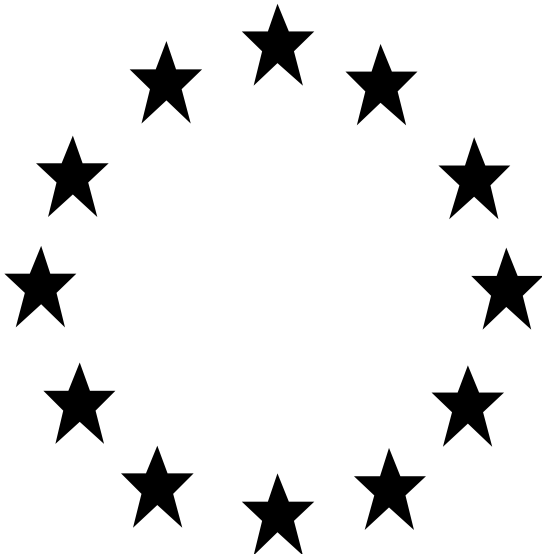

Draft Assessment Report (DAR)

- public version -

Initial risk assessment provided by the rapporteur Member State United Kingdom for the existing active substance

METHOMYL

of the second stage of the review programme referred to in Article 8(2) of Council Directive 91/414/EEC

Volume 1

November 2004

Council Directive 91/414/EEC

Methomyl

Volume 1

Report and Proposed Decision of the United Kingdom made to the European Commission under Article 8(1) of 91/414/EEC

Draft: April 2004

PESTICIDES SAFETY DIRECTORATE
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LEVEL 1

Methomyl

STATEMENT OF THE SUBJECT MATTER AND PURPOSE FOR WHICH THE DRAFT ASSESSMENT REPORT WAS PREPARED

1.1 Purpose for which the draft assessment report was prepared

Council Directive 91/414/EEC established a review programme for all active substances on the Community market by 25 July 1993. This monograph on the review of methomyl has been prepared for submission to the Standing Committee on the Food Chain and Animal Health to enable a decision to be made on the inclusion of methomyl on Annex I of the Directive 91/414/EEC.

1.2 Summary and assessment of information relating to the collective provision of the dossier

DuPont de Nemours (France) S.A.S. and the Makhteshim Agan International Co-ordination Centre notified their interest in securing methomyl Annex I inclusion. However, the two companies did not successfully conclude an agreement on collective provision of data. Only the former submitted a complete dossier.

The dossier submitted by Makhteshim Agan International Co-ordination Centre was found to be substantially incomplete. On this basis the RMS has checked only the identity and impurities of the a.s. in this latter, incomplete, dossier and taken into consideration the information available where this might indicate a greater risk than that identified by the data in the other dossier submitted. **For this second notifier, please refer to the separate report on the Makhteshim-Agan source.**

1.3 Identity of the active substance

1.3.1 Name and address of applicant(s) for inclusion of the active in Annex I (Annex IIA 1.1)

Applicant	DUPONT DE NEMOURS (FRANCE) S.A.S.
Address	DuPont Crop Protection 137, rue de l'Université F-75334 Paris Cédex 07 France
Primary Contact:	[redacted]
Contact and address for correspondence:	[redacted]
Telephone:	[redacted]
Telefax:	[redacted]
Email:	[redacted]

1.3.2 Common name and synonyms (IIA 1.3)

Methomyl (ISO approved), no synonyms

1.3.3 Chemical name (IIA 1.4)

CAS Name:	Methyl N-[[(methylamino)carbonyl]oxy]ethanimidothioate
IUPAC Name:	S-Methyl N-(methylcarbamoyloxy)thioacetimidate

1.3.4 Manufacturer's development code number (IIA 1.5)

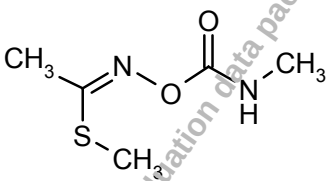
DPX-X1179, IN-X1179

1.3.5 CAS, EEC and CIPAC numbers (IIA 1.6)

CAS registry number:	16752-77-5
CIPAC number:	264
EEC number:	240-815-0

1.3.6 Molecular and structural formulae, molecular mass (IIA 1.7)

Empirical formula	$C_5H_{10}N_2O_2S$

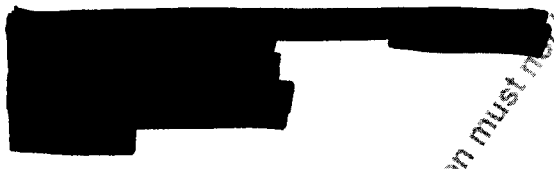


Molecular mass	162.2

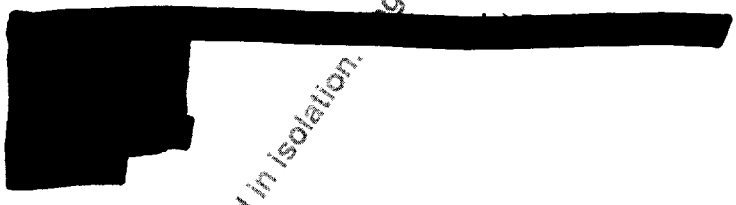
1.3.7 Manufacturers of the active substance (IIA 1.2)

a. Present Manufacturer:

b. Location of Plant(s):



Alternate plant:



c. Future manufacturer (name and address): Same as above

1.3.8 Method(s) of manufacture (IIA 1.8)

Confidential information - See Volume 4 (Annex C), Section C.1.2.

1.3.9 Specification of purity of the active substance (IIA 1.9)

Du Pont: 987 g/kg minimum

1.3.10 Identity of isomers, impurities and additives (IIA 1.10)

Confidential information - See Volume 4 (Annex C), Section C.1.2.

1.3.11 Analytical profile of batches (IIA 1.11)

Confidential information - See Volume 4 (Annex C), Section C.1.2.

1.4 Identity of the plant protection product

1.4.1 Current, former and proposed trade names and development code numbers (IIIA 1.3)

Methomyl 20 SL (synonyms: Lannate 20 SL or Methomex)

1.4.2 Manufacturer(s) of the plant protection product (IIIA 1.2)

a. Present Manufacturer: [redacted]

b. Location of Plant(s): [redacted]

c. Future manufacturer (name and address): Same as above

1.4.3 Type of the preparation and code (IIIA 1.5)

Soluble concentrate (SL).

1.4.4 Function (IIA 3.1, IIIA 1.6)

Agricultural insecticide and acaricide.

1.4.5 Composition of the preparation (IIIA 1.4)

Confidential information - See Volume 4 (Annex C), Section C.1.3.

1.5 Uses of the plant protection product

1.5.1 Field of use (IIA 3.3; IIIA 3.1)

Agriculture. Fruit and fruiting vegetables.

1.5.2 Effects on harmful organisms (IIA 3.2; IIIA 3.2)

The notifier has stated that methomyl belongs to, "*the chemical class of carbamate pesticides. It controls harmful organisms by a neurotoxic mechanism. Toxic effects are fairly rapid, leading to paralysis, and death of arthropods at normal use rates.*

Application of Methomyl 20SL provides effective control of insect and some mite species. The active substance methomyl is neurotoxic and affects the normal functioning of the CNS of the pest species. Nervous system functioning is disrupted by the action of methomyl on the acetylcholinesterase system at the synapse of the nerve axons. Inhibition of the enzyme acetylcholinesterase by methomyl results in the blockage of nerve signals resulting in paralysis and death. Entry of methomyl to the target site is through the cuticle (contact) or by ingestion.

Methomyl 20SL is active as an ovicide, larvicide and adulticide on a number of important species such as Helicoverpa and Spodoptera. In the case of Helicoverpa and Spodoptera, methomyl will kill the larvae inside the eggs on contact, including eggs laid on spray deposits. Sublethal doses on the egg often kill the first larval instar as it emerges from the egg through consumption of the shell. In addition, any emerged neonates can be killed on contact with leaf residues of methomyl.

Methomyl, when applied as Methomyl 20SL, has both contact and stomach activity with rapid knock down effects. Methomyl is active on all larval stages from neonates to 5th instars. Methomyl also has adulticide properties on many species of insect. The activity of methomyl, from a contact perspective, is similar over a broad range of temperatures. Stomach activity may be reduced at low temperatures due to a reduction in feeding intake of treated material. Toxic effects of methomyl are evident within minutes following an application. Thus, methomyl provides rapid knockdown of pests."

1.5.3 Summary of intended uses (IIA 3.4; IIIA 3.3, 3.4, 3.5, 3.6, 3.7, 3.9)

The following uses described in this section are the limited range of representative uses submitted by the Notifier in accordance with Article 6 (2) b of Commission Regulation 451/2000.

Methomyl is an ovicide, larvicide and adulticide on insect pest species in grapes and fruiting vegetables, specifically, courgette, cucumber, tomato and aubergine (sometimes referred to in the text as "field vegetables").

1.5.3.1 Details of intended uses (IIIA 3.3, IIA 3.4)

Table 1.1 Summary of Good Agricultural Practice (GAP) for products containing methomyl formulated as Methomyl 20 SL (soluble conc.)

Crop and/or situation (a)	North (N) or South (S) Europe	Product name	F G or I (b)	Pests or Group of pests controlled (c)	Formulation		Application				Application rate per treatment			PHI (days) (i)
					Type (d-f)	Conc. of a.s. (i)	method kind (g-h)	growth stage & season (j)	number min max (k)	interval between applications (min days)	kg a.s./hL min max	Water L/ha Min max	kg a.s./ha min max	
Cucumber/ Courgette	SE	Methomyl 20 SL	F	Biting and sucking insects	SL	200g/L	MV/HV; foliar	Pre-harvest	1-2	14	0.025 - 0.09	500 - 1,000	0.25 - 0.45	7
Tomato/ Eggplant	SE	Methomyl 20 SL	F	Biting and sucking insects	SL	200g/L	MV/HV; foliar	Pre-harvest	1-2	14	0.025 - 0.09	500 - 1,000	0.25 - 0.45	7
Grape (table & wine)	France (NE); SE	Methomyl 20 SL	F	Biting and sucking insects	SL	200g/L	HV; foliar	Pre-harvest	1-2	14	0. 08 - 0.12	300 -450	0.35	14
Grape (table & wine)	France (NE); SE	Methomyl 20 SL	F	Biting and sucking insects	SL	200g/L	HV; foliar	Pre-harvest	1-2	14	0. 04 - 0.10	> 450 - 1200	0.45	14

Remarks:

(a) For crops, the EU and Codex classifications (both) should be used; where relevant, the use situation should be described (e.g., fumigation of a structure)
(b) Outdoor or field use (F), glasshouse application (G), or indoor application (I)
(c) e.g., biting/sucking insects, nematodes, soil born insects, foliar fungi, weeds
(d) e.g., wettable powder (WP), emulsifiable concentrate (EC), granule (GR)
(e) GCPF Codes – GIFAP Technical Monograph No. 2, 1989
(f) All abbreviations must be explained
(g) Method: high volume spraying, low volume spraying, spreading, dusting, drench; HV = high volume foliar spraying; MV = medium volume foliar spraying

Remarks:

(h) Kind, e.g., overall, broadcast, aerial spraying, row, individual plant, between the plant – type of equipment used must be indicated.
Foliar = foliar spraying
(i) g/kg or g/L
(j) Growth stage at last treatment (BBCH Monograph, Growth Stages of Plants, 1997, Blackwell, ISBN 3-8263-3152-4), including where relevant, information on season at time of application
(k) The minimum and maximum number of application possible under practical conditions of use must be provided
(l) PHI – minimum pre-harvest interval
(m) Remarks may include: Extent of use/economic importance/restrictions

1.5.3.2 Application rate (IIIA 3.4)

Maximum recommended dose rates of Methomyl 20SL

Crop	Rate of plant protection product	Rate of active substance		
		Methomyl		
	L/ha	kg/ha	g/ha	g/hL[a]
Grape (wine & table)	1.75- 2.25	0.35-0.45	350-450	40-120
Tomato/eggplant	1.25-2.25	0.25-0.45	250-450	25-90
Cucumber/ courgette	1.25-2.25	0.25-0.45	250-450	25-90

a Maximum and minimum spray concentration based on a lower and upper spray volume during the season of 300 to 1200 L/ha for grapes and 500 to 1000 L/ha for tomato, eggplant, cucumber and courgette

1.5.3.3 Concentration of active substance in material used (IIIA 3.5)

Methomyl 20 SL contains 200 g/l a.s. (nominal)

The notifier states, "*Methomyl 20SL is typically applied using spray volumes between 300 and 1,200 L/ha in grapes and between 500 – 1,000 L/ha in open field vegetables. A maximum application rate of 2.25 L of Methomyl 20SL per hectare results in active substance concentrations in the spray mixture between 40-150g/hL in grapes. When applied in open field vegetables, an application rate between 1.25-2.25 L of Methomyl 20SL per hectare results in active substance concentrations in the spray mixture between 25-90 g/hL.*"

1.5.3.4 Method of application (IIIA 3.6)

Diluted in water and applied using conventional tractor-mounted hydraulic field sprayers with directed booms, or high- to medium-volume air blast sprayers.

1.5.3.5 Number and timing of applications and duration of protection (IIIA 3.7)

The notifier proposes application at a minimum interval of 14 days with a maximum of 2 applications per year on grapes. The latest first application at BBCH 75 (berries pea-sized, bunches hang); a second 14 days before harvest. The earliest first application would be around BBCH 50 (inflorescence emerges), i.e.,

- An early application occurs late May/early June at BBCH growth stage 50-57 before full flowering (which is BBCH stage 65 = full flowering: 50% of flower hoods fallen[1]).
- A second, late application occurs earliest in early - mid August (BBCH 75) or mid August - mid September.

On fruiting vegetables product will be applied at a minimum interval of 14 days with a maximum of 2 applications per year. The first application can be performed when the first leaves develop, the last at least 7 days before harvest.

1.5.3.6 Necessary waiting period or other precautions to avoid phytotoxic effects on succeeding crops (IIIA 3.8)

For grape, this is not relevant. For the other crops, the notifier contests that there is no restriction required.

1.5.3.7 Proposed instructions for use (IIIA 3.9)

The notifier has provided a draft label.

1.5.4 Information on authorisations in EU Member States (IIIA 12.1)

Methomyl is not currently approved in the UK (Rapporteur Member State) but has been in the past. The notifier has provided the following summary:

Authorised uses (crops, harmful organisms, rates of application, number of applications, timings of applications - growth stages and where appropriate, season)	**Actual uses, if current practice is known to deviate from the authorised uses (crops, harmful organisms, rates of application, number of applications, timings of applications - growth stages and where appropriate, season)**
Austria Lannate® 25WP – Vegetables: Foliar in-door and out-door spray application at 0.04-0.06 kg active substance/hL for the control of biting and sucking foliar insects. PHI = 21 days. Lannate® 25WP – Fruits: Foliar outdoor spray application at 0.02-0.03 kg active substance/hL for the control of biting and sucking foliar insects. PHI = 21 days. Lannate® 25WP – Beets: Foliar outdoor spray application at 0.05 kg active substance/hL for the control of biting and sucking foliar insects. Lannate® 25WP – Grapes: Foliar outdoor spray application at 0.03-0.05 kg active substance/hL for the control of grape berry moth. PHI = 21 days.	**Austria** As per label

[1] U Meier (1997), *Growth stages of plants*, BBCH monograph. BBA. Berlin Wien: Blackwell Scientific Publishing House

Authorised uses (crops, harmful organisms, rates of application, number of applications, timings of applications - growth stages and where appropriate, season)	**Actual uses, if current practice is known to deviate from the authorised uses (crops, harmful organisms, rates of application, number of applications, timings of applications - growth stages and where appropriate, season)**
Lannate® 25WP – Hops: Foliar outdoor spray application at 0.006-0.03 kg active substance/hL for the control of hop aphid. PHI = 21 days.	
Belgium <u>Lannate® 25WP – Pome fruit (apple, pear):</u> Foliar outdoor spray application at 0.0375-0.5 kg active substance/hL for the control of aphids, caterpillars and leaf rollers with a 7 day spray interval. PHI = 21 days. <u>Lannate® 25WP – Tomato/cucumber/lettuce:</u> Foliar indoor spray application at 0.0313 kg active substance/hL for the control of aphids with a 7 day spray interval. PHI = 7 days. <u>Lannate® 25WP – Hops:</u> Foliar outdoor spray application at 0.0313 kg active substance/hL for the control of hop aphid with a 7 day spray interval. PHI = 21 days.	**Belgium** As per label with the exception that indoor applications have a post harvest interval of 3 instead of 7 days.
France <u>Lannate® 20L – Pome fruit:</u> Foliar outdoor spray application max. 3 times at 0.075-0.5 kg active substance/hL for the control of foliar biting and sucking insects. PHI = 7 days. <u>Lannate® 20L – Stone fruit:</u> Foliar outdoor spray application max. 3 times at 0.05-0.075 kg active substance/hL for the control of foliar biting and sucking insects. PHI = 7 days. Lannate® 20L – Grapes: Foliar outdoor spray application 2-3 times at 0.5 kg active substance/hL for the control of grape berry moth and other biting and sucking foliar insects. PHI = 7 days. <u>Lannate® 20L – Leafy vegetables:</u> Foliar outdoor spray application max. 3 times at 0.3 kg active substance/ha for the control of biting and sucking foliar insects. PHI = 14 days. <u>Lannate® 20L – Cabbage:</u> Foliar outdoor spray one application at 0.3 kg active substance/ha for the control of biting and sucking foliar insects. PHI = 7 days. Lannate® 20L – Artichoke: Foliar outdoor spray application max. 3 times at 0.4 kg active substance/ha for the control of biting and sucking foliar insects. PHI = 7 days. <u>Lannate® 20L – Tomato/eggplant/pepper:</u> Foliar in- and outdoor spray application max. 3 times at 0.45 kg active substance/ha for the control of biting	**France** As per label

Authorised uses (crops, harmful organisms, rates of application, number of applications, timings of applications - growth stages and where appropriate, season)	**Actual uses, if current practice is known to deviate from the authorised uses (crops, harmful organisms, rates of application, number of applications, timings of applications - growth stages and where appropriate, season)**
and sucking foliar insects. For the control of thrips in tomatoes, max. 0.5 kg active substance is applied. PHI = 7 days. Lannate® 20L – Cucumber/courgette/gherkin/melon: Foliar in- and outdoor spray application max. 3 times at 0.3 kg active substance/ha for the control of biting and sucking foliar insects. PHI = 7 days. Lannate® 20L – Peas/flax Foliar outdoor spray application once at 0.3 kg active substance/ha for the control of bean aphids and thrips, respectively. PHI = 7 days in peas, none in flax.	
Greece Lannate® 20L and Lannate® 25WP – Fruit trees (pome-/stone fruits, almonds; olive and citrus): Foliar outdoor spray application 1-3 times at 0.036-0.054 or 0.054-0.09 kg active substance/hL for the control of biting and sucking foliar insects. PHI = 20 days. Lannate® 20L and Lannate® 25WP – Vegetables (tomato/pepper/eggplant/courgette/cucumber/(water-)melon/beans/lettuce/cauliflower/cabbage/potato): Foliar or soil out- and indoor spraying once at 0.72-2.7 kg active substance/ha for the control of biting and sucking foliar insects. Foliar out- and indoor spray application max. 3 times for the control of aphids, leaf and fruit larvae at 0.45 kg active substance/ha. PHI = 15 days (eggplant, beans, courgette, cauliflower, cabbage, lettuce, pepper, potato). PHI = 20 days for cucurbits. PHI = 7 days for tomato. Lannate® 20L and Lannate® 25WP – Grapes: Foliar outdoor spray application 1-3 times at 0.036-0.054 kg active substance/hL for the control of *Lobesia* spec. PHI = 20 days. Lannate® 20L and Lannate® 25WP – Clover and Corn: Foliar outdoor spray application 1-3 times at 0.54 kg active substance/ha for the control of biting and sucking foliar insects. PHI = 20 days. Lannate® 20L and Lannate® 25WP – Cotton: Foliar outdoor spray application 1-3 times at 0.27-0.7 kg active substance/ha for the control of biting and sucking foliar insects with a spray interval of 7 days. PHI = 20 days. Lannate® 20L and Lannate® 25WP – Tobacco: Foliar outdoor spray or seed bed irrigation application 1-3 times at 0.54-2.7 kg active substance/ha for the	**Greece** Lannate® 20L as per label. Lannate® 25WP as per label. Lannate® 90SP uses as per label are in the process of being replaced by Lannate® 25WP approved uses.

Authorised uses (crops, harmful organisms, rates of application, number of applications, timings of applications - growth stages and where appropriate, season)	**Actual uses, if current practice is known to deviate from the authorised uses (crops, harmful organisms, rates of application, number of applications, timings of applications - growth stages and where appropriate, season)**
control of biting and sucking foliar insects and soil born insects. PHI = 20 days. Lannate® 25WP – Grapes: Foliar outdoor spray application 1-3 times at 0.020-0.027 kg active substance/hL for the control of *Lobesia* spec. Repeat in following generations. PHI = 20 days. Lannate® 90SP – Vegetables (tomato/pepper/ eggplant/courgette/cucumber/(water-)melon/ beans/lettuce/cauliflower/cabbage/potato): Foliar or soil outdoor spray application once at 0.72-2.7 kg active substance/ha for the control of biting and sucking foliar insects. PHI = 15 days (eggplant, beans, courgette, cauliflower, cabbage, lettuce, pepper, potato). Foliar outdoor spray application max. 3 times for the control of aphids, leaf and fruit larvae at 0.45 kg active substance/ha. PHI = 15 days (eggplant, beans, courgette, cauliflower, cabbage, lettuce, pepper, potato). PHI = 20 days for cucurbits. PHI = 7 days for tomato. Lannate® 90SP – Grapes: Foliar outdoor spray application 1-3 times at 0.020-0.054 kg active substance/hL for the control of *Lobesia* spec. Repeat in following generations. PHI = 20 days.	

Authorised uses (crops, harmful organisms, rates of application, number of applications, timings of applications - growth stages and where appropriate, season)	Actual uses, if current practice is known to deviate from the authorised uses (crops, harmful organisms, rates of application, number of applications, timings of applications - growth stages and where appropriate, season)
Italy Lannate® 20L – Pome (apple, pear) and stone fruit (peach, apricot, plum, cherry, almond): Foliar outdoor spray application at 0.05-0.04 kg active substance/hL for the control of biting and sucking foliar insects. PHI = 10 days. Lannate® 20L – Grapes: Foliar outdoor spray application at 0.04-0.05 kg active substance/hL for the control of grape berry moth. PHI = 10 days. Lannate® 20L – Bean and pea; Citrus and Olive trees: Foliar outdoor spray application at 0.036-0.04 kg active substance/hL for the control of Lepidoptera larvae and bern insects, respectively. PHI = 10 days. Lannate® 20L – Vegetables (tomato/pepper/ eggplant/cucumber/courgette/(water-)melon/pumpkin): Foliar outdoor spray application at 0.04 kg active substance/hL for the control of Noctuides insects repeated every 5-7 days during vegetative period. PHI = 10 days. Lannate® 20L – Cabbage, lettuce: Foliar outdoor spray application at 0.04-0.05 kg active substance/hL for the control of cabbage worms repeated every 5-7 days during vegetative period. PHI = 10 days for cabbage; 14 days for lettuce. Lannate® 20L – Sugar beet: Foliar outdoor spray application at 0.04-0.05 kg active substance/hL for the control of sugar beet weevil and flea beetle. Treat at first appearance of pest, repeat once or twice at 12 – 15 day spray interval. PHI = 10 days. Lannate® 25WP – Pome (apple, pear) and Stone fruit (peach, apricot, plum, cherry, almond): Foliar outdoor spray application at 0.045-0.05 kg active substance/hL for the control of biting and sucking foliar insects. PHI = 10 days. Lannate® 25WP – Grapes: Foliar outdoor spray application at 0.0375-0.05 kg active substance/hL for the control of grape berry moth. PHI = 10 days. Lannate® 25WP – Bean and pea; Citrus and Olive trees: Foliar outdoor spray application at 0.0375-0.045 kg active substance/hL for the control of Lepidoptera larvae and bern insects, respectively. PHI = 10 days.	**Italy** Lannate® 20L and Lannate® 25WP as per label with the exception for grapes as is applied max. twice at a rate of max. 0.45 kg active substance/ha. PHI = 28 days.

Authorised uses (crops, harmful organisms, rates of application, number of applications, timings of applications - growth stages and where appropriate, season)	**Actual uses, if current practice is known to deviate from the authorised uses (crops, harmful organisms, rates of application, number of applications, timings of applications - growth stages and where appropriate, season)**
Lannate® 25WP – Vegetables (tomato/pepper/ eggplant/cucumber/courgette/(water-)melon/pumpkin): Foliar outdoor spray application at 0.0375 kg active substance/hL for the control of Noctuides insects repeated every 5 – 7 days during vegetative period. PHI = 10 days. Lannate® 25WP – Cabbage, lettuce: Foliar outdoor spray application at 0.0375-0.05 kg active substance/hL for the control of cabbage worms, repeat every 5 – 7 days during vegetative period. PHI = 10 days for cabbage; 14 days for lettuce. Lannate® 25WP – Sugar beet: Foliar outdoor spray application at 0.045-0.05 kg active substance/hL for the control of sugar beet weevil and flea beetle. Treat at first appearance of pest and repeat once or twice at 12 – 15 day interval. PHI = 10 days.	
Portugal Lannate® 20L – Pome (apple, pear) and stone fruit (peach): Foliar outdoor spray application at 0.038 kg active substance/hL as needed for the control of aphids. PHI = 21 days. Lannate® 20L – Tomato: Foliar outdoor spray application at 0.038 kg active substance/hL as needed for the control of aphids and tomato fruit worm. PHI = 7 days. Lannate® 20L – Grapes: Foliar outdoor spray application at 0.038 kg active substance/hL as needed for the control of grape berry moth. PHI = 21 days.	**Portugal** As per label
Spain Lannate® 20L and Lannate® 25WP – Pome and stone fruit: Foliar outdoor spray application 1-5 times at 0.03-0.05 kg active substance/hL at rates of 0.5-0.75 kg active substance/ha for the control of aphids and leaf miners. PHI = 7 days. Lannate® 20L and Lannate® 25WP – Tomato: Foliar outdoor spray application 1-5 times at 0.03-0.05 kg active substance/hL at rates of 0.3-0.5 kg active substance/ha for the control of aphids and moths.	**Spain** As per label

Authorised uses (crops, harmful organisms, rates of application, number of applications, timings of applications - growth stages and where appropriate, season)	Actual uses, if current practice is known to deviate from the authorised uses (crops, harmful organisms, rates of application, number of applications, timings of applications - growth stages and where appropriate, season)
PHI = 3 days. Lannate® 20L and Lannate® 25WP – Citrus: Foliar outdoor spray application 1-5 times at 0.03-0.05 kg active substance/hL at rates of 0.5-1.25 kg active substance/ha for the control of citrus whitefly. PHI = 7 days. Lannate® 20L and Lannate® 25WP- Sugar beet: Foliar outdoor spray application 1-5 times at 0.03-0.05 kg active substance/hL at rates of 0.3 kg active substance/ha for the control of aphids, moths leafhoppers and -miners. PHI = 7 days. Lannate® 20L and Lannate® 25WP – Cotton: Foliar outdoor spray application 2-3 times at 0.03-0.05 kg active substance/hL at rates of 0.3-0.4 kg active substance/ha for the control of aphids, moths leafhoppers and -miners. PHI = 7 days. Lannate® 20L and Lannate® 25WP – Hops: Foliar outdoor spray application 1-5 times at 0.03-0.05 kg active substance/hL at rates of 0.3-0.5 kg active substance/ha for the control of aphids, moths leafhoppers and -miners. PHI = 7 days. Lannate® 20L and Lannate® 25WP - Tobacco: Foliar outdoor spray application 1-5 times at 0.03-0.05 kg active substance/hL at rates of 0.3-0.5 kg active substance/ha for the control of aphids, moths leafhoppers and -miners. PHI = 7 days.	
Netherlands Lannate® 20L – Vegetables (tomato/courgette/cucumber/melon/eggplant/pepper): Foliar in- and outdoor spray application 1-3 times with a 7 day spray interval at 0.025 kg active substance/hL at a rate of 0.4 kg active substance/ha for the control of caterpillars, aphids, white fly, leaf miners. PHI = 3 days. Lannate® 25WP - Vegetables (tomato/courgette/cucumber/melon/eggplant/pepper): Foliar indoor spray application 1-3 times with a 7 day spray interval at 0.025-0.08 kg active substance/hL at a rate of 0.4 kg active substance/ha for the control of caterpillars, aphids, white fly, leaf miners. PHI = 3 days.	**Netherlands** As per label

LEVEL 2

Methomyl

REASONED STATEMENT OF THE OVERALL CONCLUSIONS DRAWN BY THE RAPPORTEUR MEMBER STATE

2.1.1 Identity

Before Annex I listing can be recommended the following requirements relating to analytical validation (see following sections) will need to be addressed:

Demonstration of calibration linearity for process impurities 13703 and B1884 for analytical method ESB-21-87 (X1179.220.03.L). In the light of the outcome for this point, a revised technical specification may be needed.

2.1.2 Physical and chemical properties

The active substance, methomyl, is a white powder with a slightly sulphurous odour. Methomyl melts at 79.6 ± 0.1°C and decomposes at 192 ± 3.1°C. The vapour pressure (7.2 x 10-4 pascals at 25ºC) and Henry's law constant (2.1 x 10-6 pascals/mole) indicate volatilisation from aqueous systems is unlikely due to the high water solubility (55 mg/ml) of methomyl. Methomyl should not bio-accumulate since methomyl is soluble in water (55 mg/mL) and the Kow is low (1.24). The log Kow is 0.09. Methomyl does not ionise at environmentally relevant pHs and is stable in water. Methomyl does not absorb the energy in sunlight at wavelengths of 290 nm and above and no direct photolysis occurs, although indirect photolysis has been observed in the presence of nitrate. Methomyl is soluble in all representative organic solvents. Methomyl is expected to dissipate from the troposphere (~ 19 hours) through reaction with photochemically-produced hydroxyl radicals. Methomyl is not flammable, and has no explosive properties, and is non-oxidising, thus, methomyl should present no hazard in shipment or storage.

Methomyl 20SL Soluble Concentrate has a flash point of 34.5°C and is therefore classified as flammable. It has an auto ignition temperature of 304°C. It is not explosive nor is it an oxidiser. The pH of a 1% concentration of the preparation in water was measured at 4.9 pH units, both before and after accelerated storage. The active ingredient content of Methomyl 20SL as manufactured was 204 g/L. The physical and chemical properties of the preparation were measured using CIPAC, ASTM and EEC Methods. All physical and chemical property specifications, as defined by "*The Manual on the Development and Use of FAO Specifications for Plant Protection Products*," were met both prior to and after completion of accelerated storage. The preparation was stored at a temperature of 54°C for a period of 2 weeks. Acceptable stability was also demonstrated under ambient warehouse conditions after two years storage.

2.1.3 Details of uses and further information

Information supplied adequately addresses methods for handling the active substance and plant protection products for inclusion in Annex I..

2.1.4 Classification and labelling

2.1.4.1 Active substance classification and labelling requirements

Proposed Classification of the active substance on the basis of toxicological properties

Hazard symbol:

Indication of danger: VERY TOXIC (T+)

Risk phrases: Very toxic by inhalation (R26)
Toxic if swallowed (R25)

Safety phrases:

S36	Wear suitable protective clothing
S39	Wear eye protection
S45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible)

Proposed Classification of the active substance for environmental effects

Hazard symbol:	N	Dangerous to the environment
Indication of danger:		Dangerous to the environment
Risk phrases :	R50	Very toxic to aquatic organisms
	R53	May cause long term adverse effects in the aquatic environment
Safety phrases:	S60	This material and its container must be disposed of as hazardous waste
	S61	Avoid release into the environment. Refer to special instructions/Safety data sheets

2.1.4.2 Preparation classification and labelling requirements proposed by the Rapporteur

Classification on the basis of the physical and chemical properties

Risk phrase :	R20	Flammable

Classification of the preparation on the basis of toxicological properties

Hazard symbol:

Indication of danger: TOXIC

Risk phrases: "Toxic if swallowed" (R25)
"Harmful by inhalation" (R20) and
"Risk of serious damage to eyes" (R41).

Safety phrases: S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice
S36 Wear suitable protective clothing
S39 Wear eye protection
S46 If swallowed, seek medical advice immediately and show this container or label

Classification of the preparation for environmental effects

Hazard symbol:	N	Dangerous to the environment
Indication of danger:		
Risk phrases :	R50	Very toxic to aquatic organisms
	R53	May cause long term adverse effects in the aquatic environment
Safety phrases:	S60	This material and its container must be disposed of as hazardous waste
	S61	Avoid release into the environment. Refer to special instructions/Safety data sheets

2.2 Methods of analysis

2.2.1 Analytical methods for analysis of the active substance as manufactured

2.2.2 Analytical methods for formulation analysis

An acceptably-validated method for determination of methomyl in the technical material and in Methomyl 20SL has been submitted. An acceptable alternative is also available.

2.2.3 Analytical methods for residue analysis

Residues monitoring in plant commodities is acceptably supported by variations on the HPLC-Fluorescence method reported by deKok et al., and a confirmatory methods using HPLC-MS was reported. GC-MS confirmatory methods were also referenced, though not described in this dossier submission. Acceptable LOQs of 0.01mg/kg have been demonstrated for the fluorescence and HPLC-MS methods, and while original and ILV studies do not duplicate each other exactly and statistical data is limited for some crops there is sufficient breadth and depth of data to give assurance that methods will be widely reliable and robust.

Environmental monitoring of soil also draws on the HPLC-Fluorescence method of deKok et al. An LOQ of 0.001mg/kg was validated for soil. ELISA was also validated for soil with an LOQ of 0.025mg/kg. The analysis of sediment samples by HPLC-MS to an LOQ of 0.05mg/kg has also been demonstrated but the method was not fully validated; however, there is no requirement for a monitoring method for sediment under 91/414.

Water samples were also analysed using the HPLC-Fluorescence method of deKok et al. An LOQ of 0.0001mg/kg was validated for ground water. Using the same method, validated LOQs of 0.00025mg/kg were achieved for a Florida-sourced surface water and two synthetic surface waters were validated to 0.0025mg/kg.

Air was analysed by HPLC-MS. The LOQ for methomyl was 0.58 µg/m^3 air (determined as the oxime, expressed as parent methomyl) validated up to 5.8µg/ m^3 air without breakthrough.

Human serum and urine were analysed by HPLC-MS each to a validated LOQ of 0.01mg/kg (determined as the oxime, expressed as parent methomyl). Limited validation data were reported for a confirmatory analysis using GC/PFPD. The validated LOQ of 0.01mg/kg is accepted as sufficient for analysis of exposure cases.

In summary: methods have been evaluated for the analysis of methomyl in plant food commodities, environmental samples and human fluids and were found to be acceptably validated to the necessary limits of quantification. Methods were also supplied for analysis of food products of animal origin, but as these will not be needed for monitoring they have not been considered under this evaluation.

Based on methods of analysis, methomyl can be recommended for Annex I inclusion.

2.3 Impact on human and animal health

The proposed NOELs/NOAELs and LOELs for the standard toxicity studies are presented in Table 2.2.

2.3.1 Effects having relevance to human and animal health arising from exposure to the active substance or to impurities contained in the active substance or to their transformation products

Methomyl was readily absorbed from the gastrointestinal tract (only 2-4% eliminated in faeces) and rapidly eliminated within 24 hours of dosing (80% in the rat and 63% in the monkey). Urinary excretion accounted for 53% of the administered dose in rats and 29% in monkeys. Expired air accounted for approximately 33% of the administered dose in rats and 39% in monkeys. The excretion half-life was about 5 hours in the rat and between 12 and 24 hours in the monkey. There were no sex differences in the absorption, the rate of elimination or in the distribution and concentration of the tissue residues in rats. At termination, approximately 8-10% of the dose was retained in the rat tissues and approximately 5% in the monkey. Total radioactive tissue levels in rats were lower or similar to plasma levels, indicating no specific bioaccumulation with the exception of some retention of radioactivity in red blood cells.

Metabolism was extensive in both the rat and monkey but there are some differences in the metabolic pathways and profiles. In the rat, the metabolite profiles in the urine were nearly identical between male and female rats. The major urine metabolite was the mercapturic acid derivative of methomyl (IN-KA129) together with at least 10 other minor urinary metabolites. Acetonitrile was the major residue in blood and liver. In the monkey, over 18 metabolites were observed, none of which were greater than 4% and included those metabolites common with the rat. The monkey excretes more $14CO_2$ and less 14C-acetonitrile than the rat in expired air, the monkey excretes considerably less of the mercapturic acid derivative of methomyl in urine (0.8% in monkey *v*18% in rat) and the monkey excreted a greater number of urinary metabolites.

Three major pathways were proposed for the rat: displacement of S-methyl from *syn*-methomyl by glutathione followed by transformation to the mercapturic acid derivative; conversion of methomyl to methomyl oxime (synonyms: MHTA or IN-1177) and CO_2 release; and isomerisation of *syn*-methomyl to *anti*-methomyl (IN-B1884), followed by a Beckmann rearrangement and formation of acetonitrile (IN-07467). Two major pathways were proposed for the monkey: hydrolysis of the carbamate ester of methomyl to methomyl oxime which is subsequently metabolised to CO_2; and isomerisation of *syn*-methomyl to *anti*-methomyl, followed by a Beckmann rearrangement and formation of acetonitrile. A minor pathway involved displacement of S-methyl from *syn*-methomyl by glutathione followed by transformation to the mercapturic acid derivative (IN-KA129). Acetonitrile was further metabolised via conjugation with cysteine and sulphate.

Methomyl has a high order of acute toxicity in experimental animals via the oral, ocular and inhalation routes of exposure, but it has a relatively low order of acute toxicity via the dermal route. Intentional (suicides) and accidental human exposures indicate that fatalities can occur at oral doses as low as 12 mg/kg bw. Although the results of the acute oral and inhalation studies are borderline, the weight of evidence indicates that methomyl should be classifiable as Very Toxic (by inhalation) and Toxic (if swallowed) based on the submitted GLP compliant studies. Additional oral toxicity studies (see footnote to Table 6.12) indicate a higher classification might be appropriate. Methomyl is unclassified via the dermal route of exposure. It is not an eye or skin irritant and does not cause skin sensitisation.

Short-term feeding studies have been conducted in rats, mice and dogs (2-year dog study included in this section). They have not been conducted to modern protocols or standards. None of these studies carried out ophthalmological examinations or carried out reliable determinations to evaluate brain cholinesterase activity. Where cholinesterase activities have been determined, the results are considered to be equivocal because of deficiencies in the reporting and/or the methodology. The overall quality of the short-term oral studies is below that normally expected and inadequate for use in the setting of reference values. However, two additional studies were performed to assess the degree and reversibility of cholinesterase inhibition (B.6.8.2-6.8.3).

The most sensitive endpoint in the short-term feeding studies appears to be the haematological changes seen in mice (at 150 ppm) and rats (at 270 ppm). In the 2-year dog study, the most sensitive endpoints appear to be the organ weight and histopathological changes in the kidneys (pigment disposition and slight swelling of the epithelial cells of the proximal convoluted tubules) and spleen (pigment deposition and extramedullary haematopoiesis) at dose levels ≥ 400 ppm. Haematological changes and mortality were evident in dogs at 1000 ppm. These feeding studies are considered inappropriate for the setting of reference doses for regulatory purposes on a stand-alone basis.

Two 21-day dermal toxicity studies were conducted in rabbits. In the first study, statistically significant decreases in plasma and brain cholinesterase activities, as well as increased incidences of hyper-reactivity, were observed in male and female rabbits at the high dose (500 mg/kg bw/day). In the second study, there were no clear treatment-related effects on plasma, red blood cell or brain cholinesterase activities. A NOAEL of 90 mg/kg bw/day was determined for this second study, the highest dose used, however some equivocal clinical signs and cholinesterase inhibition patterns were noted, which were difficult to interpret with the small group size of 6 rabbits. In the first study (occlusive applications), the methomyl was moistened with approximately 5 ml of deionised water under an occlusive dressing while in the second study (semi-occlusive applications) the methomyl was moistened by 1 ml of deionised water (test site was 190 cm^2 of shaved skin in both studies).

The company has submitted a battery of genotoxicity studies (study dates 1984-1995) in which the mutagenic and DNA damaging potential of methomyl has been evaluated in accordance with the protocols of international test guidelines. Negative results were obtained in all of these studies (including an *in vivo* clastogenicity assay and a bone marrow micronucleus assay). Positive results have been reported in the literature (two reports) but no published studies were submitted for evaluation. The company has evaluated both of these of these published papers and submitted a summary of their findings. Based on deficiencies in the study protocols and the route of administration (i.p. injection) in the *in vivo* study, the company considers these publications to be unsuitable for assessing the genotoxic potential of methomyl. Methomyl was not oncogenic in long-term studies conducted in rats and mice and did not induce reproductive or developmental toxicity in studies performed in rats and rabbits. Based on the results of the company studies, the weight of the evidence indicates that methomyl does not pose a mutagenic or genotoxic concern.

In the long-term rat study, body weight effects and mild haematological changes were observed (reduced RBC count, haemoglobin and haematocrit). In the long-term mouse study, reduced survival and mild transient haematology changes (as seen in rats) were observed (the haematological changes were not present after 26 weeks). There was no evidence of methomyl-induced carcinogenic activity in rats or mice.

In the two-generation reproduction toxicity study, the main effects on parental animals were reduced body weight and food consumption, and increased relative spleen weight. There were no effects on reproduction and fertility but the combined mean pup weights were reduced (male and female data not reported separately). In the three generation reproduction toxicity study, there were no effects on parents or reproduction and fertility. Pup weight and food consumption were reduced in F3 pups.

Developmental toxicity studies were conducted in rats and rabbits. In the rat developmental study, the maternal effects included reduced body weight and food consumption. There were no effects on the rat foetuses. In the rabbit developmental study, deaths, decreased body weight and clinical signs of cholinesterase activity were observed in the dams. There was no evidence of methomyl-induced teratogenic activity in rats or rabbits.

Modern neurotoxicity studies have been conducted in the rat and a delayed neurotoxicity study was conducted in hens in the 1960s. Following an acute oral (gavage) dose of methomyl in water to rats, clinical signs of systemic toxicity and cholinesterase inhibition (plasma, erythrocyte and brain) were observed in both sexes at peak exposure (30 minutes post dosing). It was noted that fore and hind limb grip strength was not affected by treatment. A NOAEL of 0.25 mg/kg bw was determined for reversible dose-related brain cholinesterase activity at the next highest dose. Clinical signs were evident at 1 mg/kg bw in a pilot study (tremors, low posture, abnormal gait and uncoordinated righting reflex). Following dietary administration for 90-days to rats, there were effects on body weight, food consumption, clinical signs of systemic toxicity, brain cholinesterase activity and some of the functional observational battery (FOB) parameters at the top dose level. Although clinical signs, FOB effects and reduced brain cholinesterase activity were observed, no effects on plasma or erythrocyte cholinesterase activities were detected. After 13 weeks of dosing, male forelimb and hindlimb grip strength was reduced at the top dose level. Although there was an effect on brain cholinesterase activity following dietary administration, there were no effects on plasma or erythrocyte cholinesterase activities. A NOAEL of 150 ppm was determined for both sexes (equivalent to 9.42 and 11.2 mg/kg bw/day, respectively). There was no evidence of delayed toxicity in the hen test.

Several additional studies were performed to assess the reversibility of cholinesterase inhibition in rats, acute oral administration in rats (gavage and dietary bolus dosing), repeated oral dosing in rats (gavage dosing) and the *in vitro* activity of human and rat cholinesterase. A human volunteer study was also carried out to evaluate cholinesterase activity and the potential clinical signs of systemic toxicity in humans. The results of these *in vivo* studies and the neurotoxicity studies are presented in Table 2.1:

Table 2.1 Summary of the cholinesterase data

Study details	NOAEL	LOEL	Reference
Acute oral administration in male volunteers (n = 5/group) (capsule/bolus dosing)	0.1 mg/kg bw	0.2 mg/kg bw: RBC cholinesterase depression (≥ 20%) & increased salivation. 0.3 mg/kg bw: RBC cholinesterase depression (≥ 20%), increased salivation & headache.	McFarlane *et al*, 1998.
[a]Acute oral administration in male rats (dietary/bolus dosing)	30 ppm (1.0 mg/kg bw)	60 ppm (1.88 mg/kg bw): RBC cholinesterase depression (≥ 20%) & no reaction to tail pinch. 120 ppm (3.74 mg/kg bw): RBC and brain cholinesterase depression (≥ 20%) & no reaction to tail pinch. 360 ppm (9.98 mg/kg bw): plasma, RBC and brain cholinesterase depression (≥ 20%), no reaction to tail pinch and other behavioural effects.	Filliben, 1996
Acute oral (gavage) administration in male and female rats (reversibility study).	Not determined	[b]3.0 mg/kg bw: Plasma, RBC and brain cholinesterase depression (≥ 20%) & clinical signs.	Malley, 1997
[c]Acute neurotoxicity study in male and female rats (gavage).	0.25 mg/kg bw for males and females	0.5 mg/kg bw: Reversible red blood cell and brain cholinesterase inhibition (≥20%).	Mikles, 1998a
Ten day oral (gavage) administration in male rats.	Not determined	5.1 mg/kg bw/day: clinical signs shortly after dosing	Sherman, 1964
90-day (dietary) neurotoxicity study in male and female rats.	150 ppm (9.42 and 11.2 mg/kg bw/day for males and females.	1500 ppm: Reduced body weight and food consumption, clinical signs, brain cholinesterase inhibition and effects on FOB parameters.	Mikles, 1998b

Key: a) Rats preconditioned to eat within a two hour period. b) Recovery was complete by 3 hours post dosing. c) Clinical signs were evident at 1 mg/kg bw in a pilot study (tremors, low posture, abnormal gait and uncoordinated righting reflex).

In the human volunteer study, there were statistically significant depressions in RBC cholinesterase activity at doses of 0.2 (0.75-1.75 post dosing) and 0.3 mg/kg bw (0.5-1.75 hours post dosing), a single occurrence of a mild headache at a dose of 0.3 mg/kg bw, and quantitatively increased salivation at 0.2 and 0.3 mg/kg bw. Red blood cholinesterase activity was depressed by 19% at 0.1 mg/kg bw at 1.25 hour post dosing (<20% cut off). Four of the subjects in the 0.1 mg/kg bw group had red blood cell cholinesterase depression (>20%). The red blood cell cholinesterase activity in the remaining subject was greater than the baseline for all the post-dosing time point except one. The baseline for this individual was noticeably lower than the other members of the group. Plasma cholinesterase activity was depressed at 0.2 mg/kg bw and above. However, it should be noted that clinical symptoms have been reported in

humans at an estimated acute oral dose level of 0.15 mg/kg bw (estimated range 0.09-0.31 mg/kg bw) in an epidemiology study.

The *in vitro* assays comparing human AChE with rat whole blood (AChE and BuChE) cholinesterase showed that the concentration of methomyl required to produce a 50% reduction in human enzyme activity (0.265×10^{-5} M) was approximately 6-fold lower compared to the rat (1.56×10^{-5} M).. The regeneration half-life ($t_{0.5}$) was slightly longer for human AChE (38.0 minutes) compared to rat AChE/BuChE (26.6 minutes). However, interpretation of the results is confounded by the fact that the human and rat enzyme samples were not comparable and the use of a limited concentration range.

In residue trials (B.7.6.3), methomyl was found in all trials in the range 0.02-0.59 mg/kg but since methomyl oxime levels were not determined, these values are considered to be an underestimation of the total residues. The processing studies (B.7.8.1) indicate that in certain circumstances there may be significant levels of methomyl oxime in processed products. Although this metabolite was not identified in the rat metabolism study and no toxicity data have been submitted on the methomyl oxime itself, based on the metabolism of this metabolite and structural considerations it has been concluded that methomyl oxime was tested in the toxicity studies and does not give rise to toxicological concerns (B.6.8.1). Further reassurance would be required if it was present as a residue at levels significantly higher than the parent.

Table 2.2 The proposed NOELs/NOAELs and LOELs for the standard toxicity studies

Type of study	NOELs/NOAELs	LOEL/effects	Reference
21-day dermal study in rabbits.	50 mg/kg bw/day for male and female	500 mg/kg bw/day: Brain cholinesterase inhibition, haematological changes and clinical signs.	Brock, 1989
21-day dermal study in rabbits.	90 mg/kg bw/day for male and females	90 mg/kg bw/day: the top dose used	Finlay 1997
90-day feeding study in rats.	50 ppm (4.1 & 3.6 mg/kg bw/day in males and females, respectively).	250 ppm: Body weight and food consumption effects. Increased erythroid hyperplasia (males) and reduced RBC parameters (females).	Busey, 1966
90-day feeding study in rats.	Males: 200 ppm (13.6 mg/kg bw/day). Females: 135 ppm (10 mg/kg bw/day).	400 ppm: Haematological changes. 270 ppm: Haematological changes.	Cox, 1979a
35-week feeding study in rats.	100 ppm (only females evaluated) 300 ppm (15 mg/kg bw/day) for both sexes.	300 ppm: Haematological changes. 600 ppm: body weight effects	Cox, 1980
90-day feeding study in mice.	Males: 150 ppm (26.6 mg/kg bw/day). Females: 75 ppm (15.5 mg/kg bw/day).	300 ppm: Haematological changes. 150 ppm: Haematological changes.	Cox, 1979b
23-week feeding study in mice.	100ppm: 100 ppm (16.6 & 23.2 mg/kg bw/day, respectively).	300 ppm: Haematological changes.	Cox, 1979
90-day feeding study in dogs.	400 ppm: (14.7 & 12.5 mg/kg bw/day in males and females,	400 ppm: top dose used.	Sherman, 1967

	respectively).		
2-year feeding study in dogs	100 ppm (3.0 mg/kg bw/day for both sexes)	400 ppm: organ weight and histopathology changes in the kidney and spleen.	Busey, 1968

Table 2.2 The proposed NOELs/NOAELs and LOELs for the standard toxicity studies (continued)

Type of study	NOELs/NOAELs	LOEL/effects	Reference
2-year chronic /carcinogenicity study in rats	100 ppm (4.8 & 6.3 mg/kg bw/day in males and females, respectively)	400 ppm: Body weight effects and haematological changes.	Kaplan, 1981
2-year chronic /carcinogenicity study in mice	Males: Not determined Females: 50 ppm	50 ppm: Reduced survival. 75 ppm: reduced survival.	Snyder, 1981
Multigeneration study in rats (two generations).	Parental: 75 ppm (4.6 and 6.7 mg/kg bw/day for F0 males and F1 males, respectively & 4.8 and 6.3 for F0 females and F1 females, respectively). Reproduction: 1200 ppm. Pup growth and development: 75 ppm	600 ppm: reduced body weight and food consumption. Top dose used. 600 ppm: Reduced pup weight.	Lu, 1983
Multigeneration study in rats (three generations).	Parental: 100 ppm (8 mg/kg bw/day). Reproduction: 100 ppm (8 mg/kg bw/day). Pup growth and development: 50 ppm (4 mg/kg bw/day).	Top dose used. Top dose used. 100 ppm: pup weight effects.	Busey, 1968
Developmental study in rats.	Maternal: 100 ppm (9.4 mg/kg bw/day). Pup development: 400 ppm (339 mg/kg bw/day).	400 ppm: Reduced body weight. Top dose used.	Culik & Rogers, 1978.
Developmental study in rabbits.	Maternal: 6 mg/kg bw/day. Pup development: 16 mg/kg bw/day.	16 mg/kg bw/day: Deaths, decreased body weight and clinical signs of cholinesterase activity. Top dose used.	Feussner *et al*, 1983.

2.3.2 Proposal for an acceptable daily intake (ADI)

The most sensitive toxicological effect of methomyl was a rapid but reversible inhibition of cholinesterase following bolus dosing (i.e. acute gavage and dietary studies and capsular study in human volunteers). In the standard repeat dose feeding studies, there were reductions in body weight and food consumption, mild regenerative (reversible) haematological changes, increased kidney and spleen weights and histological changes in the kidneys (pigment disposition and slight swelling of the epithelial cells of the proximal convoluted tubules) and spleen (pigment deposition

and extramedullary haematopoiesis). In the 90-day neurotoxicity study, clinical signs, brain cholinesterase inhibition and effects on FOB parameters were observed. Methomyl was not carcinogenic, genotoxic or a reproductive toxin.

Normally, the results obtained from the longer-term (subchronic and chronic) studies are used for the calculation of an acceptable daily intake (ADI). Hence, the company has proposed an ADI derived from the NOAEL of 3 mg/kg bw/day determined for the 2-year dog study. However, there are clear effects on cholinesterase activity following single oral bolus doses in rats (gavage and dietary) and human volunteers (capsules) at dose levels lower than 3 mg/kg bw/day (Table 6.80). In addition, clinical symptoms have been reported in humans at an estimated acute oral dose level of 0.15 mg/kg bw (estimated range 0.09-0.31 mg/kg bw) in an epidemiology study. These data are relevant to the consumer risk assessment and the lowest NOAEL determined for the most sensitive species (i.e. humans) must be used to set the reference doses for consumers.

Based on the NOAEL of 0.1 mg/kg bw determined for male volunteers and an assessment factor of 10 x 2 (10 for intra species variation and 2 for the small group size, wide inter-individual variations in the study and clinical symptoms reported in humans at the estimated LOEL of 0.09 – 0.31 mg/kg bw), **an ADI of 0.005 mg/kg bw/day can be proposed.**

This proposed ADI is supported by the alternative ADI based on animal data; i.e. 0.0025 mg/kg bw/day, based on the NOAEL of 0.25 mg/kg bw/day determined for the acute rat study (Mikles, 1998a) and an assessment factor of 100.

2.3.3 Proposal for an acute reference dose (ARfD)

An ARfD is considered necessary for methomyl based on its mechanism of action and its acute oral toxicity profile. The acute reference dose is intended to represent a limit value of a pesticide that may be consumed as a result of eating at a single sitting. In setting the ARfD, both the acute and short-term studies (including developmental studies) are taken into consideration.

There are no specific reproductive effects. The acute data reviewed indicates that humans are the most sensitive species to methomyl-induced cholinesterase inhibition.

Based on the NOAEL of 0.1 mg/kg bw determined for male volunteers and an assessment factor of 10 x 2 (10 for intra species variation and 2 for the small group size, wide inter-individual variations in the study and clinical symptoms reported in humans at the estimated LOEL of 0.09 – 0.31 mg/kg bw), **an ARfD of 0.005 mg/kg bw/day can be proposed.**

2.3.4 Proposal for an acceptable operator exposure level (AOEL)

The company has not proposed a systemic AOEL for methomyl but they have submitted a case for the use of a dermal AOEL and an inhalation AOEL for the operator exposure risk assessment.

a) Systemic AOEL

In view of the short-term exposure of operators to methomyl, it is generally considered appropriate to use no observed adverse effect levels from relevant subchronic oral studies in setting a systemic AOEL. In addition, the reproductive effects observed in the developmental studies are also taken into consideration. However, the data reviewed indicated that humans were the most sensitive species to methomyl-induced cholinesterase inhibition; therefore, the NOAEL determined in the single dose human volunteer study is considered to be relevant to the setting of a systemic AOEL.

Based on the NOAEL of 0.1 mg/kg bw determined for male volunteers and an assessment factor of 10 x 2 (10 for intra species variation and 2 for the small group size, wide inter-individual variations in the study and clinical symptoms reported in humans at the estimated LOEL of 0.09 – 0.31 mg/kg bw), **a systemic AOEL of 0.005 mg/kg bw/day can be proposed (adjustment for gastrointestinal absorption is not necessary).**

b) Dermal AOEL

Two rabbit dermal studies have been submitted for evaluation. The studies used small groups of rabbits for which there are no comparable oral data and some equivocal findings were seen. Both of these studies were performed using methomyl moistened with deionised water (5 ml or 1 ml) and evaluated cholinesterase activity (critical endpoint). However, operators will be exposed to the formulation (a soluble concentrate) which contains high levels of solvents ([redacted]). Hence, the material tested in the dermal studies is not representative of the material to which the operators will be exposed (i.e. the absorption characteristics of methomyl from the formulated product might be significantly different from the material tested). Although dermal absorption studies have been performed using the formulation product, cholinesterase inhibition has not been evaluated in these studies. Furthermore, there are no dermal metabolism data or information on the pattern of use. Therefore, it is considered to be inappropriate to set a dermal AOEL at the present time on the dermal data submitted.

c) Inhalation AOEL

No repeat-dose inhalation studies have been submitted for evaluation.

Two acute inhalation studies have been submitted for evaluation (one using methomyl and one using the formulated product). In the study with methomyl, deaths occurred at 0.182/0.179 mg/l (gravimetric/analysed) and above. Prior to death these decedents exhibited clinical signs typical of reduced cholinesterase activity. Gross necropsy revealed expanded lungs and oedema of the pleural cavities. In the study with the formulation, deaths and clinical signs typical of reduced cholinesterase activity occurred at 0.88 mg/l and above. The mean lung weight to body weight ratios were elevated in the decedents and two rats had congestion of the lungs. Microscopy revealed minimal dilation of renal convoluted tubules in the decedents. NOAELs were not established for cholinesterase activity in these acute studies and the lung

effects appear to be dependent on the route of exposure. Therefore, it is considered inappropriate to set an inhalation AOEL at the present time.

2.3.5 Proposal for a maximum allowable concentration in drinking water (MAC)

Using the WHO 1994 model to calculate the MAC for drinking water it is appropriate to divide the ADI by an additional assessment factor of 10 and thus derive an intake of 0.0005 mg/kg bw/day.

Assuming the average value for consumption by a typical 60 kg person is 2 litres/day, a daily intake of 0.0005 mg/kg bw/day would be achieved by drinking water containing 0.015 mg/litre. Thus, **a MAC of 15 µg/l of water can be derived for methomyl.**

2.3.6 Impact on human and animal health arising from exposure to the active substance or to impurities in it

Operator exposure estimates using the German model indicate that the use of 'Methomyl 20SL' on fruiting vegetable crops through tractor-mounted/trailed equipment will result in an acceptable level of systemic exposure to methomyl for a operator wearing protective gloves when handling the concentrate and coveralls and protective gloves during application (due to the product classification, the use of a faceshield will also be required when handling the concentrate), the corresponding UK POEM estimates indicate an unacceptable level of systemic exposure for an operator wearing protective gloves when handling the concentrate and when handling contaminated surfaces.

Operator exposure estimates using the German model and the UK POEM and calculations based on operator monitoring (dosimetry) data indicate that the use of 'Methomyl 20SL' on grapes through tractor-mounted/trailed equipment will result in an unacceptable level of systemic exposure to methomyl for an operator wearing protective equipment.

Bystander exposure estimates based on published field study measurements indicate that the level of systemic exposure to methomyl for an unprotected bystander at the time of application is likely to be acceptable for the use of 'Methomyl 20SL' on field crops but unacceptable for the use on grapes.

Worker exposure estimates based on dislodgeable foliar residue decline studies and using published transfer coefficient data indicate that the levels of systemic exposure to methomyl for an unprotected worker harvesting field crops and grapes treated with 'Methomyl 20SL' are likely to be acceptable.

2.4 Residues

2.4.1 Definition of the residues relevant to MRLs

Based on the metabolism data submitted for grapevine, residues for monitoring and risk assessment purposes should be defined as methomyl.

Residues in succeeding crops are unlikely to be of significance. A residue definition for succeeding crops is not required.

A residue definition for animal products is not required.

2.4.2 Residues relevant to consumer safety

Plant metabolism

The metabolism and distribution of methomyl was investigated in grapes treated at 1.1N maximum total dose. Methomyl was the major metabolite identified in grape berries accounting for 82.6% 51.4% total recovered radioactivity (TRR) (0.485 mg/kg) in samples harvested14 days after application. Other significant metabolites identified were methomyl oxime (7.2% TRR, 0.068 mg/kg) and IN-HUZ57 (5.6% TRR, 0.052 mg/kg). Approximately 11% TRR (0.102 mg/kg) were attributed to an unidentified polar fraction which was found to consist of at least 7 components, none of which were found at levels greater than 3.1% TRR (0.03 mg/kg). No other metabolites were found in significant levels in the 14 day samples.

Further metabolism studies on tobacco, cabbage and maize were submitted although these studies were not performed to modern standards and appear mainly to study the translocation and uptake of radiolabelled methomyl, as well as identify potential metabolites formed. In these studies the majority of applied radioactivity was broken down to carbon dioxide and acetonitrile or was bound to natural plant compounds (e.g. glucose). However significant amounts of applied radioactivity were not extracted from plant tissues. These studies were not considered as acceptable in order to propose a residue definition.

Based on the metabolism data for grapes the most significant metabolite was methomyl; however significant levels of the metabolite methomyl oxime were found. It is considered that methomyl oxime is less toxic than the parent compound methomyl therefore a residue definition of methomyl only is proposed.

No data were submitted for succeeding crops. The longest DT90 value for total extractable residues originating from labelled methomyl in soil is 43 days (Section B.8.1.4) therefore significant residues in succeeding crops are unlikely.

Animal metabolism

The metabolism and distribution of methomyl was investigated in goats and laying hens. A significant percentage of the dose applied was either expired as volatile metabolites (31% and 53% in the goat and hen study respectively) or excreted (22% and 26% respectively). TRR in milk and eggs did not reach a plateau after 3 days.

No residues of methomyl or metabolites closely related by structure to methomyl were detected in any samples. Further characterisation indicated extensive metabolism of methomyl and/or incorporation of radioactivity into natural products.

Both the goat and poultry metabolism studies are considered acceptable under this evaluation as no uses on crops fed to animals have been identified. Further consideration of the data would be required if a future use on crops for animal feed is proposed.

Residues trials

Residue trials were performed on the following crops: grapevine, cucurbits (cucumber and courgette), and Solanaceae (tomato). All trials were performed in the field. Trials were carried out using either a 200 g/l soluble concentrate formulation or a 250 g/kg wettable powder formulation. The difference in these formulation types is not considered to have a significant impact on the residues found.

For grapevines a total of 22 trials were conducted over two seasons in northern and southern EU countries. Residues of methomyl were found in all trials in the range 0.02 – 0.59mg/kg. There was no significant difference between residues found in trials from the north and those from the south.

For cucurbits a total of 10 trials were conducted over 2 seasons in southern EU countries. All trials were overdosed however given that the decline data show that residues are relatively non-persistent in these crops it is considered that the trials are acceptable. In all the trials no residues of methomyl were found above the LOQ value of 0.02 mg/kg in samples with a 7 day PHI. There are sufficient trials of cucumber and courgette combined to propose MRLs for these crops.

For solanaceae a total of 10 trials were conducted over 2 seasons in southern EU countries. All trials were overdosed however given that the decline data show that residues are relatively non-persistent in these crops it is considered that the trials are acceptable. In all the trials no residues of methomyl were found above the LOQ value of 0.02 mg/kg in samples with a 7 day PHI. Sufficient trials data were submitted to support the use on tomato and for extrapolation to aubergine.

Residues stability

Acceptable storage stability data were submitted for grape, processed grape fractions; broccoli, lettuce, potato, bean seed, peanut, milk, liver and muscle for methomyl. The storage stability data provided support the analysis of methomyl for the residues trials, processing data and livestock feeding studies evaluated.

Processing data

A hydrolysis study showed that methomyl remains the primary analyte after exposure to simulated pasteurisation, baking, brewing, and boiling and sterilisation conditions of processing. Significant proportions of the metabolite methomyl oxime were formed with increasing pH and temperature. It is considered that in some cases there may be significant residues of methomyl oxime in processed products however methomyl oxime is considered less toxic than the parent compound.

Studies undertaken in processed grape fractions indicated that the majority of processing factors for commodities for human consumption were less than 1.0.

No processing studies were performed on tomato, cucumber and courgette samples as no significant residues were found in the residues trials.

Livestock feeding studies

A feeding study performed at three dosing level on Holstein cows showed dosing did not have a significant effect on animal body weights or milk production. Residues in all milk samples from the animals dosed at 34 and 86 mg/kg feed dry matter (DM) were individually all below the LOQ of 0.01 mg/kg. Analysis was not carried out on all the milk samples from the animals dosed at 8 mg/kg feed DM because residues above 0.01 mg/kg were not anticipated. Residues in all samples of muscle, liver, kidney and fat from all dose groups were also all individually below the LOQ of 0.01 mg/kg.

A poultry feeding study was not submitted. A feeding study is not required for the representative uses, as the consumption of grape, cucumber, courgette, tomato and aubergine by animals is negligible.

Consumer exposure

The residue definition for risk assessment purposes is methomyl only.

The long term total dietary intake for methomyl has been carried out using the UK Rees/Day Model. Total intakes for all consumer groups were all well within the proposed ADI of 0.005 mg/kg bw/day, accounting for <10% of the proposed ADI. Intakes were also calculated using the WHO Standard European diet. All intakes were < 3% of the proposed ADI.

The long term-risks to consumers from consumption of these commodities are acceptable.

The NESTIs for residues of methomyl from the consumption of a number of crops have been calculated for 10 consumer groups (UK data).

Based on acute exposure estimates for short term dietary exposure, intakes for the consumption of cucumber, courgette, tomato and aubergine are well below the

proposed ARfD of 0.005 mg/kg bw/day. The short-term risks to consumers from consumption of these commodities are acceptable.

The intakes for the consumption of table grapes exceed the proposed ARfD for the majority of consumer groups using a variability factor of 5.

The notifier submitted probabilistic modelling data for adults and toddlers, performed with the DEEM-UK™ model using residue data generated from the supervised trials. The intakes calculated for the consumption of cucumber, courgette, tomato and aubergine were below the proposed ARfD of 0.005 mg/kg bw/day. A value of 0.01mg/kg was used for these exposure estimates. Using a value of 0.02 m/kg (LOQ) would not lead to exceedance of the proposed ARfD. The intakes for consumption of grapes only calculated for adults were below the proposed ARfD but were above the proposed ARfD for toddlers.

Given that the use on grapes gives rise to an exceedance of the proposed ARfD, the risk to consumers is unacceptable for the proposed grape use.

2.4.3 Residues relevant to worker safety

See Section 2.3.6.

2.4.4 Proposed EU MRLs and compliance with existing MRLs

Commodity	Current EU MRL (mg/kg)	Proposed EU MRL following review under 91/414 (mg/kg)	Comments
Table grape	0.05	0.5	R(ber) = 0.410, R(max) = 0.465
Wine grape	1	0.5	
Cucumber	0.05	0.05	
Courgette	0.05	0.05	
Tomato	0.5	0.05	
Aubergine	0.5	0.05	

2.4.5 Proposed EU import tolerances and compliance with existing MRLs

None

2.4.6 Basis for differences, if any, in conclusions reached having regard to established or proposed CAC MRLs

Not considered in this Draft Assessment Report.

2.5 Fate and behaviour in the environment

2.5.1 Definition of the residues relevant to the environment

In soil parent methomyl only was the major (>10% applied) component of the residue.

In surface water methomyl only was the major (>10% Applied) component of the residue.

In sediment parent methomyl and acetonitrile were the major (>10% Applied) components of the residue, the acetonitrile residue was very transient.

In groundwater, parent methomyl only is considered to have the potential to be detected and this is considered unlikely from the representative uses assessed in this document.

It is proposed that the relevant residue for monitoring should therefore be parent methomyl in the environmental compartments soil, water, sediment, groundwater and air.

2.5.2 Fate and behaviour in soil

Data from radiolabelled studies carried out on four different soils at 20°C and one soil at 10°C was used to characterise the route of degradation of methomyl in soil. This resulted in the minor metabolite methomyl oxime (Z-methyl N-hydroxyethanimidothioate, INX1177) being identified at up to 2.5% AR. Methomyl and its extractable breakdown products were readily mineralised to carbon dioxide. At study termination, in 20°C experiments carbon dioxide represented 75%AR at 92 days, 51and 61%AR at 30 days and 51%AR at 21 days. In these experiments and at these times unextracted residues accounted for 14%AR, 32 and 25%AR and 31%AR respectively. It should be noted that in the 92 day experiment, unextracted residues had declined from a peak of 24%AR at days 21-30 indicating further mineralisation of unextracted residues might be expected had the 21 day and 30 day studies been of longer duration.

Under anaerobic conditions the route of degradation may also include the production of minor amounts of organic volatile components. In the soil the only minor metabolite identified (as for aerobic incubations) was methomyl oxime but it was formed at lower amounts than under aerobic conditions (it represented a maximum measured amount of only 0.7% AR). Trapped organic volatiles represented up to 3.9%AR and there was some loss of radioactivity from the system (total recoveries were 85-89%AR). In this study these organic volatiles were not characterised but other data (see section B.8.2.4 and B.8.4.4 a) and c)) indicate that under reducing conditions acetonitrile, methanethiol and dimethyl disulfide may be produced. The rate of degradation under anaerobic conditions was comparable to that under aerobic conditions (25ºC first order DT50 14 days under anaerobic conditions compared to 10.5 days under aerobic conditions for this Madera loam soil, see tables B.8.32 and B.8.33). For the representative uses (fruiting vegetables in southern Europe and grape vines) anaerobic soil conditions would be expected to be rare.

In a soil photolysis study under natural light conditions at 39°40'N at 18-24°C on a dry viable soil methomyl degraded more rapidly than in dark controls producing the major volatile metabolite acetonitrile (represented 40%AR after 30 days light exposure). As the rate of degradation (photolysis half life of 34 days in this study) was slower than occurred in wetter dark aerobic incubations (first order DT50, 4-22 days at 20°C and field capacity, see below), under practical use conditions microbial degradation in soil is likely to predominate over photolytic degradation in soil.

Satisfactory data on the rate of degradation in the dark under aerobic laboratory conditions are available when methomyl was used as test substance on 4 different soils and when methomyl oxime was used as test substance on three of these soils. Data for methomyl when thiodicarb was applied as test substance are available on a further 4 different soils. The resulting first order DT50 for methomyl were 4-22 days (geometric mean 7.4 days, r^2 0.97-1.0, DT90 13-74 days). This range for methomyl oxime was 0.5-0.8 days (geometric mean 0.67 days, r^2 0.81-0.98). All the above values were normalised to –10kPa and 20ºC in accordance with agreed FOCUS procedures.

The first order DT50 resulting from anaerobic degradation of methomyl at 25°C in one soil was 14 days (r^2=0.98, DT90 48 days).

The longest DT90 in soil for the total extractable residue where methomyl was applied as test substance that is of pertinence to the assessment of residues in following edible crops is 43 days (calculated for the Madera loam soil, r^2=0.997). Therefore less than 10% of the methomyl applied and its extractable degradation products remains in soil 100 days after application so the requirement for data to address the potential for residues in following crops is not triggered.

From the supported intended uses with two applications of 450g methomyl/ha with a 14 day application interval, assuming 60% crop interception (leaf development growth stage for vines), even incorporation in the top 5cm, a soil bulk density of 1.5g cm^3 and a first order soil DT50 of 22 days, an initial PECsoil of 0.39mg/kg is calculated. For fruiting vegetables at this rate assuming 50% crop interception an initial PECsoil of 0.49mg/kg is calculated. On grape vines at later growth stages (flowering onwards) at least 70% crop interception would occur. In these situations a PEC soil of 0.296mg/kg is calculated. With the lower application rate on vines of 350 g/ha and 60% crop interception, the maximum soil PEC is lower, at 0.187 mg/kg.

2.5.3 Fate and behaviour in water

Mobility in soil and groundwater

In guideline laboratory batch adsorption studies methomyl weakly adsorbed to all five soils tested. The mean K_{foc} value was 25.2 ml/g (from a range of 13.3 – 42.8 ml/g). Methomyl demonstrated a non-linear sorption behaviour over the tested range of concentrations (5 to 0.05 ppm). The mean 1/n value was 0.86 (from a range of 0.82 – 0.89).

Again in guideline laboratory batch adsorption studies the minor soil degradation product methomyl oxime (Z-methyl N-hydroxyethanimidothioate) weakly adsorbed to all five soils tested. The mean K_{foc} value was 11.4 ml/g (from a range 6.6 – 20.0 ml/g). Methomyl oxime demonstrated a non-linear sorption behaviour over the tested range of concentrations (5 to 0.05 ppm). The mean 1/n value was 0.78 (from a range of 0.68 – 0.95).

In a laboratory column leaching study carried out using 3 soils, methomyl in leachate represented 46-55%AR in the Speyer 2.1 sand soil. This proportion was lower in the Speyer 2.2 loamy sand and 2.3 sandy loam at up to 11.8 and 6.6% AR respectively. Methomyl oxime was observed up to 2.2% of the applied radioactivity in soil and up to 1.7%AR in leachate. One-13% of the applied radioactivity was unextractable from the soil after leaching.

An aged residue laboratory column leaching study on a single soil was also evaluated for methomyl. Methomyl oxime was observed below 1% of the applied radioactivity in soil and leachate. About 58% of the applied radioactivity was unextractable from the soil. The major radioactive component in the leachate (5% AR) co-chromatographed with methomyl.

All these data indicate that methomyl and its minor soil metabolite methomyl oxime have the potential to be mobile in soil. There is no evidence to suggest that soil pH affects adsorption potential, although adsorption is low. However the aged column leaching study provides evidence that due to the relatively rapid degradation of both compounds that occurs in soil, the potential for leaching to deeper soil layers may not be realised under practical intended use conditions.

This was confirmed by the results of first tier FOCUSPRZM 2.2.1 groundwater modelling for the 7 FOCUS scenarios where grapes and 5 scenarios where tomatoes are defined as pertinent crops. Predicted 80th % annual average concentrations (as defined by FOCUS) <0.001µg/l for methomyl oxime (both crops) and methomyl on tomatoes at all the pertinent scenarios. On grape vines this value was calculated to be up to 0.003µg/l (Hamburg scenario).

FOCUS PEARL 1.1.1 predicted 80th % annual average concentrations passed 1m depth (as defined by FOCUS) of up to 0.002µg/l on tomatoes and 0.005µg/l on vines for methomyl oxime at all the pertinent scenarios. For parent methomyl on tomatoes this value was predicted to be up to 0.04µg/l (Piacenza) at all the pertinent scenarios. Again for parent methomyl but on grape vines this value was calculated to be up to 0.084µg/l (Piacenza) at all the pertinent scenarios.

Therefore from the representative uses, based on the results from first tier FOCUS groundwater modelling, contamination of vulnerable shallow groundwater above 0.1µg/l would not be expected for parent methomyl or its minor soil degradation product methomyl oxime (INX1177).

However even in more vulnerable situations than represented by the FOCUS scenarios, groundwater contamination by parent methomyl would be unlikely in practice because data on degradation in the saturated zone indicate that any methomyl that was to leach

to the saturated zone would be degraded relatively rapidly under the reducing conditions that are likely to be present (Half lives in 4 anaerobic subsoils incubated in the laboratory at 10°C were ≤8 hours).

Surface water

Methomyl is stable to hydrolysis at environmentally relevant pH and temperatures. It is also stable to direct aqueous photolysis. Methomyl was demonstrated to photolyse under sterile laboratory aqueous photolytic conditions in a natural water and in buffer solution in the presence of nitrate (i.e by indirect photolysis). The study design did not identify breakdown products. At 25°C with summer sunlight *ca.* 40°N first order DT50 were 10-50days. (No degradation was observed in dark controls). Whilst this degradation rate could occur in the top layers of natural surface waters in a real water body, indirect photolysis is unlikely to contribute significantly to dissipation in real aquatic situations as this degradation rate is slower than has been shown to occur in non sterile systems (see below).

Guideline (20°C) laboratory sediment water studies were carried out on 4 different natural sediment water systems. In these studies methomyl dissipated relatively rapidly, with first order DT50 in the whole systems of 2.5-4.8 days (r^2, 0.95-0.99). First order DT50 in the water phase alone were 2.5-5 days (r^2, 0.85-0.99). In 3 of the 4 systems, whilst partitioning of radioactivity to sediment occurred, the sediment extractable radioactivity present as methomyl was negligible with methomyl staying almost entirely in the water phase (maximum sediment concentrations of methomyl at any time point were in the range <1% -6.2% AR). The exception to this was in the 5.8% organic carbon Hinchingbrooke silty clay loam water / sediment system, where 2 days after application to the water column methomyl reached 11.4%AR in sediment. However this methomyl sediment residue declined rapidly to <0.4%AR by day 14 of the experiment. The only breakdown products identified (other than CO_2 and CO_3) were acetonitrile acetamide and methomyl oxime (Z-methyl N-hydroxyethanimidothioate) which had maximum concentrations of 6-7.4, 5.4-8.8 and 1.1-7.1%AR respectively in water and 10.2-10.9, 1.8 and <0.2-3.8%AR respectively in sediment.

These data demonstrate that in natural sediment water systems, in the aerobic water phase no major >10%AR breakdown products will be formed. In sediment (where conditions can become anaerobic) acetonitrile was detected above 10%AR (at only 1 sampling date in any system) at maxima of 10.2%AR (immediately after application Hinchingbrooke system, only 2.7% on a mass basis) and 10.9%AR (at day 7 Auchingilsie system, only 2.8% on a mass basis). These levels in sediment declined relatively rapidly being <0.4%AR (<0.1% by mass) 13 days later and 0.7%AR (0.2% by mass) 22 days later in each system respectively. 14 days after the test substance was applied, concentrations of acetonitrile in sediment were <10% AR (<0.4 and 1.7%AR in the Hinchingbrooke and Auchingilisie systems respectively). In the Manningtree sandy silt loam and Ongar clay loam systems acetonitrile was not detected in sediment extracts.

In these guideline (20°C) laboratory sediment water studies, by the end of the experiments mineralisation to CO_2 accounted for 32-46%AR (102 days) and 72% at 31

days and 60% at 44 days in the different systems. In two of the systems significant quantities of acetonitrile was recovered from volatile traps (24-27%AR by day 102). This was not the case in the other two experiments, where total recoveries were reasonable but the only volatile trapped was CO_2. An explanation for this may have been that the sediment of the Manningtree and Ongar systems remained largely aerobic, whereas in the Hinchingbrooke and Auchingilisie sediments, anaerobic conditions occurred (evidence from differences in redox potential measurements). Levels of unextracted residue in sediment peaked at 15-20%AR (days 7 and 14), declining marginally after this to 10-15%AR at study ends (31-102 days).

In a non guideline outdoor natural sediment water study carried out in September and October at *ca.* 40°N where water temperatures were in the range 11.9-43.7°C, methomyl was applied to water columns of 13.1cm depth overlying 4.4cm of sediment with aquatic plants present (*ca.* 0.09g/ml). Methomyl dissipation from the water column was faster than in the dark 20°C guideline laboratory sediment water studies with a first order DT50 of 1.4 days (r^2=0.9, non linear least squares). In the study sorption to plants was a major sink for the applied methomyl accounting for up to 38%AR after 48 hours.

In addition, a body of data (not guideline studies) was provided that demonstrates that under reducing conditions (anaerobic conditions in sediment, anaerobic conditions in saturated subsoil, (see section B.8.2.4) or when ferrous ions are present in solution) methomyl is rapidly degraded and forms the volatile breakdown products acetonitrile or in saturated subsoil methanethiol. Under these conditions breakdown of methomyl has been shown to be very rapid (half lives in hours).

Methomyl degrades in the aquatic environment by a number of processes. Under aerobic conditions methomyl will be degraded to methomyl oxime which will be rapidly mineralised to carbon dioxide. This will be the dominating degradation process in the water phase of natural aquatic environments due to the aerobic nature of this compartment. In sediments, anaerobic conditions might be present at times. Under such conditions, micro-organisms degrade methomyl to acetonitrile, which is further degraded to carbon dioxide and/or acetamide. In the guideline laboratory sediment water studies all these identified metabolites were only formed at low levels. Only acetonitrile in sediment ever represented > 10%AR (up to 10.9%AR only 2.8% on a mass basis) and this declined rapidly. Following the criteria in the aquatic guidance document (Sanco/3268/2001 rev 4, 17 October 2002) because of the fate and behaviour profile of these metabolites in the guideline studies only an aquatic risk assessment for parent methomyl is required.

In the calculation of PEC for the subsequent aquatic risk assessment it is considered appropriate to use the longest 20°C dark guideline aerobic sediment water study water phase first order DT50 of 5 days, this representing a conservative but realistic value.

Data were provided that indicated that in major grape vine growing areas and Southern European vegetable production areas, in a large majority of situations, there are reasonable distances between these crops and surface water bodies, indicating that larger no spray zone distances to mitigate surface water exposure from spray drift should be workable in member states.

For the representative uses where two applications of 450g/ha and a 14 day spray interval is used, with distances from the treated crop to a 30 cm deep static water body of 1m for low growing vegetables a PEC in surface water of 4.1µg/l is calculated. With this distance at 3m for grape vines and taller growing vegetables PEC in surface water of 12.4µg/l (late applications with air assistance) are calculated. Parent methomyl remains in the water phase and was not present in sediment. In line with EU guidance a PEC sediment is not required as a separate risk assessment to sediment dwellers is not required. That carried out for free living invertebrates using the PECsw is considered to be protective of sediment dwellers.

Larger buffer zones are required to demonstrate acceptable risk to aquatic organisms. For the use on low growing vegetables with a no spray zone of 30m and for applications to grape vines and a no spray zone of 50m a PEC in surface water of 0.15µg/l was calculated.

2.5.4 Fate and behaviour in air

The vapour pressure of 7.2 x 10^{-4} Pa at 25°C, Henrys law constant of 2.1x10^{-6} pascals-m^3/mole and dimensionless Henrys law coefficient at 20°C of 8.6x10^{-10} indicate that methomyl due to its high water solubility (54.6 g/l at 25°C) is unlikely to volatilise from water / soil water. This was confirmed by the study on volatility from soil and the available laboratory sediment water studies. A volatility experiment using bean leaves indicates volatilisation from plants will occur (up to 27% volatilised within 24 hours at 20°C with a relative humidity of 50 ± 10%). The Atkinson calculation indicates that volatilisation losses to the upper atmosphere will be degraded by indirect phototransformation with a half-life calculated at 19 hours. Long range transport of methomyl is therefore not likely to be very significant.

Any potential losses of methomyl to the atmosphere after application will be diluted through mixing and diffusion in air and eliminated in the upper atmosphere by indirect phototransformation. Concentrations in air can therefore be assessed as likely to be negligible.

2.6 Effects on non-target species

It should be noted that the risk assessment focuses on the appropriate worst-case scenario arising from the proposed uses. This is refined further considering other less-worse-case uses where this is necessary to identify an acceptable use. (Following the original submission, the notifier revised the GAP to that shown in Table 1.1. However, no new ecotoxicological risk assessment was presented to fully reflect the new GAP).

2.6.1 Effects on terrestrial vertebrates

The risk assessment has not been based on the methodology outlined in SANCO/4145/2000 as this was not finalised at the time of dossier compilation.

Birds

The end points obtained are summarised in Table 2.6.1. In carrying out the bird risk assessment the following procedure has been followed for calculating the acute toxicity:exposure ratio. The LD50 has been compared to the daily food consumption (wet weight) and residue levels as outlined in EPPO (1992). As regards the short and long-term risk assessment the appropriate endpoint, in terms of ppm diet, has been compared to residues on treated food, where the residue data have been taken from EPPO (1992). It is considered that for the representative uses the appropriate exposure scenario is via the consumption of contaminated insects.

i) Use on grapevines and fruiting vegetables at the maximum proposed rate (2 applications at 450 g a.s./ha).

The scenario considered is use in grapevines which also covers the other proposed uses on short and tall vegetables. According to the EPPO vertebrate risk assessment scheme, the daily food consumption of a small bird (<100 g bw, such as a small insectivorous species) is approximately equal to 30% of its bodyweight. As this is in dry weight a conversion factor of 2.4 is required in order for comparisons with the toxicity value to be made. As a result the daily fresh weight of food required for a small bird is 72%. Using this estimate, together with the predicted residue on small insects (EPPO), and the worst case assumption that the diet consists entirely of contaminated insects, acute and dietary toxicity exposure ratios (TER) have been calculated and are presented in Table 2.6.1. The estimated theoretical exposure (ETE) level of insects is considered to be 0.45 kg as./ha multiplied by the residue conversion factor for small insects of 29 (EPPO) i.e. 13.05 ppm. It is considered unlikely that multiple applications would lead to greater residues on insects than single sprays. For example, individuals of pest species such as aphids are likely to be killed by a single treatment.

Table 2.6.1 Toxicity exposure ratios for exposure of insectivorous birds to methomyl from use at 450 g a.s./ha

Category	Time scale	Toxicity endpoint	ETE*	TER	Annex VI trigger
Grape (table and vine)[1]					
Small insectivorous bird	Acute	LD50 24.2 mg a.s./kg bw	9.4 ppm a.s.[2]	2.6	10
Small insectivorous bird	Short term dietary	LC50 3952 ppm a.s.	13.05 ppm a.s.[3]	303	10
Small insectivorous bird	Long-term	NOEC 150 ppm a.s.	13.05 ppm a.s.[3]	11.5	5

*ETE= estimated theoretical exposure in the diet based on the EPPO vertebrate risk assessment scheme.
[1] This scenario also covers all other proposed uses i.e. cucumbers, courgettes, tomatoes and aubergines.
[2] Based on an estimated food intake of 72% of bodyweight.
[3] Based on a direct comparison of the study end point and the ETE.

The acute TER is below the Annex VI trigger and requires further consideration.

The short term and long term dietary risk are above the Annex VI trigger value and the risk is therefore acceptable.

Additional information was provided to refine the acute risk to birds. This examined degradation in insects and within the bird, the occurrence of feeding bouts through the day and the weight and quantity of insects necessary to obtain a lethal dose. Degradation was shown to be rapid in injected insects, however it was unclear whether this could be directly extrapolated to sprayed insects. In addition it was considered that the metabolism of methomyl was likely to be rapid within the bird. It was considered that the acute TER may not be the most appropriate end point for the risk assessment as it may be difficult for birds to obtain sufficient treated food in one day to obtain a lethal dose. This is in line with the 'time quotient>1' scenario in the 'Report of the SETAC/OECD workshop on Avian Toxicity Testing (OECD 1996). Therefore it is considered that the dietary route of exposure is the most appropriate scenario.

The TER for the dietary route of exposure is above the trigger value of 10. However, it should be noted that this has been calculated via the EPPO approach comparing a toxicity end point in terms of food concentration with environmental concentrations. Where the dietary approach is being used to cover the acute exposure it is necessary for the LC50 to be calculated in terms of mg a.s./kg bw/day, i.e. account needs to be taken of both food consumption and body weight in the dietary study. In addition, the situation is more complex where the LC50 value is below the top concentration and there is food avoidance. This is the case for methomyl where there was a decrease in consumption at 1000 ppm and concentrations above this (Medlicott, B.A and Harris, T (2000)). Therefore further detailed consideration of the appropriate dietary end points to be derived from this study is necessary before an acceptable dietary risk can be identified.

ii) Use on fruiting vegetables (cucumber, courgette, tomato, aubergine) at the lower rate (2 applications at 250 g a.s./ha)

Using the same assumptions as above at (i) use at the lower rate of 2 applications of 250 g a.s./ha is also assessed. The resulting TERs are shown in the table below.

Table 2.6.2 Toxicity exposure ratios for exposure of insectivorous birds to methomyl from use at 250 g a.s./ha

Category	Time scale	Toxicity endpoint	ETE*	TER	Annex VI trigger
Listed vegetables					
Small insectivorous bird	Acute	LD50 24.2 mg a.s./kg bw	5.22 ppm a.s. [2]	4.6	10
Small insectivorous bird	Short term dietary	LC50 3952 ppm a.s.	7.25 ppm a.s. [3]	545	10
Small insectivorous bird	Long-term	NOEC 150 ppm a.s.	7.25 ppm a.s. [3]	21	5

*ETE= estimated theoretical exposure in the diet based on the EPPO vertebrate risk assessment scheme.

[1] This scenario also covers all other proposed uses i.e. cucumbers, courgettes, tomatoes and aubergines.
[2] Based on an estimated food intake of 72% of bodyweight.
[3] Based on a direct comparison of the study end point and the ETE.

The acute TER is below the Annex VI trigger and requires further consideration. Again as argued at (i) above it is considered likely that the dietary route of exposure is more appropriate. However, as at (i) further information is required. Therefore further detailed consideration of the appropriate dietary end points are necessary before an acceptable dietary risk can be identified. The short term and long term dietary risk are above the Annex VI trigger value and the risk is therefore acceptable.

Conclusion

An acute risk from methomyl to small insectivorous birds was identified for both proposed uses. Extra information was provided that showed that there was degradation on insects, that methomyl was rapidly metabolised and that it will be difficult for a bird to obtain an acute lethal dose. On the basis of this information it is considered that the dietary route of exposure is more appropriate than the acute risk. However, to undertake a satisfactory risk assessment to address the acute risk it is necessary for the dietary end points from the LC50 study to be converted to mg a.s./kg bw /day. Food avoidance occurred in the dietary study and therefore this needs to be appropriately considered in deriving the end points. The expectation, is that with appropriate additional information it should be possible to identify an acceptable use for methomyl.

The dietary and long term risk were considered acceptable. It should be noted that use of the EPPO approach is considered acceptable for the dietary risk. The issues discussed above relate to the appropriate approach to use when the dietary risk is also effectively being used to cover the acute risk.

Mammals

The risk assessment for mammals was undertaken using the same approach as outlined for birds. It is considered that there are therefore two exposure scenarios that need to be addressed, i.e. grapes and fruiting vegetables.

i) Grapes – herbivorous mammal; 2 applications at 450 g a.s./ha

It is considered that the most appropriate scenario for use in grapevines is a small herbivorous mammal potentially grazing grass strips between the vines. Residue trials have been provided and the maximum value derived from grass strips in these is a concentration of 18 mg a.s./kg on grass and broadleaf vegetation. The resulting TERs are shown below.

Table 2.6.3 Toxicity exposure ratios for exposure of small herbivorous mammals in grapevines to methomyl

Category	Time scale	Toxicity endpoint	ETE*	TER	Annex VI trigger
Grape (table and vine)[1]					
Small herbivorous mammal	Acute	30 mg a.s./kg bw	12.96	2.3[1]	10
Small herbivorous mammal	Long-term	75 ppm feed	18 ppm	4.2[2]	5

*ETE= Based on the maximum value from field trials

[1] Based on an estimated food intake of 72% of bodyweight.

[2] Based on a direct comparison of the study end point and the ETE.

Both the acute and long term TERs are below the Annex VI trigger value. The following points were noted: that it was possible that mammals may not live permanently in vineyards, they may obtain food from other sources and that there may not always be grass strips present or that it may be senesced. However, it was not possible to verify these statements and use them in the risk assessment. Additional information was provided that considered degradation and metabolism in the animal and on foliage. It is considered that such an approach is potentially feasible to address this issue however further explanation is required of exactly how the values are being used. In addition, consideration of the scientific concept behind this type of approach is required.

At this stage it is considered that there is insufficient information available to identify an acceptable use on grapes for mammals. However, it should be noted that the TER is >1 (being 2.3) and the expectation is that it will be possible to address this issue with further appropriate information and clarification.

For the long term risk it is important to note that the residues declined very rapidly on vegetation and the DT50 value on foliage was considered to be 2 days. The residue field trials showed that the maximum residue recorded three days after the second application was only 11 mg a.s./kg. If this value is used in the risk assessment the resulting long term TER is 6.8 i.e. greater than the Annex VI trigger value. It should be noted that this risk assessment has been based on the worst case scenario that herbivorous mammals obtained 100% of their diet from the treated area. This is unlikely to be the case. Therefore taking these factors into consideration it is considered that the long term risk to herbivorous mammals is acceptable.

In addition, it should be noted that it could be argued that the NOAEL of 600 ppm for pup survival could be used for the long term risk assessment rather than considering effects on pup growth and development. If this value was used then the long term TER is 600/18 i.e. 33. It is considered that the long term risk to herbivorous mammals is acceptable and that this does not need to be considered further.

ii) Vegetables – insectivorous mammal; 2 applications at 450 g a.s./ha

The appropriate route of exposure was considered to be via the consumption of contaminated insects. The risk assessment approach is as detailed above the ETE is 0.45 kg a.s./ha x2.7 (EPPO factor for large insects) i.e. 1.22 mg a.s./kg. The resulting TERs are shown in the following table.

Table 2.6.4 Acute and long term toxicity exposure ratios for insectivorous mammals to methomyl

Category	Time scale	Toxicity endpoint	ETE*	TER	Annex VI trigger
Vegetables					
Insectivorous mammal	Acute	30.4 mg a.s./kg bw	0.88	341	10
Insectivorous mammal	Long-term	75 ppm feed	1.22 ppm	61[2]	5

*ETE= estimated theoretical exposure in the diet based on the EPPO vertebrate risk assessment scheme.
[1] Based on an estimated food intake of 72% of bodyweight.
[2] Based on a direct comparison of the study end point and the ETE.

The acute and long term TERs are above the trigger value and the risk is acceptable.

iii) Use on fruiting vegetables (cucumber, courgette, tomato, aubergine) at the lower rate (2 applications at 250 g a.s./ha)

The risk from this use is covered by the risk assessment undertaken at (ii) above and the risk is acceptable.

Conclusion

For herbivorous mammals (use on grapes) the acute risk was below the trigger value. Further refinement is possible. However additional consideration of the proposed approach and of the principles underlying the concept is required. The expectation is that it should be possible to address this issue with appropriate additional information. The long term risk to herbivorous mammals was considered acceptable. For insectivorous mammals (use on fruiting vegetables) both the acute and long-term risk was acceptable. Therefore an acceptable use has been identified on the proposed vegetable crops.

Metabolites (birds and mammals)

It is considered that the metabolite methomyl oxime was intrinsically evaluated in the toxicological studies with the active substance. Therefore it is considered that the risk assessment for methomyl also addresses the risk from the metabolite methomyl oxime.

2.6.2 Effects on aquatic species

The active substance was of similar toxicity to the formulation and therefore the risk assessment was based on the active substance.

Risk assessment for exposure via spray drift

i) Taller growing crops and grapes post-flowering (2 applications at 450 g a.s./ha)

At 3m the acute TERs for fish (50.8) aquatic invertebrates (1.37) were below the Annex VI trigger of 100. In addition, the chronic TERs for fish (5.9) and aquatic invertebrates (0.129) were below the trigger value of 10. For algae the TER was 8064 i.e. above the trigger value. Additional species testing was provided for aquatic invertebrates to reduce the acute uncertainty factor. However, the risk assessment approach was primarily driven by the chronic risk to aquatic invertebrates so this information was not actually used. The risk assessment approach was based on initial Predicted Environmental Concentrations (PECs) as it was considered that the use of time weighted average PECs could underestimate the risk. At 50 m all TERs were acceptable as shown in the following table.

Table 2.6.5 Acute and chronic toxicity exposure ratios for methomyl from spray drift at 50 m (tall vegetables and late grapes)

Species	LC/EC 50 mg a.s./l	PEC at 50 m (mg a.s./l)	TER for a.s.	Annex VI trigger
Acute risk				
Fish *Lepomis macrochirus*	0.63	0.00015	4200	100
Aquatic invert. *Daphnia magna*	0.017	0.00015	113	100
Algae *Scenedesmus subspicatus and Pseudokirchneriella subcapitata*	>100	0.00015	>666667	10
Chronic risk				
Fish *Pimephales promelas*	0.073	0.00015	487	10
Aquatic invert. *Daphnia magna*	0.0016	0.00015	10.7	10

ii) Low growing vegetables e.g. courgettes, aubergines (2 applications at 450 g a.s./ha)

At 30 m all TERs were above the required trigger values and acceptable as shown in the following table.

Table 2.6.6 Acute and chronic toxicity exposure ratios for methomyl from spray drift at 30 m (low growing vegetables)

Species	LC/EC50 mg a.s./l	PEC at 30 m (mg a.s./l)	TER for a.s.	Annex VI trigger
Acute risk				
Fish *Lepomis macrochirus*	0.63	0.00015	4200	100
Aquatic invert. *Daphnia magna*	0.017	0.00015	113	100
Algae *Scenedesmus subspicatus and Pseudokirchneriella subcapitata*	>100	0.00015	>666667	10
Chronic risk				
Fish *Pimephales promelas*	0.073	0.00015	487	10
Aquatic invert. *Daphnia magna*	0.0016	0.00015	10.7	10

iii) Other proposed uses

For the other proposed uses e.g. grapes pre-flowering, lower rates of use on vegetables Member States should use the information provided to undertake a risk assessment.

Overall the risk to aquatic organisms was considered to be acceptable with appropriate risk mitigation measures ***i.e., buffer zones of 30 and 50 m***.

2.6.3 Effects on bees and other arthropod species

The hazard quotients for the maximum proposed application rate are shown in the following table.

Table 2.6.7 Acute and oral hazard quotients for methomyl and Methomyl 20 SL

Test Substance	Exposure route	LD50 (µg a.s./bee)	Methomyl application rate (g a.s./ha)	Hazard quotient (Oral or acute)
Methomyl	oral	0.28	450	1607
Methomyl	contact	0.16	450	2813
Methomyl 20SL	oral	0.20	450	2250
Methomyl 20SL	contact	0.17	450	2647

These results indicate a potential risk to bees when used in accordance with Good Agricultural Practice. Some semi-field trials with aged residues were provided, however the data were variable and were only of limited use. It was considered that a risk to bees was identified and that appropriate risk management measures should be considered at a Member State level. No additional requirements were identified.

A large number of non-target arthropod studies on a range of species were provided. These included laboratory studies with glass plate as well as more refined extended laboratory studies e.g. where residues were aged and more realistic substrates were used. In addition, a range of field studies were undertaken with *Typhlodromus pyri* and other predatory mites.

Methomyl was generally moderately to highly toxic to all 6 species tested and hence the extensive nature of the data provided. Aged residue trials with a range of species indicated that as residues aged effects declined as was expected with a DT50 on foliage of 2 days. Field trials with *T. pyri* showed that recovery of >60% occurred at varying intervals from 56 to 371 days. Variability in results was considered to be due to weather conditions and availability of prey and it was noted that this species was not of high mobility. Data for *Aphidius rhopalosiphi* showed that mummies were not impacted at 450 g a.s./ha. It was considered that there data demonstrated a potential for recovery within one year in-field. Off-field data at spray drift rates (33.75 g a.s./ha) showed there was no adverse impact on *T. pyri*. For *A. rhopalosiphi* it was noted that the laboratory LR25 value on barley seedlings of 8.3 g a.s./ha was greater than the spray drift value at 10 m of 4.8 g a.s./ha i.e. effects in the field should be less than 25%. It was considered that the risk to off-crop species was acceptable with appropriate risk mitigation measures at Member State. Drift rates in low growing vegetables will be lower and the above risk assessment also covers this.

It was considered that the risk to non-target arthropods was acceptable. Appropriate risk mitigation measures can be considered at Member State level for the off-field habitat.

2.6.4 Effects on earthworms and other soil macro-organisms

Acute risk

The acute risk to earthworms was considered acceptable with the maximum PECsoils from the proposed uses as shown in the following table.

Table 2.6.8 Short term risk to earthworms

Scenario	LC50 (mg a.s./kg))	PEC mg as/kg	Short term TER	Annex VI trigger 91/414 EEC
Tall and short vegetables	LC50: 19	0.493	38.5	10
Grapes -early use	LC50: 19	0.394	48.2	10
Grapes – late use	LC50 19	0.296	64.1	10

Chronic risk

The *Guidance Document on Terrestrial Ecotoxicology under Directive 91/414/EEC* SANCO/10329/2002 17 Oct 2002 states that a sub lethal study on earthworms is not required when the DT90f is <100 days and the number of applications is less than three. The laboratory DT90 in soil at reference conditions is 74 days (DT50 22.2 days, first order, see Table B.8.32). Under field conditions the DT90 would be expected to be shorter than this. In addition, only two applications are recommended. Therefore according to the guidance document it is not necessary to undertake an assessment of the long term risk to earthworms.

However, a chronic study for earthworms has actually been provided and therefore this end point (1.5 mg a.s./kg soil) can be used in a long term risk assessment. The chronic risk to earthworms from the proposed uses is considered in the following table:

Table 2.6.9 Chronic risk to earthworms

Scenario	NOEC (mg a.s./kg))	PEC mg as/kg	Chronic TER	Annex VI trigger 91/414 EEC
Tall and short vegetable (450 g a.s. ha)	1.5	0.493	3.04	5
Grapes -early use	1.5	0.394	3.81	5
Grapes – late use	1.5	0.296	5.06	5

In addition, use is proposed on fruiting vegetables at 250 g a.s./ha. This rate is 1.8 times lower than that the 450 g a.s./ha rate and therefore the TER will be 1.8 times greater i.e. 5.47. This is above the chronic trigger value and acceptable.

Late use on grapes results in a TER above the trigger value and indicates that the risk is acceptable. Similarly this is the case for use on fruiting vegetables at 250 g a.s./ha. However, the TERs for use at the maximum proposed rate (2 applications at 450 g a.s./ha) on vegetables and for early use on grapes results in a TER below the trigger value. More information is required before a conclusion can be reached on the acceptability of the risk from early use on grapes and from use on fruiting vegetables at 450 g a.s./ha.

2.6.5 Effects on soil micro-organisms

Methomyl 20 SL at 0.45 and 4.5 kg a.s./ha had no adverse effect on soil respiration or carbon mineralization (effects <25%). Methomyl 20 SL is recommended at a maximum of 0.450 kg a.s./ha with 2 applications. The risk to soil micro-organisms is therefore considered to be acceptable.

2.6.6 Effects on other non-target organisms (flora and fauna)

No adverse phytotoxic effects were seen on a range of plants at 2.25 litres Methomyl 20 SL/ha (0.45 kg a.s/ha). The risk to non-target plants is considered acceptable.

2.6.7 Effects on biological methods of sewage treatment

The 3 hour EC50 was >100 mg a.s./l. Given the nature of the proposed contamination of sewage treatment plants is considered unlikely. The risk is considered acceptable.

APPENDIX 1

Methomyl

STANDARD TERMS AND ABBREVIATIONS

Technical Terms

A	ampere
Ach	acetylcholine
Ache	acetylcholinesterase
ADI	Acceptable Daily Intake
ADP	adenosine diphosphate
AE	acid equivalent
AFID	alkali flame-ionization detector or detection
A/G	albumin/globulin ratio
ai	active ingredient
ALD50	approximate median lethal dose 50%
ALT	alanine aminotransferase (SGPT)
AOEL	Acceptable Operator Exposure Level
AMD	automatic multiple development
ANOVA	analysis of variance
AP	alkaline phosphatase
approx	approximate
ARC	anticipated residue contribution
ARfD	acute reference dose
as	active substance
AST	aspartate aminotransferase (SGOT)
ASV	air saturation value
ATP	adenosine triphosphate
BCF	bioconcentration factor
bfa	body fluid
BOD	biological oxygen demand
bp	boiling point
BSAF	biota-sediment accumulation factor
BSE	bovine spongiform encephalopathy
BSP	bromosulfophthalein
Bt	*Bacillus thuringiensis*
Bti	bacillus thuringiensis israelensis
Btk	bacillus thuringiensis kurstaki
Btt	bacillus thuringiensis tenebrionis
BUN	blood urea nitrogen
bw	body weight
c	centi-(= 10^{-2}
°C	degree celsius (centigrade)
CA	controlled atmosphere
CAD	computer aided design
CADDY	computer aided dossier and data supply (an electronic dossier interchange and archiving format)
cd	candela
CDA	controlled drop(let) application
cDNA	complementary DNA
CEC	cation exchange capacity
cf	confer, compare to
CFU	colony forming units
ChE	cholinesterase

CI	confidence interval
CL	confidence limits
cm	centimetre
CNS	central nervous system
COD	chemical oxygen demand
CPK	creatinine phosphatase
cv	coefficient of variation
Cv	ceiling value
CXL	Codex Maximum Residue Limit (Codex MRL)
d	day
DES	diethylstilboestrol
DFR	dislodgeable foliar residue
DMSO	dimethylsulfoxide
DNA	deoxyribonucleic Acid
dna	designated national authority
DO	dissolved oxygen
DOC	dissolved organic carbon
dpi	days pot inoculation
DRES	dietary risk evaluation system
DT	disappearance time
DT_{50}	period required for 50 percent dissipation (define method of estimation)
DT_{90}	period required for 90 percent dissipation (define method of estimation)
dw	dry weight
DWQG	drinking water quality guidelines
ε	decadic molar extinction coefficient
EC_{50}	effective concentration
ECD	electron capture detector
ECU	European currency unit
ED_{50}	median effective dose
EDI	estimated daily intake
ELISA	enzyme lined immunosorbent assay
e-mail	electronic mail
EMDI	estimated maximum daily intake
EPMA	electron probe micro analysis
ERC	environmentally relevant concentration
ERL	extraneous residue limit
F	field
F_o	parental generation
F_1	filial generation, first
F_2	filial generation, second
FIA	fluorescence immuno assay
FID	flame ionization detector
FOB	functional observation battery
fp	freezing point
FPD	flame photometric detector
FPLC	fast protein liquid chromatography
g	gram
G	glasshouse
GAP	Good Agricultural Practice

GC	gas chromatography
GC-EC	gas chromatography with electron capture detector
GC-FID	gas chromatography with flame ionization detector
GC-MS	gas chromatography-mass spectrometry
GC-MSD	gas chromatography with mass-selective detection
GEP	good experimental practice
GFP	good field practice
GGT	gamma glutamyl transferase
GI	gastro-intestinal
GIT	gastro-intestinal tract
GL	guideline level
GLC	gas liquid chromatography
GLP	good laboratory practice
GM	geometric mean
GMO	genetically modified organism
GMM	genetically modified micro-organism
GPC	gel-permeation chromatography
GPPP	good plant protection practice
GPS	global positioning system
GSH	glutathion
GV	granulosevirus
h	hour(s)
H	Henry's Law constant (calculated as a unitless value) (see also K)
ha	hectare
Hb	haemoglobin
HCG	human chorionic gonadotropin
Hct	haematocrit
HDT	highest dose tested
hL	hectolitre
HEED	high energy electron diffraction
HID	helium ionization detector
HPAEC	high performance anion exchange chromatography
HPLC	high performance liquid chromatography
HPLC-MS	high pressure liquid chromatography - mass spectrometry
HPPLC	high pressure planar liquid chromatography
HPTLC	high performance thin layer chromatography
HRGC	high resolution gas chromatography
H_s	Shannon-Weaver index
Ht	haematocrit
I	indoor
I_{50}	inhibitory dose, 50%
IC_{50}	median immobilisation concentration
ICM	integrated crop management
ID	ionization detector
IEDI	international estimated daily intake
IGR	insect growth regulator
im	intramuscular
inh	inhalation
ip	intraperitoneal

IPM	integrated pest management
IR	infrared
ISBN	international standard book number
ISSN	international standard serial number
iv	intravenous
IVF	*in vitro* fertilization
k	kilo
K	Kelvin or Henry's Law constant (in atmospheres per cubic meter per mole) (see also H)[13]
K_{ads}	adsorption constant
K_{des}	apparent desorption coefficient
K_{oc}	organic carbon adsorption coefficient
K_{om}	organic matter adsorption coefficient
kg	kilogram
L	litre
LAN	local area network
LASER	light amplification by stimulated
LBC	loosely bound capacity
LC	liquid chromatography
LC-MS	liquid chromatography - mass spectrometry
LC_{50}	lethal concentration, median
LD_{50}	lethal dose, median; dose letalis media
LCA	life cycle analysis
LC_{Lo}	lethal concentration low
LC-MS-MS	liquid chromatography with tandem mass spectrometry
LD_{50}	lethal dose, median; dosis letalis media
LD_{Lo}	lethal dose low
LDH	lactate dehydrogenase
LOAEC	lowest observable adverse effect concentration
LOAEL	lowest observable adverse effect level
LOD	limit of determination
LOEC	lowest observable effect concentration
LOEL	lowest observable effect level
LOQ	limit of quantification (determination)
LPLC	low pressure liquid chromatography
LSC	liquid scintillation counter
LSD	least squared denominator multiple range test
LSS	liquid scintillation spectrometry
LT	lethal threshold
m	metre
M	molar
µm	micrometer (micron)
MC	moisture content
MCH	mean corpuscular haemoglobin
MCHC	mean corpuscular haemoglobin concentration
MCV	mean corpuscular volume
MDL	method detection limit
MFO	mixed function oxidase
µg	microgram

mg	milligram
MHC	moisture holding capacity
min	minute(s)
ml	millilitre
MLT	median lethal time
MLD	minimum lethal dose
mm	millimetre
mol	Mol
MOS	margin of safety
mp	melting point
MRE	maximum residue expected
mM	Milimoles
MRL	maximum residue level
mRNA	messenger ribonucleic acid
MS	mass spectrometry
MSDS	material safety data sheet
MTD	maximum tolerated dose
n	normal (defining isomeric configuration)
NAEL	no adverse effect level
nd	not detected
NEDI	national estimated daily intake
NEL	no effect level
NERL	no effect residue level
ng	nanogram
nm	nonometer
NMR	nuclear magnetic resonance
no	number
NOAEC	no observed adverse effect concentration
NOAEL	no observed adverse effect level
NOEC	no observed effect concentration
NOED	no observed effect dose
NOEL	no observed effect level
NOIS	notice of intent to suspend
NPD	nitrogen-phosphorus detector or detection
NPV	nuclear polyhedrosis virus
NR	not reported
NTE	neurotoxic target esterase
OC	organic carbon content
OCR	optical character recognition
ODP	ozone-depleting potential
ODS	ozone-depleting substances
OM	organic matter
op	organophosphorous pesticide
Pa	pascal
PAD	pulsed amperometric detection
2-PAM	2-pralidoxime
pc	paper chromatography
PC	personal computer
PCV	haematocrit (packed corpuscular volume)

PEC	Predicted Environmental Concentration
PEC_A	predicted environmental concentration in air
PEC_S	predicted environmental concentration in soil
PEC_{SW}	predicted environmental concentration in surface water
PEC_{GW}	predicted environmental concentration in ground water
PED	plasma-emissions-detector
PFPD	Pulsed flame photometric detection or detector
pH	pH-value
PHED	pesticide handler's exposure data
PHI	pre-harvest interval
PIC	prior informed consent
pic	phage inhibitory capacity
PIXE	proton induced X-ray emission
pKa	negative logarithm (to the base 10) of the dissociation constant)
PNEC	predicted no effect concentration
po	by mouth
P_{ow}	partition coefficient between n-octanol and water
POP	persistent organic pollutants
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
ppp	plant protection product
ppq	parts per quadrillion (10^{-24})
ppt	parts per trillion ($10^{-12)}$
PSP	phenolsulfophthalein
PrT	prothrombin time
PRL	practical residue limit
PT	prothrombin time
PTDI	provisional tolerable daily intake
PTT	partial thromboplastin time
QSAR	quantitative structure-activity relationship
r	correlation coefficient
r^2	coefficient of determination
RBC	red blood cell
REI	restricted entry interval
Rf	retardation factor
RfD	reference dose
RH	relative humidity
RL_{50}	median residual lifetime
RNA	ribonucleic acid
RP	reversed phase
rpm	rotations per minute
rRNA	ribosomal ribonucleic acid
RRT	relative retention time
RSD	relative standard deviation
s	second
SAC	strong adsorption capacity
SAP	serum alkaline phosphatase
SAR	structure/activity relationship

SBLC	shallow bed liquid chromatography
sc	subcutaneous
sce	sister chromatid exchange
SD	standard deviation
se	standard error
SEM	standard error of the mean
SEP	standard evaluation procedure
SF	safety factor
SFC	supercritical fluid chromatography
SFE	supercritical fluid extraction
SIMS	secondary ion mass spectroscopy
SOP	standard operating procedures
sp	species (only after a generic name)
SPE	solid phase extraction
SPF	specific pathogen free
spp	subspecies
sq	square
SSD	sulphur specific detector
SSMS	spark source mass spectrometry
STEL	short term exposure limit
STMR	supervised trials median residue
t	tonne (metric ton)
$t_{½}$	half-life (define method of estimation)
T_3	tri-iodothyroxine
T_4	thyroxine
TADI	temporary acceptable daily intake
TBC	tightly bound capacity
TCD	thermal conductivity detector
TC_{Lo}	toxic concentration, low
TID	thermionic detector, alkali flame detector
TD_{Lo}	toxic dose low
TDR	time domain reflectrometry
TER	Toxicity Exposure Ratio
TER_1	toxicity exposure ration for initial exposure
TER_{ST}	toxicity exposure ration following repeated exposure
TER_{LT}	toxicity exposure ration following chronic exposure
tert	tertiary (in a chemical name)
TEP	typical end-use product
TGGE	temperature gradient gel electrophoresis
TIFF	tag image file format
TLC	thin layer chromatography
Tlm	median tolerance limit
TLV	threshold limit value
TMDI	theoretical maximum daily intake
TMRC	theoretical maximum residue contribution
TMRL	temporary maximum residue limit
TOC	total organic carbon
Tremcard	Transport emergency card
tRNA	transfer ribonucleic acid

TSH	Thyroid stimulating hormone (thyrotropin)
TWA	time weighted average
UDS	unscheduled DNA synthesis
UF	uncertainty factor (safety factor)
ULV	ultra low volume
UV	ultraviolet
v/v	volume ratio (volume per volume)
WBC	white blood cell
wk	week
wt	weight
w/v	weight per volume
w/w	weight per weight
XRFA	X-ray fluorescence analysis
yr	year
<	less than
≤	less than or equal to
>	greater than
≥	greater than or equal to

Organisations and Publications

ACPA	American Crop Protection Association
ASTM	American Society for Testing and Materials
BA	Biological Abstracts (Philadelphia)
BART	Beneficial Arthropod Registration Testing Group
CA	Chemical Abstracts
CAB	Centre for Agriculture and Biosciences International
CAC	Codex Alimentarius Commission
CAS	Chemical Abstracts Service
CCFAC	Codex Committee on Food Additives and Contaminants
CCGP	Codex Committee on General Principles
CCPR	Codex Committee on Pesticide Residues
CCRVDF	Codex Committee on Residues of Veterinary Drugs in Food
CE	Council of Europe
CIPAC	Collaborative International Pesticides Analytical Council Limited
COREPER	Comite des Representants Permanents
EC	European Commission
ECB	European Chemical Bureau
ECCA	European Crop Care Association
ECDIN	Environmental Chemicals Data and Information Network of the European Communities
ECDIS	European Environmental Chemicals Data and Information System
ECE	Economic Commission for Europe
ECETOC	European Chemical Industry Ecology and Toxicology Centre
ECLO	Emergency Centre for Locust Operations
ECMWF	European Centre for Medium Range Weather Forecasting
ECPA	European Crop Protection Association
EDEXIM	European Database on Export and Import of Dangerous Chemicals
EHC (no.)	Environmental Health Criteria (number)

EINECS	European Inventory of Existing Commercial Chemical Substances
ELINCS	European List of New Chemical Substances
EMIC	Environmental Mutagens Information Centre
EPA	Environmental Protection Agency
EPO	European Patent Office
EPPO	European and Mediterranean Plant Protection Organisation
ESCORT	European Standard Characteristics of Beneficials Regulatory Testing
EU	European Union
EUPHIDS	European Pesticide Hazard Information and Decision Support System
EUROPOEM	European Predictive Operator Exposure Model
FAO	Food and Agriculture Organisation of the UN
FOCUS	Forum for the Co-ordination of Pesticide Fate Models and their Use
FRAC	Fungicide Resistance Action Committee
GATT	General Agreement on Tariffs and Trade
GAW	Global Atmosphere Watch
GIFAP	Groupement International des Associations Nationales de Fabricants de Produits Agrochimiques
GCOS	Global Climate Observing System
GCPF	Global Crop Protection Federation (formerly known as GIFAP)
GEDD	Global Environmental Data Directory
GEMS	Global Environmental Monitoring System
GIEWS	Global Information and Early Warning System for Food and Agriculture
GRIN	Germplasm Resources Information Network
HRAC	Herbicide Resistance Action Committee
IARC	International Agency for Research on Cancer
IATS	International Academy of Toxicological Science
IBT	Industrial Bio-Test Laboratories
ICBB	International Commission of Bee Botany
ICBP	International Council for Bird Preservation
ICES	International Council for the Exploration of the Seas
ICPBR	International Commission for Plant-Bee Relationships
ILO	International Labour Organisation
IMO	International Maritime Organisation
IOBC	International Organisation for Biological Control of Noxious Animals and Plants
IPCS	International Programme on Chemical Safety
IRAC	Insecticide Resistance Action Committee
IRC	International Rice Commission
ISCO	International Soil Conservation Organisation
ISO	International Organisation for Standardisation
IUPAC	International Union of Pure and Applied Chemistry
JECFA	FAO/WHO Joint Expert Committee on Food Additives
JFCMP	Joint FAO/WHO Food and Animal Feed Contamination Monitoring Programme
JMP	Joint Meeting on Pesticides (WHO/FAO)
JMPR	Joint Meeting on the FAO Panel of Experts on Pesticide Residues in Food and the Environment and the WHO Expert Group on Pesticide Residues (Joint Meeting on Pesticide Residues)
NATO	North Atlantic Treaty Organisation

NAFTA	North American Free Trade Agreement
NCI	National Cancer Institute (USA)
NCTR	National Centre for Toxicological Research (USA)
NGO	non-governmental organisation
NTP	National Toxicology Programme (USA)
OECD	Organisation for Economic Co-operation and Development
OLIS	On-line Information Service of OECD
PAN	Pesticide Action Network
RNN	Re-registration Notification Network
RTECS	Registry of Toxic Effects of Chemical Substances (USA)
SCPH	Standing Committee on Plant Health
SETAC	Society of Environmental Toxicology and Chemistry
SI	Systeme International d'Unites
SITC	Standard International Trade Classification
TOXLINE	Toxicology Information On-line
UN	United Nations
UNEP	United Nations Environment Programme
WCDP	World Climate Data Programme
WCP	World Climate Programme
WCRP	World Climate Research Programme
WFP	World Food Programme
WHO	World Health Organisation
WTO	World Trade Organisation
WWF	World Wildlife Fund

APPENDIX 2

Methomyl

Appendix 2 Specific terms and abbreviations

Technical Terms

ADME	adsorption, distribution, metabolism and excretion
ADR	European agreement concerning the international carriage of dangerous goods by road
AR	applied radioactivity
a.s.	active substance
AUC	area under curve
BuChE	Butyrylcholinesterase
C	Carbon
CHO	Chinese hamster ovary
CO	Carbon monoxide
CO_2	Carbon dioxide
EC	emulsifiable concentrate
ETE	Estimated theoretical exposure
HCl	Hydrochloric acid
HDPE	high density polyethylene
HGPRT	hypoxanthine–guanine phosphoribosyl transferase
HPT	hypothalamus-pituitary-testicular
ILV	Independent laboratory validation
K_{ads}	adsorption constant
K_F	Freundlich coefficient
K_{OH}	hydroxyl radical rate constant
K_{OW}	octanol water partition coefficient
KOH	Potassium hydroxide
LC	Liquid chromatography
LH	Luteinizing Hormone
LOQ	limit of quantification
MAC	Maximum Allowable Concentration
MATC	Maximum Acceptable Toxic Concentration
MMAD	mass median aerodynamic diameter
Mbq	Mega becquerels
MS	Member State
MWHC	maximum water holding capacity
n	Number of subjects, organisms, etc
N	Normal (of acids etc)
NaOH	Sodium hydroxide
NESTI	National estimate of short-term intake
NMS	Northern Member State
NNG	Net nuclear grains
OM	Organic Matter
P_0 / P_1	parental generation, first (author dependent)
PCE	polychromatic erythrocytes
PCN	potato cyst nematode
PDE	potential dermal exposure
PEC_a	predicted environmental exposure in air
PEC_{gw}	predicted environmental exposure in ground water
PEC_s	predicted environmental exposure in soil
PEC_{sw}	predicted environmental exposure in surface water

PELMO	Pesticide Leaching Model
PHED	Pesticide Handlers Exposure Database
pKa	dissociation constant
POEM	Predictive Operator Exposure Model
PPE	personal protective equipment
r^2	correlation coefficient
RPE	respiratory protective equipment
RSD	relative standard deviation
s	second
SC	suspension concentrate
SL	Soluble concentrate (formulation)
SMS	Southern Member State
TER	toxicity exposure ratio
TLC	thin layer chromatography
TRR	Total recovered radioactivity
UK	United Kingdom
WP	wettable powder

Organisations and Publications

BBA	Federal Biological Research Centre for Agriculture and Forestry (Germany)
BBCH	BASF–Bayer–Ciba-Geigy–Hoechst growth stage classification
BVL	Federal Office for Consumer Protection and Food Safety (Germany)
Defra	Department for Environment, Food and Rural Affairs (UK)
DIN	German national accrediting/standardisation body
EFSA	European Food Safety Authority
EPA	Environmental Protection Agency (USA)
ICAO	International Civil Aviation Organisation
MAFF	(Former) Ministry of Agriculture, Fisheries and Food (UK)
PSD	Pesticides Safety Directorate (UK)
SANCO	Health and Consumer Protection Directorate-General of the European Commission
SCFCAH	Standing Committee on the Food Chain and Animal Health (EC)

APPENDIX 3

Methomyl

LISTING OF END POINTS

List of end points (based on doc 1654/VI/94, Rev. 7, 22 April 1998)

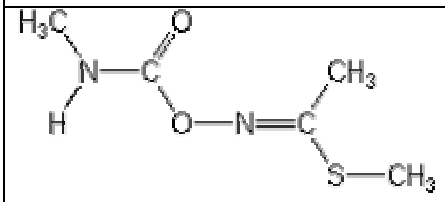
Identity, Physical and Chemical Properties, Details of Uses, Further Information, Methods of Analysis

Rapporteur Member State	Month and year	Active Substance (Name)
United Kingdom	**April 2004**	**Methomyl**

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

Active substance (ISO Common Name)	Methomyl
Function (*e.g.* fungicide)	Insecticide/acaricide
Rapporteur Member State	United Kingdom

Identity (Annex IIA, point 1)

Chemical name (IUPAC)	*S*-methyl (*EZ*)-*N*-(methylcarbamoyloxy)thioacetimidate
Chemical name (CA)	methyl *N*-[[(methylamino)carbonyl]oxy] ethanimidothioate
CIPAC No	264
CAS No	16752-77-5
EEC No (EINECS or ELINCS)	240-815-0
FAO Specification (including year of publication)	***AGP CP/350 (1997) and 264 TC (2002)*** ***(Minimum declared must be 98%)***
Minimum purity of the active substance as manufactured (g/kg)	Minimum declared 987.0 g/kg.
Identity of relevant impurities (of toxicological, environmental and/or other significance) in the active substance as manufactured (g/kg)	None.
Molecular formula	$C_5H_{10}N_2O_2S$
Molecular mass	162.2
Structural formula	

List of end points (based on doc 1654/VI/94, Rev. 7, 22 April 1998)

Identity, Physical and Chemical Properties, Details of Uses, Further Information, Methods of Analysis

Rapporteur Member State	Month and year	Active Substance (Name)
United Kingdom	**April 2004**	**Methomyl**

Physical-chemical properties (Annex IIA, point 2)

Melting point (state purity if not purified)	79.6 ± 0.1°C (98.02% pure)
Boiling point (state purity if not purified)	Not applicable; test material is a solid which decomposes after melting
Temperature of decomposition	192 ± 3.1°C (98.02% pure)
Appearance (state purity if not purified)	Solid, white powder
Relative density (state purity if not purified)	1.318 ± 0.001 g/cm^3 (1318 kg/m^3) @ 20.3 ± 0.4°C.
Surface tension	0.0737 N/m (1 mg/ml solution in water at 20.1 ± 0.3°C).) (98.02% pure)
Vapour pressure (in Pa, state temperature)	5.4 x 10^{-6} mm Hg (7.2x 10^{-4} Pas) at 25°C
Henry's law constant (Pa m^3 mol $^{-1}$)	At 25°C: 2.1x10^{-11} atm-m^3/mole 2.1X10^{-6} Pa-m^3/mole
Solubility in water (g/l or mg/l, state temperature)	55 mg/ml(25°C) pH 7 only (Methomyl is non-ionising) acceptable
Solubility in organic solvents (in g/l or mg/l, state temperature)	Solubilities at 20°C: **Solvent** — **Solubility (mg/L)** Ethyl Acetate — 7.74x10^4 n-Heptane — 97.1 1-Octanol — 2.40x10^4 Xylene — 9.58x10^3 Acetone — >250g/kg Acetonitrile — >250g/kg Dichloromethane — >250g/kg Dimethylformamide — >250g/kg Methanol — >250g/kg

List of end points (based on doc 1654/VI/94, Rev. 7, 22 April 1998)

Identity, Physical and Chemical Properties, Details of Uses, Further Information, Methods of Analysis

Rapporteur Member State	Month and year	Active Substance (Name)
United Kingdom	April 2004	Methomyl

Partition co-efficient (log P_{OW}) (state pH and temperature)	K_{ow} of methomyl at 25°C: = 1.24 (Log K_{ow} = 0.09). Mean of results for two concentrations, differing by a factor 10: K_{ow} = 1.14 (at 0.1mg/ml) and 1.35 (at 1mg/ml). No data for effect of pH (4 – 10). Case made that methomyl does not ionise in environmental pH range
Hydrolytic stability (DT_{50}) (state pH and temperature)	Hydrolysis of methomyl at 25°C was studied at pH 5, 7, and 9, and at two concentrations, 10 and 100ppm. At pH 9, methomyl hydrolysed with a half-life of ~30days. Methomyl was stable at pH 5 and 7. The hydrolysis product at pH 9 was IN-X1177 (methomyl-oxime, S-methyl N-hydroxythioacetimidate)
Dissociation constant	Not applicable. Methomyl does not ionise at environmentally relevant pH.
UV/VIS absorption (max.) (if absorption > 290 nm state ε at wavelength)	UV / VIS absorbance maximum for acidic, basic, and neutral solutions of methomyl was 234 nm(25°C). **pH** **λ_{max}** **ε** **log ε** 1.74 234 8.98×10^3 3.95 10.92 234 8.89×10^3 3.95 7.02 234 9.01×10^3 3.95 • No absorption maxima beyond 290nm were observed (all pH conditions). Solutions in methanol at higher concentrations measured over a longer cell path length also showed no absorption maxima beyond 290 nm. • No effect of pH on absorbance / λmax for time periods up to 30 min.
Photostability (DT_{50}) (aqueous, sunlight, state pH)	Methomyl does not undergo direct photolysis. Methomyl does not absorb the energy of sunlight at wavelengths ~290 nm and above. Indirect aqueous photolysis was observed in the presence of nitrate
Quantum yield of direct phototransformation in water at Σ > 290 nm	Not applicable. Methomyl does not absorb the energy of sunlight at wavelengths ~290 nm and above.

List of end points (based on doc 1654/VI/94, Rev. 7, 22 April 1998)

Identity, Physical and Chemical Properties, Details of Uses, Further Information, Methods of Analysis

Rapporteur Member State	Month and year	Active Substance (Name)
United Kingdom	**April 2004**	**Methomyl**

Flammability	Not classified as highly flammable
Explosive properties	Not classified as explosive

List of end points (based on doc 1654/VI/94, Rev. 7, 22 April 1998)

Identity, Physical and Chemical Properties, Details of Uses, Further Information, Methods of Analysis

Rapporteur Member State	Month and year	Active Substance (Name)
United Kingdom	**April 2004**	**Methomyl**

Summary of intended uses

Crop and/or situation (a)	North (N) or South (S) Europe	Product name	F G or I (b)	Pests or Group of pests controlled (c)	Formulation		Application				Application rate per treatment			PHI (days) (i)
					Type (d-f)	Conc. of a.s. (i)	method kind (g-h)	growth stage & season (j)	number min max (k)	interval between applications (min days)	kg a.s./hL min max	Water L/ha Min max	kg a.s./ha min max	
Cucumber/ Courgette	SE	Methomyl 20 SL	F	Biting and sucking insects	SL	200g/L	MV/HV; foliar	Pre-harvest	1-2	14	0.025 - 0.09	500 - 1,000	0.25 - 0.45	7
Tomato/ Eggplant	SE	Methomyl 20 SL	F	Biting and sucking insects	SL	200g/L	MV/HV; foliar	Pre-harvest	1-2	14	0.025 - 0.09	500 - 1,000	0.25 - 0.45	7
Grape (table & wine)	France (NE); SE	Methomyl 20 SL	F	Biting and sucking insects	SL	200g/L	HV; foliar	Pre-harvest	1-2	14	0. 08 - 0.12	300 -450	0.35	14
Grape (table & wine)	France (NE); SE	Methomyl 20 SL	F	Biting and sucking insects	SL	200g/L	HV; foliar	Pre-harvest	1-2	14	0. 04 - 0.10	> 450 - 1200	0.45	14

List of end points (based on doc 1654/VI/94, Rev. 7, 22 April 1998)

Identity, Physical and Chemical Properties, Details of Uses, Further Information, Methods of Analysis

Rapporteur Member State	Month and year	Active Substance (Name)
United Kingdom	**April 2004**	**Methomyl**

Remarks:

(a) For crops, the EU and Codex classifications (both) should be used; where relevant, the use situation should be described (e.g., fumigation of a structure)
(b) Outdoor or field use (F), glasshouse application (G), or indoor application (I)
(c) e.g., biting/sucking insects, nematodes, soil born insects, foliar fungi, weeds
(d) e.g., wettable powder (WP), emulsifiable concentrate (EC), granule (GR)
(e) GCPF Codes – GIFAP Technical Monograph No. 2, 1989
(f) All abbreviations must be explained
(g) Method: high volume spraying, low volume spraying, spreading, dusting, drench;
HV = high volume foliar spraying; MV = medium volume foliar spraying

Remarks:

(h) Kind, e.g., overall, broadcast, aerial spraying, row, individual plant, between the plant – type of equipment used must be indicated;
Foliar = foliar spraying
(i) g/kg or g/L
(j) Growth stage at last treatment (BBCH Monograph, Growth Stages of Plants, 1997, Blackwell, ISBN 3-8263-3152-4), including where relevant, information on season at time of application
(k) The minimum and maximum number of application possible under practical conditions of use must be provided
(l) PHI - minimum pre-harvest interval
(m) Remarks may include: Extent of use/economic importance/restrictions

List of end points (based on doc 1654/VI/94, Rev. 7, 22 April 1998)

Residues

Rapporteur Member State	Month and year	Active Substance (Name)

Methods of Analysis

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

Technical a.s. (principle of method)	Reversed-phase HPLC with UV detection (235nm)
Impurities in technical as (principle of method)	Reversed-phase HPLC with UV detection (230nm)
Plant protection product (principle of method)	Reversed-phase HPLC with UV detection (235nm)

Analytical methods for residues (Annex IIA, point 4.2)

Unless otherwise stated, residue methods and associated LOQs refer to determination of parent methomyl.

Food/feed of plant origin (principle of method and LOQ for methods for monitoring purposes)	Reversed-phase HPLC with post-column derivatisation (phthalaldehyde/mercaptoethanol reaction) and fluorescence detection (Ex. 330nm, Em. 466nm) LOQ: 0.01mg/kg for wide range of commodities. Confirmation by reversed-phase HPLC-MS (single ion monitoring) to LOQ of 0.01mg/kg for acceptable range of crops.
Food/feed of animal origin (principle of method and LOQ for methods for monitoring purposes)	*Submitted but not required. Not evaluated.*
Soil (principle of method and LOQ)	Reversed-phase HPLC with post-column derivatisation (phthalaldehyde/mercaptoethanol reaction) and fluorescence detection (Ex. 330nm, Em. 466nm). LOQ 0.001mg/kg. ELISA with UV detection also available to validated LOQ of 0.025mg/kg. The above methods serve interchangeably as monitoring / confirmatory methods

List of end points (based on doc 1654/VI/94, Rev. 7, 22 April 1998)

Residues

Rapporteur Member State	Month and year	Active Substance (Name)

Water (principle of method and LOQ)	Analytical methods as for soil (HPLC-fluorescence and ELISA-UV detection) but with lower LOQs. Ground w. LOQ 0.0001mg/kg Surface w. LOQ 0.00025mg/kg
Air (principle of method and LOQ)	Reversed-phase HPLC with MS detection (single ion m/z 163). LOQ 0.58µg/m^3 Confirmation by conversion of residues to methomyl oxime and determination by reversed-phase HPLC-MS (single ion, m/z 106).
Body fluids and tissues (principle of method and LOQ)	Residues converted to methomyl oxime and determined by GC/MS (m/z 88 for monitoring; m/z 58 and m/z 105 for confirmation. LOQ 0.01mg/kg Additional confirmation by GC/PFPD: LOQ 0.01mg/kg

Classification and proposed labelling (Annex IIA, point 10)

with regard to physical/chemical data	***None for the active substance***

List of end points (based on doc 1654/VI/94, Rev. 7, 22 April 1998)

Residues

Rapporteur Member State	Month and year	Active Substance (Name)

Impact on Human and Animal Health

Absorption, distribution, excretion and metabolism in mammals (Annex IIA, point 5.1)

Rate and extent of absorption ‡	Rapid after gavage administration with peak effects seen 0.5 to 3 hours post dosing. Also extensive excretion in urine and in expired air within 24 hours post dosing. Absorption >90% in the rat and approximately 75% in the monkey.
Distribution in the rat‡	Widespread (highest levels in the gastro-intestinal tract, liver, blood, and skin).
Distribution in the monkey‡	Widespread (highest levels in fat and muscle).
Potential for accumulation ‡	Although the radioactive tissues residues appear to be high at 168 hours, (8-9% in the rat & approximately 5% in the monkey), methomyl is broken down into small carbon compounds which join the pool of naturally occurring carbon compounds and are incorporated into the tissues.
Rate and extent of excretion ‡	Methomyl was rapidly excreted in expired air and urine (within 24 hours of dosing (80% in the rat and 63% in the monkey) and extensive elimination in the rat at 168 hours post dosing (approximately 91%). In the monkey, approximately 75% eliminated at 168 hours post dosing.
Metabolism in animals ‡	Three major pathways were proposed: displacement of *S*-methyl from *syn*-methomyl by glutathione followed by transformation to the mercapturic acid derivative (18% of the dose); conversion of methomyl to methomyl oxime (MHTA or IN-X1177) and CO_2 release; and isomerisation of *syn*-methomyl to *anti*-methomyl (IN-B1884), followed by a Beckmann rearrangement and formation of acetonitrile.
Toxicologically significant compounds (animals, plants and environment) ‡	Parent.

List of end points (based on doc 1654/VI/94, Rev. 7, 22 April 1998)

Residues

Rapporteur Member State	Month and year	Active Substance (Name)

Acute toxicity (Annex IIA, point 5.2)

Rat LD_{50} oral ‡	Acute oral LD50 value was 34 mg/kg bw for male rats and 30 mg/kg for female rats. Classified: 'Toxic'
Rat LD_{50} dermal ‡	>2000 mg/kg bw.
Rat LC_{50} inhalation ‡	0.215 mg/l in male & females (Classified: Very Toxic).
Skin irritation ‡	Non-irritant (Not classified).
Eye irritation ‡	Slight-irritant (Not classified).
Skin sensitisation ‡	Negative in a Buehler (Not classified).

Short term toxicity (Annex IIA, point 5.3)

Target/critical effect ‡	Decreases in body weight and changes in the haematological parameters.
Lowest relevant oral NOAEL / NOEL ‡	The overall quality of the short-term oral studies is below that normally expected and inadequate for use in the setting of reference values.
Lowest relevant dermal NOAEL / NOEL ‡	90 mg/kg bw/day.
Lowest relevant inhalation NOAEL / NOEL ‡	No data submitted.

Genotoxicity (Annex IIA, point 5.4) ‡	*In vitro:* negative. *In vivo*: negative.

Long term toxicity and carcinogenicity (Annex IIA, point 5.5)

Target/critical effect ‡	Decreases in body weight and changes in the haematological parameters in rats and reduced survival in mice.
Lowest relevant NOAEL / NOEL ‡	100 ppm (4.83 and 6.3 for males & females, respectively (2-year rat study).
Carcinogenicity ‡	No evidence of carcinogenic activity in rats or mice.

List of end points (based on doc 1654/VI/94, Rev. 7, 22 April 1998)

Residues

Rapporteur Member State	Month and year	Active Substance (Name)

Reproductive toxicity (Annex IIA, point 5.6)

Reproduction target / critical effect ‡	Reduced body weight and food consumption in parents. Reduced pup weight.
Lowest relevant reproductive NOAEL / NOEL ‡	75 ppm (equivalent to 4.6 and 6.7 mg/kg bw/day for males and females, respectively).
Developmental target / critical effect ‡	Deaths, reduced body weight and clinical signs of toxicity (rabbit study).
Lowest relevant developmental NOAEL / NOEL ‡	Maternal toxicity: 6 mg/kg bw/day (rabbit). Embryo-foetal toxicity: Not detected in rat or rabbit at the top dose levels tested.

Neurotoxicity/Delayed neurotoxicity (Annex IIA, point 5.7) ‡

Acute neurotoxicity (gavage administration)	NOAEL: 0.25 for males and females, respectively. Reversible RBC and brain cholinesterase inhibition (≥20%) at the next highest dose.
Short-term neurotoxicity (dietary administration).	NOAEL: 150 ppm (equivalent to 9.42 & 11.2 mg/kg bw/day for males and females, respectively. Reduced body weight and food consumption, clinical signs, brain cholinesterase inhibition and effects on FOB parameters at the next highest dose.
Delayed neurotoxicity.	Methomyl is a carbamate and would not be expected to cause delayed neurotoxicity. No evidence for this effect was seen in the hen test.

Other toxicological studies (Annex IIA, point 5.8) ‡

Acute oral administration in male rats (preconditioned dietary/bolus dosing).	NOAEL 30 ppm (1 mg/kg bw). RBC cholinesterase inhibition (≥20%) and no reaction to tail pinch at 60 ppm, the next highest dose.
Acute oral (gavage) administration in male and female rats (reversibility study).	NOAEL: Not determined. Reversible RBC and brain cholinesterase inhibition (≥20%) and clinical signs at 3 mg/kg bw (only dose used).
10-day oral (gavage) administration in male rats.	NOAEL: Not determined. Clinical signs shortly after dosing at 5.1 mg/kg bw (only dose used).

List of end points (based on doc 1654/VI/94, Rev. 7, 22 April 1998)

Residues

Rapporteur Member State	Month and year	Active Substance (Name)

Medical data (Annex IIA, point 5.9) ‡

Worker monitoring data.	The company's acceptable worker exposure limit (AEL) for methomyl is 2.5 mg/m^3 (8-hours time weighted average).
Human volunteer study (acute oral/capsule)	NOAEL: 0.1 mg/kg bw. Reversible RBC and cholinesterase inhibition (≥20%) and increased salivation at 0.2 mg/kg bw, the next highest dose.

Summary (Annex IIA, point 5.10)

	Value	Study	Safety factor
ADI ‡	0.005 mg/kg bw/day	Human volunteer study	10 x 2
ARfD (acute reference dose) ‡	0.005 mg/kg bw/day	Human volunteer study	10 x 2
Systemic AOEL ‡	0.005 mg/kg bw/day	Human volunteer study	10 x 2

Dermal absorption (Annex IIIA, point 7.3) ‡

In vivo rat study using Methomyl 20 SL formulation.	Values of 10% and 1% are proposed for the in-uses dilution and concentrate, respectively.

Acceptable exposure scenarios (including method of calculation)

Operator	Operator exposure estimates using the German model indicate that the use of 'Methomyl 20SL' on grapes through tractor-mounted/trailed equipment will result in an unacceptable level of systemic exposure to methomyl for an operator wearing protective gloves when handling the concentrate, and coveralls and protective gloves during application (exposure equivalent to 1.9x the systemic AOEL of 0.005 mg/kg bw/day proposed in this evaluation). The corresponding UK POEM estimates also indicate an unacceptable level of systemic exposure for an operator wearing protective gloves when handling the concentrate and during application (exposure equivalent to 30x

List of end points (based on doc 1654/VI/94, Rev. 7, 22 April 1998)

Residues

Rapporteur Member State	Month and year	Active Substance (Name)

	to 34x the proposed systemic AOEL). Similarly, calculations based on operator monitoring (dosimetry) data indicate that the supported use of 'Methomyl 20SL' on grapevines will result in an unacceptable level of exposure to methomyl (up to 4x the systemic AOEL) when operators wear coveralls, gloves and face shield when handling the concentrate; coveralls during application; and coveralls and gloves when handling contaminated surfaces. Operator exposure estimates using the German model indicate that the use of 'Methomyl 20SL' on field crops through tractor-mounted/trailed equipment will result in an acceptable level of systemic exposure to methomyl for a operator wearing protective gloves when handling the concentrate and coveralls and protective gloves during application (exposure equivalent to 21% to 42% of the systemic AOEL). The corresponding UK POEM estimates indicate an unacceptable level of systemic exposure for an operator wearing protective gloves when handling the concentrate and when handling contaminated surfaces (exposure equivalent to 22x to 25x the systemic AOEL). Although the use of 'Methomyl 20SL' through hand-held sprayers on field crops and grapes is not being supported by the notifier, operator exposure estimates indicate that such uses may result in an unacceptable risk to operators.
Workers	Worker exposure estimates based on dislodgeable foliar residue decline studies and using published transfer coefficient data indicate that the levels of systemic exposure to methomyl for an unprotected worker harvesting treated field crops and grapes are likely to be acceptable (equivalent to 14% and 29% of the systemic AOEL of 0.005 mg/kg bw/day, respectively).

List of end points (based on doc 1654/VI/94, Rev. 7, 22 April 1998)

Residues

Rapporteur Member State	Month and year	Active Substance (Name)

Bystanders	Bystander exposure estimates based on published field study measurements indicate that the level of systemic exposure to methomyl for an unprotected bystander at the time of application is likely to be acceptable for field crops but unacceptable for grapes (equivalent to 5% of the systemic AOEL of 0.005 mg/kg bw/day and 1.4x the systemic AOEL, respectively).

Classification and proposed labelling (Annex IIA, point 10)

with regard to toxicological data	Toxic if swallowed Very toxic by inhalation

List of end points (based on doc 1654/VI/94, Rev. 7, 22 April 1998)

Residues

Rapporteur Member State	Month and year	Active Substance (Name)

Residues

Metabolism in plants (Annex IIA, point 6.1 and 6.7, Annex IIIA, point 8.1 and 8.6)

Plant groups covered	Fruiting crops
Rotational crops	No data submitted. Significant residues in succeeding crops unlikely.
Plant residue definition for monitoring	Methomyl
Plant residue definition for risk assessment	Methomyl
Conversion factor (monitoring to risk assessment)	Not required

Metabolism in livestock (Annex IIA, point 6.2 and 6.7, Annex IIIA, point 8.1 and 8.6)

Animals covered	Goat, hen.
Animal residue definition for monitoring	Not applicable.
Animal residue definition for risk assessment	Not applicable.
Conversion factor (monitoring to risk assessment)	Not applicable.
Metabolism in rat and ruminant similar (yes/no)	Yes
Fat soluble residue: (yes/no)	No

Residues in succeeding crops (Annex IIA, point 6.6, Annex IIIA, point 8.5)

.....	Not required. Significant residues in succeeding crops unlikely.

Stability of residues (Annex IIA, point 6 introduction, Annex IIIA, point 8 introduction)

.....	Methomyl residues are stable in the following commodities: Grapes : up to 27 months at ≤ -20°C. Raisin & grape juice: up to 8 months at ≤ -18°C. Wine: up to 11 months at ≤ -18°C. Broccoli & lettuce: up to 24 months at ≤ -20°C. Potato, bean seed & peanut: up to 26 months at ≤ -20°C. Milk: up to 181 days at ≤ -70°C.

List of end points (based on doc 1654/VI/94, Rev. 7, 22 April 1998)

Residues

Rapporteur Member State	Month and year	Active Substance (Name)

Liver: up to 165 days at ≤ -70°C. Cow Muscle: up to 181 days at ≤ -70°C.

Residues from livestock feeding studies (Annex IIA, point 6.4, Annex IIIA point 8.3)

Intakes by livestock ≥ 0.1 mg/kg diet/day:	Ruminant: no	Poultry: no	Pig: no
Muscle Liver Kidney Fat Milk Eggs	Consumption of crops by animals is negligible. A ruminent feeding study was submitted and evaluated. All residues in all commodities were < 0.01 mg/kg at dose rates of 34 and 86 mg/kg feed DM. A poultry feeding study was not submitted.		

List of end points (based on doc 1654/VI/94, Rev. 7, 22 April 1998)

Residues

Rapporteur Member State	Month and year	Active Substance (Name)

Summary of critical residues data (Annex IIA, point 6.3, Annex IIIA, point 8.2)

Crop	Northern or Mediterranean Region	Trials results relevant to the critical GAP (a)	Recommendation/comments	MRL	STMR (b)
Grapevine	N. and S. EU	1 x 0.02, 2 x 0.03, 3 x 0.05, 2 x 0.06, 2 x 0.07, 1 x 0.09, 1 x 0.10, 1 x 0.11, 1 x 0.13, 1 x 0.18, 1 x 0.20, 1 x 0.21, 1 x 0.26, 1 x 0.28, 1 x 0.33, 1 x 0.59.		0.5	0.090
Cucumber	S. EU	6 < 0.02.	Sufficient trials to propose MRL when considered with courgette data	0.05	0.02
Courgette	S. EU	3 < 0.02.	Sufficient trials to propose MRL when considered with cucumber data	0.05	0.02
Tomato	S. EU	9 < 0.02.	Extrapolation to aubergine acceptable.	0.05	0.02

(a) Numbers of trials in which particular residue levels were reported *e.g.* 3 x <0.01, 1 x 0.01, 6 x 0.02, 1 x 0.04, 1 x 0.08, 2 x 0.1, 2 x 0.15, 1 x 0.17
(b) Supervised Trials Median Residue *i.e.* the median residue level estimated on the basis of supervised trials relating to the critical GAP

Consumer risk assessment (Annex IIA, point 6.9, Annex IIIA, point 8.8)

ADI	0.005 mg/kg
TMDI (% ADI) (European diet)	Grapes - 0.000116 mg/kg bw/day (2.3%) Tomato - 0.000019 mg/kg bw/day (<1%) Aubergine - 0.000001 mg/kg bw/day (<1%) Cucumber & gherkin - 0.000003 mg/kg bw day (<1%) Fruiting veg., cucurbits - 0.000011 mg/kg bw/day (<1%)
NEDI (% ADI)	Critical consumer (UK diet) = vegetarian: 0.000511 mg/kg bw/day (10%).
Factors included in NEDI	Processing factor of 0.58 for production of wine from grapes
ARfD	0.005 mg/kg
Acute exposure (% ARfD)	Table grape: critical consumer (UK diet) = toddler: 0.0360 mg/kg bw/day (**720%**). Wine: critical consumer (UK diet) = vegetarian: 0.0012 mg/kg bw/day (23.6%). Tomato: critical consumer (UK diet) = infant: 0.0010 mg/kg bw/day (19.3%). Aubergine: critical consumer (UK diet) = 4 – 6yr old child: 0.0005 mg/kg bw/day (10%). Cucumber: critical consumer (UK diet) = toddler: 0.0006 mg/kg bw/day (11.8%). Courgette: critical consumer (UK diet) = toddler: 0.0009 mg/kg bw/day (18.6%).

Processing factors (Annex IIA, point 6.5, Annex IIIA, point 8.4)

Crop/processed crop	Number of studies	Transfer factor	% Transference
Grape/ grape juice	4	0.21	
Grape/ young wine	4	0.71	
Grape/ mature wine	4	0.58	
Grape/ raisin	4	0.20	

Proposed MRLs (Annex IIA, point 6.7, Annex IIIA, point 8.6)

Proposed MRLs (mg/kg)	Grape –0.5. Cucumber – 0.05 Courgette – 0.05 Tomato – 0.05 Aubergine – 0.05

Fate and Behaviour in the Environment

Route of degradation (aerobic) in soil (Annex IIA, point 7.1.1.1.1)

Mineralisation after 100 days	75% at 92 days [14C-1]-label n=1
Non-extractable residues after 100 days	14% at 92 days [14C-1]-label n=1
Relevant metabolites - name and/or code, % of applied (range and maximum)	None major >10%AR

Route of degradation in soil - Supplemental studies (Annex IIA, point 7.1.1.1.2)

Anaerobic degradation	Mineralisation 23.4% of applied 60 days after conversion to anaerobic conditions (excludes the 29% CO2 produced in the first 14 days under aerobic conditions). Non-extractable residues 24.5% 60 days after conversion. No major soil metabolites formed.
Soil photolysis	Mineralisation and non-extracted residues minimal. No major soil metabolites. The major breakdown product identified was the volatile acetonitrile representing up to 40% AR at 30 days (study end).

Rate of degradation in soil (Annex IIA, point 7.1.1.2, Annex IIIA, point 9.1.1)

Method of calculation	Simple first order kinetics, linear regression
Laboratory studies (range or median, with n value, with r^2 value)	Methomyl [data derived from thiodicarb studies also used] DT_{50lab} (20°C, aerobic): ‡4-9.9 days, (n=6, r^2 = 0.97-1.00). DT_{50lab} (25°C, aerobic): ‡10.5 & 31 days (n=2, r^2 = 0.99). For FOCUS gw modelling- ‡Parent (aerobic, 1st order) geometric mean 7.38 days. Normalised to 20ºC, –10kPa. For PECsoil longest aerobic 1st order DT50 normalised to 20ºC, –10kPa is 22 days Minor (2.5%AR) metabolite methomyl oxime DT_{50lab} (20°C, aerobic): ‡0.7-0.9 days, (n=3, r^2 = 0.81-0.98). For FOCUS gw modelling- ‡ (aerobic, 1st order) geometric mean 0.67 days. Normalised to 20ºC, –10kPa.
	Methomyl DT_{90lab} (20°C, aerobic): ‡14-33 days, (n=6, r^2 = 0.97-1.00). DT_{90lab} (25°C, aerobic): ‡ 35 & 100 days (n=2, r^2 = 0.99). Minor (2.5%AR) metabolite Methomyl oxime DT_{90lab} (20°C, aerobic): ‡ 3-4 days, (n=3, r^2 = 0.81-0.98).
	Methomyl DT_{50lab} (10°C, aerobic): ‡23 days (n=1, r^2 = 0.99)
	Methomyl DT_{50lab} (25°C, anaerobic): ‡ (total system) 14 days (n=1, r^2 = 0.98).
	degradation in the saturated zone: ‡

	Laboratory incubations using subsoils under anaerobic conditions at 10°C gave 1st order DT 50 ≤ 8 hours (n=5, r^2 not reported)
Field studies (state location, range or median with n value)	DT_{50f}: ‡ None submitted, none required
	DT_{90f}: ‡ None submitted, none required
Soil accumulation and plateau concentration	Requirement not triggered. Data not required

Methomyl oxime =Z-methyl N-hydroxyethanimidothioate, INX1177

Soil adsorption/desorption (Annex IIA, point 7.1.2)

K_f /K_{oc} K_d pH dependence (yes / no) (if yes type of dependence)	Methomyl K_{foc} 13.3-42.8 ml/g (mean 25.2 ml/g, (1/n) = 0.82-0.89 n=5) No pH relationship observed For FOCUS gw modelling- Mean 25.2 ml/g, 1/n 0.86 Minor (2.5%AR) metabolite Methomyl oxime K_{foc} 6.6-20 ml/g (mean 11.4 ml/g, (1/n) = 0.68-0.95 n=5) No pH relationship observed For FOCUS gw modelling- Mean 11.4 ml/g, 1/n 0.78

Mobility in soil (Annex IIA, point 7.1.3, Annex IIIA, point 9.1.2)

Column leaching	Guideline: BBA part IV, 4-2 Precipitation (mm): 200 Time period (days): 2 n=3 Leachate:2-57%AR, 5.4-55%AR as methomyl 0.8-1.7%AR methomyl oxime.
Aged residues leaching	Guideline: BBA part IV, 4-2 Aged for (days) 13 days Precipitation (mm): 200 Time period (days): 2 n=1 Leachate:6.7%AR, 4.7-5.3%AR as methomyl 0.8-0.9%AR methomyl oxime.
Lysimeter/ field leaching studies	None submitted. None required

PEC (soil) (Annex IIIA, point 9.1.3)

Method of calculation	DT50: 22 days, simple 1st order kinetics longest lab value. Soil depth 5cm, soil bulk density 1.5g/cm^3
Application rate	2x450g methomyl/ha with 14 days interval assuming 60% crop interception.

PEC$_{(s)}$ (mg/kg)	Single application Actual	Single application Time weighted average	Multiple application Actual	Multiple application Time weighted average
Initial	-	-	0.394	0.394
Short term 24h			0.382	0.388
2d			0.370	0.382
4d			0.348	0.371
Long term 7d			0.316	0.354
28d			0.163	0.262
50d			0.082	0.199
100d			0.017	0.120

For applications at growth stages after flowering in grapes 70% crop interception is appropriate. In this situation the initial PEC is 0.296 mg/kg. At the lower grape application rate of 350 g/ha with 60% crop interception, the initial PEC is 0.187. For fruiting vegetables uses, 50% crop interception is appropriate. For the 450g/ha use pattern on fruiting vegetables an initial PEC is 0.493mg/kg

Route and rate of degradation in water (Annex IIA, point 7.2.1)

Hydrolysis of active substance and relevant metabolites (DT_{50}) (state pH and temperature) ‡	pH5_____: 25°C Stable
	pH7_____: 25°C Stable
	pH9_____: 25°C 1st order DT_{50} 36 days (graphical estimate) After 30 days methomyl oxime accounted fore *ca.* 42%AR
Photolytic degradation of active substance and relevant metabolites ‡	No direct aqueous photolysis (no adsorption maxima > 290nm)
Readily biodegradable (yes/no) ‡	No
Degradation in water/sediment - DT_{50} water ‡ - DT_{90} water ‡	2.5-5 days 8.3-17 days (1st order r^2=0.85-0.99, n=4)
- DT_{50} whole system ‡ - DT_{90} whole system ‡	2.5 4.8 days 8.2-16 days (1st order r^2=0.95-0.99, n=4)
Mineralisation	32&46% AR at 102 days (n=2) 72%AR at 31 days (n=1) and 60%AR at 44 days (n=1) all values at study end.
Non-extractable residues	10&15% AR at 102 days (n=2) 15.5%AR at 31 days (n=1) and 15.2%AR at 44 days (n=1) all values at study end.
Distribution in water / sediment systems (active substance) ‡	Concentrations of extractable methomyl in sediment were minimal in 3 of the systems studied (<6.2%AR at all time points). In the 5.8%oc silty clay loam system methomyl was 11.4%AR 2 days after application declining rapidly to <0.4%AR by day 14.
Distribution in water / sediment systems (metabolites) ‡	No major metabolites accumulated in the water or sediment of the systems (acetonitrile is a transient sediment component only). In addition to CO_2, the predominant breakdown products identified (acetonitrile and acetamide) are volatile.

PEC (surface water) (Annex IIIA, point 9.2.3)

Method of calculation	DT50:5 days, 1st order, longest water phase DT50 from dark 20°C lab. Sediment water study.
Application rate	Crop: 1.late applications to grapes and tall growing vegetables 2.low growing vegetables both 2 applications at 14 day intervals at 450g a.s./ha to 30cm deep static water body
Main routes of entry	1. 7.23% drift from 3m for 2 applications 2. 2.77% drift from 1m for 1 application (as concentration is higher than from 2 applications and 2.38% drift)

$PEC_{(sw)}$ (µg/l)		1. Grapevines late and tall vegetables Actual	1. Grapevines late and tall vegetables Time weighted average	2. low growing vegetables Actual	2. low growing vegetables Time weighted average
Initial		12.4	12.4	4.15	4.15
Short term	24h	10.8	11.58	6.62	3.88
	2d	9.4	10.38	3.15	3.63
	4d	7.12	9.52	2.39	3.19
Long term	7d	4.7	7.94	1.57	2.66
	14d	1.78	5.47	0.6	1.83
	28d	0.27	3.13	0.09	1.05
	50d	0.01	1.79	0.004	0.6
	100d	0.00	0.89	0.00	0.3

Applications as above but with lower drift inputs with no spray zones required to demonstrate acceptable aquatic risk.	1. 0.1% drift from 50m for 1 application 2. 0.1% drift from 30m for 1 application (as concentrations are higher than from 2 applications and 0.08% drift)

$PEC_{(sw)}$ (µg/l)		1. Grapevines late and tall vegetables Actual	1. Grapevines late and tall vegetables Time weighted average	2. low growing vegetables Actual	2. low growing vegetables Time weighted average
Initial		0.15	0.15		
Short term	24h	0.13	0.14	PEC are the same as for 1.	PEC are the same as for 1.
	2d	0.11	0.13		
	4d	0.09	0.11		
Long term	7d	0.06	0.10		
	14d	0.02	0.07		
	28d	0.003	0.04		
	50d	0.00	0.02		
	100d	0.00	0.01		

PEC (sediment)

Method of calculation	11.4% partitioning to top 5cm layer of sediment, entry route as for surface water, pattern of decline reflecting that measured in the sediment/water study
Application rate	Crop: 1.late applications to grapes and tall growing vegetables 2.low growing vegetables both 2 applications at 14 day intervals at 450g a.s./ha to 30cm deep static water body with 5cm underlying sediment with density 1.3g/cm^3 with baseline distances of 3 and 1m respectively.

PEC$_{(sed)}$ (µg/kg)	1. Grapevines late and tall vegetables Actual	1. Grapevines late and tall vegetables Time weighted average	2. low growing vegetables Actual	2. low growing vegetables Time weighted average
Initial	-	-	-	-
Short term	Peak 6.3 at 2 days	-	Peak 2.19 at 2 days	-
Long term	< 0.22, 12 days after peak	-	< 0.08, 12 days after peak	-

PEC (ground water) (Annex IIIA, point 9.2.1)

Method of calculation and type of study (*e.g.* modelling, monitoring, lysimeter)	For FOCUS gw modelling, values used- [data derived from studies conducted with thiodicarb also used] Modelling using FOCUS PRZM 2.4.1 and FOCUS PEARL 1.1.1 with appropriate FOCUS scenarios, according to FOCUS guidance on Grapes and Tomatoes Geometric mean DT50 lab: methomyl 7.38d, methomyl oxime 0.67d normalised to –10kPa, 20°C with Q10 2.2, 100% formation of methomyl from methomyl oxime. Kfoc mean: methomyl 25.2ml/g 1/n=0.86 methomyl oxime 11.4ml/g 1/n=0.78
Application rate	2x450g a.s./ha 14 day application intervals with 60% crop interception for grapes and 50% crop interception for tomatoes 1st applications 65 days after 'emergence' for grapes and 30 days after 'emergence' for tomatoes

PEC$_{(gw)}$

Maximum concentration	-
Average annual concentration (Results quoted for modelling with FOCUS gw scenarios, according to FOCUS guidance)	Annual average concentrations (80th % year) according to FOCUS guidance, see results in table below.

PEC(gw) - FOCUS modelling results

	Scenario	Parent (µg/l)	Metabolite methomyl oxime (µg/l)
PRZM 2.4.1 / Vines	Chateaudun	<0.001	<0.001
	Hamburg	0.003	<0.001
	Kremsmunster	0.001	<0.001
	Piacenza	<0.001	<0.001
	Porto	<0.001	<0.001
	Sevilla	<0.001	<0.001
	Thiva	<0.001	<0.001
PEARL 1.1.1 / Vines	Scenario	Parent (µg/l)	Metabolite methomyl oxime (µg/l)
	Chateaudun	0.003	<0.001
	Hamburg	0.001	<0.001
	Kremsmunster	0.001	<0.001
	Piacenza	0.084	0.005
	Porto	<0.001	<0.001
	Sevilla	<0.001	<0.001
	Thiva	<0.001	<0.001
PRZM 2.4.1 / Tomato	Scenario	Parent (µg/l)	Metabolite methomyl oxime (µg/l)
	Chateaudun	<0.001	<0.001
	Piacenza	<0.001	<0.001
	Porto	<0.001	<0.001
	Sevilla	<0.001	<0.001
	Thiva	<0.001	<0.001
PEARL 1.1.1 / Tomato	Scenario	Parent (µg/l)	Metabolite methomyl oxime (µg/l)
	Chateaudun	0.003	<0.001
	Piacenza	0.042	0.002
	Porto	<0.001	<0.001
	Sevilla	<0.001	<0.001
	Thiva	<0.001	<0.001

Fate and behaviour in air (Annex IIA, point 7.2.2, Annex III, point 9.3)

Direct photolysis in air ‡	Not studied-no data requested Latitude: ..... Season: ..... DT_{50} .....
Quantum yield of direct phototransformation	Methomyl has no absorption maxima >290nm
Photochemical oxidative degradation in air ‡	Tropospheric half life of 19 hours derived by the Atkinson method of calculation for reaction with OH radicals
Volatilisation ‡	from plant surfaces: ‡up to 27%AR volatilised from bean leaves within 24 hours (20°C, 50% relative humidity)
	from soil: ‡ only 3%AR volatilised from soil within 24 hours

PEC (air)

Method of calculation	Expert judgement, based on vapour pressure, dimensionless Henry's Law coefficient and information on volatilisation from plants and soil and effect of mixing and diffusion

$PEC_{(a)}$

Maximum concentration	negligible

Definition of the Residue (Annex IIA, point 7.3)

Relevant to the environment	Parent methomyl

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

Soil (indicate location and type of study)	No pertinent information available by the notifier or in published literature
Surface water (indicate location and type of study)	No pertinent information available by the notifier or in published literature
Ground water (indicate location and type of study)	No pertinent information available by the notifier or in published literature
Air (indicate location and type of study)	No pertinent information available by the notifier or in published literature

Classification and proposed labelling (Annex IIA, point 10)

with regard to fate and behaviour data	Possibly a candidate for R53

Effects on non-target species

It should be noted that the risk assessment focuses on the appropriate worst case scenario arising from the proposed uses. This is refined further considering other less worse case uses where this is necessary to identify an acceptable use.

Effects on terrestrial vertebrates (Annex IIA, Point 8.1, Annex IIIA, Points 10.1 and 10.3)

Acute toxicity to mammals	Methomyl: LD_{50} = 30 mg/kg bw
Long term toxicity to mammals	Methomyl NOAEL pup growth and development = 75ppm NOAEL pup survival = 600 ppm NOAEL fertility + reproduction = 1200 ppm
Acute toxicity to birds	Methomyl: LD_{50} = 24.2 mg/kg bw (northern bobwhite quail) (Report No. HLO 464-83)
Dietary toxicity to birds	Methomyl: LC_{50} =3952 mg/kg diet (mallard duck; Report No. DuPont-4379)
Reproductive toxicity to birds	Methomyl: NOEC = 150 mg/kg diet (mallard duck and northern bobwhite quail; Reports nos. HLO 336-91 and HLO 337-91)

Toxicity/exposure ratios for terrestrial vertebrates (Annex IIIA, points 10.1 and 10.3)

Application rate (kg as/ha)	Crop	Category (*e.g.* insectivorous bird)	Time-scale	TER	Annex VI Trigger
0.45 (x2)	Grapevine & fruiting vegetables	Insectivorous bird	Acute	**2.6**	10
‘’	‘’	‘’	Short-term	303	10
‘’	‘’	‘’	Long-term	11.5	5
0.25 (x2)	Listed fruiting vegetables[2]	‘’	Acute	**4.6**	10
			Short-term	545	10
			Long-term	21	5
0.45 (x2)	Grapevine	Herbivorous mammal	Acute	**2.3**	10
‘’	‘’	‘’	Long-term	4.2[1]	5
0.25 (x2)	Listed fruiting vegetables	Insectivorous mammals	Acute	19	10
			Long-term	61	5

[1]The long term risk is considered acceptable based on a DT50 on foliage of 2 days and the fact that the diet is unlikely to be 100% treated vegetation. Residue data showed that the maximum residue 3 DAT2 was only 11 mg a.s./kg giving a TER of 6.8 i.e. > trigger value. In addition it should be noted that the NOAEL for pup survival was 600 ppm.

The listed fruiting vegetables referred to here and subsequently are cucumber, courgette, tomato, aubergine.

The metabolite methomyl oxime was considered to be covered by the risk assessment for the active substance.

Toxicity data for aquatic species (most sensitive species of each group) (Annex IIA, Point 8.2, Annex IIIA, Point 10.2)

Group	Test substance	Time-scale	Endpoint	Toxicity (mg a.s./l)
Laboratory tests				
Acute, static – bluegill sunfish (Report No. SPL 282/571)	Methomyl	96-hour	LC_{50}	**0.63**
Acute, static – bluegill sunfish (Report No. HLR 30-91)	Methomyl 20SL	96-hour	LC_{50}	1.1
Fish early life stage – fathead minnow (Report No. HLO 702-91)	Methomyl	-	NOEC	**0.073**
Fish life cycle – fathead minnow (Report No. HLO 47-93)	Methomyl	-	NOEC	0.076
Acute, static-renewal *D. magna* (Report No. SPL 282/572)	Methomyl	48-hour	EC_{50}	**0.017**
Acute, static-renewal *D. magna*, neonates and adults (Report No. DuPont-3726)	Methomyl 20SL	48-hour	EC_{50}	0.0193 (<24-hour old *D. magna*) 0.0362 (12-day old *D. magna*)
Daphnia magna	Methomyl 20SL	48 hr	EC_{50}	Neonates = 0.0193; 12-day old adults = 0.0362
Daphnia magna	Methomyl 20SL	48 hr	EC_{50}	28-day old adult = 0.123
Daphnia magna	Methomyl 20SL	96 hr	EC_{50}	27-day old adults = 0.098; neonate = 0.084
Daphnia magna	Methomyl 20SL	96 hr	NOEC	0.026
Gammarus italicus	Methomyl	96 hr	EC_{50}	0.047
Echinogammarus tibaldii	Methomyl	96 hr	EC_{50}	0.250
Daphnia longispina	Methomyl	96 hr	EC_{50}	0.220
Cyclops strenuous	Methomyl	96 hr	EC_{50}	0.190
Gammarus pulex	Methomyl	96 hr	EC_{50}	0.760
Biomphalaria alexandrina	Methomyl	96 hr	EC_{50}	1.10
Bulinus truncatus	Methomyl	96 hr	EC_{50}	0.870
Pteronarcella badia	Methomyl	96 hr	EC_{50}	0.060
Skwala sp.	Methomyl	96 hr	EC_{50}	0.029
Gammarus pseudolimnaeus	Methomyl	96 hr	EC_{50}	1.050
Isogenus sp.	Methomyl	96 hr	EC_{50}	0.343
Chironomus sp.	Methomyl	96 hr	EC_{50}	0.032
Chironomus plumosus	Methomyl	96 hr	EC_{50}	0.088
Life-cycle, static-renewal *D. magna* (Report No. HLR 46-82)	Methomyl	21-day	NOEC	**0.0016**
Aquatic algae, *S. capricornutum* (Report No. SPL 282/573)	Methomyl	72-hour	EC_{50}	**>100**
			NOEC	100
Aquatic algal inhibition, *S. capricornutum* (Report No. SPL 282/594)	Methomyl	72-hour	EC_{50}	**>100**
			NOEC	100
Microcosm or mesocosm tests				
None				

End points in bold are those used in risk assessment.

Toxicity/exposure ratios for the most sensitive aquatic organisms (Annex IIIA, point 10.2)

Application rate (kg as/ha)	Crop	Organism	Time-scale	Distance (m)	TER	Annex VI Trigger
0.45 x 2	Late grapes and listed tall vegetables	Fish	Acute	3	**50.8**	100
‘’	‘’	Aquatic invert.	‘’	‘’	**1.37**	100
‘’	‘’	Fish	Chronic	‘’	**5.9**	10
‘’	‘’	Aquatic invert.	‘’	‘’	**0.129**	10
‘’	‘’	Algae	‘’	‘’	>8064	10
‘’	‘’	Fish	Acute	50	4200	100
‘’	‘’	Aquatic invert.	‘’	‘’	113	100
‘’	‘’	Fish	Chronic	‘’	487	10
‘’	‘’	Aquatic invert.	‘’	‘’	10.7	10
‘’	‘’	Algae	‘’	‘’	>666667	10
0.45 x 2	Listed low vegetables	Fish	Acute	1	151	100
‘’	‘’	Aquatic invert.	‘’		**4.1**	100
‘’	‘’	Fish	Chronic		17.5	10
‘’	‘’	Aquatic invert.	‘’		**0.38**	10
‘’	‘’	Algae	‘’		24096	10
‘’	‘’	Fish	Acute	30	4200	100
‘’	‘’	Aquatic invert.	‘’		113	100
‘’	‘’	Fish	Chronic		487	10
‘’	‘’	Aquatic invert.	‘’		10.7	10
‘’	‘’	Algae	‘’		>666667	10

Bioconcentration

Bioconcentration factor (BCF)	log Pow = 0.09 @ 25°C << log Pow ≥3 (Report No. AMR-1234-88)
Annex VI Trigger for the bioconcentration factor	None
Clearance time (CT50)	Not applicable
(CT90)	Not applicable
Level of residues (%) in organisms after the 14-day depuration phase	Not applicable

Effects on honeybees (Annex IIA, Point 8.3.1, Annex IIIA, Point 10.4)

Acute oral toxicity	Methomyl: 48-hour LD_{50} = 0.28 µg/bee (Report No. DuPont-2738)
	Methomyl 20SL: 48-hour LD_{50} = 0.20 µg a.s./bee (Report No. DuPont-2739)
Acute contact toxicity	Methomyl: 48-hour LD_{50} = 0.16 µg/bee (Report No. DuPont-2738)
	Methomyl 20SL: 48-hour LD_{50} = 0.17 µg a.s./bee (Report No. DuPont-2739)

Hazard quotients for honey bees (Annex IIIA, Point 10.4)

Application rate (kg a.s./ha)	Crop	Route	Hazard quotient	Annex VI Trigger
Laboratory tests				
0.45 kg a.s./ha (methomyl; Report No. DuPont-2738)	Grapes, & listed fruiting vegetables	Oral	1,607	>50
0.45 kg a.s./ha (methomyl; Report No. DuPont-2738)	‘’	Contact	2,813	>50
0.45 kg a.s./ha (Methomyl 20SL; Report No. DuPont-2739)	‘’	Oral	2,250	>50
0.45 kg a.s./ha (Methomyl 20SL; Report No. DuPont-2739)	‘’	Contact	2,647	>50

Field or semi-field tests

Semi-field test:

Methomyl 20SL was applied at 450-g a.s./ha to *Phacelia tanacetiflora* and effects on foraging honey bees exposed to spray deposits 2, 6, and 11 days after treatment were recorded. The report concluded that there was no significant effects on mortality when residues were aged for over 2 days. However, the results need to be treated with caution since effects were greater for residues aged for 6 days than those aged for 2 or 11 days. No adverse effects on behaviour, flight activity or incidence of abnormal development were observed (Report No. DuPont-4446).

Semi-field:

In a similar trial bees were exposed to spray deposits 1, 5, and 10 days after treatment. The report stated that Methomyl 20SL applied at 450-g a.s./ha to apple trees had temporary harmful effects on honey bees, if exposed 1 day after treatment and that this effect persisted for 2 days. However, similar effects were observed from residues aged for 10 days and it was considered that this statement was not supported. Most mortality occurred in the first 2 days of the evaluation period irrespective of the ageing period of the residues thus making results difficult to interpret. No abnormal behaviour and no incidence for abnormal development of the bee brood was observed, due to Methomyl 20SL (Report No. DuPont-5470).

On the basis of the information submitted it was considered that there was a potential risk to bees. The information from the aged residue trials was considered to be of only limited use. Member States need to consider appropriate risk management measures for bees.

Effects on other arthropod species (Annex IIA, Point 8.3.2, Annex IIIA, Point 10.5)

Tier 1/2	Species/stage	Test Substance	Dose (kg a.s./ha)	Endpoint	Effect (a.s.)	Annex VI Trigger (30%)
Laboratory tests						
Tier 1 (glass) – dose response (Report No. DuPont-2668)	*Typhlodromus pyri* – protonymphys	Methomyl 20SL	1, 3, 9, 27, and 81 g/ha	7-day LR_{30} LR_{50}	9.1 g/ha 12.6 g/ha	30%
Tier 2 - extended dose/response (Report No. DuPont-3766)	*Typhlodromus pyri* - protonymphys	Methomyl 20SL	6.25, 12.5, 25, 50, and 100 g/ha	7-day LR_{25} LR_{50}	22.1 g/ha 34.5 g/ha	30%
Tier 2 - field-aged residues (Report No. DuPont-4427)	*Typhlodromus pyri* - protonymphys	Methomyl 20SL	22.5, 33.75, and 450 g/ha	7-day mortality (%) at 33.75 g/ha 7-day reproduction at 450 g/ha	5.4% 3.3%	30% 30%
Tier 1 (glass) – dose response (Report No. DuPont-2669)	*Aphidius rhopalosiphi* - adults	Methomyl 20SL	0.006, 0.019, 0.056, 0.167, 0.500 g/ha	48-hr LR_{30} LR_{50}	0.20 g/ha 0.25 g/ha	30%
Tier 2 - dose/response (Report No. DuPont-3764)	*Aphidius rhopalosiphi* - adults	Methomyl 20SL	1, 3, 9, 27, 81 g/ha	48-hr LR_{25} LR_{50} reproduction	8.33 g/ha 14.7 g/ha <25%s	30%
Tier 2 - extended field-aged residues (Report No. DuPont-2563)	*Aphidius rhopalosiphi* - adults	Methomyl 20SL	1.25 kg/ha	14-day field-aged-residue: mortality (%) 14-day reproduction (result from 1520 g/ha)	<25% <27%	30%
Tier 1 – spraying over mummified aphids (DuPont-4630)	*Aphidius rhopalosiphi* – protected life stage	Methomyl 20SL	450 g/ha	7-day mortality and emergence (%) at 450 g/ha	<30%	30%
Tier 2 – field-aged spray deposits on natural soil (Report No. DuPont-3337)	*Poecilus cupreus* - adults	Methomyl 20SL	720 g/ha	1-day field aged residue: mortality, behaviour and food consumption (%)	<25%	30%
Tier 2 – extended field-aged residues (DuPont-2562)	*Chrysoperla carnea* - larvae	Methomyl 20SL	1250 g/ha	7-day field-aged spray deposits: mortality and reproduction (%)	Mortality <25%; Reproduction: <25%	30%
Tier 2 lab. Aged residues (Du Pont 3336)	*Aleochara bilineata*	Methomyl 20SL	720 g/ha	1-day aged residues: mortality and reproduction	<25%	30%
Tier 2- extended field aged residues (Du Pont 5514)	*Orius laevigatus*	Methomyl 20SL	450 g/ha	5-day aged residues: reproductive reduction	<25%	30%

Field or semi-field tests

Field tests:

Methomyl 20SL applied twice at an interval of 14 days at a rate of 2250 ml/ha (i.e., 450-g methomyl/ha) to grapevine in the field resulted in a maximum of 64% reduction in the population of *Typhlodromus pyri* 28 days after the 2nd application. The population reduction was 37% at 81 days after the 2nd application of Methomyl 20SL (Report No. DuPont-3883).

Methomyl 20SL applied twice at an interval of 14 days at a rate of 2250 ml/ha (i.e., 450-g methomyl/ha) to grapevine in the field resulted in a maximum effect of 71% reduction compared to controls 28 days after the 2nd application on a mixed population off predatory mites. The population reduction was 34% at 338 days after the 2nd application of Methomyl 20SL (Report No. DuPont-4327).

Methomyl 20SL applied twice at an interval of 13 days at a rate of 2250 ml/ha (i.e., 450-g methomyl/ha) to grapevine in the field had a maximum effect of 93% reduction compared to controls observed 56 days after the 2nd application on a mixed population off predatory mites. The population reduction was 23% at 371 days after the 2nd application of Methomyl 20SL (Report No. DuPont-4326).

Methomyl 20SL applied twice at an interval of 14 days at a rate of 2250 ml/ha (i.e., 450-g methomyl/ha) to a mixed predatory mite population had a maximum effect of 87% reduction compared to controls at 27 days after the 2nd application. The population reduction was 25% at 56 days after the 2nd application of Methomyl 20SL (Report No. DuPont-5469).

Methomyl 20SL applied twice at an interval of 14 days at a rate of 2250 ml/ha (i.e., 450-g methomyl/ha) to grapevine in the field had a maximum effect of 98.7% reduction compared to controls on *Typhlodromus pyri* at 27 days after the 2nd application. The population reduction was 36% at 83 days after the 2nd application of Methomyl 20SL (Report No. DuPont-5659).

Methomyl 20SL applied at a potential drift rate of 22.5-g methomyl/ha to grapevines in the field had no statistically significant effects on *Typhlodromus pyri* on day 8 (-5%) after application (Report No. 4330).

Methomyl 20SL applied at a potential drift rate of 33.75-g methomyl/ha to grapevines in the field had no statistically significant effects on *Typhlodromus pyri on* day 27 (max 22%) after application(Report No. DuPont-4329).

The data including the residues data showed that there was potential for re-colonisation in-field within one year and therefore the risk was considered acceptable. Off-field the data for *T.pyri* at drift rates showed that the risk was acceptable. Less detailed data were available for *A.rhopalosiphi* however it was considered that the LR25 value of 8.3 g a.s./ha was below the drift value at 10 m for late grapes and tall vegetables of 4.8 g a.s./ha (450 g a.s./ha x 1.07% drift). In addition, mummies of *A.rhopalosiphi* were not adversely effected by methomyl at a rate of 450 g a.s./ha. Therefore the risk off-field was considered to be acceptable with appropriate risk mitigation measures at Member State level.

Effects on earthworms (Annex IIA, Point 8.4, Annex IIIA, Point 10.6)

Acute toxicity	Methomyl: LC_{50} = 19 mg/kg soil dry weight (Report No. DuPont-3926)
Reproductive toxicity	Methomyl 20SL: NOEL = 7.5 mg formulation /kg artificial soil (1.5 mg a.s./kg) (Report No. DuPont-5503)

Toxicity/exposure ratios for earthworms (Annex IIIA, Point 10.6)

Application rate (kg a.s./ha)	Crop	Time-scale	TER	Annex VI Trigger
0.45 kg/ha x 2	Listed fruiting vegetables	Acute	38.5	10
	Early grape	Acute	48.2	10
0.45 kg/ha x 2	Listed fruiting vegetables	Chronic	**3.04**	5
	Late grapes	Chronic	5.06	5
	Early grapes	Chronic	**3.81**	5
0.25 kg a.s./ha	Listed fruiting vegetables	Chronic	5.47	5

Effects on soil micro-organisms (Annex IIA, Point 8.5, Annex IIIA, Point 10.7)

Nitrogen mineralisation	Methomyl 20SL: No significant effect (<25% effect) (Report No. DuPont-4113)
Carbon mineralisation	Methomyl 20SL: No significant effect (<25% effect) (Report No. DuPont-4113)

LEVEL 3

Methomyl

PROPOSED DECISION WITH RESPECT TO THE APPLICATION FOR INCLUSION OF THE ACTIVE SUBSTANCE IN ANNEX I

3.1 Background to the proposed decision

Methomyl is the ISO name for S-Methyl N-(methylcarbamoyloxy)thioacetimidate (IUPAC). It is a carbamate insecticide/acaricide which inhibits the acetylcholinesterase enzyme. Formulated as a 200 g/l soluble concentrate, "Methomyl 20SL", representative uses are as a spray treatment on grapevine and field-grown cucumber, courgette, tomato and aubergine.

Appropriate physical/chemical properties and relevant methods of analyses have been provided. Demonstration of calibration linearity for two process impurities is required for one analytical method, as is a further review of the technical specification, to justify the minimum purity of methomyl.

In mammalian toxicity studies methomyl was readily absorbed, rapidly eliminated and widely distributed, but with no evidence of bioaccumulation. Metabolism was extensive. Methomyl is highly acutely toxic by the oral, ocular and inhalational routes. Dermal applications of methomyl to rabbits resulted in clinical signs of systemic toxicity and significant decreases in plasma and brain cholinesterase activities at high dose levels.

Methomyl does not pose a genotoxic concern. There was no evidence of methomyl-induced carcinogenic activity in rats or mice. In rat multigeneration studies there was reduced body weight and food consumption, increased relative spleen weight and some evidence of an effect on pup body weight. In the rat developmental study, there were maternal effects but none on foetuses. In the rabbit developmental study, deaths, decreased body weight and clinical signs of cholinesterase activity were observed in the dams. There was no evidence of methomyl-induced teratogenic activity.

In the neurotoxicity studies, clinical signs of systemic toxicity and cholinesterase inhibition were observed in both sexes at peak exposure. Following 90-day dietary administration to rats, there were effects on body weight, food consumption, clinical signs of systemic toxicity, brain cholinesterase activity and some of the functional observational battery parameters at the top dose level. In a human volunteer study, there were transient clinical symptoms of systemic toxicity and rapid reversible RBC cholinesterase inhibition.

Based on the NOAEL of 0.1 mg/kg bw determined for RBC cholinesterase activity and clinical signs in male volunteers and an assessment factor of 10 x 2 (10 for intra species variation and 2 for the small group size and wide inter-individual variations in the study, together with symptoms from a reported human poisoning incident), the following reference doses can be proposed: ADI of 0.005 mg/kg bw/day; ARfD of 0.005 mg/kg bw/day and short-term systemic AOEL of 0.005 mg/kg bw/day (adjustment for gastrointestinal absorption is not necessary).

Application of 'Methomyl 20SL' on field crops by tractor-mounted/trailed field crop sprayers showed an acceptable risk to operators (on the basis of the German model only), bystanders and workers. The supported use of 'Methomyl 20SL' on grapes applied using similar equipment shows an unacceptable risk to operators and bystanders.

Based on metabolism data for grapes the most significant metabolite was methomyl; however significant levels of the metabolite methomyl oxime were found. It is considered that methomyl oxime is less toxic than the parent compound methomyl.

The plant residue definition for monitoring and risk assessment is methomyl. Residues in succeeding crops are unlikely to be of significance. A residue definition for succeeding crops and animal products is not required. There is no unacceptable degradation of methomyl in stored plant and animal samples.

Chronic consumer exposure is acceptable with long term intakes (NEDI) well below the ADI. Short term intakes are acceptable following consumption of treated field vegetable crops. However the risk to consumers from consumption of grapes is unacceptable. Intakes for the consumption of table grapes exceed the proposed ARfD for the majority of consumer groups.

Parent methomyl is the proposed definition as the relevant moiety that should be monitored for in the environment. There were no relevant metabolites found at > 10% AR. The worst-case aerobic soil DT50 of methomyl is 22 d (laboratory data at 20°C – 10kPa moisture content) and highest soil PEC from supported uses is 0.49 mg/kg. Methomyl and methomyl oxime (DT50 0.8 d, lab. 20°C –10kPa moisture content) have potential to be mobile in soil but due to their rapid degradation, leaching to deeper soil layers is considered unlikely. FOCUS PRZM and PEARL modelling for groundwater exposure confirmed that for the supported uses and all FOCUS groundwater scenarios groundwater concentrations > 0.1µg/l are unlikely for both parent methomyl and methomyl oxime. Further reassurance is provided by the in the saturated zone data showed methomyl degraded in < 8 hr

Methomyl is stable to hydrolysis at environmentally relevant pH and direct aqueous photolysis. In aerobic natural sediment/water systems DT50 for dissipation from the water phase were up to 5 days; DT90 were up to17 days. No metabolites were found at >10% AR in the water phase and only acetonitrile at >10% AR in the sediment; methomyl should break down rapidly in sediment. Only acetonitrile in sediment ever represented > 10% AR and this declined rapidly. Only an aquatic risk assessment for parent methomyl was required.

Based on the proposed uses on fruiting vegetables, 1m from a 30 cm-deep surface water body, the PECsw would be 4.1 µg/l. Based on the proposed use on grapevine with a 3m distance, the PECsw was 12.4 µg/l.

An acute risk to small insectivorous birds was identified from uses on both grapes and vegetables. This may be addressed by further detailed examination of this issue from a dietary perspective. An acute risk to herbivorous mammals from the use on grapes has also been identified.

The spray drift risk to aquatic organisms is considered acceptable with appropriate risk mitigation measures. It is calculated that a buffer zone of 30 m would be required for the maximum proposed rate on fruiting vegetables, and 50 m for the grape (to give PECsw of 0.15 µg/l). Risk from drain flow and runoff should be considered by Member States.

Risk mitigation measures for bees will be required as will managing the off-field risk to non-target arthropods.

The acute risk to earthworms was acceptable. Since the DT90field is <100 days according to current guidance (SANCO/10329/2002) a chronic study on earthworms is not required. However a study was provided and was considered in the risk assessment. Using these results the chronic risk to earthworms from late use on grapes and use at 250 g a.s./ha on vegetables was acceptable. However, for use at the maximum rate on vegetables and early use on grapes the toxicity exposure ratio was below the required trigger value. Additional information is therefore required.

The risk to soil micro-organisms and the effects on biological methods of sewage treatment was considered acceptable.

3.2 Proposed decision concerning inclusion in Annex I

[redacted]

3.3 Rationale for the postponement of the decision to include the active substance in Annex I, or the conditions and restrictions to be associated with a proposed inclusion in Annex I, as appropriate

The information in sections 3.2 and 3.3 has been removed upon request by the EU Commission as it relates to risk management recommendations or proposals.

LEVEL 4

Methomyl

FURTHER INFORMATION TO PERMIT A DECISION TO BE MADE, OR TO SUPPORT A REVIEW OF THE CONDITIONS AND RESTRICTIONS ASSOCIATED WITH THE PROPOSED INCLUSION IN ANNEX I

4.1 Data required before inclusion in Annex I can be considered

4.1.1 Identity

Demonstration of calibration linearity for process impurities 13703 and B1884 for analytical method ESB-21-87 (X1179.220.03.L). In the light of the outcomes for this point, a revised technical specification may be needed

4.1.2 Physical and chemical properties

The information supplied is sufficient to recommend Annex I inclusion for methomyl.

4.1.3 Data on application and further information

The information supplied is sufficient to recommend Annex I inclusion for methomyl.

4.1.4 Classification, packaging and labelling

The information supplied is sufficient to recommend Annex I inclusion for methomyl.

4.1.5 Methods of analysis

The information supplied is sufficient to recommend Annex I inclusion for methomyl.

4.1.6 Toxicology and metabolism

The information supplied is sufficient to recommend Annex I inclusion for methomyl.

4.1.7 Residues data

The information supplied is sufficient to recommend Annex I inclusion for methomyl.

4.1.8 Fate and behaviour in the environment

The information supplied is sufficient to recommend Annex I inclusion for methomyl.

4.1.9 Ecotoxicology

To demonstrate that the proposed use of methomyl on fruiting vegetables does not pose an unacceptable risk, the following areas of concern must be addressed:

1. An acute risk to small birds was identified. It may be possible for this to be addressed by further detailed examination of this issue from a dietary perspective. Further information should be provided to allow a proper calculation of the LC50 value in terms of mg a.s./kg bw/day, together with a consideration of this risk. Alternative approaches may also be possible.

2. Additional information is required to address the risk to earthworms from use at the maximum rate.

4.2 Data which should be required and evaluated at Member State level for the plant protection product

4.2.1 Identity

No further information required.

4.2.2 Physical and chemical properties

No further information required.

4.2.3 Data on application and further information

No further information required.

4.2.4 Classification, packaging and labelling

No further information required.

4.2.5 Methods of analysis

No further information required.

4.2.6 Toxicology and metabolism

For the grape use, further data are required to demonstrate an acceptable risk to operators and bystanders.

4.2.7 Residues data

Consideration must be given to revising the proposed GAP for grapes, to provide an acceptable use with respect to the short-term risk assessment.

4.2.8 Fate and behaviour in the environment

No further information required.

4.2.9 Ecotoxicology

To demonstrate that the proposed use of methomyl on grapes does not pose an unacceptable risk, the following areas of concern must be addressed:

1. An acute risk to small birds was identified. It may be possible for this to be addressed by further detailed examination of this issue from a dietary perspective. Information should be provided to allow a proper calculation of the LC50 value in terms of mg a.s./kg bw/day, together with a consideration of this risk. Alternative approaches may also be possible.

2. An acute risk to herbivorous mammals is identified. Clarification is required of the information already provided together with a consideration of the scientific concept behind this type of approach.

1. Additional information is required to address the risk to earthworms from early use on grapes.