APPENDIX B

Ice Crystal Engineering, LLC **Phone: 701 428 9882**
5074 165th Ave SE **www.iceflares.com**
Kindred, ND 58051 USA

Material Safety Data Sheet

1. PRODUCT IDENTIFICATION/COMPANY DETAILS

PRODUCT NAME: ICE Glaciogenic Burn In Place Flare
PRODUCT TYPE: Pyrotechnic Device
USE: Weather modification, aircraft mounted.
SYNONYMS: ICE Glacio
ICE EB
MANUFACTURER: ICE Crystal Engineering (LLC)
FACTORY ADDRESS: 5074 165th Ave SE, Kindred, ND 58051 USA
POSTAL ADDRESS: As Above
TELEPHONE: +1 701 428 9882
FACSIMILE: +1 701 428 9884
EMERGENCY CONTACT TELEPHONE NUMBER: +1 703 527 3887 (Code ICEC)

2. HAZARDS IDENTIFICATION

The flare contains three ingredients (Ammonium Perchlorate, Zinc Powder, and Aluminium Powder) which are listed on the internet database Hazardous Substances Information System (HSIS). None of these chemicals have any listed health effects. All three have physiochemical effects only.
The flare also contains two other chemicals, Copper Iodide and Ammonium Iodide which whilst not listed on the HSIS have potential irritant health effects according to their manufacturers MSDS. However, these chemicals exist in the mixture below the cut-off levels for the irritant hazard category, as specified in the Approved Criteria for Classifying Hazardous Substances [NOHSC: 10008(2004)], 3rd Edition, October 2004.
Overall, when classified in accordance with the Approved Criteria for Classifying Hazardous Substances [NOHSC: 10008(2004)], 3rd Edition, October 2004, the mixture of the flare ingredients is not considered as hazardous.
The flare is designed for use only by specially trained personnel when mounted on an appropriately modified aircraft.

DANGEROUS GOODS

The product is classified as Dangerous Goods, 1.4S, in accordance with the Australian Code for the Transport of Explosives by Road and Rail, 2nd ed., March 2000.
CLASS: 1.4S **U.N. NO:** 0432
SUBSIDIARY RISK: Nil

Risk Phrases

The following risk phrases relate to the finished product when stored, transported, and handled appropriately.
R10 Flammable.
R36/37 Irritating to eyes and respiratory system
The following risk phrases relate to the mixture contained within the flare and are applicable only if the casing is breached.
R9 Explosive when mixed with combustible material.
R10 Flammable.
R15 Contact with water liberates extremely flammable gases.
R36/37/38 Irritating to eyes, respiratory system and skin
R44 Risk of explosion if heated under confinement.

Safety Phrases

The following safety phrases relate to the finished product when stored, transported, and handled appropriately.
S1/2 Keep locked up and out of the reach of children.
S16 Keep away from ignition sources – No smoking.
S35 This material and its container must be disposed of in a safe way.
S41 In case of fire do not breathe fumes.
The following safety phrases relate to the mixture contained within the flare and are applicable only if the casing is breached.
S1/2 Keep locked up and out of the reach of children.
7/8 Keep container tightly closed and dry
S22 Do not breathe dust.
S24 Avoid contact with skin.
S27 Take off immediately all contaminated clothing.
S36/37 Wear suitable protective gloves/clothing.
S43 In case of fire use water.

3. COMPOSITION / INFORMATION ON INGREDIENTS

The pyrotechnic composition consists of (~70%) Ammonium Perchlorate, Zinc powder (non pyrophoric), Aluminium powder (non pyrophoric), and an organic binder. The remainder (~30%) consists of Silver Iodide, Copper Iodide, and Ammonium Iodide.

4. FIRST AID MEASURES

In the unlikely event of receiving burns from this device, seek medical attention immediately.
Exposure to the smoke may cause irritation to the eyes. Move the patient to fresh air.
Symptoms that may arise if the product is mishandled are:
Ingestion: *Symptoms.* Discomfort
Give plenty of water to drink but only if conscious. Do not induce vomiting. Seek medical attention at once.

Eye Contact: *Symptoms.* Irritation
Immediately flush the eyes with copious quantities of water. Eyelids to be held open. If irritation persists seek medical advice.
Skin Contact: *Symptoms.* Irritation
Wash the exposed area with copious amounts of soap and water. Remove contaminated clothing and wash before reuse. If irritation occurs seek medical advice
Inhalation: *Symptoms.* Throat irritation, shortness of breath
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If irritation persists, seek medical assistance.

5. FIRE FIGHTING MEASURES

In the case of fire, isolate the immediate area and deny entry.

In the event of a fire or intense heat that reaches the storage/cargo area, the pyrotechnic articles are likely to ignite. They will burn, spreading burning particles over a limited area. A mass explosion is not expected. Smoke and potentially irritating gases will be produced in a fire.
Fire can be fought with water spray if necessary, although disposal and clean up will be simplified if material is allowed to burn. If flares are exposed to heat and flames, flood with water, or direct water spray on outside of container to cool it down. Continue spray until well after fire is out. Self contained breathing apparatus (SCBA) and structural firefighter's protective clothing will provide some limited protection.
Vehicle fire (other than cargo area): Flood with water. Tyre fires may start again. Unhook and separate vehicle from trailer (if applicable and possible). Remove vehicles that are not involved in fire from fire area if you can do so without risk. If cargo area is exposed to heat and flames, direct water spray on outside of container to cool it down.
Cargo Fire: Do not move cargo or vehicle if cargo has been exposed to heat. Withdraw from area if and when fire reaches cargo and let fire burn if situation allows. If fire must be fought, flood with water spray. Use firefighting team to prevent spread of fire to adjacent structures and materials.
For additional information, call the shippers emergency telephone number at +1 703 527 3887 (Code ICEC)

6. ACCIDENTAL RELEASE MEASURES

Remove all ignition sources.
If the pyrotechnic articles are spilled as the result of an accident but do not ignite, they can safely be picked up and repackaged. The area should be kept clear of unnecessary people while this is being done. There shall be no flares, smoking and/or tools capable of producing sparks or flames in the vicinity of the spilled material. Cautiously pick up the spilled devices, place them in cardboard cartons and dispose in accordance with local regulations. The site should be cleaned up with water.

7. HANDLING AND STORAGE

The composition is an explosive (Class 1) and hence should be handled and stored in accordance with the Explosives Regulations of the relevant Competent Authority.
Store in manufacturer's approved packaging in a dry area away from sources of heat and direct sunlight. The shelf life of this product is indefinite if stored properly.
Issue No

8. EXPOSURE CONTROLS AND PERSONNEL PROTECTION

No chemical composition is released or exposed during normal handling, storage and transportation.

9. PHYSICAL AND CHEMICAL PROPERTIES

The flare consists of 150 grams of glaciogenic pyrotechnic composition glued into a phenolic paper tube with the igniter held into the end and sealed with a plastic cap. The electronic igniter is fired using the voltage supplied from the aircraft to the firing box. When activated the flare burns for between 3.5 and 4 minutes. The temperature of ignition is in excess of 260° Celsius.

10. STABILITY AND REACTIVITY

Stability
This device is stable under normal conditions.
Solubility
The device is sealed from water ingress.
Reactivity
Not applicable.
Chemical Incompatibilities
None known.

11. TOXICOLOGICAL INFORMATION

No adverse health effects are expected if the product is handled according to this MSDS. If mishandling occurs, consult first aid measures above.

The most likely route of exposure would be by inhalation of the gases following combustion. It is recommended that any effects from inhalation of the gases should be treated as outlined in Section 4: First Aid Measures.

12. ECOTOXICITY INFORMATION

Spillage of the composition or deposition of the reaction products in the soil or aquatic environment may represent a short term hazard.
If contamination of the waterways occurred this would be expected to be of a fairly low level. In the event of spillage of the flares, they should be cleaned up in accordance with Section 6 Accidental Release Measures.

13. DISPOSAL CONSIDERATIONS

Damaged or inappropriately stored flares should be destroyed under controlled conditions in accordance with local regulations.

14. TRANSPORT INFORMATION

CLASS: 1.4S **U.N. NO:** 0432
Proper Shipping Name: Articles, pyrotechnic
Gross Weight: 270 grams **NEQ:** 150 grams
Packaging instruction 135 for Inner and Outer Packaging (Australian Code for the transport of Explosives by Road and Rail, 2nd ed, March 2000, Appendix A4).

ICE Glaciogenic Burn In Place Flare
Safety Data Sheet

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name : ICE Glaciogenic Burn In Place Flare

1.2. Relevant identified uses of the substance or mixture and uses advised against

Use of the substance/mixture : Pyrotechnic Article

1.3. Details of the supplier of the safety data sheet

Ice Crystal Engineering, LLC
5074 165th Ave SE
Kindred, ND 58051
T 701-428-9882 - F 701-428-9884

1.4. Emergency telephone number

Emergency number : Chemtrec 1 800 424 9300

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

This product as manufactured is not anticipated to have any health effects. The following hazard classification relates to the mixture contained within the flare and is applicable only if the casing is breached.

Classification (GHS-US)

Expl. 1.4	H204
Ox. Sol. 1	H271
Acute Tox. 4 (Oral)	H302
Skin Irrit. 2	H315
Eye Irrit. 2A	H319
Muta. 2	H341
STOT RE 2	H373

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS01 GHS03 GHS07 GHS08

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) :
H204 - Fire or projection hazard
H271 - May cause fire or explosion; strong oxidizer
H302 - Harmful if swallowed
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H341 - Suspected of causing genetic defects
H373 - May cause damage to organs through prolonged or repeated exposure

Precautionary statements (GHS-US) :
P201 - Obtain special instructions before use
P202 - Do not handle until all safety precautions have been read and understood
P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
P220 - Keep/Store away from clothing/ combustible materials
P221 - Take any precaution to avoid mixing with combustibles
P240 - Ground/bond container and receiving equipment
P250 - Do not subject to grinding/shock/friction
P260 - Do not breathe dust/fume/gas/mist/vapors/spray
P264 - Wash thoroughly after handling
P270 - Do not eat, drink or smoke when using this product
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P283 - Wear fire/flame resistant/retardant clothing
P301 + P312 - If swallowed: Call a poison center/doctor if you feel unwell
P302 + P352 - If on skin: Wash with plenty of water
P305+P351+P338 - If in eyes: Rinse cautiously with water for several minutes. Remove contact

lenses, if present and easy to do. Continue rinsing
P306+P360 - If on clothing: Rinse immediately contaminated clothing and skin with plenty of water before removing clothes
P308 + P313 - If exposed or concerned: Get medical advice/attention
P314 - Get medical advice/attention if you feel unwell
P330 - Rinse mouth
P332+P313 - If skin irritation occurs: Get medical advice/attention
P337+P313 - If eye irritation persists: Get medical advice/attention
P362 - Take off contaminated clothing and wash before reuse
P370+P378 - In case of fire: Use water to extinguish
P370+P380 - In case of fire: Evacuate area
P371+P380+P375 - In case of major fire and large quantities: Evacuate area. Fight fire remotely due to the risk of explosion
P372 - Explosion risk in case of fire
P373 - DO NOT fight fire when fire reaches explosives
P374 - Fight fire with normal precautions from a reasonable distance
P405 - Store locked up
P501 - Dispose of contents/container in accordance with local/regional/national/international regulations.

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS-US)

Not applicable

SECTION 3: Composition/information on ingredients

3.1. Substance

Not applicable

3.2. Mixture

Name	Product identifier	%	Classification (GHS-US)
Proprietary Component 1	(CAS No) Proprietary	Trade Secret	Not classified
Proprietary Component 2	(CAS No) Proprietary	Trade Secret	Flam. Liq. 4, H227 Acute Tox. 4 (Oral), H302
Proprietary Component 3	(CAS No) Proprietary	Trade Secret	Acute Tox. 4 (Oral), H302 Skin Irrit. 2, H315 Eye Irrit. 2A, H319
Proprietary Component 4	(CAS No) Proprietary	Trade Secret	Not classified
Proprietary Component 5	(CAS No) Proprietary	Trade Secret	Not classified
Proprietary Component 6	(CAS No) Proprietary	Trade Secret	Not classified
Proprietary Component 7	(CAS No) Proprietary	Trade Secret	Not classified
Proprietary Component 8	(CAS No) Proprietary	Trade Secret	Not classified

Full text of H-phrases: see section 16

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If irritation persists, seek medical assistance.

First-aid measures after skin contact : Wash the exposed area with copious amounts of soap and water. Remove contaminated clothing and wash before reuse. If irritation occurs seek medical advice.

First-aid measures after eye contact : Immediately flush the eyes with copious quantities of water. Eyelids to be held open. If irritation persists seek medical advice.

First-aid measures after ingestion : Give plenty of water to drink but only if conscious. Do not induce vomiting. Seek medical attention at once.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after inhalation : Smoke generated from product use may cause respiratory tract irritation.

Symptoms/injuries after skin contact : Smoke generated from product use may cause skin irritation.

Symptoms/injuries after eye contact : Smoke generated from product use may cause eye irritation.

Symptoms/injuries after ingestion : Not considered a likely route of exposure under normal product use conditions.

4.3. Indication of any immediate medical attention and special treatment needed

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : If flares are exposed to heat and flames, flood with water, or direct water spray on outside of container to cool it down. Continue spray until well after fire is out.

Unsuitable extinguishing media : None.

5.2. Special hazards arising from the substance or mixture

Fire hazard : In the event of a fire or intense heat that reaches the storage/cargo area, the pyrotechnic articles are likely to ignite. They will burn, spreading burning particles over a limited area. A mass explosion is not expected. Smoke and potentially irritating gases will be produced in a fire.

Explosion hazard : Explosion risk in case of fire.

5.3. Advice for firefighters

Protection during firefighting : Self-contained breathing apparatus (SCBA) and structural firefighter's protective clothing will provide some limited protection.

Vehicle fire (other than cargo area): Flood with water. The fires may start again. Unhook and separate vehicle from trailer (if applicable and possible). Remove vehicles that are not involved in fire from fire area if you can do so without risk. If cargo area is exposed to heat and flames, direct water spray on outside of container to cool it down.

Cargo Fire: Do not move cargo or vehicle if cargo has been exposed to fire. Withdraw from area if and when fire reaches cargo and let fire burn if situation allows. If fire must be fought, flood with water spray. Use firefighting team to prevent spread of fire to adjacent structures and materials.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

6.1.1. For non-emergency personnel

No additional information available

6.1.2. For emergency responders

No additional information available

6.2. Environmental precautions

Avoid release to the environment.

6.3. Methods and material for containment and cleaning up

For containment : Isolate area. Keep unnecessary personnel away. There shall be no flares, smoking and/or tools capable of producing sparks or flames in the vicinity of the spilled material.

Methods for cleaning up : If the pyrotechnic articles are spilled as the result of an accident but do not ignite, they can safely be picked up and repackaged. Cautiously pick up the spilled devices, place them in cardboard cartons and dispose in accordance with local regulations. The site should be cleaned up with water.

6.4. Reference to other sections

No additional information available

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : This product is a Class 1.4 Explosive, Articles, pyrotechnic for technical purposes and must be handled according to manufacturer instruction.

7.2. Conditions for safe storage, including any incompatibilities

Storage conditions : Store in manufacturer's approved packaging in a dry area away from sources of heat and direct sunlight.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Proprietary Component 1 (Proprietary)	
ACGIH	Not applicable
OSHA	Not applicable

Proprietary Component 2 (Proprietary)		
ACGIH	ACGIH TWA (ppm)	5 ppm
OSHA	OSHA PEL (TWA) (mg/m³)	19 mg/m³
OSHA	OSHA PEL (TWA) (ppm)	5 ppm

Proprietary Component 4 (Proprietary)	
ACGIH	Not applicable
OSHA	Not applicable

Proprietary Component 3 (Proprietary)	
ACGIH	Not applicable
OSHA	Not applicable

Proprietary Component 6 (Proprietary)	
ACGIH	Not applicable
OSHA	Not applicable

Proprietary Component 5 (Proprietary)	
ACGIH	Not applicable
OSHA	Not applicable

Proprietary Component 8 (Proprietary)		
ACGIH	ACGIH TWA (mg/m³)	1 mg/m³ (respirable fraction)
OSHA	OSHA PEL (TWA) (mg/m³)	15 mg/m³ (total dust) 5 mg/m³ (respirable fraction)

Proprietary Component 7 (Proprietary)	
ACGIH	Not applicable
OSHA	Not applicable

8.2. Exposure controls

Appropriate engineering controls : None required under normal product handling conditions.

Hand protection : None required under normal product handling conditions.

Eye protection : None required under normal product handling conditions.

Skin and body protection : Wear suitable working clothes.

Respiratory protection : None required under normal product handling conditions.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : The flare consists of 150 grams of glaciogenic pyrotechnic composition glued into a Proprietary Component 2ic paper tube with the igniter held into the end and sealed with a plastic cap. The electronic igniter is fired using the voltage supplied from the aircraft to the firing box. When activated the flare burns for between 3.5 and 4 minutes. The temperature of ignition is in excess of 260° Celsius (500° Fahrenheit).

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability
This device is stable under normal conditions.

10.3. Possibility of hazardous reactions
Will not occur.

10.4. Conditions to avoid
Keep away from ignition sources until ready to use.

10.5. Incompatible materials
None known.

10.6. Hazardous decomposition products
Not determined.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Oral: Harmful if swallowed.

ICE Glaciogenic Burn In Place Flare	
ATE US (oral)	1293.350 mg/kg body weight

Proprietary Component 1 (Proprietary)	
LD50 oral rat	4200 mg/kg
LD50 dermal rat	> 3500 mg/kg
ATE US (oral)	4200.000 mg/kg body weight

Proprietary Component 2 (Proprietary)	
LD50 oral rat	340 mg/kg
LD50 dermal rabbit	630 mg/kg
ATE US (oral)	317.000 mg/kg
ATE US (dermal)	630.000 mg/kg

Proprietary Component 3 (Proprietary)	
ATE US (oral)	500.000 mg/kg body weight

Skin corrosion/irritation : Causes skin irritation.
Serious eye damage/irritation : Causes serious eye irritation.
Respiratory or skin sensitization : Not classified
Germ cell mutagenicity : Suspected of causing genetic defects.
Carcinogenicity : Not classified

Proprietary Component 2 (Proprietary)	
IARC group	3 - Not classifiable

Reproductive toxicity : Not classified
Specific target organ toxicity (single exposure) : Not classified

Specific target organ toxicity (repeated exposure) : May cause damage to organs through prolonged or repeated exposure.

Aspiration hazard : Not classified

SECTION 12: Ecological information

12.1. Toxicity

Proprietary Component 2 (Proprietary)	
LC50 fish 1	11.9 - 50.5 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])

Proprietary Component 2 (Proprietary)	
EC50 Daphnia 1	4.24 - 10.7 mg/l (Exposure time: 48 h - Species: Daphnia magna [Static])
LC50 fish 2	20.5 - 25.6 mg/l (Exposure time: 96 h - Species: Pimephales promelas [static])
EC50 Daphnia 2	10.2 - 15.5 mg/l (Exposure time: 48 h - Species: Daphnia magna)

Proprietary Component 7 (Proprietary)	
LC50 fish 1	2.16 - 3.05 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])
EC50 Daphnia 1	0.139 - 0.908 mg/l (Exposure time: 48 h - Species: Daphnia magna [Static])
LC50 fish 2	0.211 - 0.269 mg/l (Exposure time: 96 h - Species: Pimephales promelas [semi-static])

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

Proprietary Component 2 (Proprietary)	
BCF fish 1	(no significant bioaccumulation)
Log Pow	1.47

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Effect on the global warming : No known ecological damage caused by this product.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : Dispose of contents/container in accordance with local/regional/national/international regulations.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description : UN0432 Articles, pyrotechnic (for technical purposes), 1.4, II

UN-No.(DOT) : UN0432

DOT Proper Shipping Name : Articles, pyrotechnic
for technical purposes

Department of Transportation (DOT) Hazard Classes : 1.4 - Class 1.4 - Explosives (with no significant blast hazard) 49 CFR 173.50

Hazard labels (DOT) : 1.4S - Explosive

Packing group (DOT) : II - Medium Danger

DOT Packaging Non Bulk (49 CFR 173.xxx) : 62

DOT Packaging Bulk (49 CFR 173.xxx) : None

DOT Packaging Exceptions (49 CFR 173.xxx) : None

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 25 kg

DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	:	100 kg
DOT Vessel Stowage Location	:	01 - The material may be stowed "on deck" or "under deck" on a cargo vessel (up to 12 passengers) and on a passenger vessel.
DOT Vessel Stowage Other	:	25 - Shade from radiant heat

Air transport

UN-No. (IATA)	:	0432
Proper Shipping Name (IATA)	:	Articles, pyrotechnic
Class (IATA)	:	1 - Explosive

SECTION 15: Regulatory information

15.1. US Federal regulations

Proprietary Component 1 (Proprietary)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Proprietary Component 2 (Proprietary)

Listed on the United States TSCA (Toxic Substances Control Act) inventory
Listed on SARA Section 302 (Specific toxic chemical listings)
Listed on SARA Section 313 (Specific toxic chemical listings)

EPA TSCA Regulatory Flag	T - T - indicates a substance that is the subject of a Section 4 test rule under TSCA.
SARA Section 302 Threshold Planning Quantity (TPQ)	≤ 10000
SARA Section 313 - Emission Reporting	1.0 %

Proprietary Component 4 (Proprietary)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Proprietary Component 3 (Proprietary)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Proprietary Component 6 (Proprietary)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Proprietary Component 5 (Proprietary)

Listed on the United States TSCA (Toxic Substances Control Act) inventory

Proprietary Component 8 (Proprietary)

Listed on the United States TSCA (Toxic Substances Control Act) inventory
Listed on SARA Section 313 (Specific toxic chemical listings)

SARA Section 313 - Emission Reporting	1.0 % (dust or fume only)

Proprietary Component 7 (Proprietary)

Listed on the United States TSCA (Toxic Substances Control Act) inventory
Listed on SARA Section 313 (Specific toxic chemical listings)

SARA Section 313 - Emission Reporting	1.0 % (dust or fume only)

15.2. US State regulations

Proprietary Component 1 (Proprietary)

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

Proprietary Component 2 (Proprietary)

U.S. - Massachusetts - Right To Know List
U.S. - Minnesota - Hazardous Substance List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

Proprietary Component 8 (Proprietary)
U.S. - Massachusetts - Right To Know List U.S. - Minnesota - Hazardous Substance List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

Proprietary Component 7 (Proprietary)
U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List

SECTION 16: Other information

Full text of H-phrases::

Acute Tox. 4 (Oral)	Acute toxicity (oral) Category 4
Expl. 1.4	Explosive Category 1.4
Eye Irrit. 2A	Serious eye damage/eye irritation Category 2A
Flam. Liq. 4	Flammable liquids Category 4
Muta. 2	Germ cell mutagenicity Category 2
Ox. Sol. 1	Oxidizing solids Category 1
Skin Irrit. 2	Skin corrosion/irritation Category 2
STOT RE 2	Specific target organ toxicity (repeated exposure) Category 2
H204	Fire or projection hazard
H227	Combustible liquid
H271	May cause fire or explosion; strong oxidizer
H302	Harmful if swallowed
H315	Causes skin irritation
H319	Causes serious eye irritation
H341	Suspected of causing genetic defects
H373	May cause damage to organs through prolonged or repeated exposure

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product

1

David Musnick MD
FMI Center for Optimal Health
435 S Eagle Road Suite 100
Eagle, ID 83616
208-609-9130

drmusnick@funmedidaho.com

To Whom it may concern 5/14/25

I am very concerned about the use of cloud seeding in which aluminum is used in the cloud seeding mixtures in Idaho. Aluminum is highly toxic to the nervous system. In the past number of years I am finding a higher rate of early Dementia and numerous other neurological conditions, Parkinson's, Neuropathy etc. This aluminum gets in our water supply as well as the air and our food. I am also measuring moderate to high levels of aluminum in these neurological patients. I am requesting that aluminum be taken out of all cloud seeding and aerial spraying.

David Musnick MD
Board Certified in Sports Medicine

5/12/2025

Dear Members of the Idaho Department of Water Resources Board,

I am writing as a concerned Idaho resident to express serious concerns regarding the cloud seeding program administered by your department. As a taxpayer who lives over eight hours by car from Boise, I am compelled to speak out on several issues related to public access, scientific integrity, and program oversight.

1. Public Accessibility and Open Meetings Compliance

Your current policy of restricting public comment to in-person attendance in Boise is not inclusive or equitable. While livestreaming meetings on YouTube satisfies the technical minimums of the open meetings law, it excludes many Idahoans from meaningful participation—particularly those of us who live far from the capital. You have the technical capability to allow for remote public comment via Zoom, yet choose not to. This approach is discriminatory to rural residents and reflects poorly on a taxpayer-funded entity. Hiding behind the letter of the law while ignoring its spirit is not acceptable governance.

2. Misrepresentation of Data and Cloud Seeding Efficacy

The data being presented to support cloud seeding benefits appears selectively chosen and lacks critical context. The GAO's analysis of the data provided by IDWR does not support the percentage increases in water yield being cited by both your agency and Idaho Power. Similarly, the SNOWIE study results are being overstated—only 3 of 24 clouds produced seeding nuclei, yet large-scale percentage claims are being extrapolated from this limited dataset. This practice is misleading and does not reflect sound science. It borders on pseudoscience when used to justify environmental intervention without thorough, unbiased validation.

3. Conflicts of Interest and Political Connections

The growing perception of insider influence within your organization is deeply concerning. The sponsor of HB266 (2021), Marc Gibbs—who played a key role in reducing oversight and liability for the cloud seeding program—was later appointed to your board. Albert Barker, another board member, is a partner at the law firm representing Idaho Power. Jeff Raybould, also a board member, has a daughter currently serving in the legislature on the Resource and Conservation Committee. Whether or not these connections influence your decisions, the **optics** suggest otherwise, and they erode public trust.

4. Decline in Transparency

The recent removal of GPS coordinates from reporting data and the use of seeding flares labeled "proprietary" further reduce transparency. These changes raise legitimate concerns about what is being hidden and why. Opposition to HB1064, which proposed only minimal reporting improvements without third-party oversight, demonstrates a resistance to reasonable accountability measures.

5. Lack of Informed Consent and Ethical Oversight

Cloud seeding and other geoengineering efforts are fundamentally altering our environment. These programs are operating without informed consent from the public and without transparent, independent

oversight. This is not only a policy issue—it is an ethical one, potentially rising to the level of human rights violations.

I respectfully urge the Idaho Department of Water Resources to:

- Enable remote public comment through platforms like Zoom;
- Restore full transparency in reporting, including seeding site GPS data and full disclosure of flare contents;
- Invite independent, third-party review of cloud seeding data and methodology;
- Address and mitigate perceived conflicts of interest on the Water Resources Board.

The public is becoming increasingly aware of these programs, and it is your duty to serve with transparency and integrity. I, along with many others, will continue to monitor this issue closely.

Sincerely,

Wendy Cossette
Priest River, ID 83856

5/14/2025

We know that no good will be done for the environment when they add particles out of their natural environment. Experiments can not really be carried out accurately with so many variables in nature. All that can be done is to see what damage has occurred after the fact, then it is too late. Putting the preponderance of evidence on those concerned creates a stalemate, and those proposing or doing the deeds should be the ones to prove the safety before application. But that study (without controlled variables being possible) would be impossible to validate. Again, only the evidence after the fact would be verifiable. Knowing what silver iodide by itself does to biological life in a laboratory (known for eons) should be enough to halt any such program, since all life on earth is interdependent.

Retired Microbiologist
Idaho resident

5/14/2025

Dear board,

I'm writing because I cannot drive 8 hours to make public comments or participate in a simple zoom session which you don't offer. In fact, it is totally unacceptable not to offer zoom to the folks who live hundreds of miles away. While Idaho Statute is clear on public comment, your lack of willingness to include Idahoans to participate in the management of OUR water resources creates a bridge of distrust.

The ongoing adjudication of water rights, water curtailments, the metering of some local waterways, cloud seeding, unchecked explosive population growth and lack of oversight are only a few concerns that plague Idahoans.

From the perspective of many Idahoans, below are only a handful of concerns:

- Family members sitting on the resources board?
- Not reading the GAO report or referencing the report in a cloud seeding meeting.
- Conflicting data between IDWR and the GAO report.
- Removing GPS locations from your cloud seeding stations.
- Not disclosing the ingredients in the flares used to create precipitation by removing the labels.
- Accurate budget and itemized list of expenses.
- Accurate data on water availability.
- Liaison between IDEQ & IDWR.
- Term limits, appointed positions demand the same respect as elected.
- Independent biologist and environmental engineers as oversight instead of in house.

Going forward we're hopeful IDWR will open the doors of trust between our government and citizens.

Sincerely concerned,
Theresa Hiesener

GAO Assessment

Cloud Seeding Technology

Released 12/2024

Background:
"GAO reviewed cloud seeding technology across development and operational stages; interviewed a range of stakeholder groups, including government, industry, academia, and professional organizations; convened an expert meeting that included academics, state and federal agency officials, and representatives from industry organizations. We also reviewed key reports and scientific literature." Pg 3

Citizens' questions for the legislature & IDWR followed by GAO findings:

1. How is IDWR addressing findings from the federally commissioned GAO assessment, "Cloud Seeding Technology"
    a. "Reliable information is lacking on the conduct of optimal, effective cloud seeding and its benefits and effects. Without such information, operations will be less effective and the return on funding investments is unclear." Pg 3
2. What baseline and cumulative annual tests are available for silver iodide?
    a. "… it is not known whether more widespread use of silver iodide would have an effect on public health or the environment." Pg 3
    b. Silver iodide is nearly insoluble in water. However, when it dissolves it releases a small number of silver ions. In high enough quantities, silver ions—a known antimicrobial substance— could have harmful effects on beneficial bacteria in the environment and water resources. Other potential seeding agents— including liquid propane, other chemical salts (e.g., calcium chloride), and biological agents—are less widely used (at least in the U.S.). However, agency officials noted that new seeding agents may be subject to review by the Environmental Protection Agency (EPA). Pg 26
3. Percent increase metrics skewed?
    a. "uncertainty associated with these estimates of additional precipitation generated limits the ability of operators and researchers to evaluate cost effectiveness. In addition, the specific metrics used can also introduce estimation difficulties and make interpretation more difficult. For example, reporting effects as a percent increase would inflate results when expected precipitation before cloud seeding is low, compared to when expected precipitation is higher." Pg 21
    b. "For example, if a storm was expected to produce 0.1 inches of precipitation, and cloud seeding resulted in this storm producing 0.3 inches of precipitation, then

the percent increase is 200 percent. If a storm was expected to produce 1 inch of precipitation, and cloud seeding resulted in this storm producing 1.2 inches of precipitation, then the percent increase is 20 percent. In these examples, the total precipitation gain is the same (0.2 inches), but the percent increase values are different." Pg 21

   c. "One stakeholder told us reporting percent increase of precipitation due to cloud seeding on an annual basis is challenging because the number of storms seeded must be considered, and applying the percent increase from an individual storm to an entire year is inaccurate." Pg 21

4. Baseline accuracy?
   a. "Estimating baseline precipitation is challenging because precipitation varies naturally in the absence of cloud seeding," Pg 22
5. Statistically significant?
   a. **"when uncertainty was considered in estimates of cloud seeding effectiveness, the estimated effect was not distinguishable from zero with a high degree of statistical confidence"** Pg 22
   b. "One study reported an average precipitation increase of 3 percent between 1977 and 2018 across nine cases, but the statistical results could not conclusively determine an effect from cloud seeding in seven of the cases."
      i. "In this study, seven of nine cases failed to meet the study's criteria for statistical significance, which was a p-value of less than 0.10" Pg 22
6. Marketing material vs real data?
   a. "literature will often quote a 5 to 15 percent increase in precipitation from cloud seeding, but rarely acknowledge the statistical uncertainty associated with that increase" Pg 23
7. Pollutant wash out?
   a. "while reducing air pollution by removing particulate matter could be beneficial for air quality and human health, one stakeholder expressed concerns about where pollutants washed out of the atmosphere may eventually end up." Pg 23
8. Unintended effects: Silver iodide?
   a. "it is not known whether more widespread use of silver iodide would have an effect on public health or be a risk to the environment. Silver iodide is nearly insoluble in water. However, when it dissolves it releases a small number of silver ions. In high enough quantities, silver ions—a known antimicrobial substance—could have harmful effects on beneficial bacteria in the environment and water resources." Pg 26
      i. Follow up note: many flares are composed of less than 30% silver iodide (see MSDS). Are IPC, IDWR, and stakeholders/contractors using these types of flares? If so, why mislead the public in claiming that silver iodide is used when it accounts for a small percentage of the total make up? https://studylib.net/doc/7345793/ice-msds
      ii. COMPOSITION / INFORMATION ON INGREDIENTS The pyrotechnic composition consists of (~70%) Ammonium Perchlorate, Zinc powder (non pyrophoric), Aluminium powder (non pyrophoric), and an organic

binder. ***The remainder (~30%) consists of Silver Iodide, Copper Iodide, and Ammonium Iodide.***

9. Downstream impacts?
    a. "research suggests a potential for downstream effects" Pg 26
10. Evaluation bias?
    a. "Some contracts that do not require independent evaluations and instead use only input metrics like the number of seeding operations completed can incentivize these less-than-optimal approaches." Pg 28
    b. "when self-evaluations are done, the operators may have a vested interest in positive outcomes such as contract extensions, according to stakeholders." Pg 28

GAO report: ***Cloud Seeding Technology, Assessing Effectiveness and Other Challenges*** *12/2024*
https://www.gao.gov/assets/gao-25-107328.pdf#page15
*page numbers listed above apply to PDF pages.
**Derek Blestrud, Senior Atmospheric Scientist, Idaho Power Company is listed in Appendix II: Expert Participation. Pg 38

Idaho's SNOWIE outcomes consistent with these findings?

We have this comment from a lead scientist on the SNOWIE project. Did we understand the real success rate of the science behind cloud seeding back in 2019? Now, we have the GAO report which confirms the experimental nature of the program and assumptions made.

There are plenty of other caveats from the study, Tessendorf says. In SNOWIE, planes sprayed silver iodide into more than ***two dozen clouds that looked ripe for seeding. "But they could only draw a clear link between seeding and snowfall in three cases.*** *There's a small, hard to pinpoint signal that cloud seeding created additional ice in a handful of other cases. And then no signal at all in some instances…*
-Western Water Managers Bet on Cloud Seeding Despite Gaps in Science, January 31, 2019
https://zerogeoengineering.com/wp-content/uploads/2019/02/2019_western-water-managers-bet-cloud-seeding-despite-g.pdf

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The GAO assessment confirms many concerns citizens have with regard to the experimental nature of cloud seeding. We are now seeing IDWR and IPC expand experimentation to include seeding with liquid propane. Why has the Idaho legislature allowed this to take place? Special liability exemptions passed in 2021 through HB266 was the start of expanding risky experimentation on Idahoans.

"…Idaho Power has been experimenting with a new material, liquid propane, that can seed clouds at warmer temperatures."
https://www.boisestatepublicradio.org/news/2024-01-30/idaho-power-cloud-seeding-liquid-propane

Industry insights and quotes

"But, she added, it's also tricky to get a good sense of just how effective that transition really is, which is why most cloud seeding statistics lead to **inconclusive results. Estimates range anywhere from zero to 50% additional snowfall,** Friedrich said."
https://www.colorado.edu/today/2020/02/24/cloud-seeding

"There are plenty of other caveats from the study, Tessendorf says. In SNOWIE, planes sprayed silver iodide into more than ***two dozen clouds that looked ripe for seeding. "But they could only draw a clear link between seeding and snowfall in three cases.*** *There's a small, hard to pinpoint signal that cloud seeding created additional ice in a handful of other cases. And then no signal at all in some instances…"*

Sarah Tessendorf is a researcher at the National Center for Atmospheric Research in Boulder, Colo. and worked with French on SNOWIE. People ask her frequently if cloud seeding works. And she says it depends on how you define "work." If the question is whether or not cloud seeding is capable of producing more ice inside a cloud, then the answer is yes. But more often than not, the question is more complicated and people are hoping for more.
"So, sometimes the question ... is: 'Does it produce additional snowpack on the ground?' And we're still working to try to answer that question," Tessendorf says.
Tessendorf is cautious about what she's currently able to prove when it comes to cloud seeding. In the past, studies have shown the practice could boost snowpack by up to 15 percent. Tessendorf says the increase in snowpack cited in those studies has been a moving target over the years, with varying levels of rigorous data gathering. When she and other researchers want solid proof, they're looking for a 95 percent level of confidence that cloud seeding caused the increase, and it wasn't just a serendipitous series of storms.

"There's still enough chance that [the increase] could have been a random effect," Tessendorf says. "From a scientific perspective we haven't been fully convinced."

"But those scientific blind spots haven't stopped states and water agencies from investing in the technology. The University of Wyoming's Jeff French says water leaders should know gaps remain in our understanding of how well cloud seeding works.
"The evidence is pointing into the direction that it does have an impact and we can increase snowpack," he says. ***"But I'm skeptical still when I hear people say 10 to 15 percent because that number to me is something that is difficult to justify."***
"They should realize that that there is a risk associated with it," French says. "And that risk is that it may not be having an impact at all."

-Western Water Managers Bet on Cloud Seeding Despite Gaps in Science, January 31, 2019
https://zerogeoengineering.com/wp-content/uploads/2019/02/2019_western-water-managers-bet-cloud-seeding-despite-g.pdf

Silver iodide test note:

"People have raised a few concerns about negative effects from cloud seeding, but those effects appear to be minor. Silver ion is a toxic heavy metal, but the amount of silver iodide in seeded snowpack is so small that extremely sensitive instrumentation must be used to detect its presence."
https://phys.org/news/2022-03-cloud-seeding-drought-troubled-states.html

Drought note:
The 2008 scientific report titled "Flood or Drought: How Do Aerosols Affect Precipitation?" states: ***"The radiative effects of aerosols on clouds mostly act to suppress precipitation."***

RECEIVED
May 15, 2025
DEPARTMENT OF
WATER RESOURCES

LET IT SNOW
CLOUD SEEDERS FOR EASTERN IDAHO

May 14, 2025

Idaho Water Resource Board
Idaho Dept. of Water Resources
PO Box 83720
Boise, ID 83720

VIA E-Mail

To the Honorable Idaho Water Resource Board:

We would like to thank you for your time in serving on this very important Board for the constituents of the State of Idaho. Every person's time is valuable, and we know you give up a lot of yours to serve us as Idahoans.

We are Marty and Conni Owen, owners and operators of Let it Snow, Inc., a cloud seeding company in Eastern Idaho. We have operated cloud seeders in Idaho since 1996. What started out as a chance to establish a business serving Idahoans has evolved into a 30-year successful operation. Not only has it been a success for Let it Snow, we feel we have aided in adding much needed water to Eastern Idaho.

We would like to receive continued support for Cloud Seeding in Idaho, from you the Idaho Water Resources Board. Recently Cloud Seeding has come under the microscope in the United States while it continues to expand on a world-wide basis. State legislation regarding cloud seeding was heard in 32 states this past year, including Idaho. Senate bill 1064 threatened our programs in many unforeseen ways. The public wants the projects to be more transparent and allow them access to hours of operation and exact locations of our generators. We are very concerned about disclosing the site locations of our generators. All but one of our 25 generators are located on private land and operated by the landowner. Allowing the public knowledge of these site locations could put our operators at great risk and possibly physical or liable harm. These people have been willing to help a grass roots project become, and stay successful in producing much needed water for Idaho. Although we provide a map with general locations to NOAA on our annual reports, specific locations have never been and never should be disclosed to the public at large.

We very much would like to see cloud seeding in Idaho to continue to be successful in providing additional water to all Idahoans. Please help us do that by continuing to provide support and funding to our projects.

Thank you again for your time, and please feel free to reach out to us with any questions you might have.

Sincerely,

Marty and Conni Owen
Let it Snow, Inc.
PO Box 53, Dubois, ID 83423
208-521-2575

FOOD PRODUCERS of IDAHO, Inc.

55 SW 5th Avenue, Suite 100 • Meridian, ID 83642
phone: 208-888-0988 • fax: 208-888-4586
www.foodproducersofidaho.org

May 13, 2025

Idaho Department of Water Resources

Food Producers of Idaho, representing over 40 agriculture and commodity organizations in Idaho and the PNW, are writing in strong support of cloud seeding as a practical and science-based strategy to enhance water availability for agriculture, especially within the Bear River Basin.

Water is the foundation of American farming, and with droughts becoming more frequent and severe, we must leverage every responsible tool to sustain food production, protect rural livelihoods, and bolster local economies.

The Bear River Basin is particularly vital to Idaho agriculture, supporting irrigation for over 150,000 acres of farmland, powering hydroelectric facilities like Oneida Reservoir, and sustaining industries ranging from dairy processing to phosphate mining. However, persistent drought and variable precipitation have put these resources and the communities that rely on them at growing risk. Farmers across the region have faced difficult choices as water costs rise and surface water becomes less dependable.

Cloud seeding offers a targeted, cost-effective means to increase snowfall in the Bear River Range and Salt River Range, directly improving spring runoff and replenishing reservoirs that supply Idaho farms. The proposed Bear River Basin Program uses cutting-edge drone and ground-based technologies to seed precisely where and when conditions are most favorable. This initiative stands to significantly enhance Idaho's water resilience by reducing reliance on groundwater and ensuring more stable supplies for irrigation and power generation.

We believe this effort is not only environmentally responsible but is economically essential. By securing water for the Bear River Basin, we can protect one of Idaho's most productive agricultural regions and contribute to a stronger, more reliable food supply for the nation.

Food Producers of Idaho and the members we represent are requesting IDWR's support of the Bear River Basin Program as a critical investment in Idaho's agricultural future, rural economies, and long-term water resilience.

Sincerely,

Rick Waitley
Executive Director

Southern Idaho Potato Cooperative

55 SW 5th Avenue, Suite 100 | Meridian, ID 83642 | PH: 208-888-0988

May 13, 2025

Idaho Department of Water Resources

The Southern Idaho Potato Cooperative (SIPCO) represents farmers who raise processing potatoes in Southern Idaho. We are writing in support of cloud seeding as a practical and science-based strategy to enhance water availability for agriculture, especially within the Bear River Basin.

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Sincerely,

Kent Peterson, President