2.6  | 5.8      | 20 °C / 10.88 %                            | 14a                           | 207              | 173                     | 4.7               | SFO            |
| Gartenacker – Loam   | 2.8  | 7.6      | 20 °C / 25.08 %                            | 25a                           | 298              | 298                     | 2.2               | SFO            |
| Vetroz – Silt Loam   | 3.1  | 7.7      | 20 °C / 23.56 %                            | 26a                           | 281              | 278                     | 2.9               | SFO            |
| Cranfield 115 – Clay Loam | 2.9  | 7.4      | 20 °C / 22.1 %                            | 30.4c                         | >1000            | >1000                   | 3.3               | SFO            |
| Cranfield 164 – Silt Loam | 5.2  | 6.5      | 20 °C / 29.12 %                            | 41.2c                         | >1000            | >1000                   | 3.7               | SFO            |
| Cranfield 243 – Sandy Loam | 1.9  | 4.3      | 20 °C / 20.44 %                            | 22.7a                         | 645              | 600                     | 1.7               | SFO            |

**Geometric mean**

| 473ᵇ | 453ᵇ | - | - |

* a FOCUS default moisture content based on soil texture
* b the geometric mean was calculated assuming a default DT50 of 1000 d for Cranfield 115 and Cranfield 164 soils
* c measured pF2.5 value was above the FOCUS default pF2 and the measured pF2.5 was used as a worst-case assessment.
### Hydroxy-terbuthylazine (MT13)

Aerobic conditions (where metabolite formed from parent terbuthylazine during the study)

| Soil type                        | % OM | pH (KCl or CaCl₂) | Visual inspection | Form. frac. (ffm) | Min chi² error (%) | Method of calc.                                      |
|----------------------------------|------|-------------------|-------------------|-------------------|-------------------|----------------------------------------------------|
| Gartenacker Sandy Loam (Out)     | 3.79 | 7.25              | Acceptable        | 0.076             | 10.1              | SFO using a fixed DT₅₀ of 473 d                    |
| Pappelacker Loamy Sand           | 1.9  | 7.6               | Acceptable        | 0.065             | 27.7              | SFO using a fixed DT₅₀ of 473 d                    |
| Weide Sandy Loam                 | 2.24 | 7.5               | Acceptable        | 0.057             | 28.5              | SFO using a fixed DT₅₀ of 473 d                    |
| Speyer 2.2 Loamy Sand*           | 3.91 | 6.1               | Acceptable        | 0.302             | 25.9              | SFO using a fixed DT₅₀ of 473 d                    |
| Borstel Loamy Sand               | 2.59 | 5.8               | Very good         | 0.212             | 2.7               | SFO using a fixed DT₅₀ of 473 d                    |
| Lorsch Sandy Clay Loam           | 3.1  | 5.3               | Very good         | 0.367             | 6.3               | SFO using a fixed DT₅₀ of 473 d                    |
| Gartenacker Silt Loam 2.6 kg/ha* | 3.59 | 7.32              | Acceptable        | 0.06              | 16.1              | SFO using a fixed DT₅₀ of 473 d                    |
| Gartenacker Silt Loam 0.25 kg/ha*| 3.59 | 7.32              | Acceptable        | 0.07              | 22.4              | SFO using a fixed DT₅₀ of 473 d                    |
| Collombey Sand*                  | 2.29 | 7.7               | Acceptable        | 0.287             | 18.7              | SFO using a fixed DT₅₀ of 473 d                    |
| Les Evouettes Silt Loam          | 2.41 | 6.1               | Good              | 0.363             | 10.8              | SFO using a fixed DT₅₀ of 473 d                    |
| Speyer 2.2 Loamy Sand*           | 4.4  | 6.0               | Good              | 0.362             | 12.8              | SFO using a fixed DT₅₀ of 473 d                    |
| Speyer 2.3 Sandy Loam            | 1.28 | 6.6               | Acceptable        | 0.238             | 27.6              | SFO using a fixed DT₅₀ of 473 d                    |
| Speyer 2.2 Loamy Sand*           | 3.95 | 6.18              | Reasonable        | 0.474             | 20                | SFO using a fixed DT₅₀ of 473 d                    |
| Sisseln Sandy Loam               | 2.71 | 7.16              | Acceptable        | 0.14              | 13.4              | SFO using a fixed DT₅₀ of 473 d                    |
| Collombey Loamy Sand*            | 2.02 | 7.45              | Good              | 0.106             | 13.5              | SFO using a fixed DT₅₀ of 473 d                    |
| Diegten Clay Loam                | 2.74 | 6.9               | Very good         | 0.191             | 3.3               | SFO using a fixed DT₅₀ of 473 d                    |

**Arithmetic mean**

- 0.207

**Median**

- 0.196

(Out) = Outlier excluded.

* Average for replicate soil values calculated first [Gartenacker 0.069; Speyer 2.2 0.379; Collombey 0.196]. Note the actual value selected for modelling purposes included additional information from the field dissipation studies.

### Desethyl hydroxy-terbuthylazine (MT14)

Aerobic conditions (where metabolite applied as starting material)

| Soil type       | % OM | pH (K Cl) | temp. °C / soil moisture for study (% w/w) | Soil moisture at pH 2 (% w/w) | DT₅₀, actual (d) | DT₅₀, ref 20 °C pH2 (d) | Min chi² error (%) | Method of calc. |
|-----------------|------|-----------|-------------------------------------------|-------------------------------|-----------------|------------------------|-------------------|-----------------|
| Borstel – Loamy | 2.6  | 5.8       | 20 °C / 10.88 %                           | 14*                          | 135             | 113                    | 7.7               | SFO             |

*(Out) = Outlier excluded.

a Average for replicate soil values calculated first [Gartenacker 0.069; Speyer 2.2 0.379; Collombey 0.196]. Note the actual value selected for modelling purposes included additional information from the field dissipation studies.
### Desethyl hydroxy-terbuthylazine (MT14)

| Soil type                  | % OM | pH (KCl) | Temp. °C / soil moisture for study (% w/w) | Soil moisture at pH 2 (% w/w) | DT$_{50}$, actual (d) | DT$_{50}$, ref 20 °C pF2 (d) | Min chi² error (%)$^b$ | Method of calc. |
|----------------------------|------|----------|-------------------------------------------|-----------------------------|----------------------|-----------------------------|------------------------|-----------------|
| Gartenacker – Loam         | 2.8  | 7.6      | 20 °C / 25.08%                            | 25                          | 50.1                 | 50.1                        | 5.3                    | SFO             |
| Lorsch – sandy clay loam   | 3.1  | 5.3      | 20 °C / 19.92%                            | 22                          | 377                  | 351                         | 5.1                    | SFO             |
| Vetroz – Silt Loam         | 3.1  | 7.7      | 20 °C / 23.56%                            | 26                          | 69.7                 | 65.1                        | 4.0                    | SFO             |
| **Geometric mean**         |      |          |                                           |                             | **115**              | **107**                     |                        |                 |

$^a$ FOCUS default moisture content based on soil texture

$^b$ t-test result was >99% for every soil except Lorsch where it was >97%

### Desethyl hydroxy-terbuthylazine (MT14)

| Soil type                  | % OM | pH (KCl) | Visual inspection | Form. frac. (fm) | Min chi² error (%) | Method of calc.            |
|----------------------------|------|----------|-------------------|------------------|-------------------|---------------------------|
| Borstel – Loamy Sand       | 2.6  | 5.8      | Very good         | 0.203            | 2.7               | SFO using a fixed DT$_{50}$ of 135 d |
| Gartenacker – Loam         | 2.8  | 7.6      | Very good         | 0.179            | 9.1               | SFO using a fixed DT$_{50}$ of 50.1 d |
| Lorsch – sandy clay loam   | 3.1  | 5.3      | Very good         | 0.458            | 3.5               | SFO using a fixed DT$_{50}$ of 377 d |
| **Arithmetic mean**        |      |          |                   | **0.280**        |                   |                           |

All studies performed at 20°C

### LM1 (MT24)

| Soil type                  | % OM | pH (water) | Temp. °C / soil moisture for study (% w/w) | Soil moisture at pH 2 (% w/w) | DT$_{50}$, actual (d) | DT$_{50}$, ref 20 °C pF2 (d) | Min chi² error (%) | Method of calc. |
|----------------------------|------|------------|-------------------------------------------|-----------------------------|----------------------|-----------------------------|-------------------|-----------------|
| Gartenacker – Loam         | 1.96 | 7.5        | 20 °C / pF2                               | 35.3                        | 0.41                 | 0.41                        | 4.1 (p=5.3E-009)  | SFO             |
| 18 Acres                   | 2.88 | 7          | 20 °C / pF2                               | 29.8                        | 0.48                 | 0.48                        | 10.1 (p=1.5E-006) | SFO             |
| Vetroz – Silt Loam         | 2.36 | 7.6        | 20 °C / pF2                               | 26.4                        | 0.33                 | 0.33                        | 24.2 (p=2.8E-004) | SFO             |
| **Geometric mean**         |      |            |                                            |                             | **0.4**              | **0.4**                     |                   |                 |

All studies performed at 20°C
**LM2 (MT28)**  
Aerobic conditions (where metabolite was applied as parent)

| Soil type            | % OM | pH (water) | temp. °C / pH | Soil moisture at pH 2 (% w/w) | DT<sub>50, actual</sub> (d) | DT<sub>50, ref</sub> 20 °C pH2 (d) | Min chi² error (%) | Method of calc. |
|----------------------|------|------------|---------------|-------------------------------|-----------------------------|----------------------------------|-------------------|----------------|
| Gartenacker – Loam   | 3.1  | 7.5        | 20 °C / pH2    | 35.3                          | 19.1                        | 19.1                             | 8.8               | SFO            |
| 18 Acres             | 3.4  | 6.5        | 20 °C / pH2    | 29.8                          | 11.5                        | 11.5                             | 7.9 (2.2E-008)    | SFO            |
| Vetroz – Silt Loam   | 3.9  | 7.8        | 20 °C / pH2    | 26.4                          | 20.5                        | 20.5                             | 6.3 (3.1E-011)    | SFO            |
| **Geometric mean**   |      |            |               |                               |                             |                                  |                   |                |
|                      | 16.5 | 16.5       |               |                               |                             |                                  |                   |                |

**LM3**  
Aerobic conditions (where metabolite was applied as parent)

| Soil type            | % OM | pH (water) | temp. °C / pH | Soil moisture at pH 2 (% w/w) | DT<sub>50, actual</sub> (d) | DT<sub>50, ref</sub> 20 °C pH2 (d) | Min chi² error (%) | Method of calc. |
|----------------------|------|------------|---------------|-------------------------------|-----------------------------|----------------------------------|-------------------|----------------|
| Gartenacker – Loam   | 3.1  | 7.5        | 20 °C / pH2    | 35.3                          | 7.3                         | 7.3                              | 7.2 (3.4E-009)    | SFO            |
| 18 Acres             | 3.4  | 6.5        | 20 °C / pH2    | 29.8                          | 38.7                        | 38.7                             | 13.2 (1.3E-006)   | SFO            |
| Vetroz – Silt Loam   | 3.9  | 7.8        | 20 °C / pH2    | 26.4                          | 6.5                         | 6.5                              | 5.1 (1.6E-010)    | SFO            |
| **Geometric mean**   |      |            |               |                               |                             |                                  |                   |                |
|                      | 12.2 | 12.2       |               |                               |                             |                                  |                   |                |

**LM4**  
Aerobic conditions (where metabolite was applied as parent)

| Soil type            | % OM | pH (water) | temp. °C / pH | Soil moisture at pH 2 (% w/w) | DT<sub>50, actual</sub> (d) | DT<sub>50, ref</sub> 20 °C pH2 (d) | Min chi² error (%) | Method of calc. |
|----------------------|------|------------|---------------|-------------------------------|-----------------------------|----------------------------------|-------------------|----------------|
| Gartenacker – Loam   | 3.1  | 7.5        | 20 °C / pH2    | 35.3                          | 49.9                        | 49.9                             | 2.5 (1.1E-013)    | SFO            |
| 18 Acres             | 3.4  | 6.5        | 20 °C / pH2    | 29.8                          | 65.2                        | 65.2                             | 6.8 (2.0E-008)    | SFO            |
| Vetroz – Silt Loam   | 3.9  | 7.8        | 20 °C / pH2    | 26.4                          | 47.4                        | 47.4                             | 3.1 (1.7E-012)    | SFO            |
| **Geometric mean**   |      |            |               |                               |                             |                                  |                   |                |
|                      | 53.6 | 53.6       |               |                               |                             |                                  |                   |                |

**LM5 (MT23)**  
Aerobic conditions (where metabolite was applied as parent)

| Soil type            | % OM | pH (water) | temp. °C / pH | Soil moisture at pH 2 (% w/w) | DT<sub>50, actual</sub> (d) | DT<sub>50, ref</sub> 20 °C pH2 (d) | Min chi² error (%) | Method of calc. |
|----------------------|------|------------|---------------|-------------------------------|-----------------------------|----------------------------------|-------------------|----------------|
| Gartenacker – Loam   | 3.0  | 7.5        | 20 °C / pH2    | 35.3                          | 40.2                        | 40.2                             | 2.9 (7.6E-012)    | SFO            |
### LM5 (MT23)

Aerobic conditions (where metabolite was applied as parent)

| Soil type            | % OM | pH (water) | temp. °C / soil moisture for study (% w/w) | Soil moisture at pF 2 (% w/w) | DT$_{50}$, actual (d) | DT$_{50}$, ref 20 °C pF2 (d) | Min chi$^2$ error (%) | Method of calc. |
|----------------------|------|------------|--------------------------------------------|-------------------------------|-----------------------|-----------------------------|-----------------------|-----------------|
| 18 Acres             | 4.7  | 6.5        | 20 °C / pF2                                 | 29.8                          | 70.6                  | 70.6                        | 5.9 (1.4E-008)       | SFO             |
| Vetroz – Silt Loam   | 4.1  | 8.0        | 20 °C / pF2                                 | 26.4                          | 36.5                  | 36.5                        | 7.1 (4.2E-009)       | SFO             |

**Geometric mean**

|                | 47.0 | 47.0 | -     | -     |

### LM5

Aerobic conditions (where metabolite was formed from parent desethyl-hydroxy terbuthylazine)

| Soil type         | % OM | pH (KCl) | temp. °C / soil moisture for study (% w/w) | Soil moisture at pF 2 (% w/w) | DT$_{50}$, actual (d) | DT$_{50}$, ref 20 °C pF2 (d) | Formation fraction | Min chi$^2$ error (%) | Method of calc. |
|-------------------|------|----------|--------------------------------------------|-------------------------------|-----------------------|-----------------------------|---------------------|-----------------------|-----------------|
| Gartenacker – Loam| 2.8  | 7.6      | 20 °C / 25.08 %                             | 25                            | 119                   | 119                         | 0.491               | 4.72 (p = 0.0812)   | SFO             |
| Vetroz – Silt Loam| 3.1  | 7.7      | 20 °C / 23.56 %                             | 26                            | 146                   | 136                         | 0.440               | 3.00 (p = 0.1570)   | SFO             |

**Geometric mean**

|                | 132  | 128     | 0.466 (arithmetic mean) | -    | - |    |

*a* FOCUS default moisture content based on soil texture

*b* due to the high degree of uncertainty associated with the LM5 DT$_{50}$ values derived from this study the modelling endpoint has been taken from the LM 5 dosed studies only (i.e. geometric mean of 47.0 d).

### LM6

Aerobic conditions (where metabolite was applied as parent)

| Soil type          | % OM | pH (water) | temp. °C / soil moisture for study (% w/w) | Soil moisture at pF 2 (% w/w) | DT$_{50}$, actual (d) | DT$_{50}$, ref 20 °C pF2 (d) | Min chi$^2$ error (%) | Method of calc. |
|--------------------|------|------------|--------------------------------------------|-------------------------------|-----------------------|-----------------------------|-----------------------|-----------------|
| Gartenacker – Loam | 3.0  | 7.5        | 20 °C / pF2                                 | 35.3                          | 211                   | 211                         | 3.3 (2.5E-007)       | SFO             |
| 18 Acres           | 4.7  | 6.5        | 20 °C / pF2                                 | 29.8                          | 390                   | 390                         | 2.1 (2.2E-006)       | SFO             |
| Vetroz – Silt Loam | 4.1  | 8.0        | 20 °C / pF2                                 | 26.4                          | 171                   | 171                         | 2.6 (1.7E-009)       | SFO             |

**Geometric mean**

|                | 241  | 241     | -    | - |    |

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### Field studies ‡

| Terbutylazine | Aerobic conditions |
|---------------|--------------------|
| Soil type (indicate if bare or cropped soil was used). | Location (country or USA state). | % OM | pH | Depth (cm) | DT$90_{\text{soil}}$ 20 °C pH2 (d) | DT$90_{\text{soil}}$ 20 °C pH2 (d) | Min chi² error (%) | t-test (%) | Method of calc. |
| Loam – Bare soil | St Aubin, Switzerland | 3.1 | 7.2 | 0 – 10 | 17.4 | 58 | 5.2 | > 99% | SFO |
| Silt loam – Bare soil | Eschwege, Germany | 4.0 | 6.2 | 0 – 20 | 16.9 | 56.1 | 16.7 | > 99% | SFO |
| Silt loam – Bare soil | Goch, Germany | 6.4 | 6.25 | 0 – 20 | 28.8 | 95.8 | 8.2 | > 99% | SFO |
| Silty clay loam – Bare soil | Keeken, Germany | 7.6 | 6.1 | 0 – 20 | 24.3 | 80.9 | 17.7 | > 99% | SFO |
| Silt loam – Bare soil | Pleisheim, Germany | 2.1 | 6 | 0 – 20 | 15.4 | 51.1 | 19.2 | > 99% | SFO |
| Loamy sand – Bare soil | Lorsch Helming, Germany | 1.4 | 5.25 | 0 – 20 | 6.43 | 21.4 | 21 | > 99% | SFO |
| Loamy sand – Bare soil | Wemb, Germany | 3.8 | 6.2 | 0 – 20 | 11.1 | 36.8 | 17.7 | > 99% | SFO |
| Clay loam – Bare soil | Grisolles, Southern France | 1.62 | 7.3 | 0 – 30 | 52.5 | 175 | 13.2 | > 99% | SFO |
| Silt loam – Bare soil | Molinella, Italy | 1.31 | 7.6 | 0 – 30 | 149 | 497 | 12.9 | > 99% | SFO |
| Silt loam – Bare soil | St Firmin, France (North) (1.0) | 1.6 | 8.4 | 0 – 10 | 24.8 | 82.3 | 8.7 | > 99% | SFO |
| Silt loam – Bare soil | St Firmin, France (North) (1.5) | 1.6 | 8.4 | 0 – 10 | 21.2 | 70.5 | 9.5 | > 99% | SFO |
| Sand – Bare soil | Nevoy, France (North) (1.0) | 1.0 | 8.6 | 0 – 10 | 12.5 | 41.5 | 8.8 | > 99% | SFO |
| Sand – Bare soil | Nevoy, France (North) (1.5) | 1.0 | 8.6 | 0 – 10 | 19.4 | 64.4 | 6.5 | > 99% | SFO |
| Silt loam – Bare soil | Charny, France (North) (1.0) | 1.0 | 5.9 | 0 – 10 | 12.5 | 41.5 | 8.8 | > 99% | SFO |
| Silt loam – Bare soil | Charny, France (North) (1.0) | 1.0 | 5.9 | 0 – 10 | 17.6 | 58.5 | 9.4 | > 99% | SFO |
| Silty sand – Bare soil | Ports sur Vienne, France (North) (1.0) | 1.9 | 6.6 | 0 – 10 | 13.9 | 46.3 | 4.9 | > 99% | SFO |
| Silty sand – Bare soil | Ports sur Vienne, France (North) (1.5) | 1.9 | 6.6 | 0 – 10 | 27.9 | 92.8 | 13.7 | > 99% | SFO |
| Sandy silt loam – Bare soil | Eraclea, Italy (1.0) | 3.4 | 7.6 | 0 – 10 | 67.7 | 225 | 39.6 | > 81% | SFO |
| Sandy silt loam – Bare soil | Eraclea, Italy (1.0) | 3.4 | 7.6 | 0 – 10 | 9.51 | 31.6 | 20.2 | > 98% | SFO |
| Clay – Bare soil | Emilia, Italy | 3.3 | 7.5 | 0 – 10 | 32.6 | 1.8 | 7 | > 99% | SFO |
| Clay – Bare soil | Emilia, Italy | 3.3 | 7.5 | 0 – 10 | 31.8 | 1.6 | 5.3 | > 99% | SFO |
| Soft clayey sand – Bare soil | Hilgermissen, Germany | 1.5 | 5.9 | 0 – 10 | 33.5 | 111 | 11.8 | > 99% | SFO |
| Clayey sand – Bare soil | Leutzke, Germany | 2.9 | 5.5 | 0 – 10 | 9.72 | 32.3 | 25.7 | > 99% | SFO |
Field studies ‡

| Soil type (indicate if bare or cropped soil was used). | Location (country or USA state). | Aerobic conditions |
|------------------------------------------------------|----------------------------------|--------------------|
| Terbuthylazine                                       |                                  | % OM | pH | Depth (cm) | DT50, ref 20 °C pF2 (d) | DT90, ref 20 °C pF2 (d) | Min chi² error (%) | t-test (%) | Method of calc. |
| Geometric mean‡                                      |                                  | 21.8 | 72.6 | -          | -                        | -                        | -                         | -          |
| Median‡                                              |                                  | 20.0 | 66.5 | -          | -                        | -                        | -                         | -          |

NK – not known

‡ soils were normalised for temperature assuming a Q10 of 2.58 using a time step normalisation procedure. Soil moisture content was assumed to be at pF2 and not corrected for.

b Excluded from statistical evaluations due to poor fits

c Geometric mean of replicate trials calculated first; median based on n = 16

d The un-normalised SFO DT50 at the Molinella field site (SEU) was 149.9 d (chi² error level = 12.8%, acceptable visual fit)

d The un-normalised SFO DT50 at the Hilgermissen field site (NEU) was 46.6 d (chi² error level = 17.2%, acceptable visual fit up to approximate DT90)
### Field studies

| Desethyl terbutylazine | Aerobic conditions (where metabolite formed from parent terbutylazine during the study) |
|------------------------|------------------------------------------------------------------------------------|
| Soil type (indicate if bare or cropped soil was used). | Location (country or USA state). | % OM | pH | DT<sub>50</sub> ref 20 °C pF2 (d) | DT<sub>90</sub> ref 20 °C pF2 (d) | Form. frac. (ffm) | Min. chi<sup>2</sup> error (%) | t-test (%) | Method of calc.|
| Loam – Bare soil | St Aubin, Switzerland | 3.1 | 7.2 | 16.6 | 55.3 | 0.292 | 17.6 | >99% | SFO |
| Silt loam – Bare soil | Pleidsheim, Germany | 2.1 | 6 | 31 | 103 | 0.112 | 17 | >76% | SFO |
| Loamy sand – Bare soil | Lorsch Helming, Germany | 1.4 | 5.25 | 2.13 | 7.08 | 0.256 | 22.1 | >68% | SFO |
| Clay loam – Bare soil | Grisolles, Southern France | 1.62 | 7.3 | 51 | 169 | 0.767 | 15.6 | >99% | SFO |
| Silt loam – Bare soil | Molinella, Italy | 1.31 | 7.6 | 208 | 693 | 0.513 | 6.6 | >77% | SFO |
| Silt loam – Bare soil | St Firmin, France (North) (1.0) | 1.6 | 8.4 | 15.5 | 51.6 | 0.829 | 18.1 | >99% | SFO |
| Silt loam – Bare soil | St Firmin, France (North) (1.5) | 1.6 | 8.4 | 19 | 63.2 | 0.445 | 3.1 | >96% | SFO |
| Silt loam – Bare soil | Charny, France (North) (1.0) | 1.0 | 5.9 | 47.3 | 157 | 0.306 | 5.8 | >97% | SFO |
| Silt loam – Bare soil | Charny, France (North) (1.5) | 1.0 | 5.9 | 69.9 | 231 | 0.258 | 11.4 | >97% | SFO |
| Soft clayey sand – Bare soil | Hilgermissen, Germany | 1.5 | 5.9 | 23.4 | 77.8 | 0.695 | 8 | >99% | SFO |

**Arithmetic mean**<sup>a,b</sup> | - | - | 0.444 | - | - | - |

**Geometric mean**<sup>a,c</sup> | 26.8 | 89.2 | - | - | - | - |

**Median**<sup>a,c</sup> | 27.2 | 90.4 | - | - | - | - |

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<sup>a</sup> only valid datasets considered
<sup>b</sup> arithmetic mean of replicate soils calculated first
<sup>c</sup> geometric mean of replicate soils calculated first
<sup>d</sup> soils were normalised for temperature assuming a Q10 of 2.58 using a time step normalisation procedure. Soil moisture content was assumed to be at pF2 and not corrected for.

NB the applicant proposed a geometric mean of 29.6 d based on a marginally different set of soils considered acceptable.
Field studies

| Hydroxy-terbuthylazine | Aerobic conditions (where metabolite formed from parent terbuthylazine during the study) |
|------------------------|----------------------------------------------------------------------------------------|
| Soil type (indicate if bare or cropped soil was used). | Location (country or USA state). | % OM | pH | Visual inspection | Form. frac. (ffm) | Min chi² error (%) | Method of calc. |
| Clay loam – Bare soil | Grisolles, Southern France | 1.62 | 7.3 | Acceptable | 0.068 | 12.1 | SFO using a fixed DT₅₀ of 453 d |
| Silt loam – Bare soil | Molinella, Italy | 1.31 | 7.6 | Reasonable | 0.122 | 14.5 | SFO using a fixed DT₅₀ of 453 d |
| Loam – Bare soil | St Aubin, Switzerland | 3.1 | 7.2 | Reasonable | 0.079 | 24.2 | SFO using a fixed DT₅₀ of 453 d |
| Silt loam – Bare soil | St Firmin, France (North) (1.5) | 1.6 | 8.4 | Good | 0.056 | 11.3 | SFO using a fixed DT₅₀ of 453 d |
| Sand – Bare soil | Nevoy, France (North) (1.0) | 1.0 | 8.6 | Acceptable | 0.163 | 20.1 | SFO using a fixed DT₅₀ of 453 d |
| Sand – Bare soil | Nevoy, France (North) (1.5) | 1.0 | 8.6 | Good | 0.431 | 15.4 | SFO using a fixed DT₅₀ of 453 d |
| Silty sand – Bare soil | Ports sur Vienne, France (North) (1.5) | 1.9 | 6.6 | Reasonable | 0.198 | 20.9 | SFO using a fixed DT₅₀ of 453 d |
| Soft clayey sand – Bare soil | Hilgermissen, Germany | 1.5 | 5.9 | Acceptable | 0.154 | 32.4 | SFO using a fixed DT₅₀ of 453 d |
| **Arithmetic mean** | | | | | **0.139** | - | - |
| **Median** | | | | | **0.122** | - | - |

φ arithmetic mean of replicate soils calculated first
b arithmetic mean of replicate soils calculated first
Note the actual formation fraction proposed for modelling was derived from combined lab and field datasets and was calculated to be 0.197

| pH dependence ‡ | Possible weak negative correlation between degradation of terbuthylazine and soil pH based on laboratory studies ($r² = 0.3485$). No correlation observed based on field dissipation studies. |
|-----------------|-------------------------------------------------------------------------------------------------|
| (yes / no) (if yes type of dependence) | Soil accumulation and plateau concentration ‡ |
| No evidence of accumulation of terbuthylazine, desethyl-terbuthylazine, hydroxy-terbuthylazine or desethyl-hydroxy-terbuthylazine after repeated applications at 7 locations in Northern Italy. |
Laboratory studies ‡

| Terbutylazine | Anaerobic conditions |
|-------------|----------------------|
| Soil type   | OM % | pH | t. °C / % MWHC | DT<sub>50</sub> / DT<sub>90</sub> (d) | DT<sub>50</sub> (d) 20 °C pF2/10kPa | St. (r<sup>2</sup>) | Method of calculation |
| Gartenacker – Sandy loam - SYN | 3.79 | 7.25 | 20 oC / flooded soil | 108.3 / 359.9 | N/A | 0.981 | SFO |
| Speyer 2.3 – Sandy Loam - SYN | 2.07 | 6.3 | 20 oC / flooded soil | 131 / 436 | N/A | 0.966 | SFO |

Geometric mean | 119.1

Soil adsorption/desorption (Annex IIA, point 7.1.2)

| Terbutylazine ‡ | Soil Type | OC % | Soil pH | Kd (mL/g) | Koc (mL/g) | Kf (mL/g) | Kfoc (mL/g) | 1/n |
|----------------|------------|------|--------|---------|----------|---------|-----------|-----|
| Speyer 2.2 Loamy Sand – OXON | 2.29 | 6.0 | N/A | N/A | 5.34 | 233 | 0.98 |
| Les Evouettes Sandy Loam – OXON | 1.20 | 5.9 | N/A | N/A | 2.95 | 246 | 0.90 |
| Sisseln Sandy Loam – OXON | 1.57 | 7.1 | N/A | N/A | 2.37 | 151 | 0.93 |
| Vetroz Silt Loam - OXON | 4.1 | 7.3 | N/A | N/A | 8.18 | 200 | 0.90 |
| Pappelacker Loamy Sand – SYN | 1.1 | 7.6 | N/A | N/A | 2.10 | 191 | 0.92 |
| Lorsch Sandy Clay Loam – SYN | 1.8 | 5.3 | N/A | N/A | 5.86 | 318 | 0.94 |
| Gartenacker Loam – SYN | 2.0 | 7.1 | N/A | N/A | 3.74 | 187 | 0.88 |
| Vetroz Silt Loam - SYN | 4.7 | 7.2 | N/A | N/A | 10.49 | 223 | 0.97 |
| Borstel Loamy Sand – SYN* | 1.48 | 6.1 | N/A | N/A | 4.93 | 333 | 0.91 |

Arithmetic mean | 5.1 | 231 | 0.93 |

pH dependence, Yes or No | Possible weak negative correlation between sorption and soil pH (r<sup>2</sup> = 0.5456) |

NR = not recorded
**Desethyl-terbuthylazine (MT1)**

| Soil Type                              | OC % | Soil pH | Kd (mL/g) | Koc (mL/g) | Kf (mL/g) | Kfoc (mL/g) | I/n |
|----------------------------------------|------|---------|-----------|------------|-----------|-------------|-----|
| Collombey Loamy Sand - SYN             | 0.80 | 7.3     | N/A       | N/A        | 0.594     | 74.0        | 0.85|
| Les Evouettes Silt Loam – SYN          | 2.40 | 7.2     | N/A       | N/A        | 1.43      | 59.0        | 0.86|
| Vetroz Silt Loam - SYN                 | 4.70 | 7.2     | N/A       | N/A        | 3.29      | 70.0        | 0.91|
| Speyer 2.1 Sand – OXON                 | 0.6  | 5.9     | N/A       | N/A        | 0.43      | 67.2        | 0.95|
| Speyer 2.2 Loamy Sand – OXON           | 2.3  | 5.6     | N/A       | N/A        | 1.9       | 81.7        | 0.91|
| Beek Silt Loam – OXON                  | 0.6  | 6.6     | N/A       | N/A        | 0.28      | 43.8        | 0.94|
| Marknesse Silt Loam - OXON             | 1.3  | 7.5     | N/A       | N/A        | 1.24      | 96.9        | 0.92|

**Arithmetic mean**

|                          | 1.39* | 77.7* | 0.89 |

pH dependence (yes or no) No

*a* arithmetic mean based on all data

**Hydroxy-terbuthylazine (MT13)**

| Soil Type                              | OC % | Soil pH | Kd (mL/g) | Koc (mL/g) | Kf (mL/g) | Kfoc (mL/g) | I/n |
|----------------------------------------|------|---------|-----------|------------|-----------|-------------|-----|
| Cranfield 115 Clay Loam – OXON         | 1.7  | 7.9     | N/A       | N/A        | 3.51      | 208.6       | 0.82|
| Cranfield 164 Silt Loam – OXON         | 3.0  | 7.1     | N/A       | N/A        | 5.94      | 196.9       | 0.8 |
| Cranfield 243 Sandy Loam - OXON        | 1.1  | 5.4     | N/A       | N/A        | 2.14      | 193.1       | 0.85|
| Borstel Sandy Loam - SYN               | 1.3  | 5.0     | N/A       | N/A        | 3.64      | 279.7       | 0.87|
| Collombey Loamy Sand - SYN             | 0.80 | 7.3     | N/A       | N/A        | 1.19      | 149         | 0.91|
| Les Evouettes Silt Loam - SYN          | 2.40 | 7.2     | N/A       | N/A        | 2.49      | 104         | 0.79|
| Vetroz Silt Loam - SYN                 | 4.70 | 7.2     | N/A       | N/A        | 8.36      | 178         | 1.31|

**Arithmetic mean**

|                          | 3.90 | 187    | 0.91 |

pH dependence (yes or no) No

**Desethyl-hydroxy-terbuthylazine (MT14)**

| Soil Type                              | OC % | Soil pH | Kd (mL/g) | Koc (mL/g) | Kf (mL/g) | Kfoc (mL/g) | I/n |
|----------------------------------------|------|---------|-----------|------------|-----------|-------------|-----|
| Borstel Loamy Sand                     | 1.3  | 5.0     | 1.8       | 136        | 1.44      | 111         | 0.93|
| Lorsch Sandy Clay Loam                 | 1.8  | 5.3     | 3.8       | 211        | 3.39      | 188         | 0.97|
| Gartenacker Loam/Silt Loam             | 2.0  | 7.1     | 1.2       | 59         | 1.10      | 55          | 0.98|
| Vetroz Silt Loam                       | 4.7  | 7.2     | 2.8       | 60         | 2.67      | 57          | 0.98|
| Wisborough- Silty Clay Loam            | 3.44 | 5.02    | 4.40      | 375        | 3.36      | 98          | 0.8892|
### Terbutryn (MT26) ‡

| Soil Type                  | OC % | Soil pH (KCl) | Kd (mL/g) | Koc (mL/g) | Kf (mL/g) | Kfoc (mL/g) | 1/n |
|----------------------------|------|---------------|-----------|------------|-----------|-------------|-----|
| Pappelacker - Sandy Loam  | 1.1  | 7.6           | N/A       | N/A        | 4.3       | 392         | 1.01|
| Speyer 2.1 - sand          | 0.6  | 7.4           | N/A       | N/A        | 3.7       | 605         | 1.06|
| Gartenacker Loam/Silt Loam| 2.1  | 7.3           | N/A       | N/A        | 10.5      | 504         | 1.39|
| Vetroz Silt Loam          | 4.7  | 7.2           | N/A       | N/A        | 25.1      | 533         | 1.01|
| Illarsaz – silt loam      | 19.8 | 6.7           | N/A       | N/A        | 109.9     | 555         | 1.02|
| **Arithmetic mean**       | 13   | 518           |           |            | 33.2      | 1.02       |     |

pH dependence (yes or no) No evidence from narrow pH range studied

### LM1

| Soil Type                  | OC % | Soil pH (CaCl₂) | Kd (mL/g) | Koc (mL/g) | Kf (mL/g) | Kfoc (mL/g) | 1/n |
|----------------------------|------|-----------------|-----------|------------|-----------|-------------|-----|
| Gartenacker Silt Loam      | 2.95 | 7.1             | 0.507     | 30         | 0.51      | 30.2        | 1.03|
| 18 Acres Clay Loam         | 4.34 | 7.2             | 0.853     | 34         | 0.82      | 32.7        | 0.98|
| Vetroz Loam                | 4.09 | 7.6             | 0.832     | 35         | 0.87      | 36.6        | 1.05|
| **Arithmetic mean**       | 0.73 | 33.2           |           |            |           | 1.02       |     |

pH dependence (yes or no) No evidence from narrow pH range studied

### LM2

| Soil Type                  | OC % | Soil pH (CaCl₂) | Kd (mL/g) | Koc (mL/g) | Kf (mL/g) | Kfoc (mL/g) | 1/n |
|----------------------------|------|-----------------|-----------|------------|-----------|-------------|-----|
| Gartenacker Silt Loam      | 2.95 | 7.1             | 0.16      | 8.7        | 0.16      | 9           | 1.07|
| 18 Acres Clay Loam         | 4.74 | 6.1             | 0.35      | 13.7       | 0.35      | 13          | 0.93|
| Vetroz Loam                | 4.09 | 7.6             | 0.15      | 6.1        | 0.15      | 6           | 1.1 |

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| Arithmetic mean | 0.22 | 9.4 | 1.03 |
| pH dependence (yes or no) | Yes - slight trend relating increasing Kfoc with decreasing pH. However given the low sorption the mean was considered appropriate for modelling. |

LM3

| Soil Type                  | OC % | Soil pH (CaCl2) | Kd (mL/g) | Koc (mL/g) | Kf (mL/g) | Kfoc (mL/g) | I/n |
|---------------------------|------|-----------------|-----------|------------|-----------|------------|-----|
| Gartenacker Silt Loam     | 2.95 | 7.1             | 0.083     | 4.8        | 0.071     | 4.2        | 0.85|
| 18 Acres Clay Loam        | 4.74 | 6.1             | 0.101     | 3.7        | 0.091     | 3.3        | 0.9 |
| Vetroz Loam               | 4.09 | 7.6             | 0.098     | 4.1        | 0.087     | 3.7        | 0.87|
| Arithmetic mean           |      |                 |           |            |           |            |     |
| pH dependence (yes or no) | No evidence from narrow pH range studied |

LM4

| Soil Type                  | OC % | Soil pH (CaCl2) | Kd (mL/g) | Koc (mL/g) | Kf (mL/g) | Kfoc (mL/g) | I/n |
|---------------------------|------|-----------------|-----------|------------|-----------|------------|-----|
| Gartenacker Silt Loam     | 2.95 | 7.1             | 0.103     | 6          | 0.097     | 4.9        | 0.81|
| 18 Acres Clay Loam        | 4.74 | 6.1             | 0.474     | 17.2       | 0.463     | 15.4       | 0.91|
| Vetroz Loam               | 4.09 | 7.6             | 0.108     | 4.5        | 0.096     | 3.8        | 0.84|
| Arithmetic mean           |      |                 |           |            |           |            |     |
| pH dependence (yes or no) | Yes - trend relating increasing Kfoc with decreasing pH. However given the low sorption the mean was considered appropriate for modelling. |

LM5

| Soil Type                  | OC % | Soil pH (CaCl2) | Kd (mL/g) | Koc (mL/g) | Kf (mL/g) | Kfoc (mL/g) | I/n |
|---------------------------|------|-----------------|-----------|------------|-----------|------------|-----|
| Gartenacker Silt Loam     | 2.95 | 7.1             | 0.414     | 24         | 0.32      | 19         | 0.87|
| 18 Acres Clay Loam        | 4.74 | 6.1             | 0.549     | 20         | 0.39      | 14         | 0.88|
| Vetroz Loam               | 4.09 | 7.6             | 0.486     | 21         | 0.31      | 13         | 0.83|
| Arithmetic mean           |      |                 |           |            |           |            |     |
| pH dependence (yes or no) | No evidence from narrow pH range studied |

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### Mobility in soil (Annex IIA, point 7.1.3, Annex IIIA, point 9.1.2) – SYN and OXON

| Soil Type                | OC % | Soil pH (CaCl₂) | Kd (mL/g) | Koc (mL/g) | Kf (mL/g) | Kfoc (mL/g) | I/n |
|--------------------------|------|-----------------|-----------|------------|-----------|------------|-----|
| Gartenacker Silt Loam    | 2.95 | 7.1             | 0.282     | 16         | 0.23      | 13         | 0.92|
| 18 Acres Clay Loam       | 4.74 | 6.2             | 0.485     | 18         | 0.4       | 14         | 0.93|
| Vetroz Loam              | 4.09 | 7.6             | 0.43      | 18         | 0.31      | 13         | 0.89|
| Arithmetic mean          |      |                 |           |            | 0.38      | 13.3       | 0.91|

**pH dependence (yes or no)** No evidence from narrow pH range studied

#### Column leaching ‡ (SYN)
- Eluation (mm): 200 mm
- Time period (d): 2 d
- Leachate: < 0.01 - 0.04 % total residues/radioactivity in leachate
- 82.45 - 90.14 % active substance and 0.46 - 1.49 % extractable metabolites in soil.
- 45.48 – 87.37 % total residues/radioactivity retained in top 2 cm

#### Lysimeter/ field leaching studies ‡ (SYN)
- Location: Schmallenberg/Grafschaft, Germany
- Study type (e.g. lysimeter, field): lysimeter (x2)
- Soil properties (0 – 30 cm): Borstel Sandy Loam, pH = 5.7, OC= 1.5 %, MWHC = not stated (FC = 20 – 34 % by volume)
- Dates of application: 28/05/1990
- Crop: maize followed by the rotational crops winter wheat and winter barley.
- Number of applications: 1 application to maize in first year only
- Duration: 2 years,
- Application rate: 700 - 790 g/ha
- Average annual rainfall (mm): 863 mm
- Average annual leachate volume (mm): 418.3 mm
- % radioactivity in leachate (maximum/year): 1.45 – 1.48 % AR
- Annual average maximum concentrations (e.g. 1st or 2nd yr, Lysimeter 38 or 44):
  - < 0.02 µg/L terbuthylazine,
  - < 0.02 µg/L desethyl-terbuthylazine,
Peer review of the pesticide risk assessment of the active substance terbutylazine

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Lysimeter/ field leaching studies ‡ (SYN)

Location: Itingen, Switzerland
Study type (e.g. lysimeter, field): lysimeter
Soil properties (0 – 30 cm): Neustadt Sand, pH = 6.1, OC= 1.05, MWHC = 34.5 %
Dates of application: May 1992
Crop: maize followed by two rotations of winter wheat
Interception estimated: 25 % (based on standard crop interception values and growth stage of maize at time of application)
Number of applications: 1 application to maize in first year only
Duration:
Application rate: 891 g/ha
Average annual rainfall (mm): 1090 mm
Average annual leachate volume (mm): 413.2 mm
% radioactivity in leachate (maximum/year): 2.34 % AR
Structural assignments for the parent and metabolites in the leachate were determined

| Compound                        | Concentration (μg/L) |
|---------------------------------|----------------------|
| hydroxy-terbutylazine           | 0.03                 |
| G 28273 (MT20)                  | 0.03                 |
| G 17792 (MT19)                  | 0.05                 |
| G 28279, G 28260 (MT22, MT14)   | < 0.02               |
| Unidentified radioactivity      | 1.96                 |
| Bi-annual average concentrations |                      |
| terbutylazine                   | < 0.02               |
| desethyl-terbutylazine          | < 0.02               |
| hydroxy-terbutylazine           | 0.02                 |
| G 28273 (MT20)                  | 0.02                 |
| G 17792 (MT19)                  | 0.03                 |
| G 28279, G 28260 (MT22, MT14)   | < 0.02               |
| Unidentified radioactivity      | 1.21                 |

Amount of radioactivity in the soils at the end of the study = 65.6 – 75.2 % AR; consisting of:
5.9 – 6.4 % AR as terbutylazine,
1.2 – 1.5 % AR as desethyl-terbutylazine,
0.2 – 0.5 % AR as hydroxy-terbutylazine,
< LOD – 0.2 % AR as G 28279 (MT22),
0.1 – 0.2 % AR as GS 28260 (MT14)
based on analysis during the original study coupled with additional information from further more recent accurate mass structural elucidation work. Parent and desethyl terbuthylazine were identified in the original study. Two further metabolites were plausibly assigned to LM3 and LM6 based on the additional mass spectral elucidation work. Assignment of other peaks was less certain based on matching relative retention times since matching HPLC conditions between this study and later definitive studies were not available. Quantitative concentrations are also uncertain due to the presence of multiple components in single peaks.

Annual average concentrations (μg/l parent equivalents)

Lysimeter 27:

< 0.05 μg/L terbuthylazine (1st year); < 0.05 μg/L terbuthylazine (2nd year); < 0.05 μg/L terbuthylazine (mean of 1st and 2nd year)

< 0.05 μg/L desethylterbuthylazine (1st year);
< 0.05 μg/L desethylterbuthylazine (2nd year);
< 0.05 μg/L desethylterbuthylazine (mean of 1st and 2nd year)

0.12 μg/L LM1* (1st year); 0.33 μg/L LM1* (2nd year); 0.25 μg/L LM1* (mean of 1st and 2nd year)

0.17 μg/L LM2* (1st year); 0.17 μg/L LM2* (2nd year); 0.17 μg/L LM2* (mean of 1st and 2nd year)

0.43 μg/L LM3 (1st year); 1.09 μg/L LM3 (2nd year); 0.84 μg/L LM3 (mean of 1st and 2nd year)

0.36 μg/L LM5* (1st year); 0.70 μg/L LM5* (2nd year); 0.57 μg/L LM5* (mean of 1st and 2nd year)

0.07 μg/L MT14 and LM4* (1st year); 0.11 μg/L MT14 and LM4* (2nd year); 0.09 μg/L MT14 and LM4* (mean of 1st and 2nd year)

0.05 μg/L LM6 (1st year); 0.50 μg/L LM6 (2nd year); 0.33 μg/L LM6 (mean of 1st and 2nd year)

0.25 μg/L LM7* (1st year); 0.05 μg/L LM7* (2nd year); 0.12 μg/L LM7* (mean of 1st and 2nd year)

* = structures tentatively assigned to peaks
Lysimeter/ field leaching studies \(\downarrow\) (OXON)

Additional unidentified radioactivity (sum of smaller peaks) 0.11 μg/L (1st year); 0.29μg/l (2nd year); 0.22μg/l (mean of 1st and 2nd year)

Amount of radioactivity in the soils at the end of the study = 67.7 % AR; consisting of (0 – 18 cm depth only)
0.92 % AR as parent
0.92 % AR as desethyl-terbuthylazine,
11.97 % AR as hydroxy-terbuthylazine,
1.52 % as desethyl-hydroxy-terbuthylazine,
6.29 % unidentified

| Location: Itingen, Switzerland |
| Study type (e.g. lysimeter, field): lysimeter (x2) |
| Soil properties (0 – 30 cm): Neustadt Sand, pH = 6.1, OC= 1.05, MWHC = 34.5 % |
| Dates of application : 18/05/93 |
| Crop : maize, followed by two rotations of winter wheat |
| Number of applications: 1 application to maize in first year only. |
| Duration: 2 years |
| Application rate:  905 g/ha/lysimeter 7; 929 g/ha/lysimeter 9 (application in first year only) |
| Average annual rainfall (mm): 1090 mm |
| Average annual leachate volume (mm): 485.6 mm |
| % radioactivity in leachate (maximum/year): 1.60 - 1.70 % AR |

Annual average concentrations (e.g. 1st and 2nd yr, Lysimeter 7 and 9):
not detected – terbuthylazine, desethyl terbuthylazine, hydroxy terbuthylazine

- 0.04/0.06μg/l LM1 (lysimeter 7/9, 1st year);
- 0.12/0.15μg/l LM1 (lysimeter 7/9, 2nd year)
- 0.04/0.03μg/l LM2 (lysimeter 7/9, 1st year);
- 0.10/0.10μg/l LM2 (lysimeter 7/9, 2nd year)
- 0.26/0.31μg/l LM3 (lysimeter 7/9, 1st year);
- 0.85/0.83μg/l LM3 (lysimeter 7/9, 2nd year)
- 0.38/0.40μg/l LM4 (lysimeter 7/9, 1st year);
- 0.14/0.18μg/l LM4 (lysimeter 7/9, 2nd year)
- 0.10/0.08μg/l LM5 (lysimeter 7/9, 1st year);
- 0.71/0.62μg/l LM5 (lysimeter 7/9, 2nd year)
- 0.03/0.01μg/l LM6 (lysimeter 7/9, 1st year);
- 0.53/0.40μg/l LM6 (lysimeter 7/9, 2nd year)
- 0.08/0.08μg/l LM7 (lysimeter 7/9, 1st year);
| Study Type                       | Location                  | Soil Properties          | Dates of Application | Crop                                | Interception Estimated | Annual Rainfall | Number of Applications | Application Rate | Average Annual Leachate Volume | % Radioactivity in Leachate | Annual Average Concentrations |
|--------------------------------|---------------------------|--------------------------|----------------------|------------------------------------|------------------------|------------------|------------------------|-----------------|-------------------------------|-----------------------------|-----------------------------|
| Lysimeter/field leaching studies‡ (OXON) | Itingen, Switzerland      | Neustadt Sandy loam, pH = 6.18, OC = 1.43, MWHC = 45.35 % | 10/05/05             | bare soil followed by plot being split and one of the following crops being sown: radish, spinach, wheat | 0 %                 | 798.5 mm       | 1 application to bare soil | 972 g/ha (Lysimeter 4); 980 g/ha (Lysimeter 6) | 731 mm                      | 1.60 - 1.70 % AR                | 0.03/0.02 μg/l LM1 (lysimeter 4/6, 1st year); 0.07/0.08 μg/l LM2 (lysimeter 4/6, 1st year); 0.24/0.23 μg/l LM3 (lysimeter 4/6, 1st year); 0.11/0.21 μg/l LM4 (lysimeter 4/6, 1st year); 0.68/0.78 μg/l LM5 (lysimeter 4/6, 1st year); 0.18/0.19 μg/l LM6 (lysimeter 4/6, 1st year); 0.08/0.08 μg/l LM7 (lysimeter 4/6, 1st year); |
Study type (e.g. lysimeter, field): Field leaching study
Soil properties (0 – 30 cm): sandy loam, pH = 5.2 – 6.3, OC= 2.3 – 2.6, MWHC = not reported
Dates of application: 1990, 1992, 1994 – 1997, 1999 - 2000
Crop: maize in application years.
Interception estimated: 25 % (based on standard crop interception values and growth stage of maize at time of application)
Number of applications: 8 applications, maximum of 1 per year
Duration: 11 years
Application rate: 735 g/ha in 1990; 750 g/ha in all other application years
Average annual rainfall (mm): 587 mm (NB. data from 1993, 1995 and 1998 not reported)
Average annual leachate volume (mm): Not applicable
% radioactivity in leachate (maximum/year): Not applicable.
Frequency of detections, detections above >0.1μg/l and maximum conc.:

| Compound                      | Detection(s) | Concentration |
|-------------------------------|--------------|---------------|
| Terbuthylazine                | 1            | 0.09μg/l      |
| Desethyl terbuthylazine       | 0            |               |
| Desethyl hydroxyterbuthylazine| 17           | 0.41μg/l      |
| 2-Hydroxy terbuthylazine      | 10           | 0.08μg/l      |

Individual annual maximum concentrations (e.g. 1st, 2nd, 3rd yr):
- < 0.05 μg/L terbuthylazine
- < 0.05 μg/L desethyl-terbuthylazine
- 0.06 μg/L 2-hydroxy-terbuthylazine
- 0.25 μg/L desethylhydroxy-terbuthylazine

Individual annual average concentrations (e.g. 1st, 2nd, 3rd yr):
< 0.05 µg/L terbuthylazine  
< 0.05 µg/L desethyl-terbuthylazine  
< 0.05 µg/L 2-hydroxy-terbuthylazine  
< 0.05 - 0.12 µg/L desethylhydroxy-terbuthylazine

Amount of radioactivity in the soils at the end of the study = not reported

Note that 2-hydroxy terbuthylazine was only analysed for in 1999-2000 and 2000-2001. Desethylhydroxy terbuthylazine was only analysed for in 1997-1998, 1999-2000 and 2000-2001.

| Location: 10 sites in 5 regions (Emilia Romagna, Friuli Venezia – Giulia, Lombardia, Piemonte, Veneto) in Northern Italy |
| Study type (e.g. lysimeter, field): field leaching study |
| Soil properties: texture class – 5 sandy loams, 3 loams, 1 sandy clay and 1 clay loam; pH = 4.9 - 7.7; OC = 0.9 – 3.6%; MWHC = not reported |
| Groundwater depth: 0.12 to 7.1m below ground surface |
| Dates of application : 2005 to 2007 |
| Crop : maize |
| Irrigation: sprinkler, basin, border or no irrigation |
| Interception estimated: 0 % (applications made shortly after seeding maize) |
| Number and rate of applications: between 2005 and 2007, 7 sites had 3 annual applications of 856 g terbuthylazine/ha. The remaining 3 sites had either 2 or 1 annual application. |
| Duration: bi-monthly sampling for 3 years (17 sampling events) |
| Average annual rainfall (mm): Reported to be below the overall average for the period 2000-2007 but supplemented by irrigation at 9 out of 10 sites. |

Frequency of detections, detection >0.1µg/l and maximum conc. (excluding basin irrigated sites, n=8):

Terbuthylazine: 62 detections out of 395 samples; 3% (~13 samples) >0.1µg/l; maximum concentration = 3.20µg/l.

Desethyl terbuthylazine: 125 detections out of
395 samples; 5% (~21 samples) >0.1μg/l; maximum concentration = 3.18μg/l. Excluding results from the V2 site after April 2007 when contamination may have occurred, the peak monitored concentration was 1.984μg/l and actual concentrations >0.1μg/l were observed in 17 out of 384 samples (4.4%).

Desethyl hydroxyterbuthylazine: 57 detections out of 144 samples; 29% (~42 samples) >0.1μg/l; maximum concentration = 2.65μg/l.

2-hydroxy terbuthylazine: 2 detections out of 144 samples, 0%(0 samples) >0.1μg/l; maximum concentration = 0.05μg/l.

LM5: 11 detections out of 21 samples; 29% (~6 samples) > 0.1μg/l; maximum concentration = 0.68μg/l.

LM6: 9 detections out of 21 samples; 38% (~8 samples >0.1μg/l; maximum concentration = 1.58μg/l.

Annual average concentrations:
0.03 – 0.58 μg/L terbuthylazine (basin irrigation)
<0.01 – 0.07 μg/L terbuthylazine (sprinkler or border irrigation)
0.07 – 0.73 μg/L desethyl terbuthylazine (basin irrigation)
<0.01 – 0.22 μg/L desethyl terbuthylazine (sprinkler or border irrigation)

< 0.05 – 0.05 μg/L (single sample) 2-hydroxy terbuthylazine (analysed for 2007 only)
0.04 – 0.37 μg/L desethyl hydroxyterbuthylazine (analysed for the 2007 season only)
<0.05 – 0.48 μg/L GS16984 (LM5) (analysed for the 2007 season only)
<0.05 – 1.3 μg/L CSCD648241 (LM6) (analysed for the 2007 season only)

Additional monitoring between 2009-2010 at 7 sites across 4 regions (Emilia Romagna, Lombardy, Veneto and Friuli-Venezia-Giulia) to measure residues of LM2, 3, 4, 5 and 6.

LM2 maximum concentration = 0.26μg/l
LM3 maximum concentration = 0.29μg/l
LM4 maximum concentration = 0.50μg/l
### Route and rate of degradation in water (Annex IIA, point 7.2.1) – SYN and OXON

| Route and type of degradation | SYN - pH 5: 73 d at 25 °C (1st order) | Hydroxy-terbuthylazine: 16 % AR (50 d) | OXON - pH 4: > 1 year at 20 °C (1st order, extrapolated beyond study duration) |
|------------------------------|--------------------------------------|---------------------------------------|--------------------------------------------------------------------------------|
| Hydrolytic degradation of terbuthylazine and metabolites > 10 % ‡ | pH 7: SYN - 205 d at 25 °C (1st order) | OXON - No significant degradation at 50 °C after 5 days |                          |
|                              | pH 9: SYN - 194 d at 25 °C (1st order) | OXON - No significant degradation at 50 °C after 5 days |                          |
| Photolytic degradation of terbuthylazine and metabolites above 10 % ‡ | SYN - Xenon arc lamp (wavelengths filtered < 290 nm), 12 hours light/12 hours dark for 10 days. Light equivalent to 13.4 days of midsummer sunlight at 30/40° N. | DT₅₀: No significant degradation | OXON - Xenon arc lamp (wavelengths filtered < 290 nm) for 30 days. 1 day equivalent to 1.64 days of summer sunlight at 40° N. | DT₅₀: 14.1 d under the test conditions; equivalent to 29.5 d in natural sunlight at 40° N in the summer. | hydroxy-terbuthylazine: 38.9 % AR (30 d) | desethyl-terbuthylazine: 11.4 % AR (30 d) |

Note that as high concentrations were also found in the upstream monitoring wells (all substances), parts of residues found in downstream monitoring wells are likely to derive from previous usage following several years of commercial application in the upstream areas.
| Property                                                                 | Value                                                                 |
|------------------------------------------------------------------------|----------------------------------------------------------------------|
| Quantum yield of direct phototransformation in water at Σ > 290 nm     | 3 x 10^{-6} mol · Einstein^{-1}                                      |
| Readily biodegradable ‡ (yes/no) (OXON and SYN)                        | No                                                                  |
| Hydrolytic degradation of desethyl-terbuthylazine (MT1) and metabolites > 10 % ‡ (SYN) | pH 4: 135.9 d at 25 °C (1st order) desethyl-2-hydroxy-terbuthylazine: 11.5 % AR (30 d) pH 5: No significant degradation at 50 °C after 5 days pH 7: No significant degradation at 50 °C after 5 days pH 9: No significant degradation at 50 °C after 5 days SYN - Xenon arc lamp (wavelengths filtered < 290 nm) for 15 days. Light equivalent to 13, 15 and 23 days of summer sunlight at 30 and 50 °N on a 12 h light: 12 dark basis at pH 5, 7 and 9 respectively. DT_{50}: No significant degradation |
| Photolytic degradation of desethyl-terbuthylazine (MT1) and metabolites above 10 % ‡ | pH 4: No significant degradation at 50 °C after 5 days pH 7: No significant degradation at 50 °C after 5 days pH 9: No significant degradation at 50 °C after 5 days SYN - Xenon arc lamp (wavelengths filtered < 290 nm) for 15 days. Light equivalent to 13, 15 and 23 days of summer sunlight at 30 and 50 °N on a 12 h light: 12 dark basis at pH 5, 7 and 9 respectively. DT_{50}: No significant degradation |
| Quantum yield of direct phototransformation in water at Σ > 290 nm     | A valid molar absorption coefficient could not be calculated because of very little or no absorption occurring over the wavelength range 290 – 800 nm. |
| Readily biodegradable ‡ (yes/no)                                      | No. Not readily biodegradable                                      |
| Hydrolytic degradation of hydroxy-terbuthylazine (MT13) and metabolites > 10 % ‡ (SYN) | pH 4: No significant degradation at 50 °C after 5 days pH 7: No significant degradation at 50 °C after 5 days pH 9: No significant degradation at 50 °C after 5 days |
| Photolytic degradation of hydroxy-terbuthylazine (MT13) and metabolites above 10 % ‡ | Not performed |
| Quantum yield of direct phototransformation in water at Σ > 290 nm     | A valid molar absorption coefficient could not be calculated because of very little or no absorption occurring over the wavelength range 290 – 800 nm. |
| Readily biodegradable ‡ (yes/no)                                      | No. Not readily biodegradable                                      |
PEC (surface water) and PEC sediment (Annex IIIA, point 9.2.3)

As a result of the confirmatory information assessment, quantified predictions of LM2, LM3, LM4, LM5 and LM6 in groundwater above 0.1μg/l are available. The UK RMS therefore considers that LM2, LM3, LM4, LM5 and LM6 could be added to residue definition for surface water and sediment (by default). Endpoints for use in the surface water assessment are proposed as follows:-

LM2
DT₅₀: 16.5d
K₇₀C: 9.4 L/kg, 1/n = 1.03

LM3
DT₅₀: 12.2d
K₇₀C: 3.7 L/kg, 1/n = 0.87

LM4
DT₅₀: 53.6d
K₇₀C: 8.0 L/kg, 1/n = 0.85

LM5
DT₅₀: 47.0d
K₇₀C: 15.3 L/kg, 1/n = 0.86

LM6
DT₅₀: 241d
K₇₀C: 13.3 L/kg, 1/n = 0.91

In the absence of information on peak occurrence in soil and degradation rates in water, it is proposed that for the purposes of a simple, conservative assessment, peak occurrence in soil is set at 100% and water/sediment DT50 values set to 1000 d. These values may be refined if necessary.
PEC (ground water) (Annex IIIA, point 9.2.1)

Method of calculation and type of study (e.g. modelling, field leaching, lysimeter)

For FOCUS gw modelling, values used –
Modelling using FOCUS model(s), with appropriate FOCUSgw scenarios, according to FOCUS guidance.
Model(s) used: PEARL 4.4.4 and PELMO 4.4.3
Scenarios (list of names): Châteaudun (C), Hamburg (H), Kremsmünster (K), Okehampton (N), Piacenza (P), Porto (O), Sevilla (S), Thiva (T)

| Scenario | $Q_{10}$ | Crop | Terbuthylazine: $DT_{50}$ | $K_{FOC}$ | $\frac{1}{n}$ |
|----------|--------|------|-----------------|---------|-------------|
|          | 2.58   | maize| 20.0 d (normalised median of field studies) | worst case assessment using lowest $K_{foc}$ value of 151 L/kg and associated $\frac{1}{n}$ of 0.93 to reflect possible pH dependence: |

Metabolites:
Desethyl-terbuthylazine:
$DT_{50}$: 26.8 d (geomean of field studies).
$K_{FOC}$: 77.7 L/kg, $\frac{1}{n}$ = 0.89 (mean values).
Formation fraction: 0.44 from parent

Hydroxy-terbuthylazine:
$DT_{50}$: 453 d (geomean of lab studies)
$K_{FOC}$: 187 L/kg, $\frac{1}{n}$ = 0.91 (mean values).
Formation fraction: 0.17 from parent (Applicant) and 0.197 (RMS)

Desethylhydroxy-terbuthylazine:
$DT_{50}$: 107 d (geomean of lab studies).
$K_{FOC}$: 121 L/kg, $\frac{1}{n}$ = 0.92 (median values, Applicant) or 111 L/kg, $\frac{1}{n}$ = 0.92 (median values excluding results from the Bosket loam soil, RMS)
Formation fraction: 0.28 (from desethyl-terbuthylazine)

LM1
$DT_{50}$: 0.4d
$K_{FOC}$: 33.2 L/kg, $\frac{1}{n}$ = 1.02
Formation fraction: 0.59 (from LM5)

LM2
$DT_{50}$: 16.5d
$K_{FOC}$: 9.4 L/kg, $\frac{1}{n}$ = 1.03
| Formation fraction: 1 (from LM4) |
|----------------------------------|
| LM3                              |
| DT₅₀: 12.2d                      |
| KₚOC: 3.7 L/kg, ¹/n₀ = 0.87      |
| Formation fraction: 1 (from LM2) |
| LM4                              |
| DT₅₀: 53.6d                      |
| KₚOC: 8.0 L/kg, ¹/n₀ = 0.85      |
| Formation fraction: 0.08 (from parent terbuthylazine) |
| LM5                              |
| DT₅₀: 47.0d                      |
| KₚOC: 15.3 L/kg, ¹/n₀ = 0.86     |
| Formation fraction: 0.47 (from MT14) |
| LM6                              |
| DT₅₀: 241d                       |
| KₚOC: 13.3 L/kg, ¹/n₀ = 0.91     |
| Formation fraction: 0.41 (from LM5) |

| Application rate |
|------------------|
| Application rate: 750 g/ha Northern Europe |
| 850 g/ha Southern Europe |
| No. of applications: 1 |
| Time of application (month or season): 1 day before crop emergence |
PEC(gw) - FOCUS modelling results (80th percentile annual average concentration at 1m)

FOCUS-PEARL PEC_{GW} values for Terbuthylazine (using minimum measured K_{foc} = 151 ml/g; K_{fom} = 87.6 ml/g) and three metabolites, following application to Maize at 750 g/ha (RMS simulations)

| Scenario   | PEC at 1 m Soil Depth (µg/l) | PEC_{GW} at 1 m Soil Depth (µg/l) |
|------------|------------------------------|----------------------------------|
|            | Terbuthylazine               | Hydroxy-terbuthylazine (GS23158 or MT13) | Desethyl-terbuthylazine (GS26379 or MT1) | Desethyl-hydroxy-terbuthylazine (GS28620 or MT14) |
| Châteaudun | <0.001                       | 15.0                             | 0.061                                      | 2.17                                      |
| Hamburg    | 0.005                        | 18.3                             | 0.28                                       | 3.44                                      |
| Kremsmünster | 0.002                        | 12.8                             | 0.186                                      | 2.29                                      |
| Okehampton | 0.007                        | 13.3                             | 0.316                                      | 2.89                                      |
| Piacenza   | 0.003                        | 15.4                             | 0.163                                      | 2.25                                      |
| Porto      | <0.001                       | 7.63                             | 0.047                                      | 1.25                                      |
| Sevilla    | <0.001                       | 4.19                             | <0.001                                    | 0.188                                     |
| Thiva      | <0.001                       | 21.0                             | 0.009                                      | 1.66                                      |

1: 2-hydroxy terbuthylazine DT_{50} = 453 d, formation fraction = 0.197
2: desethyl-hydroxy terbuthylazine K_{foc} = 111 ml/g; K_{fom} = 64.4 ml/g (median of 11 values)

FOCUS-PEARL PEC_{GW} values for Terbuthylazine (using minimum measured K_{foc} = 151 ml/g; K_{fom} = 87.6 ml/g) and three metabolites, following application to Maize at 850 g/ha (RMS simulations)

| Scenario   | PEC at 1 m Soil Depth (µg/l) | PEC_{GW} at 1 m Soil Depth (µg/l) |
|------------|------------------------------|----------------------------------|
|            | Terbuthylazine               | 2-Hydroxy-terbuthylazine (GS23158 or MT13) | Desethyl-terbuthylazine (GS26379 or MT1) | Desethyl-hydroxy-terbuthylazine (GS28620 or MT14) |
| Châteaudun | < 0.001                      | 17.2                             | 0.075                                      | 2.51                                      |
| Hamburg    | 0.006                        | 20.9                             | 0.336                                      | 3.97                                      |
| Kremsmünster | 0.002                        | 14.7                             | 0.225                                      | 2.65                                      |
| Okehampton | 0.008                        | 15.2                             | 0.4                                        | 3.33                                      |
| Piacenza   | 0.003                        | 17.7                             | 0.2                                        | 2.6                                       |
| Porto      | <0.001                       | 8.69                             | 0.058                                      | 1.44                                      |
| Sevilla    | <0.001                       | 4.88                             | <0.001                                    | 0.223                                     |
| Thiva      | <0.001                       | 24.1                             | 0.011                                      | 1.93                                      |

1: 2-hydroxy terbuthylazine DT_{50} = 453 d, formation fraction = 0.197
2: desethyl-hydroxy terbuthylazine K_{foc} = 111 ml/g; K_{fom} = 64.4 ml/g (median of 11 values)
FOCUS-PEARL PEC\textsubscript{GW} values for Terbuthylazine six lysimeter metabolites LM1-LM6 (using minimum measured K\textsubscript{foc} = 151 ml/g; K\textsubscript{fom} = 87.6 ml/g) following application to Maize at 750 g/ha (RMS simulations)

| Scenario       | PEC\textsubscript{GW at 1 m Soil Depth (µg/L)} |
|----------------|-----------------------------------------------|
|                | LM1       | LM2       | LM3       | LM4       | LM5       | LM6       |
| Châteaudun     | 0.01      | 2.57      | 2.1       | 5.82      | 2.55      | 3.97      |
| Hamburg        | 0.014     | 4.59      | 3.4       | 10.4      | 4.02      | 4.72      |
| Kremsmünster   | 0.009     | 2.26      | 1.74      | 5.37      | 2.37      | 2.78      |
| Okehampton     | 0.009     | 2.26      | 1.64      | 5.43      | 2.37      | 1.8       |
| Piacenza       | 0.008     | 1.46      | 1.88      | 4.14      | 2.28      | 4.54      |
| Porto          | 0.006     | 1.23      | 0.93      | 2.66      | 1.43      | 1.67      |
| Sevilla        | 0.003     | 0.64      | 0.54      | 1.07      | 0.728     | 3.71      |
| Thiva          | 0.009     | 2.13      | 1.88      | 4.78      | 2.39      | 8.0       |

FOCUS-PEARL PEC\textsubscript{GW} values for Terbuthylazine six lysimeter metabolites LM1-LM6 (using minimum measured K\textsubscript{foc} = 151 ml/g; K\textsubscript{fom} = 87.6 ml/g) following application to Maize at 850 g/ha (RMS simulations)

| Scenario       | PEC\textsubscript{GW at 1 m Soil Depth (µg/L)} |
|----------------|-----------------------------------------------|
|                | LM1       | LM2       | LM3       | LM4       | LM5       | LM6       |
| Châteaudun     | 0.011     | 2.93      | 2.39      | 6.68      | 2.92      | 4.49      |
| Hamburg        | 0.016     | 5.19      | 3.86      | 12        | 4.62      | 5.32      |
| Kremsmünster   | 0.01      | 2.56      | 1.97      | 6.14      | 2.71      | 3.13      |
| Okehampton     | 0.01      | 2.56      | 1.86      | 6.21      | 2.7       | 2.02      |
| Piacenza       | 0.009     | 2.13      | 1.66      | 4.78      | 2.61      | 5.14      |
| Porto          | 0.007     | 1.39      | 1.06      | 3.05      | 1.65      | 1.88      |
| Sevilla        | 0.003     | 0.727     | 0.619     | 1.23      | 0.838     | 4.21      |
| Thiva          | 0.01      | 2.43      | 2.15      | 5.49      | 2.76      | 9.06      |
Residues requiring further assessment

Environmental occurring metabolite requiring further assessment by other disciplines (toxicology and ecotoxicology) or for which a groundwater exposure assessment is triggered.

| Soil: | terbuthylazine, desethyl-terbuthylazine, hydroxy-terbuthylazine |
| Surface Water: | terbuthylazine, desethyl-terbuthylazine, hydroxy-terbuthylazine (MT13), desethyl-hydroxy terbuthylazine and terbutryn (MT26) |
| Sediment: | terbuthylazine, desethyl-terbuthylazine, hydroxy-terbuthylazine (MT13), desethyl-hydroxy terbuthylazine and terbutryn (MT26) |
| Groundwater: | terbuthylazine, desethyl-terbuthylazine, hydroxy-terbuthylazine (MT13) and desethyl-hydroxy-terbuthylazine, LM1, LM2, LM3, LM4, LM5 and LM6 |
| Air: | terbuthylazine |

The above is the original residue definition for environmentally occurring metabolites requiring further assessment by other disciplines. As a result of the confirmatory information assessment, quantified predictions of LM2, LM3, LM4, LM5 and LM6 in groundwater above 0.1μg/l were available. LM2, LM3, LM4, LM5 and LM6 were additionally included in the residue definition for surface water and sediment (by default) to cover situations where groundwater can become surface water.

Monitoring data, if available (Annex IIA, point 7.4) - SYN

Soil (indicate location and type of study)

Surface water (indicate location and type of study)

a) Two sites in Germany susceptible to run-off and adjacent to streams in typical maize growing areas were selected. Upstream and downstream points of streams were monitored for terbuthylazine and desethyl-terbuthylazine (MT1) from May to August in 1999 and 2000 following terbuthylazine application to maize in adjacent field. Samples were taken every hour and combined into weekly samples. Samples also taken after heavy rainfall events. Neither analyte detected at ‘Ramholz’ site at concentrations > 0.05 µg/L (LOQ). Max weekly concentrations at the ‘Kemading’ site were 0.28 and 0.08 µg/L for terbuthylazine and desethyl-terbuthylazine (MT1) respectively. Max concentrations in event samples were 0.87 µg/L and 0.20 µg/L. Concentrations similar at upstream and downstream sample sites indicate residues arose from applications in
### Groundwater (indicate location and type of study)

| Details | Study Location | Results |
|---------|---------------|---------|
| a) Full sample details not provided. 27103 sample data from Germany for the occurrence of terbuthylazine in groundwater. 328 detections of terbuthylazine were observed with 41 > (0.15% of the total analyses) displaying residues in excess of 0.1 µg/L. The Applicant states that none of these exceedences were due to the correct GAP for approved uses being applied. | Germany | 328 detections of terbuthylazine |
| b) Full sample details not provided. Groundwater samples from more than 1000 intakes from 15 municipalities in counties around Denmark in 1990 – 2001 were analysed for residues of plant protection products and their degradation products. The mean depth to the top of the groundwater sample was 24 - 25 m with a mean intake length of 3.5 m. In addition to the groundwater survey, the report also contained information on the analyses of water samples taken from a group of “other borings” which are not used to extract groundwater for drinking purposes. 1016 intakes were analysed for terbuthylazine (the number of analyses was 4086). There were 17 (1.7 %) intakes with detections of terbuthylazine, however, none of them contained concentrations ≥ 0.1 µg/L. With regard to the group “other borings”, 1156 and 311 borings were analysed for terbuthylazine and desethyl-terbuthylazine (MT1) respectively with 1492 and 527 individual analyses respectively. Terbuthylazine and desethyl-terbuthylazine (MT1) were found in 18 (1.6 %) and 14 (4.5 %) borings, with 3 (0.3 %) and 4 (1.3 %) of these findings being detected at concentrations ≥ 0.1 µg/L. | Denmark | 1016 intakes were analysed |
| c) Danish government monitoring programme selected two sites (Jyndevad and Silstrup) in Denmark to assess the leaching potential of pesticides including terbuthylazine. Applications were made to maize in May 2001 at Jyndevad and in May/June 2002 at Silstrup. Soil pore waters and groundwaters were analysed monthly for terbuthylazine and desethyl-terbuthylazine, additionally | Denmark | Two sites (Jyndevad and Silstrup) |
at Silstrup hydroxy-terbuthylazine, hydroxy-desethyl-terbuthylazine (MT1) and atrazine-desisopropyl-2-hydroxy (MT22) were also monitored for from February 2003.

At Jyndevad, terbutylazine was not detected in either the soil pore water or the groundwater at concentrations > 0.01 µg/L in the two year monitoring period. Desethyl-terbuthylazine (MT1) was detected in pore water at 1 m depth in all but three of the monthly samples between October 2001 (five months after application) and May 2003 at concentrations of 0.020 – 0.056 µg / L, however it was not detected in pore waters at 2 m and was only detected once in any of the downstream groundwater monitoring wells.

At Silstrup terbuthylazine residues in well water at 1.5-2.5 m depth ranged from 0.013-0.124 µg/L over the year with one sample containing > 0.1 µg/L. Residues of desethyl-ranged from 0.046-0.143 µg/L over the year with two samples containing > 0.1 µg/L. Residues from deeper screens were always < 0.08 µg/L for both terbuthylazine and desethyl-terbuthylazine. Of the remaining metabolites hydroxy-terbuthylazine (MT13) was not detected in the well water. Hydroxy-desethyl-terbuthylazine (MT1) was only detected once in the well water at a depth of 1.5 – 2.5 m at a concentration of 0.016 µg/L. Atrazine-desisopropyl-2-hydroxy (MT22) was detected three times in the well at 1.5 – 2.5 m depth at concentrations around 0.01 µg/L. It was also detected once at a depth of 3.5 – 4.5 m at a concentration of 0.047 µg/L.

d) Targeted groundwater monitoring studies were conducted in Germany in areas of documented use of terbuthylazine containing products. Typical maize regions were investigated i.e. Schleswig-Holstein, Mecklenburg-West Pomerania, Muenster-Emsland (stretching from the federal state North Rhine-Westfalia to Lower Saxony), Rottal (Bavaria) and the Upper Rhine Valley (stretching from the federal state Baden-Wuerttemberg to Hesse). Groundwater was collected from monitoring screen typically situated 5 m below ground surface. Confirmed usage of terbuthylazine containing products in upstream areas (2.5 x 2.5km or 625 ha) was determined via farmer surveys and interviews over three years (2002 – 2004). Results for each site represent the sum over this period as follows:- Wanderup 277 ha, Alt-Bennebek 497ha, Breiholz-Ost 198 ha, Hagen-Suedost 61 ha, Luettow 57 ha, Torgelow 225 ha, Lelkendorf 72 ha, Warnow 60 ha, Pinnow 288ha, Tabeckendorf 114 ha, Postmuenster 92 ha, Hammersbach 102 ha, Kirchham-Pfaffenhof 336 ha, Simbach-Stoelln 137 ha, Biblis 82 ha, Lorsch 56 ha, Rheinhausen-Oberhausen 198 ha, Breisach-Weingenossenschaft 240 ha, Grezhausen 69 ha, Rehderfeld 154 ha, Flechum 114 ha, Dalumer Moor 174
The overall mean hectarage treated was reported to be 120 ha across all sites and only those sites that received at least 50 ha of treatment were included in the final 25 sites monitored. The groundwater table was mostly less than 5 meters below ground surface and a wide range of soil properties was covered by the selected regions. No residues of terbuthylazine and desethyl-terbuthylazine were detected in any of the ground water monitoring samples analysed. Small residues of GS 28620 (MT14) and GS 23158 (MT13) were found in water samples taken from ground water monitoring wells at two locations. The residues of GS 28620 (MT14) occurred in May-July 2003 and ranged from 0.05-0.06 µg/l. The residues of GS 23158 (MT13) were detectable but not quantifiable (i.e. < 0.05 but > 0.02 µg/l). In addition, the lysimeters metabolites LM3, LM5 and LM6 were detected at 19 of the 25 locations, confirming the linkage to terbuthylazine treated areas in the catchment.

Residues of the metabolite CSCD648241 (LM6) in 29 samples from 25 individual sampling points were determined to be between < 0.05 µg/l and 0.66 µg/l. Residues of the metabolite GS16984 (MT23, LM5) in 29 samples from 25 individual sampling points, were determined to be between < 0.05 µg/l and 0.98 µg/l. The metabolite CSCD692760 (LM3) was detected at 19 (10 above the LOQ and 9 below the LOQ) of the 25 locations. Quantifiable residues ranged from 0.06-0.69 µg/l.

e) In 1997, a monitoring study was carried out in four maize cultivated areas in the plain of the river Po in Italy to evaluate the degree of contamination of the groundwater table. No residues of terbuthylazine were detected above 0.1µg/l in the 1997 study. A follow-up study was conducted in 2006 in the same areas identified in the previous monitoring study. The majority of superficial wells sampled were over 20 m deep, with deep wells often greater than 50m. In these follow-up studies 8 out of approximately 100 wells were found to contain residues of terbuthylazine or its metabolites desethyl-terbuthylazine and hydroxy-terbuthylazine above 0.1 µg/l. However the average age of the wells was over 30 years and characterised by degraded materials, rust, holes or cracks etc and as a whole, the 90th percentile terbuthylazine and metabolite residues were all <0.05 µg/l on the basis of this monitoring.

f) A retrospective monitoring study was conducted in four regions of Portugal from 1999 to 2007. As a retrospective study, only limited details on the history of pesticide use in the upstream areas was available. However throughout the eight year duration of the study, 773 water samples were taken and analysed for terbuthylazine and desethyl-terbuthylazine from 68 different sampling sites, generating a total of 1546 data points. Sampling sites covered a relatively wide variety.
of sales history, cropping density, depth to groundwater and nitrate concentration (this last parameter used as general indicator for the vulnerability of an aquifer to agricultural practices). Although terbuthylazine has not been in widespread use in two of the monitored regions, it has been extensively used in vineyards in the Oeste and the Douro valley at a rate of 490 g/ha (1400 g/ha in row). Neither terbuthylazine nor desethyl-terbuthylazine residues exceeded 0.05 µg/l at the 90th percentile of the population. Overall the RMS considered that the additional data from the Portuguese monitoring programs did provide useful information. However it should be noted that the monitoring is only of partial relevance in the regions where prior use of terbuthylazine is known to be extensive, and also taking into account that the use covers applications to vineyards rather than the extensive use on maize as investigated in the German and Italian studies. Taking these caveats into account, the RMS considers that the data should be viewed as providing supporting information alongside the monitoring data from other regions, as well as taking into account the results of the standard first tier FOCUS groundwater exposure assessments.

 Retrospective monitoring studies were conducted in 3 regions of Spain covering use of terbuthylazine on olive crops in Andalucia (2000 to 2003), use on maize and citrus crops in South Eastern Spain (2000 to 2001) and use on maize and vineyards in Northern Spain (2000-2001). As retrospective studies, only limited details on the history of pesticide use in the upstream areas was available. In addition in many cases, the relatively large distance between the discharge point and the upland aquifer made it difficult to relate monitored residues back to a specific product use pattern. However throughout each study sampling sites were selected using local knowledge of cropping density, regional product sales data, hydrogeological information and information pertaining to the integrity of the respective sampling sites. In three regions the 90th percentile concentration was less than 0.1 µg/l for both terbuthylazine and metabolite desethyl-terbuthylazine (the only metabolite monitored for). However it should be noted that methods of analysis were unvalidated and the LOQ was only reported to be 0.1µg/l in the studies conducted in South Eastern Spain. In Andalucia, following extensive use of terbuthylazine on olive crops, the 90th percentile concentration of terbuthylazine was 0.14 µg/l. However the majority of detections in this region came from springs discharging groundwater into lagoons, troughs or drainage canals that were not protected from direct contamination. Overall the RMS considered that the additional data from the Spanish monitoring programs did provide limited useful information. However it should be noted that the monitoring is only of partial relevance in the regions where prior use of terbuthylazine is known to be extensive, and also taking into account that the monitoring covers areas where terbuthylazine may be applied to olive crops, citrus and
vineyards in addition to use on maize in two of the three regions investigated. In addition, the sampling of groundwater from springs discharging to surface water bodies meant that the influence of direct contamination (rather than conventional leaching) could not be excluded. Taking these caveats into account, the RMS considers that the data should be viewed as providing limited supporting information only alongside the monitoring data from other regions, as well as taking into account the results of the standard first tier FOCUS groundwater exposure assessments.

Air (indicate location and type of study)  
None

Points pertinent to the classification and proposed labelling with regard to fate and behaviour data  
Candidate for chronic (long term) aquatic hazard
### Toxicity data for aquatic species (most sensitive species of each group) (Annex IIA, point 8.2, Annex IIIA, point 10.2)

| Group          | Test substance                  | Time-scale (Test type) | End point                  | Toxicity\(^1\) (mg/L) |
|----------------|---------------------------------|------------------------|----------------------------|------------------------|
| **Laboratory tests ‡** |                                 |                        |                            |                        |
| **Fish**       |                                 |                        |                            |                        |
| *Oncorhynchus mykiss* | a.s.                           | 96 hr (static)         | Mortality, nomLC\(_{50}\) | 2.2 mg a.s./L (SYN)    |
| *Oncorhynchus mykiss* | a.s.                           | 90 d (flow-through)    | Early life cycle mmNOEC    | 0.09 mg a.s./L (SYN)   |
| *Oncorhynchus mykiss* | Preparation: ‘Gardo Gold’ (A-9476 C) | 96 hr (static)         | Mortality, mmLC\(_{50}\)  | 8.32 mg formulation/ L (1.58 mg a.s./L) (SYN) |
| *Oncorhynchus mykiss* | Preparation: ‘Terbutylazine 500 g/L SC’ | 96 hr (static)         | Mortality, mmLC\(_{50}\)  | 12 mg formulation/ L (6.6 mg a.s./L) (OXON) |
| *Oncorhynchus mykiss* | Metabolite MT1 (GS 26379, desethyl-terbutylazine ) | 96 hr (static)         | Mortality, nomLC\(_{50}\) | 18 mg/L (SYN)          |
| *Oncorhynchus mykiss* | Metabolite MT13 (GS 23158, 2-hydroyx-terbutylazine ) | 96 hr (static)         | Mortality, mmLC\(_{50}\)  | >2.5 mg/L (SYN)        |
| *Oncorhynchus mykiss* | Metabolite MT26 (GS 14260, terbutryn) | 96 hr (static)         | Mortality, mmLC\(_{50}\)  | 1.1 mg/L (SYN)         |
| **Aquatic invertebrate** |                                 |                        |                            |                        |
| *Daphnia magna* | a.s.                           | 48 h                   | Mortality, EC\(_{50}\)    | No definitive endpoint available\(^2\) |
| Group            | Test substance                  | Time-scale (Test type) | End point                        | Toxicity\(^1\) (mg/L) |
|------------------|---------------------------------|------------------------|----------------------------------|------------------------|
| Daphnia magna    | a.s.                            | 21 d (semi-static)     | Reproduction, \(_{\text{nom}}\) NOEC | 0.019 mg a.s./L (SYN) |
|                  | Preparation: ‘Gardo Gold’ (A-9476 C) | 48 h (static)          | Mortality, EC\(_{50}\)           | No definitive endpoint available\(^3\) |
|                  | Preparation: ‘Terbuthylazine 500 g/L SC’ | 48 h (static)          | Mortality, EC\(_{50}\)           | No definitive endpoint available\(^3\) |
|                  | Metabolite MT1 (GS 26379, desethyl-terbuthylazine) | 48 h (static)          | Mortality, \(_{\text{nom}}\) EC\(_{50}\) | 42 mg/L (SYN) |
|                  | Metabolite MT13 (GS 23158, 2-hydroxy-terbuthylazine) | 48 h (static)          | Mortality, \(_{\text{nom}}\) EC\(_{50}\) | >2.8 mg/L (SYN) |
| Sediment dwelling organisms | | | | |
| Chironomus riparius | a.s. | 27 d (static) | \(_{\text{nom}}\) NOEC (water phase) | 0.5 mg a.s./L (SYN) |
| Chironomus riparius | Metabolite MT13 (GS 23158, 2-hydroxy-terbuthylazine) | 28 d (static) | \(_{\text{nom}}\) NOEC (sediment phase) | 400 mg/kg (sediment) (SYN) |
| Chironomus riparius | Metabolite MT26 (GS 14260, terbutryn) | 28 d (static) | \(_{\text{nom}}\) NOEC (sediment phase) | 16 mg/kg (sediment) |
| Algae            | | | | |
| Blue green algae (Microcystis aeruginosa) | a.s. | 72 h (static) | Biomass: \(_{\text{mm}}\) E\(_{0}\)C\(_{50}\) | 0.016 mg a.s./L (OXON) |
|                  |                                |                        | Growth rate: \(_{\text{mm}}\) E\(_{1}\)C\(_{50}\) | 0.102 mg a.s./L (OXON) |
| Group                          | Test substance | Time-scale (Test type) | End point          | Toxicity\(^1\) (mg/L) |
|-------------------------------|----------------|-----------------------|--------------------|-----------------------|
| *Pseudokirchneriella subcapitata* | a.s.           | 72 h (static)         | Biomass: \(\text{mm}E_C50\) | 0.012 mg a.s./L (OXON) |
|                               |                |                       | Growth rate: \(\text{mm}E_tC50\) | 0.028 mg a.s./L (OXON) |
| *Desmodesmus subspicatus*     | Preparation: ‘Gardo Gold’ (A-9476 C) | 72 h (static) | Biomass: \(\text{nom}E_C50\) | 0.108 mg formulation/ L (0.0205 mg a.s./L) (SYN) |
|                               |                |                       | Growth rate: \(\text{nom}E_tC50\) | 0.211 mg formulation/ L (0.0401 mg a.s./L) (SYN) |
| *Pseudokirchneriella subcapitata* | Preparation: ‘Terbutylazine 500 g/L SC’ | 72 h (static) | Biomass: \(\text{mm}E_C50\) | 0.039 mg formulation/ L (0.021 mg a.s./L) (OXON) |
|                               |                |                       | Growth rate: \(\text{mm}E_tC50\) | 0.073 mg formulation/ L (0.040 mg a.s./L) (OXON) |
| *Selenastrum capricornutum*   | Metabolite MT1 (GS 26379, desethyl-terbuthylazine) | 72 h (static) | Biomass: \(\text{mm}E_C50\) | 0.14 mg/L (SYN) |
|                               |                |                       | Growth rate: \(\text{mm}E_tC50\) | 0.38 mg/L (SYN) |
| *Desmodesmus subspicatus*     | Metabolite MT13 (GS 23158) 2-hydroxy-terbuthylazin e | 72 h (static) | Biomass: \(\text{nom} E_C50\) | >3.96 mg/L (OXON) |
|                               |                |                       | Growth rate: \(\text{nom}E_tC50\) | >3.8 mg/L (SYN) |
| *Selenastrum capricornutum*   | Metabolite MT26(GS 14260) terbutryn) | 72 h (static) | Biomass: \(\text{mm}E_C50\) | 0.0017 mg/L (SYN) |
|                               |                |                       | Growth rate: \(\text{mm}E_tC50\) | 0.0036 mg/L (SYN) |
| Group                                  | Test substance | Time-scale (Test type) | End point          | Toxicity\(^1\) (mg/L) |
|----------------------------------------|----------------|-----------------------|--------------------|-----------------------|
| *Pseudokirchneriella subcapitata*      | Metabolite LM3 | 72h (static)          | Growth rate: \(\text{nomE}_C^{50}\) | 80                    |
|                                        |                |                       | Yield: \(\text{nomE}_Y^{50}\)       | 39                    |
|                                        |                |                       | Biomass: \(\text{nomE}_B^{50}\)     | 39                    |
| *Pseudokirchneriella subcapitata*      | Metabolite LM5 | 72h (static)          | Growth rate: \(\text{nomE}_C^{50}\) | >100                  |
|                                        |                |                       | Yield: \(\text{nomE}_Y^{50}\)       | >100                  |
|                                        |                |                       | Biomass: \(\text{nomE}_B^{50}\)     | >100                  |
| *Pseudokirchneriella subcapitata*      | Metabolite LM6 | 72h (static)          | Growth rate: \(\text{nomE}_C^{50}\) | >100                  |
|                                        |                |                       | Yield: \(\text{nomE}_Y^{50}\)       | >100                  |
|                                        |                |                       | Biomass: \(\text{nomE}_B^{50}\)     | >100                  |
| Higher aquatic plants                  |                |                       |                    |                       |
| *Lemna gibba*                          | a.s.           | 14 d (static)         | Frond number: \(\text{nomE}_n^{50}\) | 0.0128 mg a.s./L (OXON)|
|                                        |                |                       | Growth rate: \(\text{nomE}_r^{50}\) | 0.412 mg a.s./L (OXON)|
|                                        |                |                       | Biomass: \(\text{nomE}_b^{50}\)     | 0.0133 mg a.s./L (OXON)|
| *Lemna gibba*                          | Metabolite MT26 (GS 14260, terbutryn) | 14 d (static) | Frond density: \(\text{mmEC}^{50}\) | 0.025                  |
| *Myriophyllum aquaticum*               | Metabolite MT26 (GS 14260, terbutryn) | 14 d (static) | Root fresh weight: \(\text{nomEC}^{50}\) | 2.0 mg/kg (sediment) |

Microcosm or mesocosm tests

Higher tier data are available, but insufficient information is currently available to derive an endpoint.

\(^1\) nominal (\(\text{nom}\)) or mean measured concentrations (\(\text{mm}\)).
\(\text{E}_n^{50}\): effect concentration on frond number

In the case of preparations indicate whether end points are presented as units of preparation or a.s.
As discussed in Section B.9.2.4.3.1 of the DAR no definitive acute toxicity endpoint was derived from the submitted aquatic invertebrate studies as neither of the submitted studies used a suitable method to determine the amount of terbuthylazine in solution. However, the studies were considered to be of adequate quality to clearly demonstrate that terbuthylazine is of less toxicity to aquatic invertebrates than other aquatic species and therefore the risk assessment for fish is deemed to cover the aquatic invertebrate risk assessment.

As discussed in Section B.9.2.4.5 of the DAR no definitive toxicity endpoint for aquatic invertebrates was determined for either of the submitted aquatic invertebrate studies. However, as for the a.s. both studies were considered suitable to clearly demonstrate the formulations are of less toxicity to aquatic invertebrates than other aquatic species and therefore the risk assessment for fish is deemed to cover the aquatic invertebrate risk assessment.

**Groundwater**

Metabolite TERs for aquatic organisms when groundwater becomes surface water calculated for the Piacenza scenario, assuming a 0.844 kg a.s./ha application of terbuthylazine in Southern Europe. Metabolites LM3 and LM5 calculated from the Hamburg scenario with an application rate of 850 g/ha. Metabolite LM6 calculated from the Thiva scenario with an application rate of 850 g/ha.

| Time scale      | Organism                  | Toxicity endpoint µg/L | Diluted groundwater PEC µg/L² | TER   | Annex VI trigger value |
|-----------------|---------------------------|------------------------|-------------------------------|-------|------------------------|
| MT1 (desethyl-terbuthylazine) | Acute Fish               | LC₅₀ 18000             | 0.1429                        | 125962| 100                    |
|                 | Acute Aquatic invertebrate| EC₅₀ 42000             | 0.1429                        | 293912| 100                    |
|                 | Algae                     | E₆C₅₀ 140              | 0.1429                        | 980   | 10                     |
| MT13 (2-hydroxy-terbuthylazine) | Acute Fish               | LC₅₀ >2500             | 1.283                         | >1949 | 100                    |
|                 | Acute Aquatic invertebrate| EC₅₀ >2800             | 1.283                         | >2182 | 100                    |
|                 | Algae                     | E₆C₅₀ >3800            | 1.283                         | >2962 | 10                     |
| MT14 (desethyl-hydroxy-terbuthylazine, GS 28620) | Acute Fish               | LC₅₀ 15000¹            | 0.3627                        | 41356 | 100                    |
|                 | Acute Aquatic invertebrate| EC₅₀ 15000¹            | 0.3627                        | 41356 | 100                    |
|                 | Algae                     | E₆C₅₀ 15000¹           | 0.3627                        | 41356 | 10                    |
| LM3             | Algae                     | E₆C₅₀ 39000            | 3.88                          | 100515| 10                     |
| LM5             | Algae                     | E₆C₅₀ 100000           | 4.62                          | 216450| 10                     |
| LM6             | Algae                     | E₆C₅₀ 100000           | 9.24                          | 108225| 10                     |

¹ The study authors proposed the acute fish and *Daphnia magna* L/EC₅₀ for MT14 was >100 mg/L and the EC₅₀ to algae to be 30.7 mg/L. However, these values are greater than the water solubility of MT14 (18 mg/L) and therefore the Rapporteur has reservations in accepting quantified toxicity endpoints. The water solubility of MT14 is 18 mg/L and therefore to assume the saturation level (the amount of MT14 in solution under the conditions of the study) of 15 mg.
a.s./L is not unreasonable. Assuming the acute fish LC$_{50}$, acute *Daphnia magna* EC$_{50}$ and the algae EC$_{50}$ are 15 mg/L a TER of 2617.3 is calculated which clearly demonstrates that metabolite MT14 does not pose a high risk to fish, aquatic invertebrates and algae

**Ecotoxicologically relevant compounds** (consider parent and all relevant metabolites requiring further assessment from the fate section)

| Compartment   |          |
|---------------|----------|
| soil          | Terbuthylazine |
| water         | Terbuthylazine, metabolite MT26 (terbutryn), desethyl terbuthylazine, |
| sediment      | Terbuthylazine |
| groundwater   | None      |

**Classification and proposed labelling with regard to ecotoxicological data** (Annex IIA, point 10 and Annex IIIA, point 12.3)

| Active substance | Commission Regulation (EU) 2017/776  
Aquatic Acute 1 (H400) with an M-factor of 10  
Aquatic Chronic 1 (H410) with an M-factor of 10. |