Complete in accordance with instructions on reverse and forward 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

Form Approved: OMB No. 0648-0025 Expires 01/31/2018

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, 92ND. CONGRESS)

1. PROJECT OR ACTIVITY DESIGNATION, IF ANY
SAWPA Pilot Cloud Seeding Program

2. DATES OF PROJECT

a. DATE FIRST ACTUAL WEATHER MODIFICATION ACTIVITY IS TO BE UNDERTAKEN: 11/15/2023

b. EXPECTED TERMINATION DATE OF WEATHER MODIFICATION ACTIVITIES: 04/15/2024

3. PURPOSE OF PROJECT OR ACTIVITY
Rainfall/Snowpack augmentation

4. (a) SPONSOR

NAME		
Rachel Gray		
AFFILIATION	PHONE NUMBER	
Santa Ana Watershed Project Authority	951-354-4242	
STREET ADDRESS		
11615 Sterling Ave.		
CITY	STATE	ZIP CODE
Riverside	CA	92503

4. (b) OPERATOR

NAME		
Todd Flanagan		
AFFILIATION	PHONE NUMBER	
North American Weather Consultants	8019429005	
STREET ADDRESS		
8180 South Highland Dr Ste B-2		
CITY	STATE	ZIP CODE
Sandy	UT	84093

5. TARGET AND CONTROL AREAS (See Instructions)

TARGET AREA		CONTROL AREA	
LOCATION	SIZE OF AREA	LOCATION	SIZE OF AREA
see map .	2840 SQ.MI	n/a	n/a SQ.MI.

6. DESCRIPTION OF WEATHER MODIFICATION APPARATUS, MODIFICATION AGENTS AND THEIR DISPERSAL RATES, THE TECHNIQUES EMPLOYED, ETC. *(See Instructions)*

12 ground-based cloud nuclei generators (CNGs) will be used; each CNG emits 8 g/hr of silver iodide (AgI) when active.
Additionally, 3 ground-based AHOGS (Automated High Output Ground Sites) will be available to seed convective bands during storm periods.
The AHOGS are equipped with 150 g AgI flares.
Operational decisions will be made by NAWC meteorologists.

7. LOG BOOKS: *Enter name, affiliation, address, and telephone number of responsible individual from whom log books or other records may be obtained.*

NAME		
Todd Flanagan		
AFFILIATION	PHONE NUMBER	
North American Weather Consultants	8019429005	
STREET ADDRESS		
8180 South Highland Dr Ste B-2		
CITY	STATE	ZIP CODE
Sandy	UT	84093

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.

8. SAFETY AND ENVIRONMENT

- [ ] YES [X] NO — Has an Environmental Impact Statement, Federal or State been filed? If yes, please furnish a copy as applicable.
- [X] YES [ ] 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.
- [X] YES [ ] 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	CERTIFICATION: I certify that the above statements are true, complete and correct to the best of my knowledge and belief.	
Todd Flanagan		
AFFILIATION	SIGNATURE	
North American Weather Consultants		
STREET ADDRESS	OFFICIAL TITLE	
8180 South Highland Dr Ste B-2	Meteorologist	
CITY / STATE / ZIP CODE	DATE	PHONE NUMBER
Sandy / UT / 84093	10/26/2022	8019429005

Reset

INSTRUCTIONS FOR INITIAL REPORT ON WEATHER MODIFICATION ACTIVITIES

One completed copy of this form is to be received 10 days* or more prior to actual modification activities. A NOAA file number will be assigned by the Administrator after receipt of the initial report for each project or activity.

A supplemental report in a letter form referring to the appropriate NOAA file number must be made to the Administrator if the "Initial Report" is found to contain any material inaccuracies, misstatements, and omissions, or if there are changes in plans for the project or activity.

*For exceptions, see Sections 908.4(b) and (c), Part 908 of Title 15, Code of Federal Regulations.

Item 1. Enter designation, if any, used by operator for the project or activity.

Item 2. Enter: (a) Date first actual weather modification activity is to be undertaken;
(b) Date on which final weather modification activity is expected to occur.

Item 3. Enter the purpose of the project or activity: e.g., rainfall increase, hail suppression, cold fog dispersal, etc.

Item 4. Enter: (a) Name, phone number, affiliation, and address of the primary person for whom the project is to be performed (sponsor).

(b) Name, phone number , affiliation, and address of the person primarily responsible for carrying out the project (operator).

Item 5. A map should be attached showing size and location of target area, control area, coded number and location of each item of ground-based weather modification apparatus and coded number and location of key raingages, radars, or other precipitation measuring devices. Also show location of airport for airborne operations.

Item 6. Describe the weather modification apparatus, modification agents, and the techniques to be used. This would include type of ground or airborne apparatus to be used, type of modification material to be dispensed, rate of dispensing material in grams per hour or other appropriate units, type of precipitation gages to be used in target and control areas, and any other pertinent information such as type of radars, type of aircraft to be used, techniques to be employed, (e.g., cloud base seeding at 10,000 feet msl).

Item 7. List name, phone number , affiliation, and address of the responsible individual from whom log books or other records may be obtained.

Item 8. Provide applicable answers to questions as indicated.

Item 9. This item is to permit the reporting person to include any information not covered by items 1 through 8 but which he feels is significant or of interest. It is also to be used to include any information not covered elsewhere that the Administrator may request.

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.

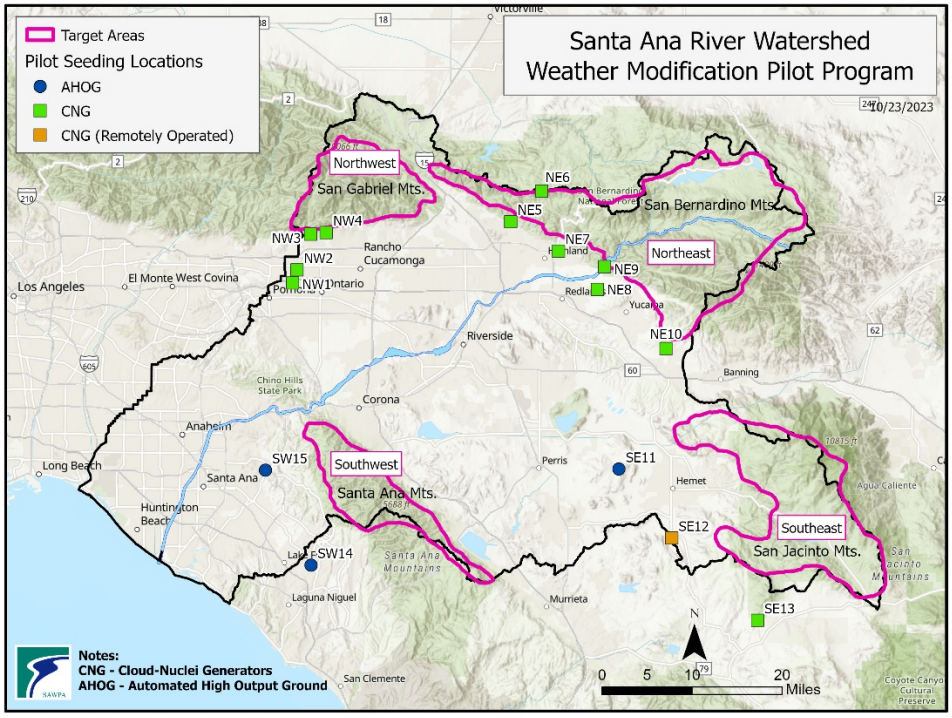
3. Public reporting burden for this collection of information is estimated to average 40 hours for reporting and 200 hours for record keeping, based on one-half hour per response on Form 17-4 and one-half hour per response on Form 17-4A, and five hours per record keeper. It is estimated that the time 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 King, 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 <u>mandatory</u>.

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.

September 1, 2000
Expires 09/30/2004



\\swsql01\GIS\projects\Mark_Norton\WeatherMod_21\WeatherMod2.aprx LoPilotProgramSites SW-3108

Meteorological Data and Computer Modeling Used to Assess Criteria

NAWC's project meteorologists will be responsible for analyzing in real-time and archiving relevant weather data (e.g., local Next Generation Weather Radar (NEXRAD) including radar displays, satellite photos and rainfall data) from each storm event. A variety of weather information is available via the internet that can be used to forecast approaching storms and to observe weather conditions during storms. Information obtained from third-party forecasting models, available from the internet, would include:

- Upper-air data, including at important levels at 850, 700, 500, 300 and 250 millibars (mb).
- Rawinsonde data: pressure, temperature, and wind observations which are plotted (in the vertical) throughout the atmosphere.
- Radar and surface observation data which allow the meteorologists to view important parameters such as precipitation intensity and surface wind speed/direction before and during seeding operations.
- Hourly observed precipitation data from ALERT networks in several counties in southern California, including streamflow data.
- Satellite imagery: visible, infrared, and water vapor presentations updated at intervals ranging from five minutes to one hour.

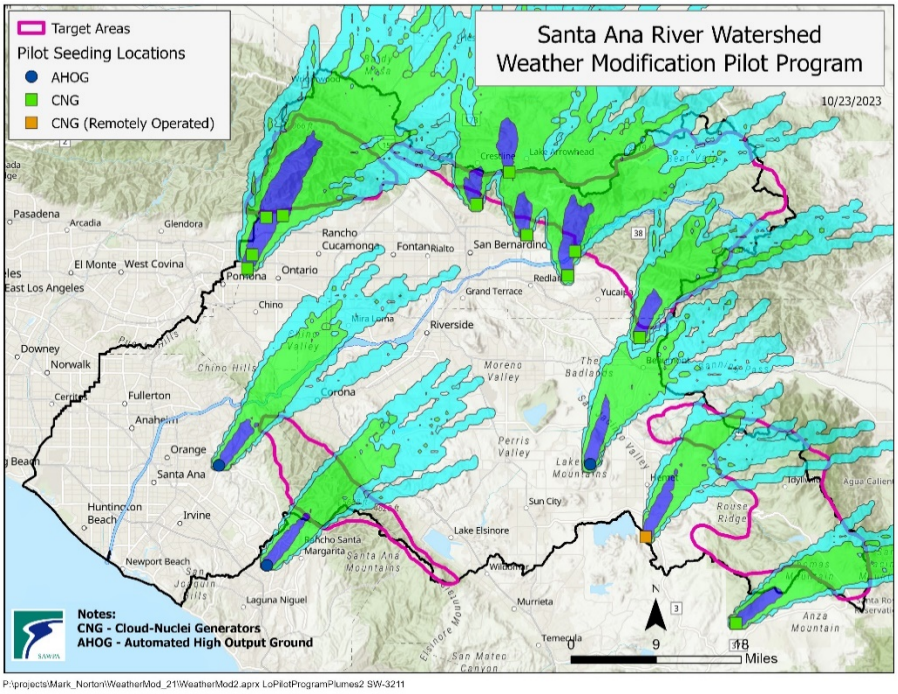
NAWC will utilize forecast models during operations, most of which were developed by National Oceanic and Atmospheric Administration (NOAA) and the National Center for Atmospheric Research (NCAR). Among the short-term forecast models NAWC proposes to use a model known as the High-Resolution Rapid Refresh (HRRR) model. This model is a high-resolution model with a 3 km grid spacing compared to the more standard grid model spacing of 12 km (e.g., NAM model), and it is re-initialized every hour using the latest meteorological observations NAWC will gather from the third-party websites. Hourly forecast outputs from the HRRR model are available for a variety of parameters including composite reflectivity, total precipitation for a selected time interval, 850 mb winds and temperatures, and 700 mb winds and temperatures. Detailed information regarding the types of data provided by the HRRR and other forecasting models, and how that data is pertinent to cloud seeding will be documented and provided to SAWPA.

The HYSPLIT model is a valuable tool that uses meteorological model data to help examine the targeting potential from each site throughout a storm event. Developed by NOAA, HYSPLIT is "a system for computing simple air parcel trajectories, as well as complex atmospheric transport and dispersion simulations. It requires meteorological data to run." (Cheat_Sheet_2020.pdf (noaa.gov))

Accurately predicting the dispersion of seeding materials is critical to the success of the Program. In addition to forecasting models, computer modeling software that predicts the dispersion and transportation of seeding materials in the atmosphere is critical to a program's success. The HYSPLIT model will be used to predict plume dispersions in both horizontal and vertical planes. Utilizing either forecast meteorological data or archived meteorological data, HYSPLIT is run for a single site or series of sites over a given period that can be set by the user to create a calculated plume dispersion based on the meteorological data.

Figure 1 is an example of a HYSPLIT model dispersion prediction for a particular storm that occurred on March 7, 2016. The 15 seeding sites are differentiated in the legend, and the dark blue, green, and cyan represent the predicted concentration and dispersion pattern of the seeding materials.

Figure 1: HYSPLIT One-hour Plume Dispersion from All 15 Ground-based Seeding Sites



The highest concentrations are in the center of the dispersion polygons shown in Figure 6 (i.e., the dark blue), with lowering concentrations as you move outward (i.e., the cyan). As discussed earlier, seedability at each of the ground sites will be considered individually. In Figure 6, it is evident that seeding from the most northern CNG site location would not be effective as the HYSPLIT output suggests the seeding plume would be directed away from the target area and over the low elevation desert to the north of the Santa Ana River Watershed. During this particular portion of the storm seeding from the AHOGS located in the northern parts of Orange County may also not prove effective, as the plume is also forecasted to miss the target area. Surface winds frequently change direction during a storm period. It is possible that earlier or later periods of this storm would provide opportunities to seed from the Orange County location. As discussed earlier, operations will be performed to provide the maximum benefit for precipitation to the Santa Ana River Watershed and the four target areas. SAWPA's role is to coordinate with the political jurisdictions outside of the target areas such as the four flood control districts.

Seeding Suspension Criteria

The feasibility study contained initial considerations regarding suspension criteria. NAWC will work with SAWPA with input from the flood control districts, within the Santa Ana River Watershed, to finalize suspension criteria for the first operational season. These criteria will then be reviewed and updated when necessary for the three additional seasons of operation (e.g., specification of areas recently burned by wildfires). Suspension will occur when any of these established criteria are exceeded. Conditions for localized suspensions may also be derived, to allow NAWC some control over operations during periods of special concern, such as with local Flash Flood Warnings or Severe Thunderstorm Warnings.

In general, suspensions will be considered when a storm is forecasted to be a 1 in 2-year event by magnitude or rainfall rates or in cases such as a series of atmospheric river events. Areas of particular concern include the Inland Empire where infrastructure may be challenged to contain runoff from a severe storm event. Areas with burn scars will be tracked and assessed as part of the multi-year program. Specifics on scenarios wherein suspensions would arise are explained below.

Flooding Situations

In addition to the possibility of flooding due to extreme rainfall, the potential also exists for wintertime flooding from rainfall on existing snowpack, especially if a lower elevation snowpack exists. Precautions must be taken to ensure accurate forecasting and timely temporary suspension of operations during these potential flooding situations. The objective of suspension under these conditions is to eliminate the real and/or perceived impact of weather modification when any increase in precipitation has the potential of creating or contributing to a significant flood hazard. When a significant rain on snow event is expected, the forecast will be monitored closely to flag the potential for warm storm rain on snow, and coordination between the meteorologist and SAWPA will be appropriate in circumstances where the freezing level is >8,000 feet and the quantitative precipitation forecast (QPF) is > 3 inches in 24 hours. We expect this situation of rain on an existing snowpack to be rare for southern California, yet still possible.

Burn Scars

After a wildfire is contained, a burn scar will form in the impacted area. According to the National Weather Service, the length of time the burn scar remains a threat for debris flow "depends on the severity of the wildfire that occurred as well as how much erosion occurs. It could take many years for vegetation to become reestablished and this is the main factor in slowing the precipitation run off that creates flash flooding and debris flows. Most burn areas will be prone to this activity for at least two years." Following a wildfire, SAWPA will share the impacted areas with NAWC and coordinate the fire severity and extents of the burn scar with the applicable flood control district. If the burn scar is a threat for debris flow, NAWC will not conduct seeding operations that will affect the burn scar area.

Severe Weather

During periods of hazardous weather phenomena associated with both winter orographic and convective precipitation systems it is sometimes necessary or advisable for the National Weather Service (NWS) to issue special weather bulletins advising the public of the weather phenomena. Each phenomenon is described in terms of criteria used by the NWS in issuing special weather bulletins. Those of concern while conducting winter cloud seeding programs include the following:

- **Winter Storm Warnings** – issued by the NWS when it expects heavy snow, along with strong winds/wind chill or freezing precipitation.
- **Flash Flood Warnings** – issued by the NWS when flash flooding is imminent or in progress, or a dam break is imminent or occurring.
- **Severe Thunderstorm Warnings** – issued by the NWS when a thunderstorm is expected to produce strong winds in excess of 58 miles per hour (mph) or hail larger than one inch in diameter.

Seeding operations may be suspended when the NWS issues a flood/flash flood warning for or adjacent to one of the target areas. However, since an objective of the cloud seeding program is to increase winter snowfall in the mountainous areas where snow commonly falls, suspensions are not generally necessary when Winter Storm Warnings are issued, unless there are special, extenuating considerations to make, for example, the effect of heavy snowfall at low elevations not typically used to heavy snow that could result in flooding situations upon melting, or heavy snowfall that is forecast to be followed by heavy rainfall over the snowpack which may also result in flooding. There is also the prospect of high winds during storms impeding seeding operations; sustained winds in excess of 30 mph at the sites may result in issues with the CNG flame remaining lit or the actual seeding plumes having very long tracks such that the nucleation occurs well after the plume has moved past the target areas.

Flash Flood Warnings are usually issued when intense convective activity causing heavy rainfall is expected, or when moderate rainfall is expected for extended periods. The types of storms that may cause problems are those that have the potential of producing 2-3 inches (or greater) of rainfall in approximately a 24-hour period, especially with high freezing levels (e.g., >8,000 feet MSL). Seeding operations shall be suspended for the duration of the warning period in the affected areas when the **24-hour rainfall is forecast to be greater than 3 inches.**