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

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

PC Code: 103613
Chemical: Glyphosate, potassium salt
DP Barcode: D372053
Decision # 423791

October 26, 2010

MEMORANDUM

SUBJECT: Assessment of Ecological Risk for Glyphosate, potassium salt (PC Code 103613; CAS # 70901-12-1) for Label Supplement to Add Uses on Roundup Ready Sweet Corn

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Pamela Hurley 10/26/10
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10/27/10

Monsanto has requested a label amendment for Roundup WeatherMAX® (EPA Reg. No. 524-537) and for Roundup PowerMAX® (EPA Reg. No. 524-549) herbicides to add Roundup ready sweet corn uses. They have also submitted a petition to increase the tolerance for sweet corn, kernels plus cobs with husks removed, and to add a glyphosate tolerance for sweet corn forage. Based on the proposed labels, the maximum application rate on a glyphosate acid equivalent (a.e.) basis is 3.71 lbs a.e./A glyphosate and on a formulation basis is 9.35 lbs formulation/A. EFED has been requested to assess the potential ecological risks.

The proposed product contains a least one surfactant. The names and CAS numbers of the surfactants are proprietary and are not provided in this assessment. It is known from toxicity testing in the open literature that one surfactant mixture that has been used in glyphosate products is considerably more toxic to aquatic organisms than technical glyphosate. That surfactant is a polyoxyethylene alkylamine mixture (POEA, CAS number 61791-26-2). Using available data from the open literature, this assessment is conducted with the assumption that the proposed surfactants are similar to the surfactant, POEA. Therefore, for the proposed use on sweet corn, a conservative estimation of risk to aquatic organisms is conducted on a formulation basis as well as on a glyphosate acid equivalent basis. In addition, a separate assessment is

conducted on the surfactant POEA alone. The aquatic toxicity endpoints are selected from studies that have been conducted with technical glyphosate and when available, from formulations containing the surfactant, POEA and from POEA alone. The terrestrial toxicity endpoints are selected from studies that have been conducted with technical glyphosate only because the vast majority of the toxicity studies on birds and mammals with the formulations do not have discreet endpoints (e.g., the LD_{50}'s and LC_{50}'s are higher than the highest dose/concentration tested). No studies are available for POEA alone. For terrestrial plants, toxicity endpoints are selected from a formulation and expressed in terms of acid equivalents.

I. Executive Summary

Roundup WeatherMAX® (EPA Reg. No. 524-537) and Roundup PowerMAX® (EPA Reg. No. 524-549) contain 48.7 – 48.8% glyphosate potassium salt (39.8% glyphosate acid equivalents) and are proposed for use on Roundup ready sweet corn during preplant, pre-emergence and in-crop post-emergence. The labels state that the products contain a systemic herbicide with no soil residual activity. It is generally non-selective and gives broad spectrum control of many annual weeds, perennial weeds, woody brush and trees. The products are formulated as water-soluble liquids and may be applied through most standard industrial or field sprayers after dilution and mixing. The instructions indicate that they can be applied via a variety of application equipment: ground broadcast spray (boom or boomless systems, pull-type sprayers, floaters, pick-up sprayers, spray coupes, and other ground broadcast equipment); aerial spray (fixed wing or helicopter); shielded and hooded sprayers, wiper applicators and sponge bars; aerial or ground injection sprayers; spot treatment; hand-held or backpack equipment; and controlled droplet size applicators (CDA).

The number of applications, application intervals and rates are provided in **Table 1**.

Table 1. Proposed Number of Applications, Application Intervals and Rates

Application Timing	Number of Applications	Application Interval (days)	Application Rate (lbs ae/A)
P/E Preplant	1	NA	3.71
P/E Postplant	4	7	1.15
P/E Preplant/Post Plant	1 (preplant)/2 (postplant)	10 (preplant)/7 (postplant)	3.71/1.15
P/E Preplant/Post Plant	1 (preplant)/4 (postplant)	10 (preplant)/7 (postplant)	1.35/1.15

Technical glyphosate is classified as practically non-toxic to slightly toxic to aquatic and terrestrial animals. Glyphosate formulations containing POEA are classified on a formulation basis as moderately toxic to freshwater fish and slightly to moderately toxic to aquatic-phase amphibians and freshwater invertebrates.

For the glyphosate acid, neither the acute nor chronic levels of concern (LOC) are exceeded for freshwater fish, aquatic-phase amphibians and invertebrates. For marine/estuarine fish and invertebrates, the acute LOC is not exceeded. No chronic studies are available for marine/estuarine fish and invertebrates; however, it is noted that the acute toxicity value for estuarine fish is approximately 6 times higher than for freshwater fish and the acute toxicity value for estuarine/marine invertebrates is approximately 75% of the acute freshwater

invertebrate value. Therefore, based on the weight of the evidence from the fish studies conducted with technical glyphosate and that the RQs for chronic exposure to freshwater species are less than 0.01, there is low concern for risk to estuarine/marine species following chronic exposure. The LOC for aquatic plants is not exceeded for either non-vascular or vascular aquatic plants.

For the glyphosate formulation containing the surfactant POEA, the acute LOCs are not exceeded for either freshwater fish, aquatic-phase amphibians or freshwater invertebrates following acute exposure to the formulation through spray drift. In addition, the aquatic plant LOC is not exceeded for either non-vascular or vascular plants. No aquatic toxicity data are available for marine/estuarine species on formulated products containing POEA. Chronic aquatic EECs were not estimated.

For the surfactant, POEA, the acute LOCs are not exceeded for freshwater fish, aquatic-phase amphibians or freshwater invertebrates following acute exposure to the surfactant through spray drift. No aquatic toxicity data on POEA are available for marine/estuarine species. Chronic aquatic EECs were not estimated.

For birds/terrestrial-phase amphibians/reptiles, there were no mortalities in any of the available acute and subacute avian studies. Therefore, no RQs were calculated. All of the terrestrial EEC values are lower than the highest dose/concentration tested; however, for 20 g birds many of the EECs are greater than $1/10^{th}$ of the highest dose tested in the study. For 100 g birds, several EECs are greater than $1/10^{th}$ of the highest dose tested in the study at the 3.71 lbs/A rate and at the 1.15 lbs/A application rate when applied 4 times per year. For these reasons, there is an uncertainty associated with listed avian species (the LOC for listed avian species is 0.1). For the subacute dietary-based EECs, again, several of the EEC values are greater than $1/10^{th}$ of the highest concentration tested with the 3.71 lbs/A application rate and with the 1.15 lbs/A rate that would be applied 4 times per season.

Following chronic exposure, the chronic LOC for birds (LOC = 1) is exceeded for short grass at the 3.71 lbs/A application rate (RQ = 1.07). However, because there were no effects at the highest concentrations tested in both bird studies and the RQ is only slightly greater than the LOC, the risk following chronic exposure is expected to be minimal.

For mammals, again, there were no mortalities in any of the available acute toxicity studies. Although no RQs were calculated, all of the terrestrial EEC values are less than $1/10^{th}$ of the highest dose tested. The chronic LOC for mammals was not exceeded, either on a dose or dietary basis.

Glyphosate is classified as practically non-toxic to honeybees. Thus, risk to terrestrial invertebrates is presumed to be negligible.

For terrestrial plants, none of the RQs for either listed or non-listed monocots or dicots exceed the LOC of 1 for any of the application rates when applied via ground application methods. However, when applied aerially, all of the application rates exceed for listed dicots through spray drift. At the highest application rate (3.71 lbs/A), the LOC for terrestrial plants is exceeded for

both listed and non-listed monocots and dicots exposed via spray drift. The highest RQ is 3.79 for listed dicots exposed via spray drift.

II. Analysis

A. Exposure Characterization

Aquatic Exposure from Glyphosate Use on Sweet Corn

Glyphosate active ingredient

Surface water modeling for glyphosate was conducted using environmental fate data shown in **Table 2.**

Table 2. PRZM / EXAMS Modeling Inputs for Glyphosate Use on Sweet Corn

PARAMETER	VALUE	SOURCE
Spray Drift Fraction	0.01	Default ground spray application
Aerobic Soil Metabolism Half-life (days)	5.4 days	MRID 42372501, 44320645
Organic Carbon Partition Coefficient (K_{oc}) (mL/ g_{oc})	3,100	MRID 44320646
Aerobic Aquatic Half-Life (days)	14.1 days	MRID 41723601
Anaerobic Aquatic half-life (days)	208 days	MRID 41723701
Aqueous Photolysis half-life (days)	Stable	MRID 41689101, 44320643
Hydrolysis half-life (days)	Stable	MRID 00108192,44320642
Molecular Weight (g/mole)	170.8	
Henry's Law constant (atm-m^3/mol)	2.0725×10^{-14}	
Water Solubility @ 25°C (mg/L)	12,000	
Vapor Pressure (torr)	9.75×10^{-10}	

Surface water modeling was conducted using PRZM (3.1.2.2)/EXAMS (2.98.04). Predicted glyphosate concentrations in surface water from glyphosate use on sweet corn are shown in **Table 3**. The KS corn standard scenario was used to represent sweet corn because it is a conservative runoff scenario among the standard PRZM/EXAMS corn scenarios.

Output files for model simulations are shown in **Appendix A**.

Table 3: Estimated Surface Water Concentrations of Glyphosate for Proposed Use on Sweet Corn.

Application Timing	Number of Apps	Application Interval (days)	Application Rate (lbs ae/A)	Concentration (µg/L)		
				Peak	21 Day Average	60 Day Average
P/E Preplant	1	NA	3.71	8.439	5.082	2.872
P/E Postplant	4	7	1.15	6.786	3.945	2.379
P/E Preplant/Post Plant	1(pre)/2(pos)	10(pre)/7(pos)	3.71/1.15	9.817	5.954	3.477
P/E Preplant/Post Plant	1(pre)/4(pos)	10 (pre)/7 (pos)	1.35/1.15	7.202	4.520	3.162

Glyphosate Formulated Products

The estimated environmental concentrations (EEC) for the glyphosate formulated products and POEA are shown in **Table 4**. These EECs were calculated using the highest single application rate for pre-plant and post-plant label recommendations. For the purpose of this assessment, the percentage of POEA in the formulated product was taken from a document available in the open literature and was assumed to be 15% (Diamond and Durkin, 1997). These EECs represent the spray drift load from a single ground spray application. Runoff was not considered because it is assumed the formulated product and the POEA will dissipate rapidly in soil.

Table 4: Estimated Environmental Concentration (EEC) of Formulated Product and POEA from Spray Drift

Application Timing	Spray Drift Fraction	Maximum Single Application of Formulated Product (Qts/A)	Peak EEC of Formulated Product (ug/L)[1]	Peak EEC of POEA (ng/L)[2]
P/E Preplant	0.01	3.3	2.12	318
P/E Postplant	0.01	1.4	0.90	135

1- [Qts formulate Product/A* 1gal/4Qts*Density of Formulated Product (lbs gal)*0.01*454E6 ug/lb]/20E6 liters
2- Peak EEC for formulated products*Percent of POEA*1000

Surface Water Monitoring Data

Surface water monitoring data for glyphosate and AMPA were obtained from NAWQA. Glyphosate and AMPA were not analyzed in the Pesticide Data Program (PDP) and USGS-EPA Pilot Reservoir Monitoring Study. Glyphosate concentrations in surface water range from <0.02 to 35 µg/L (**Table 5**). The minimum reporting limit (MRL) ranged from 0.02 to 0.15 µg/L with a median MRL of 0.1µg/L. The detection frequency for glyphosate is 38% . The NAWQA site with highest peak and average concentrations is located in Iowa on the South Fork of the Iowa River (NAWQA Station ID 5451070). The land use in watershed of the sampling site is classified as "Other". The "Other" designation has a not applicable (NA) land use code.

AMPA concentrations in surface water range from <0.02 to 28 µg/L (**Table 5**). The minimum reporting limit (MRL) ranged from 0.02 to 0.31 µg/L with a median MRL of 0.1µg/L. The

detection frequency for AMPA is 60 %. The NAWQA site with highest peak and average concentrations is located in Mississippi on the Bogue Phalia near Leland (NAWQA Station ID 7288650). The land use in watershed of the sampling site is classified as agricultural.

Table 5: Highest Reported Surface Water Concentrations of Glyphosate and AMPA in NAWQA

Compound	NAWQA Station ID	Highest Reported Concentration in NAWQA (µg/L)	
		Peak[1]	Average[2]
Glyphosate	5451070	35	1.81
AMPA	7288650	28	3.11

1- Peak glyphosate concentration at NAWQA sampling station
2- Average glyphosate concentration at NAWQA sampling station

A level of 150 ppb was detected in a Texas well (EPA, 1992). The presence of this level was attributed to substandard well construction and careless use of chemicals. Six samples from wells in Virginia had detectable residues of glyphosate ranging from 0.004 to 0.009.

Terrestrial Exposure from Glyphosate Use on Sweet Corn

A conservative exposure to terrestrial animals will be estimated using T-REX version 1.4.1. The following tables provide the terrestrial EECs used in this assessment.

Table 6. Acute Avian Dose-Based Upper Bound Kenaga EECs (mg/kg bw) 3.71 lbs/A Application

Size Class (grams)	Short Grass	Tall Grass	Broadleaf Plants/ Small Insects	Fruits/Pods/ Seeds/ Large Insects	Granivore
20	1014.08	464.79	570.42	63.38	14.08
100	578.27	265.04	325.28	36.14	8.03
1000	258.90	118.66	145.63	16.18	3.60

Table 7. Acute Mammalian Dose-Based Upper Bound Kenaga EECs (mg/kg bw) 3.71 lbs/A Application

Size Class (grams)	Short Grass	Tall Grass	Broadleaf Plants/ Small Insects	Fruits/Pods/ Seeds/ Large Insects	Granivore
15	848.93	389.09	477.52	53.06	11.79
35	586.72	268.91	330.03	36.67	8.15
1000	136.03	62.35	76.52	8.50	1.89

Table 8. Chronic Mammalian Dose-Based Upper Bound Kenaga EECs (mg/kg bw) 3.71 lbs/A Application

Size Class (grams)	Short Grass	Tall Grass	Broadleaf Plants/ Small Insects	Fruits/Pods/ Seeds/ Large Insects	Granivore
15	848.93	389.09	477.52	53.06	11.79
35	586.72	268.91	330.03	36.67	8.15

Table 8. Chronic Mammalian Dose-Based Upper Bound Kenaga EECs (mg/kg bw) 3.71 lbs/A Application					
Size Class (grams)	**Short Grass**	**Tall Grass**	**Broadleaf Plants/ Small Insects**	**Fruits/Pods/ Seeds/ Large Insects**	**Granivore**
1000	136.03	62.35	76.52	8.50	1.89

Table 9. Upper Bound Kenaga Dietary EECs (ppm) 3.71 lbs/A Application			
Short Grass	**Tall Grass**	**Broadleaf Plants/ Small Insects**	**Fruits/Pods/ Seeds/ Large Insects**
890.40	408.1	500.85	55.65

Size class not used for dietary risk quotients

Table 10. Acute Avian Dose-Based Upper Bound Kenaga EECs (mg/kg bw) 1.15 lbs/A Application, 2 applications, 7 day application interval					
Size Class (grams)	**Short Grass**	**Tall Grass**	**Broadleaf Plants/ Small Insects**	**Fruits/Pods/ Seeds/ Large Insects**	**Granivore**
20	471.50	216.11	265.22	29.47	6.55
100	268.87	123.23	151.24	16.80	3.73
1000	120.38	55.17	67.71	7.52	1.67

Table 11. Acute Mammalian Dose-Based Upper Bound Kenaga EECs (mg/kg bw) 1.15 lbs/A Application, 2 applications, 7 day application interval					
Size Class (grams)	**Short Grass**	**Tall Grass**	**Broadleaf Plants/ Small Insects**	**Fruits/Pods/ Seeds/ Large Insects**	**Granivore**
15	394.72	180.91	222.03	24.67	5.48
35	272.80	125.03	153.45	17.05	3.79
1000	63.25	28.99	35.58	3.95	0.88

Table 12. Chronic Mammalian Dose-Based Upper Bound Kenaga EECs (mg/kg bw) 1.15 lbs/A Application, 2 applications, 7 day application interval					
Size Class (grams)	**Short Grass**	**Tall Grass**	**Broadleaf Plants/ Small Insects**	**Fruits/Pods/ Seeds/ Large Insects**	**Granivore**
15	394.72	180.91	222.03	24.67	5.48
35	272.80	125.03	153.45	17.05	3.79
1000	63.25	28.99	35.58	3.95	0.88

Table 13. Upper Bound Kenaga Dietary EECs (ppm) 1.15 lbs/A Application, 2 applications, 7 day application interval			
Short Grass	**Tall Grass**	**Broadleaf Plants/ Small Insects**	**Fruits/Pods/ Seeds/ Large Insects**
414.00	189.75	232.88	25.88

Size class not used for dietary risk quotients

Table 14. Acute Avian Dose-Based Upper Bound Kenaga EECs (mg/kg bw) 1.15 lbs/A Application, 4 applications, 7 day application interval					
Size Class (grams)	**Short Grass**	**Tall Grass**	**Broadleaf Plants/ Small Insects**	**Fruits/Pods/ Seeds/ Large Insects**	**Granivore**
20	589.38	270.13	331.53	36.84	8.19
100	336.09	154.04	189.05	21.01	4.67
1000	150.47	68.97	84.64	9.40	2.09

Table 15. Acute Mammalian Dose-Based Upper Bound Kenaga EECs (mg/kg bw) 1.15 lbs/A Application, 4 applications, 7 day application interval					
Size Class (grams)	**Short Grass**	**Tall Grass**	**Broadleaf Plants/ Small Insects**	**Fruits/Pods/ Seeds/ Large Insects**	**Granivore**
15	493.40	226.14	277.54	30.84	6.85
35	341.00	156.29	191.81	21.31	4.74
1000	79.06	36.24	44.47	4.94	1.10

Table 16. Chronic Mammalian Dose-Based Upper Bound Kenaga EECs (mg/kg bw) 1.15 lbs/A Application, 4 applications, 7 day application interval					
Size Class (grams)	**Short Grass**	**Tall Grass**	**Broadleaf Plants/ Small Insects**	**Fruits/Pods/ Seeds/ Large Insects**	**Granivore**
15	493.40	226.14	277.54	30.84	6.85
35	341.00	156.29	191.81	21.31	4.74
1000	79.06	36.24	44.47	4.94	1.10

Table 17. Upper Bound Kenaga Dietary EECs (ppm) 1.15 lbs/A Application, 4 applications, 7 day application interval			
Short Grass	**Tall Grass**	**Broadleaf Plants/ Small Insects**	**Fruits/Pods/ Seeds/ Large Insects**
517.50	237.19	291.09	32.34

Size class not used for dietary risk quotients

B. Environmental Fate Summary

Glyphosate [*N*-(phosphonomethyl)glycine] is an acid, and it can also be associated with different counter cations to form salts. Several salts of glyphosate are currently marketed, as well as the acid, and are considered as the active ingredient in end-use products. For the aquatic uses, the isopropylamine salt is the active ingredient in the end-use product. The parent acid is the chemical species that exhibits herbicidal activity. In order to have comparable results, the salt is considered in terms of its glyphosate equivalent, (acid equivalent; ae), determined by multiplying the application rate by the acid equivalence ratio, defined as the ratio of the molecular weight of *N*-(phosphonomethyl)glycine to the molecular weight of the salt. For the purpose of this assessment, the acid and the salt species are referred to as "glyphosate" throughout this document.

Table 18 summarizes the environmental fate behavior of glyphosate in different media. The

environmental fate data shown in this table are taken from required studies submitted in support of registration of glyphosate.

The major route of transformation of glyphosate identified in laboratory studies is microbial degradation. In soils incubated under aerobic conditions, the half-life of glyphosate ranges from 1.8 to 5.4 days and in aerobic water-sediment systems is 7 days. However, anaerobic conditions limit the metabolism of glyphosate (half-life 208 days in anaerobic water-sediment systems). In laboratory studies, glyphosate was not observed to break down by abiotic processes, such as hydrolysis, direct photolysis in soil, or photolysis in water. In the field, dissipation half-lives were measured to be 2.4 to 160 days (n=6). Glyphosate dissipation appeared to correlate with climate, being more persistent in cold than in warm climates. Along with significant mineralization to carbon dioxide, the major metabolite of glyphosate is aminomethylphosphonic acid (AMPA).

No data are available about the environmental fate behavior of glyphosate salts. It is assumed the glyphosate salts dissociate rapidly to form glyphosate and the counter ion.

Table18. Environmental Fate Data for Glyphosate

Study	Value	Major Degradates[1], Comments	MRID #
Abiotic Hydrolysis Half-life	Stable (at 25° C for at least 30 days)	None	00108192; 44320642
Direct Aqueous Photolysis	Stable (for at least 30 days)	None	41689101; 44320643
Soil Photolysis Half-life	Stable (for at least 30 days)	Degradation in dark control was equal to that in irradiated samples	44320645.
Aerobic Soil Metabolism Half-life	1.8 and 5.4 days (sandy loam) 2.6 days (silt loam)	AMPA (max 29% at 40 d) CO_2 (≥70% after 1 year)	42372501; 44320645
Anaerobic Aquatic Metabolism Half-life	208 days (Water- silty clay loam sediment system)	AMPA (max 25% at 15 d) CO_2 (≥ 35% after 1 year) Initial degradation was rapid but slowed considerably. Non-linear modeling predicts DT_{50} = 8.1 day and DT_{90} > 1 yr	41723701; 42372502
Aerobic Aquatic Metabolism Half-life	14.1 days (Water- silty clay loam sediment)	AMPA (19-25% at 7-30 d) CO_2 (≥ 23% after 30 d)	41723601; 42372503

Study	Value						MRID #
Batch Equilibrium (mL/g)	*Soil*	*Avg K_d*	*Avg K_{oc}*	*K_F*	*1/n*	*K_{Foc}*	44320646
	sand	170	58,000	64	0.75	22,000	
	sandy loam	18	3,100	9.4	0.72	1,600	
	sandy loam	230	13,000	90	0.76	5,000	

Study	Value			Major Degradates[1], Comments			MRID #
	silty clay loam	680	33,000	470	0.93	21,000	
	silty clay loam	1,000	47,000	700	0.94	33,000	

Study	Value				MRID #
Terrestrial Field Dissipation Half-life	Glyph.	AMPA		Bare ground studies. Glyphosate and AMPA were found predominantly in the 0 to 6 inch layers	42607501; 42765001
	1.7 d	131 d	(TX)		
	7.3 d	119 d	(OH)		
	8.3 d	958 d	(GA)		
	13 d	896 d	(CA)		
	17 d	142 d	(AZ)		
	25 d	302 d	(MN)		
	114 d	240 d	(NY)		
	142 d	no data	(IA)		
Aquatic Field Dissipation	7.5 days			In a farm pond in Missouri. At 3 sites (OR, GA, MI), half-lives could not be calculated due to recharging events.	40881601
	Water: Dissipated rapidly immediately after treatment. Sediment: Glyphosate remained in pond sediments at ≥ 1 ppm at 1 year post treatment.			In ponds in Michigan and Oregon and a stream in Georgia Accumulation was higher in the pond than in the stream sediments	41552801.
Forestry Dissipation	Foliage: < 1 day Ecosystem: Glyphosate: 100 d AMPA: 118 d			3.75 lb ae/A, aerial application	41552801.

[1] Major degradates are defined as those which reach >10% of the applied.

C. Ecological Effects Summary

1. Effects to Aquatic Organisms

Table 19 summarizes the most sensitive aquatic toxicity endpoints of technical glyphosate and/or its salts. Data gaps for glyphosate include chronic marine/estuarine fish and invertebrate studies. Chronic toxicity values (NOAEC) cannot be estimated for either marine/estuarine fish or invertebrates using acute to chronic ratios because for both freshwater fish and invertebrates, the acute and chronic toxicity studies were conducted with different species.

Table 19. Aquatic Toxicity Profile for Glyphosate/Salt

Assessment Endpoint	Species	Toxicity Values	Toxicity Category[1]	Citation MRID # /Date	Comment
Acute Toxicity to Freshwater Fish	Bluegill sunfish (*Lepomis macrochirus*)	96-hr. LC_{50}: 43 mg a.e./L*	Slightly toxic	44320630/1995	

Assessment Endpoint	Species	Toxicity Values	Toxicity Category[1]	Citation MRID # /Date	Comment
Chronic Toxicity to Freshwater Fish	Fathead minnow (*Pimephales promelas*)	NOAEC: 25.7 mg a.e./L (highest concentration tested)	N/A[2]	00108171/1975	
Acute Toxicity to Aquatic-Phase Amphibians	Australian frog (*Crinia insignifera*) Adult	LC_{50}: 75 mg a.e./L	Slightly toxic	43839601/1995	
Chronic Toxicity to Aquatic-Phase Amphibians	Leopard Frog (*Rana pipiens*)	NOAEC/LOAEC: 1.8/>1.8	N/A[2]	46650501/2004	
Acute Toxicity to Freshwater Invertebrates	Midge (*Chironomus plumosus*)	48-hr LC_{50}: 53.2 mg a.e./L	Slightly toxic	00162296/1979	
Chronic Toxicity to Freshwater Invertebrates	Water flea (*Daphnia magna*)	NOAEC: 49.9 mg a.e./L	N/A	00124763/1982	LOAEC: 95.7 mg a.e./L based on reduced reproductive capacity.
Acute Toxicity to Marine/Estuarine Fish	Sheepshead minnow (*Cyprinodon variegatus*)	96-hr. LC_{50}: 240 mg a.e./L	Practically nontoxic	44320632/1996	
Acute Toxicity to Marine/Estuarine Invertebrates	Mysid (*Americamysis bahia*)	LC_{50}: 40 mg a.e./L	Slightly toxic	44320634/1996	
Acute Toxicity to Non-vascular Aquatic Plants	Green algae (*Selenastrum capricornutum*)	4-day EC_{50}: 12.1 mg a.e./L	N/A	40236901/1987	
Acute Toxicity to Toxicity to Vascular Aquatic Plants	Duckweed (*Lemna gibba*)	14-day EC_{50}: 11.9 mg a.e./L	N/A	44320638/1996	

*a.e. = expressed in terms of acid equivalents for glyphosate

[1]Categories of **acute toxicity for aquatic organisms** (U.S. EPA, 2004) based on LC_{50} (mg/L): < 0.1 very highly toxic; 0.1-1 highly toxic; >1-10 moderately toxic; >10-100 slightly toxic; >100 practically nontoxic. Toxicity categories for aquatic plants have not been defined.

[2] N/A = Not applicable

Table 20 summarizes the most sensitive acute aquatic toxicity endpoints of glyphosate formulations containing the surfactant POEA. These endpoints will be used in comparison to the estimated EECs from spraydrift for the formulation.

Table 20. Acute Aquatic Toxicity Profile for Glyphosate Formulations Containing POEA

Assessment Endpoint	Species	Toxicity Value Used in Risk Assessment	Citation MRID # /Date	Comment
Acute Toxicity to Freshwater Fish	Rainbow trout (*Oncorhynchus mykiss*)	96-hr LC_{50}: 3.17 mg formulation/L	40098001/1986	Supplemental Roundup: 30% a.i.

Table 20. Acute Aquatic Toxicity Profile for Glyphosate Formulations Containing POEA				
Assessment Endpoint	**Species**	**Toxicity Value Used in Risk Assessment**	**Citation MRID # /Date**	**Comment**
Acute Toxicity to Aquatic-Phase Amphibians	Green Frog (*Rana clamitans*) Gosner Stg 25	LC50: 6.5 mg formulation/L	46650501/2001	Supplemental Glyphosate IPA (Roundup Original with 15% POEA)
Acute Toxicity to Freshwater Invertebrates	Water flea (*Daphnia magna*)	48-hr EC_{50}: 3 ppm formulation	00162296/1979	Acceptable 30.3% Glyphosate IPA
Toxicity to Non-vascular Aquatic Plants	Freshwater diatom (*Navicula pelliculosa*)	96-hr EC_{50}: 0.39 ppm formulation	45666701/2001	Acceptable Glyphosate (glyphos) 31.0%
Toxicity to Non-vascular Aquatic Plants	Marine diatom (*Skeletonema costatum*)	96-hr EC_{50}: 0.34 ppm formulation	45666703/2001	Acceptable Glyphosate (glyphos) 31.0%
Toxicity to Vascular Aquatic Plants	Duckweed (*Lemna gibba*)	14-day EC_{50}: 4.9 ppm formulation	44125714/1984	Supplemental Glyphosate IPA salt (Roundup 41%)

Table 21 summarizes the most sensitive acute aquatic toxicity endpoints of the surfactant POEA. These endpoints will be used in comparison to the estimated EECs from spraydrift for the formulation.

Table 21. Acute Aquatic Toxicity Profile for POEA Surfactant						
Chemical	**Species**	**% a.i.[1]**	**96-hour LC_{50}/NOAEC (mg/L)/Slope**	**Toxicity Category[2]**	**MRID #/Year**	**Study Classification**
Polyoxy ethylene fatty amine (POEA)	Rainbow trout (*Oncorhynchus mykiss*)	100	LC_{50}: 1 (1.2 - 1.7)[3] NOAEC and slope not reported	Highly toxic	00162296/1979	Acceptable
Polyoxy ethylene fatty amine (POEA or MON 0818)	Green Frog (*Rana clamitans*) Gosner Stg 25	69-73	LC50: 2.2 (2.1-2.4) NOAEC: NR* Slope: NR	Moderately toxic	46650501/2001	Supplemental
MON 0818 (POEA)	Midge (*Chironomus plumosus*)	100	LC50: 13 (7.1-24.0)[2] NOAEC: N.R. Slope: N.R.	Slightly toxic	00162296/1979	Acceptable

Table 21. Acute Aquatic Toxicity Profile for POEA Surfactant						
Chemical	**Species**	**% a.i.[1]**	**96-hour LC_{50}/NOAEC (mg/L)/Slope**	**Toxicity Category[2]**	**MRID #/Year**	**Study Classification**

[1] a.i. = active ingredient, assumed 100% for technical material
[2]Based on LC_{50} (mg/L): < 0.1 very highly toxic; 0.1-1 highly toxic; >1-10 moderately toxic; >10-100 slightly toxic; >100 practically nontoxic
[3] Range is 95% confidence interval for endpoint.

2. Effects to Terrestrial Organisms

Table 22 summarizes the most sensitive terrestrial animal and plant endpoints for glyphosate.

Table 22. Terrestrial Toxicity Profile for Glyphosate/Salts

Endpoint	Species	Toxicity Value	Toxicity Category[1]	Citation MRID#/Date	Comment
Acute Avian Oral Toxicity	Bobwhite quail (*Colinus virginianus*)	LD_{50}: >3196 mg a.e./kg bw	Slightly toxic	00108204/1978	
Acute Avian Dietary Toxicity	Bobwhite quail (*Colinus virginianus*)	LC_{50}: >4971.2 PPM	Slightly toxic	44320628/1997	
Chronic Avian	Bobwhite quail (*Colinus virginianus*)	Reproduction study NOAEC: 830 PPM	N/A[2]	108207/1978	LOAEC: >830 PPM (highest concentration tested).
Acute mammalian	Rat (*rattus norvegicus*)	LD_{50} >4800 mg/kg bw	Practically non-toxic	43728003/1989	
Chronic mammalian	Rat (*rattus norvegicus*)	NOAEL: 500 mg/kg bw/day; NOAEC: 10000 ppm	N/A	41621501/1990	Reproduction study parental/pup LOAEL: 1500 mg/kg bw/day; LOAEC: 30000 ppm (soft stools, decreased body weight gain and food consumption in parents and decreased body weight gain during lactation in pups).
Acute terrestrial invertebrate	Honey bee (*Apis mellifera*)	48 hr LD_{50} (O): >100 µg/bee	Practically non-toxic	00026489/1972	
Terrestrial	Seedling	EC_{25}: >5 LB/A	N/A	40159301/1987	

Endpoint	Species	Toxicity Value	Toxicity Category[1]	Citation MRID#/Date	Comment
Plants	Emergence Monocots				
	Seedling Emergence Dicots	EC_{25}: > 5 LB/A	N/A	40159301/1987	
	Vegetative Vigor Monocots	EC_{25}: 0.16 LB/A	N/A	44125715/45045101/ 1995	
	Vegetative Vigor Dicots	EC_{25}: 0.074 LB/A	N/A	44320636/1996	

[1] Categories of **acute toxicity to terrestrial animals, avian and mammalian** (U.S. EPA, 2004). **LC_{50} (ppm):** < 50 very highly toxic; 50 - 500 highly toxic; 501 - 1000 moderately toxic; 1001-5000 slightly toxic; >5000 practically non-toxic. **LD_{50} (mg/kg bw)**: < 10 very highly toxic; 10 - 50 highly toxic; 51 - 500 moderately toxic; 501-2000 slightly toxic; >2000 practically non-toxic. Toxicity categories for terrestrial plants have not been defined.
[2] N/A = Not applicable

D. Risk Assessment Summary

Aquatic Species

1. Fish

Technical Glyphosate

Table 23 indicates that neither the acute nor chronic levels of concern (LOC) are exceeded for either freshwater fish or aquatic-phase amphibians with the highest estimated peak and 60-day average EEC values. The acute toxicity endpoint for freshwater fish was used to estimate risk for amphibians because it is a more conservative endpoint and fish are used as a surrogate for amphibians. Both chronic endpoints for freshwater fish and for aquatic-phase amphibians are used to estimate potential risk following chronic exposure because a chronic endpoint for amphibians is available and it is more conservative than the fish endpoint. For marine/estuarine fish, the acute LOC is not exceeded. Estimating a chronic toxicity value for marine/estuarine fish using an acute to chronic ratio would have considerable uncertainties because the freshwater fish acute and chronic toxicity studies were conducted with different species. However, even with the uncertainties, it is noted that the acute toxicity value for estuarine fish is approximately 6 times higher than for freshwater fish. Therefore, since neither the acute nor chronic LOCs were exceeded for freshwater fish, based on the weight of the evidence from the fish studies conducted with technical glyphosate, there is low concern for risk to estuarine/marine fish following chronic exposure.

Table 23. Technical Glyphosate: Summarized Acute and Chronic Fish Risk Quotients for Sweet Corn Use				
Scenario	**Freshwater Fish/Aquatic-Phase Amphibians (Acute)[1,2,4]**	**Freshwater Fish (Chronic)[1,2,4]**	**Estuarine/Marine Fish (Acute)[1,3,4]**	**Aquatic-Phase Amphibians (Chronic)[1,3,4]**
3.71 lb ae/A single application	<0.01	<0.01	<0.01	<0.01
3.71/1.15 lb ae/A 1(pre)/2(post)	<0.01	<0.01	<0.01	<0.01

[1] Single application of 3.71 lb a.e./A: peak EEC 8.439 µg a.e./L, 60-day average EEC 2.872 µg a.e./L. Multiple applications of 3.71 and/or 1.15 lb a.e./A: peak EEC 9.817 µg a.e./L, 60-day average EEC 3.477 µg a.e./L.
[2] Acute and chronic toxicity endpoints were 43000 µg a.e./L (LC_{50}) and 25700 µg a.e./L (NOAEC), respectively, for freshwater fish.
[3] Acute and chronic toxicity endpoints were 240000 µg/L (LC_{50}) and no chronic value (NOAEC), respectively, for estuarine/marine fish. Chronic toxicity endpoint for amphibians: 1800 µg/L (NOAEC).
[4] Risk Quotients are calculated using the following formulas: EEC/LC_{50} for acute exposure and EEC/NOAEC for chronic exposure
[5] Acute LOC for freshwater fish and aquatic-phase amphibians = 0.05 for endangered species, 0.1 for restricted use, and 0.5 for non-listed species

Glyphosate Formulation Containing the Surfactant POEA

Table 24 indicates that the acute LOCs are not exceeded for either freshwater fish or aquatic-phase amphibians following acute exposure to the formulation through spray drift. No aquatic toxicity data are available for marine/estuarine species on formulated products containing POEA. Chronic aquatic EECs were not estimated.

Table 24. Glyphosate Formulation with POEA: Summarized Acute Fish and Amphibian Risk Quotients for Sweet Corn Uses		
Scenario	**Freshwater Fish (Acute)[1,3,4]**	**Aquatic-Phase Amphibians(Acute)[2,3,4]**
9.35 lb formulation/A application	<0.01	<0.01

[1] Highest peak EEC is 2.12 µg formulation/L. The acute toxicity endpoint is 3170 µg formulation/L for freshwater fish.
[2] The acute toxicity endpoint is 6500 µg formulation/L for aquatic-phase amphibians.
[3] Risk Quotients are calculated using the following formula: EEC/LC_{50} for acute exposure
[4] Acute LOC for freshwater fish and aquatic-phase amphibians = 0.05 for endangered species, 0.1 for restricted use, and 0.5 for non-listed species.

POEA Only

Table 25 indicates that the acute LOCs are not exceeded for either freshwater fish or aquatic-phase amphibians following acute exposure to the surfactant through spray drift. No aquatic toxicity data on POEA are available for marine/estuarine species. Chronic aquatic EECs were not estimated.

Table 25. POEA: Summarized Acute Fish and Amphibian Risk Quotients for Sweet Corn Uses		
Scenario	**Freshwater Fish (Acute)[1,3,4]**	**Aquatic-Phase Amphibians(Acute)[2,3,4]**

Table 25. POEA: Summarized Acute Fish and Amphibian Risk Quotients for Sweet Corn Uses		
Scenario	**Freshwater Fish (Acute)[1,3,4]**	**Aquatic-Phase Amphibians(Acute)[2,3,4]**
9.35 lb formulation/A application	<0.01	<0.01

[1] Highest peak EEC for POEA based on spray drift is 0.318 µg POEA/L. The acute toxicity endpoint is 1000 µg POEA/L for freshwater fish.
[2] The acute toxicity endpoint is 2200 µg POEA/L for aquatic-phase amphibians.
[3] Risk Quotients are calculated using the following formula: EEC/LC_{50} for acute exposure
[4]Acute LOC for freshwater fish and aquatic-phase amphibians = 0.05 for endangered species, 0.1 for restricted use, and 0.5 for non-listed species.

2. Aquatic Invertebrates

Technical Glyphosate

Table 26 indicates that neither the acute nor chronic levels of concern (LOC) are exceeded for freshwater invertebrates. For marine/estuarine invertebrates, the acute LOC is not exceeded. Estimating a chronic toxicity value for marine/estuarine invertebrates using an acute to chronic ratio would have considerable uncertainties because the freshwater invertebrate acute and chronic toxicity studies were conducted with different species. However, even with the uncertainties, it is noted that the acute toxicity value for estuarine invertebrates is approximately 75% of the acute freshwater invertebrate value. Therefore, since the RQ for chronic exposure to freshwater invertebrates is <0.01 and neither the acute nor chronic LOCs were exceeded for freshwater invertebrates, based on the weight of the evidence from the invertebrate studies conducted with technical glyphosate, there is low concern for risk to estuarine/marine invertebrates following chronic exposure.

Table 26. Summarized Acute and Chronic Aquatic Invertebrates Risk Quotients for Sweet Corn				
Scenario	**Freshwater Inv. (Acute)[1,2,4]**	**Freshwater Inv. (Chronic)[1,2,4]**	**Estuarine/Marine Inv. (Acute)[1,3,4]**	**Estuarine/Marine Inv. (Chronic)[1,3,4]**
3.71 lb ae/A single application	<0.01	<0.01	<0.01	N/A
3.71/1.15 lb ae/A 1(pre)/2(post)	<0.01	<0.01	<0.01	N/A

[1] Single application of 3.71 lb a.e./A: peak EEC 8.439 µg a.e./L, 21-day average EEC 5.082 µg a.e./L. Multiple applications of 3.71 and/or 1.15 lb a.e./A: peak EEC 9.817 µg a.e./L, 21-day average EEC 5.954 µg a.e./L.
[2] Acute and chronic toxicity endpoints were 53200 µg a.e./L (LC_{50}) and 49900 µg a.e./L (NOAEC), respectively, for freshwater invertebrates.
[3] Acute and chronic toxicity endpoints were 40000 µg/L (LC_{50}) and no chronic value (NOAEC), respectively, for estuarine/marine invertebrates.
[4] Risk Quotients are calculated using the following formulas: EEC/LC_{50} for acute exposure and EEC/NOAEC for chronic exposure
[5]Acute LOC for freshwater and marine/estuarine invertebrates = 0.05 for endangered species, 0.1 for restricted use, and 0.5 for non-listed species

Glyphosate Formulation Containing the Surfactant POEA

Table 27 indicates that the acute LOC is not exceeded for freshwater invertebrates. No aquatic toxicity data are available for marine/estuarine species on formulated products containing POEA.

Chronic aquatic EECs were not estimated.

Table 27. Glyphosate Formulation with POEA: Summarized Acute Freshwater Invertebrate Risk Quotients for Sweet Corn Uses	
Scenario	**Freshwater Invertebrates[1,2,3]**
9.35 lb formulation/A application	<0.01

[1] Highest peak EEC is 2.12 µg formulation/L. The acute toxicity endpoint is 3000 µg formulation/L for freshwater invertebrates.
[2] Risk Quotients are calculated using the following formula: EEC/LC_{50} for acute exposure
[3]Acute LOC for freshwater fish and aquatic-phase amphibians = 0.05 for endangered species, 0.1 for restricted use, and 0.5 for non-listed species.

POEA Only

Table 28 indicates that the acute LOC for aquatic invertebrates is not exceeded following acute exposure to the surfactant through spray drift. No aquatic toxicity data are available for marine/estuarine species on POEA. Chronic aquatic EECs were not estimated.

Table 28. POEA: Summarized Acute Freshwater Invertebrate Risk Quotients for Sweet Corn Uses	
Scenario	**Freshwater Invertebrates[1,2,3]**
9.35 lb formulation/A application	<0.01

[1] Highest peak EEC for POEA based on spray drift is 0.318 µg POEA/L. The acute toxicity endpoint is 13000 µg POEA/L for freshwater invertebrates.
[2] Risk Quotients are calculated using the following formula: EEC/LC_{50} for acute exposure
[3]Acute LOC for freshwater invertebrates = 0.05 for endangered species, 0.1 for restricted use, and 0.5 for non-listed species.

3. Aquatic Plants

Technical Glyphosate

Table 29 indicates that the LOCs for aquatic non-vascular and vascular plants are not exceeded for the proposed use.

Table 29. Aquatic Plant Risk Quotients for Sweet Corn Uses		
Scenario	**Non-vascular Plants**	**Vascular Plants**
3.71 lb ae/A single application	RQ < 0.01	RQ < 0.01
3.71/1.15 lb ae/A 1(pre)/2(post)	RQ < 0.01	RQ < 0.01

Table 29. Aquatic Plant Risk Quotients for Sweet Corn Uses		
Scenario	**Non-vascular Plants**	**Vascular Plants**

[1] Single application of 3.71 lb a.e./A: peak EEC 8.439 µg a.e./L. Multiple applications of 3.71 and/or 1.15 lb a.e./A: peak EEC 9.817 µg a.e./L.
[2] Endpoints are 12100 µg a.e./L (EC_{50}) for non-vascular plants and 11900 µg a.e./L for vascular plants.
[3] Risk Quotients are calculated using the following formula: EEC/EC_{50}
[4] LOC for aquatic plants = 1

Glyphosate Formulation Containing the Surfactant POEA

Table 30 indicates that the aquatic plant LOC is not exceeded for either non-vascular or vascular plants.

Table 30. Glyphosate Formulation with POEA: Aquatic Plant Risk Quotients for Sweet Corn Uses[1,2,3]		
Scenario	**Non-vascular Plants**	**Vascular Plants**
9.35 lb formulation/A application	<0.01	<0.01

[1] Peak EEC is 2.12 µg formulation/L. The toxicity endpoint is 390 µg formulation/L for non-vascular plants and 4900 µg formulation/L for vascular plants.
[2] Risk Quotients are calculated using the following formula: EEC/EC_{50}
[3] LOC for aquatic plants = 1.

Terrestrial Species

4. Birds, Reptiles and Terrestrial-Phase Amphibians

There are no toxicity studies available for reptiles or terrestrial-phase amphibians. Therefore, birds are used as a surrogate. There were no mortalities in any of the available acute and subacute avian studies. Therefore, no RQs were calculated. The highest dose/concentrations tested in the acute/subacute avian studies were 3196.3 mg a.e./kg bodyweight (83% technical) and 4971.2 mg a.e./kg diet (95.6% technical), respectively, both with bobwhite quail. Using comparisons between the terrestrial EECs estimated from T-REX v. 1.4.1 (**Appendix B**) and the highest dose tested in the acute oral study, the results show that for all of the application rates, all of the EEC values are lower; however, for 20 g birds many of the EECs are greater than $1/10^{th}$ of the highest dose tested in the study. For 100 g birds, several EECs are greater than $1/10^{th}$ of the highest dose tested in the study at the 3.71 lbs/A rate and at the 1.15 lbs/A application rate when applied 4 times per year. For that reason, there is an uncertainty associated with listed avian species (the LOC for listed avian species is 0.1). For the subacute dietary-based EECs, again, several of the EEC values are greater than $1/10^{th}$ of the highest concentration tested with the 3.71 lbs/A application rate and with the 1.15 lbs/A rate that would be applied 4 times per season.

Following chronic exposure, the chronic LOC for birds (LOC = 1) is exceeded for short grass at the 3.71 lbs/A application rate (RQ = 1.07). However, it is noted that there were no effects at the highest concentration tested in the bobwhite quail reproduction study (e.g., the NOAEC is based on the highest concentration tested). In addition, no effects were observed in mallard ducks at the same concentration levels. Due to the fact that the RQ for short grass is slightly greater than the chronic avian LOC, there is a slight uncertainty for risk following chronic exposure.

5. Mammals

As with the avian acute toxicity studies, there were no mortalities in any of the available acute toxicity studies with mammals. Therefore, no RQs were calculated. If comparisons are made between the terrestrial EECs estimated from T-REX and the highest dose tested in the acute oral studies, the results show that all of the EEC values for all application rates are less than $1/10^{th}$ of the highest dose tested in the studies. Therefore, the uncertainties associated with the highest dose tested and the terrestrial EECs for listed species are minimal.

The chronic LOC for mammals is not exceeded, either on a dose- or a dietary basis for any of the food categories and for any of the application rates. The highest RQ is 0.77 for small mammals (15 gms) eating short grass at the 3.71 lbs/A application rate.

6. Terrestrial invertebrates

The acute contact LD_{50} for honey bees is >100 µg a.i./bee (MRID 00026489). Based on the acute contact toxicity study to honeybees, glyphosate is classified as practically non-toxic to honeybees. Thus, risk to terrestrial invertebrates is presumed to be negligible.

7. Terrestrial Plants

Terrestrial plants adjacent to the treatment area are considered in this assessment. Utilizing TERRPLANT v 1.2.2, none of the RQs for either listed or non-listed monocots or dicots exceed the LOC of 1 for terrestrial plants for any of the application rates when applied via ground application methods (**Appendix C**). However, when applied aerially, all of the application rates exceed for listed dicots through spray drift. At the highest application rate (3.71 lbs/A), the LOC for terrestrial plants is exceeded for both listed and non-listed monocots and dicots exposed via spray drift. The highest RQ is 3.79 for listed dicots exposed via spray drift.

References:

Diamond, G.L. and Durkin, P.R. 1997. Effects of Surfactants on the Toxicity of Glyphosate, with Specific Reference to RODEO. Syracuse Environmental Research Associates, Inc. Submitted to: Animal and Plant Health Inspection Service (APHIS), Biotechnology, Biologics and Environmental Protection, Environmental Analysis and Documentation, United States Department of Agriculture. SERA TR 97-206-1b. Page 18.

Appendix A

P/E Pre-plant

stored as KScopre.out
Chemical: glyphosate
PRZM environment: KSCornStd.txt modified Monday, 25 August 2008 at 15:45:08
EXAMS environment: pond298.exv modified Tueday, 26 August 2008 at 06:14:08
Metfile: w13996.dvf modified Tueday, 26 August 2008 at 06:14:52
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	8.558	7.45	4.874	2.757	2.126	0.7553
1962	2.373	2.003	1.166	0.7321	0.6048	0.3469
1963	7.349	6.39	3.927	2.173	1.655	0.5984
1964	2.252	1.908	1.117	0.625	0.4873	0.2549
1965	2.126	1.788	1.016	0.5718	0.4354	0.1785
1966	2.116	1.796	1.037	0.5471	0.4102	0.161
1967	5.98	5.306	3.368	1.971	1.528	0.5723
1968	2.302	2.015	1.606	0.9339	0.7229	0.3577
1969	5.431	4.661	2.879	1.731	1.342	0.5238
1970	2.254	1.915	1.373	0.8495	0.6587	0.3163
1971	3.178	2.803	1.925	1.175	0.9043	0.354
1972	6.465	5.563	3.407	1.955	1.518	0.5948
1973	6.116	5.296	3.327	2.007	1.555	0.6486
1974	2.269	1.935	1.42	0.8436	0.651	0.3284
1975	2.159	1.828	1.054	0.595	0.453	0.197
1976	2.469	2.133	1.643	0.9566	0.7278	0.2741
1977	11.74	9.926	5.95	3.261	2.495	0.9047
1978	2.712	2.459	1.843	1.133	0.8846	0.4626
1979	4.883	4.194	2.58	1.415	1.087	0.4363
1980	2.208	1.891	1.132	0.6753	0.509	0.2351
1981	3.036	2.661	2.2	1.41	1.083	0.4078
1982	9.187	7.914	5.944	3.435	2.67	1.022
1983	4.785	4.134	2.703	1.573	1.211	0.5844
1984	2.22	1.915	1.156	0.6909	0.533	0.2538
1985	4.643	3.932	2.512	1.363	1.035	0.3897
1986	7.37	6.686	5.105	2.885	2.203	0.8318
1987	4.345	3.808	2.443	1.386	1.072	0.5125
1988	2.216	1.964	1.248	0.7049	0.5399	0.2538
1989	6.235	5.353	3.313	1.942	1.503	0.57
1990	2.949	2.59	1.956	1.271	0.9827	0.4407

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly	
0.032258064516129	11.74	9.926	5.95	3.435	2.67	1.022	
0.0645161290322581	9.187	7.914	5.944	3.261	2.495	0.9047	
0.0967741935483871	8.558	7.45	5.105	2.885	2.203	0.8318	
0.129032258064516	7.37	6.686	4.874	2.757	2.126	0.7553	
0.161290322580645	7.349	6.39	3.927	2.173	1.655	0.6486	
0.193548387096774	6.465	5.563	3.407	2.007	1.555	0.5984	
0.225806451612903	6.235	5.353	3.368	1.971	1.528	0.5948	
0.258064516129032	6.116	5.306	3.327	1.955	1.518	0.5844	
0.290322580645161	5.98	5.296	3.313	1.942	1.503	0.5723	
0.32258064516129	5.431	4.661	2.879	1.731	1.342	0.57	
0.354838709677419	4.883	4.194	2.703	1.573	1.211	0.5238	
0.387096774193548	4.785	4.134	2.58	1.415	1.087	0.5125	
0.419354838709677	4.643	3.932	2.512	1.41	1.083	0.4626	
0.451612903225806	4.345	3.808	2.443	1.386	1.072	0.4407	
0.483870967741936	3.178	2.803	2.2	1.363	1.035	0.4363	
0.516129032258065	3.036	2.661	1.956	1.271	0.9827	0.4078	
0.548387096774194	2.949	2.59	1.925	1.175	0.9043	0.3897	
0.580645161290323	2.712	2.459	1.843	1.133	0.8846	0.3577	
0.612903225806452	2.469	2.133	1.643	0.9566	0.7278	0.354	
0.645161290322581	2.373	2.015	1.606	0.9339	0.7229	0.3469	
0.67741935483871	2.302	2.003	1.42	0.8495	0.6587	0.3284	
0.709677419354839	2.269	1.964	1.373	0.8436	0.651	0.3163	
0.741935483870968	2.254	1.935	1.248	0.7321	0.6048	0.2741	
0.774193548387097	2.252	1.915	1.166	0.7049	0.5399	0.2549	
0.806451612903226	2.22	1.915	1.156	0.6909	0.533	0.2538	

0.838709677419355	2.216	1.908	1.132	0.6753	0.509	0.2538
0.870967741935484	2.208	1.891	1.117	0.625	0.4873	0.2351
0.903225806451613	2.159	1.828	1.054	0.595	0.453	0.197
0.935483870967742	2.126	1.796	1.037	0.5718	0.4354	0.1785
0.967741935483871	2.116	1.788	1.016	0.5471	0.4102	0.161

0.1	8.4392	7.3736	5.0819	2.8722	2.1953	0.82415	
					Average of yearly averages:		0.458906666666666

Inputs generated by pe5.pl - Novemeber 2006

Data used for this run:
Output File: KScopre
Metfile: w13996.dvf
PRZM scenario: KSCornStd.txt
EXAMS environment file: pond298.exv
Chemical Name: glyphosate

Description	Variable Name		Value	Units	Comments
Molecular weight	mwt	170.8	g/mol		
Henry's Law Const.	henry	2.07E-14	atm-m^3/mol		
Vapor Pressure	vapr	9.75E-10	torr		
Solubility sol	12000	mg/L			
Kd Kd		mg/L			
Koc Koc	3100	mg/L			
Photolysis half-life	kdp		days	Half-life	
Aerobic Aquatic Metabolism		kbacw	14.1	days	Halfife
Anaerobic Aquatic Metabolism		kbacs	208	days	Halfife
Aerobic Soil Metabolism		asm	5.4	days	Halfife
Hydrolysis:	pH 7		days	Half-life	
Method: CAM	2	integer	See PRZM manual		
Incorporation Depth:	DEPI		cm		
Application Rate:	TAPP	4.155	kg/ha		
Application Efficiency:		APPEFF	0.99	fraction	
Spray Drift	DRFT	0.01	fraction of application rate applied to pond		
Application Date	Date	1-5	dd/mm or dd/mmm or dd-mm or dd-mmm		
Record 17: FILTRA					
IPSCND	1				
UPTKF					
Record 18: PLVKRT					
PLDKRT					
FEXTRC	0.5				
Flag for Index Res. Run		IR	EPA Pond		
Flag for runoff calc.	RUNOFF	none	none, monthly or total(average of entire run)		

P/E Post-plant

stored as KScopos.out
Chemical: glyphosate
PRZM environment: KSCornStd.txt modified Monday, 25 August 2008 at 15:45:08
EXAMS environment: pond298.exv modified Tueday, 26 August 2008 at 06:14:08
Metfile: w13996.dvf modified Tueday, 26 August 2008 at 06:14:52
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	2.257	1.958	1.646	1.061	0.8296	0.2962
1962	7.444	6.239	4.043	2.207	1.71	0.6819
1963	1.719	1.5	1.285	0.8929	0.7077	0.3806
1964	3.252	2.981	2.316	1.515	1.182	0.4807
1965	4.507	4.076	3.124	1.948	1.528	0.6618
1966	4.991	4.297	2.833	1.717	1.349	0.628
1967	5.881	5.083	3.859	2.587	2.04	0.8918
1968	2.629	2.252	1.864	1.344	1.088	0.5997
1969	4.223	3.62	2.619	1.787	1.411	0.6254
1970	5.809	5.157	3.592	2.266	1.781	0.7651
1971	2.134	1.874	1.618	1.108	0.8782	0.4576
1972	1.517	1.285	1.075	0.7182	0.5804	0.2773
1973	6.886	5.848	4.103	2.261	1.753	0.6768
1974	4.244	3.645	2.31	1.598	1.255	0.6027
1975	3.705	3.325	2.517	1.617	1.274	0.5732
1976	2.338	2.047	1.68	1.068	0.8359	0.3989
1977	5.622	4.943	3.622	2.824	2.186	0.8449
1978	6.982	6.474	3.954	2.392	1.882	0.8649
1979	1.986	1.721	1.344	1.036	0.8408	0.4719
1980	5.339	4.825	3.507	1.84	1.414	0.5793
1981	3.155	2.78	2.247	1.732	1.362	0.6008
1982	3.104	2.797	2.396	1.846	1.452	0.6385
1983	2.133	1.872	1.637	1.159	0.8982	0.4261
1984	5.854	5.036	3.197	2.02	1.572	0.6311
1985	5.272	4.682	2.831	1.75	1.377	0.635
1986	2.171	1.88	1.624	1.102	0.8708	0.4311
1987	3.86	3.271	2.343	1.397	1.097	0.4675
1988	2.285	2.044	1.554	1.187	0.9784	0.4487
1989	1.559	1.338	1.163	0.877	0.7075	0.3437
1990	2.933	2.546	2.165	1.528	1.191	0.4785

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly	
0.032258064516129	7.444	6.474	4.103	2.824	2.186	0.8918	
0.0645161290322581	6.982	6.239	4.043	2.587	2.04	0.8649	
0.0967741935483871	6.886	5.848	3.954	2.392	1.882	0.8449	
0.129032258064516	5.881	5.157	3.859	2.266	1.781	0.7651	
0.161290322580645	5.854	5.083	3.622	2.261	1.753	0.6819	
0.193548387096774	5.809	5.036	3.592	2.207	1.71	0.6768	
0.225806451612903	5.622	4.943	3.507	2.02	1.572	0.6618	
0.258064516129032	5.339	4.825	3.197	1.948	1.528	0.6385	
0.290322580645161	5.272	4.682	3.124	1.846	1.452	0.635	
0.32258064516129	4.991	4.297	2.833	1.84	1.414	0.6311	
0.354838709677419	4.507	4.076	2.831	1.787	1.411	0.628	
0.387096774193548	4.244	3.645	2.619	1.75	1.377	0.6254	
0.419354838709677	4.223	3.62	2.517	1.732	1.362	0.6027	
0.451612903225806	3.86	3.325	2.396	1.717	1.349	0.6008	
0.483870967741936	3.705	3.271	2.343	1.617	1.274	0.5997	
0.516129032258065	3.252	2.981	2.316	1.598	1.255	0.5793	
0.548387096774194	3.155	2.797	2.31	1.528	1.191	0.5732	
0.580645161290323	3.104	2.78	2.247	1.515	1.182	0.4807	
0.612903225806452	2.933	2.546	2.165	1.397	1.097	0.4785	
0.645161290322581	2.629	2.252	1.864	1.344	1.088	0.4719	
0.67741935483871	2.338	2.047	1.68	1.187	0.9784	0.4675	
0.709677419354839	2.285	2.044	1.646	1.159	0.8982	0.4576	
0.741935483870968	2.257	1.958	1.637	1.108	0.8782	0.4487	
0.774193548387097	2.171	1.88	1.624	1.102	0.8708	0.4311	
0.806451612903226	2.134	1.874	1.618	1.068	0.8408	0.4261	
0.838709677419355	2.133	1.872	1.554	1.061	0.8359	0.3989	
0.870967741935484	1.986	1.721	1.344	1.036	0.8296	0.3806	

0.903225806451613	1.719	1.5	1.285	0.8929	0.7077	0.3437	
0.935483870967742	1.559	1.338	1.163	0.877	0.7075	0.2962	
0.967741935483871	1.517	1.285	1.075	0.7182	0.5804	0.2773	
0.1	6.7855	5.7789	3.9445	2.3794	1.8719	0.83692	
					Average of yearly averages:		0.56199

Inputs generated by pe5.pl - Novemeber 2006

Data used for this run:
Output File: KScopos
Metfile: w13996.dvf
PRZM scenario: KSCornStd.txt
EXAMS environment file: pond298.exv
Chemical Name: glyphosate

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	170.8	g/mol	
Henry's Law Const.	henry	2.07E-14	atm-m^3/mol	
Vapor Pressure	vapr	9.75E-10	torr	
Solubility sol	12000	mg/L		
Kd Kd		mg/L		
Koc Koc	3100	mg/L		
Photolysis half-life	kdp		days	Half-life
Aerobic Aquatic Metabolism	kbacw	14.1	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	208	days	Halfife
Aerobic Soil Metabolism	asm	5.4	days	Halfife
Hydrolysis:	pH 7		days	Half-life
Method: CAM	2	integer	See PRZM manual	
Incorporation Depth:	DEPI		cm	
Application Rate:	TAPP	1.288	kg/ha	
Application Efficiency:		APPEFF	0.99	fraction
Spray Drift	DRFT	0.01	fraction of application rate applied to pond	
Application Date	Date	12-5	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1 interval	7	days	Set to 0 or delete line for single app.	
app. rate 1 apprate	1.288	kg/ha		
Interval 2 interval	7	days	Set to 0 or delete line for single app.	
app. rate 2 apprate	1.288	kg/ha		
Interval 3 interval	7	days	Set to 0 or delete line for single app.	
app. rate 3 apprate	1.288	kg/ha		
Record 17: FILTRA				
IPSCND	1			
UPTKF				
Record 18: PLVKRT				
PLDKRT				
FEXTRC	0.5			
Flag for Index Res. Run		IR	EPA Pond	
Flag for runoff calc.	RUNOFF	none	none, monthly or total(average of entire run)	

P/E Pre-plant (3.71 lbs ae/A)/Post-plant (1.15 lbs ae/A)

stored as KSpre1.out
Chemical: glyphosate
PRZM environment: KSCornStd.txt modified Monday, 25 August 2008 at 15:45:08
EXAMS environment: pond298.exv modified Tueday, 26 August 2008 at 06:14:08
Metfile: w13996.dvf modified Tueday, 26 August 2008 at 06:14:52
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	8.558	7.45	5.498	3.363	2.602	0.9292
1962	3.421	2.923	1.83	1.459	1.165	0.5984
1963	7.437	6.475	4.542	2.621	2.003	0.7606
1964	2.295	1.95	1.469	1.065	0.8306	0.4013
1965	2.179	1.838	1.38	1.145	0.8955	0.3721
1966	2.189	1.867	1.422	1.023	0.7939	0.3345
1967	6.035	5.361	3.867	2.618	2.066	0.8071
1968	2.487	2.193	2.022	1.38	1.078	0.531
1969	5.483	4.712	3.646	2.327	1.823	0.7263
1970	3.174	2.732	2.188	1.622	1.273	0.5724
1971	3.838	3.373	2.758	1.736	1.347	0.5545
1972	6.524	5.621	3.95	2.316	1.801	0.7252
1973	6.156	5.335	3.922	2.678	2.089	0.8623
1974	3.02	2.611	2.026	1.415	1.102	0.5299
1975	2.231	1.897	1.453	1.16	0.9022	0.392
1976	2.928	2.584	2.287	1.583	1.22	0.4819
1977	11.8	9.988	7.516	4.61	3.565	1.327
1978	3.436	3.088	2.315	1.898	1.506	0.7686
1979	4.989	4.297	3	1.797	1.392	0.5935
1980	2.7	2.355	1.824	1.387	1.063	0.452
1981	9.957	8.633	5.383	3.217	2.514	0.9748
1982	11.34	10.04	7.831	4.809	3.768	1.533
1983	4.973	4.316	3.4	2.284	1.772	0.8609
1984	2.879	2.522	1.711	1.363	1.075	0.488
1985	4.722	4.009	3.069	1.944	1.495	0.5976
1986	7.522	7.116	6.005	3.49	2.68	1.037
1987	4.407	3.869	2.813	1.899	1.479	0.6934
1988	2.598	2.341	1.729	1.247	0.9704	0.4365
1989	6.29	5.56	4.169	2.474	1.924	0.7524
1990	5.494	4.948	3.481	2.157	1.677	0.7171

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly	
0.032258064516129	11.8	10.04	7.831	4.809	3.768	1.533	
0.0645161290322581	11.34	9.988	7.516	4.61	3.565	1.327	
0.0967741935483871	9.957	8.633	6.005	3.49	2.68	1.037	
0.129032258064516	8.558	7.45	5.498	3.363	2.602	0.9748	
0.161290322580645	7.522	7.116	5.383	3.217	2.514	0.9292	
0.193548387096774	7.437	6.475	4.542	2.678	2.089	0.8623	
0.225806451612903	6.524	5.621	4.169	2.621	2.066	0.8609	
0.258064516129032	6.29	5.56	3.95	2.618	2.003	0.8071	
0.290322580645161	6.156	5.361	3.922	2.474	1.924	0.7686	
0.32258064516129	6.035	5.335	3.867	2.327	1.823	0.7606	
0.354838709677419	5.494	4.948	3.646	2.316	1.801	0.7524	
0.387096774193548	5.483	4.712	3.481	2.284	1.772	0.7263	
0.419354838709677	4.989	4.316	3.4	2.157	1.677	0.7252	
0.451612903225806	4.973	4.297	3.069	1.944	1.506	0.7171	
0.483870967741936	4.722	4.009	3	1.899	1.495	0.6934	
0.516129032258065	4.407	3.869	2.813	1.898	1.479	0.5984	
0.548387096774194	3.838	3.373	2.758	1.797	1.392	0.5976	
0.580645161290323	3.436	3.088	2.315	1.736	1.347	0.5935	
0.612903225806452	3.421	2.923	2.287	1.622	1.273	0.5724	
0.645161290322581	3.174	2.732	2.188	1.583	1.22	0.5545	
0.67741935483871	3.02	2.611	2.026	1.459	1.165	0.531	
0.709677419354839	2.928	2.584	2.022	1.415	1.102	0.5299	
0.741935483870968	2.879	2.522	1.83	1.387	1.078	0.488	
0.774193548387097	2.7	2.355	1.824	1.38	1.075	0.4819	
0.806451612903226	2.598	2.341	1.729	1.363	1.063	0.452	

0.838709677419355	2.487	2.193	1.711	1.247	0.9704	0.4365
0.870967741935484	2.295	1.95	1.469	1.16	0.9022	0.4013
0.903225806451613	2.231	1.897	1.453	1.145	0.8955	0.392
0.935483870967742	2.189	1.867	1.422	1.065	0.8306	0.3721
0.967741935483871	2.179	1.838	1.38	1.023	0.7939	0.3345

0.1	9.8171	8.5147	5.9543	3.4773	2.6722	1.03078	
					Average of yearly averages:		0.693683333333333

Inputs generated by pe5.pl - Novemeber 2006

Data used for this run:
Output File: KSpre1
Metfile: w13996.dvf
PRZM scenario: KSCornStd.txt
EXAMS environment file: pond298.exv
Chemical Name: glyphosate

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	170.8	g/mol	
Henry's Law Const.	henry	2.07E-14	atm-m^3/mol	
Vapor Pressure	vapr	9.75E-10	torr	
Solubility sol	12000	mg/L		
Kd Kd		mg/L		
Koc Koc	3100	mg/L		
Photolysis half-life	kdp		days	Half-life
Aerobic Aquatic Metabolism	kbacw	14.1	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	208	days	Halfife
Aerobic Soil Metabolism	asm	5.4	days	Halfife
Hydrolysis:	pH 7		days	Half-life
Method: CAM	2	integer	See PRZM manual	
Incorporation Depth:	DEPI		cm	
Application Rate:	TAPP	4.155	kg/ha	
Application Efficiency:		APPEFF	0.99	fraction
Spray Drift	DRFT	0.01	fraction of application rate applied to pond	
Application Date	Date	1-5	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1 interval	10	days	Set to 0 or delete line for single app.	
app. rate 1 apprate	1.288	kg/ha		
Interval 2 interval	7	days	Set to 0 or delete line for single app.	
app. rate 2 apprate	1.288	kg/ha		
Record 17: FILTRA				
IPSCND	1			
UPTKF				
Record 18: PLVKRT				
PLDKRT				
FEXTRC	0.5			
Flag for Index Res. Run		IR	EPA Pond	
Flag for runoff calc.	RUNOFF	none	none, monthly or total(average of entire run)	

P/E Pre-plant (1.35 lbs ae/A)/Post-plant (1.15 lbs ae/A)

stored as KSpos1.out
Chemical: glyphosate
PRZM environment: KSCornStd.txt modified Monday, 25 August 2008 at 15:45:08
EXAMS environment: pond298.exv modified Tueday, 26 August 2008 at 06:14:08
Metfile: w13996.dvf modified Tueday, 26 August 2008 at 06:14:52
Water segment concentrations (ppb)

Year	Peak	96 hr	21 Day	60 Day	90 Day	Yearly
1961	3.352	3.056	2.567	2.015	1.581	0.5748
1962	7.207	6.062	3.985	2.245	1.777	0.7787
1963	2.969	2.608	2.283	1.706	1.342	0.6012
1964	3.152	2.899	2.287	1.602	1.281	0.56
1965	4.277	3.864	3.041	1.94	1.55	0.688
1966	4.731	4.083	2.72	1.764	1.415	0.6564
1967	5.89	5.128	4.021	2.926	2.426	1.059
1968	2.624	2.271	1.991	1.609	1.329	0.7139
1969	4.276	3.705	2.739	2.235	1.811	0.7944
1970	5.603	5.008	3.56	2.42	1.908	0.8489
1971	2.69	2.375	2.041	1.51	1.209	0.5808
1972	2.528	2.201	1.98	1.429	1.145	0.5013
1973	6.957	5.949	4.371	2.742	2.178	0.8867
1974	4.13	3.57	2.351	1.799	1.443	0.7052
1975	3.584	3.224	2.513	1.703	1.368	0.6259
1976	2.783	2.447	2.017	1.386	1.101	0.4982
1977	7.086	6.245	4.536	3.607	2.882	1.126
1978	7.85	6.82	4.127	2.536	2.051	0.9792
1979	2.124	1.865	1.631	1.47	1.224	0.6137
1980	5.483	4.853	3.475	1.932	1.496	0.6393
1981	8.593	7.443	5.072	3.188	2.491	1.026
1982	7.152	6.245	4.884	3.617	2.864	1.243
1983	2.86	2.543	2.328	1.766	1.411	0.7021
1984	5.741	4.957	3.201	2.081	1.66	0.7105
1985	5.222	4.665	2.916	2.095	1.689	0.7603
1986	4.124	3.702	3.129	2.132	1.697	0.7426
1987	4.037	3.458	2.529	1.774	1.428	0.6452
1988	2.447	2.114	1.758	1.309	1.135	0.5335
1989	3.28	2.854	2.346	1.683	1.355	0.5898
1990	4.19	3.802	2.932	1.965	1.554	0.6605

Sorted results

Prob.	Peak	96 hr	21 Day	60 Day	90 Day	Yearly	
0.032258064516129	8.593	7.443	5.072	3.617	2.882	1.243	
0.0645161290322581	7.85	6.82	4.884	3.607	2.864	1.126	
0.0967741935483871	7.207	6.245	4.536	3.188	2.491	1.059	
0.129032258064516	7.152	6.245	4.371	2.926	2.426	1.026	
0.161290322580645	7.086	6.062	4.127	2.742	2.178	0.9792	
0.193548387096774	6.957	5.949	4.021	2.536	2.051	0.8867	
0.225806451612903	5.89	5.128	3.985	2.42	1.908	0.8489	
0.258064516129032	5.741	5.008	3.56	2.245	1.811	0.7944	
0.290322580645161	5.603	4.957	3.475	2.235	1.777	0.7787	
0.32258064516129	5.483	4.853	3.201	2.132	1.697	0.7603	
0.354838709677419	5.222	4.665	3.129	2.095	1.689	0.7426	
0.387096774193548	4.731	4.083	3.041	2.081	1.66	0.7139	
0.419354838709677	4.277	3.864	2.932	2.015	1.581	0.7105	
0.451612903225806	4.276	3.802	2.916	1.965	1.554	0.7052	
0.483870967741936	4.19	3.705	2.739	1.94	1.55	0.7021	
0.516129032258065	4.13	3.702	2.72	1.932	1.496	0.688	
0.548387096774194	4.124	3.57	2.567	1.799	1.443	0.6605	
0.580645161290323	4.037	3.458	2.529	1.774	1.428	0.6564	
0.612903225806452	3.584	3.224	2.513	1.766	1.415	0.6452	
0.645161290322581	3.352	3.056	2.351	1.764	1.411	0.6393	
0.67741935483871	3.28	2.899	2.346	1.706	1.368	0.6259	
0.709677419354839	3.152	2.854	2.328	1.703	1.355	0.6137	
0.741935483870968	2.969	2.608	2.287	1.683	1.342	0.6012	
0.774193548387097	2.86	2.543	2.283	1.609	1.329	0.5898	
0.806451612903226	2.783	2.447	2.041	1.602	1.281	0.5808	
0.838709677419355	2.69	2.375	2.017	1.51	1.224	0.5748	

0.870967741935484	2.624	2.271	1.991	1.47	1.209	0.56	
0.903225806451613	2.528	2.201	1.98	1.429	1.145	0.5335	
0.935483870967742	2.447	2.114	1.758	1.386	1.135	0.5013	
0.967741935483871	2.124	1.865	1.631	1.309	1.101	0.4982	
0.1	7.2015	6.245	4.5195	3.1618	2.4845	1.0557	
					Average of yearly averages:		0.734836666666667

Inputs generated by pe5.pl - Novemeber 2006

Data used for this run:
Output File: KSpos1
Metfile: w13996.dvf
PRZM scenario: KSCornStd.txt
EXAMS environment file: pond298.exv
Chemical Name: glyphosate

Description	Variable Name	Value	Units	Comments
Molecular weight	mwt	170.8	g/mol	
Henry's Law Const.	henry	2.07E-14	atm-m^3/mol	
Vapor Pressure	vapr	9.75E-10	torr	
Solubility sol	12000	mg/L		
Kd Kd		mg/L		
Koc Koc	3100	mg/L		
Photolysis half-life	kdp		days	Half-life
Aerobic Aquatic Metabolism	kbacw	14.1	days	Halfife
Anaerobic Aquatic Metabolism	kbacs	208	days	Halfife
Aerobic Soil Metabolism	asm	5.4	days	Halfife
Hydrolysis:	pH 7		days	Half-life
Method: CAM	2	integer	See PRZM manual	
Incorporation Depth:	DEPI		cm	
Application Rate:	TAPP	1.54	kg/ha	
Application Efficiency:		APPEFF	0.99	fraction
Spray Drift	DRFT	0.01	fraction of application rate applied to pond	
Application Date	Date	1-5	dd/mm or dd/mmm or dd-mm or dd-mmm	
Interval 1 interval	10	days	Set to 0 or delete line for single app.	
app. rate 1 apprate	1.54	kg/ha		
Interval 2 interval	7	days	Set to 0 or delete line for single app.	
app. rate 2 apprate	1.288	kg/ha		
Interval 3 interval	7	days	Set to 0 or delete line for single app.	
app. rate 3 apprate	1.288	kg/ha		
Interval 4 interval	7	days	Set to 0 or delete line for single app.	
app. rate 4 apprate	1.288	kg/ha		
Record 17: FILTRA				
IPSCND	1			
UPTKF				
Record 18: PLVKRT				
PLDKRT				
FEXTRC	0.5			
Flag for Index Res. Run		IR	EPA Pond	
Flag for runoff calc.	RUNOFF	none	none, monthly or total(average of entire run)	

APPENDIX B
T-REX v. 1.4.1

Summary of Risk Quotient Calculations Based on Upper Bound Kenaga EECs
3.71 lbs/A Application

Table B-1. Upper Bound Kenaga, Acute Avian Dose-Based Risk Quotients

Size Class (grams)	Adjusted LD50	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
20	2302.49	1014.08	0.44	464.79	0.20	570.42	0.25	63.38	0.03	14.08	0.01
100	2931.19	578.27	0.20	265.04	0.09	325.28	0.11	36.14	0.01	8.03	0.00
1000	4140.41	258.90	0.06	118.66	0.03	145.63	0.04	16.18	0.00	3.60	0.00

Table B-2. Upper Bound Kenaga, Subacute Avian Dietary Based Risk Quotients

	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
LC50	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
4971	890.40	0.18	408.10	0.08	500.85	0.10	55.65	0.01

Size class not used for dietary risk quotients

Table B-3. Upper Bound Kenaga, Chronic Avian Dietary Based Risk Quotients

	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
NOAEC (ppm)	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
830	890.40	1.07	408.10	0.49	500.85	0.60	55.65	0.07

Size class not used for dietary risk quotients

Table B-4. Upper Bound Kenaga, Acute Mammalian Dose-Based Risk Quotients

Size Class (grams)	Adjusted LD50	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
15	10549.59	848.93	0.08	389.09	0.04	477.52	0.05	53.06	0.01	11.79	0.00
35	8535.74	586.72	0.07	268.91	0.03	330.03	0.04	36.67	0.00	8.15	0.00
1000	3691.97	136.03	0.04	62.35	0.02	76.52	0.02	8.50	0.00	1.89	0.00

Table B-5. Upper Bound Kenaga, Acute Mammalian Dietary Based Risk Quotients

	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
LC50 (ppm)	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
0	890.40	#####	408.10	#####	500.85	#DIV/0!	55.65	#####

Size class not used for dietary risk quotients

Table B-6. Upper Bound Kenaga, Chronic Mammalian Dietary Based Risk Quotients								
NOAEC (ppm)	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
10000	890.40	0.09	408.10	0.04	500.85	0.05	55.65	0.01

Size class not used for dietary risk quotients

Table B-7. Upper Bound Kenaga, Chronic Mammalian Dose-Based Risk Quotients											
Size Class (grams)	Adjusted NOAEL	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
15	1098.92	848.93	0.77	389.09	0.35	477.52	0.43	53.06	0.05	11.79	0.01
35	889.14	586.72	0.66	268.91	0.30	330.03	0.37	36.67	0.04	8.15	0.01
1000	384.58	136.03	0.35	62.35	0.16	76.52	0.20	8.50	0.02	1.89	0.00

Summary of Risk Quotient Calculations Based on Upper Bound Kenaga EECs 1.15 lbs/A 2 applications

Table B-8. Upper Bound Kenaga, Acute Avian Dose-Based Risk Quotients											
Size Class (grams)	Adjusted LD50	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
20	2302.49	471.50	0.20	216.11	0.09	265.22	0.12	29.47	0.01	6.55	0.00
100	2931.19	268.87	0.09	123.23	0.04	151.24	0.05	16.80	0.01	3.73	0.00
1000	4140.41	120.38	0.03	55.17	0.01	67.71	0.02	7.52	0.00	1.67	0.00

Table B-9. Upper Bound Kenaga, Subacute Avian Dietary Based Risk Quotients

	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
LC50	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
4971	414.00	0.08	189.75	0.04	232.88	0.05	25.88	0.01

Size class not used for dietary risk quotients

Table B-10. Upper Bound Kenaga, Chronic Avian Dietary Based Risk Quotients

	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
NOAEC (ppm)	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
830	414.00	0.50	189.75	0.23	232.88	0.28	25.88	0.03

Size class not used for dietary risk quotients

Table B-11. Upper Bound Kenaga, Acute Mammalian Dose-Based Risk Quotients

Size Class (grams)	Adjusted LD50	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
15	10549.59	394.72	0.04	180.91	0.02	222.03	0.02	24.67	0.00	5.48	0.00
35	8535.74	272.80	0.03	125.03	0.01	153.45	0.02	17.05	0.00	3.79	0.00
1000	3691.97	63.25	0.02	28.99	0.01	35.58	0.01	3.95	0.00	0.88	0.00

Table B-12. Upper Bound Kenaga, Acute Mammalian Dietary Based Risk Quotients

	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
LC50 (ppm)	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
0	414.00	#####	189.75	#####	232.88	#DIV/0!	25.88	#####

Size class not used for dietary risk quotients

Table B-13. Upper Bound Kenaga, Chronic Mammalian Dietary Based Risk Quotients

	EECs and RQs							
NOAEC (ppm)	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
10000	414.00	0.04	189.75	0.02	232.88	0.02	25.88	0.00

Size class not used for dietary risk quotients

Table B-14. Upper Bound Kenaga, Chronic Mammalian Dose-Based Risk Quotients

Size Class (grams)	Adjusted NOAEL	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
15	1098.92	394.72	0.36	180.91	0.16	222.03	0.20	24.67	0.02	5.48	0.00
35	889.14	272.80	0.31	125.03	0.14	153.45	0.17	17.05	0.02	3.79	0.00
1000	384.58	63.25	0.16	28.99	0.08	35.58	0.09	3.95	0.01	0.88	0.00

Summary of Risk Quotient Calculations Based on Upper Bound Kenaga EECs
1.15 lbs/A 4 applications/year

Table B-15. Upper Bound Kenaga, Acute Avian Dose-Based Risk Quotients

Size Class (grams)	Adjusted LD50	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
20	2302.49	589.38	0.26	270.13	0.12	331.53	0.14	36.84	0.02	8.19	0.00
100	2931.19	336.09	0.11	154.04	0.05	189.05	0.06	21.01	0.01	4.67	0.00
1000	4140.41	150.47	0.04	68.97	0.02	84.64	0.02	9.40	0.00	2.09	0.00

Table B-16. Upper Bound Kenaga, Subacute Avian Dietary Based Risk Quotients

	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
LC50	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
4971	517.50	0.10	237.19	0.05	291.09	0.06	32.34	0.01

Size class not used for dietary risk quotients

Table B-17. Upper Bound Kenaga, Chronic Avian Dietary Based Risk Quotients

	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
NOAEC (ppm)	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
830	517.50	0.62	237.19	0.29	291.09	0.35	32.34	0.04

Size class not used for dietary risk quotients

Table B-18. Upper Bound Kenaga, Acute Mammalian Dose-Based Risk Quotients

Size Class (grams)	Adjusted LD50	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
15	10549.59	493.40	0.05	226.14	0.02	277.54	0.03	30.84	0.00	6.85	0.00
35	8535.74	341.00	0.04	156.29	0.02	191.81	0.02	21.31	0.00	4.74	0.00
1000	3691.97	79.06	0.02	36.24	0.01	44.47	0.01	4.94	0.00	1.10	0.00

Table B-19. Upper Bound Kenaga, Acute Mammalian Dietary Based Risk Quotients

LC50 (ppm)	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
0	517.50	#####	237.19	#####	291.09	#DIV/0!	32.34	#####

Size class not used for dietary risk quotients

Table B-20. Upper Bound Kenaga, Chronic Mammalian Dietary Based Risk Quotients

NOAEC (ppm)	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
10000	517.50	0.05	237.19	0.02	291.09	0.03	32.34	0.00

Size class not used for dietary risk quotients

Table B-21. Upper Bound Kenaga, Chronic Mammalian Dose-Based Risk Quotients

Size Class (grams)	Adjusted NOAEL	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
15	1098.92	493.40	0.45	226.14	0.21	277.54	0.25	30.84	0.03	6.85	0.01
35	889.14	341.00	0.38	156.29	0.18	191.81	0.22	21.31	0.02	4.74	0.01
1000	384.58	79.06	0.21	36.24	0.09	44.47	0.12	4.94	0.01	1.10	0.00

Summary of Risk Quotient Calculations Based on Upper Bound Kenaga EECs
1.35 lbs/A 1 application/year

Table B-22. Upper Bound Kenaga, Acute Avian Dose-Based Risk Quotients

Size Class (grams)	Adjusted LD50	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
20	2302.49	369.00	0.16	169.13	0.07	207.56	0.09	23.06	0.01	5.13	0.00
100	2931.19	210.42	0.07	96.44	0.03	118.36	0.04	13.15	0.00	2.92	0.00
1000	4140.41	94.21	0.02	43.18	0.01	52.99	0.01	5.89	0.00	1.31	0.00

Table B-23. Upper Bound Kenaga, Subacute Avian Dietary Based Risk Quotients

	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
LC50	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
4971	324.00	0.07	148.50	0.03	182.25	0.04	20.25	0.00

Size class not used for dietary risk quotients

Table B-24. Upper Bound Kenaga, Chronic Avian Dietary Based Risk Quotients

	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
NOAEC (ppm)	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
830	324.00	0.39	148.50	0.18	182.25	0.22	20.25	0.02

Size class not used for dietary risk quotients

Table B-25. Upper Bound Kenaga, Acute Mammalian Dose-Based Risk Quotients

Size Class (grams)	Adjusted LD50	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
15	10549.59	308.91	0.03	141.58	0.01	173.76	0.02	19.31	0.00	4.29	0.00
35	8535.74	213.50	0.03	97.85	0.01	120.09	0.01	13.34	0.00	2.97	0.00
1000	3691.97	49.50	0.01	22.69	0.01	27.84	0.01	3.09	0.00	0.69	0.00

Table B-26. Upper Bound Kenaga, Acute Mammalian Dietary Based Risk Quotients

LC50 (ppm)	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
0	324.00	#####	148.50	#####	182.25	#DIV/0!	20.25	#####

Size class not used for dietary risk quotients

Table B-27. Upper Bound Kenaga, Chronic Mammalian Dietary Based Risk Quotients

NOAEC (ppm)	EECs and RQs							
	Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects	
	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
10000	324.00	0.03	148.50	0.01	182.25	0.02	20.25	0.00

Size class not used for dietary risk quotients

Table B-28. Upper Bound Kenaga, Chronic Mammalian Dose-Based Risk Quotients

Size Class (grams)	Adjusted NOAEL	EECs and RQs									
		Short Grass		Tall Grass		Broadleaf Plants/ Small Insects		Fruits/Pods/ Seeds/ Large Insects		Granivore	
		EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ	EEC	RQ
15	1098.92	308.91	0.28	141.58	0.13	173.76	0.16	19.31	0.02	4.29	0.00
35	889.14	213.50	0.24	97.85	0.11	120.09	0.14	13.34	0.02	2.97	0.00
1000	384.58	49.50	0.13	22.69	0.06	27.84	0.07	3.09	0.01	0.69	0.00

APPENDIX C
TERRPLANT v. 1.2.2

Table C-1. Chemical Identity.	
Chemical Name	**Glyphosate Potassium Salt**
PC code	**103613**
Use	**Sweet Corn**
Application Method	**Ground**
Application Form	**Liquid**
Solubility in Water (ppm)	12,000

Table C-2. Input parameters used to derive EECs.			
Input Parameter	**Symbol**	**Value**	**Units**
Application Rate	A	**1.15**	**lb a.e./A**
Incorporation	I	**1**	none
Runoff Fraction	R	**0.05**	none
Drift Fraction	D	**0.01**	none

Table C-3. EECs for Glyphosate IPA salt. Units in lb a.e./A.		
Description	**Equation**	**EEC**
Runoff to dry areas	(A/I)*R	0.0575
Runoff to semi-aquatic areas	(A/I)*R*10	0.575
Spray drift	**A*D**	**0.0115**
Total for dry areas	**((A/I)*R)+(A*D)**	**0.069**
Total for semi-aquatic areas	**((A/I)*R*10)+(A*D)**	**0.5865**

Table C-4. Plant survival and growth data used for RQ derivation. Units are in lb a.e./A.				
	Seedling Emergence		**Vegetative Vigor**	
Plant type	**EC_{25}**	**NOAEC**	**EC_{25}**	**NOAEC**
Monocot	5	5	**0.16**	0.07
Dicot	5	5	0.074	0.049

Table C-5. RQ values for plants in dry and semi-aquatic areas exposed to Glyphosate IPA salt through runoff and/or spray drift.*				
Plant Type	**Listed Status**	**Dry**	**Semi-Aquatic**	**Spray Drift**
Monocot	non-listed	<0.1	0.12	<0.1
Monocot	listed	<0.1	0.12	0.16
Dicot	non-listed	<0.1	0.12	0.16
Dicot	listed	<0.1	0.12	0.23
*If RQ > 1.0, the LOC is exceeded, resulting in potential for risk to that plant group.				

Table C-6. Chemical Identity.	
Chemical Name	**Glyphosate potassium salt**
PC code	**103613**
Use	**Sweet Corn**
Application Method	**aerial**
Application Form	**liquid**
Solubility in Water (ppm)	**12,000**

Table C-7. Input parameters used to derive EECs.			
Input Parameter	**Symbol**	**Value**	**Units**
Application Rate	A	1.15	lb a.e./A
Incorporation	I	1	none
Runoff Fraction	R	0.05	none
Drift Fraction	D	0.05	none

Table C-8. EECs for Glyphosate IPA salt. Units in lb a.e./A.		
Description	**Equation**	**EEC**
Runoff to dry areas	(A/I)*R	0.0575
Runoff to semi-aquatic areas	(A/I)*R*10	0.575
Spray drift	**A*D**	**0.0575**
Total for dry areas	**((A/I)*R)+(A*D)**	**0.115**
Total for semi-aquatic areas	**((A/I)*R*10)+(A*D)**	**0.6325**

Table C-9. Plant survival and growth data used for RQ derivation. Units are in lb a.e./A.				
	Seedling Emergence		**Vegetative Vigor**	
Plant type	**EC_{25}**	**NOAEC**	**EC_{25}**	**NOAEC**
Monocot	5	5	0.16	0.07
Dicot	5	5	0.074	0.049

Table C-10. RQ values for plants in dry and semi-aquatic areas exposed to Glyphosate IPA salt through runoff and/or spray drift.*				
Plant Type	**Listed Status**	**Dry**	**Semi-Aquatic**	**Spray Drift**
Monocot	non-listed	<0.1	0.13	0.36
Monocot	listed	<0.1	0.13	0.82
Dicot	non-listed	<0.1	0.13	0.78
Dicot	listed	<0.1	0.13	1.17
*If RQ > 1.0, the LOC is exceeded, resulting in potential for risk to that plant group.				

Table C-11. Chemical Identity.	
Chemical Name	**Glyphosate potassium salt**
PC code	**103613**
Use	**Sweet Corn**
Application Method	**ground**
Application Form	**liquid**
Solubility in Water (ppm)	**12,000**

Table C-12. Input parameters used to derive EECs.			
Input Parameter	**Symbol**	**Value**	**Units**
Application Rate	A	3.71	lb a.e./A
Incorporation	I	1	none
Runoff Fraction	R	0.05	none
Drift Fraction	D	0.01	none

Table C-13. EECs for Glyphosate IPA salt. Units in lb a.e./A.		
Description	**Equation**	**EEC**
Runoff to dry areas	(A/I)*R	0.1855
Runoff to semi-aquatic areas	(A/I)*R*10	1.855
Spray drift	**A*D**	**0.0371**
Total for dry areas	**((A/I)*R)+(A*D)**	**0.2226**
Total for semi-aquatic areas	**((A/I)*R*10)+(A*D)**	**1.8921**

Table C-14. Plant survival and growth data used for RQ derivation. Units are in lb a.e./A.				
	Seedling Emergence		**Vegetative Vigor**	
Plant type	**EC_{25}**	**NOAEC**	**EC_{25}**	**NOAEC**
Monocot	5	5	0.16	0.07
Dicot	5	5	0.074	0.049

Table C-15. RQ values for plants in dry and semi-aquatic areas exposed to Glyphosate IPA salt through runoff and/or spray drift.*				
Plant Type	**Listed Status**	**Dry**	**Semi-Aquatic**	**Spray Drift**
Monocot	non-listed	<0.1	0.38	0.23
Monocot	listed	<0.1	0.38	0.53
Dicot	non-listed	<0.1	0.38	0.50
Dicot	listed	<0.1	0.38	0.76
*If RQ > 1.0, the LOC is exceeded, resulting in potential for risk to that plant group.				

Table C-16. Chemical Identity.	
Chemical Name	**Glyphosate potassium salt**
PC code	**103613**
Use	**Sweet Corn**
Application Method	**Aerial**
Application Form	**liquid**
Solubility in Water (ppm)	**12,000**

Table C-17. Input parameters used to derive EECs.			
Input Parameter	**Symbol**	**Value**	**Units**
Application Rate	A	3.71	lb a.e./A
Incorporation	I	1	none
Runoff Fraction	R	0.05	none
Drift Fraction	D	0.05	none

Table C-18. EECs for Glyphosate IPA salt. Units in lb a.e./A.		
Description	**Equation**	**EEC**
Runoff to dry areas	(A/I)*R	0.1855
Runoff to semi-aquatic areas	(A/I)*R*10	1.855
Spray drift	**A*D**	**0.1855**
Total for dry areas	**((A/I)*R)+(A*D)**	**0.371**
Total for semi-aquatic areas	**((A/I)*R*10)+(A*D)**	**2.0405**

Table C-19. Plant survival and growth data used for RQ derivation. Units are in lb a.e./A.				
	Seedling Emergence		**Vegetative Vigor**	
Plant type	**EC_{25}**	**NOAEC**	**EC_{25}**	**NOAEC**
Monocot	5	5	**0.16**	**0.07**
Dicot	5	5	**0.074**	**0.049**

Table C-20. RQ values for plants in dry and semi-aquatic areas exposed to Glyphosate IPA salt through runoff and/or spray drift.*				
Plant Type	**Listed Status**	**Dry**	**Semi-Aquatic**	**Spray Drift**
Monocot	non-listed	<0.1	0.41	1.16
Monocot	listed	<0.1	0.41	2.65
Dicot	non-listed	<0.1	0.41	2.51
Dicot	listed	<0.1	0.41	3.79
*If RQ > 1.0, the LOC is exceeded, resulting in potential for risk to that plant group.				

Table 21. Chemical Identity.	
Chemical Name	**Glyphosate potassium salt**
PC code	**103613**
Use	**Sweet Corn**
Application Method	**Ground**
Application Form	**Liquid**
Solubility in Water (ppm)	**12,000**

Table C-22. Input parameters used to derive EECs.			
Input Parameter	**Symbol**	**Value**	**Units**
Application Rate	A	1.35	lb a.e./A
Incorporation	I	1	none
Runoff Fraction	R	0.05	none
Drift Fraction	D	0.01	none

Table C-23. EECs for Glyphosate IPA salt. Units in lb a.e./A.		
Description	**Equation**	**EEC**
Runoff to dry areas	(A/I)*R	0.0675
Runoff to semi-aquatic areas	(A/I)*R*10	0.675
Spray drift	**A*D**	**0.0135**
Total for dry areas	**((A/I)*R)+(A*D)**	**0.081**
Total for semi-aquatic areas	**((A/I)*R*10)+(A*D)**	**0.6885**

Table C-24. Plant survival and growth data used for RQ derivation. Units are in lb a.e./A.				
	Seedling Emergence		**Vegetative Vigor**	
Plant type	**EC_{25}**	**NOAEC**	**EC_{25}**	**NOAEC**
Monocot	5	5	0.16	0.07
Dicot	5	5	0.074	0.049

Table C-25. RQ values for plants in dry and semi-aquatic areas exposed to Glyphosate IPA salt through runoff and/or spray drift.*				
Plant Type	**Listed Status**	**Dry**	**Semi-Aquatic**	**Spray Drift**
Monocot	Non-listed	<0.1	0.14	<0.1
Monocot	listed	<0.1	0.14	0.19
Dicot	Non-listed	<0.1	0.14	0.18
Dicot	listed	<0.1	0.14	0.28
*If RQ > 1.0, the LOC is exceeded, resulting in potential for risk to that plant group.				

Table C-26. Chemical Identity.	
Chemical Name	**Glyphosate potassium salt**
PC code	**103613**
Use	**Sweet Corn**
Application Method	**Aerial**
Application Form	**Liquid**
Solubility in Water (ppm)	**12,000**

Table C-27. Input parameters used to derive EECs.			
Input Parameter	**Symbol**	**Value**	**Units**
Application Rate	A	1.35	lb a.e./A
Incorporation	I	1	none
Runoff Fraction	R	0.05	none
Drift Fraction	D	0.05	none

Table C-28. EECs for Glyphosate IPA salt. Units in lb a.e./A.		
Description	**Equation**	**EEC**
Runoff to dry areas	(A/I)*R	0.0675
Runoff to semi-aquatic areas	(A/I)*R*10	0.675
Spray drift	**A*D**	**0.0675**
Total for dry areas	**((A/I)*R)+(A*D)**	**0.135**
Total for semi-aquatic areas	**((A/I)*R*10)+(A*D)**	**0.7425**

Table C-29. Plant survival and growth data used for RQ derivation. Units are in lb a.e./A.				
	Seedling Emergence		**Vegetative Vigor**	
Plant type	**EC_{25}**	**NOAEC**	**EC_{25}**	**NOAEC**
Monocot	5	5	**0.16**	**0.07**
Dicot	5	5	**0.074**	**0.049**

Table C-30. RQ values for plants in dry and semi-aquatic areas exposed to Glyphosate IPA salt through runoff and/or spray drift.*				
Plant Type	**Listed Status**	**Dry**	**Semi-Aquatic**	**Spray Drift**
Monocot	Non-listed	<0.1	0.15	0.42
Monocot	listed	<0.1	0.15	0.96
Dicot	Non-listed	<0.1	0.15	0.91
Dicot	listed	<0.1	0.15	1.38
*If RQ > 1.0, the LOC is exceeded, resulting in potential for risk to that plant group.				