UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF CHEMICAL SAFETY AND POLLUTION PREVENTION

MEMORANDUM

Date: 25-May-2016

Subject: **Carfentrazone-Ethyl:** Draft Human Health Risk Assessment for Registration Review.

PC Codes: 128712	**DP Barcode:** D430702
Decision No.: 512034	**Registration No.:** several
Petition No.: not applicable	**Regulatory Action:** registration review
Risk Assessment Type: aggregate	**Case No.:** 7422
TXR No.: not applicable	**CAS No.:** 128639-02-1
MRID No: not applicable	**40 CFR:** 180.515

From: Tom Bloem, Chemist
Sarah S. Gallagher, Ph.D., Biologist
Lata Venkateshwara, Environmental Protection Specialist
Risk Assessment Branch 1, Health Effects Division (RAB1/HED; 7509P)

Through: Kelly M. Lowe, Acting Branch Chief
George F. Kramer, Ph.D., Senior Chemist
RAB1/HED (7509P)

To: Matthew Manupella, Chemical Review Manager
Tom Myers, Team Leader
Risk Management and Implementation Branch 2 (RMIB2)
Pesticide Reevaluation Division (PRD; 7508P)

This document provides HED's draft human health risk assessment in support of registration review for carfentrazone-ethyl. The toxicology review was provided by Sarah Gallagher; the residue chemistry review, dietary risk assessment, and aggregate risk assessment were provided by Tom Bloem; and the occupational and residential risk assessments were provided by Lata Venkateshwara.

Recommendation: Carfentrazone-ethyl is a postemergent herbicide of the phenyl triazolinone group used for control of broadleaf weeds. Carfentrazone-ethyl is registered for application to numerous crops with tolerances for the combined residues of carfentrazone-ethyl and its metabolite CR-75 ranging from 0.10-15 ppm (40 CFR 180.515). Tolerances have also been established for these same compounds in/on ruminant/poultry tissues, eggs, and milk ranging from 0.02-0.10 ppm.

HED has recently completed a carfentrazone-ethyl risk assessment which resulted in dietary, residential, and aggregate exposures less than HED's level of concern (D425574, T. Bloem *et al.*, 17-Nov-2015). For the reasons stated below and provided the registered labels are revised as indicated in the Updates for Registration Review section (see (1) below), HED has determined that this recent risk assessment provides an up-to-date assessment of the toxicity, dietary, residential and aggregate risk picture for carfentrazone-ethyl.

- The residential, dietary, and aggregate risk assessments performed in the most recent risk assessment conform to all current HED science policy and risk assessment methodologies. In addition, based on a review of the currently registered application scenarios provided by EFED (D430704, D. Judkins and R. Shamblen, 19-May-2016) and BEAD (LUIS report; 15-Dec-2015) and provided the label changes indicated in the Updates for Registration Review section (see (1) below) are made, the most recent assessment adequately accounts for all registered application scenarios.
- The drinking water estimates provided by the Environmental Fate and Effects Division (EFED) in support of Registration Review are the same as those incorporated into the most recent assessment (D431806, R. Shamblen, 23-Feb-2016).
- The previously conducted residential risk assessment is protective of potential nonoccupational bystander and spray-drift exposure (see the Updates for Registration Review section and Attachment B).
- The information found in the open literature search, the epidemiological analysis, and the incident reports do not impact the assumptions incorporated into the most recent risk assessment (D430713, S. Recore, 06-Jan-2016).
- The most recent assessment considered all available toxicological data including the immunotoxicity study (MRID 49397613).
- The data evaluations performed in the most recent assessment reflect current HED practices and policies.

In order to fulfill the requirements for Registration Review, several updates to the most recent assessment are required. These updates, which are addressed in the next section, have no impact on the toxicological assessment or the dietary, residential, and aggregate risk picture provided in the November 2015 risk assessment. It is noted that as a result of these updates, HED is recommending for the establishment and deletion of several tolerances (see Attachment A).

This document, in combination with the recent November 2015 risk assessment, provides an assessment of the current status of carfentrazone-ethyl for Registration Review. Exposure estimates resulting from the registered uses are less than HED's level of concern. All data deficiencies have been resolved and all necessary updates have been made. **Provided the registered labels are revised as indicated in the Updates for Registration Review section (see (1) below) and the tolerance recommendations made in attachment A are implemented, the toxicological, residue chemistry, and ORE databases are adequate to support the registered uses; no additional data are required.**

Updates for Registration Review: In order to fulfill the requirements for Registration Review, HED has determined the following updates are required: (1) an update on several data deficiencies noted in the scoping document; (2) an up-to-date endocrine disruption statement; (3) an up-to-date spray drift and volatilization assessment; (4) review the established crop group/subgroup tolerances to determine if the commodity definitions can be updated to the current format and determine if the established tolerance can be harmonized with international maximum residue limits (MRLs); and (5) update the occupational exposure assessments to conform to current HED policy and risk assessment methodologies. These updates are addressed below.

(1) In support of registration review, HED completed a scoping document and identified several data deficiencies related to the toxicological and residue chemistry databases (D382666, K. Lowe *et al.*, 09-Feb-2011); no data deficiencies related to the occupational/residential exposure database were identified. The deficiency related to the toxicological database has been resolved with the submission of an acceptable immunotoxicity study (MRID 49397613). It is noted that the November 2015 risk assessment considered this study. The registrant has also responded to the residue chemistry deficiencies noted in the scoping document and these data were reviewed in (D426010, T. Bloem, 25-May-2016). Based on the D426010 review, the currently registered application scenarios provided by the Environmental Fate and Effects Division (EFED; D430704, D. Judkins and R. Shamblen, 19-May-2016; see Attachment G) and the Biological and Economic Analysis Division (BEAD; Label Use Information System (LUIS), 15-Dec-2015), and the currently available residue chemistry database, HED concludes that the registered labels should be revised as summarized below. Provided the labels are revised as indicated, the residue chemistry database is adequate to support the registered uses.

- The Aim 12% Microemulsion (see EPA Reg. No. 279-3303) label should be revised to indicate that harvest-aid application to legume vegetables (excluding soybean) may not exceed a maximum of 0.065 lb ai/acre (currently labeled for 0.096 lb ai/acre), and following harvest-aid application, the subsequent planted crop may only be a registered crop (D426010, T. Bloem, 25-May-2016).
- All relevant registered labels should indicate a maximum seasonal rate for "legume vegetables (crop group 6) except soybean" of 0.096 lb ai/acre (D426010, T. Bloem, 25-May-2016).
- The currently registered label should indicate that following application to cotton, potato, and the non-grass animal feed crop group 18, the subsequent planted crop may only be a registered crop (D426010, T. Bloem, 25-May-2016).
- The pre-harvest interval (PHI) table for all relevant labels should indicate a 7-day PHI for hops (D293779, T. Bloem, 14-Jul-2004).

(2) An up-to-date endocrine disruption statement is provided in Attachment D.

(3) As detailed in Attachment B, the previously conducted residential risk assessment is protective of potential non-occupational bystander and spray-drift exposure.

(4) HED evaluated the carfentrazone-ethyl residue chemistry database to determine if the established crop group/subgroup tolerances could be updated to current crop group/subgroup commodity definitions. Based on this analysis and based on a review of the legume residue chemistry data submitted in support of registration review (D426010, T. Bloem, 25-May-2016), HED is recommending for establishment of the tolerances listed in Attachment A.

As detailed in Attachment C, establishment of these tolerances has a negligible effect on the dietary and aggregate risk estimates provided in the most recent risk assessment. In addition, as detailed in Attachment F, the recommended/established tolerances are harmonized with international MRLs when possible.

(5) As detailed in Attachment E, occupational exposure resulting from the registered uses was updated to conform to current HED policy and risk assessment methodologies. All exposure estimates are less than HED's level of concern.

RDI: RAB1 (18-May-2016)

Attachment A: Recommended Tolerances.

HED evaluated the carfentrazone-ethyl residue chemistry database to determine if the established crop group/subgroup tolerances could be updated to current crop group/subgroup commodity definitions. Based on this analysis and based on a review of the legume residue chemistry data submitted in support of registration review (D426010, T. Bloem, 25-May-2016), HED is recommending for establishment of the tolerances listed in Table A.1 (40 CFR180.515(a)). With the establishment of the tolerances listed in Table A.1, the following tolerances should be deleted: acerola; asparagus; avocado; banana; canistel; date, dried fruit; feijoa; fig; guava; jaboticaba; longan, lychee; mango; noni; olive; palm heart; papaya; passionfruit; pomegranate; sapote, black; Spanish lime; star apple; starfruit; vegetable, Brassica, leafy group 5; vegetable, foliage of legume, except soybean, subgroup 7A; vegetable, leafy, except Brassica, group 4; wax jambu.

HED is recommending for establishment of the crop group/subgroup tolerances listed in Table A.1 as adequate data are available for the relevant representative crops. It is noted that the application scenarios within a crop group/subgroup were not consistent in every instance. Despite this, HED is recommending for the crop group/subgroup tolerances as the differences were minor and unlikely to lead to a difference in residues (established tolerances are identical at 0.10 ppm).

Table A.1: Tolerance Summary

Commodity	HED-Recommended Tolerance (ppm)
Vegetable, foliage of legume, group 7	15
Vegetable, leafy, group 4-16	0.10
Vegetable, *Brassica*, head and stem, group 5-16	0.10
Vegetable, stalk, stem, and leaf petiole, group 22	0.10
Fruit, tropical and subtropical, edible peel, group 23	0.10
Fruit, tropical and subtropical, small fruit, inedible peel subgroup 24A	0.10
Fruit, tropical and subtropical, medium to large fruit, smooth, inedible peel subgroup 24B	0.10
Fruit, tropical and subtropical, vine, inedible peel subgroup 24E	0.10

Attachment B: Non-Occupational Bystander and Spray Drift Risk Assessments (D433336, L. Venkateshwara, 25-May-2016).

Non-Occupational Spray Drift Exposure and Risk Estimates: Off-target movement of pesticides can occur via many types of pathways and it is governed by a variety of factors. Sprays that are released and do not deposit in the application area end up off-target and can lead to exposures to those it may directly contact. They can also deposit on surfaces where contact with residues can eventually lead to indirect exposures (*e.g.*, children playing on lawns where residues have deposited next to treated fields). The potential risk estimates from these residues can be calculated using drift modeling coupled with methods employed for residential risk assessments for turf products.

The approach to be used for quantitatively incorporating spray drift into risk assessment is based on a premise of compliant applications which, by definition, should not result in direct exposures to individuals because of existing label language and other regulatory requirements intended to prevent them.[1] Direct exposures would include inhalation of the spray plume or being sprayed directly. Rather, the exposures addressed here are thought to occur indirectly through contact with impacted areas, such as residential lawns, when compliant applications are conducted. Given this premise, exposures for children (1 to 2 years old) and adults who have contact with turf where residues are assumed to have deposited via spray drift thus resulting in an indirect exposure are the focus of this analysis analogous to how exposures to turf products are considered in risk assessment.

Several carfentrazone-ethyl products have existing labels for use on turf, thus it was considered whether the risk assessment for that use may be considered protective of any type of exposure that would be associated with spray drift. If the maximum application rate on crops adjusted by the amount of drift expected is less than or equal to existing turf application rates, the existing turf assessment is considered protective of spray drift exposure. The currently registered maximum single application rate of carfentrazone-ethyl is 0.19 lb ai/acre (wild rice and rice in the state of California). The highest degree of spray drift noted for any application method immediately adjacent to a treated field (Tier 1 output from the aerial application using fine to medium spray quality) results in a deposition fraction of 0.26 of the application rate. A quantitative spray drift assessment for carfentrazone-ethyl is not required because the maximum application rate to a crop/target site multiplied by the adjustment factor for drift of 0.26 is less than the maximum direct spray residential turf application rate of 0.2 lb ai/acre for any carfentrazone-ethyl products (0.19 lb ai/acre x $0.26 \leq 0.2$ lb ai/acre. The turf post-application MOEs have been previously assessed and are based on the revised SOPs for Residential Exposure Assessment and are not of concern to HED (i.e., see Section 5.2 of D433336, L. Venkateshwara, 25-May-2016).

Non-Occupational Bystander Post-Application Inhalation Exposure and Risk Estimates: Volatilization of pesticides may be a source of post-application inhalation exposure to individuals nearby pesticide applications. The agency sought expert advice and input on issues related to volatilization of pesticides from its Federal Insecticide, Fungicide, and Rodenticide Act Scientific Advisory Panel (SAP) in December 2009, and received the SAP's final report on March 2, 2010 (http://www.epa.gov/scipoly/SAP/meetings/2009/120109meeting.html). The agency has evaluated the SAP report and has developed a Volatilization Screening Tool and a subsequent Volatilization Screening Analysis (http://www.regulations.gov/#!docketDetail;D=EPA-HQ-OPP-2014-0219). During Registration Review, the Agency will utilize this analysis to determine if data (i.e., flux studies) or further analysis are required for carfentrazone-ethyl.

1 This approach is consistent with the requirements of the EPA's Worker Protection Standard which, when included on all labels, precludes direct exposure pathways.

Attachment C: Dietary Exposure Estimates.

Since the dietary exposure estimates provided in the most recent risk assessment did not include all the commodities associated with the tolerance recommendations made in Attachment A, a new assessment was conducted. Including the additional commodities results in an increase of ≤0.000005 mg/kg/day (≤0.02% cPAD) to the chronic dietary exposure estimates (tolerance level residues and 100% crop treated); based on toxicological considerations, acute and cancer analyses are unnecessary. This slight increase has no effect on the aggregate MOEs calculated in the previous assessment (aggregate MOEs of ≥2100; LOC for MOEs<100). A summary of the carfentrazone-ethyl chronic dietary exposure estimates resulting from all established/ recommended tolerances are provided below.

```
US EPA                                                          Ver. 3.16, 03-08-d
DEEM-FCID Chronic analysis for CARFENTRAZONE-ETHYL         NHANES 2003-2008 2-day
Residue file name: C:\Users\tbloem\Documents\work\carfentrazone-ethyl\registration
review\128712C.R08
                                              Adjustment factor #2 NOT used.
Analysis Date 05-20-2016/13:25:58     Residue file dated: 05-20-2016/13:25:44
Reference dose (RfD, Chronic) = .03 mg/kg bw/day
COMMENT 1: FQPA SF = 1x
================================================================================
                    Total exposure by population subgroup
--------------------------------------------------------------------------------
```

Population Subgroup	Total Exposure mg/kg body wt/day	Total Exposure Percent of Rfd
Total US Population	0.007976	26.6%
Hispanic	0.008834	29.4%
Non-Hisp-White	0.007826	26.1%
Non-Hisp-Black	0.007120	23.7%
Non-Hisp-Other	0.009794	32.6%
Nursing Infants	0.009367	31.2%
Non-Nursing Infants	0.021041	70.1%
Female 13+ PREG	0.007309	24.4%
Children 1-6	0.019091	63.6%
Children 7-12	0.009531	31.8%
Male 13-19	0.006139	20.5%
Female 13-19/NP	0.005917	19.7%
Male 20+	0.006553	21.8%
Female 20+/NP	0.006640	22.1%
Seniors 55+	0.006564	21.9%
All Infants	0.017437	58.1%
Female 13-50	0.006461	21.5%
Children 1-2	0.023436	78.1%
Children 3-5	0.017505	58.3%
Children 6-12	0.010256	34.2%
Youth 13-19	0.006022	20.1%
Adults 20-49	0.006621	22.1%
Adults 50-99	0.006602	22.0%
Female 13-49	0.006458	21.5%

Attachment D: Endocrine Disruption.

As required by FIFRA and FFDCA, EPA reviews numerous studies to assess potential adverse outcomes from exposure to chemicals. Collectively, these studies include acute, subchronic, and chronic durations and assess carcinogenicity, neurotoxicity, developmental, reproductive, and general or systemic toxicity. These studies include endpoints which may be susceptible to endocrine influence, including effects on endocrine target organ histopathology, organ weights, estrus cyclicity, sexual maturation, fertility, pregnancy rates, reproductive loss, and sex ratios in offspring. For ecological hazard assessments, EPA evaluates acute tests and chronic studies that assess growth, developmental, and reproductive effects in different taxonomic groups. As part of its reregistration decision for carfentrazone-ethyl, EPA reviewed these data and selected the most sensitive endpoints for relevant risk assessment scenarios from the existing hazard database. However, as required by FFDCA section 408(p), carfentrazone-ethyl is subject to the endocrine screening part of the Endocrine Disruptor Screening Program (EDSP).

EPA has developed the EDSP to determine whether certain substances (including pesticide active and other ingredients) may have an effect in humans or wildlife similar to an effect produced by a "naturally occurring estrogen, or other such endocrine effects as the Administrator may designate." The EDSP employs a two-tiered approach to making the statutorily required determinations. Tier 1 consists of a battery of 11 screening assays to identify the potential of a chemical substance to interact with the estrogen, androgen, or thyroid (E, A, or T) hormonal systems. Chemicals that go through Tier 1 screening and are found to have the potential to interact with E, A, or T hormonal systems will proceed to the next stage of the EDSP, where EPA will determine which, if any, of the Tier 2 tests are necessary based on the available data. Tier 2 testing is designed to identify any adverse endocrine-related effects caused by the substance and establish a dose-response relationship between the dose and the E, A, or T effect.

Under FFDCA section 408(p), the Agency must screen all pesticide chemicals. Between October 2009 and February 2010, EPA issued test orders/data call-ins for the first group of 67 chemicals, which contains 58 pesticide active ingredients and 9 inert ingredients. A second list of chemicals identified for EDSP screening was published on June 14, 2013[i] and includes some pesticides scheduled for registration review and chemicals found in water. Neither of these lists should be construed as a list of known or likely endocrine disruptors.

For further information on the status of the EDSP, the policies and procedures, the lists of chemicals, future lists, the test guidelines and the Tier 1 screening battery, please visit our website.[ii]

i See http://www.regulations.gov/#!documentDetail;D=EPA-HQ-OPPT-2009-0477-0074 for the final second list of chemicals.
ii http://www.epa.gov/endo/

Attachment E: Occupational Exposure (D433336, L. Venkateshwara, 25-May-2016).

Occupational Handler Exposure/ Risk Estimates: HED uses the term handlers to describe those individuals who are involved in the pesticide application process. HED believes that there are distinct job functions or tasks related to applications and exposures can vary depending on the specifics of each task. Job requirements (amount of chemical used in each application), the kinds of equipment used, the target being treated, and the level of protection used by a handler can cause exposure levels to differ in a manner specific to each application event.

Based on the anticipated use patterns and current labeling, types of equipment and techniques that can potentially be used, occupational handler exposure is expected from the proposed uses. The quantitative exposure/risk assessment developed for occupational handlers is based on the following scenarios:

- Mixing/loading liquids and water soluble packets to support aerial applications,
- Mixing/loading liquids and water soluble packets to support groundboom applications,
- Applying sprays with aircraft,
- Applying sprays with groundboom equipment,
- Flagging to support aerial spray applications,
- Mixing/loading/applying liquids via backpack (turf and aquatic areas),
- Mixing/loading/applying liquids via mechanically-pressurized handgun (turf and aquatic areas), and
- Mixing/loading/applying liquids via manually-pressurized handwand (turf).

Occupational Handler Exposure Data and Assumptions

A series of assumptions and exposure factors served as the basis for completing the occupational handler risk assessments. Each assumption and factor is detailed below on an individual basis.

Application Rate: The application rates used in this assessment are provided in Appendix C. For similar crop/application method scenarios, the highest application rate was assessed assuming this would be protective of lower application rates.

Unit Exposures: It is the policy of HED to use the best available data to assess handler exposure. Sources of generic handler data, used as surrogate data in the absence of chemical-specific data, include PHED 1.1, the AHETF database, the ORETF database, or other registrant-submitted occupational exposure studies. Some of these data are proprietary (e.g., AHETF data), and subject to the data protection provisions of FIFRA. The standard values recommended for use in predicting handler exposure that are used in this assessment, known as "unit exposures", are outlined in the "Occupational Pesticide Handler Unit Exposure Surrogate Reference Table" (https://www.epa.gov/sites/production/files/2015-09/documents/handler-exposure-table-2015.pdf), which, along with additional information on HED policy on use of surrogate data, including descriptions of the various sources, can be found at the Agency website (https://www.epa.gov/pesticide-science-and-assessing-pesticide-risks/occupational-pesticide-handler-exposure-data).

Area Treated or Amount Handled: The inputs for area treated were based on information in ExpoSAC Policy 9.1. The following summarizes the inputs used for estimating handler exposures:

- 1200 acres for aerial application to high acreage crops,
- 350 acres for aerial application to typical acreage crops,
- 350 acres for flaggers,

- 200 acres for ground application to high acreage crops,
- 80 acres for ground application to typical acreage crops,
- 40 gallons for backpack and manually-pressurized handwand applications for turf,
- 1000 gallons for mechanically-pressurized handgun for turf, and
- 5 acres for backpack and mechanically-pressurized handgun for aquatic areas.

Exposure Duration: HED classifies exposures from 1 to 30 days as short-term and exposures 30 days to six months as intermediate-term. Exposure duration is determined by many things, including the exposed population, the use site, the pest pressure triggering the use of the pesticide, and the cultural practices surrounding that use site. For most agricultural uses, it is reasonable to believe that occupational handlers will not apply the same chemical every day for more than a one-month time frame; however, there may be a large agribusiness and/or commercial applicators who may apply a product over a period of weeks (e.g., completing multiple applications for multiple clients within a region).

For carfentrazone-ethyl, based on the proposed uses, both short- and intermediate-term exposures are expected (i.e., up to 2 pre- or post-emergence directed applications).

Mitigation/Personal Protective Equipment: Estimates of inhalation exposure were calculated for "baseline" PPE, defined as no respirator. The carfentrazone-ethyl product labels direct mixers, loaders, applicators and other handlers to wear long pants, long sleeved shirts, waterproof gloves, shoes, and socks. Under the WPS, the acute toxicity of the formulated end-use product dictates the default PPE worn by occupational handlers. The formulated products are Toxicity Category IV via the dermal route and there is no systemic dermal hazard identified for carfentrazone-ethyl; therefore additional PPE (i.e., gloves) are not currently required at this time.

Occupational Handler Non-Cancer Exposure and Risk Estimate Equations

There are no risk estimates of concern for carfentrazone-ethyl at baseline attire (no PPE). The algorithms used to estimate non-cancer exposure and dose for occupational handlers can be found in Appendix A.

The Agency matches quantitative occupational exposure assessment with appropriate characterization of exposure potential. While HED presents quantitative risk estimates for human flaggers where appropriate, agricultural aviation has changed dramatically over the past two decades. According the 2012 National Agricultural Aviation Association (NAAA) survey of their membership, the use of GPS for swath guidance in agricultural aviation has grown steadily from the mid 1990's. Over the same time period, the use of human flaggers for aerial pesticide applications has decreased steadily from ~15% in the late 1990's to only 1% in the most recent (2012) NAAA survey. The Agency will continue to monitor all available information sources to best assess and characterize the exposure potential for human flaggers in agricultural aerial applications.

HED has no data to assess exposures to pilots using open cockpits. The only data available is for exposure to pilots in enclosed cockpits. Therefore, risks to pilots are assessed using the engineering control (enclosed cockpits) and baseline attire (long-sleeve shirt, long pants, shoes, and socks); per the Agency's Worker Protection Standard stipulations for engineering controls, pilots are not required to wear protective gloves for the duration of the application. With this level of protection, there are no risk estimates of concern for applicators.

Table E.1. Short-and Intermediate-Term Occupational Exposure and Risk Estimates for Carfentrazone-Ethyl. All Estimates are at Baseline Mitigation (i.e., Without Respirator, Unless Specified).

Exposure Scenario	Crop or Target[1]	Inhalation Unit Exposure (ug/lb ai) Mitigation Level (Baseline, No Respirator)	Maximum Application Rate[2]	Area Treated or Amount Handled Daily	Inhalation[3] Dose (mg/kg/day)	Inhalation[3] MOE
Mixer/Loader						
M/L, EC, Groundboom Applications	High acreage crops[6]	0.219	0.031 lb ai/A	200	0.000017	2,900,000
	Nongrass animal feeds Group 18		0.60 lb ai/A	200	0.0000329	1,500,000
	Typical acreage crops[7]		0.065 lb ai/A	80	0.0000143	3,500,000
	Rice, Wild		0.19 lb ai/A	200	0.000104	480,000
M/L, WDG, Groundboom Applications	High acreage crops	8.96	0.031 lb ai/A	200	0.000583	72,000
	Nongrass animal feeds Group 18		0.060 lb ai/A		0.00135	37,000
	Typical acreage crops		0.065 lb ai/A	80	0.000583	86,000
M/L, EC, Aerial Applications	High acreage crops	0.219	0.031 lb ai/A	1,200	0.000102	490,000
	Nongrass animal feeds Group 18		0.06 lb ai/A		0.000198	250000
	Typical acreage crops		0.065 lb ai/A	350	0.0000623	800,000
	Rice, wild (aerial applications excluded in California)		0.19 lb ai/a	1,200	0.000624	80,000
M/L, WDG, Aerial Applications	High acreage crops	8.96	0.031 lb ai/A	1,200	0.00416	12,000
	Nongrass animal feeds Group 18		0.06		0.00806	8,000
	Typical acreage crops		0.065 lb ai/A	350	0.00255	20,000
Applicator						
Applicator, Spray, Groundboom Open Cab	High acreage crops	0.34	0.031 lb ai/A	200	0.0000264	1,900,000
	Typical acreage crops		0.065 lb ai/A	80	0.0000221	2,300,000
Applicator, Spray, Aerial, Broadcast	High acreage crops	0.0049	0.031 lb ai/A	1,200	0.00000228	22,000,000
	Typical acreage crops		0.065 lb ai/A	350	0.00000139	36,000,000

		(engineering control - enclosed cockpit)				
Flagger						
Flagger, Liquids	High acreage crops	0.035	0.031 lb ai/A	350	0.0000264	1,900,000
	Typical acreage crops		0.065 lb ai/A	350	0.0000995	500,000
Mixer/Loader/Applicator						
Mixing/Loading/Applying Liquid Formulations with Backpack Sprayer	Landscaping, turf - broadcast	2.58	1.9 lb ai/gal	40 gallons	0.00245	20,000
Mixing/Loading/Applying Liquid Formulations with a Manually Pressurized Handwand	Landscaping, turf	30	1.9 lb ai/gal	40 gallons	0.0285	1,800
Mixing/Loading/Applying Liquids with a Mechanically Pressurized Handwand	Landscaping, turf	1.9	0.12 lbs ai/A	5 acres	0.0000143	3,500,000
Mixing/Loading/Applying Liquid Formulations with Backpack Sprayer	Aquatic areas, non-flowing water (e.g., ponds, lakes, fountains)	2.58	0.2 lbs ai/A	5 acres	0.0000323	1,500,000
Mixing/Loading/Applying Liquid Formulations with a Mechanically Pressurized Handwand	Aquatic areas, flowing water (e.g., tributaries, canals)	8.68	0.2 lbs ai/A	5 acres	0.000109	460,000

[1] Based on "Occupational Pesticide Handler Unit Exposure Surrogate Reference Table" (November 2015**)**; includes data from PHED/ORETF/AHETF (level of mitigation: Baseline, PPE, Eng. Controls).
[2] Based on registered labels. Assessment is based on maximum carfentrazone-ethyl application rate for each scenario. Crops were grouped according to registered rates and applicable exposure scenarios to cover all registered use sites.
[3] Exposure Science Advisory Council Policy #9.1.
[4] Inhalation Dose =Inhalation Unit Exposure (µg/lb ai) x Conversion Factor (0.001 mg/ug) x Application Rate (lb ai/gallon) x Amount Handled Daily (gallons/day) /BW (80 kg).
[5] Inhalation MOE = Inhalation NOAEL (50 mg/kg/day)/ Inhalation Dose (mg/kg/day). Inputs for MOE calculation can be found in Appendix A.

Occupational Post-application Exposure/Risk Estimates: HED uses the term post-application to describe exposures that occur when individuals are present in an environment that has been previously treated with a pesticide (also referred to as re-entry exposure). Such exposures may occur when workers enter previously treated areas to perform job functions, including activities related to crop production, such as scouting for pests or harvesting. Post-application exposure levels vary over time and depend on such things as the type of activity, the nature of the crop or target that was treated, the type of pesticide application, and the chemical's degradation properties. In addition, the timing of pesticide applications, relative to harvest activities, can greatly reduce the potential for post-application exposure. Also post-application exposures are anticipated based on the proposed new uses of carfentrazone-ethyl.

Occupational Post-application Inhalation Exposure/Risk Estimates: There are multiple potential sources of post-application inhalation exposure to individuals performing post-application activities in previously treated fields. These potential sources include volatilization of pesticides and resuspension of dusts and/or particulates that contain pesticides. The agency sought expert advice and input on issues related to volatilization of pesticides from its Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Scientific Advisory Panel (SAP) in December 2009, and received the SAP's final report on March 2, 2010: http://archive.epa.gov/scipoly/sap/meetings/web/pdf/120309meetingminutes.pdf. The Agency has evaluated the SAP report and has developed a Volatilization Screening Volatilization Screening Tool and a subsequent Volatilization Screening Analysis https://www.regulations.gov/contentStreamer?documentId=EPA-HQ-OPP-2014-0219-0003&disposition=attachment&contentType=pdf. During Registration Review, the agency will utilize this analysis to determine if data (i.e., flux studies, route-specific inhalation toxicological studies) or further analysis is required for carfentrazone-ethyl.

In addition, the Agency is continuing to evaluate the available post-application inhalation exposure data generated by the Agricultural Reentry Task Force. Given these two efforts, the Agency will continue to identify the need for and, subsequently, the way to incorporate occupational post-application inhalation exposure into the agency's risk assessments.

Although a quantitative occupational post-application inhalation exposure assessment was not performed, an inhalation exposure assessment was performed for occupational/commercial handlers. Handler exposure resulting from application of pesticides outdoors is likely to result in higher exposure than post-application exposure. Therefore, it is expected that these handler inhalation exposure estimates would be protective of most occupational post-application inhalation exposure scenarios.

Occupational Post-application Dermal Exposure/Risk Estimates: Although there is potential for dermal post-application exposure, an occupational post-application dermal exposure and risk assessment was not conducted because a dermal hazard was not identified for carfentrazone-ethyl.

Restricted Entry Interval: Carfentrazone-ethyl is classified as Toxicity Category III for acute dermal and Toxicity Category IV for acute inhalation and primary skin irritation. It is non-irritating to skin and minimally irritating to eyes. It is not a skin sensitizer. Therefore, the WPS REI of 12 hours listed on the product labels is adequate to protect agricultural workers from exposures to carfentrazone-ethyl.

Attachment F: International Residue Limits.

The table below details the U.S. tolerances and Canadian MRLs; there are no Mexican or Codex MRLs established for carfentrazone-ethyl. The U.S. and Canadian tolerance expression are identical as are the established tolerance values for all in-common commodities excluding rice grain. For rice grain, the U.S. has an established tolerance of 1.3 ppm while Canadian MRL is 0.1 ppm (wild rice). Based on the available data, HED concludes that harmonization with the Canadian rice MRL is not possible. In addition, Canada has established several MRLs in/on the milling fractions of the small grains. Based on the available data, HED concluded that the cereal-grain grain tolerances are adequate to cover residues in processed commodities (D351363, T. Bloem, 14-May-2008).

Summary of U.S. Tolerances and International MRLs.

***Residue Definition*:**

US	Canada	Mexico[1]	Codex
40 CFR 180.515: Combined residues of carfentrazone-ethyl (ethyl-alpha-2-dichloro-5-[-4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H* -1,2,4-triazol-1-yl]-4-fluorobenzenepropanoate) and its metabolite carfentrazone-chloropropionic acid (alpha, 2-dichloro-5-[-4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol-1-yl]-4-fluorobenzenepropanoic acid)	ethyl α,2-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol-1-yl]-4-fluorobenzenepropanoate, including the metabolite α, 2-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol-1-yl]-4-fluorobenzenepropanoic acid	--	None

Commodity Tolerance/Maximum Residue Limit (mg/kg)

Commodity	US	Canada	Mexico[1]	Codex
Almond, hulls	0.20	--	--	--
Animal feed, nongrass, crop group 18, forage	2.0	--	--	--
Animal feed, nongrass, crop group 18, hay	5.0	--	--	--
Animal feed, nongrass, crop group 18, seed	15	--	--	--
Artichoke, globe	0.10	--	--	--
Berry, low growing, subgroup 13-07G	0.10	0.1 strawberries	--	--
Bushberry subgroup 13-07B	0.10	0.1 blueberries, currant, elderberries, gooseberries, huckleberries	--	--
Cacao bean, bean	0.10	--	--	--
Caneberry subgroup 13-07A	0.10	0.1	--	--
Cattle, fat	0.10	0.1	--	--
Cattle, meat	0.10	0.1	--	--
Cattle, meat byproducts	0.10	0.1	--	--
Coffee, bean, green	0.10	--	--	--
Cotton, gin byproducts	10	--	--	--
Cottonseed subgroup 20C	0.20	--	--	--
Fish	0.30	--	--	--
Fruit, citrus, group 10-10	0.10	--	--	--
Fruit, pome, group 11-10	0.10	0.1	--	--
Fruit, small vine climbing, subgroup 13-07F, except fuzzy kiwifruit	0.10	0.1 grapes	--	--
Fruit, stone, group 12-12	0.10	0.1	--	--
Fruit, tropical and subtropical, edible peel, group 23	0.10	--	--	--
Fruit, tropical and subtropical, inedible peel, group 24	0.10	--	--	--
Goat, fat	0.10	0.1	--	--

Summary of U.S. Tolerances and International MRLs.

***Residue Definition*:**

US	Canada	Mexico[1]	Codex
40 CFR 180.515: Combined residues of carfentrazone-ethyl (ethyl-alpha-2-dichloro-5-[-4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H* -1,2,4-triazol-1-yl]-4-fluorobenzenepropanoate) and its metabolite carfentrazone-chloropropionic acid (alpha, 2-dichloro-5-[-4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol-1-yl]-4-fluorobenzenepropanoic acid)	ethyl α,2-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol-1-yl]-4-fluorobenzenepropanoate, including the metabolite α, 2-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol-1-yl]-4-fluorobenzenepropanoic acid	--	None

Commodity Tolerance/Maximum Residue Limit (mg/kg)

Commodity	US	Canada	Mexico[1]	Codex
Goat, meat	0.10	0.1	--	--
Goat, meat byproducts	0.10	0.1	--	--
Grain, aspirated grain fractions	1.8	--	--	--
Grain, cereal, group 15 (except rice grain and sorghum grain)	0.10	0.1 (crop group 15 crops; except sorghum grain)	--	--
Grain, cereal, group 16, forage	1.0	--	--	--
Grain, cereal, group 16, hay	0.30	--	--	--
Grain, cereal, group 16, stover	0.80	--	--	--
Grain, cereal, group 16, straw	3.0	--	--	--
Grass, forage	5.0	--	--	--
Grass, hay	8.0	--	--	--
Herbs and spices group 19	2.0	--	--	--
Hog, fat	0.10	--	--	--
Hog, meat	0.10	--	--	--
Hog, meat byproducts	0.10	--	--	--
Hop, dried cones	0.10	--	--	--
Horse, fat	0.10	0.1	--	--
Horse, meat	0.10	0.1	--	--
Horse, meat byproducts	0.10	0.1	--	--
Horseradish	0.10	0.1 horseradish roots	--	--
Kava, roots	0.10	--	--	--
Kiwifruit	0.10	--	--	--
Milk	0.05	0.05	--	--
Nut, tree, group 14-12	0.10	--	--	--
Palm heart, leaves	0.10	--	--	--
Peanut	0.10	--	--	--
Peanut, hay	0.10	--	--	--
Peppermint, tops	0.10	--	--	--
Poultry, meat byproducts	0.10	--	--	--
Psyllium, seed	0.10	--	--	--
Quinoa, grain	0.10	--	--	--
Rapeseed subgroup 20A	0.10	0.1 flax seed, mustard seed (oil seed type), rapeseed (canola)	--	--
Rapeseed, forage	0.10	--	--	--
Rice, grain	1.3	0.1 wild rice	--	--
Sheep, fat	0.10	0.1	--	--
Sheep, meat	0.10	0.1	--	--
Sheep, meat byproducts	0.10	0.1	--	--
Shellfish	0.30	--	--	--
Sorghum, grain	0.25	0.25	--	--
Soybean, seed	0.10	0.1	--	--

Summary of U.S. Tolerances and International MRLs.

***Residue Definition*:**

US	Canada	Mexico[1]	Codex
40 CFR 180.515: Combined residues of carfentrazone-ethyl (ethyl-alpha-2-dichloro-5-[-4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H* -1,2,4-triazol-1-yl]-4-fluorobenzenepropanoate) and its metabolite carfentrazone-chloropropionic acid (alpha, 2-dichloro-5-[-4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol-1-yl]-4-fluorobenzenepropanoic acid)	ethyl α,2-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol-1-yl]-4-fluorobenzenepropanoate, including the metabolite α, 2-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-3-methyl-5-oxo-1*H*-1,2,4-triazol-1-yl]-4-fluorobenzenepropanoic acid	--	None

Commodity Tolerance/Maximum Residue Limit (mg/kg)

Commodity	US	Canada	Mexico[1]	Codex
Spearmint, tops	0.10	--	--	--
Stevia	0.10	--	--	--
Strawberrypear	0.10	--	--	--
Sugarcane	0.15	--	--	--
Sunflower subgroup 20B	0.10	0.1 safflower seed, sunflower seed	--	--
Tea, dried	0.10	--	--	--
Teff, forage	1.0	--	--	--
Teff, grain	0.25	--	--	--
Teff, hay	0.30	--	--	--
Teff, straw	3.0	--	--	--
Ti, leaves	0.10	--	--	--
Ti, roots	0.10	--	--	--
Vanilla	0.10	--	--	--
Vegetable, *Brassica*, head and stem, group 5-16	0.10	--	--	--
Vegetable, bulb, group 3-07	0.10	0.1	--	--
Vegetable, cucurbit, group 9	0.10	0.1	--	--
Vegetable, foliage of legume, group 7	15	--	--	--
Vegetable, fruiting, group 8-10	0.10	0.1	--	--
Vegetable, leafy, group 4-16	0.10	--	--	--
Vegetable, leaves of root and tuber, group 2	0.10	--	--	--
Vegetable, legume, group 6	0.10	0.1	--	--
Vegetable, root and tuber, group 1	0.10	0.1	--	--
Vegetable, stalk, stem, and leaf petiole, group 22				
Wasaba, roots	0.10	--	--	--
MRLs with no US equivalent				
Barley milling fractions	--	0.8	--	--
Buckwheat milling fractions	--	0.8	--	--
Millet milling fractions	--	0.8	--	--
Oat milling fractions	--	0.8	--	--
Rye milling fractions	--	0.8	--	--
Triticale milling fractions	--	0.8	--	--
Wheat milling fractions	--	0.8	--	--
Completed: M. Negussie; 03/03/2016				

[1] Mexico adopts US tolerances and/or Codex MRLs for its export purposes.

Attachment G: Summary of Registered Application Scenarios Provided by EFED.

Table C.2. Summary of Registered Application Scenarios Provided by EFED (D430704, D. Judkins and R. Shamblen, 19-May-2016).						
Use Site Crop Type: Crop Group [2] *Subgroup* Representative Commodities	Application Type [3]	Maximum Single Application Rate [4] (lbs ai/acre)	Maximum Number of Applications per Season [5]	Minimum Re-Application Interval (d)	Pre-Harvest Interval [6]	Maximum Seasonal Application Rate [7] & [8] (lbs ai/acre)
Pre-Plant, Pre-Emergence and In-Season Applications						
Root Vegetables: Group 1 *Subgroup 1A* - Carrots, Radish, Sugarbeets *Subgroup 1B* - Carrots, Radish, except sugarbeets **Leaves of Root and Tuber Vegetables: Group 2** - Beets, Carrot, Radish, Sugarbeets **Bulb Vegetables: Group 3-07** - Chive, Dry Bulb Onions, Garlic, Onions, Leeks, Scallions, Shallots **Leafy Vegetables (Except *Brassica*): Group 4** *Subgroup 4A* - Head lettuce and leaf lettuce, and spinach *Subgroup 4B* - Celery ***Brassica* (Cole) Vegetables: Group 5** *Subgroup 5A* - Broccoli, Cauliflower, Cabbage and Cauliflower *Subgroup 5B* - Mustard greens **Legume Vegetables [14]: Group 6 – Except Soybeans** *Subgroup 6A* - Edible-podded bean and edible-podded peas *Subgroup 6B* - Any succulent shelled cultivar of bean and garden pea *Subgroup 6C* - Any dried cultivar of bean and garden pea **Foliage of Legume Vegetables: (Group 7)** *Subgroup 7A* - Any cultivar of field bean and field pea **Fruiting Vegetables (Except Cucurbits): Group 8-10** *Subgroup 8-10A* - Tomato	Aerial Ground	0.031	3	NS	0 days	0.096

Table C.2. Summary of Registered Application Scenarios Provided by EFED (D430704, D. Judkins and R. Shamblen, 19-May-2016).						
Use Site Crop Type: Crop Group [2] *Subgroup* Representative Commodities	Application Type [3]	Maximum Single Application Rate [4] (lbs ai/acre)	Maximum Number of Applications per Season [5]	Minimum Re-Application Interval (d)	Pre-Harvest Interval [6]	Maximum Seasonal Application Rate [7) & 8)] (lbs ai/acre)
Subgroup 8-10B - Pepper or Eggplant *Subgroup 8-10C* - Non-bell pepper or small eggplant **Cucurbit Vegetables: Group 9** *Subgroup 9A* - Cantaloupes *Subgroup 9B* - Summer squash and cucumber **Oil Seed: Group 20** - excludes cotton as cottonseed (*Subgroup 20C*) *Subgroup 20A* - Rapeseed, canola varieties *Subgroup 20B* - Sunflower, seed						
Tuberous and Corn Vegetables *Subgroup 1C* - Potato **Tuberous and Corm Vegetables (except potato)** *Subgroup 1D* - Sweet Potato	Aerial Ground	0.031	6	NS	7 days	0.181
Legume Vegetables: Group 6 - Soybean	Aerial Ground	0.023	1	NS	V10	0.023
Citrus Fruit: Group 10-10 *Subgroup 10-10A* - Orange or tangerine/ mandarin *Subgroup 10-10B* - Lemon or lime *Subgroup 10-10C* - Grapefruit **Pome Fruits: Group 11-10** - Apple, Pear **Stone Fruit: Group 12-12** *Subgroup 12-12A* - Cherry, sweet or Cherry, tart *Subgroup 12-12B* - Peach *Subgroup 12-12C*	Ground	0.031	4	14	3 days	0.124

Table C.2. Summary of Registered Application Scenarios Provided by EFED (D430704, D. Judkins and R. Shamblen, 19-May-2016).						
Use Site Crop Type: Crop Group [2] *Subgroup* Representative Commodities	Application Type [3]	Maximum Single Application Rate [4] (lbs ai/acre)	Maximum Number of Applications per Season [5]	Minimum Re-Application Interval (d)	Pre-Harvest Interval [6]	Maximum Seasonal Application Rate [7] & [8] (lbs ai/acre)
- Plum or Prune plum **Tree Nuts: Group 14-12** - Almond and Pecan						
Berry and Small Fruit: Group 13 *Subgroup 13-07 A. Caneberry* - Blackberry or raspberry	Ground	0.1	4	14	15 days	0.4
Subgroup 13-07B. Bushberry - Blueberry, highbush	Ground	0.031	3	NS	0 days	0.096
Subgroup 13-07F. Small fruit vine climbing, except fuzzy kiwi - Grape	Ground	0.031	4	14	3 days	0.124
Subgroup 13-07G. *Low growing berry* - Strawberry	Ground	0.031	3	NS	0 days	0.096
Cereal Grains: Group 15 - Small grains (Except Winter Wheat)	Aerial Ground	0.031	1	NA	Jointing Stage	0.031
- Small grains (Winter Wheat)	Aerial Ground	0.031	1	NA	Boot Stage	0.031
- Corn (Field, Seed, Popcorn, and Sweet)	Aerial Ground	0.016	1	NS	14-Leaf Collar Stage	0.031
- Rice (Southern US only)	Aerial Ground	0.05	2	NS	60 days	0.138
- Rice (California only)	Ground	0.19	1	NA	60 days	0.3
- Rice, Wild (Aerial applications excluded in California)	Aerial Ground	0.19	1	NA	60 days	0.3
- Sorghum (Grown for grain using foliar broadcast)	Ground	0.008	2	NS	14-Leaf Collar Stage	0.016 (0.032) [9]
- Sorghum (Grown for seed using directed, shielded or hooded sprayers)	Ground	0.016	1	NS	14-Leaf Collar Stage	0.016

Table C.2. Summary of Registered Application Scenarios Provided by EFED (D430704, D. Judkins and R. Shamblen, 19-May-2016).						
Use Site Crop Type: Crop Group [2] *Subgroup* Representative Commodities	Application Type [3]	Maximum Single Application Rate [4] (lbs ai/acre)	Maximum Number of Applications per Season [5]	Minimum Re-Application Interval (d)	Pre-Harvest Interval [6]	Maximum Seasonal Application Rate [7] & [8] (lbs ai/acre)
Forage, Fodder and Straw of Cereal Grains: Group 16 - Corn Silage	Aerial Ground	0.016	1	NS	Boot Stage	0.031
- Sorghum (Grown for forage using directed, shielded or hooded sprayers)	Aerial Ground	0.016	1	NS	Boot Stage	0.016
- Small grains	Aerial Ground	0.016	1	NS	7	0.016
Grass Forage, Fodder, and Hay: Group 17 - Centipede, Bahiagrass, Bermudagrass, Bluegrass, Bromegrass, Fescue, Orchardgrass, Ryegrass - Example use sites: Rangeland, pastures, grasses grown for hay or silage, seed production and CRP[10]	Aerial Ground	0.031	3	7	0	0.093
Nongrass Animal Feeds: Forage, Fodder, Straw, and Hay: Group 18 (Established Stands Only) - Grown for Forage, fodder, straw and/ or hay	Aerial Ground	0.04	1	NS	21	0.04
- Grown for Seed	Aerial Ground	0.04	1	NS	3	0.04
Herbs and Spices: Group 19 *Subgroups not specified*	Ground	0.031	3	NS	0	0.096
Oil Seed: Group 20 *Subgroup 20C* - Cottonseed (Cotton)	Aerial Ground	0.025	5	NS	7	0.124 (0.174)[11]
Harvest Aid Only						
Tuberous and Corn Vegetables *Subgroup 1C* - Potato	Aerial Ground	0.09	2	14	7 days	0.181
Legume Vegetables: Group 6 - Soybean	Ground	0.023	1	NS	3	0.023
Cereal Grains: Group 15 and **Forage, Fodder and Straw of Cereal Grains: Group 16** - Corn (Field Corn, Popcorn, and Sweet Corn for Seed)	Aerial Ground	0.031	1	NS	3	0.031
- Rice (harvest aid not permitted California)	Aerial Ground	0.023	1	NA	3	0.023
- Small Grains (Grown for forage using foliar broadcast)	Aerial Ground	0.016	1	NA	7	0.016
- Sorghum (Grown for grain using foliar broadcast)	Aerial Ground	0.016	1	NA	3	0.016 (0.032) [9]

Table C.2. Summary of Registered Application Scenarios Provided by EFED (D430704, D. Judkins and R. Shamblen, 19-May-2016).						
Use Site Crop Type: Crop Group [2)] *Subgroup* Representative Commodities	Application Type [3)]	Maximum Single Application Rate [4)] (lbs ai/acre)	Maximum Number of Applications per Season [5)]	Minimum Re-Application Interval (d)	Pre-Harvest Interval [6)]	Maximum Seasonal Application Rate [7) & 8)] (lbs ai/acre)
Oilseed: Group 20 - Cotton (Managed maturity and harvest aid only)	Aerial Ground	0.025	2	NS	7	0.05 (0.174)[11)]
Nongrass Animal Feeds: Forage, Fodder, Straw, and Hay: Group 18 (Established Stands Only) - Alfalfa, Clover, Velvet Bean, Kudzu, Lespedeza, Lupin, Sainfoin, Trefoil, Vetch, Crown Vetch, Milk Vetch - Grown for Forage, fodder, straw and/ or hay	Aerial Ground	0.06	1	NA	21	0.06
- Grown for Seed	Aerial Ground	0.06	1	NA	3	0.06
Peanut	Ground	0.031	1	NA	7	0.031
Sugarcane	Ground	0.031	1	NA	7	0.031
Miscellaneous Commodities: Not listed among crop group tables.						
Asparagus	Aerial Ground	0.030	2	20	5	0.06
Fallow Systems	Aerial Ground	0.031	1	NA	NA	0.031
Globe Artichoke	Aerial Ground	0.032	2	NS	0	0.096
Hops	Ground	0.031	4	14	7	0.12
Horseradish (now part of Crop Group 1A)	Aerial Ground	0.031	3	NS	0	0.096
Mint	Aerial Ground	0.030	1	NA	NS	0.030
Other Crops - Kiwifruit, Pomegranate, Fig, Olive, Date, Persimmon, Banana, Cacao, Tea, Indian Mulberry, Vanilla, Coconut, Palm Heart, Coffee and Guayule	Ground	0.031	4	14	3	0.124
Peanut	Ground	0.031	3	NS	7	0.096
Sugarcane	Ground	0.031	3	NS	7	0.096
Teff	Aerial Ground	0.031	1	NA	Jointing	0.031
Teff (grain) Hharvest aid	Aerial Ground	0.031	1	NA	3	0.031
Teff (forage) harvest aid	Aerial Ground	0.031	1	NA	7	0.031

Table C.2. Summary of Registered Application Scenarios Provided by EFED (D430704, D. Judkins and R. Shamblen, 19-May-2016).						
Use Site Crop Type: Crop Group [2] *Subgroup* Representative Commodities	Application Type [3]	Maximum Single Application Rate [4] (lbs ai/acre)	Maximum Number of Applications per Season [5]	Minimum Re-Application Interval (d)	Pre-Harvest Interval [6]	Maximum Seasonal Application Rate [7] & [8] (lbs ai/acre)
Tobacco	Ground	0.024		NS	6	0.05
Tropical Tree Fruits - Papaya, Avocado, Black Sapote, Canistel, Mamey Sapote, Mango, Sapodilla, Star apple, Guava, Feijoa, Jaboticaba, Wax jambu, Starfruit, Passionfruit, Acerola, Lychee, Longan, Spanish lime, Rambutan, Pulasan, Sugar apple, Atemoya, Custard apple, Cherimoya, Llama, Soursop, and Biriba	Ground	0.031	3	14	0	0.096
Non-Crop Uses						
Agricultural Farmstead Uses - Canal banks - Dry ditch - Grass waterways - Field edges - Terraces - Shelter belts - Equipment storage areas - Farm buildings - Fence lines	Ground	0.031	1	NS	NA	0.031
Turf [12]						
- Golf course greens and tees consisting of bentgrass, a cool-season grass	Ground	0.12	3	14	NA	0.4
- Ornamental lawns and turfgrass.	Ground	0.03	3	14	NA	0.09
Aquatic [13]						
- Ponds - Lakes - Reservoirs - Marshes - Wetlands - Bayous - Drainage ditches - Canals - Streams - Rivers - Slow-moving or quiescent bodies of water	Aquatic	0.2	NS	14	NA	0.3

Abbreviations: A= acre; ai = active ingredient; lbs. = pounds; NA = not applicable; NL = not labeled for that use; NS = not specified on the label

1) Accepted USEPA registered labels representing agricultural sites used to compile this Use Pattern summary table include 279-3194, 2012; 279-3241, 2012; 279-3242, 2012; and 279-3303, 2005). These labels are limited to products that only contain carfentrazone-ethyl as the active ingredient.
2) Refer to the 40 CFR Section 180.41 crop group tables for a complete list of crops eligible as application use sites.
3) Application type identifies aerial or ground application techniques, but does not specify timing nor drift reduction technologies (DRT) required. For example, aerial applications are not registered for crops during the growing season, and ground applications during the growing season often require the use of DRT.
4) Represents the potential maximum single application rate.
5) In most cases, the maximum number of applications are not provided on the label. Maximum number of applications provided in this table is a mathematical artifact of the division of the maximum annual application rate and the maximum single application rate. Fractional values were rounded down to the lowest whole number.
6) Pre-harvest interval are reported in days or crop growth stage.
7) Maximum seasonal rates represent the total allowable usage for all applications made to the field (Use Site) per calendar year. This includes fallow treatments, burndown treatments and all in-season treatments, including harvest aid. This information is derived from Table 1 "Maximum Allowable AIM Herbicide Use Per Acre Per Season for Crops or Crop Group" of the registrant's product labels.
8) When the maximum single application rate is multiplied by the maximum number of seasonal applications do not equal, or nearly equal, the total seasonal application rate, the difference may be attributed to a harvest-aid application rate.
9) Maximum seasonal application rates for sorghum (grown for grain) is actually 0.032 lbs ai/acre. Maximum seasonal application rates as pre-plant, pre-emergence and post-emergence is 0.016 lb ai/acre, but the label states that the harvest-aid application rate of 0.016 lbs ai/acre can also be applied in addition to the growing season stages of crop growth. Thus, these application programs are additive for use on sorghum.
10) CRP is the acronym for the US Department of Agriculture's Conservation Reserve Program. A conservation program that subsides landowners to take agricultural lands out of production for a fixed period of time.
11) Maximum seasonal application rates for cotton is actually 0.174 lbs ai/acre. Maximum seasonal application rates as pre-plant, pre-emergence and post-emergence is 0.124 lb ai/acre, but the label states that the harvest-aid application rate of 0.05 lbs ai/acre can also be applied in addition to the growing season stages of crop growth. Thus, these application programs are additive for use on cotton.
12) Accepted USEPA registered labels representing turfgrass sites used to compile this Use Pattern summary table include 279-3265, 2004; 279-3301, 2006). These labels are limited to products that only contain carfentrazone-ethyl as the active ingredient.
13) Accepted USEPA registered labels representing aquatic sites used to compile this Use Pattern summary table include 279-3279, Stingray™ Aquatic Herbicide.
14) Only the EPA registration number 279-3303 allows the use of carfentrazone-ethyl as a harvest aid on Crop Group 6, and foliage (CG 7).