REPORT OF WEATHER BUREAU SURVEY TEAM
STORM OF JULY 4 - 5, 1969
NORTHERN OHIO

ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION
WEATHER BUREAU EASTERN REGION
GARDEN CITY, NEW YORK

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On the evening and night of July 4, 1969, severe thunderstorms, tornadoes and heavy rains resulted both in the loss of life and major property damage along the shore of Lake Erie. Thunderstorms and heavy rains continued into the afternoon of July 5th causing major flooding and additional loss of life and substantial property damage in northern Ohio. To assess the extent of the storm severity, and in particular the effectiveness of our forecast and warning dissemination procedures, an investigating team was designated by the Director, Eastern Region. As provided by the Eastern Region Post Natural Disaster Survey Plan, representatives of Weather Bureau Headquarters and of the National Severe Storm Forecast Center were included. The membership of the team is listed below:

S. Grimm, Jr.	Chief, Emergency Warnings Section, Weather Bureau Headquarters
S. Bigler	Chief, Sounding Systems Branch, Weather Bureau Headquarters
H. Crumrine	Meteorologist, National Severe Storms Forecast Center, Kansas City, Missouri
W. G. Seibert	Chief, Weather Analysis and Prediction Branch, Eastern Region Headquarters
J. A. Mayer	Service Operations Evaluation Meteorologist, Eastern Region Headquarters
A. S. Kachic	Assistant Regional Hydrologist, Eastern Region Headquarters
R. Hamilton	Radar Meteorologist, Eastern Region Headquarters

Assistance was provided by Mr. Richard Fay, Meteorologist in Charge, Weather Bureau Forecast Office, Cleveland, Ohio, Mr. John McClain, Principal Assistant and other members of the Weather Bureau Forecast Office, Cleveland staff; Mr. Terry Ritter, Meteorologist in Charge, Weather Bureau Office, Akron, Ohio and Mr. Grant Vaughan, Radar Hydrologist, Weather Bureau Office, Akron, Ohio.

Members of the Survey Team looked into various aspects of the storms, forecasts and warnings, both individually and as a group. Visits were made to areas which had been the scenes of major storm damage. Informative meetings and discussions were held with representatives of state, county and local government, police, civil defense, the U. S. Coast Guard, utilities and mass news media. All of those with whom we had contact were interested and cooperative.

This was a difficult forecast situation and a very difficult warning situation both with regard to time available and because it occurred on a major holiday. Although there were already indications in the morning of the possibility of severe thunderstorms, by late afternoon the warm front with which thunderstorms were associated earlier in the day had moved to the north of Cleveland. A line of thunderstorms developed well to the north, first appearing on the Cleveland radar about 6 p.m. Reported direction of movement of thunderstorms by radar stations was such that this line did not appear to present any immediate threat.

The first indication of thunderstorms not far off the south shore of Lake Erie was received about 7 p.m. Information regarding them was included in a recreational boating forecast issued at 7:15. While this boating forecast was being released, a coordination call was received at Cleveland to the effect that a tornado watch was about to be issued by the National Severe Storms Forecast Center which would include northern Ohio. The Cleveland Weather Bureau Forecast Office immediately prepared a redefining statement based on this information which was transmitted over the Ohio ESSA Weather Wire and other communications channels with Severe Weather Watch #359 at 7:30 p.m. or shortly thereafter. The first severe thunderstorm activity was reported at 7:35 p.m. A warning was prepared and ready for transmission by 7:45 for Ottawa, Sandusky and Erie Counties. A second warning to cover Cuyahoga, Lake, Ashtabula and Lorain Counties was issued five minutes later. A severe thunderstorm hit the Lakewood, Ohio area about 8:00 p.m. In spite of communications problems which need correction, the staff on duty at Weather Bureau Forecast Office, Cleveland, did an excellent job in preparing the redefining statements and disseminating severe weather information including the severe weather watch and the related warnings under very adverse circumstances.

Comments and recommendations of the investigating team follow under the headings listed below:

General
Communications
Radar
Hydrology

GENERAL

1. Weather Bureau Offices are staffed with a minimum of personnel even for normal operation. Call back or hold over procedures are used in severe weather situations. In short fuse situations such as this one, the most critical period for warning dissemination is over before additional help can be located and can reach the station even under the best of circumstances. Recent manpower ceilings have further reduced the capability of management to improve this situation.

2. Severe weather warning procedures frequently are based on communications facilities that may not be available at night, on weekends or on holidays. All Weather Bureau Offices should be encouraged to review their severe weather procedures to assure that maximum use is made of facilities that are available on a 24 hour day, 7 day per week basis.

COMMUNICATIONS

1. Plans for installation of a Weather Bureau operated Very High Frequency FM transmitter in the Cleveland area should be completed as soon as possible. This transmitter will have a built-in tone alerting feature. It is strongly recommended that this feature also be built into as many receivers as possible. Consideration should be given to the possibility of using two frequencies by the Weather Bureau (162.55 and 163.275) to permit closer spacing of stations without interference. Longer range plans should include installations at Buffalo, Erie and Toledo as well as at Cleveland.

2. The meeting at the Cuyahoga County Civil Defense Headquarters brought out the necessity for the Cleveland Weather Bureau Forecast Office to have the capability of directly activating the Cuyahoga County Civil Defense Communications Network and through this network the State Emergency Broadcast System by which they can reach nearly all radio and television stations throughout the State of Ohio. The Cuyahoga County Civil Defense Headquarters and the Ohio Bell Telephone Company have already arranged for necessary changes in this system.

3. Installation of alerting devices on ESSA Weather Wire Service teletypewriters should be encouraged and perhaps even required. All disseminators should be reminded regularly that ESSA Weather Wire Service, when it exists, is the Weather Bureau's first means of dissemination of watches and warnings.

4. Weather Bureau Forecast Office, Cleveland should review with the Ohio Bell Telephone Company, procedures for updating forecasts on WE-1212 in cases where an amendment involves a severe weather warning.

5. The Civil Defense Warning Dissemination System in the Cleveland area and throughout northern Ohio should be reviewed and strengthened. Means of access to the Northeast Ohio Police Information Network and to the Ohio Law Enforcement Automatic Data System by Weather Bureau Offices should be established if possible.

6. The use of the Civil Defense National Warning System for dissemination of watches and warnings concerning severe weather and other national disasters should be extended. Although Civil Defense Headquarters has encouraged the use of the National Warning System in Natural Disaster Situations there is wide variation from one state to another on policies with regard to its use and in particular with regard to policies on further dissemination of watches and warnings transmitted over the National Warning System. It would, therefore, be very helpful to Weather Bureau meteorologists working with Civil Defense Directors to have a statement of National Civil Defense Policy on further dissemination of severe weather watches and warnings. The potential usefulness and importance of the National Warning System as a rapid means for dissemination of warnings to Police and Civil Defense Offices cannot be over-stressed.

7. The numbers of the Eastern Region Weather Bureau Forecast Coordination "Red Telephones" should be supplied to the National Severe Storms Forecast Center for use in coordination calls in severe weather situations. This would make it possible for the severe local storm forecaster to make coordination calls to the forecast offices having the "Red Telephone" system with a minimum of delay.

RADAR

1. Plans should be made and implemented as rapidly as possible for installation of a slow scan repeater (WBRR-68) which will enable the Cleveland Weather Bureau Forecast Office to monitor WSR-57 radars at Detroit, Cincinnati, Buffalo and Pittsburgh. See Cost Estimate immediately following this section.

2. A review should be made of Weather Bureau requirements for special radar observations and their applicability to local use radars such as the one at Cleveland. It is not realistic to expect local use radars to be operated under the same requirements as the WSR-57 stations. The location of the WSR-3 radar at Cleveland requires additional manpower at the console for proper utilization. The repeater scope in the office was very helpful to the forecasters in this situation. It could have been even more helpful if personnel had been available to operate the controls at the console.

3. The operational radar program should be improved through an intensive training and quality control program conducted by radar specialists on site. Such a program, similar to that conducted by Regional Upper Air Specialists, should stress the need for detail in radar reports and the reporting of significant systems or lines even though these may be imbedded in other more general sytems. It should stress the need of judgment by radar weather service specialists in outlining echo areas and in selecting enough points to avoid the inclusion of large echo-free areas in the coded outline without letting the number of points used become excessive.

4. Procedures for preparation of radar summaries and their distribution over the ESSA Weather Wire by both WSR-57 and local use radar stations should be reviewed, particularly with regard to requirements during severe weather situations.

5. Arrangements should be made for radar summaries from WSR-57 radar stations on the Great Lakes to be carried routinely on Coast Guard radio and teletypewriter circuits. These should be supplied whenever possible directly to the nearest Coast Guard entry point by the Weather Bureau Office concerned. This is also true of applicable watches and warnings.

6. Coordination procedures between WSR-57, WSR-3 and non-radar Weather Bureau Offices should be strengthened.

COST ESTIMATE FOR RADAR REMOTING AT CLEVELAND WBFO

Scope: To provide Cleveland WBFO with capability to dial-up radar displays from WSR-57 radars, particularly Buffalo, Detroit, Pittsburgh, and Cincinnati in FY-1970.

The Weather Bureau plans to add the requirement for dial-up capability for radar to the Federal Plan for Weather Radars and Remote Displays.

Present Equipment: WBRR-65 equipment is installed or funded at Pittsburgh, Detroit, and WBRR-68 equipment is funded for Cincinnati in the 1970 budget. Additional funding is required to reprogram installation of WBRR-68 at Buffalo (programmed for FY-1973) and for DATAPHONE equipment and connections at each location.

Estimated Costs:

WBRR-68 Buffalo ($28,500)

WBRR-68 Transmitter,	Buffalo	$13,000.
On-line Monitor	"	6,000.
Spares, Transmitter	"	1,300.
Spares, OLM	"	2,500.

Dial-up capability at Cleveland ($9,375)

WBRR-68 Recorder, Cleveland	5,200.
Spares, Recorder " "	1,000.
Dataphone Interface, 4 locations	800.
Dataphone Hook-up, 5 locations	500.
	$30,300.
E&TS, 25%	7,575.
	$37,875.

Other Costs and Recurring Costs:

Commercial Option:

Data Modem $50. installation charge (4)	$40. ea./mo.
Phone (local service) $11. installation (5)	10. ea./mo.
Demodulator, Trans. site (4)	8. ea./mo.
Demodulator, Rec. site (1)	8. ea./mo

Typical Tolls: (100 miles, 3 minutes)
Day $0.55 Night $0.40

FTS Option:

Data Modem $50. installation charge (4)	40. ea./mo.
Phone (local service) (5)	17.85 ea./mo.
Usage 7am-7pm, $0.14/min.	
Monthly charge for night & weekends	25./mo.

The one time cost for this program is approximately $40,000. The annual cost for operating this data phone link between Cleveland and the four radar stations would be $6500 per year for phone equipment and tolls plus $6500 for maintenance or a total of $13,000 per year.

HYDROLOGY

1. The Weather Bureau should investigate the feasibility of and requirements for expanding the Flash Flood Program to those communities within Weather Bureau Office, Akron's hydrologic area that presently have no service.

2. A river forecast and warning program should be developed for the Great Lakes drainage where the Weather Bureau presently has no service. The program should be of such a scope as to include River District Offices and River Forecast Center coverage for the Great Lakes drainage area.

3. The wedge shaped rain gage (6 inch capacity) used in the flash flood programs should be redesigned for a 10 or 15 inch capacity. Above four inches there is considerable loss due to splash.

4. Determine the feasibility of providing localized Quantitative Precipitation Forecasts (QPF) of relatively short duration, high intensity rainfall. This capability would be of significant aid in providing warnings of potential flash flood producing storms.

5. Consideration should be given to the advisability of issuing Flash Flood Watches or Flood Watches, similar to the Severe Weather or Tornado Watches. This procedure would serve to alert communities to the definite existence of a flood threat and would be followed up by definite warnings when warranted by later reports.

6. Review the present River District Office Alignment and flood warning responsibilities in Ohio.

At a meeting held in Cleveland, Ohio on July 16, 1969, Mr. Coy M. Ivy, a member of the House Appropriations Committee Investigative Staff requested a copy of the Weather Bureau's Report on the Fourth of July Storm that hit northern Ohio. He requested that manpower and cost figures necessary to provide coverage for Ohio and for the U. S. to be included in this report. Appendix I is the estimated cost for a River Forecast and Warning service as recommended in Hydrology Items 1 and 2 above. An underlying assumption in developing these cost estimates is the necessity to provide at least a minimum number of telemetered river and rainfall data collection sources to assure data for early flood alerts at any time. While effective warnings were issued in those areas where volunteer networks existed, considerable delay in receipt of reliable reports and numerous missing reports reduced the timeliness and accuracy of warnings.

COST ESTIMATES
FOR
OHIO AND NATIONAL FLASH FLOOD AND WARNING PROGRAM

OHIO

Positions		Recurring Cost	Non-Recurring Cost
2 Hydrologists		$36,000	
1 Technician (Hydro)		15,000	
2 Electronic Technicians		30,000	
TOTAL	5	$81,000	

Equipment	Number	Unit Cost		
Flash Flood Alarm Gages	12	$2,500		$ 30,000
Telemetered River Gages	20	2,500		50,000
Telemetered Rain Gages	30	2,500		75,000
8" Standard Rain Gages	120	75		9,000
Snow Samplers	100	200		20,000
Transceiver Radios	20	1,500		30,000
Miscellaneous				
Communications			$21,000	
Disk Drive RFC Computer			2,000	
Travel			15,000	
			$38,000	$214,000
TOTAL			$119,000	$214,000

NATIONAL PROGRAM

Equipment and Manpower	150 positions	$5 million	$5 million

ATTACHMENT 1

REPORT OF INVESTIGATING TEAM

1a. Meetings, Severe Weather Forecasts, Watches and Warnings and Their Dissemination

1b. River and Flood Forecasts, Warnings & Warning Dissemination

1c. Marine Forecasts, Warnings & Warning Dissemination

1d. Radar Support to the Forecast & Warning Program

1e. Meteorological Analysis

ATTACHMENT 1a.

Meetings, Severe Weather Forecasts, Watches and Warnings and Their Dissemination

Meetings were held on July 7th and 8th to discuss problems associated with the severe weather situations of July 4th as listed in the schedule and attendance lists below. A visit was also made to the damage area in Lakewood. All meetings were open to the news media.

Scheduled Meetings and Attendees other than Weather Bureau Representatives:

July 7, 1969

1:30 p.m.	9th District Coast Guard Headquarters, Cleveland	Federal Office Bldg. Cleveland

Capt. Donahoe, Chief, Search & Rescue
Lt. Nunes, Senior R. C. C., Controller
Capt. Winstein, Chief, Operations Division
Commander Bosk, Asst. Chief, Search & Rescue

July 8, 1969

11:00 a.m.	Mayor's Office, Lakewood, Ohio	Lakewood City Hall Detroit Ave., Lakewood, O. 12650

Robert M. Lawther, Mayor
Capt. William Leonard, Lakewood Police, Admin. & Services
Capt. Carl C. Petro, Lakewood Police, Traffic & Patrol

1:30 p.m.	Cuyahoga County Civil Defense Hqs.	Civil Defense Headquarters 4200 Marginal Dr., Cleveland

Thomas Caine, Chief Dispatcher - Police Radio
Les Cunningham, Ohio Bell Telephone Company
Emil E. Prenovero, Field Coordinator, Ohio Civil Defense
Gil Gomez, Weather Forecast, Inc.
Dick Phillips, Weather Forecast, Inc.
Howard A. Spiller, N. B. C.
Dino Ianni, N. B. C.
Ray Zunt, Supt., Cleveland Police Department
R. E. Karlover, Cleveland Police Department
Mike Mancuso, County Commissioner
Rod Porter, County Commissioner
Gerald Gilbert, Standard Glove Co.
Richard G. McKean, Public Safety Department
J. W. Cowden, Civil Defense
Albert E. Stewart, Civil Defense
Sam C. Skerote, Greater Cleveland Safety Council
William Bukhold, American Red Cross
Capt. L. N. Donahoe, U. S. Coast Guard

July 8, 1969

3:45 p.m.	TV Station WKYC, Channel 3, Cleveland	National Broadcasting Bldg. 1403 E. 6th St., Cleveland
	Mr. Wally Kinnan, Meteorologist	
4:50 p.m.	TV Station WEWS, Channel 5, Cleveland	3001 Euclid Ave., Cleveland
	Mr. Edward D. Cervenak, Manager Mr. Robert Zames, Meteorologist	

Brief Summaries of these meetings follow:

9th District Coast Guard Headquarters (1:30 p.m., July 7, 1969)

A briefing was given by the Chief, Search and Rescue on Coast Guard Operations in connection with the storm. Weather reports, forecasts and warnings transmitted on the Coast Guard teletypewriter circuit were examined and transmission times were checked. Comments based on discussions with Coast Guard personnel are included in the Marine portion of this report.

Lakewood - Office of the Mayor (11 a.m., July 8, 1969)

Mr. Grimm stated that the Weather Bureau team was on a fact-finding mission; that they were looking for ways of improving communications and methods of dissemination of watches and warnings. A discussion of the July 4th storm as it affected Lakewood followed.

Five to six thousand people were present for a 4th of July fireworks display and concert in Lakewood Park on the shore of Lake Erie. A storm offshore appeared threatening in the early evening. Police called WE1-1212 at approximately 7:45 p.m. to check the forecast. There was no mention of a severe thunderstorm or tornado watch in the recorded forecast.

The storm hit the park at 8 p.m. There were several fatalities due to fallen trees. Trees were uprooted and limbs broken off throughout the Lakewood area. Damage to buildings and injuries were primarily due to fallen trees. Trees were all blown over in the same direction. There was no evidence of cyclonic circulation.

Police in Lakewood have no capability for receiving warnings through any existing Civil Defense Communications System. They do have teletype drops on the Northeast Ohio Police Information Network, and the Ohio Law Enforcement Automatic Data System. At present these are not tied-in in any way to the Civil Defense Disaster Warning Network

Plans for installation of a Weather Bureau VHF-FM radio transmitter were mentioned. Development of Weather Bureau Spotter Networks was discussed.

Material on these networks and the ESSA-Weather Bureau Booklet on Community Tornado Preparedness have been supplied by the Cleveland Weather Bureau Forecast Office. Law enforcement agencies in Ohio are requested to supply feedback to the Weather Bureau regarding the existence of severe thunderstorms and tornadoes. Feedback arrangements could evidently be strengthened.

The Meteorologist in Charge, Weather Bureau Forecast Office, Cleveland will see that the severe weather telephone number is supplied to the Lakewood Police if this has not already been done. In this particular case the information that the weather was threatening just offshore at 7:30 or 7:45 p.m. would have been very helpful to the forecast office. It would be appropriate for the Meteorologist in Charge at Cleveland to try to persuade the City of Lakewood that a drop on the ESSA Weather Wire would be desirable.

The possibility of the use of sirens for severe weather warnings was mentioned. The reaction of the Lakewood Police to this was completely unfavorable. They felt that it would cause much confusion and possibly result in a greater toll of injuries than would otherwise occur.

Mayor Lawther was very cooperative and was interested in suggestions for improvement in dissemination of warnings.

Cuyahoga County Civil Defense Headquarters (1:30 p.m., July 8, 1969)

This meeting was chaired by Mr. Fay, Meteorologist in Charge at the Cleveland Weather Bureau Forecast Office, who opened it by stating that our purpose was to explore the methods used for dissemination of severe weather watches and warnings and the possibility of improving them. This was a well-attended meeting. Representatives were present from police, news media, the Red Cross, various utilities and Civil Defense.

Warnings for Cuyahoga County are normally transmitted on the Civil Defense Disaster Network. Access to this network is usually through County Civil Defense Headquarters, or when this is closed, through the Cleveland Police Communications Center. In this situation the Civil Defense Headquarters was not manned due to the holiday. The Cleveland Weather Bureau forecaster arranged for access to the network through the Cleveland Police.

The Weather Bureau forecaster was busy; the police were busy. A preliminary countdown that is normally included in activating the network was omitted. One or more radio stations did not get the entire watch or warning on tape. There were some misunderstandings about the use of the Emergency Action Notification Signal and the Emergency Broadcast System. These can be cleared up locally.

A recommendation was made that the Weather Bureau Forecast Office be given the capability of entering and activating the Civil Defense Disaster Network directly. This appeared to be a reasonable suggestion. The Ohio Bell Telephone Company agreed to investigate what changes would be required and what the cost would be for such an arrangement.

There appeared to be some discrepancies between the date-time groups assigned to the watches and warnings and the time of receipt of the watches and warnings by the radio stations which are difficult to reconcile. The tornado watch with a date-time group of 7:15 p.m. EDT was disseminated at 7:36 and the severe thunderstorm warning with a date-time group of 7:45 was disseminated over the Civil Defense Network at 7:59 p.m. EDT. Weather Bureau records on these dissemination times were not clear.

Meetings July 8, 1969 - 3:45 and 4:50 p.m.

Mr. W. Kinnan and Mr. R. Zames, TV Weather Forecasters, each gave us excellent briefings on the procedures used at their respective stations for keeping up with forecasts, watches and warnings. WEWS-TV operates a radar and the Station Manager, Mr. Cervenak showed us video tape replays of the echoes which had been observed.

ATTACHMENT 1b.

River and Flood Forecasts, Warnings and Warning Dissemination

Introduction

Concomitant with severe thunderstorms and reports of tornadoes was precipitation of unusually high intensity and duration.

The rain began at approximately 8:00 p.m. EDT, July 4, 1969 and ended between 1:00 and 3:00 p.m. EDT July 5, 1969. It occurred about 20 miles on either side of a line running between Toledo, Ohio and Wheeling, West Virginia with centers of greater than 10 inches located around Wooster, Ohio and Norwalk, Ohio (see page 4 of this attachment). Preliminary bucket surveys and reports from other unofficial rain gages indicated that up to 14 inches of rain occurred in certain localities.

This precipitation caused flooding which resulted in loss of life and considerable crop and property damages in a dozen Ohio counties (page 5 of this attachment). The hardest hit communities were Wooster, Ashland, Norwalk, Vermillion, Millersburg, Loudonville and Killbuck, Ohio. Wooster appeared to have suffered the most damage. Wooster had 11 fatalities and three persons were reported missing. The community was without drinking water for several days. As of July 21, 1969, 46 fatalities were reported and five persons missing as a result of the 4th of July storm. Of these 46 fatalities, 30 were attributable to the floods.

Total flood damages were estimated to be between 70 and 140 million dollars. Of these flood damages, agricultural damages were estimated between 40 to 80 millions while property damage was between 30 to 60 million dollars. Preliminary figures indicate that 7000 trucks and automobiles, with an insured value of $24,000,000 were damaged or destroyed. In Wayne County alone, 26 bridges were completely destroyed while 110 were put out of commission. As of July 18th only 26 bridges were back in commission while all others were still closed or washed out.

Operations

At Weather Bureau Office, Akron, O. the standard operating procedure is to alert the Radar Hydrologist or backup man whenever a severe weather or tornado watch is called or heavy rains are occurring. Initially, the Akron staff was alerted on the basis of the severe weather watch bulletin issued at 7:30 p.m. EDT. The Radar Hydrologist was alerted by the duty weather service specialist and arrived at 8:00 p.m. EDT, July 4, 1969 and remained on duty until approximately 4:00 p.m. EDT, July 5, 1969.

The earliest indication of flooding occurred at approximately 1:45 a.m. EDT July 5th when Radio Station WWST at Wooster, Ohio notified Weather Bureau Office, Akron that there was flooding in the north end of Wooster and police were evacuating residents of the area. Except for this bit of news no other information or hydrologic data was received until around 6:00 a.m. EDT, July 5, 1969.

The first flood alert was a general statement issued by Weather Bureau Office Akron at 4:30 a.m. EDT, July 5, 1969 (page 6 of this attachment).

It was transmitted on the Weather Bureau Radar Report and Warning Coordination Teletypewriter Circuit (RAWARC) and the ESSA Weather Wire Service (EWWS).

Based upon the station's radar observations and a report of 8.5 inches of rainfall at Berlin, Ohio, a guidance forecast was issued at 6:30 a.m. EDT over RAWARC and EWWS (see page 7 of this attachment). These forecasts were also disseminated by radio to the Corps of Engineers Office at New Philadelphia, Ohio for retransmission to their district office at Huntington, W. Va. and by telephone to designated Flash Flood Representatives within Weather Bureau Office, Akron's Hydrologic Service area. In addition, radar summaries after 6:30 a.m. EDT by WBO Akron mentioned small stream flooding and continued heavy rain and that those living near streams should expect continued rises (page 6 of this attachment).

At approximately 8:30 a.m. EDT, the Corps of Engineers (Huntington District) located at Huntington, W. Va. requested the Akron Weather Bureau Office to disseminate Corps of Engineers flood forecasts over RAWARC and EWWS. These forecasts were retransmitted by Weather Bureau Office, Akron, as requested, by 8:45 a.m. EDT. These flood forecasts were for the Tuscarawas River at New Philadelphia and Coshocton, Ohio, Clear Creek at Loudonville, Ohio and the Killbuck River at Millersburg, Ohio (page 8 of this attachment).

Early in the afternoon of July 5th river and rainfall reports began to dribble into Weather Bureau Office, Akron. With these reports and the radar indicating clearing in the affected areas, stage forecasts or statements were issued for river basins assigned to Weather Bureau Office, Akron (page 9 of this attachment). These were disseminated over RAWARC, EWWS and other communications channels.

Forecast Review

Following is a summary of the final river forecasts issued by Weather Bureau Office, Akron and their verifications. The forecasts were those disseminated at 3:30 p.m. EDT, Saturday July 5, 1969 (page 9 of this attachment). It excludes those issued by other agencies but includes those rivers in the Great Lakes Drainage where serious flooding and damages occurred and where no forecasts were issued.

Location	River	Flood Stage	Forecast	Verification
Willoughby	Chagrin	11	No Flooding	No Flooding
Independence	Cuyahoga	16	No Flooding	No Flooding
Canton	Nimishillen	11	Bankfull	No Flooding
Massillon	Tuscarawas	6*	Crest 18 ft. Sunday	16.62 crest 7:45 a.m. 7-6-69
Killbuck	Killbuck	12	21 ft. Sunday Afternoon	26.81 crest 1:30 a.m. 7-6-69

(Continued)

Location	River	Flood Stage	Forecast	Verification
Mt. Vernon	Kokosing	9*	No significant precip.	No Flooding
Newark	Licking	10*	" "	No Flooding
Urichsville	Stillwater	5*	4 ft. tonight	4.39 crest 7:30 a.m. 7-6-69
Norwalk	Vermillon	Unknown	None	Heavy Damage
Vermillon	Vermillon	Unknown	None	Heavy Damage Crest time estimated early Sunday a.m.

*Stage above which forecasts are required.

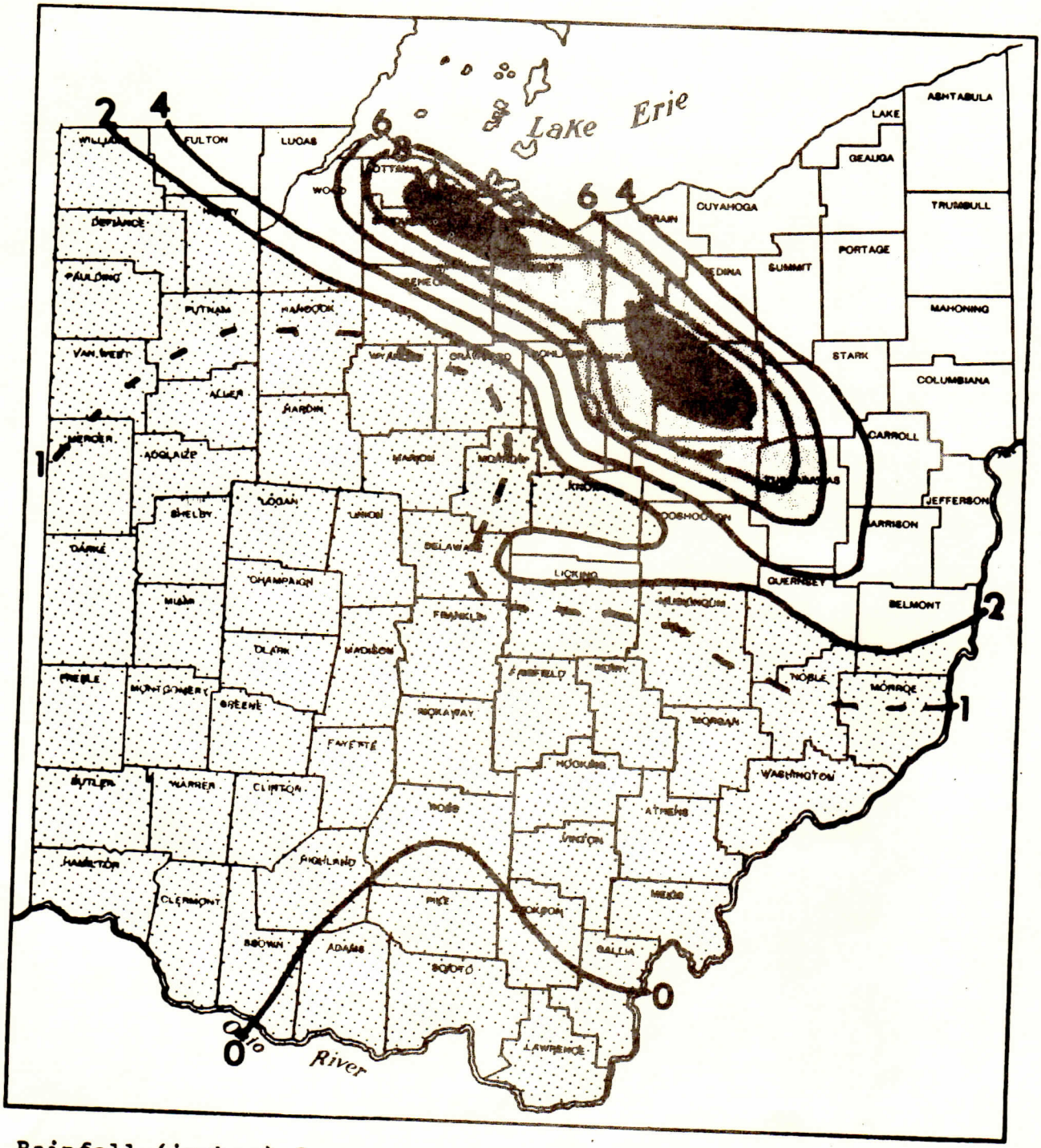
Conclusions:

In those communities where the Weather Bureau provides a formal river forecast or flash flood program, the warnings and forecasts were timely and effective. Those communities which have Flash Flood Representatives were in contact with the Weather Bureau and took appropriate actions as planned.

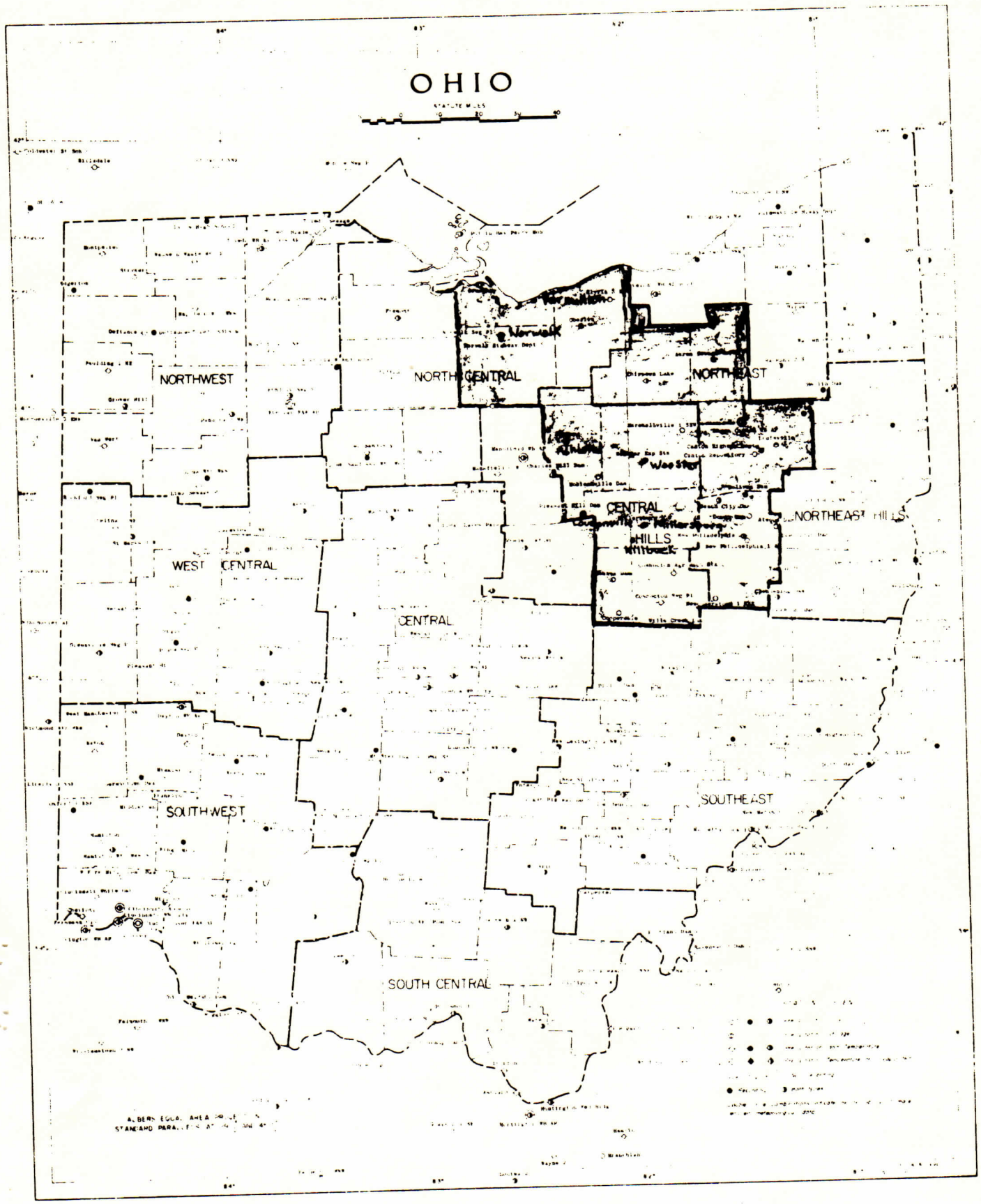
At Massillon, Ohio, the forecast initiated the action of closing the railroad opening through the levees. It took 12 men eight hours to erect the two closure structures necessary to seal the opening. This was the first time since this flood control structure was built that this action was required.

Although Wooster, Ashland and Millersburg are within Weather Bureau Office, Akron's service area, no formal hydrologic warning program exists within these communities. Preliminary indications are that the people did not receive the warning or alerts in a timely manner as had occurred with those communities in the Flash Flood Program.

Norwalk and Vermillion are in the Great Lakes Drainage where the Weather Bureau has no River Forecast and Warning Service. The approximate time of the crest and an on-site inspection indicates that river forecasts are feasible and that adequate warning could be provided to reduce damages, especially at Vermillon, Ohio.



Rainfall (inches) from storms of July 4-5, 1969 (All data from reports of Weather Bureau cooperative observers).



FLOOD DAMAGE LOCATION

ATTACHMENT 2

C O P Y

ESSA WEATHER BUREAU OFFICE AKRON CANTON AIRPORT
RIVER DISTRICT OFFICE 4 30 AM JULY 5 1969
RAINFALL HAS AVERAGED TWO TO FIVE INCHES OVER MUCH OF THE AREA SO FAR TONIGHT AND SUBSEQUENTLY THERE WILL BE CONSIDERABLE LOW LAND AND LOCALIZED FLOODING OVER NORTHERN OHIO TODAY. SOME RIVERS WILL RISE TO NEAR BANKFULL DURING THE DAY, BUT THERE SHOULD BE NO GENERAL FLOODING ALONG THE RIVERS UNLESS THE RAIN CONTINUES. ALL SHOULD BE ALERT TO THE POSSIBILITIES.
VAUGHAN

C O P Y

ESSA WEATHER BUREAU AKRON CANTON AIRPORT
RADAR SUMMARY 9.30 AM JULY 5

HEAVY THUNDERSTORMS CONTINUE TO LIE IN AN EAST WEST LINE ACROSS OHIO. THUNDERSTORMS ACCOMPANIED BY SEVERE LIGHTNING STRONG GUSTY WINDS AND HEAVY RAIN WILL CONTINUE IN THE AKRON CANTON AREA FOR AT LEAST SEVERAL MORE HOURS. THE HEAVIEST RAIN HAS FALLEN IN THE AREA SOUTH OF A MASSILLON WOOSTER LINE WITH UP TO 10 INCHES NEAR BERLIN. MOST SMALL STREAMS ARE OVER THERE BANKS AND PERSONS LIVING ALONG THEM SHOULD EXPECT ADDITIONAL RISES. FLOOD WARNINGS HAVE ALREADY BEEN ISSUED FOR PORTIONS OF THE TUSCARAWAS AND KILLBUCK RIVER BASINS.

C O P Y

ESSA WEATHER BUREAU AKRON CANTON AIRPORT
RADAR SUMMARY 12.30 PM JULY 5

AT 12.30 PM RADAR INDICATES MODERATE TO HEAVY THUNDERSTORMS EXTENDING FROM SALEM WESTWARD TO ASHLAND THEN NORTHWEST TO SANDUSKY. THE THUNDERSTORMS ARE MOVING EAST SOUTHEAST AT 35 MPH AND HAVE BEEN ACCOMPANIED BY HEAVY RAIN AND SEVERE LIGHTNING. NO WIND DAMAGE REPORTS HAVE BEEN ACCOMPANIED BY HEAVY RAIN AND SEVERE LIGHTNING NO WIND DAMAGE REPORTS HAVE BEEN REPORTED THUS FAR. MOST SMALL STREAMS IN SUMMIT STARK WAYNE HOLMES TUSCARAWAS AND CARROLL COUNTIES ARE OVER THERE BANKS FROM HEAVY RAINS OF UP TO 10 INCHES. THOSE LIVING NEAR STREAMS SHOULD EXPECT CONTINUED RISES THIS AFTERNOON.

ESSA WEATHER BUREAU AKRON OHIO
RIVER DISTRICT OFFICE 6 30 AM

JULY 5 1969

DUE TO THE UNCERTAIN RAINFALL AMOUNTS AND FORECAST AMOUNTS
THE FOLLOWING IS ISSUED FOR YOUR GUIDANCE. PLEASE USE WITH CARE
AND JUDGEMENT.
THE FOLLOWING RAINFALL AMOUNTS WILL GIVE STAGES AT..

CHAGRIN RIVER

RAINFALL	STAGE
↖1.9	9.9FT
WMRT2.45	↖↖11.9
3.00	13
	0
3.80	15.0
4.80	17.0

CUYAHOGA AT INDEPENCEDENCE

2.00	↖9.9

CUYAHOGA AT INDEPENDENCE

2.00	10.0
2.50	12.5
3.00	15.5
3.50	↖7.0
4.00	18.5

KILLBUCK

2.00	14.5
3.00	17.00
4.00	↖8.5
5.00	19.5
6.00	20.0
7.00	20.5
8.00	21.5
9.00	22.00

A REPORT FROM BERLIN GIVE 6 AM READING AS 8.5 AND RANING HARD

MTUSCARAWAS AT MASSILLON

2.60	6.0
3.90	9.0
5 30	↖4.0

NIMISHILLEN AT CANTON

2.1	5.0
3.5	8.0
5.0	↖↖11.0

VAUGHAN

##
##
ESSA WEATHER BUREAU AKRON CANTON AIRPORT
FLOOD WARNING BULLETIN

8.45AM SATURDAY JULY 5,1969

THE CORPS OF ENGINEERS AT HUNTINGTON , WVA. HAS ASKED US TO RELAY THE FOLLOWING FLOOD FORECASTS.

THE TUSCARAWAS RIVER AT NEW PHILADELPHIA WILL EXCEED FLOOD STATE TODAY BY 2 FEET AND AT 2 TO 3 FEET AT COSHOCTON. CLEAR FORK CREEK AT AT LOUDONVILLE WILL EXCEED FLOOD STAGE BY TWO TO THREE FEET TODAY.

THE KILLBUCK AT MILLERSTOWN WILL EXCEED FLOOD STATE BY 5 TO 6 FEET.
ALL PERSONS LIVING NEAR THESE STREAMS SHOULD TAKE APPROPRIATE PRECAUTIONS. THESE FORECASTS ARE BASED ON RAINFALL ALREADY ON THE GROUD. CONTINUED HEAVY RAIN WILL PRODUCE HIGHER CRESTS.

ALL RADIO STATIONS WHO REACH INTO THE AFFECTED AREAS PLEASE BROADCAST THIS BULLETIN AS SOON AS POSSIBLE.

ATTACHMENT 6

ESWC ALCKT MI A CAK 041930
ESSA WEATHER BUREAU OFFICE AKRON ACANTON AIRPORT
RIVER DISTRICT OFFICE 3 30 PM JULY 5 1969

SUMMARY OF STORMS OF JULY 4 -5 1969

CHAGRIN RIVER BASIN AVERAGE 2 INCHES NO FLOODING
CUYAHOGA RIVER BASIN AVERAGE 2 INCHES NO FLOODING
MIMISHILLEN CANTON BASIN AVE 6 IN BAKNK FULL
TUSCARAWAS BASIN VAVE 7 IN CREST [redacted] 18→5 [redacted] SUNDAY
KILLBUCK 18 HOUR MAX PCPN 9 TO 10 INCHES CREST 21FT SUNDAY AFTERNOON

9FT ABOVE SUMMER FLOOD.
KOKOSING NO SIGNIFICANT PRECIP
LICKING DITTO
SILLWATER CREST 4 FT TONIGHT..
THERE HAS BEEN CONSIDERABLE DAMAGE IN WOOSTER ON THE KILLBUCK.
MANY ROADS HAVE BEEN IMPASSABLDLE OVER THESE AREAS.
ONE RAINFALL OBSERVER CALLS IT A DISASTER M..

AS OF THIS TIME THE HEAVY RAIN HAS STOPPED NAAND IT IS EXPECTED THAT ONLY THE PRESENT RAIN WILL BRING THE FLOODING. COMMUNICATIONS IN SEVERAL AREAS HAVE BEEN HARD HIT SO IT IS DIFFICULT TO KNOW EXACTLY THE AMOUNTS.

PERSONAL INVESTIGATIONS WILL BE MADE ON MONDAY JULY 7.

VAUGHAN

↓↓

ATTACHMENT 1c

Marine Forecasts, Warnings and Warning Dissemination

Marine forecasts, recreational boating forecasts and warnings are normally disseminated through the mass news media (radio and TV) serving the Lake Erie area, through Coast Guard radio broadcast facilities over Marine Radio Station WMI, and, in the case of warnings, also by visual flag displays at Coast Guard stations and various other lake shore display stations.

The primary means of dissemination to radio and television stations is ESSA Weather Wire Service, Associated Press and United Press International. The Coast Guard communications facilities are accessible at the Cleveland Weather Bureau Forecast Office through a drop on the Ninth Coast Guard District teletypewriter network. Entries by the Cleveland Forecast Office on this network reach nearly all Coast Guard Stations in the Ninth Coast Guard District. They are broadcast on a fixed schedule (10 minutes past each hour as long as they remain in effect on 2670 KHz and 156.6 MHz) by the Coast Guard, and over WMI frequencies (2514 and 4422.2 KHz) at 12:02 and 6:02 AM and PM. In the case of warnings they are also carried on receipt over emergency marine frequencies.

The Coast Guard feels that present communications arrangements between the Cleveland Weather Bureau Forecast Office and the Coast Guard are quite satisfactory except for the problem of getting acknowledgements when a message has been sent. This is largely due to the fact that the Cleveland Weather Bureau station is in the process of moving at present. The Coast Guard teletype is not located with the other ones. Lt. Nunes thought that a voice line might be desirable. An alarm system is available on the teletypewriter circuit but does not work satisfactorily. The possibility of making this alarm system work should be investigated by Weather Bureau Forecast Office, Cleveland. The Coast Guard has been most cooperative in making their teletype communications circuit available on a high priority basis for severe weather reports, watches and warnings.

The extent to which we are able to reach the boating public with weather statements is somewhat of an unknown. Small craft warnings and recreational boating forecasts are broadcast by commercial radio and TV stations as well as over marine frequencies, but the fact that warnings are broadcast does not insure immediate receipt. The Weather Bureau VHF-FM transmitter scheduled for installation in the Cleveland area should be a great help in disseminating weather information and warnings to all segments of the public. An educational and publicity program should follow its installation.

Radar summaries are not normally carried by the Coast Guard teletype and radio circuits. In this situation special arrangements were made on the morning of July 4 (9:45 EDT) for relay of radar summaries from the Chicago and Detroit radars to the Coast Guard by Weather Bureau Forecast Office, Cleveland. Buffalo radar summaries are not available at Cleveland. If these could be relayed to Cleveland they could possibly be placed on the Coast Guard teletype circuit when circumstances make this desirable. Actually, it

would be desirable for the radar summaries to be relayed to the Coast Guard, when required, directly by WBFO Chicago, WBFO Detroit and WBO Buffalo.

One point that should be made is that small craft warnings are in effect for Lake Erie for a rather high percentage of the time during the boating season. This is due partly to the character of the Lake and partially to the prevailing weather patterns. The Cleveland Weather Bureau Forecast Office has been making a firm effort to keep the issuance of small craft warnings to a minimum consistent with the weather situation, and not to over-warn if at all possible. The tabulation below shows the extent of issuance of small craft warnings during the current season:

	Percent of Days with Small Craft Warnings	Percent of Time with Small Craft Warnings
April 1969	56	33
May	32	22
June	70	50
July 1 - 10	50	30

The higher incidence in June was due to a high number of thunderstorm situations.

Thunderstorm activity and strong echoes were reported by the radar summaries issued on July 4th throughout the day. There were several reports of cloud tops in excess of 50,000 ft.

ATTACHMENT 1d

RADAR SUPPORT TO THE FORECAST AND WARNING PROGRAM

All WSR-57 radars (Pittsburgh, Detroit, Cincinnati and Buffalo) were operational and reported throughout the storm period. Local use radars at Cleveland, Akron and Columbus began sending radar reports after the Tornado Watch was issued by NSSFC. During the storm period (7:40 - 11:45 PM EDT) there was good radar coverage over the area with the exception of a missed report from Cleveland at 8:45 PM EDT due to a power outage, and no reports from Fort Wayne due to radar breakdown.

WSR-57 observations from Pittsburgh and Detroit were very general, with a lack of detail in their reports. WSR-3 reports from Cleveland and Columbus, and observations from the Decca radar at Akron, revealed significant echo lines. Echo contours on the Pittsburgh hourly contoured overlays revealed an organized pattern of echoes which could have been encoded as a line but was not. Locations and tops of the strongest echoes within the area were reported with fairly good agreement between Pittsburgh and Detroit. Movements given by Detroit and Pittsburgh were in general agreement (between 270 and 290 degrees, and 40 - 50 knots).

The quality of the WSR-57 observations was poor in terms of the detail in reporting echo areas. A comparison of radar overlay maps with SD reports indicated the areas coded were too large, frequently 200 miles on a side, and covered too much echo free area. The echo line within the precipitation area (WRM, Part A, 5.1.2) was not reported by Detroit or Pittsburgh with the exception of the 0115Z special report by Pittsburgh. The Pittsburgh radar overlays revealed a well-defined line; also all WSR-3 and Decca radars reported the line formation. All stations, with the exception of Pittsburgh, failed to make special radar reports as stated in WRM paragraph 12.3.1.

No calls were made to the Cleveland office from any WSR-57 radar station. Between 2330Z and 0230Z the RAWARC circuit was open at Cleveland and it became necessary to contact Detroit and Akron for radar assistance. Excellent and frequent information was received from Akron on tops and intensity over the Aerotron radio.

1930 EDT
730 PM

The Cleveland WSR-3 radar was used very effectively in tracking the squall line as it moved rapidly from Lake Erie inland across the Cleveland area into east central Ohio. The WSR-3 is operated with a remote control unit which is wired to the main console several hundred feet away. There are no receiver gain controls to aid in estimating echo intensity or antenna elevation controls for measurement of echo heights. Personnel were not available for operation at the main console where these controls are located. Radar summaries from Detroit and Cincinnati were transmitted over the ESSA Weather Wire and re-transmitted on the Coast Guard teletypewriter circuit.

Attachment 1e.

Meteorological Analysis

At 0800 EDT on the morning of July 4, 1969, a low-pressure center was located in northern Iowa with a warm front extending eastward just north of Milwaukee to Muskegon, Michigan, then southeastward into the northwest corner of Ohio and on toward Wheeling, West Virginia. Thundershowers were occurring along the front through Wisconsin and Michigan. There was very little difference in surface temperatures across the front. Values ranged from the low to middle 70s. Surface dew points were very high with mid-60s most common. Over Ohio the mean relative humidity was seventy percent and the air was unstable with a lifted index of about -1. The most unstable air mass, with a lifted index of -8, was centered over west central Illinois. A low level jet was advecting this air mass east-northeastward toward Ohio.

At 850-mb. (about 5,000 ft.) a wind maximum extended from Dodge City to Kansas City toward Indianapolis, Indiana. A tongue of moisture (dew point 15°C or greater) extended from Lake Charles, Louisiana, northward to just west of Peoria, Illinois. Warm air and moisture advection occurred over Indiana and Ohio during the day. Warm air advection at this level was much greater than it was at 10,000 ft. Both factors resulted in increasing instability in the lower atmosphere.

The 850 to 500-mb thickness ridge was building in the area indicating warm air advection in the low levels further decreasing the stability and tending to build the 500-mb ridge through the Ohio Valley.

At 700-mb (about 10,000 ft.), warm but drier air was being advected into Ohio. The 700-mb wind field which can be used to steer most radar echoes was from the west to southwest in Michigan and Indiana, but veered to northwest through Ohio. Therefore, echoes moved toward the east or northeast as they approached Ohio, then turned toward the southeast as they passed through eastern Ohio.

At 500-mb (approximately 18,000 ft.) a ridge extended across the southeast part of the United States with the ridge line extending into the Ohio Valley. At 0800 EDT a short wave was located in the high plains with positive vorticity advection extended ahead of it to near Chicago. The flow over Ohio was northwesterly at 50 knots, which is not a typical 500-mb flow pattern for severe weather. Severe weather most frequently occurs with a southwest flow; however, it occasionally occurs under a regime classified by SELS as a northwest flow pattern. As the short wave moved eastward over the long wave ridge, the winds over Ohio only backed slightly keeping the flow from the northwest during the evening and night. Vorticity advection at 500-mb over Ohio was negative and remained so during the day.

The higher level wind flow at 300 and 200-mb (approximately 30,000 and 40,000 ft.) was from the northwest over Ohio and remained so during the period. The jet stream was around 40,000 feet and ran from Sault Ste. Marie to near Buffalo. A strong northwest wind flow at these levels is again not typically associated with severe weather.

During the day, the surface low moved northeastward across Lake Michigan to southern Ontario, Canada. The diffuse warm front boundary at the surface moved to northeast Ohio by evening. Thunderstorm activity was occurring in Michigan through most of the day and some scattered shower activity had moved into northern Ohio by early afternoon. Severe activity was first reported in Michigan as radar echo tops built up to 50,000 feet and above early in the afternoon. The Detroit radar indicated the large-scale precipitation area was moving eastward at 40 to 45 knots. But the individual thunderstorms in eastern Ohio within range of the Pittsburgh radar were reported to be moving from the northwest first at 30 then increased during the afternoon to 40 and 50 knots.

By 6:45 p.m. a line of thunderstorms was forming from just northwest of Toledo to 60 n.mi. north of Cleveland. Hail and a tornado were reported with this activity mostly near Detroit.

By 7:45 p.m. the severe squall line was well formed and extended from 50 n.mi. northwest of Toledo to 12 n.mi. west of Sandusky, Ohio, to a LEWP (Line Echo Wave Pattern) at 35 n.mi. north of Cleveland then eastward 30 n.mi. east of Erie. The echo pattern from just west of Sandusky to north of Cleveland was apparently associated with a mesoscale Bubble High that moved southeastward at 45 to 60 knots across Lake Erie, Cleveland and eastern Ohio areas. Winds from this feature were reported to be 60 to 100 mph and numerous reports of wind damage were received. The LEWP also moved rapidly southeastward at about 45 knots and a confirmed report of a tornado associated with this feature occurred at Perry, Ohio. The trailing side of the Bubble High moved very little and established a boundary between cooler air to the north and the more moist, warmer air to the south. The boundary zone became oriented northwest southeast from near Toledo to Wheeling, West Virginia, with little movement during the night. Surface convergence and very strong 850-mb level wind convergence in this area caused very heavy rainfall with flooding during the night. Additional severe activity was reported near Toledo and in northern Ohio during this period.

ATTACHMENT 2

RELATED STATEMENTS AND REPORTS

2a. Statements by Senior Forecaster on Duty at Weather Bureau Forecast Office, Cleveland on July 4, 1969 (Mr. Webb)

2b. Summary of Briefing for Investigating Team by Mr. Webb on Severe Weather Situation of July 4, 1969

2c. Summary of Guidance Forecasts and Severe Weather Watches issued by the National Severe Storms Forecast Center

2d. Report on Storm Damage, Lake and Geauga Counties on July 4, 1969

2e. Report on Storm Damage in Lakewood, Ohio July 4, 1969

2f. Report on Storm Damage, North Ridgeville, Elyria and LaGrange, Ohio

2g. Report on Storm of July 4th by Meteorologist in Charge, Weather Bureau Forecast Office, Cleveland, Ohio

2h. Report of Severe Weather and Related Events on July 4th and 5th by Meteorologist in Charge, Weather Bureau Office, Toledo, Ohio

2i. Report on Storm of July 4th and 5th by Meteorologist in Charge, Weather Bureau Office, Akron, Ohio (attachments not included)

Attachment 2a.

Statements by Senior Forecaster on Duty
at Weather Bureau Forecast Office,
Cleveland, O. on July 4, 1969

Showers and thunderstorms occurred over northern Ohio Friday afternoon, July 4, 1969, in connection with a warm front oriented NW-SE which was moving northeastward. By 5 PM EDT, the front had moved through Ohio except the extreme northeast and general clearing followed. The low was moving across the upper part of Lake Michigan and the cold front trailed southwestward through eastern Iowa. There were no thunderstorms indicated indicated by radar or surface reports upwind . A reasonable steering direction was considered to be about 260 to 280 degrees. A tornado watch was in effect for lower Michigan and the vector wind was given as 27035. There was a marked absence of thunderstorms along the cold front and surface reports indicated no buildups in the warm sector generally. The activity was all north and east of Ohio and the thinking was that these would continue to move away which was correct.

However, new development took place by 6 PM EDT with the appearance of a short E-W line of thunderstorms on the Cleveland Radar about 65 miles north at the closest point and a large cell just east of Battle Creek, Michigan. The latter cell was also picked up by Chicago radar and reported to have top at 64 thousand and moving 2740. No other radar reports indicated a line. At 645 PM Detroit radar still did not indicate a line. Cells were reported moving 26040.

At 7 PM EDT, the Cleveland radar showed a nearly solid E-W line of thunderstorms just off the north shore of Lake Erie extending from between Toledo and Detroit to 50 miles NNE of Cleveland indicating the line was building rapidly westward and was south of the previous position and had become a definite threat to northern Ohio.

The Recreational Boating forecast was due at 715 PM EDT and a statement was included to advise boaters of the line of thunderstorms and to take precautions. While that was being disseminated, Chicago WBFO called to advise that SELS was issuing a tornado watch for an area that included most of northern Ohio, and watches and warnings were disseminated at a rapid rate thereafter.

Further Statement by Mr. George W. Webb, Jr on the
Severe Weather Situation of July 4, 1969

The initial tornado watch and redefining statement was prepared and transmitted on the ESSA Weather Wire at about 7:20 to 7:25 p.m. EDT. I had some difficulty in contacting the Cleveland Police Radio, and they had some difficulty in activating the Civil Defense Disaster Net. I finished reading the watch and statement to the Net at 7:36 p.m., according to the clock in the broadcast booth.

On the basis of severe thunderstorms reported at Elmore and Genoa, in Ottawa County, I issued a severe thunderstorm warning for Ottawa, Sandusky and Erie Counties. While this warning was being typed for transmission on EWWS, I conacted Police Radio to activate the Disaster Net. As I finished broadcasting the warning I noted the time on the clock in the broadcast booth. It was 7:45 p.m. EDT.

Shortly after that a ship report from northwest of Cleveland indicated winds of 100 mph. Another severe thunderstorm warning was issued for Lorain, Cuyahoga, Lake and Ashtabula Counties. According to the same clock the warning was broadcast on the Disaster Net at 7:50 p.m. EDT.

After finishing the broadcast, I watched the storm to see if I could discern any tornadoes. I did observe the storm hitting Lakewood at about 8:00 pm.

George W. Webb, Jr.

ATTACHMENT 2b.

Summary of Briefing for Investigating Team by Mr. Webb on Severe Weather Situation of July 4, 1969

There was general clearing behind a warm front due to pass the Cleveland area late in afternoon of the 4th. Thunderstorm activity was diminishing; seemed to be moving to the north and east. About 6:00 p.m. the Cleveland local radar showed a line of echoes 70 miles to the north. The line showed signs of development. Also, one large cell with tops of 64,000 ft. was reported east of Battle Creek by the Chicago WSR-57 Radar. Radar reports showed cells as moving from 260 to 270 degrees. Later information indicates that the direction of movement was from 280 to 290 degrees. No lines were reported either by Chicago or Detroit WSR-57 Radars.

The recreational boating forecast issued at 7:15 p.m. EDT included the warning, "Boaters should be cautioned to not venture far from the south shore this evening and be prepared to move to safe harbor." About the time this boating forecast was issued a telephone call was received from Chicago Warning Coordination Center advising that the National Severe Storms Forecast Center was about to issue a tornado watch and describing the area that it would cover. Weather Bureau Forecast Office, Cleveland immediately prepared a redefining statement for the area concerned in northern Ohio and Lake Erie. About this same time a report of 100 mph winds was received from a ship on western Lake Erie.

At 7:45 p.m. EDT a warning was issued for Ottawa, Sandusky and Erie Counties. At 7:50 p.m. EDT a severe thunderstorm warning was issued for Cuyahoga, Lake, Ashtabula and Lorain Counties. These warnings were transmitted over the Civil Defense Disaster Radio Network as fast as it was possible to do so. They were sent out over EWWS and the Coast Guard Teletypewriter Network at almost the same time. Use of the Emergency Action Notification Signal was requested.

A severe thunderstorm hit the Lakewood area at about 8:00 p.m. A tornado report was received at 7:58 p.m. EDT from the Coast Guard Station at Ashtabula. High water and flooding was reported in the Wooster area by about 1:00 a.m.

The axis of the line of echoes as observed by the Cleveland radar remained about the same. New cells formed among it continuously. Thunderstorm activity continued until about 1:00 p.m. the following day. It is interesting to note that a strong negative vorticity advection center was forecast over the area at the time this severe weather was occurring. Reporting of echo lines by WSR-57 radar stations could be improved. Reports are too general. Reporting of the direction of movement could also be improved. Better information regarding the time specified phenomena are observed would also help offices concerned with warning responsibilities. It would be a help in some cases if the forecast office were called directly from the National Severe Storms Forecast Center. In this case it probably didn't make any difference. The Cleveland Warning Coordination Teletypewriter Circuit (RAWARC) was out for a time while the warnings were in effect. This did not significantly affect the receipt or transmission of watches and warnings since it occurred after coordination had been completed.

ATTACHMENT 2c.

Summary of Guidance Forecasts and Severe Weather Watches Issued by the National Severe Storms Forecast Center

0440 EDT, July 4th. The attached severe local storm synopsis (SELS SYNS) issued at 0440 EDT (0840Z) valid for the period beginning at 0440 EDT on the 4th and ending at 0800 EDT on July 5th indicated isolated severe thunderstorms in the late afternoon and evening for an area which included northern Ohio. This synopsis was transmitted over the Weather Bureau's Radar Warning and Coordination Teletypewriter Circuit (RAWARC).

0740E July 4th. The attached convective outlook (AC MKC) issued at 0740 EDT (1140Z) and valid for the period 0800 EDT on the 4th thru 0800 EDT on the 5th indicated isolated severe thunderstorms for an area which included northern Ohio. This was also transmitted over the Weather Bureau RAWARC Circuit.

0930 EDT. Mr. Waldman, forecaster at the Weather Bureau Forecast Office, Cleveland called the Severe Local Storms Forecast Unit (SELS) at the National Severe Storm Forecast Center to inquire about the latest thinking concerning the possibility of severe weather for northern Ohio. SELS advised him that thunderstorms occurring in Michigan at that time were expected to move into northern Ohio during the forenoon establishing a pseudo warm frontal boundary during the afternoon. The first severe weather watch would probably be issued for southern Wisconsin, northern Illinois and lower Michigan. By late afternoon or evening severe thunderstorms were likely along the boundary through northern Ohio.

1205 EDT. After the 0800 EDT upper air data was analyzed and the latest surface analysis completed, a tornado watch was issued for an area along and 70 miles either side of a line from LaCrosse, Wisconsin to Flint, Michigan to be valid 1500 to 2100 EDT.

1910 EDT (7:10 p.m.). About 7:10 p.m. EDT the Severe Local Storm Forecast Unit at Kansas City called the Chicago Weather Bureau Warning Coordination Center to coordinate a tornado watch to be valid current to 0100 EDT on July 5th. The Weather Bureau Warning Coordination Center at Chicago was to call the Weather Bureau Forecast Office at Cleveland. Tornado watch bulletin number 359 was transmitted on the Weather Bureau Radar Warning Coordination Circuit (RAWARC) at 7:18 p.m. EDT. The watch area extended for 70 miles either side of a line from 30 miles north of Toledo, Ohio to 70 miles south of Buffalo, New York.

SEND FOLLOWING MESSAGE TO:

Jul 4 08 25'69

ALSYM A MKCC

FXUS2 MKC 040840Z

DEPT OF COMMERCE
WEATHER BUREAU

SELS SYNS VALID 040840 to 051200Z

ISOLD SVR TSTMS EXPCD OVR PTNS SE MINN IA E NEBR NE KANS AFTN AND WISC ILL N MO IND MICH AND NW OHIO LATE AFTN AND EVE.

GEN TSTM ACTVTY EXPCD TO ROT OF A LN GLS SHV AMA ELP CONT YUM GJT SLC BOI MKE MSO.

500MB PROG INDCS short WAVES NEAR CNTRL MINN IA KS AND NEVADA BY 1800C. UPR LVL JTSTR PROGD SLE BOI BIL JMS DLH SSM BUF ORF. AT SFC IN GOOD AGREEMENT WITH FAX PROG 14 WITH SFC LO CNTRD IN UPR MICH BY 1800C AND CDFNT TRAILING INTO N ILL N MO KANS NE. LO LVL MSTR CNTR HAS SHIFTED DURG LAS 24 HRS FM NE KANS TO N MO WITH AXIS NWD AND IS EXPCD TO SHIFT EWD IN ADV OF SFC LO AS IT MOVS EWD. SOME DEGR INDCD BEHIND CDFNT BUT SUF MSTR RMNG TO PRODUCE TSTMS IN ASSOC WITH SEC S/W. VERY ISOLD TSTMS PSBL PTNS E MONT AND N WYO WITH THIS S/W LATE AFTN AND EVE. MST MMRS AND INTMS ACTVTY EXPCD IN AREA OF MAX LO LVL CNVGNC ASSOC WITH SFC LO AND ALG CDFNT, WITH SCT ISOLD CELLS TO RCH SVR LMTS.

MAUCH.....

2C-2

CONVECTIVE OUTLOOK

JUL 4 11 25 '69
DEPT OF COMMERCE
WEATHER BUREAU

MKCC
ALSYM A MKCC

AC MKC 041140

MKC AC 041140

VALID 041200-051200Z

ISOLD SVR TSTMS LATE MRNG AFTN THRU PRD TO THE RT OF A LN FM BUF PIT LOZ BWG STL IRK DSM DLH.

TSTMS NEXT 24 HRS TO THE RT OF A LN FM GLS SHV OKC BGS DLF...CONT..YUM GJT [illegible]...CONT..ART BGM NYC.

FRIENDS STGST ACTVTY DVLPG LATE MRNG NERN MINN NERN IA SRN WISC NRN ILL AND SPRD [illegible] AND SRN [illegible] THRU EVE AND NGT.

[illegible]

ATTACHMENT 2d.

REPORT ON STORM DAMAGE, LAKE AND GEAUGA COUNTIES ON JULY 4, 1969

Doron Boyce and I investigated the area around Perry, Fairport and Hambden, on Saturday July 5th.

Severe damage was concentrated in a small area 2½ miles west of Perry just south of Highway #20. The path of greatest damage was about one mile long and 50 yards wide. Large trees were mostly downed in a path about 100 yards wide and a mile long and some that were left standing had the tops sheared off.

Damage to trees and power lines was noted from Fairport to south of Perry on Route #84, a distance of about 7 miles. The storm at Perry apparently came through Fairport. The severe damage path was oriented WNW-ESE and may indicate that the storm turned to the right at point of maximum intensity since Fairport is directly west of the area.

Houses outside the 50 yard wide path were damaged mainly by flying debris. Debris in the severely damaged area showed some signs of a circular distribution. An "A" frame from one house was deposited in a tree and apparently came from a house 200 yards directly south indicating wind from the south although most debris was distributed toward the eastsoutheast. Part of a brick chimney was deposited 50 feet north of the house. An automobile was rolled over about 50 feet from the west to the east. A large pleasure boat circled a house in a clockwise direction.

Several houses were unroofed and a few garages demolished. One garage roof was deposited a few feet north of the garage; the garage was demolished. The most nearly destroyed house appeared to have been lifted then accordioned into the southside of the basement. The family in the basement at the time escaped with minor injuries. No deaths were reported.

One witness reported very strong winds from the south followed immediately by strong winds from the northwest. Watching from his basement window, he saw debris all going northward then all going southeastward. Small slivers of wood were driven into telephone poles. Sheriff's deputies indicated some witnesses had seen a funnel but we were unable to contact them. Children complained of their ears hurting just as the storm struck. A dog, chained to his dog house, was blown out of his collar.

The Sheriff of Lake County gave 7:42 P.M. EDT as the time of the storm. Other witnesses were vague indicating time around 7:30 P.M., EDT.

Houses appeared to be flimsily constructed consisting of studding, insulation board and aluminum siding. Couldn't help but feel that better constructed homes might have weathered the storm.

Conclusion: Apparently a small funnel touched down for a short distance through the housing development.

The area around Hambden in northern Geauga county and around Fairport showed no signs of a tornado. Damage was mainly to trees and some roof shingles.

George Webb

ATTACHMENT 2e.

REPORT ON STORM DAMAGE IN LAKEWOOD, OHIO, JULY 4, 1969 AROUND 8:00 P. M.

Most damage was due to fallen trees and was most extensive from Lake Road to Lake Erie and from east of Summit Street. There were several areas where extensive damage extended farther inland to Detroit Road or a little south of Detroit.

The storm hit the area close to 8:00 P.M., E.D.T. (electric clocks were stopped). Observed damage to houses was from trees, although newspaper reports indicated windows were blown out at Pier W and in some of the Gold Coast apartments.

There were two areas that seemed to have encountered heavier winds. One around Manor Park and the other around Roy Drive. Damage in these areas extended south of Detroit Road.

An extended period of above normal precipitation undoubtedly contributed to the uprooting of many large trees. There were also many trees that were broken off at the top. There was no evidence of twisting action.

Nearly all damage to homes appeared to have been caused by trees. All observed trees fell in a straight line toward the southeast.

Fatalities and injuries were due mainly to the large number of people who were outdoors to view fireworks displays or to escape warm temperatures and high humidities. When the rains came, they took shelter under large trees and were crushed when the trees fell in the storm. Large trees abound in Lakewood Park and it was heavily peopled.

There was no evidence of a tornado but only straight line wind damage. There were two or three areas where winds appeared to have been much stronger. From observed damage, winds probably exceeded 80 miles an hour.

John R. McClain

J. R. McClain

ATTACHMENT 2f.

REPORT ON STORM DAMAGE, NORTH RIDGEVILLE,
ELYRIA AND LA GRANGE, OHIO

Thunderstorm, July 4, 1969

Time: 0700 EDT - 0800 EDT (N. Ridgeville and Elyria, Ohio)
1500 EDT - 1700 EDT (Rt. 301 Elyria-LaGrange, Route 303 LaGrange to Black River east of Pittsfield, Diagonal Road, Nickle Plate Road, Parsons Road)

There was no evidence of tornado damage at the locations above.

A few trees were down in Elyria and North Ridgeville, and numerous branches. Other than a few flooded roads, located near the Black River, damage along Elyria and North Ridgeville streets was not extensive.

On Route 301 from Elyria to LaGrange, there was little noticeable damage until near the center of LaGrange. At this point, many branches, large and small, were along side the road. The only property damage noted was one front porch crushed by a falling branch. No sign of tornado damage, just wind damage.

Rt. 303, LaGrange to Pittsfield had spotty wind damage (branches and a few fallen old trees.) At the Black River, roughly one quarter of a mile of Route 303 was well under water. The remaining roads showed signs of occasional wind damage, but due to the high water the journey trying to get to Pittsfield ended at each road as soon as I reached the Black River.

In talking with a few persons in the LaGrange, Route 303 area, none knew of any tornado destruction near that area.

Gerald E Andress

Gerald E. Andress

Form CD-121 (11-62) (Proc. by A.O. 100-...)

UNITED STATES GOVERNMENT

ATTACHMENT 2g.

Memorandum

U.S. DEPARTMENT OF COMMERCE
WEATHER BUREAU

TO : Director, NSSFC, Kansas City
Through: Chief, WXAP, Eastern Region

DATE: July 15, 1969

In reply refer to:

FROM : MIC, WBFO, Cleveland, Ohio

SUBJECT: Thunderstorm, July 4, 1969

A line of showers and thundershowers moved from the north across Lake Erie at a southward speed of 40 miles per hour or more. The line was accompanied by strong winds in many places, and a tornado was reported in Perry Township, Lake County.

The storms moved onto the south shore of Lake Erie from Ottawa County eastward through Ashtabula County between 7:30 P.M. and 8:pp P.M., EDT, July 4, 1969. Portions of the Lake Erie shore which protrude into the lake were the first to experience the storm around 7:40 P.M., EDT, and the remainder of the shore area was hit by 8:00 P.M. or a few minutes later. Additional storms continued to develop and move on shore from the lake during the night and during the morning of July 5. Vivid lightning, very heavy rains and gusty winds accompanied these storms but the most damage from wind occurred with the first line of thunderstorms. Most extensive damage from the wind was near the lake shore. In Cuyahoga County, Lakewood received the greatest damage. According to a Cleveland Plain Dealer article of Wednesday, July 9, a group comprised of 300 insurance firms set the insured damage amount in Cuyahoga County at $2.7 million and said greatest losses were in Lakewood. Governor James A. Rhodes estimated total damage and clean-up repair costs at $30 million. The insured property excluded marine and automobile losses. Governor Rhodes, according to the Plain Dealer of July 9, 1969 estimated damage in Cuyahoga County, private and public at $950,000. Estimates of damage in the WBFO's Cleveland other counties of responsibility: Erie, $2,120,000; Huron, $3.75 million; Ottawa $1.3 million; Lake, $90,000; Lorain, $70,000; Sandusky, $100,000; Seneca $130,000.

The storm came on shore about the time great crowds of people were gathering in parks for special 4th of July entertainment and fireworks displays. It is the custom in Cuyahoga County for many small pleasure boats to anchor just off-shore to watch fireworks displays. Many boaters were able to reach shore just in advance of the storm but others were caught in open water. At one time, it was thought that more than 120 craft were missing. The Coast Guard worked through the night and during the next several days resucing people and searching for missing craft. As of July 9th the Coast Guard reported that all persons had been accounted for except two persons who had been off Geneva-on-the-Lake in Lake County when the storm hit and one person who was apparently struck by lightning off Toledo. No bodies had been recovered. In addition to these two

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drownings, 7 people were killed by falling trees, 2 by electrocution by fallen wires and one by lightning. Over 10 inches of rain fell in some places inland from the Lake and near the headwaters of the major streams. This caused heavy flooding on the 5th and 6th. Newspaper reports indicated that in the counties of Cleveland's area of responsibility, most damage from flooding occurred along the Vermilion River in Huron and Lorain Counties.

The first notice given by this office of the impending storm along the south shore of Lake Erie was in the Recreational Boating forecast with a scheduled release of 7:15 P.M., EDT. Boats were urged to take safe harbor. WBFO Chicago called about 7:15 P.M. with the coordinates of the Tornado Watch that would be issued by SELS. The Cleveland Vicinity and Sandusky and Vicinity forecasts were immediately revised and issued at 7:25 P.M., EDT to include the Tornado Watch and issued over EWWS to news media, WE 1-1212 and Behnke Answering Service for distribution in the City of Sandusky. The Tornado Watch was received over RAWARC (the redefining statement had been prepared before receipt based upon the call from WBFO Chicago) and transmitted over EWW at 7:30 PM, EDT. It was also transmitted over the Coast Guard circuit and over the Civil Defense Network which would reach nearly all radio and TV stations in Cuyahoga County. A severe thunderstorm warning was issued for Ottawa, Sandusky and Erie Counties at 7:45 P.M., EDT over EWWS and over the Civil Defense Disaster Network at 7:59 P.M., EDT. A tornado warning was issued for Ashtabula County at 8:00 P.M., EDT based upon a report of a tornado 4 miles west of Ashtabula. Other warnings were issued during the night and early morning of the 5th as additional storms appeared to develop over Lake Erie and move inland. Warnings were issued in time for the Coast Guard to call their patrol boats and auxiliary patrol back to harbor, although some did not make harbor before the storm struck.

A Civil Defense official in Lorain County advised that they received information on the impending severe weather in time to completely evacuate Cascade Park in the City of Elyria. Approximately 2000 persons had gathered there for entertainment. Radio Station WEOL Elyria, advised that they had received calls from listeners stating that they had had sufficient warning by listening to that station to secure loose objects and prepare for a storm. WEOL and their FM station WBEN is on EWWS and had broadcast weather information immediately upon receipt.

The Cuyahoga County Civil Defense Disaster Network did not function properly so complete warnings were not received at all times by stations that relied entirely upon this system for dissemination. TV stations in Cleveland are on EWWS and have professional meteorologists. It is presumed that information and warnings issued by the Weather Bureau were passed on to the public or used to a large extent in information they issued from their stations.

Large numbers of people were engaged in outdoor activities and did not have access to radio or TV. It is believed that this coupled with their seeking shelter under trees from the heavy rain was a contributing factor to the deaths that resulted from the wind.

Richard Fay

cc: State Climatologist, Columbus

Attachment 2h.

FORM CD-121 (11-63) (PRES. BY A.O. 206-10)

UNITED STATES GOVERNMENT

Memorandum

U.S. DEPARTMENT OF COMMERCE
ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION
WEATHER BUREAU

TO : Chief, WXAP, Eastern Region

DATE: July 7, 1969

In reply refer to:

FROM : MIC, WBO, Toledo, Ohio

SUBJECT: Report of severe weather and related events, Toledo, Ohio, July 4 and 5, 1969.

A tornado watch was issued by SELS, covering the eastern counties of responsibility of the WBO, Toledo, Ohio at 7:15PM EDT. This was issued to the local news media via ESSA Wire, telephone and by direct broadcast from the Weather Bureau office. The direct broadcast was made at 7:20PM EDT with all parties notified by 7:45PM EDT.

At 8:20PM EDT a rumor reached the Weather Bureau office that a tornado was sighted at Point Place, an eastern suburb of Toledo. This was verified by a call to the Toledo police as having struck the Point Place area at approximately 8:15PM EDT. No tornado warning was issued by this office because the storm moved out over Lake Erie. Later investigation of the area indicated that the major damage was of a straight line nature and was mainly in the form of broken and fallen trees, heavy rains, strong winds and flooding.

At 9:03PM EDT a report of a second touchdown was reported to the office as occurring in the vicinity of Maumee, Ohio by the Toledo police. A warning was issued immediately by sounding the Civil Defense siren's in the Toledo area, by local broadcast, telephone and ESSA wire. This funnel apparently lifted back into the parent cloud with no further sightings or damage.

At 9:38PM EDT, a severe thunderstorm was reported by State Highway police at a point just east of Bryan, Ohio. A severe thunderstorm warning was issued by the WBO, Toledo, Ohio for the following counties, Williams, Defiance, Fulton, Henry and Wood. This warning was valid from the issue time until 1AM EDT, July 5, 1969.

A second sighting of a tornado was reported to the office at 10:09PM EDT by the Toledo police Department. This was in the city of Toledo and the Civil Defense siren's were used for an immediate warning with all interested parties receiving the warning by 10:20PM EDT. This apparently was a momentary touchdown with no further sightings being reported. This warning was valid from the time of issuance until midnight.

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Chief, WXAP, Eastern Region July 7, 1969

A severe thunderstorm watch was placed in effect for the counties of Lucas, Wood and Hancock at 11PM EDT. This was to be valid until 2AM EDT of July 5, 1969. This was issued on the basis of SELS Watch Bulletin number 359.

A tornado warning was issued by the WBO, Toledo, Ohio at 1:12AM EDT July 5, 1969 for the area east and northeast of Findley, Ohio when a report was received from the State Highway Police of a tornado sighting three and a half miles northeast of that city. This warning was valid from the time of issuance until 3AM EDT.

A tornado watch was issued for all of northwestern Ohio, valid from 1:50AM EDT until 7AM EDT, July 5, 1969. This watch was cancelled at 4:30AM EDT, July 5, 1969 when it was apparent that the severity of the weather was decreasing and had cleared Toledo's area of responsibility.

A total of three and twenty-three hundredths inches of rain was received from 8PM EDT, July 4, 1969 until 1 AM EDT, July 5, 1969. The strongest wind was 53 knots in gusts at 9:40PM EDT. The highest wind recorded for July 4, 1969 was 53 milesper hour from the northwest at 9:41PM EDT.

It would be difficult to set a dollar figure on the damage which this series of storms caused in the Toledo area. An estimate would have to range from two to three million dollars. Much of the damage is hidden in nature, in that it is confined to flooding of basements and articles which may have been stored there. Surface flooding was widespread, causing crop losses, disrupting traffic by overflowing the lower sections of roads and filling the low sections of underpasses. Power lines and telephone service was affected over much of the area with lines down from falling trees and broken branches. For some areas, service has not been restored to date.

Although there were no fatalities during the series of storms, there have been two fatalaties during the cleanup operation due to live electrical wires.

M. N. Schmitz
MIC, WBO, Toledo, Ohio

cc: SELS, Kansas City, Mo.
OSC, Columbus, Ohio
WBFO, Cleveland, Ohio

Attachment 2i.

FORM CD-121 (11-63) (PRES. BY A.O. 206-10)

UNITED STATES GOVERNMENT

Memorandum

U.S. DEPARTMENT OF COMMERCE
WEATHER BUREAU

TO : Director, Eastern Region
Attn, Chief, WXAP

DATE: July 10,1969

In reply refer to:

FROM : MIC, WBO, Akron, Ohio

SUBJECT: Storm of July 4-5,1969

Summary of damage: The major damage in our counties of responsibility was caused by floods. A report on the extent,deaths and damage from the flooding will be made by Mr.Grant Vaughan to the Regional Hydrologist as soon as the floods subside.

At approximately 2045 EDT the squall line which produced the extensive damage along the Lake Erie shore reached our northern counties of responsibility. The line was moving at 50mph ESE and passed through our northern counties by 2200EDT. Damage throughout our counties was generally light consisting of a few trees and numerous limbs blown down and minor damage to a few homes. The few areas of concentrated damage all indicated straight line winds. Several people near Uniontown(020/05K from CAK) reported a funnel cloud aloft accompanied by a loud roar at the time of the first line however it apparently never touched ground. The first line was followed by continuous thunderstorm activity until 1042 EDT July 5th. Precipitation continued until 1450EDT July 5th with a total of 3.53" at the airport and up to and in some cases more than 10.00" in several of our counties.

Station Activity: A Tornado Watch was received at 1910EDT for the area and the man on duty immediately called in two extra men with an additional man arriving 4 hours later. At 2040 EDT a Tornado Warning was issued for Summit and Portage counties on the basis of reported tornadoes with the approching squall line. An All Clear was issued for the counties at 2155EDT after the line had passed to the south and east. With only strong winds being reported with this line a Severe Thunderstorm Warning was issued at 2100EDT for Wayne, Stark, Holmes, Coshocton, Carroll, and Tuscarawas counties. This area was given an All Clear at 2200EDT. A Severe Thunderstorm Warning was issued for Coshocton, Tuscarawas, Jefferson and Harrison counties at 2215EDT and was All Cleared at 2330EDT. A second line of thunderstorms formed over Lake Erie shortly after 2300EDT and began moving southeastward at 45mph. On the basis of radar indications and unconfirmed reports of strong winds and damage a Severe Thunderstorm Warning was issued for Summit, Portage, Stark, Wayne and Jefferson counties at 2345EDT.The formation of numerous short thunderstorm lines was the basis for extending this Warning at 0100EDT on the 5th.For the same reason a Severe Thunderstorm Warning was issued for Carroll, Holmes, Tuscarawas, and Harrison counties at 0130 EDT. With reports of only heavy rain and severe lightning all of the counties were All Cleared at 0230EDT. The Tornado watch was extended several times and finally expired at 0700EDT on the 5th.

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U.S. DEPARTMENT OF COMMERCE
ENVIRONMENTAL SCIENCE SERVICES ADMINISTRATION
WEATHER BUREAU

IN REPLY REFER TO:

-2-

Heavy thunderstorm activity persisted in the area until midday on July 5th. The first mention of small stream flooding by this office was at 0430EDT on the ESSA Weather Wire. Two specific forecasts for river stages in the morning and afternoon of the 5th and all radar summaries issued from 0630EDT on the 5th through 1230EDT indicated small streams over there banks and continued rises expected.

Copies of Warnings and statements are attached. Unfortunately several were lost in the confusion but should be available on ESSA Weather Wire at WBFO, Cleveland.

Terry A. Ritter

Terry A. Ritter

cc; OSC,
Director, NSSFC

ATTACHMENT 3

Log of Forecasts, Statements and Warnings Issued by the Weather Bureau Forecast Office, Cleveland, Ohio on July 4 and 5, 1969

12:10 p.m.	State Forecast: Locally heavy thunderstorms likely western Ohio by this evening and during evening elsewhere over the State.
2:00 p.m.	Special Weather Statement: Thunderstorms in Lorain County will move NE thru Lorain and into Western Cuyahoga County and continue eastward across the Cleveland area by 3:30 p.m. EDT. They will be accompanied by heavy rain and strong gusty winds. (This statement included on WE1-1212 recording for CLE area between 2 and 3:30 p.m.)
2:12 p.m.	Forecast for Cleveland and Vicinity: Thundershowers likely this evening diminishing later tonight, increasing again Saturday. Small craft warnings in effect.
4:30 p.m.	Northwest & Northeast Ohio Zones: Thundershowers likely tonight and Saturday. Other Zones: Chance of a few thundershowers tonight. Thunderstorms likely Saturday.
4:40 p.m.	Ohio Weather Story: Small Craft Warnings continue in effect on Lake Erie for high winds in thundershower activity.
4:50 p.m.	Cleveland and Vicinity Forecast: Thunderstorms likely. Small Craft Warnings remain in effect. Sandusky and Vicinity: Thunderstorms likely.
6:10 p.m.	Ohio Forecast: Chance of thunderstorms mainly north tonight and Saturday. Lake Erie: Small Craft Warnings in effect.
7:15 p.m.	Recreational Boating Forecast: Line of thundershowers 7 p.m. just off the northern shore drifting southward.
7:15 p.m. (approx.)	While Recreational Boating Forecast is being disseminated, a coordination call was received at Cleveland Weather Bureau Forecast Office from Chicago to the effect that the Weather Bureau Severe Local Storm Forecast Unit at Kansas City was in the process of issuing a Severe Weather Watch for an area that included northern Ohio. Details were supplied, forecast area was plotted by Cleveland and a redefining statement was prepared. Tornado Watch Bulletin #359 Date-Time Group 042315Z was transmitted on the Weather Bureau Radar Warning and Coordination Circuit (RAWARC) by MKCC at 2318Z.

7:25 p.m. Amended forecast issued for Cleveland and Vicinity: Tornado Watch in effect until 1 a.m. Saturday morning. Small Craft Warnings in effect for much higher winds in thunderstorms. "I" Code on EWWS indicates that this amended forecast was routed to the Ohio Bell Telephone Co. at Cleveland and that the Cleveland WE1-1212 recording is to be revised to include this information.

7:25 p.m. Revised forecast for Sandusky and Vicinity: A Tornado Watch is in effect until 1 a.m. Saturday morning. Sent to all stations on Ohio EWWS ("A" Code).

7:30 p.m. Redefining Statement added to Tornado Watch received over RAWARC and watch and redefining statement were retransmitted on EWWS. ("A" Code: all stations in Ohio) (See Remarks after 7:15 p.m. transmission by MKCC on RAWARC 7:18 p.m. EDT.) Also transmitted over Coast Guard teletypewriter circuit - See Marine Summary

7:36 p.m. Transmitted over Civil Defense Disaster Network by voice. (Some transmission problems.)

7:45 p.m. On the basis of a severe thunderstorm reported at Elmore and Genoa at 7:35 p.m., severe thunderstorm warnings were issued for the three NW Ohio Counties in the Cleveland area of responsibility. (Ottawa, Sandusky and Erie). EANS was requested (Transmitted on EWWS). This warning was also transmitted by voice on the Civil Defense Disaster Network.

7:50 p.m. A Severe Thunderstorm Warning issued for Cuyahoga, Lake, Ashtabula and Lorain Counties. (On basis of report of 100 mph winds from a vessel on Lake Erie.) (Transmitted on EWWS) Transmitted by voice over the Cuyahoga County Civil Defense Disaster Radio Network at 7:59 p.m.

7:55 p.m. Reports of winds up to 50 mph from Lorain.
Severe thunderstorm hit Lakewood, Ohio area at about 8 p.m.

8:00 p.m. Report of winds 80 mph at Southeast Shoals.

8:05 p.m. Tornado warnings issued for Ashtabula County based on 8 p.m. Coast Guard report of tornado 4 miles west of Ashtabula.

8:05 p.m. Received report of winds 50 - 60 mph Lorain, Sandusky and Huron.

8:10 p.m. Warnings broadcast over WMI Lorain Marine Radio Station.

8:10 p.m. Severe thunderstorm warnings Seneca, Huron, Medina and Geauga Counties.

8:25 p.m.	Received report of funnel cloud from Summit.
8:25 p.m.	Issued severe thunderstorm warning statement for Cuyahoga County, extended warning until 9:30 p.m.
8:26 p.m.	Received report of possible tornado in Geauga County.
8:30 p.m.	Issued tornado warnings Lorain and Cuyahoga Counties.
8:35 p.m.	Report of wind of over 60 mph Garfield Heights.
8:44 p.m.	Tornado warning for Medina County, based on tornado reports at Pittsfield.
8:45 p.m.	Severe weather statement - current warnings, tornado watch, reports in last hour and latest radar observations
8:45 p.m.	Report of tornado in Fulton County
8:55 p.m.	Report of funnel aloft in Huron County
9:02 p.m.	Severe thunderstorm Medina County
9:15 p.m.	All clear issued for severe weather warnings for Lorain, Cuyahoga, Lake, Ashtabula, Geauga and Medina Counties. Severe Weather Watch continues in effect.
9:25 p.m.	Tornado warning for Ottawa County
9:30 p.m.	All clear for Cuyahoga
9:50 p.m.	Received reports of winds 50 mph from Lake County. Considerable damage in Medina County.
9:55 p.m.	Issued severe thunderstorm warnings for Erie, Sandusky, Seneca and Huron Counties.
10:15 p.m.	Severe Thunderstorm Watch #361. Cancelled Tornado Watch #359.
10:20 p.m.	Severe weather statement - warnings current, watch status, reports of severe weather past hour.
10:20 p.m.	Issued areal redefining statement for Watch #361.
10:45 p.m.	Thunderstorm Watch included on WE1-1212.
11:00 p.m.	Special Statement - Thunderstorms developing over Lake moving Cleveland to Ashtabula from 11 p.m. to midnight.
11:05 p.m.	Severe thunderstorm warning for Lake and northern Geauga Counties until midnight (Cell on radar)

11:30 p.m.	All clear for Ottawa County for tornado warning.
11:40 p.m.	Severe thunderstorm warning issued for Erie, Sandusky, Seneca, Huron and Ottawa Counties
12:01 a.m.	All clear for Lake and Geauga Counties for warning, watch continues.
12:20 a.m.	Severe weather statement
12:50 a.m.	All clear for Ottawa, Erie, Sandusky, Huron and Seneca Counties for warning, severe weather watch continues in effect.
1:08 a.m.	Report of tornado 3½ miles north of Findlay (in Toledo area)
1:12 a.m.	Tornado warning by Toledo for Hancock County
1:15 a.m.	Severe thunderstorm warning by Akron-Canton for Stark, Summit, Portage, Wayne and Jefferson Counties
1:20 a.m.	Severe weather statement - numerous thunderstorms in watch area.
1:30 a.m.	Severe thunderstorm warning by Akron-Canton for Coshocton, Carroll, Holmes, Tuscarawas and Harrison Counties
1:40 a.m.	Tornado watch bulletin number 362 replaces number 361.
1:45 a.m.	Redefining statment issued
1:50 a.m.	Tornado warning for Sandusky, Seneca and Erie Counties Tornado reported at Van Buren.
2:25 a.m.	Severe weather statement. Thunderstorms over much of Ohio
3:20 a.m.	Severe weather statement
3:30 a.m.	Severe thunderstorm warning - Erie, Sandusky and Seneca Counties. Line of thunderstorms on radar
4:15 a.m.	Severe weather statement - warnings and watch continue.
6:25 a.m.	Severe weather statement
7:30 a.m.	All Clear Bulletin.

ATTACHMENT 4

Personnel on Duty - Weather Bureau Forecast Office, Cleveland, Ohio
8 a.m. EDT July 4th Thru 8 a.m. EDT July 5, 1969

	8:00 a.m. - 4:30 p.m.	July 4	Waldman, Raymond R.	Public Service & Marine Forecaster
			Risher, Donald E.	Observer
	10:00 a.m. - 6:30 p.m.	July 4	Winslow, Rodney C.	Aviation Forecaster
	3:30 p.m. - midnight	July 4	Webb, George H. Jr.	Public Service & Marine Forecaster
			McGuire, Thomas P.	Local Public Service Forecaster
			Chudowsky, Ronald L.	Asst. Aviation Forecaster
			Andress, Gerald E.	Communicator
	4:00 p.m. - midnight	July 4	Hobson, Lesley M.	Observer
	4:30 p.m. - 1:00 a.m.	July 4-5	Schultz, James T.	Aviation Forecaster
Extra	7:40 p.m. - 6:00 a.m.	July 4-5	McClain, John R.	Principal Assistant
Extra	10:00 p.m. - midnight	July 4	Bowes, Robert F.	Public Service & Marine Forecaster
Extra	11:00 p.m. - midnight	July 4	Dyck, Homer D.	Aviation Forecaster
Extra	11:30 p.m. - 6:00 a.m.	July 4-5	Andress, Gerald E.	Communicator
Extra	Midnight - 6:00 a.m.	July 5	Webb, George H. Jr.	Public Service & Marine Forecaster
	Midnight - 8:00 a.m.	July 5	Bowes, Robert F.	Public Service & Marine Forecaster
			Dyck, Homer D.	Aviation Forecaster
			Braithwaite, Lynn O.	Observer
Extra	Midnight - 4:00 a.m.	July 5	McGuire, Thomas P.	Local Public Service Forecaster