

Type	Pre-emergent and post-emergent systemic herbicide
Controls	Controls broadleaf weeds grasses and sedges.
Mode of Action	Acts through the inhibition of protoporphyrinogen oxidase in the chlorophyll biosynthesis pathway, leading to the subsequent build-up of toxic intermediates

Sulfentrazone herbicide products are rated high in hazard and fail Thurston County's pesticide review criteria. Sulfentrazone is rated high in hazard for inducing developmental toxicity without maternal toxicity. Risk from potential post-application exposures to treated turf ranges from low to moderate in hazard. Sulfentrazone is considered both mobile and persistent after application.

## MOBILITY

Property	Value	Reference	Value Rating
Water Solubility (mg/L)	780	1	Moderate
Soil Sorption (Kd=mL/g)	<1	1	High
Organic Sorption (Koc=mL/g)	43 (average)	2	High

Sulfentrazone is moderately soluble in water and is expected to bind poorly to all soil types. The hazard for sulfentrazone to move off the site of application with rain or irrigation water is rated high.

## PERSISTENCE

Property	Value	Reference	Value Rating
Vapor Pressure (mm Hg)	0.000000001	1	High
Biotic or Aerobic Half-life (days)	1.5	1	High
Photolysis Half-life (days)	1 to 12 (water)	1	Low
Terrestrial Field Test Half-life (days)	110 to 280	1	High
Hydrolysis Half-life (days)	Stable	1	High
Anaerobic Half-life (days)	9	1	High
Aquatic Field Test Half-life (days)	Value not found		

Sulfentrazone has a low vapor pressure and is not likely to dissipate into the air and it breaks down slowly in soil with or without oxygen. Sulfentrazone is stable in water but breaks down rapidly in sunlight. In field tests, sulfentrazone took 3 to 9 months to degrade to half of the applied concentration and is rated high in hazard for persistence.

## BIOACCUMULATION

Property	Value	Reference	Value Rating
Bioaccumulation Factor	Value not found		
Bioconcentration Factor	3.1 (estimated)	1	Low
Octanol/Water Partition Coefficient	log Kow = 0.99	1	Low

In metabolism studies, administered sulfentrazone was rapidly absorbed and eliminated with nearly all of the sulfentrazone eliminated within 72-hours (Reference 1). Bioaccumulation hazard is rated low.

# ACUTE WILDLIFE TOXICITY VALUES and Risk Assessment

Test Subject	Value	Reference	Toxicity Rating
Mammalian (LD50)	2,855 mg/kg/day	1	Low
Avian (LD50)	2,250 mg/kg	3	Low
Honey bee or insect (LD50)	Oral >25 ug/bee, Contact >200 ug/bee	3	Low
Annelida -worms (LC50)	Value not found		
Fish (LC50)	93.8 mg/L	3	Moderate
Crustacean (LC50)	60.4 mg/L	3	Moderate
Mollusk (LC50)	>10.5 mg/L	3	Moderate
Amphibian (LD50 or LC50)	Value not found		

Because sulfentrazone is both mobile and persistent it poses a risk to non-target plants from potential runoff following a ground application. The risk to non-target organisms including terrestrial animals, birds, insects, fish, mollusks is considered low for direct impacts from sulfentrazone herbicide use. The EPA determined that there is some risk to birds from chronic (long-term) exposures from eating treated short and long grasses, broadleaf plants and arthropods (Reference 3). Risk to non-target organisms is rated conditional since the risk of concern would involve using sulfentrazone herbicide on the same site year after year - which may not be typical usage for most sites.

## ACUTE HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Risk Rating
Adult residential applicator	Dermal	1 mg/kg/day	0.18 mg/kg/day	5.6	2	Moderate
Child playing on treated lawn (liquid product)	Dermal (liquid)	1 mg/kg/day	0.28 mg/kg/day	3.6	2	Moderate
Child playing on treated lawn (granular product)	Dermal (granular)	1 mg/kg/day	0.063 mg/kg/day	16	2	Low
Adult contacting treated turf grass	Dermal	1 mg/kg/day	0.16 mg/kg/day	6.1	2	Moderate

In the short-term risk assessment the No Observed Adverse Effect Level (NOAEL) of 100 mg/kg/day was used with a safety factor of 100 to evaluate potential dermal (skin) exposures (Reference 2). The resulting dose of concern is 1 mg/kg/day.

The residential application that had the highest potential risk was calculated for mixing and applying 5-gallons at maximum application rate with a backpack sprayer. This potential exposure was 18% of the dose of concern and is rated moderate in hazard. All other residential application methods had calculated exposures that are less than 10% of the dose of concern and are rated low in hazard.

Risk was calculated for people contacting treated grass after a residential application at maximum rate. All potential exposures calculated for adults or children are rated low in hazard except the potential skin exposure to a child 1 to 2 years old playing in a lawn that had been treated with a liquid product (granular products were low in hazard). The potential risk to a child 1 to 2 years old that eats a granular product is rated high in hazard.

Risk to golfers (adults or children) playing on treated turf is low in hazard.

# CHRONIC HUMAN TOXICITY HAZARDS

Property	Value	Adverse Effect	Reference	Rating
Carcinogenicity	Group E	Evidence of non-carcinogenicity in humans	1	Low
Mutagenicity	Value not found	Weakly clastogenic in vitro (not in vivo)	2	Low
Neurotoxicity - (NOAEL)	750 mg/kg bw	Decreased motor activity + staggered gait, etc.	2	Check risk
Endocrine Disruption	Value not found			
Developmental Toxicity (NOAEL)	10 mg/kg/day	Decreased fetal viability & increased alterations	1	High
Reproductive Toxicity (NOAEL)	14 mg/kg/day	Reduced litters increased stillborns	2	Moderate
Chronic Toxicity (NOAEL)	14 mg/kg/day	Reduced litters, increased stillborns	2	Check risk

Reproductive toxicity was observed along with mild maternal toxicity although developmental toxicity was observed without maternal toxicity. Developmental toxicity that is not produced as a result of maternal toxicity is rated high in hazard. Sulfentrazone is not considered carcinogenic and in mutagenicity testing, it was weakly clastogenic but only in in-vitro mutagenicity testing and therefore is not rated high in hazard for mutagenicity potential. Chronic toxicity testing indicates that the adverse effect that is observed at the lowest dose is reduced litters and increased stillborn fetuses (Reference 2).

## CHRONIC HUMAN TOXICITY - Risk Assessment

Subject and Scenario	Route	Dose of Concern	Exposure	Margin of Safety	Reference	Risk Rating
Adult applying 40-gallons with backpack sprayer	Dermal	1 mg/kg/day	0.18 mg/kg/day	5.6	2	Moderate
Apply 40-gallons (manually pressurized handwand)	Dermal	1 mg/kg/day	0.0048 mg/kg/day	210 (with gloves)	2	Low (with gloves)
Apply 40-gallons (water soluble packs)	Dermal	1 mg/kg/day	0.0158 mg/kg/day	130	2	Low
Apply 1,000-gallons with mechanical handgun	Dermal	1 mg/kg/day	0.707 mg/kg/day	1.4	2	High

### Chronic Toxicity Risk Assessment Summary:

Risk from potential occupational exposures are rated for non-agricultural applications and not for any aerial applications or applications that are combined with fertilizers because they are not applications relevant to Thurston County uses.

Applying 40-gallons at maximum application rate (either dry flowable or liquid herbicide) with a manually pressurized handwand sprayer is rated high in hazard unless the applicator wears chemically protective gloves and a single layer of protective clothes. Applying 1,000-gallons of liquid product with a mechanically pressurized handgun is rated high in hazard. Applying 40-gallons with water soluble packets using either a backpack sprayer, manually pressurized handwand or mechanically pressurized handgun is rated low in hazard.

Mixing and loading for a groundboom application of dry flowable herbicide or liquid formulation to treat up to 80 acres at maximum application rate (0.375 pounds active ingredient/acre) is rated low in hazard. And, mixing for more than 80 acres is rated moderate in hazard. Mixing and loading granular product for a tractor-drawn spreader at maximum application rate is rated low in hazard for all acreages (well over 100 acres).

Risk to the applicator applying to 200 acres (maximum application rate) with a groundboom spray is rated low in hazard. Applying 1,000-gallons with a mechanically pressurized handgun is moderate in hazard (applying 200-gallons or less would rate as low hazard). Risk from applying granular product with a tractor-drawn spreader is rated low in hazard.

### Metabolites and Degradation Products:

Metabolites include: HMS [N-(2,4-dichloro-5-(4-(difluoromethyl)-4,5-dihydro-3-hydroxymethyl-5-oxo-1H-1,2,4-triazolyl) phenyl)methanesulfonamide]] and DMS [(N-2,4-dichloro-5-[4-(difluoromethyl)-4,5-dihydro-5-oxo-1H-1,2,4-triazol-1-yl]phenyl)methanesulfonamide]

### Comments:

Non-irritating to skin; mild eye irritant (rabbits). Non-sensitizing to skin (guinea pigs) (Reference 1).

### References

1. National Center for Biotechnology Information. PubChem Compound Database; CID=86369, <https://pubchem.ncbi.nlm.nih.gov/compound/86369> (accessed June 1, 2016).
2. USEPA. Office of Chemical Safety and Pollution Prevention. MEMORANDUM. Sulfentrazone - Preliminary Human Health Risk Assessment for Registration Review and the Risk Assessment for the Section 3 Registration Request for a New Use on Apples. June 5, 2014.
3. USEPA. Office of Chemical Safety and Pollution Prevention. Preliminary Ecological Risk Assessment for the Registration Review for Sulfentrazone. June 2014.