Impact-Based Decision Support Services by NWS Baltimore/Washington Following the Collapse of the Francis Scott Key Bridge in Baltimore, Maryland

NATIONAL WEATHER SERVICE

2024 Northeast Regional Operations Workshop

November 14, 2024

Kevin Rodriguez, Lead Meteorologist, NWS Baltimore/Washington

Agenda

- FSK Bridge Collapse Impact
- NWS Baltimore/Washington Response Day 1
- NWS IDSS
- NOAA Collaboration
- Challenges & Successes

THE BALTIMORE SUN

BALTIMORESUN.COM

KEY BRIDGE FALLS

Container ship hits support column Tuesday morning

Two rescued; six road workers presumed dead

Economic cost of port shutdown could be $15M a day

Power failure central in probe

'Terrible, unforeseen tragedy' for six construction workers

Port of Baltimore suspends vessel traffic

Bridge designers raise questions

FSK Bridge Collapse Impact

- Six fatalities, two injuries
- Loss of FSK Bridge resulted in significant travel, commute, economic impact to local residents
- I-695 beltway is the only route for hazardous material traffic to cross Baltimore
  - Cannot use I-95, I-895 tunnels through city
  - Rerouted traffic across western beltway adds ~1 hour to commute
- Likely environmental impact to local marine life and water quality from debris, dredging during cleanup
- Rebuilding of FSK Bridge is expected to take several years, though officials are targeting completion by the fall of 2028
  - Plans currently being worked through by MD DOT
  - Cost upwards of $1.5 billion

FSK Bridge over the Patapsco River, 2011. Courtesy Wikipedia

FSK Bridge Collapse Impact

- Port of Baltimore
  - Generates approximately $400 million in taxes and more than $3.5 billion in business revenue annually
  - Serves over 50 ocean carriers making nearly 1,800 annual visits
  - Ranks **first in the nation** in handling automobiles, light trucks, farm and construction machinery, as well as imported sugar and gypsum
  - 1/3 of the Nation's population is within a 12 hour drive of Baltimore
  - Directly responsible for 15,000 jobs
- Economic Cost of Port Closure
  - $15 million/day in economic losses for Maryland
  - National disruption to supply chains, limited-service availability, and increased costs

FSK Bridge over the Patapsco River, 2011. Courtesy Wikipedia

NWS Baltimore/Washington Response Day 1

- Collapse occurred 1:27 AM EDT Tue 26 March 2024
  - *MV Dali* collided with supporting pier of the main truss
- WFO Staff Initial Reaction
  - Phone weather briefings for initial search & rescue by Anne Arundel, Baltimore, City of Baltimore Fire / Police officials
  - Notifications to ER ROC, local management
  - Coordinated briefings to NTSB, Maryland EOC, US Coast Guard (USCG) Sector Maryland/NCR
    - Combination of Spot Forecasts, briefing slides, phone calls

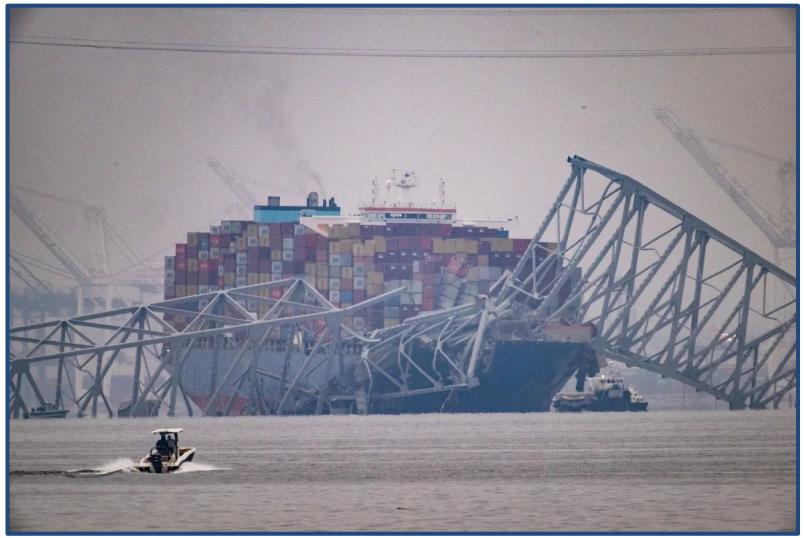


Photo Courtesy Jerry Jackson, Baltimore Sun

NWS IDSS to the Maryland State EOC

- Maryland Department of Emergency Management (MDEM) quickly spun-up their State Emergency Operations Center (MD SEOC) in Hanover, MD by late morning Tuesday (March 26, 2024)
  - WFO LWX was onsite as SEOC was spinning up
  - Meteorologist deployed each day SEOC active
- State officials staffed the MD SEOC through Friday, March 29, 2024
  - Provided onsite weather briefings & support from 0600-1800
  - Remote support from WFO 1800-0600
- USCG created a Unified Command (UC)
  - Incident response/recovery/salvage transitioned from MD SEOC to UC the weekend of March 29-30
  - Transition period challenging for WFO Ops

Chesapeake 1000 Crane Barge

1000 ton lift capacity

231 foot boom

Drafts only 8 feet!

Photo Courtesy Jerry Jackson, Baltimore Sun

NWS Baltimore/Washington Local IDSS

- Daily
  - Marine Spot Forecasts due at 0530
  - Briefing Slides due at 0600 to support UC's 0800 Daily Briefing
  - 3-Day Wind forecast due at 1200 from 1-15 May
  - 24-hour Operations Planning Forecast due at 1800
- Weekly Briefing Slides
  - Weekly planning forecasts due Saturdays
- Onsite IDSS
  - High-risk salvage operations
  - Slight risk of severe weather
  - Tropical cyclones
- As-Needed Notifications to UC Situational Section 24x7
  - FSK Lightning Watch - Potential for lightning within 1 hour
  - FSK Lightning Warning - Lightning occurring or imminent within 10 miles of FSK
- Ad-Hoc Requests

Briefing Template Introduction Slide

FSK Unified Command Meteorological Hazards

- 24-Hour Weather Watch from April 4 to May 22, 2024
- Notification to UC via phone call and dedicated Slack channel
- UC Thresholds
  - Winds >= 20 kts
    - Seas predominantly wind driven
    - During high-risk salvage ops 5 kts max error
  - Lightning (within 10 miles)
  - Abnormal tides & currents
  - Low ceilings

FSK Unified Command, Maryland Cruise Terminal, Baltimore MD

Weather Watch Critical Success

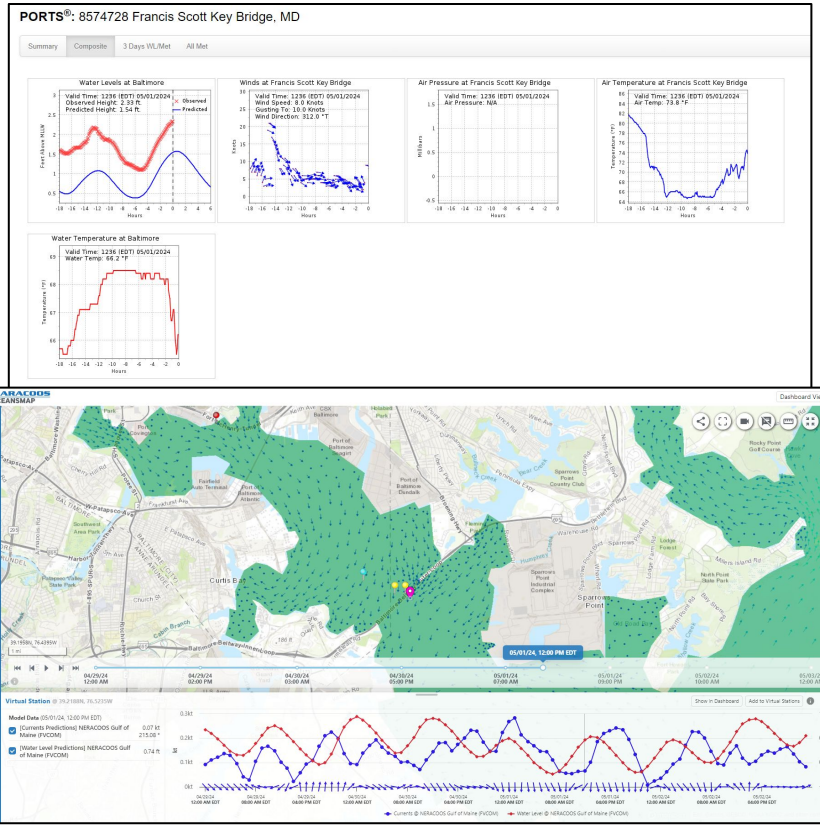
- UC planned demolition on May 12, 2024 to remove major span of FSK Bridge resting on Dali cargo ship
  - Near final steps to ultimately move the ship, reopen the channel
- Morning thunderstorms developed across Northeast MD
  - NWS Baltimore/Washington contacted UC with Lightning Watch as storms began to develop
  - UC made decision to postpone demolition to next day due to inclement weather, rough seas/tides
  - A Severe Thunderstorm moved near the bridge collapse site. No injuries or damage to equipment were reported

Explosives detonated on May 13, 2024

Courtesy of Mark Schiefelbein, Associated Press

NOAA Collaboration

- National Ocean Service (NOS)
  - Center for Operational Oceanographic Products and Services (CO-OPS)
  - Physical Oceanographic Real-Time System (PORTS)
  - Northeast Coastal Ocean Forecast System (NECOFS)
    - Modeling for tides, currents in the Patapsco River, Chesapeake Bay
    - Additional observations stations added
- CIMSS ProbSevere LightningCast
  - Lightning probability charts and LightningCast used to alert the UC
- NESDIS
  - GOES Mesoscale sectors



Challenges

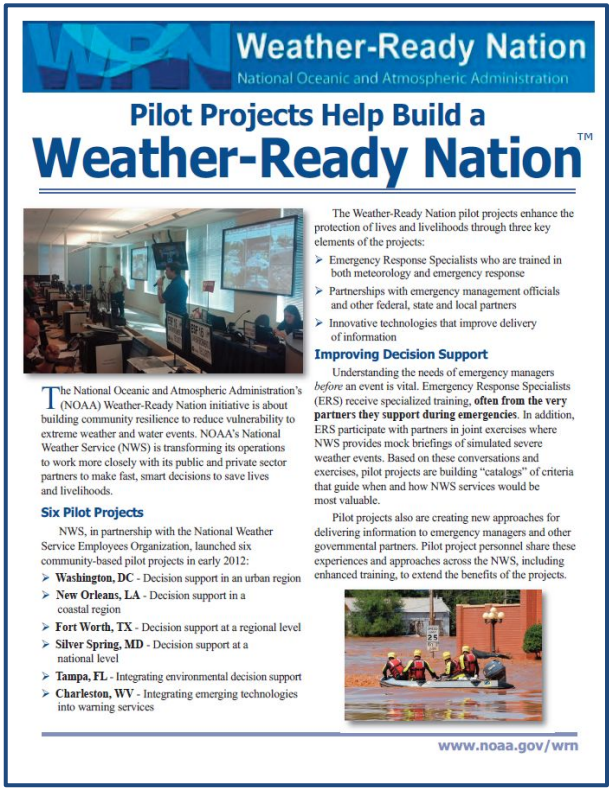
- Weather support during change of command from local, to state, to Unified Command
  - Constant communication critical
  - Who receives briefings? Need correct contact information (difficult during transitions)
- Deployed Meteorologists sent right away, however no EOC structure in place on Day 1
  - Initial support best from the WFO
- Flexibility for 24-hour Weather Watch
  - Based on weather, staff additional shift when possible
  - Additional help from MIC/WCM/SOO to fill in
  - Fortunately, we only had a few days of hazardous severe weather that required contacting the UC

NTSB personnel inspecting collapsed bridge on March 28, 2024

Courtesy of Mark Rourke, Associated Press

Successes & Lessons Learned

- Began with Weather Ready Nation Pilot Project 2012-2015
- Sustained relationship-building for over a decade with key partners
  - Maryland EM (state and local)
  - US Coast Guard
- Frequent coordination with staff from the UC's Situation Unit (SITL)
- Hiring mission-oriented staff



Weather-Ready Nation
National Oceanic and Atmospheric Administration

Pilot Projects Help Build a
Weather-Ready Nation™

The National Oceanic and Atmospheric Administration's (NOAA) Weather-Ready Nation initiative is about building community resilience to reduce vulnerability to extreme weather and water events. NOAA's National Weather Service (NWS) is transforming its operations to work more closely with its public and private sector partners to make fast, smart decisions to save lives and livelihoods.

Six Pilot Projects

NWS, in partnership with the National Weather Service Employees Organization, launched six community-based pilot projects in early 2012:

- **Washington, DC** - Decision support in an urban region
- **New Orleans, LA** - Decision support in a coastal region
- **Fort Worth, TX** - Decision support at a regional level
- **Silver Spring, MD** - Decision support at a national level
- **Tampa, FL** - Integrating environmental decision support
- **Charleston, WV** - Integrating emerging technologies into warning services

The Weather-Ready Nation pilot projects enhance the protection of lives and livelihoods through three key elements of the projects:

- Emergency Response Specialists who are trained in both meteorology and emergency response
- Partnerships with emergency management officials and other federal, state and local partners
- Innovative technologies that improve delivery of information

Improving Decision Support

Understanding the needs of emergency managers *before* an event is vital. Emergency Response Specialists (ERS) receive specialized training, **often from the very partners they support during emergencies**. In addition, ERS participate with partners in joint exercises where NWS provides mock briefings of simulated severe weather events. Based on these conversations and exercises, pilot projects are building "catalogs" of criteria that guide when and how NWS services would be most valuable.

Pilot projects also are creating new approaches for delivering information to emergency managers and other governmental partners. Pilot project personnel share these experiences and approaches across the NWS, including enhanced training, to extend the benefits of the projects.

www.noaa.gov/wrn

Summary

- FSK Bridge Collapse was a profound, far-reaching tragedy
- NWS WFO Baltimore/Washington responded commensurate to the tragedy
  - Major workload for three months
  - Hundreds of email, phone briefings
  - Deployed Meteorologists to EOC
  - 24-hour Weather Watch
- Great collaboration within NOAA
- Experienced both challenges and successes
- Honor to serve!

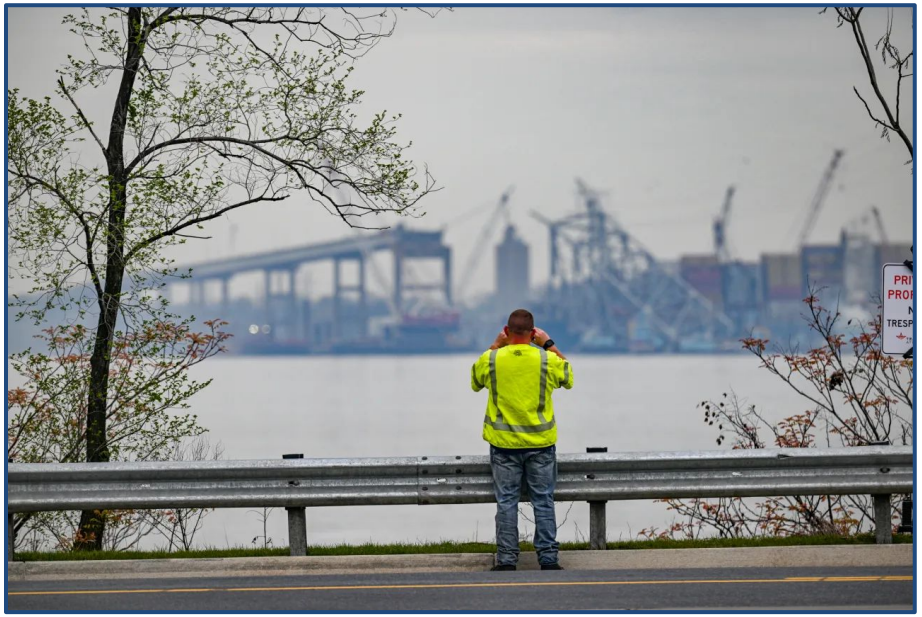
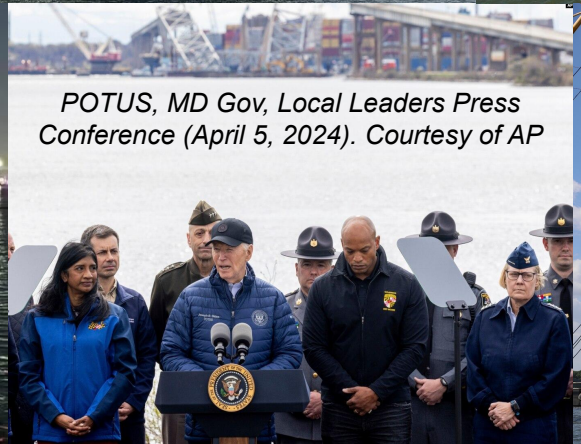


Photo Courtesy Jerry Jackson, Baltimore Sun

Courtesy of US Army Corps of Engineers (March 26, 2024)

Courtesy of US Army Corps of Engineers (April 22, 2024)
Clearing of Limited Access Channel

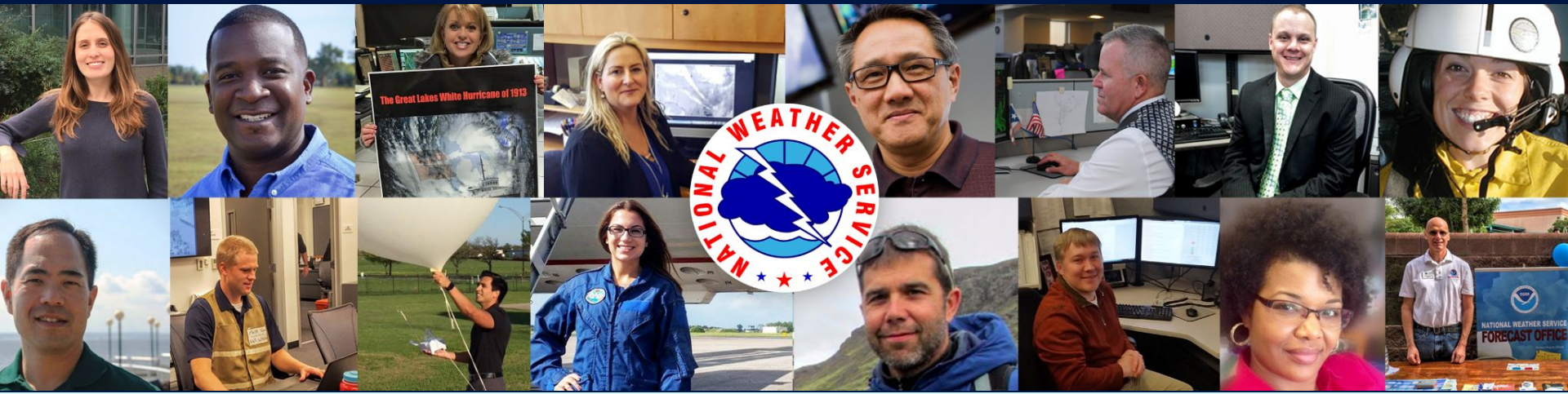
Collapsed bridge morning of March 26, 2024
Courtesy of Andrew Doyle



POTUS, MD Gov, Local Leaders Press Conference (April 5, 2024). Courtesy of AP

Courtesy of US Army Corps of Engineers (June 7, 2024)
Clearing of debris from main Baltimore Channel

Thank you!


The Great Lakes White Hurricane of 1913
NATIONAL WEATHER SERVICE
NATIONAL WEATHER SERVICE
FORECAST OFFICE