Material Safety Data Sheet
Dow AgroSciences Canada Inc.

Product Name: FRONTLINE* A Suspension Concentrate Herbicide **Issue Date:** 2009.09.03

Dow AgroSciences Canada Inc. encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. Product and Company Identification

Product Name
FRONTLINE* A Suspension Concentrate Herbicide

COMPANY IDENTIFICATION
Dow AgroSciences Canada Inc.
A Subsidiary of The Dow Chemical Company
Suite 2100, 450 1st Street SW,
Calgary, AB T2P 5H1
Canada

For MSDS updates and Product Information: 800-667-3852

Prepared By: Prepared for use in Canada by EH&S, Product Regulatory Management Department.
450-652-1029
Revision 2009.09.03

Customer Information Number: 800-667-3852

EMERGENCY TELEPHONE NUMBER
24-Hour Emergency Contact: 613-996-6666
Local Emergency Contact: 613-996-6666

2. Hazards Identification

Emergency Overview
Color: White
Physical State: Liquid.
Odor: Mild

Hazards of product:

No significant immediate hazards for emergency response are known.

Potential Health Effects

Eye Contact: May cause slight temporary eye irritation. Corneal injury is unlikely.
Skin Contact: Brief contact is essentially nonirritating to skin.
Skin Absorption: Prolonged skin contact is unlikely to result in absorption of harmful amounts.
Inhalation: Vapors are primarily water; single exposure is not likely to be hazardous. No adverse effects are anticipated from single exposure to mist.
Ingestion: Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.
Effects of Repeated Exposure: For the active ingredient(s): In animals, effects have been reported on the following organs: Kidney. Liver. For the minor component(s): In rare cases, repeated excessive exposure to propylene glycol may cause central nervous system effects.

3. Composition/information on ingredients

Component	CAS #	Amount W/W
Florasulam	145701-23-1	4.8 %
Propylene glycol	57-55-6	8.6 %
Balance		86.6 %

Amounts are presented as percentages by weight.

4. First-aid measures

Eye Contact: Hold eyes open and rinse slowly and gently with water for 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eyes. Call a poison control center or doctor for treatment advice.
Skin Contact: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for treatment advice.
Inhalation: Move person to fresh air. If person is not breathing, call an emergency responder or ambulance, then give artificial respiration; if by mouth to mouth use rescuer protection (pocket mask etc). Call a poison control center or doctor for treatment advice.
Ingestion: No emergency medical treatment necessary.
Notes to Physician: No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient. Have the Safety Data Sheet, and if available, the product container or label with you when calling a poison control center or doctor, or going for treatment.

5. Fire Fighting Measures

Extinguishing Media: This material does not burn. If exposed to fire from another source, use suitable extinguishing agent for that fire.
Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. This material does not burn. Fight fire for other material that is burning. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS.
Special Protective Equipment for Firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers,

boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.
Unusual Fire and Explosion Hazards: If exposed to fire from another source and water is evaporated, exposure to high temperatures may cause toxic fumes.
Hazardous Combustion Products: Under fire conditions some components of this product may decompose. The smoke may contain unidentified toxic and/or irritating compounds. Combustion products may include trace amounts of: Sulfur oxides. Nitrogen oxides. Hydrogen halides.

See Section 9 for related Physical Properties

6. Accidental Release Measures

Steps to be Taken if Material is Released or Spilled: Contain spilled material if possible. Small spills: Absorb with materials such as: Clay. Dirt. Sand. Sweep up. Collect in suitable and properly labeled containers. Large spills: Contact Dow AgroSciences for clean-up assistance.
Personal Precautions: Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.
Environmental Precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

7. Handling and Storage

Handling
General Handling: Keep out of reach of children. Do not swallow. Avoid breathing vapor or mist. Avoid contact with eyes, skin, and clothing. Use with adequate ventilation. Wash thoroughly after handling.

Storage
Store in a dry place. Store in original container. Keep container tightly closed when not in use. Do not store near food, foodstuffs, drugs or potable water supplies.

8. Exposure Controls / Personal Protection

Exposure Limits

Component	List	Type	Value
Propylene glycol	WEEL	TWA Aerosol.	10 mg/m3
	CAD ON OEL	TWAEV Total vapor and aerosol.	155 mg/m3 50 ppm

Consult local authorities for recommended exposure limits.
RECOMMENDATIONS IN THIS SECTION ARE FOR MANUFACTURING, COMMERCIAL BLENDING AND PACKAGING WORKERS. APPLICATORS AND HANDLERS SHOULD SEE THE PRODUCT LABEL FOR PROPER PERSONAL PROTECTIVE EQUIPMENT AND CLOTHING.

Personal Protection
Eye/Face Protection: Use safety glasses (with side shields).
Skin Protection: Wear clean, body-covering clothing.

Hand protection: Use gloves chemically resistant to this material when prolonged or frequently repeated contact could occur. Examples of preferred glove barrier materials include: Butyl rubber. Chlorinated polyethylene. Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyvinyl chloride ("PVC" or "vinyl"). NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical

requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Respiratory Protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. For most conditions no respiratory protection should be needed; however, if discomfort is experienced, use an approved air-purifying respirator. The following should be effective types of air-purifying respirators: Organic vapor cartridge with a particulate pre-filter.

Ingestion: Use good personal hygiene. Do not consume or store food in the work area. Wash hands before smoking or eating.

Engineering Controls

Ventilation: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

9. Physical and Chemical Properties

Physical State	Liquid.
Color	White
Odor	Mild
Odor Threshold	No test data available
Flash Point - Closed Cup	none below boiling point
Flammable Limits In Air	**Lower**: No test data available **Upper**: No test data available
Autoignition Temperature	No test data available
Vapor Pressure	No test data available
Boiling Point (760 mmHg)	No test data available.
Vapor Density (air = 1)	No test data available
Specific Gravity (H2O = 1)	No test data available
Freezing Point	No test data available
Melting Point	No test data available
Solubility in water (by weight)	Soluble
pH	6.2 *Literature*
Decomposition Temperature	No test data available
Evaporation Rate (Butyl Acetate = 1)	No test data available
Kinematic Viscosity	No test data available

10. Stability and Reactivity

Stability/Instability

Thermally stable at typical use temperatures.

Conditions to Avoid: Active ingredient decomposes at elevated temperatures.

Incompatible Materials: None known.

Hazardous Polymerization

Will not occur.

Thermal Decomposition

Decomposition products depend upon temperature, air supply and the presence of other materials.

11. Toxicological Information

Acute Toxicity
Ingestion
LD50, Rat, male and female > 5,000 mg/kg
Skin Absorption
LD50, Rat, male and female > 2,000 mg/kg
Inhalation
The LC50 has not been determined. Estimated. LC50, 4 h, Aerosol, Rat > 5 mg/l
Sensitization
Skin
Did not cause allergic skin reactions when tested in mice.
Repeated Dose Toxicity
Repeated skin application to laboratory animals did not produce systemic toxicity. For the active ingredient(s): In animals, effects have been reported on the following organs: Kidney. Liver. For the minor component(s): In rare cases, repeated excessive exposure to propylene glycol may cause central nervous system effects.
Chronic Toxicity and Carcinogenicity
For the active ingredient(s): For the minor component(s): Did not cause cancer in laboratory animals.
Developmental Toxicity
For the active ingredient(s): For the minor component(s) Did not cause birth defects or any other fetal effects in laboratory animals.
Reproductive Toxicity
For the active ingredient(s): In animal studies, did not interfere with reproduction. For the minor component(s): In animal studies, did not interfere with reproduction. In animal studies, did not interfere with fertility.
Genetic Toxicology
For the active ingredient(s): For the minor component(s) In vitro genetic toxicity studies were negative. For the active ingredient(s): For the minor component(s): Animal genetic toxicity studies were negative.

12. Ecological Information

ENVIRONMENTAL FATE
Data for Component: **Florasulam**

Movement & Partitioning
Bioconcentration potential is low (BCF less than 100 or log Pow less than 3).
Partition coefficient, n-octanol/water (log Pow): No test data available:
Bioconcentration Factor (BCF): 0.8 - 2.2; fish; Measured

Persistence and Degradability
Material is expected to biodegrade only very slowly (in the environment). Fails to pass OECD/EEC tests for ready biodegradability.
OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method
2 %	28 d	OECD 301B Test

Data for Component: **Propylene glycol**

Movement & Partitioning
Bioconcentration potential is low (BCF less than 100 or log Pow less than 3). Potential for mobility in soil is very high (Koc between 0 and 50). Given its very low Henry's constant, volatilization from natural bodies of water or moist soil is not expected to be an important fate process.
Henry's Law Constant (H): 1.2E-08 atm*m3/mole Measured
Partition coefficient, n-octanol/water (log Pow): -0.92 Measured
Partition coefficient, soil organic carbon/water (Koc): < 1 Estimated.

Persistence and Degradability

Material is readily biodegradable. Passes OECD test(s) for ready biodegradability.
Biodegradation may occur under anaerobic conditions (in the absence of oxygen).

Indirect Photodegradation with OH Radicals

Rate Constant	Atmospheric Half-life	Method
1.28E-11 cm3/s	10 h	Estimated.

OECD Biodegradation Tests:

Biodegradation	Exposure Time	Method
81 %	28 d	OECD 301F Test
96 %	64 d	OECD 306 Test

Biological oxygen demand (BOD):

BOD 5	BOD 10	BOD 20	BOD 28
69 %	70 %	86 %	

Chemical Oxygen Demand: 1.53 mg/mg
Theoretical Oxygen Demand: 1.68 mg/mg

ECOTOXICITY

Data for Component: **Florasulam**

Material is highly toxic to aquatic organisms on an acute basis (LC50/EC50 between 0.1 and 1 mg/L in the most sensitive species tested). Material is slightly toxic to birds on an acute basis (LD50 between 501 and 2000 mg/kg). Material is practically non-toxic to birds on a dietary basis (LC50 > 5000 ppm).

Fish Acute & Prolonged Toxicity
LC50, rainbow trout (Oncorhynchus mykiss), 96 h: > 100 mg/l
Aquatic Invertebrate Acute Toxicity
EC50, water flea Daphnia magna, 48 h, immobilization: 180 - 292 mg/l
Aquatic Plant Toxicity
EC50, green alga Pseudokirchneriella subcapitata (formerly known as Selenastrum capricornutum), Growth inhibition (cell density reduction), 72 h: 8.94 mg/l
EC50, duckweed Lemna sp., Number of fronds, 14 d: 0.00118 mg/l
Toxicity to Non-mammalian Terrestrial Species
oral LD50, Japanese quail (Coturnix coturnix japonica)
dietary LC50, mallard (Anas platyrhynchos)
contact LD50, Honey bee (Apis mellifera)
Toxicity to Soil Dwelling Organisms
LC50, Earthworm Eisenia foetida, adult, 14 d: > 1,320 mg/kg

Data for Component: **Propylene glycol**

Material is practically non-toxic to aquatic organisms on an acute basis (LC50/EC50/EL50/LL50 >100 mg/L in the most sensitive species tested).

Fish Acute & Prolonged Toxicity
LC50, rainbow trout (Oncorhynchus mykiss), 96 h: 44,000 - 51,600 mg/l
Aquatic Invertebrate Acute Toxicity
EC50, water flea Daphnia magna, 48 h, immobilization: 4,850 - 34,000 mg/l
Aquatic Plant Toxicity
EC50, green alga Pseudokirchneriella subcapitata (formerly known as Selenastrum capricornutum), biomass growth inhibition: 19,000 mg/l
Toxicity to Micro-organisms
EC50; bacteria, Growth inhibition, 16 h: 26,000 mg/l
EC50, OECD 209 Test; activated sludge, respiration inhibition, 3 h: > 1,000 mg/l

13. Disposal Considerations

If wastes and/or containers cannot be disposed of according to the product label directions, disposal of this material must be in accordance with your local or area regulatory authorities. This information presented below only applies to the material as supplied. The identification based on characteristic(s)

or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. If the material as supplied becomes a waste, follow all applicable regional, national and local laws.

14. Transport Information

TDG Small container
NOT REGULATED

TDG Large container
NOT REGULATED

IMDG
Proper Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.
Technical Name: Florasulam
Hazard Class: 9 **ID Number:** UN3082 **Packing Group:** PG III
EMS Number: F-A,S-F
Marine pollutant.: Yes

ICAO/IATA
NOT REGULATED

15. Regulatory Information

CEPA - Domestic Substances List (DSL)
All substances contained in this product are listed on the Canadian Domestic Substances List (DSL) or are not required to be listed.

Hazardous Products Act Information: CPR Compliance
This product has been classified in accordance with the hazard criteria of the Canadian Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

Hazardous Products Act Information: WHMIS Classification
This product is exempt under WHMIS.

Pest Control Products Act Registration number: 27029
National Fire Code of Canada
Not applicable

16. Other Information

Hazard Rating System

NFPA	Health	Fire	Reactivity
	1	0	0

Recommended Uses and Restrictions
Product use: End use herbicide product

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Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

N/A	Not available
W/W	Weight/Weight
OEL	Occupational Exposure Limit
STEL	Short Term Exposure Limit
TWA	Time Weighted Average
ACGIH	American Conference of Governmental Industrial Hygienists, Inc.
DOW IHG	Dow Industrial Hygiene Guideline
WEEL	Workplace Environmental Exposure Level
HAZ_DES	Hazard Designation
VOL/VOL	Volume/Volume

Dow AgroSciences Canada Inc. urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.