



## Re-evaluation Note

REV2006-11

# Lawn and Turf Uses of (2,4-Dichlorophenoxy)acetic Acid [2,4-D]

## Interim Measures

The purpose of this Re-evaluation Note is to notify registrants, pesticide regulatory officials and the Canadian public that Health Canada's Pest Management Regulatory Agency (PMRA) is implementing interim measures for products containing (2,4-dichlorophenoxy)acetic acid, commonly known as 2,4-D, used on lawns and turf.

These interim measures are consistent with Proposed Acceptability for Continuing Registration (PACR) document [PACR2005-01](#), *Re-evaluation of the Lawn and Turf Uses of (2,4-Dichlorophenoxy)acetic Acid [2,4-D]*, published 21 February 2005. Implementation of these measures at this time will ensure label changes are implemented, 2,4-D products containing diethanolamine (DEA) are phased out and additional required data are requested within normal time frames for PMRA reviews.

In the next phase of the re-evaluation of 2,4-D, the PMRA will assess the non-turf uses of 2,4-D which include agricultural, forestry, aquatic and industrial-site uses. This review will be completed and released for public comment in the near future.

In the last phase of the re-evaluation of 2,4-D, the PMRA will reconsider the comments regarding the turf review, consider comments received in response to the non-turf review and revise the assessments, as required. The PMRA will reserve its final decision regarding continued acceptability of lawn and turf uses until a final decision on the remaining uses of 2,4-D is developed.

This Re-evaluation Note includes the comments made to the PMRA in response to PACR2005-01.

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## **1.0 Background**

As part of the Action Plan on Urban Use Pesticides, the PMRA conducted a re-evaluation of the residential uses for 2,4-D. In PACR2005-01, the PMRA indicated that, based on the available scientific information, 2,4-D was acceptable for use on lawns and turf with specific label directions for use and handling.

The PMRA's re-evaluation paid special attention to the specific exposures and sensitivity of children as well as applied the latest health and environmental assessment methods for exposure and risk. An external expert scientific panel reviewed and supported the PMRA's conclusions. The United States Environmental Protection Agency (USEPA) published similar conclusions in its Reregistration Decision Document dated June 2005.

About 600 comments were received in response to the PACR2005-01. These came from registrants of products, people who care for their lawns, commercial lawn applicators and their clients, municipal and provincial governments, non-government organizations with interests in human health or environmental protection, medical professionals and the general public. Many of these comments expressing concerns were published in a recent article (Sears et al. 2006).

This Re-evaluation Note summarizes all of these comments, provides the PMRA's response to them and outlines interim measures.

## **2.0 Interim Measures**

The PMRA has carefully reviewed the comments and information received in response to the proposed regulatory decision for 2,4-D (Appendix I). Additional data that were submitted during the comment period and data that had been submitted by registrants that were not fully assessed at the time of publication of PACR2005-01 have also been reviewed. As a result, the PMRA has modified the proposed label changes and revised the additional data requirements.

At this time, the PMRA is requesting that 2,4-D products containing DEA be phased out, product labels be modified to reflect the improvements described in Appendix II of this Re-evaluation Note and additional data be submitted.

### **2.1 Phase-Out of Products Containing DEA**

In PACR2005-01, the PMRA noted that additional toxicity information on DEA had been submitted and was being evaluated. The Agency also stated that mitigation measures for 2,4-D products containing DEA could be proposed depending on the outcome of the review of that information (see PACR2005-01, Section 4.1).

The DEA formulation of 2,4-D has a different toxicity profile compared to the other formulations. Available studies and foreign review summaries showed both qualitative and quantitative differences in the toxic effects that occurred after oral and dermal administration of 2,4-D-DEA. Liver effects observed in a three-week dermal study in rabbits were not noted with the other 2,4-D formulations, and dietary studies in rats indicated that 2,4-D-DEA induced more severe thyroid and reproductive organ toxicity at lower dose levels when compared to all other formulations. Both 2,4-D-acid and pure DEA induce kidney effects, with brain and spinal cord demyelination occurring at higher doses, while DEA on its own was positive for immunotoxicity in mice (National Toxicology Program 1992a, 1992b, 1994). Thus, it is likely that the lack of toxicological equivalence between DEA and the acid form of 2,4-D is related to the DEA moiety.

Additional concerns arise from published data showing that repeated dermal application of DEA on its own is carcinogenic in mice (National Toxicology Program 1997, 2001). No tumours were evident in a similar study conducted in rats, although the doses used were lower than those used in mice. The most recent literature suggests that DEA suppresses the uptake of choline into cells and that this suppression is a potential mechanism for DEA-induced liver tumours in mice, which may not be relevant to humans. DEA also appears to be non-genotoxic. However, several outstanding issues have yet to be addressed to substantiate the choline-suppression hypothesis for DEA-induced carcinogenicity in mice. For example, despite some clinical findings in rats that were consistent with choline deficiency, short- or long-term exposures to DEA failed to elicit the one key hallmark for choline deficiency in mice or rats: fatty deposition in the liver. Also, increased tumour incidence in mice was not associated with any effect specific to choline deficiency. Currently, there are six mechanisms proposed for choline deficiency and cancer induction. Further understanding of any interplay between these proposed mechanisms and substantiation of their role in DEA tumour formation is required before this hypothesis and rationale for lack of human relevance can be accepted.

As additional data are required to address the uncertainty regarding carcinogenic potential of 2,4-D-DEA, the PMRA has determined that 2,4-D products containing DEA can no longer be supported and should be discontinued.

There is only one turf product containing 2,4-D DEA that has not been voluntarily discontinued by the registrant. Although this product is registered until 31 December 2006 (Registration Number 24669), phase-out of this product is under discussion with the registrant, PBI Gordon.

## **2.2 Changes to Required Data**

Section 9.0 of PACR2005-01 outlines the confirmatory data that are required for continued registration of 2,4-D for use on lawns and turf. The requirement for data on dioxins in 2,4-D has been revised to be consistent with the data the USEPA requested in their Reregistration Eligibility Decision dated June 2005. The USEPA requested a newer, more sensitive method of analysis be used to detect dioxins at much lower levels than those possible using the older, standard methods.

The PMRA is requesting that the last five batches of all technical products be analysed using the most sensitive appropriate analytical methods for 2,3,7,8-TCDD, 2,3,7,8-TCDF and their respective higher substituted chlorinated congeners.

The PMRA is also requesting data on the environmental fate for the intermediate transformation product chlorohydroquinone identified in the aquatic environment.

These data must be submitted within six months.

## **2.3 Instructions for Registrants**

Registrants of the technical grade active ingredient, manufacturing concentrates and products for use on lawns and turf have been informed by letter of the specific requirements affecting their product registrations and the regulatory options available to comply with these interim measures.

## **2.4 Next Steps in the Review of 2,4-D**

The PMRA is also considering these comments and additional information in its assessment of non-turf uses of 2,4-D (i.e., agricultural, forestry, industrial site and aquatic uses), which will be published later in 2006.

The PMRA will finalize the decision on the continued registration of 2,4-D for lawn and turf uses only after the PMRA assessment of the non-turf uses of 2,4-D has been released for public comment, the comments have been reviewed and a subsequent Re-evaluation Decision Document has been published.

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## List of Abbreviations

2-EHE	2-ethylhexyl ester
2,4-D	(2,4-dichlorophenoxy)acetic acid
2,4-DCA	2,4-dichloroanisole
2,4-DCP	2,4-dichlorophenol
2,4,5-T	(2,4,5-trichlorophenoxy)acetic acid
2,3,7,8-TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
2,3,7,8-TCDF	2,3,7,8-tetrachlorodibenzofuran
a.e.	acid equivalent
BEE	butoxyethyl ester
BGE	butyl glycol ester
CAS	Chemical Abstracts Service
DEA	diethanolamine
DMA	dimethylamine
EHE	ethylhexyl ester
FAO	Food and Agriculture Organization of the United Nations
g	gram(s)
ha	hectare(s)
Hg	mercury
IPA	isopropylamine
kg	kilogram(s)
km	kilometre(s)
K <sub>oc</sub>	organic carbon adsorption coefficient
L	litre(s)
m <sup>3</sup>	cubic metre(s)
MCPA	(4-chloro-2-methylphenoxy)acetic acid
mg	milligram(s)
mm	millimetre(s)
NDMA	N-nitrosodimethylamine
PACR	Proposed Acceptability for Continuing Registration
PMRA	Pest Management Regulatory Agency
ppb	parts per billion
ppm	parts per million
TEF	toxic equivalency factor
TEQ	toxic equivalents
USEPA	United States Environmental Protection Agency
WHO	World Health Organization
µg	microgram(s)
µm	micrometre(s)

## Appendix I Comments and Responses to PACR2005-01

The PMRA received nearly 600 comments in response to PACR2005-01 from a variety of stakeholders including registrants, non-governmental organizations with interests in human health or the environment, municipal and provincial governments, commercial and domestic (i.e., homeowner) applicators of 2,4-D, medical professionals and the general public. Approximately half of all letters were form letters. Many contained additional data or information for consideration by the PMRA. The PMRA has consolidated and summarized the comments received and provides responses below.

The comments have been grouped by theme, as indicated below:

- 1.0 Decision-making provisions in the new *Pest Control Products Act* (2002)
- 2.0 Transparency Issues
- 3.0 Compliance with label instructions on pest control products
- 4.0 Opposition to use and questions concerning Health Canada's Healthy Lawns Strategy
- 5.0 Combination fertilizer/pesticide products
- 6.0 Microcontaminants, formulants, metabolites and degradation products, including dioxins
- 7.0 Toxicology assessment
- 8.0 Occupational and residential exposure assessment
- 9.0 Dietary assessment
- 10.0 Environmental assessment
- 11.0 Value assessment

### 1.0 Comments on Decision-making Related to Provisions in the *New Pest Control Products Act* (2002)

#### 1.1 Comment

When will the new *Pest Control Products Act* (2002) come into force?

#### Response

The new *Pest Control Products Act* came into force on 28 June 2006.

#### 1.2 Comment

Would the assessment of 2,4-D have been better had it been conducted under the *Pest Control Products Act* 2002?

#### Response

The scientific assessment of 2,4-D would not have differed if it had been completed under the new *Pest Control Products Act*. This is because the PMRA already applies the modern risk assessment methods formalized in the new Act in its reviews of new and older chemicals. These modern risk assessment methods include an aggregate assessment that takes into account overall exposure to 2,4-D from all sources (including food, water and residential uses) and exposure routes (oral, dermal, inhalation). Also, the sensitivities



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of vulnerable groups such as infants and children are considered, and extra safety factors are applied when warranted to protect these sensitive subgroups.

### **1.3 Comment**

How would the precautionary principle have been included in decision-making under the *Pest Control Products Act 2002*?

#### **Response**

The approval system for pesticides uses a precautionary approach that provides a stringent standard of protection to human health and the environment.

Under both the old and new *Pest Control Products Act*, a pesticide can only be registered or remain registered for use in Canada if any associated risks to health or the environment have been determined to be acceptable. Risks are acceptable if, on the basis of extensive scientific data, it has been determined that there is reasonable certainty that no harm to human health, future generations or the environment will result when the pesticide is used as directed. If the level of human exposure is hundreds or thousands of times less than the no effect level observed in animal testing, the criteria used to define “acceptable risk” has been met, which was the case for 2,4-D use on lawns. This standard of acceptability applies to the pre-market evaluation of pesticides proposed for registration as well as the re-evaluation of registered pesticides for continued registration. It provides a significantly higher level of protection from risk of harm than does the approach of acting only to address threats of “serious or irreversible damage”, as required by the precautionary principle.

In the case of products containing 2,4-D for lawn-care, the risks to human health and the environment were found to be acceptable based on the available information, and the conditions of this acceptability are reflected in the label directions.

## **2.0 Transparency Issues**

### **2.1 Comment**

Is it possible to see the test data used in the assessments?

#### **Response**

After consultation on the non-turf uses of 2,4-D, the PMRA will complete its decision on all uses of 2,4-D. At that time, the confidential test data will be available for inspection in the Reading Room.

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## 2.2 Comment

Is there no concern that the data the PMRA reviews are largely sponsored by industry?

### Response

All pesticide applicants are required to develop a comprehensive database of information that demonstrates the product's value and its effects on the environment and human health. Countries including Canada, the United States and other members of the Organisation for Economic Cooperation and Development (OECD) have harmonized data requirements and study protocols. Scientists and regulators have specifically designed these protocols to produce scientifically valid data. The studies are conducted either by the applicants or, more often, by independent third party laboratories, and they must be conducted in compliance with internationally accepted study protocols and Good Laboratory Practice. In addition, the laboratories are subject to independent audits to ensure their reliability.

The PMRA has over 300 highly qualified scientists whose specialties include toxicology, chemistry, environmental science, health exposure assessment, industrial hygiene and agricultural sciences. These scientists consider their role in pesticide regulation as that of critical reviewers, equivalent to an independent scientific peer-review body.

The PMRA's scientists can and do reject studies that are deemed to be deficient due to deviations from the established study protocols. However, the studies submitted by industry to the PMRA are generally of very high quality. As well, industry-sponsored studies also lend themselves to a thorough, independent analysis of the raw data by the PMRA's scientists. Raw data must accompany each study; this translates into thousands of pages of data for a given compound that undergo thorough analyses and cross-checking between studies to ensure consistency. The PMRA can also request additional data to address concerns arising from the evaluation of the data submitted by applicants. In addition, the PMRA's scientists examine published scientific studies relevant to any review.

## 2.3 Comment

The PMRA receives funding from the pesticide industry, which could give the perception of a conflict of interest.

### Response

In accordance with government policy, cost recovery for the regulation of pesticides was introduced in April 1997 after extensive consultation with stakeholders. Cost recovery promotes fairness by shifting a portion of the costs of the program from taxpayers at large to those who benefit most directly from the program. The PMRA charges application fees in accordance with a prescribed fee schedule for the review of an application to register a pesticide as well as an annual maintenance fee per registered product, for the right to manufacture or sell a product in Canada.

Importantly, the fees for evaluating a pesticide are collected regardless of whether the assessment leads to the product being registered. The pesticide evaluators themselves are not in conflict of interest as they are public servants whose salary is not dependent on Agency cost recovery funds; they do not benefit from product registration.

More information about the PMRA's cost recovery program is available online at [www.pmra-arla.gc.ca/english/appregis/costrec-e.html](http://www.pmra-arla.gc.ca/english/appregis/costrec-e.html).

## 2.4 Comment

People have a right to know what form of 2,4-D is in a given product. A listing of 2,4-D products that are registered for weed control on turf should be provided. The list should include the fertilizer/pesticide products (weed-and-feed) and indicate the form of 2,4-D in each product.

### Response

A listing of products registered under the *Pest Control Products Act*, as of 22 September 2005, is provided in Appendix III. Information about the form of 2,4-D in each product can be found under column 5.

Similarly, Appendix IV provides a list of fertilizer/pesticide products that also contain 2,4-D and are registered under the *Fertilizers Act* as of 15 February 2006. Information about the form of 2,4-D in each product can be found under the fifth column.

The PMRA now requires that the form of 2,4-D in the product be indicated on the product label (see Appendix II, Section 2.0).

## 3.0 Compliance with Label Instructions on Pest Control Products

### 3.1 Comment

Should the word "safe" be used to describe any pesticide?

### Response

The nature of pesticides is such that conditions for safe use must be defined and described. The product label is the legal document that stipulates the conditions for safe use of a pest control product. PMRA scientists establish these conditions through the scientific review. This is why the PMRA specifies that 2,4-D can be used safely *when label directions are followed*. This is consistent with subsection 6(7) of the new *Pest Control Products Act*, which states:

No person shall package or advertise a pest control product in a way that is false, misleading, or likely to create an erroneous impression regarding its character, value, quantity, composition, safety or registration.

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This approach is also consistent with other classes of consumer products such as household cleaners, disinfectants and pharmaceuticals, which can also be used safely *when label directions are followed.*

### 3.2 Comment

How does the PMRA monitor actual use of product, which may be different from the label directions?

#### Response

The PMRA delivers a National Pesticide Compliance Program that frequently includes inspections to determine if registered products are being used and, if so, that they are used according to label directions (e.g., appropriate protective equipment, frequency and timing of applications, proper disposal of excess product and containers, pesticide storage, etc.). Any incidents of improper use, handling, application or disposal of pest control products discovered during inspection activities are followed up through investigations and/or reported to other authorities, as appropriate.

User understanding of labels is determined through monitoring/inspection programs (e.g., via survey activities) and during investigations. Programs directed at pesticide users may include questionnaires designed to determine if product labels are understood and followed. If it appears there is a problem with comprehension of the product label, the PMRA's Compliance, Laboratory Services and Regional Operations Division may request for the label to be reviewed and revised for clarity. If the issue is specific to a sector, the provincial specialist may be notified to address the situation with the growers.

When there has been a major change in the direction on registered products, the PMRA may follow up with a program to determine if users are aware of the changes in registrations or amended products.

### 3.3 Comment

How worrisome is it that homeowners do not necessarily follow the label directions—they may use too much of a product?

#### Response

The pesticide label is a legal document and is one of the final results of the review leading to registration. The label reflects the conditions for use, which are based on all the scientific studies that have been carried out on that product. The label on the product in the marketplace must be the same as the label in the PMRA's Product Register. The *Pest Control Products Act* and Regulations require the registrant, the vendor and the user to use **only** the registered label, and people are required to use products in a manner that is consistent with the label.

The PMRA shares the public's concerns with respect to appropriate use. Although there are large safety margins between the amount to which people would be exposed with

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proper use and the amount of product that can cause adverse effects in animal tests (i.e., the amount of exposure to humans is far below the dose that causes adverse effects in animal testing), people who use a pest control product must follow all the directions on the product label to maintain those margins of safety. As such, the PMRA works with provinces and territories to increase awareness and education on this issue. As well, to further minimise exposure and to encourage appropriate use, many products for residential use are packaged into ready-to-use containers.

### 3.4 Comment

Young children and pets are unable to read and do not adhere to “keep off the grass” signs.

#### Response

To minimise any unnecessary exposure, it is good practice for parents to keep their children and pets off treated lawns until residues are dry. However, it should be noted that the risk assessment was based on children entering treated areas on the day of treatment. The unique physiology, behaviours and play-habits of children, such as their body weight and hand-to-mouth contact while playing on treated grass were also considered when determining how much exposure they could encounter. The combined oral and dermal exposure indicated no unacceptable risks for children on lawns, even when residues are at their highest levels.

### 3.5 Comment

Products marked “Keep out of reach of children” are sometimes within child’s reach on store shelves.

#### Response

Administered by Health Canada’s PMRA, the *Pest Control Products Act* is the federal statute that regulates pesticides imported into, sold in or used in Canada. However, pesticide regulation in Canada is a shared jurisdiction with provincial regulators. Further, restrictions on the sale of registered pesticides and how pesticides are displayed at the point of sale are regulated at the provincial level. For more information, consult the PMRA [Information Note](#) on the *Roles of the Three Levels of Governments Regarding Pesticides in Canada*.

### 3.6 Comment

Products are often sold in larger containers than needed.

#### Response

According to Landscape Ontario, the average urban lawn is 200–300 m<sup>2</sup>. Consumers who choose to use a pest control product are encouraged by the PMRA to purchase an amount that is appropriate for their lawn size and the quantity needed for a single season only. As part of general product stewardship, manufacturers are encouraged to provide appropriate

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package sizes. Refer to the product label for instructions on storing and disposing of any unused product. Storage and disposal instructions must comply with your provincial and municipal regulations.

#### **4.0 Opposition to Use and Questions Concerning Health Canada's Healthy Lawns Strategy**

##### **4.1 Comment**

How can the PMRA support the continued use of 2,4-D given the public position against it put forward by municipal governments and public interest groups?

##### **Response**

The PMRA's mandate is to prevent unacceptable risks to people and the environment from the use of pest control products. Under the *Pest Control Products Act*, if the Minister considers that the health and environmental risks and the value of a pest control product are acceptable based on a scientific evaluation, the Minister shall confirm the registration. In other words, if a pesticide meets the criteria of "acceptable risk" and value, regardless of whether it is for agricultural or lawn care use, registration must be granted. The provinces and territories can impose further restrictions, as long as the measures they adopt are consistent with the *Pest Control Products Act* or other federal legislation. In some provinces, municipalities can also further restrict the use of pesticides.

PACR2005-01 included an assessment of the value of 2,4-D **in the maintenance** of weed-free lawns, but not the value of a weed-free lawn or even the value of a lawn, *per se*. The PMRA is aware that many Canadians are reconsidering the aesthetics and practices that have traditionally been in place for landscapes. Since the Report of the Standing Committee on Environment and Sustainable Development and the decision of the Supreme Court of Canada on *Hudson versus Spraytech*, many public interest groups and other stakeholders are labelling pesticide use on lawns as "cosmetic", "aesthetic" and "non-essential". Also, a number of municipalities are choosing to address local situations and concerns about pesticides by reducing or eliminating pesticide use on lands owned by the municipality, or by passing by-laws to restrict pesticide use on private lands where authority exists under their provincial legislation.

While such debates may affect homeowners' desires for weed control in some communities, not all Canadian communities and regions have changed their desire for weed control.

Health Canada agrees that Canadians can and should seek opportunities to minimise their exposure to and reduce their reliance on pesticides. The PMRA announced an Action Plan for Urban Use Pesticides in October 2000, developed through a partnership effort between the PMRA and the provincial and territorial governments. This Action Plan included three key elements:

- to work with the provinces and territories to implement a Healthy Lawns Strategy to show Canadians how they can reduce their reliance on lawn pesticides;
- to encourage pesticide manufacturers to develop reduced-risk products and for the PMRA to continue to register reduced-risk pesticides as quickly as possible; and
- to re-evaluate the major pesticides used for lawn care using stringent new standards that have been adopted both in Canada and the United States.

Because of the third element, the re-evaluation of the turf uses of 2,4-D was completed in advance of the non-turf uses.

For additional information on the topics discussed above, visit the following websites.

Action Plan for Urban Use Pesticides

[www.pmra-arla.gc.ca/english/pdf/hlawns/hl-ActionPlan-e.pdf](http://www.pmra-arla.gc.ca/english/pdf/hlawns/hl-ActionPlan-e.pdf)

Healthy Lawns Strategy

[www.pmra-arla.gc.ca/english/spm/urban-e.html](http://www.pmra-arla.gc.ca/english/spm/urban-e.html)

Healthy Lawns Website

[www.healthylawns.net](http://www.healthylawns.net)

Regulatory Directive [DIR2002-02](#), *The PMRA Initiative for Reduced-Risk Pesticides*

## 4.2 Comment

The PMRA's re-evaluation of 2,4-D gives no consideration to alternatives for 2,4-D such as non-pesticidal methods or integrated pest management (IPM).

### Response

The focus of the re-evaluation of 2,4-D was to examine the acceptability of 2,4-D for continued registration. While other chemical products and non-chemical methods are available, 2,4-D does not pose unacceptable health risks and is an effective weed-control product when used in accordance with label directions.

The PMRA's goal is to reduce the risk associated with the use of pesticides, particularly for children, by mitigating risks, making lower-risk pesticides available and fostering the use of alternative approaches to pest control. IPM is an approach that includes a variety of non-chemical and chemical methods for reducing pest populations to acceptable levels. Under IPM, the use of reduced-risk pesticides is considered as a last resort when all other non-chemical methods have been unsuccessful.

The PMRA encourages Canadians to visit the Healthy Lawns website as well as the PMRA's Action Plan on Urban Use Pesticides. The Healthy Lawns Strategy is based on IPM principles. The Action Plan addresses the concerns of many Canadians by making them aware of a wide range of pest prevention techniques, increasing the availability of reduced-risk pesticides and ensuring that the pesticides most commonly used on lawns meet modern scientific safety standards.

### 4.3 Comment

The value of 2,4-D on lawns and turf is questionable because it is intended for aesthetic purposes only; therefore, this use is not necessary.

#### Response

As previously noted, the PMRA's mandate is to prevent unacceptable risks to people and the environment from the use of pest control products. Under the *Pest Control Products Act*, if a pesticide meets the criteria of "acceptable risk" and value, regardless of whether it is for agricultural or lawn care use, registration must be granted. Based on the assessment in PACR2005-01, the proposed use pattern was found to be acceptable. A well maintained lawn, with or without the use of pesticides, can have non-cosmetic advantages such as controlling soil and wind erosion, reducing exposure to allergenic weeds, reducing possible injuries and increasing property value.

### 4.4 Comment

The use of 2,4-D on lawns is an aberration because it favours monoculture that is very vulnerable to insect infestation.

#### Response

As recommended on the Healthy Lawns website, pesticides are one alternative to pest control on turf and can be used as a last resource, when other methods have failed.

## 5.0 Combination Fertilizer/Pesticide Products

### Note Regarding Fertilizer/Pesticide Product Regulation

Fertilizer/pesticide products are regulated under the authority of the *Fertilizers Act*, which is administered by the Canadian Food Inspection Agency. Further comments or concerns relating to the labelling of fertilizer/pesticide products or other issues with fertilizer/pesticide products should be directed to the Fertilizer Section of the Canadian Food Inspection Agency.

The pesticide component of fertilizer/pesticide products must be registered under the *Pest Control Products Act*, which the PMRA administers. Relevant directions for use and safety precautions required to appear on pesticide labels will also be incorporated into the *Compendium of Fertilizer-Use Pesticides*. The labels of fertilizer/pesticide products must be consistent with the corresponding brochure of the *Compendium of Fertilizer-Use Pesticides*.

### 5.1 Comment

Fertilizer/pesticide combinations should be phased out because they are incompatible with IPM principles (fertilizer should be spread over the entire area whereas herbicide should be spread only where it is needed).



**Response**

Products that pose an unacceptable risk to human health or to the environment, or that are no longer supported by the registrant are phased out by the PMRA. The risk assessment for 2,4-D considered its use in fertilizers; granular applications were found to be acceptable. New label upgrades will encourage spot treatments (see Appendix II, Section 4.0).

As noted above, fertilizer/pesticide products are registered with the Canadian Food Inspection Agency under the *Fertilizers Act* and not with the PMRA under the *Pest Control Products Act*. The Healthy Lawns website indicates that combined fertilizer/pesticide products (weed-and-feed type) should only be considered when a lawn has a nutrient deficiency and a widespread weed problem that cannot be controlled using other weed-control methods (e.g., hand weeding, spot-spraying). The PMRA recognises that these products could be misused and continues to work with the Canadian Food Inspection Agency on the regulation of weed-and-feed products. In addition, the PMRA is also working with industry to promote sustainable practices and encourages registrants of weed-and-feed products to develop a stewardship program.

**5.2 Comment**

The packaging and pictures of perfect lawns on many fertilizer/pesticide packages mislead consumers into thinking products should be used to maintain a perfect lawn instead of treating weed-infested lawns.

**Response**

As noted above, the PMRA is strongly encouraging fertilizer/pesticide manufacturers to develop a stewardship program to inform consumers about the benefit of their products and alternatives to the fertilizer/pesticide products. The PMRA encourages the industry to guide homeowners to use the fertilizer/pesticides only where nutrient deficient lawns and severe broadleaf infestations occur.

2,4-D does not prevent weeds; it only works on existing infestations. As well, over-fertilisation may create problems including less resistance to disease. Such information on the packages or at the point of sale could redirect consumers to purchase and use spot-treatment products instead of broadcast products as well as to advise them to consult a specialist for the right products and quantity. The old (1970) and the new (2002) *Pest Control Products Act* both forbid any false or misleading information or advertisement on the packaging of a pest control product.

**5.3 Comment**

Weed-and-feed products need to be identified as a “higher risk” domestic product. Consumers are not always aware they contain pesticides. As such, they may not treat them as pesticides.

**Response**

Exposure to and risk from weed-and-feed products were considered in the residential assessment and considered acceptable (see also Appendix I, Section 5.1).

**6.0 2,4-D Microcontaminants, Formulants and Degradation Products, Including Dioxins****6.1 Comment**

Could the PMRA please set the record straight on the dioxins in 2,4-D. There are many reports with inconsistent messages.

**Response**

Dioxins encompass a large family of about 200 chemicals with the same basic structure. Certain types of dioxins (2,3,7,8-TCDD or 2,3,7,8-substituted higher congeners) are considered much more toxic than others and are classified as “dioxins of concern”. In the early 1980s, the manufacturing process for 2,4-D was carefully examined in light of the emerging knowledge and concerns regarding 2,3,7,8-TCDD; modifications were made to reduce the levels of contamination for all dioxins, including 2,3,7,8-TCDD. In 1983, Agriculture Canada’s Pesticides Division Memorandum to Registrants R-1-216 established a production limit of “not detectable at 1 ppb” for 2,3,7,8-TCDD in 2,4-D.

Since the 1980s, more sensitive analytical methodologies have been developed and dioxins in 2,4-D can be detected at levels much lower than before. Although 2,3,7,8-TCDD or other dioxins of concern may be present at levels below the production limit, this level of contamination is so low that they would not be detected above background levels following use of 2,4-D products, and therefore would pose no additional health risk. As noted in Health Canada’s *It’s Your Health* publication on dioxins and furans (2004), the greatest sources of dioxins in the environment include the incineration of medical and municipal waste, the burning of fuel and wood, electrical power generation and tobacco smoke.

As 2,3,7,8-TCDD and other dioxins of concern are Track 1 substances subject to virtual elimination under the federal Toxic Substances Management Policy, the PMRA will continue to request industry to monitor dioxin levels in 2,4-D using more sensitive methods of detection.

**6.2 Comment**

Please be more precise regarding dioxin levels in Canadian products.

**Response**

The levels of the dioxins and furans of concern, as listed in “The List of Pest Control Products Formulants and Contaminants of Health or Environmental Concern” (*Canada Gazette*, Part II, 30 November 2005), are available on request for technical products containing 2,4-D that are currently registered in Canada.

When dioxins have been found in Canadian products, they are at extremely low levels, often below the minimum concentration for quantification using that analytical method (i.e., the limit of quantitation). Experienced scientists at PMRA have estimated levels from the raw data of some products. The highest estimated dioxin level in a current Canadian technical product is about 0.14 toxic equivalents of 2,3,7,8-TCDD per billion 2,4-D acid molecules (i.e., 0.14 ppb TEQ, see below for an explanation of TEQs). The average estimated dioxin level in current Canadian technical products is less than 0.03 ppb TEQ.

These levels are lower than the levels of dioxins reviewed in the United States and New Zealand. A draft reassessment of 2,4-D dioxins, which is part of a larger assessment by the USEPA and the National Centre for Environmental Assessment (2003), indicates that in products registered in the United States, at least 2 of 8 technical grade active ingredients of 2,4-D and 2,4-D esters analysed for 2,3,7,8-substituted PCDDs/PCDFs contained concentrations of 2,3,7,8-TCDD above the USEPA level of quantitation (LOQ) of 0.1 ppb, and 3 of 8 technical grade active ingredients contained concentrations of 2,3,7,8-PeCDD above the USEPA LOQ of 0.5 ppb. Similarly, a 2000 review of 2,4-D from New Zealand reported their registered products contained an average of 0.7 ppb as toxic equivalents of 2,3,7,8-TCDD (New Zealand, Pesticides Board 2000). Neither country considered these levels to be of concern.

### 6.3 Comment

How are the dioxins “of concern” designated? Why does the *Canadian Environmental Protection Act* List of Toxic Substances include the mono-, di- and tri-substituted forms, but the PMRA does not?

#### Response

Polyhalogenated-dibenzo-para-dioxins and polyhalogenated-dibenzo furans vary considerably in their toxic potency. The 2,3,7,8-substituted tetrachlorodibenzo-para-dioxin (2,3,7,8-TCDD) is the most toxic of the halogenated congeners and serves as a benchmark against which the toxic potency of other congeners are measured. This is referred to as the toxic equivalents (TEQ) method, where each dioxin compound is assigned a toxic equivalency factor (TEF). This factor denotes the toxicity of a given dioxin compound relative to that of 2,3,7,8-TCDD, which is assigned the maximum toxicity designation of one. Other dioxin compounds are given equal or lower numbers, with each number roughly proportional to its toxicity relative to that of 2,3,7,8-TCDD. Developed by the World Health Organization, scientists and governments around the world use TEFs extensively.

While the *Canadian Environmental Protection Act* Priority Substances List 1 assessment concluded that all congeners with more than 2 chlorines are “toxic”, it noted that the 2,3,7,8-substituted congeners are the dioxins that contribute the most to toxicity (Environment Canada / Health Canada 1990):

Both the number of chlorine atoms and their positions on the molecule determine the properties of dioxins and furans. It is primarily those dioxins and furans with chlorines in the 2, 3, 7 and 8 positions that are retained by animals and humans, and which concentrate selectively in body fat and fatty organs such as the liver. [...]

The compound 2,3,7,8-tetrachlorodibenzodioxin (and to a lesser extent, the other dioxins and furans substituted in the 2, 3, 7 and 8 positions) is extremely toxic to mammals, with a wide variation in sensitivity among species.

Environment Canada subsequently published an assessment to justify the inclusion of PCDDs/PCDFs substituted in at least the 2,3,7,8 positions (i.e., the tetra- and higher congeners) in their Track 1 list, which are substances identified for virtual elimination. As described in Regulatory Directive [DIR99-03](#), *The Pest Management Regulatory Agency's Strategy for Implementing the Toxic Substances Management Policy*, the PMRA relies on this assessment and targets only these 2,3,7,8-substituted congeners for virtual elimination.

This emphasis on 2,3,7,8-substituted congeners is consistent with the approach of other regulatory jurisdictions, including the USEPA and the World Health Organization. The halogenation of dioxins and furans in the 2,3,7,8 positions is crucial for the binding of the molecule to a specific receptor in order to elicit the toxic effect, and the structure-activity relationships for bioaccumulation of dioxins and furans also involve primarily the 2,3,7,8-substituted congeners.

The PMRA believes that the potential exposures to dioxin and furan contaminants in 2,4-D and resultant risks are adequately identified by focussing on these toxicologically relevant congeners and by using internationally recognized TEFs to account for their different potencies.

#### **6.4 Comment**

Why does PMRA request data regarding the technical grade of 2,4-D? Why not test the end-use products that are actually used in the environment?

#### **Response**

The technical product would have the highest level of dioxin and therefore the analysis of the technical product provides clearer evidence of the presence of dioxins. Dioxins, if present in the product, are generated from the manufacturing process of the technical grade active ingredient. Detectable levels of dioxins can be present in 2,4-D because of the use of 2,4-dichlorophenol, a non-2,3,7,8-substituted polychlorinated dioxin precursor, to manufacture 2,4-D technical.

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The levels of dioxins in the end products would be proportionally lowered depending on the percentage (in the total volume) of the technical products used. If the percentage of the technical product used to formulate the final product is very low, dioxins present in the end product may be below the limit of detection.

### **6.5 Comment**

Have the dioxin levels in 2,4-D been monitored?

#### **Response**

The dioxin levels in 2,4-D and other products were monitored during and after the development of the regulatory standard presented in Memorandum to Registrants R-1-216 in the 1980s. This monitoring helped to verify that all registrants had adopted manufacturing processes to reduce dioxin contamination. The random monitoring program ended in the late 1980s when the test data confirmed that products were consistently in compliance with the standard.

### **6.6 Comment**

We have been told that dioxins are produced during the manufacturing process when the temperature is hot. Why are samples not taken of the product when it is hot?

#### **Response**

The dioxins in 2,4,5-T were produced through a combination of high temperatures in the presence of starting materials. In contrast, the manufacturing process for 2,4-D uses much lower temperatures. However, if dioxins are formed during the manufacturing process, they will be present in the final technical product because they are not destroyed under the manufacturing conditions. The analysis of the technical product at the end of the manufacturing process is more practical and best reflects the relevant levels of dioxins and furans that subsequently are used in formulation of end-use products.

### **6.7 Comment**

How is 2,4-D related to Agent Orange?

#### **Response**

Agent Orange, a military chemical from the United States, was a mixture of 2,4-D and a second herbicide, 2,4,5-T. Agent Orange was never a registered product in either Canada or the United States. The chemicals used for Agent Orange, and their contaminant levels, were not the same as those commercially available at the time, or since. With the refined manufacturing processes that have been imposed by federal regulatory bodies over the years, contamination of 2,4-D with dioxin levels of concern is not expected. 2,4,5-T was found to be contaminated with TCDD at levels much higher than ever seen in 2,4-D. 2,4,5-T was withdrawn from the market in the early 1980s.

## 6.8 Comment

The data regarding the N-nitrosodimethylamine (NDMA) content of products containing dimethylamine (DMA) should be known before a decision regarding continued registration of these products is made.

### Response

Prior to initial registration, registrants are routinely required to identify and quantify any microcontaminants of concern that are above 0.1 ppm in technical grade products. The PMRA is requesting more recent data that will allow the PMRA to update the information on file for end-use products and allow more accurate estimates of releases of NDMA from pesticides to the environment. This will also sensitize pesticide manufacturers to environmental interest in this microcontaminant. As noted in PACR2005-01, it is unlikely that trace levels of NDMA from pesticide sources would pose a health risk to humans.

## 6.9 Comment

The assessment did not include the chemical intermediate 2,4-dichlorophenol (2,4-DCP). The bad odour from use or storage of lawn pesticides is 2,4-DCP. The International Agency for Research on Cancer considers 2,4-DCP to be a possible human carcinogen.

### Response

Toxicity data indicate that 2,4-DCP is less toxic than 2,4-D. As the risk assessment is based on 2,4-D, the assessment is also inherently protective of less toxic metabolites. Note that based on known chemical reactions, it is unlikely that 2,4-D will degrade into 2,4-DCP during storage at ambient temperature. The levels of 2,4-DCP present in the manufactured 2,4-D technical product are very low and are further diluted in formulated products. Although even very low levels can have a strong odour, exposure to this odour via 2,4-D lawn-care use is not considered to be of toxicological concern. 2,4-DCP is not a human or rat metabolite, but does arise as a transient soil metabolite that is further oxidized, hydroxylated and dehalogenated. Degradation into smaller organic molecules occurs until the various components are finally degraded into carbon dioxide and water. 2,4-dichlorophenol can also be a metabolite of certain plant species, but is not formed in significant concentrations in the crop species relevant to dietary considerations. (See also Appendix I, Section 10.16).

In a 1999 review, the International Agency for Research on Cancer stated that “there is evidence suggesting *lack of carcinogenicity* of 2,4-dichlorophenol in experimental animals”. The IARC designation was given to a **class** of chemicals that includes five different polychlorophenols. Each chemical has a different toxicity profile in terms of carcinogenic capacity.

## 6.10 Comment

If you do not have adequate data on the DEA form of 2,4-D, why are products allowed to stay in the marketplace instead of being pulled from shelves immediately? How were these products approved in the first place with significant data missing?

### Response

As described in Regulatory Directive [DIR2001-03](#), *PMRA Re-evaluation Program*, the PMRA's re-evaluation assessment includes the most modern data requirements, assessment methodologies and internationally established protocols used by other OECD-member countries. Although sufficient data were submitted to support initial registration, as science evolves and standards change, additional data may be required when a product is re-evaluated. Companies are often requested to provide additional or more modern data for review. If sufficient data are not provided, products are not acceptable for continued registration.

The phase-out periods established when it is found that a re-evaluated pesticide must be withdrawn from the market depend on the nature and severity of risk and consideration of the amount of product that remains in the distribution chain. The phase-out schedule includes a date of last sale by both the registrant and the retailer and a date on which the product can no longer be used by the consumer.

## 7.0 Toxicology Assessment

### 7.1 Comment

The PMRA should not publish a document before the registrants have provided crucial information (i.e., neurotoxicity and reproduction studies).

### Response

The PMRA has accounted for the additional data requirements by applying extra safety factors in the health assessment (see PACR2005-01, Section 9.2). During the toxicology re-evaluation of 2,4-D, PMRA scientists critically examined the totality of the scientific database, including both proprietary and published studies. The purpose of this exercise is to ensure that the scientific data on file meet all current requirements and that these studies have been conducted according to standard internationally accepted protocols as well as to determine whether any additional data or information is required. 2,4-D has been extensively studied and has a large and comprehensive database.

However, as science evolves and standards change, new information on pesticides under re-evaluation is sometimes requested. As noted in Section 9.2 of PACR2005-01, the PMRA considers the additional data requirements to be confirmatory. For example, a reproduction study was available for review, but was considered deficient in some

respects, supporting the PMRA's request for a new, updated study. In the interim, additional safety factors have been applied in the risk assessment to account for any residual uncertainty, and the expected exposure to 2,4-D is far below the level that would cause concern.

## 7.2 Comment

Please comment on the use of animal toxicity data for human health risk assessment and the determination of acceptable risk.

### Response

The PMRA examines toxicity data from a number of different mammalian species, including mice, rats, rabbits and dogs, to assess cross-species similarities and differences as well as species sensitivity. Studies examine short- and long-term effects as well as the potential for a chemical to induce birth defects or reproductive effects and to cause cancer. These studies are conducted at doses many times higher than what humans are exposed to in order to understand the toxicity profile for a given chemical. Typically, the most sensitive animal species is used as the indicator species for human toxicity and health risk assessment, unless there are sufficient data to indicate another species is more appropriate. The PMRA also assumes that humans are more sensitive to effects of a chemical than the most sensitive animal species.

The difference between the human exposure level and the no effect level from animal studies is referred to as the margin of exposure / safety margin. As a minimum, this value must be a hundred times below the no effect level that has been determined from animal test data. However, this value is often several hundred times to greater than a thousand times less than the no effect level. Part of the human health assessment for 2,4-D is to ensure that there is a large enough safety margin between the level to which humans are exposed and any identified toxic effect during animal testing. If the level of human exposure is hundreds or thousands of times less than the no effect level observed in animal testing, then the criteria used to define "acceptable risk" has been met, which was the case for 2,4-D use on turf.

## 7.3 Comment

There is considerable uncertainty and a significant paucity of data remains concerning effects on foetal and child health. Why was the option of applying a 10-fold safety factor for children reduced to a 3-fold safety factor?

### Response

During the human health risk assessment, safety factors are applied to the dose where no effects occurred in animal studies. These safety factors account for interspecies extrapolation from animals to humans, for variability between humans, as well as for any other concerns identified in the toxicology data, such as potential sensitivity of the young. An additional 3-fold safety factor (instead of 10-fold) was used to calculate the acceptable daily intake, to account for potential sensitivity in the young noted in the



reproduction study and published neurotoxicity studies. As noted in PACR2005-01 (Section 4.3.2), the use of this extra 3-fold creates a safety margin that is 6000 times below the dose that had **no** effect in the rat reproduction study. This extra 3-fold also creates a safety margin of more than 18 000 times below the dose reported to cause neurotoxic effects in published studies. Thus, the additional 3-fold safety factor resulted in large safety margins that provide a high level of protection for human health.

The following documents describe the process of risk assessment and safety factor derivations, as well as terms such as margin of safety and margin of exposure. They also outline some of the special considerations that are taken into account, such as the potential sensitivity of children, when the PMRA evaluates a pest control product.

- Science Policy Notice [SPN2002-01](#), *Children's Health Priorities with the Pest Management Regulatory Agency*
- Science Policy Notice [SPN2000-01](#), *A Decision Framework for Risk Assessment and Risk Management in the Pest Management Regulatory Agency*

#### 7.4 Comment

The PMRA should not use rat studies in the risk assessment because the dog is more like humans and the rat genome has more genes to breakdown toxins (Rat Genome Sequencing Project Consortium 2004).

#### Response

As noted previously, the PMRA examines toxicity data from a number of different mammalian species, including mice, rats, rabbits and dogs, to assess cross-species similarities and differences as well as species sensitivity. Data show that renal clearance of 2,4-D is about 30-times slower in dogs compared to humans. Therefore, dogs are not an appropriate indicator of 2,4-D metabolism and toxicity in humans. The rat has similar renal clearance rates to humans; therefore, it represents a more appropriate model for 2,4-D metabolism in humans.

The genome sequencing project cited in the comment has shown that virtually every human gene has a corresponding gene sequence in mice and rats. Comparison of the Brown Norway rat genome to the human genome showed an expansion of the cytochrome P450 subfamily CYP2J in this strain of rat compared to humans.

Metabolism data reviewed in the re-evaluation indicate that 2,4-D is unmetabolized by the mouse, rat, dog and human, and excreted, largely unchanged. Therefore, potential differences in metabolism, and as a result toxicity, based on differences in cytochrome P450 enzymes is expected to be minimal.

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## 7.5 Comment

More consideration should be placed on epidemiology studies because these studies are more applicable to a human risk assessment than animal studies.

### Response

The PMRA recognizes the importance of epidemiology studies in risk assessment. The most useful and relevant epidemiological studies are those that properly characterize exposure in the specific context of how the product is used. Thus, reliance on epidemiology studies in regulatory decision making is challenging in the absence of a direct measure of exposure. Epidemiological studies tend to make use of surrogate or indirect measures for pesticide exposure (e.g., area treated, amount used, amount purchased), which can lead to unreliable estimates of the risk. Epidemiology studies that identify associations rather than causation must be examined with well conducted toxicity studies that are specifically designed to elicit toxic effects over a series of dose levels. These animal toxicity data are assessed to determine if there is any biological basis for the potential associations noted in epidemiology studies. The examination of animal toxicity data from internationally accepted guideline studies using doses well above those to which humans are typically exposed, combined with exposure data obtained from well-designed studies, is currently a useful methodology available for assessing risks to human health. Health Canada's PMRA undertakes this kind of assessment to supplement information about associations that may be established by epidemiology studies. This approach is consistent with that of other regulatory authorities that base human health risk assessments on animal toxicity data. Retrospective analyses support this approach, indicating that the method of animal toxicity studies and safety factor application is protective of the human population (Dourson et al. 1996).

Currently, a major long-term epidemiology study involving pesticide handlers is underway in the United States. This agricultural health study will address some of the limitations of epidemiology studies to date.

## 7.6 Comment

The PMRA's review relies on unethical studies such as human ingestion of 2,4-D. Canada must be bound by the Nuremburg code.

### Response

Currently, the PMRA does not use toxicity studies in humans for risk assessment in which human subjects are intentionally dosed with pesticides to identify or quantify their toxic effects. Human studies of this nature that have been brought to our attention have been used solely in a supplementary manner thus far to confirm that the animal model is an appropriate surrogate for assessment purposes. As such, the PMRA does not condone the use of human subjects for pesticide testing to establish no observed adverse effect levels for assessing risk for new or existing products.

Other types of human data exist in the scientific literature, including epidemiology, accidental poisonings, biomonitoring studies and studies designed to measure exposure through anticipated normal use. Where these data are available, the PMRA will continue to use them to inform its risk assessment.

Recently, the USEPA released guidelines for human studies involving pesticides (February 2006). The use of human subjects for pesticide testing is also the subject of current debate within the European Union. The PMRA will soon undertake an assessment of its policy on the use of human subjects for pesticide testing with appropriate public consultation.

## 7.7 Comment

The PMRA has not accounted for all routes of exposure (aggregate), cumulative risk from various phenoxy herbicides in mixtures and the synergistic effects of mixtures.

### Response

#### Combined (aggregate)

These exposures have been accounted for by estimating the total amount of exposure to 2,4-D via various routes (e.g., oral, dermal) and sources (e.g., diet, drinking water, lawn use), and ensuring that this level is several hundred to a thousand times less than the no effect level observed in animal testing.

#### Cumulative risk

The PMRA agrees that for chemicals that have a common mechanism of toxicity, a cumulative risk assessment should be performed. However, a common mechanism has not been established for the phenoxy class of herbicides. In the future, should information suggest that 2,4-D shares a common mechanism of toxicity with other compounds, additional testing may be required and a cumulative risk assessment may be necessary.

#### Mixtures of phenoxy herbicides, synergistic effects

Herbicide mixtures are more efficacious for weed control than are higher rates of a single constituent because of their synergistic effect on *plant-specific* growth regulators (see PACR2005-01, Section 6.0). Animal toxicity data on these product mixtures indicate lower toxicity values than for the full strength active ingredients.

## 7.8 Comment

With regards to products containing the DEA form of 2,4-D, the PMRA should not continue the registration of a compound that has not been fully evaluated. Did the PMRA look at other forms and formulations?

**Response****DEA**

The re-evaluation consultation document noted that additional toxicity information on DEA was being evaluated (see PACR2005-01, Section 4.1). Review of these data is now complete and the findings are included in this document.

**Formulants/Formulations**

The majority of the animal studies available for 2,4-D were conducted using the various forms of 2,4-D (see PACR2005-01, Section 2.6). Toxicology data sets that assess the acute hazard of formulated products are also available. The recommended use rates, personal protective equipment and other conditions of use specified on the labels of individual formulated products are considered during the risk assessment phase of the re-evaluation.

**7.9 Comment**

Health Canada and the Ontario Commissioner of Human Rights have recognized that people with multiple chemical sensitivities must be protected from pesticide exposure.

**Response**

The PMRA recognizes that some population groups may be more susceptible to the potential effects of pesticides. Because of this potential increased sensitivity, extra safety factors are applied to ensure that the most sensitive subpopulations are protected. A number of possible explanations for multiple chemical sensitivities have been suggested. However, scientific evidence confirming many potential or suspected causes remains to be established.

**7.10 Comment**

Please indicate the specific errors in the fetal implantation study by Cavieres (2002).

**Response**

The study by Cavieres et al. (2002) concluded that low doses of an off-the-shelf product containing 2,4-D and other herbicides caused a reduction in embryo implantation in treated mice. As treatment was initiated only **after** implantation had occurred, an effect on implantation was not plausible. The fundamental principle of study design is to ensure the parameters of interest are properly measured. If low doses did cause an effect on implantation, this should have been apparent in the animals that were dosed from gestation days 0–15. However, no such effect was reported.

A number of discrepancies in the tables, figures and written text as well as combining results from different study designs also led to difficulties in interpretation. For example, the number of animals treated per dose and season was not specified; therefore, the statistical power of the overall study could not be evaluated. Dead or cannibalized pups did not always appear to be included in the total litter size, and there was insufficient information to compare total litter size versus live litter size. The data provided were

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incomplete, and the validity of combining these various study types could not be ascertained (see also Appendix I, Section 2.2, Response).

### 7.11 Comment

The PMRA assessment should include low dose testing.

#### Response

Animal studies have tested oral dose levels ranging from 0.3–300 mg/kg body weight/day.

### 7.12 Comment

The study by Glickman (2004) on canine bladder cancer was not included in the PACR references. Is the PMRA aware of this study?

#### Response

The study by Glickman et al. (2004) reported a potential linkage between phenoxy herbicide exposure and an increased risk of urinary bladder transitional cell carcinoma in Scottish Terriers. The PMRA examined this study and found it to have a number of limitations that precluded the establishment of any link between the tumours identified and exposure to phenoxy herbicides. These limitations included significant methodological and data analysis errors. For example, of the 83 cases of bladder cancer, only 45 dogs had any type of pesticide exposure, and only 16 dogs were exposed to a phenoxy herbicide and/or dicamba. Scottish Terriers are pre-disposed to transitional cell carcinoma, regardless of any chemical exposure, and information regarding the history of this cancer type in a first degree relative was missing for 59 (71%) affected dogs. Small pure-bred dogs are prone to cancer formation in later years of life (>10 years) because they live longer than larger dogs, yet the ages of the dogs in the study were not provided. Only 62 of the 83 dogs had the tumour type confirmed by histological evaluation of the tissue samples. In the remaining 21 dogs, the diagnosis was presumptive (not completed) and it was not specified how many in this group were exposed to phenoxy herbicides and/or dicamba.

### 7.13 Comment

Did the PMRA consider the National Cancer Institute cancer study in dogs and the potential of canine malignant lymphoma (Hayes 1991)?

#### Response

This issue was addressed in PACR2005-01 (Section 4.1.1), and is repeated here for ease of reference. Although a 1991 article by the National Cancer Institute indicated an association between dogs with canine malignant lymphoma and dog-owners that applied 2,4-D to their lawn, a 1991–1992 independent panel concluded that the study design was severely flawed and, in fact, did not show an association between the two. In 1999, Michigan State University re-examined the National Cancer Institute data and also

concluded that there was no relationship between 2,4-D use and canine malignant lymphoma. A more recent Italian study investigated the association between canine malignant lymphoma, living in industrial areas and the use of chemicals by dog owners (Gavazza 2001). It was concluded that pesticide use was either not associated with the disease or was uninformative.

Although the original National Cancer Institute report received much attention, the follow-up studies did not receive the same degree of coverage, thus contributing to the perpetuation of the original conclusions in the veterinary community.

#### **7.14 Comment**

Sweden is no longer using 2,4-D, and Hardell and Eriksson (2003) indicated a decline in non-Hodgkin's lymphoma in countries where 2,4-D is banned.

#### **Response**

2,4-D is no longer used in Sweden or Norway and its use is severely restricted in Denmark. Environmental effects are cited as the primary reason for these actions, as 2,4-D has the potential to enter groundwater, the primary source of drinking water in these countries. However, subsequent to these actions, the European Commission, upon completion of their re-evaluation of 2,4-D on 1 October 2001, concluded that 2,4-D was acceptable for continued registration (European Commission 2001).

In the above-cited paper, the authors relate the decline in non-Hodgkin's lymphoma in Sweden to the ban of phenoxyacetic acids and chlorophenols. However, in the discussion, the authors also state: "Of interest is that the levelling off of the incidence of NHL [non-Hodgkin's lymphoma] during the 1990s has also occurred in countries other than Sweden. Data from the United States, Finland, and Denmark show a similar trend. However, for Norway and the United Kingdom, no such clear pattern has yet emerged." Thus, although the United States showed a levelling off of non-Hodgkin's lymphoma, there was no reported decrease in the use of phenoxyacetic acids. Norway no longer uses 2,4-D, yet there is no decline in non-Hodgkin's lymphoma. Therefore, the decline of non-Hodgkin's lymphoma incidence cannot be specifically related to a decrease in 2,4-D use.

A number of other epidemiology studies (both independent and industry-funded) from the United States, New Zealand and Australia report no association between 2,4-D and soft-tissue sarcoma, non-Hodgkin's lymphoma or Hodgkin's lymphoma (Smith et al. 1983, Hoar et al. 1986, Woods et al. 1987), and more recent studies have not shown an association between 2,4-D and non-Hodgkin's lymphoma or other cancers (e.g., Asp et al. 1994, Lynge 1998, Burns et al. 2001). Several major scientific panels have evaluated this body of research and have described the evidence for cancer effect in humans as "limited", "inconclusive", "inconsistent" and "weak".

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**7.15 Comment**

Few studies assess children's health; therefore, children's health has not been adequately addressed.

**Response**

The human health risk assessment assesses the potential of a pesticide to cause adverse short- and long-term health effects, including special endpoints such as cancer, birth defects, prenatal and postnatal effects, and endocrine disruption. Children's exposure and potential health effects were specifically considered during this re-evaluation, as it is a standard part of all risk assessments for both new products and for older products under re-evaluation.

**7.16 Comment**

2,4-D has been found in bodies/tissues, especially children.

**Response**

It is not unexpected to find traces of environmental contaminants, including pesticides, in human tissues or fluids following exposure. The amount of chemical that an individual is exposed to must be considered in the context of the toxicity of that chemical when determining if a negative health effect could occur. Exposure to relatively small amounts of a chemical does not necessarily result in a negative health effect, particularly if the levels are very small.

2,4-D can be detected in human tissue and fluids, at exceedingly small levels. However, these levels are far below the levels that cause an adverse effect in animal testing.

**7.17 Comment**

Please provide additional discussion regarding the PMRA's Scientific Advisory Panel's non-conclusion of cancer and the PMRA's response to childhood cancer ("...not within the scope of this review...").

**Response**

During the course of the 2,4-D re-evaluation, all available data, including independent and published research, were critically assessed. When multiple toxicity studies provided conflicting findings, the scientific merit of each study was considered, and all the data were examined in a weight-of-evidence approach. Such was the case in assessing the potential carcinogenicity of 2,4-D. Animal data from various species including mice, rats and dogs indicated that 2,4-D was not carcinogenic in animals, in vitro data demonstrated that 2,4-D was not mutagenic, the chemical structure of 2,4-D does not correspond to known carcinogens, and there was no convincing evidence that 2,4-D adversely affects the immune system. A number of expert panels have examined a large body of human epidemiology studies involving phenoxy herbicides and have concluded that there is insufficient evidence to support 2,4-D as a human carcinogen. In other words, there is a

lack of a positive human carcinogenicity findings. This is the basis for the USEPA classification of 2,4-D as a “Class D carcinogen - not classifiable with respect to human carcinogenicity”. The PMRA concurs with the USEPA’s classification.

The statement “...pesticides and childhood cancer is not within the scope of this review” was based on several considerations. PACR2005-01 is specific to the pesticide 2,4-D. The issue of childhood cancers and any potential relationship with pesticide exposures in general is much broader, in that available data for consideration may or may not include 2,4-D. Based on the overall analysis of the toxicity and epidemiology data for 2,4-D, the PMRA does not consider 2,4-D to be carcinogenic. As well, in the absence of any cancer findings in the animal toxicity data, a quantitative cancer risk assessment for 2,4-D is not possible, nor is it required. Therefore, it would be more appropriate to consider the broader issue of pesticide exposure and childhood cancer as a separate document.

### 7.18 Comment

The PMRA should apply the USEPA’s guidelines for childhood cancer, as published in *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens* (USEPA 2005).

#### Response

The PMRA routinely considers international risk assessment policy and guidance, such as the USEPA’s *Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens* (2005), in support of hazard and risk assessment harmonization activities. The noted guidance document is not applicable to the 2,4-D risk assessment because, as noted in the preface to the document, this guidance applies only to carcinogens acting through a mutagenic mode of action. Available data indicate that 2,4-D is not mutagenic, nor is it considered a carcinogen.

### 7.19 Comment

A study by Infante-Rivard (1999) looked at children in Montreal who had been genotyped at birth and who had acute lymphatic leukemia. Herbicide use both during pregnancy and childhood was associated with a twofold increase in leukemia incidence.

#### Response

Childhood leukemia has been associated with a number of conditions including prenatal maternal lower genital tract infection, direct postpartum supplementary oxygen treatment, resuscitation with 100% oxygen, young maternal age and abdominal x-ray. Infante-Rivard has also reported associations between childhood leukemia and congenital anomalies, and diagnostic irradiation. Currently, available data are not sufficient to link childhood leukemia to pesticide use in general, or to 2,4-D specifically. Dr. Infante-Rivard was a member of the independent 2,4-D Science Advisory Panel and agreed with the PMRA’s assessment.



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## 7.20 Comment

It is unclear whether evidence was reviewed concerning a suspected link between chlorophenoxy herbicides and cancer of the thyroid.

### Response

Rats and mice are two species that are most sensitive to the formation of thyroid neoplasia. However, there was no indication of thyroid cancer in the 2,4-D toxicology database, which included multiple studies of life-time exposures to 2,4-D in both of these species. Although thyroid hormones and reproductive effects were noted at very high doses, the effects were sporadic and occurred at doses more than 20 times higher than the no effect level that was used in the risk assessment. There is a 22 000-fold difference between the dose that caused thyroid effects in animals and the acceptable daily intake that has been established for humans.

## 7.21 Comment

Please comment regarding the International Agency for Research on Cancer classification of 2,4-D.

### Response

The International Agency for Research on Cancer's position, from 1987 with a partial update in 1998, is on the *class* of phenoxy's including dioxin-contaminated 2,4,5-T, as opposed to individual chemicals.

In 1987, the International Agency for Research on Cancer classified the chlorophenoxy class (2,4-D, MCPA and 2,4,5-T) as a class 2B carcinogen—possibly carcinogenic to humans—concluding that there was limited evidence in humans and inadequate evidence in animals. This was updated in 1998, specifically in relation to occupational exposure, stating there was limited evidence that occupational exposure to chlorophenoxy herbicides are carcinogenic to humans. This classification and 1998 occupational exposure update does not consider the Scientific Advisory Panel discussions held in 1996 that revisited the 2,4-D epidemiology and animal toxicity data.

The International Agency for Research on Cancer is the only international regulatory organization that has not revisited the issue of 2,4-D in its entirety. More recent re-evaluations by the European Union, the United States Environmental Protection Agency, New Zealand and the World Health Organization do not classify 2,4-D as human carcinogen.

## 7.22 Comment

Could you comment on the Ontario College of Family Physicians report (Ontario College of Family Physicians 2003)?

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**Response**

Scientists within the PMRA and elsewhere have carefully reviewed the Ontario College of Family Physicians report. This report examined a subset of epidemiology studies from the public literature and reported associations between pesticides and certain cancers. It is important to be aware of the concerns that have been raised in the scientific community, particularly with respect to how this literature study was conducted. The report did not consider all or even most of the relevant epidemiology evidence, which has led to many questions in interpretation.

Epidemiology studies are typically designed to look for associations, not causation. These studies must be examined in conjunction with well conducted toxicity studies, which are specifically designed to elicit toxic effects over a series of dose levels. The examination of animal toxicity data from internationally accepted guideline studies using doses well above those to which humans are typically exposed, combined with exposure data obtained from well designed studies, is currently the best methodology available for assessing risks to human health. Health Canada's PMRA undertakes this kind of assessment to supplement information about associations that may be reported in epidemiology studies.

In a response to Ontario College of Family Physicians' report, the PMRA released an Information Note stating that Canadians can and should seek opportunities to minimise their exposure to and to reduce their reliance on pesticides. Responsible pest management, which is strongly promoted by the PMRA, is consistent with recommendations of the College's report. If Canadians choose to use pesticides, they should use products only for their intended and registered use while following all instructions on the label. The label instructions specify the conditions by which products can be used safely. The PMRA also agrees that pesticides must always be stored out of the reach of children to prevent accidents. For more information, consult the PMRA [Information Note](#) on the *Ontario College of Family Physicians Report*.

**7.23 Comment**

My cat had breathing problems and accelerated heart rate after killing a mouse from farm land treated with 2,4-D.

**Response**

The symptoms reported are not typical of 2,4-D exposure, even at very high levels. It would be necessary to measure how much 2,4-D your cat was exposed to in order to determine if there was a potential for toxic effects. The use directions on the product label are developed carefully to minimize exposure, and pesticides are only approved if the estimated exposure raises no concerns. Thus, even if pets enter recently treated areas, exposure to 2,4-D would be minimal, and no adverse health effects would be expected.

## 7.24 Comment

The PMRA's risk assessment for 2,4-D should include the potential for endocrine disruption and immunotoxicity.

### Response

#### Endocrine effects

For human health assessment, the potential for a given pesticide to elicit endocrine modulating (hormonal) effects is currently assessed in animal studies such as multigeneration reproductive toxicity assays and chronic toxicity/carcinogenicity assays. These studies form part of the data requirements for pesticide registration and have the potential to reveal numerous endpoints that may be directly or indirectly related to endocrine disruption. In addition to these studies, studies in the published scientific literature have investigated the potential for 2,4-D to cause hormonal effects.

According to the weight-of-evidence from published and unpublished studies, 2,4-D does not appear to be a true endocrine disrupter. Some animal studies showed effects such as decreased thyroid, adrenal and testicular weight, which may be why some groups have included 2,4-D in this category. However, these organ weight effects occurred at very high doses and are considered secondary to high-dose toxicity.

#### Immunotoxicity

Standard data requirements for a given pesticide include assessment of hematology, clinical chemistry and histopathology parameters from short- and long-term studies that may identify immunotoxic concerns, which would then trigger the need for more specific studies to assess immunotoxic potential. There was no convincing evidence for 2,4-D-induced immunotoxicity in published or unpublished studies.

## 7.25 Comment

Why do the commercial products have warnings on the labels, but the domestic products do not?

### Response

All pesticide product labels have warnings, e.g., KEEP OUT OF REACH OF CHILDREN. Commercial product labels generally contain more stringent warnings than domestic class products—the products available to homeowners—because commercial products are often more concentrated, used in larger volumes and packaged in larger containers. In addition, commercial users are potentially exposed to much more of the pesticide than residential users because they spend more time using the product. The more stringent warnings for commercial products reflect greater potential risks associated with larger amounts of pesticide and greater potential exposure.

## 7.26 Comment

There are additional studies regarding the eye and dermal irritation potential of some forms of 2,4-D that could be considered.

### Response

Based on additional information supplied to the PMRA it has been determined that all forms of 2,4-D have slight to moderate acute oral toxicity as well as low acute dermal and inhalation toxicity. 2,4-D acid and amine forms are severe eye irritants, and the ester forms are mildly irritating to non-irritating. All forms of 2,4-D are slightly irritating to non-irritating to skin. None of the forms are dermal sensitizers. The requested label statements have been revised accordingly (see Appendix II, Section 3.0).

## 8.0 Occupational and Bystander Exposure Assessment

### 8.1 Comment

Please comment regarding the potential for exposure to 2,4-D residues that are tracked inside the home following outdoor application on turf. These residues often end up as a component of household dust, which can be ingested by children.

### Response

Exposure to 2,4-D residues through track-in and house dust are a relatively poorly characterized source of exposure. Therefore, the PMRA took a conservative approach and based the risk assessment for children on their playing on recently treated turf. As part of this assessment, all potential oral and dermal exposures were considered and combined, including ingestion of soil, turf mouthing and hand-to-mouth transfer of residues from turf. Based on the data available, 2,4-D levels in house dust are lower than levels in soil beneath recently treated turf. As soil levels do not result in unacceptable exposure, the levels for household dust did not require a separate evaluation. This approach is conservative as it represents an upper bound estimate of bioavailable 2,4-D. 2,4-D residues measured either in soil or in household dust may be bound to soil or other particles, which may lower the ability of the residues to be absorbed in the gut.

Biomonitoring studies have measured exposure to 2,4-D in homeowners applying 2,4-D and in bystanders living in the household. No detectable 2,4-D residues were found in any bystander urine samples collected for four days following exposure. Levels of 2,4-D were monitored in air samples both inside the home and outdoors downwind of the application site during application. In one study, residues of 2,4-D were found in 5 of the 76 air samples (2 indoor and 3 outdoor), with concentrations ranging from 2.2 to 20  $\mu\text{g}$  2,4-D/ $\text{m}^3$ . None was associated with detectable bystander exposure. In a second study, there were no detectable residues of 2,4-D in the air samples ( $n = 20$ ).

## 8.2 Comment

Why does the PMRA not require a short-term inhalation study? The PMRA has not fully addressed the risk of inhalation exposure following application on turf.

### Response

There was no toxicology study available for this exposure scenario for risk assessment use. As is permitted by the PMRA, the Task Force submitted a scientific rationale to waive this data requirement. 2,4-D has low acute inhalation toxicity, minimal vapour pressure and undergoes rapid environmental dissipation; thus, inhalation exposure was considered a relatively insignificant route of exposure for people re-entering treated areas, compared to the dermal and oral routes.

In addition to the submitted rationale, a number of studies measuring air concentrations following application in urban settings were considered. In these studies, 2,4-D was detected in air samples at concentrations ranging from  $5 \times 10^{-5}$  to  $34 \mu\text{g}/\text{m}^3$  (Harris 1991, Yearly and Leonard 1993, Nishioka et al. 1999, Whitmore et al. 1994). These concentrations are very low and were considered unlikely to result in measurable exposure to bystanders. In a study conducted by Harris (1991), concentrations of 2,4-D were detected in only 5 of 76 air samples (2 indoor and 3 outdoor), with concentrations ranging from 2.2 to  $20 \mu\text{g}$  of 2,4-D/ $\text{m}^3$ . None was associated with detectable bystander exposure. Additionally, 2,4-D is relatively non-volatile and meets the NAFTA criteria for an inhalation waiver based on low volatility due to a vapour pressure  $<7.5 \times 10^{-4}$  mm Hg (NAFTA 1999).

Based on these considerations, the Task Force's rationale was acceptable. For the purpose of the risk assessment, the PMRA used oral studies for any short and long-term exposure scenarios.

## 8.3 Comment

The PMRA's dermal absorption estimate fails to take into account the use of DEET, sunscreen, etc., which may dramatically increase the rate at which 2,4-D is absorbed through the skin.

### Response

Interaction of 2,4-D with other products is a valid issue to consider. However, enhanced dermal absorption of 2,4-D by sunscreens and insect repellents has been noted primarily in studies done in vitro. As no data currently shows that in vitro studies accurately and reliably predict in vivo dermal absorption, the PMRA has low confidence in the results of in vitro studies.

One of the cited studies is a human in vivo study (Moody et al. 1992). This study concluded that there was a greater percentage of absorption when 2,4-D-DMA was applied with DEET ( $14 \pm 4.5\%$ ) than without DEET ( $10\% \pm 11.5\%$ ). However, due to the wide variability in the study results, with the standard deviation exceeding the mean, the

conclusion of increased absorption cannot be supported. It should be noted that even though the conclusion of the study is not supported, the percent absorption with and without DEET were in range of the 10% dermal absorption value used in this assessment.

At this time there is no substantial evidence to support increasing the current dermal absorption value to account for interactions with other products.

#### **8.4 Comment**

How is the PMRA protecting sensitive populations groups such as children and pregnant women?

##### **Response**

To protect population groups that may be more susceptible to potential effects of pesticides, extra safety factors were applied to the no effect level identified in animal toxicity studies. This resulted in reference doses that were 300- to 1000-fold lower than the no effect level for these sensitive populations, which is more protective than the minimum 100-fold safety factor. Thus, the level of the estimated human exposure must be 300- to 1000-fold lower than the no effect level, in order for these products to be considered acceptable for continued registration. This ensures that the most sensitive subpopulations, such as children and pregnant women, are protected. The unique physiology, behaviours and play habits of children, such as their lower body weights and hand-to-mouth contact while playing on treated grass, were also taken into consideration in the exposure assessment.

#### **8.5 Comment**

The PMRA fails to address the risk to those children who deliberately ingest soil at a high rate, otherwise known as pica behaviour.

##### **Response**

The potential exposure to those children exhibiting pica behaviours was considered to be accounted for by the conservatism in the soil ingestion assessment and the residential exposure assessment.

Bioavailability of 2,4-D in soil was considered to be 100% in the soil ingestion assessment. This is considered to be a highly conservative estimation as some 2,4-D in the soil may be bound to soil particles, which may influence the ability of the residues to be absorbed in the gut. Furthermore, children involved in pica behaviour are more likely to ingest larger particles, which are considered to have lower bioavailability than finer particles due to lower bioaccessibility.

For 2,4-D, exposure to children via soil ingestion was not the driver of the risk assessment. If the amount of soil ingested by toddlers was increased to 5 or even 10 grams, the overall outcome of risk, including aggregate risk, is unchanged.

## 8.6 Comment

The personal protective equipment outlined in the PACR is not enough to protect residential applicators. Why is the personal protective equipment for commercial applicators greater?

### Response

Personal protective equipment is often specified for people when they are mixing, loading or applying pesticides to mitigate pesticide exposure.

The potential exposure to homeowners is very different than that of commercial applicators. Domestic class products, those that are used by homeowners, contain a lower amount of the active ingredient than that found in commercial class products used by commercial applicators. The type of application equipment used and the duration of time spent applying these products is also very different for homeowners. As commercial applicators have a greater exposure potential, they are usually required to wear more personal protective equipment than residential applicators. Residential exposure assessments must be acceptable even when no personal protective equipment is worn. This approach protects both the homeowner applying the pesticide and bystanders. However, the use of good hygiene and the protective clothing specified on the label further reduces the potential exposure to homeowners.

## 9.0 Dietary Assessment

### 9.1 Comment

The level of 2,4-D detected in rainfall is greater than the European drinking water standard.

### Response

The highest levels of 2,4-D in rainfall were detected in southern Alberta when rainfall was light (0.1–2 mm) and during the spray season. The levels found in rainfall do not reflect the concentrations that would be found in drinking water. Recharge of reservoirs is performed during snowmelt when 2,4-D is not present in precipitation. The highest concentrations in rainfall occur during the spraying season when runoff is significantly reduced after winter snowmelt. In addition, 2,4-D has a relatively short half life in water (1–2 weeks).

The Guidelines for Canadian Drinking Water Quality specify an interim maximum acceptable concentration of 0.1 mg/L. As part of the re-evaluation, the PMRA has compiled all available drinking water data, including those from the prairie provinces. Available data on drinking water indicate that the interim maximum acceptable concentration for drinking water would not be exceeded, and there are no health concerns from potential exposure through drinking water.

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## 10.0 Environmental Assessment

### 10.1 Comment

The definition of sensitive terrestrial habitats is too broad and needs to be clarified. The proposed buffers may not be necessary for environmental safety of these types of habitat because the risks for damage from 2,4-D drift are low. No specific scientific research indicates substantiated evidence of damage under normal circumstances.

#### Response

Although 2,4-D has been used for a very long time, the risk assessment for 2,4-D indicates that it is a risk to terrestrial plants. The PMRA is required to mitigate risks to terrestrial habitats from spray drift through the use of buffer zones. For the assessment of the lawn and turf uses of 2,4-D, sensitive terrestrial habitats refers to grasslands, forested areas, shelter belts, woodlots, hedgerows and shrublands, which non-target plants inhabit. Spray drift can have long-term impacts on terrestrial habitats. While the damage from spray drift may not seem apparent, a change in the vegetation community structure can potentially occur with continued exposure to 2,4-D spray drift. Sensitive plants die off and are replaced with less sensitive species. In addition, these habitats, in some instances, may also contain rare or endangered plants species. Our buffer zones are based on the environmental concentration of 2,4-D expected to affect 25% of a population of the most sensitive terrestrial plants (soybean, tomato, radish) provided by the 2,4-D Industry Task Force (0.0084, 0.019, 0.011 and 0.024 kg a.e./ha for 2,4-D acid, DMA, ethylhexyl ester [EHE] and butoxyethyl ester [BEE], respectively).

### 10.2 Comments

The proposed buffer zones are too big to be practical. Non-target areas such as grasslands, forests, pastures, shrublands and hedgerows are naturally occurring and could easily border a sod field on all four sides. Maintaining a 20- to 30-metre buffer on sod farms would not be feasible as, in some cases, this might mean that 1/16<sup>th</sup> to 1/10<sup>th</sup> of a field would be left unsprayed for broadleaf weeds, making it unmarketable. An untreated margin of this size would represent a huge economic loss to sod farms and provide an area around each field that would then contaminate the entire field. 2,4-D has been used on sod farms for over 50 years and, based on anecdotal evidence, it appears that non-target vegetation in these areas have not been affected by 2,4-D drift.

Possible 30-metre buffer zones could eliminate the use of 2,4-D on golf courses entirely. Besides shrouds and cones, the buffer zones do not take into consideration other drift control management means such as controlled droplet sizes as well as drift control agents and boom height. Reduced buffers of five metres for acid and EHE derivatives and three metres for DMA and BEE derivatives would protect non-target plants and property. Statements pertaining to utilizing a recognized drift reduction system such as shrouds, cones, controlled droplet nozzles or drift control spray agents could be added to product labels.



**Response**

The buffer zone table in the PACR document indicates that buffer zones (20- to 30-metres) can be reduced by 30% with cones and 70% with shrouds. Consequently, with a medium droplet size (250–350 µm volume mean diameter) and the use of shrouds a 30-metre buffer zone becomes 9 metres. A further substantial reduction can be achieved by the use of a coarse droplet size (350–450 µm volume mean diameter) instead of a medium droplet size (250–350 µm volume mean diameter). With the use a coarse droplet size, the 30-metre buffer zone would be reduced to 5 metres and the 20-metre buffer zone is reduced to 3 metres. If shrouds are used with the coarse droplet size the 30- and 20-metre buffer zones are reduced to 2 and 1 metres, respectively. The buffer zone table has been revised to provide the option of coarse droplet size and shrouds or cones and clearly indicate the size of the buffer zone if these options are used (see Appendix II, Section 4.0).

Note that buffer zones are **only** required between the point of direct application and the closest **downwind** edge of sensitive terrestrial habitats. They are not required on the other borders of the spray area. This is described in the proposed label statements in the PACR.

With respect to other drift control agents such as adjuvants, the PMRA has not received scientific studies with adjuvants to indicate their effectiveness at reducing spray drift. Registrants are invited to provide scientific study data indicating that spray drift is reduced with the use of adjuvants.

**10.3 Comment**

Is root uptake considered in setting buffer zones?

**Response**

Root uptake and exposure is not a factor in the calculation of buffer zones. The buffer zones are based on studies that detail effects from contact exposure to plants leaves and stems or on seedling emergence, and not root exposure.

**10.4 Comment**

Why are there no buffer zones for domestic class products?

**Response**

Domestic products containing 2,4-D are often applied by handheld sprayers. The person using the sprayer can easily see the spray drift when applying the pesticide. Buffer zones are provided for commercial uses where large areas are being treated using heavy equipment and the spray drift is not easily seen by the applicator operating the equipment.

### 10.5 Comment

Several proposed label statements refer to spraying products. These should be revised to include all products, not just liquids.

#### Response

The PMRA has revised the label statements from “avoid spraying” to “avoid applying” where applicable (see Appendix II, Section 4.0).

### 10.6 Comment

Do vegetative strips work for turf areas as well as crop areas?

#### Response

The vegetative strip is intended to be an untreated strip of vegetation between the treated area and neighbouring water body. This is intended to reduce runoff of 2,4-D into neighbouring water bodies. If the turf has been already treated, it would not act as a potential barrier to reduce the input of 2,4-D into neighbouring water bodies. Therefore, we believe that the statement should remain on the label.

### 10.7 Comment

Are the proposed label statements concerning run-off required for domestic class products?

#### Response

Many different pesticide formulations can be carried by run-off, resulting in damage to the environment; the class of the product is not a key factor in this. As such, label statements pertaining to run-off are required for domestic class products.

### 10.8 Comment

In the labelling statements proposed for the **ENVIRONMENTAL HAZARDS** section, the PMRA should consider additional revisions to improve clarity and allow some of these statements to appear only in the **DIRECTIONS FOR USE** section of the label.

#### Response

Several comments were noted, resulting in changes to the labelling statements. The amended label statements appear in Appendix II.

### 10.9 Comment

Is the statement “The use of this product may result in contamination of groundwater particularly in areas where soils are permeable (e.g., sandy soil) and/or the depth to the water table is shallow” applicable/supportable in a domestic setting, especially because houses are not built on shallow water tables? This statement appears to be more

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appropriate for sandy soils with other crops or sod farms, golf courses because of the larger area of application rather than domestic use applications. In the case of agricultural crops, the soil is more exposed to the spray.

**Response**

The PMRA views the label statements about groundwater contamination as appropriate. In some parts of Canada, houses are built on shallow groundwater tables (less than one metre deep). In addition, some of these houses draw their drinking water from wells in the treated areas. The statements advise the user in these settings about the potential risk of groundwater contamination. In addition to the risk from leaching, there is also a risk of “well contamination” from pesticide moving down cracks and gaps in the soil around the well casing.

**10.10 Comment**

The label statement “Do not apply when winds are gusty” is not specific enough; a more precise definition of wind speed should be provided (e.g., 8 km/hour).

**Response**

It is difficult to estimate the speed of a gust of wind. Applicators would have difficulty complying with the label directions if a wind speed were specified.

**10.11 Comment**

There is a moderate risk to small mammals based on reproductive toxicity. Small mammals such as meadow voles are an important food source for many predators, such as the red-tailed hawk. What conclusions can be drawn?

**Response**

The environmental risk assessment indicates that small mammals are potentially at risk from consuming vegetation contaminated with 2,4-D. The risk assessment is based on a number of conservative assumptions about mammalian exposure. The acute risk to mammals is moderate (risk quotient 1.0 to 10) at all application rates. The reproductive risk to mammals is also moderate at application rates of 0.529 to 1.55 kg a.e./ha. Higher rates (1.75 kg a.e./ha to 2.24 kg a.e./ha) are being discontinued. The risk quotients are calculated assuming that a small mammal feeds exclusively on contaminated food sources. However, small mammals are mobile and can forage over a wider area, so it is unlikely that they will feed exclusively on contaminated vegetation in a turf or lawn environment. In addition, the half life of 2,4-D in the field is relatively short (8–11 days); thus, exposure to mammals diminishes rapidly with time. There are other factors such as rainfall wash off in wetter climates, which also reduce exposure from contaminated vegetation. Therefore, the actual exposure in the field is likely to be less than that used in the risk assessment. In addition, there is no evidence in the available literature and databases in the United States and Canada to indicate that 2,4-D use is causing widespread mortality or reproductive difficulties in small wild mammals in the field.

### 10.12 Comment

The PACR document downplays the risks of 2,4-D to the environment.

#### Response

The risks of 2,4-D to the environment have been scientifically evaluated using conservative assumptions and have been carefully considered in the analysis of environmental safety. The risks of 2,4-D to the environment were clearly indicated in the PACR.

### 10.13 Comment

2,4-D, mecoprop and dicamba are often combined into end-use products that have synergistic herbicidal effects, yet the environmental evaluation does not consider the impact of the end-use product.

#### Response

There is no information available to indicate whether synergistic effects from phenoxy would increase the toxicity to other terrestrial organisms or aquatic organisms. The majority of toxicity studies are conducted on the technical grade active ingredient, with a more limited toxicity data set on the formulated products. Some studies are available on mixtures; however, these are very limited in both quantity and quality. Although there have been advances in developing modelling techniques and methodologies to study mixtures, this is an area of science that requires further development before this type of data can be used for risk assessment purposes. The risk assessment approach used by the PMRA is currently the best method available and is consistent with that of other regulatory agencies worldwide.

### 10.14 Comment

Possible endocrinal effects of 2,4-D have not been addressed in the PACR, while the USEPA indicated in their review that there is evidence of endocrine disrupting effects of 2,4-D on mammals.

#### Response

There is a possibility that reproductive effects **may** be an indicator of endocrinal effects. The USEPA re-evaluation document did not indicate that there were endocrinal effects from 2,4-D or its transformation products. The USEPA indicated that “these reproductive effects could be an indicator of possible endocrine disruption in birds” (USEPA 2004). Although mammalian toxicity tests examine for endocrine effects (see Appendix I, Section 7.24, Response), it is not possible with the available information to determine if reproductive effects in birds are an indicator of endocrinal disruption. Test protocols that evaluate endocrine endpoints in environmental toxicity studies are currently being developed and validated. When the appropriate testing protocols have been validated and adopted, 2,4-D may be subject to additional screening and/or testing to better characterize effects related to endocrine disruption.

### 10.15 Comment

The biotransformation rate is reduced under anaerobic conditions. The amine form is persistent under anaerobic conditions with a half life exceeding one year in sediment. Is there a potential for long-term environmental risk such as sediments be disturbed or under other scenarios?

#### Response

2,4-D is persistent under anaerobic aquatic conditions. If anaerobic sediment containing 2,4-D is disturbed, there is the possibility of remobilisation of 2,4-D to the water column. However, it is noted that 2,4-D has very low adsorption to soils and to sediment. The PACR document states that "... adsorption characteristics ( $K_{oc} < 150$ ) also indicate that they are not adsorbed by soil (WHO 1998)". Therefore, it is unlikely that 2,4-D will be found in sediment in significant concentrations. Furthermore, lakebeds and riverbeds are typically aerobic provided there is sufficient mixing of the water column by wind and wave action or flowing water. Anaerobic conditions usually only occur under certain conditions such as when there is extensive dieback of vegetation or algae resulting in anoxia or when the water column is not mixed. This occurs most often in shallow waters bodies a few metres deep during winter when ice cover cuts off oxygen from the surface water, or in lakes that are deep and remain permanently thermally stratified.

### 10.16 Comment

The transformation products of 2,4-D have not been considered. Could you also provide a degradation diagram for the transformation products of 2,4-D?

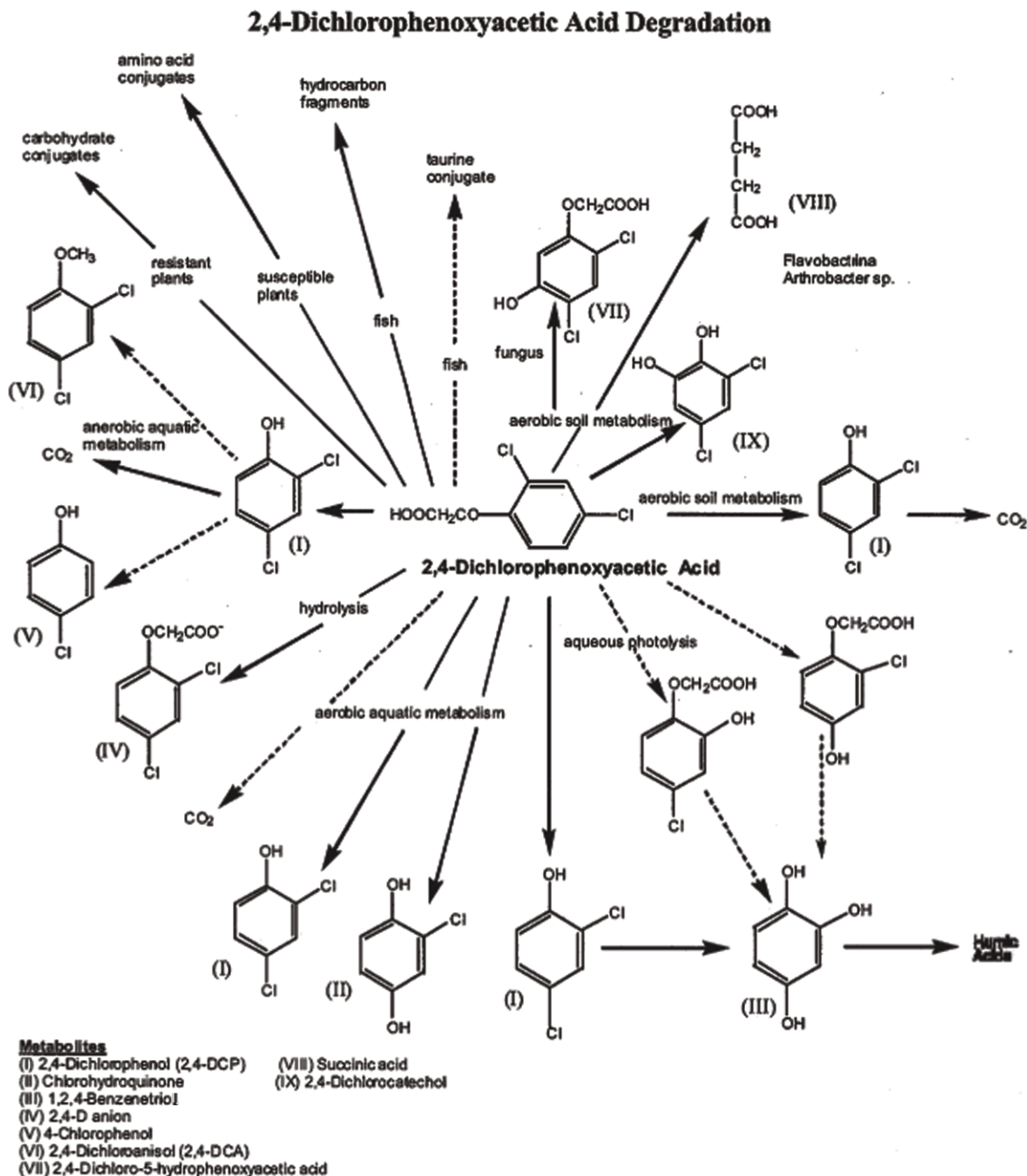
#### Response

The PMRA classifies transformation products based on the amounts relative to the initial parent concentrations. Major transformation products are those that occur in amounts greater than 10% of the initial parent concentration. In general, only major transformation products are considered in the PMRA's environmental review. Major transformation products of 2,4-D identified in the aquatic environment are 2,4-dichlorophenol (up to 22%), chlorohydroquinone (up to 17%) and carbon dioxide, which is a terminal transformation product. The only major transformation product identified in the soil environment was the terminal transformation product carbon dioxide.

Some concerns have been raised about the potential effects of 2,4-DCP on the environment. Available data on the fate and properties of the 2,4-DCP indicate that it is generally non-persistent in aerobic aquatic systems with maximum half lives of 3 hours (distilled water) and 5 days (seawater). In soil it is a minor transformation product. Given the available fate data, it is not expected to leach to groundwater. Available data on the toxicity of 2,4-DCP indicate that the lowest chronic no observed effect concentrations are 0.29 mg a.i./L for freshwater fish, 0.21 mg a.i./L for *Daphnia magna* and 0.41 mg a.i./L for the macrophyte *Lemna gibba*. These values indicate that it is less toxic than the esters of 2,4-D. Risk quotients indicate negligible risk to aquatic life from 2,4-DCP concentrations resulting from transformation of 2,4-D.

Chlorohydroquinone is likely an intermediate transformation product. Results of aerobic aquatic transformation studies suggest it is relatively non-persistent. Confirmatory data on its fate have been requested.

A degradation diagram for 2,4-D is provided hereafter.



### 10.17 Comment

Data were provided for effluent from 7 municipal stations indicating that 2,4-D was detected 100% of the time in 3 stations and 14 to 89% of the time in the other 4 stations. The maximum concentration of 2,4-D was 5.7 µg/L. The concentrations were not sufficient to present an aquatic risk, but they do indicate that pesticides are present in urban effluent treatment plants in Montreal and Longueuil.

#### Response

With respect to 2,4-D presence in urban effluent, the concentrations of 2,4-D in those municipalities provided are generally consistent with the concentrations found at other urban monitoring sites in Canada. The PMRA analyzed urban drainage monitoring data from several sources and found similar concentrations. As noted in the comment, the concentrations were not sufficient to present an aquatic risk.

### 10.18 Comment

A summary paper was submitted outlining concerns that 2,4-D vapour drift from application sites would be absorbed into leaves of deciduous forests more easily in the presence of ammonia gas, and that increasing levels of ammonia gas, leading to increasing absorption of 2,4-D, may be linked to a decline of trees and forests in Manitoba.

An analysis of precipitation in southern Manitoba indicated an increasing presence of ammonia. Vapour pressure values for 2,4-D butyl ester were cited, indicating that the phytotoxic concentration is 2.5% of the saturated vapour concentration. Some concerns were raised about vapour drift and quoted many references indicating the volatility of this ester.

A paper was cited (Grover et al. 1985) indicating 21% (up to 30% in other studies) of iso-octyl ester evaporated from a wheat field over 5 days after spraying. It does not indicate which specific iso-octyl was used in the study. Grover indicated that most of the loss comes from small droplets or vapour from aerial application.

#### Response

Highly volatile esters such as 2,4-D butyl ester are no longer registered for use in Canada. The esters currently in use (2-ethyl hexyl ester and butoxyethyl ester) are classified as low volatile esters. Some esters may be lost following spraying as vapour including 2-ethyl hexyl ester (a form of iso-octyl ester). However, in the paper by Grover (1985), it is not clear whether the 2-ethyl hexyl form was used in the study. Other iso-octyl esters include 2-octyl ester octyl and 2-ethyl-4-methylpentyl ester.

It should be noted that turf and lawn are not treated with 2,4-D by aerial application; aerial application is only used in agriculture, non-cropland and forestry. The use of a coarse droplet size (350–450 µm) and adjuvants will reduce vapour losses. For turf and

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lawn uses and for agricultural uses, a coarse droplet size is recommended to reduce buffer zones. This will also reduce vapour losses.

With respect to tree decline that was reported in the literature provided, it is acknowledged many other factors may be responsible, including increased nitrogen levels, atmospheric deposition of sulphur and nitrogenous oxides, and metal deposition. The linkage between ammonia levels and 2,4-D vapour uptake by plants has not been established conclusively in the information provided. It is a possibility, but until further research is conducted, it cannot be conclusively established that this mechanism actually occurs under field conditions, and that 2,4-D is a potential stressor to Manitoba forests.

## 11.0 Value Assessment

### 11.1 Comment

The Canadian Medical Association advised only infested areas should be treated.

#### Response

The PMRA has already proposed that **DIRECTIONS FOR USE** on the label be revised: “If weed populations do not warrant a broadcast application (e.g., entire lawn) consider spot treatments that target only weedy areas.” (PACR2005-01, Section 8.2.4)

### 11.2 Comment

The use data presented in the PACR are old and incomplete. They do not represent the current use pattern of 2,4-D on turf in Canada.

#### Response

Very little information is currently available to the PMRA for pesticide use in Canada, especially when it is specific to turf pest control. The PMRA searches for and welcomes the provision of new data. In addition, once promulgated, the new *Pest Control Products Act* will permit the collection of sales data from industry. Some sales data collected in the province of Quebec indicate that the use of herbicides for weed control on turf has increased in recent years (ministère du Développement durable, de l'Environnement et des Parcs 2001), but no similar information is available for the other provinces.

### 11.3 Comment

The term “spot treatment” should be defined.

#### Response

A spot treatment refers to the application of a pesticide to isolated patches or “spots” within a given area (e.g., treatment of spots or patches of weeds within a field or lawn).



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## 11.4 Comment

What evidence supports the following statement from Section 4.2.2 of the PACR, and what is meant by occasional: “Homeowners typically apply 2,4-D to their lawns twice a year, in the spring and fall, with occasional additional spot applications in the summer.”

### Response

The use data found in these statements were established by consulting various stakeholders such as lawn care companies, the Turfgrass Institute (University of Guelph), Landscape Ontario (landscape industry companies) and the Industry Task Force II on 2,4-D. This statement represents the typical scenario for homeowners applying 2,4-D. It is important to note that the maximum number of applications recommended per year on current 2,4-D labels is two per season. Occasional spot treatments may be performed when needed, but there is no typical number of spot treatments per year because this number will vary with year, weather, type of weed infesting the lawn and the level of tolerance for weeds.

## 11.5 Comment

Could spot treatments be a daily activity throughout the summer, and what evidence supports the following statement from Section 4.5.2: “Commercial lawn care operators treating residential lawns may be handling 2,4-D for one month during the spring and fall.”

### Response

The use data found in these statements were established by consulting various stakeholders such as lawn care companies, the Turfgrass Institute (University of Guelph), Landscape Ontario (landscape industry companies) and the Industry Task Force II on 2,4-D. This statement represents the typical scenario for lawn care operators applying 2,4-D when it is most effective, i.e., spring and fall. Summer applications are considered less effective in most areas.

## 11.6 Comment

In Section 8.2.4, replace the proposed statement “Efficacy is best when a herbicide is applied to actively growing weeds” with “Only for application to actively growing weeds.”

### Response

The statement “Efficacy is best when a herbicide is applied to actively growing weeds” was used because it reflects general weed science based on biological reality. Although 2,4-D works best on actively growing weeds, it can also provide some measure of control on weeds during the stage in which they have a reduced rate of growth.

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### 11.7 Comment

In Section 8.1, the following statement does not represent a mitigation measure, but what is currently recommended by the industry: “Do not apply more than two broadcast applications per season. This does not include spot treatments.”

#### **Response**

This statement is found in PACR 2005-01 under Section 8.2, Label recommendations and improvements. The PMRA is not proposing this statement as a mitigation measure. Rather, mitigation measure statements are found under Section 8.1.

### 11.8 Comment

The PMRA should clarify its position regarding the rates allowed for liquid fertilizer formulations containing 2,4-D alone or in co-formulated products.

#### **Response**

The rates of application allowed for liquid fertilizer formulations containing 2,4-D are the same as those allowed for liquid 2,4-D products. For liquid products containing 2,4-D alone, **including liquid fertilizer formulations**, the PMRA proposed to reduce the maximum 2,4-D rate for turf to 1.55 kg a.e./ha. For liquid coformulated products (two-way and three-way), **including liquid fertilizer formulations**, the PMRA proposed to reduce the maximum 2,4-D rate for turf to 1.25 kg a.e./ha.

### 11.9 Comment

Could the proposed label statements found in Section 8.2.4 of the PACR be reworded and shortened while still conveying the same message?

#### **Response**

The PMRA has considered proposals for rewording these statements, but believes that these statements are appropriate. Therefore, the statements will not be shortened.

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## Appendix II      Required Changes for Product Labels

### 1.0      General Label Statements

The statement “Keep out of reach of children” must appear on the primary panel of all labels.

The following statement must appear under the **DIRECTIONS FOR USE** section of the label for all commercial class products, unless aerial application has been approved for non-turf uses already on the label:

DO NOT apply by air.

The following statement must appear under the **DIRECTIONS FOR USE** section of the label of products intended for broadcast application:

DO NOT apply more than two broadcast applications per season. This does not include spot treatments.

### 2.0      Label Statements Relating to Chemistry

The guarantee statement on the labels of all products should be revised, when necessary, to specify the form of 2,4-D contained (i.e., one of the forms indicated in PACR2005-01, Section 2.6.1) and the proportion of 2,4-D acid equivalents. For example, for the DMA form, the guarantee should read: “2,4-D, present as the dimethylamine salt... y % a.e.” for solid products or “y g a.e./L” for liquid products where “y” is the equivalent concentration of 2,4-D as the acid. Note that the only form of isooctyl ester supported is the 2-ethylhexyl ester.

### 3.0      Label Statements Relating to Health

The text of technical, manufacturing concentrate and commercial class products containing the acid and amine forms of 2,4-D must include the following text:

#### **Toxicological Information**

This product may cause severe irritation to the eyes. Prolonged breathing of 2,4-D may cause coughing, burning, dizziness or temporary loss of muscle coordination. Other possible effects include fatigue, muscle weakness or nausea. Treat symptomatically.

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The text of technical, manufacturing concentrate and commercial class products containing the ester form of 2,4-D must include the following text:

### **Toxicological Information**

This product may cause mild irritation to the eyes. Prolonged breathing of 2,4-D may cause coughing, burning, dizziness or temporary loss of muscle coordination. Other possible effects include fatigue, muscle weakness or nausea. Treat symptomatically.

The statements concerning eye irritation may be modified if product-specific data are available.

## **4.0 Label Statements Relating to the Environment**

### **4.1 Domestic Class Products**

The following statement must appear under the **DIRECTIONS FOR USE** section of the label of domestic class products only:

DO NOT apply this product directly to freshwater habitats such as lakes, rivers, sloughs, ponds, prairie potholes, creeks, marshes, streams, reservoirs and wetlands, estuaries or marine habitats.

DO NOT contaminate irrigation/drinking water supplies or aquatic habitats by cleaning of equipment or disposal of wastes.

DO NOT apply to the exposed roots of trees and ornamentals.

If applying this product using a handheld sprayer, DO NOT directly spray or allow the spray to drift onto ornamentals or gardens.

Avoid application of this product when winds are gusty.

The following statements must appear under an **ENVIRONMENTAL HAZARDS** section of all domestic class products, with the exception of ready-to-use spray products for spot treatments:

### **ENVIRONMENTAL HAZARDS**

**TOXIC** to broadleaf terrestrial plants. This product may harm other broadleaf plants in the vicinity of the treatment area.

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## LEACHING

The use of this chemical may result in contamination of groundwater particularly in areas where soils are permeable (e.g., sandy soil) and/or the depth to the water table is shallow.

## RUN-OFF

To reduce runoff from treated areas into aquatic habitats, consider the characteristics and conditions of the site before treatment. Site characteristics and conditions that may lead to runoff include, but are not limited to, heavy rainfall, moderate to steep slope, bare soil, poorly draining soil (e.g., soils that are compacted, fine textured or low in organic matter and clay).

Avoid application of this product when heavy rain is forecast.

Contamination of aquatic areas as a result of runoff may be reduced by including a strip of untreated vegetation between the treated area and the edge of the water body.

## 4.2 Commercial Class Products

The following statements must appear under the **DIRECTIONS FOR USE** section of all commercial class products:

DO NOT apply this product directly to freshwater habitats such as lakes, rivers, sloughs, ponds, prairie potholes, creeks, marshes, streams, reservoirs and wetlands, estuaries or marine habitats.

DO NOT contaminate irrigation/drinking water supplies or aquatic habitats by cleaning of equipment or disposal of wastes.

DO NOT apply to the exposed roots of trees and ornamentals.

### Spray Applications

Field sprayer application: DO NOT apply during periods of dead calm. Avoid application of this product when winds are gusty. DO NOT apply with spray droplets smaller than the American Society of Agricultural Engineers (ASAE) medium classification.

In addition, the labels of liquid commercial class products that may be applied by tractor-pulled field sprayers should include the following statements:

## Buffer Zones

The buffer zones specified in the table below are required between the point of direct application and the closest downwind edge of sensitive terrestrial habitats such as grasslands, forested areas, shelter belts, woodlots, hedgerows, pastures, rangelands and shrublands. The buffer zones in the table below are reduced by 70% with the use of shrouds and 30% with the use of cones on field sprayers. A further substantial reduction can be achieved by using ASAE coarse droplet size instead of medium droplet size.

When a tank mixture is used, consult the labels of the tank-mix partners and use the largest (most restrictive) buffer zone recommended for any of the products.

<b>Buffer Zones (metres) Required to Protect Terrestrial Habitat When Using Tractor-pulled Boom Sprayers</b>						
	<b>Medium Droplet Size 250–350 µm Volume Mean Diameter</b>			<b>Coarse Droplet Size 350-450 µm Volume Mean Diameter</b>		
<b>2,4-D Derivative</b>	<b>Label Buffer Zone</b>	<b>Shrouds</b>	<b>Cones</b>	<b>Label Buffer Zone</b>	<b>Shrouds</b>	<b>Cones</b>
Acid	30	9	21	5	2	4
DMA	20	6	14	4	1	3
EHE	30	9	21	5	2	4
BEE	20	6	14	3	1	2

The following statements must appear under an **ENVIRONMENTAL HAZARDS** section of all commercial class products:

### **ENVIRONMENTAL HAZARDS**

TOXIC to broadleaf terrestrial plants. This product may harm other broadleaf plants in the vicinity of the treatment area. Observe buffer zones specified under DIRECTIONS FOR USE.

### **LEACHING**

The use of this chemical may result in contamination of groundwater particularly in areas where soils are permeable (e.g., sandy soil) and/or the depth to the water table is shallow.

## **RUN-OFF**

To reduce runoff from treated areas into aquatic habitats, consider the characteristics and conditions of the site before treatment. Site characteristics and conditions that may lead to runoff include, but are not limited to, heavy rainfall, moderate to steep slope, bare soil, poorly draining soil (e.g., soils that are compacted, fine textured or low in organic matter and clay).

Avoid application of this product when heavy rain is forecast.

Contamination of aquatic areas as a result of runoff may be reduced by including a strip of untreated vegetation between the treated area and the edge of the water body.

### **5.0 Label Statements Related to Value and Sustainability**

For consistency, the maximum application rates on the labels of all products for use on turf are limited to the following:

- 1.75 kg a.e. 2,4-D/ha for solid products containing 2,4-D alone or coformulated (granule, bar and stick);
- 1.55 kg a.e. 2,4-D/ha for liquid products containing 2,4-D alone; and
- 1.25 kg a.e. 2,4-D/ha for liquid products containing 2,4-D coformulated with other active ingredients (two-way and three-way mixtures).

The following statements must be included in the **DIRECTIONS FOR USE** section of the label of all products applied on turf:

This product is only effective when applied to the leaves of actively growing weeds. This product will not prevent new weeds—apply only when weeds are present.

The following statement is to be included in the **DIRECTIONS FOR USE** section of all products applied on turf by broadcast application:

If weed populations do not warrant a broadcast application (e.g., entire lawn), consider spot treatments that target only weedy areas.

The following statements must be included in the **DIRECTIONS FOR USE** section of all ready-to-use spray products designed for spot treatment:

This product is designed to target treatment of weedy areas of lawns.

This product may injure desirable ornamentals and vegetables.

### Appendix III List of 2,4-D Products Registered under the *Pest Controls Products Act* Affected by this Decision

**NOTE:** This list includes 2,4-D products registered for fine turf (excluding discontinued products, products with a submission for discontinuation or products registered for other sites than turf) as of 22 September 2005.

Registration Number	Marketing Class	Registrant	Product Name	Formulation Type	Form of 2,4-D <sup>1</sup>	Guarantee <sup>2</sup>
16981	Technical	Dow AgroSciences Canada Inc.	2,4-Dichlorophenoxyacetic Acid Flake Technical Herbicide	Solid	Acid	DXA 97.0%
16982	Technical	Dow AgroSciences Canada Inc.	Dow 2,4-D 2-Ethylhexyl Ester	Emulsifiable concentrate or emulsion	2-EHE	DXF 63.9%
16990	Technical	Dow AgroSciences Canada Inc.	2,4-D Butoxy Ethanol Esters	Solution	BEE	DXF 65.8%
17007	Technical	GroWell Limited	GroWell 2,4-D Technical Acid	Liquid	Acid	DXA 98.5%
17012	Technical	GroWell Limited	GroWell 2,4-D Iso Octyl Ester Technical	Solution	2-EHE	DXF 64.7%
17013	Technical	GroWell Limited	GroWell 2,4-D Butyl Glycol Ester Technical	Solution	BGE	DXF 66.6%
17044	Technical	Nufarm Agriculture Inc.	Nufarm 2,4-D Technical Acid	Solid	Acid	DXA 98.5%
17045	Technical	Nufarm Agriculture Inc.	Nufarm 2,4-D Acid	Dust or powder	Acid	DXA 99.0%
17134	Technical	Nufarm Agriculture Inc.	2,4-D Dry Powder Acid Herbicide	Dust or powder	Acid	DXA 94%
17135	Technical	Nufarm Agriculture Inc.	Nufarm 2,4-D Liquid Isooctyl Ester Herbicide	Solution	2-EHE	DXF 62.38%



Registration Number	Marketing Class	Registrant	Product Name	Formulation Type	Form of 2,4-D <sup>1</sup>	Guarantee <sup>2</sup>
17291	Technical	PBI/Gordon Corporation	2,4-Dichlorophenoxyacetic Acid Technical	Solid	Acid	DXA 98.2%
18611	Technical	Nufarm Agriculture Inc.	2,4-D Acid (Technical) Herbicide	Dust or powder	Acid	DXA 92.0%
19348	Technical	Nufarm Agriculture Inc.	2,4-D Iso-octyl Ester (Technical Grade Herbicide)	Solution	2-EHE	DXF 63.0%
24562	Technical	Nufarm Agriculture Inc.	Nufarm 2,4-D Technical Acid	Solid	Acid	DXA 96.0%
24836	Technical	Dow AgroSciences Canada Inc.	2,4-Dichlorophenoxyacetic Acid Molten State Technical Herbicide	Solution	Acid	DXA 74.8%
27263	Technical	Nufarm Agriculture Inc.	Nufarm 2,4-D 2-Ethylhexyl Ester Technical	Emulsifiable concentrate or emulsion	2-EHE	DXF 64.7%
27437	Technical	Albaugh Inc.	Albaugh 2,4-D Technical Acid Herbicide	Dust or powder	Acid	DXA 98.2%
16988	Manufacturing concentrate	Dow AgroSciences Canada Inc.	2,4-D DMA 720 Unsequestered Weed Killer	Solution	DMA	DXB 55.7%
17046	Manufacturing concentrate	Nufarm Agriculture Inc.	Nufarm 2,4-D Amine Salt	Solution	DMA	DXB 600 g/L
17107	Manufacturing concentrate	Dow AgroSciences Canada Inc.	2,4-D DMA 720 Sequestered Weed Killer	Solution	DMA	DXB 55.5%
17137	Manufacturing concentrate	Nufarm Agriculture Inc.	2,4-D Liquid Amine Sequestered Herbicide	Solution	DMA	DXB 53.1%

Registration Number	Marketing Class	Registrant	Product Name	Formulation Type	Form of 2,4-D <sup>1</sup>	Guarantee <sup>2</sup>
17138	Manufacturing concentrate	Nufarm Agriculture Inc.	2,4-D Liquid Amine Unsequestered Herbicide	Solution	DMA	DXB 56.0%
17168	Manufacturing concentrate	GroWell Limited	GroWell 2,4-D Dimethylamine Salt 600 Formulation	Solution	DMA	DXB 600 g/L
17377	Manufacturing concentrate	GroWell Limited	GroWell 2,4-D Diethanolamine Salt 600 Formulation	Solution	DEA	DXB 600 g/L
17401	Manufacturing concentrate	Nufarm Agriculture Inc.	Nufarm 2,4-D DMA Manufacturing Concentrate	Solution	DMA	DXB 720 g/L
17699	Manufacturing concentrate	GroWell Limited	GroWell 2,4-D 2-Ethylhexyl Ester 600 g.a.i./L	Emulsifiable concentrate or emulsion	2-EHE	DXF 600 g/L
18352	Manufacturing concentrate	GroWell Limited	GroWell 2,4-D Dimethylamine Salt 720 Formulation	Solution	DMA	DXB 720 g/L
18614	Manufacturing concentrate	Nufarm Agriculture Inc.	2,4-D Isooctyl Ester Manufacturing Concentrate Low Volatile Ester	Solution	2-EHE	DXF 600 g/L
18620	Manufacturing concentrate	Nufarm Agriculture Inc.	2,4-D Amine 720 Liquid Herbicide	Solution	DMA	DXB 720 g/L
18819	Manufacturing concentrate	GroWell Limited	GroWell 2,4-D Dimethylamine Salt 500 Formulation	Solution	DMA	DXB 500 g/L
18823	Manufacturing concentrate	GroWell Limited	GroWell 2,4-D 2-Ethylhexyl Ester 564 g.a.i./L Formulation	Emulsifiable concentrate or emulsion	2-EHE	DXF 564 g/L
18830	Manufacturing concentrate	GroWell Limited	GroWell 2,4-D Dimethylamine Salt 470 Formulation	Solution	DMA	DXB 470 g/L

Registration Number	Marketing Class	Registrant	Product Name	Formulation Type	Form of 2,4-D <sup>1</sup>	Guarantee <sup>2</sup>
19352	Manufacturing concentrate	Nufarm Agriculture Inc.	2,4-D Amine Manufacturing Concentrate Technical Grade Herbicide	Solution	DMA	DXB 720 g/L
19530	Manufacturing concentrate	Dow AgroSciences Canada Inc.	2,4-D Isopropylamine Salt	Solution	IPA	DXB 39.4%
20833	Manufacturing concentrate	Nufarm Agriculture Inc.	2,4-D 680 DEA Manufacturing Concentrate	Solution	DEA	DXB 680 g/L
25394	Manufacturing concentrate	United Agri Products Canada Inc.	2,4-D Dry Manufacturing Concentrate	Soluble granules	DMA	DXB 80.0%
25783	Manufacturing concentrate	Dow AgroSciences Canada Inc.	Striker Manufacturing Concentrate	Wettable granules	Acid	FLM 9.3% DXA 50.0% DPI 25.0%
27165	Manufacturing concentrate	GroWell Limited	GroWell 2,4-D Dimethylamine Salt 683 Formulation	Solution	DMA	DXB 683 g/L
27709	Manufacturing concentrate	Yara Canada L.P.	Yara Canada L.P. Herbicide 523 Manufacturing Concentrate	Solution	DMA	MEZ 171 g/L DXB 342 g/L
27721	Manufacturing concentrate	Scotts Canada Ltd.	Killex 3X Manufacturing Concentrate II (Green Cross)	Solution	DMA	MEZ 157.5 g/L DXB 285 g/L DIC 27 g/L
27723	Manufacturing concentrate	Riverdale Chemical Company	Riverdale Weedstroy Triamine (MO) Manufacturing Concentrate	Solution	DMA	MEC 78 g/L DXB 156 g/L DIG 156 g/L
27737	Manufacturing concentrate	Nufarm Agriculture Inc.	2,4-D/Mecoprop-P Manufacturing Concentrate	Solution	DMA	MEZ 180 g/L DXB 360 g/L
27738	Manufacturing concentrate	Nufarm Agriculture Inc.	CMPP-P/2,4-D Amine Manufacturing Concentrate	Solution	DMA	MEZ 180 g/L DXB 360 g/L

Registration Number	Marketing Class	Registrant	Product Name	Formulation Type	Form of 2,4-D <sup>1</sup>	Guarantee <sup>2</sup>
27808	Manufacturing concentrate	Interprovincial Cooperative Limited	IPCO 2,4-D/ Mecoprop-P Formula 3 XP (Manufacturing Grade) Herbicide	Solution	DMA	MEZ 180 g/L DXB 360 g/L
27867	Manufacturing concentrate	United Agri Products Canada Inc.	Mecoprop-P + 2,4-D Manufacturing Concentrate	Solution	DMA	MEZ 180 g/L DXB 360 g/L
27956	Manufacturing concentrate	Nu-Gro IP Inc.	Wilson Mecoprop and 2,4-D Manufacturing Concentrate	Solution	DMA	MEZ 180 g/L DXB 360 g/L
27991	Manufacturing concentrate	PBI/Gordon Corporation	Trimec DMB #2 Herbicide Powder Plus	Dust or powder	Acid	MEP 10.20 g/L DXA 45.59 g/L DIC 4.40 g/L
9561	Commercial + restricted	United Agri Products Canada Inc.	2,4-D Ester 600 Herbicide	Emulsifiable concentrate or emulsion	2-EHE	DXF 564 g/L
23563	Commercial + restricted	United Agri Products Canada Inc.	2,4-D Ester 700 Herbicide	Emulsifiable concentrate or emulsion	2-EHE	DXF 658 g/L
27818	Commercial + restricted	United Agri Products Canada Inc.	Salvo 2,4-D Ester 700	Emulsifiable concentrate or emulsion	2-EHE	DXF 660 g/L
27819	Commercial + restricted	Interprovincial Cooperative Limited	IPCO 2,4-D Ester 700 Herbicide	Emulsifiable concentrate or emulsion	2-EHE	DXF 660 g/L
27820	Commercial + restricted	Nufarm Agriculture Inc.	Nufarm 2,4-D Ester 700 Liquid Herbicide	Emulsifiable concentrate or emulsion	2-EHE	DXF 660 g/L
2687	Commercial	Dow AgroSciences Canada Inc.	Formula 40C Liquid Farm Weed Killer	Solution	DEA	DXB 470 g/L
5931	Commercial	United Agri Products Canada Inc.	2,4-D Amine 600 Herbicide	Solution	DMA	DXB 564 g/L
6330	Commercial	Dow AgroSciences Canada Inc.	2,4-D BEE-4 Herbicide Weed Killer	Emulsifiable concentrate or emulsion	BEE	DXF 500 g/L

Registration Number	Marketing Class	Registrant	Product Name	Formulation Type	Form of 2,4-D <sup>1</sup>	Guarantee <sup>2</sup>
9528	Commercial	Dow AgroSciences Canada Inc.	2,4-D Amine 500 Liquid Farm Weed Killer	Solution	DMA	DXB 470 g/L
9547	Commercial	United Agri Products Canada Inc.	2,4-D Amine 500 Herbicide	Solution	DMA	DXB 470 g/L
9560	Commercial	Dow AgroSciences Canada Inc.	2,4-D LV-600 Emulsifiable Concentrate	Emulsifiable concentrate or emulsion	2-EHE	DXF 564 g/L
9811	Commercial	Scotts Canada Ltd.	Killex Liquid Turf Herbicide	Suspension	DMA, DEA	MEC 100 g/L DXB 190 g/L DIC 18 g/L
11547	Commercial	Syngenta Crop Protection Canada Inc.	Dycleer 24 Liquid Herbicide	Solution	DMA	DXB 382 g/L DIC 200 g/L
14722	Commercial	Nufarm Agriculture Inc.	Amkil 500 2,4-D Liquid Herbicide	Solution	DMA	DXB 475 g/L
14725	Commercial	Nufarm Agriculture Inc.	Nufarm 2,4-D Amine 500 Liquid Herbicide	Solution	DMA	DXB 470 g/L
14726	Commercial	Nufarm Agriculture Inc.	Nufarm 2,4-D Amine 600 Liquid Herbicide	Solution	DMA	DXB 564 g/L
15730	Commercial	Nu-Gro IP Inc.	Wilson 2,4-D Amine 500 Liquid Weed Killer	Solution	DMA	DXB 470 g/L
16971	Commercial	Scotts Canada Ltd.	Green Cross Killex 500 Turf Herbicide Liquid Concentrate	Solution	DMA, DEA	MEC 75.00 g/L DXB 385.25 g/L DIC 18.75 g/L
17511	Commercial	Interprovincial Cooperative Limited	IPCO 2,4-D Amine 600 Liquid Herbicide	Solution	DMA	DXB 560 g/L
18963	Commercial	Plant Products Co. Ltd.	Trillion Liquid Turf Herbicide	Solution	DMA	MEC 100 g/L DXB 190 g/L DIC 18 g/L

Registration Number	Marketing Class	Registrant	Product Name	Formulation Type	Form of 2,4-D <sup>1</sup>	Guarantee <sup>2</sup>
19391	Commercial	Nu-Gro IP Inc.	Wilson Turf-Rite 2+2 (Double Strength Herbicide)	Solution	DMA, DEA	MEC 200 g/L DXB 200 g/L
19400	Commercial	Nu-Gro IP Inc.	Wilson Tri-Kil Turf Herbicide	Solution	DMA, DEA	MEC 100 g/L DXB 190 g/L DIC 18 g/L
19810	Commercial	United Agri Products Canada Inc.	PAR III Commercial Liquid Turf Herbicide	Solution	DMA	MEC 100 g/L DXB 190 g/L DIC-18 g/L
20950	Commercial	Nufarm Agriculture Inc.	Nufarm Weedar 80 2,4-D Amine Liquid Herbicide	Solution	DMA	DXB 470 g/L
21022	Commercial	Sanex Agro Inc.	Wilson 2,4-D LV 600 Emulsifiable Concentrate	Emulsifiable concentrate or emulsion	2-EHE	DXF 564 g/L
24669	Commercial	PBI/Gordon Corporation	Hi-Dep Broadleaf Herbicide	Solution	DMA, DEA	DXB 460 g/L
25395	Commercial	United Agri Products Canada Inc.	Savage Dry Soluble Herbicide	Soluble granules	DMA	DXB 80.0%
26163	Commercial	Interprovincial Cooperative Limited	WeedAway 2,4-D Amine 600 Liquid Herbicide	Solution	DMA	DXB 560 g/L
27304	Commercial	Dow AgroSciences Canada Inc.	2,4-D Ester 700 Herbicide	Emulsifiable concentrate or emulsion	2-EHE	DXF 658 g/L
27779	Commercial	Interprovincial Cooperative Limited	IPCO Premium 2-Way XP Turf Herbicide Liquid	Solution	DMA	MEZ 200 g/L DXB 200 g/L
27815	Commercial	Nufarm Agriculture Inc.	Mecoturf + 2,4-D Liquid Herbicide	Solution	DMA	MEZ 200 g/L DXB 200 g/L
27846	Commercial	Interprovincial Cooperative Limited	IPCO Premium 3-Way XP Turf Herbicide	Solution	DMA	MEP 100 g/L DXB 190 g/L DIC 18 g/L

Registration Number	Marketing Class	Registrant	Product Name	Formulation Type	Form of 2,4-D <sup>1</sup>	Guarantee <sup>2</sup>
27848	Commercial	Interprovincial Cooperative Limited	WeedAway Premium 3-Way XP Turf Herbicide	Solution	DMA	MEP 100 g/L DXB 190 g/L DIC 18 g/L
27884	Commercial	United Agri Products Canada Inc.	PAR III Turf Herbicide	Solution	DMA	MEZ 100 g/L DXB 190 g/L DIC 18 g/L
27969	Commercial	Nu-Gro IP Inc.	Wilson Turf-Rite 2+2 (Double Strength Herbicide)	Solution	DMA	MEZ 200 g/L DXB 200 g/L
27970	Commercial	Nu-Gro IP Inc.	Wilson Tri-Kil Turf Herbicide	Solution	DMA	MEZ 100 g/L DXB 180 g/L DIC 18 g/L
27972	Commercial	Plant Products Co. Ltd.	Trillion-P Liquid Turf Herbicide	Solution	DMA	MEZ 100 g/L DXB 190 g/L DIC 18 g/L
27975	Commercial	Scotts Canada Ltd.	Killex 500 Liquid Turf Herbicide Concentrate (Green Cross)	Solution	DMA	MEZ 75.0 g/L DXB 385.25 g/L DIC 18.75 g/L
27976	Commercial	Scotts Canada Ltd.	Killex Turf Herbicide Liquid Concentrate (Green Cross)	Solution	DMA	MEZ 100 g/L DXB 190 g/L DIC 18 g/L
28047	Commercial	Nufarm Agriculture Inc.	Nufarm CMPP-P/2,4-D Amine Liquid Herbicide	Solution	DMA	MEZ 180 g/L DXB 360 g/L
9103	Domestic	Nu-Gro IP Inc.	Wilson Lawn WeedOut Concentrate	Solution	DMA, DEA	MEC 50 g/L DXB 95 g/L DIC 9 g/L
9103.07	Domestic	Nu-Gro IP Inc.	C-I-L Lawn WeedOut Concentrate	Solution	DMA, DEA	MEC 50 g/L DXB 95 g/L DIC 9 g/L
11495	Domestic	Nu-Gro IP Inc.	Later's WEED-STOP Lawn Weed Killer	Solution	DMA	MEC 100 g/L DXB 100 g/L
11852	Domestic	Virterra Products Corporation	Weedex Dandelion Bar	Solid	Acid	DXA 14.0%

Registration Number	Marketing Class	Registrant	Product Name	Formulation Type	Form of 2,4-D <sup>1</sup>	Guarantee <sup>2</sup>
15114	Domestic	Nu-Gro IP Inc.	Later's Kleenup Dandelion Weedkiller	Solution	DEA	DXB 200 g/L
18014	Domestic	Nu-Gro IP Inc.	Wilson RTU Spotweed Lawn Weed Killer	Solution	DMA, DEA	MEC 3 g/L DXB 3 g/L
18087	Domestic	Nu-Gro IP Inc.	Later's Weed-Stop Spot Weed Killer	Solution	DMA	MEC 0.2% DXB 0.2%
20223	Domestic	Nu-Gro IP Inc.	Wilson Lawn WeedOut Ready to Use Herbicide	Solution	DMA	MEC 3.0 g/L DXB 3.0 g/L DIC 0.3 g/L
21738	Domestic	Virterra Products Corporation	Weedex Dandelion Stick (Ready-to-Use)	Solid	Acid	DXA 6.79%
24263	Domestic	Nu-Gro IP Inc.	Wilson Lawn Weedout™ Attach & Spray Concentrate	Solution	DMA, DEA	MEC 25 g/L DXB 50 g/L DIC 4.5 g/L
24263.02	Domestic	Nu-Gro IP Inc.	C-I-L Lawn WeedOut® Attach & Spray Concentrate	Solution	DMA, DEA	MEC 25 g/L DXB 50 g/L DIC 4.5 g/L
24531	Domestic	Nu-Gro IP Inc.	Wilson Lawn WeedOut (2) Ready-to-Use	Solution	DEA	MEC 3.0 g/L DXB 3.0 g/L DIC 0.3 g/L
24531.02	Domestic	Nu-Gro IP Inc.	C-I-L Lawn WeedOut (2) Ready-to-Use	Solution	DEA	MEC 3.0 g/L DXB 3.0 g/L DIC 0.3 g/L
24757	Domestic	Nu-Gro IP Inc.	C-I-L Lawn WeedOut Ready-to-Use Herbicide	Solution	DMA, DEA	MEC 3.0 g/L DXB 3.0 g/L DIC 0.3 g/L
26708	Domestic	Virterra Products Corporation	Concentrated WeedEx Weed Control for Lawns	Solution	DMA, DEA	MEC 50 g/L DXB 95 g/L DIC 9 g/L
26711	Domestic	Virterra Products Corporation	Ready to Use WeedEx Weed Control for Lawns	Solution	DMA, DEA	MEC 1.0 g/L DXB 1.9 g/L DIC 0.18 g/L
26724	Domestic	Home Hardware Stores Ltd.	Home Gardener WeedEx Weed Control for Your Lawn	Solution	DMA	MEC 50 g/L DXB 95 g/L DIC 9 g/L



Registration Number	Marketing Class	Registrant	Product Name	Formulation Type	Form of 2,4-D <sup>1</sup>	Guarantee <sup>2</sup>
27010	Domestic	Virterra Products Corporation	WeedEx Ready to Spray Herbicide	Solution	DMA	MEC 50 g/L DXB 95 g/L DIC 9 g/L
27799	Domestic	Scotts Canada Ltd.	Ortho Killex Ready-to-Use Lawn Weed Control Herbicide	Solution	DMA	MEZ 0.105% DXB 0.19% DIC 0.018%
27800	Domestic	Scotts Canada Ltd.	Ortho Killex Ready-to-Use Lawn Weed Control	Solution	DMA	MEZ 0.105% DXB 0.19% DIC 0.018%
27801	Domestic	Scotts Canada Ltd.	Ortho Killex Lawn Weed Control Concentrate	Solution	DMA	MEZ 52.52 g/L DXB 95 g/L DIC 9 g/L
27809	Domestic	Scotts Canada Ltd.	Ortho Killex Ready-to-Spray Lawn Weed Control	Solution	DMA	MEZ 52.52 g/L DXB 95 g/L DIC 9 g/L
27811	Domestic	Scotts Canada Ltd.	Ortho Killex with Pull N' Spray Applicator Ready-to-Use	Solution	DMA	MEZ 0.105% DXB 0.19% DIC 0.018%
27914	Domestic	Interprovincial Cooperative Limited	Co-op Premium Spot Weed Killer XP Herbicide	Solution	DMA	MEZ 1.00 g/L DXB 1.9 g/L DIC 0.18 g/L
27915	Domestic	Interprovincial Cooperative Limited	Co-op Premium Lawn Weed Killer XP Herbicide	Solution	DMA	MEZ 50 g/L DXB 95 g/L DIC 9 g/L
27949	Domestic	Nu-Gro IP Inc.	Later's Weed-Stop Lawn Weed Killer	Solution	DMA	MEZ 100 g/L DXB 100 g/L
27951	Domestic	Nu-Gro IP Inc.	Later's Weed-Stop Spot Weed Killer	Solution	DMA	MEZ 0.2% DXB 0.2%
27973	Domestic	Nu-Gro IP Inc.	C-I-L Lawn WeedOut Ready to Use Herbicide	Solution	DMA	MEZ 3.0 g/L DXB 3.0 g/L DIC 0.3 g/L
27974	Domestic	Nu-Gro IP Inc.	Wilson Lawn WeedOut Ready to Use Herbicide	Solution	DMA	MEZ 3.0 g/L DXB 3.0 g/L DIC 0.3 g/L

Registration Number	Marketing Class	Registrant	Product Name	Formulation Type	Form of 2,4-D <sup>1</sup>	Guarantee <sup>2</sup>
27982	Domestic	Home Hardware Stores Ltd.	Home Gardener Ready-to-Use Weedex	Solution	DMA	MEZ 1.0 g/L DXB 1.9 g/L DIC 0.18 g/L
27999	Domestic	Nu-Gro IP Inc.	C-I-L Lawn WeedOut (2) Ready to Use	Solution	DMA	MEZ 3.0 g/L DXB 3.0 g/L DIC 0.3 g/L
28000	Domestic	Nu-Gro IP Inc.	Wilson Lawn WeedOut (2) Ready to Use	Solution	DMA	MEZ 3.0 g/L DXB 3.0 g/L DIC 0.3 g/L
28045	Domestic	Home Hardware Stores Ltd.	Home Gardener Ready-to-spray Weedex	Solution	DMA	MEZ 50 g/L DXB 95 g/L DIC 9 g/L
28061	Domestic	Home Hardware Stores Ltd.	Home Gardener Concentrated Weedex	Solution	DMA	MEZ 50 g/L DXB 95 g/L DIC 9 g/L
28077	Domestic	Nu-Gro IP Inc.	C-I-L Lawn WeedOut Attach & Spray Concentrate	Solution	DMA	MEZ 25 g/L DXB 50 g/L DIC 4.5 g/L
28078	Domestic	Nu-Gro IP Inc.	Wilson Lawn WeedOut Attach & Spray Concentrate	Solution	DMA	MEZ 25 g/L DXB 50 g/L DIC 4.5 g/L
28081	Domestic	Nu-Gro IP Inc.	Wilson Lawn WeedOut Concentrate	Solution	DMA	MEZ 50 g/L DXB 95 g/L DIC 9 g/L
28082	Domestic	Nu-Gro IP Inc.	C-I-L Lawn WeedOut Concentrate	Solution	DMA	MEZ 50 g/L DXB 95 g/L DIC 9 g/L
28096	Domestic	Nu-Gro IP Inc.	Wilson Ready to Use Spotweed Lawn Weed Killer	Solution	DMA	MEZ 3 g/L DXB 3 g/L

<sup>1</sup> According to label front panels or electronic specification forms. Some information may not be accurate.  
<sup>2</sup> DIC: dicamba; DIG: dichlorprop amine; DXA: 2,4-D present as acid; DXB: 2,4-D present as amine; DXF: 2,4-D present as ester; DPI: clopyralid; FLM: flumetsulam; MEC: mecoprop amine; MEP: mecoprop d-isomer acid; MEZ: mecoprop d-isomer amine. Guarantees are presented as a percentage of acid equivalent per weight or as grams of acid equivalent per litre.

## Appendix IV List of 2,4-D Products Registered under the *Fertilizers Act* Affected by this Decision

**NOTE:** Fertilizer/pesticide products containing 2,4-D registered for use on lawn or turf as of 15 February 2006<sup>1</sup>.

Registration Number <i>Fertilizers Act</i>	Registrant	Brand Name	Product Name	Form of 2,4-D <sup>2</sup>
790685C	Nu-Gro I.P. Inc.	Green-Up	Weed & Feed 10-6-4 Plus 0.57% 2,4-D and 0.285% Mecoprop	DMA
800734C	Manchester Products	Super Green	10-6-4 Lawn Fertilizer Plus Weed Control with 0.5% 2,4-D	DMA
800759C	Nu-Gro I.P. Inc.	Greenleaf	Weed & Feed 22-4-4 with 1.0% 2,4-D and 0.5% Mecoprop	DMA
800760C	Nu-Gro I.P. Inc.	Greenleaf	Winterwise & Weed 6-9-18 with 0.8% 2,4-D and 0.4% Mecoprop	DMA
841748C	Federated Cooperative Ltd.	Turfgreen	20-10-5 Weed & Feed Fertilizer Plus Weed Control with 0.7% 2,4-D and 0.35% Mecoprop	DMA
851798C	Home Hardware Stores Ltd.	Home Gardener	Weed and Feed Lawn Fertilizer 21-7-7 with 0.56% 2,4-D and 0.28% Mecoprop	DMA
851868C	Home Hardware Stores Ltd.	Home Gardener	Fall Weed & Feed 6-8-12 with 0.6% 2,4-D and 0.3% Mecoprop	DMA
880020C	Preferred Partners	Parkwood	21-6-12 Lawn Fertilizer Weed and Feed with 0.76% 2,4-D and 0.38% Mecoprop	DMA
900021C	Nu-Gro I.P. Inc.	So-Green Premium Plus 3	Weed and Feed 21-7-7 with 0.78% 2,4-D, 0.41% Mecoprop and 0.06% Dicamba	DMA
900028C	Cargill Limited	Aero Green	10-6-4 Weed & Feed with 0.43% 2,4-D, 0.23% Mecoprop, 0.04% Dicamba	DMA
900029C	Cargill Limited	Aero Green	20-5-5 Weed & Feed with 0.84% 2,4-D and 0.44% Mecoprop	DMA
900032C	Scotts Canada Ltd.	Scotts Turf Builder Plus 2	Lawn Fertilizer 28-3-3 and Weed Control with 1.21% 2,4-D and 0.605% Mecoprop	Acid
900040C	Pacific Gardens Galore	Garden Plus	Weed & Feed 21-2-3 with 0.9% 2,4-D and 0.45% Mecoprop	DMA

<b>Registration Number Fertilizers Act</b>	<b>Registrant</b>	<b>Brand Name</b>	<b>Product Name</b>	<b>Form of 2,4-D<sup>2</sup></b>
900041C	Evergro Canada Inc.	Agrico	Weed & Feed 20-4-10 with 1.0% 2,4-D & 0.5% Mecoprop	DMA
900047C	Nu-Gro I.P. Inc.	Professional Turf	21-6-12 Fertilizer Plus Weed Control with 0.76% 2,4d and 0.38% Mecoprop	DMA
900075C	Art Knapp Plantland Ltd.	Growmaster	Weed & Feed 21-2-3 with 0.9% 2,4-D and 0.45% Mecoprop	DMA
910008C	Evergro Canada Inc.	Evergro	21-3-5 Spring & Summer Weed & Feed with 1.0% 2,4-D and 0.5% Mecoprop	DMA
910018C	Nutrite	Nutrite	YardPro Green Carpet Lawn Fertilizer Plus Weed Control 21-7-7 with 1% 2,4-D, 0.5% Mecoprop, 0.1% Dicamba	DMA
920006C	Nutrite	Nutrite	Professional Weed & Feed 20-3-6 Turf Fertilizer with 1.0% 2,4-D and 0.5% Mecoprop	DMA
920010C	Nu-Gro I.P. Inc.	Vigoro	Weed & Feed Turf Fertilizer 16-4-4 with 0.68% 2,4-D, 0.34% Mecoprop and 0.06% Dicamba	DMA, DEA
920011C	Nu-Gro I.P. Inc.	Nu-Gro	Premium Weed and Feed 18-4-14 with 1% Iron and 1% Magnesium with 0.68% 2,4-D, 0.34% Mecoprop and 0.06% Dicamba	DMA
920018C	Nu-Gro I.P. Inc.	Golden Vigoro	Weed & Feed Lawn Fertilizer 24-4-8 with 0.72% 2,4-D and 0.36% Mecoprop	DMA
920024C	Evergro Canada Inc.	Evergro	Broadleaf Weed & Feed 15-5-7 with 1.0% 2,4-D, 0.5% Mecoprop and 0.08% Dicamba	DMA
920031C	Nu-Gro I.P. Inc.	Canada Way	Weed & Feed 21-7-7 Lawn Fertilizer with 0.56% 2,4-D and 0.28% Mecoprop	DMA
920035C	Art Knapp Plantland Ltd.	Art Knapp	Fabulawn Weed & Feed 24-4-16 with 1.0% 2,4-D and 0.5% Mecoprop	DMA
920046C	Evergro Canada Inc.	Agrico Emerald Lawn	Fall Weed & Feed Fertilizer 6-4-18 with 0.9% 2,4-D and 0.45% Mecoprop	DMA
920047C	Evergro Canada Inc.	Evergro	6-3-20 Fall Lawn Weed & Feed with 0.9% 2,4-D and 0.45% Mecoprop	DMA

<b>Registration Number Fertilizers Act</b>	<b>Registrant</b>	<b>Brand Name</b>	<b>Product Name</b>	<b>Form of 2,4-D<sup>2</sup></b>
920055C	Nu-Gro I.P. Inc.	Hillview	Green Keeper 21-7-7 Weed & Feed with 0.79% 2,4-D and 0.395% Mecoprop	DMA
920071C	Nu-Gro I.P. Inc.	So-Green Xxpert	21-7-7 Weed & Feed Lawn Fertilizer with 0.63% 2,4-D and 0.315% Mecoprop	DMA
920098C	Scotts Canada Ltd.	Scotts Wintercare Plus 2	Fall Lawn Fertilizer 22-4-11 and Weed Control with 1.01% 2,4-D and 0.505% Mecoprop	Acid
920102C	Truro Agromart	The Agromart Group	Weed & Feed Lawn Fertilizer 10-6-4 Plus 0.57% 2,4-D & 0.285% Mecoprop	DMA
920103C	Truro Agromart	The Agromart Group	Weed & Feed Lawn Fertilizer 20-10-5 Plus 0.9% 2,4-D & 0.45% Mecoprop	DMA
920104C	Truro Agromart	The Agromart Group	Weed & Feed Lawn Fertilizer 4-9-15 Plus 0.57 2,4-D & 0.285% Mecoprop	DMA
920131C	Nu-Gro I.P. Inc.	So-Green Premium Plus	Winterizing Weed & Feed 12-14-18 with 0.68% 2,4-D and 0.34% Mecoprop	DMA
940007C	Nu-Gro I.P. Inc.	Nu-Gro	Turf Fertilizer Weed & Feed 21-3-9 Plus 0.81% 2,4-D, 0.405% Mecoprop and 0.08% Dicamba	DMA, DEA
940008C	Nu-Gro I.P. Inc.	Nu-Gro	Fall Lawn Food & Weed Control 5-10-15 with 0.64% 2,4-D and 0.32% Mecoprop	DMA
940020C	Art Knapp Plantland Ltd.	Art Knapp	Fall Weed & Feed 6-3-12 with 0.5% 2,4-D and 0.25% Mecoprop	DMA
940032C	Green Valley Fertilizer Ltd.	Green Valley Professional	Feed & Weed 22-4-10 with 1.12% 2,4-D & 0.56% Mecoprop	DMA
940051C	Nu-Gro I.P. Inc.	So-Green Premium Lawn Pro	Winterizing Weed & Feed 10-12-16 with 0.63% 2,4-D and 0.315% Mecoprop	DMA
950015C	Nu-Gro I.P. Inc.	Greenleaf Rapid Green	Weed & Feed 15-0-0 with 1.8% 2,4-D + 1.8% Mecoprop	DMA
950016C	Nu-Gro I.P. Inc.	Greenleaf Rapid Green	Weed & Feed 15-2-3 with 0.6% 2,4-D and 0.6% Mecoprop	DMA

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950017C	Nu-Gro I.P. Inc.	So-Green	Lawn Pro Weed & Feed Lawn Fertilizer 21-7-7 with 0.63% 2,4-D and 0.315% Mecoprop	DMA
950025C	Home Hardware Stores Ltd.	Home Gardener	Weed and Feed Lawn Fertilizer 25-5-5 with 0.72% 2,4-D and 0.36% Mecoprop	DMA
950094C	Nu-Gro I.P. Inc.	C-I-L Golfgreen	12-3-18 Fall Lawn Fertilizer with Weed Control with 0.68% 2,4-D and 0.34% Mecoprop	DMA
960013C	Nu-Gro I.P. Inc.	C-I-L Golfgreen	16-5-5 Liquid Lawn Fertilizer with Weed Control with 0.48% 2,4-D, 0.25% Mecoprop and 0.05% Dicamba	DMA, DEA
960026C	Nu-Gro I.P. Inc.	So-Green Xxpert Plus	Weed & Feed 21-7-7 with 0.63% 2,4-D and 0.315% Mecoprop	DMA
960028C	Nu-Gro I.P. Inc.	C-I-L Green-Up	Weed & Feed 15-2-3 Lawn Fertilizer with 0.94% 2,4-D, 0.49% Mecoprop and 0.09% Dicamba	DMA, DEA
960041C	Nu-Gro I.P. Inc.	C-I-L	Green-up Fall Weed and Feed 6-8-10 with 0.94% 2,4-D, 0.49% Mecoprop and 0.09% Dicamba	DMA, DEA
960042C	Nutrite	Nutrite Superturf	21-3-9 Lawn Fertilizer Plus Weed Control with 0.86% 2,4-D, 0.19% Mecoprop, 0.08% Dicamba	Acid
970008C	Capo Industries Ltd.	Greenpower Spray'on	15-2-3 Liquid Weed & Feed for Lawns with 1.62% 2,4-D, 0.85% Mecoprop, 0.15% Dicamba	DMA
970037C	Nu-Gro I.P. Inc.	Golden Vigoro	Fall Weed & Feed Lawn Fertilizer 12-8-16 with 0.72% 2,4-D and 0.36% Mecoprop	DMA
970040C	Nu-Gro I.P. Inc.	John Deere	Turf Fertilizer 15-3-15 Weed and Feed with 0.65% 2,4-D, 0.325% Mecoprop and 0.06% Dicamba	DMA, DEA
970041C	Nu-Gro I.P. Inc.	Circle H Farms	21-7-7 Weed & Feed Lawn Fertilizer with 0.5% 2,4-D, 0.25% Mecoprop	DMA
970042C	Nu-Gro I.P. Inc.	C-I-L Green-Up	Lawn Fertilizer 24-3-4 Weed & Feed with 0.56% 2,4-D and 0.28% Mecoprop	DMA

<b>Registration Number Fertilizers Act</b>	<b>Registrant</b>	<b>Brand Name</b>	<b>Product Name</b>	<b>Form of 2,4-D<sup>2</sup></b>
980007C	GardenWorks Ltd.	GardenWorks	Fabulawn Weed & Feed 20-2-20 with 1.0% 2,4-D and 0.5% Mecoprop	DMA
980016C	Scotts Canada Ltd.	Scotts	Feedex 16-5-5 Liquid Weed & Feed with 0.48% 2,4-D, 0.25% Mecoprop and 0.043% Dicamba	DMA, DEA
980028C	Nu-Gro I.P. Inc.	Vigoro	Weed and Feed 23-3-5 Lawn Fertilizer with 0.76% 2,4-D and 0.38% Mecoprop	DMA
980029C	Nu-Gro I.P. Inc.	Vigoro	Fall Weed & Feed 6-8-16 Lawn Fertilizer with 0.76% 2,4-D and 0.38% Mecoprop	DMA
980044C	TruServ Canada Cooperative Inc.	Grow Pro	Weed & Feed 16-4-8 Lawn Fertilizer with 0.72% 2,4-D and 0.36% Mecoprop	DMA
980045C	TruServ Canada Cooperative Inc.	Grow Pro	Fall Weed and Feed 12-3-14 Lawn Fertilizer with 0.72% 2,4-D and 0.36% Mecoprop	DMA
980046C	TruServ Canada Cooperative Inc.	Grow Pro	Fall Weed & Feed 6-4-12 Lawn Fertilizer with 0.72% 2,4-D and 0.36% Mecoprop	DMA
980049C	TruServ Canada Cooperative Inc.	Grow Pro	Weed & Feed 26-4-6 Lawn Fertilizer with 0.72% 2,4-D and 0.36% Mecoprop	DMA
980081C	Les Engrais Spray N' Green Fertilizers Inc.	Plus Green	Liquid Lawn Fertilizer 15-2-2 with 1.58% 2,4-D, 0.83% Mecoprop, 0.15% Dicamba	DMA, DEA
980083C	Les Engrais Spray N' Green Fertilizers Inc.	Spray & Green	Liquid Lawn Fertilizer and Weed Control 15-5-5 with 0.57% 2,4-D, 0.3% Mecoprop, 0.054% Dicamba	DMA, DEA
980085C	Les Engrais Spray N' Green Fertilizers Inc.	Spray & Green	Liquid Lawn Fertilizer 15-3-3 with 1.95% 2,4-D, 1.03% Mecoprop, 0.185% Dicamba	DMA, DEA
990009C	Nu-Gro I.P. Inc.	Vigoro	15-5-5 Weed & Feed Liquid Lawn Fertilizer with 0.56% 2,4-D, 0.29% Mecoprop and 0.058% Dicamba	DMA, DEA
990027C	Nu-Gro I.P. Inc.	Wilson Pow-R-Gro	Lawn Fertilizer 18-2-5 Weed and Feed with 1.06% 2,4-D, 0.56% Mecoprop and 0.1% Dicamba	DMA, DEA

<b>Registration Number Fertilizers Act</b>	<b>Registrant</b>	<b>Brand Name</b>	<b>Product Name</b>	<b>Form of 2,4-D<sup>2</sup></b>
990049C	Nu-Gro I.P. Inc.	ProTurf Dicot III	21-3-20 Fertilizer Plus Weed Control with 1.030% 2,4-D, 0.515% Mecoprop and 0.069% Dicamba	DMA, Acid
990050C	Cavendish Agri Services Ltd.	Green Line Weed & Feed	21-7-7 with 0.6% 2,4-D and 0.3% Mecoprop	DMA
990051C	Cavendish Agri Services Ltd.	Green Line Plus Weed & Feed	24-6-12 with 1% 2,4-D and 0.5% Mecoprop	DMA
2000034C	TruServ Canada Cooperative Inc.	Green Yard	Weed & Feed 26-4-6 Lawn Fertilizer with 0.72% 2,4-D and 0.36% Mecoprop	DMA
2000035C	TruServ Canada Cooperative Inc.	Green Yard	Fall Weed & Feed 6-4-12 Lawn Fertilizer with 0.72% 2,4-D and 0.36% Mecoprop	DMA
2000037C	TruServ Canada Cooperative Inc.	Green Yard	Weed & Feed 16-4-8 Lawn Fertilizer with 0.72% 2,4-D and 0.36% Mecoprop	DMA
2000038C	TruServ Canada Cooperative Inc.	Green Yard	Fall Weed & Feed 12-3-14 Lawn Fertilizer with 0.72% 2,4-D and 0.36% Mecoprop	DMA
2000043C	Schultz Company	Schultz Supreme Green	Liquid Weed & Feed 15-5-5 with 0.57% 2,4-D, 0.3% Mecoprop & 0.054% Dicamba	DMA, DEA
2000044C	Schultz Company	Schultz Supreme Green	Weed & Feed 24-4-14 with 1.0% 2,4-D, 0.5% Mecoprop and 0.1% Dicamba	DMA
2000064C	Cavendish Agri Services Ltd.	Atlantic Fairway Two Turf Fertilizer	20-6-12 with 1% 2,4-d and 0.5% Mecoprop	DMA
2001015C	Nu-Gro I.P. Inc.	C-I-L Golfgreen	24-3-6 Lawn Fertilizer with Weed Control with 0.99% 2,4-D and 0.495% Mecoprop	DMA
2001027C	Nu-Gro I.P. Inc.	C-I-L Super Golfgreen	26-3-4 Lawn Fertilizer with Weed Control with 0.99% 2,4-D and 0.495% Mecoprop	DMA
2001057C	Nu-Gro I.P. Inc.	Vigoro	Ultra Turf 28-3-3 Lawn Fertilizer with Weed Control with 0.99% 2,4-D and 0.495% Mecoprop	DMA
2001065C	Home Hardware Stores Ltd.	Home Gardener	Weedex Feed 17-5-5 Liquid Lawn Fertilizer with Weed Control with 0.66% 2,4-D, 0.35% Mecoprop and 0.06% Dicamba	DMA, DEA



<b>Registration Number Fertilizers Act</b>	<b>Registrant</b>	<b>Brand Name</b>	<b>Product Name</b>	<b>Form of 2,4-D<sup>2</sup></b>
2001072C	Valley Fertilizers Ltd.	Grass Master	Fall Lawn Fertilizer and Weed Control with 0.9% 2,4-D, 0.45% Mecoprop 22-10-12	DMA
2001074C	Valley Fertilizers Ltd.	Grass Master	Spring Lawn Fertilizer with 0.5% MN and Weed Control with 0.9% 2,4-D, 0.45% Mecoprop 26-4-9	DMA
2001078C	Virterra Products Corporation	Weed Master	Weedex Feed 17-5-5 Liquid Lawn Fertilizer with Weed Control with 0.66% 2,4-D, 0.35% Mecoprop and 0.06% Dicamba	DMA, DEA
2001096C	Canadian Tire Corporation	Canadian Tire	Fall Weed and Feed Lawn Fertilizer 4-8-12 with 0.44% 2,4-D and 0.22% Mecoprop	DMA
2002005C	Nu-Gro I.P. Inc.	Nu-Gro Professional	10-6-4 Turf Fertilizer Plus Weed Control with 0.58% 2,4-D and 0.29% Mecoprop	DMA
2002006C	Nu-Gro I.P. Inc.	Nu-Gro Professional	16-4-6 Turf Fertilizer Plus Weed Control with 0.68% 2,4-D, 0.34% Mecoprop and 0.08% Dicamba	DMA
2002007C	Nu-Gro I.P. Inc.	Nu-Gro Professional	16-4-4 Turf Fertilizer Plus Weed Control with 0.68% 2,4-D, 0.34% Mecoprop and 0.08% Dicamba	DMA
2002024C	Nu-Gro I.P. Inc.	Vigoro Ultra Turf	12-3-18 Fall Lawn Fertilizer with Weed Control with 0.99% 2,4-D and 0.495% Mecoprop	DMA
2002036C	John Connon Nurseries Ltd.	Connon's	21-3-9 Lawn Fertilizer Weed & Feed 1.0% 2,4-D and 0.5% Mecoprop	DMA
2004016C	Evergro Products Inc.	Evergro	Turf Grass Fertilizer Weed 'N' Feed 18-5-18 with 1.1% 2,4-D, 0.5% Mecoprop and 0.08% Dicamba	DMA
2004018C	Scotts Canada Ltd.	Scotts Turf Builder Pro	Lawn Fertilizer 29-3-3 and Weed Control with 1.00% 2,4-D and 0.50% Mecoprop-p	Acid
2004019C	Scotts Canada Ltd.	Scotts Turf Builder Plus 2	Lawn Fertilizer 28-3-3 and Weed Control with 1.21% 2,4-D and 0.605% Mecoprop-p	Acid
2004020C	Scotts Canada Ltd.	Scotts	Lawn Fertilizer 27-3-3 and Weed Control with 1.21% 2,4-D and 0.605% Mecoprop-p	Acid

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2004021C	Scotts Canada Ltd.	Scotts Feedex	16-5-5 Liquid Weed'N Feed with 0.48% 2,4-D, 0.25% Mecoprop-p, 0.043% Dicamba	DMA
2005003C	Fertichem Inc.	Enviro-Sol	Engrais Pour Pelouse 20-3-15 Turfgrass Fertilizer Avec/with 0.4% 2,4-D, 0.2% Mecoprop, 0.04% Dicamba	DMA
2005014C	Nutrite	Plantsmart	28-3-3 Lawn Food Plus Weed Control 1.2% 2,4-D, 0.6% Mecoprop-p	DMA
2005015C	Scotts Canada Ltd.	Scotts Wintercare Plus 2	Fall Lawn Fertilizer 22-4-11 and Weed Control with 1.01% 2,4-D and 0.505% Mecoprop-p	Acid
2005016C	Spancan Corporation	Pro Green	14-7-7 Lawn Fertilizer Plus Weed Control with 0.5% 2,4-D, 0.25% Mecoprop-p	DMA
2005017C	Spancan Corporation	Garden Master	5-10-15 Fall Lawn Fertilizer Plus Weed Control with 0.6% 2,4-D, 0.3% Mecoprop-p plus 1% Iron	DMA
2005018C	Spancan Corporation	Garden Master	21-2-10 Lawn Fertilizer Plus Weed Control with 0.68% 2,4-D, 0.34% Mecoprop-p	DMA
2005019C	Nutrite	Nutrite	Winterguard 4-9-15 Fall Lawn Fertilizer Plus Weed Control with 0.56% 2,4-D, 0.28% Mecoprop-p	DMA
2005020C	Nutrite	Yardpro Green Carpet	Lawn Fertilizer Plus Weed Control 21-7-7 with 0.9% 2,4-D, 0.45% Mecoprop-p	DMA
2005021C	Garden Gallery Inc.	Garden Gallery	18-4-10 Lawn Fertilizer and Weed Control with 0.8% 2,4-D, 0.4% Mecoprop-p and 1% Iron	DMA
2005022C	Garden Gallery Inc.	Garden Gallery	10-4-18 Fall Lawn Fertilizer and Weed Control with 0.8% 2,4-D, 0.4% Mecoprop-p and 1% Iron	DMA
2005024C	Evergro Canada Inc.	Agrico	Weed & Feed 20-4-10 with 1.0% 2,4-D and 0.5% Mecoprop-p	DMA
2005025C	Nutrite	Nutrite Superturf	21-3-9 Lawn Fertilizer Plus Weed Control with 0.9% 2,4-D, 0.45% Mecoprop-p	DMA
2005026C	GardenWorks Ltd.	GardenWorks	Fabulawn Weed & Feed 20-2-20 with 2.0% 2,4-D & 0.5% Mecoprop-p	DMA

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2005061C	Nu-Gro IP Inc.	Circle H Farms	21-7-7 Weed and Feed Lawn Fertilizer with 0.5% 2,4-D and 0.25% Mecoprop-p	DMA
2005062C	Nu-Gro IP Inc.	So-Green	Lawnpro Weed & Feed Lawn Fertilizer 21-7-7 with 0.63% 2,4-D and 0.315% Mecoprop-p	DMA
2005069C	Nu-Gro IP Inc.	So-Green	Ultra Winterizing Lawn Fertilizer Weed & Feed 12-14-22 with 0.86% 2,4-D and 0.43% Mecoprop-p with 0.1% Iron	DMA
2005070C	Nu-Gro IP Inc.	So-Green	Ultra Plus Weed & Feed 27-7-7 Lawn Fertilizer with 0.99% 2,4-d, 0.495% Mecoprop-p with 0.1% Iron	DMA
2005073C	Nu-Gro IP Inc.	Vigoro Ultra Turf	28-3-3 Weed & Feed Turf Fertilizer with 0.99% 2,4-D and 0.495% Mecoprop-p with 0.25% Iron	DMA
2005077C	Evergro Canada Inc.	Evergro	6-3-20 Fall Lawn Weed & Feed with 0.9% 2,4-D and 0.45% Mecoprop	DMA
2005078C	Evergro Canada Inc.	Evergro	Turfgrass Fertilizer Weed & Feed 18-5-18 with 1.1% 2,4-D, 0.55% Mecoprop-p and 0.10% Dicamba	DMA
2005096C	Nu-Gro IP Inc.		Weed and Feed 10-6-4 plus 0.57% 2,4-D and 0.285% Mecoprop-p	DMA
2005097C	Nu-Gro IP Inc.		Premium Weed and Feed 18-4-14 with 1% Iron and 1% Magnesium plus 0.89% 2,4-D, 0.445% Mecoprop-p and 0.08% Dicamba	DMA
2005098C	Nu-Gro IP Inc.		Weed and Feed 21-7-7 Lawn Fertilizer with 0.56% 2,4-D and 0.28% Mecoprop-p	DMA
2005099C	Nu-Gro IP Inc.		Fall Lawn Food and Weed Control 5-10-15 with 0.64% 2,4-D and 0.32% Mecoprop-p	DMA
2005100C	Nu-Gro IP Inc.		Weed and Feed Lawn Fertilizer 24-4-8 with 0.72% 2,4-D and 0.36% Mecoprop-p	DMA
2005101C	Nu-Gro IP Inc.	Professional Turf	Fertilizer 21-6-12 Plus Weed Control with 0.76% 2,4-D and 0.38% Mecoprop-p	DMA
2005102C	Nu-Gro IP Inc.	Nu-Gro Professional	10-6-4 Turf Fertilizer Plus Weed Control with 0.58% 2,4-D and 0.29% Mecoprop-p	DMA

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2005103C	Nu-Gro IP Inc.	Nu-Gro Professional	16-4-16 Turf Fertilizer Plus Weed Control with 0.68% 2,4-D, 0.34% Mecoprop-p and 0.06% Dicamba	DMA
2005104C	Nu-Gro IP Inc.	John Deere	Turf Fertilizer 15-3-15 Weed and Feed with 0.65% 2,4-D, 0.325% Mecoprop-p and 0.06% Dicamba	DMA
2005105C	Nu-Gro IP Inc.	Nu-Gro	Weed and Feed Turf Fertilizer 16-4-4 with 0.89% 2,4-D, 0.445% Mecoprop-p and 0.08% Dicamba	DMA
2005106C	Nu-Gro IP Inc.	C-I-L Green-up	Lawn Fertilizer 24-3-4 Weed & Feed with 0.56% 2,4-D and 0.28% Mecoprop-p	DMA
2005107C	Nu-Gro IP Inc.	C-I-L	Green-up Weed and Feed 15-2-3 Liquid Lawn Fertilizer with 0.94% 2,4-D, 0.47% Mecoprop-p and 0.09% Dicamba	DMA
2005108C	Canadian Tire Corporation		Fall Weed & Feed Lawn Fertilizer 4-8-12 with 0.44% 2,4-D and 0.22% Mecoprop-p	DMA
2005109C	Nu-Gro IP Inc.	Vigoro Ultra Turf	12-3-18 Fall Weed & Feed Turf Fertilizer with 0.99% 2,4-D and 0.495% Mecoprop-p with 0.25% Iron	DMA
2005113C	Nu-Gro IP Inc.	C-I-L	Golfgreen 16-5-5 Weed & Feed Liquid Lawn Fertilizer with 0.475% 2,4-D, 0.25% Mecoprop-p and 0.045% Dicamba	DMA
2005114C	Nu-Gro IP Inc.	Vigoro Ultra Turf	15-5-5 Weed & Feed Liquid Lawn Fertilizer with 0.64% 2,4-D, 0.34% Mecoprop-p and 0.061% Dicamba	DMA
2005115C	Schultz Company	Schultz Supreme Green	Weed and Feed 15-5-5 Liquid Lawn Fertilizer with 0.57% 2,4-D, 0.3% Mecoprop-p and 0.054% Dicamba	DMA
2005116C	Home Hardware Stores Ltd.	Home Gardener	Weed and Feed Lawn Fertilizer 21-7-7 with 0.56% 2,4-D and 0.28% Mecoprop-p	DMA
2005117C	Home Hardware Stores Ltd.	Home Gardener	6-8-12 Fall Weed & Feed Lawn Fertilizer with 0.6% 2,4-D and 0.3% Mecoprop-p	DMA
2005118C	Federated Cooperative Ltd.	Turfgreen	20-10-5 Weed & Feed Lawn Fertilizer Plus Weed Control with 0.7% 2,4-D and 0.35% Mecoprop-p	DMA

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2005119C	Nu-Gro IP Inc.	C-I-L Golfgreen	24-3-6 Weed & Feed Lawn Fertilizer with 0.99% 2,4-D and 0.495% Mecoprop-p with 0.21% Iron	DMA
2005120C	Nu-Gro IP Inc.	Hillview	Green Keeper 21-7-7 Weed and Feed Lawn Fertilizer with 0.79% 2,4-D and 0.395% Mecoprop-p	DMA
2005122C	Nu-Gro IP Inc.	ProTurf Dicot III	21-3-20 Fertilizer Plus Weed Control with 1.09% 2,4-D, 0.545% Mecoprop-p and 0.1% Dicamba	DMA
2005123C	Nu-Gro IP Inc.	C-I-L Golfgreen	12-3-18 Fall Weed & Feed Lawn Fertilizer with 0.99% 2,4-D and 0.495% Mecoprop-p	DMA
2005124C	Nu-Gro IP Inc.	Nu-Gro	21-3-9 Turf Fertilizer Plus Weed Control with 0.9% 2,4-d, 0.45% Mecoprop-p and 0.08% Dicamba	DMA
2005126C	Nu-Gro IP Inc.	Wilson Pow-R- Gro	Liquid Lawn Fertilizer 18-2-5 with 1.065% 2,4-D, 0.56% Mecoprop-p and 0.1% Dicamba	DMA
2005127C	Nu-Gro IP Inc.	Canada Way	Weed & Feed 21-7-7 Lawn Fertilizer with 0-56% 2,4-D and 0.28% Mecoprop-p	DMA
2005128C	Nu-Gro IP Inc.	Nu-Gro Professional	16-4-4 Turf Fertilizer Plus Weed Control with 0.68% 2,4-D, 0.34% Mecoprop-p and 0.06% Dicamba	DMA
2005129C	Nu-Gro IP Inc.	So-green Xxpert	Lawn Fertilizer 21-7-7 Weed and Feed with 0.63% 2,4-D and 0.315% Mecoprop-p and Micronutrients	DMA
2005130C	Preferred Partners	Parkwood	Weed and Feed 21-6-12 Lawn Fertilizer with 0.76% 2,4-D and 0.38% Mecoprop-p with 1% Iron	DMA
2005131C	Schultz Company	Schultz Supreme Green	Weed and Feed 24-4-14 Lawn Fertilizer with 0.76% 2,4-D and 0.38% Mecoprop-p	DMA
2005132C	Schultz Company	Schultz Supreme Green	Fall Weed & Feed 15-10-20 Lawn Fertilizer with 0.76% 2,4-D and 0.38% Mecoprop-p	DMA
2005134C	Nutrite	Superturf	24-4-12 Lawn Fertilizer Plus Weed Control with 1% 2,4-D, 0,5% Mecoprop-p	DMA

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2005135C	Evergro Canada Inc.	Evergro	21-3-5 Spring + Summer Lawn Weed + Feed with 0.6% Iron, 1.0% 2,4-D + 0.5% Mecoprop-p	DMA
2005136C	Evergro Canada Inc.	Evergro	Turfgrass Fertilizer Broadleaf Weed + Feed 15-5-7 with 1.4% Iron, 1.1% 2,4-D, 0.55% Mecoprop-p and 0.10% Dicamba	DMA
2005137C	Pacific Gardens Galore	Garden Plus	Weed + Feed 21-2-3 Lawn Fertilizer with 0.9% 2,4-D + 0.45% Mecoprop-p	DMA
2005141C	Nu-Gro IP Inc.	So-Green Xxpert	Winterizing Weed and Feed 10-12-14 Lawn Fertilizer with 0.68% 2,4-D and 0.34% Mecoprop-p with Micronutrients	DMA
2005142C	Home Hardware Stores Ltd.	Home Gardener	Weedex Feed 17-5-5 Liquid Lawn Fertilizer with Weed Control with 0.66% 2,4-D, 0.35% Mecoprop-p, and 0.06% Dicamba	DMA

<sup>1</sup> This list was generated using data collected on 15 February 2006. Some information may not be accurate after this date.

<sup>2</sup> Based on product contents listed in Appendix III.

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## Appendix V      Bibliography

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