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Office of Pesticide Programs

Addendum to the 2002 Interim Reregistration Eligibility Decision (IRED) for Disulfoton

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ADDENDUM TO THE 2002 INTERIM REREGISTRATION ELIGIBILITY DECISION (RED)

For

Disulfoton

CASE No. 0102

Approved by: Steven Bradbury

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Date: 12/30/08

I. Introduction

This document serves as an Addendum to the Disulfoton Interim Reregistration Eligibility Decision (IRED), which was completed in March 2002 and published in July 2002. This addendum addresses public comments received on the IRED and also discusses the status of several studies required to confirm the Agency's reregistration decision. The IRED served as an interim regulatory decision for disulfoton while the cumulative risks of the organophosphate pesticides were considered, as required by the Food Quality Protection Act (FQPA). The Organophosphorus (OP) Cumulative Risk Assessment, 2006 Update, issued on July 31, 2006, completed the Agency's reassessment of all disulfoton tolerances, taking into account the cumulative risks of exposure to this group of OP pesticides with a common mechanism of toxicity. As stated in the *Federal Register* notice of August 2, 2006, as a result of the publication of the Organophosphorus Cumulative Assessment, the IREDs previously issued for a number of organophosphate pesticides, including disulfoton, are now considered final Reregistration Eligibility Decisions (REDs). The disulfoton RED, in conjunction with the Organophosphorus Cumulative Risk Assessment and this Addendum, presents the Agency's assessment of the dietary, occupational, non-occupational, and ecological risks associated with the use of disulfoton and identifies risk mitigation measures that are necessary to support its continued use.

A. Background

The disulfoton 2002 IRED concluded that there are no dietary (food and drinking water) risks of concern associated with the current use of disulfoton. To address potential risks associated with the residential use of disulfoton, EPA required registrants to implement a number of mitigation measures, including child resistant packaging and deletion of indoor and home garden use. Therefore, remaining residential uses do not exceed the Agency's level of concern. To mitigate ecological risk, the Agency limited applications of disulfoton to one per calendar year for all crops, except for asparagus, barley, coffee, and peanuts (North Carolina only), for which no more than two applications of disulfoton per calendar year are permitted.

The 2002 IRED identified occupational risks of concern [margins of exposure (MOE) < 100] for handlers who mix, load, and apply disulfoton and for workers who are exposed to disulfoton residues after application to agricultural crops. As part of its assessment, the Agency considered the benefits of registered uses and identified measures necessary to mitigate these occupational risks of concern, such as the cancellation of certain uses, the requirement of engineering controls for mixing, loading, and application of products containing disulfoton, and the use of maximum Personal Protective Equipment (PPE) when engineering controls are not feasible.

To confirm its reregistration conclusions, the Agency required the submission of confirmatory data, which among other requirements included: 1) a worker exposure monitoring study; and, 2) a drinking water monitoring study for disulfoton and its degradates to confirm conclusions that drinking water risks are likely to be lower than

modeled estimates. The Agency issued a generic data call-in (DCI) for these studies in January 2004.

The Agency received a number of substantive comments concerning the mitigation measures proposed in the IRED. Some comments addressed the need to add an additional commodity, Christmas trees, to the list of crops eligible for a second application of disulfoton. Other comments focused on issues concerning the 2002 IRED's mitigation measures required for use of disulfoton on commercial ornamentals, asparagus, barley and wheat.

II. Disulfoton Conifer Tree Use

A. Request for Two-Application Exception for Christmas Trees

The Agency received comments from the North Carolina Cooperative Extension Service on August 16, 2002, requesting that the Agency allow two applications to Christmas trees as was allowed for asparagus, barley, coffee, peanuts (North Carolina only), and potatoes. As part of the ecological risk mitigation measures stipulated in the IRED, Christmas tree growers were to be limited to one application of disulfoton per calendar year.

The commenter claimed that a second application in the late summer or early fall during drought conditions is sometimes necessary to control resurgence in spider mite populations. The Agency has established that at this time there are no viable alternatives to disulfoton under these pest conditions. Also, usage reports indicate that instances of a second application are relatively low; one report indicated that fewer than 2% of growers chose to reapply disulfoton in dry years. Although the maximum number of applications would increase, the maximum seasonal rate would still be limited to 4.5 lb a.i./A, the rate stipulated in the 2002 IRED. Consequently, the Agency has decided to allow a second application of disulfoton to Christmas trees, if needed.

B. Results of Confirmatory Worker Exposure Monitoring Study

Bayer CropScience (Bayer), the technical registrant of disulfoton, submitted voluntary cancellation requests for most uses of Di-Syston 15G (EPA Reg. No. 264-723) (15% active ingredient disulfoton in a granular formulation), rather than develop confirmatory worker exposure monitoring data required by the generic data requirements of the IRED. However, Bayer ultimately chose to keep Christmas tree and coffee uses on the label. The IRED stipulated that the use of the granular formulation on coffee was eligible for reregistration provided that a closed transfer system was implemented by June 2004; current labels incorporate this requirement. The granular formulation for Christmas trees was deemed eligible for reregistration provided that the application rate was reduced to 4.5 lb a.i./A, the use was limited to firs, a closed transfer system was implemented by June 2004, and confirmatory exposure data for loader/applicators demonstrated risk within acceptable parameters.

In support of the continued use of the Di-Syston 15G formulation on Christmas trees, the Di-Syston Exposure Task Force submitted a study in February 2005, entitled "Pesticide Exposure Study for a Hand-Operated, Metered, Closed System Applicator for Di-Syston® (Disulfoton) in Fraser Fir Production in Western North Carolina" (MRID 464780-01). The study sought to determine the dermal and inhalation exposure to agricultural workers when using a new closed-system applicator (the Select-a-Feed system) for applying granular insecticide (Di-Syston 15G granules) at the base of Fraser fir Christmas trees.

In the study, workers wore an inner whole body dosimeter, short sleeved shirts and short pants, a disposable Tyvek® suit, gloves, hat, and a dust/mist respirator. As use of the Tyvek® suit exceeds the personal protective equipment (PPE) requirements listed on the current product label (current PPE requirements for Di-Syston 15G use on Christmas trees include: long sleeved shirt and long pants, shoes plus socks, and loaders must wear chemical resistant gloves), the Agency believes this worker exposure study does not adequately represent the possible exposures that could result from using the Select-a-Feed applicator system. However, the Agency does believe that the study provides evidence that a closed system granular dispenser, such as the Select-a-Feed system, would likely greatly reduce dermal and inhalation exposure to disulfoton during granular applications to conifer trees. Consequently, the Agency will not require additional confirmatory worker exposure data to maintain the granular use on Christmas trees. As stipulated in the IRED, the loading of disulfoton for use on conifer trees must be made with a closed loading system that meets the requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 C.F.R. 170.240(d)(4)] and that is designed by the manufacturer to enclose the pesticide to prevent handler contact.

III. Request for Continued Use of Disulfoton on Easter Lilies

The 2002 disulfoton IRED established that there was not a critical need for disulfoton use on ornamentals grown for field or nursery stock on a national basis and concluded that this use is not eligible for reregistration. This decision was based on a number of factors, including low reported usage of disulfoton on ornamentals, in general, and the availability of a number of alternatives. However, during the public comment period for the IRED, the Easter Lily Research Foundation and Crockett United Lily Growers, Inc. submitted comments on June 18, 2002 and July 9, 2002, respectively, concerning the use of disulfoton on field-grown lily bulbs. These groups requested Special Local Need (SLN) FIFRA Section 24(c) registrations to allow the continued use of disulfoton on Easter lilies in Oregon and California. SLN registrations were issued based on information provided in public comments and from communication between the Agency and the commenting parties. A subsequent comment submitted by the Easter Lily Research Foundation on October 24, 2004 requested the use of Di-Syston 8 Emulsifiable Concentrate (8EC) on Easter lily bulbs rather than the granular formulation.

Although the Agency evaluated ornamental uses for the IRED, the use of Disulfoton on Easter lily bulbs was not assessed specifically. As described in the comments, the bulbs are planted in furrows in the fall. After placing the bulbs in the

furrows, a tractor applies Di-Syston directly over the bulbs before a soil implement covers the bulbs with anywhere from 2.5 to 6 inches of soil depending on the size of the planting stock. Workers do not enter the fields again until the following spring. Commenters also state that use rates are within the range of the Federal label rate of 3.5 to 7.25 ounces of Di-Syston 15G per 100 row feet. The use rates (taking into account row spacing) in pounds active ingredient per acre are as follows:

- 13,068 row feet per acre with 40 inch spacing equals 4.3 to 8.9 lb a.i./A;

- 14,520 row feet per acre with 36 inch spacing equals 4.8 to 9.9 lb a.i./A;

These rates correspond to the rates on the national labels prior to the signing of the IRED. When the Agency calculated margins of exposure (MOEs) for the use rates above (assuming 5 to 10 acres treated per day), most short-term risks did not exceed the Agency's level of concern with the addition of gloves and a dust/mist respirator (as required on the label) except at the higher acreage (10 acres) and at higher rates (8.9 and 9.9 lb a.i./A). The maximum single rate of application is revised to not exceed 8.48 lb a.i./A.

The Agency is aware that the ornamental industry has little tolerance for insect damage that can result in aesthetically imperfect plants that consumers will not purchase. The Agency did evaluate several alternative insecticides but found that none matched the overall efficacy of disulfoton. Disulfoton use on Easter lily ornamentals in the United States takes place exclusively in Oregon and California, and existing application methods should minimize applicator exposure. Based on this information, the Agency believes there is a strong justification for the continued registration of disulfoton for Easer lily bulbs and has approved the SLN requests. In 2005 and 2008 respectively, SLN registrations were granted to allow the use of Di-Syston 8EC on Easter lily bulbs in the states of Oregon and California. Subsequently, the Easter lily use was placed on the national Di-Syston 8 EC label (EPA Reg. No. 264-734). Please refer to a Memorandum entitled "BEAD Responses to Comments from Stakeholders on Disulfoton Interim Reregistration Eligibility Decision" dated November 21, 2002, for more information on the Agency's evaluation of these comments.

IV. Request for Reduced Asparagus REI

The reregistration decision for disulfoton use on asparagus stipulated that the liquid formulation only was eligible for reregistration, and then only in states where disulfoton was registered as a Section 24(c) SLN for asparagus. The IRED reduced the maximum number of allowable applications for asparagus from three times per year to two times per year and the Restricted Entry Interval (REI) was extended to 26 days. Bayer CropScience subsequently submitted a draft SLN label proposing an REI of 7 days for disulfoton use on asparagus in the state of Washington. In support of the 7-day REI, Bayer CropScience submitted two separate studies to EPA assessing postapplication exposure to disulfoton following application to potatoes:

- Dingledine, J, et al. (1989) Di-Syston 8: A Residue Monitoring study in Potatoes to Assess Exposure to Avian Species Following Broadcast Application in Michigan. Bayer Report No. 99620. MRID No. 41201801

- Willard, T. (1998) Dissipation of Dislodgeable Foliar Disulfoton Residues from Di-Syston 8 Treated Potatoes. Bayer Report No. 108561. MRID No. 44688001.

A. Study Results and Analysis

EPA deemed neither study adequate to assess postapplication worker exposure because total toxic residues could not be converted to surface residues in the residue monitoring study, and possible toxic degradates were not considered in the dislodgeable foliar residue study. However, Bayer CropScience subsequently combined the studies and used the specific leaf weight of potato leaves to evaluate dislodgeable foliar residue dissipation. The pesticide residue amounts derived from leaf weight were used to estimate postapplication worker exposure to disulfoton after foliar applications to crops. In evaluating the study data, the Agency found it appropriate to differentiate between arid and non-arid areas to allow for the decreased dissipation inherent in arid areas and the innate increased dissipation characteristics of non-arid areas. The Agency has determined that an 11-day REI is appropriate for arid areas (where average annual rainfall is less than 25 inches per year) and a 7-day REI is appropriate for non-arid areas. This distinction results in MOEs $\geq$ 100 for both arid and non-arid areas. As indicated in the IRED, use of Di-Syston 8 on asparagus will continue to be limited to states with a Section 24(c) SLN: California, Michigan, North Carolina, Oregon and Washington.

V. Request for Continued Use of Disulfoton on Barley

In response to the 2002 IRED, the Agency received comments from the Idaho Barley Commission in August 2002. The Commission submitted economic loss scenarios resulting from the proposed deletion of disulfoton as a treatment option. Two economic loss scenarios were mentioned: quality reduction and yield loss. The analysis concludes that 50% of the affected harvest would be downgraded from the higher-priced malting barley market to the feed market if disulfoton use was deleted. In addition, the analysis estimates yield losses of 30% for all states except Montana (2%) and Colorado (20%). The economic impact was calculated by multiplying the adjusted yield loss production figures by the price differential between the malting and feed markets for each state.

The Idaho Barley Commission stated that these economic losses would be due primarily to damage by the Russian wheat aphid, which they contend would be more difficult to control if disulfoton was unavailable. These pests hide inside tightly-curled younger leaves of plants, which protect them from parasitic insects and from insecticides that act through direct contact. Disulfoton, a systemic pesticide that is absorbed by the plant, is more effective in controlling this aphid species. The Commission estimated that the aggregated negative economic impact to U.S. barley producers from a cancellation of disulfoton use would be approximately $4 million annually.

After reviewing stakeholder concerns, the Agency concurs that some negative economic impact is likely to occur for barley growers in the event of disulfoton cancellation. However, the Agency has determined that viable alternatives are available to growers including imidacloprid and thiamethoxam as seed treatments, and methyl parathion in place of disulfoton foliar sprays. Stakeholders asserted that methyl parathion is not a viable alternative because malting barley buyers will not purchase barley that has been treated with methyl parathion, apparently for marketing reasons. However, the Agency was unable to confirm these assertions as the malting barley breweries contacted would not disclose their pesticide use requirements.

In addition to the availability of alternative treatments, the Agency considered several other factors in the disulfoton barley reregistration decision. The nationwide proportion of barley acreage treated with disulfoton is low (less than 0.5% based on USDA/NASS estimates). Thus, negative economic impact on national barley production is likely also to be low. In addition, modifications of cultural practices can significantly reduce the risk of aphid infestation. These practices include planting the crop later in the season to avoid aphid migratory flights and discing or otherwise controlling weeds in or near fields that could serve as a refuge for aphids, although some aphids (e.g., greenbugs) are not as effectively managed by this latter method.

In conclusion, based on the most current pest management and economic information available, the Agency believes that some barley growers may suffer economic losses without the use of disulfoton as a foliar application. However, these losses will most likely be due to the deprivation of premium target markets and increased cost of seed treatment, as opposed to direct yield losses due to insect pest. Furthermore, based on the current low levels of disulfoton usage, the Agency believes that the majority of growers will not be significantly affected in this way. The Agency is also confident that the national production of barley will not be significantly affected, in terms of economic returns, by the loss of foliar disulfoton. Therefore, the Agency will proceed with the cancellation of disulfoton use on barley, as specified in the 2002 IRED. Please refer to the Memorandum entitled "BEAD's Updated Response to Comment from a Stakeholder on Disulfoton Interim Reregistration Eligibility Decision" dated November 4, 2004 for additional information on the Agency's evaluation of this comment.

VI. Comment Concerning Cancellation of Di-Syston 15G on Wheat

A comment dated May 24, 2005 from Dr. David Buntin of the University of Georgia claimed a lack of viable alternatives for the 15% granular formulation of disulfoton, Di-Syston 15G, to control the Hessian fly on winter wheat crops in the Southeastern United States. The 2002 IRED had stipulated that all registered uses of disulfoton on wheat were to be phased out by June 2005, as part of the mitigation effort to address drinking water, ecological, and occupational risks.

To evaluate this comment, the Agency investigated the availability of viable alternatives to control the Hessian fly, as well as the economic significance of winter

wheat in the Southeastern United States. The primary means of Hessian fly management is through utilization of resistant cultivars of wheat and by planting later in the fall. When resistant strains are not available, chemical control becomes the primary means of pest management. There are a limited number of chemical control options available: two pyrethroid chemicals, thiamethoxam and lambda-cyhalothrin, are registered for foliar applications. However, these chemicals target only the adult Hessian fly, leaving a narrow window of generally only two days for effective application. Imidacloprid is registered as a seed treatment, but the cost of applying imidacloprid to winter wheat crops is expected to be substantially more expensive than disulfoton application. In addition, another organophosphate insecticide, phorate, is no longer registered for use on wheat. The lack of an effective, economical alternative to Di-Syston 15G affords winter wheat growers minimal alternatives when resistant varieties are unavailable.

The Agency also investigated the significance of winter wheat for the Southeastern United States (including Georgia, South Carolina, Alabama and Florida), where Hessian flies have the potential to damage winter wheat crops. Considering 2004 numbers, total harvested acreage for the region amounted to approximately 360,000 acres, or about 1% of the U.S. total. Economic data for Georgia were used as a case study to evaluate the economic significance of winter wheat for the region. In Georgia, the economic significance of winter wheat amounts to less than 1% of the $2.35 billion agricultural economy.

Winter wheat is not a large portion of Georgia's or the Southeastern United States' agricultural economies. However, if winter wheat is the only grain crop planted in the winter in double-crop systems in this region, the Agency recognizes that it could still constitute an important component of the region's economy despite its small acreage. For additional details concerning the Agency's evaluation of this comment, please see the memorandum entitled "Impact of Loss of Disulfoton for Hessian Fly Control in Alabama, Florida, Georgia, and South Carolina Winter Wheat," dated March 12, 2008.

Although the Agency's evaluation established the economic significance of winter wheat, the 2002 IRED determined there is substantial occupational risk associated with the application of disulfoton on wheat. MOEs (margins of exposure) of < 100 are considered of concern by the Agency and many of the handler scenarios for disulfoton had MOEs < 100, even with the use of maximum PPE (i.e. double layer clothing, gloves, and a respirator). Of particular concern are ground applications, which according to information provided, are the preferred methods of application for controlling the Hessian fly. Handler exposure while loading the granules into the ground application equipment is of particular concern. Currently, there is no closed system available for Di-Syston 15G use on winter wheat to minimize risk during loading and application to mixer-loaders and applicators. In the absence of application equipment capable of minimizing worker exposure while handling Di-Syston 15G granules, the Agency will continue to not allow the use of Di-Syston 15G on winter wheat.

VII. Waiver Request for a Surface Water Monitoring Study for Disulfoton

The technical registrant for disulfoton, Bayer CropScience, submitted a waiver request in response to the generic DCI requirement included in the IRED for a surface water monitoring study for disulfoton and the degradation products, the oxons d. sulfoxide and d. sulfone. Aquatic metabolism studies submitted to the Agency indicate that while disulfoton itself is not persistent in water, the total residues including the parent and the degradates d. sulfoxide and d. sulfone are persistent, with aquatic half-lives ranging from 46 to 51 days for aerobic aquatic metabolism and 315 to 385 days for anaerobic aquatic metabolism. The 2002 IRED had assumed a half life of 259 days for both the anaerobic and aerobic metabolism rates. In the absence of refined toxicity information on these degradates, the 2006 OP cumulative considered the sulfone oxon at least 10x as toxic as the parent chemical. This assumption differs from the 2002 IRED, which considered the oxon degradates and the parent chemical to be of equal toxicity.

In support of the waiver request, the registrant submitted an updated Tier 2 PRZM/EXAMS analysis based on a revised disulfoton label. The registrant indicated in the waiver request document that the barley, potatoes, and wheat uses were to be eliminated from the Di-Syston 8EC label. Per the 2002 IRED, these crop scenarios were included in the overall assessment for drinking water exposure from surface water sources. The registrant indicated that the surface water drinking water assessment should be based on the remaining crops, rather than the ones that have been eliminated from the label. The registrant submitted data on the remaining uses in lieu of barley, potatoes, and wheat, including the following crop scenarios: beans, Brussels sprouts, cabbage, lettuce, and asparagus. In evaluating the data submitted by the registrant, the Agency used the current use patterns to recalculate the estimated surface drinking water concentrations (EDWCs) for disulfoton and the associated degradates.

Using the new model inputs, the Agency was unable to reproduce the EDWC results from the registrant's modeling. The EDWCs for several crop uses continued to exceed the drinking water level of comparison (DWLOC) established in the 2002 IRED. Crops with chronic DWLOC exceedances include asparagus, beans, Brussels sprouts and broccoli, cabbage, cauliflower, lettuce, and Christmas trees. Crops with acute DWLOC exceedances include Christmas trees, lettuce, cauliflower, cabbage, Brussels sprouts and broccoli. Based on the number of DWLOC exceedances among the EDWCs for the different crops, as well as the known persistence and toxicity of the disulfoton degradates, d. sulfoxide and d. sulfone, the Agency denied the waiver request. The study is now due on August 15, 2010, consistent with the 22-month timeframe for completion specified by OPPTS Guideline No. 835.7200. Please refer to Memorandums entitled "Waiver request for a surface water monitoring study for disulfoton" dated January 8, 2007 and "Disulfoton Waiver Request Clarification for surface water monitoring study" dated July 29, 2008 for additional information on the Agency's evaluation of this waiver request.

VIII. Label Amendments

The technical registrant has voluntarily deleted the following uses from the Di-Syston 15 G label: beans, Brussels sprouts, cabbage, cauliflower, cotton, peanuts, peppers, radish grown for seed, broccoli, and clover grown for seed. Additionally, as a result of the 2002 IRED, the registrant submitted to the Agency Voluntary Use Deletions affecting several disulfoton products. Appendix A: *Table of Use Patterns Eligible for Reregistration for Disulfoton* has been revised to reflect these use deletions, as well as the adjustment to the asparagus REI, the increased number of applications allowed for Christmas trees and the use of disulfoton on Easter lily. The Appendix A included with this Addendum supersedes the Appendix A included in the 2002 Disulfoton IRED document. Additionally, this Addendum includes revisions to Table 16 of the RED, *Summary of Revised RED Labeling for Disulfoton*. The included sections of the label table have been updated to reflect the changes introduced by this document. The revised sections supersede the corresponding sections from the 2002 IRED. The remainder of the label requirements stipulated in the 2002 IRED remain unchanged.

Revisions to Table 16. Summmary of Revised RED Labeling for Disulfoton

DESCRIPTION	LABELING	PLACEMENT ON LABEL
Restricted-Entry Interval for Liquid Formulations	"Use this product only in accordance with its labeling and with the Worker Protection Standard, 40 CFR part 170. This Standard contains requirements for the protection of agricultural workers on farms, forests, nurseries, and greenhouses, and handlers of agricultural pesticides. It contains requirements for training, decontamination, notification, and emergency assistance. It also contains specific intructions and exceptions pertaining to the statements on this label about personal protective equipment (PPE), notification to workers, and restricted-entry interval. The requirements in this box only apply to uses of this product that are covered by the Worker Protection Standard." "Do not enter or allow workers to enter into treated areas during the restricted entry interval (REI). The REI is 48 hours. In areas where average rainfall is less than 25 inches a year the REI is 72 hours." "The REI for foliar applications to asparagus is 7 days, but is increased to 11 days in areas where the average annual rainfall is less than 25 inches per year." *Note: information on average annual rainfall for your area is available from any nearby weather bureau, such as one affiliated with the National Oceanographic and Atmospheric Administration. Information on average rainfall is also available on-line through the National Weather Service at* http://www.nws.noaa.gov*"* "Exception: if the product is soil-injected or soil-incorporated, the WPS, under certain circumstances, allows workers to enter the treated areas without restriction if there will be no contact with anything that has been treated."	Directions for Use, Agricultural Use Requirements Box
Early Re-Entry Personal Protective Equipment established by the RED	"The following PPE is required for early entry to treated areas that is permitted under the WPS and that involves contact with anything that has been treated, such as plants, soil, or water: Coveralls worn over long-sleeve shirt and long pants, Chemical-resistant gloves made of any waterproof material, Chemical-resistant footwear plus socks, Protective eyewear, and Chemical-resistant headgear (if overhead exposure)" "Notify workers of the application by warning them orally and by posting warning signs at entrances to treated areas"	Directions for Use, Agricultural Use Requirements Box

DESCRIPTION	LABELING	PLACEMENT ON LABEL
Other Application Restrictions (Risk Mitigation)	Application Restrictions (all crop sites) Application by hand-held equipment is prohibited for all sites except coffee and Christmas trees. Crop-Specific Application Restrictions Asparagus (California, Michigan, North Carolina, Oregon, and Washington 24(c) registrations): Di-Syston 8EC label is to state "Do not apply more than twice per season." Beans: "Not for use on dry beans, peas, or lentils." Cabbage: The liquid Di-Syston 8EC label must specify, "Do not apply by chemigation." Cole Crops (broccoli, Brussels sprouts, cauliflower): The Di-Syston 8EC label must specify "For use in California only." "Apply by shank injection only." "Apply only once per year" for broccoli and cauliflower. Easter lily: The Di-Syston 8EC label must specify that for Easter lilies, only "one in furrow application is allowed per year." With an application rate of "0.53 to 1.1 fl. oz per 100 row feet." Lettuce: The liquid Di-Syston 8EC label must state "For use in California only." Cotton: Number of applications must be reduced from 3 to 1 per year, at a rate of 1 lb ai/A. All labels must specify "Aerial applications are prohibited." "Apply at plant, in furrow only." "For use only as an herbicide safener." Christmas Trees: Maximum application rate on the Section 3 Di-Syston 15G label is 4.5 lb ai/A. Label must specify: "For use on firs only." "Product must be either soil incorporated, watered in, or applied to areas with permanent groundcover." "Do not apply more than twice per season." Coffee: "For use in Puerto Rico only." "Do not apply more than twice per year."	

REVISED APPENDIX A

Disulfoton (Case 102): Use Patterns Eligible for Reregistration

Site Application Timing Application Type Application Equipment	Formulation [EPA Reg. no.]	Maximum Single Application Rate	Maximum Number of Applications Per Season	Maximum Seasonal Rate lbs ai/A	Preharvest Interval Days	Use Limitations
FOOD/FEED CROPS						
Asparagus						
Postharvest (fern stage) Foliar application Ground or aerial	8 lb/gal EC [CA840192]	1.0 lb a.i./A	2	2	180	Use limited to CA, NC, OR, MI, and WA. No more than 2 applications per year. The REI is 7 days, but is increased to 11 days when average annual rainfall is less than 25 inches per year.
	8 lb/gal EC [MI060002]					
	8 lb/gal EC [NC860005]					
	8 lb/gal EC [OR040030]					
	8 lb/gal EC [WA040015]					
Beans, Succulent (including snap or green lima)						
At-planting Soil injection Ground	8 lb/gal EC [264-734]	1.0 lb a.i./A	1	1	60	Not for use on dry beans, peas, or lentils. The feeding of treated vines or hay to livestock animals is prohibited.

Site Application Timing Application Type Application Equipment	Formulation [EPA Reg. no.]	Maximum Single Application Rate	Maximum Number of Applications Per Season	Maximum Seasonal Rate, lbs ai/A	Preharvest Interval Days	Use Limitations
Broccoli						
At-planting or Postemergence Soil injection Ground	8 lb/gal EC [264-734]	1.0 lb a.i./A	1	1	14	Limited for use in California only. Chemigation is not permitted. Apply by shank injection only.
Brussels Sprouts						
At-planting or Postemergence Soil incorporated or soil injection Ground	8 lb/gal EC [264-734]	1.0 lb a.i./A	1	1	30	Limited for use in California only. Do not apply to plants grown for seed. Chemigation is not permitted. Apply by shank injection only.
Cabbage (including tight-heading varieties of Chinese cabbage)						
Preplant or Broadcast spray to transplant seed beds.	8 lb/gal EC [264-734]	1 lb a.i./A	1	1	NS	Chemigation is not permitted.
At-planting or postemergence Soil incorporated or soil injection Ground	8 lb/gal EC [264-734]	2 lb a.i./A	1	2	42	Chemigation is not permitted
Cauliflower						
At-planting or postemergence Soil incorporated or soil injection Ground	8 lb/gal EC [264-734]	1.0 lb a.i./A	1	1	40	Limited for use in California only. Do not apply to plants grown for seed. Chemigation is not permitted. Apply by shank injection only.

Site Application Timing Application Type Application Equipment	Formulation [EPA Reg. no.]	Maximum Single Application Rate	Maximum Number of Applications Per Season	Maximum Seasonal Rate, lbs ai/A	Preharvest Interval Days	Use Limitations
Coffee Beans						
Preharvest and Postharvest Soil (uniformly under tree canopy) Ground	15% G [264-723]	2-4 g/ft of tree height not to exceed 8.3 lb a.i./A	2	17	90	Disulfoton use on coffee is limited to Puerto Rico only. Products must be soil incorporated, watered in, or applied to areas with permanent ground cover. No more than one preharvest and one postharvest application may be made during the year. Closed loading/transfer system required.
Cotton						
At-planting/replanting Preplant Soil injection or in-furrow soil Soil spray Ground	8 lb/gal EC [264-734]	1.0 lb a.i./A	1	1	NS	Aerial applications are prohibited. Apply at-plant, in-furrow only. For use only as a herbicide safener. Do not graze treated fields. The feeding of treated forage to livestock is prohibited.
At-planting Soil injection or in-furrow soil Ground	6.5% G [400-408]	1.0 lb a.i./A	1	1	NS	
Lettuce						
Chemigation Side dress injection Ground	8 lb/gal EC [264-734]	2.0 lb a.i./A	1	2	60	Limited for use in California only. Application to transplanted lettuce is prohibited. Low pressure (drip or trickle) chemigation systems only.
	8 lb/gal EC [CA810044]	2.0 lb a.i./A	1	2	60	Limited for use in California only. Application to transplanted lettuce is prohibited. Low pressure (drip or trickle) chemigation systems only.

Site Application Timing Application Type Application Equipment	Formulation [EPA Reg. no.]	Maximum Single Application Rate	Maximum Number of Applications Per Season	Maximum Seasonal Rate, lbs ai/A	Preharvest Interval Days	Use Limitations
NON-FOOD/FEED USES						
Radish Grown for Seed						
At first seed stalk bolting Soil incorporated Ground	8 lb/gal EC [WA920026]	2.0 lb a.i./A	1	2	NS	Do not feed or graze radish forage or fodder. Do not cut radish tops for hay or forage. No portion of the treated field, including seed, seed screening, forage or stubble may be used for human or animal consumption.
Christmas Trees (Fir Species)						
At first bud break Broadcast Ground	15% G [264-723]	4.5 lb a.i./A	2	4.5	NS	For use on firs only. Products must be soil incorporated, watered in, or applied to areas with permanent ground cover. Closed loading/transfer system required. Not for use on bare ground plantations.
	15% G [NC8800081]					For use on firs only. Products must be soil incorporated, watered in, or applied to areas with permanent ground cover. Closed loading/transfer system required. Not for use on bare ground plantations.
Residential Use on Ornamental Flowers, Roses, Shrubs and Trees						
Apply every 6 weeks throughout growing season. Broadcast/soil Incorporated or watered in Ground	1% G [72155-49]	0.3 lb/1000 ft2 for flowerbeds or 0.01 lb/4 ft shrub or 0.0013 lb a.i./bush for roses	NS	NS	NS	For residential use only. Not for commercial use. Product must be soil incorporated or watered in. Do not apply with belly grinder. Product intended for hand application must be in child resistant packaging with a self contained measuring cup/lid, which clearly measures correct amount to apply. Not for use indoors or in greenhouses. Not for use on home vegetable gardens, including use on spinach and tomatoes.

Site Application Timing Application Type Application Equipment	Formulation [EPA Reg. no.]	Maximum Single Application Rate	Maximum Number of Applications Per Season	Maximum Seasonal Rate, lbs ai/A	Preharvest Interval Days	Use Limitations
Residential Use on Ornamental Flowers, Roses, Shrubs and Trees						
Apply every 6 weeks throughout growing season. Broadcast/soil Incorporated or watered in Ground	1% G [432-1286]	0.3 lb/1000 ft2 for flowerbeds or 0.01 lb/4 ft shrub or 0.0013 lb a.i./bush for roses	NS	NS	NS	For residential use only. Not for commercial use. Product must be soil incorporated or watered in. Do not apply with belly grinder. Product intended for hand application must be in child resistant packaging with a self contained measuring cup/lid, which clearly measures correct amount to apply. Not for use indoors or in greenhouses. Not for use on home vegetable gardens, including use on spinach and tomatoes.
Commercial Use on Easter Lilies						
Soil treatment in furrows before covering bulbs with soil.	8 lb/gal EC [264-734] 8 lb/gal EC [CA050010] 8 lb/gal EC [OR050024]	8.48 lb a.i./A	1	8.48 lb a.i./A	NS	A higher dosage (not to exceed the maximum single application rate) is recommended for heavy organic or muck soils.