

16-1684 ✓

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|---|--|--|-------------------|--|--|--------------------------------|-------------------|
| Complete in accordance with instructions on reverse and forward copy: | | | | Form Approved: OMB No. 0648-0025 Expires 03-31-08 | | | |
| TO: National Oceanic and Atmospheric Administration Office of Oceanic and Atmospheric Research 1315 East-West Highway SSMC-3 Room 11216 Silver Spring, MD 20910 | | | | NOAA FORM 17-4 (4-81) U.S. DEPARTMENT OF COMMERCE NAT'L OCEANIC AND ATMOSPHERIC ADM. INITIAL REPORT ON WEATHER MODIFICATION ACTIVITIES (P.L. 205, 92 ND . CONGRESS) | | | |
| 1. PROJECT OR ACTIVITY DESIGNATION, IF ANY Tahoe-Truckee Project | | | | 2. DATES OF PROJECT | | | |
| 3. PURPOSE OF PROJECT OR ACTIVITY Snowfall Augmentation | | | | a. DATE FIRST ACTUAL WEATHER MODIFICATION ACTIVITY IS TO BE UNDERTAKEN 11/01/2015 | | | |
| | | | | b. EXPECTED TERMINATION DATE OF WEATHER MODIFICATION ACTIVITIES 07/31/2016 | | | |
| 4. (a) SPONSOR | | | | 4. (b) OPERATOR | | | |
| NAME Truckee Meadows Water Authority | | | | NAME Desert Research Institute | | | |
| AFFILIATION Water Utility | | PHONE NUMBER (775) 834-0808 | | AFFILIATION Nevada System of High Education | | PHONE NUMBER (775) 674-7140 | |
| STREET ADDRESS 1355 Capital Blvd. | | | | STREET ADDRESS 2215 Raggio Parkway | | | |
| CITY Reno | | STATE NV | ZIP CODE 89502 | CITY Reno | | STATE NV | ZIP CODE 89512 |
| 5. TARGET AND CONTROL AREAS (See Instructions) | | | | | | | |
| TARGET AREA | | | | CONTROL AREA | | | |
| LOCATION Lake Tahoe and Truckee River Basin | | SIZE OF AREA 1030 SQ.MI | | LOCATION None | | SIZE OF AREA SQ.MI. | |
| 6. DESCRIPTION OF WEATHER MODIFICATION APPARATUS, MODIFICATION AGENTS AND THEIR DISPERSAL RATES, THE TECHNIQUES EMPLOYED, ETC. (See Instructions) | | | | | | | |
| Five remotely controlled AgI solution-burning ground based generators will be used. An AgI solution burned in a propane flame with an AgI release rate of about 28 gram per hour per generator. Cloud seeding criteria are evaluated using a variety of weather instrumentation including NRCS SNOTEL sensors to monitor precipitation, snow water accumulation and temperature at high elevations in the target area. NWS Doppler radars at Reno and Sacramento, and NOAA satellite images are used to monitor cloud and precipitation development over the target area. NWS upper air soundings and Doppler VAD data are used to monitor the upper level winds, temperatures, and humidity. Surface weather stations, including several mountain top sites in and around the target area, provide data on surface temperature, winds and humidity. The U. of Utah MesoWest network of surface stations is used extensively. | | | | | | | |
| 7. LOG BOOKS: Enter name, affiliation, address, and telephone number of responsible individual from whom log books or other records may be obtained. | | | | | | | |
| NAME Frank McDonough | | | | THIS REPORT IS REQUIRED BY PUBLIC LAW 92-205; 85 STAT 735: 15 U.S.C. 330b. KNOWING AND WILLFUL VIOLATION OF ANY RULE ADOPTED UNDER THE AUTHORITY OF SECTION 2 OF PUBLIC LAW 92-205 SHALL SUBJECT THE PERSON VIOLATING SUCH RULE TO A FINE OF NOT MORE THAN \$10,000, UPON CONVICTION THEREOF. | | | |
| AFFILIATION Desert Research Institute | | PHONE NUMBER (775) 674-7140 | | | | | |
| STREET ADDRESS 2215 Raggio Parkway | | | | | | | |
| CITY Reno | | STATE NV | ZIP CODE 89512 | | | | |
| 8. SAFETY AND ENVIRONMENT | | | | | | | |
| <input type="checkbox"/> YES | | <input checked="" type="checkbox"/> NO | | Has an Environmental Impact Statement, Federal or State been filed? If yes, please furnish a copy as applicable. | | | |
| <input checked="" type="checkbox"/> YES | | <input type="checkbox"/> NO | | Have provisions been made to acquire the latest forecasts, advisories, warnings, etc. of the National Weather Service, Forest Service, or others when issued prior to and during operations? If yes, please specify on a separate sheet. | | | |
| <input checked="" type="checkbox"/> YES | | <input type="checkbox"/> NO | | Have any safety procedures (operational constraints, provisions for suspension of operations, monitoring methods, etc.) and any environmental guidelines (related to the possible effects of the operations) been included in the operational plans? If yes, please furnish copies or a description of the specific procedures and guidelines. | | | |
| 9. OPTIONAL REMARKS (See Instructions. Use Separate Sheet.) | | | | | | | |
| NAME Frank McDonough | | | | CERTIFICATION: I certify that the above statements are true, complete and correct to the best of my knowledge and belief. | | | |
| AFFILIATION Desert Research Institute | | | | SIGNATURE <i>Frank McDonough</i> | | | |
| STREET ADDRESS 2215 Raggio Parkway | | | | OFFICIAL TITLE Assistant Research Scientist | | | |
| CITY Reno | | STATE NV | ZIP CODE 89512 | DATE 04/15/2016 | | PHONE NUMBER | |

INTERIM ACTIVITY REPORTS AND FINAL REPORT

This report is required by Public Law 92-205; 85 Stat. 735; 145 U.S.C. 330b. Knowing and willful violation of any rule adopted under the authority of Section 2 of Public Law 92-205 shall subject the person violating such rule to a fine of not more than \$10,000, upon conviction thereof.

NOAA FILE NUMBER

16-1684

INTERIM
REPORT

FINAL
REPORT

Complete in accordance with instructions on reverse and forward one copy to:

National Oceanic and Atmospheric Administration
Office of Oceanic and Atmospheric Research
1315 East-West Highway SSMC-3 Room 11554
Silver Spring, MD 20910

REPORTING PERIOD

FROM 11/01/2015

TO 06/30/2016

| MONTH | (a) NUMBER OF MODIFICATION DAYS | (b) NUMBER OF MODIFICATION DAYS PER MAJOR PURPOSE | | | | (c) HOURS OF APPARATUS OPERATION BY TYPE | | (d) TYPE AND AMOUNT OF AGENT USED | | | | |
|-------------------------------|--|---|-----------|-----|-------|--|--------|--------------------------------------|-------------------|------|--------------------|-------|
| | | INCREASE PRECIPITA- TION | ALLEVIATE | | OTHER | AIRBORNE | GROUND | SILVER IODIDE | CARBON DIOXIDE | UREA | SODIUM CHLORIDE | OTHER |
| | | | HAIL | FOG | | | | | | | | |
| JANUARY | 10 | 10 | 0 | 0 | 0 | 0 | 341 | 8,275 | 0 | 0 | 0 | 0 |
| FEBRUARY | 2 | 2 | 0 | 0 | 0 | 0 | 35 | 918 | 0 | 0 | 0 | 0 |
| MARCH | 7 | 7 | 0 | 0 | 0 | 0 | 203 | 5,182 | 0 | 0 | 0 | 0 |
| APRIL | 3 | 3 | 0 | 0 | 0 | 0 | 66 | 1,714 | 0 | 0 | 0 | 0 |
| MAY | 1 | 1 | 0 | 0 | 0 | 0 | 24 | 622 | 0 | 0 | 0 | 0 |
| JUNE | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| JULY | | | | | | | | | | | | |
| AUGUST | | | | | | | | | | | | |
| SEPTEMBER | | | | | | | | | | | | |
| OCTOBER | | | | | | | | | | | | |
| NOVEMBER | 5 | 5 | 0 | 0 | 0 | 0 | 160 | 4,278 | 0 | 0 | 0 | 0 |
| DECEMBER | 7 | 7 | 0 | 0 | 0 | 0 | 264 | 6,631 | 0 | 0 | 0 | 0 |
| TOTAL | 35 | 35 | 0 | 0 | 0 | 0 | 1,093 | 27,620 | 0 | 0 | 0 | 0 |
| TOTALS FOR FINAL REPORT | | | | | | | | | | | | |

DATE ON WHICH FINAL WEATHER MODIFICATION ACTIVITY OCCURRED (For Final Report only.)

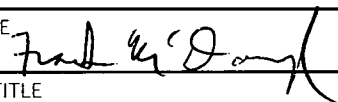
CERTIFICATION: I certify that all statements in this report on this weather modification project are complete and correct to the best of my knowledge and are made in good faith.

NAME OF REPORTING PERSON

Frank McDonough

AFFILIATION Desert Research Institute

SIGNATURE



STREET ADDRESS 2215 Raggio Parkway

OFFICIAL TITLE

Associate Research Scientist

CITY Reno

STATE NV

ZIP CODE 89506

DATE 07/15/2016

INFORMATION PROVIDED UNDER THE PROVISIONS OF THE PAPERWORK REDUCTION ACT OF 1995

The Paperwork Reduction Act of 1995 requires that individuals or organizations be provided with the following information if they provide information on paper forms which are collected by the Federal Government. (This includes reports required of weather modification activities.)

1. Public Law 92-205, enacted December 18, 1971 (amended by Public Law 94-490, Section 6(b), October 15, 1976) requires that all non-federal weather modification activities in the United States and its territories be reported to the Secretary of Commerce. The National Oceanic and Atmospheric Administration has implemented the Act and the current reporting requirements are published in the Catalog of Federal Regulations (15 CFR 908).
2. The intent of the program is to increase expertise in the field of weather modification, to allow scientists and other concerned persons to have access to information on current and past efforts at weather modification, to help avoid unneeded and wasteful duplications, to aid in preventing territorial overlapping of weather modification operations, to provide data to assess possible harmful or dangerous activities, and to furnish information to check both desirable and undesirable atmospheric changes against records of weather modification efforts. To meet this objective, information is collected on the location and size of the target area, names and addresses OF sponsors and operators, beginning and ending dates of the project, specific purpose, description of apparatus and seeding agents to be used, number of days of operations, number of hours of operations of each type of weather modification apparatus, and total amount of seeding agent used.
3. Public reporting burden for this collection of information is estimated to average 40 hours for reporting and 200 hours for record keeping, based on one-half hour per response on Form 17-4 and one-half hour per response on Form 17-4A, and five hours per record keeper. It is estimated that the time per response is approximately the same across all respondents. Send comments regarding this burden estimate or any other aspect of this data collection, including suggestions for reducing this burden to: Ms. Karen Williams, DOC/NOAA/OAR, 1315 East West Highway, Silver Spring, MD 20910.
4. Reporting of this information under Public Law 92-205, enacted December 18, 1971 (amended by Public Law 94-490, Section 6(b), October 15, 1976) is mandatory.
5. Confidentiality is not a requirement for this reporting; no sensitive information is required.
6. Notwithstanding any other provision of the law, no person is required to respond to, nor shall any person be subject to a penalty for failure to comply with, a collection of information subject to the requirements of the Paperwork Reduction Act, unless that collection of information displays a currently valid OMB Control Number.

DRI CLOUD SEEDING PROGRAM
Operational Guidelines and Safety Restrictions

In the event of any emergency which affects public welfare in the region of any seeding operations being carried on by the DRI Cloud Seeding Program, the seeding operations in that region will be suspended until the emergency conditions are no longer a threat to the public. Seeding suspensions are generally expected to occur due to one or more of the following conditions:

- A) When an extreme avalanche danger exists as determined by the U.S. Forest Service.
- B) When the National Weather Service (NWS) forecasts a warm winter storm (freezing level >8000 ft.) with the possibility of considerable rain at the higher elevations which might lead to local flooding.
- C) When the Project Meteorologist determines that potential flood conditions may exist in or around any of the project areas, the National Weather Service Flood Forecast Services at Reno or Sacramento will be consulted about the possibility of any of the following warnings or forecasts being in effect.
 - 1. Flash flood warnings by the NWS.
 - 2. Forecasts of excessive runoff issued by the CA/NV River Forecast Center, including such forecasts for rivers on the adjoining west slope of the Sierra Nevada.
 - 3. Quantitative precipitation forecasts issued by the NWS that would produce excessive runoff in or around the project area.

In addition to the above, if any of the following conditions or forecasts exist; seeding operations may be suspended, at the discretion of the Project Meteorologist, in and around the areas of concern:

- A) When the wind speed is 60 knots or more for over 30 minutes at the 700 mb level (~10,000 ft). For monitoring purposes in the western part of Nevada, the winds measured at Slide Mountain (9,650 ft) are considered equivalent to the 700 mb level winds. The Reno and Elko upper air soundings can also be used to monitor this criterion, as can the Doppler winds from the Reno and Elko NEXRAD radars.
- B) When wind directions lie outside of the range between 180 and 330 degrees during ground-based seeding operations on the west side of the Sierra Nevada crest. The winds measured at Slide Mountain or Ward Peak (8,480 ft), and the upper air soundings and NEXRAD Doppler winds from Reno and Elko can be used to monitor wind direction.

- C) When the water content of the snowpack in the target area, as measured at existing snow courses or SNOTEL sites, exceeds the accumulation envelope defined by the following percentages to date of long-term averages on the same date. NRCS SNOTEL data and reports are used to monitor snowpacks.

December 1...175%
January 1.....150%

February 1...150%
March 1....150%

April 1...140%
May 1....140%

Intermediate limits shall be derived by linear interpolation between the percentages given above.

- D) During major holidays such as Thanksgiving, Christmas, New Year's Day, and President's Day, in areas and times of heavy traffic on Highways 50 and 80, over the Sierra Nevada.

Created: 8/27/1990
Revised: 10/21/2009

DRI CLOUD SEEDING PROGRAM **Weather Monitoring Facilities and Procedures**

The DRI Cloud Seeding Program is operated from the Desert Research Institute Division of Atmospheric Sciences, located in the Northern Nevada Science Center (NNSC), Reno, Nevada. The project has 24-hour access to a broad base of National Weather Service (NWS) weather data through UNIDATA, a program managed by the University Corporation for Atmospheric Research (UCAR). The data are received by the Western Regional Climate Center (WRCC) at DRI and are available through the WRCC web site: <http://www.wrcc.dri.edu>.

In addition to the above NWS data products (supplied through UNIDATA and other sources), the data from remote weather stations on Slide Mountain, Ward Peak, the Squaw Valley and Alpine Meadows Ski Resorts, on Conway Summit and other Walker Basin sites, and at a sites near the Ruby Mountains, are continuously available through the Internet or telephone modem at the NNSC. Data from the Bureau of Land Management RAWS network, and the Natural Resource Conservation Service SNOTEL network are available through the WRCC on a near real time basis. The DRI Cloud Seeding Program maintains its own web page with the bulk of these weather data links at the following address.

<http://cloudseeding.dri.edu/Weather/Weather.html>

The DRI Cloud Seeding Program meteorologist also confers directly with the National Weather Service forecasters and National Forest Service staff when flood or avalanche potential exists in any of the project areas. [See Operational and Safety Guidelines.]

DRI CLOUD SEEDING PROGRAM

Cloud Seeding Operations Criteria

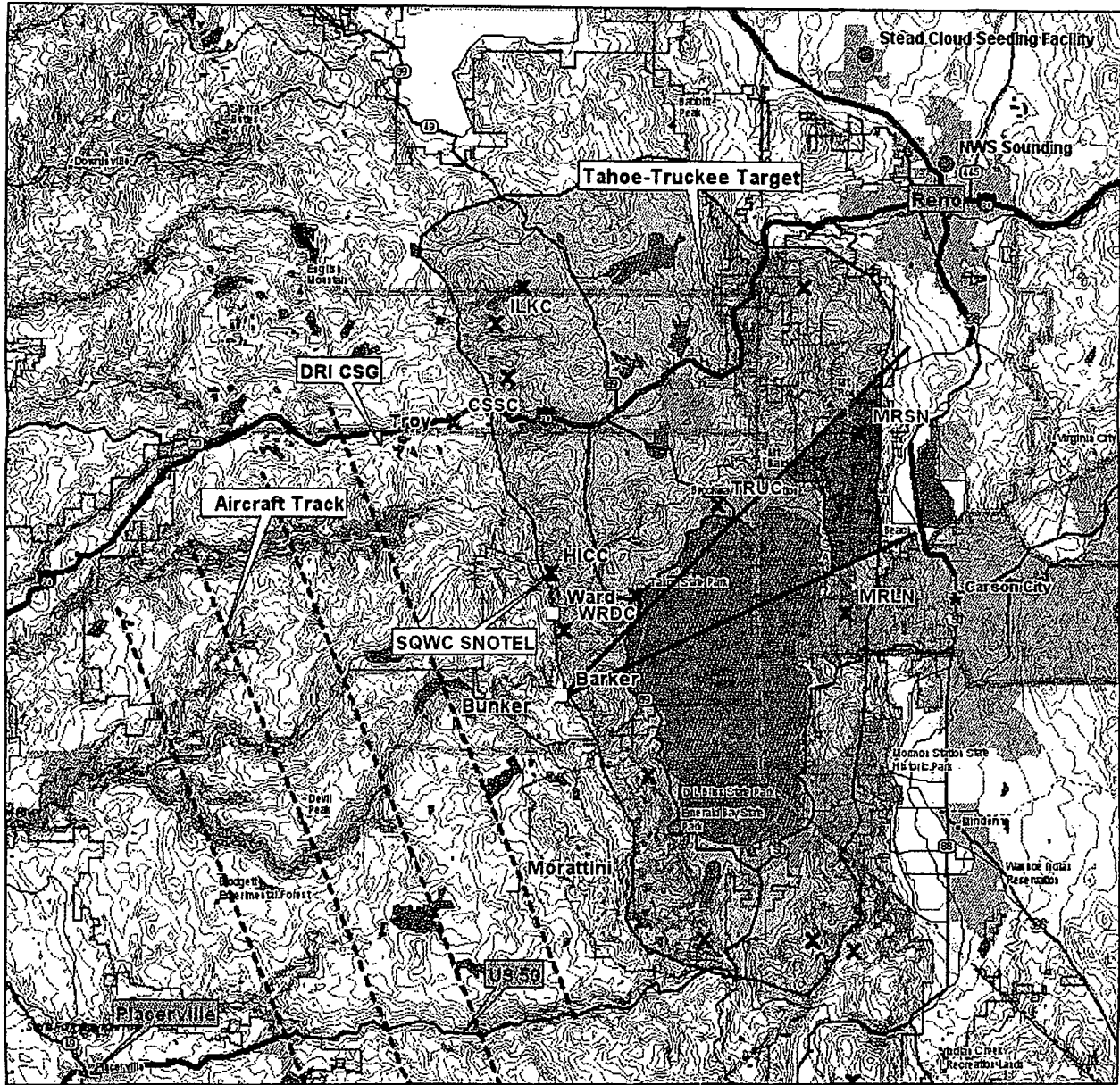
The following weather and cloud conditions are required in order to initiate or continue cloud seeding operations in any one of the operational areas of the DRI Program. Operations can also be initiated based on a 0-3 hour forecast of these conditions existing in any of the three operational areas. Seeding suspension criteria will always override seeding operations criteria.

1. Cloudiness of sufficient areal extent to cover at least 50% of the intended target area. Verification is by means of GOES visible or infrared satellite images and NEXRAD radar images.
2. Clouds of sufficient depth, with cloud bases at least as low as the highest mountain peaks, to provide the potential for precipitation over the target areas. Verification of these conditions can be obtained by one or more of the following:
 - a) NWS hourly reports of cloud conditions and precipitation at, but not limited to, the following sites: MMH, BLU, TRK, TVL, RNO, and EKO.
 - b) Visual observations (including webcam images) and/or reports of cloud conditions by the project meteorologist, other project staff, contacts in any of the project areas, or internet links to webcams.
 - c) Observation of precipitation from any automatic recording gauge whose data are telemetered by telephone modem or the Internet to DRI. The DRI has access to many such gages in the Sierra Nevada and other mountain ranges throughout Nevada.
 - d) WSR-88D (NEXRAD) radar images obtained from Sacramento, Reno or Elko NWS radar sites.
3. Wind directions that are conducive to transporting seeding material over the target areas. This criterion will vary by area as follows:
 - a) Truckee-Tahoe area: Wind direction at 700 mb, as measured by the Reno NWS soundings (or soundings launched by other agencies), or estimated by weather stations close to the 10,000 ft altitude level, from (clockwise) between 180 and 330 degrees.
 - b) Ruby Mountains: Wind directions in the cloud layer from 190 to 330 degrees as verified by the NWS Elko sounding, Elko NEXRAD VAD data, or remote weather station data.

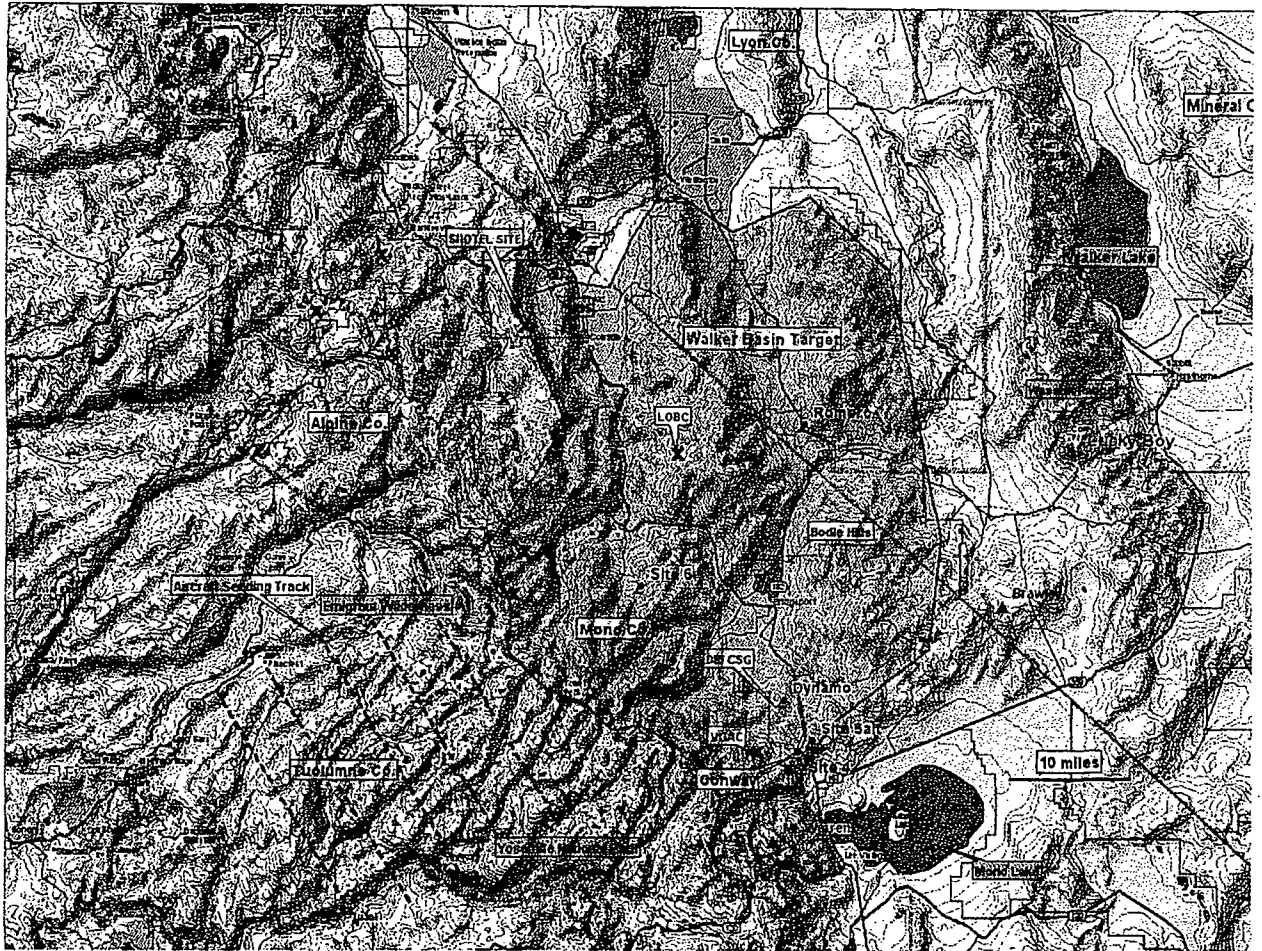
- c) Walker Basin area: Wind directions in the cloud layer from 60° clockwise through about 270° as verified by the NWS Reno sounding, or remote weather station data.
4. Wind speeds at or near 700 mb should not exceed 30 m s^{-1} (~60 kts) in order for adequate time to be available for growth of ice crystals initiated by seeding. Mountain top weather stations, NWS Reno and Elko upper air soundings, other soundings, and NEXRAD radars will provide verification of wind speed.
 5. The existence of supercooled liquid water (SLW) in clouds is a condition necessary for successful cloud seeding. This quantity is not routinely measured over all the target areas, but the observation of icing at Slide Mountain (or other mountain top site), or the observation of liquid water from one of DRI's microwave radiometers should be given strong consideration in the decision to initiate a seeding operation in any area where these data are available. In addition, aircraft icing data and forecasts, such as are available at <http://adds.aviationweather.noaa.gov/> can also be used to verify or predict the presence of SLW.
 6. To increase the likelihood of ice crystal formation by AgI seeding aerosols from ground generators, the temperature near 10,000 ft should be -5°C , or colder, as verified by data from the mountain top weather stations, or Reno, Elko, or other soundings. Operations may be initiated at a temperature as warm as -3°C , provided the -5°C threshold is forecast to be met within 0 to 3 hours. In addition, if unstable atmospheric conditions are apparent, seeding can also be initiated at temperatures above -5°C .

The project meteorologist is responsible for forecasting and verifying seedable conditions, and also for initiating and terminating operations. Logs documenting the weather conditions during an operation will be kept on file at DRI by the meteorologist or other staff members.

Created: 7/21/1994
Revised: 10/12/2010



Map showing the Tahoe-Truckee Project area. The shaded region is the target for seeding operations. Ground seeding generator locations are shown by yellow squares. The blue lines depict a simplified seeding plume from one site. SNOTEL sites are shown by red Xs and the Reno upper air sounding site is shown by the cyan-colored circle. Black dashed lines show potential aircraft seeding tracks, but aircraft seeding will not be used during the 2010-11 winter.



Map showing the Walker Basin Project area. The shaded region is the target for seeding operations. Ground seeding generator locations are shown by blue pins. Aircraft seeding tracks are shown by blue dashed lines. SNOTEL sites are shown by red Xs.

Desert Research Institute

15 April 2016

Ms. Karen Williams
Manager: Weather Modification Activities Reporting Program
1315 East-West Highway (R/WA Room 11216)
Silver Spring, MD 20910

Dear Ms. Williams:

Enclosed are our **Initial Reports on Weather Modification Activities** for the 2015-2016 winter season. There are two areas where we will be conducting cloud seeding activities this year. These areas have been seeded and reported on in the past. Looking though the files here at DRI in 2011 these projects had numbers of

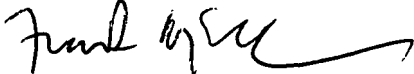
11-1530 Tahoe-Truckee Project

11-1529 Walker Basin Project

Enclosed with the reports are maps showing the locations of the projects and the DRI Cloud Seeding Program operational guidelines, safety restrictions, weather monitoring procedures and cloud seeding criteria.

If questions arise please feel free to contact me at (775) 674-7140.

Sincerely,



Frank McDonough
Assistant Research Scientist

Cc: Maria Garretson

May 6, 2016

Mr. Frank McDonough
Desert Research Institute
2215 Raggio Parkway
Reno, NV 89512

Dear Mr. McDonough:

Thank you for your Initial Reports for DRI. Your projects were assigned the following file numbers:

| <u>Project Name</u> | <u>NOAA File Number</u> |
|---------------------|-------------------------|
| Tahoe-Truckee | 16-1684 |
| Walker Basin | 16-1685 |

As a reminder, please submit a Final Report within 45 days after the project has terminated. This is mandated under Public Law 92-205.

Sincerely,



Karen Williams, Manager
Weather Modification Activities
Reporting Program

May 6, 2016

Mr. Frank McDonough
Desert Research Institute
2215 Raggio Parkway
Reno, NV 89512

Dear Mr. McDonough:

Thank you for your Initial Reports for DRI. Your projects were assigned the following file numbers:

| <u>Project Name</u> | <u>NOAA File Number</u> |
|---------------------|-------------------------|
| Tahoe-Truckee | 16-1684 |
| Walker Basin | 16-1685 |

As a reminder, please submit a Final Report within 45 days after the project has terminated. This is mandated under Public Law 92-205.

Sincerely,



Karen Williams, Manager
Weather Modification Activities
Reporting Program

July 15, 2016

Dear Ms. Williams:

Please find the Final Reports for water year 2016 weather modification projects enclosed.

| <u>Project Name</u> | <u>NOAA File Number</u> |
|---------------------|-------------------------|
| Tahoe-Truckee | 16-1684 |
| Walker Basin | 16-1685 |

Please let me know if you have any questions or need additional information

Best Regards,

Frank McDonough

Project Manager

Frank.McDonough@dri.edu

(775) 674-7140