

## Improving Monitoring and Forecasting of Precipitation and Coastal Flooding in the San Francisco Bay Area

### THE CHALLENGE

When big storms hit California, current technology does not provide forecasters with the detailed information needed to inform reservoir operations, flood protection, combined sewer-stormwater systems and emergency preparedness. Accurate and timely precipitation information is critical for making decisions regarding public safety, infrastructure operations, and resource allocations. Standard weather radars, originally designed to look up into Midwest thunderstorms, are often unable to give an accurate picture of what is happening in the complex landscape of California’s coastal mountain ranges. Improved monitoring and prediction of precipitation in the San Francisco Bay region can enhance public safety through early warning and storm tracking when hazardous weather events come onshore.

AQPI observing assets include a coastal Doppler C-band weather radar along the Sonoma County coast which will point offshore to improve tracking of incoming storms and four gap-filling X-band radar units strategically located to provide high-resolution coverage over populated and flood prone urban areas throughout the San Francisco Bay region. The radar data will be assimilated by atmospheric models to improve short-term prediction of precipitation. The AQPI System also will improve runoff and coastal flooding predictions in and around the Bay. This will be valuable to wastewater and flood protection managers, and will provide better inputs to urban hydrologic and hydraulic models.

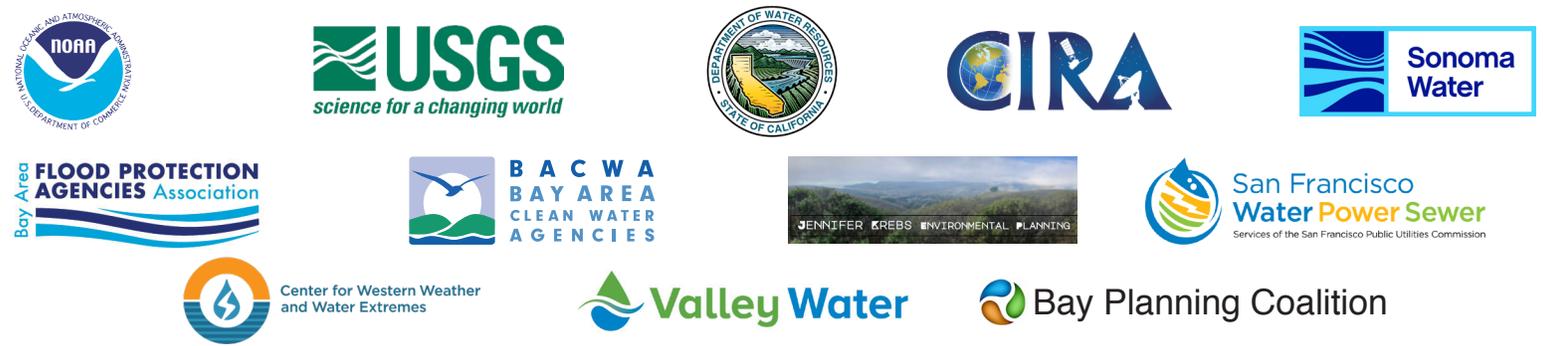
To address climate change and sea level rise with possibly more extreme storms the System will implement the Coastal Storm Modeling System (CoSMoS). This system will forecast flooding around the San Francisco Bay coastline.

### THE SOLUTION

The Advanced Quantitative Precipitation Information (AQPI) System is a regional project awarded to Sonoma Water and collaborating partners by the California Department of Water Resources. The AQPI System consists of improved weather radar data for precipitation estimation and short-term nowcasting (0-1 hours); additional surface measurements of precipitation, streamflow and soil moisture; and a suite of forecast modeling systems to improve lead time on precipitation and coastal Bay inundation from extreme storms—especially high-moisture laden atmospheric rivers.

### NOAA CONTRIBUTIONS

NOAA is responsible for building the AQPI System, deploying surface meteorological and streamflow instrumentation, developing high resolution quantitative precipitation estimation (QPE), quantitative precipitation forecast (QPF), and tributary streamflow forecast products, as well as delivering AQPI products to end users. In particular, the new radar data will be assimilated into the NOAA High Resolution Rapid Refresh (HRRR) model.



# AQPI KEY FEATURES

Five new, state-of-the-art radar systems to improve monitoring of precipitation offshore and within the Bay region.

High-resolution precipitation forecasts.

Coastal flooding, storm surge, and tributary streamflow forecasts.



NOAA's National Water Model will be coupled to the coastal storm model (CoSMoS) developed by the USGS for coastal flooding forecasts in and around the Bay coastline.

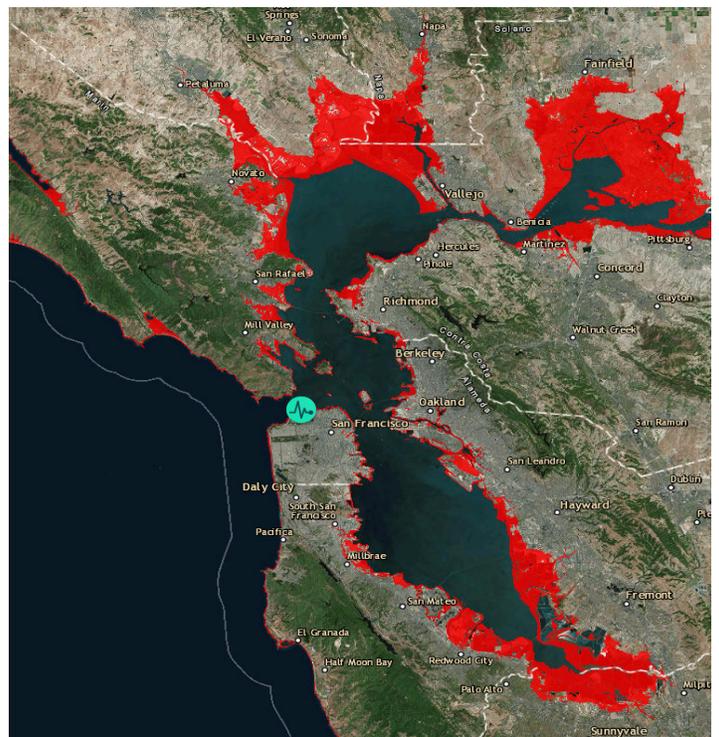
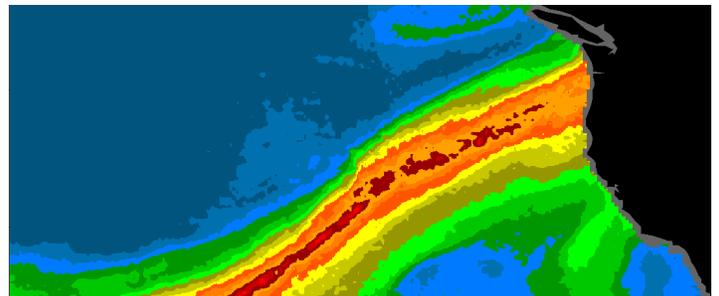
## ANTICIPATED BENEFITS

The AQPI System can aid water managers in securing water supplies while mitigating flood risk and minimizing potential water quality impacts to the Bay from storm runoff and combined sewer overflows. The system can be expected to provide benefits exceeding costs by a ratio of at least 4:1. These benefits accrue through:

- Avoided flood damage costs from early warnings.
- Forecast-based operations to maximize reservoir capture for water supply and fisheries flows.
- Minimization of water quality impacts from combined sewer.
- Enhancement of public safety for the various transportation modes (pedestrian, highways, marine and airports).

These benefits will become increasingly important as costs associated with extreme weather events continue to escalate. In 2011 and 2012 alone, weather related disasters across the U.S. caused 1,107 fatalities and \$188 billion in economic damages. Between 1954 and 2013, California received 79 presidential disaster declarations of which more than half (46) were related to flooding.

**At right:** (Top) atmospheric rivers hitting the West Coast can bring drought-busting precipitation or hazardous storm conditions. (Bottom) map of San Francisco Bay region showing areas prone to shallow flooding (red).



FOR MORE INFORMATION: Visit <https://www.sonomawater.org/aqpi/> and <http://www.esrl.noaa.gov/psd/aqpi/>, or contact:

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