

2023 HURREVAC Training Webinar Series

Day 3 – Evacuation Timing Features

June 14, 2023



FEMA



NATIONAL HURRICANE PROGRAM



Today's Presenters



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NATIONAL HURRICANE PROGRAM

Administrative Details



Downloadable handouts

- Today's slides
- New HURREVAC Workspace Guide
- Also posted on hurrevac.com in the Learning Resources section

Live Transcription

- English / Español
- Links in the chat window

Questions

- Submit in the question box
- All attendees are muted

Registration

- Registration still open for Days 4 & 5

Feedback

- Daily survey launches after webinar

Certificate

- One for each day attended
- Emailed about **one hour** after conclusion
- Goes only to the email used for signup

Recording

- Posted to the HURREVAC YouTube channel later today
- Will remain available as a resource





THIS WEEK'S AGENDA

JUNE 12: Introduction to HURREVAC and General Overview of the Program

JUNE 13: Wind Forecast Features

JUNE 14: Evacuation Timing Features

JUNE 15: Storm Surge and Other Water Hazards

JUNE 16: Exercise Tools and Applying HURREVAC

All sessions begin at 2 PM EDT and run for approximately 90 minutes.

Registration is still open for Days 4 & 5!

OVERVIEW

**HES & HURREVAC
EVACUATION TIMING
FEATURES**



National Hurricane Program



products



FORECAST
PRODUCTS



STORM SURGE
MODELING



HURRICANE
EVACUATION
STUDIES



services



OPERATIONAL
SUPPORT



PLANNING
SUPPORT

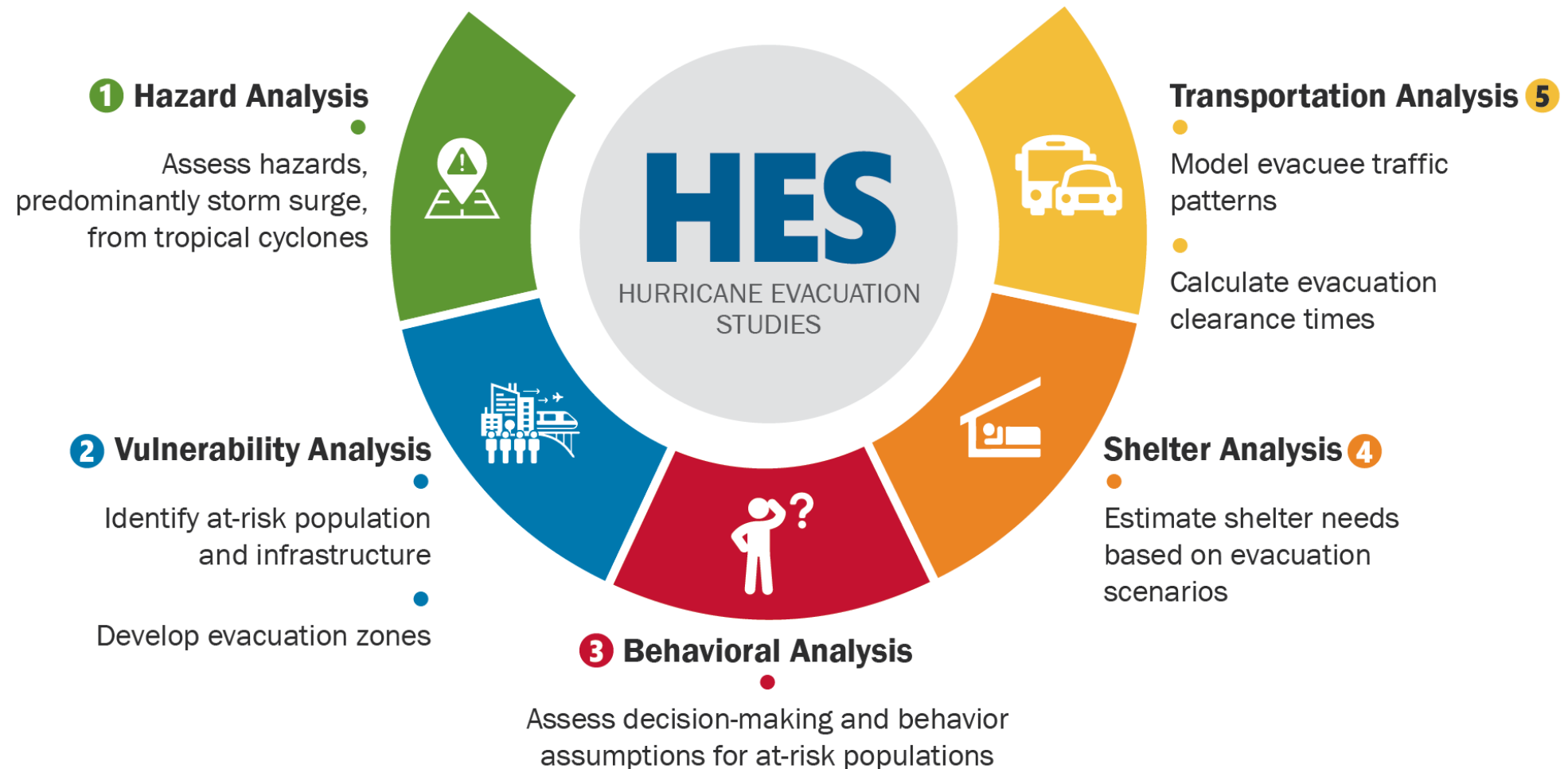


TRAINING



INFORMED
DECISIONS

Hurricane Evacuation Studies



FY23 Hurricane Evacuation Studies

ACTIVE STUDIES

NEW JERSEY

- Final Report complete
- County briefings & trainings ongoing

NEW YORK

- Study initiated
- Hazards analysis anticipated completion in September 2023

GEORGIA

- Study ongoing
- Anticipated completion in August 2023

ALABAMA/ MISSISSIPPI

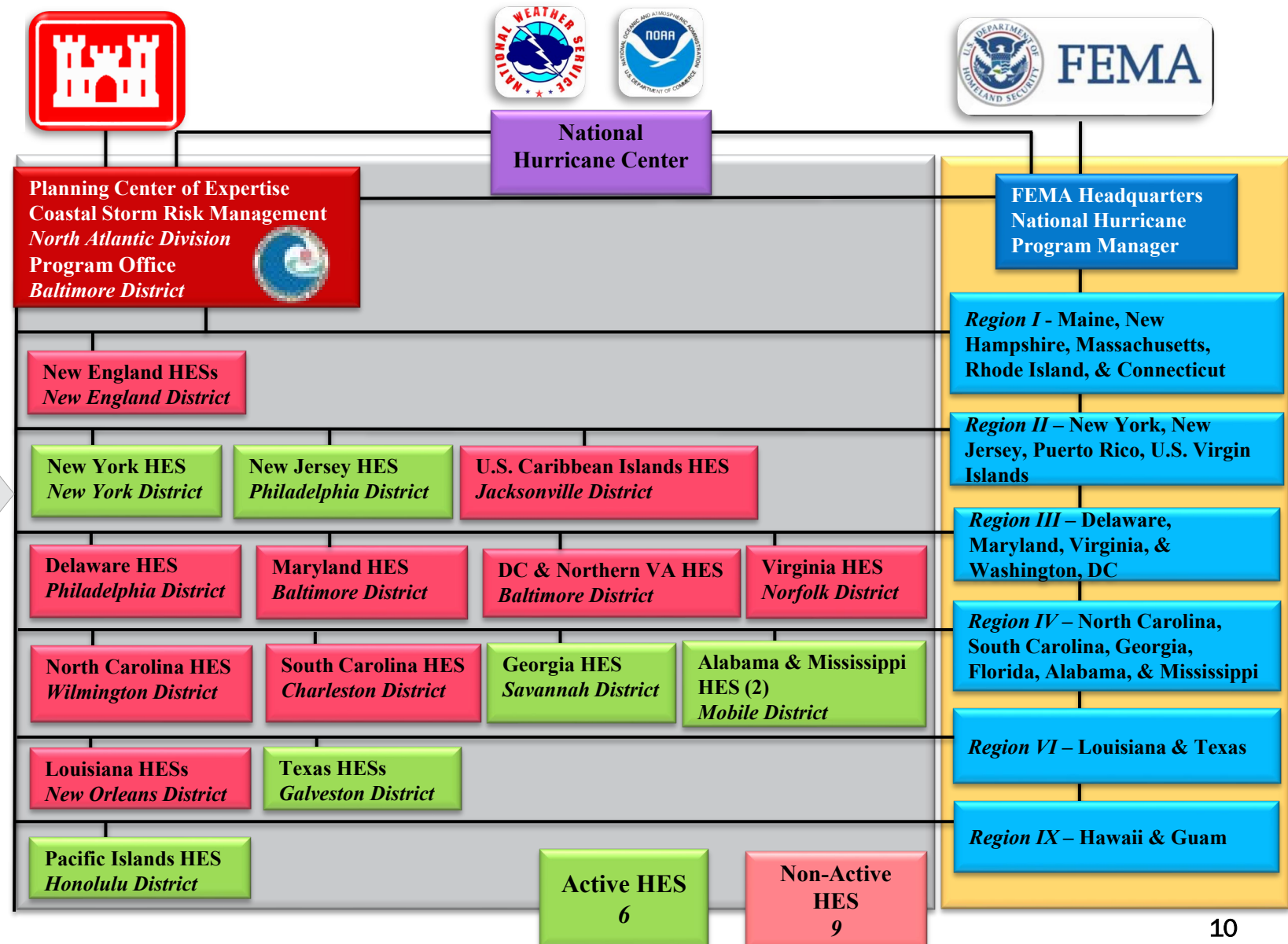
- Study ongoing
- Anticipated completion in July 2023

TEXAS (Galv./Houston/Sabine)

- Study initiated
- Hazards analysis anticipated completion in September 2023

HAWAII

- Hazard Analyses completed
- County briefings ongoing





HAZARDS ANALYSIS

Outcomes

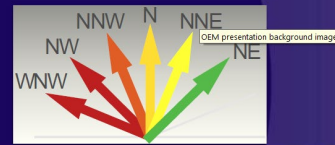


- Refined understanding of hurricane risks through:
 - Grouping and mapping MOMs and MEOWs
 - Overlaying storm surge and FEMA maps
 - Mapping Maximum Envelopes of Wind

Maximum Surge Heights by Storm Bearing

	WNW	NW	NNW	N	NNE	NE
Category 1	12.6	12.1	10.7	8.8	6.6	5
Category 2	20.9	20	20.1	16.5	11.4	8.1
Category 3	26.6	27.6	27.4	23.4	17	11.3
Category 4	32.4	33.9	33.9	30.6	21.7	14.6

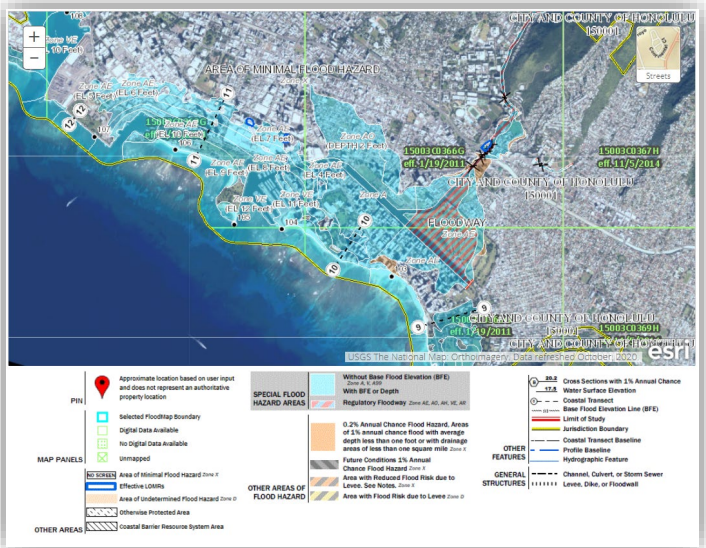
Storm bearings



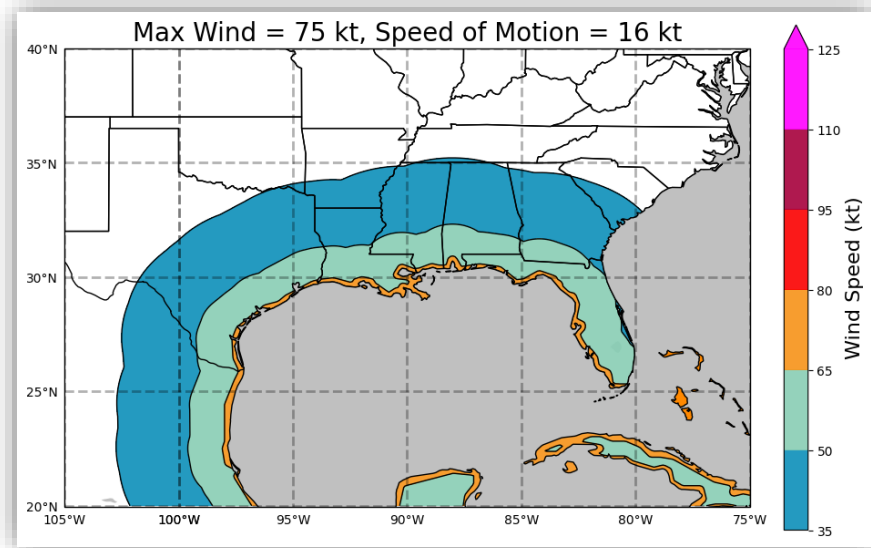
Confidential - FOUO



MOM and MEOWS Groupings



FEMA Flood Maps



Maximum Envelopes of Wind

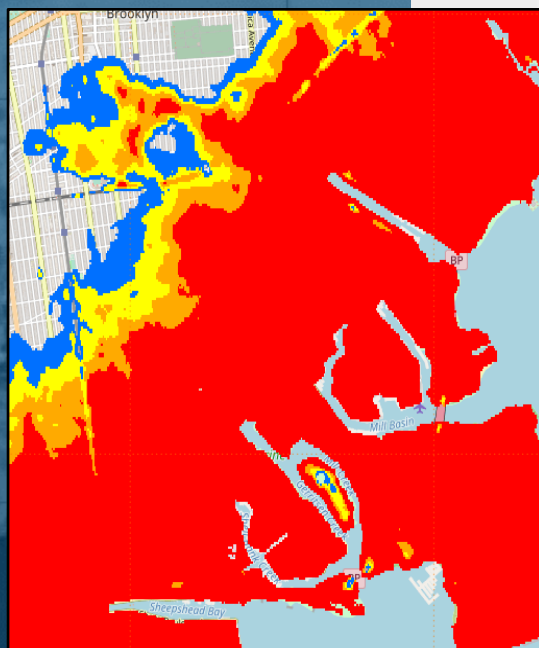


VULNERABILITY ANALYSIS

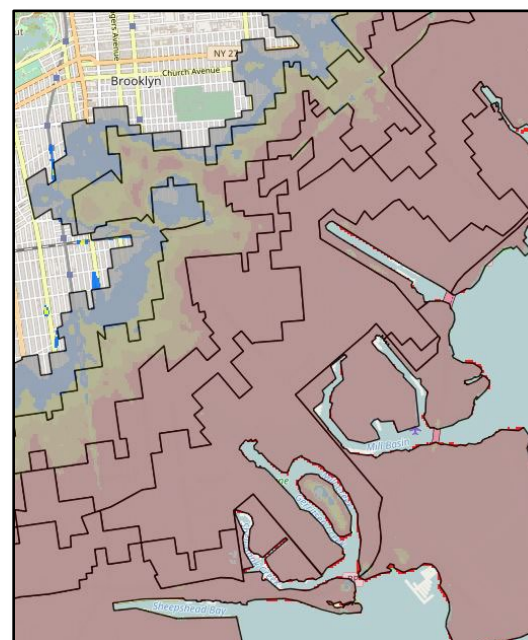
Outcomes



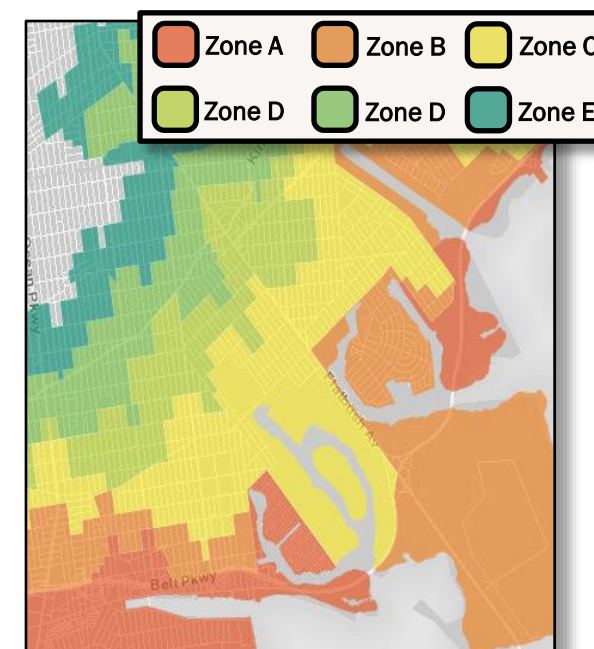
- Identify Vulnerable Population and Critical Infrastructure
- Develop (or refine) Evacuation Zones by combining hazard maps, vulnerability data, transportation network, and state & local input.



Hazard Maps



State + Local Input



Evacuation Zones

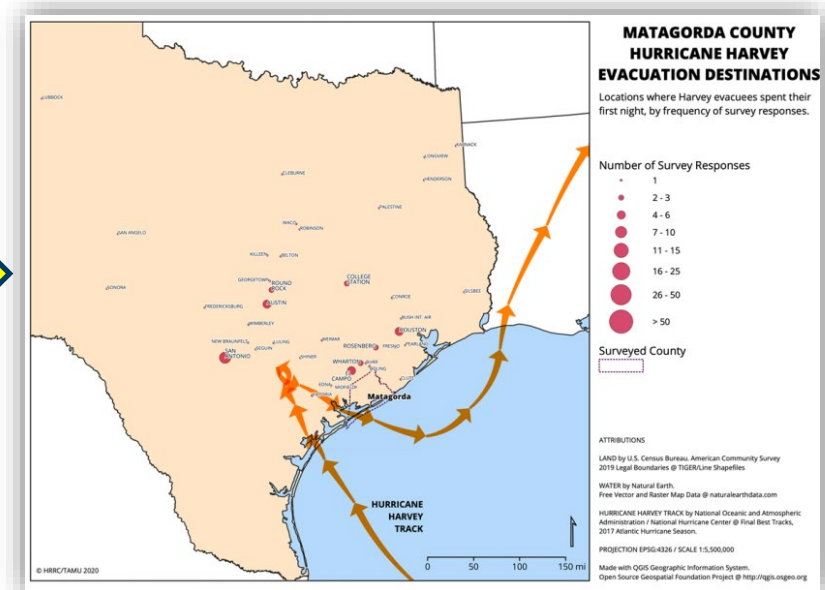
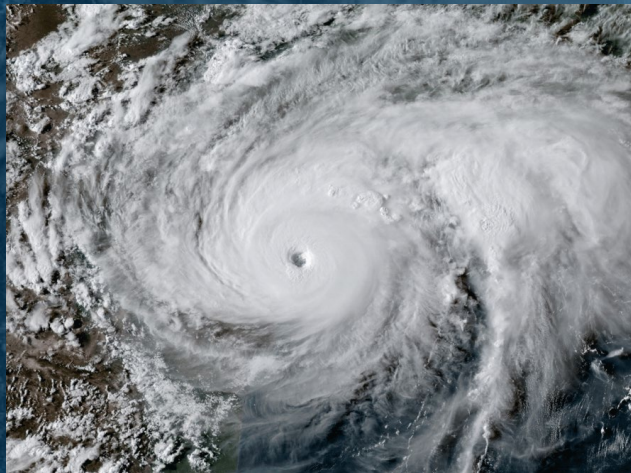


BEHAVIORAL ANALYSIS

Outcomes



- Conduct surveys to develop understanding of how populations respond to hurricane threats
 - Evacuation participation rates
 - Response time
 - Destination weights
 - Public shelter usage rates
 - Vehicle usage





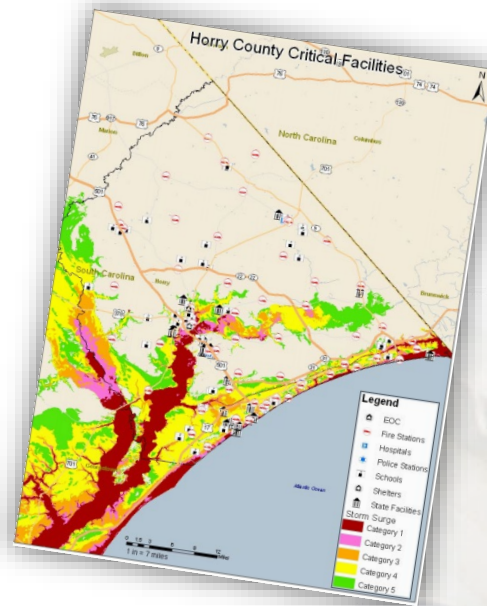
SHELTER ANALYSIS



Outcomes

Conduct a detailed geospatial analysis and use shelter rates (from the behavioral analysis) to:

- Identify shelter locations
- Identify shelter vulnerability
- Perform and a demand vs capacity analysis



Name	Address	City	State	Zip	Surge Area	Evacuation Zone	FEMA 100 Year Floodplain	Capacity
Aynor Elementary School	516 Jordanville Rd.	Aynor	SC	29511	NA	NA	N	413
Aynor High School	201 Highway 24	Aynor	SC	29511	NA	NA	N	627
Conway Elementary School	1101 Snowhill Dr.	Conway	SC	29526	4	NA	N	683
Conway High School	2301 Church St.	Conway	SC	29527	NA	NA	N	1,280
Green Sea Floyds Elementary School	5000 Tulip Grove Rd.	Green Sea	SC	29545	NA	NA	N	533
Green Sea Floyds Middle & High School	4990 Tulip Grove Rd.	Green Sea	SC	29545	NA	NA	N	1,115
Loris Elementary School	901 Highway 9 Bus. East	Loris	SC	29569	NA	NA	N	464
Loris High School	301 Loris Lions Rd.	Loris	SC	29569	NA	NA	N	1,090
Pee Dee Elementary School	6555 Hwy 134	Conway	SC	29527	NA	NA	N	533
South Conway Elementary School	3001 Fourth Ave.	Conway	SC	29526	4	NA	Y	495
Whittemore Park Middle School	1808 Rhue St.	Conway	SC	29527	NA	NA	N	845
Total								8,078

County	Shelter	Scenario A				Scenario B				Scenario C			
		Low Occ	Med Occ	High Occ	Extreme Occ	Low Occ	Med Occ	High Occ	Extreme Occ	Low Occ	Med Occ	High Occ	Extreme Occ
Horry	Shelter Demand	9,590	9,914	10,568	10,894	13,972	14,335	15,068	15,434	24,276	24,645	25,395	25,769
	Shelter Capacity	8,078	8,078	8,078	8,078	8,078	8,078	8,078	8,078	6,900	6,900	6,900	6,900
	Deficit / Surplus	-1,512	-1,836	-2,490	-2,816	-5,894	-6,257	-6,990	-7,356	-17,376	-17,745	-18,495	-18,869
Georgetown	Shelter Demand	2,722	2,762	2,845	2,885	3,996	4,039	4,131	4,177	4,387	4,432	4,523	4,570
	Shelter Capacity	2,560	2,560	2,560	2,560	2,560	2,560	2,560	2,560	2,560	2,560	2,560	2,560
	Deficit / Surplus	-162	-202	-285	-325	-1,436	-1,479	-1,571	-1,617	-1,827	-1,872	-1,963	-2,010

Note: Shelter capacity estimates are intended to provide a general overview of potential space surpluses or deficits when projected demand is reviewed in light of available identified spaces. Capacity figures are subject to change. Any specific shelter data or list is subject to change and may not reflect actual shelters employed.



TRANSPORTATION ANALYSIS

Outcomes



- Develop Evacuation Scenarios through close coordination with local & state emergency managers
- Transportation modeling to get Clearance Times using the Real Time Evacuation Planning Model (RtePM)
- HURREVAC Integration

Scenario	Subregion					Dir		Cat			Zones				Part Rate			LR		NC		Likely		REGIONAL CLEARANCE TIME
	SS	P	MP	NN	ES	NW	NE	1/2	3	4	A	B	C	D	L	M	H	W	WO	W	WO	ML	CAT	
ES-1																								28
ES-2																								28
ES-3																								45
ES-4																								38
ES-5																								58
ES-6																								50
ES-7																								34
ES-8																								45
ES-9																								38
ES-10																								58
ES-11																								58
ES-12																								50
ES-13																								67
ES-14																								67
ES-15																								58



Evacuation Scenarios

Timeline Actions

Timing Arcs

State: Virginia County: Virginia Beach Use Base Location

HURREVAC makes recommendations for evacuation start times based on how long it takes to evacuate a vulnerable population ahead of the arrival of tropical-storm-force winds (34kt/39mph). To utilize this capability of the program, you must first select one or more evacuation scenarios from a region's Hurricane Evacuation Study. Refer to the Study's technical data report, or ask your state's Hurricane Program Manager for guidance on making selections appropriate to a particular storm situation.

[Virginia HES 2020](#)

Total Evacuation hours: Range of 15 hours - 96 hours

Internal Regions Evacuating:

External Regions Evacuating:

Evacuation Zone:

Storm Direction:

Evacuation Participation Rate:

Roadway Modification:

Add Scenario

Saved Scenarios

Delete Selection

<input type="checkbox"/> Location	Scenario	Hours
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HES Modernization Program

FY22 - FY24



- **Improve usability of HES outputs**
 - Based on stakeholder inputs, improve deliverables to make them more useful for planning and operational response
 - Update methodologies and data used to complete the 5 components
- **Increase efficiency**
 - Reduce time and cost to complete the studies
- **Increase frequency of updates**
 - Develop a strategy for updates & maintenance based on established criteria (i.e. new data/technologies)
- **Develop HES strategic direction and communications**

Evacuation Timing Features in HURREVAC

EVACUATION
ROUTE



National Hurricane Program



products



FORECAST
PRODUCTS



STORM SURGE
MODELING



HURRICANE
EVACUATION
STUDIES



services



OPERATIONAL
SUPPORT



PLANNING
SUPPORT



TRAINING



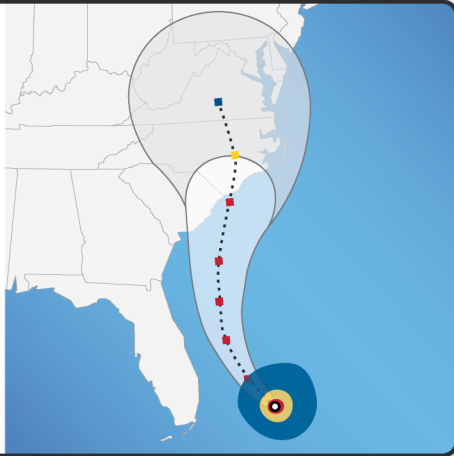
INFORMED
DECISIONS

Calculating Evacuation Start Time



HAZARDS

Storm Forecast



**Arrival Time of
Tropical-Storm-Force Winds**



PLANNING SCENARIOS

HES Data
(Hurricane Evacuation Study)
Pre-Determined
Evacuation Zones
and Scenarios



**Clearance Time
Scenario**



EVACUATION

**Evacuation
Start Time**



-

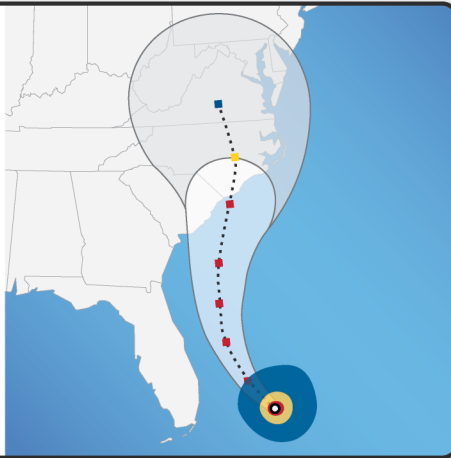
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Calculating Evacuation Start Time



HAZARDS

Storm Forecast



Arrival Time of
Tropical-Storm-Force Winds

8pm Saturday

PLANNING SCENARIOS

HES Data
(Hurricane Evacuation Study)
Pre-Determined
Evacuation Zones
and Scenarios



CATEGORY 3

Clearance Time
Scenario



36 Hours

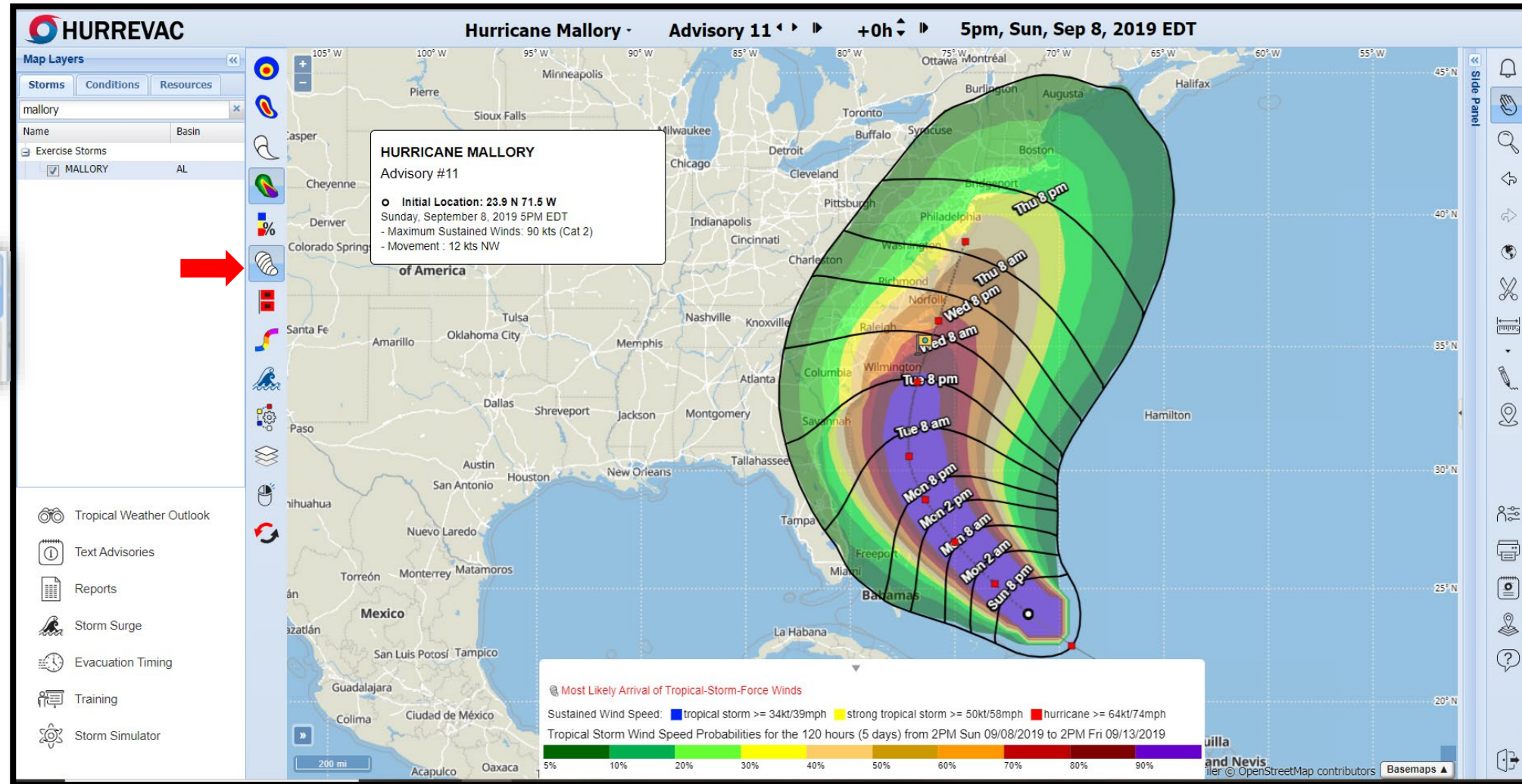
EVACUATION

Evacuation
Start Time



8am Friday

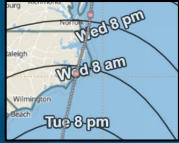
Tropical Storm Force Winds Time of Arrival Graphic



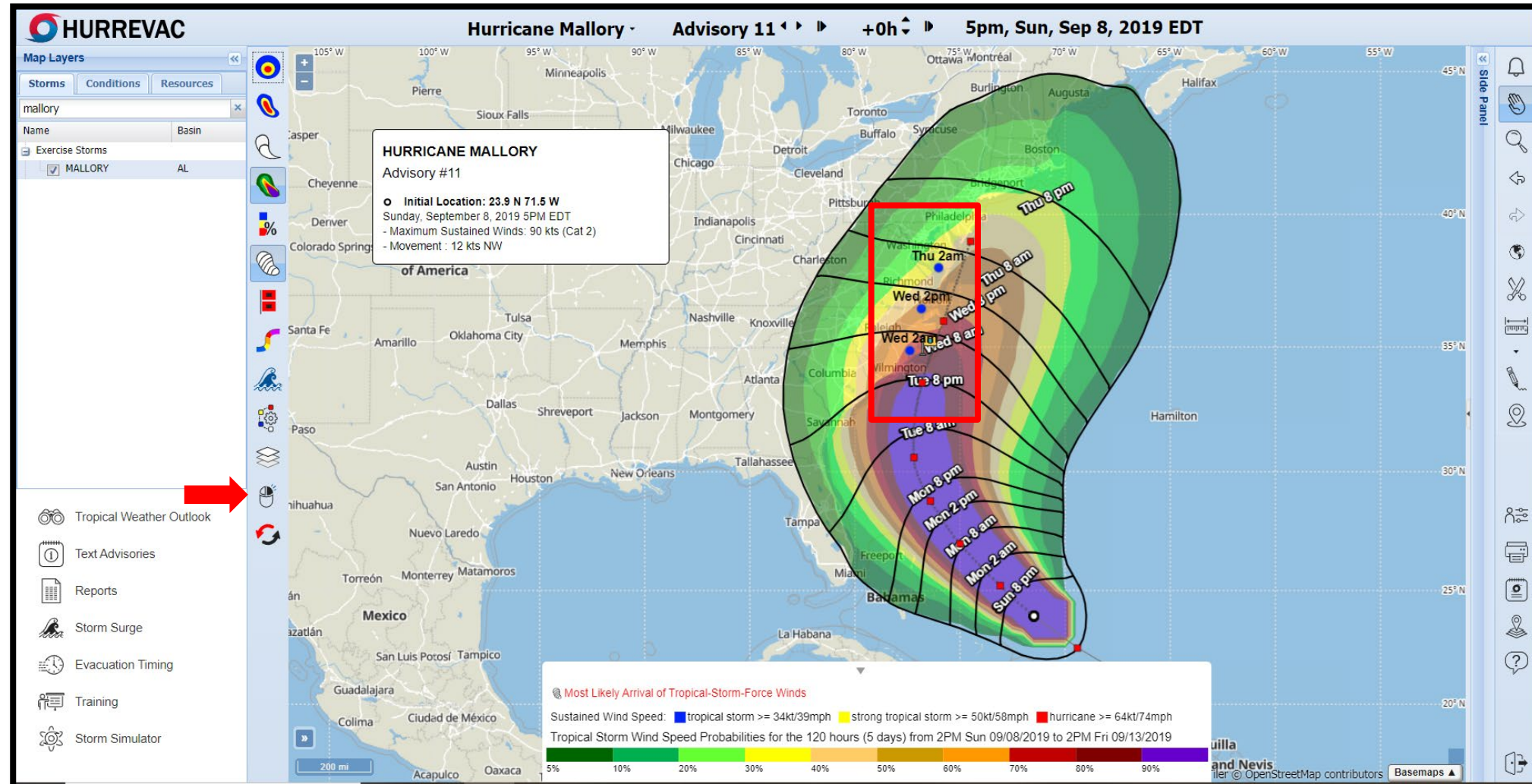
ARRIVAL OF HAZARDS (WINDS)

Tropical Storm Force Winds

Time of Arrival Graphic

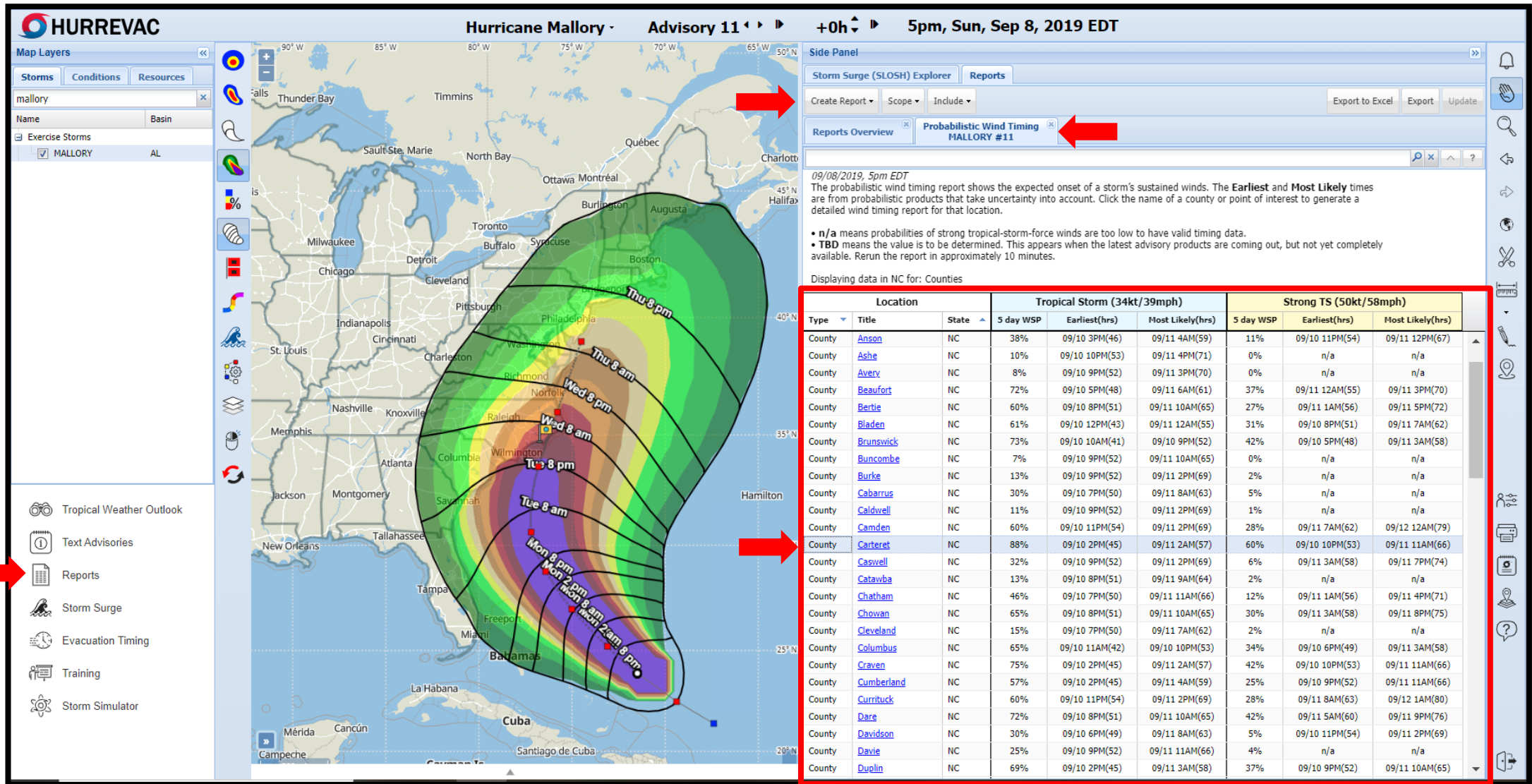
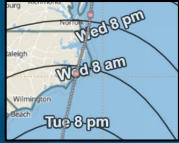


Users can place
single location
wind timing flags!



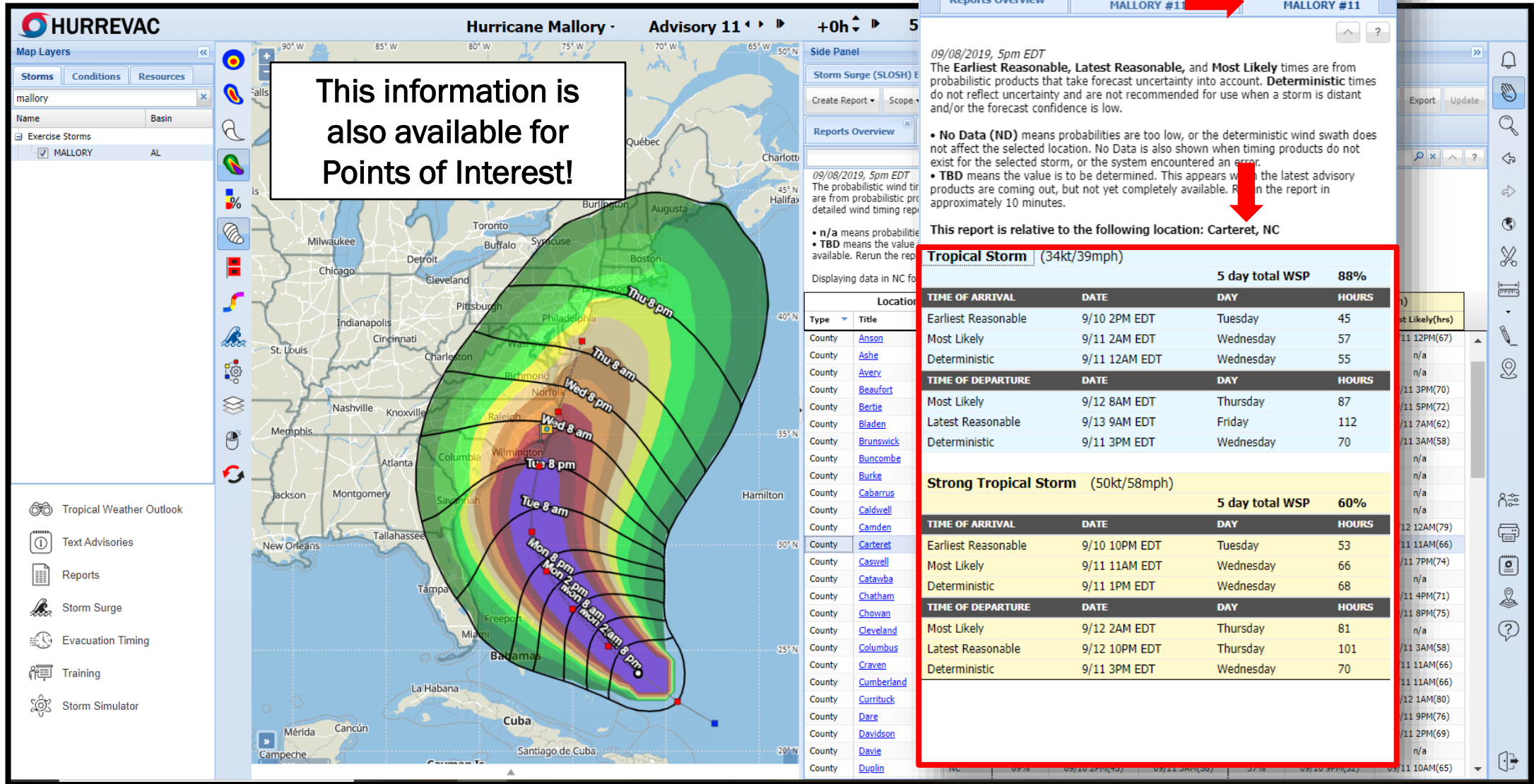
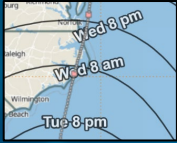
ARRIVAL OF WINDS

Reports- Multiple Locations



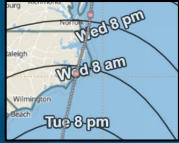
ARRIVAL OF WINDS

Reports- Counties



ARRIVAL OF WINDS

Reports- Single Location



Right Click

Set Base Location

Create Point of Interest

Show Range Marks

Storm Info Box Here

Show Surge Viewer

Place Surge Flags

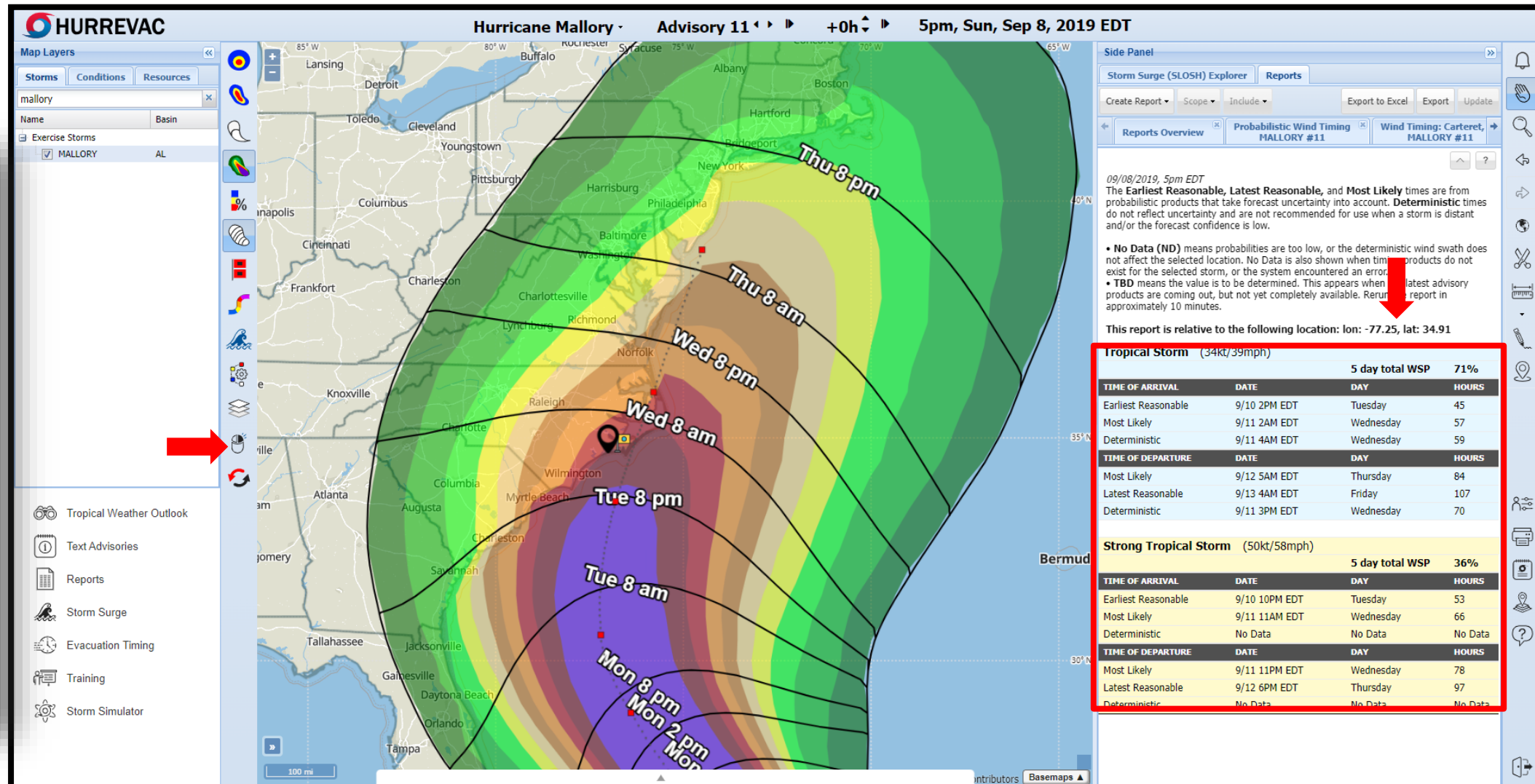
Remove Surge Flags

Create Wind Timing Report

Create Wind Prob Report

Place Wind Timing Flags

Remove Wind Timing Flags





CLEARANCE TIMES

Evacuation Scenarios

HURREVAC

Map Layers

Storms Conditions Resources

mallory

Name Basin

Exercise Storms

MALLORY AL

Tropical Weather Outlook

Text Advisories

Reports

Storm Surge

Evacuation Timing

Training

Storm Simulator

Hurricane Mallory - Advisory 11 +0h 5pm, Sun, Sep 8, 2019 EDT

Evacuation Timing

Evacuation Scenarios Timeline Actions Timing Arcs

State: North Carolina County: Carteret Use Base Location

HURREVAC makes recommendations for evacuation start times based on how long it takes to evacuate a vulnerable population ahead of the arrival of tropical-storm-force winds (34kt/39mph). To utilize this capability of the program, you must first select one or more evacuation scenarios from a region's Hurricane Evacuation Study. Refer to the Study's technical data report, or ask your state's Hurricane Program Manager for guidance on making selections appropriate to a particular storm situation.

Technical Data Report

Total Evacuation hours: Range of 10 hours - 43 hours

Scenario: Scenario C

Response: Moderate (7 hour) response

Seasonal Population: Medium number of evacuees from seasonal population

Scope of Reported Time:

Time to evacuate the county

Time to evacuate danger zone within county

Add Scenario

Saved Scenarios

Location	Scenario	Hours
Carteret, NC	Scenario A/Immediate response/Medium number of eva...	15
Carteret, NC	Scenario B/Moderate (7 hour) response/High number of ...	36



TIMELINE ACTIONS

Adding Other Timeline Actions

HURREVAC

Map Layers

Storms Conditions Resources

mallory

Name Basin

Exercise Storms

☒ MALLORY AL

Evacuation Timing

Evacuation Start Timeline Actions Timing Arcs

State: North Carolina County: Carteret Use Base Location

In addition to the evacuation start timing, HURREVAC can also keep track of other actions to be taken relative to the timing of various storm events. Individual timeline items are manually input by specifying a (county) location and then entering the action(s) to be taken either before or after the storm event. Check with your agency for hurricane preparedness plans or guidelines on timeline items to enter below.

Timeline Item Abbreviation: Action 2

Timeline Item Description: Prepare Roadways

Time offset

Hours: 38

☒ Before Trigger Point ☐ After Trigger Point

Storm Trigger Point

☒ Arrival of Tropical-Storm-Force Winds (34kt / 39mph)

☐ Arrival of Strong Tropical-Storm-Force Winds (50kt / 58mph)

☐ Closest Approach of Eye

Add Timeline Item

Saved Timelines Delete Selection

Location	Timeline Item	Offset	Storm Trigger Point
<input type="checkbox"/> Carteret, NC	Action 1: Send out communications	40 hours before	Arrival of TS Winds

Hurricane Mallory - Advisory 11 +0h 5pm, Sun, Sep 8, 2019 EDT

Tropical Weather Outlook

Text Advisories

Reports

Storm Surge

Evacuation Timing

Training

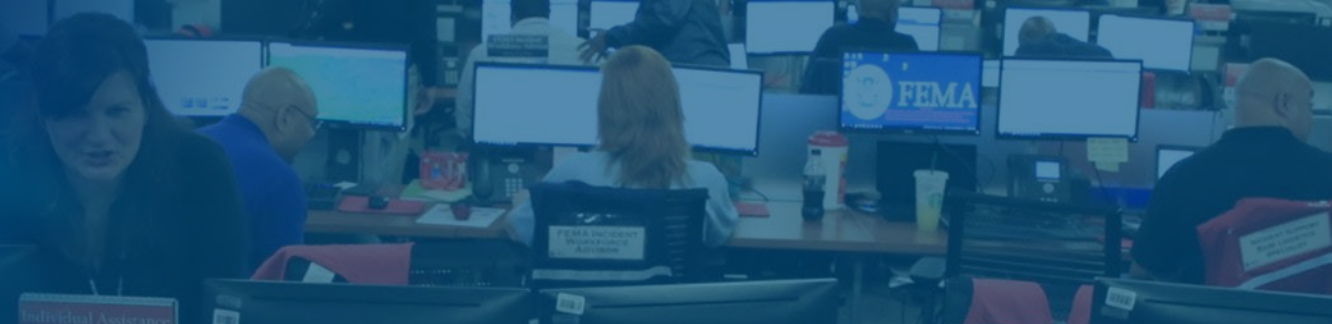
Storm Simulator

Side Panel



EVACUATION TIMES

Adding Timing Arcs



Map Layers

Storms

Conditions

Resources

mallory

Exercise Storms

☒ MALLORY

AL

Tropical Weather Outlook

Text Advisories

Reports

Storm Surge

Evacuation Timing

Training

Storm Simulator

Hurricane Mallory

Advisory 11

+0h

5pm, Sun, Sep 8, 2019 EDT

Evacuation Timing

Evacuation Scenarios

Timeline Actions

Timing Arcs

Timing arcs are graphical depictions of when protective actions should be taken in advance of an approaching storm. The size (radius) of each arc is determined by multiplying the number of hours needed for that action by the average forward speed of the storm in the hours before the hazards arrive at the location you have chosen.

Speed Override

Override Forward Speed: ☐

Speed(Knots) in whole units

Evacuation Scenarios and Timeline items to Display as Arcs

Save Arc Selections

Location	Scenario	Hours	Show Arc
Carteret, NC	Scenario A/Immediate response/Medium number of evacuees from se:	15	<input checked="" type="checkbox"/>
Carteret, NC	Scenario B/Moderate (7 hour) response/High number of evacuees from	36	<input checked="" type="checkbox"/>
Carteret, NC	Send out communications	40	<input checked="" type="checkbox"/>

Map

Billings

Minneapolis

Chicago

Indianapolis

Nashville

Atlanta

Montgomery

Tallahassee

Tampa

Cancún

North Bay

Ottawa

Montréal

Burlington

Augusta

Halifax

Philadelphia

Washington

Richmond

Norfolk

Raleigh

Wilmington

Columbia

Savannah

Freeport

Miami

La Habana

Cuba

Santiago de Cuba

Haiti

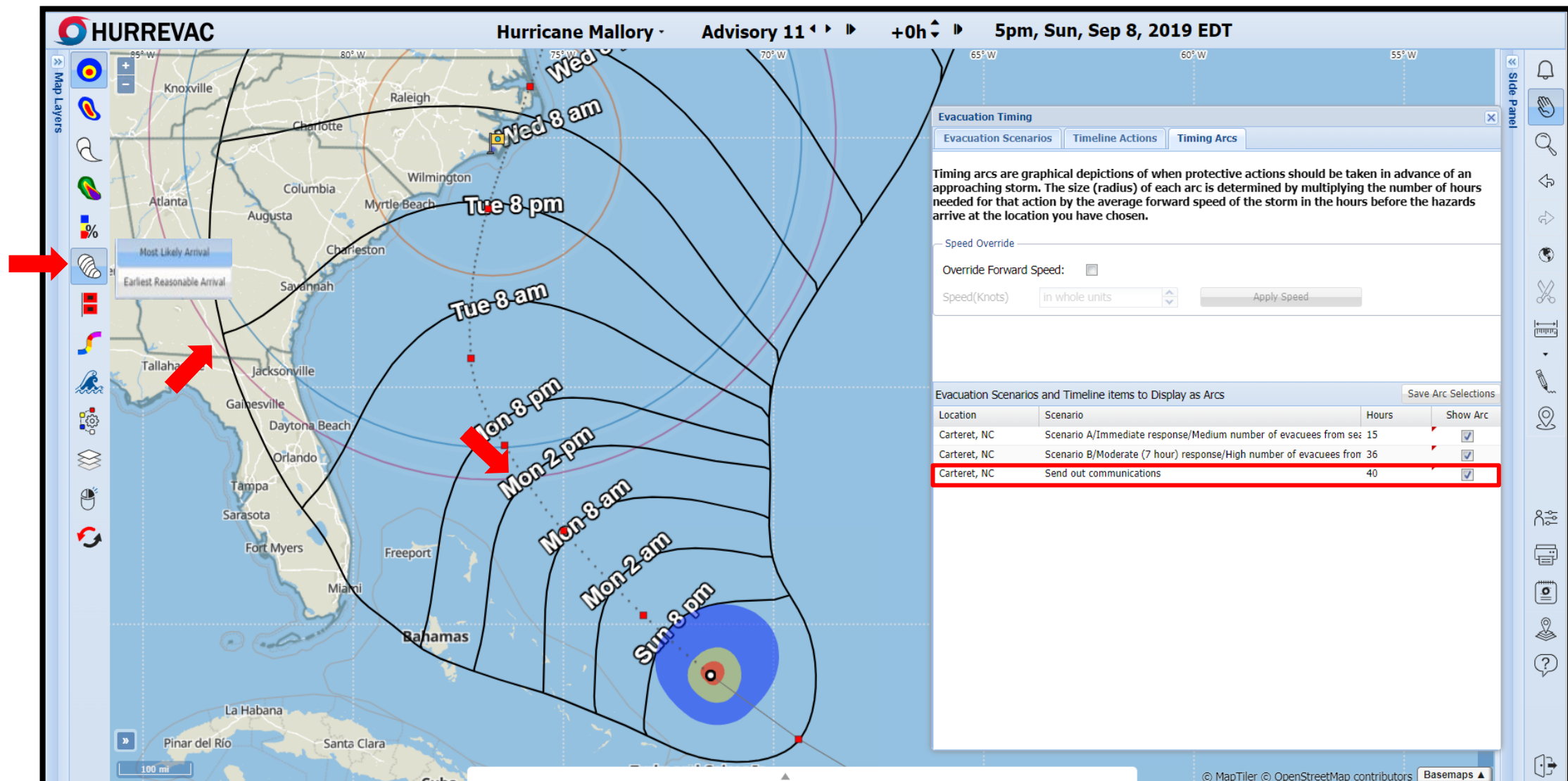
Puerto Rico

Side Panel



EVACUATION TIMES

Using Timing Arcs





EVACUATION TIMES

Evacuation Timing Report

Map Layers

Storms

Conditions

Resources

mallory

Name

Basin

Exercise Storms

☒ MALLORY

AL

Tropical Weather Outlook

Text Advisories

Reports

Storm Surge

Evacuation Timing

Training

Storm Simulator

Hurricane Mallory

Advisory 11

+0h

5pm, Sun, Sep 8, 2019 EDT

Side Panel

Storm Surge (SLOSH) Explorer

Reports

Create Report

Scope

Include

Export to Excel

Export

Update

Reports

Evacuation Timing MALLORY #11

09/08/2019, 5pm EDT

This report shows the **Earliest** and **Latest** times for starting an evacuation or executing timeline actions based on locations and settings selected by the user. These times are calculated by subtracting the evacuation scenario clearance time from the **Earliest Reasonable** and **Most Likely** onset times of tropical-storm-force winds.

Timeline actions based on the arrival of 39 mph (34 kt) winds are also included in the report. Those user-selected time offsets are subtracted from each of the forecast wind arrival times.

This report provides guidance on the timing of protective actions, but *does not* evaluate the overall necessity of an evacuation decision or which scenario should be used. Clearance times – and the resulting start times – depend on the parameters chosen for the evacuation scenario(s). Hurricane Evacuation Studies (HES) contain additional information. Links to HES materials can be found in the **Evacuation Scenarios** window or the **Library** folder of the **Resources** tab.

- **N/A** means there is no valid timing data for the location because the wind probabilities are too low.
- **TBD** means the value is to be determined. This appears when the latest advisory products are coming out, but not yet completely available. Rerun the report in approximately 10 minutes.

The report uses your saved **Evacuation Scenarios** and any **Timeline actions** based on the arrival of 39 mph (34kt) winds.

State	County	Scenario	Earliest-Reasonable TS Onset Time	Most-Likely TS Onset Time	Evac Clearance Time	Earliest Evac Start Time	Latest Evac Start Time	TS Probability (%)
NC	Carteret	A/Imm/Med SP/...	Tue 01 PM	Wed 03 AM	15 hrs	Mon 10 PM	Tue 12 PM	88
NC	Carteret	B/Mod/High SP/...	Tue 01 PM	Wed 03 AM	36 hrs	Mon 01 AM	Mon 03 PM	88
NC	Carteret	Action 1	Tue 01 PM	Wed 03 AM	40 hrs	Sun 09 PM	Mon 11 AM	88

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HURREVAC Demo

EVACUATION
ROUTE



Thank you!

HURREVAC Support Team
support@hurrevac.com



FEMA



NATIONAL HURRICANE PROGRAM



HURREVAC

HURRICANE DECISION SUPPORT TOOL