

Hurricane Evacuation Study, Hurricane Evacuation Zones and Evacuation Time Estimates



HURRICANE
EVACUATION
ROUTE

CD-1F

Paul A. Morey
FEMA Region I
Hurricane Program Manager

Christine Packard
Massachusetts Emergency Management Agency
Deputy Director

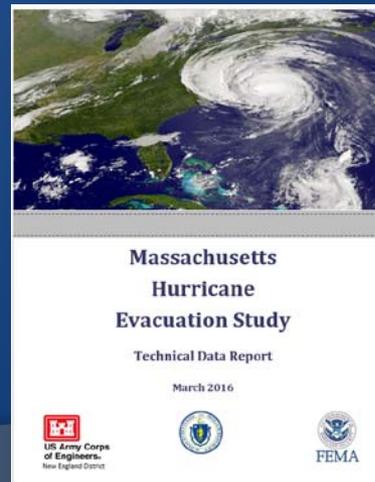
Presentation Agenda

- Review Hurricane Evacuation Study Process
 - Technical basis for development of tools
- Review Tools and How They Are Used by Local and State Emergency Management Officials
 - Inundation Maps
 - Hurricane Evacuation Zones
 - Evacuation Clearance Times

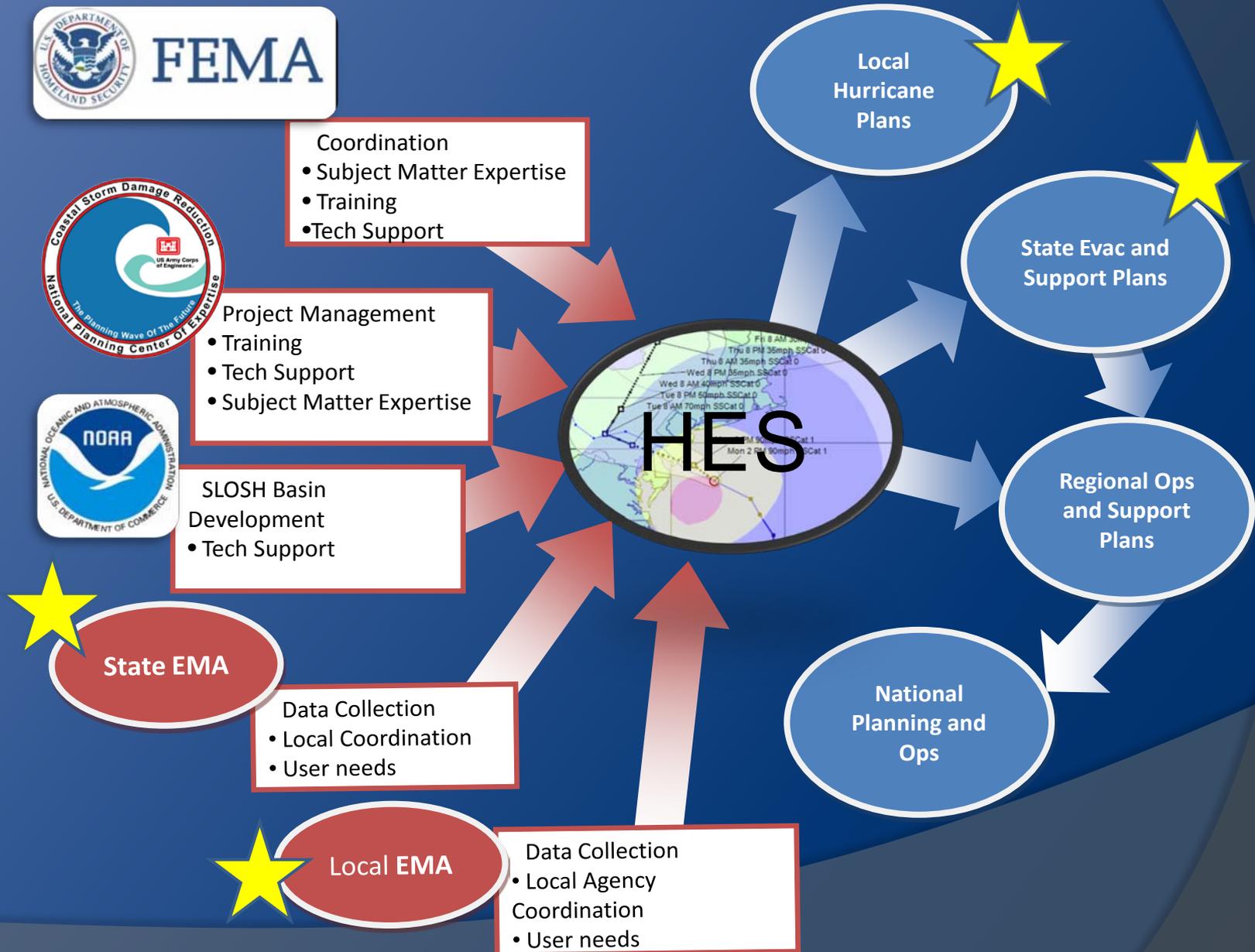
Hurricane Evacuation Study Funding

FEMA is the primary funding agency through the National Hurricane Program

- Additional partners that provide funding and in-kind services:
 - Army Corps of Engineers
 - State Emergency Management Agencies
 - City Emergency Management Agencies
 - National Hurricane Center – In kind services



Partnerships - Roles and Responsibilities



Hurricane Evacuation Study Components

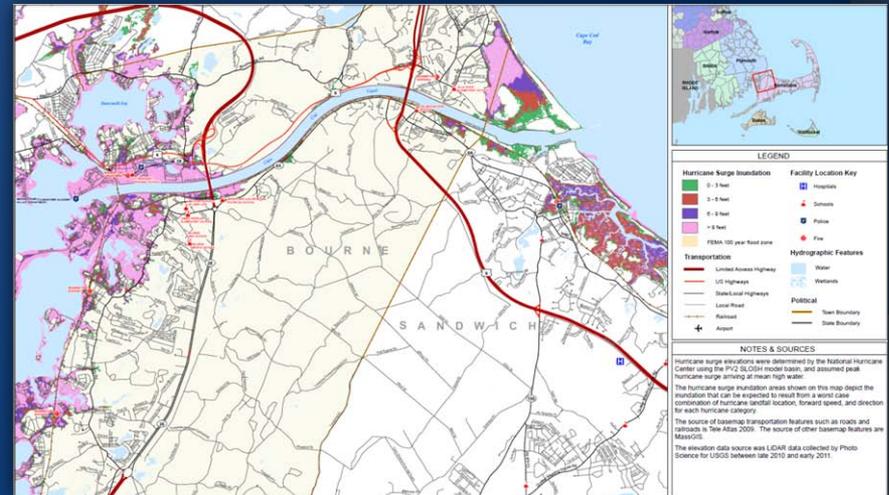
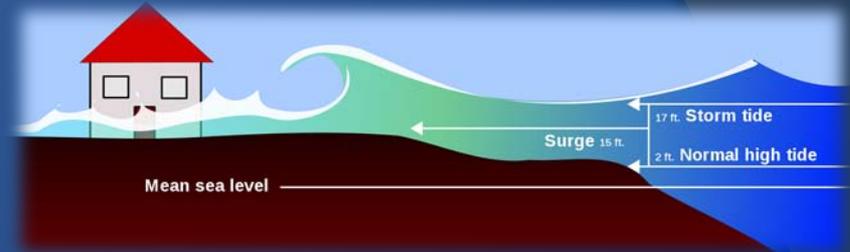
Informs hurricane plans with data from five analyses:

- Hazard Analysis (inundation maps)
- Vulnerability (at-risk populations and facilities)
- Behavior
- Shelter Capacity
- Transportation (Evacuation Clearance Times)

Hazards Analysis – Why we evacuate

Understanding Storm Surge Potential

- Storm surge has the highest potential for death and damage
- Storm surge is the main reason we evacuate the coast
- Worst Case Scenario Surge Maps used to assess a community's risk



Vulnerability Analysis

Who may need to evacuate and What is at risk

- Citizens residing in surge prone areas
- Critical facilities
- Mobile/Manufactured home communities
- Vulnerable shelters
- Colleges/Universities



3.0 Vulnerability Analysis

Table 3-13: Critical Facilities – Community Health Centers

Town	Zone ¹	Facility	Address	Zip
Barnstable County				
Barnstable	Inland	O'Neill/Duffy Health Center Noah Shelter	77 Winter St	02601
	Inland	Duffy Health Center	105 Park St	02601
	Inland	Mid-Upper Cape Community Health Center	30 Elm Ave	02601
Falmouth	A	Cape Cod Free Clinic & Community Health Center	65C Town Hall Sq	02540
Harwich	Inland	Ellen Jones Community Dental Center	351 Pleasant Lake Ave	02645
Mashpee	Inland	Cape Cod Free Clinic & Community Health Center	40 Steeple St	02649
Orleans	A	Outer Cape Health Services, Inc.	260 Cranberry Hwy	02653
	Inland	WIC Nutrition Program	159 Route 6A	02653
Provincetown	B	Provincetown Health Center	49 Harry Kemp Way	02657
Wellfleet	Inland	Wellfleet Health Center	3130 State Hwy	02667
Bristol County				
Fall River	Inland	HealthFirst Family Care Center, Inc.	102 County St	02723
	Inland	SSTAR Family Healthcare Center	386 Stanley St	02720
	Inland	St. Vincent's School	2425 Highland Ave	02720
New Bedford	Inland	Greater New Bedford Community Health Center, Inc.	874 Purchase St	02740

Hurricane Behavioral Analysis

- Attitudes about risk from hurricane hazards – Primarily storm surge
- Evacuation intentions and past experiences
- Evacuation destinations
- Evacuation routes
- Sources of forecast information



Table 4-2: Perceived Vulnerability of Home – Believe Home would Flood Dangerously

Category 2			Category 3			Category 4		
A / 1-2	B / 3-4	Non-Surge	A / 1-2	B / 3-4	Non-Surge	A / 1-2	B / 3-4	Non-Surge
28%	18%	15%	46%	33%	25%	67%	54%	37%

Shelter Analysis

Understanding Shelter Need

Key Sheltering Information:

- Location/Identification
- **Potential Shelter Demand**
- **Flood Risk**
- Capacity
- ARC vs. Local Shelter
- **Pet Friendly**



Transportation Analysis

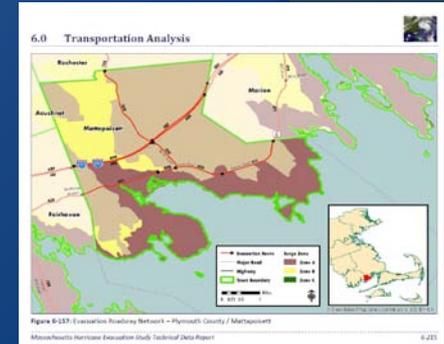
Understand traffic congestion potential based upon evacuation decisions

- Traffic Patterns (bottle necks)
- Evacuating Vehicles

Clearance Times are based on:

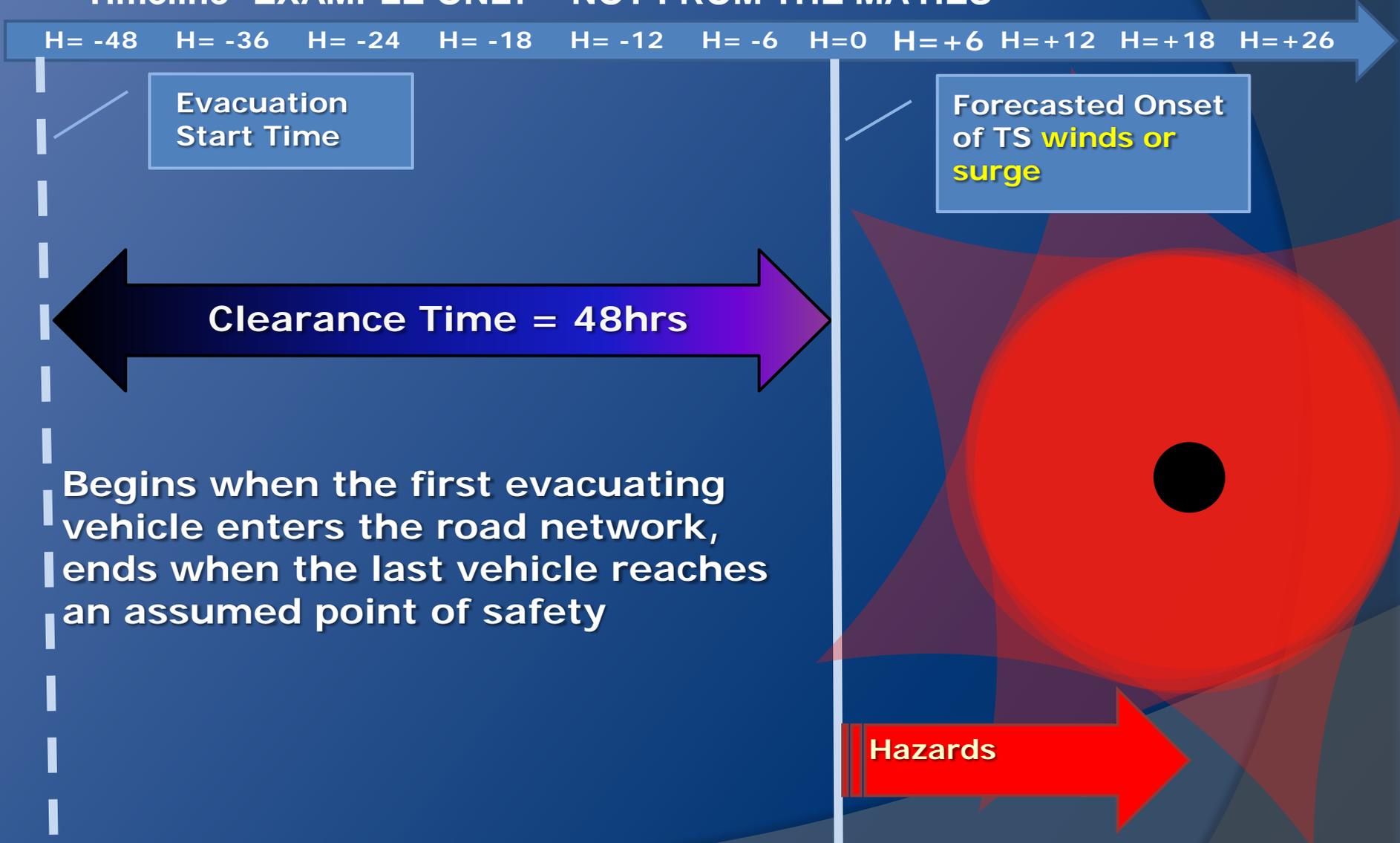
Variables of:

- Response – Slow, medium, rapid
- Population – High or low tourist occupancy
- Evacuation Scenarios (one way, multi state)
- Storm Category – Cat 1-4



Evacuation Clearance Times

Timeline *EXAMPLE ONLY – NOT FROM THE MA HES



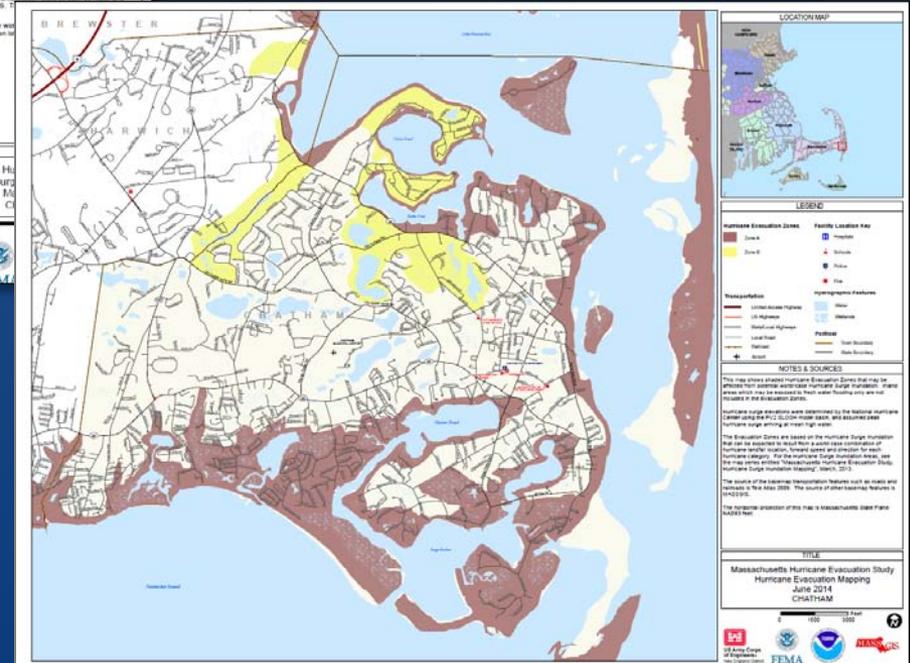
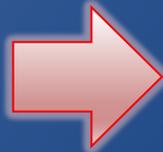
Begins when the first evacuating vehicle enters the road network, ends when the last vehicle reaches an assumed point of safety

Hazards

Resulting Tools – Hurricane Inundation Maps

- Hurricane Inundation Maps
 - Generally based on category of storm
 - Depicts the reach of storm surge, not the depth
 - Used for planning purposes
- Not Flood Insurance Rate Maps
- Located at <http://www.mass.gov/eopss/agencies/mema/emergencies/hurricanes/hurricane-inundation-maps.html>

Resulting Tools – Hurricane Evacuation Zones



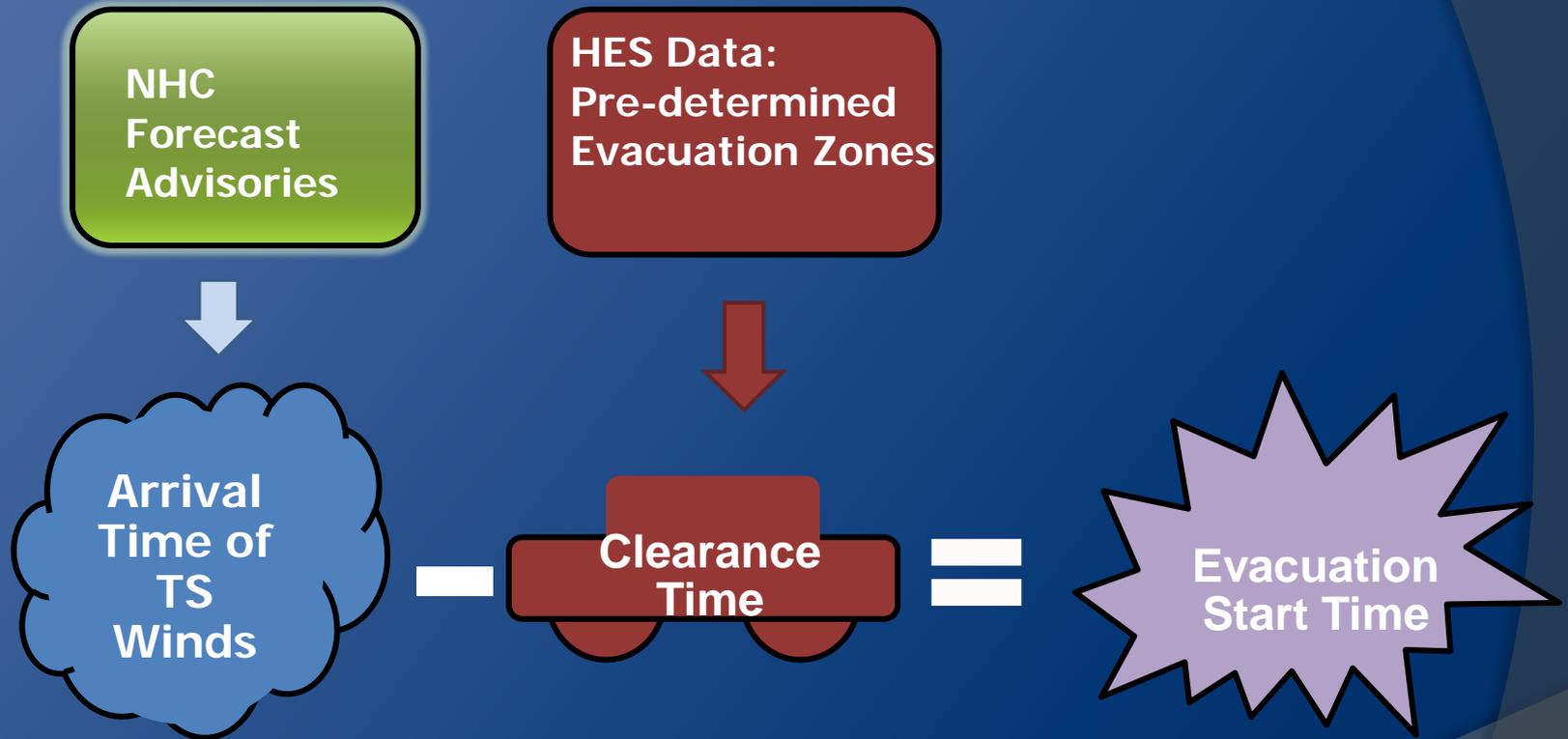
Resulting Tools – Hurricane Evacuation Zones

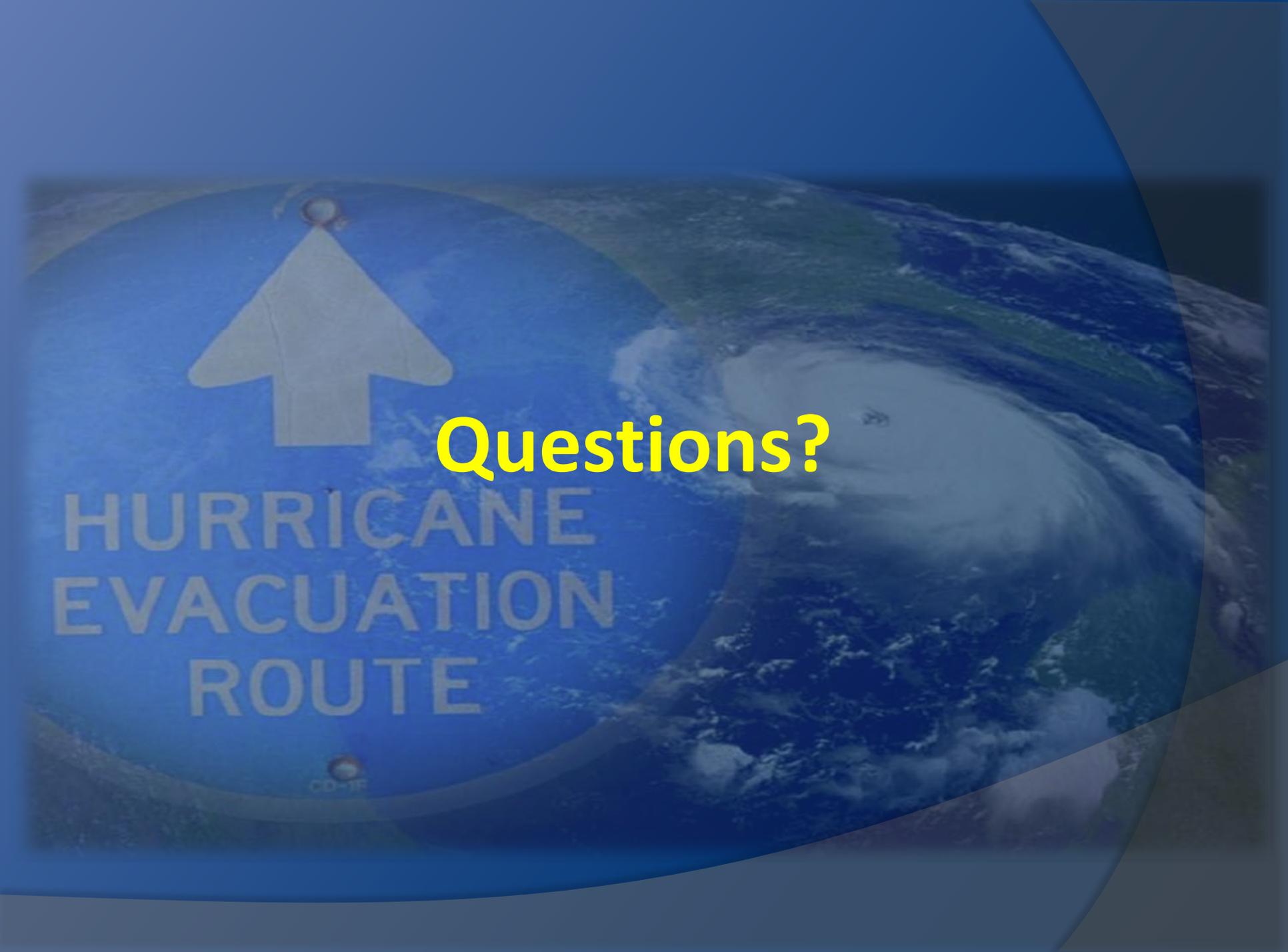
- Based on Hurricane Inundation Maps
- Provided to local emergency management officials to identify recognizable boundaries and eliminate “lily pads”
- Primarily two zones (A and B)
 - Boston and Cambridge have a third zone (C) to account for a westerly track
- Used for decision-making and public messaging
- **KNOW YOUR ZONE:**
<http://www.mass.gov/eopss/agencies/mema/emergencies/hurricanes/hurricane-evacuation-zones.html>

Resulting Tools – Evacuation Clearance Times

- Developed through the HES
- Estimated times for all vehicles to clear the road
- Use estimated time to determine when evacuations should begin
- Clearance times range depending upon weather conditions, time of year and response of the public
 - Depending upon these factors, clearance times range from 3 to 34 hours

Evacuation Decision Calculation





Questions?

HURRICANE
EVACUATION
ROUTE

CD-1F