

SOMERSET COUNTY FLOOD INFORMATION SYSTEM

INTRODUCTION

The timely warning of a flood is crucial to the protection of lives and property. One has only to recall the flood of August 2, 1973, in Somerset County, New Jersey, in which six lives were lost and major property damage occurred, to realize how unexpected and costly, especially in terms of human life, a flood can be. Accurate forecasts and warnings cannot be made, however, without detailed information about precipitation and streamflow in the drainage basin.

Recognizing the need for detailed hydrologic information for Somerset County, the U.S. Geological Survey (USGS), in cooperation with Somerset County, installed the Somerset County Flood Information System (SCFIS) in 1990. The availability of data provided by this system will improve the flood forecasting ability of the National Weather Service (NWS), and has assisted Somerset County and municipal agencies in planning and execution of flood-preparation and emergency evacuation procedures in the county.

This fact sheet describes the Somerset County Flood Information System and identifies its benefits.

ORIGINAL SOMERSET COUNTY FLOOD-WARNING SYSTEM

Since the mid 1960's the NWS has been able to effectively forecast flooding on larger streams in Somerset County, such as the Raritan and Millstone Rivers. Flooding on smaller streams in urban areas is more difficult to predict, however. In response to this problem the NWS, in cooperation with the Green Brook Flood Control Commission, installed a rain gage in North Plainfield, and two flash-flood alarms, one on Green Brook at Seeley Mills and one on Stony Brook at Watchung, in the early 1970's.

In 1978, New Jersey's first local flood-warning system was installed by the USGS in Somerset County. This system consisted

of a network of eight streamflow-gaging stations equipped with rain gages and linked by telephone telemetry, and eight auxiliary rain gages. The gages were installed throughout the county to collect rainfall and runoff data that could be used to improve flood-monitoring capabilities and flood-frequency estimates.

COLLECTING HYDROLOGIC DATA

Information needed for flood forecasting includes stream stage (the height of the water level in the stream above an arbitrary datum) and the amount and distribution of precipitation. Streamflow is measured at a streamflow-gaging station, where automated equipment is used to continuously monitor and record water levels. Because stream discharge, or the volume that flows past a point on the stream during a specific time interval, is difficult to measure accurately and continuously, discharge is commonly estimated from pre-established stage-discharge relations, or rating curves. The rating curves are developed by USGS personnel who visit the gaging station periodically to measure discharge manually under a variety of flow conditions. The rating curve also allows stream stage to be determined from an estimate of stream discharge.

Precipitation gages distributed throughout the drainage basin are used to measure and record the amount of precipitation that falls during a given storm. This information, together with the NWS's Doppler radar, allows the amount and distribution of precipitation to be accurately estimated. From this estimate, stream discharge at a given location can be predicted and converted to an estimate of stream stage.

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In early 1990, the USGS replaced the telephone telemetry of the first network with radio links between the gaging stations and the base-station computer. During the same period 5 stream gages and 10 rain

gages, as well as connections to 1 Passaic Flood Warning System (PFWS) and 5 NWS streamflow gages, were added to the network. The new streamflow gages were placed at critical flood-prone locations to provide real-time indications of imminent flooding. The additional rain gages were installed throughout the county to provide much needed information on the spatial distribution of rainfall, especially heavy precipitation.

In 1996 and 1997 the system was adjusted further, some gages were added and others were removed. Currently, the network consists of 23 streamflow gages and 21 rain gages; their locations are shown in figure 1.

The base-station computer, located at the Somerset County Engineering Division in the Somerset County administration building in Somerville, N.J., receives the streamflow and rainfall data by very high frequency (VHF) radio link and telephone and uses a software configuration based on the NWS's ALERT software to record the incoming data. The radio communication links provide continuous, real-time reports on streamflow, while the telephone links provide intermittent data.

PASSAIC FLOOD WARNING SYSTEM

Information on stage, discharge, and precipitation within the Passaic River Basin is obtained through a UHF-radio link with the PFWS, installed just north of Somerset County. The Passaic Flood Warning System, completed in 1988, encompasses parts of 10 counties in New York and New Jersey, and consists of 35 rain gages, 21 streamflow-gaging stations, and 12 base-station computers. The backbone communication network for the PFWS ties together the base-stations of the 4 counties, the 3 NWS offices, the Army Corps of Engineers in New York, the N.J. State Police, the N.J. Dept. of Environmental Protection, and the USGS. The NWS flood watches, warnings, and weather forecasts are relayed over the backbone network

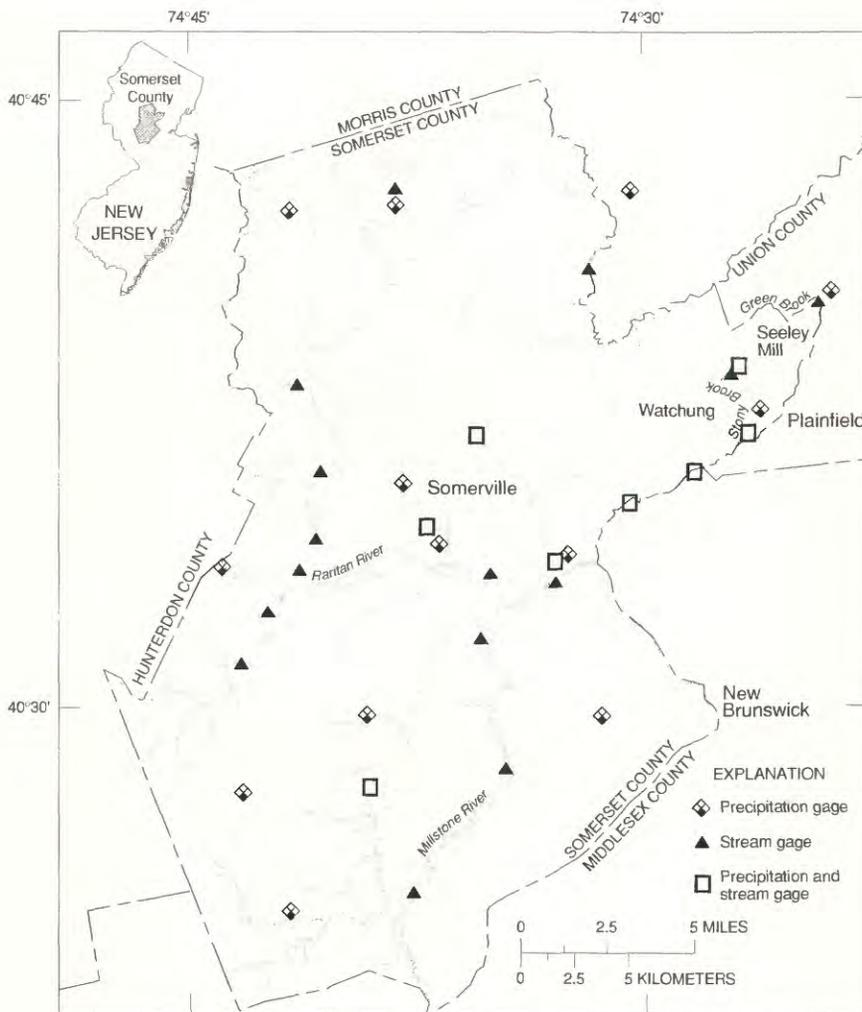


Figure 1. Locations of Somerset County Flood Information System gages in Somerset County, N.J., and vicinity.

along with precipitation and stream-stage data to keep all base-station computers up to date. The link with the PFWS also enables the Somerset County system to be part of the New Jersey Integrated Flood Observations and Warning System (IFLOWS) network.

INTEGRATED FLOOD OBSERVATIONS AND WARNING SYSTEM

IFLOWS is a software package designed for the NWS that enables the two-way transfer of messages and the one-way transfer of forecasts, warnings, guidance, and data between the NWS internal communications systems and the base-station computers of the SCFIS and PFWS. Currently, both the SCFIS and PFWS use a proprietary software package called DataCommand¹. This package is an enhanced version of ALERT (a NWS software package) that

facilitates the exchange of data between base stations and IFLOWS systems.

BENEFITS OF THE SOMERSET COUNTY FLOOD INFORMATION SYSTEM

The Somerset County Flood Information System provides valuable information that benefits the residents of Somerset County, the State of New Jersey, and Federal agencies that regulate the county's waterways.

- The hydrologic data collected aids the NWS in developing timely and accurate flood forecasts.
- The availability of real-time stream-stage and precipitation data along with the NWS severe weather and flood forecasts, watches, and warnings allow the State, county, and high-risk municipalities to develop efficient emergency evacuation procedures.
- The real-time stream-stage data could be used in conjunction with other time-of-travel data as part of an early response

system for hazardous waste spills. Such a system would give emergency-response agencies and water-supply utilities a tool to plan actions in accordance with the location of the spill.

- Real-time knowledge of stream-stage can allow commercial business and industry to take actions to reduce inventory and structural losses during a storm event.
- The hydrologic data collected can be used to optimize the design and operation of dams, levees, bridges, and water- and wastewater-treatment facilities.
- The hydrologic data collected can be used to plan future public water supplies, assist in monitoring water quality, and aid in the assessment of the effects of environmental regulations.
- The public and private sectors can utilize the data for development and environmental concerns.

REFERENCES CITED

Dunne, Paul, and Velnich, A.J., 1994, Development, installation, and operation of a flood-monitoring system in Somerset County, New Jersey: U.S. Geological Survey Open File Report 94-65, 23 p.

Somerset County Department of Public Works, 1996, Somerset County Flood Information System: Operations Manual: Somerville, N.J., Somerset County Department of Public Works, Division of Engineering, September 1996, 16 p.

- William M. Summer

For Additional Information Contact:

- **U.S. Geological Survey**
District Chief
U.S. Geological Survey
810 Bear Tavern Road
West Trenton, NJ 08628
(609) 771-3900
(609) 771-3915 (FAX)

USGS "Home Page":
<http://www.usgs.gov>

New Jersey District's "Water Resources Home Page":
<http://nj.usgs.gov>

- **Partners in project:**
Somerset County Division of Engineering:
(908) 231-7024

¹Use of a trade name in this fact sheet is for identification purposes only and does not constitute endorsement by the U.S. Geological Survey.