Evaluation Manual for the Authorisation of Plant protection products according to Regulation (EC) No 1107/2009

NL part

Plant protection products

Chapter 6 Fate and behaviour in the environment; behaviour in surface water and sediment

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ctgb

Board for the Authorisation of Plant protection products and Biocides

Chapter 6 Fate and behaviour in the environment; behaviour in surface water and sediment

Category: Plant protection products

Important changes with the last version of the E.M.

Evaluation manual PPP NL part Chapter 6 Behaviour in surface water and sediment Version 2.0; January 2014		**Evaluation manual PPP NL part Chapter 6 Behaviour in surface water and sediment Version 2.1; October 2016**	
Paragraph and page number	Short explanation of old EM situation	Paragraph and page number	New situation in the updated E.M.
2.1 – 2.4	No division between field use and protected use	2.1-2.4	Throughout a division between the assessment for field uses and protected crops is given The Dutch Hoofdlijnenakkoord Zuivering Glastuinbouw has been added
2.3.3		2.3.3	Procedure for non-standard TWA concentrations added.
2.3.4.2	Old format text concerning monitoring data from pesticidesatlas.nl	2.3.4.2	New format text concerning monitoring data from pesticidesatlas.nl, new correlation analysis. Additional information concerning WFD versus authorisation threshold added. Role of Ctgb in Emission

			Reduction Plans specified.
2.4.1		2.4.1	Non-relevance assessment for surface water metabolites in surface water intended for drinking water is added based on extrapolation of the guidance document on non-relevance of groundwater metabolites.
Appendix 1			Decision tree has been updated to reflect changes in data requirements and changes in assessment framework
Appendix 2	For downward spraying only 50-75-90% spray drift reducing nozzles are mentioned.		Consequences of change in Activity Decree (expected entry into force date January 2017) have been implemented. - For downward spraying spray drift reducing nozzles are replaced with spray drift reducing techniques in order to facilitate the transition to the use of drift reducing technology (DRT) classes. - Requirement of minimum reduction of 75% on the whole field has been added (Activity Decree). The procedure and conditions for the use of 95% spray drift reduction techniques are added - For fruit cultivation it is stressed that the Activity decree requires 75% reduction + 4.5 m crop free zone or 90% spray drift reduction in combination with a 3 m crop free zone - The use in hop will be assessed on the basis of the drift values for dormant trees. Activity Decree change is expected to enter into force in January 2017. Conditions under which 95%

			spray drift reduction can be requested are specified. For the first tier assessment of crops not included in the Activity decree a value of 5.4% is used representing a conventional spraying technique. Application in reed added (100% spray drift)
Appendix 3		Appendix 3	Section added on drinking water assessment for protected crops.

GENERAL INTRODUCTION

This chapter describes the data requirements for estimation of the behaviour of an active substance in a plant protection product and its metabolites, degradation products and reaction products in surface water and sediment and how reference values are derived in the NL framework (§2 - §2.5).

I BEHAVIOUR IN SURFACE WATER AND SEDIMENT

2. NL FRAMEWORK

The NL framework (§2 - §2.5) describes the authorisation procedure for plant protection products based on active substances, included in Commission Implementing Regulation (EU) No 540/2011.

The plant protection product that contains such substances may be authorised if the criteria laid down in Regulation (EC) No 1107/2009 are met, also taking into account the national stipulations described in the Bgb (Plant protection products and Biocides Decree). The evaluation dossiers must meet the requirements in Regulation (EU) No 283/2013 and Commission Regulation (EU) No 284/2013 of Regulation (EC) No 1107/2009 (see Type of application).

A Member State may deviate from the EU evaluation on the basis of agricultural, phytosanitary and ecological, including climatological, conditions which are specific for that Member State, in this case the Netherlands.

The NL framework describes the data requirements (§2.2), evaluation methodologies (§2.3), criteria and trigger values (§2.4) for which specific rules apply in the national approval framework or when the national framework has been elaborated in more detail than the EU framework.

2.1. Introduction

This chapter describes the procedure to determine estimated or measured concentrations in surface water and sediment following normal agricultural applications (field uses and protected uses (e.g., greenhouse and walk-in tunnels)). Evaluation of the aspect behaviour in surface water and sediment with regard to emission routes to surface water deviates from the EU evaluation methodology for field uses, and a NL-specific methodology is followed.

This is because the Netherlands have their own NL-specific spray drift values data base, based on the geographical and climatological circumstances. A NL-specific scenario for emission to surface water via drainage pipes is not yet available (see section developments). Emission to surface water via atmospheric deposition is described in *Chapter 6 fate and behaviour in the environment: behaviour in air*.

The following water systems are distinguished in the national risk assessment:

- edge-of-field ditch: relevant for the risk assessment for organisms that depend on surface water and/or sediment (aquatic and sediment organisms, and birds and mammals (through consumption of surface water and secondary poisoning), see also *Chapter 7 Ecotoxicology; aquatic organisms*, and 7. *Ecotoxicology; terrestrial organisms; birds and mammals*. The following further subdivision is relevant for the exposure assessment:
    - Field uses
    - Protected uses (specifically greenhouse uses, for which some national specific choices and options are described)

- Drinking water abstraction points: relevant for the assessment of the drinking water criterion for surface water intended for the production of drinking water (this Chapter).

For the assessment of the emission to the edge-of-field ditch, a decision tree with corresponding explanatory notes is presented in Appendix 1 to this chapter. This decision tree summarises the approval framework for the behaviour in surface water and sediment (edge-of-field ditch).

For the assessment of the drinking water criterion for surface water intended for the production of drinking water, the schematic decision trees are presented in Appendix 3.

The other points described in this chapter are further elaborations of the EU procedure.

2.2. Data requirements

The data requirements for chemical Plant protection products are in agreement with the provisions in EU framework (see §1.2 of the EU part). NL-specific data requirements and further interpretations of the EU data requirements are given in the text below. For the other general chemical parameters of a substance that are required as model input data reference is made to Chapter 2 Physical-chemical properties.

2.3. Risk assessment

The evaluation methodologies for chemical Plant protection products are in agreement with the provisions described in EU framework (see §1.3 of the EU part). NL-specific evaluation methodologies and further elaborations of the EU procedures are given in the text below.

Please note that for non-professional use the dose rate in kg/ha may be corrected to match a maximum acreage of 500 m2.

2.3.1. Edge-of-field ditch

The exposure concentration (Predicted Environmental Concentration (PEC)) is the model-calculated concentration in surface water and sediment. The calculations are based on the maximum specified frequency and the minimum specified interval for the use in question.

The risk assessment procedure differs for the field uses and protected uses.

Field uses

The exposure concentration as result of spray drift is calculated with the TOXSWA programme according to the Plant protection products and Biocides Decree (Bgb) (Appendix I). The spray drift values used for exposure assessment used in NL framework are described in various spray drift tables (standard values and values with mitigation). These tables are included in Appendix 2 to this chapter.

The TOXSWA model (v1.2, GUI 1.0) is used for determination of the concentration of an active substance in a standard ditch by emission via spray drift. All processes and process parameters considered in TOXSWA, including spray drift percentage, are based on research relevant for the Netherlands. This means that the model is tailored to the NL situation. For determination of the PEC, agricultural use in compliance with the prescribed method of application (GAP) is assumed. Loading of surface water and sediment by agricultural use of Plant protection products is only based on drift of spray mist (spray drift).

The most important substance-related input parameters of the TOXSWA model are:

- Geometric mean DT50 for degradation rate in surface water at 20°C (days)
- Geometric mean DT50 for degradation rate in sediment at 20°C (days)
- Arithmetic mean K_{om} and corresponding arithmetic mean 1/n for suspended organic matter (L/kg) (if not available use K_{om} soil)
- Arithmetic mean K_{om} and corresponding arithmetic mean 1/n for sediment (L/kg) (if not available use K_{om} soil)
- Saturated vapour pressure (Pa) usually available at 20 or 25 °C
- Solubility in water (mg/L) usually available at 20 or 25 °C
- Molecular mass (g/mol)

A conversion factor of 1.724 is used to translate K_{oc} into K_{om}.

The degradation parameters should be derived in line with FOCUS Guidance Document on Degradation Kinetics (SFO or pseudo-SFO). When no separate degradation half-lives (DegT50 values) are available for the water and sediment compartment (accepted level P-II values), the system degradation half-life (DegT50-system, level P-I) is used as input for the degrading compartment and a default value of 1000 days is to be used for the compartment in which no degradation is assumed. This is in line with the recommendations in the FOCUS Guidance Document on Degradation Kinetics. The other model parameters are applied in accordance with the standard settings of the TOXSWA model.

For a summary of the risk assessment methodology for water and sediment we refer to the decision tree with explanatory notes, presented in Appendix 1 to this chapter. National spray drift values can be applied on the basis of article 8f of the Plant protection products and Biocides Decree (Bgb). The loading of surface water and sediment is calculated on the basis of the spray drift percentage values as presented in Appendix 2 to this chapter.

Protected crops

The "EFSA Guidance Document on clustering and ranking of emissions of active substances of plant protection products and transformation products of these active substances from protected crops (greenhouses and crops grown under cover) to relevant environmental compartments" *(in short: EFSA Guidance Document on Protected crops)* has entered into force in the Netherlands as of March 2016.

For a description of the risk assessment on EU level (substance approval or (inter)zonal authorisation assessment) refer to the EU part of the Evaluation Manual. In principle emission from greenhouses is not a Dutch specific issue. However the GEM model contains several scenarios that are specifically tuned to conditions in The Netherlands. Furthermore several policy choices are made in The Netherlands that may not be the same as requirements of other member states. Hence in this Chapter national deviations from or additions to the guidance document are further elaborated upon.

In the guidance document a subvision between non-permanent covers, walk-in tunnels, greenhouses and closed buildings is made, each with a different (tiered) exposure assessment.

Non-permanent covers

Use under non-permanent covers is assessed as field use. This means that for the Dutch assessment a TOXSWA 1.2 simulation is required. See field uses for the assessment methodology.

Walk-in tunnels
Walk-in tunnels are to be assessed via EU methodology (see Chapter 6 surface water, EU part). No specific NL scenarios are available.

Greenhouse uses
For the estimation of exposure to surface water resulting from greenhouse uses the Greenhouse Emission Model (GEM) is developed. The Guidance Document on Protected crops mentions two example scenarios ("soil bound chrysanthemum in the Netherlands" and "non-soil bound rose in the Netherlands", both available in GEM).

In the Dutch decision tree and the resulting simulation model GEM several scenarios were developed that are representative for the Dutch situation.

Soil-bound uses (see Wipfler et al., WUR-Alterra report 2388, 2015)
The Guidance Document on Protected crops states that "the models generally used to calculate leaching and drainage from open-field cultivation can equally well be used to calculate leaching and drainage from walk-in tunnels and greenhouses *if appropriate scenarios are available*. […]

Appropriate scenarios are to be established/selected by the notifier and the selection and parameterisation is to be justified, until methodology and scenarios are established and approved by competent bodies. However currently there are no such models available and only example scenarios have been presented in the guidance."

As a tiered approach the walk-in tunnel assessment i.e. up to FOCUS Step 3 Drainage scenarios may be used as a first tier, as is also proposed in the EFSA Guidance Document Appendix D. Refer to the EU part of the Evaluation Manual.

In the second tier the chrysanthemum scenario available in GEM can be used (as also indicated in Table 1 of the Guidance Document), using conservative input parameters.

The most important substance-related input parameters of the GEM model for the soil-bound scenario are:

- First tier: Longest hydrolysis DT50 for degradation rate in water at 20°C within the greenhouse (days), refinement possible in higher tier (e.g., OECD 309, outdoor mesocosms)
- Geometric mean DT50 for degradation rate in soil at 20°C (days).
    - *Please note that in the scenario report it is recommended to adjust the DT50 values obtained in open field soils by a default factor of 10 in the absence of a thorough dataset to account for the presumably slower degradation in greenhouse soils. The Dutch ministries have decided that this adjustment factor will not be used until more experience has been gained with the model.*
- Geometric mean DT50 for degradation rate in surface water at 20°C (days)
- Geometric mean DT50 for degradation rate in sediment at 20°C (days)
- Arithmetic mean K_{om} and corresponding arithmetic mean 1/n for suspended organic matter (L/kg) (if not available use K_{om} soil)
- Arithmetic mean K_{om} and corresponding arithmetic mean 1/n for sediment (L/kg) (if not available use K_{om} soil)
- Saturated vapour pressure (Pa) usually available at 20 or 25 °C
- Solubility in water (mg/L) usually available at 20 or 25 °C
- Molecular mass (g/mol)

Further refinement can be made in Tier 3 (substance data and time window) and Tier 4 (crop management i.e. realistic scenarios for other crops than chrysanthemum). The report states that although the soil-bound scenario is based on application by spraying, it can also be used for soil applied plant protection products (PPP) e.g. fungicides.

Non-soil bound uses (see Van der Linden et al, RIVM report 607407005, 2015 [provisionary])
For soilless cultivation a simple tiered approach is described in the guidance document (Appendix D). For the drip irrigation, two simple calculation methods are provided as a conservative approach. For spray applications it is suggested to take into account the amount of condensation water as a total dose per season applied at once (step 1).The model GEM with the soil-less scenario in rose is given as highest tier in the EFSA Guidance Document. Refer to the EU part of the Evaluation Manual.

The model GEM also contains additional scenarios to the rose scenario that is mentioned as example scenario in the guidance document. In total there are four available crop scenarios: rose, tomato, sweet pepper and ficus, which were discerned based on the leading emission factors sodium tolerance and transpiration. All greenhouse grown crops of the Dutch DTG list can be chosen in the model and the model will then use the most appropriate crop scenario.

Depending on the applied for use the most appropriate scenario needs to be used.
As various application methods can be used in a greenhouse several substance fate models are available within GEM:
Model A: application by drip irrigation/in nutrient solution.
Model B: spray/fog application to crop grown on shielded slabs (drip irrigation system.
Model C: spray/fog application to crops grown in pots in an ebb/flow system.

The non-soil bound scenario was developed with the possibility to choose between two temporal percentiles: the 50th and the 90th percentile (see scenario description). This percentile is largely governed by the flow velocity of the receiving ditch. The Dutch Ministries of Economic Affairs and Infrastructure and Environment have chosen to use the 50th temporal percentile and the 90th temporal percentile factor will not be used for national authorisations until more experience has been gained with the model.

The most important substance-related input parameters of the GEM model for the substrate scenarios are:

- The equilibrium sorption coefficient K_{OM} (L kg-1) to substrate (specific for pot plants). In case no specific information is available it is suggested to use the sorption coefficient for soil here.
- Half-life in recirculation water (d) and the temperature at which it was measured. In case no specific information is available it is suggested to use the DegT50 for hydrolysis.
- Molar activation energy (kJ mol-1) for the degradation in recirculation water. It is suggested to use a molar activation energy of 75 kJ mol-1.
- Half-life in the disinfection tank (d) and the temperature at which it was measured. In case no specific information is available it is suggested to use the DegT50 for hydrolysis.
- Half-life on the greenhouse floor (d). In case no specific information is available it is suggested to use 100 d.
- Half-life in substrate (d). In case no specific information is available it is suggested to use the DegT50 for degradation in soil.
- Geometric mean DT50 for degradation rate in surface water at 20°C (days).
- Geometric mean DT50 for degradation rate in sediment at 20°C (days).
- Half-life in greenhouse air (d) and the temperature at which it was measured. It is suggested to use the half-life in air here, when available, otherwise a half-life of 100 d could be used.
- Molar activation energy (kJ mol-1) for the degradation in greenhouse air. It is suggested to use a molar activation energy in air of 45 kJ mol-1.

If water is discharged from the cultivation system via a water purification system (e.g. active carbon filter, UV or ozone treatment system), the user can specify the removal efficiency of the system by pressing the 'Mitigation' button and entering the removal fraction. The reduction is applied to both discharge of recirculation water as well as filter cleaning water.

Since October 2015 the "Hoofdlijnenakkoord waterzuivering in de glastuinbouw" entered into force in the Netherlands. This agreement between several stakeholders in the Netherlands focuses on synchronising the authorisation procedure with the Activity Decree (Activiteitenbesluit[1]) in which a generic 95% purification for greenhouses is prescribed from 2018 onwards.

In this policy agreement it is laid down that for the authorisation of uses for which 95% or less purification is needed to pass the aquatic risk assessment, Ctgb will not restrict the use on the label until 2018 (delayed purification restriction).

If more than 95% purification is needed to achieve an acceptable aquatic risk, the applicant can submit an adequate risk assessment with refinements of substance properties (e.g., realistic degradation or sorption in recirculation systems) and management properties (e.g., waiting periods, recycling of filter rinse water) using GEM that in combination with 95% reduction results in an acceptable risk for aquatic organisms.

If more than 95% purification is still required after substance or parameter refinement Ctgb will judge on a case by case basis whether a more restricted use can be granted.

For further guidance on the use of the model refer to the GEM manual.

Closed buildings
For closed buildings, emission to surface water is not assessed on an EU level since there is no established methodology. The Guidance Document on Protected crops does not fill in this data gap. In the absence of an EU harmonised approach, some national approaches for exposure assessment to STP and/or surface water are described in the EU part of the Evaluation Manual.

2.3.2. Drinking water abstraction points

Surface water destined for the production if drinking water should meet the drinking water criterion. For most active substances in plant protection products this drinking water limit is 0.1 µg/L.

Field uses
Agricultural use (professional use)
For the assessment of surface water destined for the production of drinking water at **agricultural use** the methodology developed in the WG "Implementatie drinkwatercriterium" is followed (Adriaanse et al, 2008, Alterra report 1635). The methodology exists of 2 tiers: pre-registration modelling and post-registration monitoring.

The pre-registration modelling tier (first tier) is based on the model DROPLET that starts with a FOCUS D3 edge-of-field scenario cf. FOCUS 2001 but with Dutch spray drift values.
From the edge-of-field concentration the concentration at the abstraction point is calculated by multiplying with factors accounting for e.g. (i) the relative crop area, i.e. the ratio of the area of

[1] The actual version of the Activity Decree can be found at http://wetten.overheid.nl/zoeken

the crop and the entire intake area, (ii) market share, reflecting that the active substance is not used on the entire area of a crop, (iii) difference in timing of applications within the area of use, (iv) degradation and volatilisation from the edge-of-field watercourse to the abstraction point and (v) (in very specific case) additional dilution by a lake or incoming river.

The post-registration monitoring tier (highest tier) for the relevant substances, see below for interpretation) consists of an analysis of monitoring data on all abstraction points. A 90th percentile value is calculated for each individual abstraction point.

In fact, for all substances pre-registration modelling is the first tier. However jumping in tiers is possible.
The interpretation of Ctgb of the WG report/decision tree is therefore as follows:

- The analysis of post-registration monitoring data is only relevant for substances that have been indicated (on a yearly basis) as substances of concern by the VEWIN.
- For substances that have been on the market for over 3 years at the time of the assessment and are not included on the list of substances of concern, there is no need to analyse monitoring data or perform model calculations (a standard paragraph is added to the assessment)
- For new substances on the Dutch market (< 3 years) pre-registration modelling is needed. If modelled concentrations exceed the drinking water criterion, first, (spray drift) reducing measures should be proposed. If then the use of the substance is still predicted to exceed the drinking water criterion but with a factor < 5, authorisation could be granted under condition of post-registration monitoring.

For the full text please refer to Alterra report 1635 and the user manual of DROPLET (Van Leerdam et al, 2010, Alterra 2020). A decision tree is presented in Appendix 3.

Agricultural use (non-professional use)
The developed decision trees and models are not suitable for non-professional (agricultural) use since the area of use cannot be described adequately. Therefore as an approximation a more qualitative assessment following the interim decision tree or RAT factor approach should be used (see Appendix 3) based on the PECsw as calculated with TOXSWA.
Alternatively, a DROPLET assessment based on the corresponding professional use may be submitted as a conservative approach.

Non-agricultural use
For the pre-registration assessment of surface water destined for the production of drinking water after **application to hardened surfaces** a separate methodology was developed by the WG “Implementatie drinkwatercriterium” (Linders et al., 2010, RIVM report 601450021 together with Addendum and calculation tool, Van der Linden, 2016).
See Appendix 3 for a short description.

Protected crop uses
The developed decision trees and models are not suitable for protected use since the area of use (greenhouses) is not taken into account in DROPLET. Therefore as an approximation a more qualitative assessment following the interim decision tree should be used (see Appendix 3), based on the PECsw calculated with GEM (or one of the lower tier calculation methodologies for protected crops).

2.3.3. Refinement options for PEC calculations

Options to refine the risk assessment on the exposure side by decreasing the exposure concentrations are:

- Higher tier data on the fate of a substance in the aquatic environment (including sediment) or within the greenhouse,
- Mitigation of the exposure by spray drift reducing technologies (field use) and end-of-pipe water purification measures or management refinements (greenhouse).

Supplementary research to establish the fate of the active substance(s) in representative aquatic (model) ecosystems (including sediment) should be in accordance with the requested use of the product and relevant for the Dutch agricultural and climatologic situation.

Another way to adjust (predicted) exposure concentrations is the prescription of the use of emission mitigating measures/techniques (spray drift for field uses, purification for greenhouses). The spray drift mitigation options are described in Appendix 2 (Drift Tables) for the field uses.

Please note that Ctgb considers that in view of the changed definition in the Activity Decree (drift reduction on the whole field instead of only in the 14 meter bordering the surface water body) any additional drift reduction resulting from the authorisation assessment also applies to the whole field (see Appendix 2 for more details on the change in the Activity Decree).

Refined exposure calculations might be combined with a refined adequate risk assessment for aquatic organisms, as included in *Chapter 7. Ecotoxicology; aquatic*.
This may include argumentation that a time-weighted average (TWA) concentration is relevant for risk assessment. For the calculation of TWA concentrations for another time window than standard available in the TOXSWA output (i.e., 4, 21 and 28 days) please refer to the working instruction on the Ctgb website.

2.3.4. Use of monitoring data

2.3.4.1. Introduction

Monitoring data are taking into account in the risk assessment, provided that these meet qualitative and quantitative requirements as described below.

An essential condition for the application of monitoring data in the evaluation of the permissibility of Plant protection products is that it must with reasonable certainty be possible to establish a plausible causal relationship between the use in compliance with legal instructions for use and the monitoring concentration of a Plant Protection Product in the environment.

When such a relationship is lacking, monitoring data can have a warning function, making a study into the possible risks desirable. This also means that monitoring data in the context of the evaluation of the permissibility will have to meet a number of quality criteria such as, e.g., regarding the number of measurements, set-up of measurements etc.
Currently two existing types of data sets are taken into account:

1. Surface water quality monitoring from an eco(toxico)logical perspective (water boards, gathered in Pesticide atlas, paragraph 2.3.4.2)

and

2. monitoring data for surface water destined for the production of drinking water (Vewin data, paragraph 2.3.4.3).

Furthermore, general criteria were set up to assess the acceptability of other/additional monitoring data sets not described below (a reference to these criteria is made in paragraph 2.3.4.4).

2.3.4.2. Monitoring data for surface water (ecotoxicological quality)

In principle, monitoring data are higher tier data in the context of a tiered risk assessment. However, monitoring data in surface water are of limited use as refinement for registration purposes, as monitoring may not adequately capture the initial exposure relevant for the aquatic risk assessment. Therefore, the absence of exceedance based on monitoring data cannot be used as such to overrule the predicted concentrations. Furthermore monitoring in surface water is often performed in other waterbodies than in the edge-of-field ditch which is the relevant waterbody for the registration. If however monitoring data show that there is threshold exceedance further assessment is triggered.

Regular screening monitoring data of the various water boards are gathered in the Pesticide Atlas, maintained by CML, part of Leiden University). It is verified that the data in this Atlas comply with the criteria set below for Category 1 data. On a yearly basis Ctgb provides an update of the relevant aquatic thresholds for authorisation to CML. The Pesticide Atlas includes a statistical correlation analysis between concentrations, threshold exceedance and land use that may indicate probable relationships. In this version also the correlation analysis of land use with the environmental quality standards (EQS) of the Water Framework Directive (WFD) is included.

Data from the Pesticide Atlas are used to evaluate potential exceedances of the authorisation threshold and environmental quality standards (MKN in Dutch, data source http://www.rivm.nl/rvs/Normen). These environmental quality standards consist either of the harmonised WFD thresholds (AA-EQS and MAC-EQS) derived according to the Fraunhofer methodology as laid down in RIVM report 601782001 or of an MPC value (which is usually derived on the basis of outdated guidance).

If an exceeding of the authorisation threshold is observed, first an analysis of land use with the exceeding is made by reviewing the correlation analysis on www.bestrijdingsmiddelenatlas.nl. The applicant is requested to submit a further adequate risk assessment when the authorisation threshold is exceeded and a relation with the proposed use is plausible (*i.e.*, when a statistically significant correlation between threshold exceedance and land use is found).

The applicant should then substantiate that the proposed use does not contribute to the exceeding, or submit a proposal for emission reduction. If there is a correlation of exceeding with already authorised uses, this will be mentioned as a signal for future (re-)registrations of the product.

Ctgb is not the responsible authority for the examination of the WFD threshold. WFD thresholds are essentially identical to the MPC-INS which is laid down in the RGB in the way that these thresholds are derived (*i.e.* following the earlier mentioned Fraunhofer methodology). However there has been a status change with regard to the role of this MPC-INS in the authorisation procedure for plant protection products. Until 2011 the MPC-INS was included as an authorisation criterion in the RGB (article 2.10). In 2011 an adaptation of the RGB was made due to the implementation of 1107/2009 EC. It is now laid down in the RGB that Ctgb can calculate the MTR-INS on request (article 8.11).

In the project Decision Tree Water “Terugkoppeling monitoring naar toelating” a plausible cause analysis protocol (De Werd & Kruijne, 2013) was developed that also uses the Pesticide Atlas as data source for monitoring data. As a transitional measure, awaiting the implementation of the work of the working group *Terugkoppeling Monitoring naar Toelating*, Ctgb has until now considered monitoring data in relation to exceedance of EQS values(MPC-INS).

The result of the Working Group has been implemented in the Emission Reduction Plan (ERP) approach. This implementation of the Emission Reduction Plan is steered by the Ministry of Infrastructure and Environment and aims at reduction of the threshold exceedance with regard to the WFD thresholds. Ctgb is not the responsible authority to address any potential exceedance of the WFD thresholds.

When the applicant concludes that the authorisation conditions need to be amended, an application for label change can be proposed. Ctgb will judge whether the proposed emission reduction will be adequate and amend the label accordingly.

Hence, Ctgb continues to report monitoring data in relation to ecological threshold exceedance but will only draw consequences when the authorisation threshold is exceeded and a plausible relation with the relevant land use is present (statistically significant correlation as defined by the Pesticide Atlas).

2.3.4.3. Monitoring data at Drinking water abstraction points (drinking water quality)

The Vewin assembles the monitoring data of all drinking water companies into a data set comprising all drinking water abstraction points in surface water and supplies these data to Ctgb on a yearly basis. It is verified that the data of the Vewin comply with the criteria set below for Category 1 data. Furthermore, the Vewin data are designated by the WG drinking water criterion to be used in the authorisation procedure.

A causal or statistical correlation with land use cannot be made because of the more diffuse source of the surface water reaching the drinking water abstraction points. Therefore the criterion of a plausible causal relation up to specific crops or applications is not applicable to this assessment. However, it should be clear that a substantial part of the source of the substance is agricultural before the monitoring data will affect authorisations of PPP.

2.3.4.4. Additional monitoring data

When an applicant wishes additional monitoring data to be considered in the evaluation, these should meet certain criteria and the monitoring protocol should be discussed with the Ctgb on beforehand. The Ctgb criteria for taking additional monitoring data into account are described in Evaluation Manual version 1.0, G6 water, NL part, 2.3.5.4 (2010).

2.4. Approval

The evaluation of products on the basis of existing active substances already included in Commission Implementing Regulation (EU) No 540/2011 or new substances has been laid down in Regulation (EC) No 1107/2009. Where no European methodology is agreed upon, a national methodology is applied as described in the Plant protection product and Biocides Decree (Bgb).

2.4.1. Criteria and reference values

The concentration in surface water and sediment as determined according to the methods in this chapter are primarily used for assessment of the risk to aquatic organisms. The ecotoxicological criteria and reference values have been laid down in the section Ecotoxicology; aquatic organisms. Furthermore, the concentration in surface water is relevant with regard to the secondary poisoning assessment for fish-eating birds and mammals, see section Ecotoxicology; birds and mammals.

The criterion laid down for surface water intended for drinking water production is that the concentration of any active substance and the metabolites formed from that active substance must be lower than 0.1 µg/L. A separate decision tree is available for this assessment (see Appendix 3).

In the case of metabolites that are declared non-relevant with regard to groundwater this non-relevance can be extrapolated to surface water intended for the abstraction of drinking water. This is sustained by the Guidance Document (GD) on non-relevant metabolites where it is stated in the introduction that: "*This guidance document focuses on groundwater, though the general approach may also be applicable for the regional management of **surface water resources intended for the abstraction of drinking water** in Member States.*"

2.4.2. Decision making

The procedure for taking a decision on approval regarding the risk to aquatic organisms has been elaborated in chapter 7 Ecotoxicology; aquatic.

The criterion laid down for surface water intended for drinking water production is that the concentration of any active substance and the metabolites formed from that active substance must be lower than the drinking water threshold laid down in the Drinking Water Directive (0.1 µg/L for organic substances).

2.5. Developments

The following developments will be implemented in the coming years. For the moment, assessment is based on either the old situation or on interim methodologies as described in this Chapter.

- Introduction of the new model DRAINBOW (Working group Water, "blootstelling waterorganismen"). Expected in 2017/2018. Aspects that will (or might) change as a result of the Working Group's progress:
    - spray drift differentiation for field crops (edge-of-field) based on minimum agronomic crop-free zone
    - introduction of spray drift matrix with spray drift reducing technologies (DRT) classes (for edge-of-field exposure assessment) instead of separate techniques/spray drift values;
    - implementation/further development of certification of spray drift reducing technologies into the mentioned classes
    - spray drift data tall fruit dormant and full leaf distinction based on BBCH code instead of fixed date.
    - introduction of emission route via drainage from adjacent field
    - Guidance for the input parameters for degradation in water
- Some of the above aspects will also be affected by the project "Eénduidige voorschriften". The policy advice was finalised at the end of 2015. Up to date there is no clear effectuation of this advice. A management structure for the classification of individual techniques in DRT classes and the translation to label instructions is not fully developed yet. Ctgb will closely follow the developments and when feasible implement this.

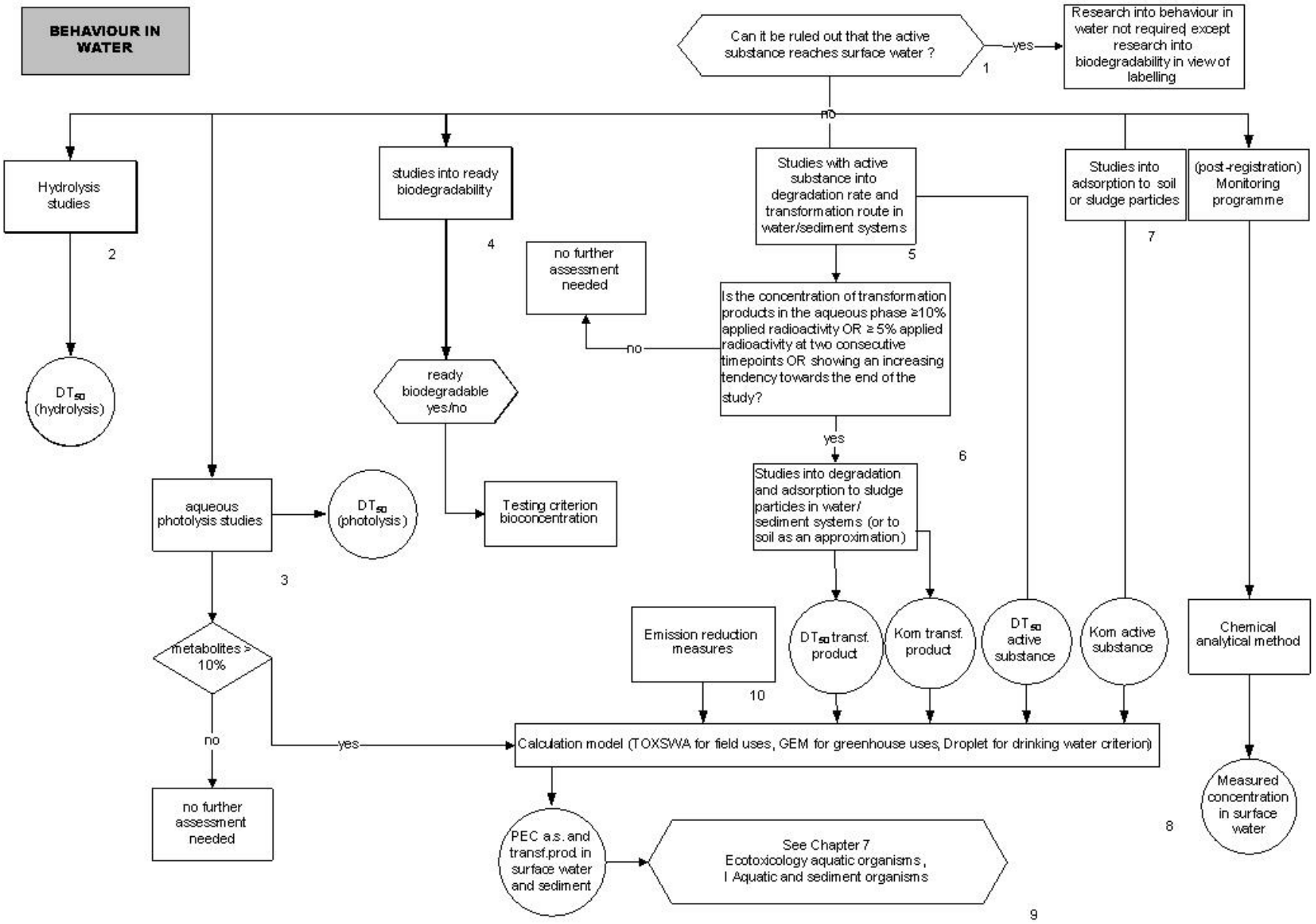
- Dust drift from seed treatments (not NL specific, see EU part of the Evaluation Manual for details)

3. APPENDICES

Appendix 1 Explanatory notes decision tree behaviour in surface water and sediment

1) For each active substance, information concerning behaviour in surface water and sediment (283/2013 7.2) must be provided, unless it can be demonstrated that it can be ruled out that the substance reaches surface water and sediment during good (agricultural) use of the product, according to the WG/GA (Statutory Use Instructions/Directions For Use).
2) For the performance of the hydrolysis study, reference is made to question 283/2013 A2.09.1a and 7.2.1.1. This information is used as background information during the assessment.
3) Data on the photochemical degradation (283/2013 A2.09.2a/A2.09.3a and 283/2013 7.2.1.2 and 7.2.1.3) are used as background information in the assessment. Any photolysis metabolites exceeding the trigger of 10% should be assessed.
4) Data on “ready biodegradability” are required for testing the bioconcentration factor. The criterion for bio-concentration is associated with the degree of biodegradability ‘ready biodegradable’ / ‘not ready biodegradable’ of a substance.
5) A study in water must be conducted into the dissipation (disappearance) of the active substance, and the transformation of the active substance into its degradation products (283/2013 7.2.2.). The routes through which the transformation processes take place, and the rates of the transformations must, where possible, be determined.
6) Toxicologically or ecologically relevant degradation products in the aqueous phase are degradation products formed in the aqueous phase of which the laboratory research into the degradation in a water/sediment system at any point in time showed an amount higher than or equal to 10% or 2x5% or increasing towards the study end of the added amount of active substance. For these metabolites, data on the rate of degradation and sorption are required.
   NB For toxicologically or ecologically relevant degradation products in the sediment phase formed in the sediment phase in a water/sediment system after 14 days the trigger for further assessment remains to be 10% of the added amount of active substance. For these metabolites, data on the toxicity for sediment organisms are required.

7) The data obtained on adsorption to soil can be used (see 283/2013 7.1.3) for evaluation of the adsorption of the test substance to suspended solids and sediment..
8) The exposure (Predicted Environmental Concentration (PEC)) is the value calculated by a calculation model, taking into consideration the frequency of application. When calculating the concentration of a Plant Protection Product in surface water and sediment, the relevant emission routes of the product to surface water and sediment should be determined, and the concentration must then be calculated with the appropriate module. For the current Dutch assessment of Plant protection products, the emission route spray drift is considered for field uses (TOXSWA) and emission from greenhouses is addressed in GEM.
9) In the assessment diagram concerning the risk to aquatic organisms, the PEC is related to toxicity data of the different tested aquatic organisms, for which reference is made to the next Chapter 7 Ecotoxicology; aquatic.
10) In a refined exposure assessment, emission reducing measured can be applied to decrease the PEC. Another option for refinement of the exposure assessment is the generation of supplementary data about the fate of the substance in the aquatic environment (including sediment) which may lead to adjustment of the calculated exposure concentration.


BEHAVIOUR IN WATER
Can it be ruled out that the active substance reaches surface water ?
1
yes
Research into behaviour in water not required except research into biodegradability in view of labelling
no
Hydrolysis studies
2
DT50 (hydrolysis)
studies into ready biodegradability
4
ready biodegradable yes/no
Testing criterion bioconcentration
Studies with active substance into degradation rate and transformation route in water/sediment systems
5
no further assessment needed
no
Is the concentration of transformation products in the aqueous phase ≥10% applied radioactivity OR ≥ 5% applied radioactivity at two consecutive timepoints OR showing an increasing tendency towards the end of the study?
yes
6
Studies into degradation and adsorption to sludge particles in water/ sediment systems (or to soil as an approximation)
Studies into adsorption to soil or sludge particles
7
(post-registration) Monitoring programme
Chemical analytical method
aqueous photolysis studies
3
DT50 (photolysis)
metabolites > 10%
no
no further assessment needed
yes
Emission reduction measures
10
DT50 transf. product
Kom transf. product
DT50 active substance
Kom active substance
Calculation model (TOXSWA for field uses, GEM for greenhouse uses, Droplet for drinking water criterion)
PEC a.s. and transf.prod. in surface water and sediment
See Chapter 7 Ecotoxicology aquatic organisms, I Aquatic and sediment organisms
9
Measured concentration in surface water
8

Appendix 2 Spray drift and emission percentages

Framework
National spray drift values can be applied on the basis of Article 8f of the Plant protection products and Biocides Decree (Bgb). Ctgb bases their assessment on average spray drift values determined by WUR-PRI (now Wageningen UR, division Plant research).

Activity Decree
A major general change affecting the use of spray drift values in the assessment of plant protection products is the Entry into force of the new Activity Decree (Activiteitenbesluit), which is expected per January 2017.

Until the entry into force date, the current spray drift values (e.g., 1% for downward spraying, based on 50% spray drift reducing nozzles in combination with a maximum sprayer boom height of 0.50 m above crop canopy and the use of an end nozzle and a crop-free zone of 1.5 m to the top of bank of the waterbody (edge-of-field ditch) as in the Evaluation Manual of 2014 remain valid.

The standard requirement for downward sprayed field applications will become the use of a 75% reducing technique on the whole field instead of the last 14 m of the field.

Furthermore the minimum crop free zone will change from 25 cm to 50 cm (cereals). For fruit culture the standard requirement is the use of 75% reduction in combination with 4.5 m crop free zone, and 90% reduction in combination with 3 m crop free zone.

For applications for authorisation made after the entry into force of this Activity Decree this will be used to determine the standard spray drift value for cultivations that fall within the scope of this Decree.

Please note that Ctgb considers that in view of the changed definition in the Activity Decree (drift reduction on the whole field instead of only in the 14 meter bordering the surface water body) any additional drift reduction resulting from the authorisation assessment also applies to the whole field.

Implementation of DRT classes
The desire for the introduction of DRT (drift reducing technology) classes is based on several policy and scientific developments and can lead to more clear and accessible labels (Instructions for use).

In October 2015 the working group “Eénduidige voorschriften” has given their final advice to the responsible project group. The implementation of DRT classes to achieve easier accessible and clearer labels is not finalised yet.

To this end, there should be a publicly accessible list in which users can check which techniques belong to a certain class. This is not the responsibility of Ctgb. Ctgb will -for the time being- continue to prescribe individual mitigation techniques for fruit culture and lane trees (sideways and upward spraying). For downward spraying the required % spray drift reducing technique will be mentioned on the label, instead of the required % spray drift reducing nozzle. This is a transitional approach awaiting the full implementation of the DRT classes.

Spray drift values

In Table 1 a general overview of the default spray drift percentages used by Ctgb under the new Activity Decree for all crop types is presented. Spray drift values are different for downward sprayed crops (arable crops) and for upward or sideways sprayed crops (fruit and lane trees).

Upward and sideways spraying

For the spray drift values in fruit, all experimental spray drift data up to and including 2005 are used. For the dormant stage data from 1998 are maintained. Furthermore the spray drift percentage for soft fruit was set to the full-leaf values for large fruit based on a literature inventory of actual spray drift data in small fruit cultivation in which it is demonstrated that the field crop spray drift value of 1 % is not protective. In the absence of actual measurements in small fruit, the full-leaf values for large fruit are taken as an approximation.

For the cultivation of lane trees updated spray drift data (2010) were added during the Evaluation Manual update of January 2014.

See Table 2 for a more detailed description for the situation for fruit trees and Table 3 for lane trees.

Downward spraying

Spray drift values based on 75% reduction are only valid for crops covered by the Activity Decree. If applicants wish to apply for other uses (e.g. amenity use and field edges), the spray drift value based on conventional spraying techniques should be used, and mitigation can be proposed as required. See explanatory notes for more detail.

Table 1 Spray drift percentages to be used (standard situations*)

Application	**Subdivision**	**Spray drift %**	**Remarks**
Upward and sideways spraying techniques			
Fruit crops (large and soft fruit) – 3 m crop free zone**	without leaves (dormant)	16.6	Based on 1998 data
	With leaves (full leaf)	8.6	Based on 2005 data
Lane trees – 5 m crop free zone	Spindles (“spillen”, closely spaced)	0.8	Based on 1998 data
	Transplanted trees (“opzetters”, widely spaced)	2.8	Based on 1998 data
	High lane trees	5.8	Based on 2010 data
Downward spraying techniques			
Field crops (including downward sprayed forest trees and hedging plants and flower bulbs/bulb flowers)		For crops covered by the Activity Decree: 0.5 Other crops:	Based on report IMAG 97-04 in combination with a 75% spray drift reducing technique as per the new Activity Decree Differentiation of the spray drift figures to cover different crop-free zones is under development Based on report IMAG 97-04,

		5.4	conventional technique
Special applications	-mud-bank -dry ditch -reed -Knapsack	100 100 100 1.2	see explanatory notes
Applications without spray drift	See explanatory notes	0	

* Spray drift-mitigation measures will be discussed in more detail in the explanatory notes below.

** for small fruit (grapes, berries, …) the full leaf situation is used as an approximation for the exposure assessment, since

- the use of spray drift values from downward directed spraying is too best-case (inventory report Van de Zande J.C., M. Wenneker, A. de Bruine. 2011. Inventarisatie kleinfruitteelten en afleiden driftdepositie en maatregelpakketten*. PRI report 398.*)
- the full leaf values are comparable in order of magnitude with the EU spray drift values for vines (Rautmann)

Explanatory notes spray drift percentages

General

The proposed spray drift percentages are derived from research by the Wageningen UR division Plant Research (WUR-PRI).

On an individual basis an applicant/registration holder can request Ctgb to consider additional spray drift-mitigation measures and corresponding spray drift percentages for a particular application. These spray drift percentages must be supported by reliable scientific data.
The additional measures should be realistic and enforceable. Below, specific mitigation options are described per crop/application type.

Explanation per crop/application

Upward and sideward spraying

Fruit crops (including soft fruit and hop cultivation)

Large fruit (pome- and stone fruit/top fruit)
Standard spray drift percentages are based on a crop-free zone of 3 meter (standard situation, see Table 1).

However, the Activity Decree (version 2017) prescribes that in large fruit a 75% drift reducing technique is compulsory, in combination with a crop free zone of 4.5 m. A crop free zone of 3 meter is only allowed when a drift reducing technique of at least 90% is used. These reduction percentages apply to the full leaf stage.

The spray drift measurements of WUR-PRI –the basis of the Ctgb spray drift table- also include techniques that may not meet the requirements from the Activity Decree. These are greyed out and should not be used for labelling of plant protection products, because then the authorisation would provide less strict mitigation than the Activity Decree. They can be used in the assessment to show that authorisation can be granted based on higher spray drift values.
Users of plant protection products should always comply to the rules of the Activity Decree.

An exception to this is the biological cultivation, which may use a crop free zone of 3 meter without any spray drift reduction. If for a product for which an application for authorisation is made it is clearly indicated on the label (instructions for use) to be applicable for biological cultivation, Ctgb will use the default spray drift values. Any required additional mitigation should then be stated on the label.

The mitigation measures based on application techniques and crop free zones combinations that are not included in the conditions defined in the Activity Decree cannot be used in practice.

Applicants should consider this when using the spray drift mitigation measures as indicated in Table 2 in their assessment and when proposing mitigation on the label (WG).
For completeness (and for biological production systems) also the old standard situation is included. A distinction is made between spray drift values in the dormant stage and in the full-leaf stage. This distinction is now fixed to the date of May 1st. In future, the spray drift curves will be based on BBCH codes (see section on developments in main text).

The spray drift values for the full-leaf stage are based on the WUR-PRI spray drift database up to 2005 [2]. For the dormant stage, values from 1998 are retained (these values were not based on experiments but extrapolated based on an estimated factor with regard to the spray drift data set in full-leaf). The limited data set of experimental values in the dormant stages up to 2005 are lower than the 1998 extrapolated values. However, newer (still unpublished) spray drift measurements have extended the data set of 2005 and the new data set shows higher values than the 2005 data alone. Therefore the 1998 data are retained for the dormant stage. These values are valid for *fungicide* and *insecticide* treatments. See Table 2.

For *herbicide* use in fruit trees, downward spraying is applicable. WUR-PRI reported spray drift values of 0.026 % for “zwartstroken” (bare soil surface strips) below the trees and 0.07 % for the grass vegetation between the trees (“grasstroken”) [3]. See Table 2.

Soft fruit (berries and grapes)
Based on an inventory report by PRI[4] it was decided in 2014 that for sideways or upwards sprayed soft fruit (grapes and berries) the large fruit spray drift values are used. For all application periods, only the full-leaf values are used. This is done to acknowledge the difference between large fruit and small fruit as established by Rautmann and Ganzelmeier (basis for EU spray drift values) to some extent.
With regard to the crop-free zone it is concluded in the PRI 398 report that although according to the Activity Decree the obligatory distance to the ditch for small fruit is only 0.5 m, in practice the distance is about 3 meter. This is in line with the minimum distance set for large fruit. Therefore the use of the spray drift values of large fruit (minimal crop-free zone 3

[2] Van de Zande J.C. & Huijsmans J. 2012 Notitie update driftcijfers fruit voor een nieuwe Ctgb drifttabel. Intern PRI report 07-03-2012

[3] Stallinga, H., J.C. van de Zande, A.M. van der Lans, P. van Velde & J.M.G.P. Michielsen, 2012. Drift en driftreducerende spuittechnieken voor onkruidbestrijding in de boomteelt. Referentie techniek en driftreducerende spuitdoppen, Veldmetingen 2010-2011. Wageningen UR Plant Research International, Plant Research International Rapport 454, Wageningen.

[4] Van de Zande J.C., M. Wenneker, A. de Bruine. 2011. Inventarisatie kleinfruitteelten en afleiden driftdepositie en maatregelpakketten. PRI report 398.

m) is defensible at this stage.
The use of the full-leaf spray drift values for large fruit also for small fruit must be seen as a transition phase until sufficient actual measurements leading to separate spray drift values for soft fruit are available.

After consultation with WUR-PRI, the following spray drift mitigation options from Table 2 are considered realistic for use in soft fruit:
- all described spray drift reducing nozzles
- tunnel sprayer
- windbreak on the edge of the driving track and one-sided spraying of the last tree row

Hop cultivation
For the sideways and upward application in hop no spray drift deposition values are available. Hop cultivation in The Netherlands is usually 3-4 meter high (Limburg)
For the assessment the values applicable to tall fruit in the dormant stage are used, based on expert judgement of WUR-PRI (now Wageningen UR division Plant Research, personal communication, 2014). The default value for the assessment is hence 16.6%. Based on practical applicability the following spray drift mitigation measures can be accepted for hop:
- Wanner with reflection shields and 90% (venturi) spray drift nozzles (0.8% spray drift, see Table 2)
- KWH k1500-3R2 VLOS and 90% spray drift nozzles (0.7% spray drift, see Table 2).

The use of a standard (axial) orchard sprayer with venturi-nozzles is not recommended as the larger droplet size will not reach the top of the crop and hence efficacy will be impaired.

Spray drift mitigation techniques and spray drift deposition values
See Table 2 for a description of all spray drift-mitigation measures for large fruit. A division was made to acknowledge the *preliminary* classification into DRT classes (based on expert judgement of WUR-PRI). Please note that a 75% spray drift reducing technique in combination with 4.5 m crop free zone or a 90% spray drift reducing technique in combination with a 3 m crop free zone is the requirement laid down in the Activity Decree. All options that do not comply to these qualifications have been greyed out.
An exception is the windbreak measure. Since this is not a technique this measure is not classified in any of the DRT classes.
Please note that with the entry into force of the new Activity Decree Ctgb considers that all additional mitigation measures should also apply to the whole field.

Table 2: Spray drift values for various spray drift-mitigation measures in comparison with standard fruit growing situations

Spray drift percentage [%]				
Spray drift-mitigation measure top fruit	**Crop-free zone of 3 m**		**Crop-free zone of 4.5 m**	
	Without leaves (dormant)	with leaves (full-leaf)	Without leaves	with leaves
Standard orchard sprayer* [x]	16.6	8.6	10.3	6.3
Standard orchard sprayer [x] + 6 m crop-free zone	6.9	4.7	n.a	n.a.
Standard orchard sprayer [x] and emission shield (2.5 m high)	6.7	3.4	6.7	3.4
Standard orchard sprayer [x] and one-sided spraying of last tree row	9.8	4.7	6.5	3.3

Standard orchard sprayer [x] + 9 m crop-free zone	3.6	2.7	n.a.	n.a.
Standard orchard sprayer [x] in combination with windbreak on the edge of the driving track and one-sided spraying of the last tree row	7.0	0.9	7.0	0.9
DRT50 (Preliminary classification)				
Sensor-controlled spraying	12.8	4.1	7.4	3.0
Cross flow fan sprayer with reflection shields	7.5	3.9	4.6	2.8
Wanner equipment with reflection shield and standard nozzles [xxx]	4.8	3.4	3.3	2.8
50% spray drift reducing nozzle and one-sided spraying of the last tree row	-[xxxx]	2.7	-[xxxx]	1.8
DRT75 (Preliminary classification)				
Tunnel sprayer	2.5	1.3	1.6	1.0
75% spray drift reducing nozzle and one-sided spraying of the last tree row	-[xxxx]	2.0	-[xxxx]	1.2
KWH k1500-3R2 VLOS 3-row sprayer with variable air support system and standard nozzles [xxxxx]	8.3	1.7	5.0	1.4
DRT90 (Preliminary classification)				
90% spray drift reducing nozzle and one-sided spraying of the last tree row	2.5	1.0	1.0	0.7
KWH Mistral VLBS with 90% spray drift reducing nozzles (540 rpm) [xxxxx]	-[xxxx]	0.75	-[xxxx]	0.54
DRT95 (Preliminary classification)				
90 % spray drift reducing nozzle+ one-sided spraying last tree row and reduced air fan setting [xx]	1.3	0.36	0.6	0.26
Wanner equipment with reflection shield and 90% spray drift reducing nozzles (Lechler ID 90-015C) [xxx]	0.8	0.41	0.42	0.29
95% spray drift reducing nozzle and one-sided spraying of the last tree row	-[xxxx]	0.8	-[xxxx]	0.31
KWH k1500-3R2 VLOS 3-row sprayer with variable air support system and 90% spray drift reducing nozzles [xxxxx]	0.70	0.43	0.32	0.25
KWH k1500-3R2 VLOS 3-row sprayer with variable air support system and 90% spray drift reducing nozzles and low air setting (400 rpm pto) [xxxxx]	0.65	0.05	0.23	0.04
KWH Mistral VLBS with 90% spray drift reducing nozzles and low air setting (400 rpm) [xxxxx]	-[xxxx]	0.30	-[xxxx]	0.15

Herbicide use in orchards (downward spraying)			
		3 m crop free zone	**4.5 m crop free zone**
"Zwartstroken" (bare soil surface strip underneath tree)	Standard nozzle	0.026	0.023
	50% spray drift reducing nozzle + end nozzle	0.016	0.012
	90% spray drift reducing nozzle + end nozzle	0.007	0.007
	Shielded sprayer -	0.010	0.010

	standard nozzles		
	Agricult LVS	0.04	0.035
"Grasstroken" (grass surface area in orchard)	Standard nozzle	0.07	0.07
	50% spray drift reducing nozzle + end nozzle	0.026	0.026
	90% spray drift reducing nozzle + end nozzle	0.008	0.008
	Shielded sprayer - standard nozzles	0.014	0.014
	Agricult LVS	0.07	0.07

* relevant for biological production
x valid for cross-flow fan and axial fan orchard sprayer
xx fan setting off in dormant and low in full-leaf stage
xxx M. Wenneker, R. Anbergen, N. Joosten, J.C. van de Zande, 2006. Emissiereductie bij inzet van een Wannerspuit met reflectieschermen in de fruitteelt; PPO report nr. 2006-13
xxxx data not available yet
xxxxx Stallinga, H., M. Wenneker, J.C. van de Zande, J.M.G.P. Michielsen, P. van Velde, A.T. Nieuwenhuizen & L. Luckerhoff, 2012. Drift en driftreductie van de innovatieve drierijige emissiearme fruitteeltspuit van KWH. Veldmetingen 2011. Wageningen UR Plant Research International, Plant Research International Rapport 458, Wageningen.
xxxxx Stallinga, H., P. van Velde, J.M.G.P. Michielsen, M. Wenneker, J.C. van de Zande, 2016. Driftreductie KWH Mistral boomgaardspuit met VLBS – effect van doptype en luchthoeveelheid. Wageningen UR Plant Research International, Plant Research International Rapport 643, Wageningen.

Lane trees

For the growth of lane trees, separate spray drift percentages are used based on research by PRI, A distinction is made between the growth of "spillen" (spindles; closely spaced trees) and "opzetters" (transplanted trees; widely spaced trees) because of the differences in tree shape, and the resulting differences in spray drift emission. Spindles form dense rows (plant distance 30 cm), whilst transplanted trees are planted further apart (1 m plant distance), are taller, and often have bare lower trunk.

Based on the available PRI data set including spray drift reducing techniques[5], spray drift deposition values are presented in Table 3. These values are valid for fungicide and insecticide treatments (sideways and upwards). Again, as for fruit trees, combinations of crop-free zones and techniques that are not in accordance with the policy aims of the Activity Decree and are not certified by the TCT (Technische Commissie Techniekbeoordeling) are indicated with a grey shading.

For *herbicide* use in lane trees, downward spraying is applicable. See Table 3.

Table 3: Spray drift values for various spray drift-mitigation techniques in comparison with standard lane trees growing situations

Spray drift percentage [%]		
Spray drift-mitigation technique lane trees	**Crop-free zone of 1.5/2 m (agronomic minimum zone)**	**Crop-free zone of 5 m (Activity Decree)**
High lane trees (>5 meter)	**2 m**	
Standard axial sprayer (TXB8003)	17.1	5.8
Mast sprayer (XR80015)	11.0	4.9
Mast sprayer (Venturi ID90015)	9.8	1.6

[5] Van de Zande J. & Huijsmans J. 2012 Notitie update driftcijfers laanbomenteelt voor Ctgb. Intern PRI report 07-03-2012

Standard axial sprayer + 5 m crop free*	2.3	0.9
Mast sprayer (XR80015) + 5 m crop free*	2.2	1.7
Mast sprayer (Venturi ID90015) + 5 m crop free*	0.12	0.09
Transplanted trees	**2 m**	
Standard axial sprayer	10.4	2.8
Standard axial sprayer + 5 m crop free*	1.1	0.33
Axial sprayer + 50 % spray drift reducing nozzles**	5.4	1.1
Axial sprayer + 75 % spray drift reducing nozzles**	4.8	1.5
Axial sprayer + 90 % spray drift reducing nozzles**	6.7	0.72
Axial sprayer + 95 % spray drift reducing nozzles**	2.5	0.19
Spindle trees	**2 m** **1.5 m**	
Standard axial sprayer	2.7 3.4	0.76
Standard axial sprayer + 5 m crop free*	0.28 0.35	0.09
Axial sprayer + 50 % spray drift reducing nozzles**	1.2 1.5	0.32
Axial sprayer + 75 % spray drift reducing nozzles**	1.1 1.2	0.43
Axial sprayer + 90 % spray drift reducing nozzles**	0.17 1.2	0.05
Axial sprayer + 95 % spray drift reducing nozzles**	0.17 0.43	0.05

Herbicide use in tree nursery (downward spraying)		
soil surface underneath trees and up till 0.50 m from edge of surface water	standard nozzle	0.07
	50% spray drift reducing nozzle + end nozzle	0.026
	90% spray drift reducing nozzle + end nozzle	0.008
	shielded sprayer - standard nozzles	0.014
	Agricult LVS	0.07

* in this 5 m crop free zone only non-sprayed crops of the same height can be grown. These crops are eligible from CIW report referred to in the explanatory notes of the Activity Decree, Artikel 3.80: *Op grond van het vijfde lid moet voor de opwaarts bespoten boomkwekerijgewassen, zoals laan- en parkbomen, een teeltvrije zone van tenminste 500 cm worden aangehouden. In de teeltvrije zone mogen gewassen geteeld worden waarin geen gewasbeschermingsmiddelen worden gespoten. Dit komt overeen met de CIW-aanbevelingen[1] voor de vergunningverlening, waarin bovendien een lijst van gewassen is opgenomen die niet bespoten worden.*

[1] Commissie Integraal Waterbeheer, 1998, Protocol opwaarts spuiten (laan)bomen.

NB: Please note that this option is not originally intended as spray drift reducing measure, but as a means to use the crop free zone space for non-sprayed trees. Furthermore Article 3.80 states that non-sprayed crops of the same height MAY be grown but does not say SHOULD be grown. If this is not done, there is no spray drift mitigating effect. Therefore Ctgb interprets this measure as: an ADDITIONAL crop free zone of 5 m should be used, in which non-sprayed trees of the same height may be grown. Hence the total crop free zone is 10 m when using this mitigation technique.

** extrapolated from fruit

Downward spraying

Field Crops (including downward sprayed forest trees and hedging plants, and flower bulbs
Spray drift percentage: 0.5%.

In the first tier assessment, the starting point up to now was the obligatory use of 50% spray drift-reducing nozzles in the edge of the field (last 14 m of the field) in combination with a maximum sprayer boom height of 0.50 m above crop canopy and the use of an end nozzle to prevent overspray and a crop-free zone of 1.5 m adjacent to the water body.
With the entry into force of the new Activity Decree the use of a 75% spray drift reducing technique on the whole field will be obligatory. Based on the existing database this means that the default spray drift value for the pre-registration calculations will be 0.5 %.

As spray drift mitigation can be achieved both with spray drift reducing nozzles as with spray drift reducing techniques Ctgb will after the entry into force of the new Activity Decree (expected January 2017) prescribe the use of spray drift reducing *techniques* instead of spray drift reducing *nozzles*. This will facilitate the transition of the product label towards the future situation in which DRT (drift reducing technology) classes will be used.
Eligible spray drift reducing nozzles and techniques, classified according to drift reduction classes by the TCT (Technische Commissie Techniekbeoordeling), are listed on the website of Helpdesk Water.

The first tier assessment is based on the obligatory use of a 75% spray drift-reducing technique on the whole field . For this situation, a spray drift emission of 0.5 % is available, based on spray drift data of WUR-PRI for potatoes with a crop-free buffer zone of 1.5 m. Currently this spray drift value is also used for all other field crops with downward spraying, irrespective of the specific (agronomic) crop-free buffer zone.

In reality, crops are separated in the Activity Decree into three main groups based on their minimal obligatory crop-free zone (up to now: cereals: 25 cm, intensively cultivated crops: 75 cm and remaining crops: 50 cm). Please note that after the entry into force of the changes in the Activity Decree (expected January 2017) the minimum crop free zone is 50 cm for both cereals and remaining crops.

In the decision tree currently under development by the WG Water, spray drift differentiation between crops on the basis of crop-free buffer zones will be implemented on the basis of WUR-PRI data. These differentiated spray drift values will be implemented in the new exposure model for the Dutch edge-of-field ditch (implementation expected in 2017/2018), or sooner depending on developments in other projects (e.g., Eénduidige voorschriften).

Refined assessment
If further spray drift reduction than 75% is necessary to meet the ecotoxicological threshold values, the use of 90 % spray drift reducing techniques can be requested by the applicant. The corresponding spray drift values used for the assessment is 0.2 % (90 % spray drift reducing technique) for all field crops.

Furthermore, it is possible to consider additional measures with accompanying spray drift percentages on an individual basis for each application and crop combination on the basis of specific spray drift research by WUR-PRI submitted by the applicant.

The Ctgb currently does not accept the generic use of additional mitigation measures

because the actual national assessment framework does not take into account the differentiation of crop free zones for different crops. This could lead to severe underestimation of the real spray drift values, especially for crops that are grown with a small crop free zone. If the level of spray drift reduction is higher, this effect will become more pronounced. For the current use of 75% and 90% spray drift reduction this is not taken into account due to historic insights, but Ctgb is of the opinion that this historic situation should not be extrapolated to higher levels of spray drift reduction.

Hence, Ctgb only accepts the use of additional spray drift mitigation on a case by case basis if this is substantiated with a spray drift deposition calculation that takes into account the specific crop-free zone and nozzle position to last crop row for the specific use under consideration.

At this moment 95% spray drift reducing techniques may be accepted for use in the authorisation process. The use of 97.5 and 99% reducing techniques in downward spraying may be technically feasible but from a policy perspective these are still under discussion and is therefore not recommended for use in the assessment. A division into DRT classes (including the 95% reduction class) has been proposed in the published report of the Working Group Water "blootstelling waterorganismen" on spray drift[6].

Deviating spray drift values for specific crop related techniques
WUR-PRI has indicated that the crops forest trees and hedging plants (downward sprayed) is considered to be sprayed with boom sprayers like a common field crop, and that the same percentage can be used based on the same assumptions as described above. In practice, however, a specific spraying technique is often used in specific regions (i.e. on small parcels in the Boskoop region), *i.e.*, a hand-held spray boom. From field experiments (IMAG Nota 98-31[7]) the following spray drift values are available:
- 1.2 % for standard nozzle.
- 0.6 % for 50 % spray drift reducing nozzle or a shielded standard spray nozzle.
However these techniques do not necessarily meet the 75% spray drift reduction that is now laid down in the adapted Activity Decree (2017). As these values are also applied for non-professional applications with a knapsack (assuming a crop-free zone of 0.50 m), they are maintained in the Evaluation Manual.

Greenhouse Applications
For all greenhouse uses a pseudo-spray drift value of 0.1% was used in the past to account for all types of emission. From March 2016 onwards the Greenhouse Emission Model (GEM) should be used instead. The use of the 0.1% as spray drift has therefore become obsolete. See main text of this chapter.

Special Applications (field)
For mud-banks and dry-ditch beds, a default spray drift value of 100 % applies. This is also valid for reed as a worst case estimate, taking into account the wet environment of the crop applied for.

- Knapsack (handheld equipment)

[6] Zande, J.C van de, H.J Holterman & J.F.M Huijsmans. 2012. Spray drift for the assessment of exposure of aquatic organisms to plant protection products in the Netherlands. Part 1: field crops and downward spraying . WUR-PRI Report 419, Wageningen. Table 4, page 18.
[7] Driftreductie in de lage boomteelt bij een bespuiting met een handgeduwde spuitboom, een afgeschermde spuitboom en een dichte afscherming op de perceelsrand, IMAG nota 98-31

For hand held equipment (*rugspuit/spuitlans*) a spray drift percentage of 0.6 % is assumed when a 50 % spray drift reducing nozzle or a shielded standard spray nozzle is used. For knapsack application without mitigation a value of 1.2 % applies. These values are based on a crop free zone of 0.50 m (extrapolated from the forest trees and hedging plants spraying technique).

These spray drift values can only be used for applications by non-professional users (*particulier gebruik*). For non-professional application with small spraying cans a value of 0.5 % is used.

Applications without spray drift

A spray drift percentage of 0% applies for:

1) Enclosed spaces (indoor uses, not greenhouses and walk-in tunnels):
   a. storage cells and
   b. shower rooms and comparable enclosed spaces;
2) witloof/chicory (forcing)
3) Specific field applications:
   a. application of granules using a specially mounted granule sprinkler,
   b. drenching,
   c. dipping,
   d. foaming,
   e. placing of bait,
   f. injection of soil/plant,
   g. treatment of plant base
   h. smearing,
   i. jointing,
   j. treatment of furrow,
   k. dosing pistol or comparable apparatus, and
   l. seed treatment.

Developments

Differentiated spray drift percentages for downward sprayed crops

As mentioned above, it is anticipated that Ctgb will switch to differentiated percentages for each crop tuned to the minimum agronomic crop-free zone based on a spray drift matrix that is properly substantiated by new scientific insights. Implementation of these differentiated percentages will be upon instruction from the ministries to use the new Dutch exposure surface water model DRAINBOW or sooner depending on developments in other projects (e.g., Eénduidige voorschriften).

Distinction bare-full leaf situation in fruit

Change of date distinction to BBCH/growth stage distinction for fruit (WG water). This will be implemented upon instruction from the ministries to use the new Dutch exposure surface water model DRAINBOW.

Appendix 3 Decision tree Drinking Water Criterion

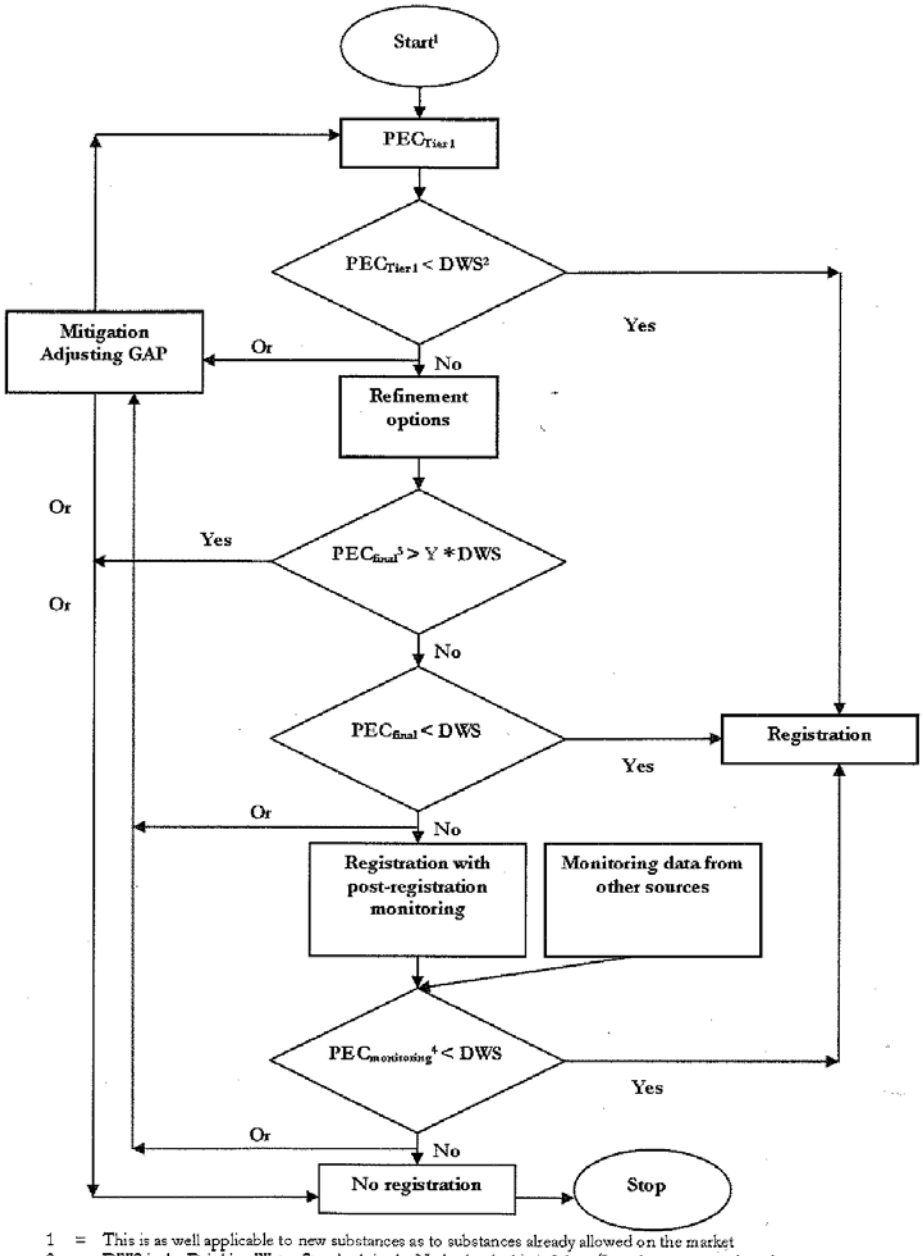
FIELD USES

PROFESSIONAL USE

1. AGRICULTURAL CROP TREATMENTS

For the assessment of the drinking water criterion, Ctgb uses the decision tree as developed by the Working Group Implementation Drinking Water Criterion (see Alterra report 1635) from January 2010 onwards.

The decision tree from the report is presented below.



1 = This is as well applicable to new substances as to substances already allowed on the market
2 = DWS is the Drinking Water Standard; in the Netherlands this is 0.1 µg/L at the moment when the report was issued
3 = In case no refined assessment has been applied the PEC_{final} is $PEC_{Tier\ 1}$
4 = Before making a decision it has to be analysed whether the substance is of Dutch origin or not

Tier I calculation:
The equation to calculate the substance concentration in the surface water at the abstraction points ($PEC_{Tier\ I}$) reads:

$$PEC_{TierI} = \sum_{all}^{crops} ((PEC_{FOCUS\_NL,D3} \cdot f_{corrFOCUSscen}) f_{use\_intensity}) \cdot f_{timing} \cdot f_{dissipation} \cdot f_{add\_dilution}$$

With:

$PEC_{Tier\ I}$	PEC in surface water at location where it is abstracted for drinking water preparation (µg/L)
$PEC_{FOCUS\_NL,D3}$	global maximum PEC edge-of-field for the FOCUS D3 scenario based upon Dutch spray drift deposition data (µg/L)
$f_{corrFOCUSscen}$	correction factor for implicit choices concerning contributing areas made in FOCUS D3 scenario (-)
$f_{use\_intensity}$	factor considering the use of the substance (-)
f_{timing}	factor considering the difference in timing of application within the area of use (-)
$f_{dissipation}$	factor considering the dissipation from the edge-of-field watercourse to the abstraction point (-)
$f_{add\_dilution}$	factor considering additional dilution, e.g. by considerable water flows entering the intake area, or by lakes via which water travels to the abstraction point

Further detailed explanation of these terms is given in Adriaanse et al, 2008, Alterra report 1635.

Tier II evaluation of monitoring data:
The quality criteria to which monitoring data should comply are elaborated in paragraph 5.2.6 of Alterra report 1635. The procedure of evaluation of monitoring data described applies to post-registration monitoring data but can be extrapolated to the evaluation of existing (VEWIN) monitoring data (paragraph 5.3) since no clear guidance is given there.

In short, the procedure is as follows (for details see Alterra report 1635). Ideally the monitoring data should comply with the following criteria (set up for post-registration monitoring purposes for new substances):

- 13 measurements should be available for each drinking water abstraction point each year for the calculation of a 90-percentile value for each calendar year.
- if (due to exceptional circumstances) less than 13 measurements per year are available, the maximum value should be taken and should be below 0.1 µg/L
- if 12 measurements are available per year, the maximum value should also be taken and should be below 0.15 µg/L (explained in note *b* on page 68 of the report)

However, Ctgb considers that it is the responsibility of the water quality managers to decide whether to monitor a specific substance. Hence, any missing data for one or more specific abstraction point(s) for a potentially problematic substance cannot lead to a request for additional information from the applicant.

The 90-percentile value over a 5-year period is to be calculated for each abstraction point. If the 90-percentile over the 5-year period exceeds the threshold, an adequate risk assessment should be provided.

Next to the 90-percentile for 5 years, an analysis per year can be done if sufficient data are available. If the 90-percentile value for one year exceeds the threshold, a problem analysis should be provided.

No overall 90-percentile over the various drinking water abstraction points is calculated. Each individual abstraction point should meet the drinking water limit.

The Ctgb uses the possibility of jumping to higher tiers for the assessment of the drinking water. This means that in practice three categories of substances are distinguished:

1. **New substances** on the Dutch market (< 3 years authorised in NL): A Tier I PEC is calculated according to the methodology in Alterra report 1635. A Tier II cannot be performed yet as there are no monitoring data for new substances. If Tier I fails (with less than a factor 5 exceeding), post-registration obligation will be imposed in order to collect Tier II data for future evaluations of the substance. *(if the VEWIN during the authorisation period indicates that the substance is regarded as a substance of concern on the basis of new, adequate and sufficient monitoring data the substance will move to the third category)*

2. Old (> 3 years authorised in NL) **substances of no concern**: if there are no indications from the VEWIN that the substance is a potential problem for drinking water production, then no Tier I calculations are deemed necessary. The substance meets the drinking water criterion based on the Tier II information (as the available VEWIN monitoring data indicate no problems). *(if the VEWIN during the authorisation period indicates that the substance is regarded as a substance of concern on the basis of new, adequate and sufficient monitoring data the substance will move to the third category)*

3. Old (> 3 years authorised in NL) **substances of concern**: the VEWIN indicated that the substance is a potential problem for drinking water production by including it on a yearly updated list on the basis of monitoring data. In this case, Tier II is used directly (jumping of Tier I) the available monitoring data of the VEWIN of the most recent 5 years at all drinking water abstraction points will be analysed on the basis of the criteria set out in the Alterra report.

The list of substances of concern is yearly updated by VEWIN and published on the VEWIN website (http://www.vewin.nl/probleemstoffen).

For further details refer to Alterra report 1635.

2. NON-AGRICULTURAL USE (USE ON HARDENED SURFACES)

Alterra report 1635 only provides guidance for agricultural applications (direct emission to edge-of-field ditches). For the specific use on hardened surfaces, an assessment methodology is provided to the Ctgb (Linders et al., 2010, RIVM report 601450021 together with Addendum and calculation tool, Van der Linden, 2016.

This methodology takes into account, among other parameters, the ratio of hardened surfaces and total area, the fraction treated area, and flow velocity in the catchment area. This methodology is used for new substances (< 3 years on the Dutch market, in analogy with the agricultural use) with proposed uses on hardened surfaces.

For substances that have been on the Dutch market for more than 3 years the above described procedure in Alterra report 1635 is followed, i.e. evaluation of monitoring data.

NON-PROFESSIONAL USE

1. AGRICULTURAL CROP TREATMENTS

The developed decision trees and models described above are not suitable for non-professional (agricultural) use since the area of use cannot be described adequately.

Therefore the interim decision tree of the Ctgb, as laid down in C-163.5, still applies as a first tier in those situations for new substances (< 3 years on the Dutch market). For full text of C-163.5 see Evaluation Manual version 1.0.

In the interim decision tree, in short, the PIEC in the edge-of-field ditch according to TOXSWA is used as a basis for further calculations. A dilution factor of 10 and a travelling time of 14 days is taken into account to predict the concentration at the drinking water abstraction point. The applicant may also submit a RAT factor approach.

2. NON-AGRICULTURAL USE (USE ON HARDENED SURFACES)

For non-professional use on hardened surfaces, the above approach for non-professional agricultural crop treatments is not entirely applicable. Therefore a qualitative assessment is performed on a case-by-case basis.

For substances that have been on the Dutch market for more than 3 years the above described procedure in Alterra report 1635 is followed, i.e. evaluation of monitoring data.

PROTECTED CROPS

PROFESSIONAL USE

The developed decision trees and models described above are not suitable for greenhouse uses since the area of use is not available in DROPLET. Therefore the assessment is made analogously to the interim decision tree.

The PIEC in the edge-of-field ditch according to GEM (or a lower tier result) is used as a basis for further calculations. A dilution factor of 10 and a travelling time of 14 days is taken into account to predict the concentration at the drinking water abstraction point.

NON-PROFESSIONAL USE

A qualitative assessment is performed on a case-by-case basis.