

South Carolina Floods of 2015

Mario Formisano, Director

Dorchester County

Emergency Management Department

South Carolina 101



Nickname:
The Palmetto State



State Capital:
Columbia

Motto:
“Dum Spiro Spero”
– “While I breathe,
I hope”
Adopted in 1776.



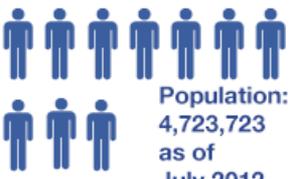
Geography:
South Carolina is bordered to the north by North Carolina, to the south and west by Georgia, and to the east by the Atlantic Ocean.



Time Zone:
Eastern



Coastline:
187 miles

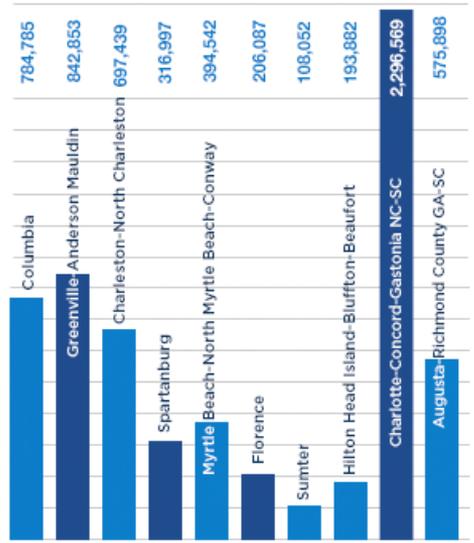


Population:
4,723,723
as of July 2012



- Government 18.8%
- Professional and Business Services 12.5%
- Retail Trade 12.1%
- Manufacturing 12%
- Education and Health Services 11.9%
- Leisure and Hospitality 11.3%
- Finance, Insurance and Real Estate 5.1%
- Construction 4%
- Wholesale Trade 3.6%
- Transportation, Warehousing and Utilities 3.4%
- All Other 5.4%

Major Industries by Percentage of Total Employment (March 2012)



MSA	Population (2012)
Columbia	784,785
Greenville-Anderson Mauldin	842,853
Charleston-North Charleston	697,439
Spartanburg	316,997
Myrtle Beach-North Myrtle Beach-Conway	394,542
Florence	206,087
Sumter	108,052
Hilton Head Island-Bluffton-Beaufort	193,882
Charlotte-Concord-Gastonia NC-SC	2,296,569
Augusta-Richmond County GA-SC	575,898

Major MSA Populations (2012)



Size:
32,020 square miles



Number of Counties:
46

SC Natural Disaster History

- 1959 Hurricane Gracie
- 1989 Hurricane Hugo
- 1999 Hurricane Floyd
- 2003, 2004, 2006 Winter/Ice Storms
- 2014 Severe Winter Storm
- 2016 Severe Storms & Flooding
- * *Earthquake of 1886*

Key Discussion Areas

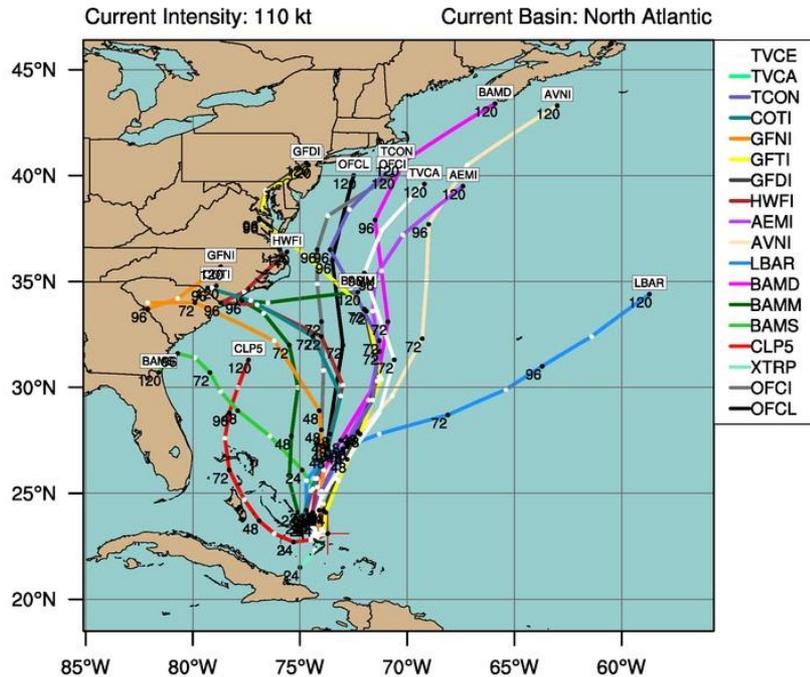
- Situation and Overall Impact
- State perspective (part 1)
 - Response
 - Factors Contributing to Success
 - Where to Improve
- Local perspective (part 2)
 - Response Mission
 - Lessons Learned
 - Recovery Process

October 1, 2015 Joaquin's Approach



MAJOR HURRICANE JOAQUIN (AL11)

Early-cycle track guidance initialized at 1200 UTC, 01 October 2015



By using this plot, the user agrees to the UCAR Terms of Use which can be accessed at: <http://www2.ucar.edu/terms-of-use>

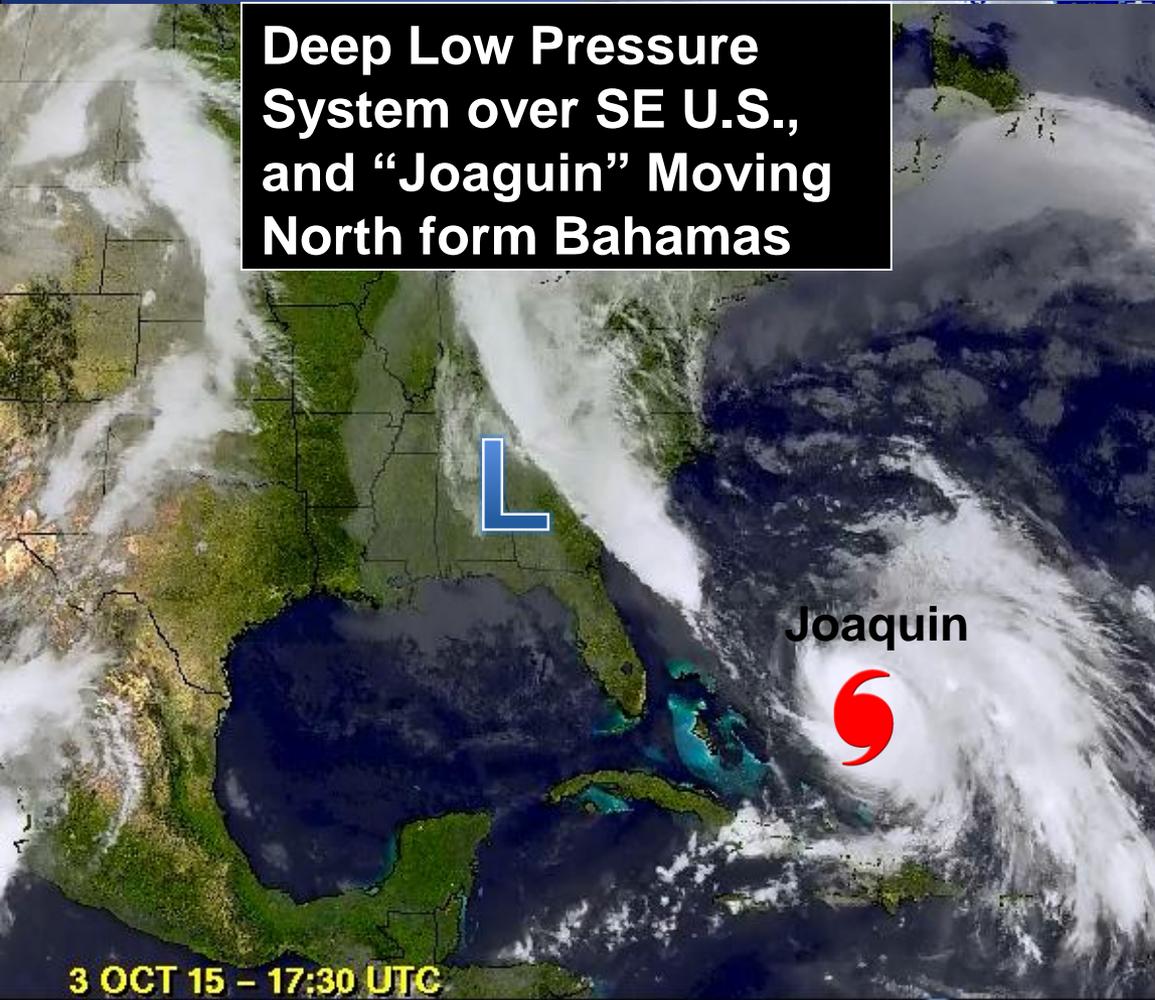
Plot generated at 1521 UTC 01 October 2015



The "Set Up" - Satellite View

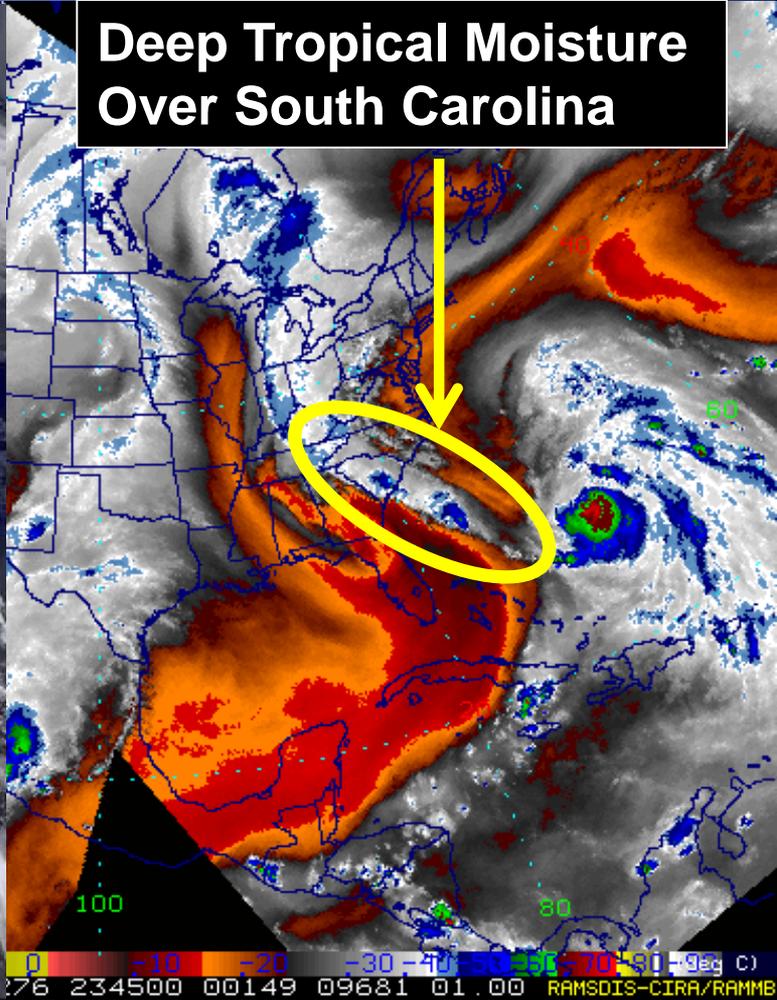
Sat. Oct. 3

Deep Low Pressure System over SE U.S., and "Joaquin" Moving North from Bahamas



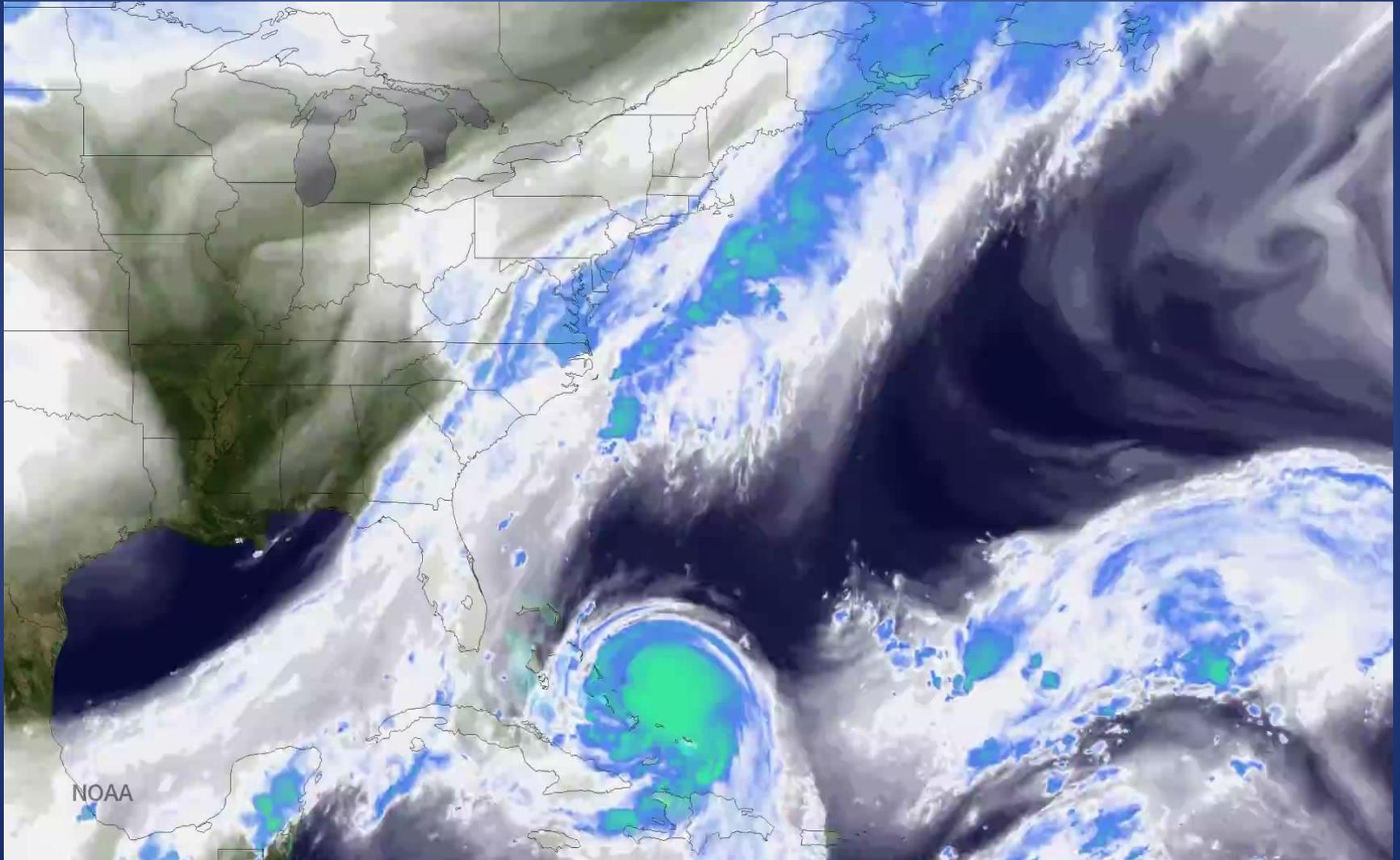
3 OCT 15 - 17:30 UTC

Deep Tropical Moisture Over South Carolina

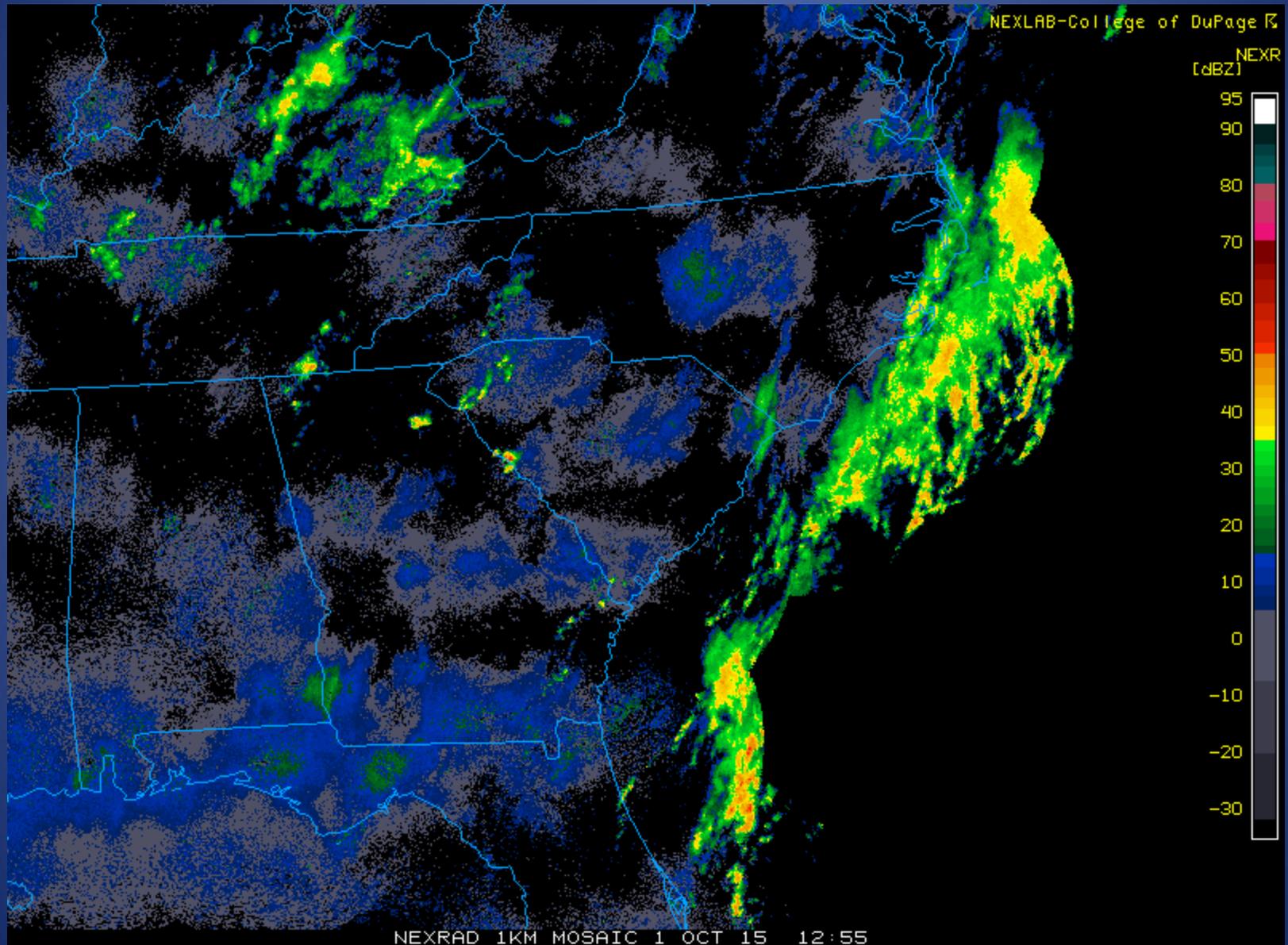


0 -10 -20 -30 -40 -50 -60 -70 -80 -90 (C)
76 234500 00149 09681 01.00 RAMSDIS-CIRA/RAMMB

Water Vapor/Moisture Loop



Radar Loop Oct. 1 – 5, 2015



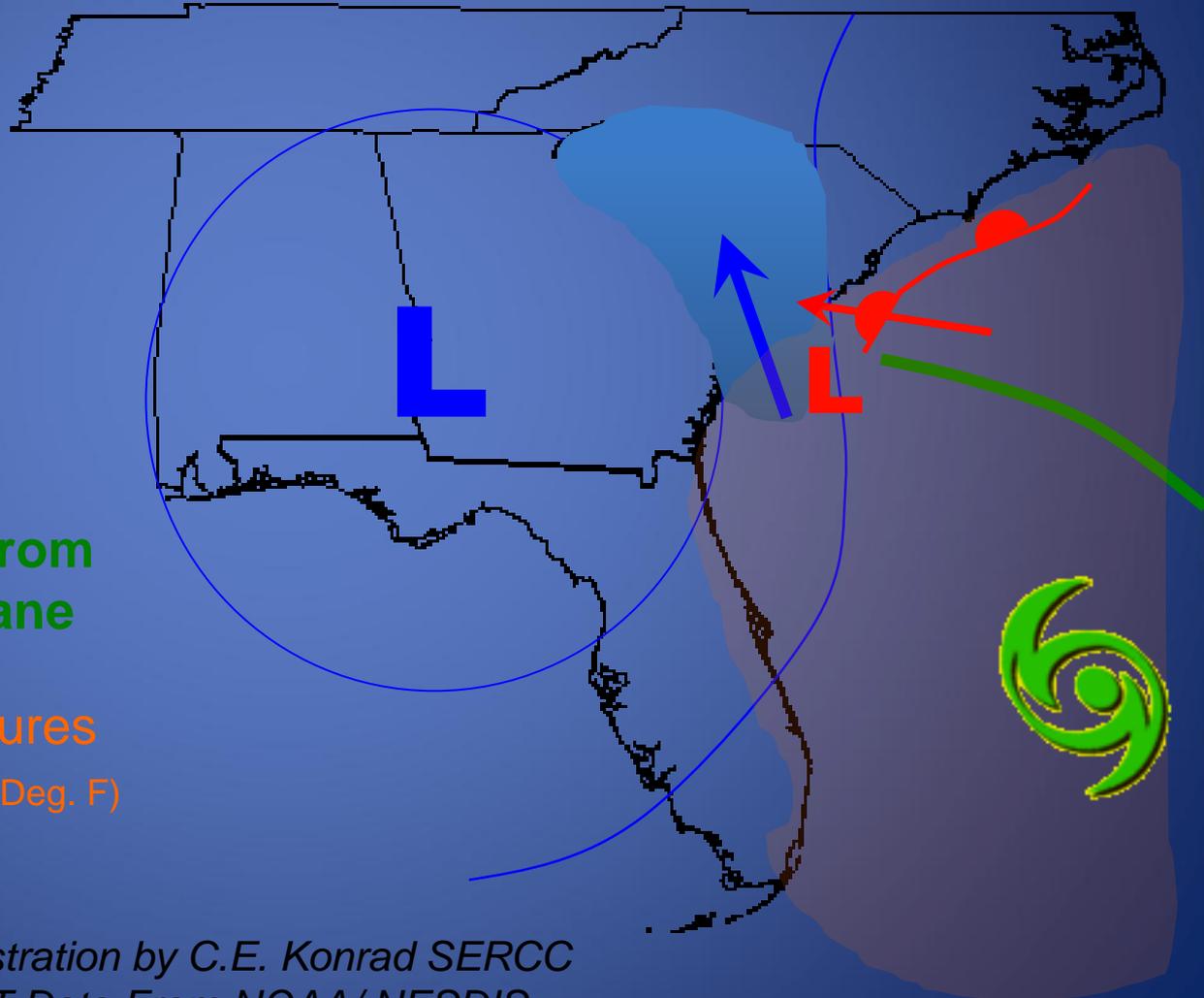
Weather Factors Contributing to Heavy Rainfall

A. Nearly Stationary Upper Level Low → Provided Lift Across SC

B. Surface Coastal Front and Low - Level Jet Provided Moisture

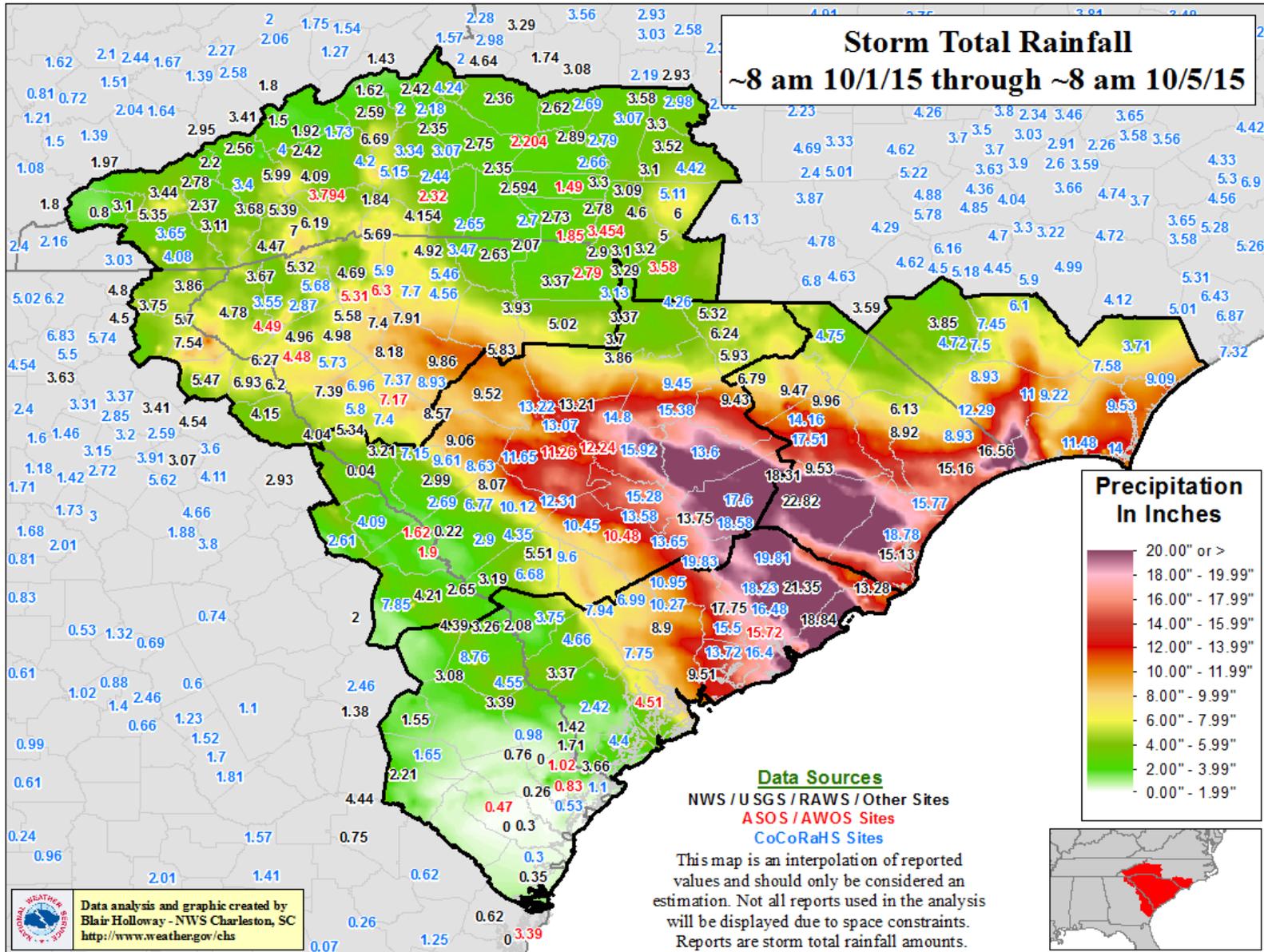
C. Additional Moisture from Outer Fringes of Hurricane Joaquin

D. Sea Surface Temperatures Much Above Normal (3-4.5 Deg. F)



*Illustration by C.E. Konrad SERCC
SST Data From NOAA/ NESDIS*

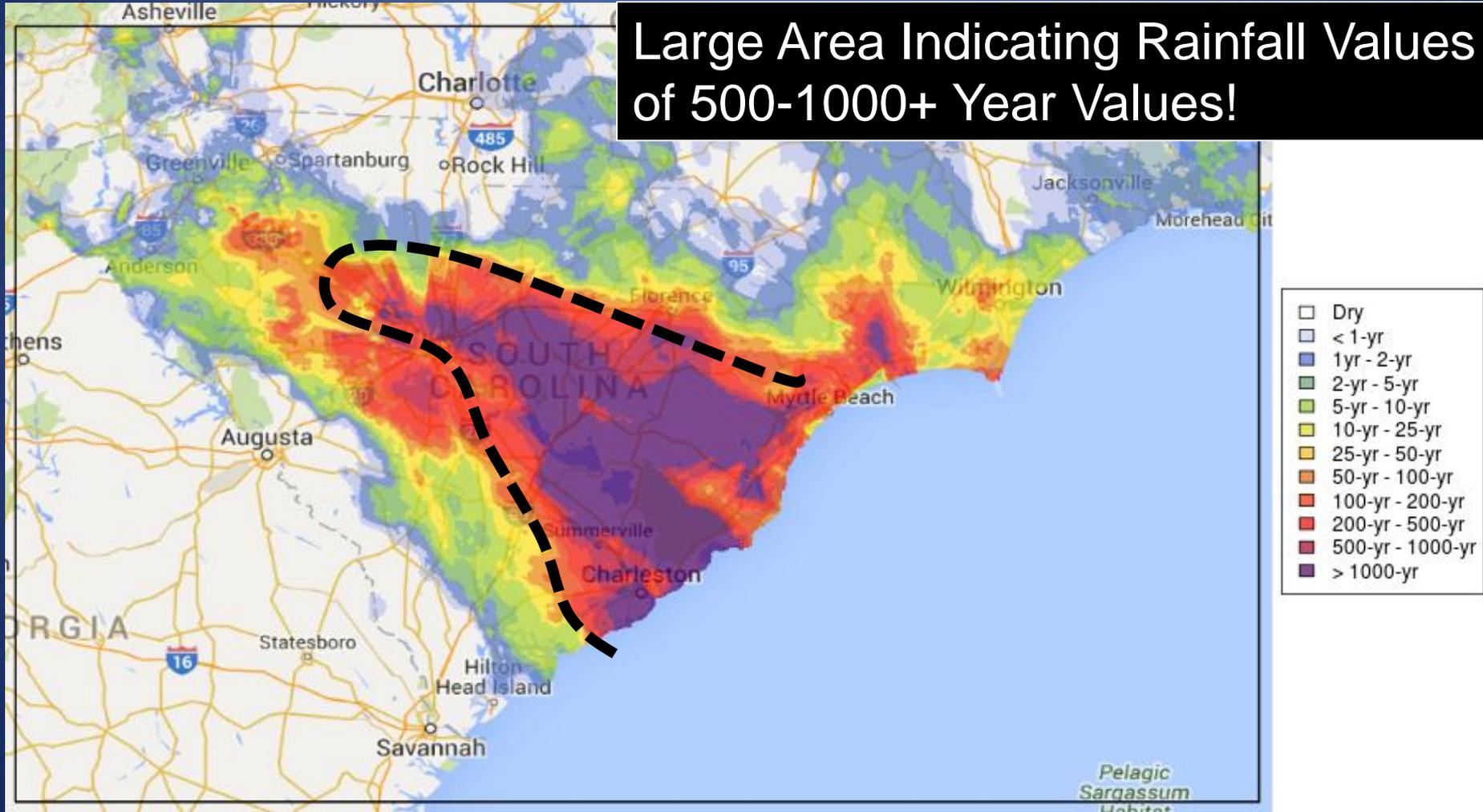
Regional Rainfall Totals Oct. 1 – 4



Prelim 96 Hour Average "Recurrence"

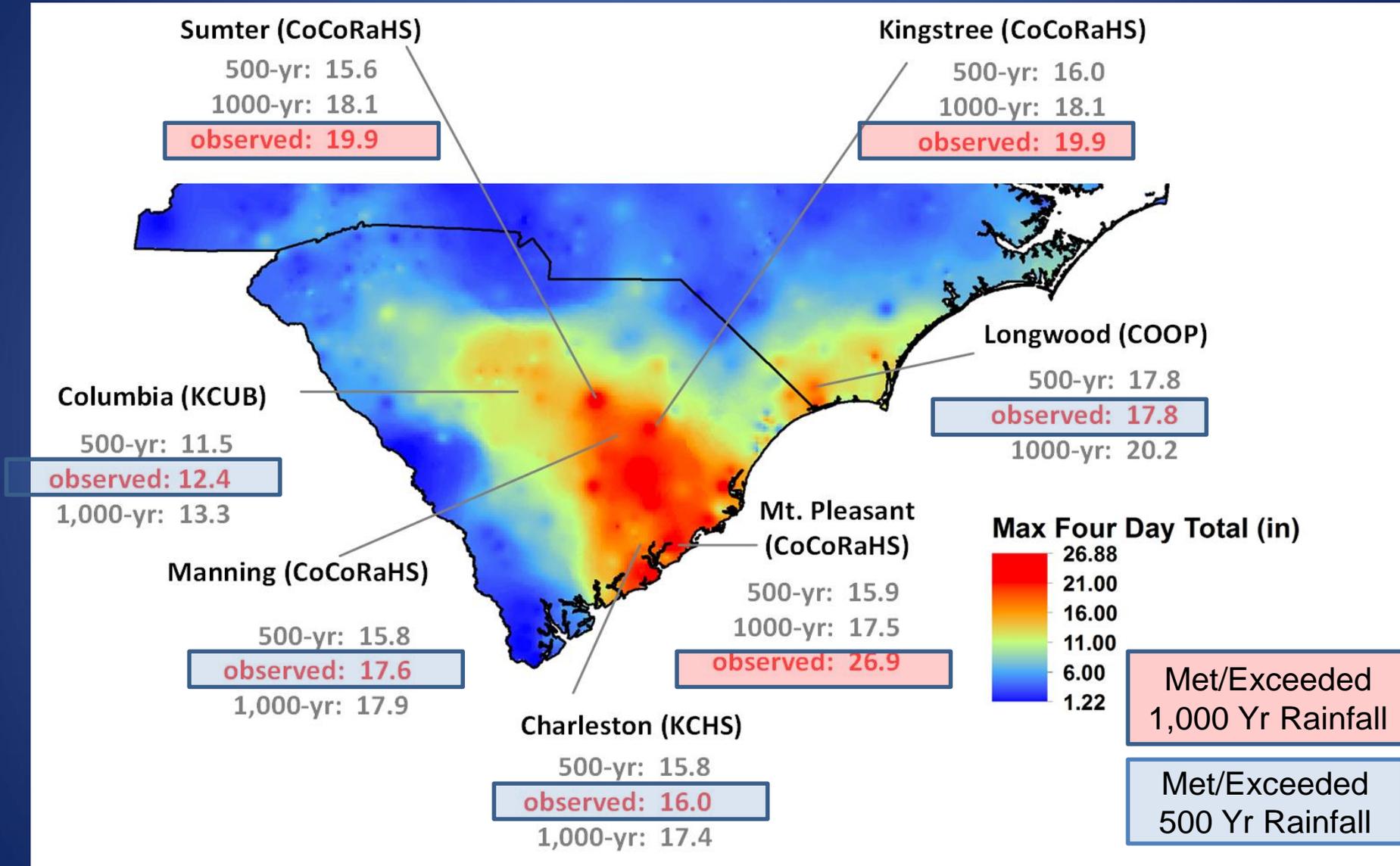
created by MetStorm 10-09-15

Large Area Indicating Rainfall Values of 500-1000+ Year Values!



Pelagic Sargassum Habitat

Heavy Rainfall: How Extreme?



From Carolinas Integrated Science & Assessment (CISA) report

<http://www.cisa.sc.edu/PDFs/October%202015%20Flood%20Event%204%20Pager.pdf>

What is a 100, 1000 Year Flood?

- 100 and 1,000 Year Flood Does NOT = Amount of Years between Floods
- 100 Year Flood Has 1% Chance of Occurring ANY Year
- 1,000 Year Flood Has 0.1% Chance of Occurring ANY Year
- Probabilities Only as Good as Past Data. More Data → Better Statistics!
- **Note:** This was NOT a 1,000 Year Event for most Rivers



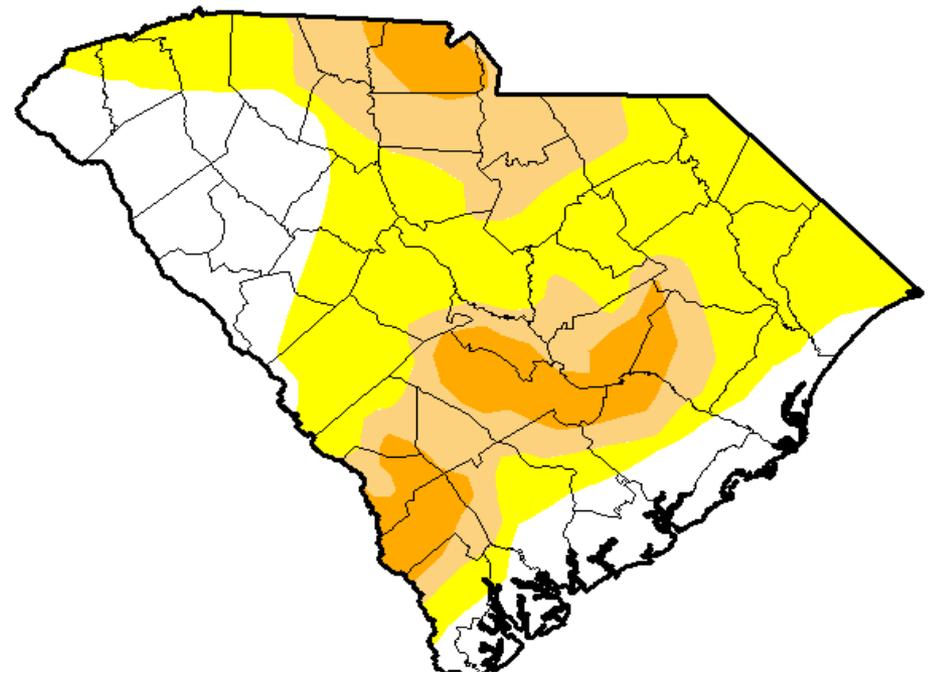
Mitigating Factors for Flooding

Dry Conditions Prior to Event –
Especially Interior Areas

Dams Provide Flood control –
Largely rivers flowing from central SC

U.S. Drought Monitor **South Carolina**

September 29, 2015



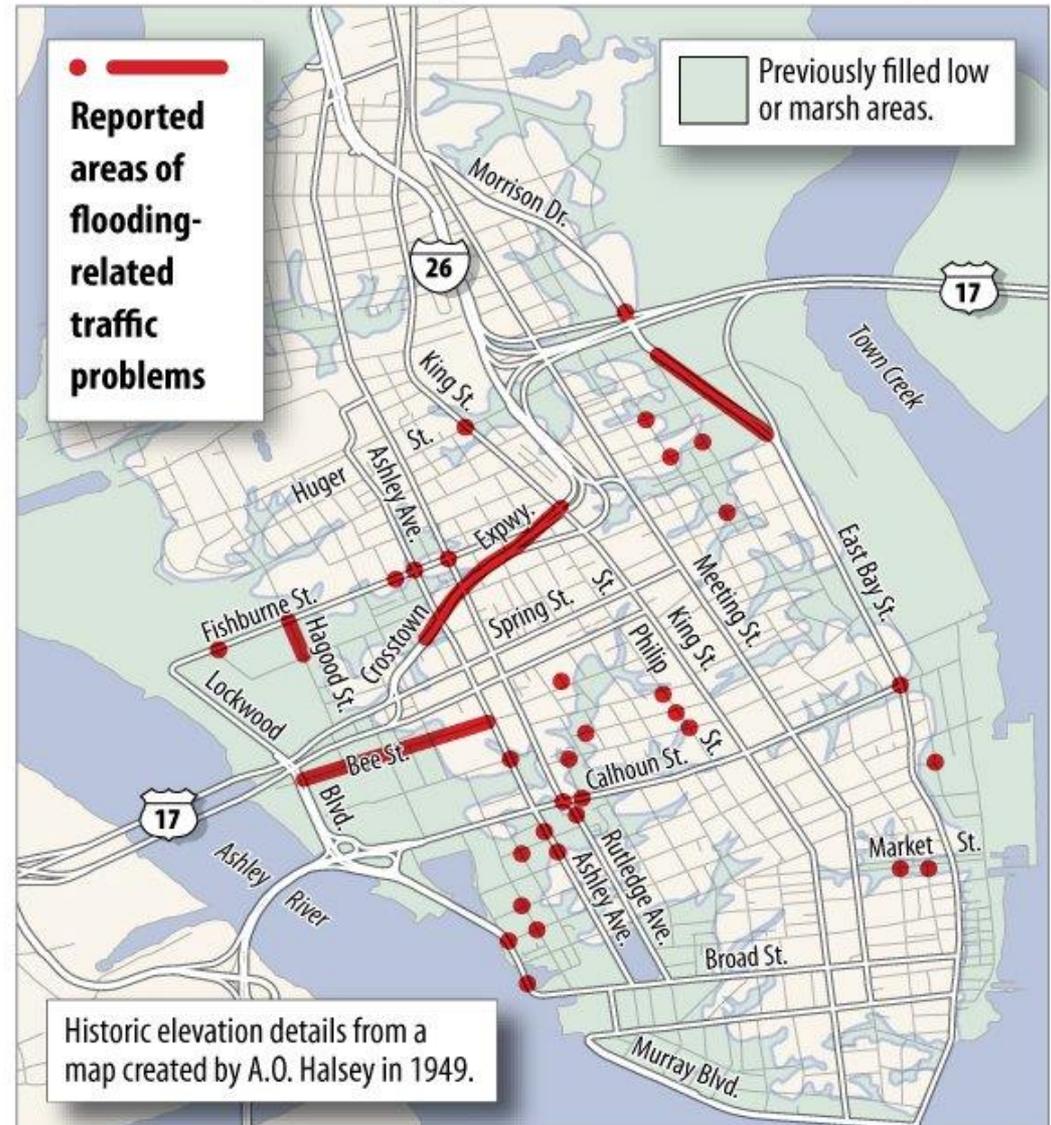
Intensity:



Need a Better Knowledge of ALL Flood Prone Areas in our Region

Flood-prone areas to avoid during heavy rains

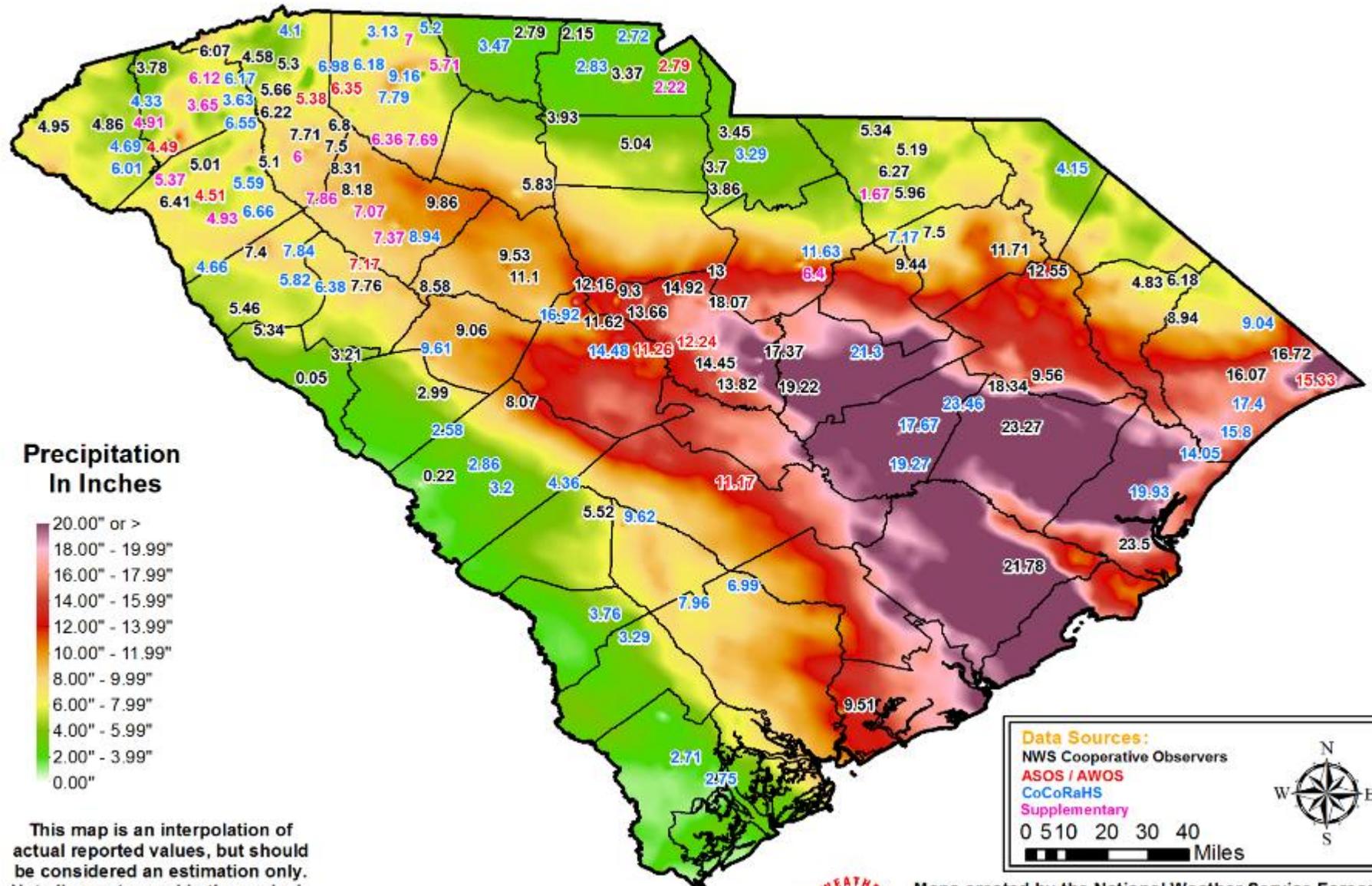
These areas have been previously reported to have flood-related traffic problems. Various conditions such as high tides and clogged drains can contribute to the flooding potential.



SOURCE: CHARLESTON POLICE, ESRI

GILL GUERRY/STAFF

South Carolina Precipitation Storm Total Ending at 7 AM Oct. 5th, 2015



This map is an interpolation of actual reported values, but should be considered an estimation only. Not all reports used in the analysis will be displayed due to space constraints. Reports are precipitation through the above mentioned period.



Maps created by the National Weather Service Forecast Office in Greenville/Spartanburg and in cooperation with the NWS Forecast Offices in Columbia and Charleston South Carolina as well as Wilmington North Carolina.



Storm Numbers

- Storm related fatalities: 19
- Displaced citizens: Over 20,000
- Shelters:
 - 32 (includes standby locations)
 - 26 counties with shelters
 - 941 citizens sheltered
- Emergency meals served: More than 2.7 million
- Citizens without water: 40,000



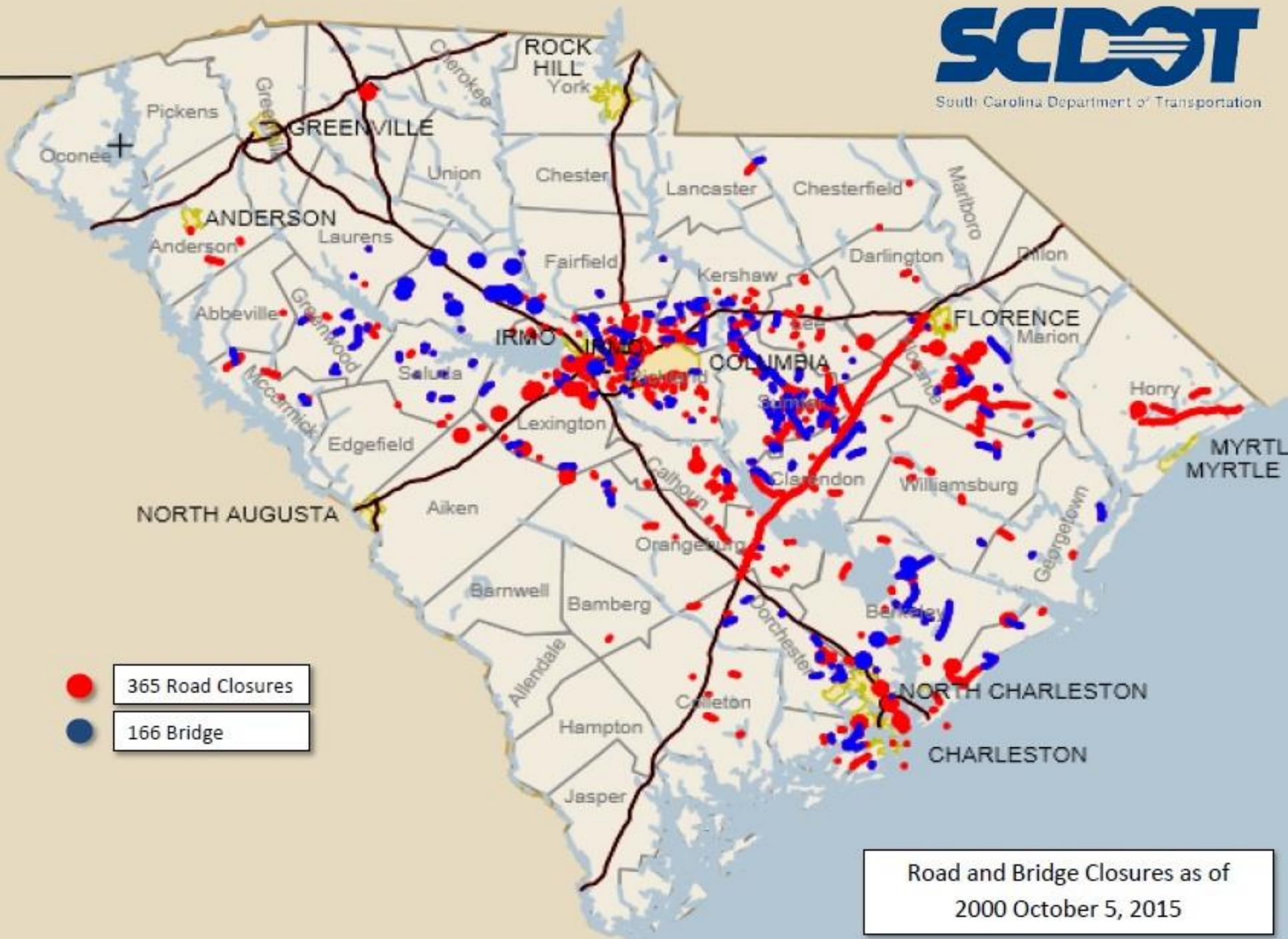
Storm Numbers (con't)

- Highway Patrol calls: 8,407
- Collisions during the event: 3,521
- Dam failures: 36
- Dams under emergency orders: 75
- Roads and bridges closed: 500+
- Water rescues: Over 1,500
- Calls taken by the Public Information Phone System: 12,900+



Storm Numbers (con't)

- State logistics requests: Over 900
- EMAC
 - 42 requests
 - 10 states
- SC National Guard: 4,100 personnel



- 365 Road Closures
- 166 Bridge

Road and Bridge Closures as of 2000 October 5, 2015

Dam
Failure,
Richland
County.



- The Columbia Canal washout left the City of Columbia without drinking water until it could be repaired.
- USACE provided UAV (drone) flights of the canal and of several dam breaches.



Wise Ferry Road, Lexington



Gibson Pond, Lexington



Old Black Oak Road, Moncks Corner







Glenhaven Drive, Columbia



Timberlane Road, Lexington



Forest Acres



Florence County



Rescue Operations, Georgetown County



Water Distribution, Richland County



Garner's Ferry Road, Columbia



Forest Acres



Donated Goods





Glenhaven Drive, Columbia



National Guard Water Operations, Columbia



National Guard Temporary Road Repair



National Guard Air Operations



National Guard Air Operations



National Guard High Water Assistance



National Guard Evacuation Assistance



Public Information



Federal Recovery Assistance

Category	State	Federal	Loans	Total
• FEMA Individual Assistance (IA)				
	<u>\$ 2,906,556</u>	<u>\$ 83,995,023</u>		<u>\$ 86,901,579</u>
Housing Assistance		\$ 75,275,356		\$ 75,275,356
ONA	\$ 2,906,556	\$ 8,719,667		\$ 11,626,223
• FEMA Public Assistance (PA)				
Current Total Estimate	<u>\$ 66,071,057</u>	<u>\$ 198,213,171</u>		<u>\$ 264,284,228</u>
State Agency Estimate	\$ 21,196,915	\$ 63,590,745		\$ 84,787,660
Local Govt. Estimate	\$ 44,874,142	\$ 134,622,426		\$ 179,496,568
• FEMA National Flood Insurance Program				
<i>Claims Paid to Date</i>		<u>\$ 129,663,721</u>		<u>\$ 129,663,721</u>
• SBA Loans			<u>\$ 151,431,400</u>	
• Non-Federal Share	\$ 69,146,057			

Factors Contributing to Success



- Advance notice
- Early decision making at all levels
- State agency heads directly involved
- Pre-staging of emergency assets
- EMD and NG liaisons deployed forward

Factors Contributing to Success (con't)



- Mutual Aid
 - Counties provided assistance to other counties and the State
 - EMAC
- Extensive planning, training and exercising at all levels of government
- National Guard capabilities
- Emergency management profession in SC is mature and experienced



Where to Improve

- Initial findings
 - Validating information
 - Managing information expectations
 - Flood and inundation modeling
 - Enhance state regulated dam program
 - Enhance mosquito abatement programs
 - Shelter staffing
 - Staff augmentation for EOCs at all levels
 - Meeting unmet needs beyond FEMA assistance

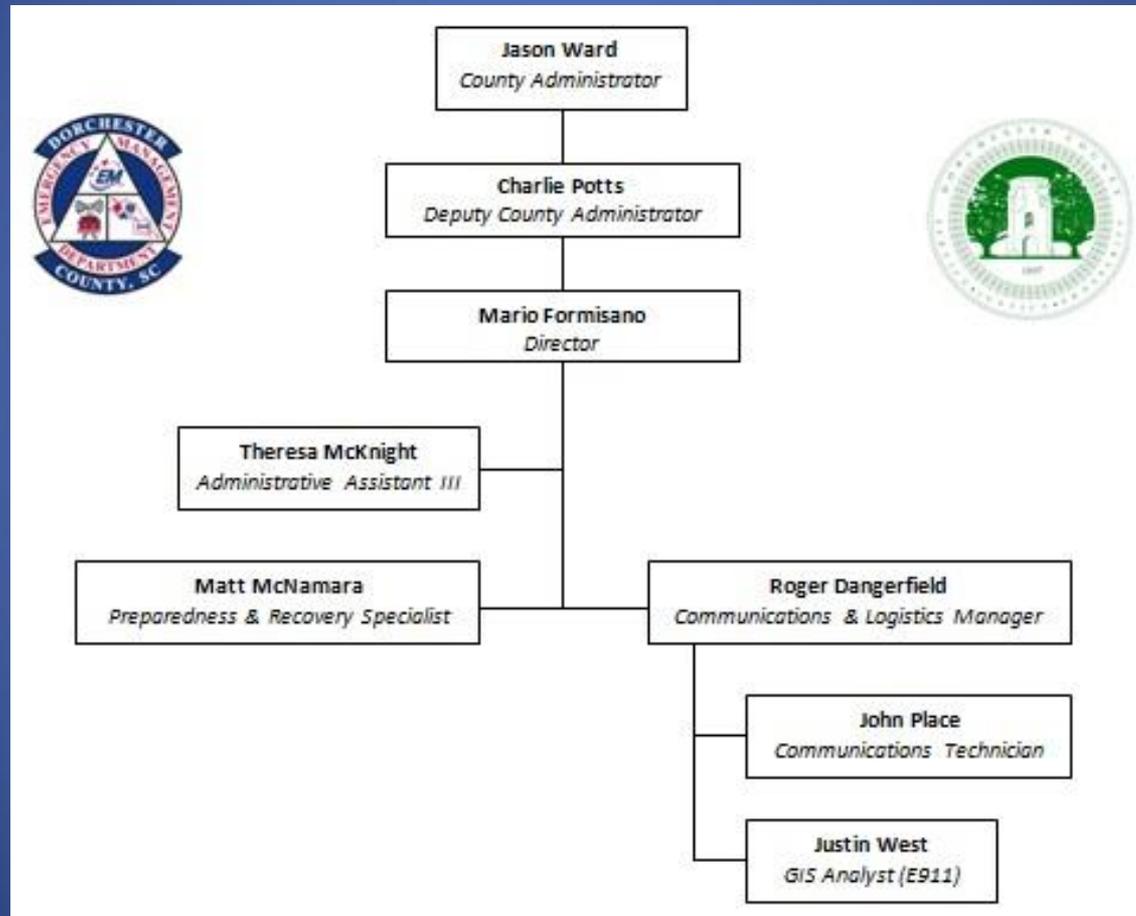
October 2015 Flood Response & Recovery

Dorchester County, SC

Dorchester County 101

- County Seat: Saint George
- 575 sq mi
- Pop: 148,468 (2014)
- Form of Gov't: Council/Administrator
- 757 employees
- Median HH income: \$54,452

Org Chart & Staff

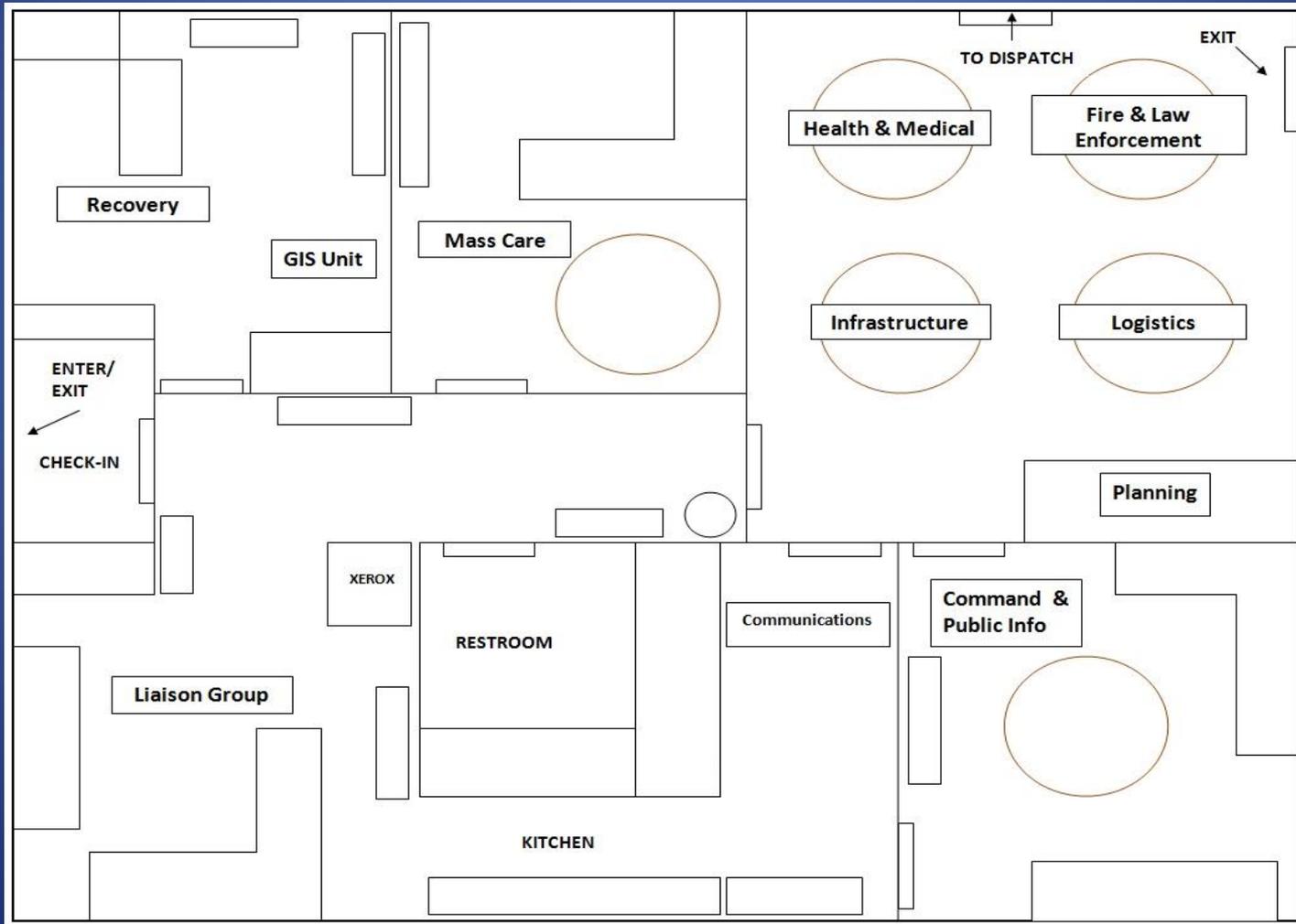


Divisions

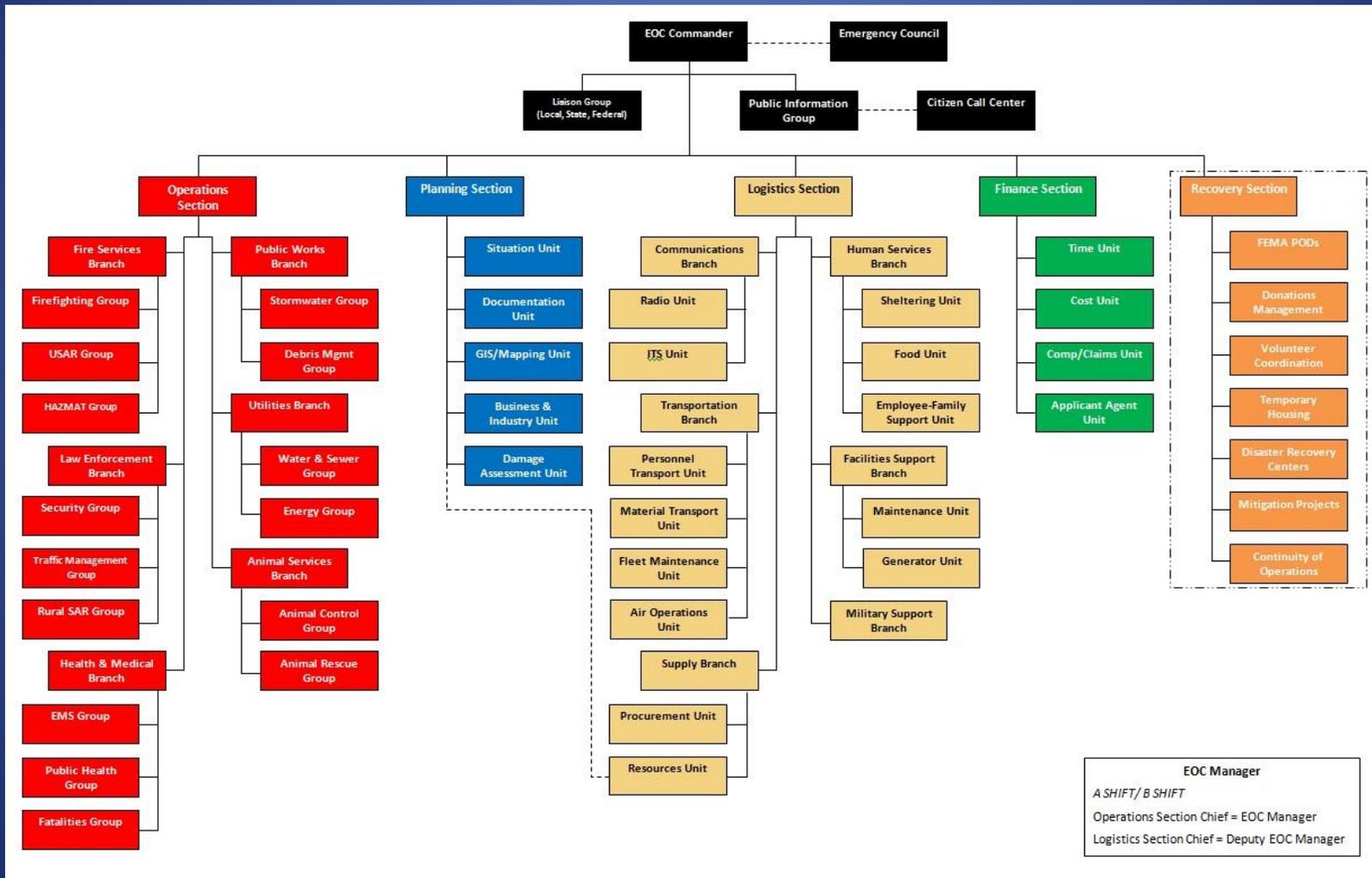
- Emergency Preparedness
 - Coordinates disaster planning, training and exercises; Public Education; CERT
- Communications Support
 - Radio equip/system diagnostics, 800 MHz, VHF, Amateur program administration
- E-911 Services
 - GIS, Equipment maintenance and service, 911 fund administration

Primary EOC

Carl Knight Law Enforcement Complex
212 Deming Way, Suite 3, Summerville, SC



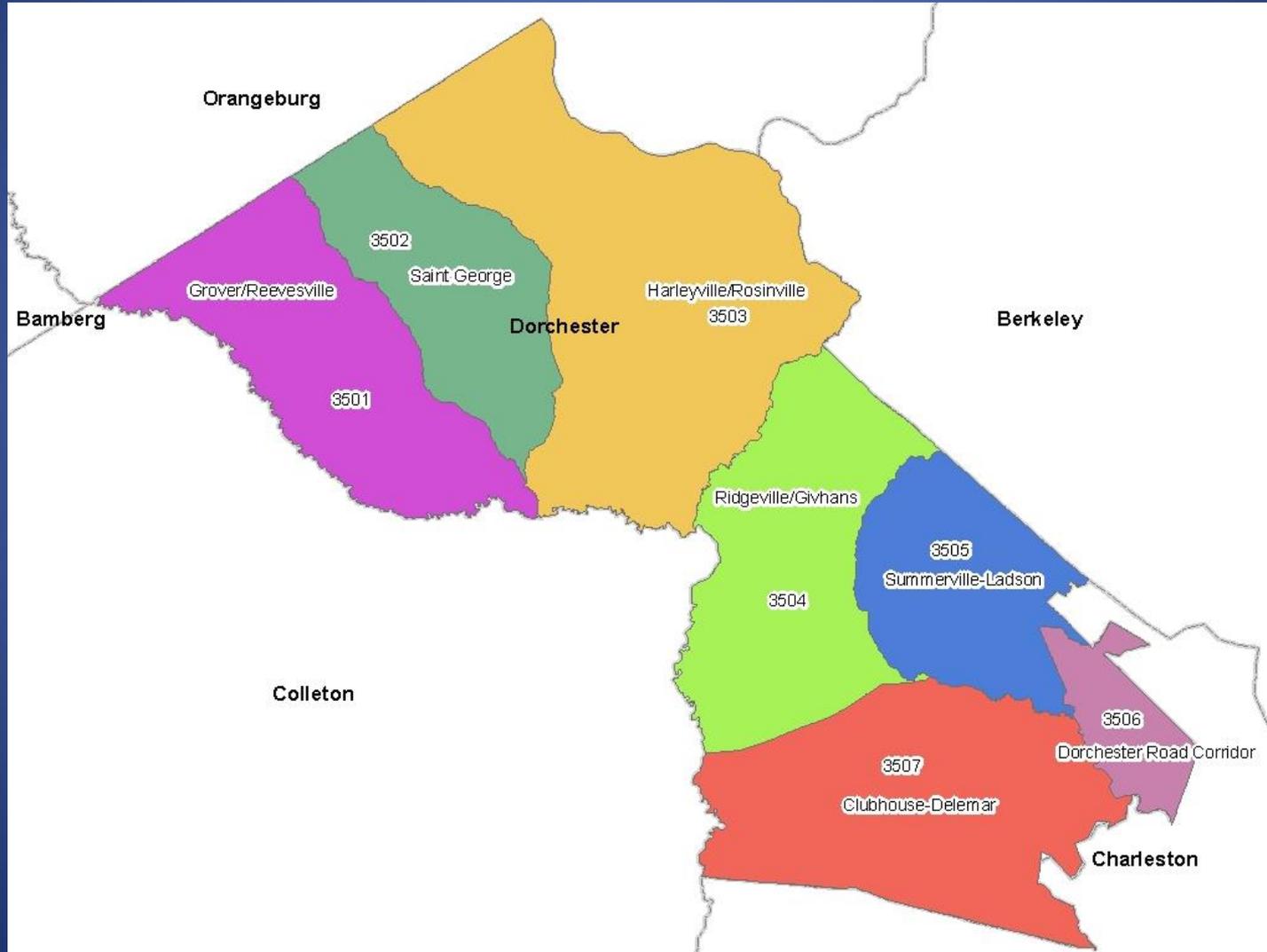
Emergency Support Functions

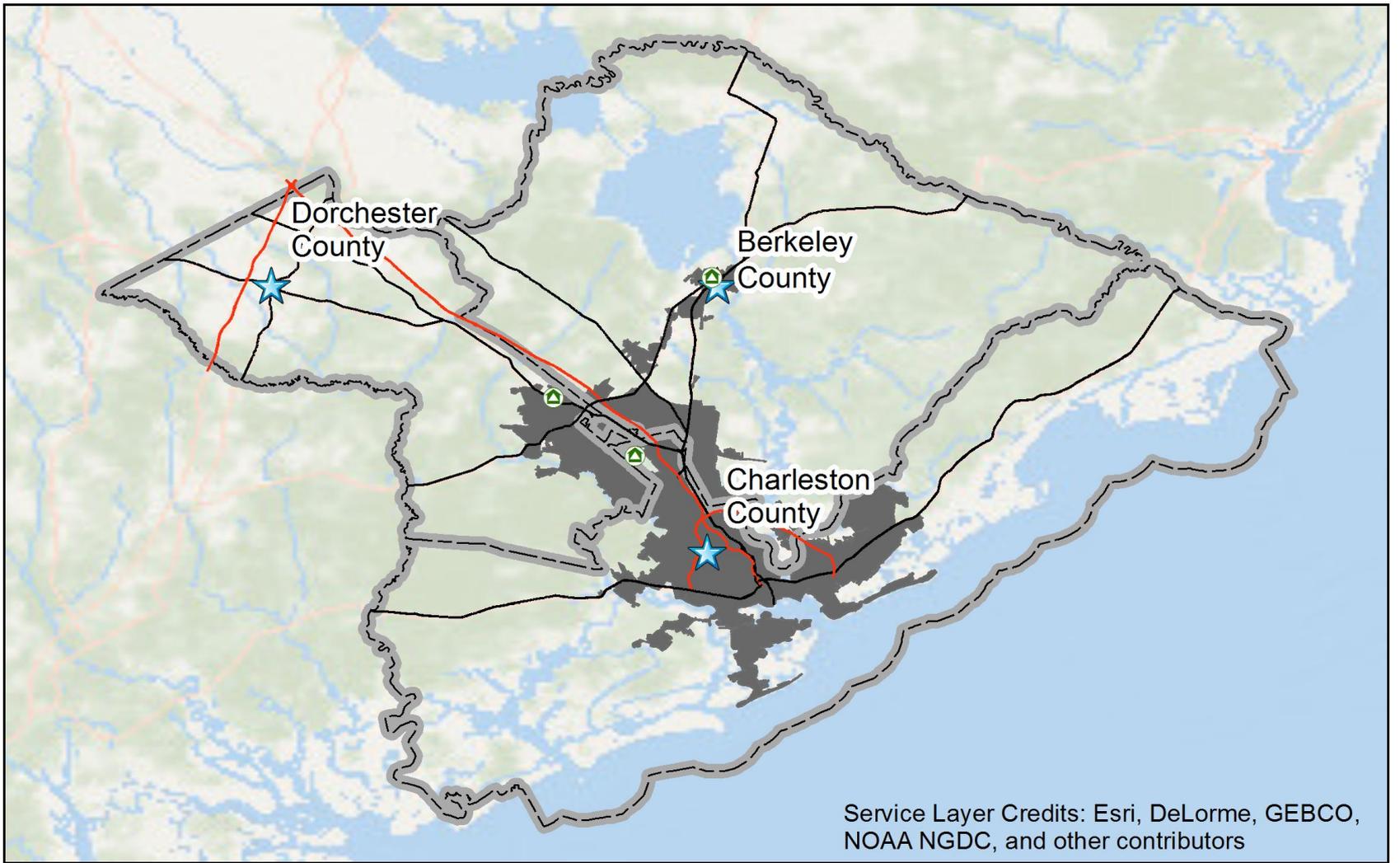


Operating Conditions (OPCON)

- OPCON 5: Most day-to-day operations. Pre-disaster prep activities that do not yet warrant EOC activation.
- OPCON 4: Possibility of an emergency or disaster that may require emergency operations. EM staff closely monitoring.
- OPCON 3: Disaster or emergency situation likely. EOP and other emergency plans activated. Limited EOC staffing.
- OPCON 2: Disaster or emergency situation is imminent or in effect. Full EOC staffing to meet the needs of the response.
- OPCON 1: Major disaster or emergency situation in effect; highest state of emergency operations.

Operational Areas

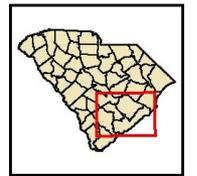




1:2,000,000

Tri-County Urban Area

-  EOC
-  Seat of Government
-  Interstate
-  US Highway
-  County Boundary
-  Major Urban Area



Emergency Council

- County Council Chairman serves as Chair;
- Executive Advisory Group comprised of Mayors and Public/Special Service District Chairpersons;
- Operations Group comprised of the Administrator and staff, EMD, EMS, Fire, Police, ARC, DSS, PWD, and others.

Emergency Measures & Decisions

- ✓ Declare “State of Emergency”;
- ✓ Property access for debris removal;
- ✓ Private roads and ditches access;
- ✓ Water usage limitation;
- ✓ Alcohol and firearm sale limitations;
- ✓ Establish curfew;
- ✓ Prohibit price gouging;
- ✓ Business license issue moratorium;
- ✓ Zoning and building permit moratorium;
- ✓ Regulating outdoor burning;
- ✓ Others as required.

2015 October Flood Event

DCEOC OPCON Sequence

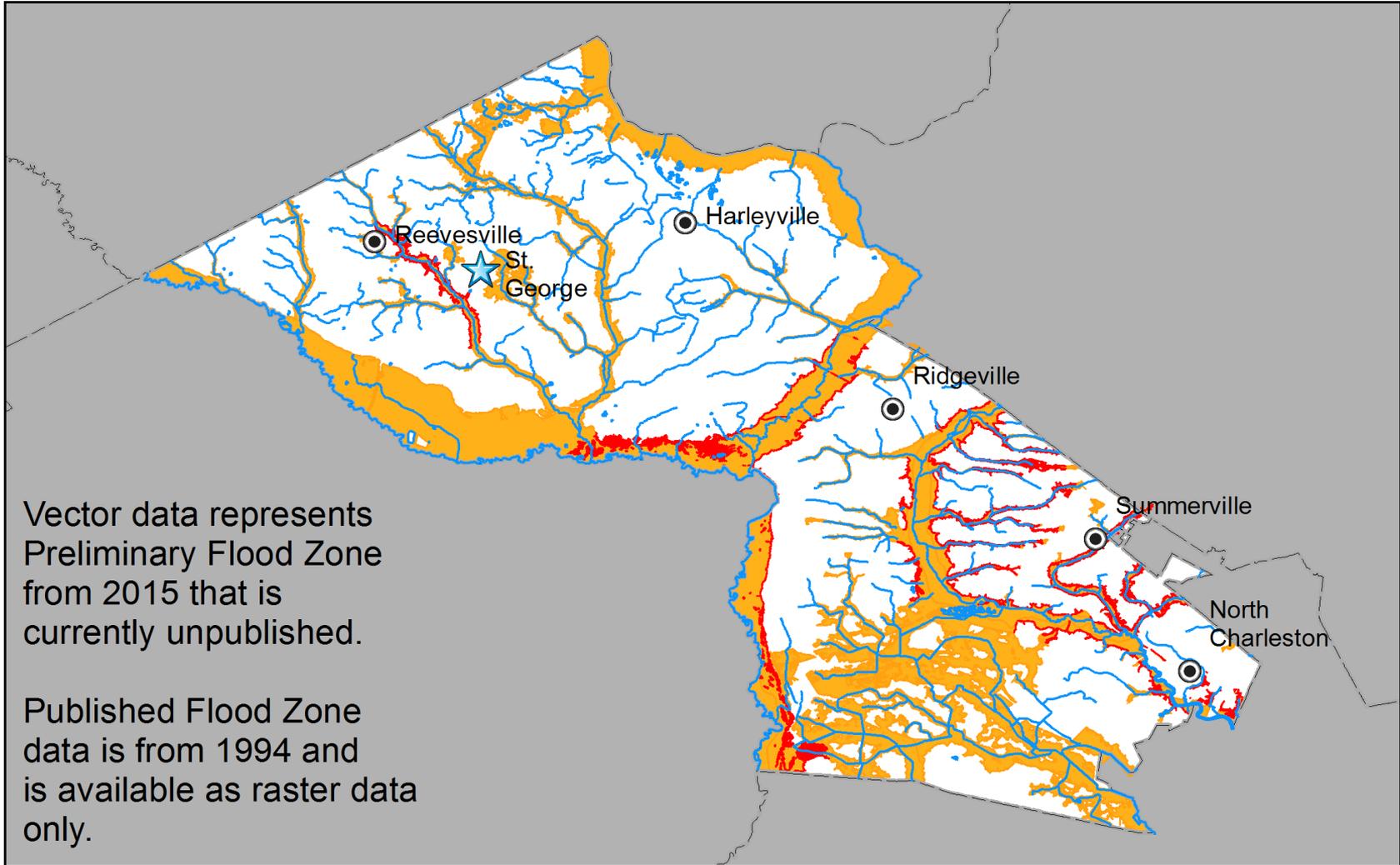
- 4:** 10/1 – 10/2 (Preparations)
 - County government/schools, early dismissal on 10/2
- 1:** 10/3 – 10/7 (Response, Short-term Recovery)
 - 24 hour staffing until 10/6, CCC activated
- 3:** 10/8 – 10/11 (Transition into Recovery)
 - County government reopened
- 4:** 10/12 – 10/15
 - FEMA DRC opened 10/16

Response Facts

- Afternoon of 10/3 State of Emergency Declaration and Curfew
- 10/3 – 10/5, 140+ water rescues
- EMAC/Mutual Aid: ICW SEOC, TN Water Rescue; Type II USAR (Fairfax, VA)
- SCNG assist w/ sandbags & other logistics
- 1 unsolicited truck of donations

Mass Care

- Summerville High School Shelter
 - Peaked at 97 evacuees
 - Open for 8 days
 - Relocated on Day 8
- Salvation Army and Red Cross Canteens
- Tyson Foods



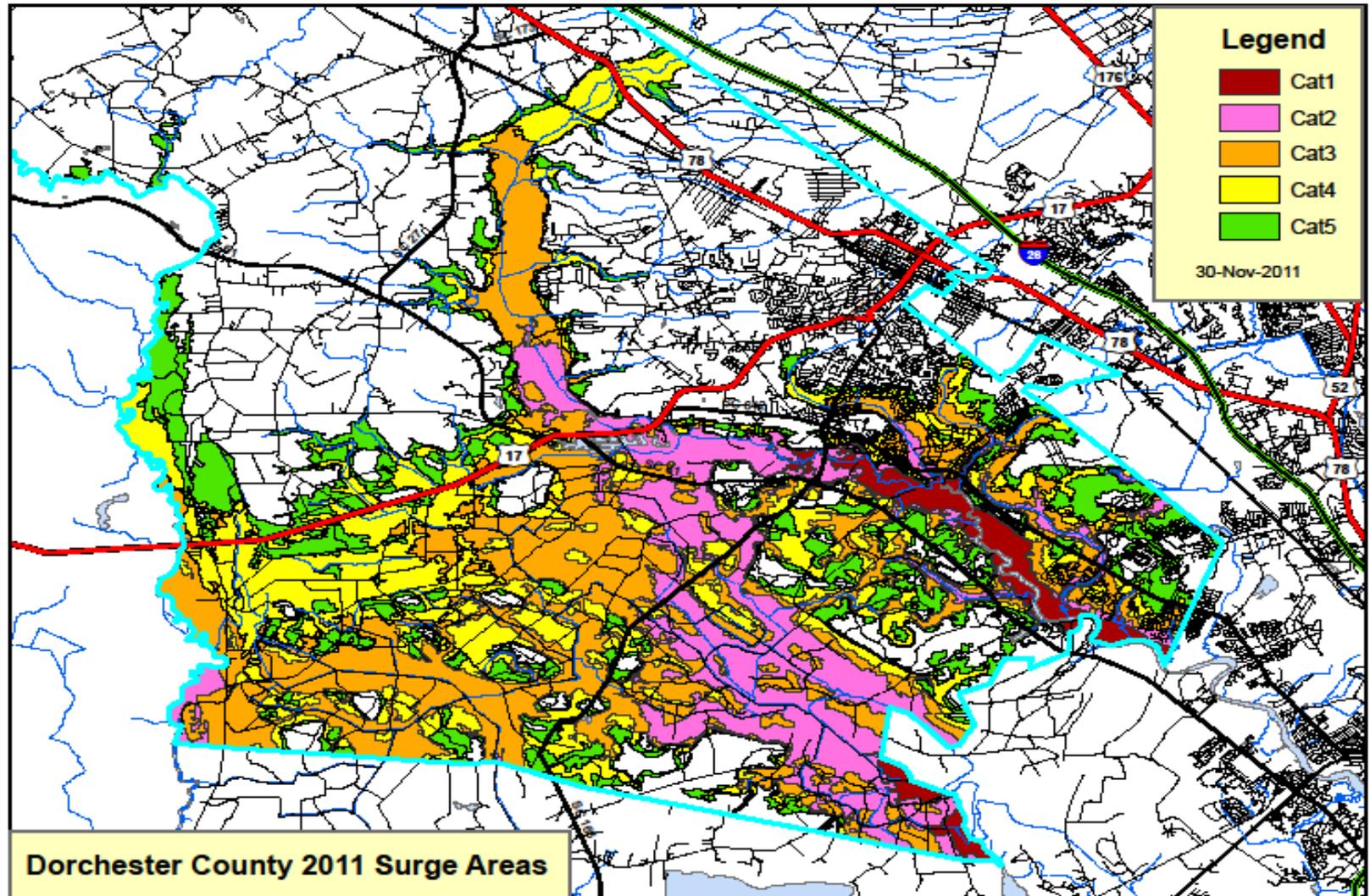
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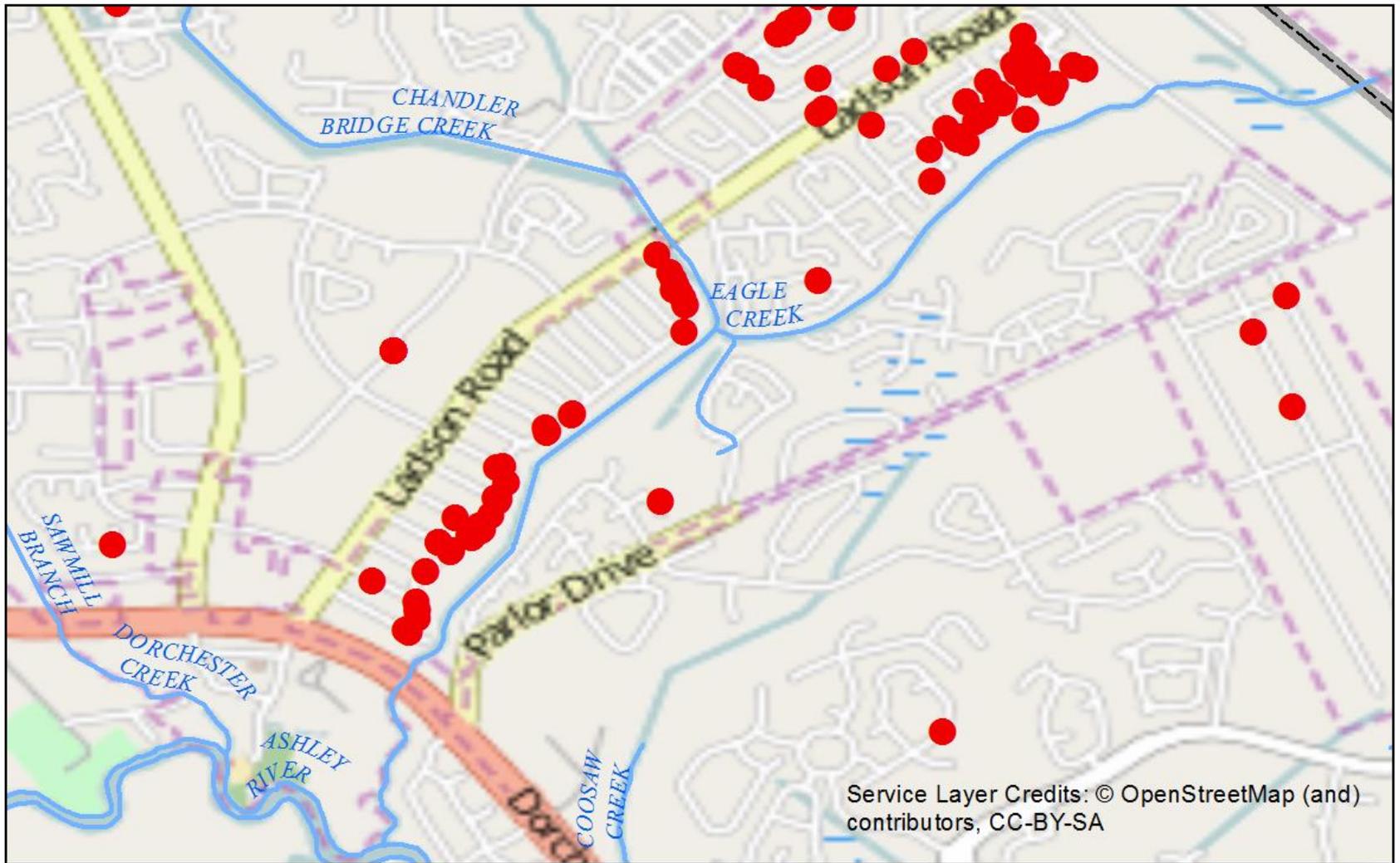
FEMA Flood Zones

- Municipality
- ★ Seat of Government
- Hydrology
- 500 Year Zone
- County Boundary
- 100 Year Zone



2011 SLOSH Model





1:50,000

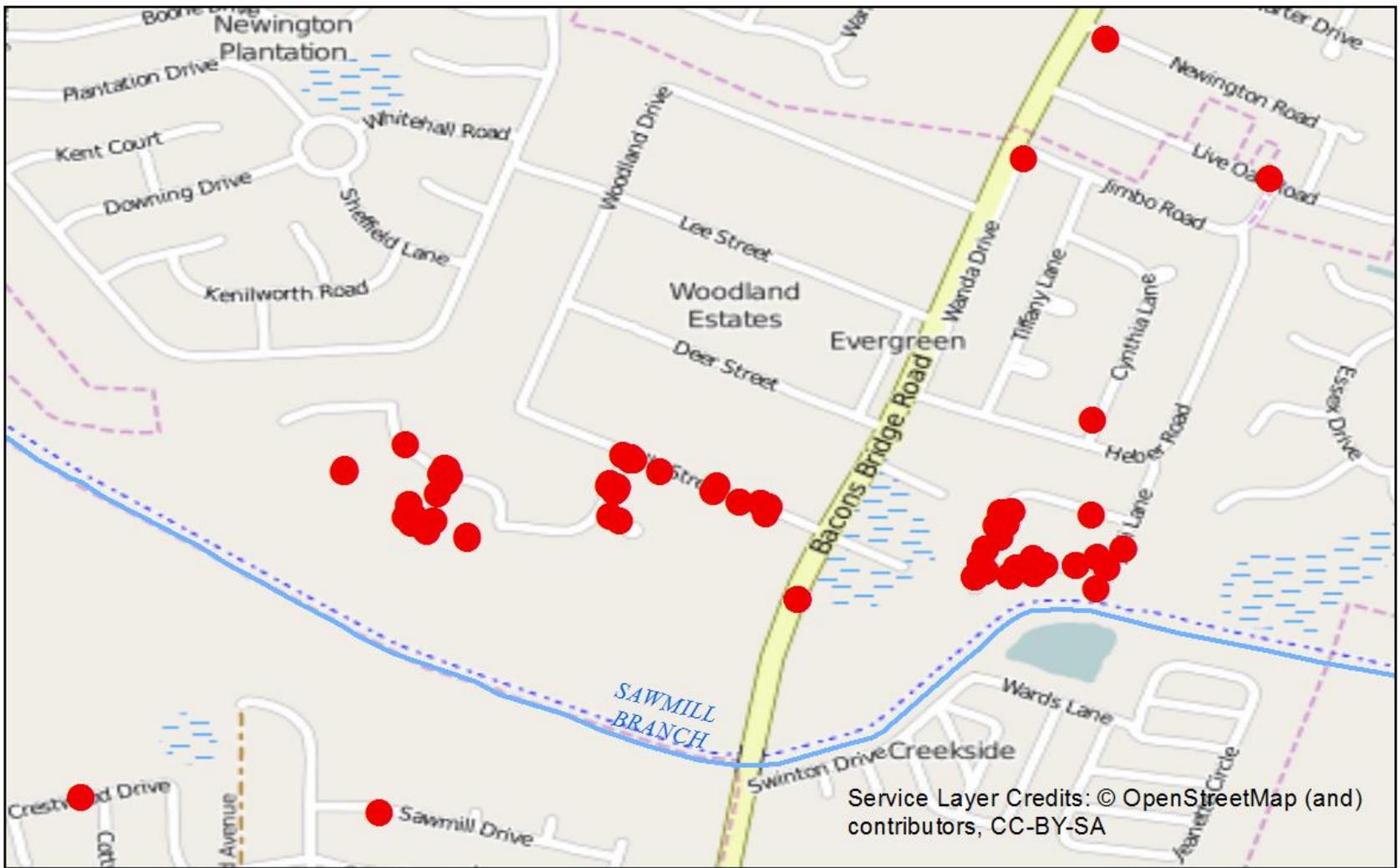
Tranquil Acres/Estates

● Damaged Property — Waterlines - - - County Boundary









Service Layer Credits: © OpenStreetMap (and contributors, CC-BY-SA)



1:24,000

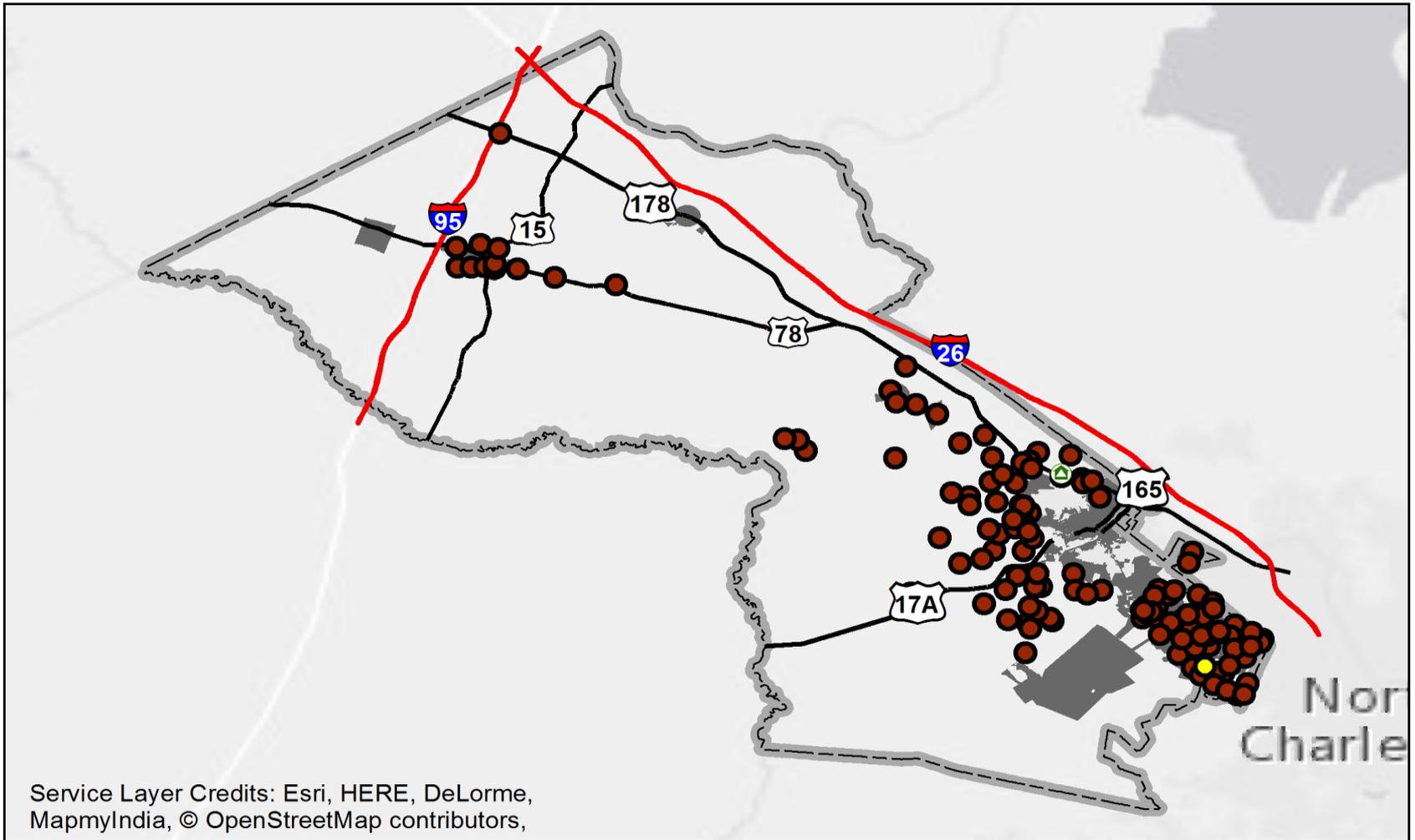
Arbor Oaks

- Damaged Property
- Waterlines
- County Boundary





Council approves “hazardous pay” for flood workers

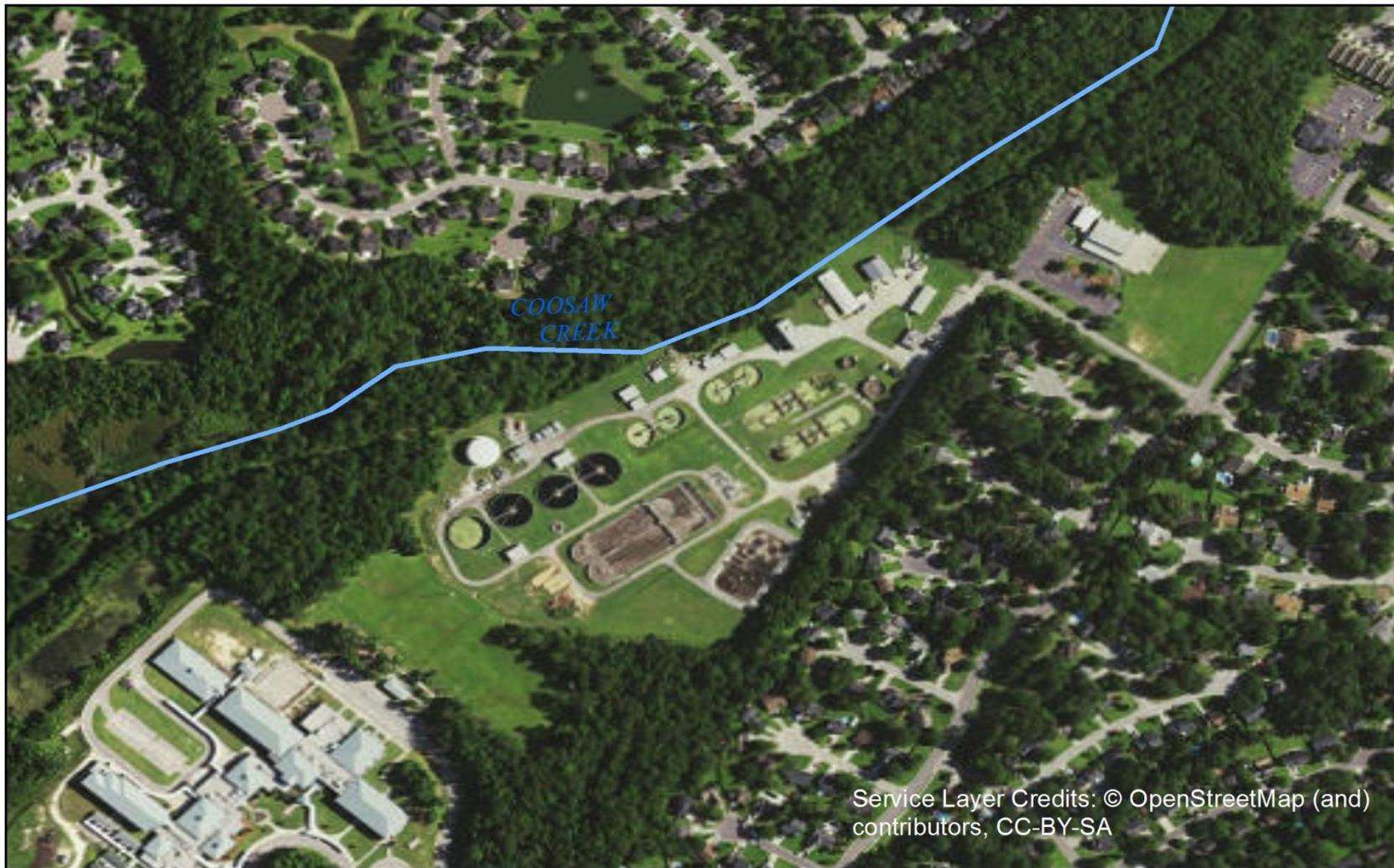


1:1,000,000

Waste Water Facilities

-  EOC
-  Waste Water Facility
-  Freeway
-  County Boundary
-  Pump Station
-  Highway
-  Municipal Area





Service Layer Credits: © OpenStreetMap (and) contributors, CC-BY-SA



1:12,000

Lower Waste Water Facility

Imagery dates: 2011 - 2015

— Waterlines  County Boundary





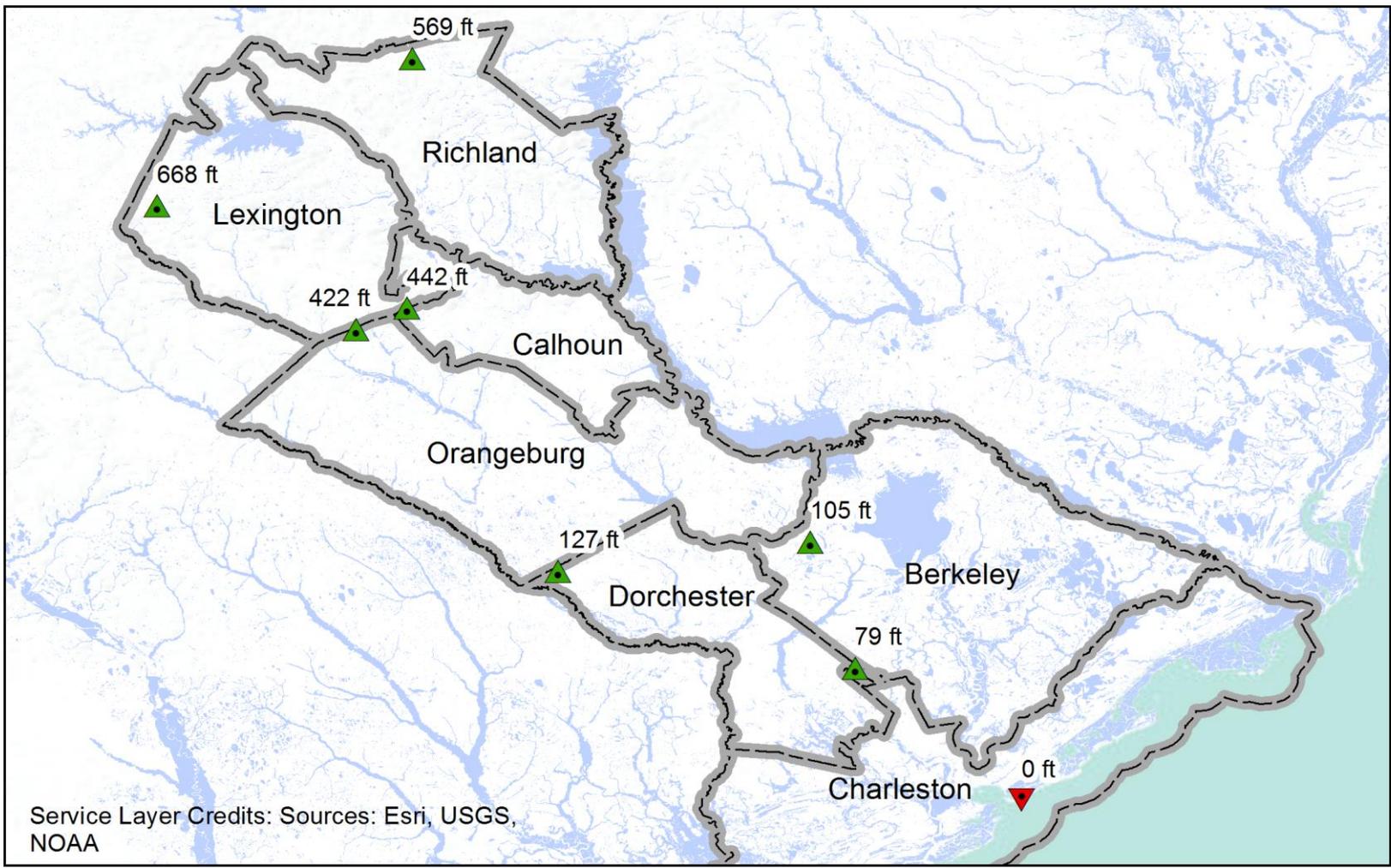
A photograph of a fenced-in industrial site. The fence is made of chain-link metal. In the center, a white rectangular sign is attached to the fence. The sign has black text that reads "DORCHESTER COUNTY", "DANGER", "KEEP OUT", and "EMERGENCY 832-0075". Below the emergency number, there is a small, faint label that says "PUMP #". A yellow vertical post is visible in the foreground, partially behind the fence. In the background, there are several large, cylindrical tanks or containers, some of which are white and some are green. The area is surrounded by trees and foliage. The entire image is set against a solid blue background.

DORCHESTER COUNTY
DANGER
KEEP OUT
EMERGENCY 832-0075
PUMP #





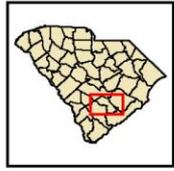




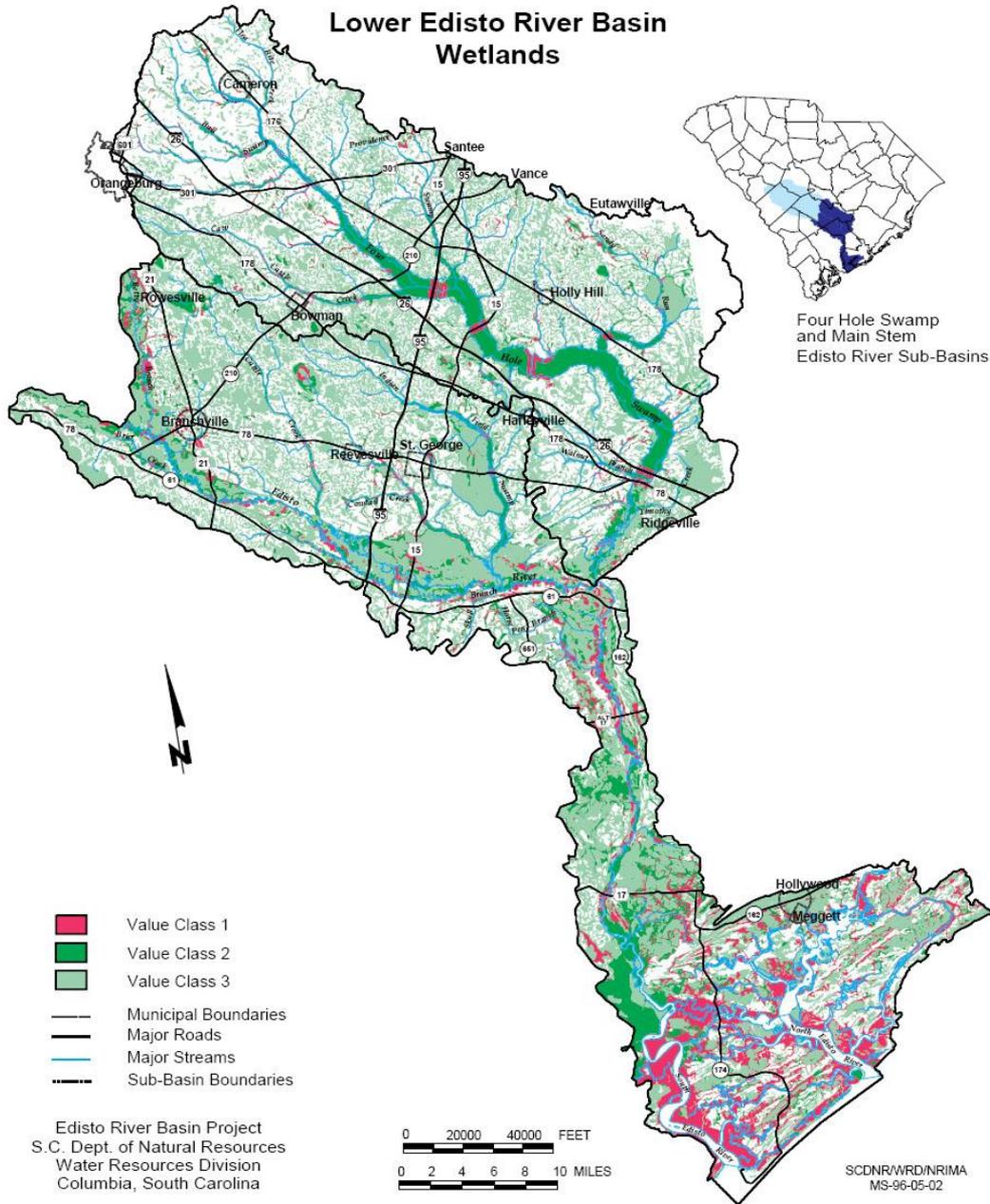
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Point Elevations

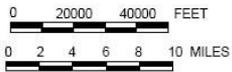
-  Highest Point
-  Lowest Point
-  County Boundary
-  Hydrology



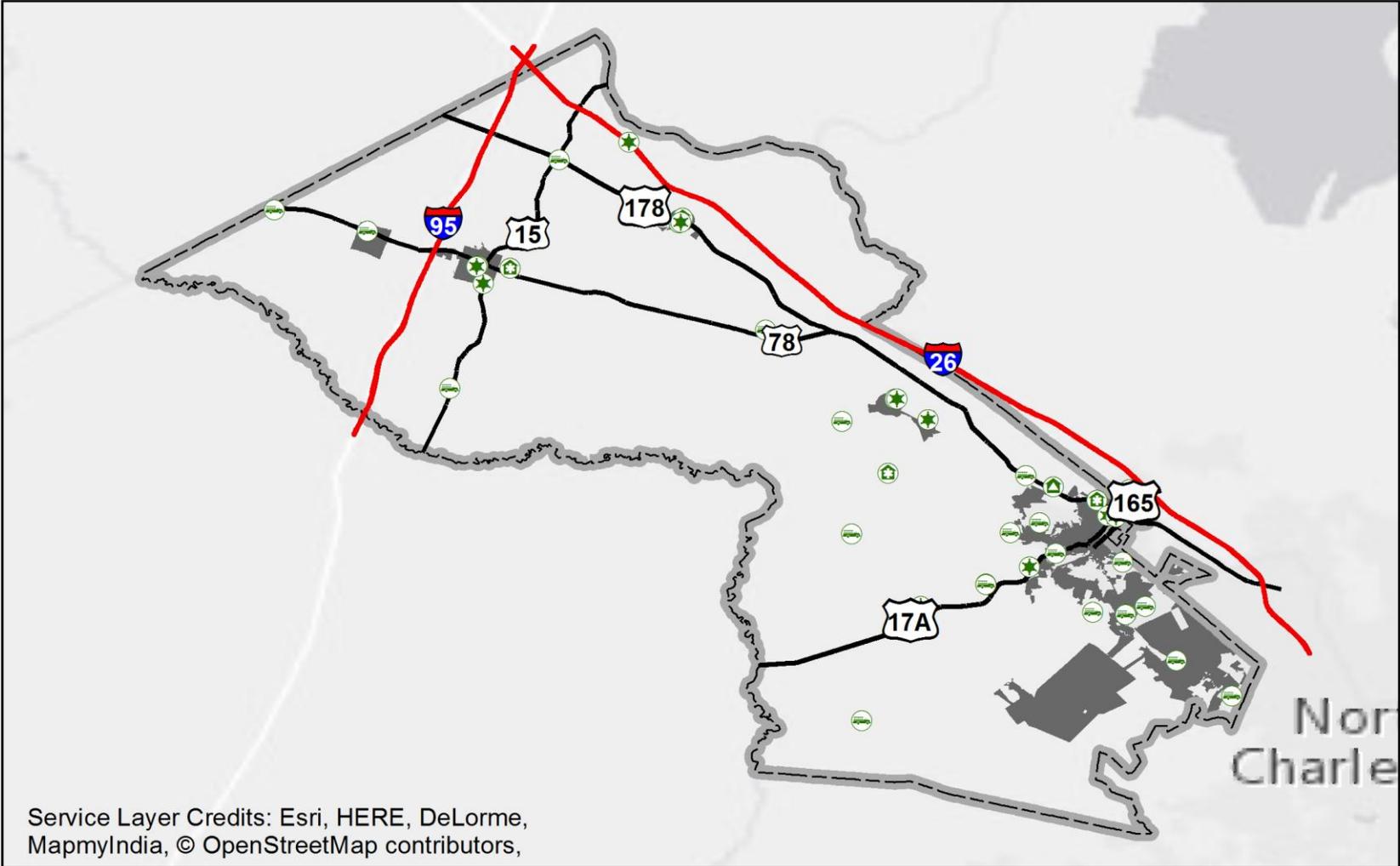
Lower Edisto River Basin Wetlands



Edisto River Basin Project
S.C. Dept. of Natural Resources
Water Resources Division
Columbia, South Carolina



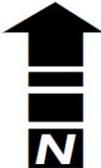
SCDNR/WRD/NRIMA
MS-96-05-02



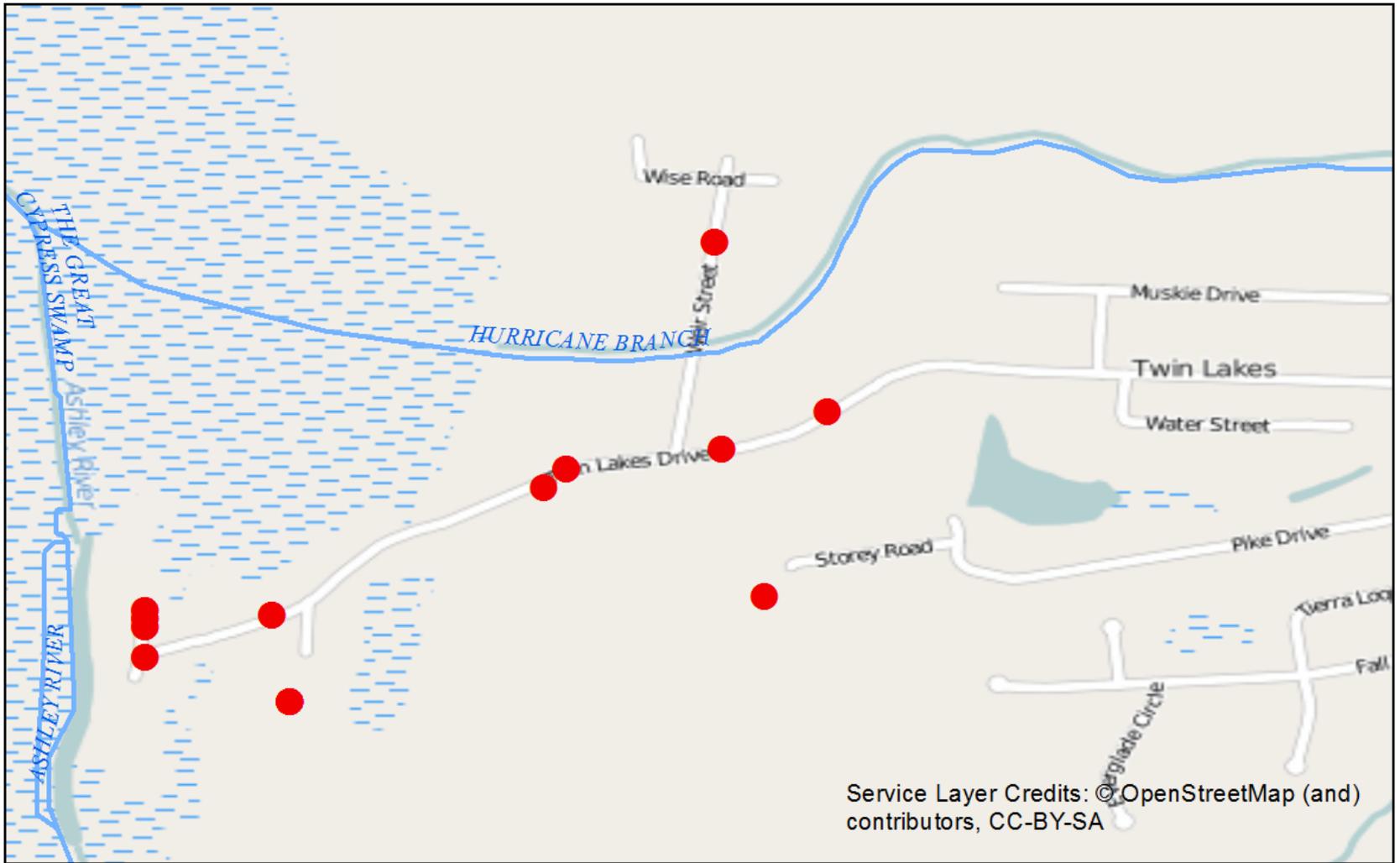
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Public Safety Facilities

-  EOC
-  EMS Station
-  Freeway
-  County Boundary
-  Police Stations
-  Fire Station
-  Highway
-  Municipal Area







Service Layer Credits: © OpenStreetMap (and contributors, CC-BY-SA)



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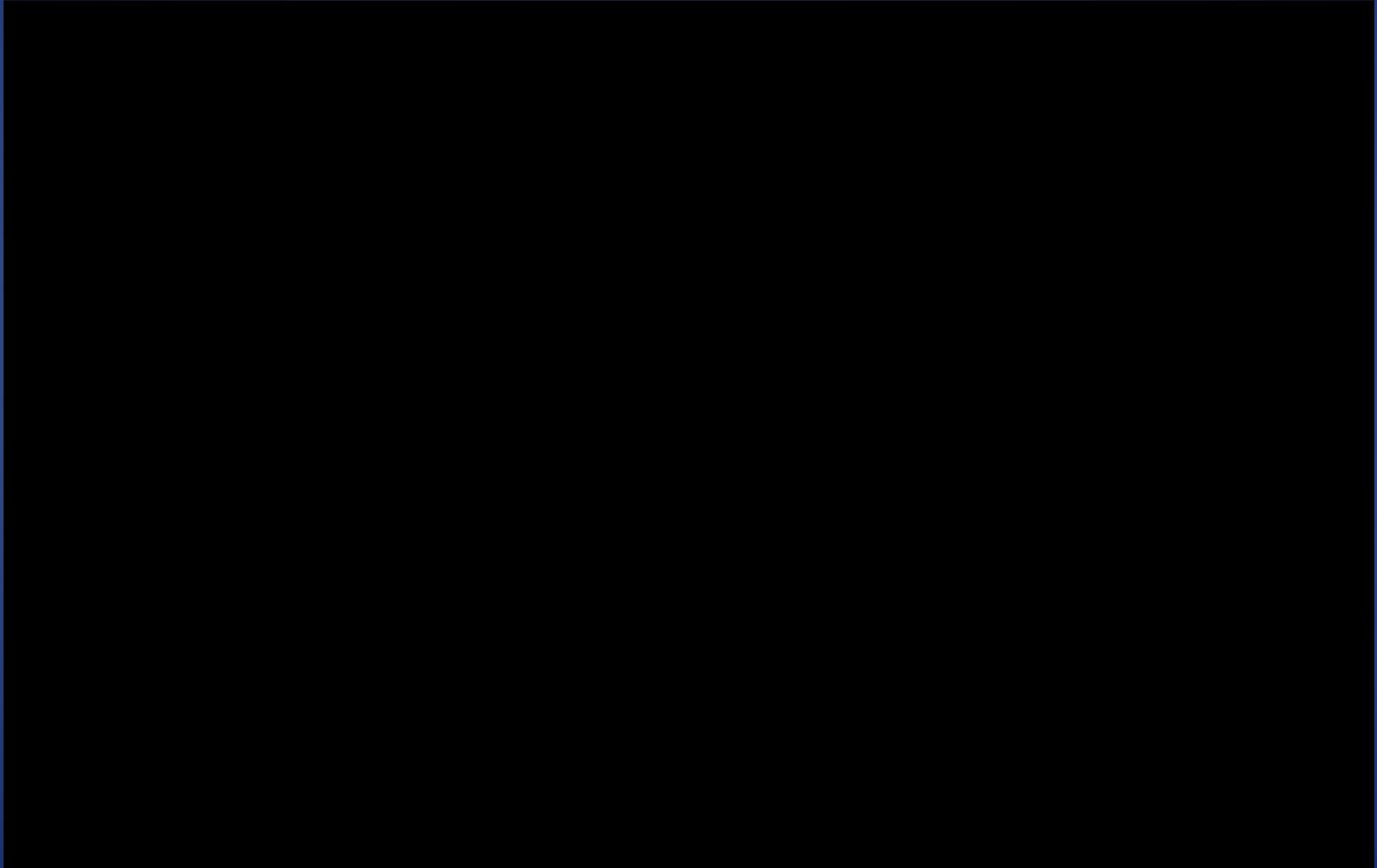
Twin Lakes Area

● Damaged Property
 — Waterlines
 County Boundary





Animal Rescue





Canaan United Methodist



Casket Retrieval



BREAKING
WEATHER ALERT

GRAVESITES DISTURBED

LIVE

MUST SEE VIDEO

ABC11 EYEWITNESS NEWS

CASKET RETRIEVED
Dorchester County, SC







Response Lessons Learned

Challenges

- Water rescue resources
- Movement of supplies
- Roads/bridges closures
- Public obedience
- Limited flood forecast capabilities after rain

Keys to Success

- Situation reports and information sharing
- Leadership involvement
- Dedicated public info team
- Social media
- Next day planning
- Cooperation

IA Stats

Registrations- **4,085**

Total awarded through the Individuals and Households Program (IHP) **\$4,156,187.94**

Housing Assistance (HA) **\$3,545,738.57**

Other Needs Assistance (ONA) **\$610,449.37**

IA Stats Cont.

Over **40%** of Applicants Failed the Income Test for loan repayment (**FIT**)

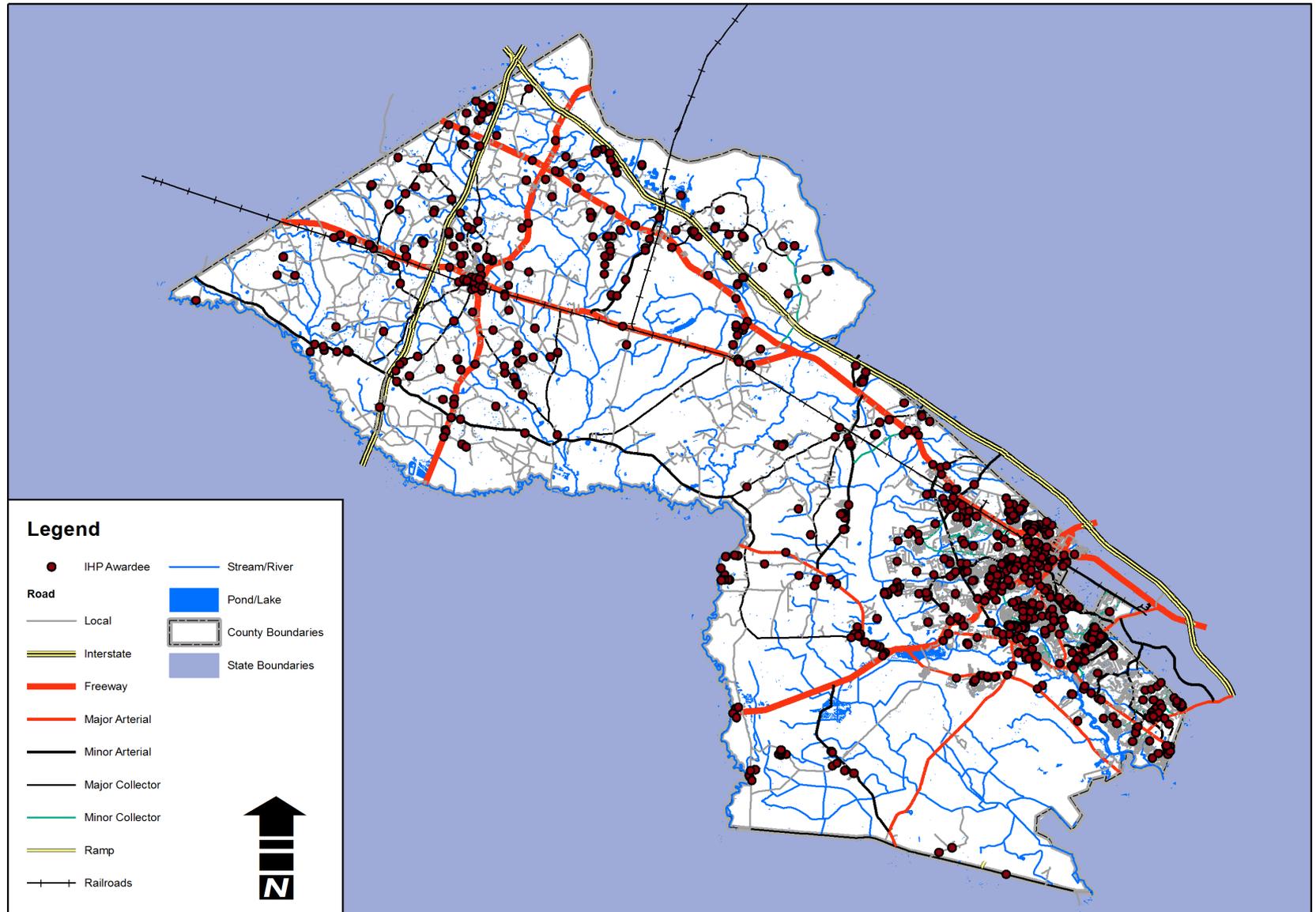
Unmet Need

FEMA Verified Loss – FEMA Grant = Unmet Need

~ **\$2,000,000.00**

1:350,000

IHP Awardee Locations



PA Stats

- Preliminary DA w/ FEMA = \$3.5M
- Latest figures for county = \$3M
- Challenges w/ Cat B worksheets
- Minimal Cat A expenditures
- Vector Control Issues

Short-term Recovery

- Driven by response/rescue data
- VOAD needs assessment
- Local Gov't damage assessment
- FEMA support (DRCs, DSATs)
- County Council Town Hall Meeting

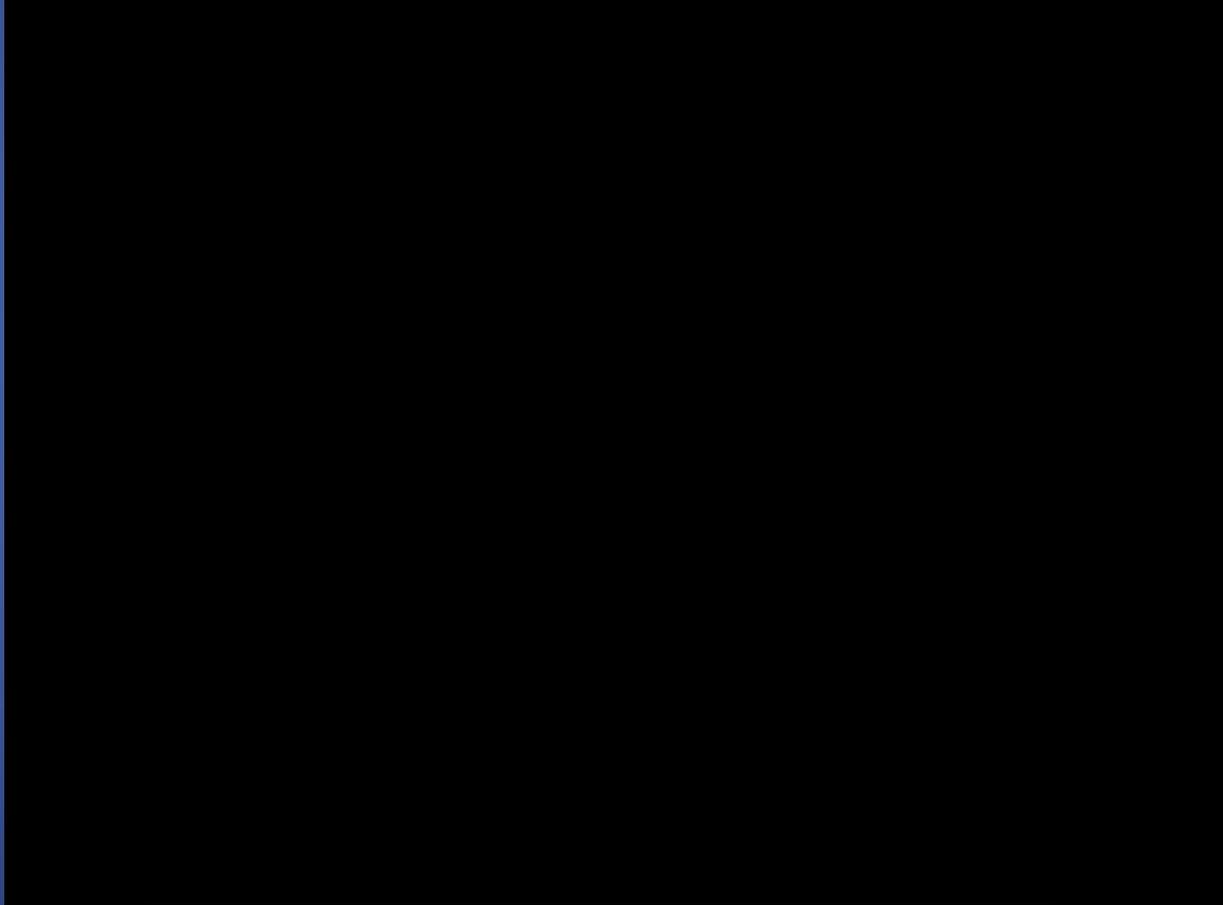
Intermediate

- Minimal impacts to business community
- FEMA assisted w/ temp housing solutions
- FEMA DSAT teams were critical
- Initial DRC issues (from mobile to fixed)
- Substantial Damage Estimates

Long-term

- Regional LTRG formed w/ committees
- State case management contract
- HMGP projects
- EMs have to be patient..

Feel Good Story



2016 SCEMA Volunteer of the Year



Team Dorchester February 2016 IEMC





QUESTIONS?

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