APPENDIX C

AGDRIFT MODELING FOR THE HUMAN HEALTH RISK ASSESSMENT

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LIST OF TABLES

LIST OF ACRONYMS, ABBREVIATIONS, AND SYMBOLS

a.i.	-	Active ingredient
BLM	-	Bureau of Land Management
^{o}C	-	Degrees Celsius
cms	-	Cubic meters per second
^{o}F	-	Degrees Fahrenheit
ft	-	Foot (feet)
in	-	Inches
gal/acre	-	Gallons per acre
HHRA	-	Human Health Risk Assessment
kg/ha	-	Kilograms per hectare
L/ha	-	Liters per hectare
lb/acre	-	Pounds per acre
m	-	Meters
mg	-	Milligrams
mph	-	Miles per hour
m/s	-	Meters per second
µm	-	micrometers
NASA	-	National Aeronautics and Space Administration
SDTF	-	Spray Drift Task Force
USDA	-	U.S. Department of Agriculture
USDI	-	U.S. Department of the Interior
USEPA	-	U.S. Environmental Protection Agency

1.0 AGDRIFT MODELING FOR THE HUMAN HEALTH RISK ASSESSMENT

Off-site spray drift and resulting terrestrial deposition rates and waterbody concentrations were predicted using the computer model AgDRIFT®, Version 2.0.05 (Spray Drift Task Force [SDTF] 2002). AgDRIFT® is a product of the Cooperative Research and Development Agreement between the U.S. Environmental Protection Agency's (USEPA) Office of Research and Development and the SDTF (a coalition of pesticide registrants). AgDRIFT® was developed for use in regulatory assessments of off-site drift associated with agricultural use of pesticides through aerial, ground, or orchard/airblast applications; it is based on the computer program AGDISP, which was developed by the National Aeronautics and Space Administration (NASA), the U.S. Department of Agriculture (USDA) Forest Service, and the U.S. Army. AgDRIFT® was created in response to the idea that pesticide drift is primarily a function of application technique (e.g., droplet size and release height), environmental conditions, and physical properties of the spray solution and is not a function of the specific active ingredient. The computational approach employed by AgDRIFT® is based on a simple model that has evolved over a period of more than 20 years and yields high correlation with field measurement datasets. This model was selected for use in the risk assessment because of its acceptability for use in regulatory assessments of off-site drift and its suitability to this particular application.

AgDRIFT® allows the user to choose between three tiers (Tiers I, II, and III) of increasingly complex evaluations of off-site drift and deposition. The basic difference between the three tiers is the amount of control users have in selecting model input variables. Tier I represents a screening level model and supports the evaluation of aerial and ground application scenarios, whereas Tiers II and III permit an increasing level of access to model details for evaluation of aerial application scenarios only (e.g., agricultural and forestry applications). Tier I is based on a set of standard "Good Application Practices" and requires little knowledge of the actual application conditions or herbicide properties. Tier I allows the user to modify a small number of model variables. Tiers II and III are based on the same set of "Good Application Practices" as Tier I; however, Tiers II and III allow the user to modify a progressively larger set of variables to make the scenario more representative of actual environmental conditions. Tier I was used in the risk assessment to evaluate off-site drift associated with ground application scenarios. Tier II was used to evaluate off-site drift associated with aerial applications in agriculture-like (e.g., rangeland) and forestry scenarios in the risk assessment. Both Tier I and Tier II were used to evaluate impacts to terrestrial areas and to small waterbodies. The ground and aerial application models and the model input variables (including variables specific to the application method, environmental setting, and herbicide evaluated) are discussed below.

1.1 Ground Applications

Ground applications were modeled using Tier 1 of the AgDRIFT® model for both low- and high-placed boom application techniques. The actual model runs conducted were based on the specific U.S. Department of Interior Bureau of Land Management (USDI BLM) uses of each herbicide. Off-site spray drift and resulting terrestrial deposition rates and waterbody concentrations were predicted at 25, 100, and 900 feet (ft) from the application area for each herbicide application scenario. The AgDRIFT® model determined the fraction of the application rate that is deposited on the off-site location without considering herbicide degradation. Waterbody concentrations were determined from the predicted deposition rates through a process representative of simple mixing, also without considering herbicide degredation.

The Tier I ground-application model variables (most of which cannot be changed by the user) are summarized for each herbicide in Tables C-1 to C-6, and those model inputs that can be modified are discussed below:

- Boom Height – The Tier I ground application model allows selection of a low (20 inches [in]; 0.51 meters [m]) or a high (50 in [1.27 m]) boom height. The AgDRIFT® software default setting is the low boom

height, but as mentioned above, off-site spray drift associated with ground-level herbicide application was modeled using both the low- and high-boom options. Higher boom heights will result in increased predicted off-site drift and deposition.

- Drop Size Distribution – The drop size distribution of the released herbicide spray mixture is a major controlling variable in off-site drift of herbicides; finer drop sizes will result in greater predicted off-site drift and deposition. The Tier I ground application model allows the user to select from two drop size distributions: very fine to fine or fine to medium/coarse. The AgDRIFT® software default setting is a very fine to fine drop size distribution; however, for this risk assessment the BLM was able to supply information regarding the equipment typically used in herbicide application that supports the use of a fine to medium/coarse drop size distribution. Therefore, this drop size distribution has been assumed for the evaluation of off-site spray drift associated with ground-level herbicide applications.

- Data Percentile – The Tier I ground application model allows bounding of predicted deposition rates based on the field data collected in support of the SDTF model development. The AgDRIFT® user manual recommends the 90th percentile of this data for regulatory use and the 50th percentile for public use. The 90th percentile was utilized in this risk assessment.

- Number of Swathes – The Tier I ground application allows modification of the number of application swaths required to cover an application area. The default assumption of 20 swaths (13.72-m [45-ft] wide) was used in this risk assessment.

1.2 Aerial Applications

The Tier II AgDRIFT® model was used in this risk assessment to evaluate off-site drift associated with agricultural-like (rangeland) and forestry aerial herbicide applications. The Tier II AgDRIFT® evaluation is dependent on a large number of modeling inputs specific to the herbicides considered in the risk assessment, the spraying conditions (e.g., the environmental setting), the spray system to be used, and the meteorological conditions under which the herbicides will be applied. These inputs are discussed below and presented in Tables C-1 to C-6.

Off-site spray drift and resulting terrestrial deposition rates and waterbody concentrations were predicted at 100, 300, and 900 ft from the application area for each herbicide application scenario. The AgDRIFT® model determined the fraction of the application rate that is deposited on the off-site location without considering herbicide degradation. As with ground applications, waterbody concentrations were determined from the predicted deposition rates through a process representative of simple mixing without considering herbicide degradation.

The Tier II aerial evaluation of off-site drift depends on the following model inputs:

- Drop Size Distribution – The drop size distribution of the released herbicide spray mixture is a major controlling variable in off-site drift of herbicides. Smaller herbicide drop sizes will increase off-site spray drift. The Tier II aerial application model allows the user to choose from four drop size distributions (very fine to fine, fine to medium, medium to coarse, and coarse to very coarse). If the herbicide product label does not mandate a specific drop size classification or dictate equipment usage to achieve this classification, then the AgDRIFT® default fine to medium distribution will be assumed. Distributions specific to the six herbicides, if available, are identified in Tables C-1 to C-6.

- Aircraft Type – It is possible to choose the specific aircraft type to be used in applying the herbicide product. There are four aircraft to select from:

    - Ag Husky slow, fixed-wing aircraft

    - Air Tractor AT-502 fast, fixed-wing aircraft

- Wasp Helicopter
- Air Tractor AT-401 slow, fixed-wing aircraft

The Air Tractor AT-401 is the default aircraft set in the AgDRIFT® model. Aircraft type affects drift primarily through airspeed; faster airspeeds will increase predicted off-site drift. Unless a specific aircraft type was identified in an individual herbicide label as being most appropriate for aerial applications, the Air Tractor AT-401 was used for the evaluation of off-site drift associated with agriculture-like and forestry applications.

- Boom Length – Boom length is defined as the percent length of the spray boom relative to the wing span or rotor diameter of the aircraft. Default values are available for each of the above aircraft; however, users can define boom widths ranging from 0 to 85% of the wing span or rotor diameter. Depending on aircraft type (discussed above), default boom widths range from approximately 69 to 76% of aircraft wing span or rotor diameter. These defaults have been utilized in this risk assessment.

- Boom Height – Boom height is the height of the spray boom above the ground in agricultural-like applications and the height of the spray boom above the canopy in forestry applications. AgDRIFT® users can define a specific boom height within a range of 3 to 30 ft (0.9 to 9.1 m) above the ground or above the forest canopy. For this risk assessment the default boom height of 10 ft (3.05 m) was used for agricultural-like applications, and a boom height of 20 ft (6.1 m) was assumed for forestry applications because it is expected that under most aerial forestry application scenarios a pilot will fly closer to 20 ft above the forest canopy to avoid colliding with individual trees that may be taller than the average canopy height. Increased assumed boom heights will result in greater predicted off-site drift.

- Number of Flight Lines – This represents the number of aircraft flight lines located a swath width apart within an application area. Users can specify between 1 and 20 flight lines; a default of 20 flight lines was used in this risk assessment. A greater number of flight lines may produce increased off-site drift.

- Swath Width – Swath width measures the distance between flight lines. A swath width ranging from 15 to 100 ft (approximately 4.5 to 30.5 m) can be defined. The default value of 1.2 times the aircraft wingspan was used in this risk assessment. Smaller swath widths will result in increased off-site drift.

- Swath Displacement – Swath displacement is the horizontal ground distance from the farthest downwind flight line to the edge of the application area. All calculations assume a default of ½ the swath width as the swath displacement. This default can be overridden by a user-defined swath displacement representing a fraction of the maximum application rate or a fixed distance downwind. User-defined swath displacement can range from –½ to 2 swaths. A value of –½ swath displacement is used if the farthest downwind flight line (the aircraft centerline) coincides with the edge of the application area. Decreased swath displacement will increase off-site drift.

- Meteorological Parameters – Wind speed, relative humidity, and temperature can be user-defined or set at the Tier II defaults of 10 miles per hour (mph; 4.47 meters per second [m/s]), 50%, and 86 degrees Fahrenheit (°F) (30 degrees Celsius [°C]), respectively. These defaults are the meteorological conditions used for generic herbicide labels. Hot and dry conditions with light to moderate winds would generally result in the greatest amount of drift and deposition. The average meteorological conditions for Phoenix, Arizona, between May and October (i.e., hot and dry) were obtained from the AgDRIFT® model library of meteorological data and used in this risk assessment.

- Herbicide Mixture-Specific Inputs – The Tier II evaluation allows user-defined inputs regarding the following usage characteristics of the herbicides being evaluated:
  - Herbicide Carrier Type (water or oil).

- Spray Volume Rate (gallons per acre [gal/acre] or Liters per hectare [L/ha]) – volumetric rate at which final herbicide mixture is pumped through the spray booms and nozzles.

- Active Rate (lb/acre or kilograms [kg]/ha) – rate at which the herbicide active ingredient is applied.

- Nonvolatile Rate (pounds per acre [lb/acre] or kg/ha) – rate at which the nonvolatile components of the final herbicide mixture are applied. If volatility information was not provided in the individual herbicide labels, the non-volatile rate was assumed to be equal to the active rate.

These inputs are specific to the herbicides being considered; therefore, the herbicide labels were reviewed and inputs identified. In addition, in a Tier II assessment of aerial forestry applications the Active Rate and Nonvolatile Rate are expressed as the Active Fraction and the Nonvolatile Fraction of the final herbicide mixture (as pumped through the spray boom and nozzles), respectively. Herbicide-specific values for these parameters are presented in Tables C-1 to C-6.

1.3 Aquatic Assessment

In this risk assessment, herbicide impacts to waterbodies via aquatic exposure pathways are predicted to result from off-site drift, deposition to a hypothetical waterbody, and simple mixing of an individual herbicide within the hypothetical waterbody. Two types of hypothetical waterbodies are considered in this risk assessment: 1) a small pond 0.25 acres in surface area (0.10 hectares) and 1-meter (3.3 ft) deep and 2) a small stream representative of Pacific Northwest low-order streams that provide habitat for critical life-stages of anadromous salmonids. The stream size was established as 6.6-ft (2-m) wide and 0.7-ft (0.2-m) deep with a mean water velocity of approximately 0.3 m/s (1.0 ft/s), resulting in a baseflow discharge of 0.12 cubic meters per second (cms; 4.2 cubic feet per second). For ground application scenarios, pond and stream concentrations were predicted at 25, 100, and 900 ft (8, 31, and 274 m) from the application area. For aerial application scenarios, pond and stream concentrations were predicted at 100, 300, and 900 ft (31, 91, 274 m) from the application area.

1.4 Terrestrial Assessment

For both the Tier I and Tier II AgDRIFT® models, it is necessary to identify the following parameters for the terrestrial assessment (i.e., the evaluation of the impact of off-site drift on terrestrial receptors):

- Terrestrial Field Definition – This field defines the type of terrestrial field to evaluate (point or area average). The "point" terrestrial field definition was utilized in this risk assessment. Point terrestrial fields produce more conservative results.

- Distance to the Point or Area – This is the distance from edge of the application area to the terrestrial point or area to be evaluated. A range of distances were considered in this risk assessment. To evaluate off-site herbicide drift from ground-level applications, distances of 25, 100, and 900 ft (8, 31, and 274 m) to the point terrestrial field were considered. To evaluated off-site herbicide drift from aerial applications, distances of 100, 300, and 900 ft (31, 91, 274 m) to the point terrestrial field were considered. A smaller distance between the evaluated terrestrial field and the area of application will result in greater estimated impact from off-site drift. A default input of 200 ft (60.96 m) is presented in the AgDRIFT® software.

The results of the AgDRIFT® modeling conducted for the herbicides considered in the HHRA are summarized in Tables C-7 to C-12 and are presented in the chemical-specific reports associated with that evaluation (ENSR 2005a-j).

TABLE C-1
Chemical-Specific Inputs for AgDRIFT® Model - Dicamba

Scenario	Parameter	Input Options	Units	Value
Tier 1 Ground (Agricultural)	Boom height (high = 1.27 m; low = 0.508 m)	Low or high	m	1.27 and 0.508 m
	Drop size distribution	Very fine to fine or fine to medium/course	--	Fine to medium/coarse
	Active rate		lb/acre	0.1875 to 0.3125
It is assumed that dicamba is used only in ground application scenarios.				

TABLE C-2
Chemical-Specific Inputs for AgDRIFT® Model - Diflufenzopyr

Scenario	Parameter	Input Options	Units	Value
Tier 1 Ground (Agricultural)	Boom height (high = 1.27 m; Low = 0.508 m)	Low or high	m	1.27 and 0.508
	Drop size distribution	Very fine to fine or fine to medium/course	--	Fine to medium/coarse
	Active rate		lb/acre	0.075 to 0.125
It is assumed that diflufenzopyr is used only in ground application scenarios.				

TABLE C-3
Chemical-Specific Inputs for AgDRIFT® Model - Diquat

Scenario	Parameter	Input Options	Units	Value
Tier 1 Ground (Agricultural)	Boom height (high = 1.27 m; Low = 0.508 m)	Low or high	m	1.27 and 0.508
	Drop size distribution	Very fine to fine or fine to medium/course	--	Fine to medium/coarse
	Active rate		lb/acre	1.0 to 4.0
Tier 2 Aerial (Agricultural)	Aircraft type	Ag Husky, Air Tractor AT-502, Wasp helicopter, or Air Tractor AT-401	--	Air Tractor AT-401
	Boom length		m	< 85% of wingspan or helicopter rotor width
	Boom height		m	3.05
	# flight lines		--	20[1]
	Swath width (separation between flight lines)	1.2x wingspan or user defined	[2]	1.2x aircraft wingspan or rotor width
	Swath displacement	Aircraft centerline, fixed distance, fraction of swath width	--	0.5 swath width[3]
	Drop size distribution	Very fine to fine, fine to medium, medium to coarse, coarse to very coarse	--	Fine to medium
	Wind speed		m/s	10
	Temperature		°C	31
	Relative humidity		%	25
	Flux plane		m	0
	Spray material	Oil or water based	--	Water
	Active rate		lbs a.i./acre	1.0 to 4.0
	Non-volatile rate		lbs/acre	1.0 to 4.0[4]
	Spray volume rate		gal/acre	5-gal herbicide mixture/acre

[1] Assumes a total of 20 flight lines, 60 ft apart are applied to an agricultural field.
[2] Swath width can be expressed as a distance (m or ft) or the default assumption of 1.2x the aircraft wingspan or rotor width.
[3] AgDRIFT® users manual does not identify a specific assumption, but rather defines the setting as that required to ensure that ½ the application rate is recovered at the edge of the application area. In AgDRIFT Tier II documentation, this is defined as equivalent to approximately ½ of a swath width.
[4] Because the volatility of the product is unknown, the nonvolatile rate was set equal to the active rate.

TABLE C-4
Chemical-Specific Inputs for AgDRIFT® Model - Fluridone

Scenario	Parameter	Input Options	Units	Value
Tier 1 Ground (Agricultural)	Boom height (high = 1.27 m; Low = 0.508 m)	Low or high	m	1.27 and 0.508
	Drop size distribution	Very fine to fine or fine to medium/course	--	Fine to medium/coarse
	Active rate		lb/acre	0.045 to 0.41
Tier 2 Aerial (Agricultural)	Aircraft type	Ag Husky, Air Tractor AT-502, Wasp helicopter, or Air Tractor AT-401	--	Air Tractor AT-401
	Boom length		m	< 85% of wingspan or helicopter rotor width
	Boom height		m	3.05
	# flight lines		--	20[1]
	Swath width (separation between flight lines)	1.2x wingspan or user defined	[2]	1.2x aircraft wingspan or rotor width
	Swath displacement	Aircraft centerline, fixed distance, fraction of swath width	--	0.5 swath width[3]
	Drop size distribution	Very fine to fine, fine to medium, medium to coarse, coarse to very coarse	--	Fine to medium
	Wind speed		m/s	10
	Temperature		°C	31
	Relative humidity		%	25
	Spray material	Oil or water based	--	Water
	Active rate		lbs a.i./acre	0.045 to 0.41
	Non-volatile rate		lbs/acre	0.045 to 0.41[4]
	Spray volume rate		gal/acre	5-gal herbicide mixture/acre

[1] Assumes a total of 20 flight lines, 60 ft apart are applied to an agricultural field.
[2] Swath Width can be expressed as a distance (m or ft) or the default assumption of 1.2x the aircraft wingspan or rotor width.
[3] AgDRIFT® users manual does not identify a specific assumption, but rather defines the setting as that required to ensure that ½ the application rate is recovered at the edge of the application area. In AgDRIFT Tier II documentation, this is defined as equivalent to approximately ½ of a swath width.
[4] Because the volatility of the product is unknown, the nonvolatile rate was set equal to the active rate.

TABLE C-5
Chemical-Specific Inputs for AgDRIFT® Model - Imazapic

Scenario	Parameter	Input Options	Units	Value
Tier 1 Ground (Agricultural)	Boom height (high = 1.27 m; low = 0.508 m)	Low or high	m	1.27 and 0.508
	Drop size distribution	Very fine to fine or fine to medium/course	--	Fine to medium/coarse
	Active rate		lb/acre	0.0313 to 0.1875
Tier 2 Aerial (Agricultural)	Aircraft type	Ag Husky, Air Tractor AT-502, Wasp helicopter, or Air Tractor AT-401	--	Air Tractor AT-401
	Boom length		m	< 85% of wingspan or helicopter rotor width
	Boom height		m	3.05
	# Flight lines		--	20[1]
	Swath width (separation between flight lines)	1.2x wingspan or user defined	[2]	1.2x aircraft wingspan or rotor width
	Swath displacement	Aircraft centerline, fixed distance, fraction of swath width	--	0.5 swath width[3]
	Drop size distribution	Very fine to fine, fine to medium, medium to coarse, coarse to very coarse	--	Fine to medium
	Wind speed		m/s	10
	Temperature		°C	31
	Relative humidity		%	25
	Spray material	Oil or water based	--	Water
	Active rate		lbs a.i./acre	0.0313 to 0.1875
	Non-volatile rate		lbs/acre	0.0313 to 0.1875[4]
	Spray volume rate		gal/acre	5-gal herbicide mixture/acre

TABLE C-5 (Cont.)
Chemical-Specific Inputs for AgDRIFT® Model - Imazapic

Scenario	Parameter	Input Options	Units	Value
Tier 2 Aerial (Forestry)	Aircraft type	Ag Husky, Air Tractor AT-502, Wasp helicopter, or Air Tractor AT-401	--	Air Tractor AT-401
	Boom length			< 85% of wingspan or helicopter rotor width
	Boom height		ft	20
	Canopy height	Must be less than boom height		< boom height
	# flight lines		--	20[1]
	Swath width (separation between flight lines)	Aircraft centerline, fixed distance, fraction of swath width	[2]	1.2x aircraft wingspan or rotor width
	Swath displacement	Aircraft centerline, fixed distance, fraction of swath width	--	0.5 swath width[3]
	Drop size distribution	Very fine to fine, fine to medium, medium to coarse, coarse to very coarse	--	Fine-to-Medium
	Wind speed		m/s	10
	Temperature		°C	31
	Relative humidity		%	25
	Flux plane		m	0
	Spray material	Oil or water based	--	Water
	Active fraction of spray material		Fraction	0.00075 to 0.0045[4]
	Non-volatile fraction of the spray material		Fraction	0.00075 to 0.0045[5]
	Spray volume rate		gal/acre	5-gal herbicide mixture/acre

[1] Assumes a total of 20 flight lines, 60 ft apart are applied to an agricultural field.
[2] Swath Width can be expressed as a distance (m or ft) or the default assumption of 1.2x the aircraft wingspan or rotor width.
[3] AgDRIFT Users manual does not identify a specific assumption, but rather defines the setting as that required to ensure that ½ the application rate is recovered at the edge of the application area. In AgDRIFT Tier II documentation, this is defined as equivalent to approximately ½ of a swath width.
[4] Because the volatility of the product is unknown, the nonvolatile rate was set equal to the active rate.
[5] Calculated assuming a 5 gallon per acre spray volume rate, a typical application rate of 0.0313 lb a.i./acre, and a maximum application rate of 0.1875 lb a.i./acre.

TABLE C-6
Chemical-Specific Inputs for AgDRIFT® Model – Sulfometuron Methyl

Scenario	Parameter	Input Options	Units	Value
Tier 1 Ground (Agricultural)	Boom height (high = 1.27 m; Low = 0.508 m)	Low or high	m	1.27 and 0.508
	Drop size distribution	Very fine to fine or fine to medium/course	--	Fine to medium/coarse
	Active rate		lb/acre	0.141 to 0.375
Tier 2 Aerial (Agricultural)	Aircraft type	Ag Husky, Air Tractor AT-502, Wasp helicopter, or Air Tractor AT-401	--	Label specifies a helicopter
	Boom length		m	< 85% of helicopter rotor width
	Boom height		m	3.05
	# flight lines		--	20[1]
	Swath width (separation between flight lines)	1.2x wingspan or user defined	[2]	1.2x aircraft wingspan or rotor width
	Swath displacement	Aircraft centerline, fixed distance, fraction of swath width	--	0.5 swath width (c)
	Drop size distribution	Very fine to fine, fine to medium, medium to coarse, coarse to very coarse	--	0.5
	Wind speed		m/s	10
	Temperature		°C	31
	Relative humidity		%	25
	Spray material	Oil or water based	--	Water
	Active rate		lbs a.i./acre	0.141-0.375 lb/acre
	Non-volatile rate		lbs/acre	Label identifies sulfometuron-methyl as nonvolatile; 0.188-0.5 lb/acre (d)
	Spray volume rate		gal/acre	Label specifies 5-40 gal herbicide mixture/acre; BLM typical spray output rate for helicopter is 5-gal herbicide mixture/acre

TABLE C-6 (Cont.)
Chemical-Specific Inputs for AgDRIFT® Model – Sulfometuron Methyl

Scenario	Parameter	Input Options	Units	Value
Tier 2 Aerial (Forestry)	Aircraft type	Ag Husky, Air Tractor AT-502, Wasp helicopter, or Air Tractor AT-401	--	Label specifies a helicopter
	Boom length			< 85% of helicopter rotor width
	Boom height		ft	20
	Canopy height	Must be less than boom height		< boom height
	# flight lines		--	20[1]
	Swath width (separation between flight lines)	Aircraft centerline, fixed distance, fraction of swath width	[2]	1.2x aircraft wingspan or rotor width
	Swath displacement	Aircraft centerline, fixed distance, fraction of swath width	--	0.5 swath width[3]
	Drop size distribution	Very fine to fine, fine to medium, medium to coarse, coarse to very coarse	--	>150-200 micrometers, equivalent to Fine-to-Medium
	Wind speed		m/s	10
	Temperature		deg C	31
	Relative humidity		%	25
	Flux plane		--	Water
	Spray material	Oil or water based	Fraction	0.0038 to 0.0090[4]
	Active fraction of spray material		Fraction	0.0045 to 0.012[5]
	Non-volatile fraction of the spray material		gal/acre	Label specifies 5-15 gal herbicide mixture/acre; BLM typical spray output rate for helicopter is 5-gal herbicide mixture/acre

1 Assumes a total of 20 flight lines, 60 ft apart are applied to an agricultural field.
2 Swath width can be expressed as a distance (m or ft) or the default assumption of 1.2x the aircraft wingspan or rotor width.
[3] AgDRIFT Users manual does not identify a specific assumption, but rather defines the setting as that required to ensure that ½ the application rate is recovered at the edge of the application area. In AgDRIFT Tier II documentation this is defined as equivalent to approximately ½ of a swath width.
[4] Calculated assuming a 5-gallon-per-acre spray volume rate, a typical application rate of 0.141 lb a.i./acre, and a maximum application rate of 0.375 lb a.i./acre.
[5] Label identifies the herbicide product as nonvolatile; therefore, nonvolatile rate and nonvolatile fraction were calculated assuming the active ingredient comprises 75 percent of the final product.

Spray volu

TABLE C-7
AgDRIFT® Exports for Spray Drift Scenarios - Dicamba

Mode of Application	Application Height/Type	Distance From Receptor (ft)	Typical Application Rate		Maximum Application Rate	
			Terrestrial Deposition Rate (mg/cm^2)	Pond Concentration (mg/L)	Terrestrial Deposition Rate (mg/cm^2)	Pond Concentration (mg/L)
Plane	Forested	100	NA	NA	NA	NA
Plane	Forested	300	NA	NA	NA	NA
Plane	Forested	900	NA	NA	NA	NA
Plane	Non-forested	100	NA	NA	NA	NA
Plane	Non-forested	300	NA	NA	NA	NA
Plane	Non-forested	900	NA	NA	NA	NA
Helicopter	Forested	100	NA	NA	NA	NA
Helicopter	Forested	300	NA	NA	NA	NA
Helicopter	Forested	900	NA	NA	NA	NA
Helicopter	Non-forested	100	NA	NA	NA	NA
Helicopter	Non-forested	300	NA	NA	NA	NA
Helicopter	Non-forested	900	NA	NA	NA	NA
Ground	Low Boom	25	2.64E-05	1.27E-04	4.40E-05	2.13E-04
Ground	Low Boom	100	9.32E-06	7.01E-05	1.55E-05	1.16E-04
Ground	Low Boom	900	1.43E-06	1.35E-05	2.39E-06	2.26E-05
Ground	High Boom	25	4.36E-05	2.05E-04	7.27E-05	3.42E-04
Ground	High Boom	100	1.47E-05	1.08E-04	2.45E-05	1.80E-04
Ground	High Boom	900	1.83E-06	1.72E-05	3.06E-06	2.86E-05

NA = Not Applicable.

TABLE C-8
AgDRIFT® Exports for Spray Drift Scenarios - Diflufenzopyr

Mode of Application	Application Height/Type	Distance From Receptor (ft)	Typical Application Rate		Maximum Application Rate	
			Terrestrial Deposition Rate (mg/cm^2)	Pond Concentration (mg/L)	Terrestrial Deposition Rate (mg/cm^2)	Pond Concentration (mg/L)
Plane	Forested	100	NA	NA	NA	NA
Plane	Forested	300	NA	NA	NA	NA
Plane	Forested	900	NA	NA	NA	NA
Plane	Non-forested	100	NA	NA	NA	NA
Plane	Non-forested	300	NA	NA	NA	NA
Plane	Non-forested	900	NA	NA	NA	NA
Helicopter	Forested	100	NA	NA	NA	NA
Helicopter	Forested	300	NA	NA	NA	NA
Helicopter	Forested	900	NA	NA	NA	NA
Helicopter	Non-forested	100	NA	NA	NA	NA
Helicopter	Non-forested	300	NA	NA	NA	NA
Helicopter	Non-forested	900	NA	NA	NA	NA
Ground	Low Boom	25	1.06E-05	5.11E-05	1.41E-05	6.82E-05
Ground	Low Boom	100	3.73E-06	2.80E-05	4.97E-06	3.74E-05
Ground	Low Boom	900	5.73E-07	5.41E-06	7.64E-07	7.22E-06
Ground	High Boom	25	1.75E-05	8.21E-05	1.75E-05	1.09E-04
Ground	High Boom	100	5.87E-06	4.33E-05	5.87E-06	5.77E-05
Ground	High Boom	900	7.34E-07	6.87E-06	7.34E-07	9.16E-06

NA = Not Applicable.

TABLE C-9
AgDRIFT® Exports for Spray Drift Scenarios - Diquat

Mode of Application	Application Height/Type	Distance From Receptor (ft)	Typical Application Rate		Maximum Application Rate	
			Terrestrial Deposition Rate (mg/cm^2)	Pond Concentration (mg/L)	Terrestrial Deposition Rate (mg/cm^2)	Pond Concentration (mg/L)
Plane	Forested	100	NA	NA	NA	NA
Plane	Forested	300	NA	NA	NA	NA
Plane	Forested	900	NA	NA	NA	NA
Plane	Non-forested	100	1.10E-03	8.08E-03	5.10E-03	3.89E-02
Plane	Non-forested	300	5.00E-04	4.15E-03	2.30E-03	1.99E-02
Plane	Non-forested	900	2.00E-04	1.96E-03	6.00E-04	5.85E-03
Helicopter	Forested	100	NA	NA	NA	NA
Helicopter	Forested	300	NA	NA	NA	NA
Helicopter	Forested	900	NA	NA	NA	NA
Helicopter	Non-forested	100	1.00E-03	6.82E-03	4.40E-03	3.23E-02
Helicopter	Non-forested	300	4.00E-04	3.24E-03	1.70E-03	1.48E-02
Helicopter	Non-forested	900	2.00E-04	1.58E-03	3.00E-04	2.55E-03
Ground	Low Boom	25	1.00E-04	6.82E-04	6.00E-04	2.73E-03
Ground	Low Boom	100	4.97E-05	3.74E-04	2.00E-04	1.49E-03
Ground	Low Boom	900	7.64E-06	7.22E-05	3.06E-05	2.89E-04
Ground	High Boom	25	2.00E-04	1.09E-03	9.00E-04	4.38E-03
Ground	High Boom	100	7.83E-05	5.77E-04	3.00E-04	2.31E-03
Ground	High Boom	900	9.78E-06	9.16E-05	3.91E-05	3.66E-04

NA = Not Applicable.

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TABLE C-10
AgDRIFT® Exports for Spray Drift Scenarios - Fluridone

Mode of Application	Application Height/Type	Distance From Receptor (ft)	Typical Application Rate		Maximum Application Rate	
			Terrestrial Deposition Rate (mg/cm^2)	Pond Concentration (mg/L)	Terrestrial Deposition Rate (mg/cm^2)	Pond Concentration (mg/L)
Plane	Forested	100	NA	NA	NA	NA
Plane	Forested	300	NA	NA	NA	NA
Plane	Forested	900	NA	NA	NA	NA
Plane	Non-forested	100	4.00E-04	2.94E-03	1.50E-03	1.13E-02
Plane	Non-forested	300	2.00E-04	1.43E-03	7.00E-04	5.94E-03
Plane	Non-forested	900	6.63E-05	6.31E-04	3.00E-04	2.80E-03
Helicopter	Forested	100	NA	NA	NA	NA
Helicopter	Forested	300	NA	NA	NA	NA
Helicopter	Forested	900	NA	NA	NA	NA
Helicopter	Non-forested	100	4.00E-04	2.50E-03	1.30E-03	9.42E-03
Helicopter	Non-forested	300	1.00E-04	1.09E-03	5.00E-04	4.62E-03
Helicopter	Non-forested	900	5.32E-05	5.15E-04	2.00E-04	2.01E-03
Ground	Low Boom	25	5.77E-05	2.79E-04	2.00E-04	9.13E-04
Ground	Low Boom	100	2.04E-05	1.53E-04	6.66E-05	5.01E-04
Ground	Low Boom	900	3.13E-06	2.96E-05	1.02E-05	9.67E-05
Ground	High Boom	25	9.54E-05	4.49E-04	3.00E-04	1.47E-03
Ground	High Boom	100	3.21E-05	2.36E-04	1.00E-04	7.73E-04
Ground	High Boom	900	4.01E-06	3.76E-05	1.31E-05	1.23E-04

NA = Not Applicable.

TABLE C-11
AgDRIFT® Exports for Spray Drift Scenarios - Imazapic

Mode of Application	Application Height/Type	Distance From Receptor (ft)	Typical Application Rate		Maximum Application Rate	
			Terrestrial Deposition Rate (mg/cm^2)	Pond Concentration (mg/L)	Terrestrial Deposition Rate (mg/cm^2)	Pond Concentration (mg/L)
Plane	Forested	100	9.49E-05	6.79E-04	6.00E-04	4.54E-03
Plane	Forested	300	3.38E-05	2.88E-04	2.00E-04	1.95E-03
Plane	Forested	900	9.99E-06	9.37E-05	6.94E-05	6.53E-04
Plane	Non-forested	100	2.34E-05	1.56E-04	2.00E-04	1.15E-03
Plane	Non-forested	300	7.36E-06	6.41E-05	6.10E-05	5.38E-04
Plane	Non-forested	900	3.05E-06	2.93E-05	2.63E-05	2.50E-04
Helicopter	Forested	100	6.44E-05	3.26E-04	4.00E-04	1.99E-03
Helicopter	Forested	300	1.16E-05	9.59E-05	7.08E-05	5.81E-04
Helicopter	Forested	900	2.75E-06	2.55E-05	1.67E-05	1.55E-04
Helicopter	Non-forested	100	2.02E-05	1.32E-04	1.00E-04	1.00E-03
Helicopter	Non-forested	300	5.70E-06	4.89E-05	4.85E-05	4.21E-04
Helicopter	Non-forested	900	2.37E-06	2.26E-05	1.91E-05	1.81E-04
Ground	Low Boom	25	4.41E-06	2.13E-05	2.64E-05	1.28E-04
Ground	Low Boom	100	1.56E-06	1.17E-05	9.32E-06	7.01E-05
Ground	Low Boom	900	2.39E-07	2.26E-06	1.43E-06	1.35E-05
Ground	High Boom	25	7.28E-06	3.43E-05	4.36E-05	2.05E-04
Ground	High Boom	100	2.45E-06	1.81E-05	1.47E-05	1.08E-04
Ground	High Boom	900	3.06E-07	2.87E-06	1.83E-06	1.72E-05

NA = Not Applicable.

TABLE C-12
AgDRIFT® Exports for Spray Drift Scenarios – Sulfometuron Methyl

Mode of Application	Application Height/Type	Distance From Receptor (ft)	Typical Application Rate		Maximum Application Rate	
			Terrestrial Deposition Rate (mg/cm^2)	Pond Concentration (mg/L)	Terrestrial Deposition Rate (mg/cm^2)	Pond Concentration (mg/L)
Plane	Forested	100	NA	NA	NA	NA
Plane	Forested	300	NA	NA	NA	NA
Plane	Forested	900	NA	NA	NA	NA
Plane	Non-forested	100	1.10E-03	8.08E-03	5.10E-03	3.89E-02
Plane	Non-forested	300	5.00E-04	4.15E-03	2.30E-03	1.99E-02
Plane	Non-forested	900	2.00E-04	1.96E-03	6.00E-04	5.85E-03
Helicopter	Forested	100	NA	NA	NA	NA
Helicopter	Forested	300	NA	NA	NA	NA
Helicopter	Forested	900	NA	NA	NA	NA
Helicopter	Non-forested	100	1.00E-03	6.82E-03	4.40E-03	3.23E-02
Helicopter	Non-forested	300	4.00E-04	3.24E-03	1.70E-03	1.48E-02
Helicopter	Non-forested	900	2.00E-04	1.58E-03	3.00E-04	2.55E-03
Ground	Low Boom	25	1.00E-04	6.82E-04	6.00E-04	2.73E-03
Ground	Low Boom	100	4.97E-05	3.74E-04	2.00E-04	1.49E-03
Ground	Low Boom	900	7.64E-06	7.22E-05	3.06E-05	2.89E-04
Ground	High Boom	25	2.00E-04	1.09E-03	9.00E-04	4.38E-03
Ground	High Boom	100	7.83E-05	5.77E-04	3.00E-04	2.31E-03
Ground	High Boom	900	9.78E-06	9.16E-05	3.91E-05	3.66E-04

NA = Not Applicable.

2.0 REFERENCES

ENSR. 2005a. Bromacil Ecological Risk Assessment Final Report. Prepared for the Bureau of Land Management, Reno, Nevada. Westford, Massachusetts.

ENSR. 2005b. Chlorsulfuron Ecological Risk Assessment Final Report. Prepared for the Bureau of Land Management, Reno, Nevada. Westford, Massachusetts.

ENSR. 2005c. Dicamba Ecological Risk Assessment Final Report. Prepared for the Bureau of Land Management, Reno, Nevada. Westford, Massachusetts.

ENSR. 2005d. Diflufenzopyr Ecological Risk Assessment Final Report. Prepared for the Bureau of Land Management, Reno, Nevada. Westford, Massachusetts.

ENSR. 2005e. Diquat Ecological Risk Assessment Final Report. Prepared for the Bureau of Land Management, Reno, Nevada. Westford, Massachusetts.

ENSR. 2005f. Diuron Ecological Risk Assessment Final Report. Prepared for the Bureau of Land Management, Reno, Nevada. Westford, Massachusetts.

ENSR. 2005g. Fluridone Ecological Risk Assessment Final Report. Prepared for the Bureau of Land Management, Reno, Nevada. Westford, Massachusetts.

ENSR. 2005h. Imazapic Ecological Risk Assessment Final Report. Prepared for the Bureau of Land Management, Reno, Nevada. Westford, Massachusetts.

ENSR. 2005i.Sulfometuron Methyl Ecological Risk Assessment Final Report. Prepared for the Bureau of Land Management, Reno, Nevada. Westford, Massachusetts.

ENSR. 2005j. Tebuthiuron Ecological Risk Assessment Final Report. Prepared for the Bureau of Land Management, Reno, Nevada. Westford, Massachusetts.

Spray Drift Task Force (SDTF). 2002. A user's guide for AgDRIFT 2.0.05: a Tiered Approach for the Assessment of Spray Drift of Pesticides. Regulatory Version. Spray Drift Task Force (SDTF).