## Usage Risk Assessment

**Introduction** An assessment of the mobility to surface waters for the proposed application is the third aspect of the drainflow risk decision tree – "Does the product proposed for use contain an active ingredient of concern to water quality, most notably under the Water Framework Directive (WFD), and is it likely to be mobile?" In order to inform this question the mobility of the active ingredients was modelled using the edge of field and catchment fate sub-routines of the Minor Uses Screening Tool.

**Approach** The usage risk assessments were undertaken using an implementation of the CRD Minor Uses Screening Tool (MUSTool). This tool is described fully in the final report of Defra project PS2238. The inputs required for the MUSTool are:

- Compound properties which were taken from European Draft Assessment and Review Reports (See Table 1).
- Application rate and date which were set at predetermined thresholds based on typical application rates and active ingredient concentrations (See Table 2) and made on the 15$^{th}$ of each month.
- Crop treatment proportion, that proportion of the winter wheat and winter oilseed rape assumed to be treated, was extracted from the online FERA pesticide usage survey statistics for the most recent year available (See Table 2). While some regional variation might be expected only the national numbers were used as these are the most reliable.

The edge of field and catchment concentrations for each model run were extracted and stored in a lookup database for use by the web tool.

***Web Tool Design*** The CRD tool is an advanced 3 tier application consisting of a web browser tool that controls a web service calculation layer and a backend database and model data repository. The tool itself consists of an easy to use interface, coded in C# and using Microsoft's Silverlight technology, to provide interactive mapping and intuitive user control whilst retaining the convenience of an online tool. The tool is hosted on a dedicated IIS server system hosted within a climate controlled and monitored facility with daily backups. This structure allows processing to be done on the CRD servers with the users computer requiring only a very minimum specification.

The CRD tool interface provides a simple way for users to gain access to complex model runs without the need to know about complex paramaterisation and inner workings of the models. The CRD tool interacts with a large database of pesticide model simulations through a transparent XML SOAP (Simple Object Access Prototype) webservice based middle layer that translates simple user requests into the the appropriate lookups and calculations required to perform the tool functions. This layer simplifies user inputs from the tool and encourages a rigourous seperation of the tool interface from the model data component. This enables upgrading of model concepts at a later date without need to change the interface. SQL Server 2005 installed on a fast database server system is used as the tool data store and stored procedures have been created to make data management rigourous and efficient in this multiuser tool. The web service component interacts with these stored procedures directly to give a seemless tool whose internal workings are invisible to the user. The CRD tool uses ESRI's ArcServer product and standard data mapping interchange protocols to prepare and show maps within the tool both nationally and locally.

**Table 1: Summary of the compound properties used in the parameterisation of the Minor Uses Screening Tool.**

| Active Ingredient Name | Koc (L/kg) | Soil $DT_{50}$ (days) | Plant Uptake | Ecotoxicological Endpoint (ug/L) | Safety Factor |
|---|---|---|---|---|---|
| 2,4-D | 56 | 13.67 | 0.5 | 270 | 10 |
| Carbendazim | 225 | 30 | 0 | 1.5 | 10 |
| Carbetamide | 88.6 | 11.2 | 0.5 | 1000 | 10 |
| Chlorotoluron | 205 | 92 | 0.5 | 24 | 10 |
| Clopyralid | 4.9 | 36 | 0.5 | 99000 | 100 |
| Cypermethrin | 26492 | 107 | 0 | 0.03 | 10 |
| Fluroxypyr (acid) | 68 | 13.4 | 0.5 | 14300 | 100 |
| Glyphosate (trimesium salt) | 21699 | 49 | 0.5 | 720 | 10 |
| Iprodione | 202 | 26 | 0 | 660 | 100 |
| Linuron | 410 | 135 | 0 | 7 | 10 |
| MCPA | 74 | 41 | 0.5 | 152 | 10 |
| Mecoprop-P | 20 | 8.2 | 0.5 | 200000 | 100 |
| Metaldehyde | 60.4 | 5.1 | 0 | 56000 | 100 |
| Metazachlor | 110 | 6.8 | 0.5 | 0.19 | 10 |
| Propyzamide | 840 | 53.8 | 0 | 4700 | 100 |

**Table 2: Summary of the application rates modelled in the Minor Uses Screening Tool.**

| Active Ingredient Name | Application Rate (kg/ha) | Proportion of winter cereal treated† | Proportion of winter oilseed rape treated† |
|---|---|---|---|
| 2,4-D | 0.1; 0.5; 1; 3 | 0.00258 | 0.00001 |
| Carbendazim | 0.01; 0.05; 0.1; 0.3 | 0.01139 | 0.36125 |
| Carbetamide | 0.1; 0.5; 1; 3 | 0.00574 | 0.08606 |
| Chlorotoluron | 0.5; 1; 3; 5 | 0.12614 | 0.00001 |
| Clopyralid | 0.01; 0.05; 0.1; 0.3 | 0.01568 | 0.23347 |
| Cypermethrin | 0.01; 0.05; 0.1; 0.3 | 0.16469 | 0.026875 |
| Fluroxypyr | 0.01; 0.05; 0.1; 0.3 | 0.27931 | 0.00278 |
| Glyphosate | 0.1; 0.5; 1; 3 | 0.21854 | 0.67151 |
| Iprodione | 0.05; 0.1; 0.5; 1 | 0.00004 | 0.04079 |
| Linuron | 0.1; 0.3; 0.5; 1 | 0.01526 | 0.00007 |
| MCPA | 0.1; 0.5; 1; 3 | 0.02247 | 0.07326 |
| Mecoprop-P | 0.1; 0.5; 1; 3 | 0.19342 | 0.00037 |
| Metaldehyde | 0.1; 0.3; 0.5; 1 | 0.09879 | 0.34013 |
| Metazachlor | 0.1; 0.5; 0.8; 1 | 0.00051 | 0.65004 |
| Propyzamide | 0.1; 0.5; 1; 2 | 0.00011 | 0.36714 |

† taken from http://pusstats.csl.gov.uk/mytreatindex.cfm

**Web Tool Calculations** The web tool requires the following mandatory data from the user in order to undertake an assessment:

1. Location of the field e.g. Easting/Northing of 426173,291339
2. Soil type of drained field being treated e.g. clay loam over clay
3. Crop to be treated e.g. wheat
4. Product planned for use e.g. Buckler
5. Application rate of that product e.g. 1.7 L/ha
6. Date of application e.g. 18/10

The web tool uses this information in the following way in order to derive the results that it presents:

1. Drain Risk – The drain risk that was calculated for the 1km grid cell that underlies that location according to the approach outlined above is extracted. In the example that is “Low”.
2. Drainflow Probability – The drain flow probability for the supplied location is extracted from the MORECS grid square that underlies that location for the crop selected (winter cereal or winter oilseed rape where winter cereal

includes wheat, barley, linseed and triticale) and the week of application. In the example that is “15%”.

3. WFD Concern – The product being applied is checked against the product database for active ingredients. Only active ingredients identified in Defra project PS2242 as having the potential for non-compliance under the Water Framework Directive and that are used on winter cereals and winter oilseed rape will be returned as being of potential WFD concern. In the example that is chlorotoluron “True” and diflufenican “False”.
4. Local Risk – The risk to local water bodies is determined in the following manner: (i) the MUSTool climate region for the provided location is identified, (ii) for that region, crop, soil, month of application and each active ingredient of WFD concern the modelled edge of field (EOF) concentrations for the default modelled application rates that bound the intended user application rate are returned, (iii) the modelled EOF concentration is interpolated linearly to the user application rate between these bounding modelled EOF concentrations. These interpolated EOF concentrations are categorised into risk classes using an ecotoxicological threshold (ET) and a safety factor (SF) extracted from European Draft Assessments and Review Reports (See Table 1) such that:
    i. High Risk: Modelled concentration > ET * SF
    ii. Medium High Risk: Modelled concentration > ET
    iii. Medium Low Risk: Modelled concentration > ET/SF
    iv. Low: Modelled concentration < ET/SF
    v. In the example for chlorotoluron this is “Medium High”
5. Catchment Risk – The risk to drinking water is determined in the following manner: (i) the WFD catchment for the provided location is identified, (ii) for that WFD catchment, crop, month of application and each active ingredient of WFD concern the modelled catchment concentrations for the default modelled application rates that bound the intended user application rate are returned, (iii) the modelled catchment concentration is interpolated linearly to the user application rate between these bounding modelled catchment concentrations. These interpolated catchment concentrations are categorised into risk classes using the drinking water standard (DWS) of 0.1 µg/L and a safety factor (SF) of 50 such that:
    i. High Risk: Modelled concentration > DWS * SF
    ii. Medium High Risk: Modelled concentration > DWS
    iii. Medium Low Risk: Modelled concentration > DWS/SF

iv. Low: Modelled concentration < DWS/SF

v. In the example for chlorotoluron this is “Medium Low”

The instructions for using the tool and interpreting the results are described fully in the User Manual.

**Interpreting The Results** The results from the web tool are presented in a results tab and include the Drain Risk Class, the Drainflow Probability and Active Ingredient Risk Classes. The results produced and what these mean are described below.

*Drain Risk Class* The drain risk classification system makes use of national datasets. Local risk factors for your field(s) may be different and the values presented are meant to serve as a guide ONLY. Always check for agricultural drains and if they are flowing prior to applying pesticides.

| **Drain Risk Class** | **What does this mean?** |
|---|---|
| High | Soils requiring under-drainage are widespread and under-drainage would be intensive |
| Medium High | Soils requiring under-drainage are common and under-drainage may be intensive |
| Medium Low | Soils requiring under-drainage are present but these would probably not be intensively under-drained |
| Low | Few soils that might be under-drained are present and these would probably not be intensively under-drained |
| Very Low | Typically soils in this class would not be under-drained |

*Drainflow Probability* The drainflow probability tool makes use of national datasets and reports modelled values for an average year. Local conditions for your field(s) for the current cropping season may be different and the values presented are meant to serve as a guide ONLY. Always check if your agricultural drains are running or might flow if rainfall is imminent before applying pesticides. Medium and High risk ratings suggest that you should consult your agronomist to discuss your crop protection management plan with respect to water protection.

| **Drainflow Probability Class** | **What does this mean?** |
|---|---|
| High | >80% probability that the drains are already running or being close to flowing at the time of application |
| Medium High | >60% probability that the drains are already running or being close to flowing at the time of |

| | |
|---|---|
| | application |
| Medium Low | >40% probability that the drains are already running or being close to flowing at the time of application |
| Low | >20% probability that the drains are already running or being close to flowing at the time of application |
| Very Low | <20% probability that the drains are already running or being close to flowing at the time of application |

*Active Ingredient Risk Classes* The active ingredient risk classification tool makes use of national datasets and reports modelled values for a representative year and typical practice. Local conditions for your field(s) and catchment for the current cropping season may be different and the values presented are meant to serve as a guide ONLY.

WFD Concern: The active ingredients in the product you plan to use may be a problem under the Water Framework Directive. If they are extra care and attention should be paid when using these products.

Local Risk: Indicator of whether the application regime proposed may impact on local ditches and streams. N/A is returned if this compound is not of WFD concern.

Catchment Risk: Indicator of whether the application regime proposed may impact the quality of drinking water. N/A is returned if this compound is not of WFD concern or the selected location is not within a drinking water protected area or its safe guard zone.

High and medium risk classes for local and catchment risk ratings suggest that you should consult your agronomist to discuss your crop protection management plan with respect to water protection. For all ratings - always be vigilant and keep abreast of Environment Agency and Water Company water quality alerts – if an active ingredient in a product you are using is being detected in surface water you may still be part of the problem and should consult your agronomist.

| Local Risk Class | What does this mean? |
|---|---|
| High | Local water bodies receiving drainflow from fields treated according to the proposed regime are at risk of being impacted |
| Medium High | Local water bodies receiving drainflow from fields treated according to the proposed regime may be at risk of being impacted |
| Medium Low | Local water bodies receiving drainflow from fields treated according to the proposed regime may possibly be at risk of being impacted |
| Low | Local water bodies receiving drainflow from fields treated according to the proposed regime are unlikely to be at risk of being impacted |

| Catchment Risk Class | What does this mean? |
|---|---|
| High | If everyone in your catchment who uses this compound also treated their fields according to the proposed regime the catchment water quality is at risk of being impacted |
| Medium High | If everyone in your catchment who uses this compound also treated their fields according to the proposed regime the catchment water quality may be at risk of being impacted |
| Medium Low | If everyone in your catchment who uses this compound also treated their fields according to the proposed regime the catchment water quality may possibly be at risk of being impacted |
| Low | If everyone in your catchment who uses this compound also treated their fields according to the proposed regime the catchment water quality is unlikely to be impacted |